MEMORANDUM

DATE: April 8, 2024

TO: Ryan Howser, PCD-Project Manager

FROM: Charlene Durham, PCD-Engineering
719-520-7951

SUBJECT: SF-23-004 – Saddlehorn Ranch Filing No. 3
Sixth Submittal

Engineering Division
Planning and Community Development (PCD)-Engineering reviews plans and reports to ensure general conformance with El Paso County standards and criteria. The project engineer is responsible for compliance with all applicable criteria, including other governmental regulations. Notwithstanding anything depicted in the plans in words or graphic representation, all design and construction related to roads, storm drainage and erosion control shall conform to the standards and requirements of the most recent version of the relevant adopted El Paso County standards, including the Land Development Code (LDC), the Engineering Criteria Manual (ECM), the Drainage Criteria Manual (DCM), and the Drainage Criteria Manual Volume 2 (DCM2). Any deviations from regulations and standards must be requested, and approved by the ECM Administrator, in writing. Any modifications necessary to meet overlooked criteria after-the-fact will be entirely the developer's responsibility to rectify.

The comments include unresolved previous comments and new comments resulting from the re-submittal in ***bold purple italic***. All previous comments that have been resolved have been noted or deleted. A written response to all comments and redlines is required for review of the re-submittal. Please arrange a meeting between the developer's team and County staff to review and discuss these comments and prepared revisions/responses prior to the next submittal. Additional comments may be generated on items added or revised after the original comments.

General / Letter of Intent/Final Plat

1. Resolved.
2. See Final Plat redlines. See updated/remaining redlines. See PPRBD comments regarding street names. Revise all documents as applicable. ***See updated redlines on Final Plat.*** **JR Response: Redlines addressed**
3. Resolved.

Transportation / Traffic Impact Study (TIS) / Noise Study

1. Resolved.
2. Provide draft escrow agreement(s) and road fee credit agreement request(s). Partially resolved; agreement not received, see redlines on table. ***Partially resolved. See redlines on Road Fee credit agreement and calculations.*** (This will need to be submitted as an RIF EDARP file also.)
   JR Response: Redlines addressed

Final Drainage Report (FDR)

1. See FDR redlines. ***See updated redlines in report.***
   JR Response: Redlines revised.
2. Provide detailed discussion and analysis addressing channel stability as compared to DBPS recommendations or confirm DBPS recommendations. Provide complete hydraulic analysis including shear stresses. Add discussion comparing channel information to the Haegler DPBS (velocity, flow depth, shear stress, etc.) for the channel through the site to the south boundary of Saddlehorn Ranch. *Unresolved.* Unresolved. Partially resolved; Channel calculations have been provided but discussion has not been added to report. ***Partially resolved; see redlines. The areas with supercritical flows and high velocities need to have further stabilization and grade control addressed. If additional, more detailed modeling will clarify where improvements may not be needed, provide that.***
   JR Response: Detail modeling has been provided to show areas that will need protection due to super critical flows and high velocities. These areas have been called out and protection added as necessary. The exact location of the protection have been clarified in the CDs.
3. Resolved.

Construction Plans / Geotechnical Issues / Grading and Erosion Control Plan / SWMP

1. See CD/GEC Plan redlines. ***See updated/remaining redlines.***
   JR Response: Redlines revised.
2. If channel stabilization is needed provide channel improvements CDs. Supercritical flows are of concern. Unresolved**.** ***Partially resolved; see redlines and FDR comments above.***
   JR Response: Redlines revised in channel CDs and FDR.
3. Resolved.
4. Resolved.
5. Submit a revised GEC Plan to match the revised grading shown on the CDs.
   Unresolved; ensure that revisions to channel stabilization are included.
   JR Response: a more detail design for the stabilization has been included with the CDs showing the extents for protection.

Forms / SIA / FAE

1. ***Resolved.***
2. Provide separate easements for County acceptance and maintenance of the culverts, wingwalls and riprap on both sides of San Isidro trail. ***Resolved in the maintenance agreement; provide final exhibits and verify numbering per CAO comments.***
   JR Response: Easements have been added. These exhibits have been added to the maintenance agreement.
3. See attached Engineering Final Submittal Checklist for reference. ***Provide all applicable items highlighted in blue.***
4. Update FAE to 2024 form. ***Resolved; see updated FAE redlines.***
   JR Response: FAE redlines resolved.
5. Update the CDs in the O&M Plan. ***Provide updated O&M when available.***
   JR Response: O&M Provided.
6. ***Provide a deviation request for low culvert cover (ECM Section 3.3.2.I.7 / 4.3.6.3); include culvert profile.***
   JR Response: Culvert in question was constructed with Filing 2.

Attachments/Electronic Redlines

1. Final Plat redlines
2. FDR redlines
3. CD redlines
4. FAE redlines
5. SW Facility Agreement redlines (provide final exhibits - see County Attorney comments)
6. Road Fee Credit Agreement redlines
7. Engineering Final Submittal Checklist

Engineering Final Submittal Checklist	
Check Box	**Item: Report/Form**
☐	Drainage Report (signed)
☒	PBMP Applicability Form
☒	Traffic Impact Study (signed)
☐☐	Grading & Erosion Control Plan **and checklist** (signed)
☐	Street **and Channel** Construction Plans (signed)
☐☐	Deviation Request (signed)
☐	Proof of embankment/pond submittal to State Engineer
☒	ESQCP (signed)
☐	* Financial Assurance Estimate, SIA (signed)
☐	* **Channel,** Pond/BMP Maint. Agreement and Easement (signed)
☐	* Operation & Maintenance Manual
☐	AutoCAD base drawing
☐	~~Pre-Development Site Grading Acknowledgement and Right of Access Form (signed)~~
☐☒	Other: Offsite Easements, Other Permits (FEMA LOMR, USACE, Floodplain…), Conditions of Approval, Street light license agreement, etc. _
Pre-Construction Checklist:	
☐	Driveway/Access Permit (Temporary access permits to be obtained from EPC DPW)
☐	Work Within the ROW Permit (DPW or CDOT)
☐☐	* Stormwater Management Plan (SWMP) **and checklist** Submit to PCD-Inspections 2 weeks prior to precon.
☐	* Colorado Discharge Permit (COR:_____)
☐	* County Construction Activity Permit
☐	* CDPHE APEN – (if over 25 ac. or 6 mos.)
☐	* Financial Surety (Letter of Credit/Bond/Collateral/Check)
☐	Construction Permit Fee: *Major Final Plat (CO and/or PBMPS and/or offsite impvts.)* $_____ **(Verify fees with Inspections Supervisor at time of scheduling)**
☐	Other: Dewatering Pemit,_____

* - required items to obtain an ESQCP

Permit Fee and Collateral must be separate checks

Post Construction Submittal Checklist: (ECM 5.10.6)	
☐	As-Built Drawings
☐	Pond Certification Letter
☐	Acceptance Letter for wet utilities

- ☐ = Need final / signed version
- ☒ = complete, in file
- ☐ = PCD Staff to provide
- ☐ = Undetermined at this time
- ☐ = Need later

SADDLEHORN RANCH FILING NO.3

A PARCEL OF LAND LOCATED IN THE NORTH HALF AND THE SOUTHWEST QUARTER OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF EL PASO, STATE OF COLORADO

KNOW ALL MEN BY THESE PRESENTS

THAT GORILLA CAPITAL CO SADDLEHORN RANCH, LLC, BEING THE OWNER OF THE FOLLOWING TRACT OF LAND:

A PARCEL OF LAND LOCATED IN SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH P.M., COUNTY OF EL PASO, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: THE WEST LINE OF SECTION 3, T3S, R64W, 6TH P.M., MONUMENTED BY A 3-1/4" ALUMINUM CAP STAMPED "PLS 17496" IN A RANGE BOX AT THE NORTHWEST CORNER OF SECTION 3 AND A NO. 6 REBAR IN A RANGE BOX AT THE SOUTHWEST CORNER OF SECTION 3, BEARING N00°32'28"W AS REFERENCED TO COLORADO STATE PLANE CENTRAL ZONE.

COMMENCING AT THE NORTHWEST CORNER OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN;

THENCE S57°37'42"E A DISTANCE OF 93.41 FEET, TO A POINT ON THE SOUTHERLY RIGHT-OF-WAY LINE OF JUDGE ORR ROAD RECORDED UNDER RECEPTION NO. 215008985 IN THE RECORDS OF THE EL PASO COUNTY CLERK AND RECORDER;

THENCE ON SAID SOUTHERLY RIGHT-OF-WAY LINE, THE FOLLOWING TWO (2) COURSES:

1. S89°59'23"E A DISTANCE OF 822.24 FEET;
2. N00°00'39"E A DISTANCE OF 20.00 FEET, TO A POINT ON THE SOUTHERLY RIGHT-OF-WAY OF JUDGE ORR ROAD RECORDED UNDER RECEPTION NO. 215008986;

THENCE ON SAID SOUTHERLY RIGHT-OF-WAY LINE, S89°59'23"E A DISTANCE OF 2,475.34 FEET;

THENCE DEPARTING SAID SOUTHERLY RIGHT-OF-WAY LINE THE FOLLOWING EIGHT (8) COURSES:

1. S00°42'27"E A DISTANCE OF 40.00 FEET;
2. N89°59'23"W A DISTANCE OF 600.05 FEET;
3. S00°42'27"E A DISTANCE OF 1366.43 FEET, TO A POINT OF CURVE;
4. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 710.00 FEET, A CENTRAL ANGLE OF 34°50'03" AND AN ARC LENGTH OF 431.66 FEET, TO A POINT OF NON-TANGENT;
5. S53°01'17"W A DISTANCE OF 50.63 FEET, TO A POINT OF CURVE;
6. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 320.00 FEET, A CENTRAL ANGLE OF 29°21'21" AND AN ARC LENGTH OF 163.95 FEET, TO A POINT OF TANGENT;
7. S23°39'56"W A DISTANCE OF 488.23 FEET, TO A POINT OF CURVE;
8. ON THE ARC OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 3,780.00 FEET, A CENTRAL ANGLE OF 02°54'45" AND AN ARC LENGTH OF 192.15 FEET, TO A POINT ON THE NORTHERLY LINE OF SADDLEHORN FILING NO.2 RECORDED UNDER RECEPTION NO. 223715159, SAID POINT BEING A POINT OF CURVE;

THENCE ON THE NORTHERLY LINES OF SAID SADDLEHORN RANCH FILING NO. 2, THE FOLLOWING THIRTEEN (13) COURSES:

1. ON THE ARC OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 3,780.00 FEET, A CENTRAL ANGLE OF 03°09'58" AND AN ARC LENGTH OF 208.89 FEET, TO A POINT OF TANGENT;
2. S29°44'39"W A DISTANCE OF 495.87 FEET;
3. N60°15'21"W A DISTANCE OF 60.00 FEET;
4. S29°44'39"W A DISTANCE OF 35.38 FEET;
5. N58°07'32"W A DISTANCE OF 223.80 FEET, TO A POINT OF CURVE;
6. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 2,780.00 FEET, A CENTRAL ANGLE OF 13°06'52" AND AN ARC LENGTH OF 636.31 FEET, TO A POINT OF TANGENT;
7. N71°14'24"W A DISTANCE OF 260.86 FEET, TO A POINT OF CURVE;
8. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 780.00 FEET, A CENTRAL ANGLE OF 18°44'59" AND AN ARC LENGTH OF 255.25 FEET, TO A POINT OF TANGENT;
9. N89°59'23"W A DISTANCE OF 303.52 FEET;
10. N00°00'37"E A DISTANCE OF 35.00 FEET;
11. N89°59'23"W A DISTANCE OF 60.00 FEET;
12. S00°00'37"W A DISTANCE OF 35.00 FEET;
13. N89°59'23"W A DISTANCE OF 442.27 FEET, TO A POINT ON THE WEST LINE OF SAID SECTION 3, SAID POINT ALSO BEING THE NORTHWESTERLY CORNER OF SAID SADDLEHORN RANCH FILING NO. 2;

THENCE ON SAID WEST LINE, N00°32'28"W A DISTANCE OF 836.74 FEET, TO A POINT ON THE SOUTHERLY LINE OF CURTIS ROAD RECORDED UNDER RECEPTION NO. 215008985;

THENCE ON THE SOUTHERLY AND EASTERLY RIGHT-OF-WAY LINES OF SAID CURTIS ROAD, THE FOLLOWING FIVE (5) COURSES:

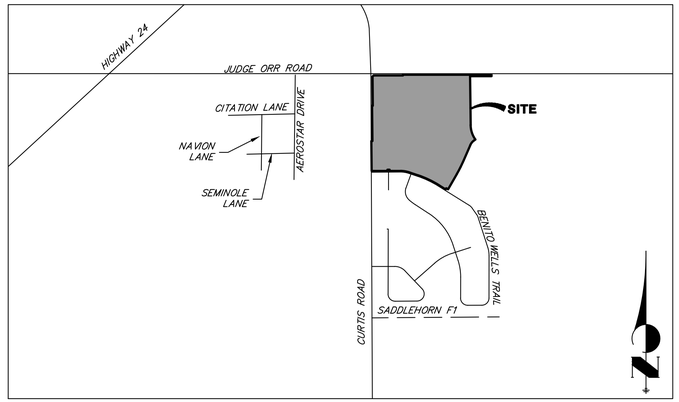
1. N89°33'03"E A DISTANCE OF 30.00 FEET;
2. N00°32'28"W A DISTANCE OF 984.54 FEET;
3. N89°27'33"E A DISTANCE OF 20.00 FEET;
4. N00°32'28"W A DISTANCE OF 820.00 FEET;
5. N44°44'03"E A DISTANCE OF 40.00 FEET, TO THE POINT OF BEGINNING;

CONTAINING A CALCULATED AREA OF 7,665,666 SQUARE FEET OR 175.9795 ACRES.

JR Response
Corrected to be 43 lots.

DEDICATION

THE ABOVE OWNER HAS CAUSED SAID TRACT OF LAND TO BE PLATTED INTO 44 LOTS, STREETS, 1 TRACT, AND EASEMENTS AS SHOWN ON THIS PLAT. THE UNDERSIGNED DOES HEREBY DEDICATE, GRANT AND CONVEY TO EL PASO COUNTY THOSE STREETS AND PUBLIC EASEMENTS AS SHOWN ON THE PLAT; AND FURTHER RESTRICTS THE USE OF ALL PUBLIC EASEMENTS TO EL PASO COUNTY AND/OR ITS ASSIGNS, PROVIDED HOWEVER, THAT THE SOLE RIGHT AND AUTHORITY TO VACATE, RELEASE OR QUIT-CLAIM ALL OR ANY SUCH PUBLIC EASEMENTS SHALL REMAIN EXCLUSIVELY VESTED IN EL PASO COUNTY. ALL PUBLIC STREETS ARE HEREBY DEDICATED TO EL PASO COUNTY FOR PUBLIC USE. THIS TRACT OF LAND AS HEREIN PLATTED SHALL BE KNOWN AS "SADDLEHORN RANCH FILING NO. 3" IN EL PASO COUNTY, COLORADO.



VICINITY MAP
1"=2000'

OWNERS CERTIFICATE

THE UNDERSIGNED, BEING ALL THE OWNERS, MORTGAGEES, BENEFICIARIES OF DEEDS OF TRUST AND HOLDERS OF OTHER INTERESTS IN THE LAND DESCRIBED HEREIN, HAVE LAID OUT, SUBDIVIDED, AND PLATTED SAID LANDS INTO LOTS, TRACTS, STREETS, AND EASEMENTS AS SHOWN HEREON UNDER THE NAME AND SUBDIVISION OF SADDLEHORN RANCH FILING NO. 3. ALL PUBLIC IMPROVEMENTS SO PLATTED ARE HEREBY DEDICATED TO PUBLIC USE AND SAID OWNER DOES HEREBY COVENANT AND AGREE THAT THE PUBLIC IMPROVEMENTS WILL BE CONSTRUCTED TO EL PASO COUNTY STANDARDS AND THAT PROPER DRAINAGE AND EROSION CONTROL FOR SAME WILL BE PROVIDED AT SAID OWNER'S EXPENSE, ALL TO THE SATISFACTION OF THE BOARD OF COUNTY COMMISSIONERS OF EL PASO COUNTY, COLORADO. UPON ACCEPTANCE BY RESOLUTION, ALL PUBLIC IMPROVEMENTS SO DEDICATED WILL BECOME MATTERS OF MAINTENANCE BY EL PASO COUNTY, COLORADO. THE UTILITY EASEMENTS SHOWN HEREON ARE HEREBY DEDICATED FOR PUBLIC UTILITIES AND COMMUNICATION SYSTEMS AND OTHER PURPOSES AS SHOWN HEREON. THE ENTITIES RESPONSIBLE FOR PROVIDING THE SERVICES FOR WHICH THE EASEMENTS ARE ESTABLISHED ARE HEREBY GRANTED THE PERPETUAL RIGHT OF INGRESS AND EGRESS FROM AND TO ADJACENT PROPERTIES FOR INSTALLATION, MAINTENANCE, AND REPLACEMENT OF UTILITY LINES AND RELATED FACILITIES.

_____
GORILLA CAPITAL CO SADDLEHORN RANCH, LLC

BY: _____

STATE OF COLORADO)
)SS.
COUNTY OF _____)

ACKNOWLEDGED BEFORE ME THIS _____ DAY OF _____, 20_____ BY

_____.

MY COMMISSION EXPIRES _____

WITNESS MY HAND AND OFFICIAL SEAL_____
NOTARY PUBLIC

ACCEPTANCE CERTIFICATE FOR TRACTS

THE DEDICATION OF TRACT A IS HEREBY ACCEPTED FOR OWNERSHIP AND MAINTENANCE BY THE SADDLEHORN RANCH METROPOLITAN DISTRICT.

SADDLEHORN RANCH METROPOLITAN DISTRICT

BY: _____
PRESIDENT

STATE OF COLORADO)
)SS.
COUNTY OF _____)

ACKNOWLEDGED BEFORE ME THIS _____ DAY OF _____, 20_____ BY

_____ AS _____.

MY COMMISSION EXPIRES: _____

WITNESS MY HAND AND OFFICIAL SEAL _____
NOTARY PUBLIC

CLERK AND RECORDER

STATE OF COLORADO)
)SS
COUNTY OF EL PASO)

I HEREBY CERTIFY THAT THIS INSTRUMENT WAS FILED FOR RECORD IN MY OFFICE

AT _____ O'CLOCK ____.M., THIS _____ DAY OF _____ , 20____, A.D.

AND IS DULY RECORDED AT RECEPTION NO. _____ OF THE RECORDS OF EL PASO COUNTY, COLORADO.

CHUCK BROERMAN, RECORDER

BY: _____
DEPUTY

GENERAL NOTES:

1. PER C.R.S. 38-51-106, "ALL LINEAL UNITS DEPICTED ON THIS LAND SURVEY PLAT ARE U.S. SURVEY FEET". ONE METER EQUALS 39.37/12 U.S. SURVEY FEET, EXACTLY ACCORDING TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
2. BASIS OF BEARING: THE WEST LINE OF SECTION 3, T3S, R64W, 6TH P.M., MONUMENTED BY A 3-1/4" ALUMINUM CAP STAMPED "PLS 17496" IN A RANGE BOX AT THE NORTHWEST CORNER OF SECTION 3 AND A NO. 6 REBAR IN A RANGE BOX AT THE SOUTHWEST CORNER OF SECTION 3, BEARING N00°32'28"W AS REFERENCED TO COLORADO STATE PLANE CENTRAL ZONE.
3. ALL REFERENCES TO BOOKS, PAGES, MAPS, AND RECEPTION NUMBERS ARE PUBLIC DOCUMENTS ON FILE WITH THE CLERK AND RECORDER OF EL PASO COUNTY, STATE OF COLORADO.
4. THIS SITE IS WITHIN A SPECIAL FLOOD HAZARD AREA "ZONE AE" (SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD), AS DETERMINED BY GRAPHIC INTERPRETATION. FLOODPLAIN INFORMATION WAS OBTAINED FROM F.E.M.A. FLOODPLAIN, AS SHOWN ON THE FLOOD INSURANCE RATE MAP FOR EL PASO COUNTY, COLORADO, MAP NUMBER 08041C0558G, REVISED DATE OF DECEMBER 7, 2018.
5. THIS LAND SURVEY DOES NOT CONSTITUTE A TITLE SEARCH BY JR ENGINEERING, LLC. FOR ALL INFORMATION REGARDING EASEMENTS, RIGHT-OF-WAY OR TITLE OF RECORD, JR ENGINEERING, LLC RELIED UPON TITLE COMMITMENT NO. 83142ECS, AMENDMENT NO. 2, PREPARED BY STEWART TITLE GUARANTY COMPANY COMPANY, DATED JULY 10, 2021, 7:30 A.M.
6. ANY PERSON WHO KNOWINGLY REMOVES, ALTERS OR DEFACES ANY PUBLIC LAND SURVEY MONUMENT OR LAND BOUNDARY MONUMENT OR ACCESSORY COMMITS A CLASS TWO (2) MISDEMEANOR PURSUANT TO C.R.S. § 18-4-508"

(SEE SHEET 2 FOR ADDITIONAL NOTES)

SURVEYORS CERTIFICATE

I DEREK LEE VAGIAS, A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS PLAT TRULY AND CORRECTLY REPRESENTS THE RESULTS OF A SURVEY MADE ON DATE OF SURVEY, BY ME OR UNDER MY DIRECT SUPERVISION AND THAT ALL MONUMENTS EXIST AS SHOWN HEREON; THAT MATHEMATICAL CLOSURE ERRORS ARE LESS THAN 1:10,000 ; AND THAT SAID PLAT HAS BEEN PREPARED IN FULL COMPLIANCE WITH ALL APPLICABLE LAWS OF THE STATE OF COLORADO DEALING WITH MONUMENTS, SUBDIVISION, OR SURVEYING OF LAND AND ALL APPLICABLE PROVISIONS OF THE EL PASO COUNTY LAND DEVELOPMENT CODE.

I ATTEST THE ABOVE ON THIS ____ DAY OF _____, 20_____,

_____
DEREK LEE VAGIAS, DATE
COLORADO REGISTERED PLS #38578
FOR AND ON BEHALF OF JR ENGINEERING, LLC

PLANNING AND COMMUNITY DEVELOPMENT DIRECTOR CERTIFICATE

THIS PLAT FOR SADDLEHORN RANCH FILING NO. 3 WAS APPROVED FOR FILING BY THE EL PASO COUNTY, COLORADO PLANNING AND COMMUNITY DEVELOPMENT DEPARTMENT DIRECTOR ON THE _____ DAY OF _____, 20_____, SUBJECT TO ANY NOTES OR CONDITIONS SPECIFIED HEREON.

_____
PLANNING AND COMMUNITY DEVELOPMENT DIRECTOR

CONTACTS:

OWNER	GORILLA CAPITAL, LLC 1342 HIGH STREET EUGENE, OR 97401 P~541-393-9043
DEVELOPER	ROI PROPERTY GROUP, LLC 2495 RIGDON STREET NAPA, CALIFORNIA 94558 P~707-633-9700
ENGINEER	JR ENGINEERING, LLC ATTN: BRYAN LAW 5475 TECH CENTER DRIVE, SUITE 235 COLORADO SPRINGS, CO 80919 P~(303) 267-6254
SURVEYOR	JR ENGINEERING, LLC ATTN: DEREK VAGIAS 7200 S ALTON WAY, C400, CENTENNIAL, CO 80112 P~(303) 740-9393

FEES:

RECORDING: _____
PARK: _____
SCHOOL: _____
DRAINAGE: _____
BRIDGE: _____

NO.	REVISION	BY	DATE
5	REV#4-COUNTY COMMENTS	BTO	2/7/2024
4	REV#3-COUNTY COMMENTS	BTO	11/17/2023
3	REV#2-COUNTY COMMENTS	DV	7/19/2023
2	REV#1-COUNTY COMMENTS	BTO	4/24/2023
1	INITIAL SUBMITTAL	BTO	11/29/2022

JOB NO. 25142.05
JULY 19, 2023
SHEET 1 OF 5

PCD FILE: SF-23-004

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

SADDLEHORN RANCH FILING NO.3

A PARCEL OF LAND LOCATED IN THE NORTH HALF AND THE SOUTHWEST QUARTER OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF EL PASO, STATE OF COLORADO

GENERAL NOTES CONTINUED:

7. TRACT A IS FOR OPEN SPACE AND DRAINAGE PURPOSES. TRACT A SHALL BE OWNED AND MAINTAINED BY THE SADDLEHORN RANCH METROPOLITAN DISTRICT. THIS PROPERTY IS SUBJECT TO A PRIVATE DRAINAGE FACILITY MAINTENANCE AGREEMENT AND EASEMENT AS RECORDED AT RECEPTION NO. _____ OF THE RECORDS OF EL PASO COUNTY. THE SADDLEHORN METROPOLITAN DISTRICT IS RESPONSIBLE FOR MAINTENANCE OF THE SUBJECT DRAINAGE FACILITIES. EL PASO COUNTY OWNS AND IS RESPONSIBLE FOR MAINTENANCE OF THE BOX CULVERT, WINGWALLS, ENERGY DISSIPATION, AND ACCESS ROAD LOCATED AT THE CROSSING WITH SAN ISIDRO TRAIL.

8. THE ADDRESSES EXHIBITED ON THIS PLAT ARE FOR INFORMATIONAL PURPOSES ONLY. THEY ARE NOT THE LEGAL DESCRIPTION AND ARE SUBJECT TO CHANGE.

9. ALL PROPERTY OWNERS ARE RESPONSIBLE FOR MAINTAINING PROPER STORM WATER DRAINAGE IN AND THROUGH THEIR PROPERTY. PUBLIC DRAINAGE EASEMENTS SHALL BE MAINTAINED BY THE INDIVIDUAL LOT OWNERS UNLESS OTHERWISE INDICATED. STRUCTURES, FENCES, MATERIALS OR LANDSCAPING THAT COULD IMPEDE THE FLOW OR RUNOFF SHALL NOT BE PLACED IN THE DRAINAGE EASEMENTS.

10. WATER SERVICE SHALL BE SUPPLIED BY SADDLEHORN RANCH METROPOLITAN DISTRICT.

11. SEWAGE TREATMENT IS THE RESPONSIBILITY OF EACH INDIVIDUAL PROPERTY OWNER. THE EL PASO COUNTY HEALTH DEPARTMENT MUST APPROVE EACH SYSTEM AND IN SOME CASES THE DEPARTMENT MAY REQUIRE AN ENGINEER DESIGNED SYSTEM PRIOR TO PERMIT APPROVAL.

12. IMPERVIOUS LOT COVERAGE IS RESTRICTED TO NO MORE THAN 10,900 SQUARE FEET PER LOT TO CONFORM WITH THE EL PASO COUNTY'S MS4 STORM WATER DISCHARGE PERMIT.

13. UNLESS SHOWN OTHERWISE, ALL SIDE, FRONT AND REAR LOT LINES ARE HEREBY PLATTED WITH A 10 FOOT WIDE PUBLIC UTILITY AND DRAINAGE EASEMENT. ALL EXTERIOR SUBDIVISION BOUNDARIES ARE HEREBY PLATTED WITH A 20 FOOT WIDE PUBLIC UTILITY AND DRAINAGE EASEMENT. THE SOLE RESPONSIBILITY FOR MAINTENANCE OF THESE EASEMENTS IS HEREBY VESTED WITH THE INDIVIDUAL PROPERTY OWNERS.

14. THE FOLLOWING REPORTS HAVE BEEN SUBMITTED IN ASSOCIATION WITH THE PRELIMINARY PLAN OR FINAL PLAT FOR THIS SUBDIVISION AND ARE ON FILE AT THE COUNTY PLANNING AND COMMUNITY DEVELOPMENT DEPARTMENT: TRANSPORTATION IMPACT STUDY; DRAINAGE REPORT; WATER RESOURCES REPORT; WASTEWATER DISPOSAL REPORT, GEOLOGY AND SOILS REPORT; FIRE PROTECTION REPORT, WILDFIRE HAZARDS REPORT; NATURAL FEATURES REPORT.

15. DEVELOPER SHALL COMPLY WITH FEDERAL AND STATE LAWS, REGULATION, ORDINANCES, REVIEW AND PERMIT REQUIREMENTS, AND OTHER AGENCY REQUIREMENT, IF ANY, OF APPLICABLE AGENCIES INCLUDING, BUT NOT LIMITED TO, THE COLORADO DEPARTMENT OF PARKS AND WILDLIFE, COLORADO DEPARTMENT OF TRANSPORTATION, U.S. ARMY CORPS OF ENGINEERS, AND THE U.S. FISH & WILDLIFE SERVICE REGARDING THE ENDANGERED SPECIES ACT, PARTICULARLY AS IT RELATES TO THE LISTED SPECIES (E.G., PREBLES MEADOW JUMPING MOUSE).

16. NO LOT OR INTEREST THEREIN, SHALL BE SOLD, CONVEYED, OR TRANSFERRED WHETHER BY DEED OR BY CONTRACT, NOR SHALL BUILDING PERMITS BE ISSUED, UNTIL AND UNLESS EITHER THE REQUIRED PUBLIC AND COMMON DEVELOPMENT IMPROVEMENTS HAVE BEEN CONSTRUCTED AND PRELIMINARILY ACCEPTED IN ACCORDANCE WITH THE SUBDIVISION IMPROVEMENTS AGREEMENT BETWEEN THE APPLICANT/OWNER AND EL PASO COUNTY AS RECORDED UNDER RECEPTION NO. _____ IN THE OFFICE OF THE CLERK AND RECORDER OF EL PASO COUNTY, COLORADO OR, IN THE ALTERNATIVE, OTHER COLLATERAL IS PROVIDED TO MAKE PROVISION FOR THE COMPLETION OF SAID IMPROVEMENTS IN ACCORDANCE WITH THE EL PASO LAND DEVELOPMENT CODE AND ENGINEERING CRITERIA MANUAL. ANY SUCH ALTERNATIVE COLLATERAL MUST BE APPROVED BY THE BOARD OF COUNTY COMMISSIONERS OR , IF PERMITTED BY THE SUBDIVISION IMPROVEMENTS AGREEMENT, BY THE DEVELOPMENT SERVICES DEPARTMENT DIRECTOR AND MEET THE POLICY AND PROCEDURE REQUIREMENTS OF EL PASO COUNTY PRIOR TO THE RELEASE BY THE COUNTY OF ANY LOTS FOR SALE, CONVEYANCE OR TRANSFER. THIS PLAT RESTRICTION MAY BE REMOVED OR RESCINDED BY THE BOARD OF COUNTY COMMISSIONERS OR, IF PERMITTED BY THE SUBDIVISION IMPROVEMENTS AGREEMENT, BY THE PLANNING AND COMMUNITY DEVELOPMENT DEPARTMENT DIRECTOR UPON EITHER APPROVAL OF AN ALTERNATIVE FORM OF COLLATERAL OR COMPLETION AND PRELIMINARY ACCEPTANCE BY THE EL PASO BOARD OF COUNTY COMMISSIONERS OF ALL IMPROVEMENT REQUIRED TO BE CONSTRUCTED AND COMPLETED IN ACCORDANCE WITH SAID SUBDIVISION IMPROVEMENTS AGREEMENT. THE PARTIAL RELEASE OF LOTS FOR SALE, CONVEYANCE OR TRANSFER MAY ONLY BE GRANTED IN ACCORDANCE WITH ANY PLANNED PARTIAL RELEASE OF LOTS AUTHORIZED BY THE SUBDIVISION IMPROVEMENTS AGREEMENT.

17. A DRIVEWAY PERMIT IS REQUIRED TO BE APPLIED FOR AND APPROVED BY EL PASO COUNTY PLANNING AND COMMUNITY DEVELOPMENT DEPARTMENT PRIOR TO THE ESTABLISHMENT OF ANY DRIVEWAY. INDIVIDUAL LOT PURCHASERS ARE RESPONSIBLE FOR CONSTRUCTING DRIVEWAYS, INCLUDING DRAINAGE CULVERTS FROM ESTACADO PLACE, VAQUERO COURT, BARROSITO TRAIL, DEL CAMBRE TRAIL, CARRIZO SPRINGS ROAD, BADITO PLACE, COCHITI PLACE, AND SAND ISIDRO TRAIL PER LAND DEVELOPMENT CODE SECTION 6.3.3.C.2 AND 6.3.3.C3. DUE TO THEIR LENGTH, SOME OF THE DRIVEWAYS WILL NEED TO BE SPECIFICALLY APPROVED BY THE FALCON FIRE PROTECTION DISTRICT.

18. THERE SHALL BE NO DIRECT LOT ACCESS TO CURTIS ROAD OR JUDGE ORR ROAD.

19. THE FOLLOWING LOTS (1–8, 10, 11, 23–25, 28–33, 38) HAVE BEEN FOUND TO BE IMPACTED BY GEOLOGIC HAZARDS (SHALLOW GROUNDWATER). MITIGATION MEASURES AND A MAP OF OTHER HAZARDS CAN BE FOUND IN THE "SOIL, GEOLOGY, AND GEOLOGIC HAZARD STUDY SADDLEHORN FILING NO. 3"PREPARED BY ENTECH ENGINEERING DATED MAY 17, 2023 FOR SADDLEHORN RANCH FILING NO. 3 FILE # SF–23–004 AVAILABLE AT THE EL PASO COUNTY PLANNING AND COMMUNITY DEVELOPMENT DEPARTMENT. SITE SPECIFIC INVESTIGATION INCLUDING GROUNDWATER MONITORING/OBSERVATION ON EVERY LOT WITHIN FILING NO 3 IS REQUIRED TO DETERMINE SOILS CONDITIONS AND DETERMINE DEPTHS TO WATER AND FLUCTUATIONS IN GROUNDWATER LEVELS. THE LOWEST FLOOR LEVELS SHOULD BE CONSTRUCTED A MINIMUM OF 3 FEET ABOVE GROUNDWATER LEVELS.

    OTHER HAZARDS INCLUDE:

    - HYDROCOMPACTION: CENTRAL PORTION OF FILING 3
    - LOOSE OR COLLAPSIBLE SOILS: CENTRAL PORTION OF FILING 3
    - FLOODPLAIN AND DRAINAGE AREAS: TRACT A OF FILING 3

20. THIS SUBDIVISION IS SURROUNDED BY AGRICULTURAL LAND. PROPERTY OWNERS MAY BE IMPACTED BY SOUNDS, SMELLS AND/OR ACTIVITIES ASSOCIATED WITH ACTIVE AGRICULTURAL PRACTICES. PURSUANT TO ARTICLE 3.5, TITLE 35, C.R.S., IT IS THE DECLARED POLICY OF THE STATE OF COLORADO TO CONSERVE, PROTECT, AND ENCOURAGE THE DEVELOPMENT AND IMPROVEMENT OF ITS AGRICULTURAL LAND FOR THE PRODUCTION OF FOOD AND OTHER AGRICULTURAL PRODUCTS. COLORADO IS A "RIGHT–TO–FARM" STATE PURSUANT TO C.R.S. 35–3.5–101, ET SEQ. LANDOWNERS, RESIDENTS AND VISITORS MUST BE PREPARED TO ACCEPT THE ACTIVITIES, SIGHTS, SOUNDS, AND SMELLS OF AGRICULTURAL OPERATIONS AS A NORMAL AND NECESSARY IMPACT OF LIVING IN A COUNTY WITH A STRONG RURAL CHARACTER AND A HEALTHY AGRICULTURAL SECTOR. STATE LAW PROVIDES THAT RANCHING, FARMING, OR OTHER AGRICULTURAL ACTIVITIES AND OPERATIONS SHALL NOT BE CONSIDERED TO BE NUISANCES SO LONG AS OPERATED IN CONFORMANCE WITH THE LAW AND IN A NON–NEGLIGENT MANNER. THEREFORE, ALL MUST BE PREPARED TO ENCOUNTER NOISES, ODORS, LIGHTS, MUD, DUST, SMOKE, CHEMICALS, MACHINERY ON PUBLIC ROADS, LIVESTOCK ON PUBLIC ROADS, STORAGE AND DISPOSAL OF MANURE, AND THE APPLICATION BY SPRAYING OR OTHERWISE OF CHEMICAL FERTILIZERS, SOIL AMENDMENTS, HERBICIDES, AND PESTICIDES, AND ONE OR MORE OF WHICH MAY NATURALLY OCCUR AS A PART OF LEGAL AND NON–NEGLIGENT AGRICULTURAL OPERATIONS.

21. MAILBOXES SHALL BE INSTALLED IN ACCORDANCE WITH ALL EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS AND UNITED STATES POSTAL SERVICE REGULATIONS.

22. THE SUBDIVIDER AGREES ON BEHALF OF HIM/HERSELF AND ANY DEVELOPER OR BUILDER SUCCESSORS AND ASSIGNEES THAT SUBDIVIDER AND/OR SAID SUCCESSORS AND ASSIGNS SHALL BE REQUIRED TO PAY TRAFFIC IMPACT FEES IN ACCORDANCE WITH THE EL PASO COUNTY ROAD IMPACT FEE PROGRAM RESOLUTION (RESOLUTION NO. 19–471), OR ANY AMENDMENTS THERETO, AT OR PRIOR TO THE TIME OF BUILDING PERMIT SUBMITTALS.

23. THIS PROPERTY IS INCLUDED WITHIN A SPECIAL TAXING DISTRICT, SADDLEHORN RANCH METROPOLITAN DISTRICT, CREATED OF THE PURPOSE OF CONSTRUCTING AND MAINTAINING CERTAIN PUBLIC IMPROVEMENTS, DRAINAGE AND RECREATION IMPROVEMENTS. SPECIAL TAXING DISTRICTS ARE SUBJECT TO GENERAL OBLIGATION INDEBTEDNESS THAT IS PAID BY REVENUES PRODUCED FROM ANNUAL TAX LEVIES ON THE TAXABLE PROPERTY WITHIN SUCH DISTRICTS. THE BUYER SHOULD FAMILIARIZE HIMSELF / HERSELF WITH THE POTENTIALITY AND RAMIFICATIONS THEREOF.

24. WATER IN THE DENVER BASIN AQUIFERS IS ALLOCATED BASED ON A 100 YEAR AQUIFER LIFE; HOWEVER, FOR EL PASO COUNTY PLANNING PURPOSES, WATER IN THE DENVER BASIN AQUIFERS IS EVALUATED BASED ON A 300 YEAR AQUIFER LIFE. APPLICANT AND ALL FUTURE OWNERS IN THE SUBDIVISION SHOULD BE AWARE THAT THE ECONOMIC LIFE OF A WATER SUPPLY BASED ON WELLS IN A GIVEN DENVER BASIN AQUIFER MAY BE LESS THAN EITHER THE 100 YEARS OR 300 YEARS USED FOR ALLOCATION INDICATED DUE TO ANTICIPATED WATER LEVEL DECLINES. FURTHERMORE, THE WATER SUPPLY PLAN SHOULD NOT RELY SOLELY UPON NON–RENEWABLE AQUIFERS. ALTERNATIVE RENEWABLE WATER RESOURCES SHOULD BE ACQUIRED AND INCORPORATED IN A PERMANENT WATER SUPPLY PLAN THAT PROVIDES FUTURE GENERATIONS WITH A WATER SUPPLY.

25. THIS PROPERTY IS PRESENTLY LOCATED IN THE VICINITY OF AN AIRPORT, WITHIN WHAT IS KNOWN AS AN AIRPORT INFLUENCE AREA. FOR THIS REASON, THE PROPERTY MAY BE SUBJECT TO SOME OF THE ANNOYANCES OR INCONVENIENCES ASSOCIATED WITH PROXIMITY TO AIRPORT OPERATIONS (E.G. NOISE, VIBRATION, OR ODORS), INDIVIDUAL SENSITIVITIES TO THOSE ANNOYANCES CAN VARY FROM PERSON TO PERSON. YOU MAY WISH TO CONSIDER WHAT AIRPORT ANNOYANCES, IF ANY, ARE ASSOCIATED WITH THE PROPERTY BEFORE YOU COMPLETE YOUR PURCHASE AND DETERMINE WHETHER THEY ARE ACCEPTABLE TO YOU.

OWNERSHIP & MAINTENANCE TABLE

TRACT	AREA (SF)	AREA (AC)	USE	OWNER	MAINTENANCE
A	1,688,662	38.7663	OPEN SPACE, DRAINAGE	SADDLEHORN RANCH METROPOLITAN DISTRICT	SADDLEHORN RANCH METROPOLITAN DISTRICT
TOTAL TRACT AREA	1,688,662	38.7663			
TOTAL ROW AREA	811,791	18.6362			
TOTAL LOT AREA(43 LOTS)	5,165,213	118.5770	(NET AREA)		
TOTAL SITE AREA	7,665,666	175.9795	(GROSS AREA)		
GROSS DENSITY	0.244 DU/AC		DU=DWELLING UNIT		
NET DENSITY	0.363 DU/AC				

NO.	REVISION	BY	DATE
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2	REV#1–COUNTY COMMENTS	BTO	4/24/2023
1	INITIAL SUBMITTAL	BTO	11/29/2022

JOB NO. 25142.05
JULY 19, 2023
SHEET 2 OF 5

J·R ENGINEERING
A Westrian Company

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Fort Collins 970–491–9888 • www.jrengineering.com

SADDLEHORN RANCH FILING NO.3

A PARCEL OF LAND LOCATED IN THE NORTH HALF AND THE SOUTHWEST QUARTER OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF EL PASO, STATE OF COLORADO

POINT OF COMMENCEMENT
NW COR SEC 3, T13S, R64W, 6TH P.M.
NO. 6 REBAR WITH A 3-1/4" ALUMINUM CAP
STAMPED: PLS 17496 1992
IN RANGE BOX

POINT OF BEGINNING

S57°37'42"E 93.41'

NORTH LINE SEC. 3, T13S, R64W
S89°59'23"E 5275.26'

S89°59'23"E 2475.34'

JUDGE ORR ROAD

N89°59'23"W 600.05'

SEE MATCH LINE A

NE CORNER SECTION 3
T13S, R64W, 6TH PM
3.25" ALUMINUM CAP
STAMPED: LS 17496 1992
IN A RANGE BOX

MATCH LINE A

S89°59'23"E 2475.34'
630.05'
S00°42'27"E 40.00'
N89°59'23"W 600.05'

20' R.O.W. DEDICATION REC. NO. 215008985

30' R.O.W. DEDICATION REC. NO. 215008986

20' R.O.W. DEDICATION REC. NO. 215008985

90' PUBLIC UTILITY EASEMENT REC. NO. 205184675

30' R.O.W. DEDICATION REC. NO. 215008986

BASIS OF BEARING
WEST LINE SEC. 3, T13S, R64W
S00°32'28"E 5307.26'

SW COR SEC 3, T13S, R64W, 6TH P.M.
NO. 6 REBAR
IN RANGE BOX

N00°32'28"W 820.00'

N00°32'28"W 984.54'

S00°32'28"E 2650.12'

N44°14'03"E 40.00'

N89°27'33"E 20.00'

S89°27'32"W 307.54'

N89°59'23"W 1227.32'

S89°59'23"E 822.24'

N00°00'39"E 20.00'

428.86'

1416.43'

N89°59'23"W 1356.93'

630.05'

580.74'

646.58'

436.99'

494.90'

425.04'

RIGHT-OF-WAY TO BE DEDICATED BY THIS PLAT

delete "to be"

10' UTILITY & DRAINAGE EASEMENT

25' UTILITY & DRAINAGE EASEMENT

SIGN EASEMENT SEE DETAIL C ON SHEET 5

EXTENDED SETBACK LINE

JR Response
Comment addressed as requested.

JR Response
Missing label added.

is dimension label missing?

ROCOSO TRAIL
60' PUBLIC R.O.W.

BARROSETTO TRAIL
60' PUBLIC R.O.W.

DEL CAMBRE TRAIL
60' PUBLIC R.O.W.

CARRIZO SPRINGS ROAD
60' PUBLIC R.O.W.

CURTIS ROAD

ASSUMED 30' PRESCRIPTIVE R.O.W.

18' R.O.W. PRESERVATION LINE

22' RIGHT-OF-WAY TO BE DEDICATED BY THIS PLAT

42' RIGHT-OF-WAY TO BE DEDICATED BY THIS PLAT

UTILITY & DRAINAGE EASEMENT SEE DETAIL A ON THIS SHEET

10' UTILITY & DRAINAGE EASEMENT

30' WATERLINE EASEMENT

TRACT A
1,688,662 SF
38.7663 AC

35	109,237 SF	2.5077 AC
36	110,132 SF	2.5283 AC
37	134,259 SF	3.0822 AC
38	219,223 SF	5.0327 AC
39	119,085 SF	2.7338 AC
40	110,086 SF	2.5272 AC
42	108,972 SF	2.5017 AC
43	134,259 SF	3.0822 AC
34	108,941 SF	2.5010 AC
33	110,627 SF	2.5396 AC
26	113,772 SF	2.6119 AC
27		
28	109,108 SF	2.5048 AC
29	109,069 SF	2.5039 AC
30	137,376 SF	3.1537 AC
32	142,224 SF	3.2650 AC
31	114,826 SF	2.6360 AC
19	108,992 SF	2.5021 AC
18	122,174 SF	2.8047 AC
17	133,326 SF	3.0607 AC
20	141,128 SF	3.2399 AC
25	111,821 SF	2.5670 AC
24	123,968 SF	2.8459 AC
23	110,049 SF	2.5264 AC
21	125,866 SF	2.8895 AC
22	163,058 SF	3.7433 AC
16		

DETAIL A

50 25 0 50
ORIGINAL SCALE: 1" = 50'

100 50 0 100
ORIGINAL SCALE: 1" = 100'

SHEET 4

SHEET 5

* UNPLATTED
NOT A PART OF THIS SUBDIVISION

LEGEND

○	SET 18" LONG #5 REBAR WITH A 1.5" ALUMINUM CAP STAMPED "JR ENG LS 38578"
▲	RECOVERED 1.5" ALUMINUM CAP STAMPED "JR ENG LS 38578"
S.F.	SQUARE FEET
(R)	RADIAL BEARING
(####)	ADDRESS NUMBER
*	NOT A PART OF THIS SUBDIVISION
	PROPOSED SUBDIVISION BOUNDARY
	PROPOSED LOT LINE
	PROPOSED RIGHT-OF-WAY LINE
	PROPOSED CENTERLINE
	PROPOSED EASEMENT
	EXISTING RIGHT-OF-WAY
	EXISTING PROPERTY LINE
	EXISTING CENTERLINE
100YR 6698	100 YEAR FLOODPLAIN
	FEMA FIRM BASE FLOOD ELEVATION
	GEOLOGIC HAZARD AREA

SEE SHEET 5 FOR LINE AND CURVE TABLE

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JOB NO. 25142.05
JULY 19, 2023
SHEET 3 OF 5

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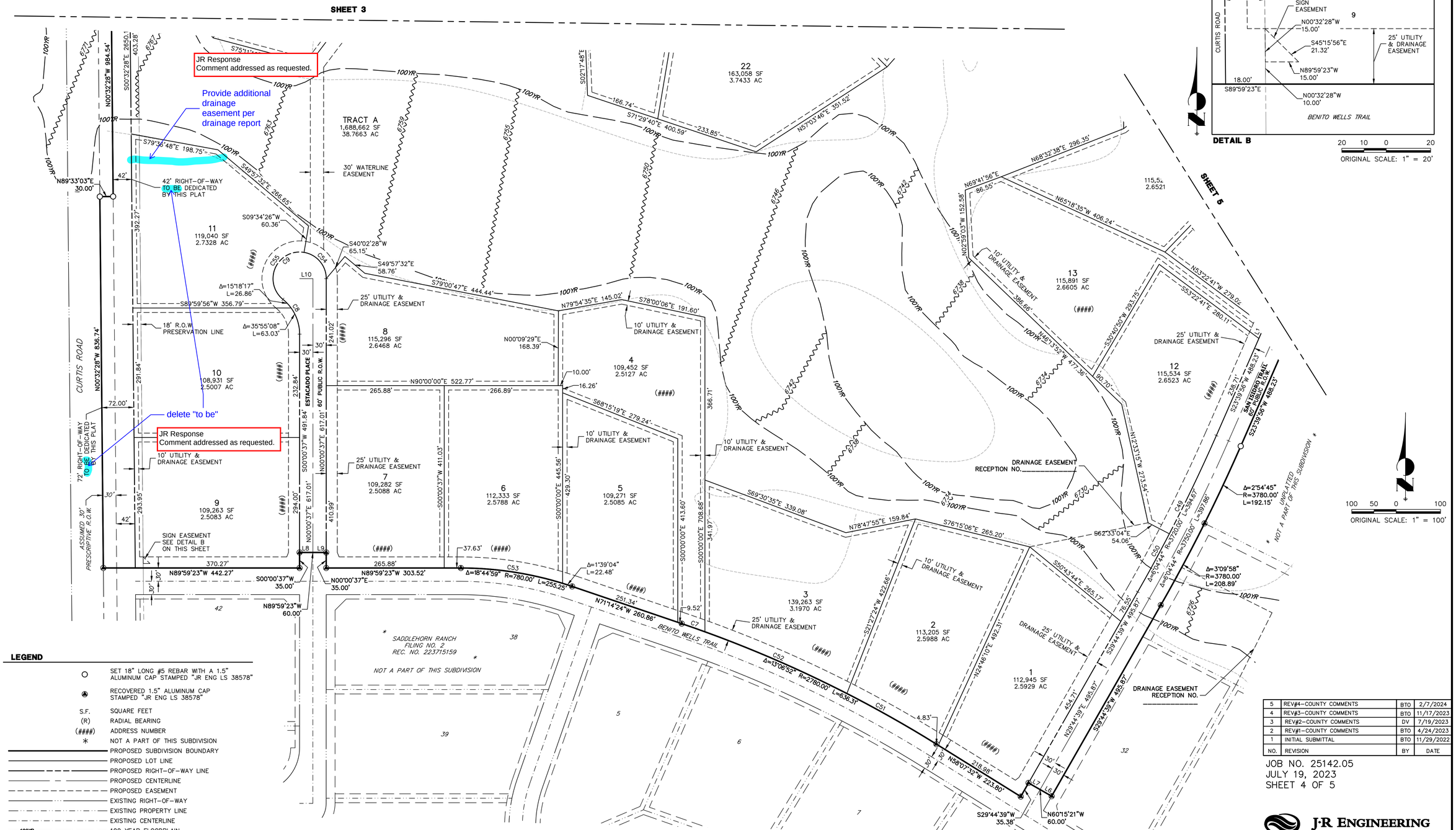
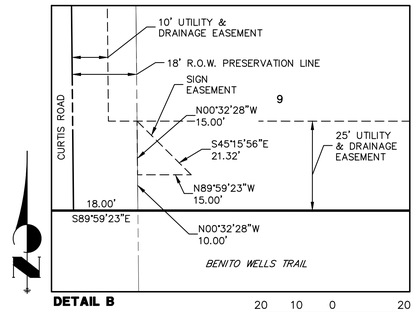
SADDLEHORN RANCH FILING NO.3

A PARCEL OF LAND LOCATED IN THE NORTH HALF AND THE SOUTHWEST QUARTER OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF EL PASO, STATE OF COLORADO





LEGEND

○	SET 18" LONG #5 REBAR WITH A 1.5" ALUMINUM CAP STAMPED "JR ENG LS 38578"
▲	RECOVERED 1.5" ALUMINUM CAP STAMPED "JR ENG LS 38578"
S.F.	SQUARE FEET
(R)	RADIAL BEARING
(####)	ADDRESS NUMBER
*	NOT A PART OF THIS SUBDIVISION
	PROPOSED SUBDIVISION BOUNDARY
	PROPOSED LOT LINE
	PROPOSED RIGHT-OF-WAY LINE
	PROPOSED CENTERLINE
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	EXISTING RIGHT-OF-WAY
	EXISTING PROPERTY LINE
	EXISTING CENTERLINE
100YR 6698	100 YEAR FLOODPLAIN
	FEMA FIRM BASE FLOOD ELEVATION
	GEOLOGIC HAZARD AREA

SEE SHEET 5 FOR LINE AND CURVE TABLE

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SHEET 4 OF 5

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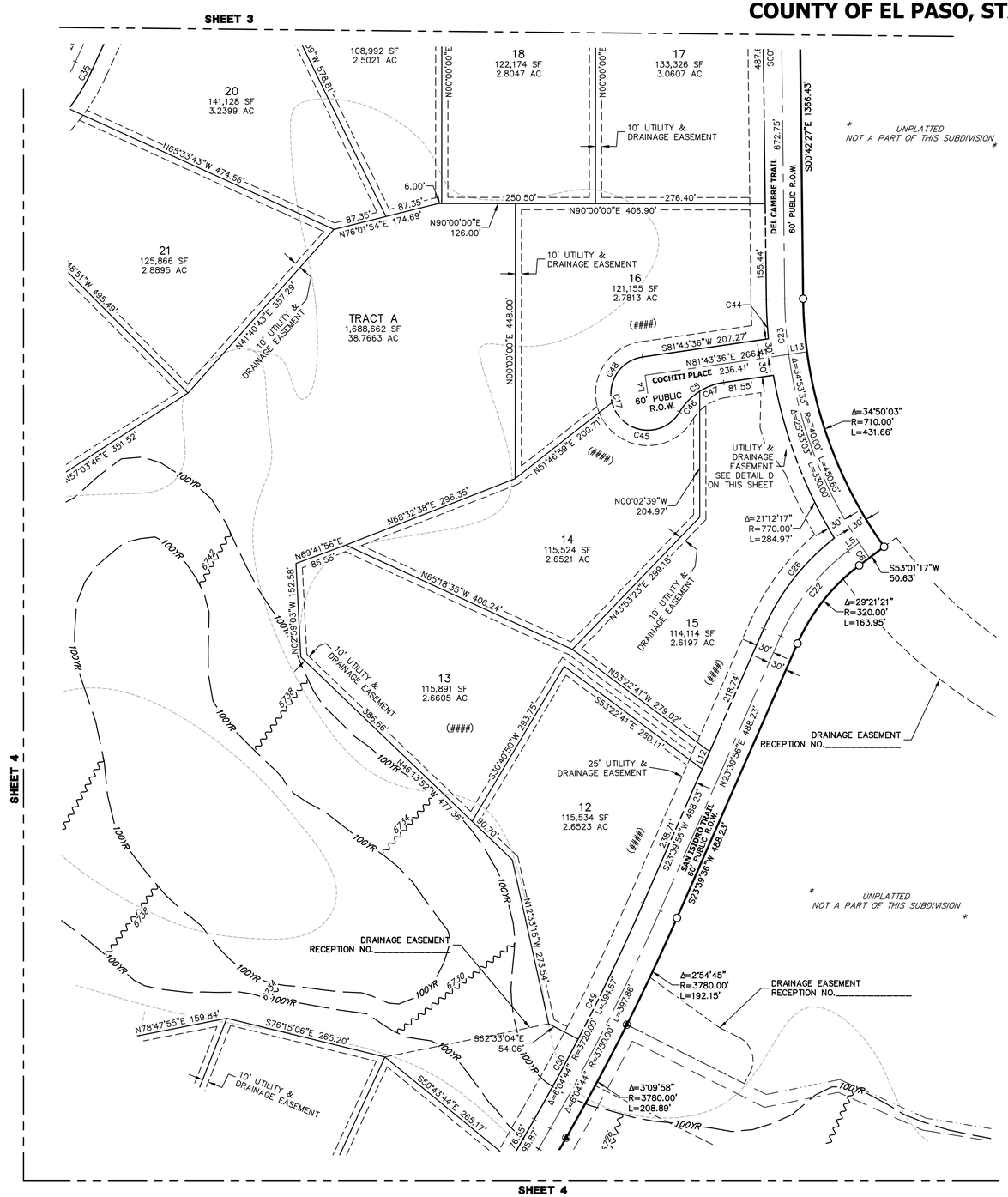
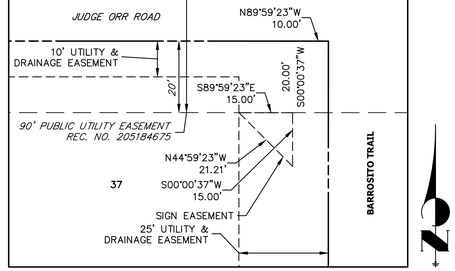


LINE TABLE		
LINE	BEARING	DISTANCE
L1	N00°00'21"E	30.00'
L2	N89°59'23"W	30.00'
L3	S89°59'23"E	30.00'
L4	N08°16'24"W	30.00'
L5	N53°01'17"E	21.96'
L6	S60°15'21"E	30.00'
L7	S60°15'21"E	30.00'
L8	N89°59'23"W	30.00'
L9	S89°59'23"E	30.00'
L10	S89°59'23"E	30.00'
L11	S00°00'37"W	30.00'
L12	S23°39'56"W	30.78'
L13	N81°43'36"E	30.00'
L14	S00°00'37"W	114.60'
L15	S65°33'43"E	106.61'
L16	S65°33'43"E	106.61'
L17	N65°33'43"W	106.61'
L18	S89°59'23"E	73.33'
L19	S00°00'37"W	50.75'

CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C1	51°13'24"	100.55'	89.89'
C2	6°12'29"	500.00'	54.17'
C3	30°38'09"	500.00'	267.35'
C4	24°25'40"	500.00'	213.17'
C5	51°13'24"	100.55'	89.89'
C6	2°19'31"	740.00'	30.03'
C7	1°08'30"	2780.00'	55.40'
C8	51°13'24"	100.55'	89.89'
C9	231°13'24"	60.00'	242.14'
C10	51°13'24"	100.55'	89.89'
C11	231°13'25"	60.00'	242.14'
C12	59°21'51"	300.00'	310.83'
C13	59°21'51"	330.00'	341.91'
C14	59°21'51"	270.00'	279.75'
C15	30°38'09"	470.00'	251.31'
C16	231°13'25"	60.00'	242.14'
C17	231°13'24"	60.00'	242.14'
C18	24°25'40"	575.00'	245.15'
C19	24°25'40"	605.00'	257.94'
C20	24°25'40"	545.00'	232.36'

CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C21	231°13'24"	60.00'	242.14'
C22	29°21'21"	350.00'	179.32'
C23	7°00'59"	740.00'	90.62'
C24	14°36'23"	500.00'	127.47'
C25	21°10'58"	530.00'	195.95'
C26	28°30'12"	380.00'	189.04'
C27	91°57'10"	60.00'	96.29'
C28	6°33'48"	100.55'	11.52'
C29	64°47'53"	60.00'	67.86'
C30	74°28'22"	60.00'	77.99'
C31	12°54'16"	545.00'	122.75'
C32	27°15'55"	330.00'	157.04'
C33	16°10'53"	330.00'	93.20'
C34	33°36'58"	330.00'	193.61'
C35	90°00'00"	330.00'	518.36'
C36	21°04'49"	470.00'	172.92'
C37	9°33'20"	470.00'	78.38'
C38	115°36'43"	60.00'	121.07'
C39	115°36'43"	60.00'	121.07'
C40	6°43'10"	330.00'	38.70'

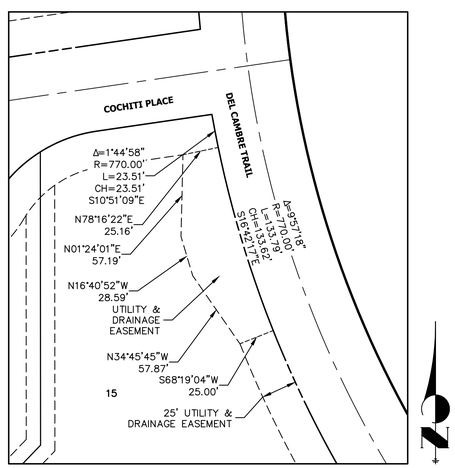
CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C41	2°57'47"	530.00'	27.41'
C42	9°34'52"	530.00'	88.63'
C43	11°36'06"	530.00'	107.32'
C44	4°48'16"	770.00'	64.57'
C45	135°15'30"	60.00'	141.64'
C46	27°16'04"	100.55'	47.85'
C47	23°57'20"	100.55'	42.04'
C48	95°57'55"	60.00'	100.49'
C49	3°47'00"	3720.00'	245.64'
C50	2°17'44"	3720.00'	149.03'
C51	4°46'49"	2780.00'	231.95'
C52	7°11'32"	2780.00'	348.97'
C53	17°05'55"	780.00'	232.77'
C54	80°26'10"	60.00'	84.23'
C55	150°47'14"	60.00'	157.90'



DETAIL C

20 10 0 20

ORIGINAL SCALE: 1" = 20'



DETAIL D

50 25 0 50

ORIGINAL SCALE: 1" = 50'

LEGEND

○	SET 18" LONG #5 REBAR WITH A 1.5" ALUMINUM CAP STAMPED "JR ENG LS 38578"
◭	RECOVERED 1.5" ALUMINUM CAP STAMPED "JR ENG LS 38578"
S.F.	SQUARE FEET
(R)	RADIAL BEARING
(####)	ADDRESS NUMBER
*	NOT A PART OF THIS SUBDIVISION
———	PROPOSED SUBDIVISION BOUNDARY
———	PROPOSED LOT LINE
———	PROPOSED RIGHT-OF-WAY LINE
———	PROPOSED CENTERLINE
- - - - -	PROPOSED EASEMENT
———	EXISTING RIGHT-OF-WAY
———	EXISTING PROPERTY LINE
———	EXISTING CENTERLINE
100YR	100 YEAR FLOODPLAIN
6698	FEMA FIRM BASE FLOOD ELEVATION
	GEOLOGIC HAZARD AREA
	SEE SHEET 5 FOR LINE AND CURVE TABLE

100 50 0 100

ORIGINAL SCALE: 1" = 100'

NO.	REVISION	BY	DATE
5	REV#4-COUNTY COMMENTS	BTO	2/7/2024
4	REV#3-COUNTY COMMENTS	BTO	11/17/2023
3	REV#2-COUNTY COMMENTS	DV	7/19/2023
2	REV#1-COUNTY COMMENTS	BTO	4/24/2023
1	INITIAL SUBMITTAL	BTO	11/29/2022

JOB NO. 25142.05
JULY 19, 2023
SHEET 5 OF 5

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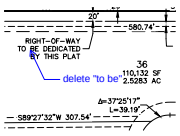
ENG-SF23004-R6_Final Plat.pdf Markup Summary

Callout (6)



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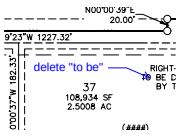

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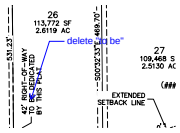

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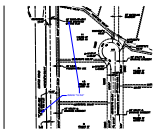

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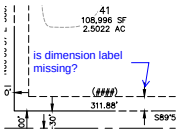

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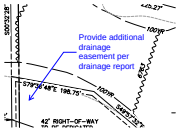

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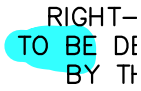
Provide additional drainage easement per drainage report

(7)



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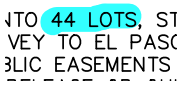

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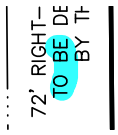

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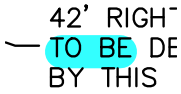

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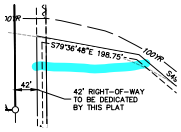

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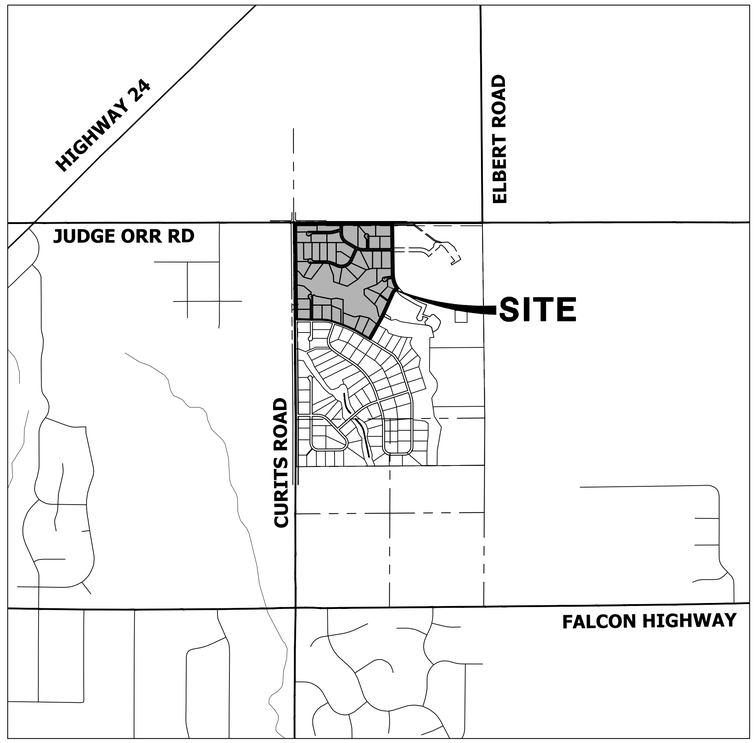
SADDLEHORN RANCH - FILING 3

LOCATED IN SECTION 3
TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH P.M.,
EL PASO COUNTY, STATE OF COLORADO

CONSTRUCTION DOCUMENTS

ABBREVIATIONS

AC	ACRE
AD	ALGEBRAIC DIFFERENCE
AH	AHEAD
ARCH	ARCHITECT
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASSY	ASSEMBLY
AVE	AVENUE
BB	BOX BASE
BK	BACK
BNDY	BOUNDARY
BOP	BOTTOM OF PIPE
BOV	BLOW OFF VALVE
BFV	BUTTERFLY VALVE
BLVD	BOULEVARD
BW	BOTTOM OF WALL
C&G	CURB & GUTTER
CATV	CABLE TELEVISION
CB	CATCH BASIN
CBC	CONCRETE BOX CULVERT
CDOT	COLORADO DEPARTMENT OF TRANSPORTATION
CDS	CUL-DE-SAC
CF	CUBIC FOOT
CFS	CUBIC FEET PER SECOND
CIP	COMPLETE IN PLACE
CL	CENTER LINE
CLOMR	CONDITIONAL LETTER OF MAP REVISION
CLR	CLEAR
CMP	CORRUGATED METAL PIPE
CO	CLEAN OUT
COCS	CITY OF COLORADO SPRINGS
CONC	CONCRETE
CR	CIRCLE
CSP	CORRUGATED STEEL PIPE
CSU	COLORADO SPRINGS UTILITIES
CT	COURT
CTRB	CONCRETE THRUST REDUCER BLOCK
CY	CUBIC YARD
DBPS	DRAINAGE BASIN PLANNING STUDY
DE	DRAINAGE EASEMENT
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DR	DRIVE
DRC	DESIGN REVIEW COMMITTEE
DU	DWELLING UNITS
DY	DAY
E	EAST
EA	EACH
EGL	ENERGY GRADE LINE
EL	ELEVATION
ELEC	ELECTRIC
EOA	EDGE OF ASPHALT
EPC	EL PASO COUNTY
ERCP	ELLIPTICAL RCP
ESMT	EASEMENT
EST	ESTIMATE
EX	EXISTING
FDP	FINAL DEVELOPMENT PLAN
FDR	FINAL DRAINAGE REPORT
FES	FLARED END SECTION
FF	FINISHED FLOOR ELEVATION
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL	FLOWLINE
FIL	FILING
FO	FIBER OPTIC CABLE
GB	GRADE BREAK
GE	GAS EASEMENT
GIS	GEOGRAPHIC INFORMATION SYSTEM
GL	GAS LINE
GPS	GLOBAL POSITIONING SYSTEM
GV	GATE VALVE
HBP	HOT BITUMINOUS PAVEMENT
HC	HANDICAP
HDC	HIGH DEFLECTION COUPLING
HDPE	HIGH DENSITY POLYETHYLENE
HGL	HYDRAULIC GRADE LINE
HMA	HOT MIX ASPHALT
HOA	HOME OWNERS ASSOCIATION
HP	HIGH POINT
HR	HOUR
I	INLET
IE	IRRIGATION EASEMENT
INT	INTERSECTION
INV	INVERT
IRR	IRRIGATION
KB	KICK (THRUST) BLOCK
LB	POUND
LE	LANDSCAPE EASEMENT
LF	LINEAR FOOT
LN	LANE
LOMR	LETTER OF MAP REVISION
LP	LOW POINT
LS	LUMP SUM
LT	LEFT
MAX	MAXIMUM
M/D	MOISTURE DENSITY
MDDP	MASTER DEVELOPMENT DRAINAGE PLAN
MH	MANHOLE
MIN	MINIMUM
MS	MOUNTABLE SIDEWALK
N	NORTH
NRCP	NON-REINFORCED CONCRETE PIPE
ODP	OFFICIAL DEVELOPMENT PLAN
OHE	OVERHEAD ELECTRIC
OHU	OVERHEAD UTILITY
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PCR	POINT OF CURB RETURN
PDP	PRELIMINARY DEVELOPMENT PLAN
PE	PROFESSIONAL ENGINEER
PI	POINT OF INTERSECTION
PKWY	PARKWAY
PL	PROPERTY LINE
PR	PROPOSED
PRC	POINT OF REVERSE CURVATURE
PT	POINT OF TANGENCY
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
R	RADIUS
RCBC	REINFORCED CONCRETE BOX CULVERT
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
ROW	RIGHT OF WAY
RT	RIGHT
S	SOUTH
STE	STEEL
SAN	SANITARY SEWER
SF	SQUARE FOOT
ST	STREET
STA	STATION
STM	STORM SEWER
SY	SQUARE YARD
SY-IN	SQUARE YARD INCH
TB	THRUST BLOCK
TBC	TOP BACK OF CURB
TBW	TOP BACK OF WALK
TEL	TELEPHONE
TN	TON
TOA	TOP OF ASPHALT
TOB	TOP OF BOX
TOC	TOP OF CURB OR CONCRETE
TOF	TOP OF FOUNDATION
TOP	TOP OF PIPE
TW	TOP OF WALL
TYP	TYPICAL
UDFCD	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
UE	UTILITY EASEMENT
U&DE	UTILITY & DRAINAGE EASEMENT
UGE	UNDERGROUND ELECTRIC
VCP	VITRIFIED CLAY PIPE
VPC	VERTICAL POINT OF CURVATURE
VPI	VERTICAL POINT OF INTERSECTION
VPT	VERTICAL POINT OF TANGENCY
VTC	VEHICLE TRACKING CONTROL
W	WEST
WL	WATER LINE
WM	WATER MAIN
WRD	WATER RESOURCES DEPARTMENT
WS	WATER SURFACE
WSE	WATER SURFACE ELEVATION
WTR	WATER
YR	YEAR



VICINITY MAP
SCALE: 1" = 2000'

SHEET INDEX

1	– COVER SHEET
2	– GENERAL NOTES
3	– LEGEND
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6–8	– CURTIS RD & JUDGE ORR RD DEMOLITION PLAN
9–11	– CURTIS RD & JUDGE ORR RD GRADING PLAN
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30	– OVERALL UTILITY PLAN & SERVICE PLAN
31–41	– WATER DISTRIBUTION PLAN
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59	– POND E OUTLET STRUCTURE DETAILS
60–63	– DETAILS

CONTACTS:

OWNER	GORILLA CAPITAL CO SADDLEHORN RANCH, LLC 1342 HIGH STREET EUGENE, OR 97401 P~541-393-9043
ENGINEER/SURVEYOR	JR ENGINEERING, LLC ATTN: BRYAN LAW 5475 TECH CENTER DRIVE, SUITE 235 COLORADO SPRINGS, CO 80919 P~(303) 267-6254
FIRE PROTECTION DISTRICT	FALCON FIRE PROTECTION 12072 ROYAL COUNTY DOWN ROAD FALCON, CO 80831 P~(719) 495-4050
DISTRICT	SADDLEHORN RANCH METRO DISTRICT

J·R ENGINEERING

BENCHMARK:

THE VERTICAL DATUM IS BASED OFF AN OPUS SOLUTION RAN ON CONTROL POINT #100 (NO. 4 REBAR) AND IS ADJUSTED TO NGVD 1929, ELEVATION 6754.61.

BASIS OF BEARINGS:

THE WEST LINE OF SECTION 3, T3S, R64W, 6TH P.M., MONUMENTED BY A 3-1/4" ALUMINUM CAP STAMPED "PLS 17496" IN A RANGE BOX AT THE NORTHWEST CORNER OF SECTION 3 AND A NO. 8 REBAR IN A RANGE BOX AT THE SOUTHWEST CORNER OF SECTION 3, BEARING N00°32'28"W AS REFERENCED TO COLORADO STATE PLANE CENTRAL ZONE.

Know what's **below.**
Call before you dig.

THE LOCATIONS OF EXISTING ABOVE GROUND AND UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL ABOVE GROUND AND UNDERGROUND UTILITIES.

PCD FILE NUMBER: SF-23-004

OWNER/DEVELOPER STATEMENT

I, THE OWNER/DEVELOPER HAVE READ AND WILL COMPLY WITH ALL OF THE REQUIREMENTS SPECIFIED IN THESE DETAILED PLANS AND SPECIFICATIONS.

JOHN HELMICK — DATE 3/20/24

GORRILA CAPITAL CO SADDLEHORN RANCH, LLC
1342 HIGH STREET
EUGENE, OR 97401

DISTRICT APPROVALS

THESE DOCUMENTS HAVE BEEN REVIEWED AND APPROVED FOR STORM DRAIN AND ASSOCIATED UTILITY SERVICE CONSTRUCTION.

DocuSigned by: Sandra Lehmann — DATE 10/16/2023
AA31C2C2F0F8418...
FOR AND ON BEHALF OF THE SADDLEHORN RANCH METRO DISTRICT

EL PASO COUNTY STATEMENT

COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH COUNTY DESIGN CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUNTY THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

FILED IN ACCORDANCE WITH THE REQUIREMENTS OF THE EL PASO COUNTY LAND DEVELOPMENT CODE, DRAINAGE CRITERIA MANUAL, VOLUMES 1 AND 2, AND ENGINEERING CRITERIA MANUAL AS AMENDED.

IN ACCORDANCE WITH ECM SECTION 1.12, THESE CONSTRUCTION DOCUMENTS WILL BE VALID FOR CONSTRUCTION FOR A PERIOD OF 2 YEARS FROM THE DATE SIGNED BY THE EL PASO COUNTY ENGINEER. IF CONSTRUCTION HAS NOT STARTED WITHIN THOSE 2 YEARS, THE PLANS WILL NEED TO BE RESUBMITTED FOR APPROVAL, INCLUDING PAYMENT OF REVIEW FEES AT THE PLANNING AND COMMUNITY DEVELOPMENT DIRECTORS DISCRETION.

JOSHUA PALMER, P.E. — DATE

COUNTY ENGINEER/ECM ADMINISTRATOR

ENGINEER'S STATEMENT

THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECT SUPERVISION. SAID PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR DETAILED ROADWAY, DRAINAGE, GRADING AND EROSION CONTROL PLANS AND SPECIFICATIONS, AND SAID PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH APPLICABLE MASTER DRAINAGE PLANS AND MASTER TRANSPORTATION PLANS. SAID PLAN AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR ROADWAY AND DRAINAGE FACILITIES ARE DESIGNED AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARATION OF THESE DETAILED PLANS AND SPECIFICATIONS.

COLORADO REGISTERED BRYAN T. LAW 25043 PROFESSIONAL ENGINEER

BRYAN T. LAW, P.E. — DATE 3/20/24
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
	.	.	.

H-SCALE	1"=2000'	DESIGNED BY	AMT
V-SCALE	N/A	DRAWN BY	AMT
DATE	3/20/24	CHECKED BY	

SADDLEHORN RANCH – FILING 3
COVER SHEET

SHEET 1 OF 63
JOB NO. 25142.05

STANDARD NOTES FOR EL PASO COUNTY CONSTRUCTION PLANS

1. ALL DRAINAGE AND ROADWAY CONSTRUCTION SHALL MEET THE STANDARDS AND SPECIFICATIONS OF THE CITY OF COLORADO SPRINGS/EL PASO COUNTY DRAINAGE CRITERIA MANUAL, VOLUMES 1 AND 2, AND THE EL PASO COUNTY ENGINEERING CRITERIA MANUAL.

2. CONTRACTOR SHALL BE RESPONSIBLE FOR THE NOTIFICATION AND FIELD NOTIFICATION OF ALL EXISTING UTILITIES, WHETHER SHOWN ON THE PLANS OR NOT, BEFORE BEGINNING CONSTRUCTION. LOCATION OF EXISTING UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. CALL 811 TO CONTACT THE UTILITY NOTIFICATION CENTER OF COLORADO (UNCC).

3. CONTRACTOR SHALL KEEP A COPY OF THESE APPROVED PLANS, THE GRADING AND EROSION CONTROL PLAN, THE STORMWATER MANAGEMENT PLAN (SWMP), THE SOIL AND GEOTECHNICAL REPORT, AND THE APPROPRIATE DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS AT THE JOB SITE AT ALL TIMES, INCLUDING THE FOLLOWING:
   3.1. EL PASO COUNTY ENGINEERING CRITERIA MANUAL (ECM)
   3.2. CITY OF COLORADO SPRINGS/ EL PASO COUNTY DRAINAGE CRITERIA MANUAL, VOLUMES 1 AND 2
   3.3. COLORADO DEPARTMENT OF TRANSPORTATION (CDOT) STANDARD SPECIFICATIONS AND BRIDGE CONSTRUCTION
   3.4. CDOT M&S STANDARDS

4. NOTWITHSTANDING ANYTHING DEPICTED IN THESE PLANS IN WORDS OR GRAPHIC REPRESENTATION, ALL DESIGN AND CONSTRUCTION RELATED TO ROADS, STORM DRAINAGE AND EROSION CONTROL SHALL CONFORM TO THE STANDARDS AND REQUIREMENTS OF THE MOST RECENT VERSIONS OF THE RELEVANT ADOPTED EL PASO COUNTY STANDARDS, INCLUDING THE LAND DEVELOPMENT CODE, THE ENGINEERING CRITERIA MANUAL, THE DRAINAGE CRITERIA MANUAL, AND THE DRAINAGE CRITERIA MANUAL VOLUME 2. ANY DEVIATIONS FROM REGULATIONS AND STANDARDS MUST BE REQUESTED, AND APPROVED, IN WRITING. ANY MODIFICATIONS NECESSARY TO MEET CRITERIA AFTER-THE-FACT WILL BE ENTIRELY THE DEVELOPER'S RESPONSIBILITY TO RECTIFY.

5. IT IS THE DESIGN ENGINEER'S RESPONSIBILITY TO ACCURATELY SHOW EXISTING CONDITIONS, BOTH ONSITE AND OFFSITE, ON THE CONSTRUCTION PLANS. ANY MODIFICATIONS NECESSARY DUE TO CONFLICTS, OMISSIONS, OR CHANGED CONDITIONS WILL BE ENTIRELY THE DEVELOPER'S RESPONSIBILITY TO RECTIFY.

6. CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS INSPECTIONS, PRIOR TO STARTING CONSTRUCTION.

7. IT IS THE CONTRACTOR'S RESPONSIBILITY TO UNDERSTAND THE REQUIREMENTS OF ALL JURISDICTIONAL AGENCIES TO OBTAIN ALL REQUIRED PERMITS, INCLUDING BUT NOT LIMITED TO EL PASO COUNTY EROSION AND STORMWATER QUALITY CONTROL PERMIT (ESQCP), REGIONAL BUILDING FLOODPLAIN DEVELOPMENT PERMIT, U.S. ARMY CORPS OF ENGINEERS-ISSUED 401 AND/OR 404 PERMITS, AND COUNTY AND STATE FUGITIVE DUST PERMITS.

8. CONTRACTOR SHALL NOT DEVIATE FROM THE PLANS WITHOUT FIRST OBTAINING WRITTEN APPROVAL FROM THE DESIGN ENGINEER AND EL PASO COUNTY DPW. CONTRACTOR SHALL NOTIFY THE DESIGN ENGINEER IMMEDIATELY UPON DISCOVERY OF ANY ERRORS OR INCONSISTENCIES.

9. ALL STORM DRAIN PIPE SHALL BE CLASS III RCP UNLESS OTHERWISE NOTED AND APPROVED BY DPW.

10. CONTRACTOR SHALL COORDINATE GEOTECHNICAL TESTING PER ECM STANDARDS. PAVEMENT DESIGN SHALL BE APPROVED BY EL PASO COUNTY DPW PRIOR TO PLACEMENT OF CURB AND GUTTER AND PAVEMENT.

11. ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE SITE AT APPROVED CONSTRUCTION ACCESS POINTS.

12. SIGHT VISIBILITY TRIANGLES IDENTIFIED IN THE PLANS, SHALL BE PROVIDED AT ALL INTERSECTIONS. OBSTRUCTIONS GREATER THAN 18 INCHES ABOVE FLOWLINE ARE NOT ALLOWED IN SIGHT TRIANGLES.

13. SIGNING AND STRIPING SHALL COMPLY WITH EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS AND MUTCD CRITERIA.

14. CONTRACTOR SHALL OBTAIN ANY PERMITS REQUIRED BY EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS, INCLUDING WORK WITHIN THE RIGHT-OF-WAY AND SPECIAL TRANSPORT PERMITS.

15. THE LIMITS OF CONSTRUCTION SHALL REMAIN WITHIN THE PROPERTY LINE UNLESS OTHERWISE NOTED. THE OWNER/DEVELOPER SHALL OBTAIN WRITTEN PERMISSION AND EASEMENTS, WHERE REQUIRED, FROM ADJOINING PROPERTY OWNER(S) PRIOR TO ANY OFF-SITE DISTURBANCE, GRADING, OR CONSTRUCTION.

SOIL RIPRAP NOTES:

1. ELEVATION TOLERANCES FOR THE SOIL RIPRAP SHALL BE 0.10 FEET. THICKNESS OF SOIL RIPRAP SHALL BE NO LESS THAN THICKNESS SHOWN AND NO MORE THAN 2-INCHES GREATER THAN THE THICKNESS SHOWN.

2. WHERE "SOIL RIPRAP" IS DESIGNATED ON THE CONTRACT DRAWINGS, RIPRAP VOIDS ARE TO BE FILLED WITH NATIVE SOIL. THE RIPRAP SHALL BE PRE-MIXED WITH THE NATIVE SOIL AT THE FOLLOWING PROPORTIONS BY VOLUMES: 65 PERCENT RIPRAP AND 35 PERCENT SOIL. THE SOIL USED FOR MIXING SHALL BE NATIVE TOPSOIL AND SHALL HAVE A MINIMUM FINES CONTENT OF 15 PERCENT. THE SOIL RIPRAP SHALL BE INSTALLED IN A MANNER THAT RESULTS IN A DENSE, INTERLOCKED LAYER OF RIPRAP WITH RIPRAP VOIDS FILLED COMPLETELY WITH SOIL. SEGREGATION OF MATERIALS SHALL BE AVOIDED AND IN NO CASE SHALL THE COMBINED MATERIAL CONSIST PRIMARILY OF SOIL; THE DENSITY AND INTERLOCKING NATURE OF RIPRAP IN THE MIXED MATERIAL SHALL ESSENTIALLY BE THE SAME AS IF THE RIPRAP WAS PLACED WITHOUT SOIL.

3. WHERE SPECIFIED (TYPICALLY AS "BURIED SOIL RIPRAP"), A SURFACE LAYER OF TOPSOIL SHALL BE PLACED OVER THE SOIL RIPRAP ACCORDING TO THE THICKNESS SPECIFIED ON THE CONTRACT DRAWINGS. THE TOPSOIL SURFACE LAYER SHALL BE COMPACTED TO APPROXIMATELY 85% OF MAXIMUM DENSITY AND WITHIN TWO PERCENTAGE POINTS OF OPTIMUM MOISTURE IN ACCORDANCE WITH ASTM D698. TOPSOIL SHALL BE ADDED TO ANY AREAS THAT SETTLE.

4. ALL SOIL RIPRAP THAT IS BURIED WITH TOPSOIL SHALL BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO ANY TOPSOIL PLACEMENT.

SIGNING AND STRIPING NOTES

1. ALL SIGNS AND PAVEMENT MARKING SHALL BE IN COMPLIANCE WITH THE CURRENT MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).

2. PLACEMENT OF GROUND SIGNS SHALL BE IN COMPLIANCE WITH CDOT DETAIL S-614-1.

3. STRIPING AND PAVEMENT MARKINGS SHALL BE IN COMPLIANCE WITH CDOT DETAIL S-627-1.

4. REMOVAL OF EXISTING PAVEMENT MARKINGS SHALL BE ACCOMPLISHED BY A METHOD THAT DOES NOT MATERIALLY DAMAGE THE PAVEMENT. THE PAVEMENT MARKINGS SHALL BE REMOVED TO THE EXTENT THEY WILL NOT BE VISIBLE UNDER DAY OR NIGHT CONDITIONS. AT NO TIME WILL IT BE ACCEPTABLE TO PAINT OVER EXISTING PAVEMENT MARKINGS.

5. ANY DEVIATION FROM THE STRIPING AND SIGNING PLAN SHALL BE APPROVED BY EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS.

6. ALL SIGNS SHOWN ON THE SIGNING AND STRIPING PLAN SHALL BE NEW SIGNS. EXISTING SIGNS MAY REMAIN OR BE REUSED IF THEY MEET CURRENT EL PASO COUNTY AND MUTCD STANDARDS.

7. STREET NAME AND REGULATORY STOP SIGNS SHALL BE ON THE SAME POST AT INTERSECTIONS.

8. ALL REMOVED SIGNS SHALL BE DISPOSED OF IN A PROPER MANNER BY THE CONTRACTOR.

9. ALL STREET NAME SIGNS SHALL BE "D" SERIES LETTERS, WITH LOCAL ROADWAY SIGNS BEING 4" UPPER-LOWER CASE LETTERING ON 8" BLANK AND NON-LOCAL ROADWAY SIGNS BEING 6" LETTERING. UPPER-LOWER CASE ON 12" BLANK, WITH A WHITE BORDER THAT IS NOT RECESSED. MULTI-LANE ROADWAYS WITH SPEED LIMITS OF 40 MPH OR HIGHER SHALL HAVE 8" UPPER-LOWER CASE LETTERING ON 18" BLANK WITH A WHITE BORDER THAT IS NOT RECESSED. THE WIDTH OF THE NON-RECESSED WHITE BORDERS SHALL MATCH PAGE 255 OF THE 2012 MUTCD "STANDARD HIGHWAY SIGNS".

10. ALL TRAFFIC SIGNS SHALL HAVE A MINIMUM HIGH INTENSITY PRISMATIC GRADE SHEETING.

11. ALL LOCAL RESIDENTIAL STREET SIGNS SHALL BE MOUNTED ON A 1.75" X 1.75" SQUARE TUBE SIGN POST AND STUB POST BASE,. FOR OTHER APPLICATIONS, REFER TO THE CDOT STANDARD S-614-8 REGARDING USE OF THE P2 TUBULAR STEEL POST SLIPBASE DESIGN.

12. ALL SIGNS SHALL BE SINGLE SHEET ALUMINUM WITH 0.100" THICKNESS.

13. ALL LIMIT LINES/STOP LINES, CROSSWALK LINES, PAVEMENT LEGENDS, AND ARROWS SHALL BE A MINIMUM 125 MIL THICKNESS PREFORMED THERMOPLASTIC PAVEMENT MARKINGS WITH TAPERED LEADING EDGES PER CDOT STANDARD S-627-1. WORD AND SYMBOL MARKINGS SHALL BE THE NARROW TYPE, STOP BARS SHALL BE 24" IN WIDTH, CROSSWALK LINES SHALL BE 12" WIDE AND 8' LONG PER CDOT S-267-1.

14. ALL LONGITUDINAL LINES SHALL BE A MINIMUM 15MIL THICKNESS EPOXY PAINT. ALL NON-LOCAL RESIDENTIAL ROADWAYS SHALL INCLUDE BOTH RIGHT AND LEFT EDGE LINE STRIPING AND ANY ADDITIONAL STRIPING AS REQUIRED BY CDOT S-627-1.

15. THE CONTRACTOR SHALL NOTIFY EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS (719) 520-6819 PRIOR TO AND UPON COMPLETION OF THE SIGNING AND STRIPING.

16. THE CONTRACTOR SHALL OBTAIN A WORK IN THE RIGHT OF WAY PERMIT FROM THE EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS (DPW) PRIOR TO ANY SIGNAGE OR STRIPING WORK WITHIN AN EXISTING EL PASO COUNTY ROADWAY.

Know what's **below.**
Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

COLORADO BRYAN T. LAW 25043 REGISTERED PROFESSIONAL ENGINEER

3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
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(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

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DATE	3/20/24
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CHECKED BY	

SADDLEHORN RANCH - FILING 3

GENERAL NOTES

SHEET 2 OF 63

JOB NO. 25142.05

LAYER LINETYPE LEGEND

	EXISTING	PROPOSED
PHASE LINE		
MATCH LINE		
SECTION LINE		
BOUNDARY LINE		
PROPERTY LINE		
EASEMENT LINE		
RIGHT OF WAY		
R.O.W. A LINE	A	A
CENTERLINE		
CITY LIMITS		
WIRE FENCE		
CHAIN LINK FENCE		
WOOD FENCE		
MASONRY FENCE		
GUARDRAIL		
CONC. BARRIER		
CABLE TV	TV	TV
ELECTRIC	E	E
FIBER OPTIC	FO	FO
GAS MAIN	G	G
IRRIGATION MAIN	IRR	IRR
OIL/PETRO. MAIN	O	O
OVERHEAD UTILITY	OHU	OHU
SANITARY SEWER	S	
STORM DRAIN		
TELEPHONE	T	T
WATER MAIN	W	
RAW WATER LINE	RWL	RWL
SWALE/WATERWAY FLOWLINE		
DIVERSION DITCH		
DIVERSION CHANNEL		
MAJOR DRAINAGE BASIN		
MINOR DRAINAGE BASIN		
TOP OF SLOPE		
TOE OF SLOPE		
EDGE OF WATER		
INDEX CONTOUR	6100	6100
INTERMEDIATE CONTOUR		
DEPRESSION CONT. (INDEX)	6100	6100
DEPRESSION CONT. (INTER)		
TOP OF CUTS		
TOE OF FILLS		
CUT AND FILL LINE		C/F
SILT FENCE	SF	SF
100 YEAR FLOODPLAIN	100YR	100YR
500 YEAR FLOODPLAIN	500YR	500YR
FLOODWAY	FLDWY	FLDWY
BASE FLOOD ELEVATION		
EDGE OF WETLANDS		
STONE WALL		
FLOW ARROWS		

UTILITIES LEGEND

	EXISTING	PROPOSED
STORM SEWER		
MANHOLE		
STORM INLET		
AREA INLET – SQUARE		
AREA INLET – ROUND		
FLARED END SECTION		
RIPRAP		
SANITARY SEWER		
LINE MARKER	Mkr San	
SERVICE MARKER		
CLEAN–OUT		
MANHOLE W/ DIRECTIONAL FLOW ARROW		
WATER LINE		
LINE MARKER	Mkr W	
SERVICE MARKER		
FIRE HYDRANT		
FIRE CONNECTION		
MANHOLE		
BEND		
BLOW–OFF VALVE		
WELL	WELL	WELL
METER		
VALVE		
REDUCER		
THRUST BLOCK		
CROSS		
PLUG W/ THRUST BLOCK		
TEE		
REVERSE ANCHOR		
ANODE		
AIR & VACUUM VALVE ASSEMBLY		
TRANSMISSION BLOW–OFF ASSEMBLY		
GAS LINE		
MARKER	Mkr G	
SERVICE MARKER		
METER		
VALVE		
PLUG		
TEE		
DRY UTILITIES		
CABLE TV MARKER	Mkr TV	
CABLE TELEVISION PEDESTAL		
ELECTRIC MARKER	Mkr E	
ELECTRIC SERVICE MARKER		
ELECTRICAL PEDESTAL		
ELECTRICAL METER		
ELECTRICAL MANHOLE		
FIBER–OPTIC MARKER	Mkr FO	
IRRIGATION PEDESTAL		
TELEPHONE MARKER	Mkr T	
TELEPHONE PEDESTAL		
TELEPHONE MANHOLE		
UTILITY POLE		
GUY ANCHOR		
GUY POLE		
MISC. UTILITIES		
VENT PIPE	VP	VP
TEST HOLE DESIGNATOR	TH# FIRM/AGENCY	

MONUMENTATION LEGEND

ALUMINUM CAP – FOUND	AC
BRASS CAP – FOUND	BC
BENCHMARK – FOUND	
CROSS – FOUND	
MONUMENT – SET	
MONUMENT – FOUND (DEFAULT)	
MONUMENT – FOUND (ALTERNATE 1)	
MONUMENT – FOUND (ALTERNATE 2)	
MONUMENT – FOUND (ALTERNATE 3)	
MONUMENT – FOUND (ALTERNATE 4)	
MONUMENT – FOUND (ALTERNATE 5)	
MONUMENT – FOUND (ALTERNATE 6)	
MONUMENT – FOUND (ALTERNATE 7)	
NAIL & WASHER – FOUND	NAIL & WASHER
PANEL – FOUND	
PK NAIL – FOUND	PK NAIL
ROW MONUMENT – FOUND	
ROW MARKER – FOUND	
SECTION CORNER – FOUND	
SECTION CORNER – SET	
QUARTER–SECTION CORNER – FOUND	
QUARTER–SECTION CORNER – SET	
SECTION CENTER – FOUND	
SECTION CENTER – FOUND	
CONTROL/TRAVERSE POINT – SET	

Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043 — STATE OF COLORADO — BRYAN T. LAW — REGISTERED PROFESSIONAL ENGINEER

3/20/24
DATE

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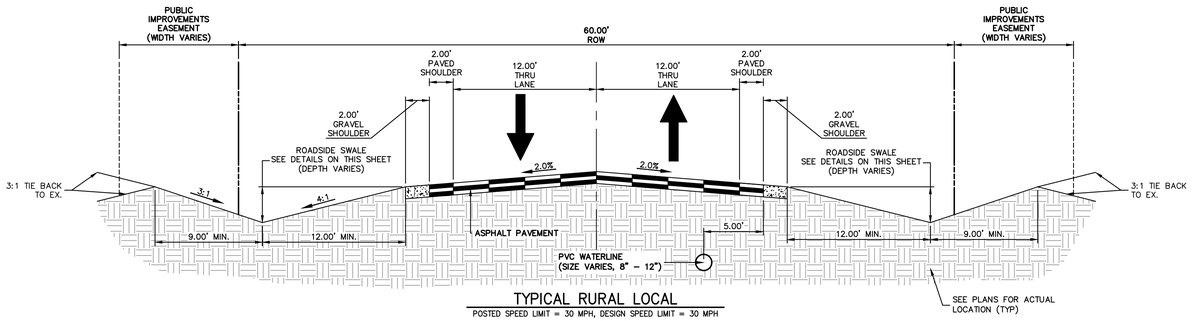
V–SCALE	N/A
DATE	3/20/24
DESIGNED BY	AMT
DRAWN BY	AMT
CHECKED BY	

SADDLEHORN RANCH – FILING 3

LEGEND

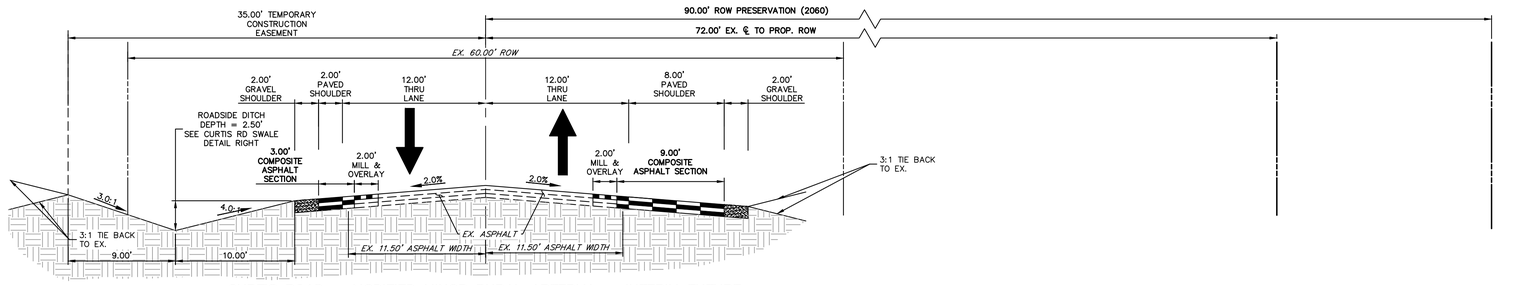
SHEET 3 OF 63

JOB NO. 25142.05



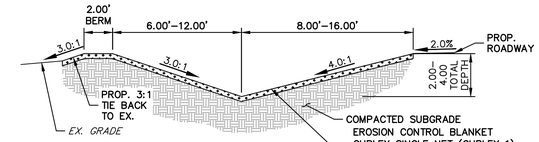
TYPICAL RURAL LOCAL

POSTED SPEED LIMIT = 30 MPH, DESIGN SPEED LIMIT = 30 MPH
SCALE: 1" = 5'



CURTIS ROAD – MODIFIED MINOR RURAL ARTERIAL – INTERIM FUTURE

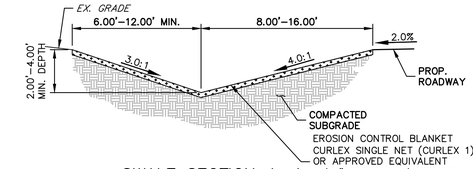
STA: 48+87.43–68+72.31
POSTED SPEED LIMIT = 45 MPH
SCALE: 1" = 6'
(LOOKING NORTH)



SWALE SECTION B–B

SCALE: 1"=5'

SWALE SEED MIX:
EROSION CONTROL BLANKET WITH PAWNEE BUTTES SEED INC. – "LOW GROW NATIVE MIX"
- –IDAHO FESCUE
- –SANDBERG BLUEGRASS
- –ROCKY MOUNTAIN FESCUE
- –BIG BLUEGRASS



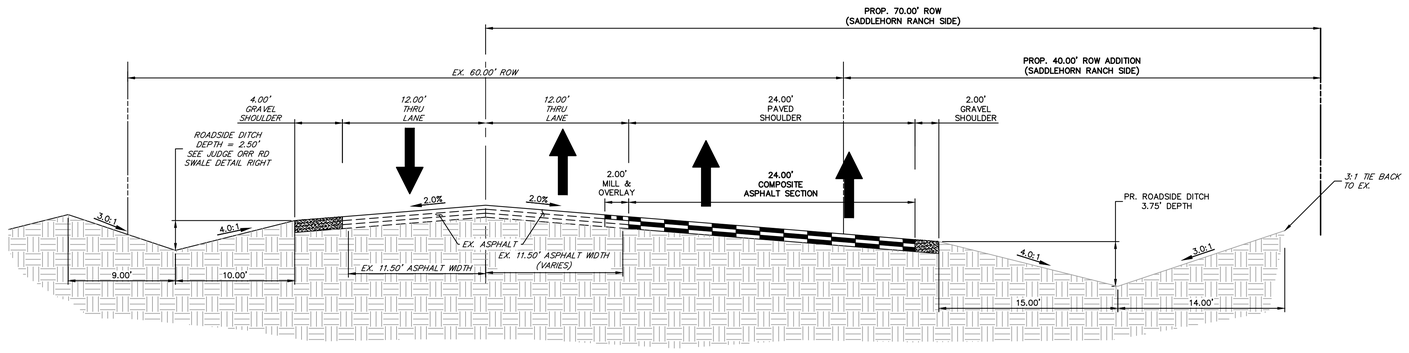
SWALE SECTION A–A

SCALE: 1"=5'

SWALE SEED MIX:
EROSION CONTROL BLANKET WITH PAWNEE BUTTES SEED INC. – "LOW GROW NATIVE MIX"
- –IDAHO FESCUE
- –SANDBERG BLUEGRASS
- –ROCKY MOUNTAIN FESCUE
- –BIG BLUEGRASS

ROADSIDE SWALE NOTES

1. SWALE SECTION A–A PROVIDES MINIMUM SWALE DIMENSIONS. IN AREAS WHERE 3:1 TIE BACK TO EXISTING DOES NOT PROIVDE MINIMUM SWALE DEPTH, SWALE TO BE CUT DEEPER SUCH THAT 4' DEPTH IS PROVIDED RELATIVE TO EXISTING GRADE.
2. SWALE SECTION B–B TO BE USED IN FILL AREAS OF ROADWAY WHERE CUTTING SWALE DEEPER TO ACHIEVE 4.0' DEPTH RELATIVE TO EXISTING GRADE CAN NOT BE ACHIEVED DUE TO DOWN STREAM GRADE REQUIREMENTS. 2.0' BERM MUST BE PROVIDED TO MITIGATE FUTURE EROSION.



EX. JUDGE ORR ROAD – TYPICAL SECTION

POSTED SPEED LIMIT = 45 MPH, DESIGN SPEED LIMIT = 50 MPH
*NOTE: ULTIMATE SECTION HAS BEEN OVERLAYED.

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ENGINEER'S STATEMENT

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BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043 — BRYAN T. LAW — REGISTERED PROFESSIONAL ENGINEER

3/20/24
DATE

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BRADY WILLIAMS

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V-SCALE	N/A
DATE	3/20/24
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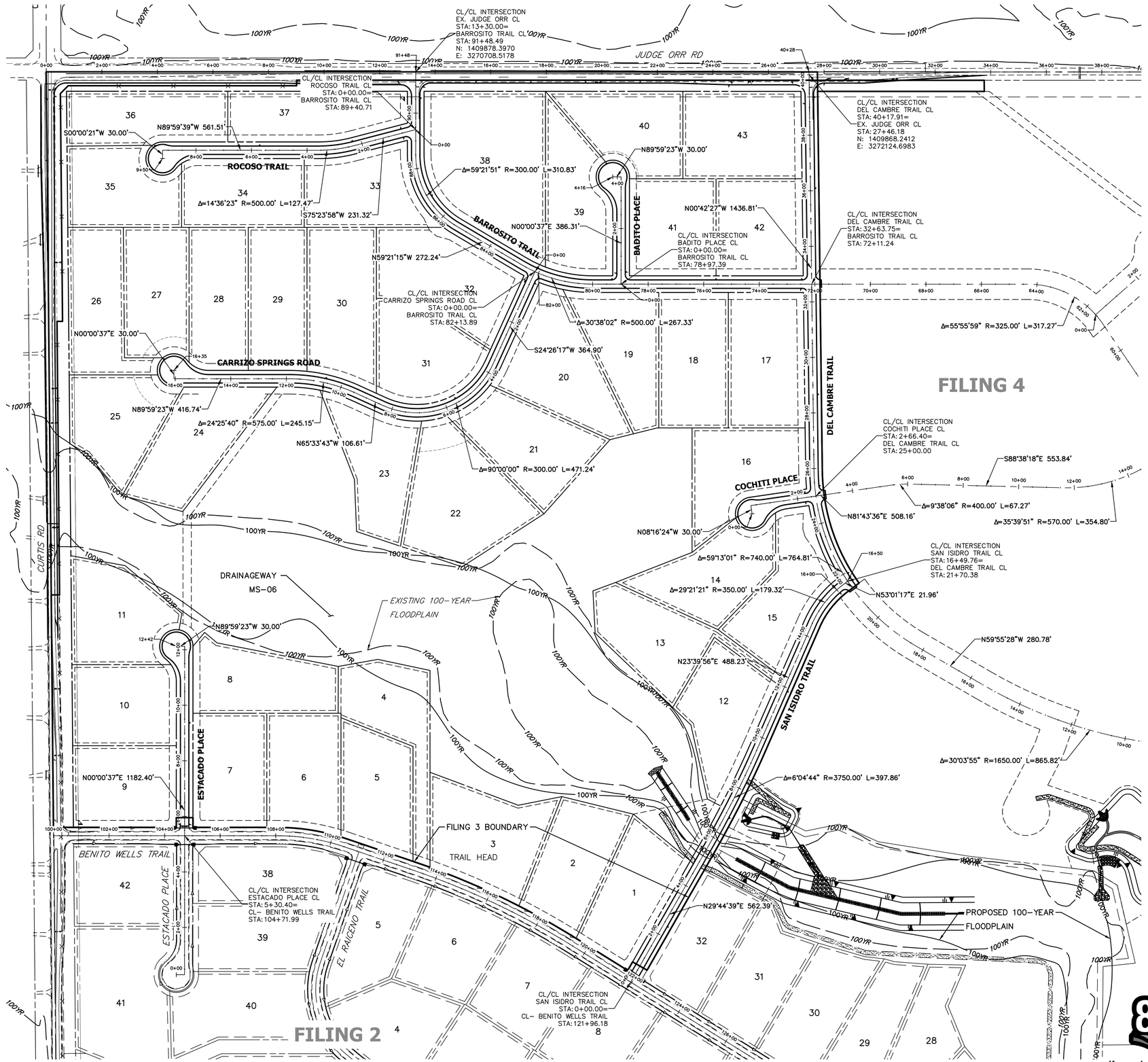
SADDLEHORN RANCH – FILING 3

TYPICAL SECTIONS

SHEET 4 OF 63

JOB NO. 25142.05



175 88 0 175 350

ORIGINAL SCALE: 1" = 175'

811 Know what's below. Call before you dig.

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COLORADO REGISTERED BRYAN T. LAW 25043 PROFESSIONAL ENGINEER

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No.	REVISION	BY	DATE
	.	.	.

H-SCALE	1"=175'
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	CJS
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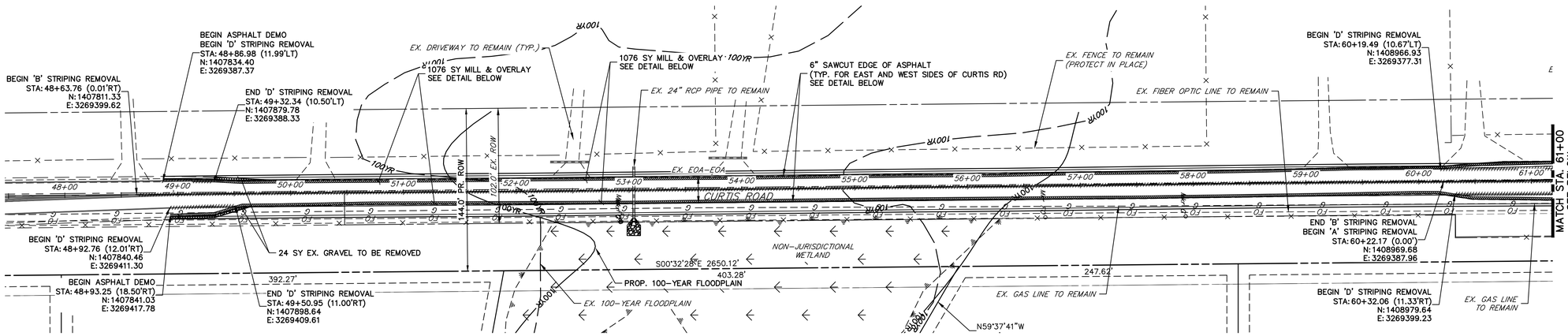
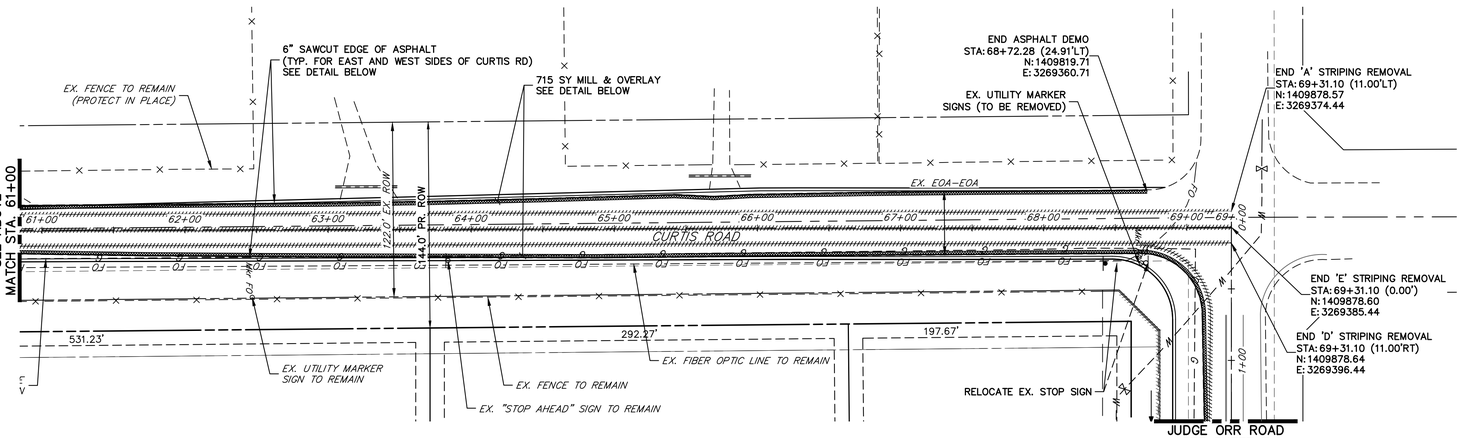
SADDLEHORN RANCH – FILING 3

HORIZONTAL CONTROL PLAN

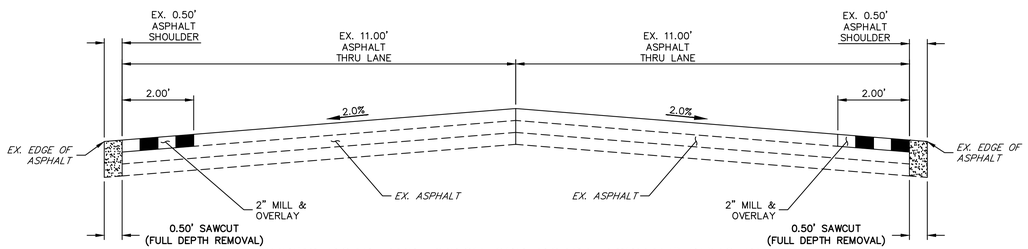
SHEET 5 OF 63

JOB NO. 25142.05





CURTIS ROAD DEMOLITION
STA. 48+00 TO STA. 69+31



CURTIS ROAD AND JUDGE ORR ROAD* ASPHALT DEMO DETAIL
SCALE: 1" = 2'

LEGEND

- PROPOSED SIGN
- EXISTING SIGN
- (XX) PROPOSED STRIPE
- (XX) EXISTING STRIPE
- (A) CENTER LINE – 4" WIDE, 3" GAP, SOLID DOUBLE YELLOW
- (B) CENTER LINE – 4" WIDE, 10' LONG, 30' GAP, DASHED SINGLE YELLOW
- (C) LANE LINE – 4" WIDE, 10' LONG, 30' GAP, WHITE
- (D) EDGE LINE – 4" WIDE, SOLID WHITE
- (E) CHANNELIZING LINE – 8" WIDE, SOLID WHITE
- (F) WIDE DOTTED ENTRANCE LINE – 8" WIDE x 2' LONG, 4' GAP, WHITE
- (G) STOP BAR – 2' SOLID WHITE

DEMOLITION LEGEND

- 2' MILL & OVERLAY
- 6" SAWCUT & DEMOLITION
- STRIPING REMOVAL
- FENCE REMOVAL

DEMOLITION NOTES

1. ALL EXISTING ℄ STRIPING TO REMAIN, UNLESS OTHERWISE NOTED.
2. ALL EXISTING ASPHALT BETWEEN LIMITS OF MILL AND OVERLAY TO REMAIN.
3. EXISTING ASPHALT OUTSIDE THE EXISTING EDGE LINE STRIPING IS TO BE DEMOLISHED, TYPICAL BOTH SIDES OF CURTIS ROAD.
4. EXISTING EDGE LINE STRIPING TO BE REMOVED WITHIN LIMITS OF CURTIS ROAD IMPROVEMENTS. SEE CURTIS ROAD STRIPING PLAN FOR PROPOSED STRIPING.

50 25 0 50 100
ORIGINAL SCALE: 1" = 50'

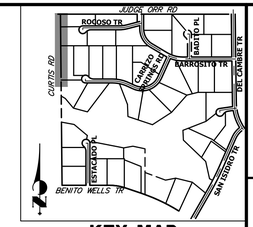
Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE



KEY MAP
N.T.S

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

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No.	REVISION	BY	DATE
	.		

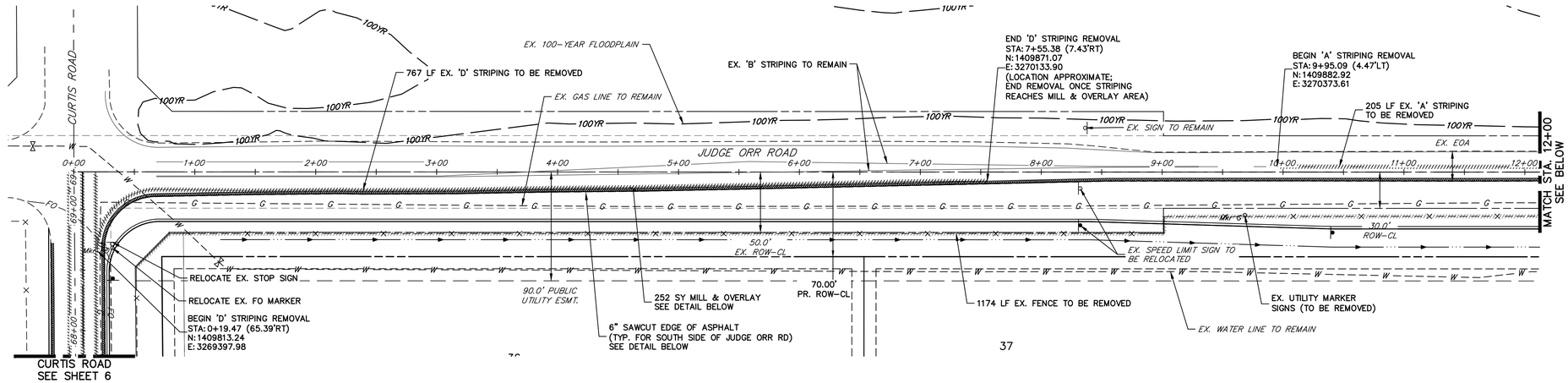
H-SCALE	1"=50'
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

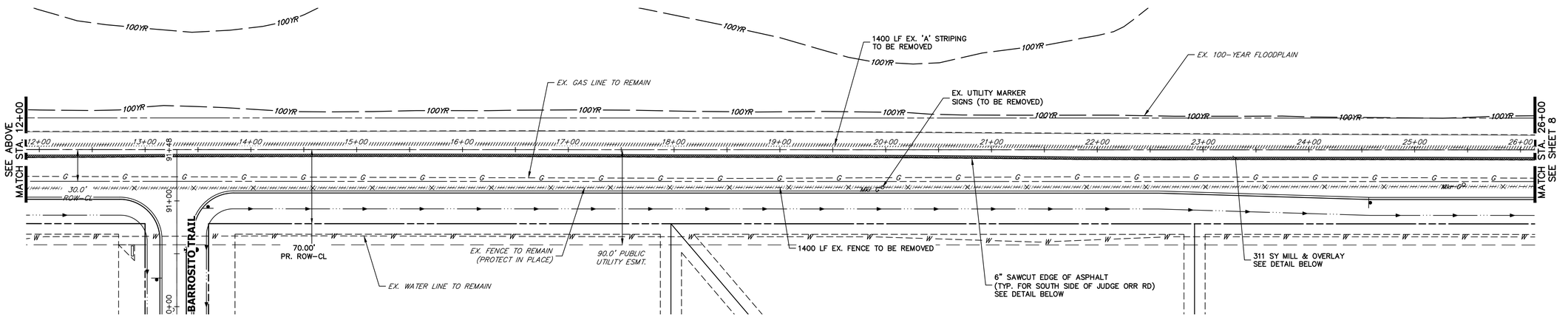
SADDLEHORN RANCH – FILING 3

CURTIS RD & JUDGE ORR RD
DEMOLITION PLAN

SHEET 6 OF 63

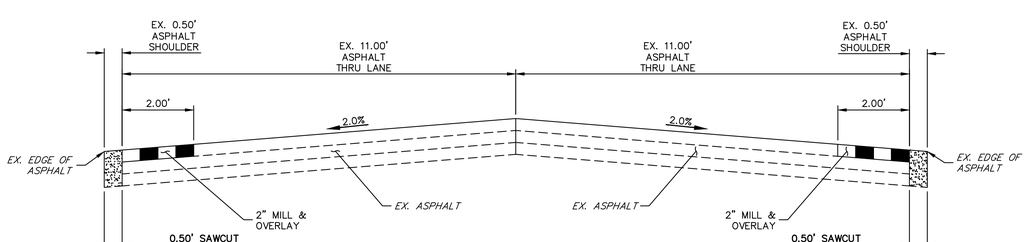
JOB NO. 25142.05





JUDGE ORR ROAD DEMOLITION

STA. 0+00 TO STA. 26+00



CURTIS ROAD AND JUDGE ORR ROAD* ASPHALT DEMO DETAIL

SCALE: 1" = 2'

*JUDGE ORR ROAD TO HAVE DEMO WORK ON SOUTH SIDE OF ROAD ONLY

LEGEND

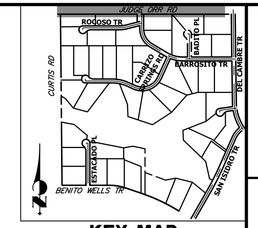
- PROPOSED SIGN
- EXISTING SIGN
- (XX) PROPOSED STRIPE
- (XX) EXISTING STRIPE
- (A) CENTER LINE – 4" WIDE, 3" GAP, SOLID DOUBLE YELLOW
- (B) CENTER LINE – 4" WIDE, 10' LONG, 30' GAP, DASHED SINGLE YELLOW
- (C) LANE LINE – 4" WIDE, 10' LONG, 30' GAP, WHITE
- (D) EDGE LINE – 4" WIDE, SOLID WHITE
- (E) CHANNELIZING LINE – 8" WIDE, SOLID WHITE
- (F) WIDE DOTTED ENTRANCE LINE – 8" WIDE x 2' LONG, 4' GAP, WHITE
- (G) STOP BAR – 2' SOLID WHITE

DEMOLITION LEGEND

- 2' MILL & OVERLAY
- 6" SAWCUT & DEMOLITION
- STRIPING REMOVAL
- FENCE REMOVAL

DEMOLITION NOTES

1. ALL EXISTING ℄ STRIPING TO REMAIN, UNLESS OTHERWISE NOTED.
2. ALL EXISTING ASPHALT BETWEEN LIMITS OF MILL AND OVERLAY TO REMAIN.
3. EXISTING ASPHALT OUTSIDE THE EXISTING EDGE LINE STRIPING IS TO BE DEMOLISHED, TYPICAL BOTH SIDES OF CURTIS ROAD.
4. EXISTING EDGE LINE STRIPING TO BE REMOVED WITHIN LIMITS OF CURTIS ROAD IMPROVEMENTS. SEE CURTIS ROAD STRIPING PLAN FOR PROPOSED STRIPING.



KEY MAP
N.T.S

N

50 25 0 50 100
ORIGINAL SCALE: 1" = 50'

811 Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043

3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
	.		

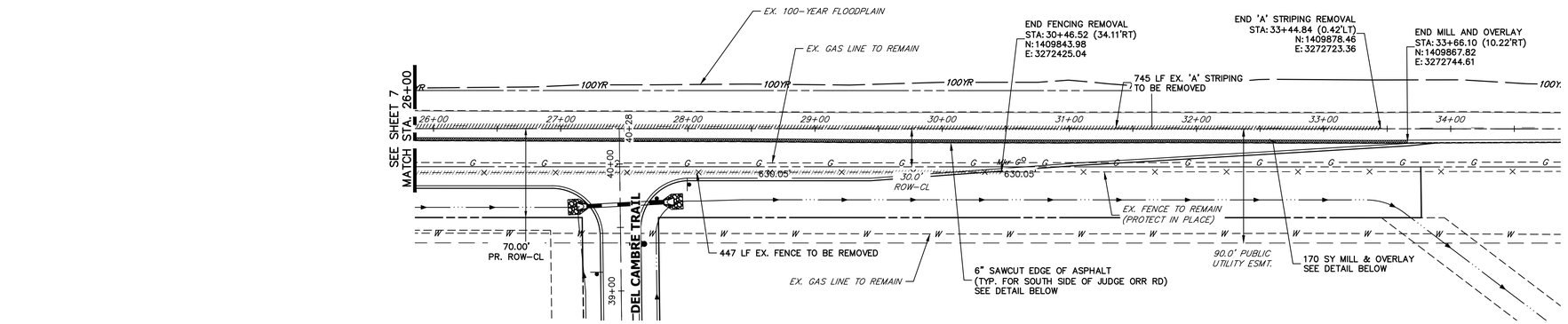
H-SCALE	1"=50'
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

SADDLEHORN RANCH – FILING 3

CURTIS RD & JUDGE ORR RD
DEMOLITION PLAN

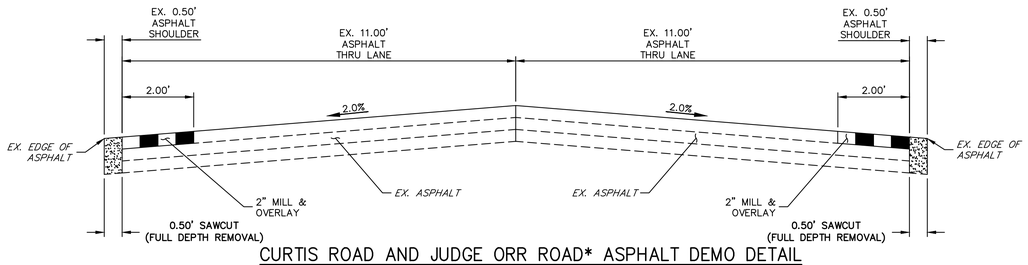
SHEET 7 OF 63

JOB NO. 25142.05



JUDGE ORR ROAD DEMOLITION

STA. 26+00 TO STA. 34+00



CURTIS ROAD AND JUDGE ORR ROAD* ASPHALT DEMO DETAIL

SCALE: 1" = 2'

*JUDGE ORR ROAD TO HAVE DEMO WORK ON SOUTH SIDE OF ROAD ONLY

LEGEND

- PROPOSED SIGN
- EXISTING SIGN
- (XX) PROPOSED STRIPE
- (XX) EXISTING STRIPE
- (A) CENTER LINE – 4" WIDE, 3" GAP, SOLID DOUBLE YELLOW
- (B) CENTER LINE – 4" WIDE, 10' LONG, 30' GAP, DASHED SINGLE YELLOW
- (C) LANE LINE – 4" WIDE, 10' LONG, 30' GAP, WHITE
- (D) EDGE LINE – 4" WIDE, SOLID WHITE
- (E) CHANNELIZING LINE – 8" WIDE, SOLID WHITE
- (F) WIDE DOTTED ENTRANCE LINE – 8" WIDE x 2' LONG, 4' GAP, WHITE
- (G) STOP BAR – 2' SOLID WHITE

DEMOLITION LEGEND

- 2' MILL & OVERLAY
- 6" SAWCUT & DEMOLITION
- STRIPING REMOVAL
- FENCE REMOVAL

DEMOLITION NOTES

1. ALL EXISTING ℄ STRIPING TO REMAIN, UNLESS OTHERWISE NOTED.
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50 25 0 50 100

ORIGINAL SCALE: 1" = 50'

Know what's below. Call before you dig.

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COLORADO P.E. 25043
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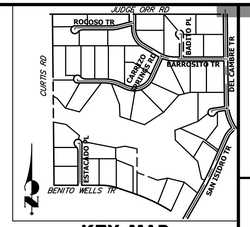
3/20/24
DATE



KEY MAP
N.T.S

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No.	REVISION	BY	DATE
	.		
	.		
	.		

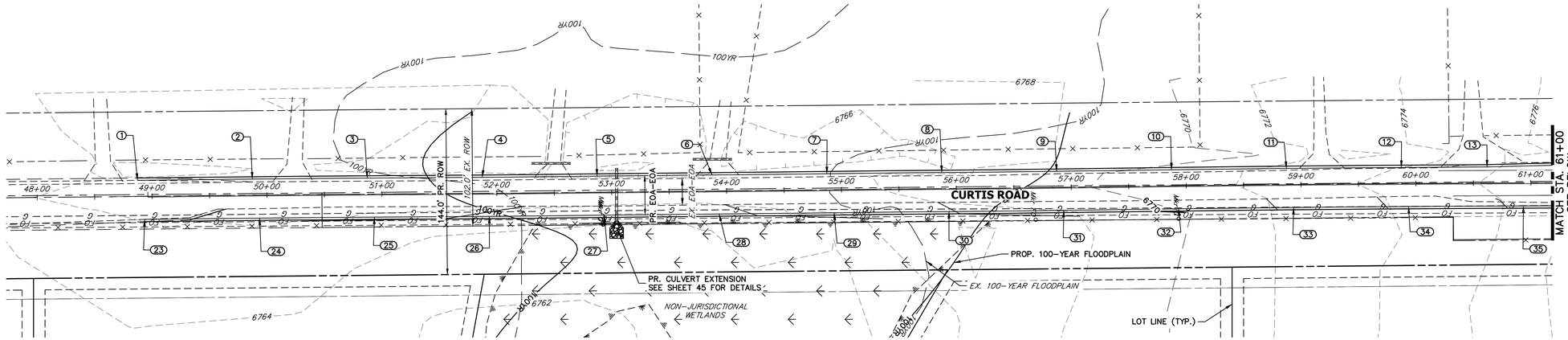
H-SCALE	1"=50'
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

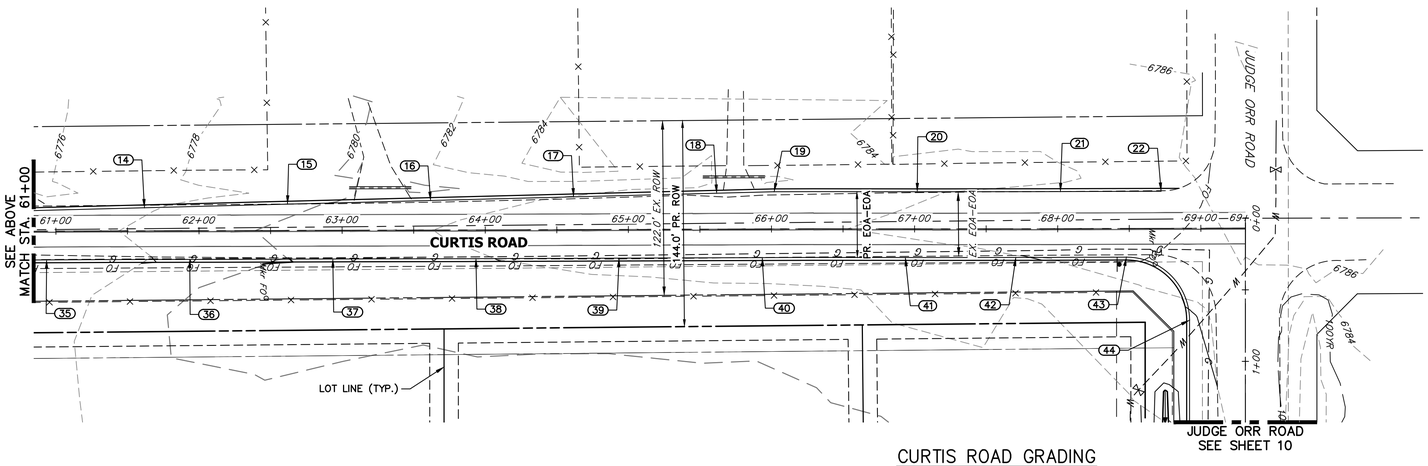
SADDLEHORN RANCH – FILING 3

CURTIS RD & JUDGE ORR RD DEMOLITION PLAN

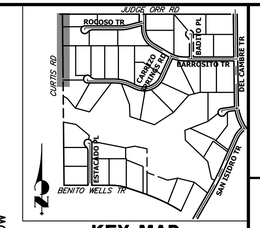
SHEET 8 OF 63

JOB NO. 25142.05





CURTIS ROAD GRADING
STA. 48+00 TO STA. 69+31



KEY MAP
N.T.S

POINT TABULATION					
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
1	48+87.43	14.00' (LT)	EX. CURTIS ROAD	6766.18	±	MATCH EX ASPH
2	49+87.40	14.00' (LT)	EX. CURTIS ROAD	6766.44		EOA
3	50+87.37	14.00' (LT)	EX. CURTIS ROAD	6766.55		EOA
4	51+87.36	14.00' (LT)	EX. CURTIS ROAD	6766.19		EOA
5	52+87.42	14.00' (LT)	EX. CURTIS ROAD	6765.59		EOA
6	53+87.41	14.00' (LT)	EX. CURTIS ROAD	6766.00		EOA
7	54+87.43	14.00' (LT)	EX. CURTIS ROAD	6767.18		EOA
8	55+87.38	14.00' (LT)	EX. CURTIS ROAD	6767.46		EOA
9	56+87.45	14.00' (LT)	EX. CURTIS ROAD	6769.09		EOA
10	57+87.45	14.00' (LT)	EX. CURTIS ROAD	6770.61		EOA
11	58+87.40	14.00' (LT)	EX. CURTIS ROAD	6772.20		EOA
12	59+87.36	14.00' (LT)	EX. CURTIS ROAD	6774.00		EOA
13	60+61.95	14.04' (LT)	EX. CURTIS ROAD	6775.80		EOA PI
14	61+61.88	16.17' (LT)	EX. CURTIS ROAD	6777.69		EOA
15	62+61.88	18.46' (LT)	EX. CURTIS ROAD	6779.29		EOA
16	63+61.83	20.72' (LT)	EX. CURTIS ROAD	6781.05		EOA
17	64+61.84	22.95' (LT)	EX. CURTIS ROAD	6782.03		EOA
18	65+61.81	25.11' (LT)	EX. CURTIS ROAD	6783.00		EOA
19	66+01.93	26.00' (LT)	EX. CURTIS ROAD	6783.01		EOA PI
20	67+01.83	26.00' (LT)	EX. CURTIS ROAD	6783.54		EOA
21	68+01.93	26.00' (LT)	EX. CURTIS ROAD	6784.18		EOA
22	68+72.31	26.00' (LT)	EX. CURTIS ROAD	6785.63	±	MATCH EX ASPH
23	48+93.29	20.00' (RT)	EX. CURTIS ROAD	6766.04	±	MATCH EX ASPH
24	49+93.33	20.00' (RT)	EX. CURTIS ROAD	6766.44		EOA
25	50+93.37	20.00' (RT)	EX. CURTIS ROAD	6766.22		EOA

POINT TABULATION						
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
26	51+93.40	20.00' (RT)	EX. CURTIS ROAD	6765.92		EOA
27	52+93.30	20.00' (RT)	EX. CURTIS ROAD	6765.63		EOA
28	53+93.32	20.00' (RT)	EX. CURTIS ROAD	6765.81		EOA
29	54+93.29	20.00' (RT)	EX. CURTIS ROAD	6766.70		EOA
30	55+93.36	20.00' (RT)	EX. CURTIS ROAD	6767.94		EOA
31	56+93.26	20.00' (RT)	EX. CURTIS ROAD	6769.00		EOA
32	57+93.26	20.00' (RT)	EX. CURTIS ROAD	6770.37		EOA
33	58+93.34	20.00' (RT)	EX. CURTIS ROAD	6772.33		EOA
34	59+93.39	20.00' (RT)	EX. CURTIS ROAD	6774.39		EOA
35	60+93.43	20.00' (RT)	EX. CURTIS ROAD	6776.32		EOA
36	61+93.49	20.00' (RT)	EX. CURTIS ROAD	6778.54		EOA
37	62+93.45	20.00' (RT)	EX. CURTIS ROAD	6780.56		EOA
38	63+93.45	20.00' (RT)	EX. CURTIS ROAD	6781.89		EOA
39	64+93.45	20.00' (RT)	EX. CURTIS ROAD	6782.54		EOA
40	65+93.46	20.00' (RT)	EX. CURTIS ROAD	6783.01		EOA
41	66+93.54	20.00' (RT)	EX. CURTIS ROAD	6783.52		EOA
42	67+70.73	19.92' (RT)	EX. CURTIS ROAD	6783.95		EOA
43	68+47.92	20.00' (RT)	EX. CURTIS ROAD	6784.76		PCR
44	68+91.92	64.14' (RT)	EX. CURTIS ROAD	6783.88		PCR

50 25 0 50 100
ORIGINAL SCALE: 1" = 50'

Know what's **below.** **Call** before you dig.

STREET IMPROVEMENT NOTES

1. ALL STATIONING IS ℄, UNLESS OTHERWISE NOTED.
2. ALL PROFILE ELEVATIONS ARE ℄ UNLESS OTHERWISE NOTED.
3. ALL POINT TABULATIONS ARE EDGE OF ASPHALT, UNLESS OTHERWISE NOTED.
4. ALL CURB RETURN RADII ARE 20', UNLESS OTHERWISE NOTED.
5. ALL SLOPE LABELS ARE SWALE CENTERLINE, UNLESS OTHERWISE NOTED.
6. SEE SHEET 4 FOR TYPICAL STREET SECTIONS, SWALE SECTION A-A AND SECTION B-B DIMENSIONS AND DETAILS.
7. ALL PROPOSED ROW WIDTHS ARE 60', UNLESS OTHERWISE NOTED.
8. ABBREVIATIONS: EOA = EDGE OF ASPHALT, P.I.E. = PUBLIC IMPROVEMENTS EASEMENT.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

COLORADO REGISTERED BRYAN T. LAW 25043 PROFESSIONAL ENGINEER

3/20/24
DATE

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No.	REVISION	BY	DATE
	.		

H-SCALE	1"=50'
V-SCALE	N/A
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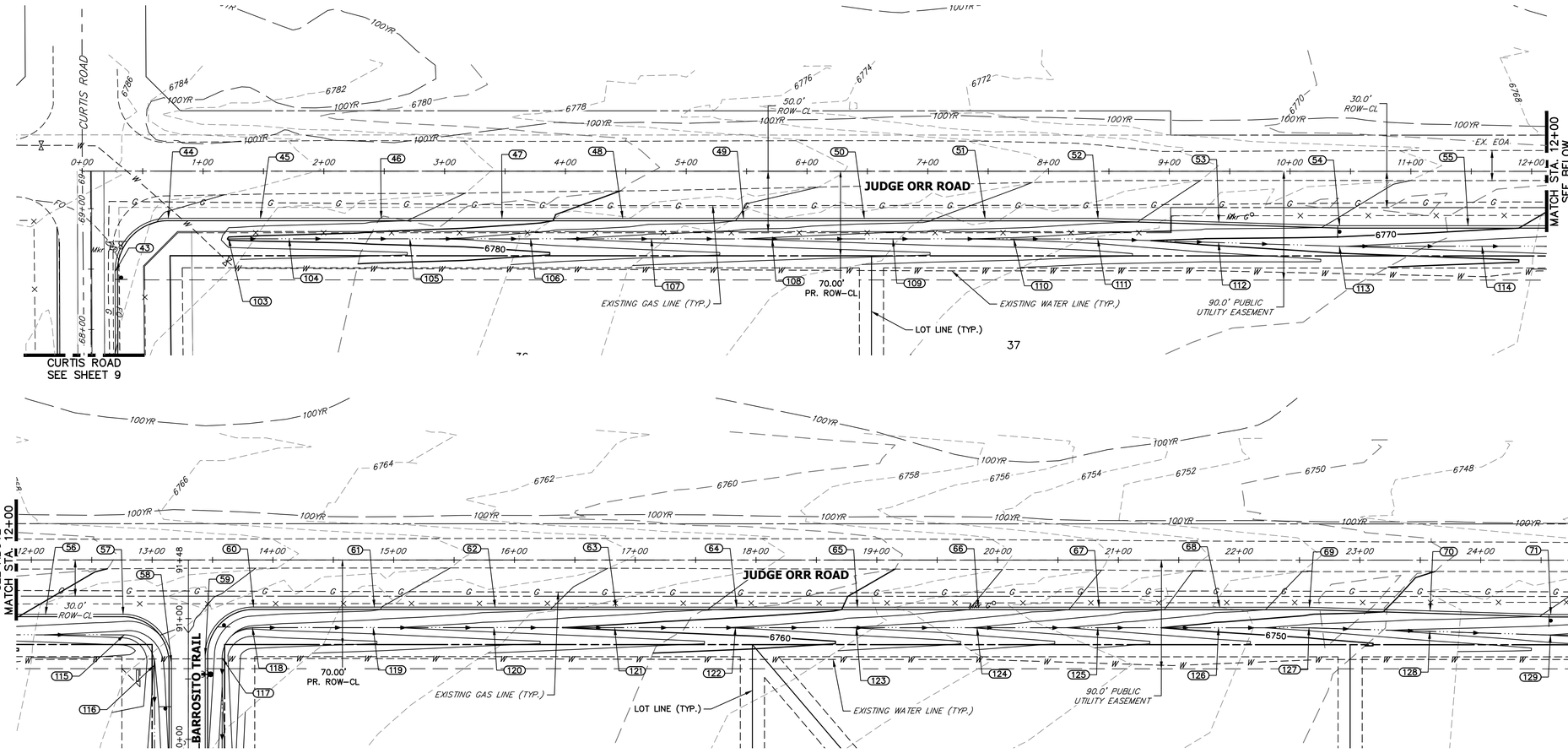
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

SADDLEHORN RANCH – FILING 3

CURTIS RD & JUDGE ORR RD GRADING PLAN

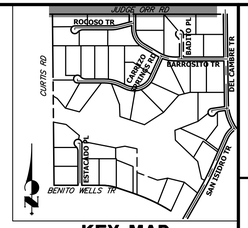
SHEET 9 OF 63

JOB NO. 25142.05



JUDGE ORR ROAD GRADING

STA. 0+00 TO STA. 26+00



KEY MAP
N.T.S

POINT TABLULATION						
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
43	0+27.19	83.14' (RT)	EX. JUDGE ORR CL	6784.76		PCR
43	68+47.92	20.00' (RT)	EX. CURTIS ROAD	6784.76		PCR
45	1+47.47	39.00' (RT)	EX. JUDGE ORR CL	6783.15		EOA
46	2+47.47	39.00' (RT)	EX. JUDGE ORR CL	6782.24		EOA
47	3+47.47	39.00' (RT)	EX. JUDGE ORR CL	6781.08		EOA
48	4+47.47	39.00' (RT)	EX. JUDGE ORR CL	6779.48		EOA
49	5+47.47	39.00' (RT)	EX. JUDGE ORR CL	6777.85		EOA
50	6+47.47	39.00' (RT)	EX. JUDGE ORR CL	6776.75		EOA
51	7+47.47	39.00' (RT)	EX. JUDGE ORR CL	6775.70		EOA
52	8+41.00	39.00' (RT)	EX. JUDGE ORR CL	6774.56		EOA PI
53	9+41.00	42.00' (RT)	EX. JUDGE ORR CL	6772.94		EOA
54	10+41.00	45.00' (RT)	EX. JUDGE ORR CL	6771.85		EOA PI
55	11+47.38	45.00' (RT)	EX. JUDGE ORR CL	6770.57		EOA
56	12+11.69	45.00' (RT)	EX. JUDGE ORR CL	6769.78		EOA
57	12+76.00	45.00' (RT)	EX. JUDGE ORR CL	6769.04		PCR
58	13+16.00	85.00' (RT)	EX. JUDGE ORR CL	6767.36		PCR
59	13+44.00	79.00' (RT)	EX. JUDGE ORR CL	6767.44		PCR
60	13+84.00	39.00' (RT)	EX. JUDGE ORR CL	6767.36		PCR
61	14+84.00	39.00' (RT)	EX. JUDGE ORR CL	6766.23		EOA
62	15+84.00	39.00' (RT)	EX. JUDGE ORR CL	6764.60		EOA

POINT TABLULATION						
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
63	16+84.00	39.00' (RT)	EX. JUDGE ORR CL	6763.24		EOA
64	17+84.00	39.00' (RT)	EX. JUDGE ORR CL	6761.68		EOA
65	18+84.00	39.00' (RT)	EX. JUDGE ORR CL	6759.73		EOA
66	19+84.00	39.00' (RT)	EX. JUDGE ORR CL	6757.86		EOA
67	20+84.00	39.00' (RT)	EX. JUDGE ORR CL	6755.43		EOA
68	21+84.00	39.00' (RT)	EX. JUDGE ORR CL	6752.62		EOA
69	22+58.12	39.00' (RT)	EX. JUDGE ORR CL	6751.14		EOA PI
70	23+58.12	42.00' (RT)	EX. JUDGE ORR CL	6749.37		EOA
71	24+58.12	45.00' (RT)	EX. JUDGE ORR CL	6747.90		EOA PI
72	25+75.62	45.00' (RT)	EX. JUDGE ORR CL	6746.20		EOA
103	1+21.19	56.00' (RT)	EX. JUDGE ORR CL	6779.61		BEGIN SWALE
104	1+71.19	56.00' (RT)	EX. JUDGE ORR CL	6779.20		SWALE
105	2+71.19	56.00' (RT)	EX. JUDGE ORR CL	6778.23		SWALE
106	3+71.19	56.00' (RT)	EX. JUDGE ORR CL	6776.60		SWALE
107	4+71.19	56.00' (RT)	EX. JUDGE ORR CL	6774.97		SWALE
108	5+71.19	56.00' (RT)	EX. JUDGE ORR CL	6773.73		SWALE
109	6+71.19	56.00' (RT)	EX. JUDGE ORR CL	6772.60		SWALE
110	7+71.19	56.00' (RT)	EX. JUDGE ORR CL	6771.73		SWALE
111	8+40.78	56.00' (RT)	EX. JUDGE ORR CL	6770.75		SWALE PI
112	9+40.76	59.00' (RT)	EX. JUDGE ORR CL	6769.14		SWALE

POINT TABLULATION						
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
113	10+40.75	62.00' (RT)	EX. JUDGE ORR CL	6768.06		SWALE PI
114	11+58.87	62.00' (RT)	EX. JUDGE ORR CL	6766.61		SWALE
115	12+77.00	62.00' (RT)	EX. JUDGE ORR CL	6765.16		SWALE PC
116	13+02.00	87.00' (RT)	EX. JUDGE ORR CL	6763.85		SWALE PT
117	13+58.00	81.22' (RT)	EX. JUDGE ORR CL	6764.37		SWALE PC
118	13+83.00	56.00' (RT)	EX. JUDGE ORR CL	6763.62		SWALE PT
119	14+83.00	56.00' (RT)	EX. JUDGE ORR CL	6762.29		SWALE
120	15+83.00	56.00' (RT)	EX. JUDGE ORR CL	6760.77		SWALE
121	16+83.00	56.00' (RT)	EX. JUDGE ORR CL	6759.35		SWALE
122	17+83.00	56.00' (RT)	EX. JUDGE ORR CL	6757.89		SWALE
123	18+83.00	56.00' (RT)	EX. JUDGE ORR CL	6755.91		SWALE
124	19+83.00	56.00' (RT)	EX. JUDGE ORR CL	6753.90		SWALE
125	20+83.00	56.00' (RT)	EX. JUDGE ORR CL	6751.35		SWALE
126	21+83.00	56.00' (RT)	EX. JUDGE ORR CL	6748.81		SWALE
127	22+57.86	56.00' (RT)	EX. JUDGE ORR CL	6747.23		SWALE PI
128	23+57.86	59.00' (RT)	EX. JUDGE ORR CL	6745.48		SWALE
129	24+57.86	62.00' (RT)	EX. JUDGE ORR CL	6743.96		SWALE PI
130	25+57.87	61.90' (RT)	EX. JUDGE ORR CL	6742.36		SWALE

STREET IMPROVEMENT NOTES

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ORIGINAL SCALE: 1" = 50'

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BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043 — REGISTERED PROFESSIONAL ENGINEER — STATE OF COLORADO

3/20/24
DATE

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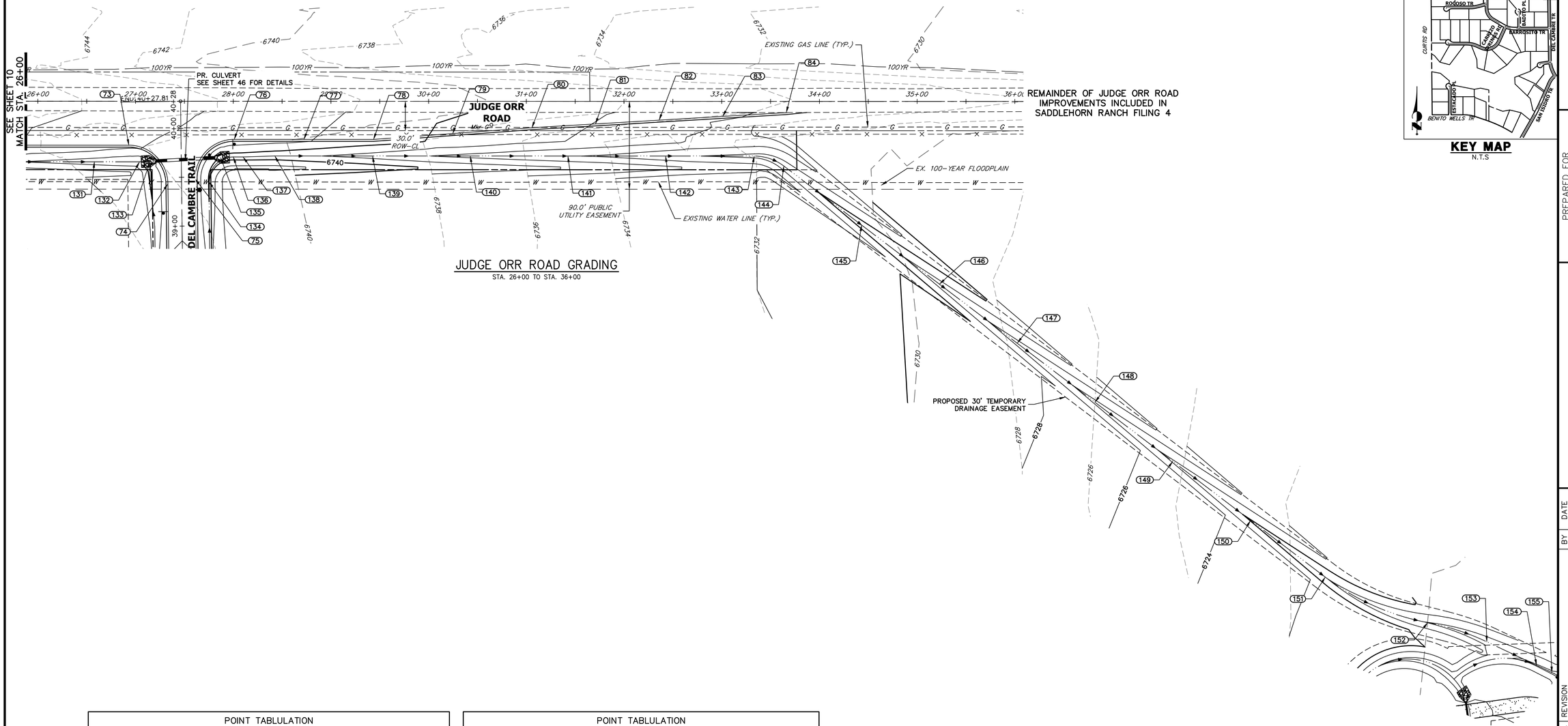
H-SCALE	1"=50'
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

SADDLEHORN RANCH – FILING 3

CURTIS RD & JUDGE ORR RD GRADING PLAN

SHEET 10 OF 63

JOB NO. 25142.05


SEE SHEET 10
MATCH STA. 26+00
PR. CULVERT
SEE SHEET 46 FOR DETAILS
JUDGE ORR ROAD
DEL CAMBRE TRAIL
30.0' ROW-CL
90.0' PUBLIC UTILITY EASEMENT
EXISTING WATER LINE (TYP.)
EXISTING GAS LINE (TYP.)
EX. 100-YEAR FLOODPLAIN
PROPOSED 30' TEMPORARY DRAINAGE EASEMENT
REMAINDER OF JUDGE ORR ROAD IMPROVEMENTS INCLUDED IN SADDLEHORN RANCH FILING 4
100YR
6740
6742
6744
6738
6736
6734
6732
6730
6728
6726
6724
6722
6720
6718
6716
6714
6712
6710
6708
6706
6704
6702
6700
6698
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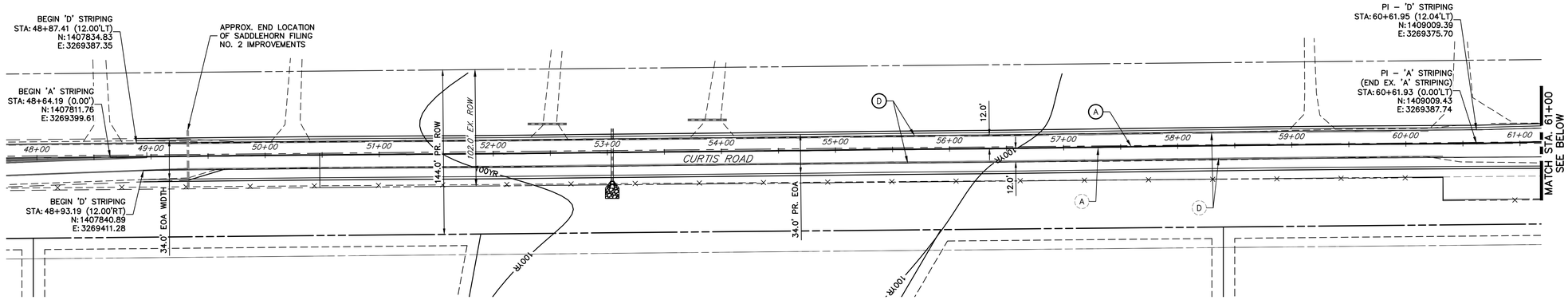
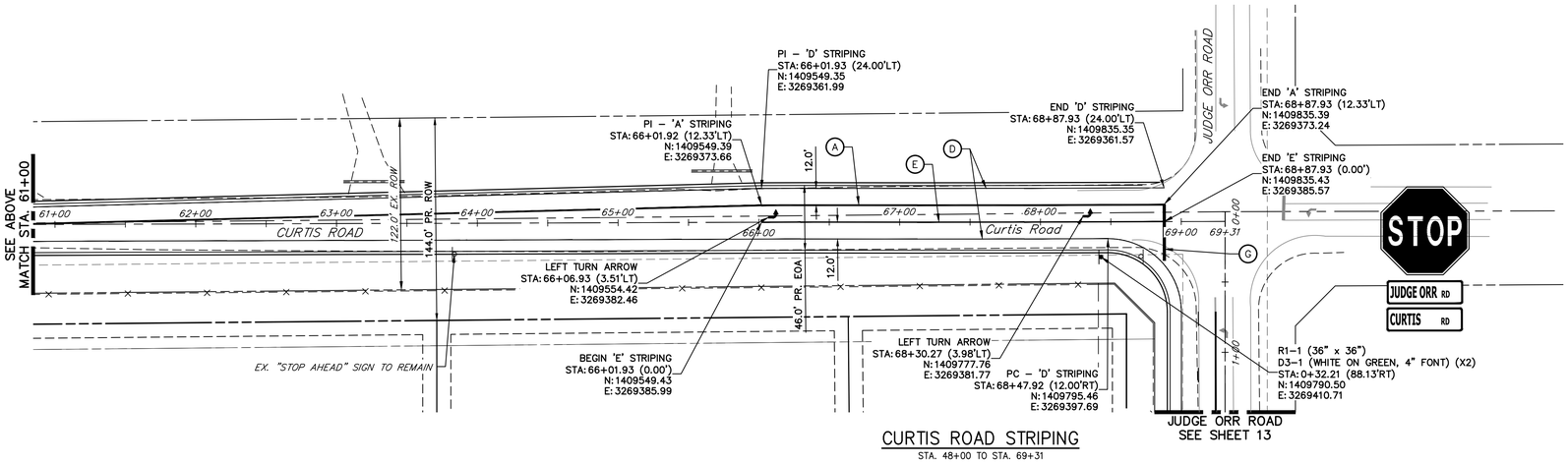
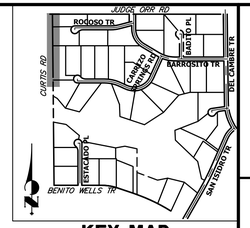




CURTIS ROAD STRIPING
STA. 48+00 TO STA. 69+31



KEY MAP
N.T.S

SIGNING AND STRIPING NOTES

1. ALL SIGNS AND PAVEMENT MARKING SHALL BE IN COMPLIANCE WITH THE CURRENT MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).
2. PLACEMENT OF GROUND SIGNS SHALL BE IN COMPLIANCE WITH CDOT DETAIL S–614–1.
3. STRIPING AND PAVEMENT MARKINGS SHALL BE IN COMPLIANCE WITH CDOT DETAIL S–627–1.
4. REMOVAL OF EXISTING PAVEMENT MARKINGS SHALL BE ACCOMPLISHED BY A METHOD THAT DOES NOT MATERIALLY DAMAGE THE PAVEMENT. THE PAVEMENT MARKINGS SHALL BE REMOVED TO THE EXTENT THEY WILL NOT BE VISIBLE UNDER DAY OR NIGHT CONDITIONS. AT NO TIME WILL IT BE ACCEPTABLE TO PAINT OVER EXISTING PAVEMENT MARKINGS.
5. ANY DEVIATION FROM THE STRIPING AND SIGNING PLAN SHALL BE APPROVED BY EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS.
6. ALL SIGNS SHOWN ON THE SIGNING AND STRIPING PLAN SHALL BE NEW SIGNS. EXISTING SIGNS MAY REMAIN OR BE REUSED IF THEY MEET CURRENT EL PASO COUNTY AND MUTCD STANDARDS.
7. STREET NAME AND REGULATORY STOP SIGNS SHALL BE ON THE SAME POST AT INTERSECTIONS.
8. ALL REMOVED SIGNS SHALL BE DISPOSED OF IN A PROPER MANNER BY THE CONTRACTOR.
9. ALL STREET NAME SIGNS SHALL BE "D" SERIES LETTERS, WITH LOCAL ROADWAY SIGNS BEING 4" UPPER–LOWER CASE LETTERING ON 8" BLANK AND NON–LOCAL ROADWAY SIGNS BEING 6" LETTERING. UPPER–LOWER CASE ON 12" BLANK, WITH A WHITE BORDER THAT IS NOT RECESSED. MULTI–LANE ROADWAYS WITH SPEED LIMITS OF 40 MPH OR HIGHER SHALL HAVE 8" UPPER–LOWER CASE LETTERING ON 18" BLANK WITH A WHITE BORDER THAT IS NOT RECESSED. THE WIDTH OF THE NON–RECESSED WHITE BORDERS SHALL MATCH PAGE 255 OF THE 2012 MUTCD "STANDARD HIGHWAY SIGNS".
10. ALL TRAFFIC SIGNS SHALL HAVE A MINIMUM HIGH INTENSITY PRISMATIC GRADE SHEETING.
11. ALL LOCAL RESIDENTIAL STREET SIGNS SHALL BE MOUNTED ON A 1.75" X 1.75" SQUARE TUBE SIGN POST AND STUB POST BASE,. FOR OTHER APPLICATIONS, REFER TO THE CDOT STANDARD S–614–8 REGARDING USE OF THE P2 TUBULAR STEEL POST SLIPBASE DESIGN.
12. ALL SIGNS SHALL BE SINGLE SHEET ALUMINUM WITH 0.100" THICKNESS.
13. ALL LIMIT LINES/STOP LINES, CROSSWALK LINES, PAVEMENT LEGENDS, AND ARROWS SHALL BE A MINIMUM 125 MIL THICKNESS PREFORMED THERMOPLASTIC PAVEMENT MARKINGS WITH TAPERED LEADING EDGES PER CDOT STANDARD S–627–1. WORD AND SYMBOL MARKINGS SHALL BE THE NARROW TYPE, STOP BARS SHALL BE 24" IN WIDTH, CROSSWALK LINES SHALL BE 12" WIDE AND 8' LONG PER CDOT S–267–1.
14. ALL LONGITUDINAL LINES SHALL BE A MINIMUM 15MIL THICKNESS EPOXY PAINT. ALL NON–LOCAL RESIDENTIAL ROADWAYS SHALL INCLUDE BOTH RIGHT AND LEFT EDGE LINE STRIPING AND ANY ADDITIONAL STRIPING AS REQUIRED BY CDOT S–627–1.
15. THE CONTRACTOR SHALL NOTIFY EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS (719) 520–6819 PRIOR TO AND UPON COMPLETION OF THE SIGNING AND STRIPING.
16. THE CONTRACTOR SHALL OBTAIN A WORK IN THE RIGHT OF WAY PERMIT FROM THE EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS (DPW) PRIOR TO ANY SIGNAGE OR STRIPING WORK WITHIN AN EXISTING EL PASO COUNTY ROADWAY.

LEGEND

- PROPOSED SIGN
- EXISTING SIGN
- (XX) PROPOSED STRIPE
- (XX) EXISTING STRIPE
- (A) CENTER LINE – 4" WIDE, 3" GAP, SOLID DOUBLE YELLOW
- (B) CENTER LINE – 4" WIDE, 10' LONG, 30' GAP, DASHED SINGLE YELLOW
- (C) LANE LINE – 4" WIDE, 10' LONG, 30' GAP, WHITE
- (D) EDGE LINE – 4" WIDE, SOLID WHITE
- (E) CHANNELIZING LINE – 8" WIDE, SOLID WHITE
- (F) WIDE DOTTED ENTRANCE LINE – 8" WIDE x 2' LONG, 4' GAP, WHITE
- (G) STOP BAR – 2' SOLID WHITE

Curtis Road Sign Tabulation		
Sign	Dimensions	Proposed
R1-1	36" x 36"	1
D3-1	Varies* x 12"	2

*Sign width depends on street name

50 25 0 50 100
ORIGINAL SCALE: 1" = 50'

811 Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043 — 3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365–6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303–740–9393 • Colorado Springs 719–593–2593
Fort Collins 970–491–9888 • www.jrengineering.com

No.	REVISION	BY	DATE
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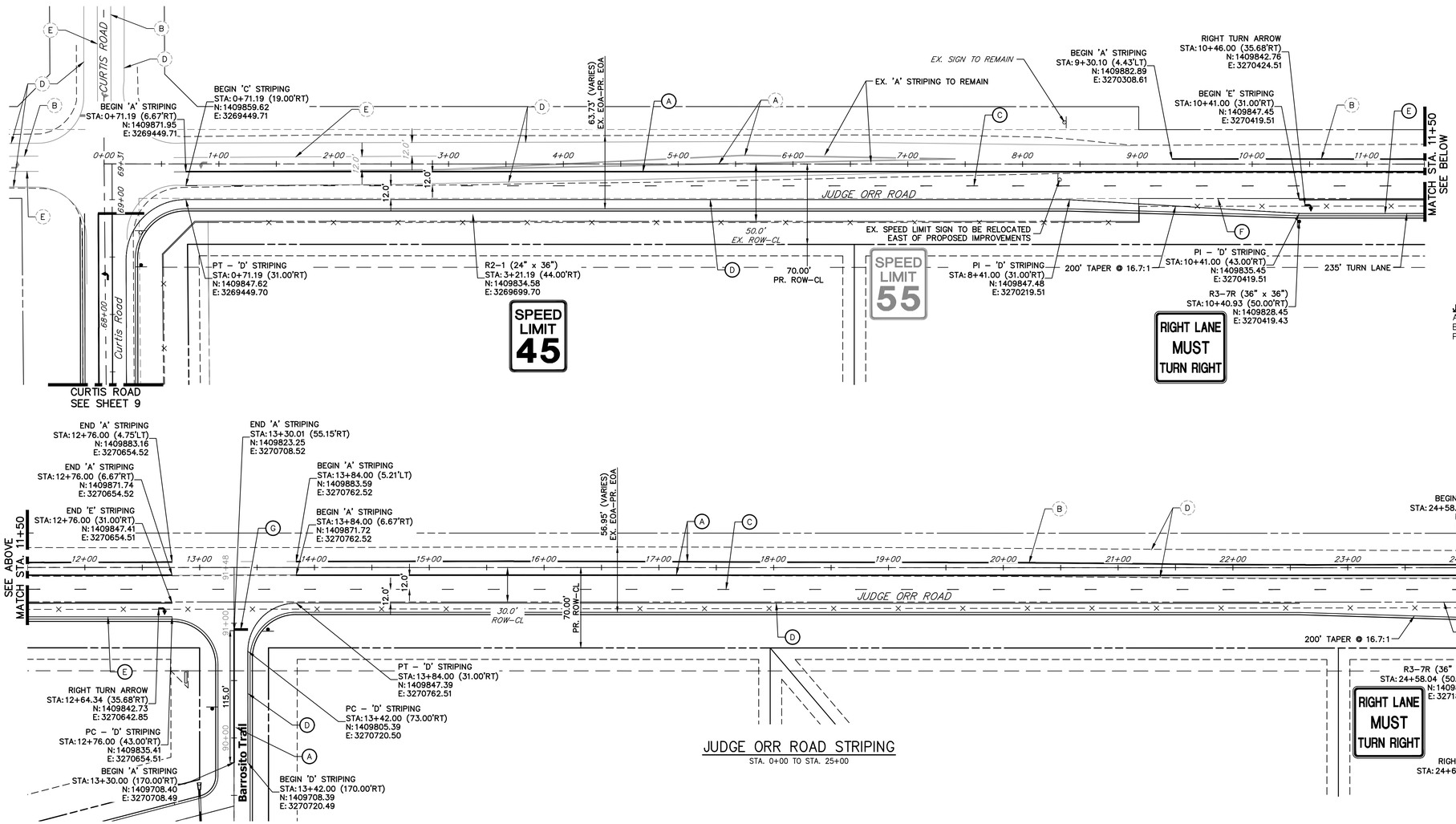
H–SCALE	1"=50'
V–SCALE	N/A
DATE	3/20/24
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

SADDLEHORN RANCH – FILING 3

CURTIS RD & JUDGE ORR RD SIGNAGE & STRIPING PLAN

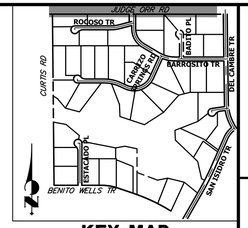
SHEET 12 OF 63

JOB NO. 25142.05



JUDGE ORR ROAD STRIPING

STA. 0+00 TO STA. 25+00



KEY MAP
N.T.S

JUDGE ORR EXISTING STRIPING NOTE:
ALL EXISTING STRIPING SHOWN ON JUDGE ORR ROAD IS APPROXIMATE BASED ON THE BEST DATA AVAILABLE. EXISTING STRIPING SHOWN ON PLANS MAY NOT EXACTLY MATCH EXISTING CONDITIONS ON SITE.

SIGNING AND STRIPING NOTES

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11. ALL LOCAL RESIDENTIAL STREET SIGNS SHALL BE MOUNTED ON A 1.75" X 1.75" SQUARE TUBE SIGN POST AND STUB POST BASE,. FOR OTHER APPLICATIONS, REFER TO THE CDOT STANDARD S-614-8 REGARDING USE OF THE P2 TUBULAR STEEL POST SLIPBASE DESIGN.
12. ALL SIGNS SHALL BE SINGLE SHEET ALUMINUM WITH 0.100" THICKNESS.
13. ALL LIMIT LINES/STOP LINES, CROSSWALK LINES, PAVEMENT LEGENDS, AND ARROWS SHALL BE A MINIMUM 125 MIL THICKNESS PREFORMED THERMOPLASTIC PAVEMENT MARKINGS WITH TAPERED LEADING EDGES PER CDOT STANDARD S-627-1. WORD AND SYMBOL MARKINGS SHALL BE THE NARROW TYPE, STOP BARS SHALL BE 24" IN WIDTH, CROSSWALK LINES SHALL BE 12" WIDE AND 8' LONG PER CDOT S-267-1.
14. ALL LONGITUDINAL LINES SHALL BE A MINIMUM 15MIL THICKNESS EPOXY PAINT. ALL NON-LOCAL RESIDENTIAL ROADWAYS SHALL INCLUDE BOTH RIGHT AND LEFT EDGE LINE STRIPING AND ANY ADDITIONAL STRIPING AS REQUIRED BY CDOT S-627-1.
15. THE CONTRACTOR SHALL NOTIFY EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS (719) 520-6819 PRIOR TO AND UPON COMPLETION OF THE SIGNING AND STRIPING.
16. THE CONTRACTOR SHALL OBTAIN A WORK IN THE RIGHT OF WAY PERMIT FROM THE EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS (DPW) PRIOR TO ANY SIGNAGE OR STRIPING WORK WITHIN AN EXISTING EL PASO COUNTY ROADWAY.

LEGEND

- PROPOSED SIGN
- EXISTING SIGN
- (XX) PROPOSED STRIPE
- (XX) EXISTING STRIPE
- (A) CENTER LINE - 4" WIDE, 3" GAP, SOLID DOUBLE YELLOW
- (B) CENTER LINE - 4" WIDE, 10' LONG, 30' GAP, DASHED SINGLE YELLOW
- (C) LANE LINE - 4" WIDE, 10' LONG, 30' GAP, WHITE
- (D) EDGE LINE - 4" WIDE, SOLID WHITE
- (E) CHANNELIZING LINE - 8" WIDE, SOLID WHITE
- (F) WIDE DOTTED ENTRANCE LINE - 8" WIDE x 2' LONG, 4' GAP, WHITE
- (G) STOP BAR - 2' SOLID WHITE

Judge Orr Road Sign Tabulation (1/2)			
Sign	Dimensions	Proposed	Relocate Existing
R2-1	30" x 36"	1	1
R3-7R	36" x 36"	2	-

50 25 0 50 100
ORIGINAL SCALE: 1" = 50'

Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
	.	.	.

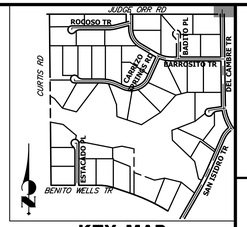
H-SCALE	1"=50'
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

SADDLEHORN RANCH - FILING 3

CURTIS RD & JUDGE ORR RD SIGNAGE & STRIPING PLAN

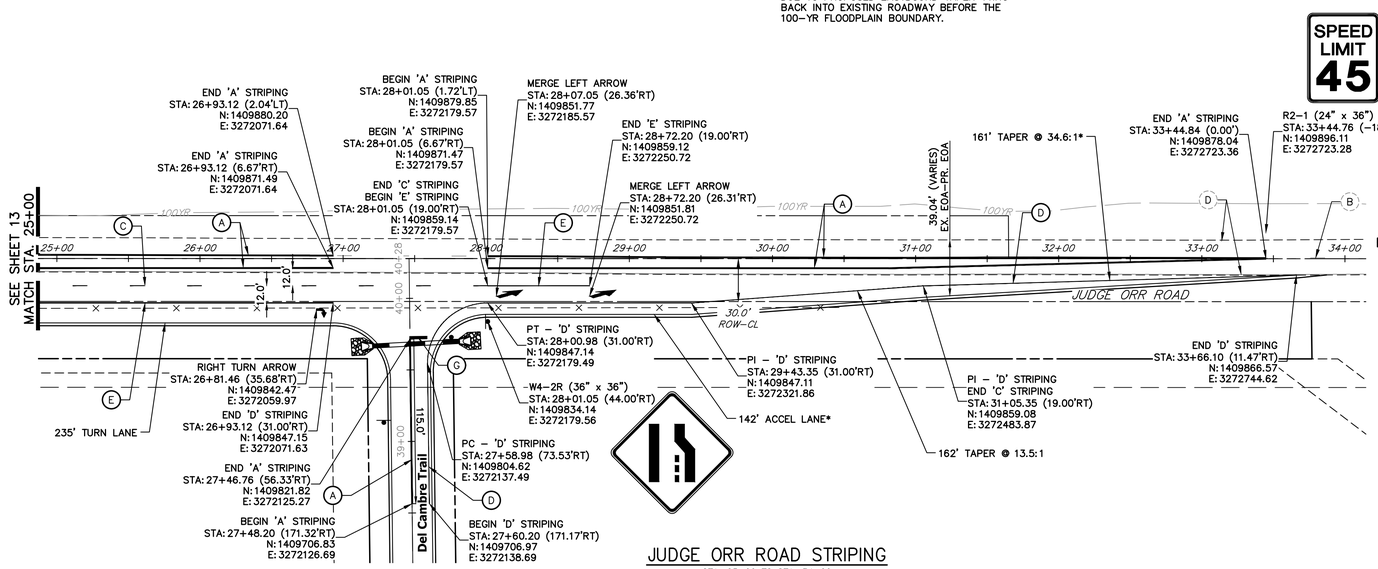
SHEET 13 OF 63

JOB NO. 25142.05



KEY MAP
N.T.S

*ACCELERATION LANE AND LANE REDIRECT TAPER ARE BOTH SHORTER THAN STANDARD DUE TO PROPOSED EASTBOUND TAPER TYING BACK INTO EXISTING ROADWAY BEFORE THE 100-YR FLOODPLAIN BOUNDARY.



JUDGE ORR ROAD STRIPING
STA. 25+00 TO STA. 34+00

JUDGE ORR EXISTING STRIPING NOTE:
ALL EXISTING STRIPING SHOWN ON JUDGE ORR ROAD IS APPROXIMATE BASED ON THE BEST DATA AVAILABLE. EXISTING STRIPING SHOWN ON PLANS MAY NOT EXACTLY MATCH EXISTING CONDITIONS ON SITE.

SIGNING AND STRIPING NOTES

1. ALL SIGNS AND PAVEMENT MARKING SHALL BE IN COMPLIANCE WITH THE CURRENT MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).
2. PLACEMENT OF GROUND SIGNS SHALL BE IN COMPLIANCE WITH CDOT DETAIL S-614-1.
3. STRIPING AND PAVEMENT MARKINGS SHALL BE IN COMPLIANCE WITH CDOT DETAIL S-627-1.
4. REMOVAL OF EXISTING PAVEMENT MARKINGS SHALL BE ACCOMPLISHED BY A METHOD THAT DOES NOT MATERIALLY DAMAGE THE PAVEMENT. THE PAVEMENT MARKINGS SHALL BE REMOVED TO THE EXTENT THEY WILL NOT BE VISIBLE UNDER DAY OR NIGHT CONDITIONS. AT NO TIME WILL IT BE ACCEPTABLE TO PAINT OVER EXISTING PAVEMENT MARKINGS.
5. ANY DEVIATION FROM THE STRIPING AND SIGNING PLAN SHALL BE APPROVED BY EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS.
6. ALL SIGNS SHOWN ON THE SIGNING AND STRIPING PLAN SHALL BE NEW SIGNS. EXISTING SIGNS MAY REMAIN OR BE REUSED IF THEY MEET CURRENT EL PASO COUNTY AND MUTCD STANDARDS.
7. STREET NAME AND REGULATORY STOP SIGNS SHALL BE ON THE SAME POST AT INTERSECTIONS.
8. ALL REMOVED SIGNS SHALL BE DISPOSED OF IN A PROPER MANNER BY THE CONTRACTOR.
9. ALL STREET NAME SIGNS SHALL BE "D" SERIES LETTERS, WITH LOCAL ROADWAY SIGNS BEING 4" UPPER-LOWER CASE LETTERING ON 8" BLANK AND NON-LOCAL ROADWAY SIGNS BEING 6" LETTERING. UPPER-LOWER CASE ON 12" BLANK, WITH A WHITE BORDER THAT IS NOT RECESSED. MULTI-LANE ROADWAYS WITH SPEED LIMITS OF 40 MPH OR HIGHER SHALL HAVE 8" UPPER-LOWER CASE LETTERING ON 18" BLANK WITH A WHITE BORDER THAT IS NOT RECESSED. THE WIDTH OF THE NON-RECESSED WHITE BORDERS SHALL MATCH PAGE 255 OF THE 2012 MUTCD "STANDARD HIGHWAY SIGNS".
10. ALL TRAFFIC SIGNS SHALL HAVE A MINIMUM HIGH INTENSITY PRISMATIC GRADE SHEETING.
11. ALL LOCAL RESIDENTIAL STREET SIGNS SHALL BE MOUNTED ON A 1.75" X 1.75" SQUARE TUBE SIGN POST AND STUB POST BASE,. FOR OTHER APPLICATIONS, REFER TO THE CDOT STANDARD S-614-8 REGARDING USE OF THE P2 TUBULAR STEEL POST SLIPBASE DESIGN.
12. ALL SIGNS SHALL BE SINGLE SHEET ALUMINUM WITH 0.100" THICKNESS.
13. ALL LIMIT LINES/STOP LINES, CROSSWALK LINES, PAVEMENT LEGENDS, AND ARROWS SHALL BE A MINIMUM 125 MIL THICKNESS PREFORMED THERMOPLASTIC PAVEMENT MARKINGS WITH TAPERED LEADING EDGES PER CDOT STANDARD S-627-1. WORD AND SYMBOL MARKINGS SHALL BE THE NARROW TYPE, STOP BARS SHALL BE 24" IN WIDTH, CROSSWALK LINES SHALL BE 12" WIDE AND 8' LONG PER CDOT S-267-1.
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LEGEND

- PROPOSED SIGN
- EXISTING SIGN
- (XX) PROPOSED STRIPE
- (XX) EXISTING STRIPE
- (A) CENTER LINE - 4" WIDE, 3" GAP, SOLID DOUBLE YELLOW
- (B) CENTER LINE - 4" WIDE, 10' LONG, 30' GAP, DASHED SINGLE YELLOW
- (C) LANE LINE - 4" WIDE, 10' LONG, 30' GAP, WHITE
- (D) EDGE LINE - 4" WIDE, SOLID WHITE
- (E) CHANNELIZING LINE - 8" WIDE, SOLID WHITE
- (F) WIDE DOTTED ENTRANCE LINE - 8" WIDE x 2' LONG, 4' GAP, WHITE
- (G) STOP BAR - 2' SOLID WHITE

Judge Orr Sign Tabulation (2/2)		
Sign	Dimensions	Proposed
R2-1	30" x 36"	1
W4-2R	36" x36"	1

50 25 0 50 100
ORIGINAL SCALE: 1" = 50'

Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
	.	.	

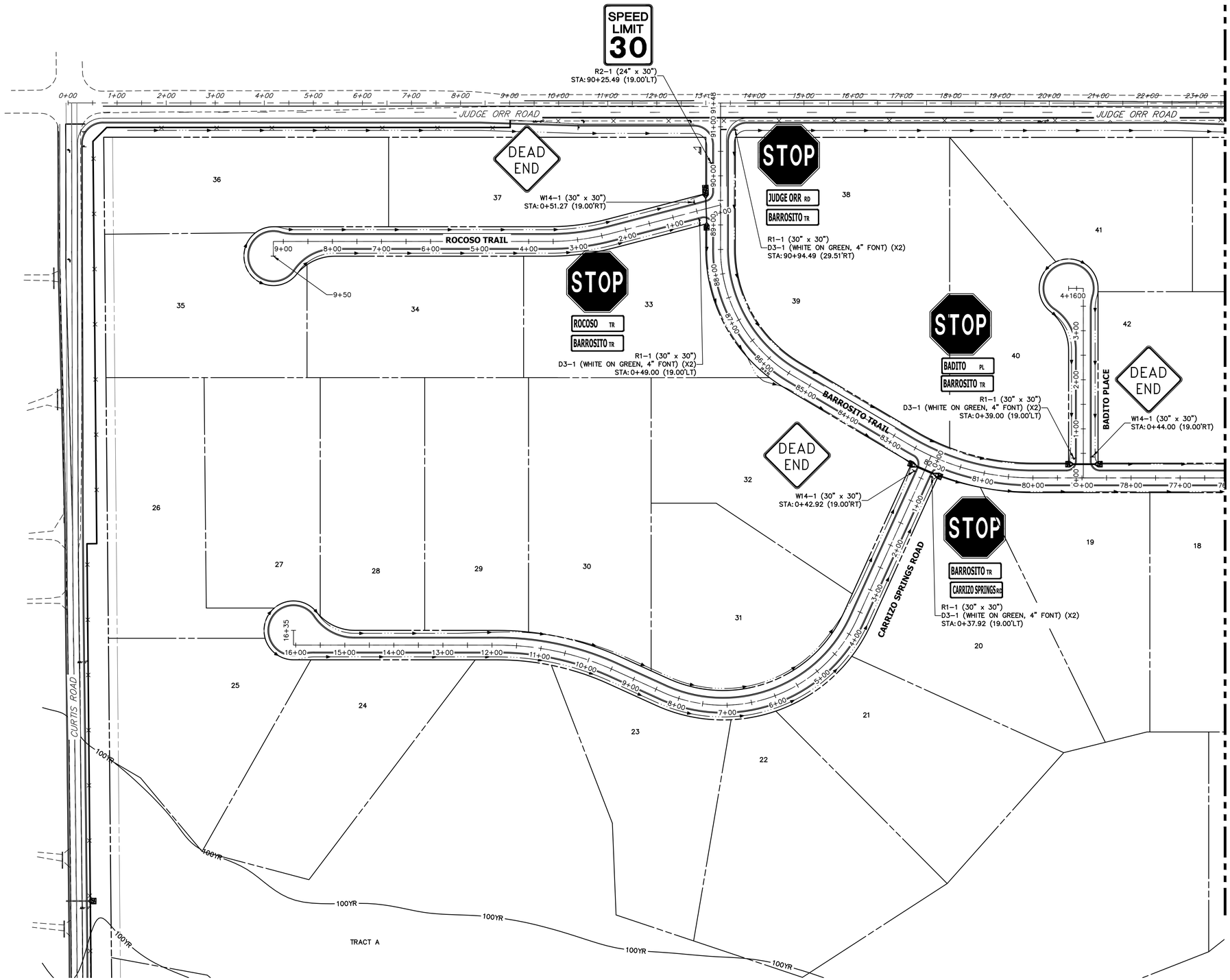
H-SCALE	1"=50'
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

SADDLEHORN RANCH - FILING 3

CURTIS RD & JUDGE ORR RD SIGNAGE & STRIPING PLAN

SHEET 14 OF 63

JOB NO. 25142.05



KEY MAP
N.T.S

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

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Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
	.		

H-SCALE	1"=100'
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	AMT
DRAWN BY	AMT
CHECKED BY	

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

SADDLEHORN RANCH – FILING 3

SIGNAGE PLAN

SHEET 15 OF 63

JOB NO. 25142.05

Know what's **below.**
Call before you dig.

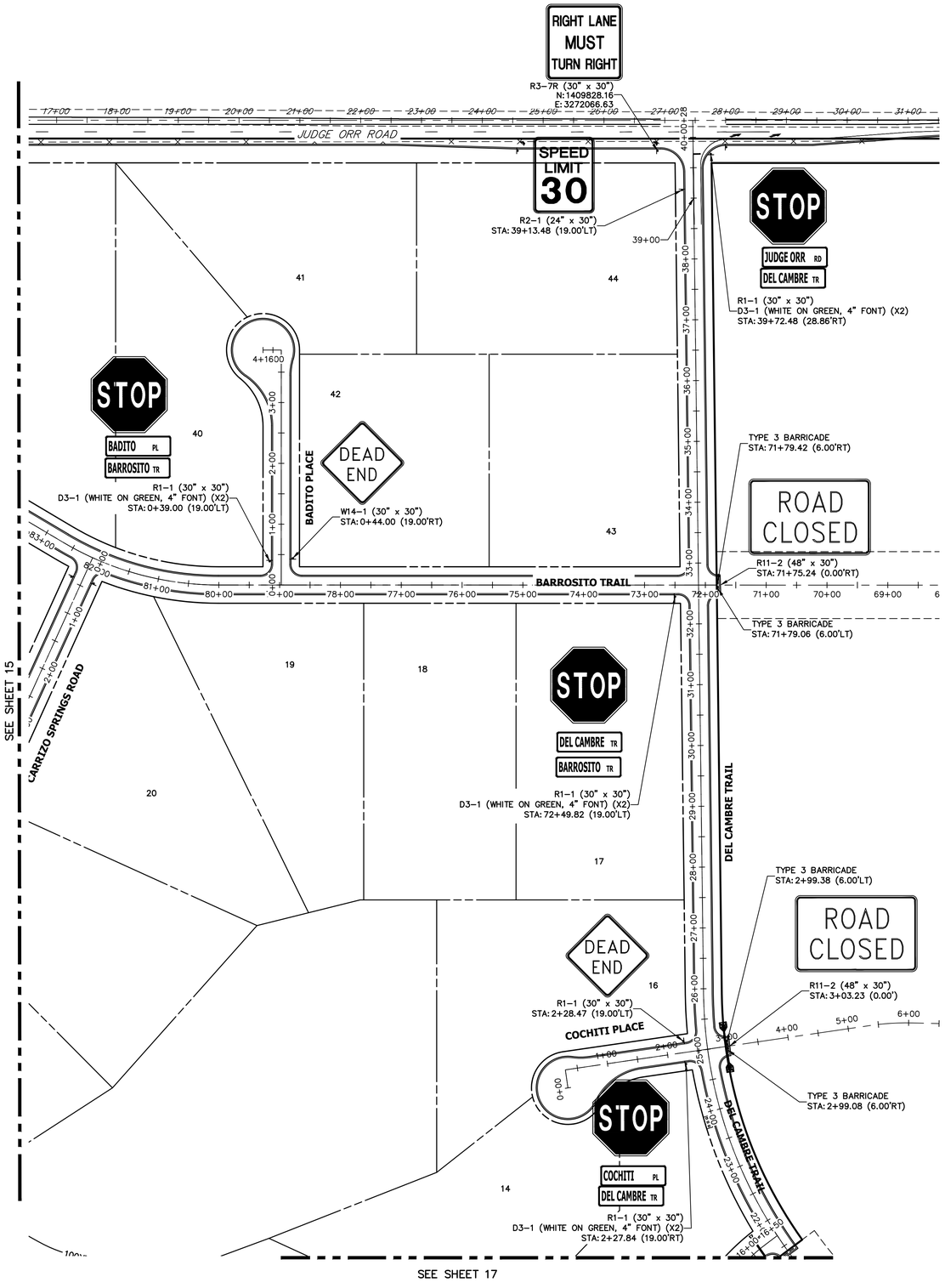
ENGINEER'S STATEMENT

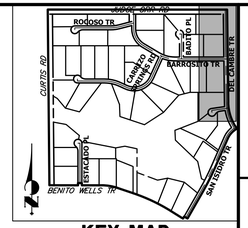
PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

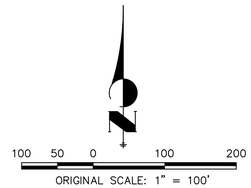
COLORADO BRYAN T. LAW 25043 REGISTERED PROFESSIONAL ENGINEER

3/20/24
DATE





KEY MAP
N.T.S



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ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043

3/20/24
DATE

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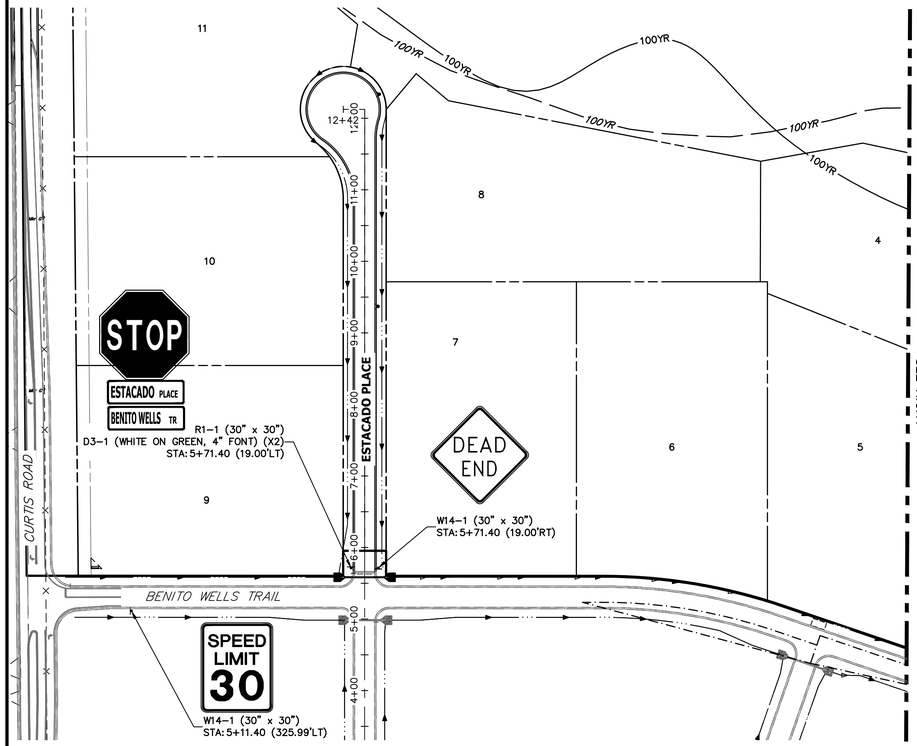
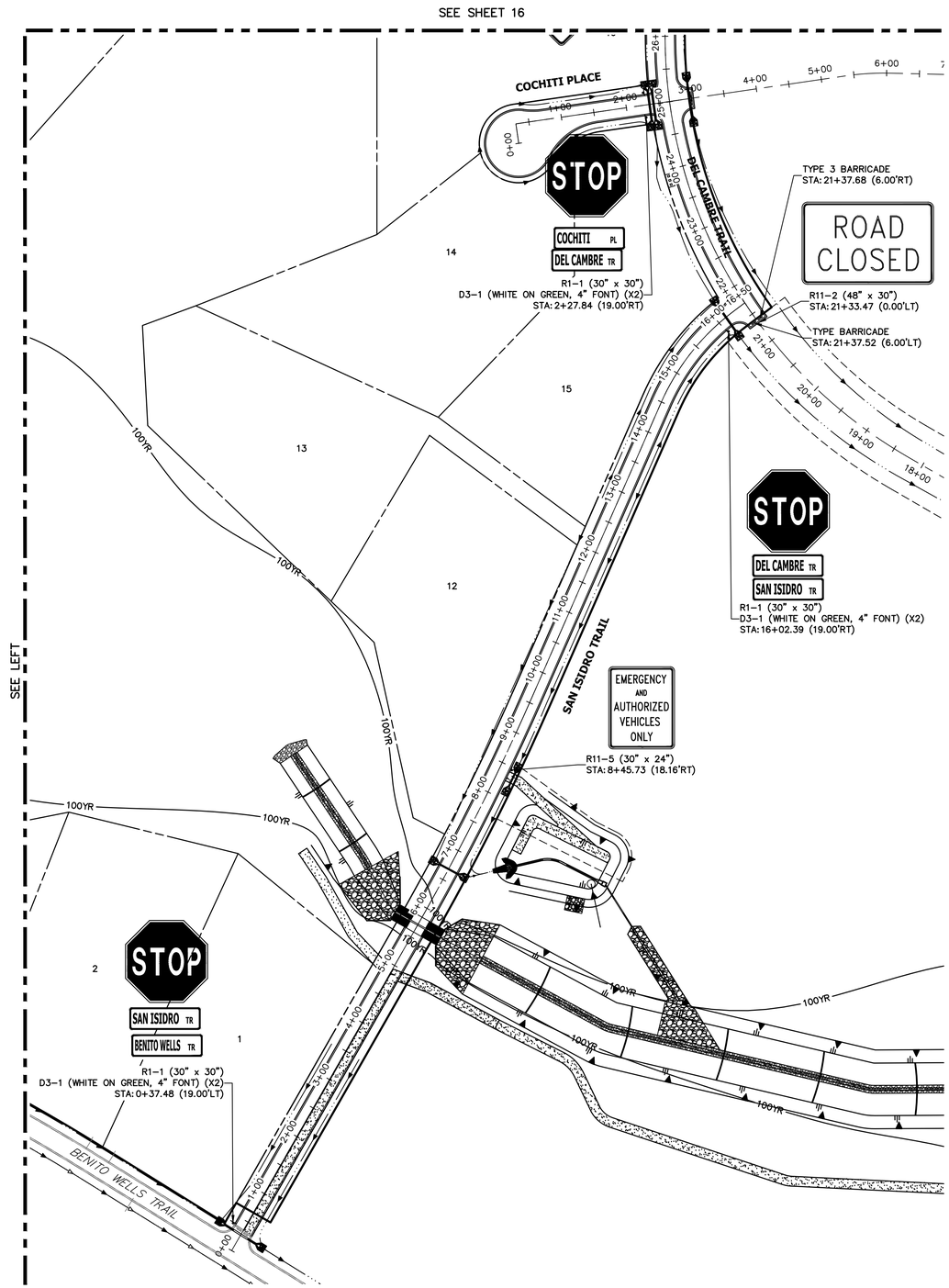
No.	REVISION	BY	DATE

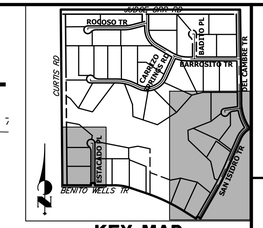
H-SCALE	1"=100'	DESIGNED BY	AMT
V-SCALE	N/A	DRAWN BY	AMT
DATE	3/20/24	CHECKED BY	

SADDLEHORN RANCH – FILING 3
SIGNAGE PLAN

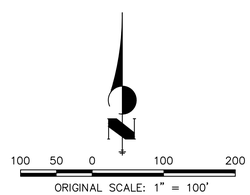
SHEET 16 OF 63
JOB NO. 25142.05







KEY MAP
N.T.S



Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043

3/20/24
DATE

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PREPARED FOR
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(707) 365-6891
BRADY WILLIAMS

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Fort Collins 970-491-9888 • www.jrengineering.com

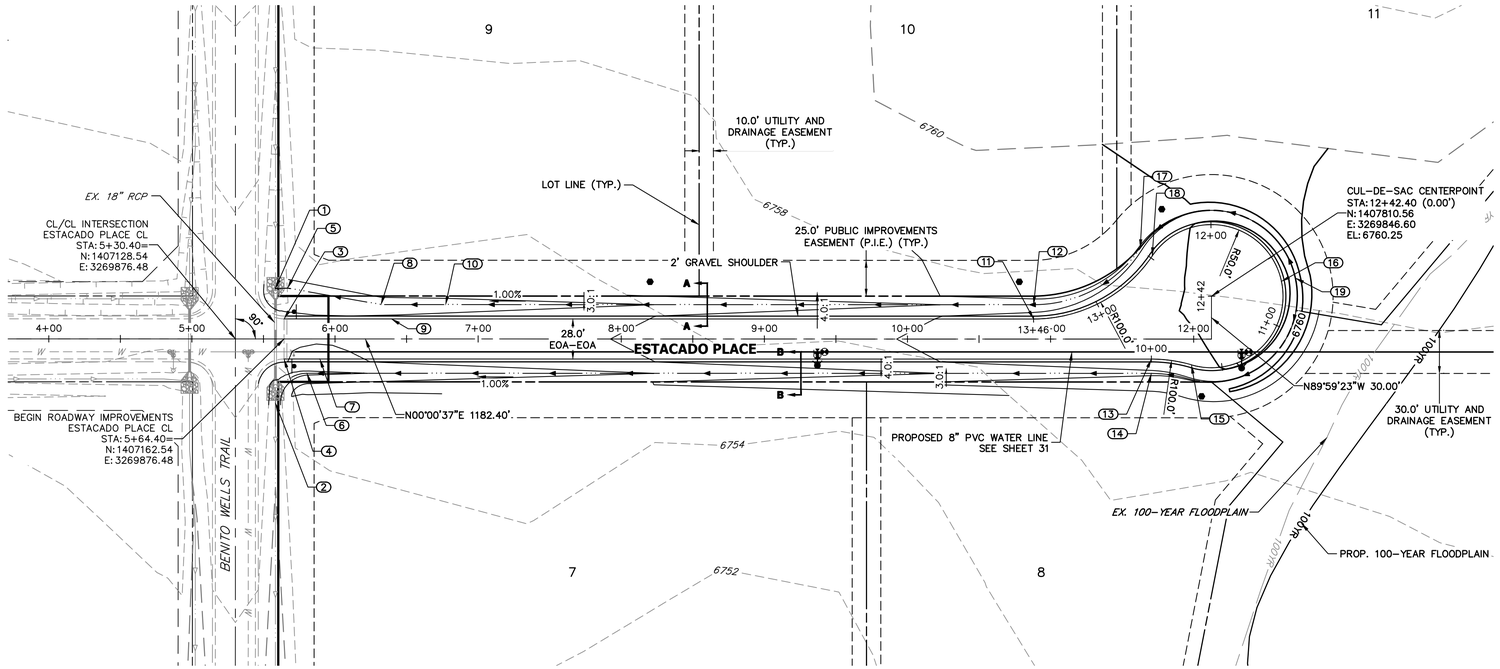
No.	REVISION	BY	DATE
	.	.	.

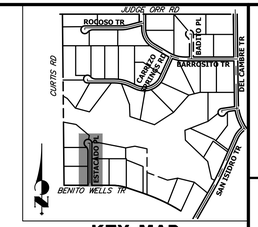
H-SCALE	1"=100'
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	AMT
DRAWN BY	AMT
CHECKED BY	

SADDLEHORN RANCH – FILING 3
SIGNAGE PLAN

SHEET 17 OF 63

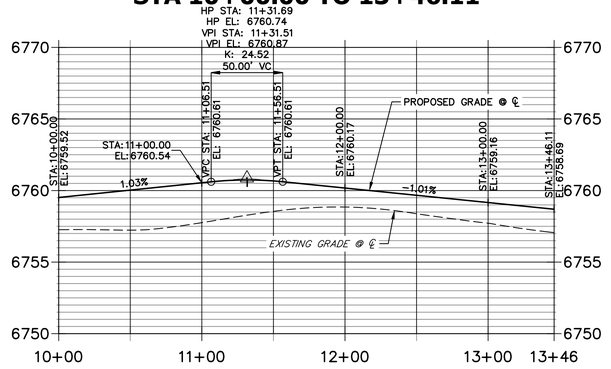
JOB NO. 25142.05



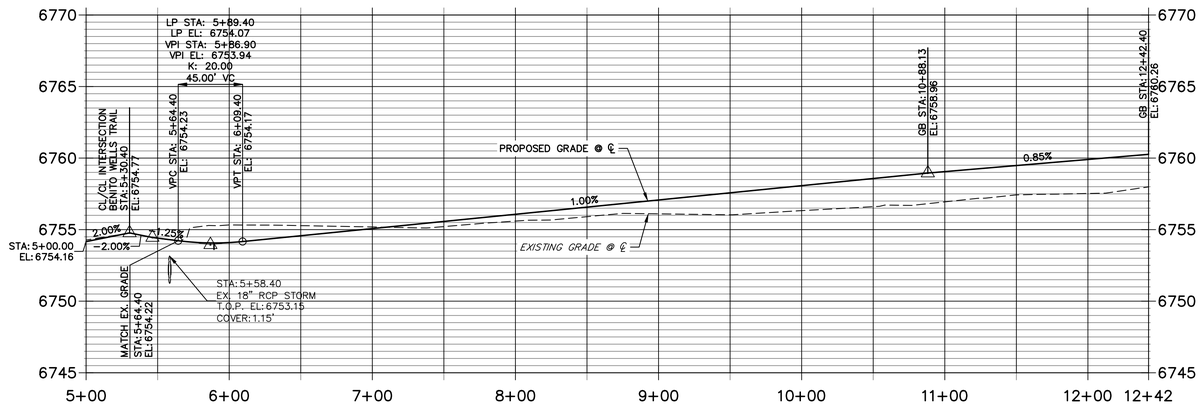


KEY MAP
N.T.S

ESTACADO PLACE CUL-DE-SAC PROFILE
STA 10+00.00 TO 13+46.11



ESTACADO PLACE CL PROFILE
STA 5+00.00 TO 12+42.40



POINT TABLULATION

POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
1	5+58.40	35.51' (LT)	ESTACADO PLACE CL	6751.95		TIE INTO EX. SWALE
2	5+58.40	44.89' (RT)	ESTACADO PLACE CL	6750.83		TIE INTO EX. SWALE
3	5+64.40	14.00' (LT)	ESTACADO PLACE CL	6754.36		MATCH EX ASPH
4	5+64.40	14.00' (RT)	ESTACADO PLACE CL	6754.08		MATCH EX ASPH
5	5+66.90	35.51' (LT)	ESTACADO PLACE CL	6751.99		SWALE PI
6	5+80.37	24.00' (RT)	ESTACADO PLACE CL	6751.58		SWALE PC
7	5+89.40	14.00' (RT)	ESTACADO PLACE CL	6753.79		LOW PT
8	6+32.16	24.00' (LT)	ESTACADO PLACE CL	6752.32		SWALE PI
9	6+39.40	14.00' (LT)	ESTACADO PLACE CL	6754.19		GB
10	6+77.29	24.00' (LT)	ESTACADO PLACE CL	6752.54		SWALE GB
11	10+88.13	14.00' (LT)	ESTACADO PLACE CL	6758.69		PC
12	10+88.13	24.00' (LT)	ESTACADO PLACE CL	6756.65		SWALE PC/GB
13	11+70.40	14.00' (RT)	ESTACADO PLACE CL	6759.52		PC
14	11+70.40	24.00' (RT)	ESTACADO PLACE CL	6757.48		SWALE PC/GB
15	11+98.40	18.00' (RT)	ESTACADO PLACE CL	6759.79		PRC

POINT TABLULATION

POINT NUMBER	NORTHING	EASTING	ELEVATION	NOTES	DESCRIPTION
16	1407859.48	3269836.29	6760.87		HIGH PT
17	1407760.85	3269812.99	6757.61		SWALE PRC/GB
18	1407769.14	3269818.59	6759.65		PRC
19	1407869.21	3269833.97	6758.83		SWALE HIGH PT

50 25 0 50 100

HORIZONTAL
ORIGINAL SCALE: 1" = 50'
VERTICAL
ORIGINAL SCALE: 1" = 5'

811 Know what's **below.** **Call** before you dig.

STREET IMPROVEMENT NOTES

1. ALL STATIONING IS ℄, UNLESS OTHERWISE NOTED.
2. ALL PROFILE ELEVATIONS ARE ℄, UNLESS OTHERWISE NOTED.
3. ALL POINT TABULATIONS ARE EDGE OF ASPHALT, UNLESS OTHERWISE NOTED.
4. ALL CURB RETURN RADII ARE 20', UNLESS OTHERWISE NOTED.
5. ALL SLOPE LABELS ARE SWALE CENTERLINE, UNLESS OTHERWISE NOTED.
6. SEE SHEET 4 FOR TYPICAL STREET SECTIONS, SWALE SECTION A–A AND SECTION B–B DIMENSIONS AND DETAILS.
7. ALL PROPOSED ROW WIDTHS ARE 60', UNLESS OTHERWISE NOTED.
8. ABBREVIATIONS: EOA = EDGE OF ASPHALT, P.I.E. = PUBLIC IMPROVEMENTS EASEMENT.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

COLORADO REGISTERED BRYAN T. LAW 25043 PROFESSIONAL ENGINEER

3/20/24
DATE

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PREPARED FOR
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2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

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No.	REVISION	BY	DATE
	.	.	

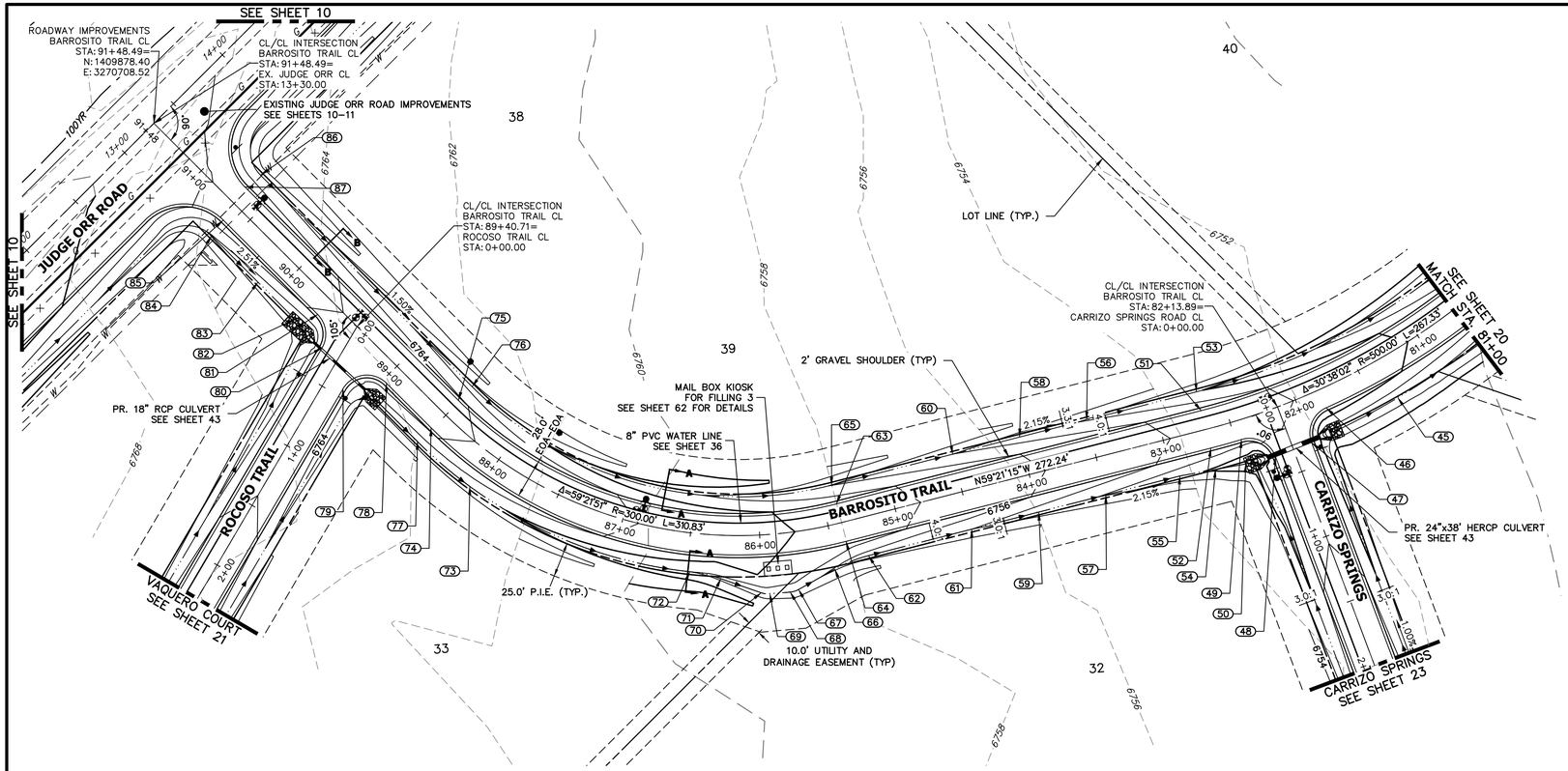
H–SCALE	1"=50'
V–SCALE	1"=5'
DATE	3/20/24
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

SADDLEHORN RANCH – FILING 3

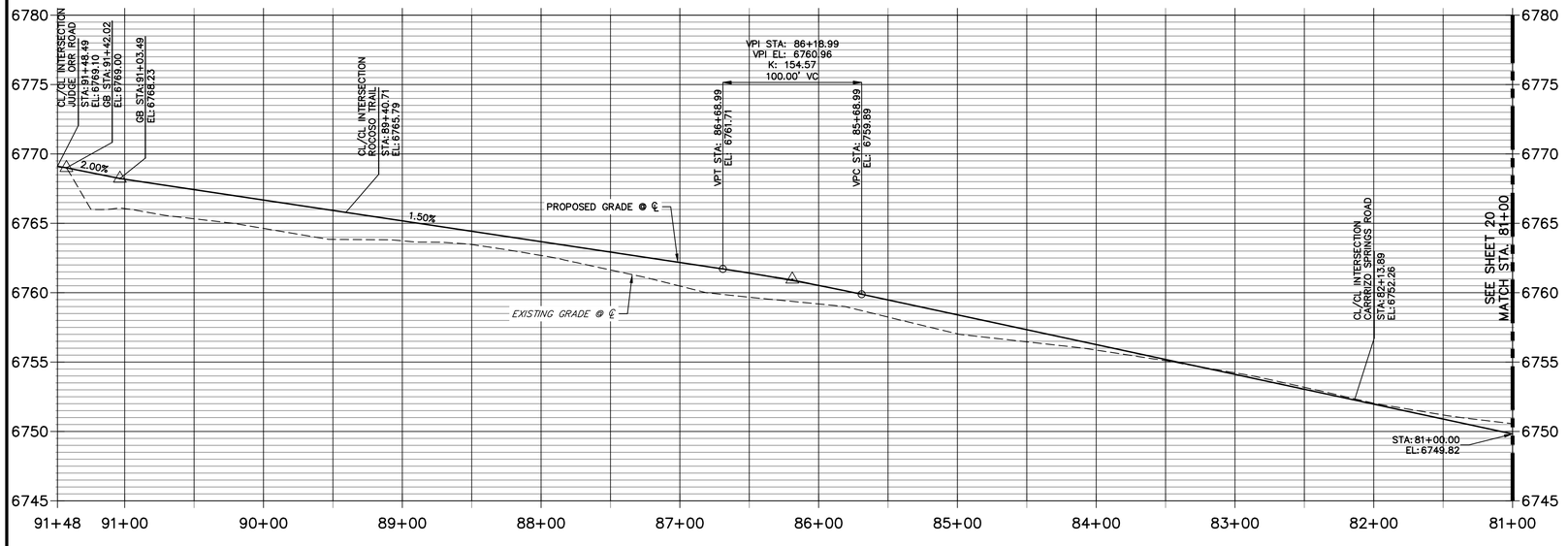
STREET IMPROVEMENT PLAN AND PROFILE

SHEET 18 OF 63

JOB NO. 25142.05

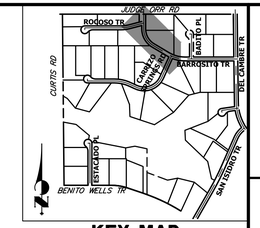


BARROSITO TRAIL CL PROFILE
STA 81+00.00 TO 91+48.49



POINT TABULATION

POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
45	81+34.71	31.01' (LT)	BARROSITO TRAIL CL	6746.55		SWALE GB
46	81+82.03	14.00' (LT)	BARROSITO TRAIL CL	6751.30		PCR
47	82+00.76	33.10' (LT)	BARROSITO TRAIL CL	6751.42		PCR
48	82+27.02	33.10' (LT)	BARROSITO TRAIL CL	6751.42		PCR
49	82+45.75	14.00' (LT)	BARROSITO TRAIL CL	6752.67		PCR
50	82+47.83	31.76' (LT)	BARROSITO TRAIL CL	6748.44		SWALE GB
51	82+68.07	14.00' (RT)	BARROSITO TRAIL CL	6753.15		PC
52	82+68.07	14.00' (LT)	BARROSITO TRAIL CL	6753.15		PC
54	82+68.67	29.80' (LT)	BARROSITO TRAIL CL	6749.65		SWALE GB
55	82+94.74	28.00' (LT)	BARROSITO TRAIL CL	6750.68		SWALE PI/GB
56	83+50.00	28.00' (RT)	BARROSITO TRAIL CL	6751.87		SWALE GB
57	83+50.00	28.00' (LT)	BARROSITO TRAIL CL	6751.87		SWALE GB
58	84+00.00	28.00' (RT)	BARROSITO TRAIL CL	6752.94		SWALE GB
59	84+00.00	28.00' (LT)	BARROSITO TRAIL CL	6752.94		SWALE GB
60	84+50.00	28.00' (RT)	BARROSITO TRAIL CL	6754.01		SWALE GB
61	84+50.00	28.00' (LT)	BARROSITO TRAIL CL	6754.01		SWALE GB
62	85+27.11	28.00' (LT)	BARROSITO TRAIL CL	6755.09		SWALE PT/GB
63	85+40.30	14.00' (RT)	BARROSITO TRAIL CL	6758.99		PT
64	85+40.30	14.00' (LT)	BARROSITO TRAIL CL	6758.99		PT
65	85+40.30	28.00' (RT)	BARROSITO TRAIL CL	6755.95		SWALE PT/GB
66	85+51.83	31.67' (LT)	BARROSITO TRAIL CL	6752.01		SWALE PC/GB
67	85+77.07	41.79' (LT)	BARROSITO TRAIL CL	6752.53		SWALE PT/GB
68	85+82.52	42.93' (LT)	BARROSITO TRAIL CL	6752.60		SWALE PC/GB
69	85+95.46	42.93' (LT)	BARROSITO TRAIL CL	6752.74		SWALE PT/GB
70	86+00.91	41.79' (LT)	BARROSITO TRAIL CL	6752.74		SWALE PC/GB
71	86+26.93	31.40' (LT)	BARROSITO TRAIL CL	6752.74		SWALE PT/GB
72	86+47.54	28.00' (LT)	BARROSITO TRAIL CL	6753.46		SWALE PC/GB
73	88+05.40	28.00' (LT)	BARROSITO TRAIL CL	6760.44		SWALE GB
74	88+51.13	14.00' (LT)	BARROSITO TRAIL CL	6764.16		PC
75	88+51.13	14.00' (RT)	BARROSITO TRAIL CL	6764.16		PC
76	88+51.13	28.00' (RT)	BARROSITO TRAIL CL	6761.12		SWALE PC/GB
77	88+51.16	27.88' (LT)	BARROSITO TRAIL CL	6760.72		SWALE PC
78	88+96.71	14.00' (LT)	BARROSITO TRAIL CL	6764.85		PCR
79	89+16.06	39.05' (LT)	BARROSITO TRAIL CL	6764.90		PCR
80	89+47.63	28.95' (LT)	BARROSITO TRAIL CL	6765.09		PCR
81	89+66.98	14.00' (LT)	BARROSITO TRAIL CL	6765.90		PCR
82	89+76.20	28.00' (LT)	BARROSITO TRAIL CL	6762.00		SWALE GB
83	90+14.10	28.00' (LT)	BARROSITO TRAIL CL	6762.66		SWALE GB
84	90+61.49	28.00' (LT)	BARROSITO TRAIL CL	6763.85		SWALE GB
85	90+63.49	14.00' (LT)	BARROSITO TRAIL CL	6767.36		PCR
86	90+67.49	28.00' (RT)	BARROSITO TRAIL CL	6764.37		SWALE GB
87	90+69.49	14.00' (RT)	BARROSITO TRAIL CL	6767.44		PCR



KEY MAP
N.T.S

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

H-SCALE	1"=50'
V-SCALE	1"=5'
DATE	3/20/24
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

STREET IMPROVEMENT NOTES

1. ALL STATIONING IS ℄, UNLESS OTHERWISE NOTED.
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4. ALL CURB RETURN RADII ARE 20', UNLESS OTHERWISE NOTED.
5. ALL SLOPE LABELS ARE SWALE CENTERLINE, UNLESS OTHERWISE NOTED.
6. SEE SHEET 4 FOR TYPICAL STREET SECTIONS, SWALE SECTION A-A AND SECTION B-B DIMENSIONS AND DETAILS.
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8. ABBREVIATIONS: EOA = EDGE OF ASPHALT, P.I.E. = PUBLIC IMPROVEMENTS EASEMENT.

50 25 0 50 100
HORIZONTAL
ORIGINAL SCALE: 1" = 50'
VERTICAL
ORIGINAL SCALE: 1" = 5'

811 Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

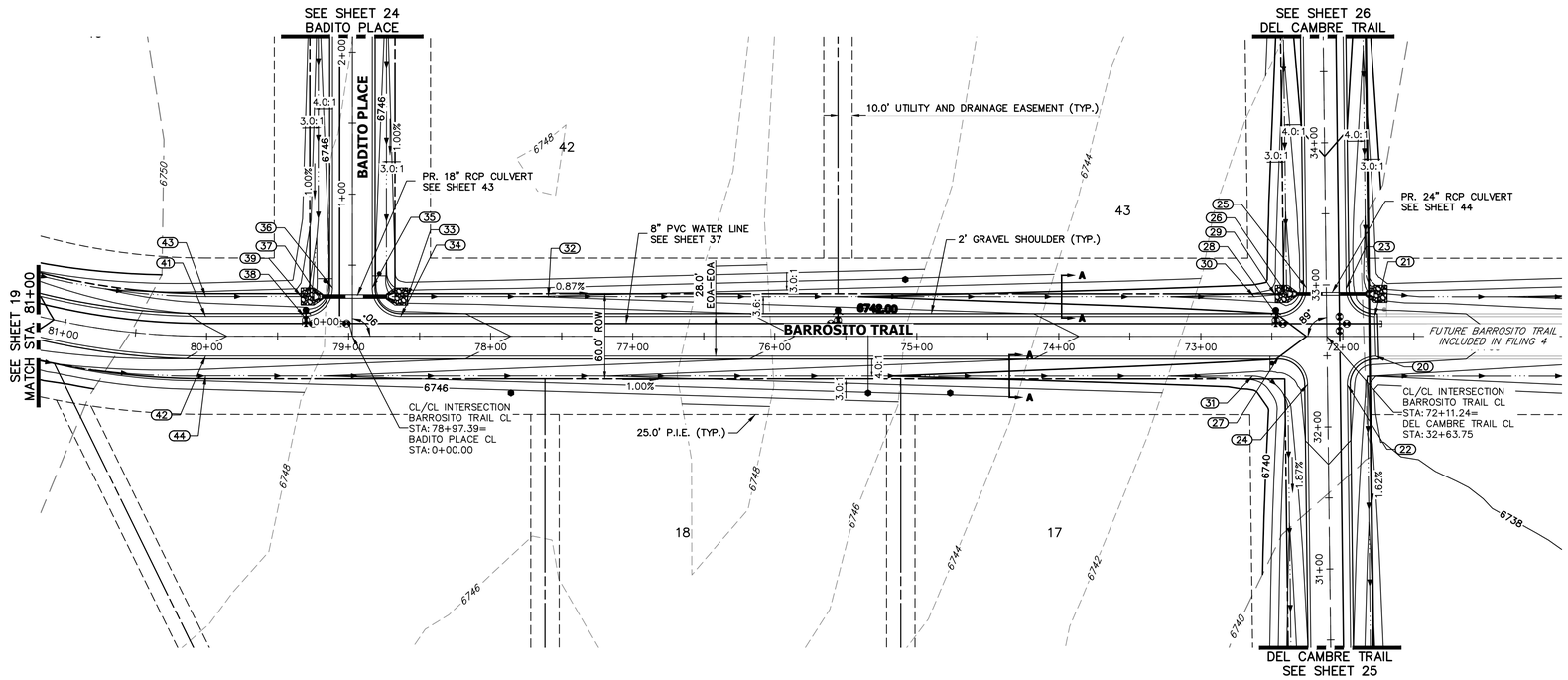
3/20/24
DATE

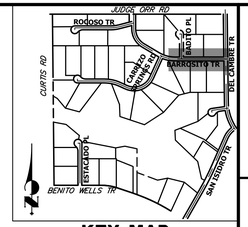
SADDLEHORN RANCH – FILING 3

STREET IMPROVEMENT PLAN AND PROFILE

SHEET 19 OF 63

JOB NO. 25142.05

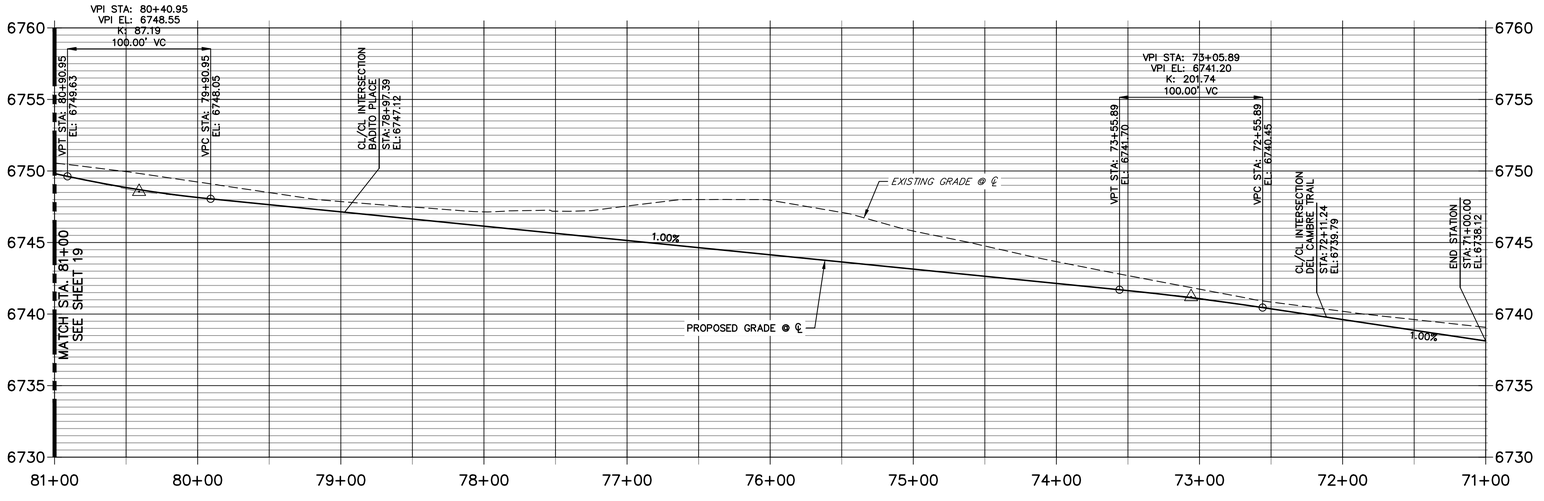




KEY MAP
N.T.S

POINT TABLULATION						
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
20	71+76.81	14.00' (LT)	BARROSITO TRAIL CL	6738.99		PCR
21	71+77.67	14.00' (RT)	BARROSITO TRAIL CL	6739.00		PCR
22	71+96.81	34.25' (LT)	BARROSITO TRAIL CL	6738.82		PCR
23	71+97.66	33.75' (RT)	BARROSITO TRAIL CL	6738.92		PCR
24	72+24.82	33.75' (LT)	BARROSITO TRAIL CL	6738.83		PCR
25	72+25.67	34.25' (RT)	BARROSITO TRAIL CL	6738.92		PCR
26	72+39.62	30.00' (RT)	BARROSITO TRAIL CL	6735.02		END SWALE
27	72+44.82	14.00' (LT)	BARROSITO TRAIL CL	6740.01		PCR
28	72+45.67	14.00' (RT)	BARROSITO TRAIL CL	6740.02		PCR
30	72+62.48	28.00' (RT)	BARROSITO TRAIL CL	6737.23		SWALE PI/GB
32	77+59.39	28.00' (RT)	BARROSITO TRAIL CL	6741.91		SWALE GB
33	78+58.41	28.00' (RT)	BARROSITO TRAIL CL	6742.42		BEGIN SWALE
34	78+63.39	14.00' (RT)	BARROSITO TRAIL CL	6746.50		PCR
35	78+83.39	34.00' (RT)	BARROSITO TRAIL CL	6746.25		PCR
36	79+11.39	34.00' (RT)	BARROSITO TRAIL CL	6746.27		PCR
37	79+21.39	28.00' (RT)	BARROSITO TRAIL CL	6743.90		END SWALE
38	79+31.39	14.00' (RT)	BARROSITO TRAIL CL	6747.18		PCR
39	79+33.53	28.00' (RT)	BARROSITO TRAIL CL	6744.16		SWALE GB
41	80+00.72	14.00' (RT)	BARROSITO TRAIL CL	6747.87		PT
42	80+00.72	14.00' (LT)	BARROSITO TRAIL CL	6747.87		PT
43	80+00.72	28.00' (RT)	BARROSITO TRAIL CL	6744.83		SWALE PT/GB
44	80+00.72	28.00' (LT)	BARROSITO TRAIL CL	6744.83		SWALE PT/GB

BARROSITO TRAIL CL PROFILE (2)
STA 71+00.00 TO 81+00.00



50 25 0 50 100

HORIZONTAL
ORIGINAL SCALE: 1" = 50'

VERTICAL
ORIGINAL SCALE: 1" = 5'

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ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW
25043
REGISTERED
PROFESSIONAL ENGINEER
COLORADO

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE

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.	. .	.	. .

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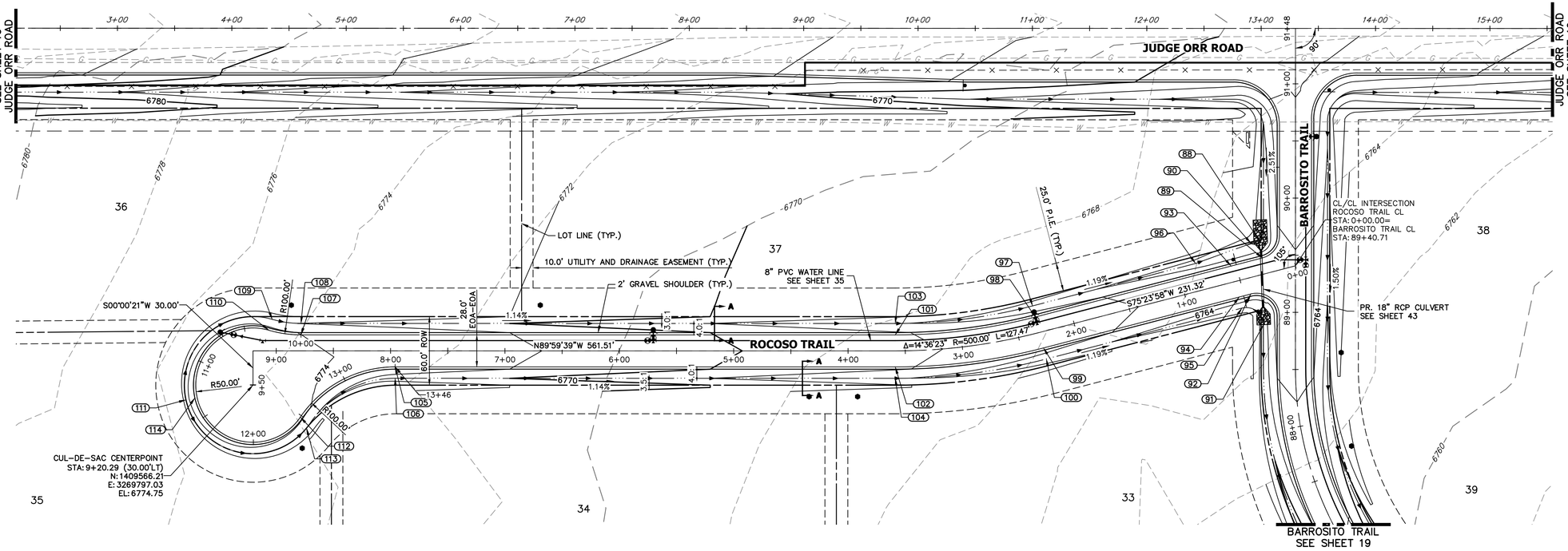
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

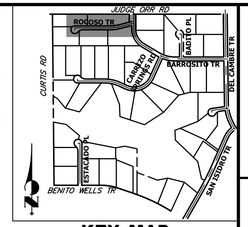
SADDLEHORN RANCH – FILING 3

STREET IMPROVEMENT PLAN AND PROFILE

SHEET 20 OF 63

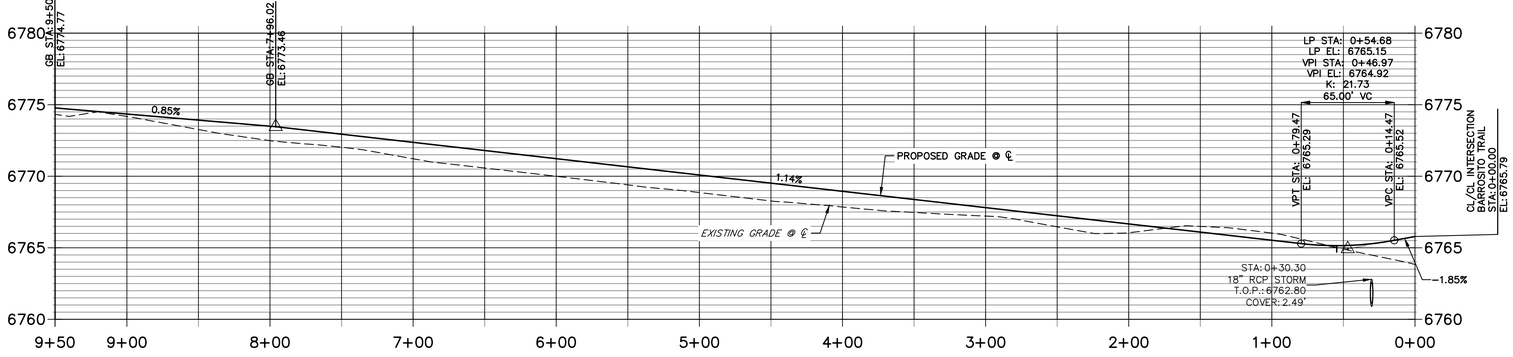
JOB NO. 25142.05



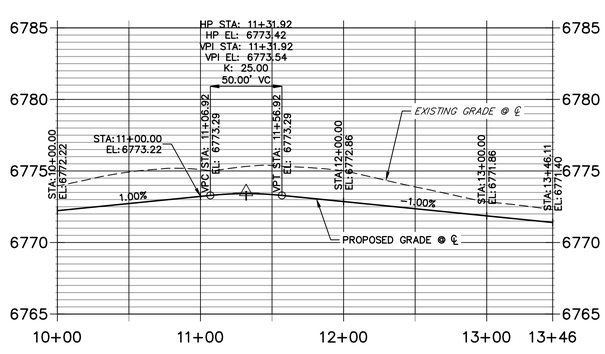


KEY MAP
N.T.S

ROCOSO TRAIL CL PROFILE
STA 0+00.00 TO 9+50.29



ROCOSO TRAIL CUL-DE-SAC PROFILE
STA 10+00.00 TO 13+46.11



POINT TABLULATION						
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
88	0+24.28	27.26' (RT)	ROCOSO TRAIL CL	6761.23		END SWALE
89	0+26.27	14.00' (RT)	ROCOSO TRAIL CL	6765.09		PCR
90	0+32.61	28.74' (RT)	ROCOSO TRAIL CL	6761.92		SWALE GB
91	0+40.09	42.78' (LT)	ROCOSO TRAIL CL	6760.88		END SWALE
92	0+44.00	14.00' (LT)	ROCOSO TRAIL CL	6764.90		PCR
93	0+54.47	14.00' (RT)	ROCOSO TRAIL CL	6764.87		LOW PT
94	0+54.47	14.00' (LT)	ROCOSO TRAIL CL	6764.87		LOW PT
95	0+54.60	24.00' (LT)	ROCOSO TRAIL CL	6762.77		SWALE PC/GB
96	0+84.00	24.00' (RT)	ROCOSO TRAIL CL	6762.95		SWALE GB
97	2+31.32	24.00' (RT)	ROCOSO TRAIL CL	6764.70		SWALE GB
98	2+31.32	14.00' (RT)	ROCOSO TRAIL CL	6766.74		PT
99	2+31.32	14.00' (LT)	ROCOSO TRAIL CL	6766.74		PT
100	2+31.32	24.00' (LT)	ROCOSO TRAIL CL	6764.70		SWALE PT/GB
101	3+58.78	14.00' (RT)	ROCOSO TRAIL CL	6768.20		PC
102	3+58.78	14.00' (LT)	ROCOSO TRAIL CL	6768.20		PC

POINT TABLULATION						
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
103	3+58.78	24.00' (RT)	ROCOSO TRAIL CL	6766.16		SWALE PC/GB
104	3+58.78	24.00' (LT)	ROCOSO TRAIL CL	6766.16		SWALE PC/GB
105	7+96.02	14.00' (LT)	ROCOSO TRAIL CL	6773.18		PT
106	7+96.02	24.00' (LT)	ROCOSO TRAIL CL	6771.14		SWALE PT/GB
107	8+78.29	14.00' (RT)	ROCOSO TRAIL CL	6774.00		PT
108	8+78.29	24.00' (RT)	ROCOSO TRAIL CL	6771.96		SWALE PT/GB
109	9+03.49	27.60' (RT)	ROCOSO TRAIL CL	6772.25		SWALE PC/GB
110	9+06.29	18.00' (RT)	ROCOSO TRAIL CL	6774.29		PRC

POINT TABLULATION					
POINT NUMBER	NORTHING	EASTING	ELEVATION	NOTES	DESCRIPTION
111	1409553.35	3269738.43	6773.28		SWALE HIGH PT
112	1409538.21	3269838.45	6774.16		PRC
113	1409528.63	3269843.80	6772.18		SWALE PC/GB
114	1409555.06	3269746.24	6775.28		HIGH PT

HORIZONTAL
ORIGINAL SCALE: 1" = 50'
VERTICAL
ORIGINAL SCALE: 1" = 5'

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PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

COLORADO REGISTERED BRYAN T. LAW 25043 PROFESSIONAL ENGINEER

3/20/24
DATE

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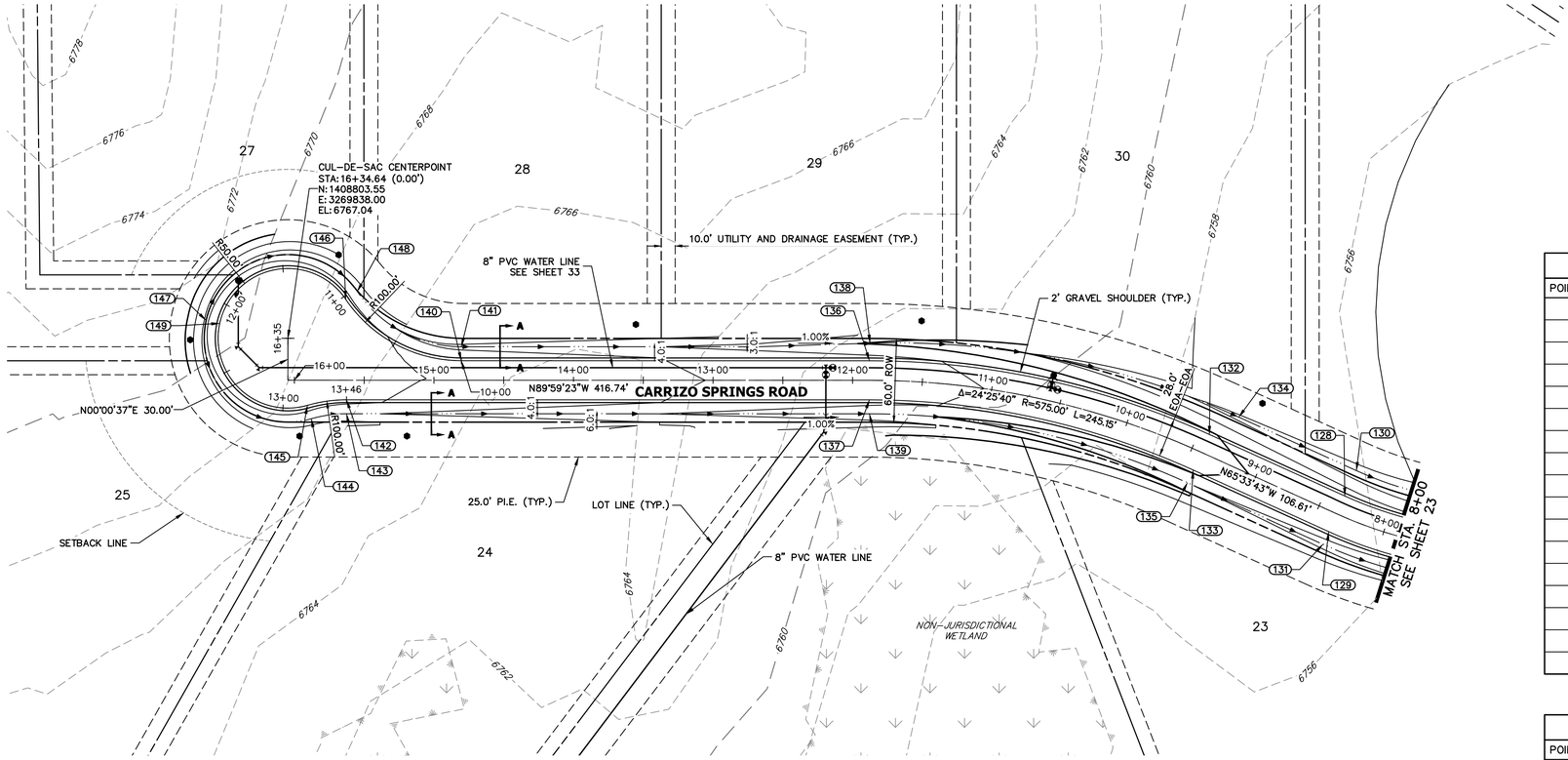
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

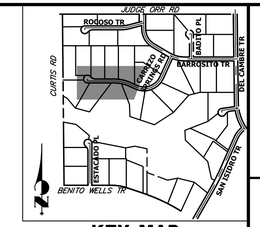
SADDLEHORN RANCH – FILING 3

STREET IMPROVEMENT PLAN AND PROFILE

SHEET 21 OF 63

JOB NO. 25142.05



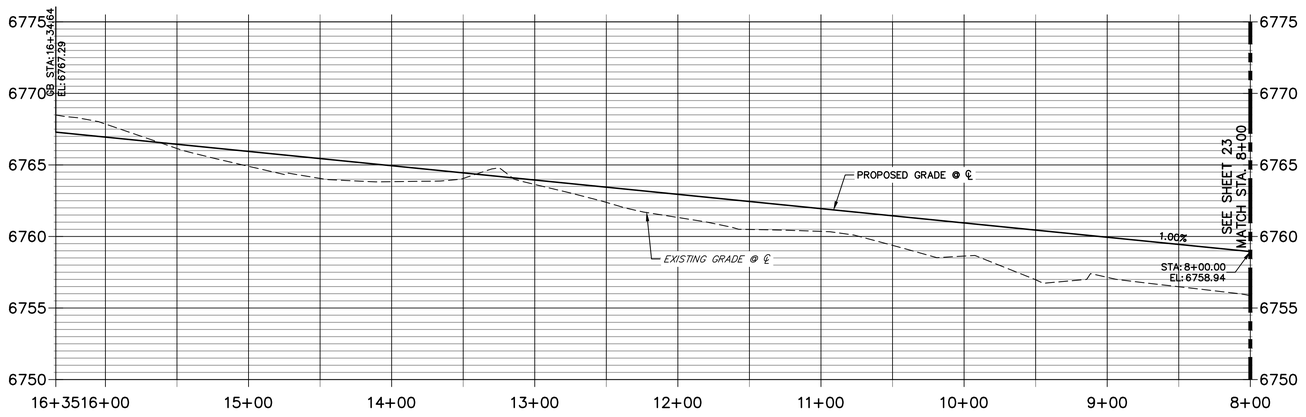


KEY MAP
N.T.S

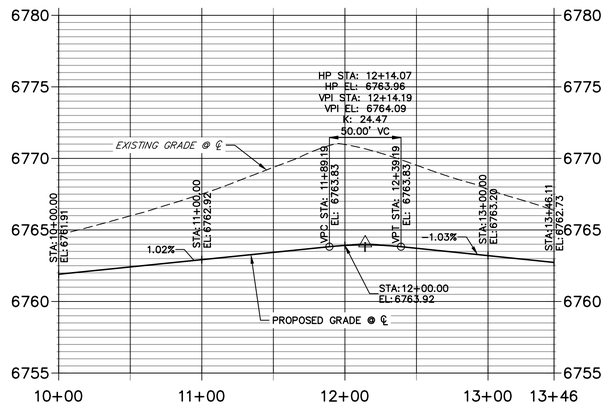
POINT TABLULATION					
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
128	8+36.14	14.00' (RT)	CARRIZO SPRINGS ROAD CL	6759.03		PT
129	8+36.14	14.00' (LT)	CARRIZO SPRINGS ROAD CL	6759.03		PT
130	8+36.14	34.00' (RT)	CARRIZO SPRINGS ROAD CL	6754.49		SWALE PT/GB
131	8+36.14	24.00' (LT)	CARRIZO SPRINGS ROAD CL	6756.99		SWALE PT/GB
132	9+42.75	14.00' (RT)	CARRIZO SPRINGS ROAD CL	6760.09		PC
133	9+42.75	14.00' (LT)	CARRIZO SPRINGS ROAD CL	6760.09		PC
134	9+28.68	34.00' (RT)	CARRIZO SPRINGS ROAD CL	6755.41		SWALE PC/GB
135	9+42.75	24.00' (LT)	CARRIZO SPRINGS ROAD CL	6758.05		SWALE PC/GB
136	11+87.90	14.00' (RT)	CARRIZO SPRINGS ROAD CL	6762.54		PT
137	11+87.90	14.00' (LT)	CARRIZO SPRINGS ROAD CL	6762.54		PT
138	11+87.46	26.55' (RT)	CARRIZO SPRINGS ROAD CL	6759.86		PT
139	11+87.90	24.00' (LT)	CARRIZO SPRINGS ROAD CL	6760.50		PT
140	14+80.36	14.00' (RT)	CARRIZO SPRINGS ROAD CL	6765.47		PT
141	14+80.36	24.00' (LT)	CARRIZO SPRINGS ROAD CL	6763.43		SWALE PT/GB
142	15+62.64	14.00' (LT)	CARRIZO SPRINGS ROAD CL	6766.29		PC
144	15+87.84	27.60' (LT)	CARRIZO SPRINGS ROAD CL	6764.53		PRC
145	15+90.64	18.00' (LT)	CARRIZO SPRINGS ROAD CL	6766.57		PRC

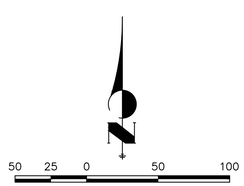
POINT TABLULATION					
POINT NUMBER	NORTHING	EASTING	ELEVATION	NOTES	DESCRIPTION
146	1408831.54	3269879.43	6766.44		PRC
147	1408816.43	3269779.40	6765.57		SWALE HIGH PT
148	1408837.14	3269887.72	6764.40		PRC
149	1408814.28	3269789.17	6767.61		HIGH PT

CARRIZO SPRINGS ROAD CL PROFILE
STA 8+00.00 TO 16+34.64



CARRIZO SPRINGS ROAD CUL-DE-SAC PROFILE
STA 10+00.00 TO 13+46.11





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ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE

Know what's **below.** **Call** before you dig.

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
.	.	.	.
.	.	.	.
.	.	.	.

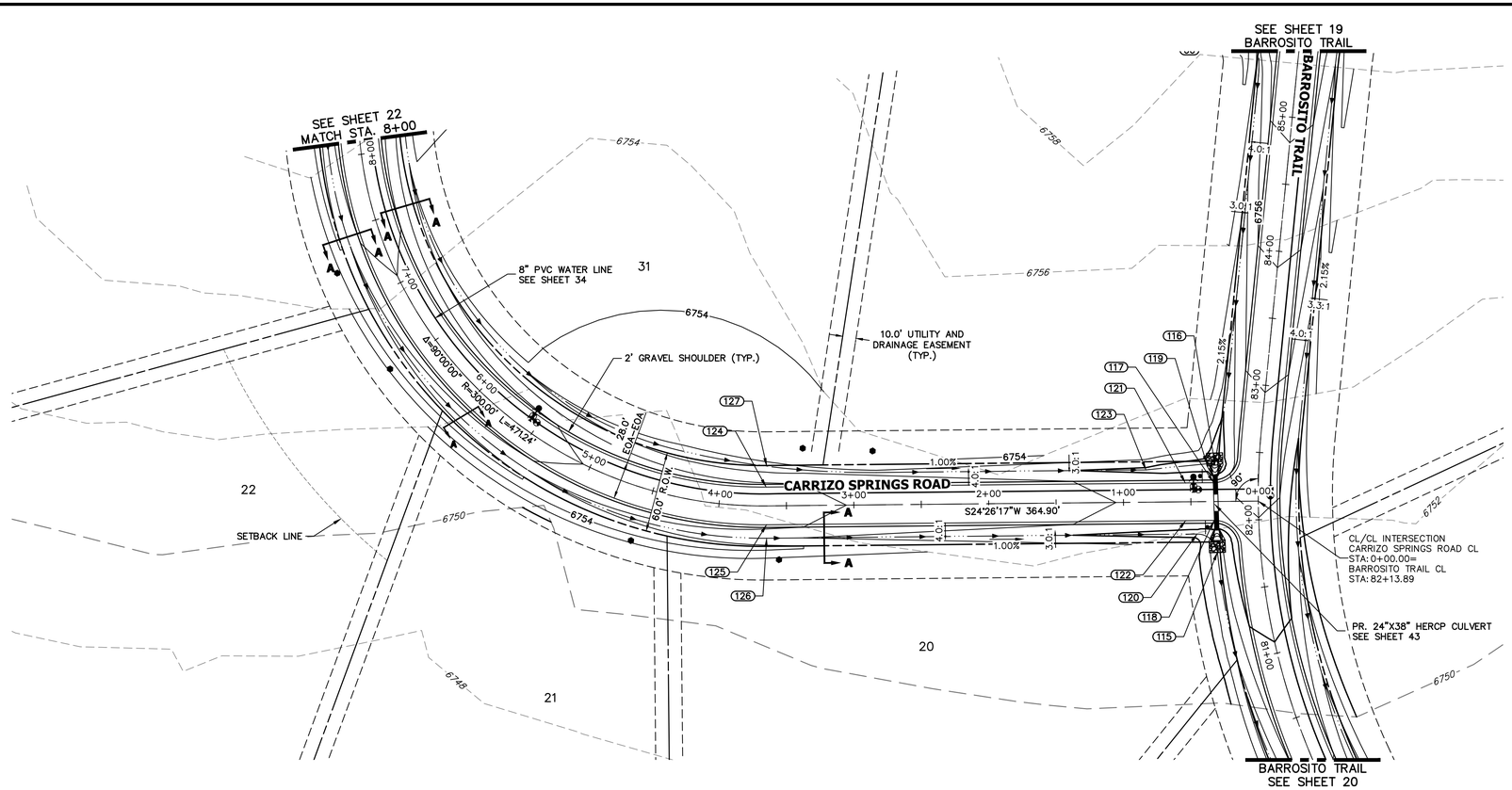
H-SCALE	1"=50'
V-SCALE	1"=5'
DATE	3/20/24
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

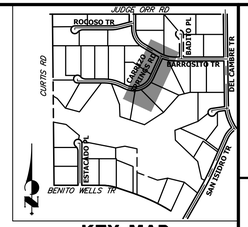
SADDLEHORN RANCH – FILING 3

STREET IMPROVEMENT PLAN AND PROFILE

SHEET 22 OF 63

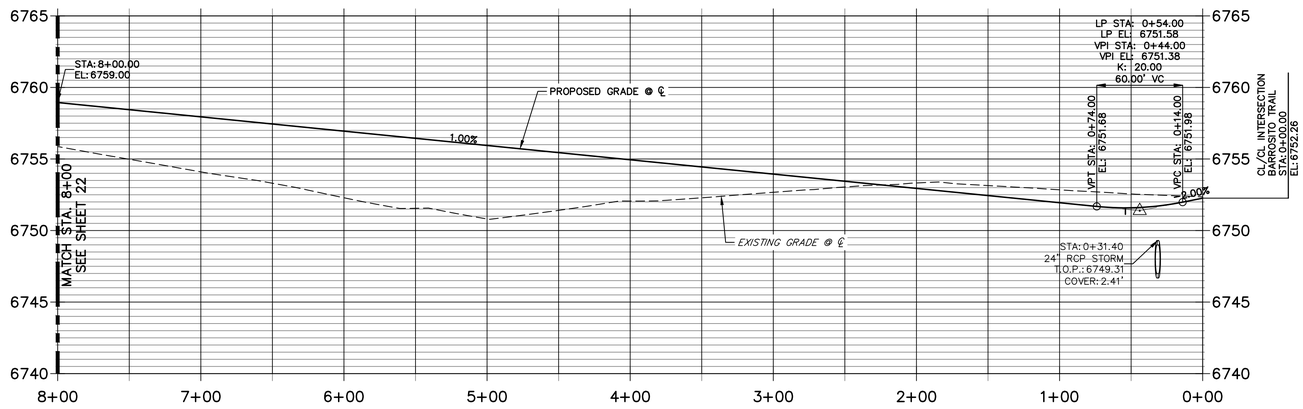
JOB NO. 25142.05





KEY MAP
N.T.S

CARRIZO SPRINGS ROAD CL PROFILE (2)
STA 0+00.00 TO 8+00.00



POINT TABULATION

POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
115	0+30.68	37.62' (LT)	CARRIZO SPRINGS ROAD CL	6746.78		SWALE PT/GB
116	0+31.97	28.06' (RT)	CARRIZO SPRINGS ROAD CL	6747.29		END SWALE
117	0+32.92	14.00' (RT)	CARRIZO SPRINGS ROAD CL	6751.42		PCR
118	0+32.92	14.00' (LT)	CARRIZO SPRINGS ROAD CL	6751.42		PCR
119	0+37.97	28.06' (RT)	CARRIZO SPRINGS ROAD CL	6748.79		SWALE GB
120	0+45.62	24.00' (LT)	CARRIZO SPRINGS ROAD CL	6749.08		SWALE PC/GB
121	0+54.00	14.00' (RT)	CARRIZO SPRINGS ROAD CL	6751.31		LOW PT
122	0+54.00	14.00' (LT)	CARRIZO SPRINGS ROAD CL	6751.31		LOW PT
123	0+83.09	24.00' (RT)	CARRIZO SPRINGS ROAD CL	6749.46		SWALE PI/GB
124	3+64.90	14.00' (RT)	CARRIZO SPRINGS ROAD CL	6754.31		PC
125	3+64.90	14.00' (LT)	CARRIZO SPRINGS ROAD CL	6754.31		PC
126	3+64.90	24.00' (LT)	CARRIZO SPRINGS ROAD CL	6752.27		SWALE PC/GB
127	3+64.33	29.46' (RT)	CARRIZO SPRINGS ROAD CL	6750.90		SWALE PC/GB

50 25 0 50 100

HORIZONTAL
ORIGINAL SCALE: 1" = 50'
VERTICAL
ORIGINAL SCALE: 1" = 5'

811 Know what's **below.** **Call** before you dig.

STREET IMPROVEMENT NOTES

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2. ALL PROFILE ELEVATIONS ARE ℄, UNLESS OTHERWISE NOTED.
3. ALL POINT TABULATIONS ARE EDGE OF ASPHALT, UNLESS OTHERWISE NOTED.
4. ALL CURB RETURN RADII ARE 20', UNLESS OTHERWISE NOTED.
5. ALL SLOPE LABELS ARE SWALE CENTERLINE, UNLESS OTHERWISE NOTED.
6. SEE SHEET 4 FOR TYPICAL STREET SECTIONS, SWALE SECTION A–A AND SECTION B–B DIMENSIONS AND DETAILS.
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ENGINEER'S STATEMENT

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COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

COLORADO REGISTERED BRYAN T. LAW 25043 PROFESSIONAL ENGINEER

3/20/24
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DATE 3/20/24
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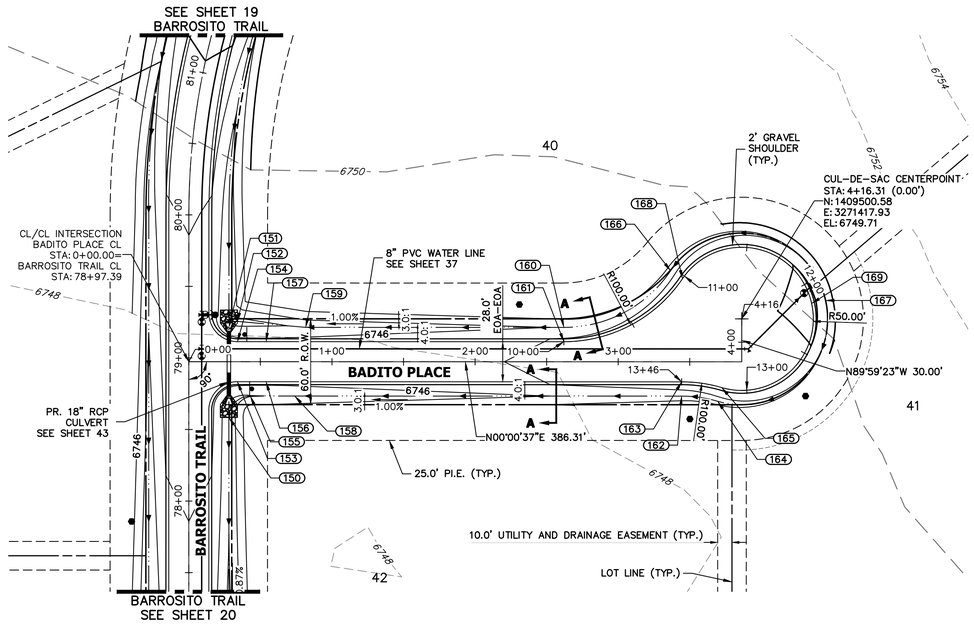
SADDLEHORN RANCH – FILING 3

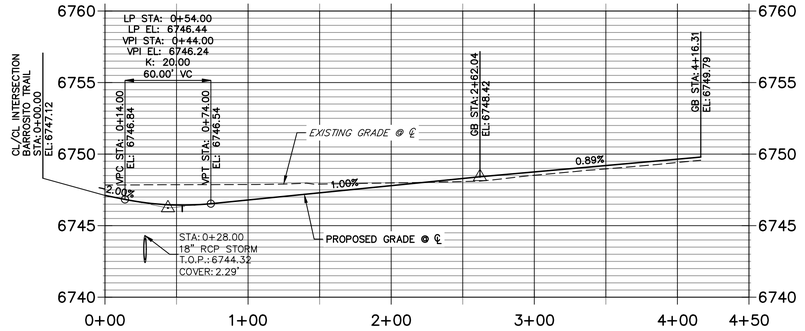
STREET IMPROVEMENT PLAN AND PROFILE

SHEET 23 OF 63

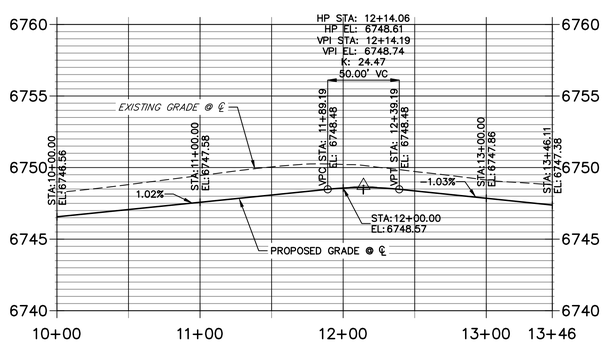
JOB NO. 25142.05



BADITO PLACE CL PROFILE
STA 0+00.00 TO 4+50.00

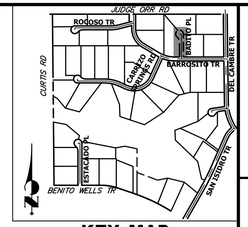


BADITO PLACE CUL-DE-SAC PROFILE
STA 10+00.00 TO 13+46.11



POINT TABLULATION						
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
150	0+28.00	39.00' (RT)	BADITO PLACE CL	6742.42		SWALE PT/GB
151	0+28.00	24.00' (LT)	BADITO PLACE CL	6743.90		END SWALE
152	0+34.00	28.17' (LT)	BADITO PLACE CL	6743.18		SWALE PI/GB
153	0+34.00	14.00' (RT)	BADITO PLACE CL	6746.25		PCR
154	0+34.00	14.00' (LT)	BADITO PLACE CL	6746.27		PCR
155	0+43.00	24.00' (RT)	BADITO PLACE CL	6743.91		SWALE PC/GB
156	0+54.00	14.00' (RT)	BADITO PLACE CL	6746.16		LOW PT
157	0+54.00	14.00' (LT)	BADITO PLACE CL	6746.16		LOW PT
158	0+74.00	24.00' (RT)	BADITO PLACE CL	6744.22		SWALE GB
159	0+81.62	24.00' (LT)	BADITO PLACE CL	6744.29		SWALE PI/GB
160	2+62.04	24.00' (LT)	BADITO PLACE CL	6746.10		SWALE PC/GB
161	2+62.04	14.00' (LT)	BADITO PLACE CL	6748.14		PC
162	3+44.31	24.00' (RT)	BADITO PLACE CL	6746.92		SWALE PC/GB
163	3+44.31	14.00' (RT)	BADITO PLACE CL	6748.96		PC
164	3+69.51	27.60' (RT)	BADITO PLACE CL	6747.20		PRC
165	3+72.31	18.00' (RT)	BADITO PLACE CL	6749.24		PRC

POINT TABLULATION					
POINT NUMBER	NORTHING	EASTING	ELEVATION	NOTES	DESCRIPTION
166	1409450.88	3271384.33	6747.07		PRC
167	1409559.19	3271405.07	6748.32		SWALE HIGH PT
168	1409459.16	3271389.93	6749.11		PRC
169	1409549.42	3271407.22	6750.28		HIGH PT



KEY MAP
N.T.S

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No.	REVISION	BY	DATE
.	.	.	.

H-SCALE 1"=50' | V-SCALE 1"=5' | DATE 3/20/24 | DESIGNED BY RWK | DRAWN BY RWK | CHECKED BY

SADDLEHORN RANCH – FILING 3

STREET IMPROVEMENT PLAN AND PROFILE

SHEET 24 OF 63

JOB NO. 25142.05

50 25 0 50 100
HORIZONTAL
ORIGINAL SCALE: 1" = 50'
VERTICAL
ORIGINAL SCALE: 1" = 5'

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COLORADO P.E. 25043
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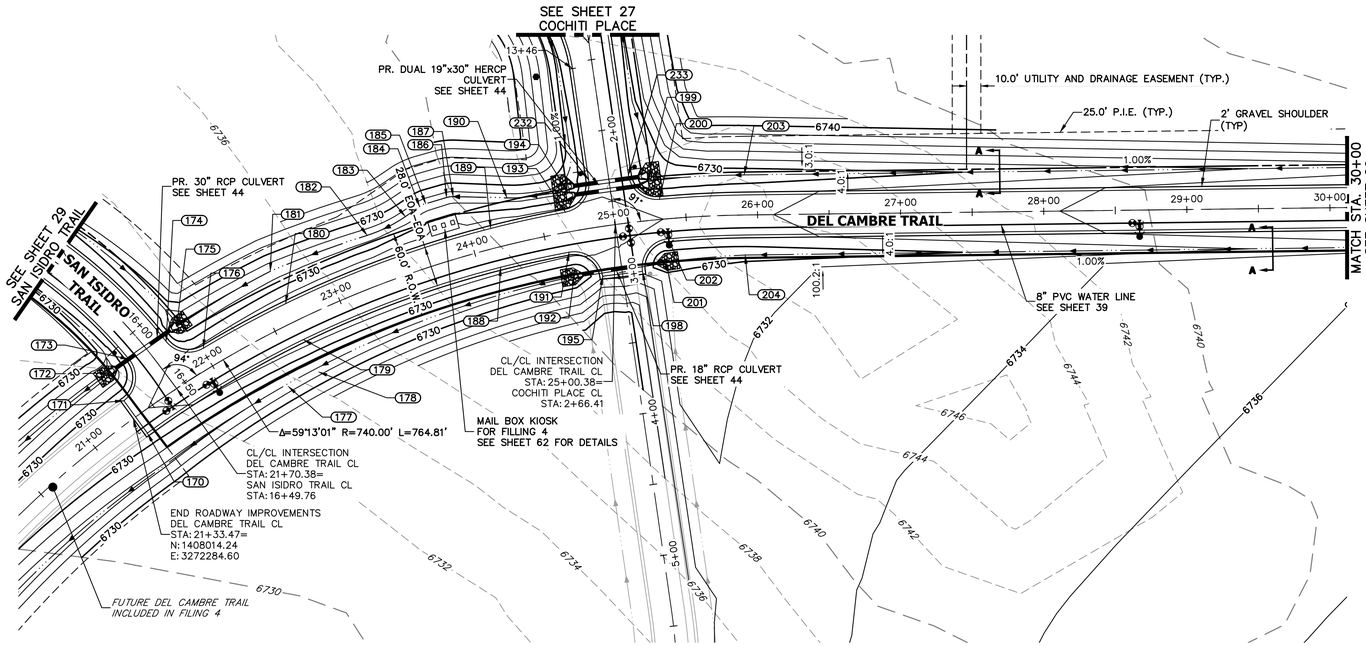
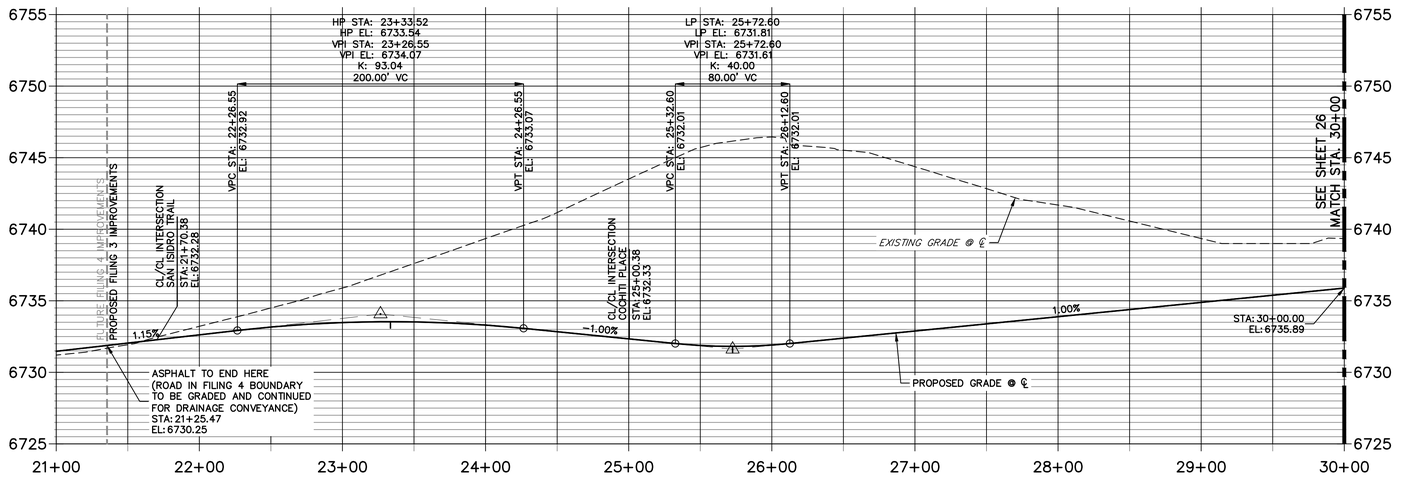
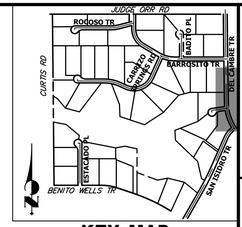
COLORADO REGISTERED BRYAN T. LAW 25043 PROFESSIONAL ENGINEER

3/20/24
DATE



DEL CAMBRE TRAIL CL PROFILE
STA 21+00.00 TO 30+00.00





KEY MAP
N.T.S

POINT TABULATION						
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
170	21+35.47	14.00' (RT)	DEL CAMBRE TRAIL CL	6731.60		PCR
171	21+35.47	14.00' (LT)	DEL CAMBRE TRAIL CL	6731.60		PCR
172	21+38.03	35.82' (LT)	DEL CAMBRE TRAIL CL	6725.39		BEGIN SWALE
173	21+54.52	35.46' (LT)	DEL CAMBRE TRAIL CL	6731.40		PCR
174	21+81.77	31.66' (LT)	DEL CAMBRE TRAIL CL	6731.48		PCR
175	21+93.47	37.22' (LT)	DEL CAMBRE TRAIL CL	6725.76		BEGIN SWALE
176	22+00.79	14.00' (LT)	DEL CAMBRE TRAIL CL	6732.35		PCR
177	22+40.08	38.40' (RT)	DEL CAMBRE TRAIL CL	6726.72		SWALE GB
178	22+64.87	39.00' (RT)	DEL CAMBRE TRAIL CL	6727.24		PCC
179	22+65.08	14.00' (RT)	DEL CAMBRE TRAIL CL	6733.00		HIGH PT
180	22+65.08	14.00' (LT)	DEL CAMBRE TRAIL CL	6733.00		HIGH PT
181	22+65.27	39.00' (LT)	DEL CAMBRE TRAIL CL	6726.14		PC
182	23+34.00	35.32' (LT)	DEL CAMBRE TRAIL CL	6726.54		SWALE PRC
183	23+62.08	38.79' (LT)	DEL CAMBRE TRAIL CL	6726.69		SWALE PC
184	23+73.10	42.29' (LT)	DEL CAMBRE TRAIL CL	6726.75		SWALE PT
185	23+77.51	42.97' (LT)	DEL CAMBRE TRAIL CL	6726.77		SWALE PC
186	23+91.89	42.97' (LT)	DEL CAMBRE TRAIL CL	6726.85		SWALE PT
187	23+96.30	42.29' (LT)	DEL CAMBRE TRAIL CL	6726.87		SWALE PC
188	24+15.08	14.00' (RT)	DEL CAMBRE TRAIL CL	6732.89		LOW PT
189	24+15.08	14.00' (LT)	DEL CAMBRE TRAIL CL	6732.89		LOW PT
190	24+30.69	32.04' (LT)	DEL CAMBRE TRAIL CL	6727.06		SWALE PT
191	24+65.08	14.00' (RT)	DEL CAMBRE TRAIL CL	6732.41		PCR
192	24+65.31	31.25' (RT)	DEL CAMBRE TRAIL CL	6727.28		END SWALE
193	24+67.56	14.00' (LT)	DEL CAMBRE TRAIL CL	6732.38		PCR
194	24+71.24	28.10' (LT)	DEL CAMBRE TRAIL CL	6727.55		END SWALE
195	24+86.05	34.48' (RT)	DEL CAMBRE TRAIL CL	6731.42		PCR
196	24+86.68	33.56' (LT)	DEL CAMBRE TRAIL CL	6731.45		PCR
197	25+13.48	33.20' (LT)	DEL CAMBRE TRAIL CL	6731.46		PCR
198	25+15.43	34.88' (RT)	DEL CAMBRE TRAIL CL	6731.41		PCR
199	25+26.15	28.00' (LT)	DEL CAMBRE TRAIL CL	6727.69		BEGIN SWALE
200	25+32.60	14.00' (LT)	DEL CAMBRE TRAIL CL	6731.73		PCR
201	25+33.20	30.00' (RT)	DEL CAMBRE TRAIL CL	6727.80		BEGIN SWALE
202	25+36.39	14.00' (RT)	DEL CAMBRE TRAIL CL	6731.70		PCR
203	25+91.00	28.00' (LT)	DEL CAMBRE TRAIL CL	6728.48		SWALE PC/GB
204	25+91.00	28.00' (RT)	DEL CAMBRE TRAIL CL	6728.49		SWALE PC/GB

50 25 0 50 100

HORIZONTAL
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VERTICAL
ORIGINAL SCALE: 1" = 5'

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3/20/24
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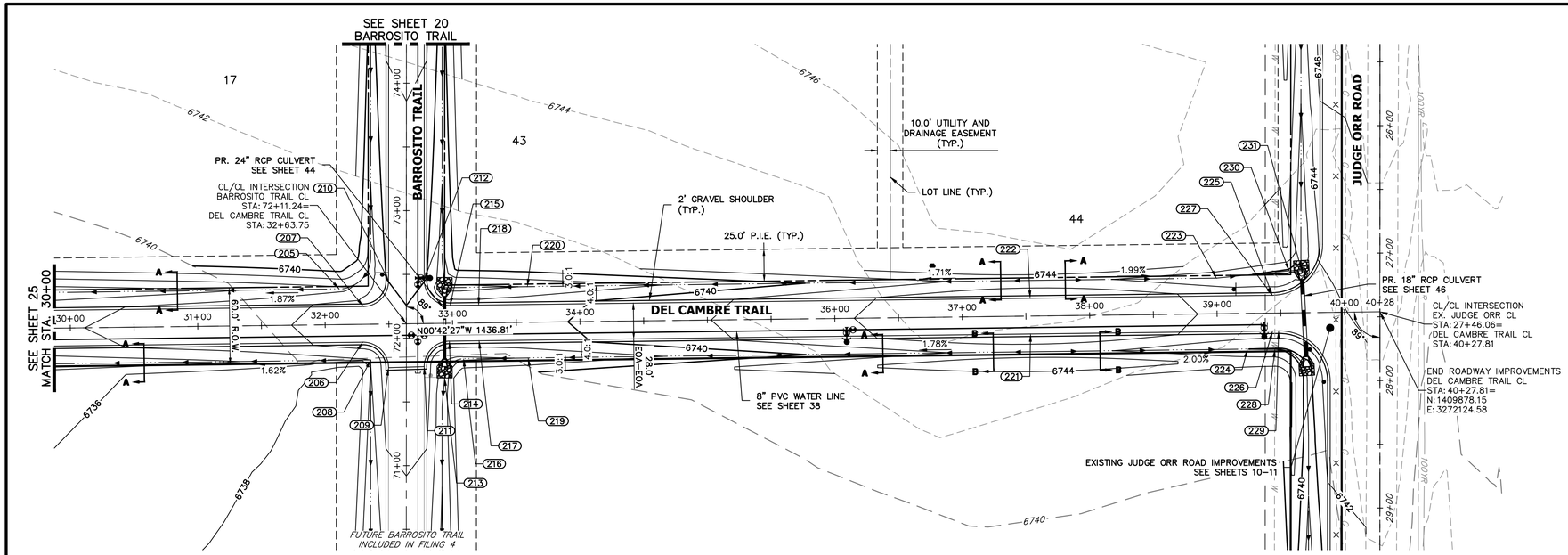
V-SCALE	1"=5'
DATE	3/20/24
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

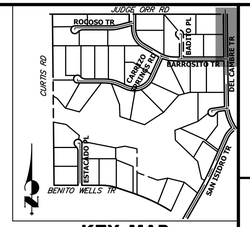
SADDLEHORN RANCH – FILING 3

STREET IMPROVEMENT PLAN AND PROFILE

SHEET 25 OF 63

JOB NO. 25142.05

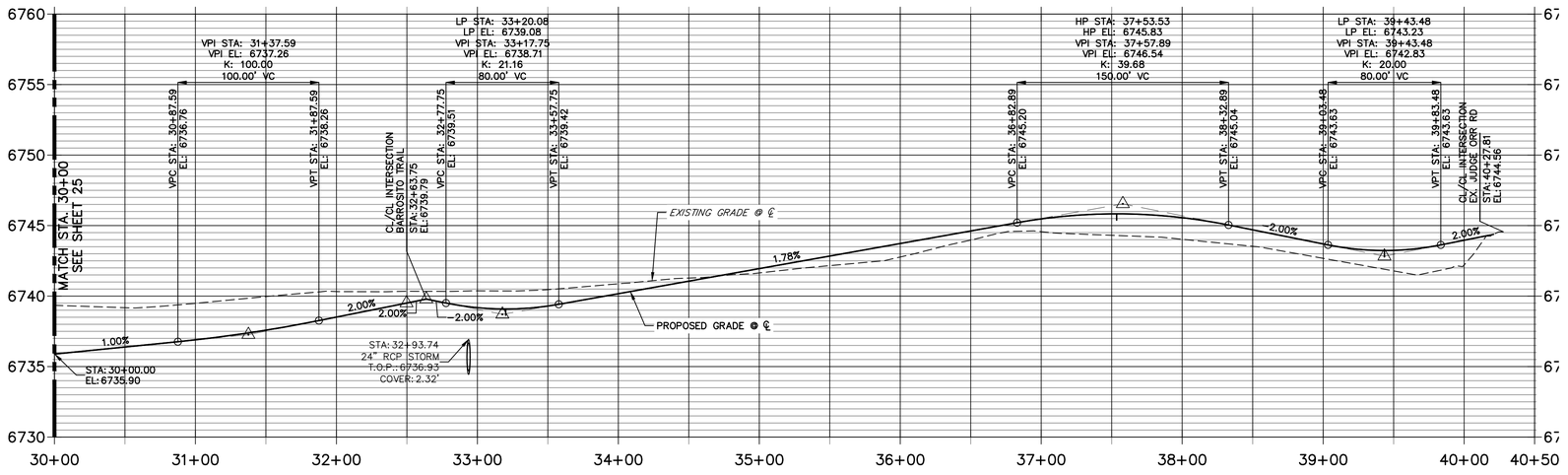




KEY MAP
N.T.S

POINT TABLULATION						
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
205	32+11.41	28.00' (LT)	DEL CAMBRE TRAIL CL	6735.42		SWALE PC/GB
206	32+29.32	14.00' (RT)	DEL CAMBRE TRAIL CL	6738.82		PCR
207	32+30.17	14.00' (LT)	DEL CAMBRE TRAIL CL	6738.83		PCR
208	32+35.40	28.00' (RT)	DEL CAMBRE TRAIL CL	6736.03		PI
209	32+49.32	34.25' (RT)	DEL CAMBRE TRAIL CL	6738.99		PCR
210	32+50.17	33.75' (LT)	DEL CAMBRE TRAIL CL	6740.01		PCR
211	32+77.33	33.75' (RT)	DEL CAMBRE TRAIL CL	6739.00		PCR
212	32+78.18	34.25' (LT)	DEL CAMBRE TRAIL CL	6740.02		PCR
213	32+93.22	42.84' (RT)	DEL CAMBRE TRAIL CL	6734.47		SWALE PT/GB
214	32+97.33	14.00' (RT)	DEL CAMBRE TRAIL CL	6738.92		PCR
215	32+98.18	14.00' (LT)	DEL CAMBRE TRAIL CL	6738.92		PCR
216	33+08.28	28.00' (RT)	DEL CAMBRE TRAIL CL	6735.60		SWALE PC/GB
217	33+20.59	14.00' (RT)	DEL CAMBRE TRAIL CL	6738.81		LOW PT
218	33+20.59	14.00' (LT)	DEL CAMBRE TRAIL CL	6738.81		LOW PT
219	33+59.01	28.00' (RT)	DEL CAMBRE TRAIL CL	6736.12		SWALE GB
220	33+59.01	27.98' (LT)	DEL CAMBRE TRAIL CL	6736.13		SWALE GB
221	37+53.46	14.00' (RT)	DEL CAMBRE TRAIL CL	6745.55		HIGH PT
222	37+53.46	14.00' (LT)	DEL CAMBRE TRAIL CL	6745.55		HIGH PT
223	38+99.75	28.00' (LT)	DEL CAMBRE TRAIL CL	6740.38		SWALE PI/GB
224	39+23.48	28.00' (RT)	DEL CAMBRE TRAIL CL	6740.01		SWALE GB
225	39+43.48	14.00' (LT)	DEL CAMBRE TRAIL CL	6742.95		PCR
226	39+43.48	14.00' (RT)	DEL CAMBRE TRAIL CL	6742.95		LOW PT
227	39+43.48	14.00' (LT)	DEL CAMBRE TRAIL CL	6742.95		LOW PT
228	39+45.14	28.00' (RT)	DEL CAMBRE TRAIL CL	6739.91		SWALE PC/GB
229	39+48.13	14.00' (RT)	DEL CAMBRE TRAIL CL	6742.96		PCR

DEL CAMBRE TRAIL CL PROFILE (2)
STA 30+00.00 TO 40+50.00



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50 25 0 50 100

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2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

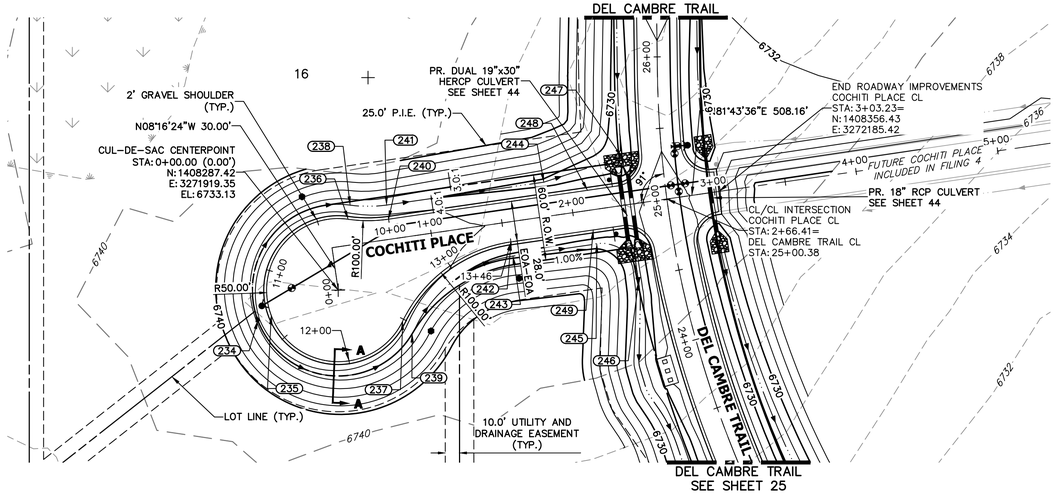
H-SCALE	1"=50'
V-SCALE	1"=5'
DATE	3/20/24
DESIGNED BY	RWK
DRAWN BY	RWK
CHECKED BY	

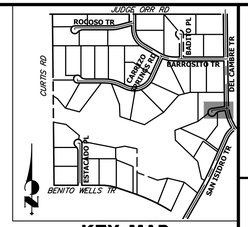
SADDLEHORN RANCH – FILING 3

STREET IMPROVEMENT PLAN AND PROFILE

SHEET 26 OF 63

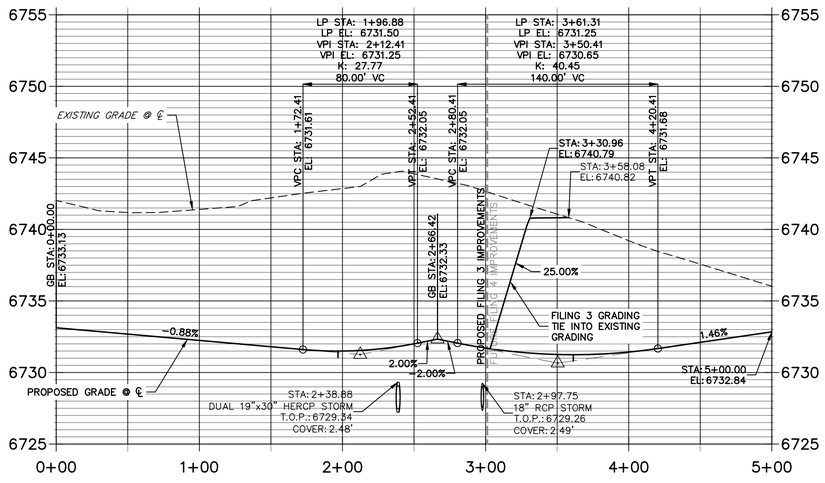
JOB NO. 25142.05





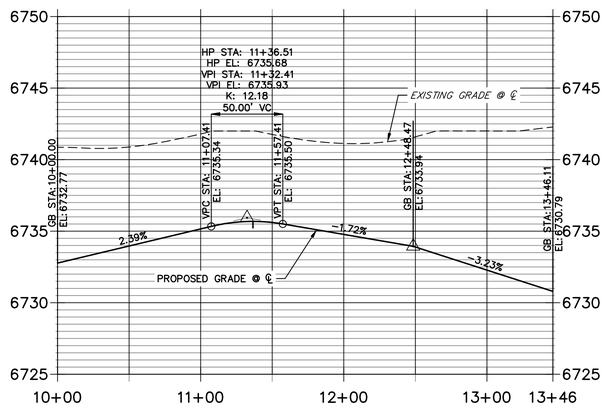
KEY MAP
N.T.S

COCHITI PLACE CL PROFILE
STA 0+00.00 TO 5+00.00



POINT TABLULATION						
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
232	2+32.84	14.00' (RT)	COCHITI PLACE CL	6731.45		PCR
233	2+33.47	14.00' (LT)	COCHITI PLACE CL	6731.46		PCR
236	0+44.00	18.00' (LT)	COCHITI PLACE CL	6732.66		PRC
238	0+46.80	27.60' (LT)	COCHITI PLACE CL	6730.62		PRC
240	0+72.00	14.00' (LT)	COCHITI PLACE CL	6732.38		PT
241	0+72.00	24.00' (LT)	COCHITI PLACE CL	6730.34		PT
242	1+54.27	14.00' (RT)	COCHITI PLACE CL	6731.56		PT
243	1+54.27	24.00' (RT)	COCHITI PLACE CL	6729.52		PT
244	1+83.02	24.00' (LT)	COCHITI PLACE CL	6729.25		SWALE PI/GB
245	2+13.48	24.00' (RT)	COCHITI PLACE CL	6728.92		SWALE PC/GB
246	2+38.51	54.38' (RT)	COCHITI PLACE CL	6727.11		SWALE PC/GB
247	2+39.46	33.68' (LT)	COCHITI PLACE CL	6727.88		SWALE GB
248	2+12.41	14.00' (LT)	COCHITI PLACE CL	6731.27		LOW PT
249	2+12.41	14.00' (RT)	COCHITI PLACE CL	6731.27		LOW PT

COCHITI PLACE CUL-DE-SAC PROFILE
STA 10+00.00 TO 13+46.11



POINT TABLULATION					
POINT NUMBER	NORTHING	EASTING	ELEVATION	NOTES	DESCRIPTION
234	1408266.25	3271863.21	6731.66		HIGH PT
235	1408269.78	3271872.56	6733.70		HIGH PT
237	1408265.68	3271964.37	6732.53		PRC
239	1408256.97	3271971.04	6730.55		PRC

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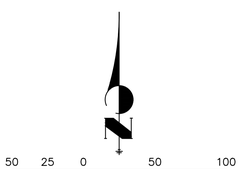

Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043

3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

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BRADY WILLIAMS

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.	.	.	.

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V-SCALE	1"=5'
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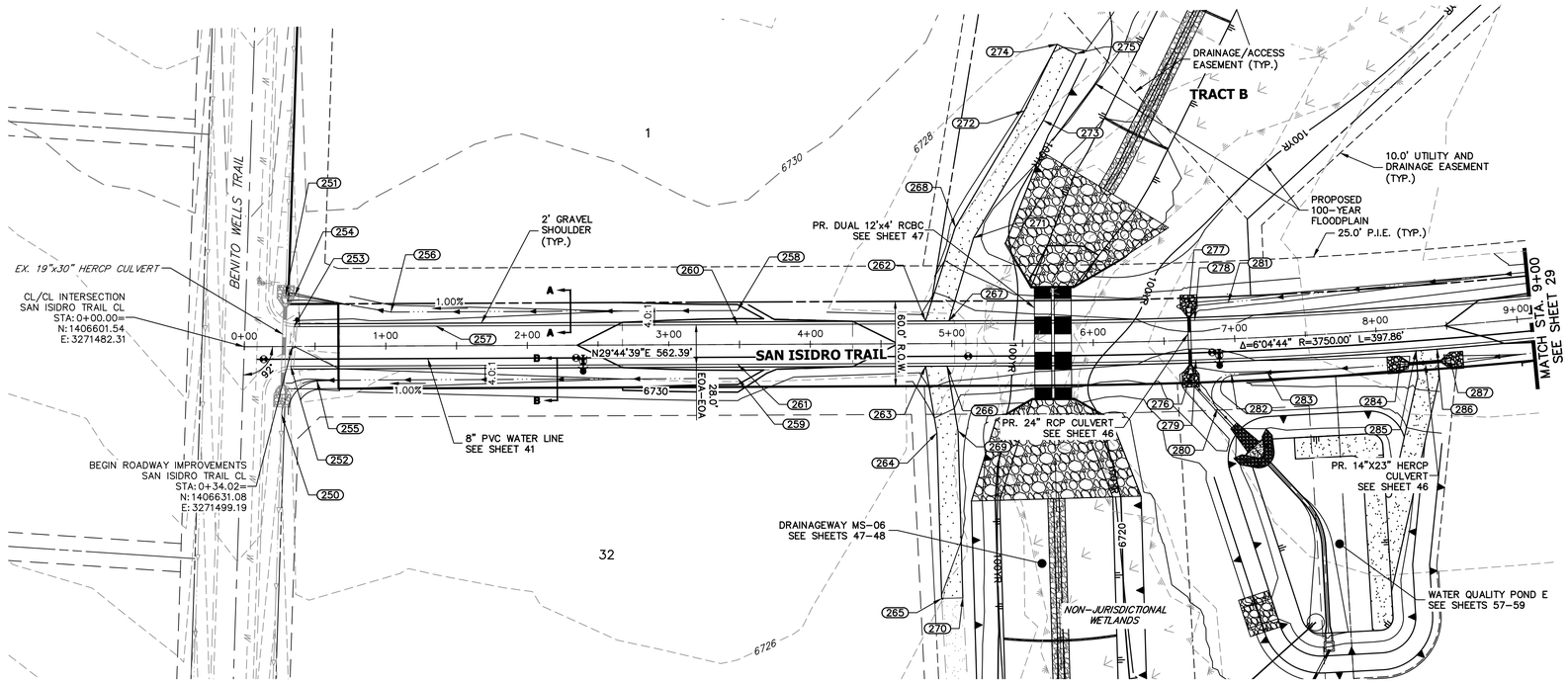
DRAWN BY	RWK
CHECKED BY	

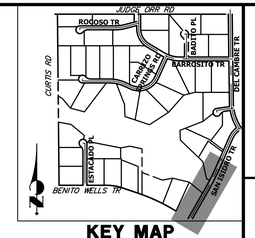
SADDLEHORN RANCH – FILING 3

STREET IMPROVEMENT PLAN AND PROFILE

SHEET 27 OF 63

JOB NO. 25142.05



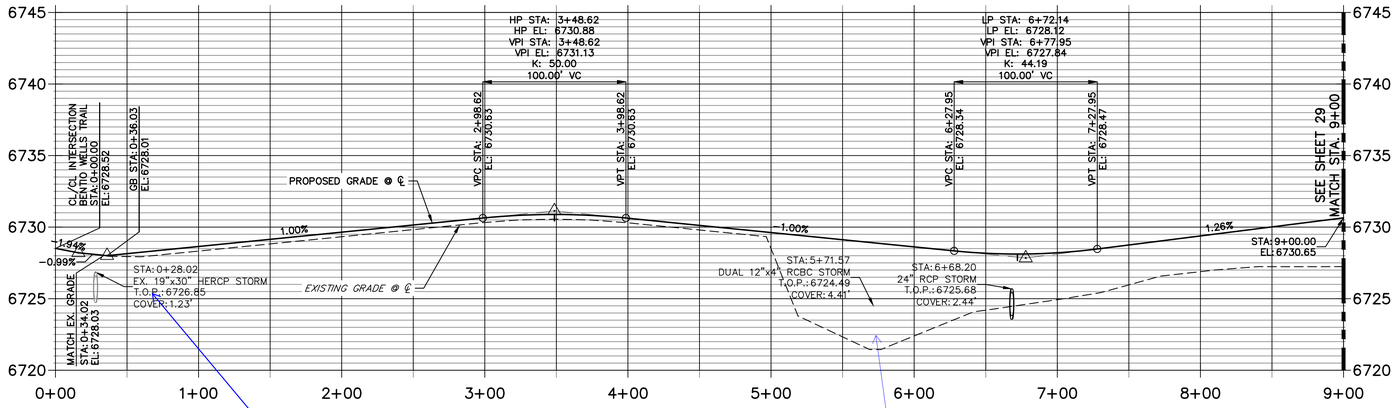


KEY MAP
N.T.S

POINT TABULATION

POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
250	0+26.23	48.07' (RT)	SAN ISIDRO TRAIL CL	6724.42		END SWALE
251	0+29.37	36.22' (LT)	SAN ISIDRO TRAIL CL	6725.45		BEGIN SWALE
252	0+32.76	14.00' (RT)	SAN ISIDRO TRAIL CL	6727.76		MATCH EX ASPH
253	0+35.29	14.00' (LT)	SAN ISIDRO TRAIL CL	6728.28		MATCH EX ASPH
254	0+35.78	35.99' (LT)	SAN ISIDRO TRAIL CL	6725.53		SWALE PI/GB
255	0+51.21	24.00' (RT)	SAN ISIDRO TRAIL CL	6725.84		SWALE PT/GB
256	1+03.76	24.00' (LT)	SAN ISIDRO TRAIL CL	6726.37		SWALE PI/GB
257	1+35.31	14.00' (LT)	SAN ISIDRO TRAIL CL	6728.72		GB
258	3+48.62	24.00' (LT)	SAN ISIDRO TRAIL CL	6728.56		END SWALE
259	3+48.62	24.00' (RT)	SAN ISIDRO TRAIL CL	6728.56		END SWALE
260	3+48.62	14.00' (LT)	SAN ISIDRO TRAIL CL	6730.60		HIGH PT
261	3+48.62	14.00' (RT)	SAN ISIDRO TRAIL CL	6730.60		HIGH PT
262	4+81.44	16.00' (LT)	SAN ISIDRO TRAIL CL	6729.49		BEGIN DWY CUT
263	4+81.44	16.00' (RT)	SAN ISIDRO TRAIL CL	6729.49		BEGIN DWY CUT
264	4+89.19	63.13' (RT)	SAN ISIDRO TRAIL CL	6725.32		PI
265	4+92.04	180.22' (RT)	SAN ISIDRO TRAIL CL	6723.98		END MAINTENANCE ROAD
266	4+96.64	16.00' (RT)	SAN ISIDRO TRAIL CL	6729.33		END DWY CUT
267	4+98.08	16.00' (LT)	SAN ISIDRO TRAIL CL	6729.32		END DWY CUT
268	5+02.90	82.37' (LT)	SAN ISIDRO TRAIL CL	6724.69		PI
269	5+04.16	61.73' (RT)	SAN ISIDRO TRAIL CL	6725.02		PI
270	5+07.04	179.86' (RT)	SAN ISIDRO TRAIL CL	6723.68		END MAINTENANCE ROAD
271	5+15.74	74.61' (LT)	SAN ISIDRO TRAIL CL	6724.42		PI
272	5+52.17	164.42' (LT)	SAN ISIDRO TRAIL CL	6725.33		PI
273	5+65.60	157.47' (LT)	SAN ISIDRO TRAIL CL	6725.03		PI
274	5+76.13	211.25' (LT)	SAN ISIDRO TRAIL CL	6726.09		END MAINTENANCE ROAD
275	5+90.28	204.45' (LT)	SAN ISIDRO TRAIL CL	6725.80		END MAINTENANCE ROAD
276	6+67.92	24.00' (RT)	SAN ISIDRO TRAIL CL	6723.79		LOW PT
277	6+68.26	24.00' (LT)	SAN ISIDRO TRAIL CL	6723.95		LOW PT
278	6+72.14	14.00' (LT)	SAN ISIDRO TRAIL CL	6727.84		LOW PT
279	6+72.14	14.00' (RT)	SAN ISIDRO TRAIL CL	6727.84		LOW PT
280	6+85.87	48.88' (RT)	SAN ISIDRO TRAIL CL	6723.54		PT
281	6+96.51	25.82' (LT)	SAN ISIDRO TRAIL CL	6725.00		SWALE GB
282	6+96.64	24.96' (RT)	SAN ISIDRO TRAIL CL	6725.64		PC
283	7+22.13	24.92' (RT)	SAN ISIDRO TRAIL CL	6725.82		SWALE GB
284	8+15.33	24.80' (RT)	SAN ISIDRO TRAIL CL	6726.29		END SWALE
285	8+27.11	16.00' (RT)	SAN ISIDRO TRAIL CL	6729.12		BEGIN DWY CUT
286	8+42.05	16.00' (RT)	SAN ISIDRO TRAIL CL	6729.27		END DWY CUT
287	8+50.87	24.80' (RT)	SAN ISIDRO TRAIL CL	6726.65		BEGIN SWALE

SAN ISIDRO TRAIL CL PROFILE
STA 0+00.00 TO 9+00.00



provide culvert profile and verify if deviation is needed

This culvert was constructed with Filing 2

show culvert

ADDED culvert to profile

50 25 0 50 100

HORIZONTAL
ORIGINAL SCALE: 1" = 50'
VERTICAL
ORIGINAL SCALE: 1" = 5'

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BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
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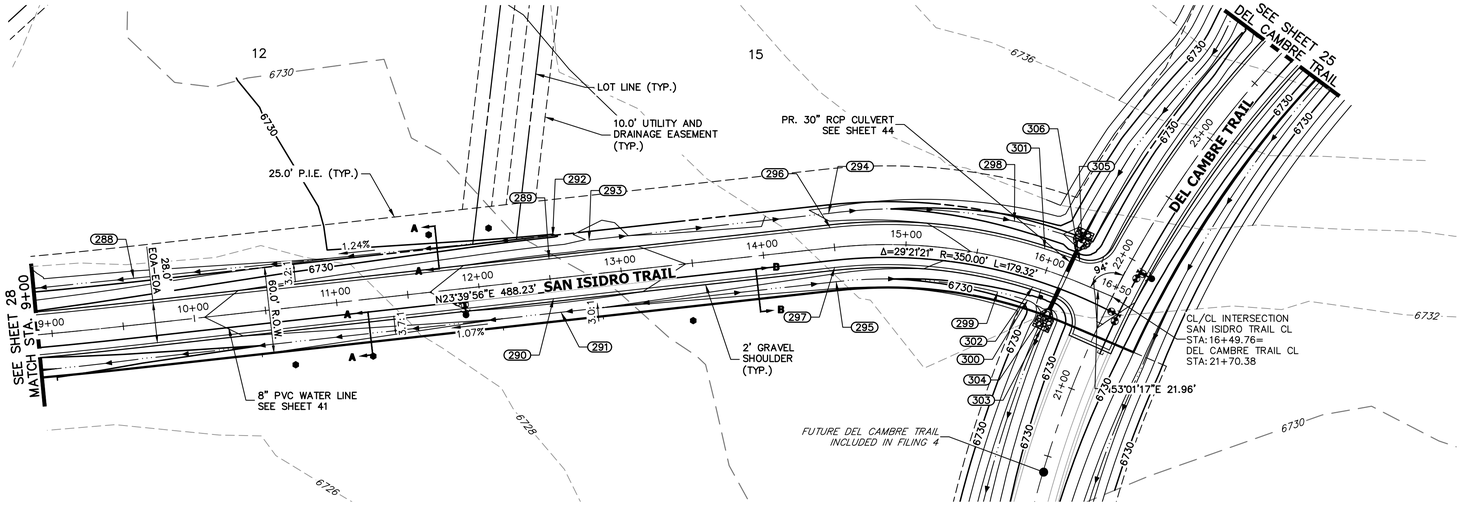
V-SCALE	1"=5'	DRAWN BY	RWK
DATE	3/20/24	CHECKED BY	

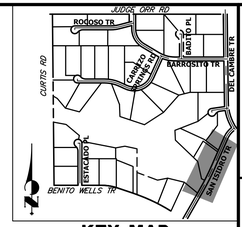
SADDLEHORN RANCH – FILING 3

STREET IMPROVEMENT PLAN AND PROFILE

SHEET 28 OF 63

JOB NO. 25142.05

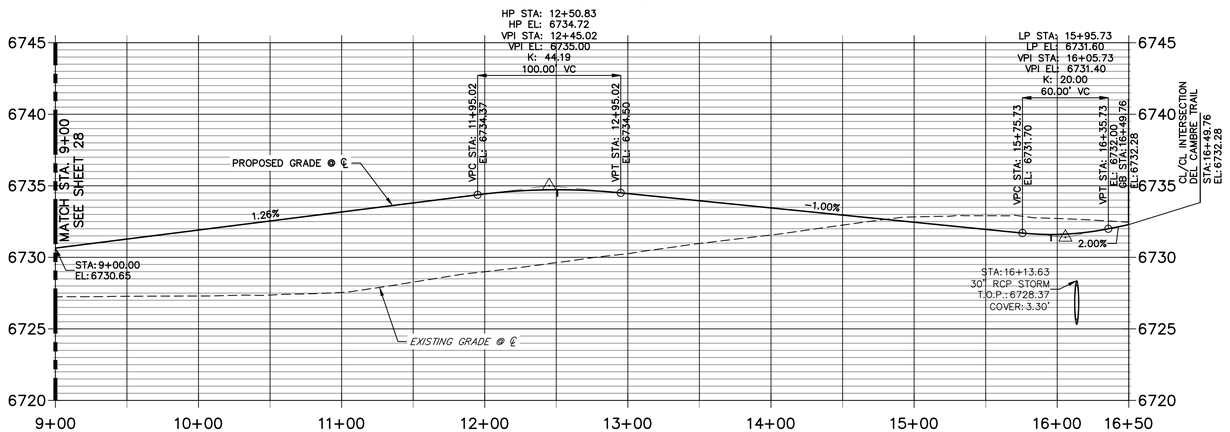




KEY MAP
N.T.S

POINT TABLULATION						
POINT NUMBER	STATION	OFFSET	ALIGNMENT	ELEVATION	NOTES	DESCRIPTION
288	9+60.92	32.57' (LT)	SAN ISIDRO TRAIL CL	6726.31		SWALE GB
289	12+50.83	14.00' (LT)	SAN ISIDRO TRAIL CL	6734.44		HIGH PT
290	12+50.83	14.00' (RT)	SAN ISIDRO TRAIL CL	6734.44		HIGH PT
291	12+55.06	24.00' (RT)	SAN ISIDRO TRAIL CL	6732.13		HIGH PT
292	12+55.19	29.82' (LT)	SAN ISIDRO TRAIL CL	6729.65		END SWALE
293	12+80.06	24.00' (LT)	SAN ISIDRO TRAIL CL	6732.26		BEGIN SWALE
294	14+48.48	24.00' (LT)	SAN ISIDRO TRAIL CL	6730.65		SWALE PC/GB
295	14+48.48	24.00' (RT)	SAN ISIDRO TRAIL CL	6730.42		SWALE PC/GB
296	14+48.48	14.00' (LT)	SAN ISIDRO TRAIL CL	6732.69		PC
297	14+48.48	14.00' (RT)	SAN ISIDRO TRAIL CL	6732.69		PC
298	15+70.27	26.88' (LT)	SAN ISIDRO TRAIL CL	6728.72		SWALE GB
299	15+70.50	24.00' (RT)	SAN ISIDRO TRAIL CL	6729.21		SWALE GB
300	15+93.80	24.00' (RT)	SAN ISIDRO TRAIL CL	6728.98		SWALE PC/GB
301	15+94.45	14.00' (LT)	SAN ISIDRO TRAIL CL	6731.32		LOW PT
302	15+94.45	14.00' (RT)	SAN ISIDRO TRAIL CL	6731.32		LOW PT
303	16+10.68	39.88' (RT)	SAN ISIDRO TRAIL CL	6725.39		SWALE PT/GB
304	16+12.88	14.00' (RT)	SAN ISIDRO TRAIL CL	6731.40		PCR
305	16+15.61	27.98' (LT)	SAN ISIDRO TRAIL CL	6725.77		END SWALE
306	16+19.35	14.00' (LT)	SAN ISIDRO TRAIL CL	6731.48		PCR

SAN ISIDRO TRAIL CL PROFILE (2)
STA 9+00.00 TO 16+50.00



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BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

COLORADO REGISTERED BRYAN T. LAW 25043 PROFESSIONAL ENGINEER

3/20/24
DATE

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BRADY WILLIAMS

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No.	REVISION	BY	DATE
	. . .	.	. .

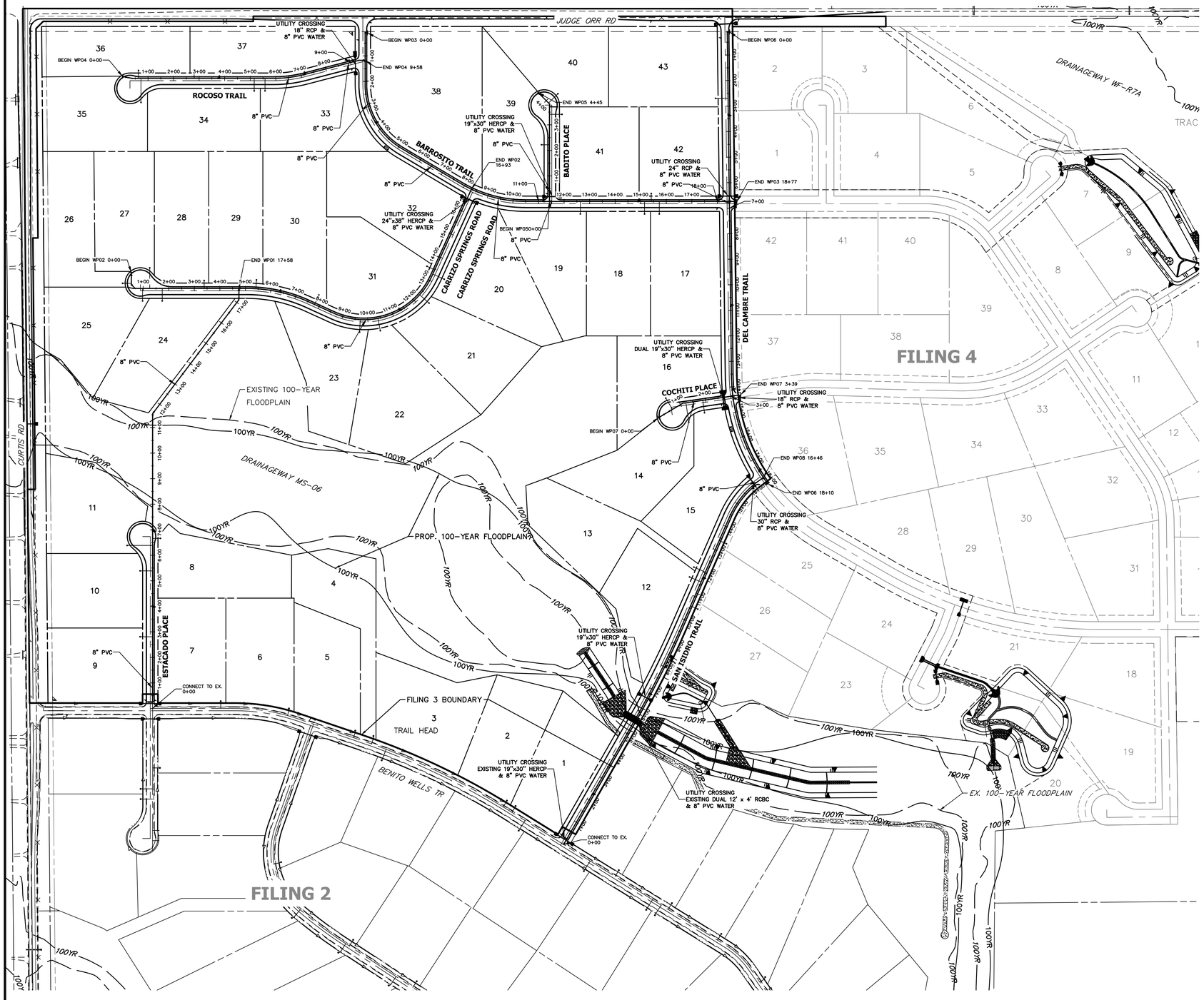
H-SCALE 1"=50' | V-SCALE 1"=5' | DATE 3/20/24 | DESIGNED BY RWK | DRAWN BY RWK | CHECKED BY

SADDLEHORN RANCH – FILING 3

STREET IMPROVEMENT PLAN AND PROFILE

SHEET 29 OF 63

JOB NO. 25142.05



ID NO.	PIPE ℄ STATION	PIPE ALIGNMENT
FUTURE LOT 1	10+59.04	WP08
FUTURE LOT 2	11+13.56	WP08
FUTURE LOT 3	13+38.48	WP08
LOT 7	6+65.82	WP01
LOT 9	2+80.73	WP01
LOT 10	5+38.75	WP01
LOT 11	6+38.27	WP01
LOT 12	11+61.36	WP08
LOT 13	12+03.49	WP08
LOT 14	1+22.54	WP07
LOT 15	1+89.08	WP07
LOT 16	0+63.29	WP07
LOT 17	15+72.74	WP03
LOT 18	15+14.94	WP03
LOT 19	12+63.50	WP03
LOT 20	13+27.68	WP02
LOT 21	12+31.15	WP02
LOT 22	10+39.96	WP02
LOT 23	9+70.27	WP02
LOT 24	1+74.50	WP02
LOT 25	1+18.37	WP02
LOT 26	0+85.68	WP02
LOT 27	1+01.16	WP02
LOT 28	3+38.51	WP02
LOT 29	5+41.21	WP02
LOT 30	7+80.35	WP02
LOT 31	13+45.84	WP02
LOT 32	13+97.89	WP02
LOT 33	5+58.00	WP04
LOT 34	5+15.58	WP04
LOT 35	0+72.39	WP04
LOT 36	2+41.53	WP04
LOT 37	2+80.52	WP04
LOT 38	1+98.52	WP03
LOT 39	2+89.37	WP03
LOT 40	2+21.93	WP05
LOT 41	3+59.85	WP05
LOT 42	3+41.08	WP05
LOT 43	15+41.15	WP03
LOT 44	2+69.26	WP06

NOTES

LOTS 1–6 WILL BE SERVICED BY THE FILING 2 IMPROVEMENTS

200 100 0 200 400

ORIGINAL SCALE: 1" = 200'

Know what's below. Call before you dig.

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No.	REVISION	BY	DATE
	.		

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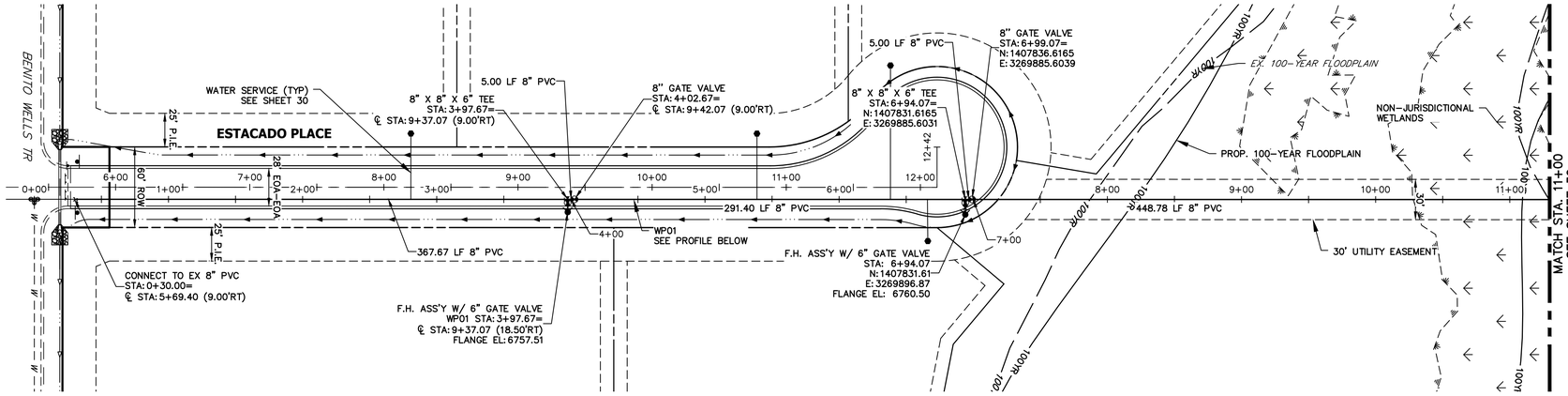
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	JMC
DRAWN BY	JMC
CHECKED BY	

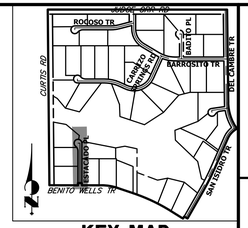
SADDLEHORN RANCH – FILING 3

OVERALL UTILITY PLAN & SERVICE PLAN

SHEET 30 OF 63

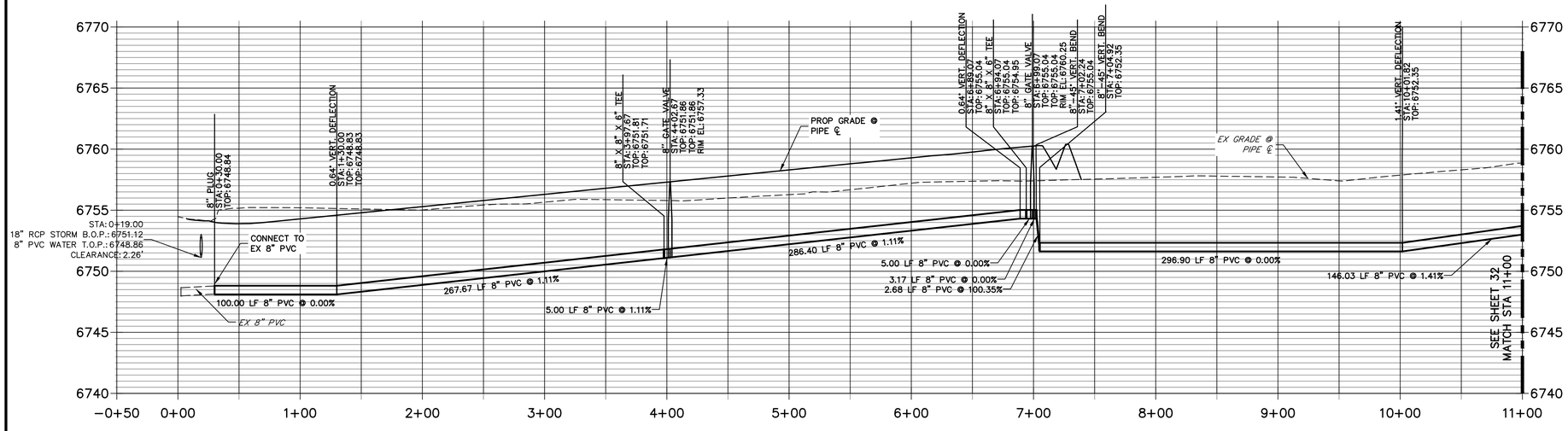
JOB NO. 25142.05





KEY MAP
N.T.S

WP01 PROFILE
STA -0+50.00 TO 11+00.00



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50 25 0 50 100

HORIZONTAL
ORIGINAL SCALE: 1" = 50'
VERTICAL
ORIGINAL SCALE: 1" = 5'

Know what's **below.**
Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE

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PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
	.	.	.

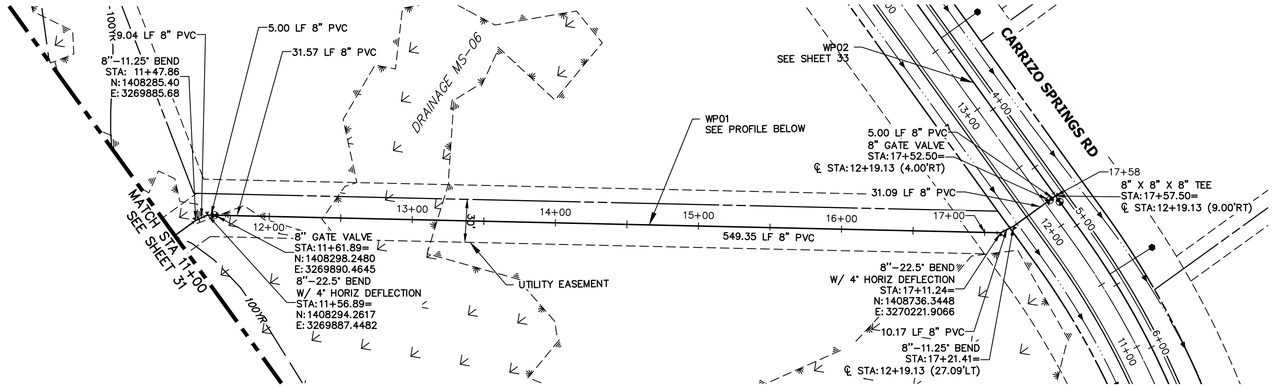
H-SCALE	1"=50'	DESIGNED BY	JMC
V-SCALE	1"=5'	DRAWN BY	JMC
DATE	3/20/24	CHECKED BY	

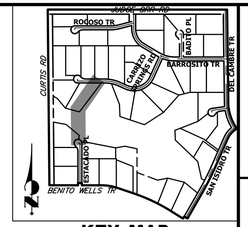
SADDLEHORN RANCH – FILING 3

WATER DISTRIBUTION PLAN

SHEET 31 OF 63

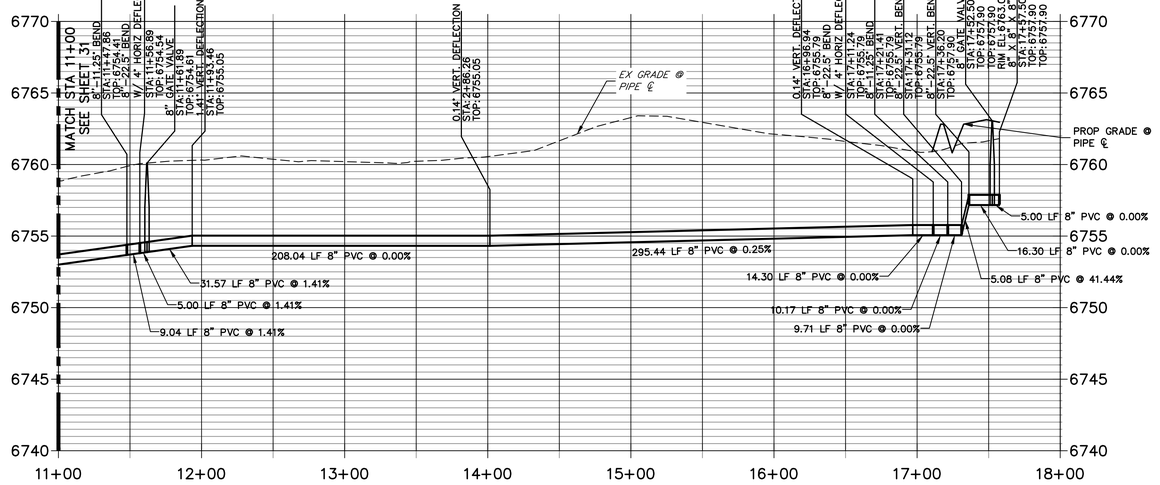
JOB NO. 25142.05





KEY MAP
N.T.S

WP01 PROFILE (2)
STA 11+00.00 TO 18+00.00



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VERTICAL
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V-SCALE	1"=5'
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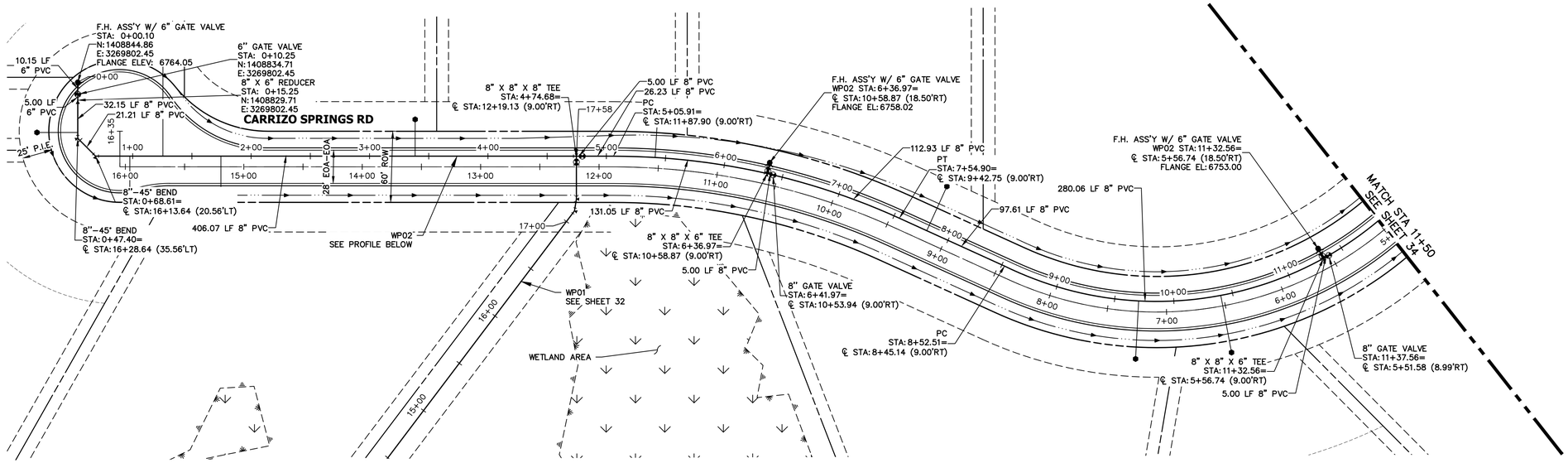
DRAWN BY	JMC
CHECKED BY	

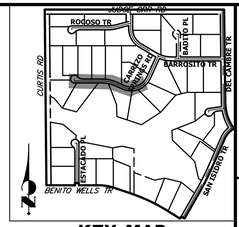
SADDLEHORN RANCH – FILING 3

WATER DISTRIBUTION PLAN

SHEET 32 OF 63

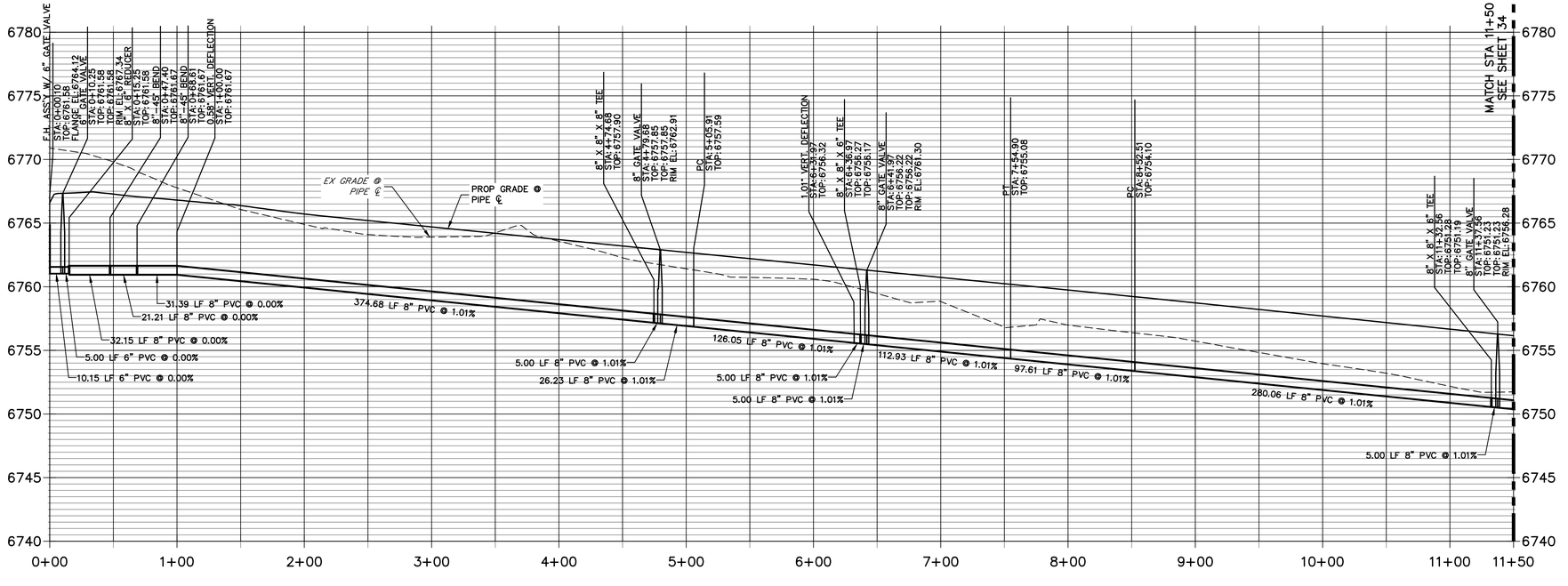
JOB NO. 25142.05





KEY MAP
N.T.S

WP02 PROFILE
STA 0+00.00 TO 11+50.00



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DATE	3/20/24
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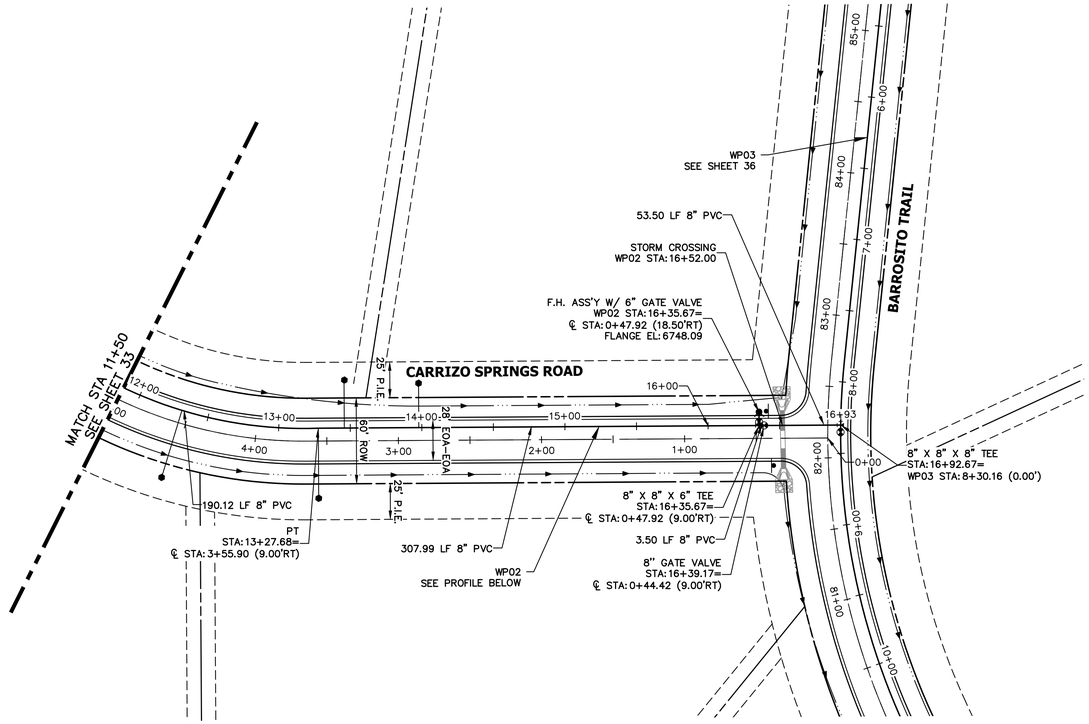
CHECKED BY	

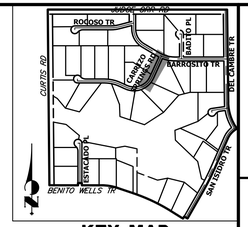
SADDLEHORN RANCH – FILING 3

WATER DISTRIBUTION PLAN

SHEET 33 OF 63

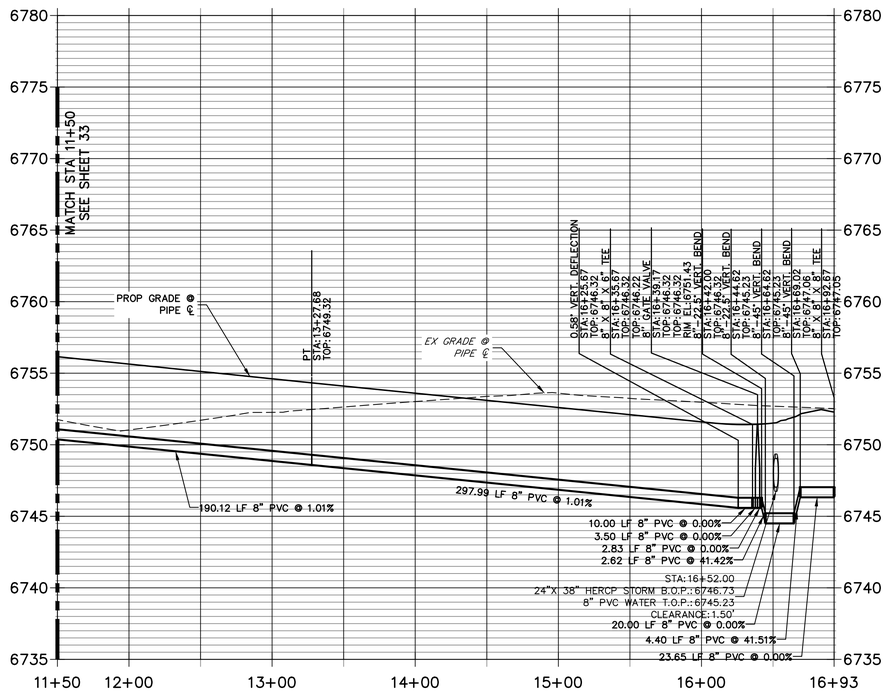
JOB NO. 25142.05





KEY MAP
N.T.S

WP02 PROFILE (2)
STA 11+50.00 TO 16+92.67



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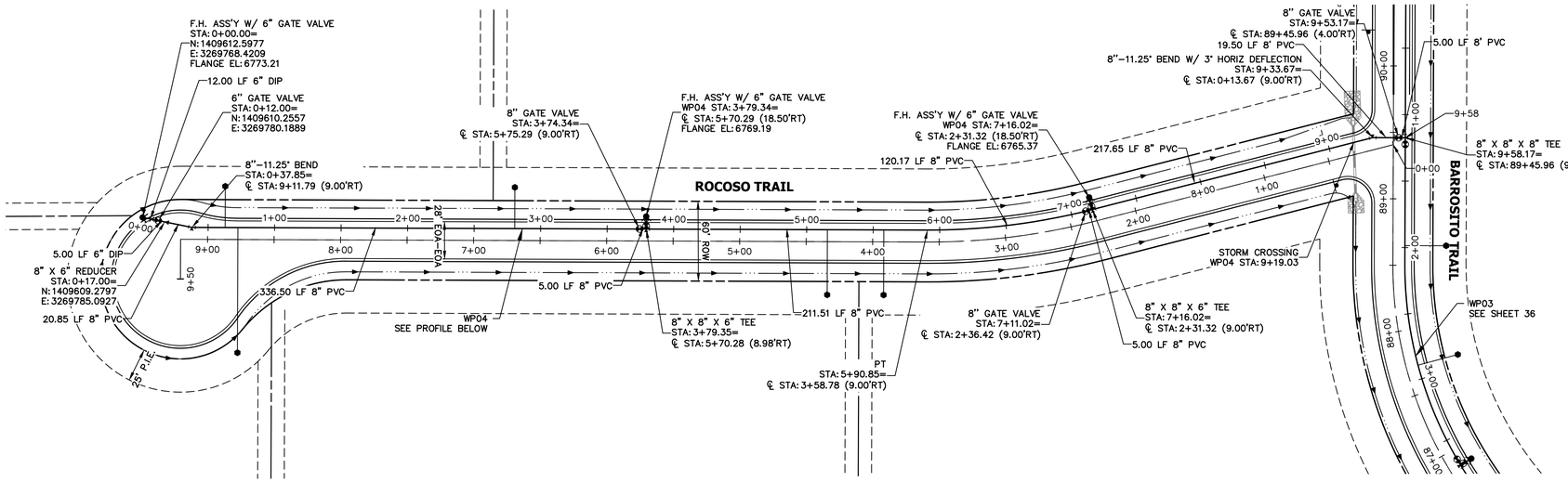
DRAWN BY	JMC
CHECKED BY	

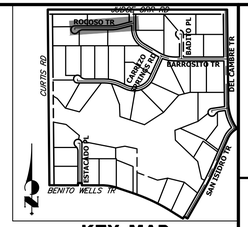
SADDLEHORN RANCH – FILING 3

WATER DISTRIBUTION PLAN

SHEET 34 OF 63

JOB NO. 25142.05





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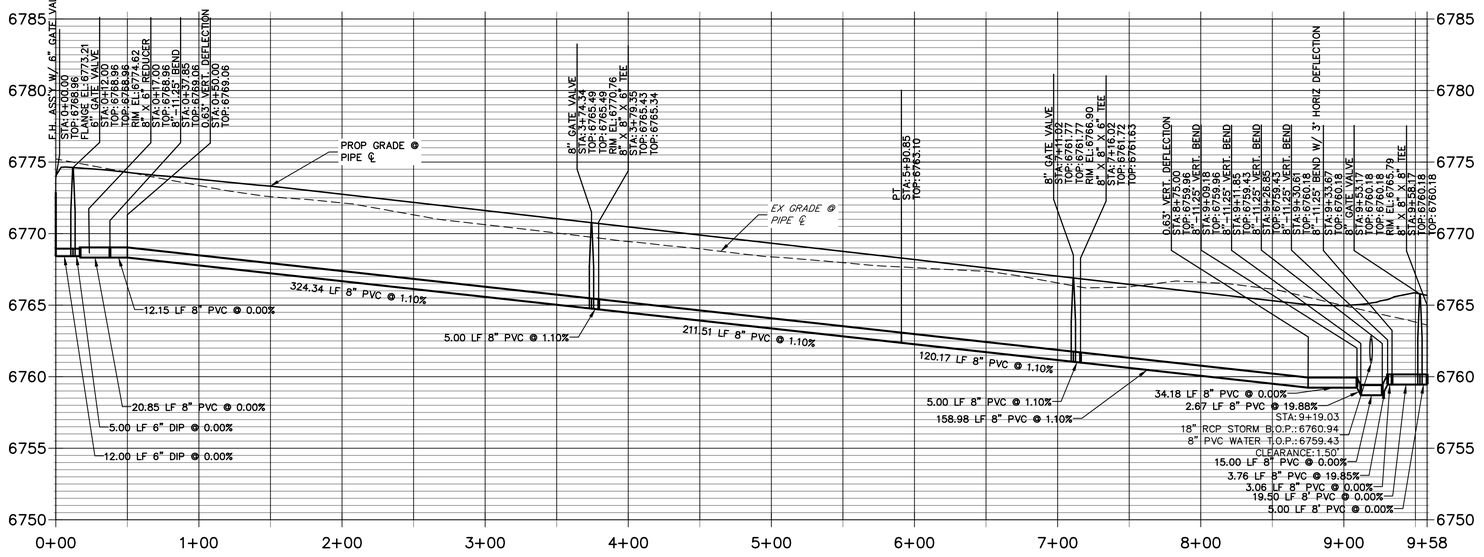
WP04 PROFILE
STA 0+00.00 TO 9+58.17



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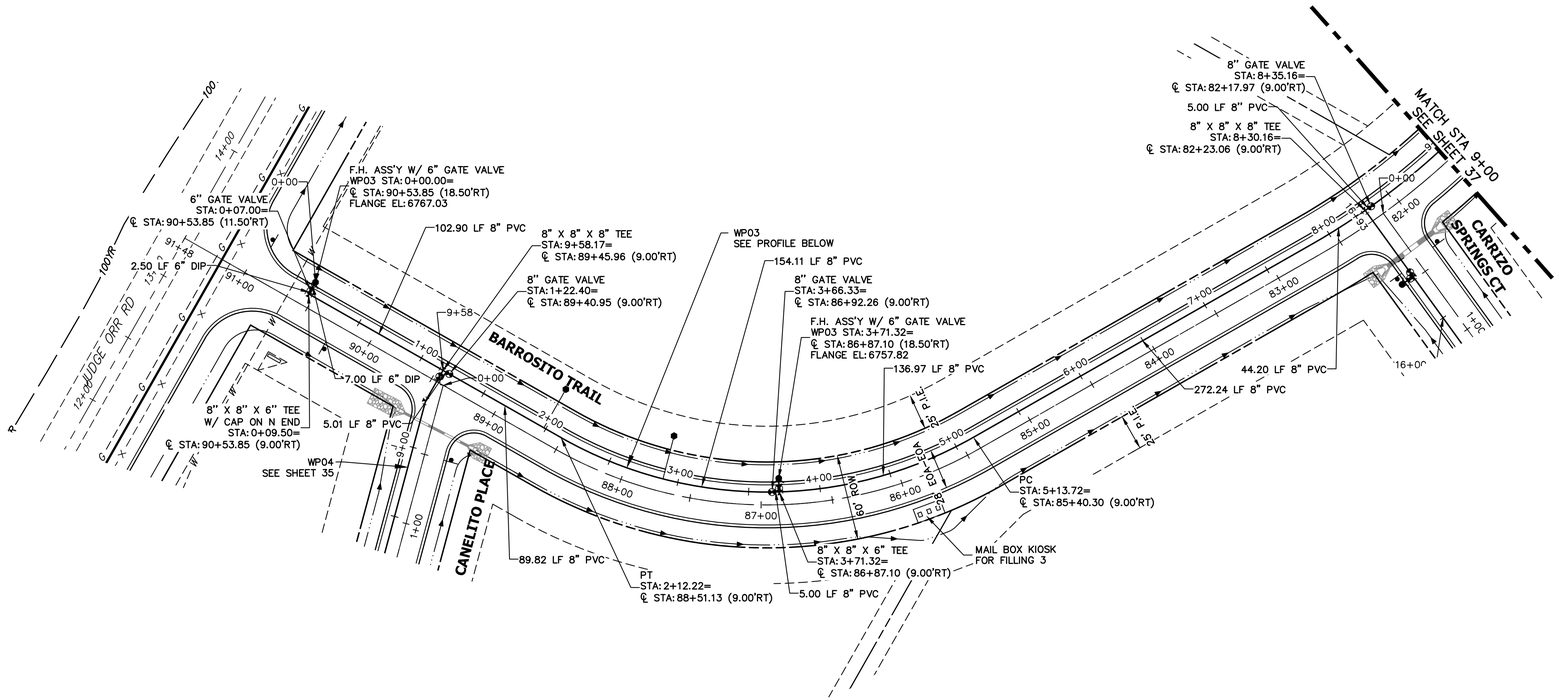
H-SCALE 1"=50' | V-SCALE 1"=5' | DATE 3/20/24 | DESIGNED BY JMC | DRAWN BY JMC | CHECKED BY

SADDLEHORN RANCH – FILING 3
WATER DISTRIBUTION PLAN

SHEET 35 OF 63
JOB NO. 25142.05



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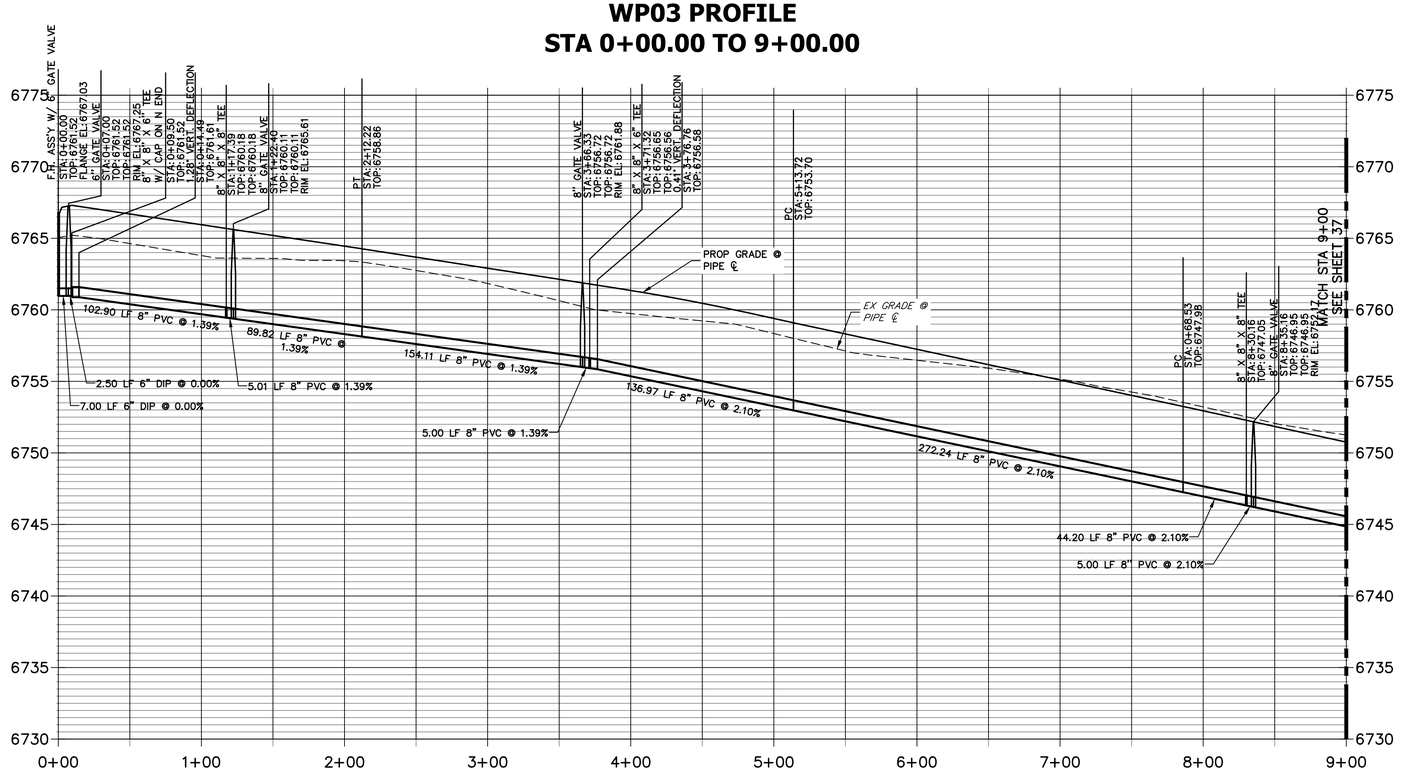
WP03 PROFILE
STA 0+00.00 TO 9+00.00



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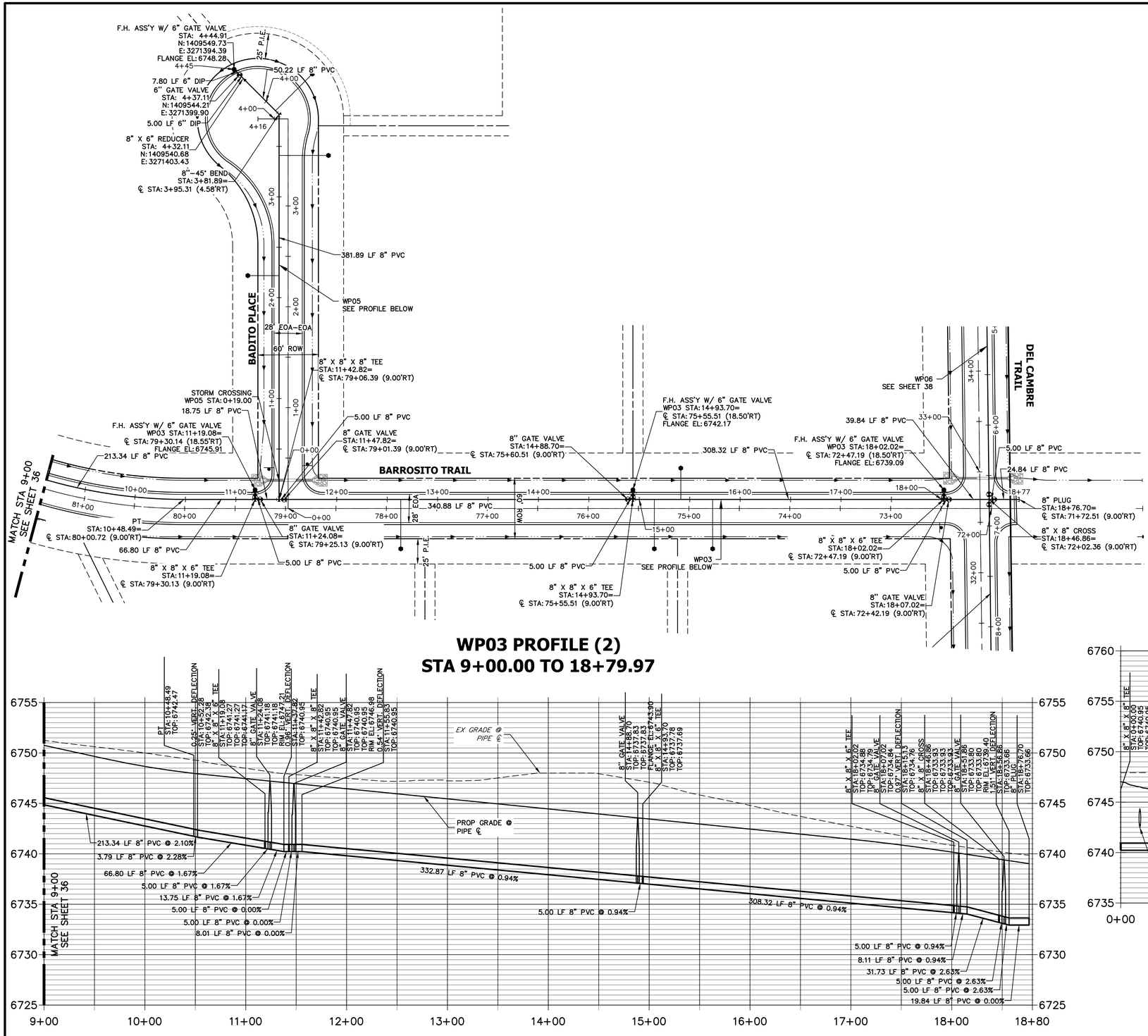
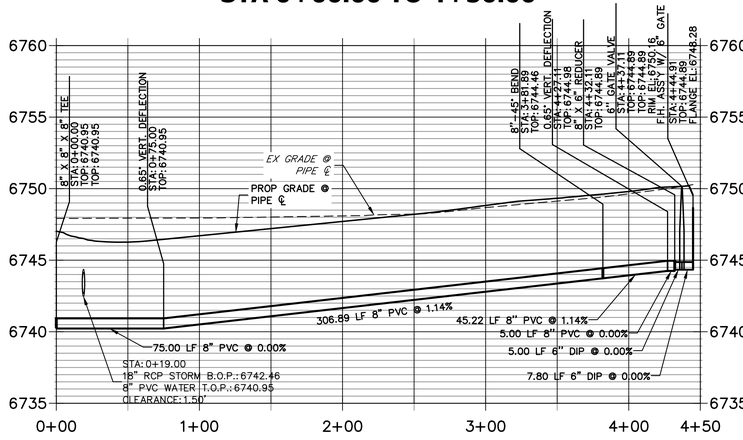
SADDLEHORN RANCH – FILING 3
WATER DISTRIBUTION PLAN

SHEET 36 OF 63
JOB NO. 25142.05



WP03 PROFILE (2)
STA 9+00.00 TO 18+79.97

WP05 PROFILE
STA 0+00.00 TO 4+50.00



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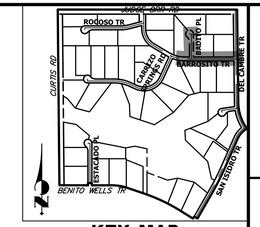


KEY MAP
N.T.S

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

BY	DATE	No.	REVISION
		.	

H-SCALE	1"=50'
V-SCALE	1"=5'
DATE	3/20/24
DESIGNED BY	JMC
DRAWN BY	JMC
CHECKED BY	

SADDLEHORN RANCH – FILING 3
WATER DISTRIBUTION PLAN

Know what's below. Call before you dig.

HORIZONTAL
ORIGINAL SCALE: 1" = 50'
VERTICAL
ORIGINAL SCALE: 1" = 5'

ENGINEER'S STATEMENT

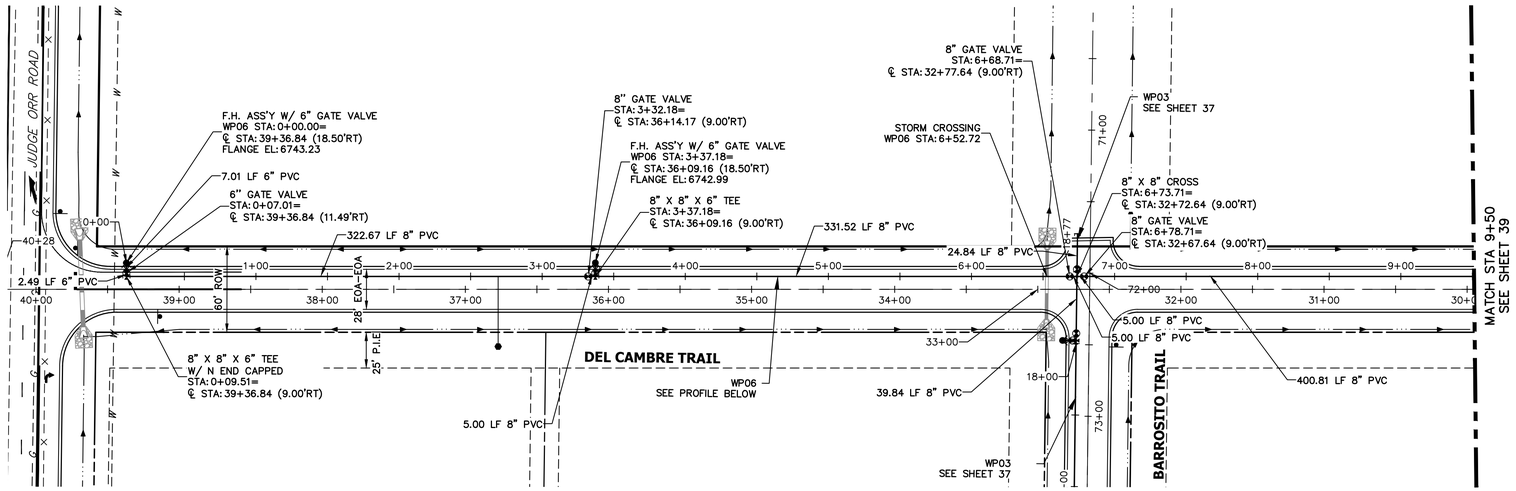
PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043

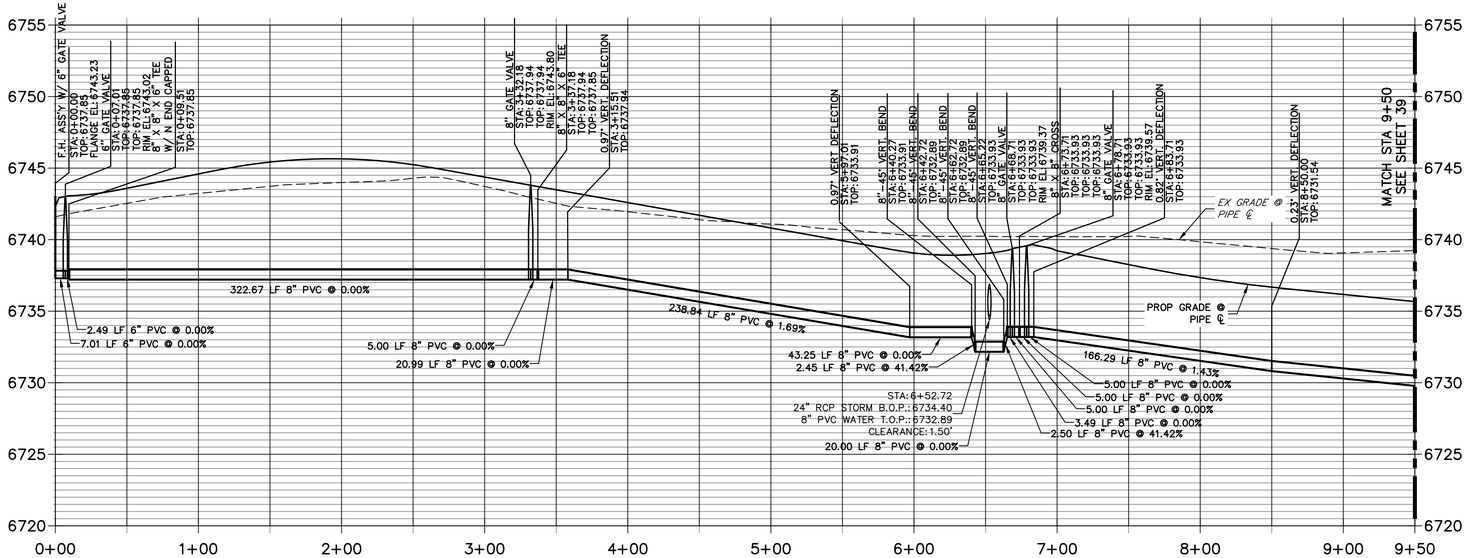
3/20/24
DATE

SHEET 37 OF 63
JOB NO. 25142.05



KEY MAP
N.T.S

WP06 PROFILE
STA 0+00.00 TO 9+50.00



NOTES

1. ALL WATER LINES ARE OWNED AND MAINTAINED BY SADDLEHORN RANCH METROPOLITAN DISTRICT, UNLESS OTHERWISE NOTED.
2. THE LOCATIONS OF EXISTING ABOVE GROUND AND UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL ABOVE GROUND AND UNDERGROUND UTILITIES.
3. ALL CURVILINEAR PIPE MUST BE ACCOMPLISHED BY USING HIGH DEFLECTION COUPLERS.
4. P.I.E. REPRESENTS PUBLIC IMPROVEMENTS EASEMENT.
5. ALL HORIZONTAL BENDS, TEES, AND CROSSES REQUIRE CONCRETE THRUST REACTION BLOCKS (CTRB). SEE CSU DETAILS A4-2 AND A4-3.
6. ALL HORIZONTAL AND VERTICAL DEFELCTIONS TO BE ACCOMPLISHED WITH HIGH DEFLECTION (HD) COUPLINGS.
7. ALL VERTICAL BENDS REQUIRE MECHANICAL JOINT RESTRAINTS (MJR). SEE CSU DETAIL A4-4.
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50 25 0 50 100

HORIZONTAL
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VERTICAL
ORIGINAL SCALE: 1" = 5'

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	.		.

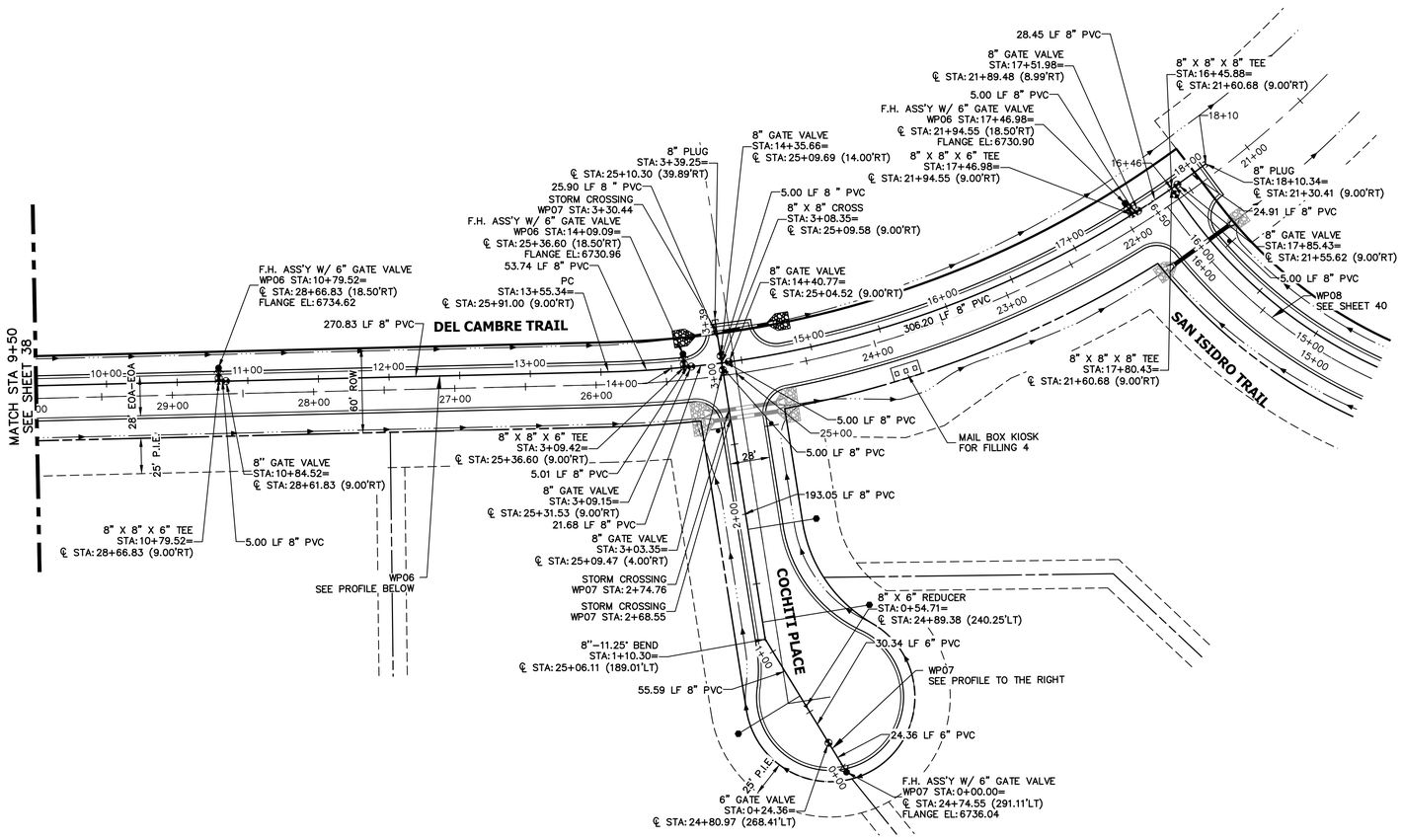
H-SCALE	1"=50'
V-SCALE	1"=5'
DATE	3/20/24
DESIGNED BY	JMC
DRAWN BY	JMC
CHECKED BY	

SADDLEHORN RANCH – FILING 3

WATER DISTRIBUTION PLAN

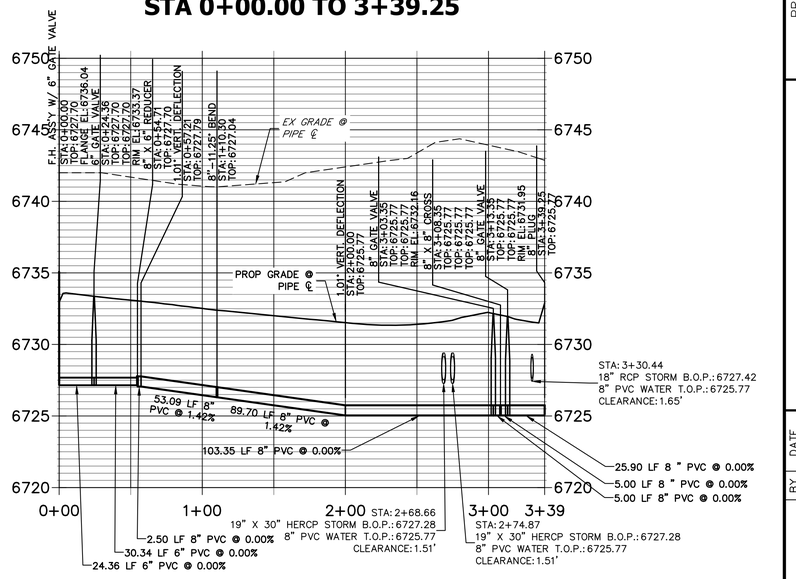
SHEET 38 OF 63

JOB NO. 25142.05

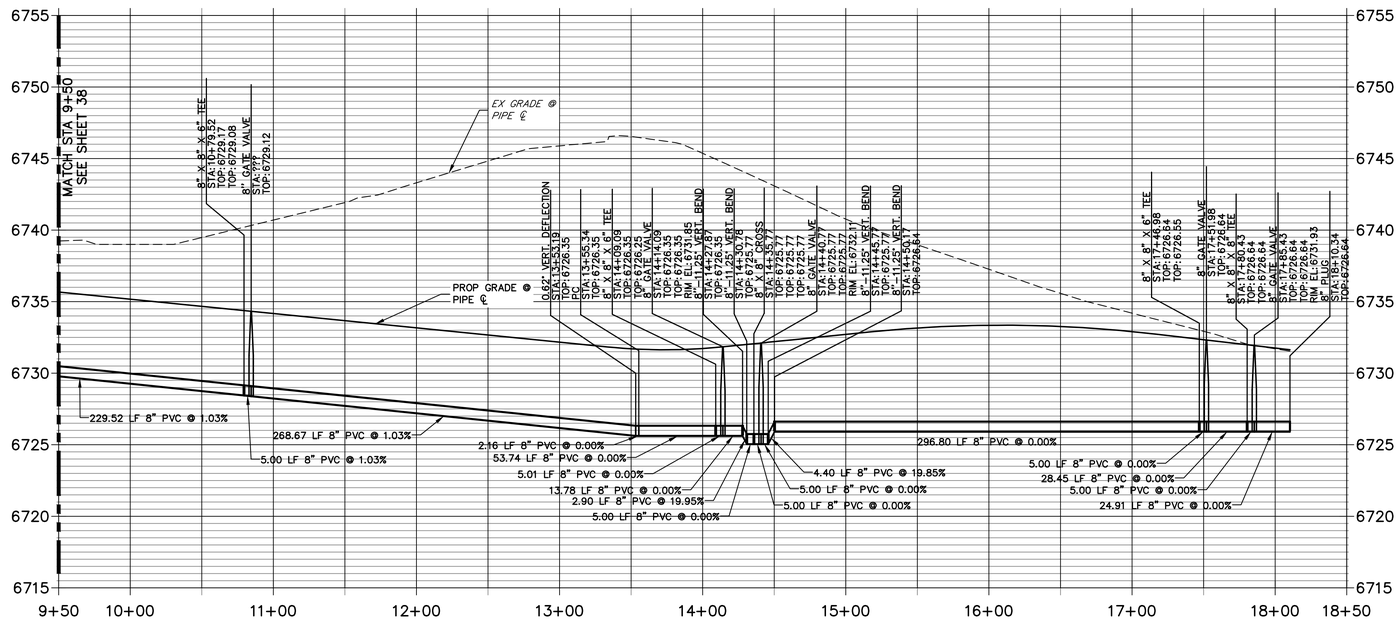


KEY MAP
N.T.S

WP07 PROFILE
STA 0+00.00 TO 3+39.25



WP06 PROFILE (2)
STA 9+50.00 TO 18+50.00



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50 25 0 50 100
HORIZONTAL
ORIGINAL SCALE: 1" = 50'
VERTICAL
ORIGINAL SCALE: 1" = 5'

811 Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT

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BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE

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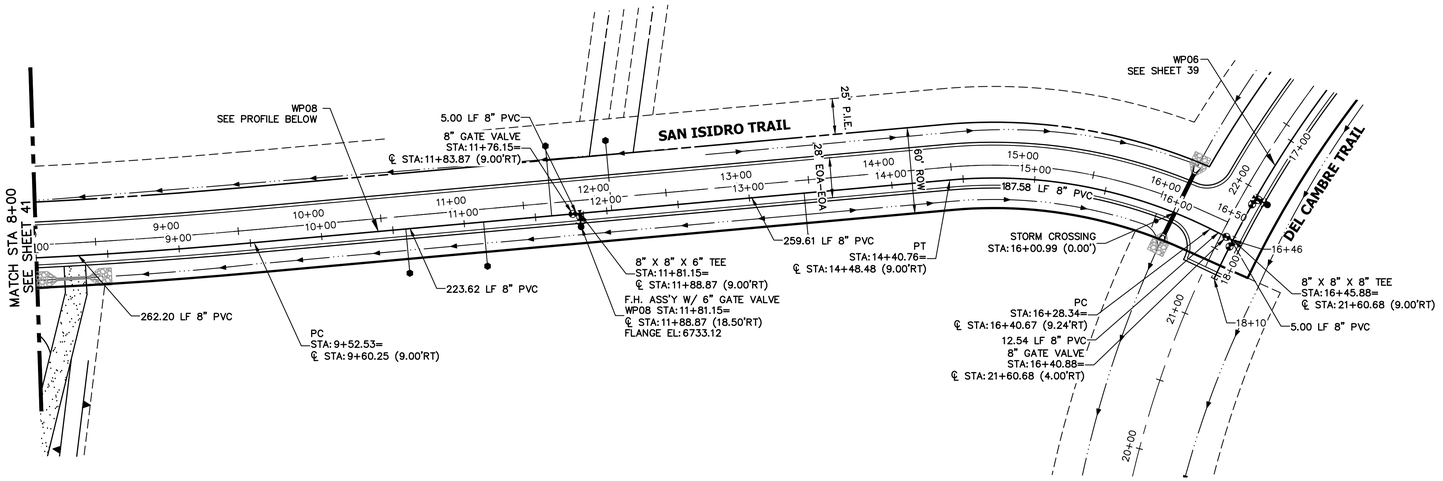
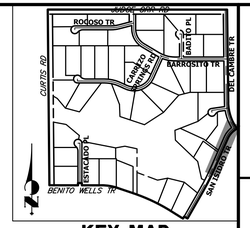
H–SCALE	1"=50'	DESIGNED BY	JMC
V–SCALE	1"=5'	DRAWN BY	JMC
DATE	3/20/24	CHECKED BY	

SADDLEHORN RANCH – FILING 3
WATER DISTRIBUTION PLAN

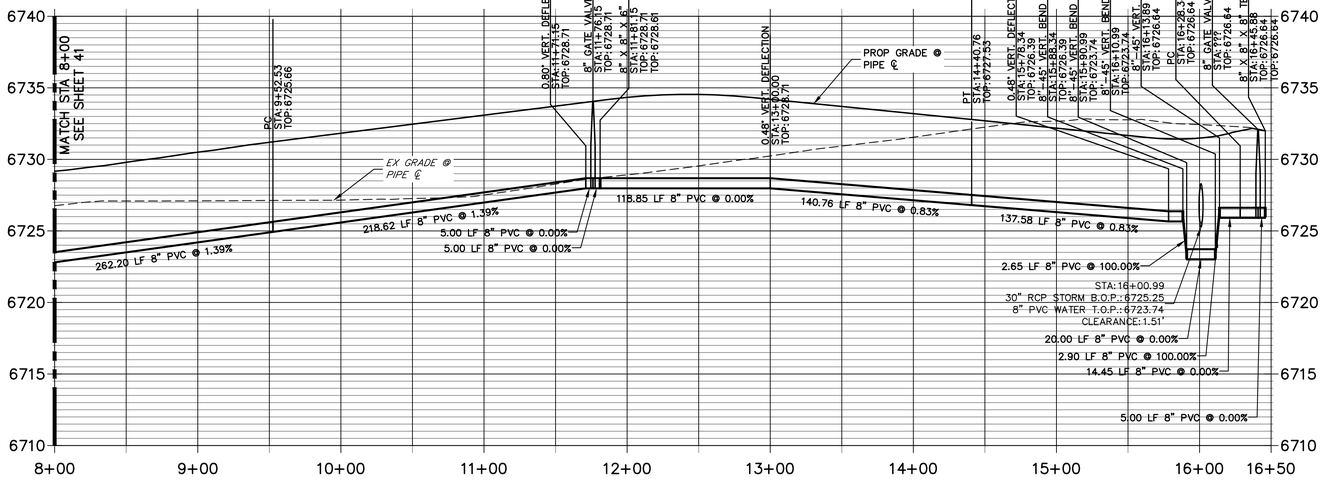
SHEET 39 OF 63
JOB NO. 25142.05





KEY MAP
N.T.S

WP08 PROFILE
STA 8+00.00 TO 16+50.00



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50 25 0 50 100

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VERTICAL
ORIGINAL SCALE: 1" = 5'

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BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043 — BRYAN T. LAW — COLORADO REGISTERED PROFESSIONAL ENGINEER

3/20/24
DATE

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BRADY WILLIAMS

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	.	.	

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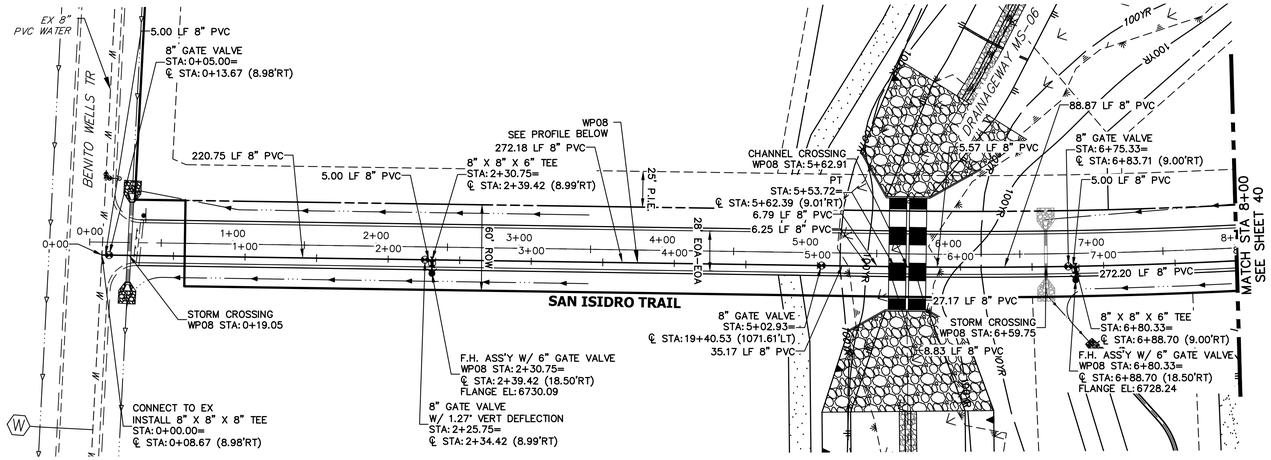
V-SCALE 1"=5'
DATE 3/20/24
DESIGNED BY JMC
DRAWN BY JMC
CHECKED BY

SADDLEHORN RANCH – FILING 3

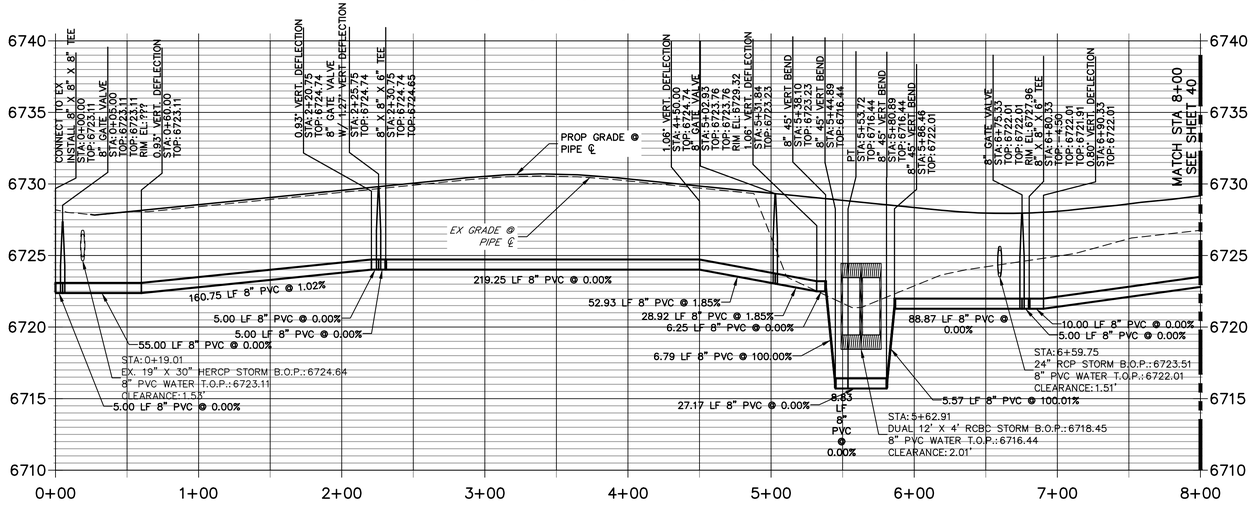
WATER DISTRIBUTION PLAN

SHEET 40 OF 63

JOB NO. 25142.05



WP08 PROFILE (2)
STA 0+00.00 TO 8+00.00



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50 25 0 50 100

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VERTICAL
ORIGINAL SCALE: 1" = 5'

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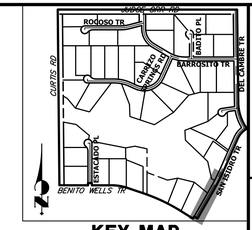

KEY MAP
N.T.S

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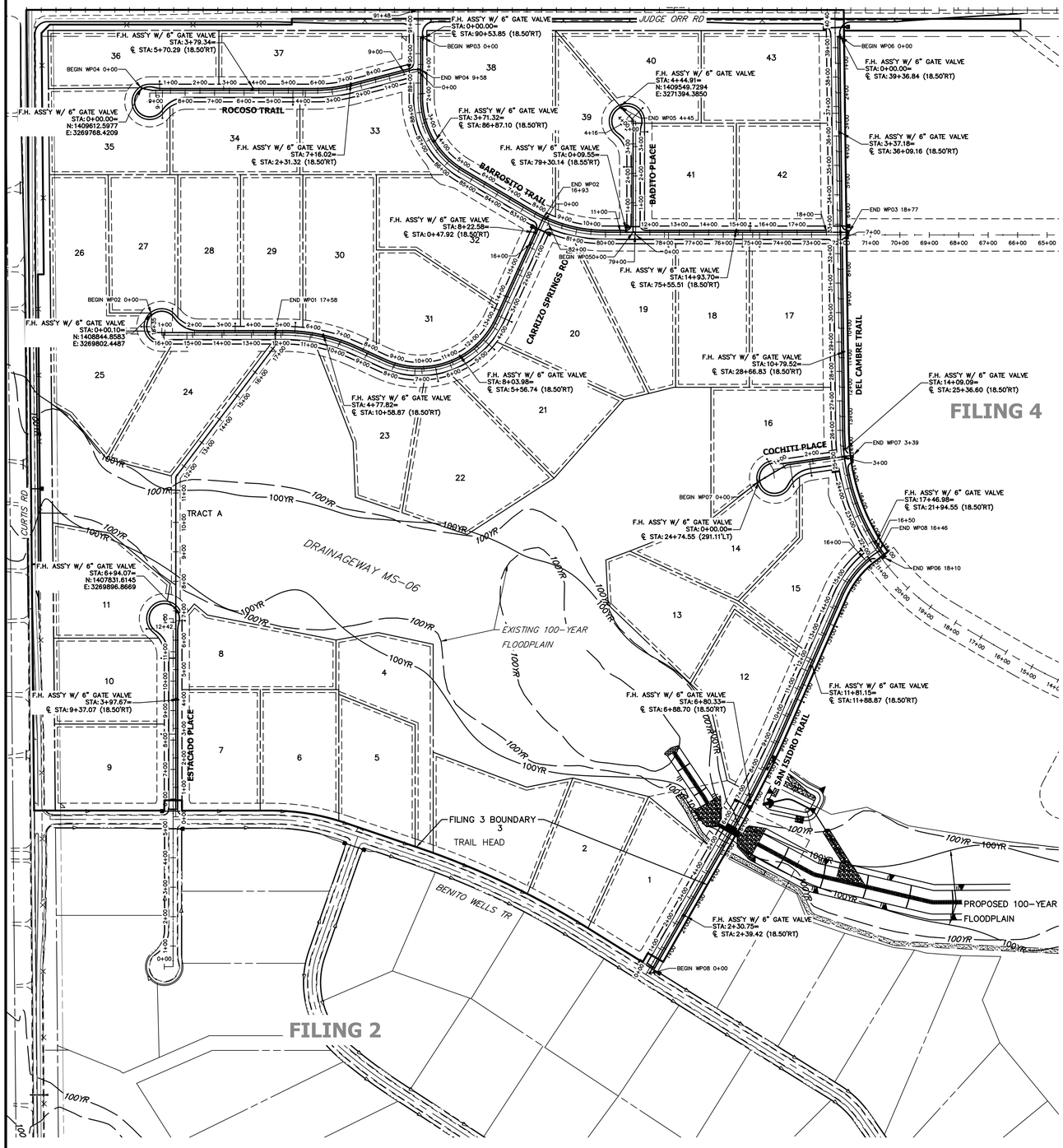
V-SCALE	1"=5'	DRAWN BY	JMC
DATE	3/20/24	CHECKED BY	

SADDLEHORN RANCH – FILING 3

WATER DISTRIBUTION PLAN

SHEET 41 OF 63

JOB NO. 25142.05



200 100 0 200 400

ORIGINAL SCALE: 1" = 200'

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BRYAN T. LAW, P.E.
COLORADO P.E. 25043
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COLORADO REGISTERED BRYAN T. LAW 25043 PROFESSIONAL ENGINEER

3/20/24
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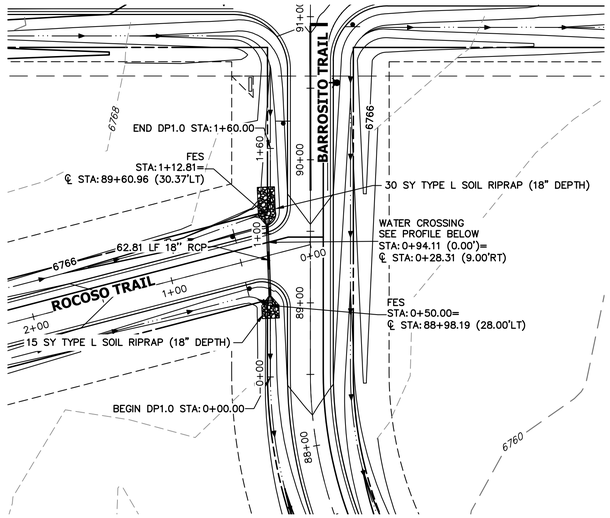
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	JMC
DRAWN BY	JMC
CHECKED BY	

SADDLEHORN RANCH – FILING 3

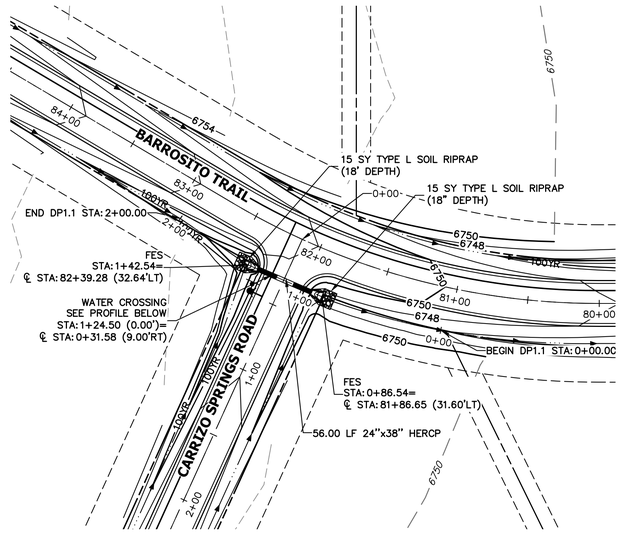
OVERALL FIRE HYDRANT PLAN

SHEET 42 OF 63

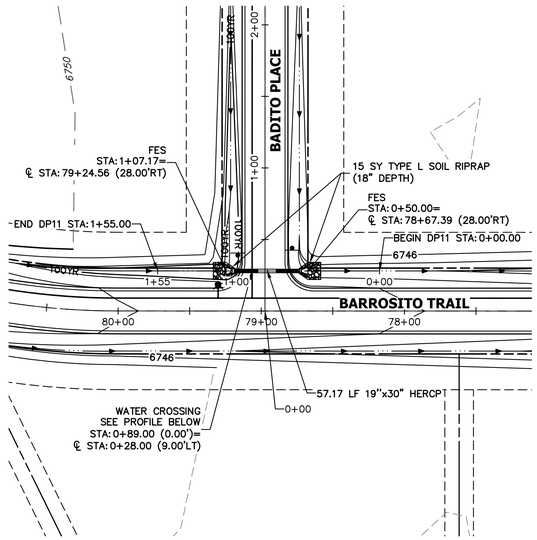
JOB NO. 25142.05



A1 CULVERT - PLAN

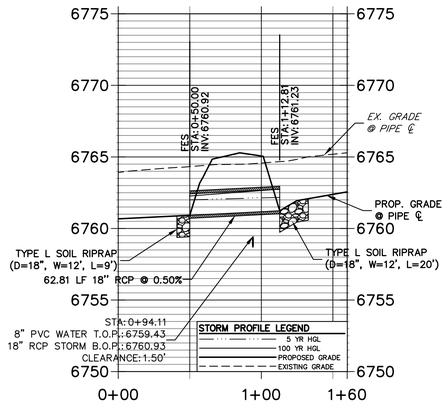


A2 CULVERT - PLAN



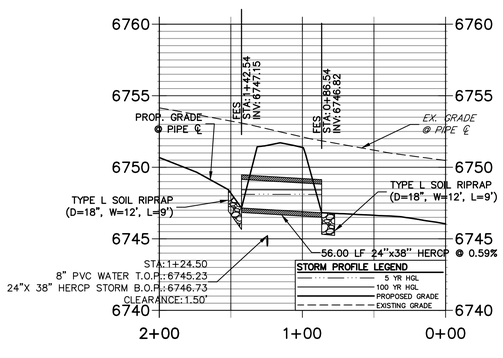
A3 CULVERT - PLAN

DP1.0 PROFILE
STA 0+00.00 TO 1+60.00



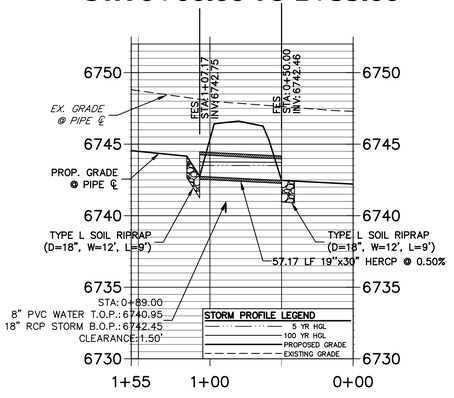
A1 CULVERT - PROFILE

DP1.1 PROFILE
STA 0+00.00 TO 2+00.00



A2 CULVERT - PROFILE

DP11 PROFILE
STA 0+00.00 TO 1+55.00



A3 CULVERT - PROFILE

STORM SEWER NOTES

1. PIPE LENGTHS MEASURED FROM CENTER OF MANHOLES TO CENTER OF MANHOLES, INSIDE FACE OF INLETS, OUTLET END OF FLARED END SECTIONS AND FACE OF WALLS WHERE APPLICABLE.
2. ℄ STATIONS & OFFSETS ARE LABELED AT CENTER OF STRUCTURE.
3. CONTRACTOR TO FIELD VERIFY EXISTING UTILITY LOCATIONS, PRIOR TO EXTENSION OF MAINS AND SERVICE CONNECTIONS. CONTRACTOR TO COORDINATE CONNECTIONS WITH UTILITY PROVIDER.
4. ALL STORM SEWER PIPES, INLETS, MANHOLES, AND UNDERGROUND FACILITIES ARE PUBLIC.
5. ALL PUBLIC WATER LINES ARE OWNED BY SADDLEHORN RANCH METROPOLITAN DISTRICT.

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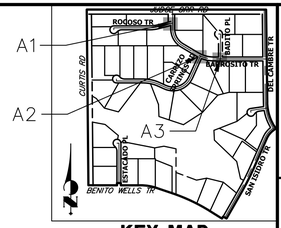

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V-SCALE	1"= 5'
DATE	3/20/24
DESIGNED BY	AMT
DRAWN BY	WKN
CHECKED BY	

SADDLEHORN RANCH – FILING 3

STORM SEWER PLAN AND PROFILE

HORIZONTAL
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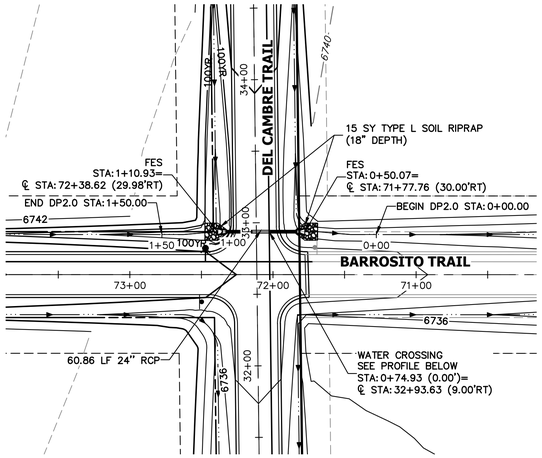
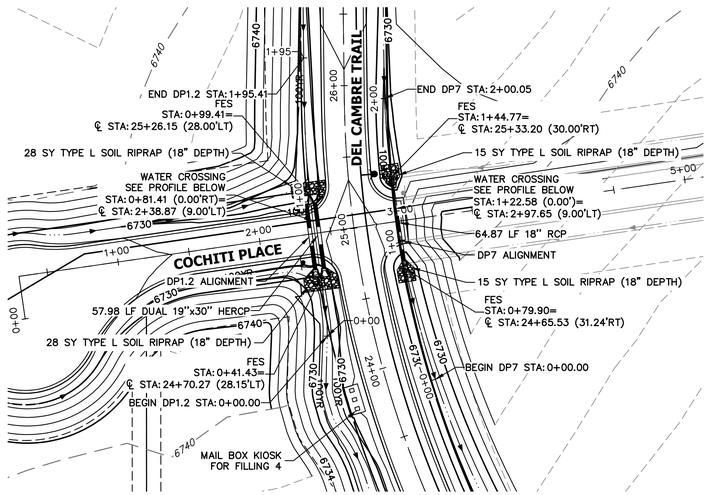
VERTICAL
ORIGINAL SCALE: 1" = 5'

SHEET 43 OF 63

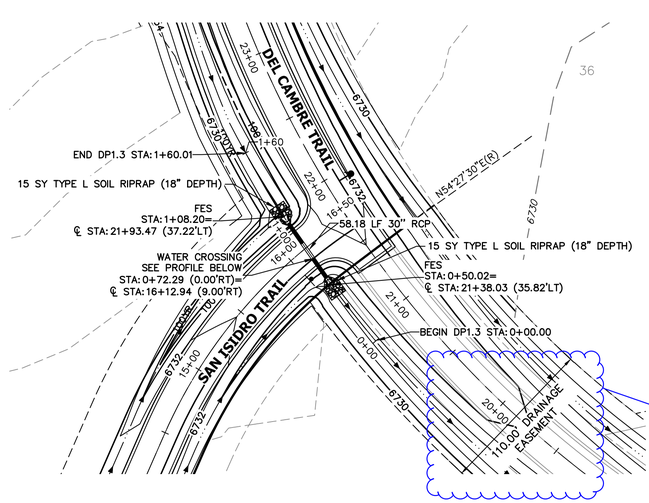
JOB NO. 25142.05



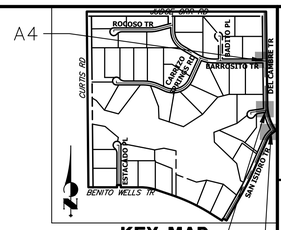
A4 CULVERT - PLAN



A5 & A6 CULVERT - PLAN



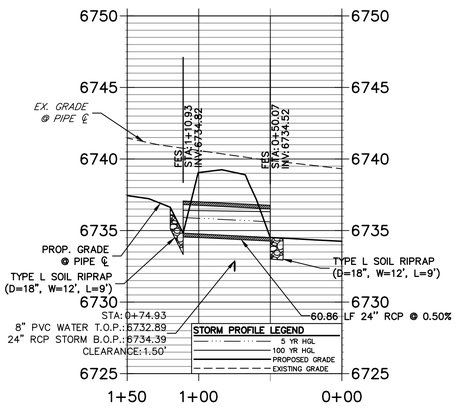
A7 CULVERT - PLAN



Add reception number and note that this will be vacated when the road is platted

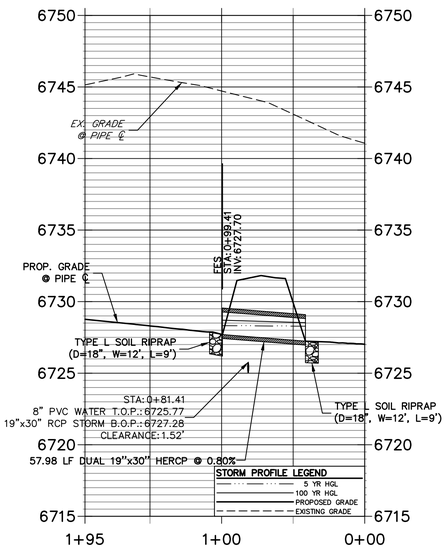
ADDED label for reception number and vacated note

DP2.0 PROFILE
STA 0+00.00 TO 1+50.00



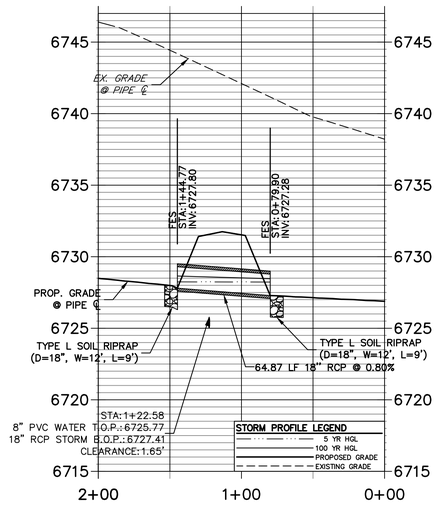
A4 CULVERT - PROFILE

DP1.2 PROFILE
STA 0+00.00 TO 1+95.41



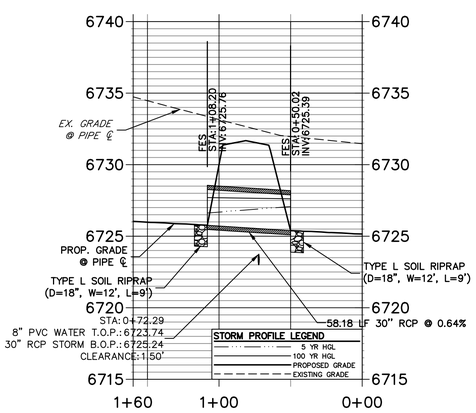
A5 CULVERT - PROFILE

DP7 PROFILE
STA 0+00.00 TO 2+00.05



A6 CULVERT - PROFILE

DP1.3 PROFILE
STA 0+00.00 TO 1+60.01



A7 CULVERT - PROFILE

STORM SEWER NOTES

1. PIPE LENGTHS MEASURED FROM CENTER OF MANHOLES TO CENTER OF MANHOLES, INSIDE FACE OF INLETS, OUTLET END OF FLARED END SECTIONS AND FACE OF WALLS WHERE APPLICABLE.
2. ℄ STATIONS & OFFSETS ARE LABELED AT CENTER OF STRUCTURE.
3. CONTRACTOR TO FIELD VERIFY EXISTING UTILITY LOCATIONS, PRIOR TO EXTENSION OF MAINS AND SERVICE CONNECTIONS. CONTRACTOR TO COORDINATE CONNECTIONS WITH UTILITY PROVIDER.
4. ALL STORM SEWER PIPES, INLETS, MANHOLES, AND UNDERGROUND FACILITIES ARE PUBLIC.
5. ALL PUBLIC WATER LINES ARE OWNED BY SADDLEHORN RANCH METROPOLITAN DISTRICT.

Know what's below. Call before you dig.

N

50 25 0 50 100

HORIZONTAL
ORIGINAL SCALE: 1" = 50'

VERTICAL
ORIGINAL SCALE: 1" = 5'

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
	.	.	

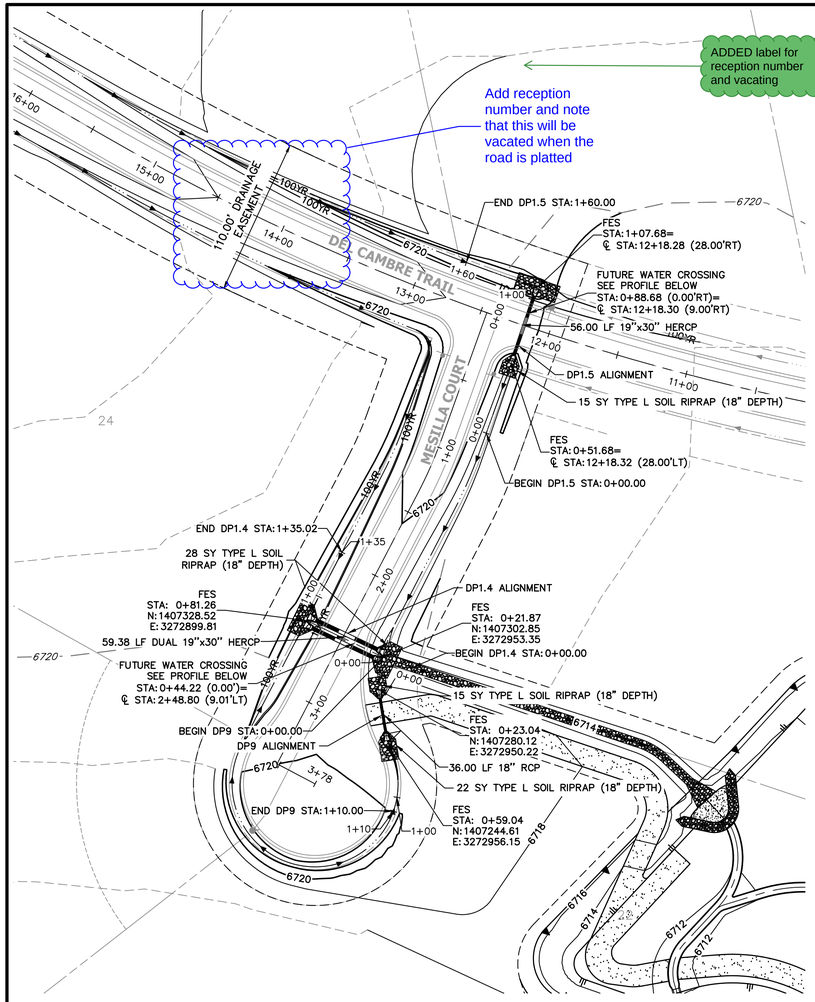
H-SCALE	1"=50'		
V-SCALE	1"= 5'	DATE	3/20/24
		DESIGNED BY	AMT
		DRAWN BY	WKN
		CHECKED BY	

SADDLEHORN RANCH – FILING 3

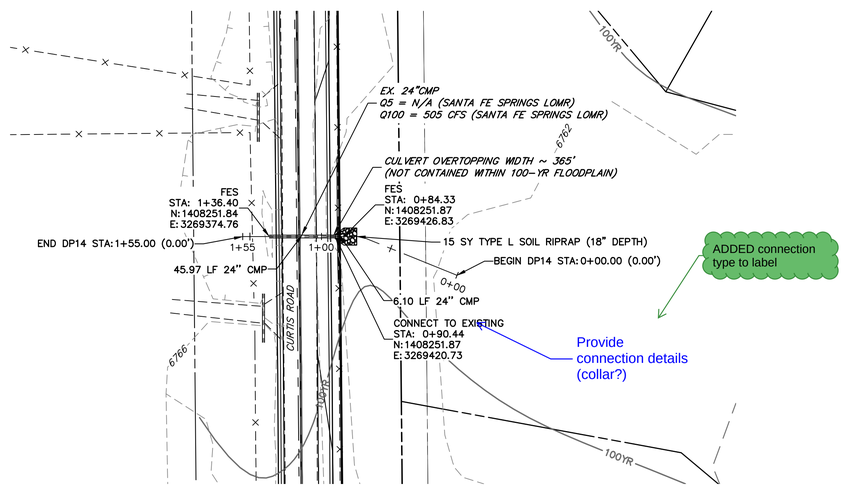
STORM SEWER PLAN AND PROFILE

SHEET 44 OF 63

JOB NO. 25142.05

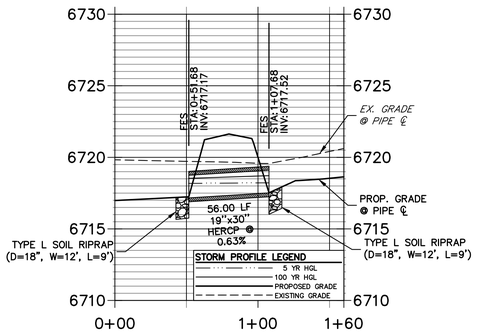


A8 + A9 + A12 CULVERT - PLAN



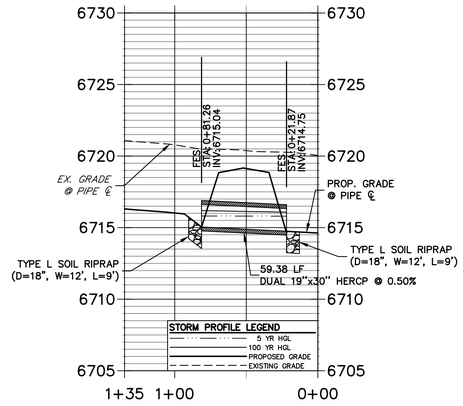
A14 CULVERT - PLAN

DP1.5 PROFILE
STA 0+00.00 TO 1+60.00



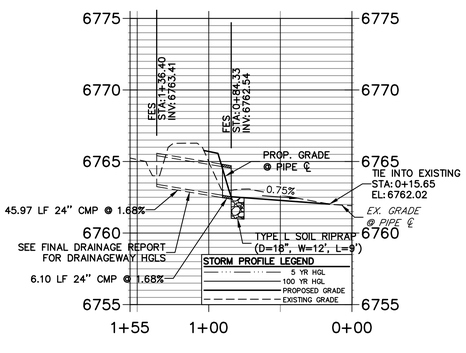
A8 CULVERT - PROFILE

DP1.4 PROFILE
STA 0+00.00 TO 1+35.02

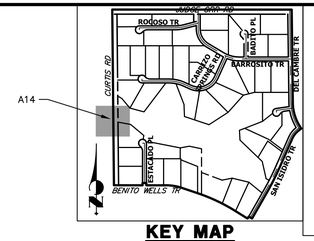


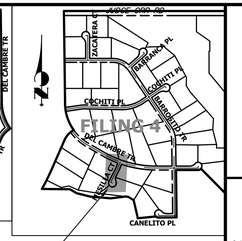
A9 CULVERT - PROFILE

DP14 PROFILE
STA 0+00.00 TO 1+55.00

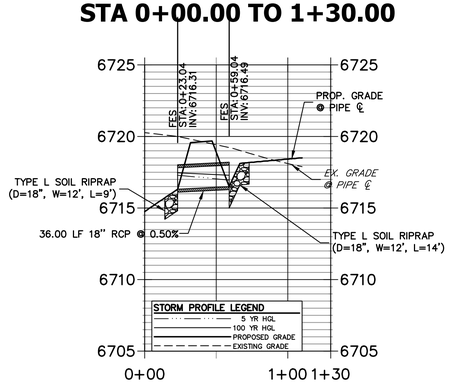


A14 CULVERT - PROFILE





DP9 PROFILE
STA 0+00.00 TO 1+30.00



A12 CULVERT - PROFILE

STORM SEWER NOTES

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5. ALL PUBLIC WATER LINES ARE OWNED BY SADDLEHORN RANCH METROPOLITAN DISTRICT.

Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE

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BRADY WILLIAMS

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No.	REVISION	BY	DATE
	.		
	.		

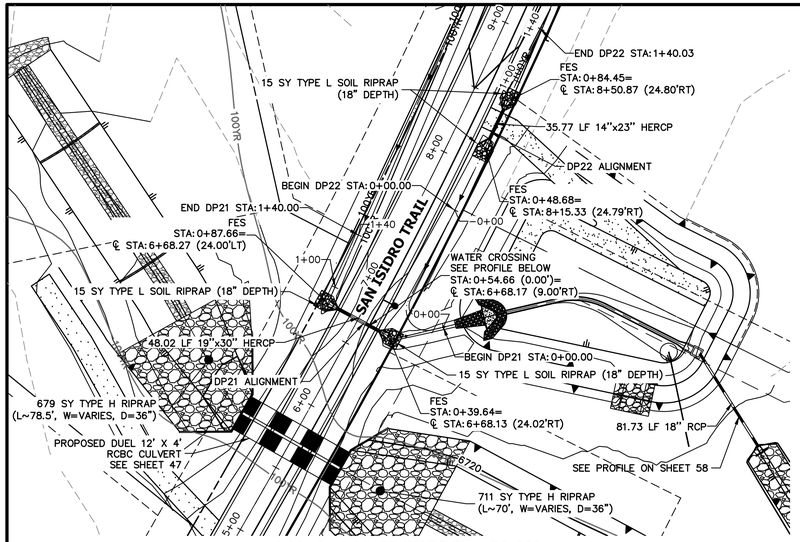
H-SCALE	1"=50'	DESIGNED BY	AMT
V-SCALE	1"= 5'	DRAWN BY	WKN
DATE	3/20/24	CHECKED BY	

SADDLEHORN RANCH – FILING 3

STORM SEWER PLAN AND PROFILE

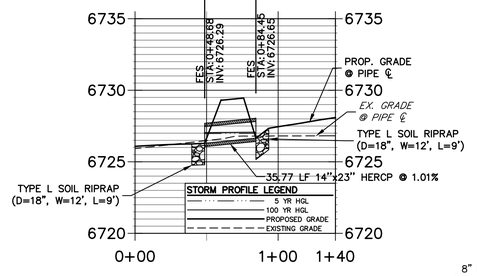
SHEET 45 OF 63

JOB NO. 25142.05



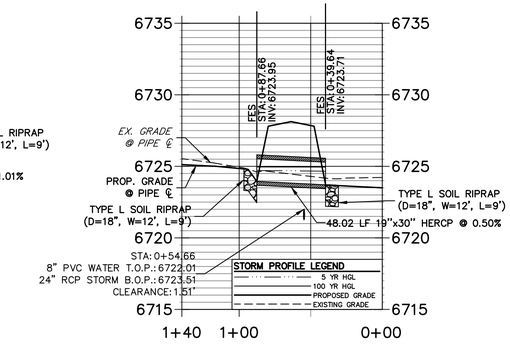
A10 & A11 CULVERT - PLAN

DP22 PROFILE
STA 0+00.00 TO 1+40.03

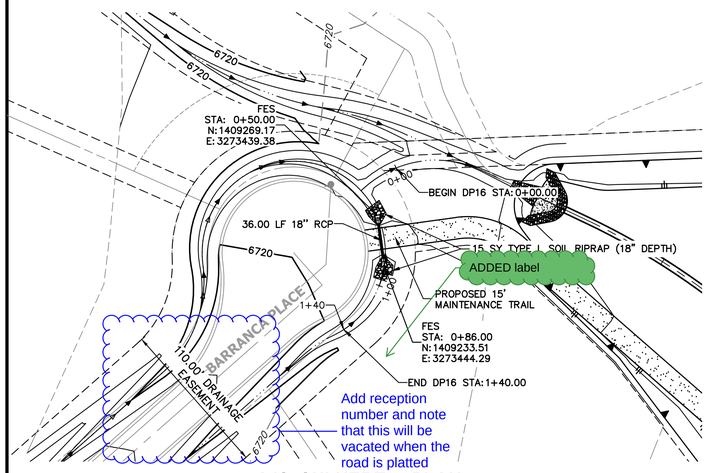


A10 CULVERT - PROFILE

DP21 PROFILE
STA 0+00.00 TO 1+40.00

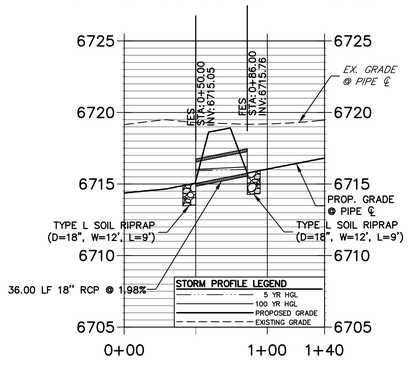


A11 CULVERT - PROFILE

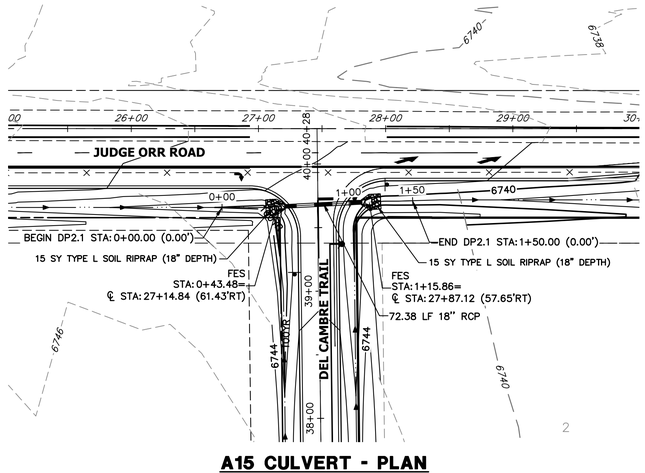


A13 CULVERT - PLAN

DP16 PROFILE
STA 0+00.00 TO 1+40.00

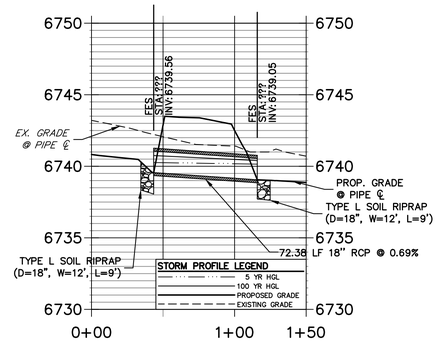


A13 CULVERT - PROFILE

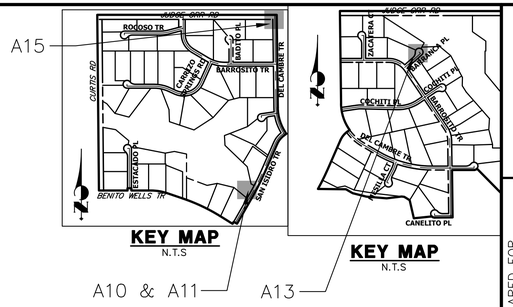


A15 CULVERT - PLAN

DP2.1 PROFILE
STA 0+00.00 TO 1+50.00



A15 CULVERT - PROFILE



STORM SEWER NOTES

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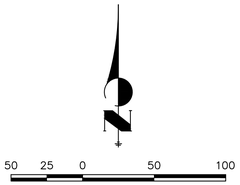

Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043 — REGISTERED PROFESSIONAL ENGINEER — STATE OF COLORADO

3/20/24
DATE

UNTIL SUCH TIME AS THESE PLANS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

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A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
	.	.	.

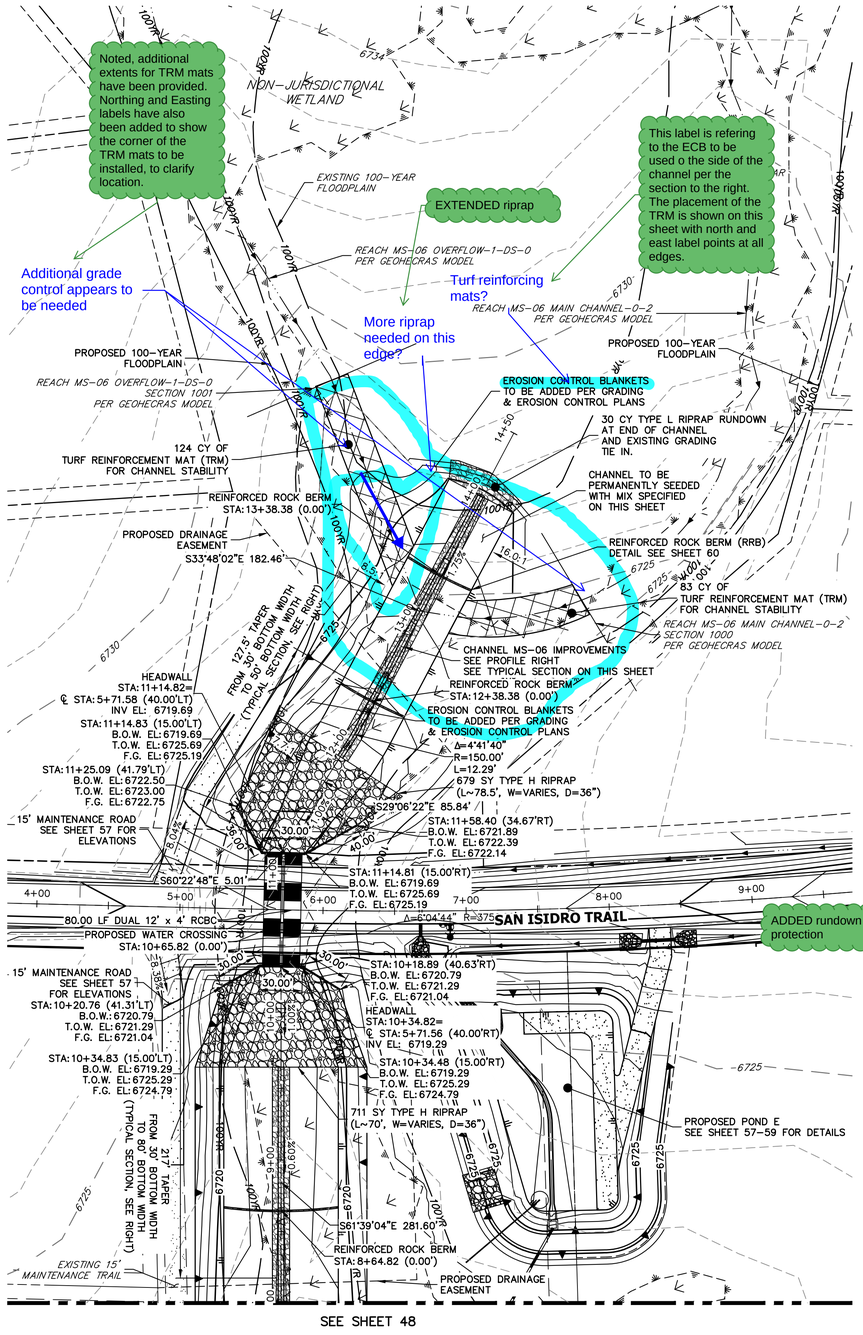
H-SCALE 1"=50' | V-SCALE 1"= 5' | DATE 3/20/24 | DESIGNED BY AMT | DRAWN BY WKN | CHECKED BY

SADDLEHORN RANCH – FILING 3

STORM SEWER PLAN AND PROFILE

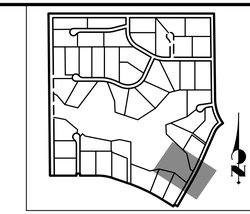
SHEET 46 OF 63

JOB NO. 25142.05

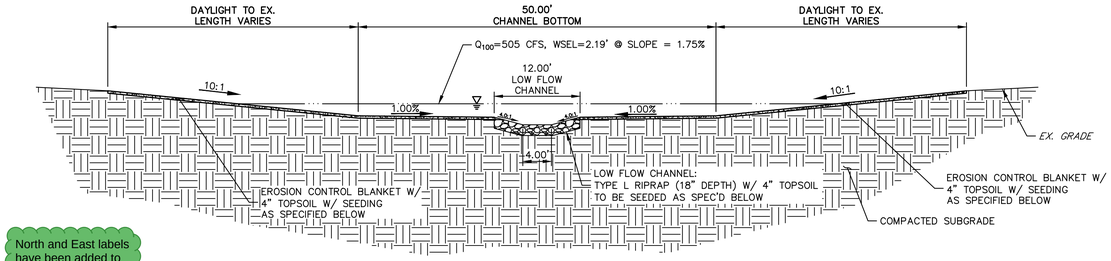


North and East labels have been added to all corners of the TRM mats to be placed. Specifications reference to MHFD volume 3 added to this page

Provide TRM specifications, dimensions and locations



KEY MAP
1" = 1200'



MS-06 CHANNEL IMPROVEMENTS - TYPICAL SECTION

SCALE: 1"=10'

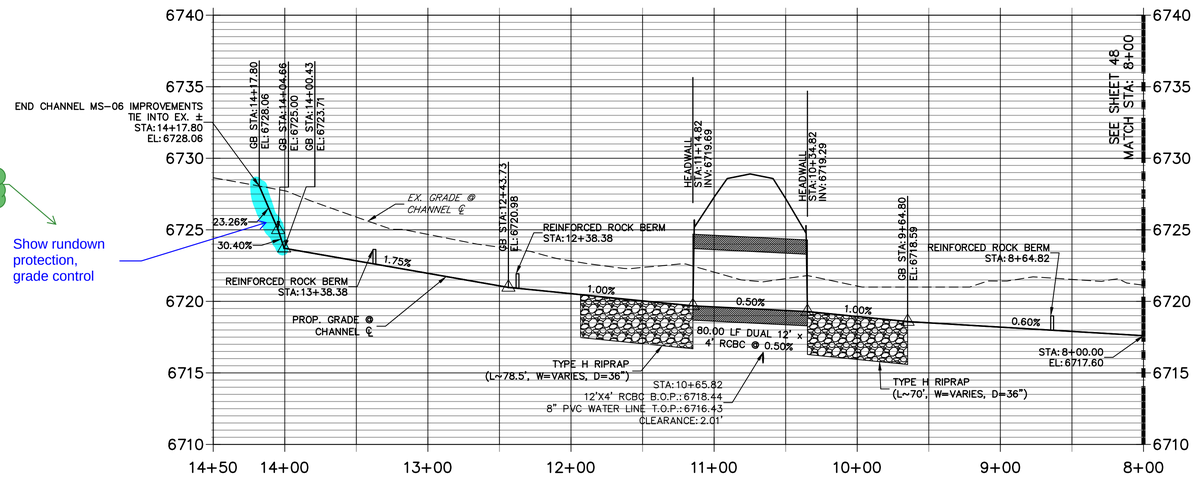
TYPICAL SECTION FOR CHANNEL WEST OF SAN ISIDRO TRAIL

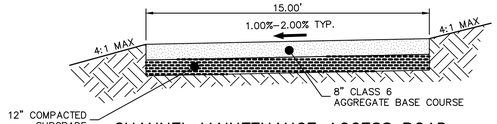
CHANNEL SEED MIX: EROSION CONTROL BLANKET WITH PAWNEE BUTTES SEED INC. – "LOW GROW NATIVE MIX"
- –IDAHO FESCUE
- –SANDBERG BLUEGRASS
- –ROCKY MOUNTAIN FESCUE
- –BIG BLUEGRASS

or TRM

TRM IS NOT TO BE USED IN THE CHANNEL SECTION. IT WILL ONLY BE USED IN SECTIONS OF THE CHANNEL TO REMAIN IN EXISTING CONDITIONS TO PROVIDE STABILITY.

MS-06 PROFILE (1)
STA 8+00.00 TO 14+50.00





CHANNEL MAINTENANCE ACCESS ROAD TYPICAL SECTION
N.T.S.

50 25 0 50 100
HORIZONTAL ORIGINAL SCALE: 1" = 50'
VERTICAL ORIGINAL SCALE: 1" = 5'

Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE

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BRADY WILLIAMS

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Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

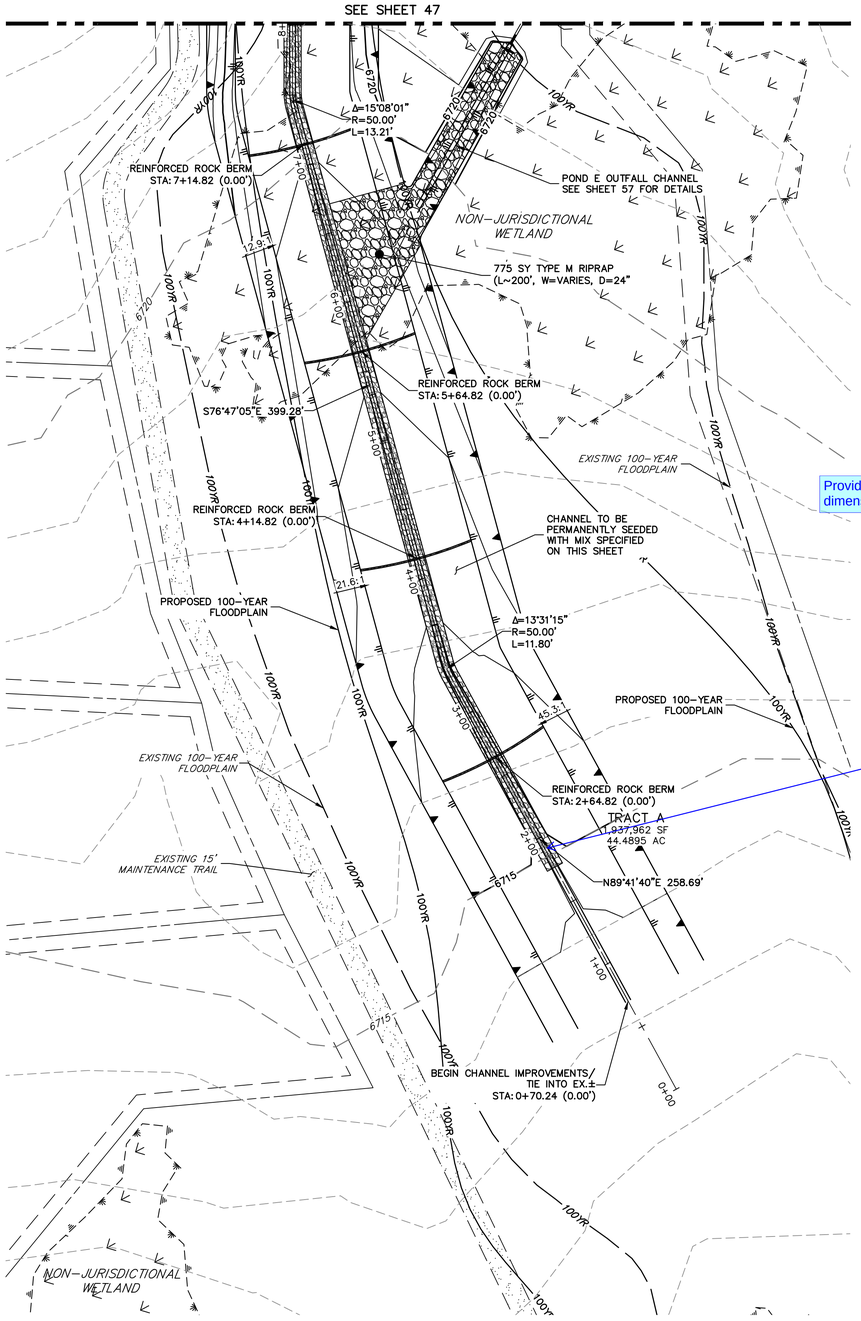
H-SCALE	1"=50'
V-SCALE	1"=5'
DATE	3/20/24
DESIGNED BY	AAM
DRAWN BY	AAM
CHECKED BY	

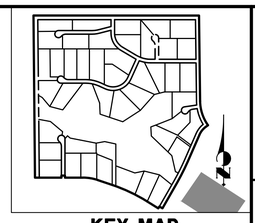
SADDLEHORN RANCH – FILING 3

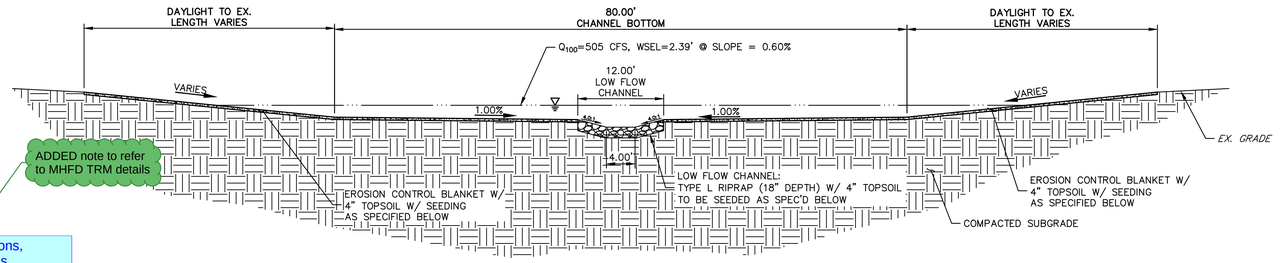
CHANNEL IMPROVEMENT PLANS

SHEET 47 OF 63

JOB NO. 25142.05







ADDED note to refer to MHFD TRM details

Provide TRM specifications, dimensions and locations

MS-06 CHANNEL IMPROVEMENTS - TYPICAL SECTION

SCALE: 1"=10'

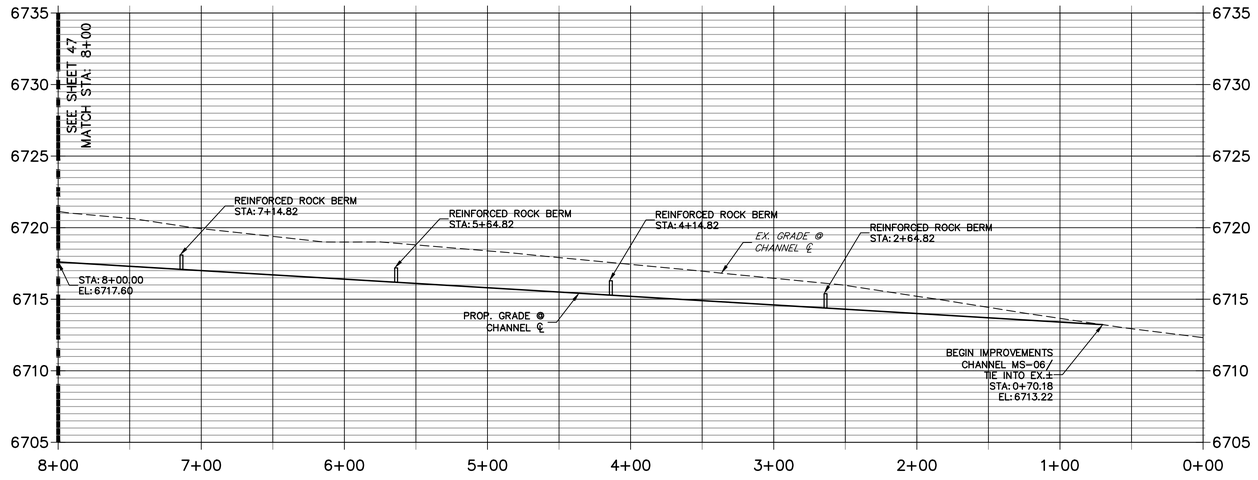
TYPICAL SECTION FOR CHANNEL EAST OF SAN ISIDRO TRAIL

CHANNEL SEED MIX: EROSION CONTROL BLANKET WITH PAWNEE BUTTES SEED INC. – "LOW GROW NATIVE MIX"
- –IDAHO FESCUE
- –SANDBERG BLUEGRASS
- –ROCKY MOUNTAIN FESCUE
- –BIG BLUEGRASS

NOTED channel is riprapped to slow the velocities down. The riprap has been extended to ensure stabilization.

velocities are too high here and upstream

MS-06 PROFILE
STA 0+00.00 TO 8+00.00



50 25 0 50 100

HORIZONTAL
ORIGINAL SCALE: 1" = 50'

VERTICAL
ORIGINAL SCALE: 1" = 5'

Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT

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COLORADO REGISTERED BRYAN T. LAW 25043 PROFESSIONAL ENGINEER

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE

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PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

H-SCALE	1"=50'
V-SCALE	1"=5'
DATE	3/20/24
DESIGNED BY	AAM
DRAWN BY	AAM
CHECKED BY	

SADDLEHORN RANCH – FILING 3

CHANNEL IMPROVEMENT PLANS

SHEET 48 OF 63

JOB NO. 25142.05

ADDED LABEL

Add reception number and note that this will be vacated when the road is platted

110.00' DRAINAGE ESMT

60.00' FUTURE ROW

FUTURE MESILLA COURT

FUTURE SADDLEHORN FILING 4

PROPOSED DUAL 19"X30" HERCP CULVERT (A9) SEE SHEET 45 FOR PLAN AND PROFILE

PROPOSED 18" RCP CULVERT (A12) SEE SHEET 45 FOR PLAN AND PROFILE

PROPOSED FOREBAY SEE DETAILS ON THIS SHEET

CONCRETE CUTOFF WALL W/ WEIR (L=66.25', W=8", H=VARIES FROM 4'-0" TO 4'-2") SEE DETAILS ON THIS SHEET

30" RIPRAP FOREBAY BERM W/ CONCRETE WALL & WEIR SEE DETAILS ON THIS SHEET

POND C TRICKLE CHANNEL 1

POND C TRICKLE CHANNEL 2

PROPOSED 6' TRICKLE CHANNEL SEE DETAILS ON THIS SHEET

PROPOSED 15' MAINTENANCE & ACCESS ROAD SEE DETAILS ON THIS SHEET

POND BOTTOM

OUTLET STRUCTURE
STA: 2+13.00
N:1407056.61
E: 3273162.14

PROPOSED SPILLWAY SEE DETAILS ON THIS SHEET

41.21 LF 30" RCP

30" FES
STA: 1+71.79
N:1407016.43
E: 3273171.29

PR. CUTOFF WALL L=10', T=10", D=3'

349.88 SY TYPE L RIPRAP (18" DEPTH)

PR. CUTOFF WALL L=48', T=10", D=3'

EXISTING 100-YEAR FLOODPLAIN

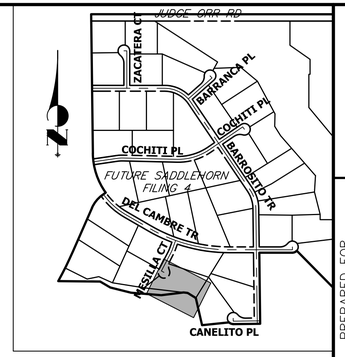
PROPOSED 100-YEAR FLOODPLAIN

PROPERTY LINE

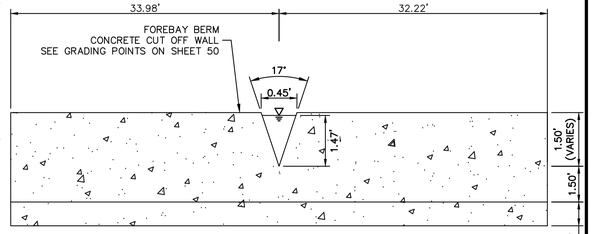
DRAINAGEWAY MS-06

RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D_{50}* (INCHES)
TYPE VL	70 – 100 50 – 70 35 – 50 2 – 10	12 9 6 2	6
TYPE L	70 – 100 50 – 70 35 – 50 2 – 10	15 12 9 3	9
TYPE M	70 – 100 50 – 70 35 – 50 2 – 10	21 18 12 4	12
TYPE H	70 – 100 50 – 70 35 – 50 2 – 10	30 24 18 6	18

*D_{50} = MEAN ROCK SIZE



KEY MAP
N.T.S



POND C FOREBAY WEIR
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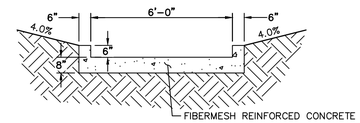

POND C TRICKLE CHANNEL
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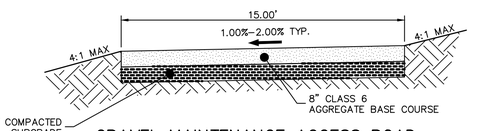

GRAVEL MAINTENANCE ACCESS ROAD TYPICAL SECTION
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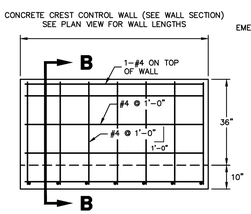
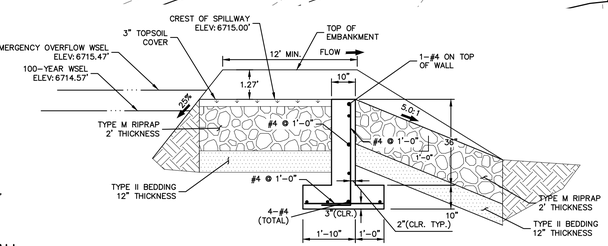
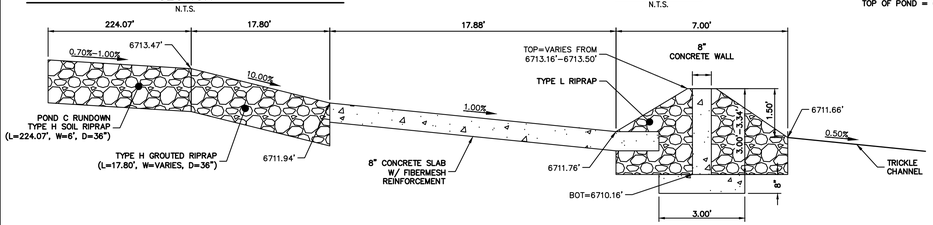


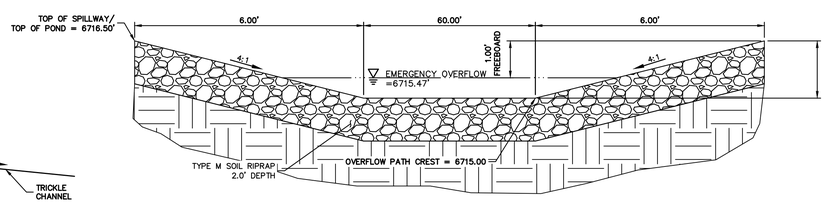
TYPICAL CONCRETE CREST CONTROL WALL SECTION
N.T.S.



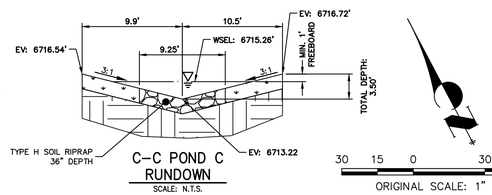
B-B
N.T.S.



POND C FOREBAY
N.T.S.



POND C EMERGENCY SPILLWAY
SCALE: N.T.S.



C-C POND C RUNDOWN
SCALE: N.T.S.

30 15 0 30 60
ORIGINAL SCALE: 1" = 30'

GRADING POINT NOTES

1. GRADING POINTS SHOWN ON NEXT PAGE.

Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043

3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

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.	.	.	.

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DRAWN BY	AAM
CHECKED BY	

SADDLEHORN RANCH – FILING 3

POND C GRADING PLAN

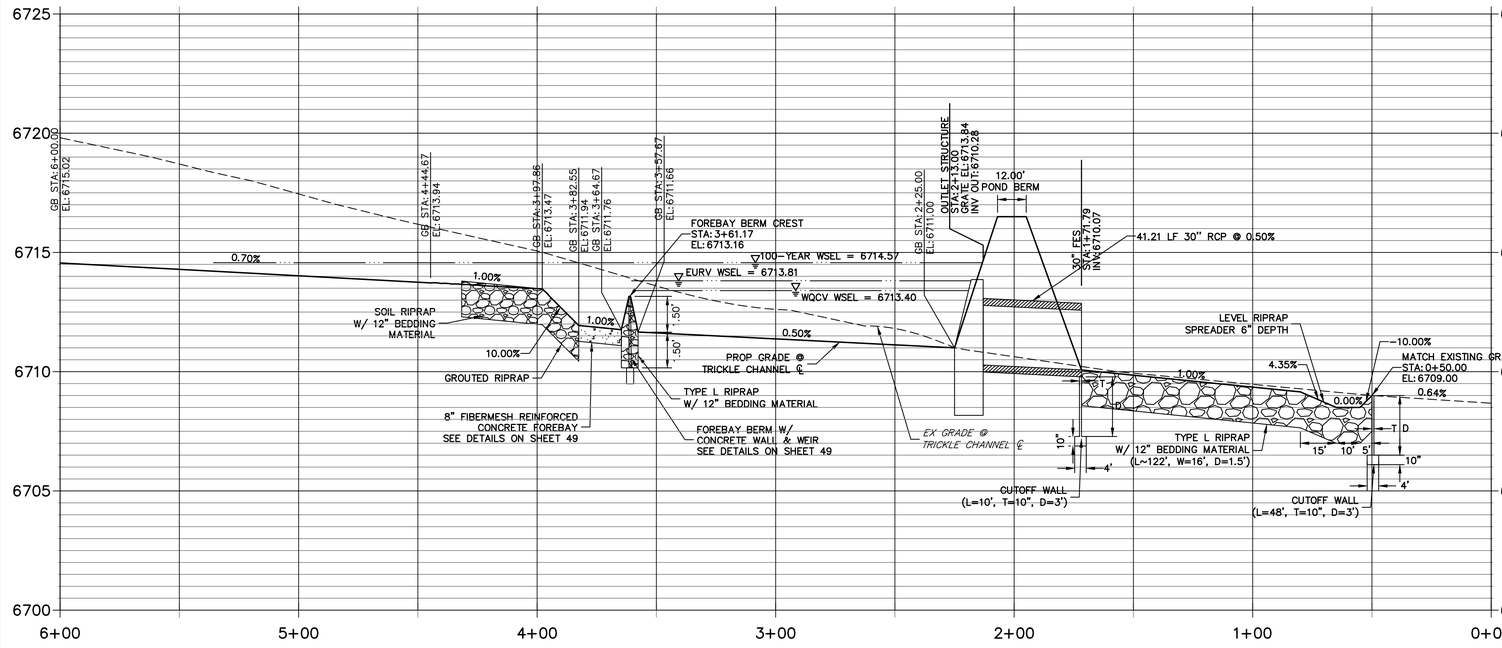
SHEET 49 OF 63

JOB NO. 25142.05

POINT TABULATION			
ID NO.	DESCRIPTION	NORTHING/EASTING	ELEVATION
1	ACCESS ROAD	N:1407254.86 E:3272944.69	6719.40
2	ACCESS ROAD	N:1407269.46 E:3272941.04	6719.25
3	ACCESS ROAD	N:1407261.69 E:3272985.54	6719.38
4	ACCESS ROAD	N:1407276.48 E:3272983.06	6719.18
5	ACCESS ROAD	N:1407261.50 E:3272987.95	6719.36
6	ACCESS ROAD	N:1407275.72 E:3272992.72	6719.06
7	ACCESS ROAD	N:1407215.98 E:3273123.69	6717.60
8	ACCESS ROAD	N:1407230.20 E:3273128.46	6717.30
9	ACCESS ROAD	N:1407182.68 E:3273149.26	6716.58
10	ACCESS ROAD	N:1407188.83 E:3273135.58	6716.74
11	ACCESS ROAD	N:1407151.05 E:3273135.05	6713.72
12	ACCESS ROAD/TOE	N:1407148.86 E:3273138.34	6713.15
13	ACCESS ROAD/TOE	N:1407105.14 E:3273097.99	6713.01
14	ACCESS ROAD	N:1407074.40 E:3273112.09	6712.71
15	ACCESS ROAD	N:1407101.87 E:3273115.13	6712.80
16	ACCESS ROAD	N:1407088.49 E:3273119.92	6712.67
17	ACCESS ROAD/TOP	N:1407179.74 E:3273131.49	6716.49
18	TOP	N:1407113.33 E:3273066.82	6716.50
19	TOP	N:1407082.99 E:3273047.83	6716.67
20	TOP	N:1407052.73 E:3273074.50	6716.50
21	TOP	N:1407064.07 E:3273078.45	6716.50
22	TOE	N:1407096.95 E:3273089.95	6712.98
23	TOE	N:1407077.00 E:3273096.04	6712.88
24	TOP	N:1407048.55 E:3273123.00	6716.50
25	TOP	N:1407037.22 E:3273119.05	6716.50
26	TOP	N:1407036.33 E:3273157.07	6716.50
27	TOP	N:1407047.84 E:3273153.66	6716.50
28	TOE	N:1407065.55 E:3273128.92	6712.54
29	ACCESS ROAD	N:1407072.85 E:3273123.67	6712.59
30	ACCESS ROAD	N:1407087.72 E:3273125.66	6712.61
31	ACCESS ROAD	N:1407073.10 E:3273134.59	6712.29
32	ACCESS ROAD	N:1407087.86 E:3273131.91	6712.41
33	TOE	N:1407065.09 E:3273148.54	6711.76
34	ACCESS ROAD/TRICKLE CHANNEL	N:1407076.42 E:3273152.81	6711.55
35	ACCESS ROAD/TRICKLE CHANNEL	N:1407077.67 E:3273159.70	6711.53
36	ACCESS ROAD/TRICKLE CHANNEL	N:1407092.85 E:3273161.41	6711.59
37	ACCESS ROAD/TRICKLE CHANNEL	N:1407091.81 E:3273153.61	6711.62
38	OUTLET STRUCTURE	N:1407070.99 E:3273157.87	6711.02
39	TRICKLE CHANNEL INV	N:1407073.89 E:3273157.01	6711.03
40	TRICKLE CHANNEL INV	N:1407102.87 E:3273163.83	6711.19
41	TRICKLE CHANNEL INV	N:1407128.63 E:3273187.83	6711.36
42	SPILLWAY TOP	N:1407052.17 E:3273168.27	6716.50
43	SPILLWAY TOP	N:1407040.67 E:3273171.68	6716.50
44	SPILLWAY CREST	N:1407053.88 E:3273174.02	6715.00
45	SPILLWAY CREST	N:1407042.37 E:3273177.44	6715.00
46	SPILLWAY CREST	N:1407045.39 E:3273239.85	6715.00
47	SPILLWAY CREST	N:1407035.12 E:3273233.63	6715.00
48	SPILLWAY TOP	N:1407041.61 E:3273245.54	6716.50
49	SPILLWAY TOP	N:1407031.90 E:3273238.49	6716.50
50	ACCESS ROAD	N:1407094.91 E:3273188.13	6712.53

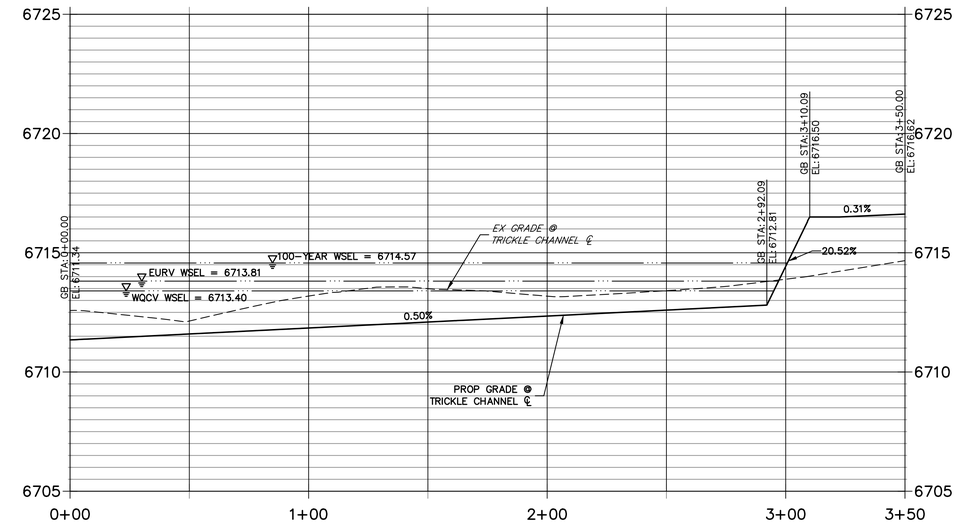
POINT TABULATION			
ID NO.	DESCRIPTION	NORTHING/EASTING	ELEVATION
51	ACCESS ROAD	N:1407079.95 E:3273189.28	6712.69
52	ACCESS ROAD	N:1407075.97 E:3273262.60	6713.77
53	ACCESS ROAD	N:1407063.38 E:3273254.44	6713.92
54	TOE	N:1406999.84 E:3273294.28	6714.67
55	TOP	N:1406995.41 E:3273276.83	6716.50
56	TOP	N:1406992.46 E:3273265.20	6716.50
57	TOP	N:1406925.76 E:3273282.11	6716.50
58	TOP	N:1406928.71 E:3273293.74	6716.50
59	TOE	N:1406933.13 E:3273311.19	6715.14
60	TOE	N:1406926.74 E:3273386.53	6714.98
61	TOP	N:1406919.45 E:3273402.98	6716.50
62	TOP	N:1406914.58 E:3273413.95	6716.50
63	ACCESS ROAD	N:1406993.25 E:3273362.69	6714.33
64	ACCESS ROAD	N:1406987.47 E:3273364.71	6714.39
65	ACCESS ROAD	N:1406995.30 E:3273387.09	6714.24
66	TRICKLE CHANNEL INV	N:1407184.71 E:3273196.17	6711.66
67	TOE OF BERM	N:1407180.78 E:3273180.81	6712.62
68	RIPRAP	N:1407184.73 E:3273162.16	6714.22
69	RIPRAP	N:1407189.19 E:3273158.00	6715.13
70	RIPRAP	N:1407191.58 E:3273163.61	6713.13
71	TOE OF BERM	N:1407190.66 E:3273167.95	6712.02
72	RIPRAP/CONCRETE	N:1407197.45 E:3273173.15	6711.98
73	RIPRAP/CONCRETE	N:1407209.47 E:3273167.37	6714.79
74	RIPRAP/CONCRETE	N:1407215.67 E:3273174.02	6714.80
75	RIPRAP/CONCRETE	N:1407208.97 E:3273185.91	6711.98
76	TOE OF BERM	N:1407213.42 E:3273193.12	6712.02
77	RIPRAP	N:1407219.55 E:3273192.48	6713.66
78	RIPRAP	N:1407224.89 E:3273195.44	6715.28
79	RIPRAP	N:1407220.29 E:3273199.44	6714.04
80	TOE OF BERM	N:1407199.68 E:3273201.60	6712.53
81	TOE OF BERM	N:1407189.93 E:3273191.50	6711.76
82	TRICKLE CHANNEL INV	N:1407129.65 E:3273191.16	6711.38
83	TRICKLE CHANNEL INV	N:1407137.77 E:3273217.72	6711.52
84	TRICKLE CHANNEL INV	N:1407131.73 E:3273291.42	6711.90
85	TRICKLE CHANNEL INV	N:1407121.70 E:3273311.56	6712.01
86	TRICKLE CHANNEL INV	N:1407099.52 E:3273337.56	6712.18
87	TRICKLE CHANNEL INV	N:1407048.87 E:3273375.99	6712.50
88	TRICKLE CHANNEL INV	N:1407017.92 E:3273415.10	6712.75
89	TRICKLE CHANNEL INV	N:1407013.52 E:3273425.02	6712.81
90	TOE	N:1407056.86 E:3273444.24	6714.49
91	TOP	N:1407049.56 E:3273460.69	6716.50
92	TOP	N:1407044.70 E:3273471.66	6716.50
93	TOE	N:1407148.05 E:3273425.41	6714.59
94	TOP	N:1407161.27 E:3273437.62	6716.50
95	TOP	N:1407170.08 E:3273445.77	6716.50
96	TOE	N:1407270.67 E:3273292.72	6714.31
97	TOP	N:1407283.89 E:3273304.94	6716.50
98	TOP	N:1407292.70 E:3273313.08	6716.50
99	TOE	N:1407269.09 E:3273250.41	6714.16
100	TOP	N:1407281.37 E:3273237.25	6716.50

POND C TRICKLE CHANNEL 1 PROFILE
STA 0+00.00 TO 6+00.00



POINT TABULATION			
ID NO.	DESCRIPTION	NORTHING/EASTING	ELEVATION
101	RIPRAP	N:1407001.63 E:3273166.61	6709.99
102	RIPRAP	N:1407002.15 E:3273182.60	6710.02
103	RIPRAP	N:1406938.50 E:3273168.67	6709.60
104	RIPRAP	N:1406939.02 E:3273184.66	6709.63
105	RIPRAP	N:1406911.99 E:3273206.11	6710.18
106	RIPRAP	N:1406910.17 E:3273150.14	6710.16
107	RIPRAP	N:1406894.29 E:3273154.10	6709.75
108	RIPRAP	N:1406895.85 E:3273202.07	6710.04
109	BEGIN TRICKLE CHANNEL TAPER TO 4.0' TRICKLE CHANNEL	N:1407073.03 E:3273154.13	6711.03
110	BEGIN TRICKLE CHANNEL TAPER TO 4.0' TRICKLE CHANNEL	N:1407074.74 E:3273159.89	6711.03
111	TOE OF BERM	N:1407183.03 E:3273170.19	6713.00
112	TOE OF BERM	N:1407198.82 E:3273194.66	6711.88
113	TOE OF BERM	N:1407187.61 E:3273182.36	6711.88
114	TOE OF BERM	N:1407215.00 E:3273199.99	6712.97
115	TOP OF BERM	N:1407187.32 E:3273193.83	6714.16
116	END CONCRETE WALL/ TOP OF BERM	N:1407219.92 E:3273195.96	6714.50
117	END CONCRETE WALL/ TOP OF BERM	N:1407188.16 E:3273162.89	6714.49
118	RIPRAP	N:1407016.16 E:3273163.29	6710.77
119	RIPRAP	N:1407016.69 E:3273179.29	6710.24

POND C TRICKLE CHANNEL 2 PROFILE
STA 0+00.00 TO 3+50.00



30 15 0 30 60

HORIZONTAL
ORIGINAL SCALE: 1" = 30'
VERTICAL
ORIGINAL SCALE: 1" = 3'

811 Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043 — REGISTERED PROFESSIONAL ENGINEER

3/20/24
DATE

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BRADY WILLIAMS

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No.	REVISION	BY	DATE

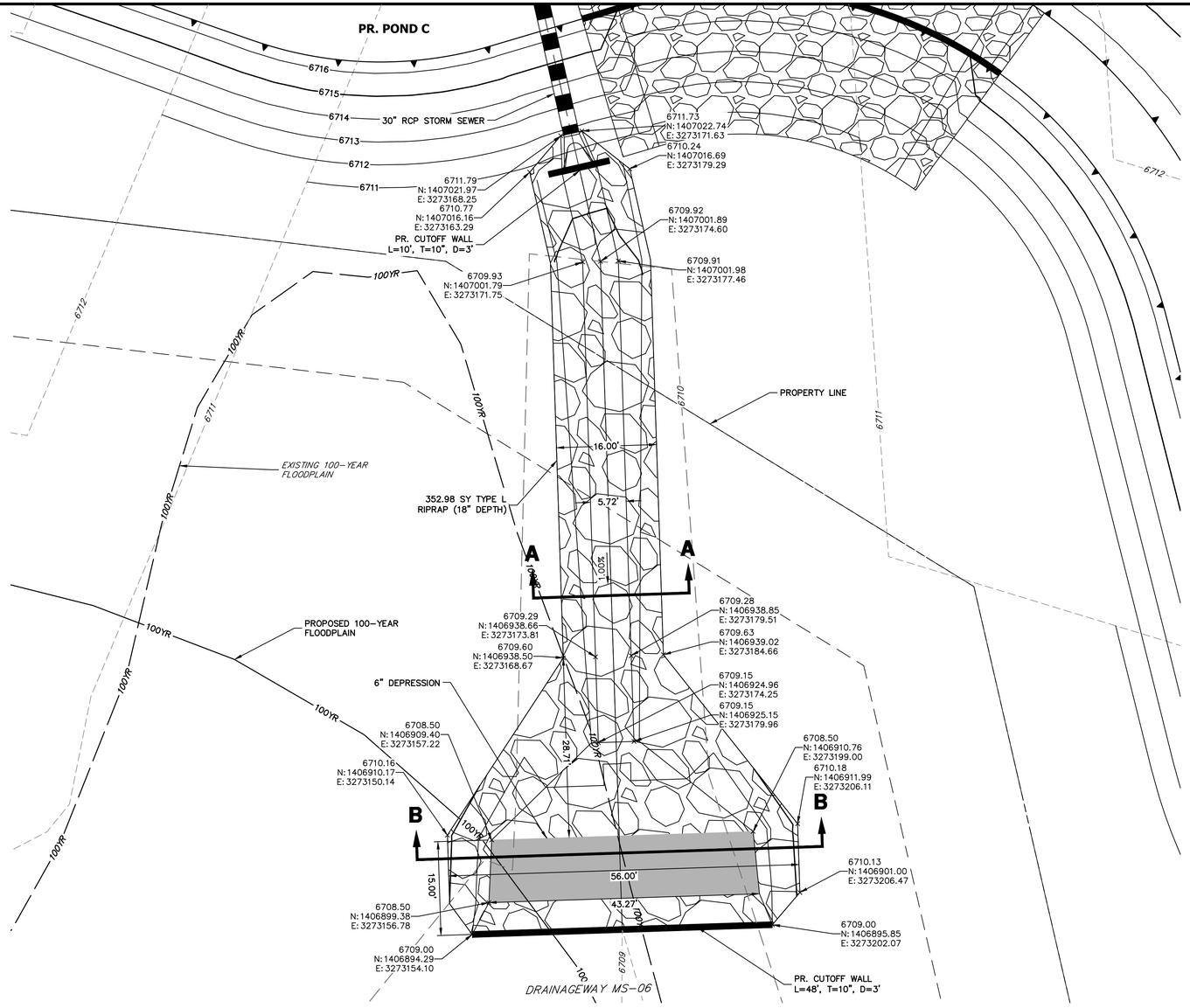
H-SCALE	1"=30'	DESIGNED BY	AAM
V-SCALE	1"= 3'	DRAWN BY	AAM
DATE	3/20/24	CHECKED BY	

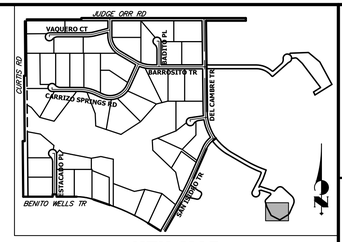
SADDLEHORN RANCH – FILING 3

POND C GRADING PLAN

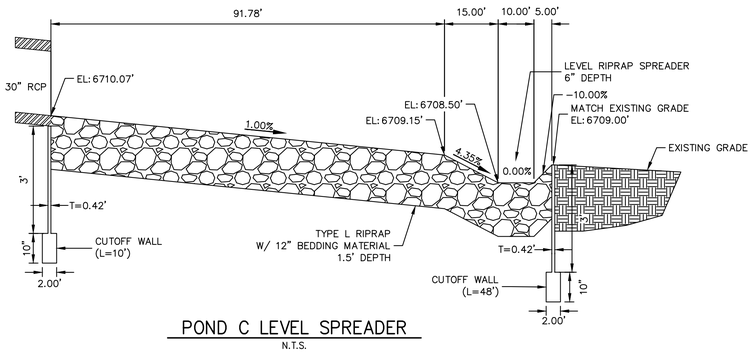
SHEET 50 OF 63

JOB NO. 25142.05

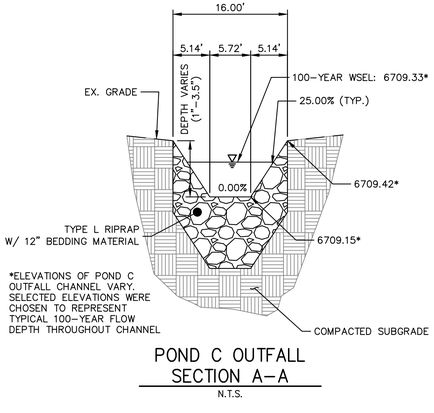




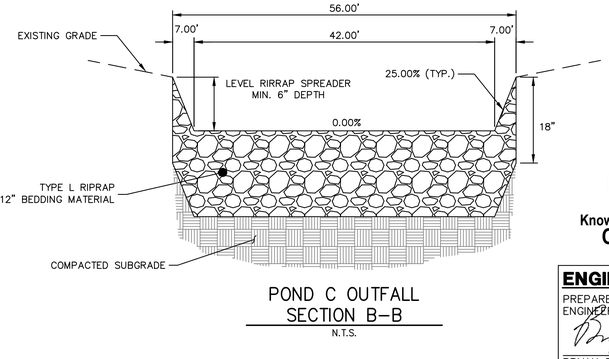
KEY MAP
N.T.S



POND C LEVEL SPREADER
N.T.S.



POND C OUTFALL
SECTION A-A
N.T.S.



POND C OUTFALL
SECTION B-B
N.T.S.

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10 5 0 10 20
ORIGINAL SCALE: 1" = 10'

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FOR AND ON BEHALF OF JR ENGINEERING, LLC

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.	.	.	.

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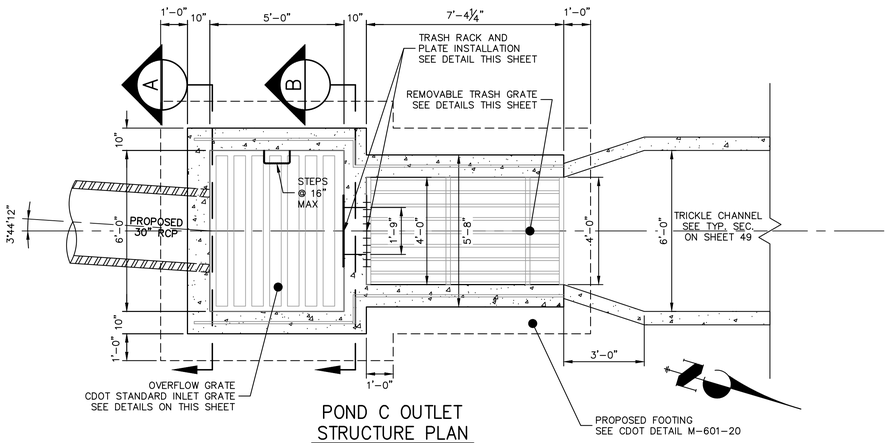
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	MMC
DRAWN BY	MMC
CHECKED BY	

SADDLEHORN RANCH – FILING 3

POND C GRADING PLAN

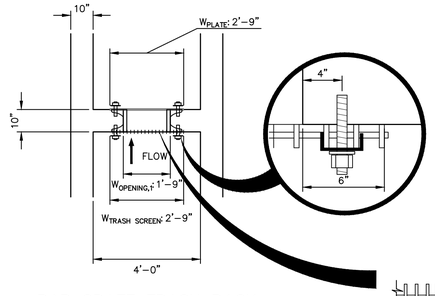
SHEET 51 OF 63

JOB NO. 25142.05



POND C OUTLET STRUCTURE PLAN

SCALE: 3/8"=1'



BAR GRATE TRASH RACK AND PLATE DETAIL (PLAN)

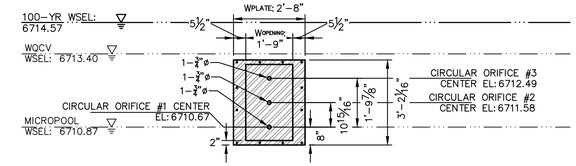
SCALE: 3/8"=1'

WATER DEPTH ABOVE LOWEST OPENING, H	MINIMUM BEARING BAR SIZE, BARS ALIGNED VERTICALLY
2.0 FT.	1" x 3/16"
3.0 FT.	1-1/4" x 3/16"
4.0 FT.	1-3/4" x 3/16"
5.0 FT.	2" x 3/16"
6.0 FT.	2-1/4" x 3/16"

R VALUE=(NET OPEN AREA)/GROSS RACK AREA)
=0.71 FOR CROSS RODS ON 2" CENTERS
=0.77 FOR CROSS RODS ON 4" CENTERS

BAR GRATE DETAIL

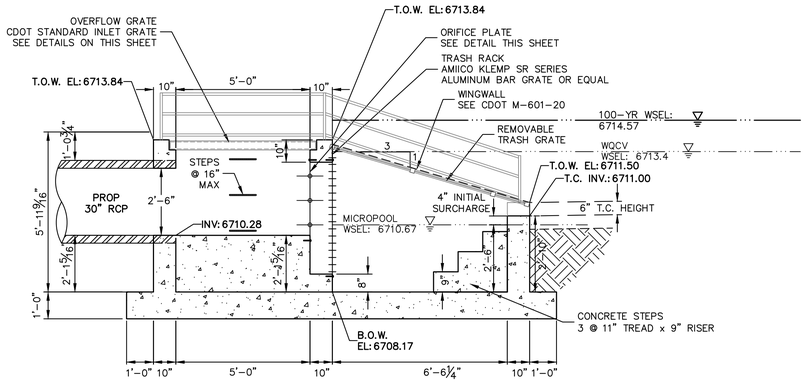
N.T.S.



⅜" THICK ORIFICE PLATE, GALVANIZED STEEL WITH
3 – 1-¾"ø CIRCULAR ORIFICES
BOLT PLATE TO CONCRETE @ 10" O.C. MAX.
PROVIDE GASKET BETWEEN PLATE AND CONCRETE

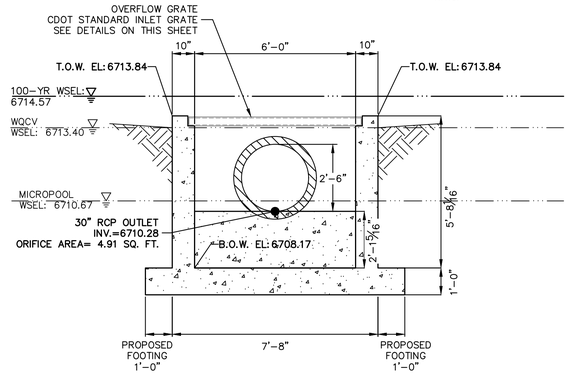
ORIFICE PLATE DETAIL

SCALE: 3/8"=1'



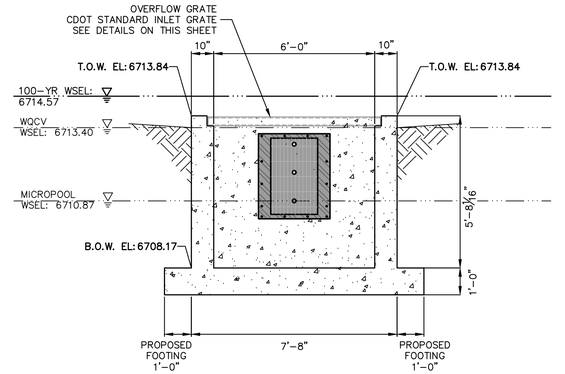
POND C OUTLET STRUCTURE PROFILE

SCALE: 3/8"=1'



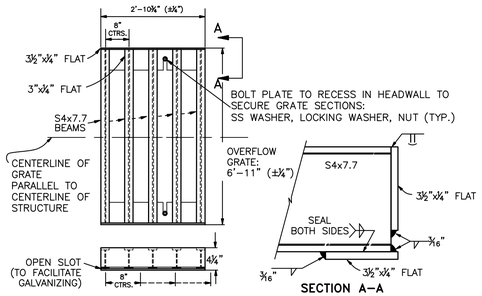
A A–A SECTION

SCALE: 3/8"=1'



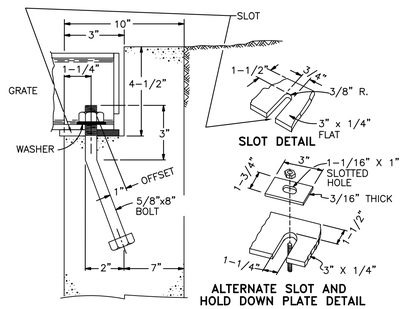
B B–B SECTION

SCALE: 3/8"=1'



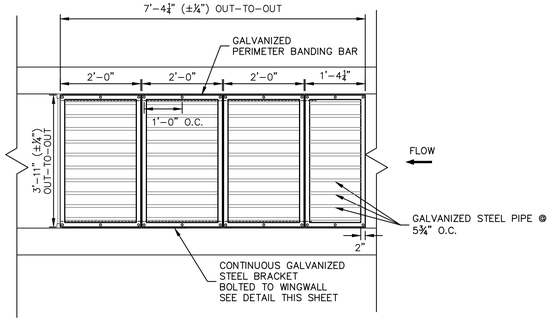
OVERFLOW GRATE DETAILS

N.T.S.



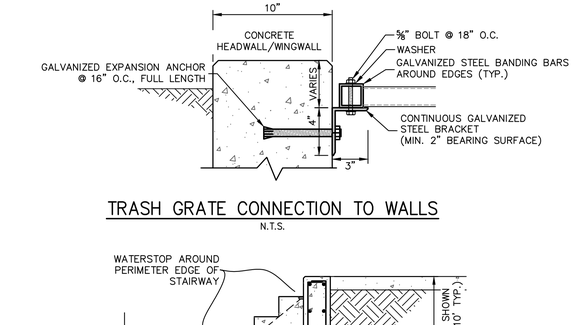
OVERFLOW GRATE INSTALLATION DETAIL

N.T.S.



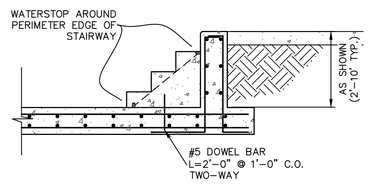
REMOVABLE TRASH GRATE DETAIL (PLAN)

N.T.S.



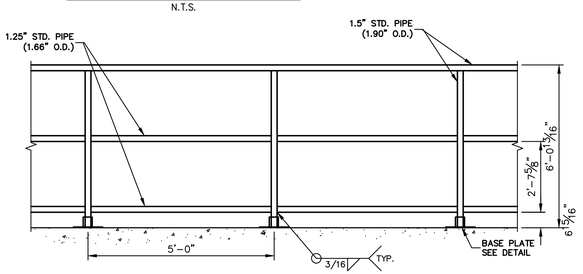
TRASH GRATE CONNECTION TO WALLS

N.T.S.



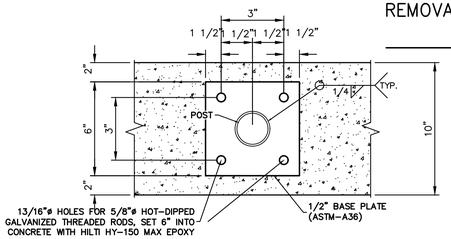
CONCRETE STEP DETAIL

SCALE: 3/8"=1'



PEDESTRIAN RAILING DETAIL

SCALE: NTS
RAILING TO BE HOT-DIPPED GALVANIZED



BASE PLATE DETAIL

SCALE: NTS

Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043

3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

BY	DATE	No.	REVISION
		.	.

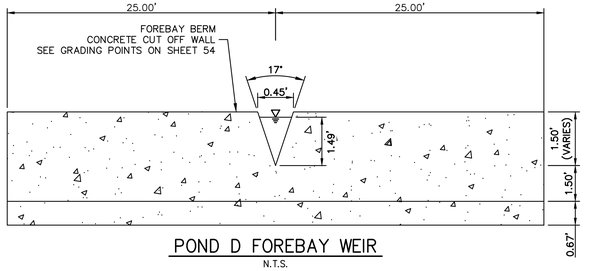
H-SCALE	3/8"=1'
V-SCALE	3/8"=1'
DATE	3/20/24
DESIGNED BY	AAM
DRAWN BY	MMC
CHECKED BY	

SADDLEHORN RANCH – FILING 3

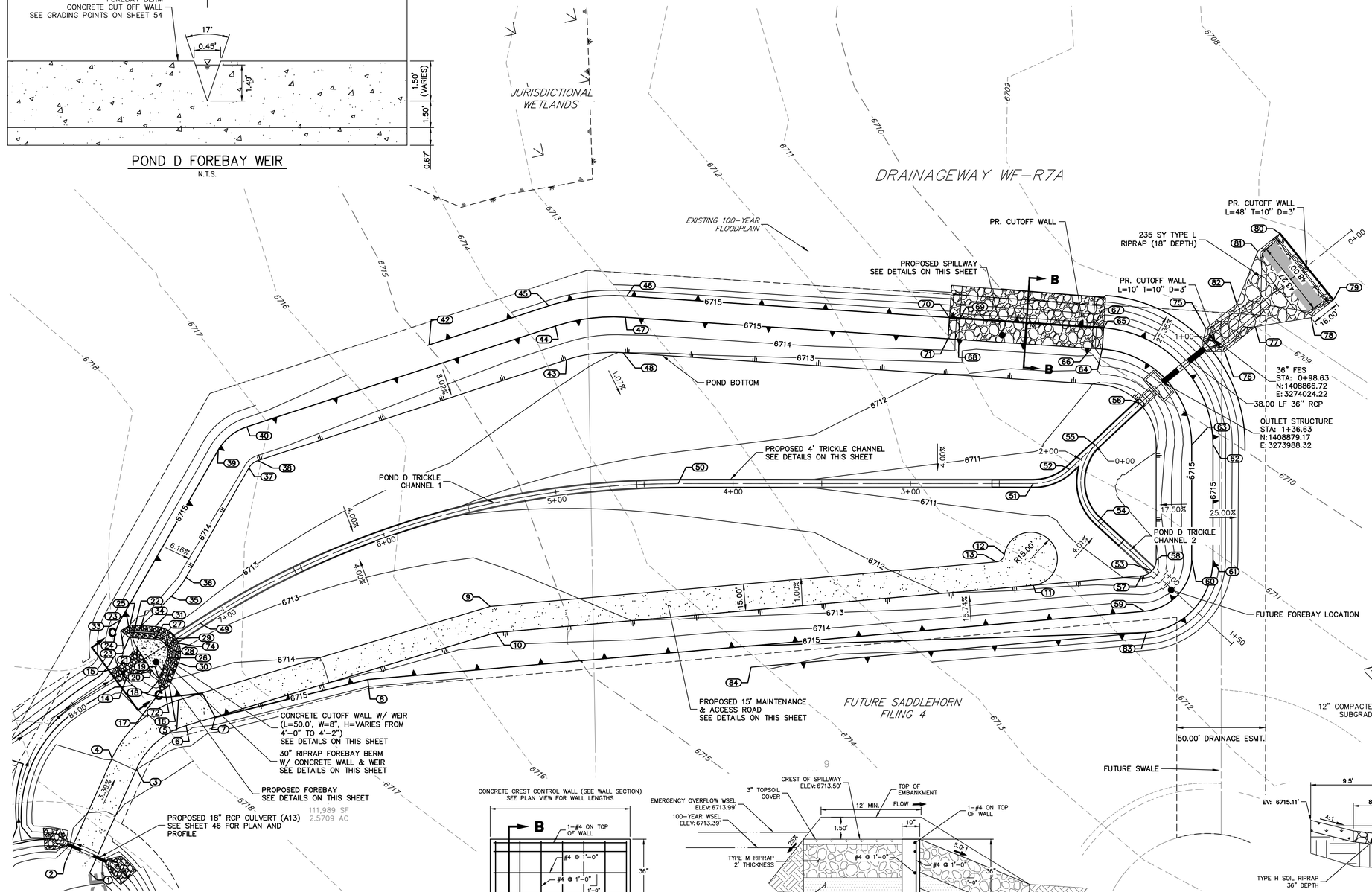
POND C OUTLET STRUCTURE DETAILS

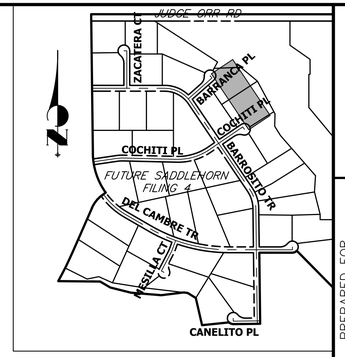
SHEET 52 OF 63

JOB NO. 25142.05



POND D FOREBAY WEIR
N.T.S.

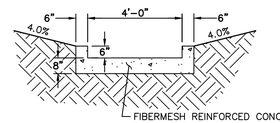




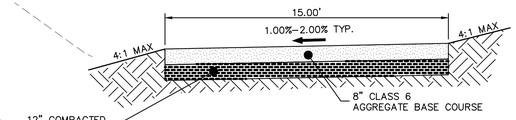
KEY MAP
N.T.S

RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D_{50}* (INCHES)
TYPE VL	70 – 100 50 – 70 35 – 50 2 – 10	12 9 6 2	6
TYPE L	70 – 100 50 – 70 35 – 50 2 – 10	15 12 9 3	9
TYPE M	70 – 100 50 – 70 35 – 50 2 – 10	21 18 12 4	12
TYPE H	70 – 100 50 – 70 35 – 50 2 – 10	30 24 18 6	18

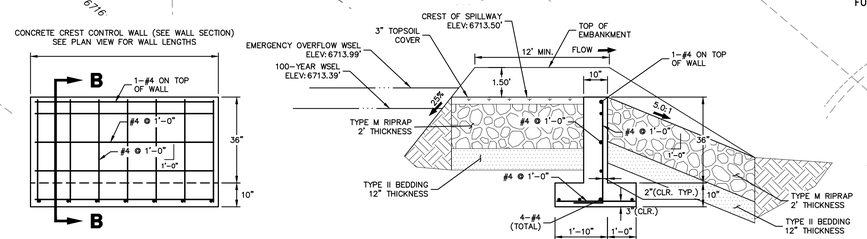
*D_{50} = MEAN ROCK SIZE



POND D TRICKLE CHANNEL
N.T.S.

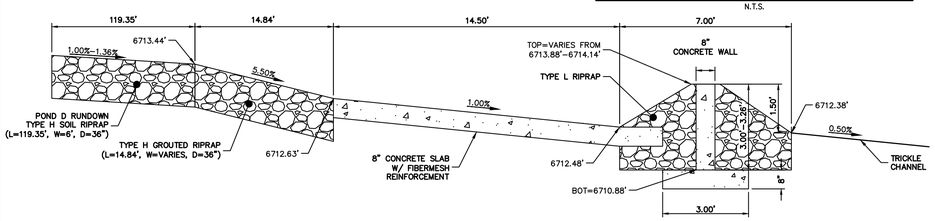


GRAVEL MAINTENANCE ACCESS ROAD TYPICAL SECTION
N.T.S.

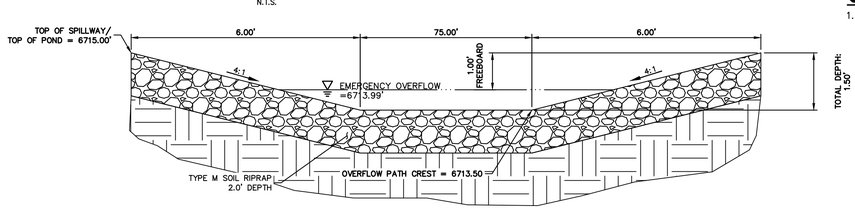


TYPICAL CONCRETE CREST CONTROL WALL SECTION
N.T.S.

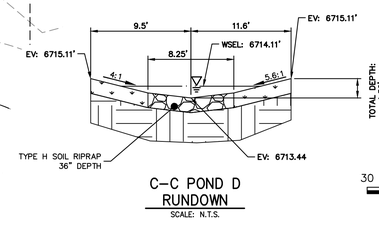
B–B
N.T.S.



POND D FOREBAY
N.T.S.



POND D EMERGENCY SPILLWAY
SCALE: N.T.S.



C–C POND D RUNDOWN
SCALE: N.T.S.

30 15 0 30 60

ORIGINAL SCALE: 1" = 30'

GRADING POINT NOTES
1. GRADING POINTS SHOWN ON NEXT PAGE.

811 Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT
PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043 — REGISTERED PROFESSIONAL ENGINEER — STATE OF COLORADO

3/20/24
DATE

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BRADY WILLIAMS

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Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
.	.	.	. .

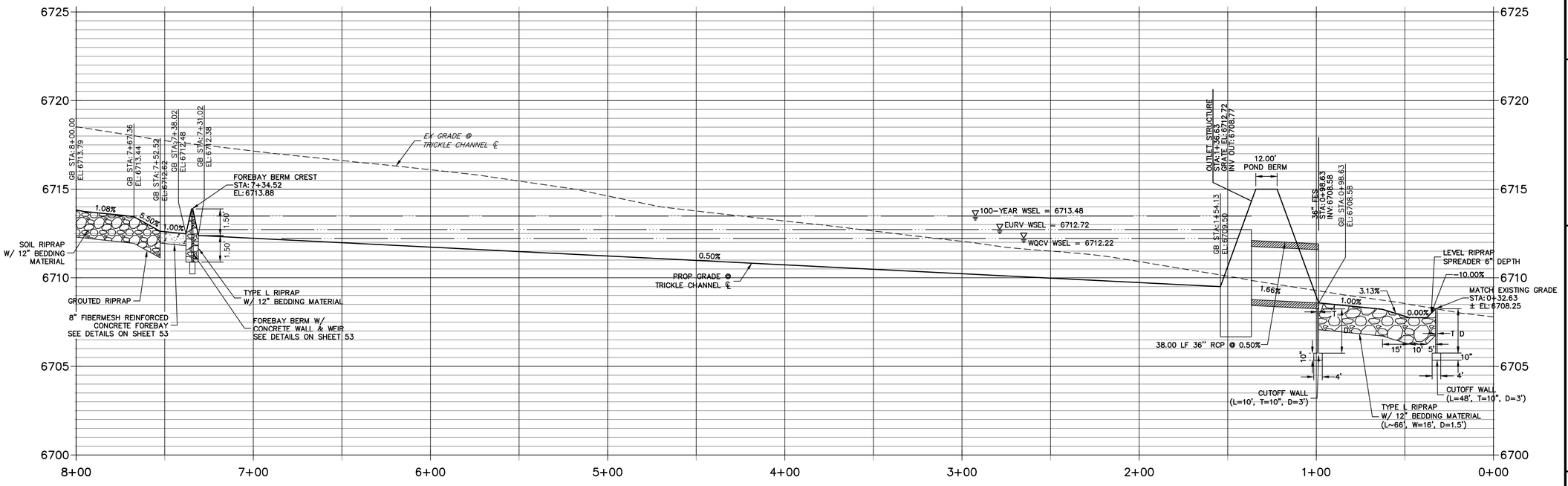
H-SCALE	1" = 30'
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	AAM
DRAWN BY	AAM
CHECKED BY	

SADDLEHORN RANCH – FILING 3
POND D GRADING PLAN

SHEET 53 OF 63

JOB NO. 25142.05

POND D TRICKLE CHANNEL 1 PROFILE
STA 0+00.00 TO 8+00.00



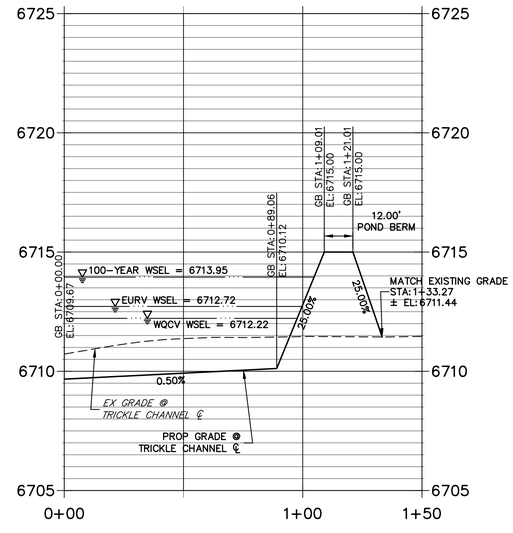
POINT TABULATION			
ID NO.	DESCRIPTION	NORTHING/EASTING	ELEVATION
1	ACCESS ROAD	N: 1409244.07 E: 3273432.99	6718.81
2	ACCESS ROAD	N: 1409258.86 E: 3273430.50	6718.53
3	ACCESS ROAD	N: 1409252.82 E: 3273496.53	6716.98
4	ACCESS ROAD	N: 1409267.68 E: 3273494.49	6716.98
5	ACCESS ROAD	N: 1409253.42 E: 3273542.16	6715.42
6	ACCESS ROAD	N: 1409242.12 E: 3273532.29	6715.60
7	ACCESS ROAD/TOP	N: 1409230.98 E: 3273545.04	6715.00
8	TOP	N: 1409169.37 E: 3273608.56	6715.00
9	ACCESS ROAD	N: 1409132.79 E: 3273680.17	6713.23
10	ACCESS ROAD/TOE	N: 1409122.51 E: 3273669.14	6713.37
11	ACCESS ROAD/TOE	N: 1408880.14 E: 3273852.69	6711.70
12	ACCESS ROAD	N: 1408903.04 E: 3273858.87	6711.59
13	ACCESS ROAD	N: 1408904.63 E: 3273852.96	6711.66
14	RIPRAP/CONCRETE	N: 1409284.74 E: 3273536.25	6713.77
15	RIPRAP/CONCRETE	N: 1409292.18 E: 3273539.76	6713.76
16	RIPRAP	N: 1409262.06 E: 3273546.28	6714.28
17	RIPRAP	N: 1409264.57 E: 3273540.72	6714.72
18	RIPRAP	N: 1409268.94 E: 3273544.98	6713.10
19	TOE OF BERM	N: 1409269.22 E: 3273546.47	6712.69
20	RIPRAP/CONCRETE	N: 1409275.38 E: 3273548.25	6712.66
21	RIPRAP/CONCRETE	N: 1409288.81 E: 3273554.58	6712.66

POINT TABULATION			
ID NO.	DESCRIPTION	NORTHING/EASTING	ELEVATION
22	TOE OF BERM	N: 1409294.06 E: 3273558.15	6712.69
23	RIPRAP	N: 1409295.67 E: 3273557.27	6713.17
24	RIPRAP	N: 1409301.73 E: 3273557.94	6714.74
25	RIPRAP	N: 1409299.03 E: 3273563.41	6713.97
26	TOE OF BERM	N: 1409271.54 E: 3273558.72	6712.57
27	TOE OF BERM	N: 1409283.16 E: 3273564.12	6712.57
28	TOE OF BERM	N: 1409275.90 E: 3273564.53	6712.48
29	TRICKLE CHANNEL INV	N: 1409272.93 E: 3273570.86	6712.38
30	TOE OF BERM	N: 1409264.65 E: 3273559.92	6713.29
31	TOE OF BERM	N: 1409286.64 E: 3273570.19	6713.23
33	TOP	N: 1409305.11 E: 3273562.95	6715.00
34	TOE OF BERM	N: 1409293.48 E: 3273566.45	6713.47
35	TOE	N: 1409287.99 E: 3273589.27	6713.65
36	TOE	N: 1409286.65 E: 3273602.90	6713.70
37	TOE	N: 1409289.41 E: 3273673.96	6713.85
38	TOE	N: 1409287.34 E: 3273680.07	6713.84
39	TOP	N: 1409309.40 E: 3273673.19	6715.00
40	TOP	N: 1409302.70 E: 3273692.88	6715.00
42	TOP	N: 1409240.31 E: 3273786.51	6715.00
43	TOE	N: 1409170.22 E: 3273820.65	6713.12
44	TOP	N: 1409185.58 E: 3273833.45	6715.00

POINT TABULATION			
ID NO.	DESCRIPTION	NORTHING/EASTING	ELEVATION
45	TOP	N: 1409194.80 E: 3273841.13	6715.00
46	TOP	N: 1409160.67 E: 3273869.01	6715.00
47	TOP	N: 1409154.98 E: 3273858.45	6715.00
48	TOE	N: 1409145.50 E: 3273840.84	6712.99
49	TRICKLE CHANNEL INV	N: 1409266.10 E: 3273585.27	6712.30
50	TRICKLE CHANNEL INV	N: 1409079.92 E: 3273794.97	6710.88
51	TRICKLE CHANNEL INV	N: 1408910.53 E: 3273901.28	6709.88
52	TRICKLE CHANNEL INV	N: 1408897.48 E: 3273919.03	6709.77
53	TRICKLE CHANNEL INV	N: 1408827.83 E: 3273895.28	6710.12
54	TRICKLE CHANNEL INV	N: 1408868.37 E: 3273902.70	6709.91
55	TRICKLE CHANNEL INV	N: 1408892.39 E: 3273938.29	6709.67
56	OUTLET STRUCTURE	N: 1408883.64 E: 3273971.40	6709.50
57	TOE	N: 1408831.25 E: 3273889.72	6710.72
58	TOE	N: 1408829.06 E: 3273901.68	6710.72
59	TOP	N: 1408819.17 E: 3273873.78	6715.00
60	TOP	N: 1408812.12 E: 3273912.32	6715.00
61	TOP	N: 1408801.95 E: 3273918.69	6715.00
62	TOP	N: 1408836.42 E: 3273973.62	6715.00
63	TOP	N: 1408846.59 E: 3273967.24	6715.00
64	SPILLWAY TOP	N: 1408917.92 E: 3273986.08	6715.00
65	SPILLWAY TOP	N: 1408923.61 E: 3273996.64	6715.00

POINT TABULATION			
ID NO.	DESCRIPTION	NORTHING/EASTING	ELEVATION
66	SPILLWAY CREST	N: 1408923.21 E: 3273983.23	6713.50
67	SPILLWAY CREST	N: 1408928.90 E: 3273993.80	6713.50
68	SPILLWAY CREST	N: 1408989.24 E: 3273947.68	6713.50
69	SPILLWAY CREST	N: 1408994.93 E: 3273958.24	6713.50
70	SPILLWAY TOP	N: 1409000.22 E: 3273955.40	6715.00
71	SPILLWAY TOP	N: 1408994.53 E: 3273944.83	6715.00
72	END CONCRETE WALL/ TOP OF BERM	N: 1409265.50 E: 3273545.63	6714.14
73	END CONCRETE WALL/ TOP OF BERM	N: 1409297.35 E: 3273560.34	6714.14
74	TOP OF BERM	N: 1409274.42 E: 3273567.70	6713.88
75	RIPRAP	N: 1408874.52 E: 3274026.93	6709.18
76	RIPRAP	N: 1408858.93 E: 3274021.52	6709.31
77	RIPRAP	N: 1408851.63 E: 3274042.58	6709.00
78	RIPRAP	N: 1408827.67 E: 3274063.60	6708.62
79	RIPRAP	N: 1408822.42 E: 3274078.72	6708.34
80	RIPRAP	N: 1408867.77 E: 3274094.45	6708.09
81	RIPRAP	N: 1408873.02 E: 3274079.33	6708.31
82	RIPRAP	N: 1408867.22 E: 3274047.98	6708.85
83	TOP	N: 1408811.93 E: 3273864.22	6715.00
84	TOP	N: 1408990.16 E: 3273729.23	6714.21

POND D TRICKLE CHANNEL 2 PROFILE
STA 0+00.00 TO 1+50.00



30 15 0 30 60

HORIZONTAL
ORIGINAL SCALE: 1" = 30'

VERTICAL
ORIGINAL SCALE: 1" = 3'

811 Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043

3/20/24
DATE

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BRADY WILLIAMS

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A Westrian Company
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Fort Collins 970-491-9888 • www.jrengineering.com

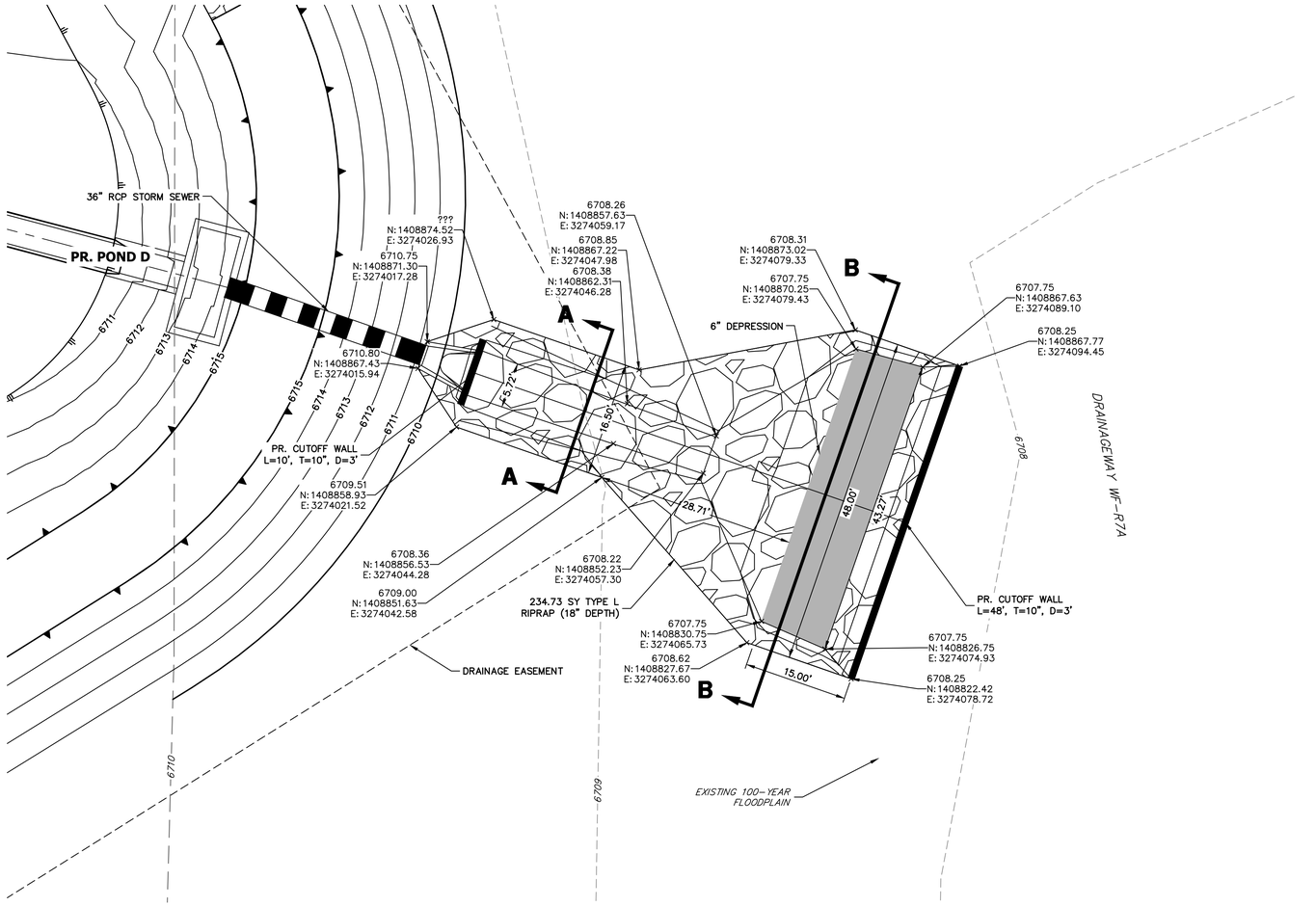
No.	REVISION	BY	DATE
.	.	.	.
.	.	.	.

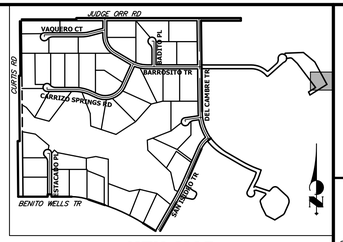
H-SCALE	1" = 30'
V-SCALE	1" = 3'
DATE	3/20/24
DESIGNED BY	AAM
DRAWN BY	AAM
CHECKED BY	

SADDLEHORN RANCH – FILING 3
POND D GRADING PLAN

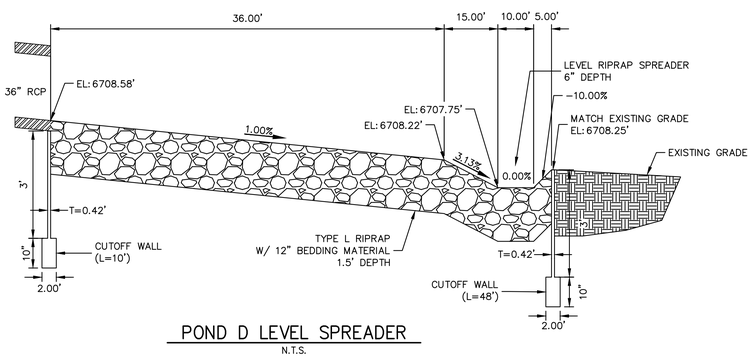
SHEET 54 OF 63

JOB NO. 25142.05

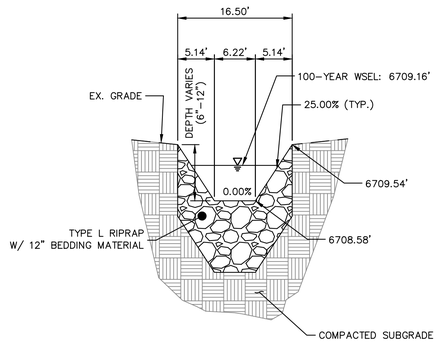




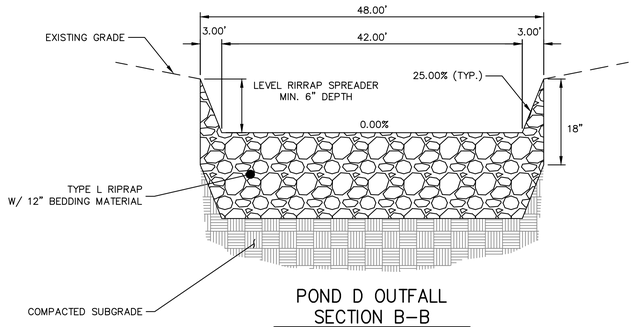
KEY MAP
N.T.S



POND D LEVEL SPREADER
N.T.S.



POND D OUTFALL
SECTION A-A
N.T.S.



POND D OUTFALL
SECTION B-B
N.T.S.

10 5 0 10 20
ORIGINAL SCALE: 1" = 10'

Know what's below.
Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

25043

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
	.	.	.

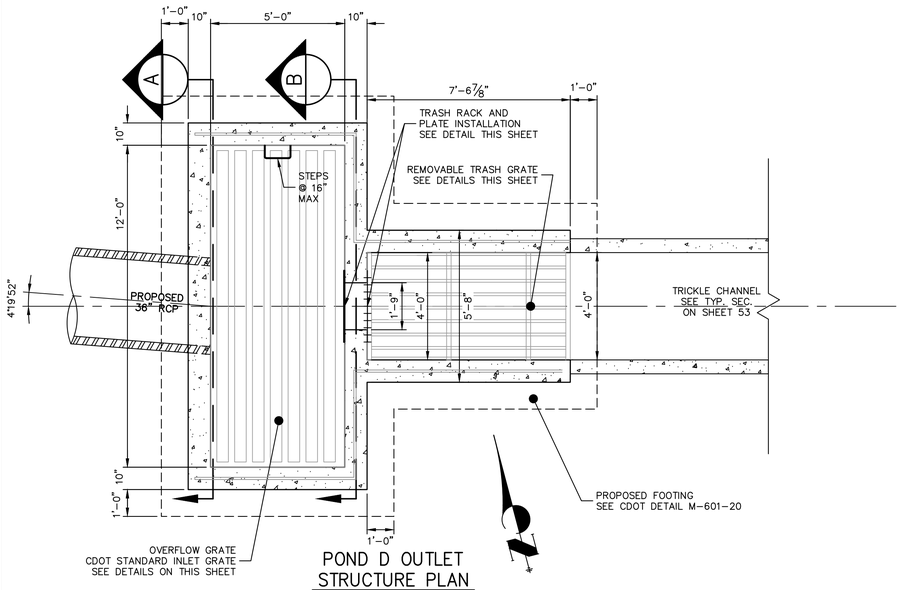
H-SCALE	1"=10'
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	MMC
DRAWN BY	MMC
CHECKED BY	

SADDLEHORN RANCH – FILING 3

POND D GRADING PLAN

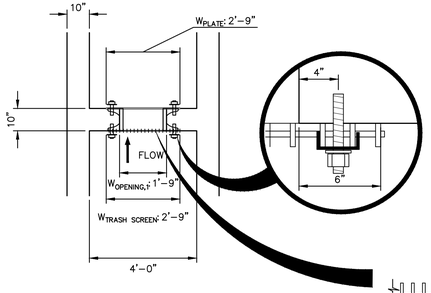
SHEET 55 OF 63

JOB NO. 25142.05



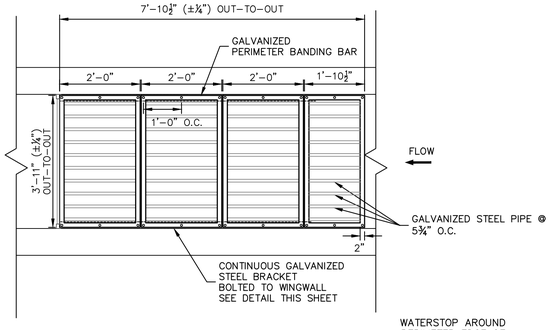
POND D OUTLET STRUCTURE PLAN

SCALE: 3/8"=1'



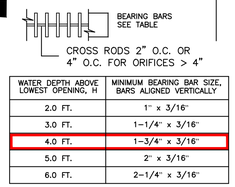
BAR GRATE TRASH RACK AND PLATE DETAIL (PLAN)

SCALE: 3/8"=1'



REMOVABLE TRASH GRATE DETAIL (PLAN)

N.T.S.

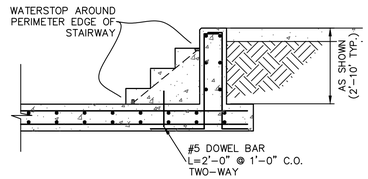


WATER DEPTH ABOVE LOWEST OPENING, H	MINIMUM BEARING BAR SIZE, BARS ALIGNED VERTICALLY
2.0 FT.	1" x 3/16"
3.0 FT.	1-1/4" x 3/16"
4.0 FT.	1-3/4" x 3/16"
5.0 FT.	2" x 3/16"
6.0 FT.	2-1/4" x 3/16"

R VALUE=(NET OPEN AREA)/(GROSS RACK AREA)
=0.71 FOR CROSS RODS ON 2" CENTERS
=0.77 FOR CROSS RODS ON 4" CENTERS

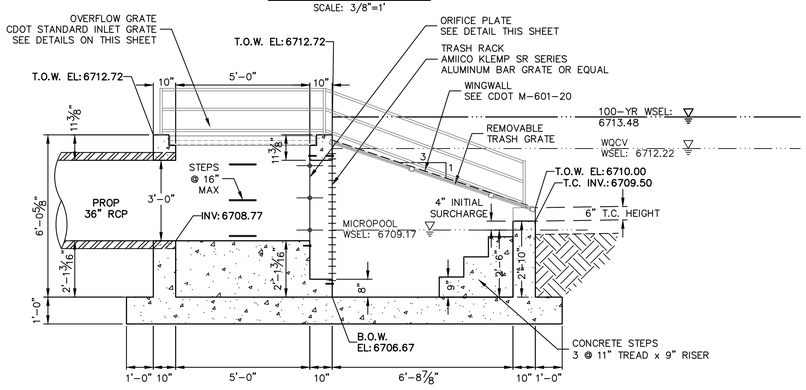
BAR GRATE DETAIL

N.T.S.



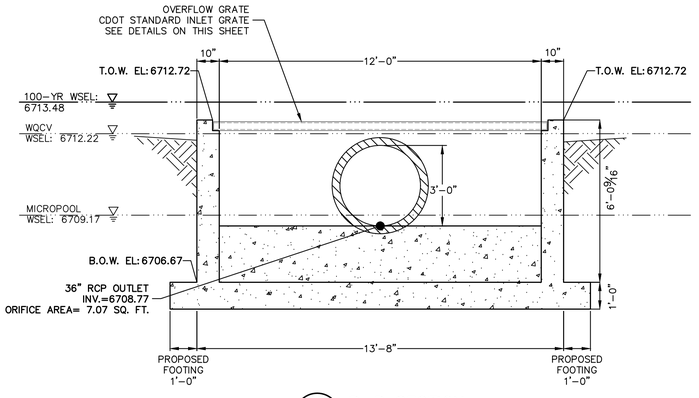
CONCRETE STEP DETAIL

SCALE: 3/8"=1'



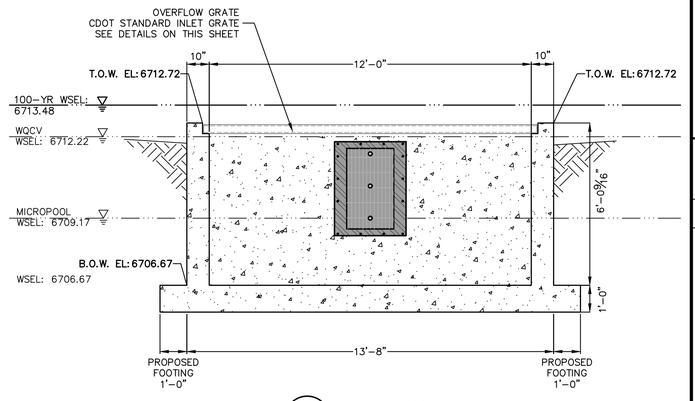
POND D OUTLET STRUCTURE PROFILE

SCALE: 3/8"=1'



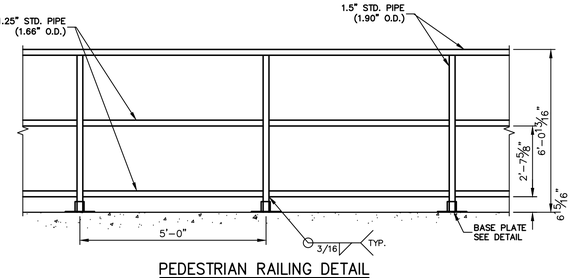
B B-B SECTION

SCALE: 3/8"=1'



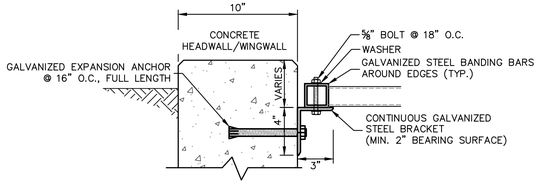
B B-B SECTION

SCALE: 3/8"=1'



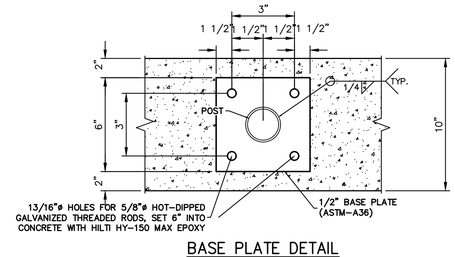
PEDESTRIAN RAILING DETAIL

SCALE: NTS
RAILING TO BE HOT-DIPPED GALVANIZED



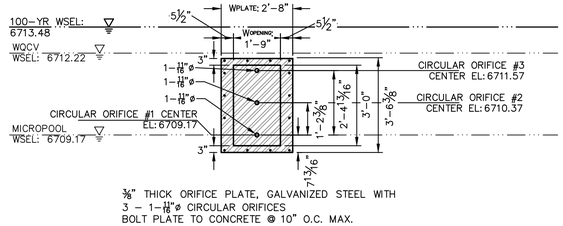
TRASH GRATE CONNECTION TO WALLS

N.T.S.



BASE PLATE DETAIL

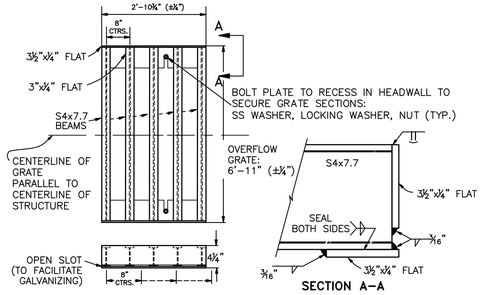
SCALE: NTS



⅜" THICK ORIFICE PLATE, GALVANIZED STEEL WITH 3 – 1-11/16"ø CIRCULAR ORIFICES
BOLT PLATE TO CONCRETE @ 10" O.C. MAX.
PROVIDE GASKET BETWEEN PLATE AND CONCRETE

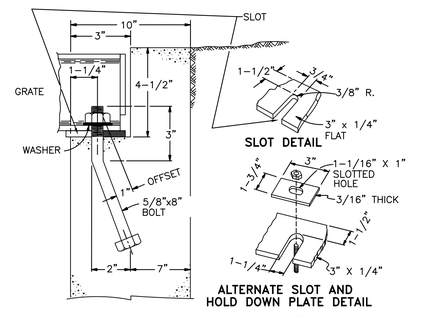
ORIFICE PLATE DETAIL

SCALE: 3/8"=1'



OVERFLOW GRATE DETAILS

N.T.S.



OVERFLOW GRATE INSTALLATION DETAIL

N.T.S.

811 Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043 — REGISTERED PROFESSIONAL ENGINEER

3/20/24
DATE

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PREPARED FOR
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2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

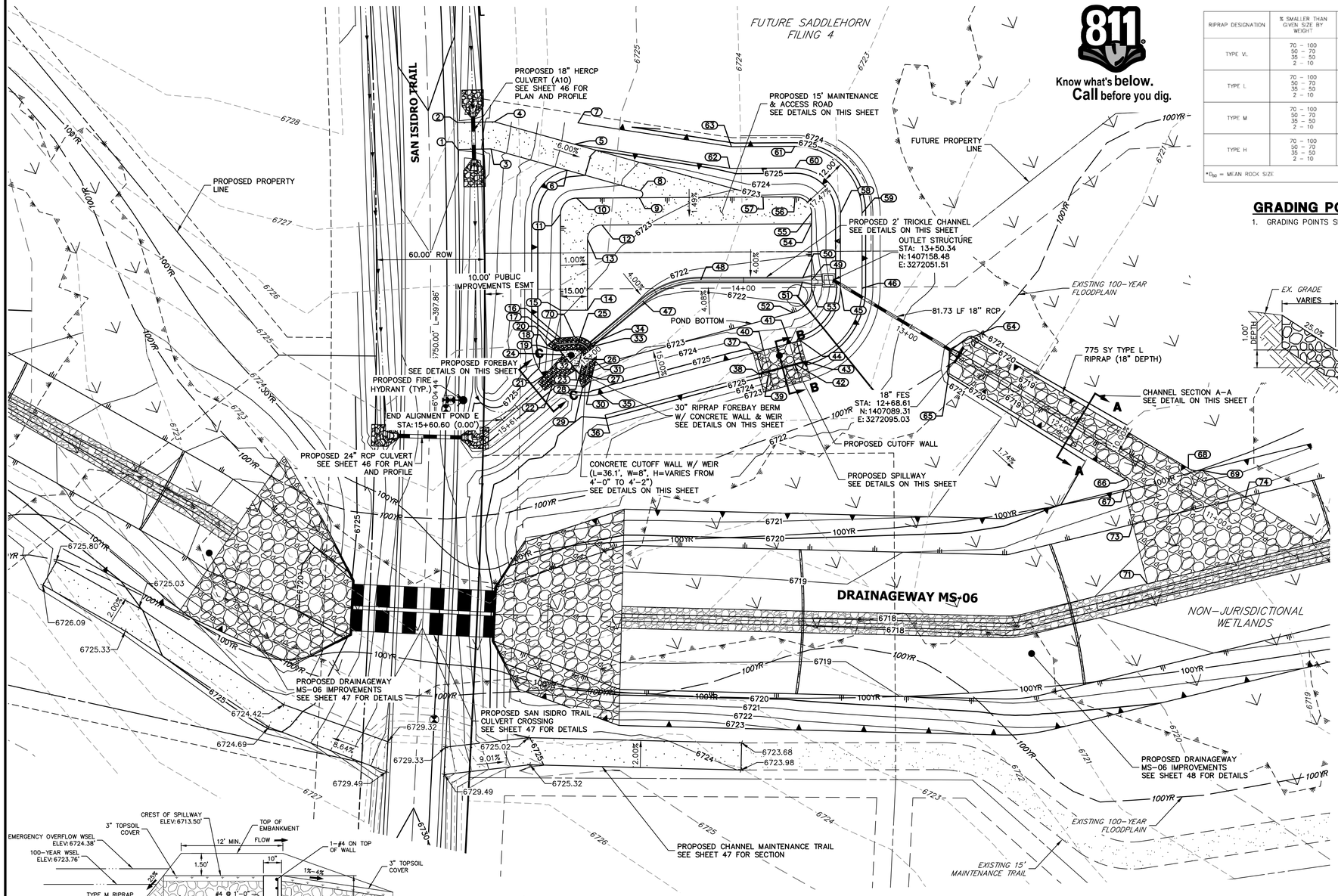
H-SCALE	3/8"=1'
V-SCALE	3/8"=1'
DATE	3/20/24
DESIGNED BY	AAM
DRAWN BY	MMC
CHECKED BY	

SADDLEHORN RANCH – FILING 3

POND D OUTLET STRUCTURE DETAILS

SHEET 56 OF 63

JOB NO. 25142.05



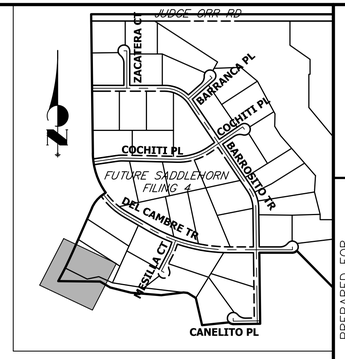
811 Know what's below. Call before you dig.

RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D_{50}* (INCHES)
TYPE VL	70 – 100 50 – 70 35 – 50 2 – 10	12 9 6 2	6
TYPE L	70 – 100 50 – 70 35 – 50 2 – 10	15 12 9 3	9
TYPE M	70 – 100 50 – 70 35 – 50 2 – 10	21 18 12 4	12
TYPE H	70 – 100 50 – 70 35 – 50 2 – 10	30 24 18 6	18

*D_{50} = MEAN ROCK SIZE

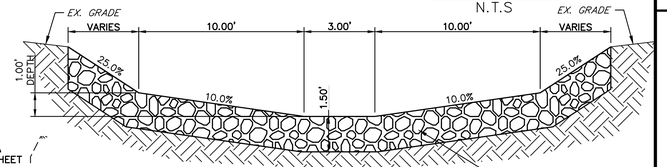
GRADING POINT NOTES

1. GRADING POINTS SHOWN ON NEXT PAGE.



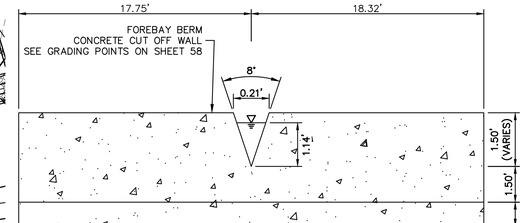
KEY MAP

N.T.S



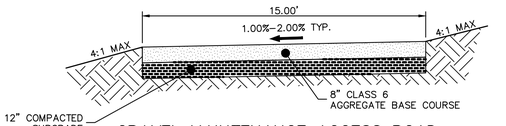
CHANNEL SECTION A–A

N.T.S.



POND E FOREBAY WEIR

N.T.S.



GRAVEL MAINTENANCE ACCESS ROAD TYPICAL SECTION

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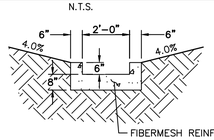
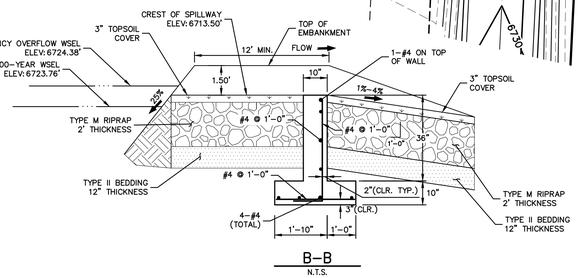


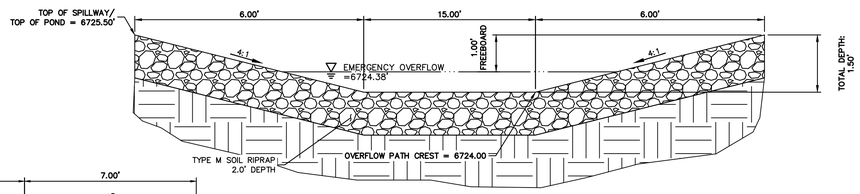
POND E TRICKLE CHANNEL

N.T.S.



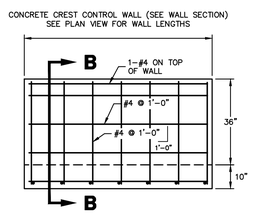
B–B

N.T.S.



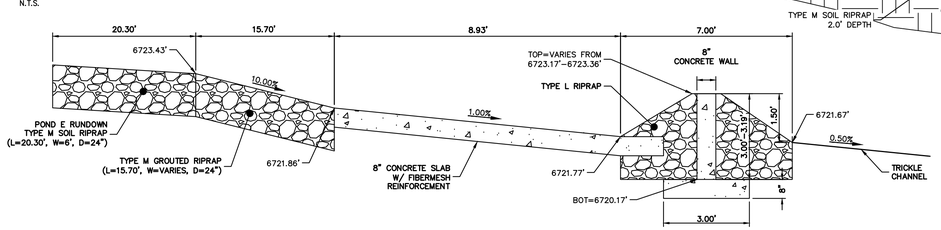
POND E EMERGENCY SPILLWAY

SCALE: N.T.S.



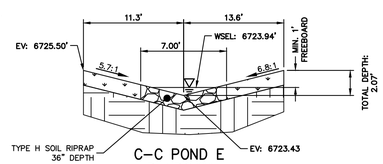
TYPICAL CONCRETE CREST CONTROL WALL SECTION

N.T.S.



POND E FOREBAY

N.T.S.



C–C POND E RUNDOWN

SCALE: N.T.S.

30 15 0 30 60

ORIGINAL SCALE: 1" = 30'

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043

3/20/24
DATE

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BRADY WILLIAMS

J·R ENGINEERING
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Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

H-SCALE	1" = 30'
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	AAM
DRAWN BY	AAM
CHECKED BY	

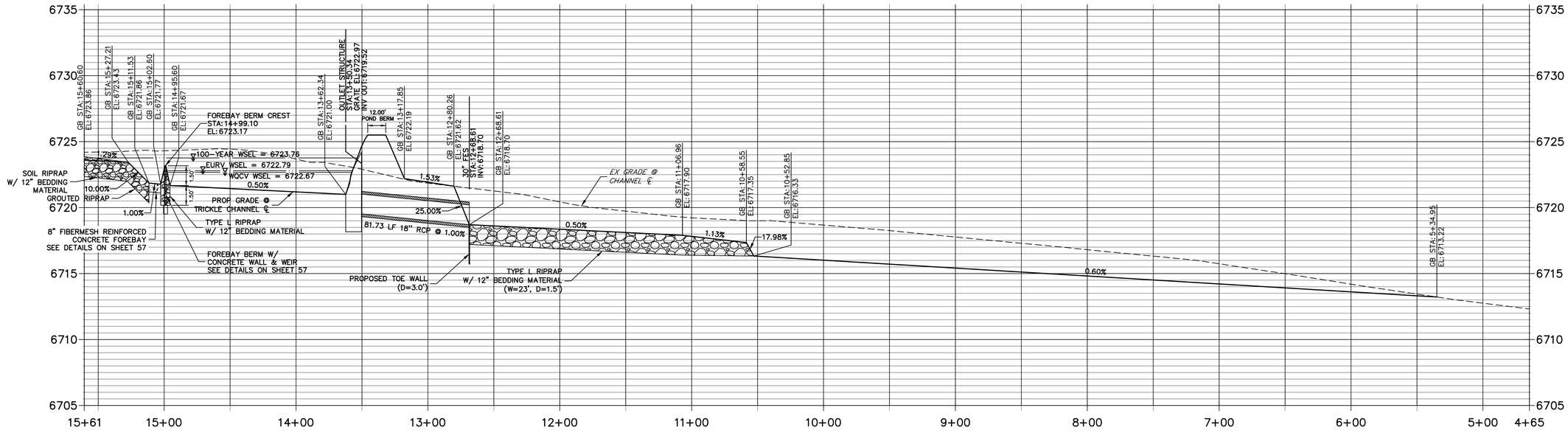
SADDLEHORN RANCH – FILING 3

POND E GRADING PLAN

SHEET 57 OF 63

JOB NO. 25142.05

POND E PROFILE
STA 4+64.77 TO 15+60.60



40 20 0 40 80

HORIZONTAL
ORIGINAL SCALE: 1" = 40'

VERTICAL
ORIGINAL SCALE: 1" = 4'

POINT TABULATION			
ID NO.	DESCRIPTION	NORTHING/EASTING	ELEVATION
1	ACCESS ROAD	N: 1407317.19 E: 3271898.86	6729.12
2	ACCESS ROAD	N: 1407330.72 E: 3271905.34	6729.27
3	ACCESS ROAD	N: 1407309.23 E: 3271915.27	6728.63
4	ACCESS ROAD	N: 1407321.76 E: 3271923.80	6728.65
5	ACCESS ROAD/TOP	N: 1407290.56 E: 3271957.78	6725.50
6	ACCESS ROAD/TOP	N: 1407279.51 E: 3271947.64	6725.50
7	TOP	N: 1407300.30 E: 3271964.80	6725.50
8	ACCESS ROAD	N: 1407251.12 E: 3271978.55	6723.46
9	ACCESS ROAD/TOE	N: 1407247.86 E: 3271976.31	6723.19
10	ACCESS ROAD/TOE	N: 1407263.39 E: 3271945.27	6723.37
11	ACCESS ROAD/TOE	N: 1407259.41 E: 3271933.22	6723.40
12	ACCESS ROAD	N: 1407243.75 E: 3271951.00	6723.16
13	ACCESS ROAD	N: 1407240.22 E: 3271940.29	6723.18
14	ACCESS ROAD	N: 1407205.23 E: 3271922.52	6722.67
15	ACCESS ROAD/TOE	N: 1407212.02 E: 3271909.15	6723.11
16	TOE OF BERM	N: 1407198.27 E: 3271902.17	6722.53
17	TOE OF BERM	N: 1407199.27 E: 3271899.80	6722.95
18	RIPRAP	N: 1407198.00 E: 3271893.83	6723.95
19	TOE OF BERM	N: 1407192.83 E: 3271897.07	6722.42

POINT TABULATION			
ID NO.	DESCRIPTION	NORTHING/EASTING	ELEVATION
20	TOE OF BERM	N: 1407192.02 E: 3271898.99	6721.90
21	RIPRAP/CONCRETE	N: 1407183.83 E: 3271884.51	6724.10
22	RIPRAP/CONCRETE	N: 1407176.81 E: 3271886.15	6724.42
23	RIPRAP/CONCRETE	N: 1407178.57 E: 3271901.86	6721.89
24	RIPRAP/CONCRETE	N: 1407189.28 E: 3271899.36	6721.89
25	TOE OF BERM	N: 1407188.69 E: 3271906.84	6721.82
26	TOE OF BERM	N: 1407182.36 E: 3271908.35	6721.82
27	TOE OF BERM	N: 1407175.90 E: 3271902.75	6721.90
28	TOE OF BERM	N: 1407173.93 E: 3271901.04	6722.55
29	RIPRAP	N: 1407167.86 E: 3271900.41	6724.32
30	TOE OF BERM	N: 1407169.35 E: 3271906.33	6724.00
31	TOE OF BERM	N: 1407177.69 E: 3271913.57	6722.46
32	TOE OF BERM	N: 1407185.95 E: 3271909.30	6721.77
33	TOP OF BERM	N: 1407186.74 E: 3271912.71	6723.17
34	TRICKLE CHANNEL INV	N: 1407187.54 E: 3271916.12	6721.67
35	TOP	N: 1407160.73 E: 3271907.48	6725.50
36	TOP	N: 1407148.99 E: 3271904.99	6725.50
37	SPILLWAY TOP	N: 1407142.45 E: 3271993.62	6725.50
38	SPILLWAY TOP	N: 1407130.71 E: 3271991.13	6725.50

POINT TABULATION			
ID NO.	DESCRIPTION	NORTHING/EASTING	ELEVATION
39	SPILLWAY CREST	N: 1407129.46 E: 3271997.00	6724.00
40	SPILLWAY CREST	N: 1407141.20 E: 3271999.49	6724.00
41	SPILLWAY CREST	N: 1407138.09 E: 3272014.16	6724.00
42	SPILLWAY CREST	N: 1407126.35 E: 3272011.67	6724.00
43	SPILLWAY TOP	N: 1407125.11 E: 3272017.54	6725.50
44	SPILLWAY TOP	N: 1407136.84 E: 3272020.03	6725.50
45	TOP	N: 1407152.61 E: 3272053.01	6725.50
46	TOP	N: 1407147.18 E: 3272063.71	6725.50
47	TRICKLE CHANNEL INV	N: 1407195.89 E: 3271952.01	6721.48
48	TRICKLE CHANNEL INV	N: 1407191.77 E: 3271985.98	6721.31
49	OUTLET STRUCTURE	N: 1407163.93 E: 3272040.81	6721.00
50	BEGIN TRICKLE CHANNEL TAPER TO 4.0' TRICKLE CHANNEL	N: 1407167.08 E: 3272036.81	6721.03
51	BEGIN TRICKLE CHANNEL TAPER TO 4.0' TRICKLE CHANNEL	N: 1407165.30 E: 3272035.90	6721.03
52	TOE	N: 1407152.50 E: 3272023.35	6722.22
53	TOE	N: 1407159.85 E: 3272038.74	6721.62
54	ACCESS ROAD/TOE	N: 1407191.75 E: 3272054.94	6722.55
55	ACCESS ROAD/TOE	N: 1407197.05 E: 3272057.63	6722.61
56	TOE	N: 1407209.18 E: 3272053.63	6722.74
57	ACCESS ROAD/TOE	N: 1407217.11 E: 3272037.78	6722.83

POINT TABULATION			
ID NO.	DESCRIPTION	NORTHING/EASTING	ELEVATION
58	TOP	N: 1407189.81 E: 3272071.90	6725.50
59	TOP	N: 1407184.37 E: 3272082.60	6725.50
60	TOP	N: 1407223.48 E: 3272060.79	6725.50
61	TOP	N: 1407234.22 E: 3272066.16	6725.50
62	TOP	N: 1407239.63 E: 3272028.52	6725.50
63	TOP	N: 1407249.93 E: 3272034.75	6725.50
64	RIPRAP	N: 1407095.43 E: 3272104.76	6719.70
65	RIPRAP	N: 1407083.18 E: 3272085.29	6719.70
66	RIPRAP	N: 1406986.52 E: 3272146.10	6719.13
67	RIPRAP/TOP	N: 1406982.01 E: 3272142.88	6719.71
68	RIPRAP	N: 1406976.32 E: 3272179.70	6719.18
69	RIPRAP/TOP	N: 1406971.91 E: 3272185.88	6719.53
70	TOE OF BERM	N: 1407195.19 E: 3271909.43	6722.45
71	RIPRAP	N: 1406929.44 E: 3272130.53	6717.82
72	RIPRAP	N: 1406906.99 E: 3272226.10	6717.23
73	RIPRAP/TOE	N: 1406962.54 E: 3272138.31	6718.16
74	RIPRAP/TOE	N: 1406947.87 E: 3272200.77	6717.77

Know what's **below.**
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ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

25043 — REGISTERED PROFESSIONAL ENGINEER

3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
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BRADY WILLIAMS

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Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
.	.	.	.

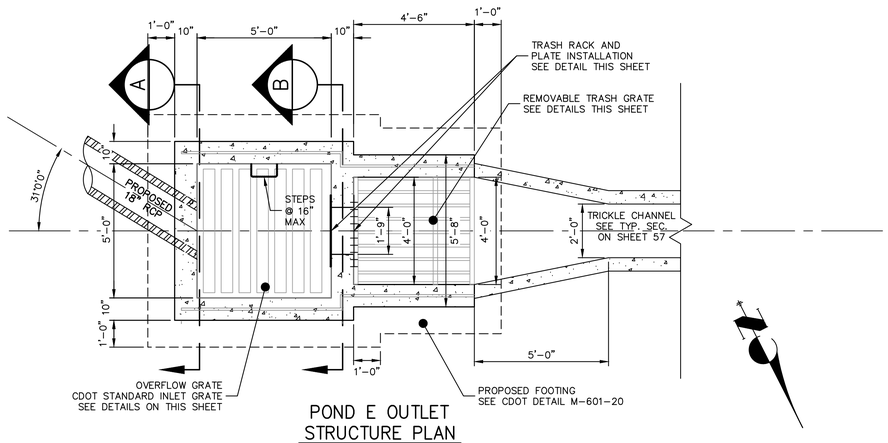
H-SCALE	1"=40'
V-SCALE	1"= 4'
DATE	3/20/24
DESIGNED BY	AAM
DRAWN BY	AAM
CHECKED BY	

SADDLEHORN RANCH – FILING 3

POND E GRADING PLAN

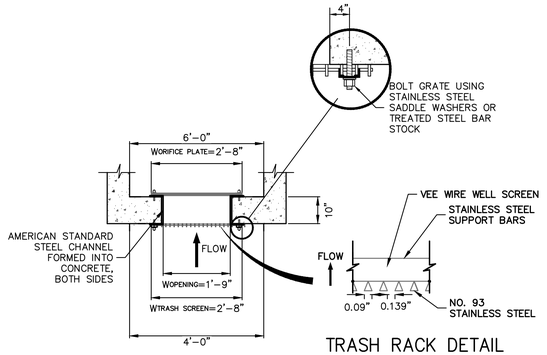
SHEET 58 OF 63

JOB NO. 25142.05



POND E OUTLET STRUCTURE PLAN

SCALE: 3/8"=1'

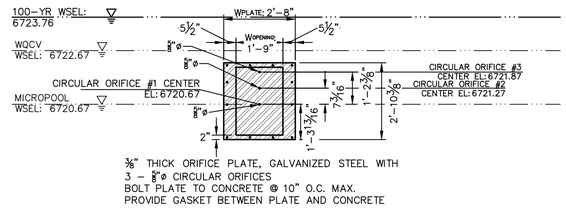


TRASH RACK AND PLATE DETAIL (PLAN)

N.T.S.

TRASH RACK DETAIL

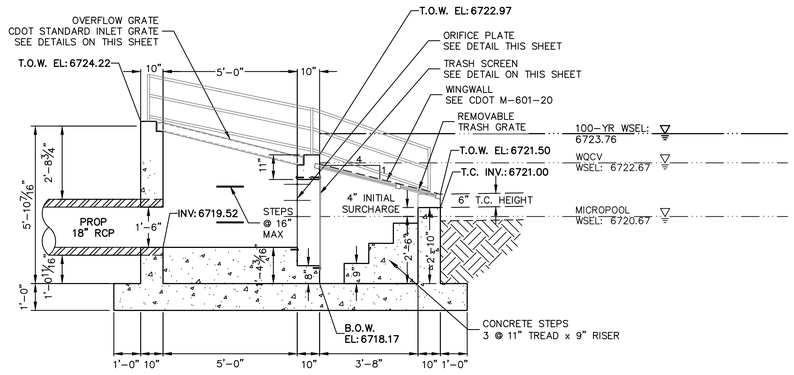
SCALE: N.T.S.



⅜" THICK ORIFICE PLATE, GALVANIZED STEEL WITH
3 – 8"ø CIRCULAR ORIFICES
BOLT PLATE TO CONCRETE @ 10" O.C. MAX.
PROVIDE GASKET BETWEEN PLATE AND CONCRETE

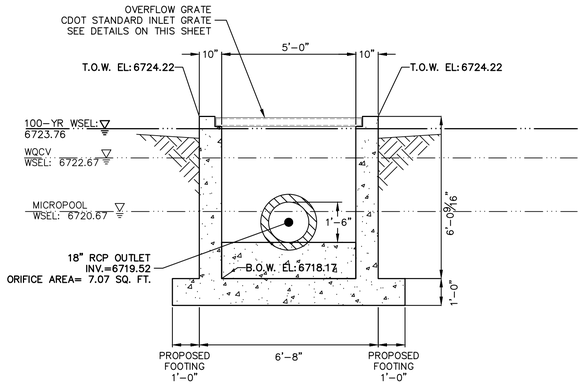
ORIFICE PLATE DETAIL

SCALE: 3/8"=1'



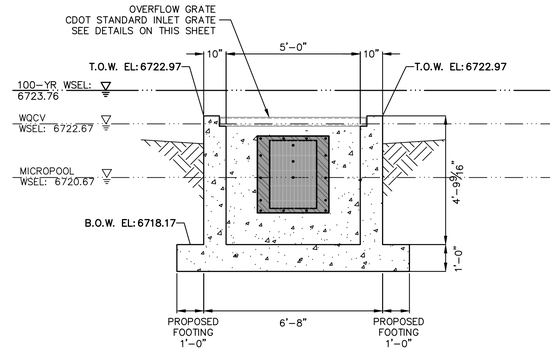
POND E OUTLET STRUCTURE PROFILE

SCALE: 3/8"=1'



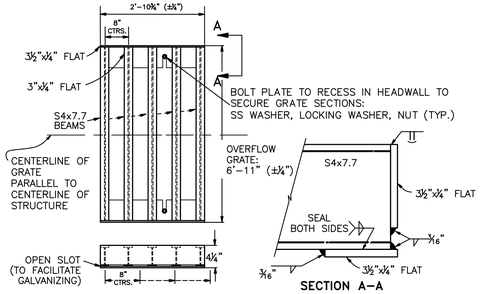
A A–A SECTION

SCALE: 3/8"=1'



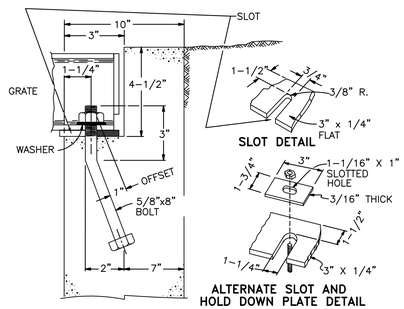
B B–B SECTION

SCALE: 3/8"=1'



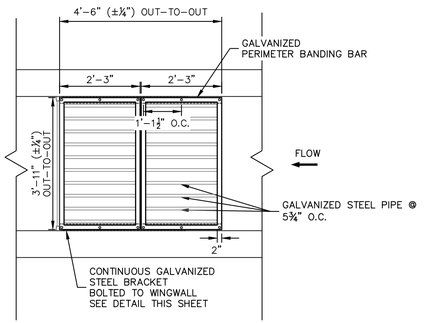
OVERFLOW GRATE DETAILS

N.T.S.



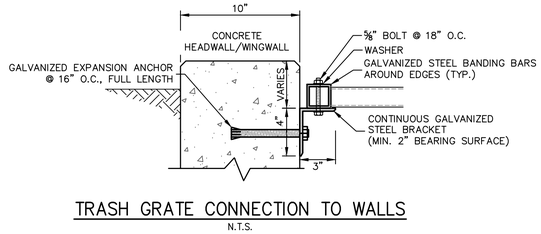
OVERFLOW GRATE INSTALLATION DETAIL

N.T.S.



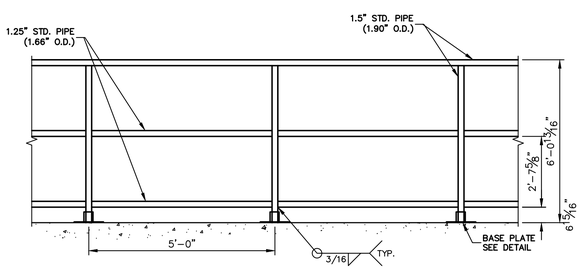
REMOVABLE TRASH GRATE DETAIL (PLAN)

N.T.S.



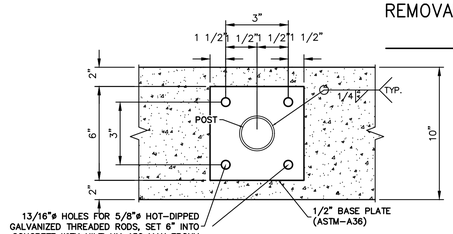
TRASH GRATE CONNECTION TO WALLS

N.T.S.



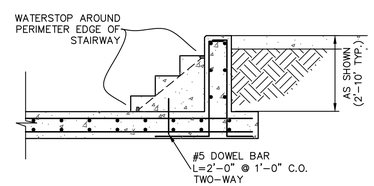
PEDESTRIAN RAILING DETAIL

SCALE: NTS
RAILING TO BE HOT-DIPPED GALVANIZED



BASE PLATE DETAIL

SCALE: NTS



CONCRETE STEP DETAIL

SCALE: 3/8"=1'

Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

3/20/24
DATE

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BRADY WILLIAMS

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No.	REVISION	BY	DATE

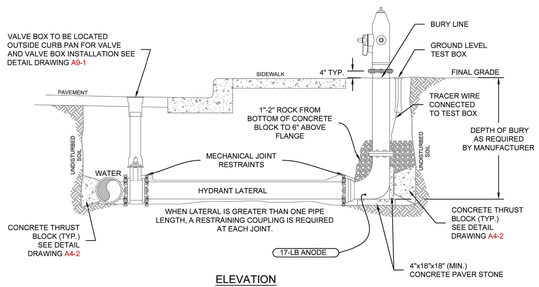
H-SCALE	3/8"=1'
V-SCALE	3/8"=1'
DATE	3/20/24
DESIGNED BY	AAM
DRAWN BY	MMC
CHECKED BY	

SADDLEHORN RANCH – FILING 3

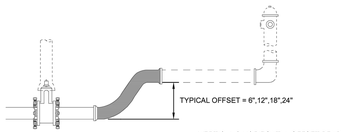
POND E OUTLET STRUCTURE DETAILS

SHEET 59 OF 63

JOB NO. 25142.05



ELEVATION



VERTICAL & HORIZONTAL OFFSET BEND UPON INSPECTOR'S AND COLORADO SPRINGS UTILITIES APPROVAL

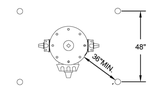
ELEVATION

NOTE:
DIP LATERALS AND HYDRANTS SHALL BE POLY WRAPPED AND INCLUDE 1-17lb. ANODE.

NOTES:

1. MECHANICAL JOINT RESTRAINTS SHALL BE INSTALLED PER DETAIL DRAWINGS A4-4, A4-5, & CHAPTER 5.
2. TRACER WIRE AND GROUND LEVEL TEST BOX TO BE INSTALLED WITH EACH FIRE HYDRANT. PLACE TEST BOX WITHIN 6" FROM THE HYDRANT.
3. REFERENCE DETAIL DRAWINGS A5-1 & A5-2 FOR FIRE HYDRANT LOCATION.
4. INSTALLATION OF A PRIVATE FIRE HYDRANT WILL REQUIRE A SECONDARY VALVE INSTALLED AT THE PROPERTY LINE.
5. HYDRANT BASE BLOCK SHALL BE PLACED ON UNDISTURBED EARTH.
6. DO NOT BLOCK WEEP HOLE WITH POLYWRAP.
7. COVER DRAIN ROCK WITH POLYWRAP PRIOR TO BACKFILL.
8. FOR HDPE HYDRANT CONNECTION SEE DETAIL DRAWING A10-9.
9. FOR PRIVATE FIRE HYDRANTS A SECONDARY VALVE SHALL BE INSTALLED ON THE PROPERTY LINE OR RIGHT-OF WAY LINE.

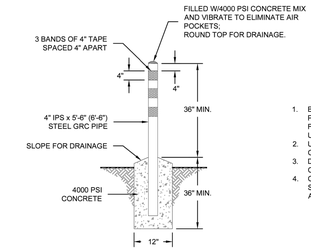
Colorado Springs Utilities	FIRE HYDRANT INSTALLATION	A5-3 DATED 03/2014



BOLLARD PLACEMENT (TOP VIEW)

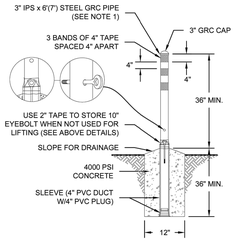
REFERENCE PROTECTION OF EQUIPMENT FROM VEHICULAR DAMAGE INFORMATION PACKET (COLORADO SPRINGS FIRE DEPARTMENT)

BOLLARDS ARE NECESSARY WHERE FIRE HYDRANTS ARE SUBJECT TO DAMAGE FROM VEHICULAR MOVEMENT.



CONCRETE FILLED POST

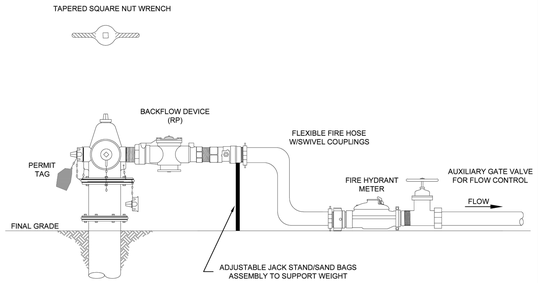
1. BARRICADE POSTS SHALL BE INSTALLED PLUMB AND LEVEL ACROSS THE TOPS FROM ONE TO ANOTHER WHEN TWO ARE USED.
2. USE 4" GRC PIPE AND PAINT WITH TWO COATS OF SILVER PAINT.
3. DIG 12" X 36" HOLE - CONDUIT TO BE CENTERED IN HOLE.
4. CONCRETE FOR ANCHORING POSTS SHALL BE 4000PSI MIX #2, APPROXIMATELY 8.3 CU.FT./POLE



REMOVABLE CAPPED - PIPE POST (WITH APPROVAL OF CSFD)

1. POST, REMOVABLE, AND ASSEMBLE WITH SCRAP 4" PVC DUCT SLEEVE, 10" X 1/2" EYEBOLT, 4" PVC PIPE PLUG, 2" BLACK TAPE AND 4" ORANGE REFLECTIVE TAPE AS SHOWN.
2. USE BANDS OF REFLECTIVE TAPE ON TOP OF POSTS TO WARN MOTORISTS, CYCLISTS, ETC. THE FIRST BAND SHOULD BE NO LOWER THAN 4" FROM THE TOP OF THE POST.
3. INTERMEDIATE POSTS ACROSS AT LEAST ONE SIDE (PREFERABLY THE FRONT) OF THE APPARATUS SHALL BE OF THE REMOVABLE TYPE; ALL OTHERS CAN BE PERMANENT.

Colorado Springs Utilities	FIRE HYDRANT PROTECTION POSTS (BOLLARDS)	A5-4 DATED 03/2014

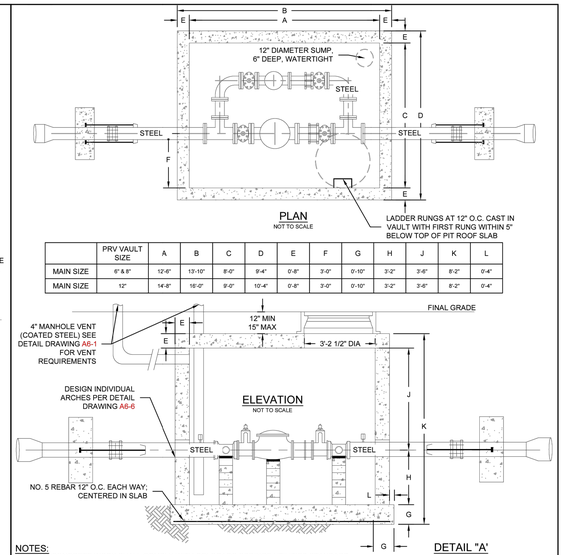


ASSEMBLY SEQUENCE

NOTES:

1. FLUSH HYDRANT BEFORE CONNECTING BACKFLOW AND METER CONFIGURATION WITH STAND. BACKFLOW PREVENTION ASSEMBLY MUST BE CONNECTED DIRECTLY TO THE HYDRANT.
2. HYDRANTS SHALL BE FULLY OPENED WHEN IN USE; DO NOT THROTTLE HYDRANT FLOW WITH THE HYDRANT STEM VALVE. FLOW SHALL BE CONTROLLED WITH THE OUTLET GATE VALVE ONLY. WHERE BALL VALVES ARE PROVIDED FOR ISOLATION AND TESTING OF THE RP, THE HANDLE SHALL BE REMOVED FROM THE VALVES. THESE VALVES ARE ONLY TO BE USED IN SERVICING AND TESTING RP AND SHALL NOT BE USED TO CONTROL HYDRANT FLOWS AND SHALL BE IN THE FULL OPEN POSITION AT ALL TIMES DURING HYDRANT FLOWS.
3. USE OF HYDRANT REQUIRES A PERMIT, AND ADHERENCE TO ALL TERMS AND CONDITIONS OF THE PERMIT AND ASSOCIATED REQUIREMENTS. CONTACT SPRINGS UTILITIES DEVELOPMENT SERVICES AT (719) 668-8111.
4. SEE REFERENCE HYDRANT USE PERMIT IN CONSTRUCTION SECTION 5.7.
5. USE OF A HYDRANT WITHOUT A BACKFLOW PREVENTION DEVICE IS IN VIOLATION OF THE COLORADO SPRINGS WATER CODE FOR CROSS CONNECTION CONTROL (CITY CODE 12.4.1203) ALL HYDRANT CONNECTIONS REQUIRE A REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER (RP) TYPE PER COLORADO PRIMARY DRINKING WATER REGULATION. KEEP THE RP CENTER DISCHARGE OUTLET AT LEAST 12 INCHES ABOVE GRADE.
6. NO HOSE SHALL BE CONNECTED BETWEEN THE HYDRANT AND BACKFLOW DEVICE.
7. CONTRACTOR SHALL USE A HYDRANT WRENCH WITH TAPERED SQUARE BOX DESIGNED SPECIFICALLY FOR COLORADO SPRINGS UTILITIES FIRE HYDRANTS TO OPERATE THE FIRE HYDRANT. NO OTHER TYPE OF WRENCH SHALL BE USED.
8. PERMITS WILL NOT BE ISSUED FOR FIRE HYDRANTS WITH WATER PRESSURE GREATER THAN 120 PSI.

Colorado Springs Utilities	FIRE HYDRANT BACKFLOW AND METER CONFIGURATION	A5-5 DATED 01/2017

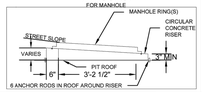


PLAN
NOT TO SCALE

LADDER RUNGS AT 12" O.C. CAST IN VAULT WITH FIRST RUNG WITHIN 5" BELOW TOP OF PIT ROOF SLAB

	PRV VAULT SIZE	A	B	C	D	E	F	G	H	J	K	L
MAIN SIZE	6" & 8"	12'-6"	13'-10"	8'-0"	9'-4"	0'-8"	3'-0"	0'-10"	3'-2"	3'-8"	8'-2"	0'-4"
MAIN SIZE	12"	14'-8"	16'-0"	9'-0"	10'-4"	0'-8"	3'-0"	0'-10"	3'-2"	3'-8"	8'-2"	0'-4"

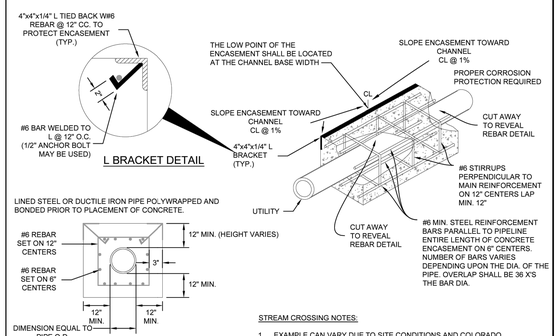
DETAIL 'A'



NOTES:

1. ALL CONCRETE WORK SHALL COMPLY WITH COLORADO SPRINGS UTILITIES STANDARD SPECIFICATIONS AND THE LATEST ACI-318 CODE.
2. ALL CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
3. VAULTS FOR PRESSURE REGULATOR STATIONS LARGER THAN 12 INCH WILL BE SPECIFICALLY DESIGNED BY THE ENGINEER AND APPROVED BY COLORADO SPRINGS UTILITIES.
4. SHOP DETAIL DRAWINGS FOR ALL VAULTS ARE REQUIRED AND WILL BE APPROVED BY COLORADO SPRINGS UTILITIES.
5. FOR VAULT OPENINGS SEE PER DETAIL DRAWING A6-6.
6. STEEL PIPE SHALL BE COATED PER SECTION 4.4.B.7.

Colorado Springs Utilities	PRESSURE REGULATOR STATIONS 6", 8" & 12" VAULT DIMENSIONS	A6-4 DATED 01/2017



L BRACKET DETAIL

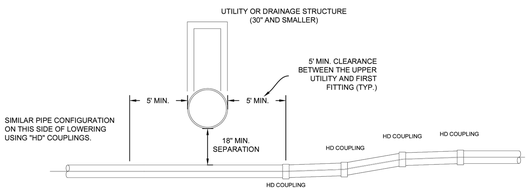
CONCRETE ENCASEMENT DETAIL WITHOUT CAISSON

STREAM CROSSING NOTES:

1. EXAMPLE CAN VARY DUE TO SITE CONDITIONS AND COLORADO SPRINGS UTILITIES INSPECTOR'S DIRECTIONS.
2. ALL STREAM CROSSINGS SHALL BE REVIEWED AND APPROVED BY COLORADO SPRINGS UTILITIES PLANNING AND ENGINEERING.
3. CONCRETE ENCASEMENT OF THE WATER MAIN IS NOT REQUIRED WHEN CROSSING FORMED CONCRETE CHANNELS. CASING PIPE IS STILL REQUIRED.

Colorado Springs Utilities	PIPE ENCASEMENT DETAIL	A7-8 DATED 01/2017

EXAMPLE OF A SLIP JOINT OF PVC PIPE WITH HIGH DEFL COUPLINGS



HIGH DEFLECTION COUPLING (4'-12") 4° DEFL. (i.e. MAX. 2° IN AND OUT OF COUPLING) (REFERENCE DETAIL DRAWING A4-1)

NOTE:

1. MINIMUM PIPE LENGTH 5' BETWEEN EACH HD COUPLING.

ELEVATION

PER SLIP JOINT OF PVC PIPE W/HIGH DEFLECTION COUPLINGS

PIPE DATA		MFRS. TOTAL JOINT DEFL W/ COUPL	DESIGN DEFLECTION (80% MAX.)		MIN. RADIUS FOR DEFLECTING CURVES WITH HIGH DEFL. COUPLINGS
	PIPE SIZE		(HORZ. DEFL.)	(VERT. DEFL.)	20'L
CLASS 305 (DR 41)	4"	5°00'	4°00"	6.99%	286'
	6"	5°00'	4°00"	6.99%	286'
	8"	5°00'	4°00"	6.99%	286'
CLASS 235 (DR 51)	12"	5°00'	4°00"	6.99%	286'

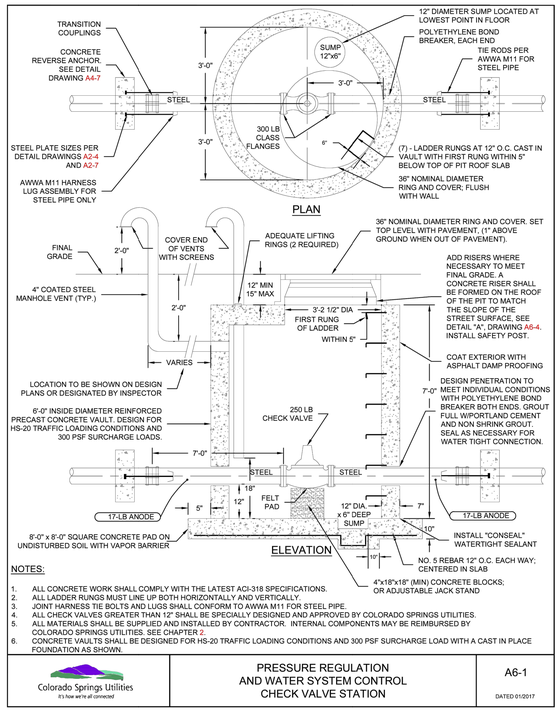
NO DEFLECTION COUPLINGS FOR 16" OR GREATER

DATA FOR PVC PIPES

NOTES:

1. SEE DETAIL DRAWING A4-1 DETAIL FOR HORIZONTAL RADIUS.

Colorado Springs Utilities	LOWERING WITH HIGH DEFLECTION COUPLINGS	A7-9 DATED 03/2014



NOTES:

1. ALL CONCRETE WORK SHALL COMPLY WITH THE LATEST ACI-318 SPECIFICATIONS.
2. ALL LADDER RUNGS MUST LINE UP BOTH HORIZONTALLY AND VERTICALLY.
3. JOINT HARNESS TIE BOLTS AND LUGS SHALL CONFORM TO AWWA M11 FOR STEEL PIPE.
4. ALL CHECK VALVES GREATER THAN 12" SHALL BE SPECIALLY DESIGNED AND APPROVED BY COLORADO SPRINGS UTILITIES.
5. ALL MATERIALS SHALL BE SUPPLIED AND INSTALLED BY CONTRACTOR. INTERNAL COMPONENTS MAY BE REIMBURSED BY COLORADO SPRINGS UTILITIES. SEE CHAPTER 2.
6. CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD WITH A CAST IN PLACE FOUNDATION AS SHOWN.

Colorado Springs Utilities	PRESSURE REGULATION AND WATER SYSTEM CONTROL CHECK VALVE STATION	A6-1 DATED 01/2017

Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

COLORADO REGISTERED BRYAN T. LAW 25043 PROFESSIONAL ENGINEER

3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
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BRADY WILLIAMS

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Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
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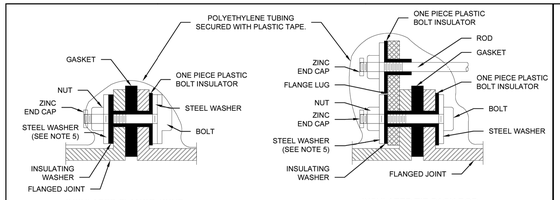
H-SCALE	N/A		
V-SCALE	N/A		
DATE	3/20/24		
DESIGNED BY	MMC		
DRAWN BY	MMC		
CHECKED BY			

SADDLEHORN RANCH – FILING 3
DETAILS

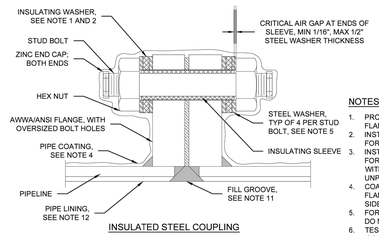
SHEET 60 OF 63

JOB NO. 25142.05

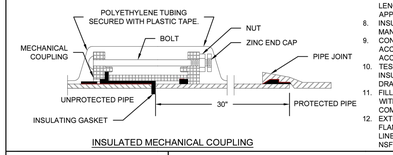


INSULATED FLANGE JOINT

INSULATED TIE BACK ROD
(WITH APPROVAL OF COLORADO SPRINGS UTILITIES)



INSULATED STEEL COUPLING



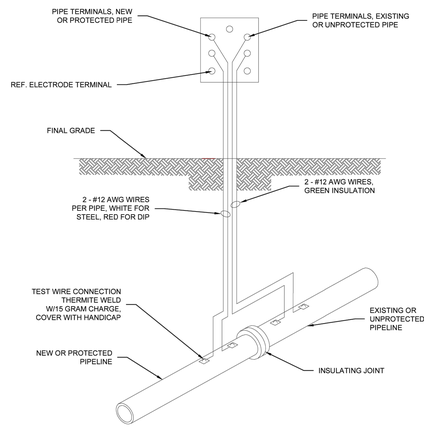
INSULATED MECHANICAL COUPLING

NOTES:

1. PROVIDE INSULATING KIT FOR APPLICABLE FLANGE TYPE AND PRESSURE RATING.
2. INSTALL DOUBLE INSULATING WASHER SET FOR VAULT OR EXPOSED FLANGES.
3. INSTALL SINGLE INSULATING WASHER SET FOR BURIED OR SUBMERGED FLANGES WITH INSULATORS OR WRAP ON UNPROTECTED SIDE OF FLANGE.
4. COAT BURIED OR IMMERSED INSULATING FLANGES FOR 12-INCHES MINIMUM ON EACH SIDE OF FLANGE.
5. FOR PIPE LESS THAN 36-INCHES DIAMETER, DO NOT INSTALL INNER STEEL WASHERS.
6. TEST COMPLETED JOINT FOR ELECTRICAL ISOLATION AND REPAIR AS REQUIRED.
7. CARE SHOULD BE TAKEN TO INSURE THAT THE TIE-BACK BOLTS DO NOT, ALONG THEIR LENGTH, CONTACT ANY PART OF THE PIPE APPURTENANCES.
8. INSULATION KITS SHALL BE INSTALLED PER MANUFACTURER RECOMMENDATIONS.
9. CONTINUITY TESTING SHALL BE ACCOMPLISHED PRIOR TO FINAL ACCEPTANCE.
10. TEST STATIONS SHALL BE INSTALLED AT INSULATING COUPLINGS PER DETAIL DRAWING A8-4.
11. FILL INTERIOR GAP BETWEEN FLANGES WITH DIELECTRIC FILLER OF SEALANT COMPATIBLE WITH SPECIFIED PIPE LINING.
12. EXTEND SPECIFIED PIPE LINING TO FACE OF FLANGE AND COAT INTERIOR OF MORTAR LINED PIPE FOR TWO PIPE DIAMETERS WITH NSF APPROVED EPOXY AT 20 MILS DFT.

Colorado Springs Utilities	INSULATOR INSTALLATION	A8-3
It's how we're all connected		DATED 03/2014

TERMINAL BOARD
WIRING DIAGRAM



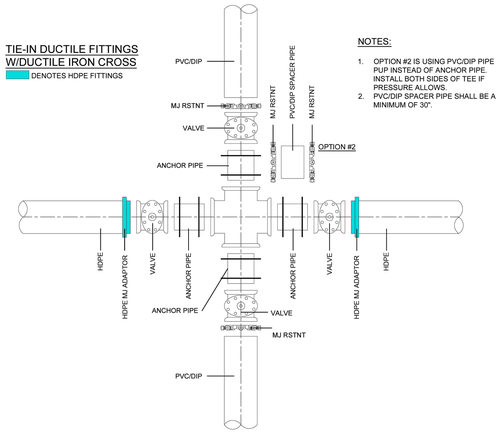
NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH COLORADO SPRINGS UTILITIES TO WIRE THE TERMINAL BOARD.
2. THERMITE WELD WIRES TO PIPE WITH A 15 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
3. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
4. THE CONTRACTOR SHALL VERIFY CONTINUITY OF ALL WIRES TO TERMINAL BOARD PRIOR TO FINAL ACCEPTANCE.

Colorado Springs Utilities	INSTALLATION OF CATHODIC PROTECTION TEST STATION AT AN INSULATING JOINT	A8-4
It's how we're all connected		DATED 03/2014

TIE-IN DUCTILE FITTINGS
W/DUCTILE IRON CROSS

DENOTES HDPE FITTINGS



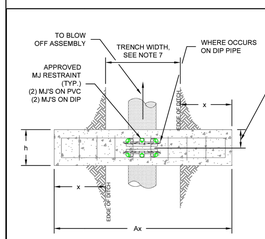
NOTES:

1. OPTION #2 IS USING PVC/DIP PIPE PUP INSTEAD OF ANCHOR PIPE. INSTALL BOTH SIDES OF TEE IF PRESSURE ALLOWS.
2. PVC/DIP SPACER PIPE SHALL BE A MINIMUM OF 30".

NOTES:

1. FLANGED FITTINGS TO BE APPROVED BY COLORADO SPRINGS UTILITIES. FOR 16" OR LARGER HDPE PIPE USE BUTTERFLY VALVES.
2. WHEN CONNECTING AN MJ FITTING TO AN MJ FITTING, AN MJ KIT SHALL BE USED. THE MJ KIT CONSISTS OF A GASKET AND BOLTS (AND A RING IF NOT ON THE FITTING)

Colorado Springs Utilities	DUCTILE IRON MAIN CROSS CONNECTION TO PVC/DIP USING HDPE FITTINGS AND/OR DUCTILE FITTINGS	A10-5
It's how we're all connected		DATED 06/2015



PLAN
DEAD END OR
REVERSE ANCHOR

ELEVATION
DEAD END OR
REVERSE ANCHOR

DIAMETER (in)	PRESSURE (psi)	x (in)	Ax (in)	y (in)	Ay (in)	Ab (sf)	h (in)	Vol (cy)
4	250	12	72	12	28.80	6.80	18	1.0
6	250	18	84	12	30.90	9.73	18	1.0
8	250	36	120	12	33.05	18.53	18	1.5
12	170	36	120	15	43.20	24.60	18	2.0
12	250	48	144	18	49.20	36.80	24	3.75
16	170	54	156	18	53.40	44.05	24	4.25
16	250	60	168	24	65.40	60.50	36	8.5

NOTES:

1. THE MINIMUM BEARING SURFACE AREAS SHOWN ARE BASED ON A MAX STATIC PIPE PRESSURE OF 170/250 POUNDS PER SQUARE INCH PLUS A SAFETY FACTOR OF 1.5, AND AN ALLOWABLE SOIL BEARING CAPACITY OF 1500 POUNDS PER SQUARE FOOT. FOR HDPE ADDITIONAL ASSUMPTIONS INCLUDE A MAX 50°-F TEMPERATURE CHANGE AND A POISSON RATIO OF 0.45. REFERENCE AWWA M-23, M-41 AND M-55.
2. THE DESIGN ENGINEER IS RESPONSIBLE FOR VERIFYING ASSUMPTION BASED ON ACTUAL SITE CONDITIONS. IF SITE VARY FROM THE ASSUMPTIONS THE DESIGN ENGINEER SHALL PROVIDE A SITE SPECIFIC DESIGN THAT SHALL BE IN ACCORDANCE WITH AWWA M-23, PVC PIPE - DESIGN AND INSTALLATION AND AWWA M-41, DUCTILE-IRON PIPE AND FITTINGS. SITE SPECIFIC DESIGNS USING GEOTECHNICAL INFORMATION SHALL BE SUBMITTED TO COLORADO SPRINGS UTILITIES FOR APPROVAL.
3. THE MINIMUM LATERAL BEARING SURFACE AREA (Ab) AND APPROXIMATE VOLUME OF CONCRETE (Vol) SHALL BE SHOWN ON THE CONSTRUCTION PLANS FOR ALL CONCRETE REVERSE ANCHORS.
4. THE APPROXIMATE VOLUMES SHOWN ARE BASED ON THE MINIMUM DIMENSIONS IN THE TABLE. THE APPROXIMATE VOLUME IS ROUNDED UP TO THE NEAREST 0.25 CUBIC YARDS.
5. A SITE SPECIFIC DESIGN SHALL BE REQUIRED FOR PIPES LARGER THAN 16 INCHES OR MAX STATIC PIPE PRESSURES GREATER THAN 250 POUNDS PER SQUARE INCH. THE DESIGN ENGINEER HAS THE OPTION OF PROVIDING A SITE SPECIFIC DESIGN FOR PIPES SMALLER THAN 16 INCHES OR MAX STATIC PRESSURES LESS THAN THE PRESSURE LISTED IN THE TABLE.
6. FOR CORROSION PROTECTION OF THE RODS SEE DETAIL DRAWING A8-11.
7. A TRENCH WIDTH OF 4 FEET AND 6" BEDDING UNDER THE PIPE ARE ASSUMED FOR BEARING CALCULATIONS, (Ax, Ay, x AND y).
8. THE DESIGN ENGINEER SHALL ENSURE THE CONSTRUCTION OF THE CONCRETE REVERSE ANCHOR SHALL NOT CONFLICT WITH OTHER UTILITIES.
9. DUCTILE IRON FITTINGS AND PIPE SHALL BE WRAPPED IN POLYETHYLENE TUBING WHERE ADJACENT TO CONCRETE.

Colorado Springs Utilities	CONCRETE REVERSE ANCHOR FOR MECHANICAL JOINT RESTRAINTS	A4-8
It's how we're all connected		DATED 06/2015

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

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V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	MMC
DRAWN BY	MMC
CHECKED BY	

SADDLEHORN RANCH – FILING 3
DETAILS

SHEET 61 OF 63
JOB NO. 25142.05

CSU WATER LESS SECTION 2.6.H.2 UTILITY CROSSINGS

WHEN CROSSING ANOTHER UTILITY, MINIMUM VERTICAL SEPARATION IS REQUIRED TO BE MAINTAINED, REFER TO SECTION 2.6.G. WHEN CROSSING A STORM SEWER OR WASTEWATER MAIN, IT IS PREFERRED TO LAY THE WATER MAIN ABOVE THE STORM SEWER OR WASTEWATER MAIN. HOWEVER, A WATER LOWERING MAY BE REQUIRED TO MEET DEPTH AND VERTICAL SEPARATION CRITERIA, REFER TO DETAIL DRAWING A7–1. WHERE THE WATER MAIN CROSSES UNDER ANOTHER UTILITY GREATER THAN 30 INCHES IN DIAMETER, THE WATER MAIN SHALL BE INSTALLED IN A CASING PIPE, SEE DETAIL DRAWING A7–2.

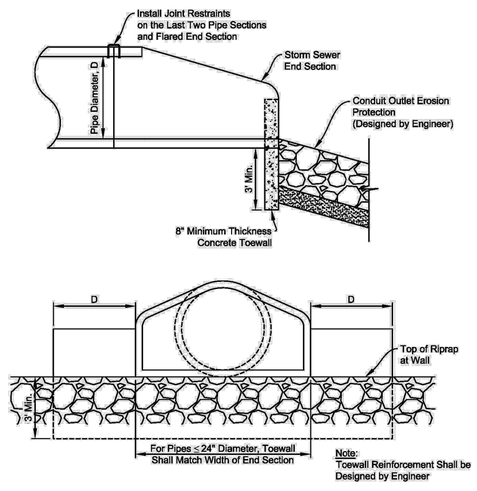
WHERE THE WATER MAIN CROSSES OTHER UTILITY INFRASTRUCTURE AND THE REQUIRED SEPARATION CANNOT BE MET, THE DESIGN ENGINEER SHALL DESIGN AND CONSTRUCT THE CROSSING TO PROTECT THE WATER MAIN FROM OTHER UTILITY INFRASTRUCTURE. WHERE THE WATER MAIN CROSSES A WASTEWATER, STORM SEWER, OR A NONPOTABLE WATER MAIN OR SERVICE LINE AND THE WATER MAIN IS THE LOWER UTILITY OR WHERE THE MINIMUM SEPARATION CANNOT BE MET, THE WATER OR OTHER UTILITY SHALL HAVE SECONDARY CONTAINMENT. IF THE WATER MAIN IS GREATER THAN 5 FEET BELOW THE WASTEWATER, STORM SEWER, OR A NONPOTABLE WATER MAIN SECONDARY CONTAINMENT IS NOT REQUIRED. THE FOLLOWING METHODS OF INSTALLATION SHALL BE CONSIDERED SECONDARY CONTAINMENT BY COLORADO SPRINGS UTILITIES:

- THE WATER MAIN OR THE WASTEWATER, STORM SEWER, OR NONPOTABLE WATER MAIN SHALL BE INSTALLED IN A CASING PIPE EXTENDING NO LESS THAN 9 FEET ON EITHER SIDE OF THE CENTERLINE OF THE CROSSING. SEE DETAIL DRAWING A7–3, OR
- THE WATER MAIN OR THE WASTEWATER, STORM SEWER, OR NONPOTABLE WATER MAIN SHALL BE CONSTRUCTED WITHOUT MECHANICAL JOINTS FOR 9 FEET ON EITHER SIDE OF THE CROSSING, OR
- A FULL JOINT OF WATER MAIN SHALL BE CENTERED UNDER THE UPPER UTILITY, OR
- THE WATER MAIN OR THE WASTEWATER, STORM SEWER, OR NONPOTABLE WATER MAIN SHALL BE ENCASED IN FLOW FILL, PER THE SPECIFICATION IN THE SECTION 4.4.S, FOR 9 FEET ON EITHER SIDE OF THE CROSSING, WITH LIMITS EXTENDING TO 6 INCHES AND ABOVE THE PIPE.
- THE WATER MAIN IS CONSTRUCTED OF HDPE OR WELDED STEEL AND THERE ARE NO MECHANICAL FITTINGS WITHIN 9 FEET ON EITHER SIDE OF THE CROSSING.

WHEREVER MINIMUM SEPARATION CANNOT BE MET, FLOW FILL, PER SECTION 4.4.S, SHALL BE USED TO ACHIEVE ACCEPTABLE COMPACTION BETWEEN THE UPPER AND LOWER UTILITY, SEE DETAIL DRAWING A7–6.

IF THE WATER MAIN CROSSES ANOTHER UTILITY, AND A GEOTECHNICAL ANALYSIS OR FIELD CONDITIONS INDICATE POTENTIAL SETTLEMENT THAT MAY CAUSE A POINT LOAD ON THE WATER MAIN, A SAFETY HAZARD EXISTS THAT WOULD COMPROMISE MAINTENANCE OF THE WATER MAIN, OR ADEQUATE SEPARATION CANNOT BE ATTAINED TO PREVENT A POINT LOAD ON THE WATER MAIN, THEN BRIDGING OF THE WATER MAIN OR OTHER UTILITY MAY BE REQUIRED AT THE DISCRETION OF COLORADO SPRINGS UTILITIES. SEE DETAIL DRAWINGS A7–5 AND A7–6.

Figure 10-1. Conceptual Toewall Detail



Know what's below. Call before you dig.

ENGINEER'S STATEMENT

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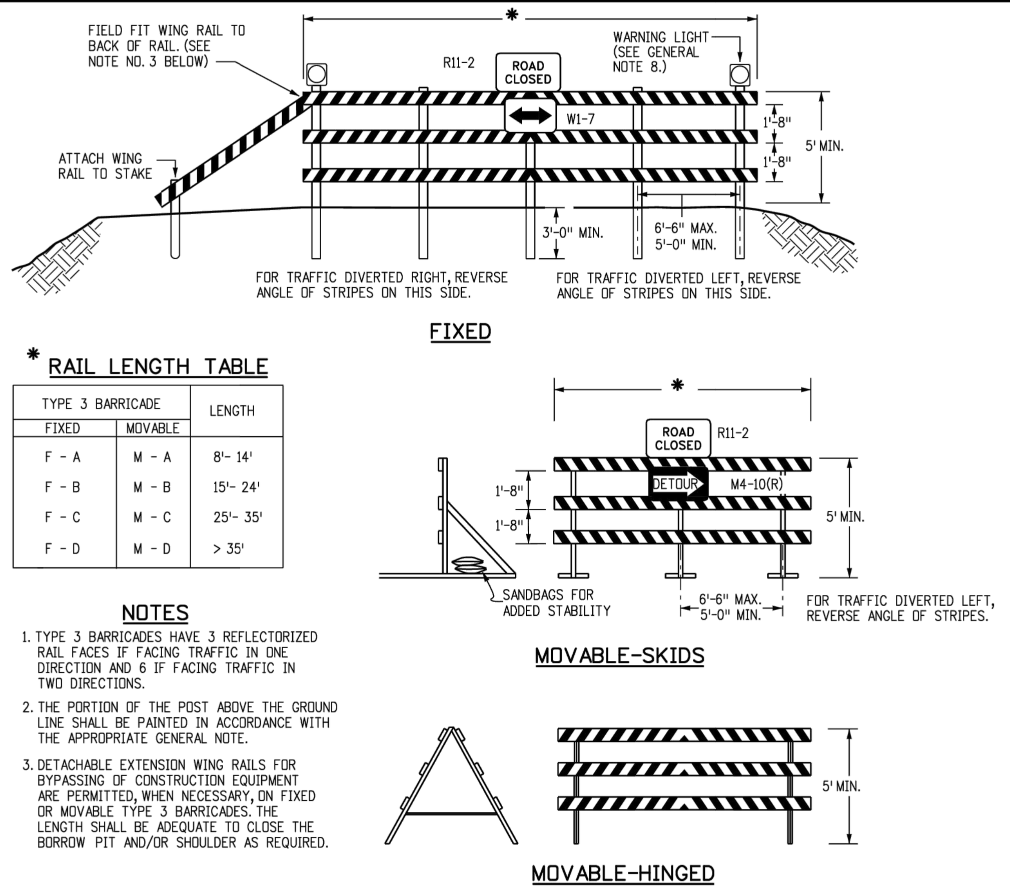


*** RAIL LENGTH TABLE**

TYPE 3 BARRICADE		LENGTH
FIXED	MOVABLE	
F - A	M - A	8'- 14'
F - B	M - B	15'- 24'
F - C	M - C	25'- 35'
F - D	M - D	> 35'

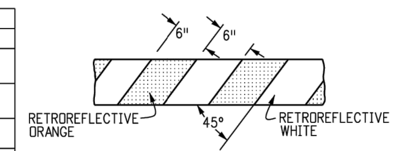
NOTES

1. TYPE 3 BARRICADES HAVE 3 REFLECTORIZED RAIL FACES IF FACING TRAFFIC IN ONE DIRECTION AND 6 IF FACING TRAFFIC IN TWO DIRECTIONS.
2. THE PORTION OF THE POST ABOVE THE GROUND LINE SHALL BE PAINTED IN ACCORDANCE WITH THE APPROPRIATE GENERAL NOTE.
3. DETACHABLE EXTENSION WING RAILS FOR BYPASSING OF CONSTRUCTION EQUIPMENT ARE PERMITTED, WHEN NECESSARY, ON FIXED OR MOVABLE TYPE 3 BARRICADES. THE LENGTH SHALL BE ADEQUATE TO CLOSE THE BORROW PIT AND/OR SHOULDER AS REQUIRED.

TYPICAL TYPE 3 BARRICADES

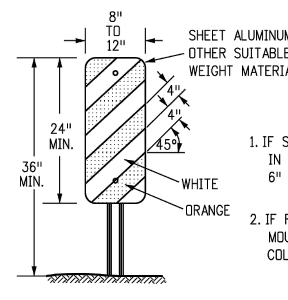
TYPICAL BARRICADE CHARACTERISTICS

	BARRICADE DESIGNATIONS
	TYPE 3
RAIL WIDTH	8" MIN.-12" MAX.
RAIL LENGTH	AS REQUIRED, SEE RAIL LENGTH TABLE
HEIGHT	5' MIN.
USE	TEMPORARY OR PERMANENT
STRIPES	SEE DETAIL OF BARRICADE STRIPING AND APPROPRIATE GENERAL NOTES.



FOR RAILS LESS THAN 3' LONG, 4" WIDE STRIPES SHALL BE USED.

RAIL STRIPING DETAIL

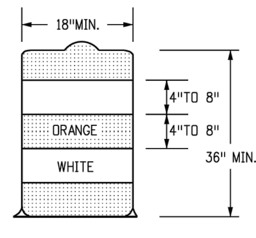


1. IF SPECIAL PANELS 3' OR GREATER IN HEIGHT ARE REQUIRED, THEN 6" STRIPES SHALL BE USED.
2. IF FIXED PLACEMENT IS REQUIRED, MOUNT ON DELINEATOR POST. SEE COLORADO STANDARD PLAN S-612-1.

TYPICAL VERTICAL PANEL

GENERAL NOTES

1. THE VARIOUS TYPES, COMBINATIONS AND APPLICATIONS OF SIGNS AND WARNING LIGHTS FOR BARRICADES REQUIRED FOR EACH PROJECT SHALL BE:
   A. AS SPECIFIED OR DETAILED IN THE PLANS.
   B. AS SHOWN IN APPLICABLE TYPICAL ILLUSTRATIONS.
   C. AS CALLED FOR AND SUBJECT TO APPROVAL BY THE ENGINEER.
2. TEMPORARY AND PERMANENT BARRICADES TYPE 3 SHALL BE FABRICATED FROM APPROVED CRASH TESTED MATERIALS. SEE SECTION 614 AND 630 OF THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION FOR ADDITIONAL REQUIREMENTS.
3. ALL PAINTING SHALL CONFORM WITH THE FOLLOWING:
   A. THE APPLICABLE SECTION OF 508 OF THE STANDARD SPECIFICATIONS.
   B. ALL SKIDS, BRACES AND POSTS SHALL BE PAINTED WITH 2 COATS OF EXTERIOR WHITE PAINT
   C. THE BACKSIDES OF RAILS AND VERTICAL PANEL CHANNELIZING DEVICES FACING ONE DIRECTION OF TRAFFIC ONLY SHALL BE PAINTED WITH "EXTERIOR WHITE PAINT.
   D. ALUMINUM OR GALVANIZED STEEL SKIDS, BRACES AND POSTS SHALL NOT BE PAINTED.
4. ALL STRIPED SURFACES SHALL CONFORM WITH THE FOLLOWING:
   A. THE ENTIRE AREA OF ORANGE AND WHITE STRIPES SHALL BE FABRICATED AS ONE PIECE.
   B. HORIZONTAL RAILS, WING RAILS AND VERTICAL PANEL CHANNELIZING DEVICES SHALL HAVE ORANGE AND WHITE STRIPES ON THE FACE SIDE(S) SLANTING DOWNWARD AT A 45° ANGLE TOWARD THE SIDE(S) TO WHICH TRAFFIC IS TO PASS OR TURN.
   C. PERMANENT BARRICADES SHALL HAVE RETROREFLECTIVE RED AND WHITE STRIPES. THEY MAY BE USED AT LOCATIONS TO MARK THE END OF A ROAD, STREET OR HIGHWAY THAT ENDS AT A "T" INTERSECTION, OR WHERE THERE IS NO CROSSROAD OR OUTLET.
   D. ALL RETROREFLECTIVE SHEETING SHALL CONFORM TO ASTM D4956:
      1. ORANGE AND WHITE SHALL BE TYPE II, III OR IV.
      2. RED AND WHITE SHALL BE TYPE II, III OR IV.
5. FOR ALL WOODEN BARRICADE COMPONENTS NOMINAL LUMBER DIMENSIONS ARE SATISFACTORY.
6. ALL SCREWS, BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED OR CADMIUM PLATED.
7. STABILITY OF BARRICADES AND CHANNELIZING DEVICES SHALL CONFORM WITH THE FOLLOWING:
   A. SKIDS (BASES) OF MOVABLE BARRICADES SHALL BE WEIGHTED WITH SANDBAGS ONLY WHERE NECESSARY TO PROVIDE STABILITY
   B. NO MOVABLE OR PORTABLE DEVICE SHALL BE WEIGHTED BY ANY METHOD OR WITH ANY MATERIAL THAT WOULD MAKE THEM HAZARDOUS TO MOTORISTS.
8. WARNING LIGHTS USED WITH BARRICADES, DRUMS AND VERTICAL PANELS SHALL CONFORM WITH THE FOLLOWING:
   A. USE FLASHING WARNING LIGHTS WHEN DEVICES ARE USED SINGLY, AND STEADY BURN LIGHTS WHEN THEY ARE USED IN A SERIES FOR CHANNELIZATION.
   B. THEY SHALL BE POSITIONED ABOVE THE TOP RAIL OF BARRICADES OR ON TOP OF DRUMS AND VERTICAL PANELS.
9. CONCRETE BARRIER (TEMPORARY) SHALL CONFORM WITH:
   A. PRECAST CONCRETE BARRIER AS SHOWN ON COLORADO STANDARD PLAN M-606-14.
   B. BARRIER REFLECTORS SHALL BE INSTALLED THAT MEET THE REQUIREMENTS OF STANDARD TYPICAL DELINEATOR INSTALLATIONS, EXCEPT THE MAXIMUM SPACING SHALL BE 50', AND THEY WILL NOT BE PAID FOR BUT ARE INCLUDED IN THE COST OF THE BARRIER.
   C. CONCRETE BARRIER END TREATMENT SHALL BE IN ACCORDANCE WITH CLEAR ZONE CRITERIA, AND PLACED AS SHOWN ON THE PLANS.
10. SIGN PANELS MOUNTED ON BARRICADES WILL BE PAID FOR SEPARATELY.



1. THE 18" MINIMUM DIMENSION SHALL APPLY TO THE SMALLEST MEASUREMENT OF OBLONG, RECTANGULAR, OR FLATTENED SIDE DRUMS.
2. THERE SHALL BE AT LEAST TWO ORANGE AND TWO WHITE HORIZONTAL, CIRCUMFERENTIAL, RETROREFLECTIVE STRIPES ON EACH DRUM.

TYPICAL DRUM

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12	Initials: JSW	Date:	Comments
Last Modification Date: 06/03/16	Initials: MBhat	06/03/16	UPDATED GENERAL NOTES 4 C
Full Path: www.coloradodot.info/library/traffic/traffic-s-standard-plans			
Drawing File Name: S-630-02.dgn			
CAD Ver.: MicroStation V8i Scale: Not to Scale Units: English			

Colorado Department of Transportation
2829 W Howard Place
Denver, Colorado 80204
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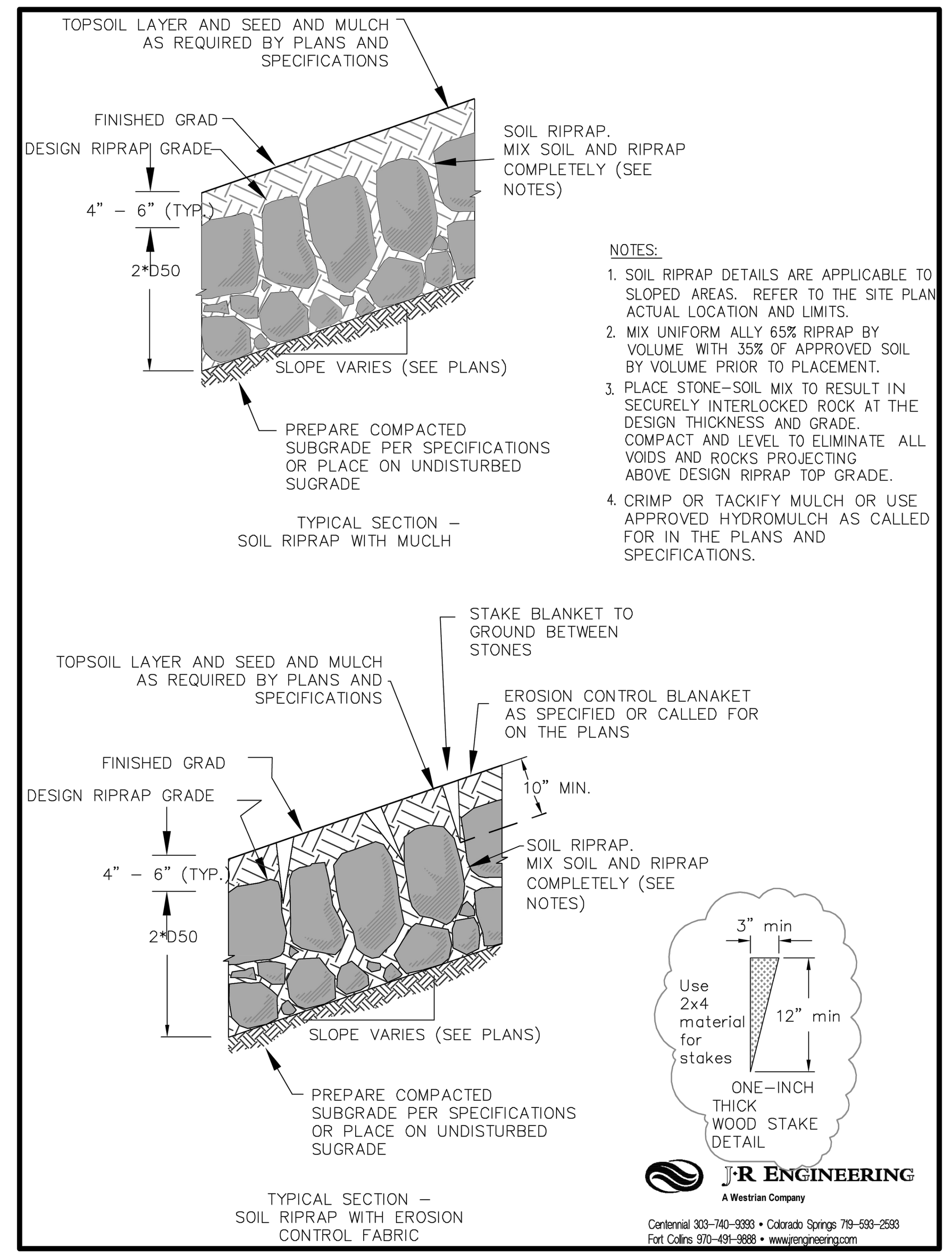
Safety & Traffic Engineering KCM

BARRICADES, DRUMS, CONCRETE BARRIERS (TEMP) & VERTICAL PANELS
Issued By: Safety & Traffic Engineering Branch July 4, 2012

STANDARD PLAN NO. S-630-2
Sheet No. 1 of 1

X:\References_Criteria\UDFCD\Details\Fig MD-13b Soil Riprap Typical Details.dwg, 8.5x11 Portrait, 4/19/2019 9:29:51 AM, CS



NOTES:

1. SOIL RIPRAP DETAILS ARE APPLICABLE TO SLOPED AREAS. REFER TO THE SITE PLAN ACTUAL LOCATION AND LIMITS.
2. MIX UNIFORM ALLY 65% RIPRAP BY VOLUME WITH 35% OF APPROVED SOIL BY VOLUME PRIOR TO PLACEMENT.
3. PLACE STONE–SOIL MIX TO RESULT IN SECURELY INTERLOCKED ROCK AT THE DESIGN THICKNESS AND GRADE. COMPACT AND LEVEL TO ELIMINATE ALL VOIDS AND ROCKS PROJECTING ABOVE DESIGN RIPRAP TOP GRADE.
4. CRIMP OR TACKIFY MULCH OR USE APPROVED HYDROMULCH AS CALLED FOR IN THE PLANS AND SPECIFICATIONS.

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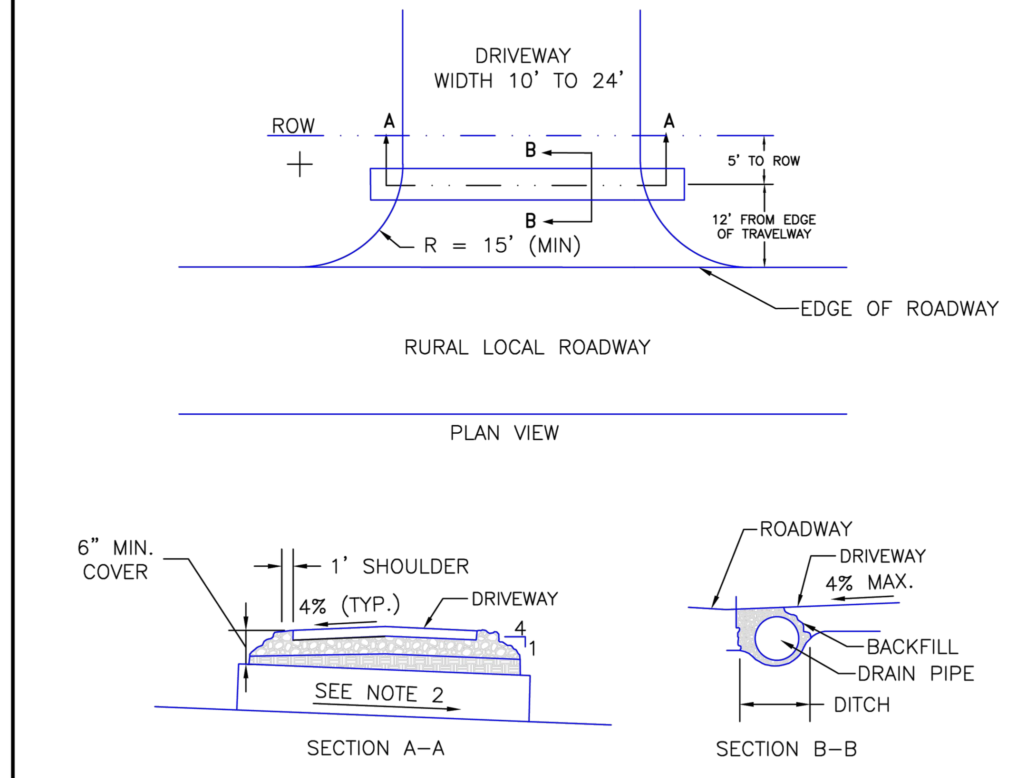
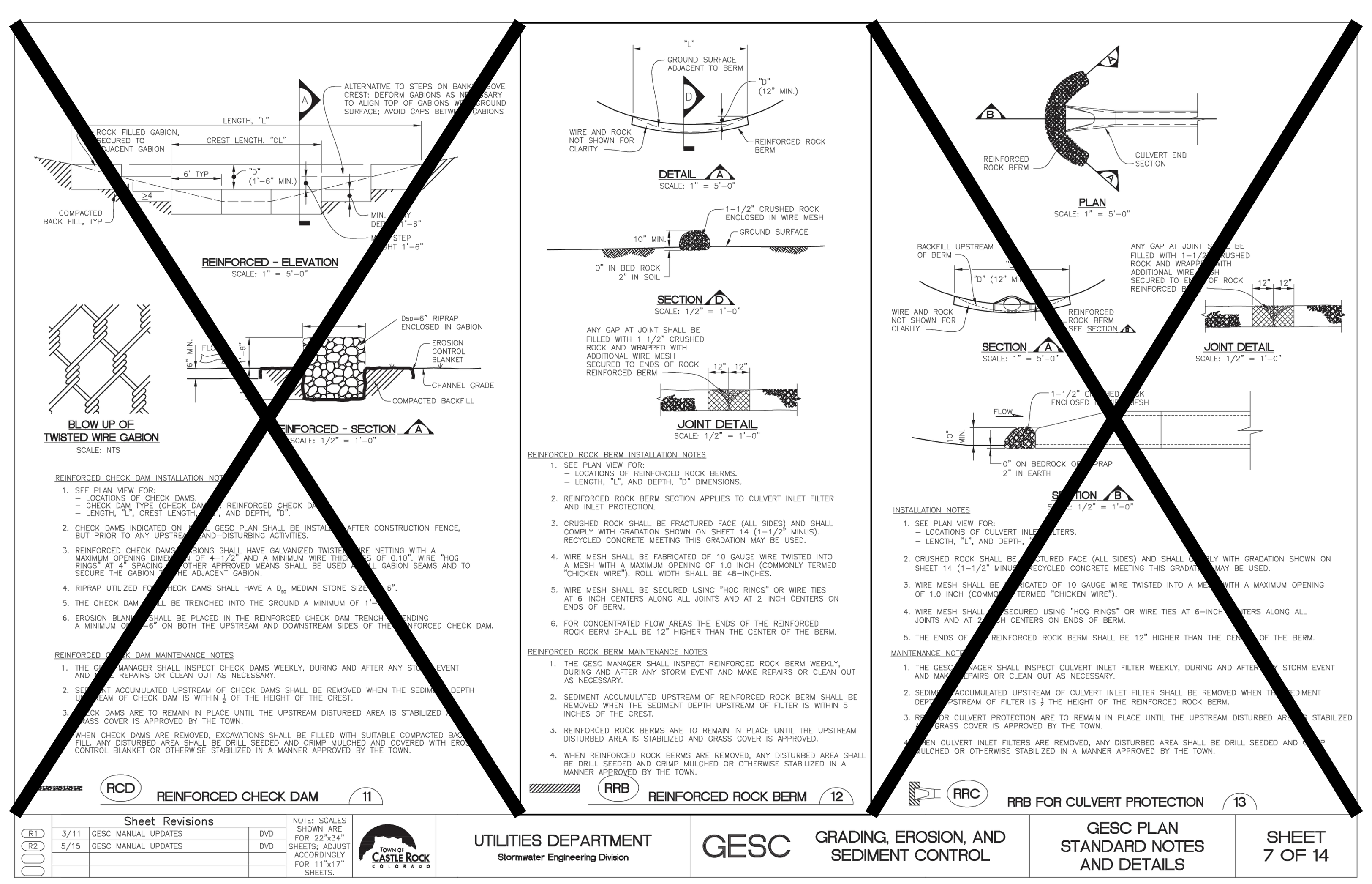
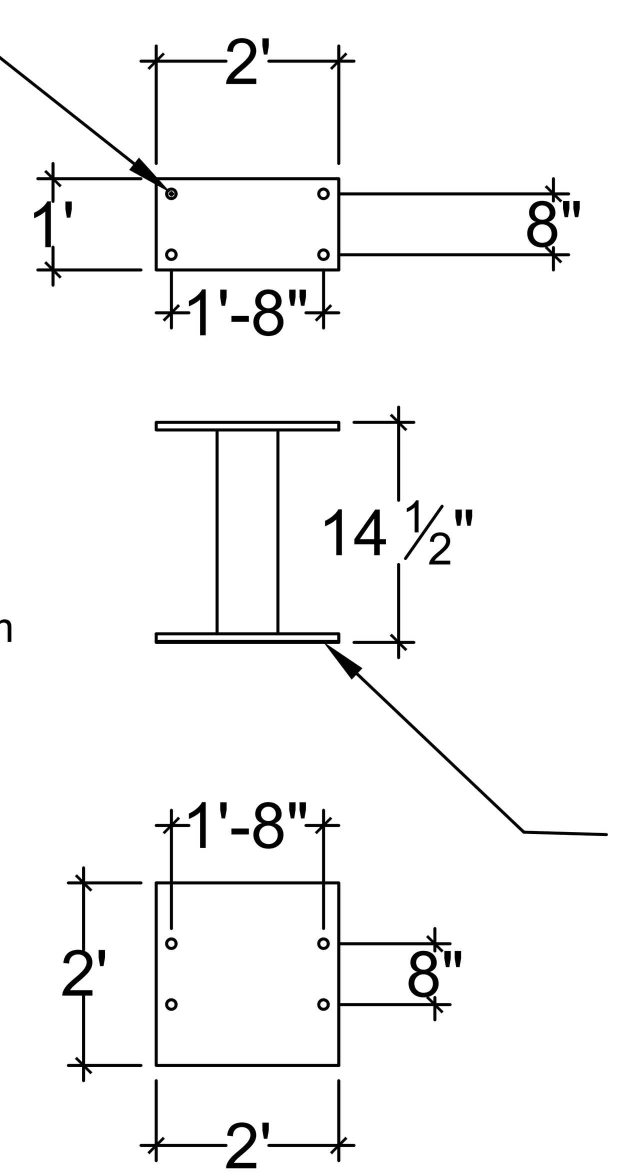


NOTES
1. SURFACE TREATMENT OF DRIVEWAY TO MATCH SURFACE TREATMENT OF ROAD WITHIN THE ROW.
2. DRAIN PIPE TO BE 18" DIAMETER CMP MINIMUM.
3. PIPE SLOPE TO BE CONSISTENT WITH FLOWLINE OF DITCH, MINIMUM OF 1% PREFERED.
4. ALL DRIVEWAYS SHALL HAVE A 4 PERCENT CROWN.
5. WHEN SLOPING TOWARDS ROAD, DRIVEWAYS SHALL HAVE A MAXIMUM GRADE OF 4 PERCENT FOR A MINIMUM OF 20 FEET WHERE THE SITE ALLOWS.

SCALE: NOT TO SCALE

8/11/11	Driveway Access on Rural Local Roadway Standard Drawing	EL PASO COUNTY DEPARTMENT OF TRANSPORTATION
DATE APPROVED:		
André P. Brackin	REVISION DATE: 12/8/15	FILE NAME: SD_3–14
DEPARTMENT OF TRANSPORTATION		

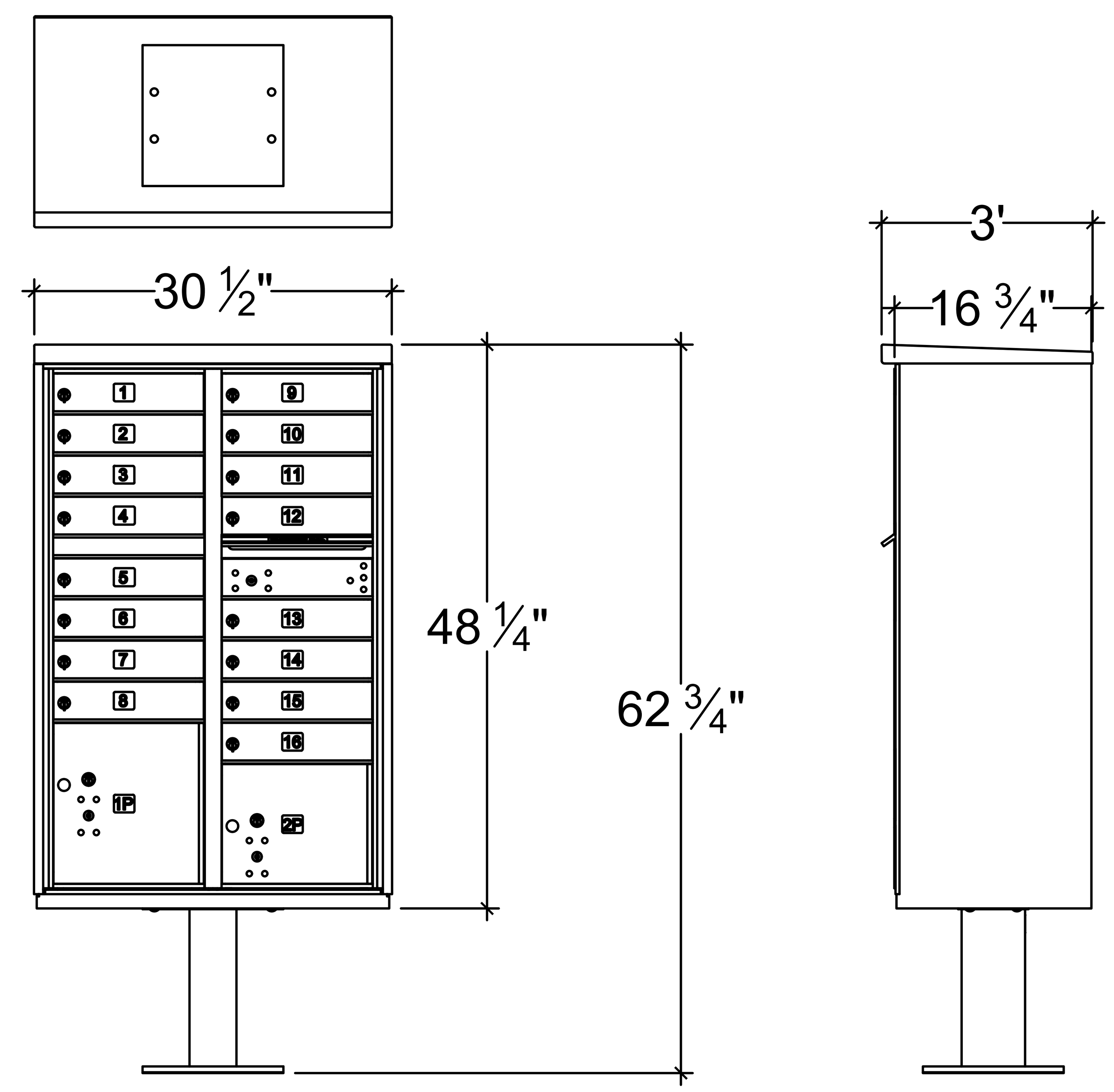




Salsbury
18300 Central Avenue
Carson, CA 90746-4008
Phone: (800) 624-5269

email: engineering@mailboxes.com

SALSBURY CLUSTER BOX
UNIT 3300 SERIES "F"
MODEL 3316 W/ PEDESTAL
3385 OR EQ. (16)
MAILBOXES, (1) OUTGOING
MAIL COMPARTMENT, (2)
PARCEL LOCKERS



Know what's below. Call before you dig.

ENGINEER'S STATEMENT
PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING
BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC
3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

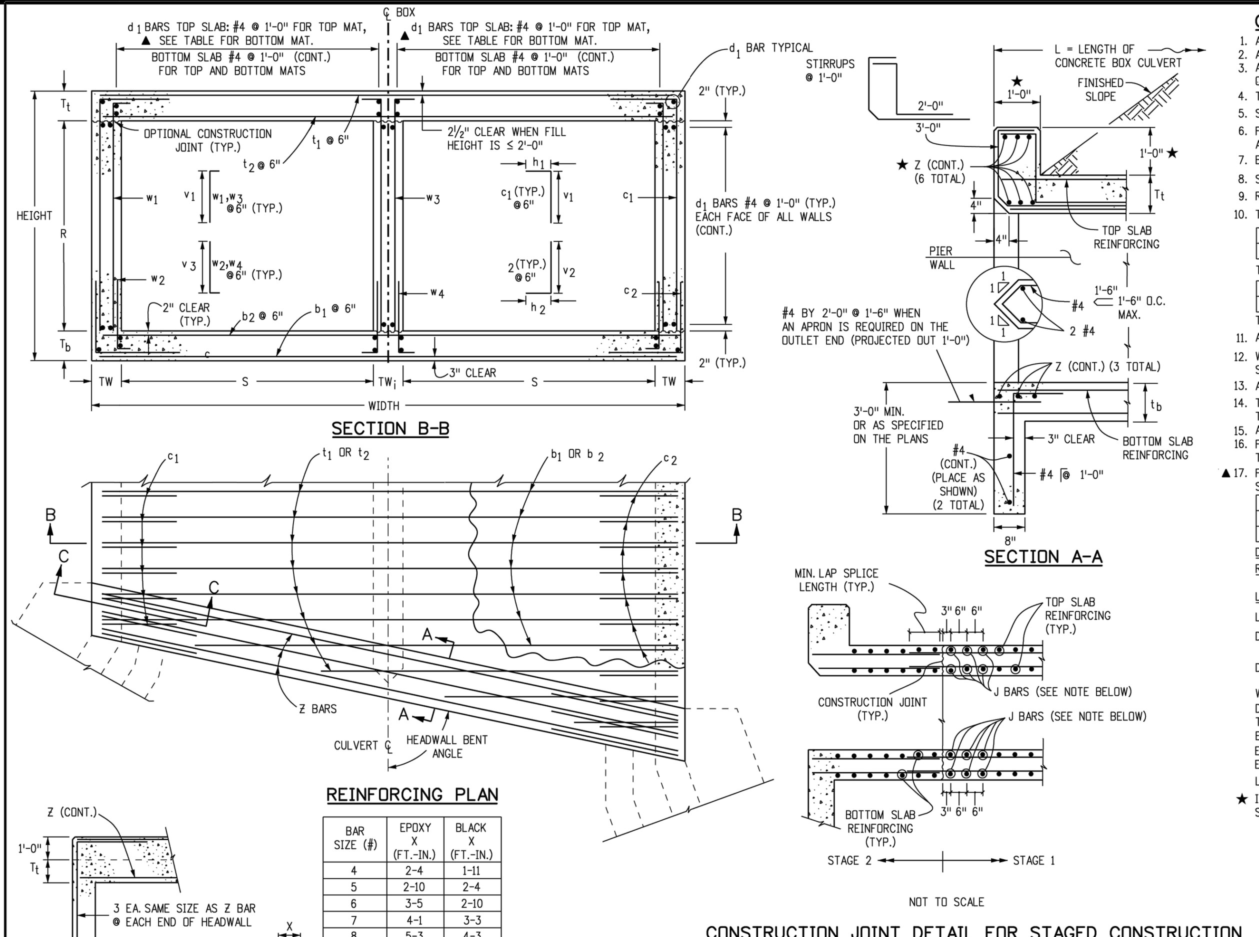
J·R ENGINEERING
A Westrian Company
Centennial 303–740–9393 • Colorado Springs 719–593–2593
Fort Collins 970–491–9888 • www.jrengineering.com

No.	REVISION	BY	DATE
.	.	.	.
.	.	.	.

H-SCALE	N/A
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	MMC
DRAWN BY	MMC
CHECKED BY	

SADDLEHORN RANCH – FILING 3
DETAILS

SHEET 62 OF 63
JOB NO. 25142.05



SECTION B-B

REINFORCING PLAN

BAR SIZE (#)	EPOXY X (FT.-IN.)	BLACK X (FT.-IN.)
4	2-4	1-11
5	2-10	2-4
6	3-5	2-10
7	4-1	3-3
8	5-3	4-3
9	6-8	5-5

SECTION C-C

HEADWALL CORNER REINFORCING DETAIL

SECTION A-A

CONSTRUCTION JOINT DETAIL FOR STAGED CONSTRUCTION

NOTE: THIS DETAIL IS FOR CONSTRUCTION JOINTS INSTALLED PERPENDICULAR TO THE ℄ OF THE BOX ONLY. THE CONTRACTOR CAN DESIGN AND INSTALL J BARS AT HIS EXPENSE TO SUPPORT TEMPORARY LIVE LOADS DURING STAGE 1 CONSTRUCTION. J BARS SHALL BE THE SAME SIZE AS THE TOP AND BOTTOM SLAB REINFORCING WHEN THERE ARE NO TEMPORARY LIVE LOADS TO SUPPORT.

GENERAL NOTES

1. ALL CONCRETE SHALL BE CLASS D (BOX CULVERT).
2. ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS PLACED.
3. ALL CONSTRUCTION JOINTS NOT SHOWN ON THE PLANS SHALL BE CONSTRUCTED ONLY IF APPROVED BY THE ENGINEER.
4. THE CONTRACTOR SHALL MAINTAIN THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.
5. STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH STANDARD PLAN M-206-1.
6. FOR ANY CULVERT SPAN 20 FT. OR GREATER, A FOUNDATION INVESTIGATION AND REPORT ARE REQUIRED.
7. BACKFILL SHALL NOT BEGIN UNTIL TOP SLAB HAS REACHED DESIGN STRENGTH, f'c.
8. SPLICE QUANTITIES FOR LONGITUDINAL AND TRANSVERSE BARS ARE NOT INCLUDED.
9. REINFORCING STEEL SHALL BE GRADE 60.
10. THE MINIMUM LAP SPLICE LENGTH FOR EPOXY COATED REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-3"	1'-7"	2'-5"	2'-10"	3'-8"	4'-8"	5'-11"	7'-3"

THE MINIMUM LAP SPLICE LENGTH FOR BLACK REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-1"	1'-4"	1'-7"	1'-11"	2'-6"	3'-1"	3'-11"	4'-10"

THE ABOVE SPLICE LENGTHS ARE FOR CLASS B SPLICES.

11. ALL DIMENSIONS ARE PERPENDICULAR TO THE CENTERLINE OF THE BOX.
12. WINGWALLS SHALL BE TIED TO CONCRETE BOX CULVERT IN ACCORDANCE WITH STANDARD PLAN M-601-20.
13. ALL TRANSVERSE REINFORCING SHALL BE NORMAL TO THE CENTERLINE OF THE BOX.
14. THE FILL HEIGHT IS THE DISTANCE MEASURED FROM THE TOP OF THE TOP SLAB TO THE TOP OF PAVEMENT.
15. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾".
16. FOR FILL HEIGHTS LESS THAN 2 FT, A WATERPROOFING MEMBRANE SHALL BE PROVIDED FOR THE TOP OF THE TOP SLAB AND 18" DOWN ALONG THE TOPS OF THE EXTERIOR WALLS.

▲17. FOR FILL HIEGHTS LESS THAN 2 FT, THE d_1 BARS FOR THE BOTTOM MAT OF THE TOP SLAB SHALL BE AS FOLLOWS:

S	6, 8	10, 12, 16	14, 18	20
BAR SIZE:	#4	#5	#6	#7
SPACING	0'-6"	1'-0"	1'-2"	1'-2"

DESIGN DATA: 7TH EDITION, 2014, OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

RATING DATA: 2ND EDITION, 2011, OF THE AASHTO MANUAL FOR BRIDGE EVALUATION

LOADING DATA: f_y = 60,000 psi., f'_c = 4,500 psi.,

LIVE LOAD = AASHTO LRFD, HL-93 TRUCK, HL-93 TANDEM, COLORADO PERMIT TRUCK AND NRL

DEAD LOAD CASE 1: VERTICAL EARTH LOAD = 120 LBS./CU.FT. HORIZONTAL EARTH LOAD = 30 LBS./CU.FT.

DEAD LOAD CASE 2: VERTICAL EARTH LOAD = 120 LBS./CU.FT. HORIZONTAL EARTH LOAD = 60 LBS./CU.FT.

WEARING SURFACE - 12 IN. THICK CONCRETE PAVEMENT.
DEAD LOAD - TYPE 7 BARRIER.
THRUST IS NOT CONSIDERED IN THIS STANDARD, I.E. THRUST = 0.
EXTREME HEADWATER TO DEPTH RATIO IS IN ACCORDANCE WITH THE CDOT DRAINAGE MANUAL.
EXTREME HEADWATER TO DEPTH RATIO WAS INCLUDED IN THE CULVERT DESIGNS BUT EXCLUDED FROM THE RATINGS AS PER THE AASHTO MANUAL FOR BRIDGE EVALUATION.
LIVE LOAD SURCHARGE ON EXTERIOR WALLS = 2 FT. OF EARTH

★ IF HEADWALL MOUNT GUARDRAIL IS USED (SEE STANDARD PLAN M-606-1, SHEET 19) AND THE NOTES BELOW:
- ALL REINFORCING STEEL SHALL BE ACCORDING TO THIS BOX CULVERT PLAN.
- ANY SPECIAL DESIGN FOR STIRRUPS WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
- HEADWALL DIMENSION AND CONCRETE QUANTITY SHALL BE ACCORDING TO STANDARD PLAN M-606-1, SHEET 19.
- POST ANCHORS SHALL BE PROVIDED ACCORDING TO STANDARD PLAN M-606-1, SHEET 19.
- POST ANCHORS AND CONCRETE FOR HEADWALL MOUNT OF GUARDRAIL WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
- POST ANCHORS WHEN REQUIRED AND ENCASED IN HEADWALL CONCRETE, SHALL CONFORM TO ASTM A 36 OR AASHTO M 169 STEEL.

18. SEE M-603-3 FOR PRECAST CONCRETE BOX CULVERT DETAILS.

Computer File Information		Sheet Revisions	
Creation Date: 07/31/19		Date:	Comments
Designer Initials: JBE	(R-X)		
Last Modification Date: 07/31/19	(R-X)		
Detailer Initials: LTA	(R-X)		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)		

Colorado Department of Transportation
2829 West Howard Place
CDOT HQ, 3rd Floor
Denver, CO 80204
Phone: 303-757-9021 FAX: 303-757-9868
Project Development Branch JBK

DOUBLE CONCRETE BOX CULVERT (CAST-IN-PLACE)

Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO. M-601-2
Standard Sheet No. 1 of 2
Project Sheet Number:

DOUBLE CONCRETE BOX CULVERT DIMENSIONS, QUANTITIES & RATING FACTORS (EXCLUDING HEADWALL & TOEWALL QUANTITIES)

BOX SIZE S	R	HT.	WIDTH	FILL HEIGHT ALLOWED	SLAB & WALL THICKNESS (INCHES) T_t	T_b	TW & TW_i	BAR SIZES t_1*	t_2	b_1	b_2	w_1* & w_2	w_3* & w_4	c_1*	c_2	d_1▲	DIMENSIONS h_1	h_2	v_1	v_2	v_3	QUANTITIES CONCRETE	REBAR STL	MEMBRANE	RATING FACTORS HL-93 INVENTORY	HL-93 OPERATING	COLORADO PERMIT	NRL VEHICLE
FT	FT	FT-IN	FT-IN	FT-FT				#	#	#	#	#	#	#	#	NO.	FT-IN	FT-IN	FT-IN	FT-IN	FT-IN	CY/LF	LBS/LF	CY/LF				
6	6	7-9	14-6	< 2	11	10	10	5	6	5	6	4	4	5	5	114	3-5	2-4	6-8	3-1	1-11	1.495	338	1.944	1.27	1.65	2.09	2.05
		7-7.5	14-6	2 TO 10	10	9.5	10	5	5	5	5	4	4	5	5	102	2-6	2-4	6-8	3-1	1-11	1.428	300		1.81	2.35	2.90	2.82
		7-7.5	14-6	10 TO 12.8	10	9.5	10	4	4	4	4	4	4	5	5	102	2-6	2-4	6-8	3-1	1-11	1.428	258		4.53	5.88	6.42	7.36
		7-8	14-6	12.8 TO 20	10	10	10	4	4	4	4	4	4	5	5	102	2-6	2-4	6-8	3-1	1-11	1.451	258		◆	◆	◆	◆
	8	9-9	14-6	< 2	11	10	10	5	6	5	6	4	4	5	5	126	3-5	2-4	8-8	3-1	1-11	1.681	365	1.944	1.28	1.66	2.10	2.05
		9-7.5	14-6	2 TO 10	10	9.5	10	5	5	5	5	4	4	5	5	114	2-6	2-4	8-8	3-1	1-11	1.613	327		1.82	2.36	2.85	2.77
		9-7.5	14-6	10 TO 12.8	10	9.5	10	4	4	4	4	4	4	5	5	114	2-6	2-4	8-8	3-1	1-11	1.613	285		4.66	6.04	6.82	5.08
		9-8	14-6	12.8 TO 20	10	10	10	4	5	5	5	4	4	5	5	114	2-6	2-4	8-8	3-1	1-11	1.636	317		◆	◆	◆	◆
	10	11-9	14-6	< 2	11	10	10	5	6	5	6	4	4	5	5	138	3-5	2-4	10-8	3-1	1-11	1.866	392	1.944	1.28	1.67	1.00	2.06
		11-7.5	14-6	2 TO 10	10	9.5	10	5	5	5	5	4	4	5	5	126	2-6	2-4	10-8	3-1	1-11	1.799	354		1.83	2.38	1.00	2.78
		11-7.5	14-6	10 TO 12.8	10	9.5	10	4	4	4	4	4	4	5	5	126	2-6	2-4	10-8	3-1	1-11	1.799	312		2.22	2.88	2.79	1.96
		11-8.5	14-10.5	12.8 TO 20	10	10.5	11.5	4	5	4	5	4	4	5	5	126	2-6	2-4	10-8	3-2	2-0	2.006	336		◆	◆	◆	◆
8	6	7-10.5	18-6	< 2	12.5	10	10	5	6	5	6	4	4	5	5	134	3-5	2-4	6-10	3-1	1-11	1.840	394	2.389	1.20	1.56	1.76	1.65
		7-8	18-6	2 TO 10	10	10	10	5	5	5	5	4	4	5	5	118	2-6	2-4	6-8	3-1	1-11	1.698	344		1.47	1.90	2.19	2.15
		7-10	18-6	10 TO 15	10	12	10	5	4	5	5	4	4	5	5	118	2-6	2-4	6-8	3-3	2-1	1.812	332		2.89	3.74	4.00	4.38
		7-11	18-9	15 TO 16.8	10.5	12.5	11	5	4	5	5	4	4	5	5	118	2-6	2-5	6-8	3-4	2-2	1.942	335		3.37	4.37	4.60	4.86
		7-11	18-9	16.8 TO 20	10.5	12.5	11	5	4	5	5	4	4	5	5	118	2-6	2-4	6-8	3-4	2-2	1.942	335		◆	◆	◆	◆
	8	9-10.5	18-6	< 2	12.5	10	10	5	6	5	6	4	4	5	5	146	3-5	2-4	8-10	3-1	1-11	2.025	421	2.389	1.21	1.57	1.71	1.61
		9-8	18-6	2 TO 10	10	10	10	5	5	5	5	4	4	5	5	130	2-6	2-4	8-8	3-1	1-11	1.883	371		1.46	1.89	2.18	2.13
		9-10	18-6	10 TO 15	10	12	10	5	4	5	5	4	4	5	5	130	2-6	2-4	8-8	3-3	2-1	1.997	359		2.96	3.83	4.10	4.37
		9-11	18-9	15 TO 16.8	10.5	12.5	11	5	4	5	5	4	4	5	5	130	2-6	2-5	8-8	3-4	2-2	2.146	362		3.44	4.46	4.70	4.96
		9-11	18-9	16.8 TO 20	10.5	12.5	11	5	4	5	5	4	4	5	5	130	2-6	2-5	8-8	3-4	2-2	2.146	362		◆	◆	◆	◆
10	6	8-0.5	22-6	< 2	13.5	11	10	5	6	5	6	4	4	5	5	134	3-5	2-4	6-11	3-2	2-0	2.257	444	2.833	1.15	1.49	1.65	1.49
		8-1.5	22-6	2 TO 5	13	12.5	10	5	6	5	6	4	4	5	5	134	2-6	2-4	6-11	3-4	2-2	2.326	434		1.52	1.98	1.82	1.84
		8-2	22-6	5 TO 10	13	13	10	5	4	6	6	4	4	5	5	134	2-6	2-4	6-11	3-5	2-2	2.361	417		1.77	2.29	2.65	3.77
		8-2.5	22-9	10 TO 15	13	13.5	11	6	5	6	6	5	5	5	5	134	2-6	2-5	6-11	3-5	2-7	2.472	495		3.57	4.63	4.62	5.05
		8-5.5	23-0	15 TO 20	14	15.5	12	6	5	6	6	5	5	5	5	134	2-6	2-6	7-0	3-7	2-9	2.761	501		3.36	4.36	4.38	4.52
	8	10-1	22-6	< 2	14	11	10	5	6	5	6	4	4	5	5	146	3-5	2-5	8-11	3-2	2-0	2.477	472	2.833	1.22	1.58	1.60	1.44
		10-1.5	22-6	2 TO 5	13	12.5	10	5	6	5	6	4	4	5	5	146	2-6	2-4	8-11	3-4	2-2	2.512	461		1.52	1.97	1.79	1.79
		10-3	22-6	5 TO 10	13	14	10	5	4	5	6	4	4	5	5	146	2-6	2-4	8-11	3-5	2-3	2.616	425		1.74	2.25	2.61	3.53
		10-3	22-9	10 TO 15	13	14	11	6	5	6	5	5	5	5	5	146	2-6	2-5	8-11	3-5	2-7	2.711	508		3.95	5.12	5.26	5.69
		10-5.5	23-0	15 TO 20	14	15.5	12	6	5	6	6	6	6	5	5	146	2-6	2-6	9-0	3-7	2-9	2.983	588		3.46	4.48	4.51	4.64
	10	12-2	22-6	< 2	14	12	10	5	6	5	6	4	4	5	5	158	3-5	2-5	10-11	3-3	2-1	2.731	499	2.833	1.24	1.60	1.79	1.61
		12-2	22-6	2 TO 5	13	13	10	5	6	5	6	4	4	5	5	158	2-6	2-4	10-11	3-4	2-2	2.731	488		1.64	2.12	1.89	1.88
		12-3	22-6	5 TO 10	13	14	10	5	4	5	6	4	4	5	5	158	2-6	2-4	10-11	3-5	2-3	2.801	452		1.72	2.23	2.58	2.74
		12-5.5	22-9	10 TO 15	14	15.5	11	5	6	6	4	5	5	5	5	158	2-6	2-5	11-0	3-7	2-9	3.090	527		2.42	3.14	3.18	2.25
		12-5.5	23-0	15 TO 20	14	15.5	12	6	5	6	6	5	5	5	5	158	2-6	2-5	11-0	3-7	2-9	3.205	567		2.11	2.73	2.64	1.86
12	6	8-3.5	26-6	< 2	14.5	13	10	5	6	5	6	4	4	5	5	150	3-5	2-5	7-0	3-4	2-2	2.805	500	3.278	1.16	1.51	1.51	1.59
		8-5	26-6	2 TO 5	14	15	10	5	6	6	6	4	4	5	5	150	2-6	2-4	7-0	3-6	2-4	2.927	512		1.22	1.59	1.43	1.54
		8-5.5	26-6	5 TO 10	14	15.5	10	6	5	6	6	4	4	5	5	150	2-6	2-4	7-0	3-6	2-5	2.968	488		2.10	2.72	3.13	3.89
		8-6.5	26-9	10 TO 15	15	15.5	11	6	6	7	6	5	5	5	5	150	3-3	2-5	7-1	3-7	2-9	3.129	610		1.86	2.42	2.36	2.53
	8	10-4	26-6	< 2	14.5	13.5	10	5	6	5	6	4	4	5	5	162	3-5	2-5	9-0	3-5	2-3	3.031	528	3.278	1.16	1.51	1.56	1.59
		10-5.5	26-6	2 TO 5	14	15.5	10	5	6	5	6	4	4	5	5	162	2-6	2-4	9-0	3-7	2-5	3.154	515		1.22	1.58	1.43	1.51
		10-7.5	26-6	5 TO 10	16	15.5	10	5	6	6	6	4	4	5	5	162	3-3	2-4	9-2	3-7	2-5	3.317	544		1.70	2.21	2.16	2.39
		10-7.5	26-9	10 TO 15	16	15.5	11	6	6	7	6	5	5	5	5	162	3-3	2-5	9-2	3-7	2-9	3.416	644		2.83	3.67	3.54	3.80
	10	12-5	26-6	< 2	15	14	10	5	6	5	6	4	4	5	5	174	3-9	2-5	11-0	3-5	2-3	3.298	556	3.278	1.23	1.60	1.66	1.69
		12-5.5	26-6	2 TO 5	14	15.5	10	5	6	5	6	4	4	5	5	174	2-6	2-5	11-0	3-7	2-5	3.339	543		1.22	1.58	1.43	1.52
		12-7.5	26-6	5 TO 10	16	15.5	10	5	6	6	6	4	4	5	5	174	3-3	2-4	11-2	3-7	2-5	3.502	571		1.82	2.36	2.31	2.56
		12-7.5	26-9	10 TO 15	16	15.5	11	6	6	7	6	5	5	5	5	174	3-3	2-5	11-2	3-7	2-9	3.619	678		2.33	3.02	2.92	2.08
14	6	8-5.5	30-6	< 2	15.5	14	10	6	7	6	7	5	5	6	6	166	4-4	2-9	7-1	3-9	2-7	3.333	766	3.722	1.15	1.49	1.54	1.53
		8-4.5	30-6	2 TO 5	14	14.5	10	6	7	6	7	5	5	6	6	166	2-10	2-8	7-0	3-10	2-8	3.238	731		1.28	1.66	1.41	1.50
		8-6.5	30-6	5 TO 10	15.5	15	10	6	7	7	7	5	5	6	6	166	3-8	2-8	7-1	3-10	2-8	3.427	770		1.37	1.78	1.65	1.83
		8-8	30-6	10 TO 12	16	16	10	7	6	7	7	5	5	6	6	166	3-8	2-9	7-2	3-11	2-9	3.568	773		2.27	2.95	2.50	2.66
	8	10-5.5	30-6	< 2	15.5	14	10	6	7	6	7	5	5	6	6	178	4-4	2-9	9-1	3-9	2-7	3.518	803	3.722	1.15	1.49	1.49	1.50
		10-4.5	30-6	2 TO 5	14	14.5	10	6	7	6	7	5	5	6	6	178	2-10	2-8	9-0	3-10	2-8	3.424	768		1.26	1.64	1.38	1.46
		10-6.5	30-6	5 TO 10	15.5	15	10	6	7	7	7	5	5	6	6	178	3-8	2-8	9-1	3-10	2-8	3.612	807		1.37	1.77	1.65	1.83
		10-8.5	30-6	10 TO 12	16	16.5	10	7	5	7	7	5	5	6	6	178	3-8	2-8	9-2	4-0	2-10	3.800	783		1.46	1.90	2.09	2.27
	10	12-5.5	30-6	< 2	15.5	14	10	6	7	6	7	5	5	6	6	190	4-4	2-9	11-1	3-9	2-7	3.703	839	3.722	1.15	1.50	1.46	1.48
		12-5	30-9	2 TO 5	14	15	11	6	7	6	7	5	5	6	6	190	2-10	2-9	11-0	3-10	2-8	3.771	809		1.30	1.69	1.42	1.57
		12-6.5	30-6	5 TO 7	15.5	15	10	6	5	7	7	5	5	6	6	190	3-8	2-8	11-1	3-10	2-8	3.797	783		1.49	1.93	2.18	2.78
		12-8.5	30-6	7 TO 12	16	16.5	10	7	5	7	7	5	5	6	6	190	3-8	2-8	11-2	4-0	2-10	3.985	820		1.47	1.91	2.11	2.02
16	6	8-6.5	34-9	< 2	16	14.5	11	6	7	6	7	5	5	6	6	182	4-4	2-9	7-1	3-9	2-8	3.882	825	4.194	1.12	1.46	1.44	1.44
		8-5	34-6	2 TO 5	14	15	10	7	6	6	7	5	5	6	6	182	2-10	2-8	7-0	3-10	2-8	3.644	799		1.00	1.29	1.09	1.02
		8-6	34-6	5 TO 7	14	16	10	7	6	7	6	5	5	6	6	182	2-10	2-8	7-0	3-11	2-9	3.750	800		1.66	2.16	1.94	2.21
		8-7.5	34-9	7 TO 10	15.5	16	11	7	6	8	6	5	5	6	6	182	3-8	2-9	7-1	3-11	2-9	3.990	853		1.64	2.13	1.89	2.06
	8	10-7.5	34-9	< 2	16.5	15	11	6	7	6	7	5	5	6	6	194	4-4	2-9	9-2	3-10	2-8	4.193	864	4.194	1.18	1.54	1.45	1.46
		10-6	34-6	2 TO 5	15	15	10	8	6	7	6	5	5	6	6	194	2-10	2-8	9-1	3-10	2-8	3.935	880		1.02	1.32	1.42	1.36
		10-7	34-6	5 TO 7	15	16	10	8	6	7	6	5	5	6	6	194	2-10	2-8	9-1	3-11	2-9	4.042	881		1.72	2.23	2.23	2.13
		10-8	34-9	7 TO 10	15.5	16.5	11	7	6	8	6	5	5	6	6	194	3-8	2-9	9-1	4-0	2-10	4.247	891		1.60	2.07	1.84	2.00
	10	12-7.5	34-9	< 2	16.5	15	11	6	7	6	7	5	5	6	6	206	4-4	2-9	11-2	3-10	2-8	4.397	901	4.194	1.19	1.54	1.41	1.42
		12-6.5	34-6	2 TO 5	15.5	15	10	8	6	7	6	5	5	6	6	206	2-10	2-8	11-1	3-10	2-8	4.174	916		1.02	1.33	1.43	1.37
		12-7.5	34-6	5 TO 7	15.5	16	10	8	6	7	6	5	5	6	6	206	2-10	2-8	11-1	3-11	2-9	4.280	918		1.74	2.26	2.23	2.12
18	6	8-8	38-9	< 2	17	15	11	7	8	7	8	5	5	6	6	198	4-4	2-10	7-2	3-10	2-9	4.438	1094	4.639	1.14	1.47	1.27	1.32
		8-6.5	38-9	2 TO 5	15	15.5	11	8	8	8	8	5	5	6	6	198	3-8	2-9	7-1	3-11	2-9	4.259	1153		1.32	1.71	1.73	1.65
		8-7.5	38-9	5 TO 7	15.5	16	11	8	8	8	8	5	5	6	6	198	3-8	2-9	7-1	3-11	2-9	4.378	1153		2.23	2.89	2.57	2.58
	8	10-9	38-9	< 2	17.5	15.5	11	7	8	7	8	5	5	6	6	210	4-4	2-9	9-3	3-10	2-9	4.762	1132	4.639	1.19	1.55	1.28	1.33
		10-7	38-9	2 TO 5	15	16	11	8	9	8	9	5	5	6	6	210	3-8	2-9	9-1	3-11	2-9	4.522	1302		1.47	1.90	1.80	1.83
		10-7	38-9	5 TO 7	15	16	11	8	9	8	9	5	5	6	6	210	3-8	2-9	9-1	3-11	2-9	4.522	1302		2.20	2.85	2.45	2.46
	10	12-9	38-9	< 2	17.5	15.5	11	7	8	7	8	5	5	6	6	222	4-4	2-9	11-3	3-10	2-9	4.965	1168	4.639	1.16	1.51	1.24	1.29
		12-7	38-9	2 TO 5	15	16	11	8	9	8	9	6	6	6	6	222	3-8	2-9	11-1	3-11	3-1	4.726	1404		1.53	1.98	1.78	1.88
		12-7	38-9	5 TO 7	15	16	11	8	9	8	9	6	6	6	6	222	3-8	2-9	11-1	3-11	3-1	4.726	1404		2.20	2.85	2.39	2.39
20	6	8-10	43-0	< 2	18	16	12	8	9	8	9	6	6	7	7	214	5-0	3-3	7-3	4-3	3-1	5.179	1546	5.111	1.16	1.51	1.22	1.31
		8-7.5	43-0	2 TO 5	15.5	16	12	8	9	8	9	6	6	7	7	214	4-3	3-3	7-1	4-4	3-1	4.847	1480		1.48	1.91	1.51	1.70
	8	10-10	43-0	< 2	18	16	12	8	9	8	9	6	6	7	7	226	5-0	3-3	9-3	4-4	3-1	5.401	1595	5.111	1.14	1.48	1.16	1.24
		10-7.5	43-0	2 TO 5	15.5	16	12	8	9	8	9	6	6	7	7	226	4-3	3-3	9-1	4-4	3-1	5.069	1528		1.52	1.97	1.46	1.68
	10	12-10.5	43-0	< 2	18	16.5	12	8	9	8	9	6	6	7	7	238	5-0	3-3	11-3	4-4	3-2	5.690	1645	5.111	1.16	1.50	1.20	1.28
		12-7.5	43-0	2 TO 5	15.5	16	12	8	9	8	9	6	6	7	7	238	5-4	3-3	11-1	4-4	3-1	5.292	1585		1.52	1.97	1.43	1.64

HEADWALL AND TOEWALL QUANTITIES

HEADWALL BENT ANGLE	90° TO 75°			74° TO 60°			59° TO 45°		
CLEAR SPAN (S)	Z	STIRRUPS	REBAR QUANT.	Z	STIRRUPS	REBAR QUANT.	Z	STIRRUPS	REBAR QUANT.
	#	#	LBS/LF	#	#	LBS/LF	#	#	LBS/LF
6	4	4	20.8	4	4	20.4	6	4	31.2
8	4	4	19.9	5	4	24.3	7	4	36.2
10	5	4	25.0	6	4	30.6	9	4■	57.8
12	6	4	30.0	6	4	29.6	9	5■	61.3
14	6	4	29.7	7	4	35.7	★	★	★
16	6	4	29.0	8	5	46.7	★	★	★
18	7	4	35.0	9	5	54.9	★	★	★
20	7	4	34.4	★	★	★	★	★	★
CONCRETE QUANTITY = 0.086 CY/LF									

NOTES

■ 1. SIX INCH SPACING AT EACH END OF THE SPAN FOR A DISTANCE OF 1/4 OF THE SPAN LENGTH; 12 INCH SPACING ELSEWHERE.

2. QUANTITIES ARE GIVEN FOR ONE HEADWALL AND ONE TOEWALL AND ARE BASED ON PER LINEAR FOOT OF HEADWALL. STEEL QUANTITIES INCLUDE ALL REINFORCING. QUANTITIES SHALL BE PAID FOR AS SHOWN ON THE PLANS.

★ 3. SKEWED HEADWALLS ARE NOT RECOMMENDED FOR THESE SPANS. A SPECIAL DESIGN IS REQUIRED.

4. FOR HEADWALL AND TOEWALL DETAILS SEE M-601-2, SHEET 1 OF 2.

5. WHEN THE FILL HEIGHTS ARE LESS THAN OR EQUAL TO 2 FT, ALL REINFORCING BARS IN THE HEADWALL, ALL REINFORCING BARS DESIGNATED BY AN ASTERISK (*), AND THE d_1 BARS IN THE TOP MAT OF THE TOP SLAB SHALL BE EPOXY COATED.

6. REINFORCING QUANTITIES INCLUDE BOTH EPOXY-COATED AND UNCOATED BARS.

7. WHEN A (RISE) R OF LESS THAN 6 FT IS REQUIRED, USE THE BAR SIZES AND THE SLAB AND WALL THICKNESSES FOR THE 6 FT RISE (IF AVAILABLE ON THE TABLE).

▲ 8. FOR SIZE AND SPACING OF THE BOTTOM MAT BARS IN THE TOP SLAB SEE TABLE ON M-601-2, SHEET 1 OF 2. ALL OTHER d_1 BARS ARE #4's AT 1'-0" SPACING. THE NUMBER OF BARS REQUIRED IS LISTED ON THIS SHEET AND INCLUDES BOTH #4 BARS AND THOSE FROM THE TABLE.

◆ 9. LIVE LOAD IS NEGLECTED AS PER AASHTO LRFD SECTION 3.6.1.2.6. FOR THESE STRUCTURES REFER TO THE CDOT RATING MANUAL.

10. FOR ALL NEW CULVERT DESIGNS, A RATING IS REQUIRED. THE RATING SUMMARY SHEET SHOULD BE PRINTED FROM THE CDOT EXTERNAL WEBSITE AND SUBMITTED TO THE BRIDGE RATING UNIT OR INCLUDED AS PART OF A LARGER DESIGN PACKAGE. FOR ADDITIONAL INFORMATION, SEE THE CDOT RATING MANUAL.

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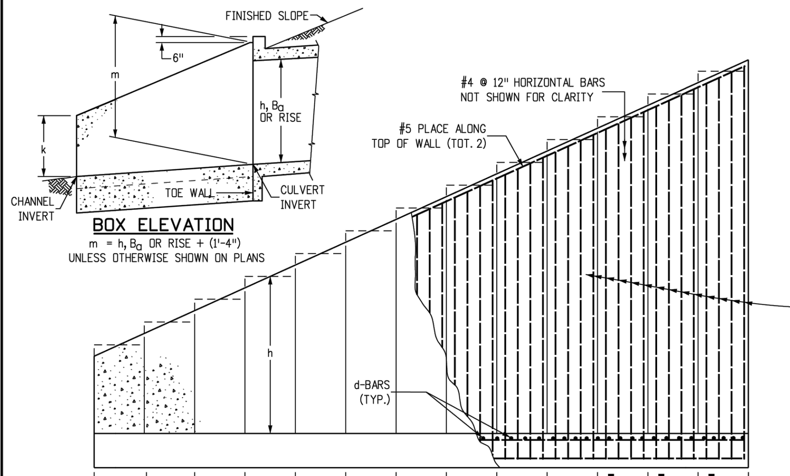
DOUBLE CONCRETE BOX CULVERT (CAST-IN-PLACE)

Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO. M-601-2
Standard Sheet No. 2 of 2
Project Sheet Number:



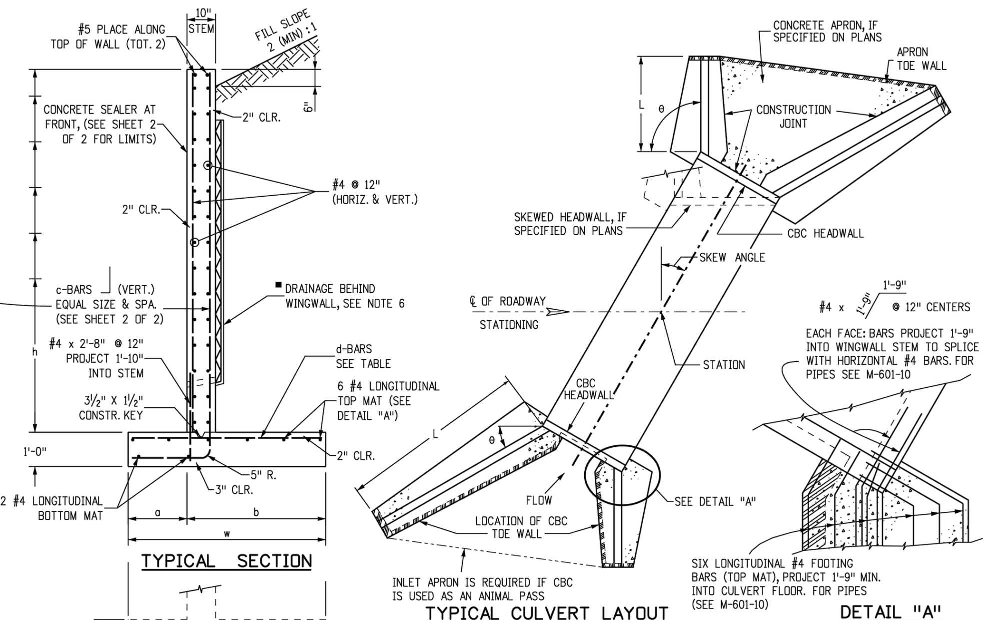
BOX ELEVATION

m = h, B_g OR RISE + (1'-4") UNLESS OTHERWISE SHOWN ON PLANS

h =	2'	3'	4'	5'	6'	7'	8'	9'	10'	11'	■ 12'	■ 13'	■ 14'
a =	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	2'-8"	2'-10"	3'-0"
b =	1'-8"	2'-0"	2'-4"	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"	4'-4"	4'-8"	5'-0"	5'-4"	5'-8"
w =	2'-8"	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-2"	8'-8"
d-BARS	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#5 @ 11"	#5 @ 10"	#5 @ 10"	#5 @ 8"	#6 @ 8"	#7 @ 9"	#7 @ 7"
✱ CONC. CY/LF	0.161	0.210	0.259	0.309	0.358	0.407	0.457	0.506	0.556	0.605	0.654	0.704	0.753

✱ DOES NOT INCLUDE TOE WALL QUANTITIES SEE SHEET 2 OF 2 FOR REINFORCING STEEL QUANTITY

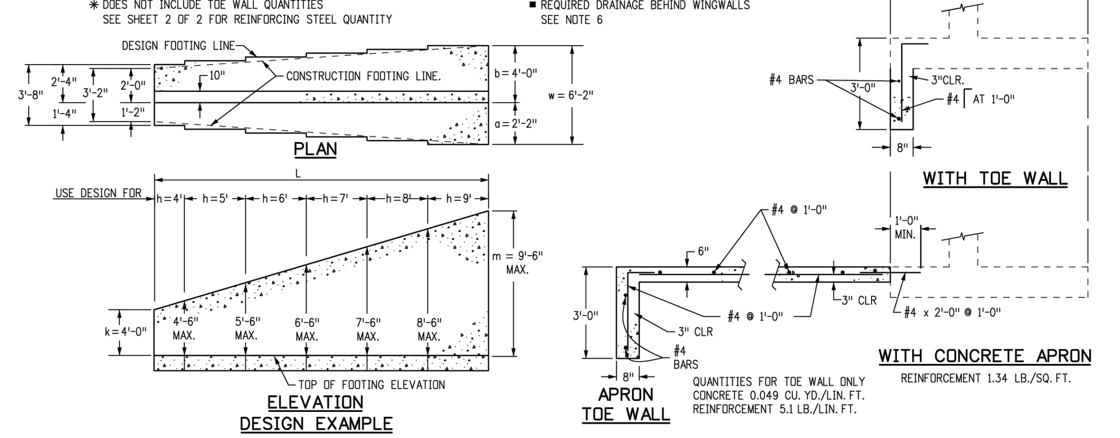
■ REQUIRED DRAINAGE BEHIND WINGWALLS SEE NOTE 6



TYPICAL SECTION

TYPICAL CULVERT LAYOUT

DETAIL "A"



PLAN

ELEVATION DESIGN EXAMPLE

APRON TOE WALL

WITH TOE WALL

WITH CONCRETE APRON

DESIGN DATA:

AASHTO LRFD EIGHTH EDITION, 2017
DESIGN METHOD: LOAD AND RESISTANCE FACTOR DESIGN, YIELD LINE METHOD

REINFORCED CONCRETE:
CONCRETE CLASS D (BOX CULVERT): f'_c = 4,500 PSI
REINFORCING STEEL: f_y = 60,000 PSI

LOADING:
AT-REST EARTH (FLUID) PRESSURE FOR CONCRETE STEM DESIGN = 55 PCF FOR 2 (MIN.) : 1 SLOPED BACKFILL
ACTIVE EARTH (FLUID) PRESSURE FOR CONCRETE FOOTING DESIGN = 40 PCF FOR 2 (MIN.) : 1 SLOPED BACKFILL
LIVE LOAD SURCHARGE = 2'
MINIMUM RESISTANCE FOR SOIL BEARING = 5.5 KSF
SOIL BEARING RESISTANCE FACTOR = 0.45

GENERAL NOTES:

1. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾ IN.
2. WINGWALL FOOTING AND FLOOR OF BOX CULVERT SHALL BE PLACED MONOLITHICALLY.
3. DIMENSIONS "h", "k", "L", "m" AND ANGLE "θ" FOR WINGWALL SHALL BE AS SHOWN ON THE PLANS.
4. MINIMUM CLASS B LAP SPLICE LENGTH FOR BLACK REINFORCING BARS:

BAR SIZE:	#4	#5	#6	#7
SPLICE LENGTH:	1'-6"	1'-11"	2'-3"	2'-7"

5. DESIGN DOES NOT CONSIDER ANY SCOUR EFFECTS.
6. WINGWALL DRAIN SHALL BE REQUIRED IF "h" ≥ 12.0 FT., SEE SHEET 2 OF 2 FOR DETAILS.

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WINGWALLS FOR PIPE OR BOX CULVERTS

Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO. M-601-20
Standard Sheet No. 1 of 2
Project Sheet Number:

c-BARS AND REINFORCING STEEL QUANTITY (EXCLUDE TOE WALL)

✱ REINFORCING STEEL QUANTITY INCLUDES STEM AND FOOTING QUANTITIES, BUT DOES NOT INCLUDE TOE WALL QUANTITIES.

L (MULTIPLE OF m)		≤ (1.0 x m)		≤ (1.25 x m)		≤ (1.5 x m)		≤ (1.75 x m)		≤ (2.0 x m)		≤ (2.25 x m)		≤ (2.5 x m)		≤ (2.75 x m)		≤ (3.0 x m)		≤ (3.25 x m)		≤ (3.5 x m)	
m (FT)	k (FT)	c-BARS	✱ REINF. LB./L.F.	c-BARS	✱ REINF. LB./L.F.	c-BARS	✱ REINF. LB./L.F.	c-BARS	✱ REINF. LB./L.F.	c-BARS	✱ REINF. LB./L.F.	c-BARS	✱ REINF. LB./L.F.	c-BARS	✱ REINF. LB./L.F.	c-BARS	✱ REINF. LB./L.F.	c-BARS	✱ REINF. LB./L.F.	c-BARS	✱ REINF. LB./L.F.	c-BARS	✱ REINF. LB./L.F.
14	4	#4 @ 10"	53.60	#5 @ 10"	57.95	#5 @ 10"	57.10	#5 @ 8"	60.22	#5 @ 7"	62.43	#5 @ 7"	62.09	#5 @ 6"	65.38	#5 @ 6"	65.15	#6 @ 8"	67.10	#6 @ 8"	66.94	#6 @ 7"	70.66
	5	#4 @ 10"	55.86	#5 @ 10"	60.46	#5 @ 10"	59.60	#5 @ 8"	62.89	#5 @ 7"	65.23	#5 @ 7"	64.88	#5 @ 6"	68.34	#5 @ 6"	68.11	#6 @ 8"	70.17	#6 @ 8"	70.00	#6 @ 7"	73.90
	6	#5 @ 10"	64.43	#6 @ 10"	70.60	#6 @ 10"	69.69	#6 @ 8"	74.93	#6 @ 8"	74.45	#6 @ 7"	78.30	#6 @ 6"	83.64	#6 @ 6"	83.40	#6 @ 6"	83.22	#6 @ 6"	83.05	#7 @ 7"	89.64
	7	#5 @ 10"	67.29	#6 @ 10"	73.76	#6 @ 10"	72.83	#6 @ 8"	78.32	#6 @ 8"	77.84	#6 @ 7"	81.87	#6 @ 6"	87.45	#6 @ 6"	87.21	#6 @ 6"	87.02	#6 @ 6"	86.86	#7 @ 7"	93.73
	8	#5 @ 8"	74.71	#6 @ 8"	83.46	#6 @ 7"	87.09	#6 @ 6"	92.54	#7 @ 7"	99.47	#7 @ 7"	99.08	#7 @ 6"	107.11	#7 @ 6"	106.86	#7 @ 6"	106.66	#7 @ 6"	106.49	#7 @ 6"	106.35
	9	#5 @ 8"	78.10	#6 @ 8"	87.23	#6 @ 7"	91.03	#6 @ 6"	96.72	#7 @ 7"	103.93	#7 @ 7"	103.54	#7 @ 6"	111.90	#7 @ 6"	111.65	#7 @ 6"	111.45	#7 @ 6"	111.28	#7 @ 6"	111.13
13	4	#4 @ 10"	50.51	#4 @ 10"	49.25	#5 @ 10"	53.71	#5 @ 10"	53.09	#5 @ 10"	52.36	#5 @ 9"	53.85	#5 @ 8"	55.54	#5 @ 7"	57.85	#5 @ 7"	57.67	#5 @ 7"	57.51	#6 @ 9"	59.93
	5	#4 @ 10"	52.66	#4 @ 10"	51.37	#5 @ 10"	56.09	#5 @ 10"	55.46	#5 @ 10"	54.99	#5 @ 9"	56.29	#5 @ 8"	58.08	#5 @ 7"	60.51	#5 @ 7"	60.33	#5 @ 7"	60.17	#6 @ 9"	62.72
	6	#5 @ 10"	54.92	#5 @ 10"	59.48	#5 @ 10"	60.31	#6 @ 9"	67.56	#6 @ 9"	67.08	#6 @ 9"	66.70	#6 @ 8"	69.53	#6 @ 8"	69.28	#6 @ 7"	73.12	#6 @ 7"	72.95	#6 @ 7"	72.81
	7	#5 @ 10"	57.36	#5 @ 10"	62.16	#5 @ 9"	63.05	#6 @ 9"	70.66	#6 @ 9"	70.16	#6 @ 9"	69.78	#6 @ 8"	72.75	#6 @ 8"	72.50	#6 @ 7"	76.52	#6 @ 7"	76.35	#6 @ 7"	76.20
	8	#5 @ 10"	66.39	#6 @ 10"	72.82	#6 @ 8"	77.97	#6 @ 7"	81.68	#6 @ 7"	81.19	#6 @ 6"	86.67	#6 @ 6"	86.37	#7 @ 7"	93.18	#7 @ 7"	92.97	#7 @ 7"	92.80	#7 @ 7"	92.64
	9	#5 @ 10"	69.37	#6 @ 10"	76.10	#6 @ 8"	81.49	#6 @ 7"	85.37	#6 @ 7"	84.87	#6 @ 6"	90.59	#6 @ 6"	90.29	#7 @ 7"	97.39	#7 @ 7"	97.18	#7 @ 7"	97.00	#7 @ 7"	96.85
12	2	#4 @ 10"	43.91	#4 @ 10"	42.65	#4 @ 10"	41.82	#4 @ 10"	41.22	#4 @ 10"	40.78	#4 @ 9"	41.29	#5 @ 10"	44.61	#5 @ 10"	44.37	#5 @ 10"	44.18	#5 @ 10"	44.01	#5 @ 10"	43.87
	3	#4 @ 10"	45.82	#4 @ 10"	44.55	#4 @ 10"	43.71	#4 @ 10"	43.11	#4 @ 10"	42.66	#4 @ 9"	43.22	#5 @ 10"	46.75	#5 @ 10"	46.51	#5 @ 10"	46.32	#5 @ 10"	46.15	#5 @ 10"	46.01
	4	#4 @ 10"	47.80	#4 @ 10"	46.51	#4 @ 10"	45.65	#5 @ 10"	50.06	#5 @ 10"	49.59	#5 @ 10"	49.23	#5 @ 10"	48.94	#5 @ 10"	48.69	#5 @ 9"	50.00	#5 @ 8"	51.72	#5 @ 8"	51.57
	5	#4 @ 10"	49.84	#4 @ 10"	48.53	#4 @ 10"	47.66	#5 @ 10"	52.33	#5 @ 10"	51.85	#5 @ 10"	51.48	#5 @ 10"	51.19	#5 @ 10"	50.94	#5 @ 9"	52.33	#5 @ 8"	54.14	#5 @ 8"	54.00
	6	#4 @ 10"	51.99	#4 @ 10"	50.65	#5 @ 10"	55.34	#5 @ 8"	58.41	#5 @ 8"	57.93	#6 @ 10"	60.60	#6 @ 10"	60.29	#6 @ 9"	62.42	#6 @ 9"	62.22	#6 @ 9"	62.04	#6 @ 8"	64.89
	7	#4 @ 10"	54.30	#5 @ 10"	58.80	#5 @ 10"	57.87	#5 @ 8"	61.10	#5 @ 8"	60.61	#6 @ 10"	63.43	#6 @ 10"	63.11	#6 @ 9"	65.35	#6 @ 9"	65.15	#6 @ 9"	64.97	#6 @ 8"	67.96
	8	#5 @ 10"	62.91	#5 @ 10"	61.45	#5 @ 7"	67.46	#5 @ 6"	70.68	#5 @ 6"	70.20	#6 @ 7"	76.44	#6 @ 7"	76.13	#6 @ 7"	75.87	#6 @ 6"	81.30	#6 @ 6"	81.12	#6 @ 6"	80.98
	9	#5 @ 10"	65.64	#5 @ 10"	64.15	#5 @ 7"	70.44	#5 @ 6"	73.82	#5 @ 6"	73.33	#6 @ 7"	79.86	#6 @ 7"	79.54	#6 @ 7"	79.28	#6 @ 6"	84.95	#6 @ 6"	84.77	#6 @ 6"	84.62
11	2	#4 @ 10"	41.70	#4 @ 10"	40.42	#4 @ 10"	39.57	#4 @ 10"	38.96	#4 @ 10"	38.50	#4 @ 10"	38.15	#4 @ 10"	37.87	#4 @ 10"	37.63	#4 @ 9"	38.25	#5 @ 10"	41.46	#5 @ 10"	41.31
	3	#4 @ 10"	43.57	#4 @ 10"	42.27	#4 @ 10"	41.40	#4 @ 10"	40.79	#4 @ 10"	40.33	#4 @ 10"	39.97	#4 @ 10"	39.69	#4 @ 10"	39.45	#4 @ 9"	40.12	#5 @ 10"	43.54	#5 @ 10"	43.39
	4	#4 @ 10"	45.48	#4 @ 10"	44.16	#4 @ 10"	43.28	#4 @ 10"	42.66	#4 @ 9"	43.09	#5 @ 10"	46.57	#5 @ 10"	46.27	#5 @ 10"	46.02	#5 @ 10"	45.82	#5 @ 10"	45.65	#5 @ 10"	45.50
	5	#4 @ 10"	47.46	#4 @ 10"	46.10	#4 @ 10"	45.21	#4 @ 10"	44.58	#4 @ 9"	45.06	#5 @ 10"	48.74	#5 @ 10"	48.44	#5 @ 10"	48.19	#5 @ 10"	47.99	#5 @ 10"	47.81	#5 @ 10"	47.67
	6	#4 @ 10"	49.52	#4 @ 10"	48.14	#4 @ 9"	48.23	#5 @ 10"	51.88	#5 @ 10"	51.38	#5 @ 9"	52.57	#5 @ 9"	52.27	#5 @ 8"	53.99	#5 @ 8"	53.79	#5 @ 7"	56.16	#5 @ 7"	56.01
	7	#4 @ 10"	51.73	#4 @ 10"	50.31	#4 @ 9"	50.43	#5 @ 10"	54.29	#5 @ 10"	53.78	#5 @ 9"	55.04	#5 @ 9"	54.73	#5 @ 8"	56.55	#5 @ 8"	56.35	#5 @ 7"	58.84	#5 @ 7"	58.70
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	9	#4 @ 10"	56.20	#5 @ 10"	60.87	#5 @ 10"	59.85	#5 @ 8"	63.21	#5 @ 7"	65.60	#5 @ 6"	69.09	#5 @ 6"	68.78	#5 @ 6"	68.52	#6 @ 8"	70.69	#6 @ 8"	70.51	#6 @ 7"	74.57
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	3	#4 @ 10"	41.68	#4 @ 10"	40.35	#4 @ 10"	39.47	#4 @ 10"	38.84	#4 @ 10"	38.36	#4 @ 10"	38.00	#4 @ 10"	37.71	#4 @ 10"	37.46	#4 @ 10"	37.27	#4 @ 9"	37.91	#4 @ 9"	37.76
	4	#4 @ 10"	43.58	#4 @ 10"	42.22	#4 @ 10"	41.31	#4 @ 10"	40.67	#4 @ 10"	40.19	#4 @ 10"	39.82	#4 @ 10"	39.53	#4 @ 10"	39.28	#4 @ 10"	39.08	#4 @ 9"	39.77	#4 @ 9"	39.63
	5	#4 @ 10"	45.53	#4 @ 10"	44.14	#4 @ 10"	43.21	#4 @ 10"	42.56	#4 @ 10"	42.07	#5 @ 10"	46.44	#5 @ 10"	46.13	#5 @ 10"	45.87	#5 @ 10"	45.67	#5 @ 10"	45.49	#5 @ 10"	45.34
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	3	#4 @ 10"	36.73	#4 @ 10"	35.23	#4 @ 10"	34.23	#4 @ 10"	33.53	#4 @ 10"	33.00	#4 @ 10"	32.59	#4 @ 10"	32.26	#4 @ 10"	31.99	#4 @ 10"	31.78	#4 @ 10"	31.59	#4 @ 10"	31.43
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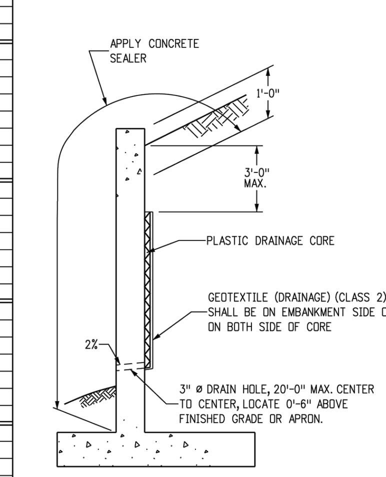
EXAMPLE:

SELECT THE c-BARS SIZE, SPACING AND STEEL QUANTITY FOR A 25.0 FEET LONG WINGWALL WITH m = 11.8 FT. AND k = 6.3 FT.

SOLUTION:

1. DETERMINE WINGWALL LENGTH IN MULTIPLE OF m:
   L / m = 25.0 / 11.8 = 2.12
   L = (2.12 x m), USE L ≤ (2.25 x m)
2. ROUND TO REAREST WHOLE NUMBER FOR m AND k:
   m = 11.8 FT., USE m = 12.0 FT.
   k = 6.3 FT., USE k = 6.0 FT.
3. DETERMINE c-BARS BY USING THE TABLE:
   L ≤ (2.25 x m)
   m = 12
   k = 6
   c-BARS: #6 @ 10"
   REINF. STEEL = 60.60 LB / LF
4. DETERMINE REINFORCING STEEL QUANTITY OF WHOLE WINGWALL:
   REINFORCING STEEL QUANTITY = 25.0 x 60.60 = 1,515 LB.



LIMITS OF CONCRETE SEALER AND WINGWALL DRAIN DETAILS

NOTES: 1. THE GEOCOMPOSITE SHALL BE SECURED TO THE WALL TO PREVENT MOVEMENT DURING BACKFILLING.

2. COST OF GEOCOMPOSITE DRAIN AND CONCRETE SEALER SHALL BE INCLUDED IN THE WORK.

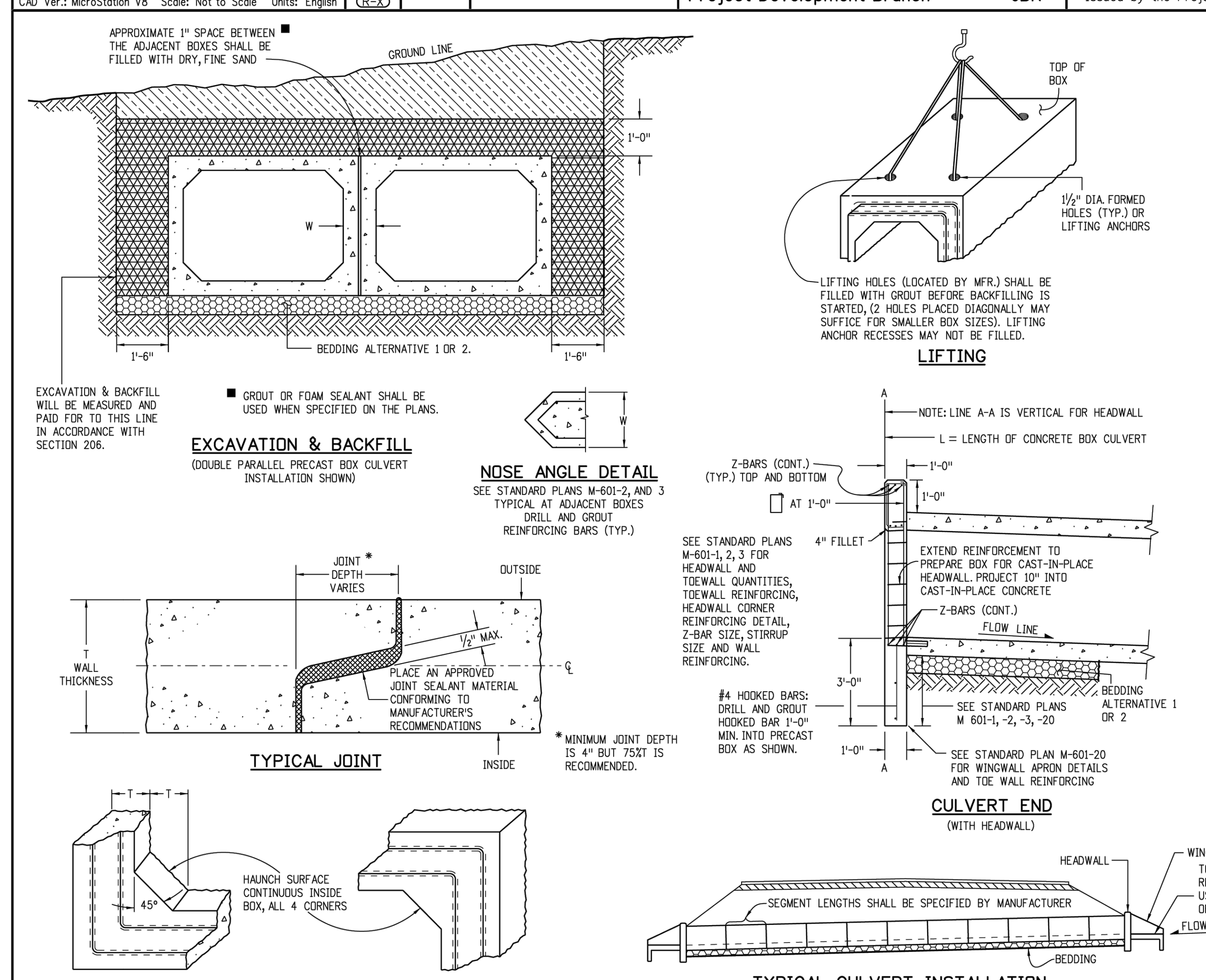
Computer File Information		Sheet Revisions	
Creation Date: 07/31/19		Date:	Comments
Designer Initials: JBK	(R-X)		
Last Modification Date: 07/31/19	(R-X)		
Detailer Initials: LTA	(R-X)		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)		

Colorado Department of Transportation
2829 West Howard Place
CDOT HQ, 3rd Floor
Denver, CO 80204
Phone: 303-757-9021 FAX: 303-757-9868
Project Development Branch JBK

WINGWALLS FOR PIPE OR BOX CULVERTS

Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO. M-601-20
Standard Sheet No. 2 of 2
Project Sheet Number:



EXCAVATION & BACKFILL (DOUBLE PARALLEL PRECAST BOX CULVERT INSTALLATION SHOWN)

NOSE ANGLE DETAIL
SEE STANDARD PLANS M-601-2, AND 3 TYPICAL AT ADJACENT BOXES DRILL AND GROUT REINFORCING BARS (TYP.)

LIFTING

CULVERT END (WITH HEADWALL)

TYPICAL JOINT

CORNERS

TYPICAL CULVERT INSTALLATION

GENERAL NOTES

1. PRECAST CONCRETE BOX CULVERT SHALL CONFORM TO THE REQUIREMENTS OF THE FOLLOWING SPECIFICATIONS:

ITEM OR CONDITION	MIN. COVER	AASHTO	EQUIV. ASTM
2 FT. OR MORE COVER	2 FT.	M 259, TABLE 2	C 1433, TABLE 2
LESS THAN 2 FT. COVER	0 FT.	M 273, TABLE 2	C 1433, TABLE 2
PREFORMED JOINT MATERIAL	———	M 198, 6.1 OR 6.2	C 990, 6.1 OR 6.2
SPAN 20 FT. OR MORE	0 FT.	———	C 1577

THE SPECIFICATIONS LISTED ABOVE SHOW REINFORCING PLACEMENT, EARTH COVER AND OTHER DETAILS NEEDED TO MANUFACTURE THE BOX CULVERTS.

THE DESIGN FOR A PRECAST CONCRETE BOX WITH A SPAN LARGER THEN 12 FT. SHALL BE PROVIDED BY THE MANUFACTURER.

2. THE CONTRACTOR SHALL SUBMIT TWO SETS OF WORKING DRAWINGS TO THE ENGINEER FOR INFORMATION ONLY, PRIOR TO FABRICATION.
3. BEDDING ALTERNATIVE 1 OR 2 IS REQUIRED:
   BEDDING ALTERNATIVE IS AT THE CONTRACTOR'S OPTION. BEDDING AND EXCAVATION FOR BEDDING WILL NOT BE MEASURED AND PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE WORK.
   BEDDING ALTERNATIVE 1 CONSISTS OF 6 IN. OF AGGREGATE BASE COURSE (CLASS 6) COMPACTED TO NOT LESS THAN 95% MAXIMUM DENSITY DETERMINED IN CONFORMANCE WITH AASHTO T 180.
   BEDDING ALTERNATIVE 2 CONSISTS OF AN 3 IN. THICK, MINIMUM, LEAN CONCRETE BASE. CEMENT CONTENT = 250 LBS./CU. YD.
   AGGREGATE GRADATION FOR ALTERNATIVE 2 BEDDING:
   PASSING 2 IN. SIEVE — 100%
   PASSING NO. 4 SIEVE — 20% TO 70%
   PASSING NO. 200 SIEVE — 5% TO 15%
4. CBC JOINTS USING RUBBER GASKETS SHALL MEET ASTM C1677.
5. CLASS 1 DRAINAGE GEOTEXTILE SHALL BE COMPLETELY WRAPPED AROUND ALL CBC JOINTS WHICH DO NOT HAVE RUBBER GASKETS. THE GEOTEXTILE SHALL EXTEND A MINIMUM OF 1 FT. ON EACH SIDE OF JOINTS AND SHALL OVERLAP AND BE SECURELY ATTACHED FOR AT LEAST 1 FT. AT ITS ENDS. THE WRAP SHALL BE A SMOOTH FIT (NOT LOOSE OR STRETCHED) JUST PRIOR TO BACKFILL. THE GEOTEXTILE MATERIAL SHALL MEET THE APPLICABLE REQUIREMENTS OF SECTION 420. COST FOR GEOTEXTILE WILL NOT BE MEASURED AND PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE WORK.
6. FOR ANY CULVERT SPAN 20 FT. OR GREATER, A FOUNDATION INVESTIGATION AND REPORT ARE REQUIRED. A LOAD-AND-RESISTANCE FACTOR DESIGN (LRFD) IS REQUIRED USING ASTM C 1577.
7. THE CONTRACTOR HAS THE OPTION OF PROVIDING A CBC WHICH MEETS ASTM C 1577 FOR SPANS LESS THAN 20 FT.
8. SEE M-601-1, 2, AND 3 FOR CAST-IN-PLACE CONCRETE BOX CULVERT DETAILS.

LEGEND

- STRUCTURE EXCAVATION LIMITS
- STRUCTURE BACKFILL, (CLASS 1)
- EMBANKMENT MATERIAL
- EARTH
- BEDDING
- CONCRETE

Computer File Information		Sheet Revisions	
Creation Date: 07/31/19		Date:	Comments
Designer Initials: JBK	(R-X)		
Last Modification Date: 07/31/19	(R-X)		
Detailer Initials: LTA	(R-X)		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)		

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Project Development Branch JBK

PRECAST CONCRETE BOX CULVERT

Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO. M-603-3
Standard Sheet No. 1 of 1
Project Sheet Number:

Know what's below. Call before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

COLORADO REGISTERED BRYAN T. LAW 25043 PROFESSIONAL ENGINEER

3/20/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE
.	.	.	.
	.	.	.

H-SCALE	N/A
V-SCALE	N/A
DATE	3/20/24
DESIGNED BY	MMC
DRAWN BY	MMC
CHECKED BY	

SADDLEHORN RANCH – FILING 3

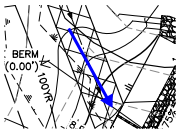
DETAILS

SHEET 63 OF 63

JOB NO. 25142.05

ENG-SF23004-R6_Construction Drawings.pdf Markup Summary

Arrow (1)



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Author: Jeff Rice - EPC Engineering Review
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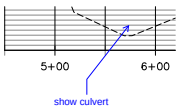
Callout (9)



Subject: Callout
Page Label: [28] 28 San Isidro Trail
Author: Jeff Rice - EPC Engineering Review
Date: 4/4/2024 4:48:57 PM
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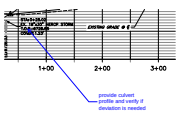
show culvert



Subject: Callout
Page Label: [28] 28 San Isidro Trail
Author: Jeff Rice - EPC Engineering Review
Date: 4/4/2024 5:08:03 PM
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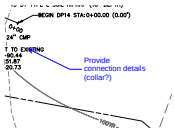
provide culvert profile and verify if deviation is needed



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Page Label: [1] 2514205 DP01-2514205 DP03
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 9:47:41 AM
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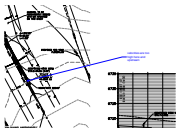
Provide connection details (collar?)



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Page Label: [1] 2514205 DP01-2514205 DP03
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:55:45 AM
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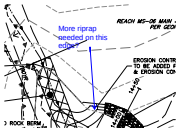
velocities are too high here and upstream



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Page Label: [44] 44 2514205 DP02
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:57:09 AM
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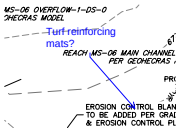
More riprap needed on this edge?



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Page Label: [44] 44 2514205 DP02
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:57:37 AM
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Color:
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Turf reinforcing mats?

Subject: Callout
Page Label: [44] 44 2514205 DP02
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:58:44 AM
Status:
Color:
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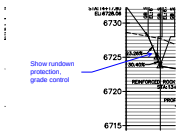
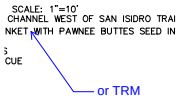
Space:

Additional grade control appears to be needed



Subject: Callout
Page Label: [44] 44 2514205 DP02
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 12:00:36 PM
Status:
Color:
Layer:
Space:

Show rundown protection, grade control



Subject: Callout
Page Label: [44] 44 2514205 DP02
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 12:02:20 PM
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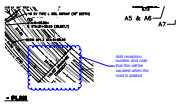
Color:
Layer:
Space:

or TRM

Cloud+ (4)



Subject: Cloud+
Page Label: [1] 2514205 DP02
Author: Jeff Rice - EPC Engineering Review
Date: 4/4/2024 5:04:47 PM
Status:
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Space:

Add reception number and note that this will be vacated when the road is platted

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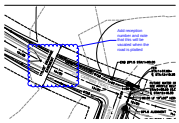

Subject: Cloud+
Page Label: [1] 2514205 DP01-2514205 DP03
Author: Jeff Rice - EPC Engineering Review
Date: 4/4/2024 5:05:34 PM
Status:
Color:
Layer:
Space:

Add reception number and note that this will be vacated when the road is platted

Subject: Cloud+
Page Label: [2] 2514205 DP01-2514205 DP04
Author: Jeff Rice - EPC Engineering Review
Date: 4/4/2024 5:06:18 PM
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Color:
Layer:
Space:

Add reception number and note that this will be vacated when the road is platted

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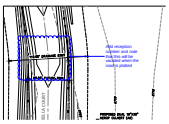

Subject: Cloud+
Page Label: [1] GRO1
Author: Jeff Rice - EPC Engineering Review
Date: 4/4/2024 5:05:03 PM
Status:
Color:
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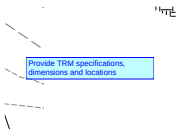
Add reception number and note that this will be vacated when the road is platted

Text Box (2)



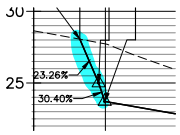
Subject: Text Box
Page Label: [1] 2514205 DP01-2514205 DP03
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:56:09 AM
Status:
Color:
Layer:
Space:

Provide TRM specifications, dimensions and locations

Subject: Text Box
Page Label: [44] 44 2514205 DP02
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:56:15 AM
Status:
Color:
Layer:
Space:

Provide TRM specifications, dimensions and locations

(4)



Subject:
Page Label: [44] 44 2514205 DP02
Author: Jeff Rice - EPC Engineering Review
Date: 4/4/2024 4:57:34 PM
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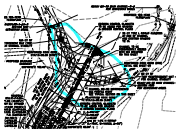

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Page Label: [44] 44 2514205 DP02
Author: Jeff Rice - EPC Engineering Review
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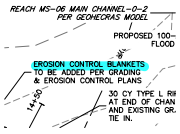

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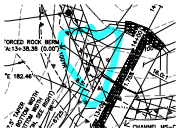

Subject:
Page Label: [44] 44 2514205 DP02
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:59:20 AM
Status:
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2024 Financial Assurance Estimate Form
(with pre-plat construction)

Updated: 03/01/24

PROJECT INFORMATION		
Saddlehorn Filing 3	3/1/2024	SF-23-004
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining	
SECTION 1 - GRADING AND EROSION CONTROL (Construction and Permanent BMPs)								
Earthwork								*
less than 1,000; $5,300 min		CY	$ 8.00	=	$ -		$ -	*
1,000-5,000; $8,000 min		CY	$ 6.00	=	$ -		$ -	*
5,001-20,000; $30,000 min		CY	$ 5.00	=	$ -		$ -	*
20,001-50,000; $100,000 min		CY	$ 3.50	=	$ -		$ -	*
50,001-200,000; $175,000 min	139190.	CY	$ 2.50	=	$ 347,975.00		$ 347,975.00	*
greater than 200,000; $500,000 min		CY	$ 2.00	=	$ -		$ -	*
Permanent Erosion Control Blanket	11656.	SY	$ 9.00	=	$ 104,904.00		$ 104,904.00	*
Permanent Seeding (inc. noxious weed mgmnt.) & Mulching	25.59	AC	$ 2,018.00	=	$ 51,640.62		$ 51,640.62	*
Permanent Pond/BMP (provide engineer's estimate)	See Below	EA		=	$ -		$ -	*
Pond C Detention Outlet Structure	1.	EA	$ 15,000.00	=	$ 15,000.00		$ 15,000.00	
Pond C Detention Emergency Spillway	1.	EA	$ 5,000.00	=	$ 5,000.00		$ 5,000.00	
Pond C Concrete/Riprap Forebay	1.	EA	$ 3,000.00	=	$ 3,000.00		$ 3,000.00	
Pond C Concrete Trickle Channel	55.	CY	$ 95.00	=	$ 5,225.00		$ 5,225.00	
Pond D Detention Outlet Structure	1.	EA	$ 15,000.00	=	$ 15,000.00		$ 15,000.00	
Pond D Detention Emergency Spillway	1.	EA	$ 5,000.00	=	$ 5,000.00		$ 5,000.00	
Pond D Concrete/Riprap Forebay	1.	EA	$ 3,000.00	=	$ 3,000.00		$ 3,000.00	
Pond D Concrete Trickle Channel	65.	CY	$ 95.00	=	$ 6,175.00		$ 6,175.00	
Pond E Detention Outlet Structure	1.	EA	$ 10,000.00	=	$ 10,000.00		$ 10,000.00	
Pond E Detention Emergency Spillway	1.	EA	$ 4,000.00	=	$ 4,000.00		$ 4,000.00	
Pond E Concrete/Riprap Forebay	1.	EA	$ 3,000.00	=	$ 3,000.00		$ 3,000.00	
Pond E Concrete Trickle Channel	10.	CY	$ 95.00	=	$ 950.00		$ 950.00	
Drianageway riprap, d50 size from 6" to 24"	3000.	Tons	$ 83.00	=	$ 249,000.00		$ 249,000.00	
Concrete Washout Basin	1.	EA	$ 1,172.00	=	$ 1,172.00		$ 1,172.00	
Inlet Protection	19.	EA	$ 217.00	=	$ 4,123.00		$ 4,123.00	
Outlet Protection	19.	EA	$ 217.00	=	$ 4,123.00		$ 4,123.00	
Rock Check Dam	107.	EA	$ 651.00	=	$ 69,657.00		$ 69,657.00	
Safety Fence	11061.	LF	$ 3.00	=	$ 33,183.00		$ 33,183.00	
Sediment Basin	3.	EA	$ 2,294.00	=	$ 6,882.00		$ 6,882.00	
Sediment Trap		EA	$ 538.00	=	$ -		$ -	
Silt Fence	22874.	LF	$ 3.00	=	$ 68,622.00		$ 68,622.00	
Slope Drain	157.	LF	$ 43.00	=	$ 6,751.00		$ 6,751.00	
Straw Bale		EA	$ 33.00	=	$ -		$ -	
Straw Wattle/Rock Sock	112.	LF	$ 8.00	=	$ 896.00		$ 896.00	
Surface Roughening		AC	$ 269.00	=	$ -		$ -	
Temporary Erosion Control Blanket		SY	$ 3.00	=	$ -		$ -	
Temporary Seeding and Mulching		AC	$ 1,793.00	=	$ -		$ -	
Vehicle Tracking Control	4.	EA	$ 3,085.00	=	$ 12,340.00		$ 12,340.00	
*Gravel Maintenance Access Road	3486.	SY	$ 50.00	=	$ 174,300.00		$ 174,300.00	
[insert items not listed but part of construction plans]				=	$ -		$ -	
MAINTENANCE (35% of Construction BMPs)				=	$ 133,306.95		$ 133,306.95	
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)			**Section 1 Subtotal**	=	$ 1,344,225.57		$ 1,344,225.57	
SECTION 2 - PUBLIC IMPROVEMENTS *								
ROADWAY IMPROVEMENTS								*
Construction Traffic Control	1.	LS	$ 50,000.00	=	$ 50,000.00		$ 50,000.00	*
Removal of Asphalt (Full Depth)	515.	SY	$ 10.00	=	$ 5,150.00		$ 5,150.00	*
Removal of Asphalt (Planing-2")	2524.	SY	$ 5.00		$ 12,620.00		$ 12,620.00	
Removal of Striping	7096.74	LF	$ 1.00		$ 7,096.74		$ 7,096.74	
Removal of Fencing	3020.	LF	$ 5.00		$ 15,100.00		$ 15,100.00	
Aggregate Base Course (133 lbs/cf) 4" thick	12595.	Tons	$ 37.00	=	$ 466,015.00		$ 466,015.00	*
Aggregate Base Course (135 lbs/cf)		CY	$ 66.00	=	$ -		$ -	*
Asphalt Pavement (3" thick)		SY	$ 18.00	=	$ -		$ -	*
Asphalt Pavement (4" thick)		SY	$ 25.00	=	$ -		$ -	*
Asphalt Pavement (6" thick)		SY	$ 38.00	=	$ -		$ -	*
Asphalt Pavement (115 lb/cy-in) 3-5 " thick	14852.	Tons	$ 114.00	=	$ 1,693,128.00		$ 1,693,128.00	*
Raised Median, Paved		SF	$ 11.00	=	$ -		$ -	*
Regulatory Sign/Advisory Sign	32.	EA	$ 392.00	=	$ 12,544.00		$ 12,544.00	*
Guide/Street Name Sign	26.	EA	$ 250.00	=	$ 6,500.00		$ 6,500.00	*
Epoxy Pavement Marking	8228.	SF	$ 17.00	=	$ 139,876.00		$ 139,876.00	*
Thermoplastic Pavement Marking	209.	SF	$ 30.00	=	$ 6,270.00		$ 6,270.00	*
Barricade - Type 3	6.	EA	$ 259.00	=	$ 1,554.00		$ 1,554.00	*
Delineator - Type I		EA	$ 31.00	=	$ -		$ -	*
Curb and Gutter, Type A (6" Vertical)		LF	$ 38.00	=	$ -		$ -	*
Curb and Gutter, Type B (Median)		LF	$ 38.00	=	$ -		$ -	*
Curb and Gutter, Type C (Ramp)		LF	$ 38.00	=	$ -		$ -	*
4" Sidewalk (common areas only)		SY	$ 62.00	=	$ -		$ -	*
5" Sidewalk		SY	$ 77.00	=	$ -		$ -	*
6" Sidewalk		SY	$ 94.00	=	$ -		$ -	*

PROJECT INFORMATION		
Saddlehorn Filing 3	3/1/2024	SF-23-004
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining	
8" Sidewalk		SY	$ 125.00	=	$ -		$ -	*
Pedestrian Ramp		EA	$ 1,496.00	=	$ -		$ -	*
Cross Pan, local (8" thick, 6' wide to include return)		LF	$ 79.00	=	$ -		$ -	*
Cross Pan, collector (9" thick, 8' wide to include return)		LF	$ 119.00	=	$ -		$ -	*
Curb Opening with Drainage Chase		EA	$ 1,926.00	=	$ -		$ -	*
Guardrail Type 3 (W-Beam)		LF	$ 65.00	=	$ -		$ -	*
Guardrail Type 7 (Concrete)		LF	$ 94.00	=	$ -		$ -	*
Guardrail End Anchorage		EA	$ 2,731.00	=	$ -		$ -	*
Guardrail Impact Attenuator		EA	$ 4,902.00	=	$ -		$ -	*
Sound Barrier Fence (CMU block, 6' high)		LF	$ 102.00	=	$ -		$ -	*
Sound Barrier Fence (panels, 6' high)		LF	$ 104.00	=	$ -		$ -	*
Electrical Conduit, Size =		LF	$ 22.00	=	$ -		$ -	*
Traffic Signal, (provide engineer's estimate)		EA		=	$ -		$ -	*
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	*
STORM DRAIN IMPROVEMENTS								*
Concrete Box Culvert (M Standard), Size (W x H)		LF		=	$ -		$ -	*
18" Reinforced Concrete Pipe	328.	LF	$ 82.00	=	$ 26,896.00		$ 26,896.00	*
24" Reinforced Concrete Pipe	127.	LF	$ 98.00	=	$ 12,446.00		$ 12,446.00	*
30" Reinforced Concrete Pipe	81.	LF	$ 123.00	=	$ 9,963.00		$ 9,963.00	*
36" Reinforced Concrete Pipe	30.	LF	$ 151.00	=	$ 4,530.00		$ 4,530.00	*
42" Reinforced Concrete Pipe		LF	$ 201.00	=	$ -		$ -	*
48" Reinforced Concrete Pipe		LF	$ 245.00	=	$ -		$ -	*
54" Reinforced Concrete Pipe		LF	$ 320.00	=	$ -		$ -	*
60" Reinforced Concrete Pipe		LF	$ 374.00	=	$ -		$ -	*
66" Reinforced Concrete Pipe		LF	$ 433.00	=	$ -		$ -	*
14" x 23" HERCP	23.56	LF	$ 155.16	=	$ 3,655.57		$ 3,655.57	
19" x 30" HERCP	186.06	LF	$ 185.60	=	$ 34,532.74		$ 34,532.74	
24" x 38" HERCP	43.81	LF	$ 222.02	=	$ 9,726.70		$ 9,726.70	
12' x 4' RCBC	156.	LF	$ 1,100.00	=	$ 171,600.00		$ -	
72" Reinforced Concrete Pipe		LF	$ 495.00	=	$ -		$ -	
18" Corrugated Steel Pipe		LF	$ 105.00	=	$ -		$ -	
24" Corrugated Steel Pipe	7.	LF	$ 121.00	=	$ 847.00		$ -	
30" Corrugated Steel Pipe		LF	$ 154.00	=	$ -		$ -	
36" Corrugated Steel Pipe		LF	$ 184.00	=	$ -		$ -	
42" Corrugated Steel Pipe		LF	$ 212.00	=	$ -		$ -	*
48" Corrugated Steel Pipe		LF	$ 223.00	=	$ -		$ -	*
54" Corrugated Steel Pipe		LF	$ 327.00	=	$ -		$ -	*
60" Corrugated Steel Pipe		LF	$ 353.00	=	$ -		$ -	*
66" Corrugated Steel Pipe		LF	$ 427.00	=	$ -		$ -	*
72" Corrugated Steel Pipe		LF	$ 502.00	=	$ -		$ -	*
78" Corrugated Steel Pipe		LF	$ 578.00	=	$ -		$ -	*
84" Corrugated Steel Pipe		LF	$ 691.00	=	$ -		$ -	*
Flared End Section (FES) RCP Size = 18" RCP (unit cost = 6x pipe unit cost)	13.	EA	$ 402.00	=	$ 5,226.00		$ 5,226.00	*
Flared End Section (FES) CSP Size = 24" RCP (unit cost = 6x pipe unit cost)	6.	EA	$ 486.00	=	$ 2,916.00		$ 2,916.00	*
Flared End Section (FES) CSP Size = 30" RCP (unit cost = 6x pipe unit cost)	3.	EA	$ 600.00		$ 1,800.00		$ 1,800.00	
Flared End Section (FES) CSP Size = 36" RCP (unit cost = 6x pipe unit cost)	1.	EA	$ 840.00		$ 840.00		$ 840.00	
Flared End Section (FES) CSP Size = 14" X 23" HERCP (unit cost = 6x pipe unit cost)	2.	EA	$ 930.96		$ 1,861.92		$ 1,861.92	
Flared End Section (FES) CSP Size = 19" X 30" HERCP (unit cost = 6x pipe unit cost)	4.	EA	$ 1,113.60		$ 4,454.40		$ 4,454.40	
Flared End Section (FES) CSP Size = 24" X 38" HERCP (unit cost = 6x pipe unit cost)	2.	EA	$ 1,332.12		$ 2,664.24		$ 2,664.24	
End Treatment- Headwall	1.	EA	$ 10,000.00	=	$ 10,000.00		$ 10,000.00	*
End Treatment- Wingwall	1.	EA	$ 10,000.00	=	$ 10,000.00		$ 10,000.00	*
End Treatment - Cutoff Wall	12.	CY	$ 560.00	=	$ 6,720.00		$ 6,720.00	*
Curb Inlet (Type R) L=5', Depth < 5'		EA	$ 7,212.00	=	$ -		$ -	*
Curb Inlet (Type R) L=5', 5' ≤ Depth < 10'		EA	$ 9,377.00	=	$ -		$ -	*
Curb Inlet (Type R) L =5', 10' ≤ Depth < 15'		EA	$ 10,859.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', Depth < 5'		EA	$ 9,925.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', 5' ≤ Depth < 10'		EA	$ 10,230.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', 10' ≤ Depth < 15'		EA	$ 12,805.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', Depth < 5'		EA	$ 12,907.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', 5' ≤ Depth < 10'		EA	$ 13,835.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', 10' ≤ Depth < 15'		EA	$ 15,130.00	=	$ -		$ -	*
Curb Inlet (Type R) L =20', Depth < 5'		EA	$ 13,755.00	=	$ -		$ -	*
Curb Inlet (Type R) L =20', 5' ≤ Depth < 10'		EA	$ 15,181.00	=	$ -		$ -	*
Grated Inlet (Type C), Depth < 5'		EA	$ 6,037.00	=	$ -		$ -	*
Grated Inlet (Type D), Depth < 5'		EA	$ 7,458.00	=	$ -		$ -	*
Storm Sewer Manhole, Box Base		EA	$ 15,130.00	=	$ -		$ -	*
Storm Sewer Manhole, Slab Base		EA	$ 8,322.00	=	$ -		$ -	*
Geotextile (Erosion Control)		SY	$ 9.00	=	$ -		$ -	*
Rip Rap, d50 size from 6" to 24"	558.	Tons	$ 104.00	=	$ 58,032.00		$ 58,032.00	*
Rip Rap, Grouted		Tons	$ 124.00	=	$ -		$ -	*

please round off so that totals are correct

Rounded up totals for pipes

verify per FDR comments

PROJECT INFORMATION		
Saddlehorn Filing 3	3/1/2024	SF-23-004
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	(with Pre-Plat Construction) Remaining	
Drainage Channel Construction, Size (W x H)		LF		=	$ -		$ -	*
Drainage Channel Lining, Concrete		CY	$ 741.00	=	$ -		$ -	*
Drainage Channel Lining, Rip Rap		CY	$ 145.00	=	$ -		$ -	*
Drainage Channel Lining, Grass		AC	$ 1,911.00	=	$ -		$ -	*
Drainage Channel Lining, Turf Reinforcment Mat (TRM)	207.	SY	$ 50.00	=	$ 10,350.00		$ 10,350.00	*
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)		**Section 2 Subtotal**		=	$ 2,804,915.30		$ 2,804,915.30	
SECTION 3 - COMMON DEVELOPMENT IMPROVEMENTS (Private or District and NOT Maintained by EPC)**								
ROADWAY IMPROVEMENTS								
WATER SYSTEM IMPROVEMENTS								
Water Main Pipe (PVC), Size 8"	10232.	LF	$ 84.00	=	$ 859,488.00		$ 859,488.00	
Water Main Pipe (Ductile Iron), Size 8"		LF	$ 98.00	=	$ -		$ -	
Water Main Pipe (Ductile Iron), Size 6"	349.6	LF	$ 94.59	=	$ 33,068.66		$ 33,068.66	
Gate Valves, 8"	35.	EA	$ 2,418.00	=	$ 84,630.00		$ 84,630.00	
Fire Hydrant Assembly, w/ all valves	24.	EA	$ 8,584.00	=	$ 206,016.00		$ 206,016.00	
Water Service Line Installation, inc. tap and valves	40.	EA	$ 1,723.00	=	$ 68,920.00		$ 68,920.00	
Fire Cistern Installation, complete		EA		=	$ -		$ -	
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	
SANITARY SEWER IMPROVEMENTS								
Sewer Main Pipe (PVC), Size 8"		LF	$ 84.00	=	$ -		$ -	
Sanitary Sewer Manhole, Depth < 15 feet		EA	$ 5,708.00	=	$ -		$ -	
Sanitary Service Line Installation, complete		EA	$ 1,825.00	=	$ -		$ -	
Sanitary Sewer Lift Station, complete		EA		=	$ -		$ -	
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	
LANDSCAPING IMPROVEMENTS (For subdivision specific condition of approval, or PUD)								
		EA		=	$ -		$ -	
		EA		=	$ -		$ -	
		EA		=	$ -		$ -	
		EA		=	$ -		$ -	
		EA		=	$ -		$ -	
** - Section 3 is not subject to defect warranty requirements		**Section 3 Subtotal**		=	$ 1,252,122.66		$ 1,252,122.66	
LETTERS OF MAP REVISION			0.00	=	$ 8,000.00		$ 8,000.00	
AS-BUILT PLANS (Public Improvements inc. Perma			0.00	=	$ 10,000.00		$ 10,000.00	
POND/BMP CERTIFICATION (inc. elevations and vo			00.00	=	$ 10,000.00		$ 10,000.00	

round off

Rounded off

Total Construction Financial Assurance $ 5,429,263.53
(Sum of all section subtotals plus as-builts and pond/BMP certification)

Total Remaining Construction Financial Assurance (with Pre-Plat Construction) $ 5,421,263.53
(Sum of all section totals less credit for items complete plus as-builts and pond/BMP certification)

Total Defect Warranty Financial Assurance $ 661,886.98
(20% of all items identified as (*). To be collateralized at time of preliminary acceptance)

Approvals

I hereby certify that this is an accurate and complete estimate of costs for the work as shown on the Grading and Erosion Control Plan and Construction Drawings associated with the Project.

COLORADO REGISTERED BRYANT T. LAW 25043 PROFESSIONAL ENGINEER

Signature needs to be through seal

Engineer (P.E. Seal Required)

Nathan Steele
Approved by Owner / Applicant

March 8, 2024
Date

Approved by El Paso County Engineer / ECM Administrator

Date

FINAL DRAINAGE REPORT
FOR
SADDLEHORN RANCH – FILING 3

Prepared For:
ROI Property Group, LLC
2495 Rigdon Street
Napa, CA 94558
(707) 365-6891

February 1st, 2024
Project No. 25142.05

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive
Colorado Springs, CO 80919
719-593-2593

El Paso County PCD File No.:
SF234

ENGINEER'S STATEMENT:
The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by El Paso County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

Signature needs to be through seal

JR Response: Revised to Signature is through seal.

Bryan Law, Colorado P.E. # 25043
For and On Behalf of JR Engineering, LLC

8/15/23
Date

DEVELOPER'S STATEMENT:
I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

Business Name: ROI Property Group, LLC

By: Nathan Steele

Title: Senior Vice President
Address: 1280 S. 800 E, Suite 200
Orem, UT 84097

El Paso County:
Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volumes 1 and 2 and Engineering Criteria Manual, as amended.

Joshua Palmer, P.E.
County Engineer/ ECM Administrator

Date

Conditions:

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PURPOSE

This document is the Final Drainage report for Filing 3 of Saddlehorn Ranch. The purpose of this report is to:

1. Identify on-site and off-site drainage patterns.
2. Recommend storm water facilities to collect and convey storm runoff from the proposed development to appropriate discharge and/or detention locations.
3. Recommend water quality and detention facilities to control discharge release rates to below historic.
4. Demonstrate compliance with surrounding major drainage basin planning studies, master development drainage plans and flood insurance studies.

GENERAL LOCATION AND DESCRIPTION

Location

The proposed Saddlehorn Ranch Filing 3, known as "Filing 3" from herein, is a parcel of land located in Section 3 and 10, Township 13 South, Range 64 West of the 6th Principal Meridian in El Paso County, Colorado. Saddlehorn Ranch is an 824 acre, rural, single family-development. Filing 3 is 175.98 acres and is comprised of 43 lots of the overall Saddlehorn Ranch development. Saddlehorn Ranch is bound by Judge Orr Road to the North and Curtis Road to the West. To the East, Saddlehorn Ranch is bound by undeveloped land owned by Brent Houser Enterprises, LLC. To the south, Saddlehorn Ranch is bound by undeveloped properties owned by Carolyn Gudzunas and Faye Reynolds. Filing 3 is bound by future Filing 4 to the east, Filing 2 to the south, Judge Orr Road to the north, and by Curtis Road to the west. A vicinity map is presented in Appendix A.

Currently, there are two major Drainageway that will receive flows from Filing 3: Gieck Ranch (WF-R7A) and Haegler Ranch Main Stem 6 (MS-06). These Drainageways were analyzed, both hydrologically and hydraulically, in the following reports:

- Haegler Ranch Basin Drainage Basin Planning Study (DBPS), May 2009.
- Santa Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision, June 2004.
- Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch, May 2020.
- Geick Ranch Drainage Basin Planning Study (DBPS), October 2007

The impact of these Drainageways and planning studies on the proposed development will be discussed later in the report.

Description of Property

Filing 3 is currently unoccupied and undeveloped. The existing ground cover is sparse vegetation and open space, typical of a Colorado rolling range land condition. In general, Filing 3 slopes from south to southeast and the existing drainageways follows this topography.

Per a NRCS web soil survey of the area, Filing 3 is made up of Type A and D soils. Type A soils cover roughly 76% of Filing 3 while Type D soils cover 24% of Filing 3. Group A soils have a high infiltration rate when thoroughly wet. Type D soils have a very slow infiltration when thoroughly wet. A NRCS soil survey map has been presented in Appendix A.

Floodplain Statement

Based on the FEMA FIRM Map number 08041C0558G, dated December 7, 2018, Filing 3 lies within Zone AE and Zone X. Zone AE is defined as area subject to inundation by the 1-percent-annual-chance flood event. Zone X is defined as area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. All proposed residential development within Filing 3 will occur in Zone X. The FIRM Map has been presented in Appendix A.

DRAINAGE BASINS AND SUB-BASINS

Existing Major Basin Descriptions

Filing 3 lies within Haegler Ranch Drainage Basin based on the "*Haegler Ranch Drainage Basin Planning Study*" prepared by URS Corporation in May 2009.

The Haegler Ranch Drainage Basin covers approximately 16.6 square miles in unincorporated El Paso County, CO. The Haegler Ranch Drainage Basin is tributary to Black Squirrel Creek. In its existing condition, the basin is comprised of rolling rangeland with poor vegetative cover associated with Colorado's semi-arid climate. The natural Drainageways within the basin are typically shallow and wide with poorly defined flow paths in most areas. Anticipated land use for the basin includes residential and commercial development. Residential developments will range from 0.125 – 5 acre lots with a mix of low, medium and high density developments.

As part of its drainage research, JR Engineering reviewed the following drainage studies, reports and LOMRs:

- Haegler Ranch Drainage Basin Planning Study prepared by URS Corporation in May 2009
- Santa Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision prepared by Tri-Core Engineering in June 2004.
- Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch, prepared by JR Engineering, May 2020.
- Gieck Ranch Drainage Basin Planning Study (DBPS), October 2007

The "*Haegler Ranch Drainage Basin Planning Study*" was used to establish a stormwater management plan for the existing and future stormwater infrastructure needs within the Haegler Ranch Drainage Basin. Based on provided drainage maps and analysis, in the existing condition Haegler Ranch contributes a total of 710 cfs onto the site. Of the 710 cfs, 590 cfs crosses Curtis Road in an existing 24" CMP onto the site. Major Drainageway MS-06 conveys the stormwater through the site and to its off-site confluence with Major Drainageway MS-05. The remaining 210 cfs crosses Curtis Road in an existing 36" CMP onto the

site. Major Drainageway T-6 conveys the stormwater through the site and to its off-site confluence with Major Drainageway MS-05. Both Curtis Road culverts are undersized for existing and future flows and overtopping occurs locally near the culvert crossings. The overtopping culvert at the intersection of MS-06 and Curtis Road is not contained within the 100-year floodplain limits.

The existing 24" CMP and 36" CMP culvert will not be upsized within the context of this report and development. The culvert is owned by El Paso County and timing of improvements, if any, will be controlled by the County.

Furthermore, the *Haegler Ranch DBPS* recommends channel improvements within Drainageway MS-06. Per the *Haegler Ranch DBPS*, all recommended channel sections are trapezoidal with side slopes of 4:1 and a maximum depth of five feet. Within the limits of the site, three (3) channel bottom widths are recommended for MS-06. The first reach, from station 0+00 – 31+34, is proposed with a 15' bottom width, the second reach from 31+34 to 74+61, MS-06 is proposed with a 30' bottom width, and the last reach from station 74+61 - 103+62 is proposed with a 20' channel bottom. The portion of the MS-06 channel improvements along Filing 3 has been analyzed with the Engineer's Certification of No Impact Letter. This letter shows the proposed Drainageway MS-06 sections and flow depths. This letter can be found in Appendix E.

Based on flood impacts, stream stability and cost effectiveness, this study recommended a sub-regional detention approach. This allows future development anywhere in the basin with the construction of an associated sub-regional pond. However, based on the *Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch,* Filing 3 will utilize three on-site full spectrum water quality and detention ponds instead. These full spectrum detention ponds will limit developed discharge into the MS-06 and WF-R7A Drainageways to less than historic rates.

The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR was executed on Haegler Ranch Tributary 2, 3, and 4. The LOMR revised the onsite effective flood zone from Zone A to Zone AE. See FIRM Map Panel 08041C0558G for limits of LOMR study and revised flood zones, presented in Appendix E.

The Gieck Ranch Drainage Basin covers approximately 22 square miles and begins approximately five miles northeast of the Town of Falcon and travels approximately 15 miles to the southeast. The Gieck Ranch Drainage Basin is tributary to Black Squirrel Creek which drains south to the Arkansas River near the city of Pueblo, Colorado. The majority of the area within the basin is undeveloped and is characterized as rolling range land typically associated with Colorado's semi-arid climates. Anticipated land use for the basin includes residential, industrial, agricultural and commercial development. Residential developments will range from 0.125 – 5 acre lots with a mix of low, medium and high density developments.

Based upon provided drainage maps and analysis, Gieck Ranch discharges a total of 1,017 cfs onto the site within Major Drainageway Gieck Ranch West Fork Reach 7A (WF-R7A). An existing 66" CMP and 36" CMP convey the offsite flow across Judge Orr Road onto the site. The existing culverts at Judge Orr Road are undersized for existing and future flows resulting in localized overtopping. The DBPS recommends the culvert be upsized to four –12' x 5' box culverts. The culvert will not be upsized within

the context of this report and development. The culvert is owned by El Paso County and timing of the recommended improvements will be controlled by the County. The overtopping at the intersection of WF-R7A is not contained within the 100-year floodplain. Therefore, at time of Final Drainage Report for Filing 4, berming will be provided that will protect proposed lots from overtopping flows.

See Table 2 for comparison of Drainageway identification and the naming convention used within the context of this report. See Table 3 for a comparison of 100-year flows as calculated in the aforementioned DBPS and LOMR. An existing conditions drainage map is presented in Appendix E.

Table 1: Major Drainageway Naming Convention

Major Drainageway Naming Conventions			
Saddlehorn Ranch MDDP/PDR:	Per Haegler Ranch DBPS:	Per Geick Ranch DBPS:	Per Sante Fe Springs LOMR:
MS-06	Main Stem (MS-06)	N/A*	Haegler Ranch Tributary 3
WF-R7A	N/A*	West Fork (Middle)/WF-R7A	N/A*

Table 2: Major Drainageway – Ex. 100-Year Flow Comparison

Major Drainageways: 100-Year Flow Comparison				
Drainageway Name	Contributing Area (sq. mi.)	Q_{100} Per Haegler Ranch DBPS:	Q_{100} Per Geick Ranch DBPS:	Q_{100} Per Sante Fe Springs LOMR:
MS-06 @ Curtis Road	1.05	590 cfs	N/A*	505 cfs
WF-R7A @ Judge Orr Road	1.50	N/A*	1,017 cfs	N/A*

*N/A: Flow regime outside limits of study.

The *Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch* proposed the overall drainage facility design for Saddlehorn Ranch. Within the context of this report, onsite drainage basins the associated full spectrum water quality pond were established. As it pertains to Filing 3, three full spectrum water quality ponds are recommended. Roadside ditches and local street culverts will be utilized to capture and convey Filing 3's runoff to the water quality ponds. Saddlehorn Filing 4 will also utilize the same three ponds. Thus, the ponds were sized for both the Filing 3 and Filing 4 improvements. Pond C and Pond E will discharge into Drainageway MS-06, while Pond D will release into Drainageway WF-R7A. All ponds are full spectrum and will release at less than historic rates.

Existing Sub-basin Drainage

On-site, existing sub-basin drainage patterns are generally from northwest to southeast by way of Drainageway MS-06 and Drainageway WF-R7A. On-site areas flow directly into these drainageways, which also bypass off-site flows through the site.

On-site, existing drainage basins were established based upon existing topography and the limits of the 100-year floodplain. These existing sub-basins were analyzed in the *Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch.* An existing drainage map has been provided in Appendix E.

Proposed Sub-basin Drainage

The proposed Filing 3 basin delineation is as follows;

Basin C consists of Sub-Basins C1-C10 combining for a total of 93.77 acres. In its existing condition, Basin C is rolling rangeland and runoff generally flows southeast towards Drainageway MS-06. In the proposed condition, Basin C will be rural 2.5 acre lots, paved roadway, and will include Pond C. Runoff from this basin will be collected in road side ditches and conveyed to Pond C located in the southeast corner of the future Filing 4 development. Pond C will be a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway MS-06.

Basin D consists of Sub-basins D1-D7 combining for a total of 74.66 acres. In its existing condition, Basin D is rolling rangeland and runoff generally flows east to Drainageway WF-R7A. In the proposed condition, Basin D will be rural 2.5 acre lots, paved roadway, a church site and will include Pond D. Runoff from this basin will be collected in road side ditches and conveyed west to Pond D located in the northeast corner of the future Filing 4 development. Pond D is a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway WF-R7A.

Basin E consists of Sub-basins E1-E4 combining for a total of 18.37 acres. In its existing condition, Basin E is rolling rangeland and runoff generally flows south towards Drainageway MS-06. In the proposed condition, Basin E will be rural 2.5 acre lots, paved roadway, and will include Pond E. Runoff from this basin will be collected in road side ditches and conveyed to Pond E located in the southern portion of the Filing 3 development along San Isidro Trail. Pond E will be a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway MS-06.

Basin F consists of Sub-basins F1-F4 combining for a total of 14.32 acres. In its existing condition, Basin F is rolling rangeland and paved road (Curtis Road and Benito Wells Trail). Runoff generally flows east along Benito Wells Trail. In the proposed condition, Basin F will be rural 2.5 acre lots and paved roadway. Runoff from this basin will be collected in road side ditches and conveyed to Pond F located in the southeastern portion of the Filing 2 development along Benito Wells Trail. Pond F will be a full spectrum water quality and detention pond, and will release at less than historic rates into Drainageway MS-06.

Basin UD consists of Sub-basins UD1-UD5 combining for a total of 74.27 acres. In their existing condition, these basins are rolling rangeland. Runoff from Basins UD1-UD3 generally flows south and

east to Drainageway MS-06. Basin UD5 flows east to Drainageway MS-06. Basin UD4 represents Drainageway MS-06 and the runoff generated along the Filing 3 boundary. In the proposed condition, Basins UD1, UD2, UD3, and most of UD5 will be rural 2.5 acre lots with an Imperviousness = 6.2% and will be excluded from permanent stormwater quality management per Section I.7.1.B.5 of the ECM – Stormwater Quality Policy and Procedures. Per the MS4 Permit Exclusion Map, 0.53 acres of Basin UD5, which consists of paved roads at 45% imperviousness, will be excluded per Section I.7.1.C.1. shown in red. Additionally, the entirety of Basin UD4, which is a non-jurisdictional wetland to remain undeveloped at 2% impervious, will not be detained in PBMP per section I.7.1.B.7.

Basin OS consists of Sub-basins OS1-OS5 combining for a total of 9.35 acres of offsite area. In their existing condition, these basins are paved roadway (Curtis Road & Judge Orr Road) and undeveloped area. In the proposed condition, these basins will be improved with 8' of pavement width for both the Curtis Road and Judge Orr Road stretches. Basins OS1-OS4 will flow on-site prior to being captured in a roadside swale and conveyed to a proposed full spectrum detention pond prior to being released into Drainageway MS-06 or Drainageway WF-R7A. Basin OS5 will not be detained by a pond due to its location relative to the site. Basin OS5 adds an additional paved area of 0.54 acres to the existing Curtis Road. Per Appendix I Section 7.1.B.2 of the El Paso County Engineering Criteria Manual, this is allowable as less than 1 acre of paved area per mile is being added to the existing roadway. The undisturbed pervious area within Basin OS5, which comprises the rest of the basin, will be excluded per Exclusion I.7.1.B.7 of the El Paso County Engineering Criteria Manual. The other portion that could not be captured due to its proximity to Drainageway MS-06, is located along San Isidro Trail. This area is 0.53 acres and is comprised of open space and asphalt. Due to topography this area will be excluded per Exclusion I.7.1.C.1 of the El Paso County Engineering Criteria Manual

A summary table of proposed basin parameters and flow rates are presented in Appendix B.

Basin C runoff along with runoff from Sub-Basins OS1 and OS2 will be captured in roadside swales and conveyed to the proposed Pond C. This full spectrum pond will release treated flows at less than historic rates to minimize adverse impacts downstream. Basin D along with runoff from Sub-Basins OS3 and OS4 will be captured in roadside swales and conveyed to the proposed Pond D. Basin E will be captured in roadside swales and conveyed to the proposed Pond E. Pond C and Pond E will discharge into Drainageway MS-06. Pond D will discharge into Drainageway WF-R7A.

See Table 3 below for proposed Filing 3 pond parameters.

Table 3: Pond Summary

Tributary Sub-Basin	Pond Name	Tributary Acres	WQ Volume (ac-ft)	Total Detention Volume (ac-ft)	Provided Volume (ac-ft)	Maximum 100-Year Discharge (cfs)
C	POND C	96.84	0.737	3.064	4.235	41.2
D	POND D	78.02	0.673	3.026	3.127	60.9
E	POND E	18.37	0.086	0.419	0.424	9.2

Drainageway MS-06

average

JR Response: Average added to text.

JR Response: Text revised to clarify the following. 0.07 was used in areas within the wetlands. For areas outside of this, 0.060 was used.

Drainageway MS-06 was evaluated in its existing conditions as part of the Filing
analyze the existing flood plain and channel stability. The proposed improvements for the
(5,300 FT) of this Filing 3 adjacent drainage way have been evaluated in this Filing 3 Dra
its current condition MS-06 is a heavily vegetated channel with weeds as tall as the typical flow depth,
and deep and pools, this would classify that channel as a natural minor stream with sluggish reacheds,
weedy and deep pools. per the El Paso County Drainage Criteria Manual Table 10-2. Given this
classification a Manning's roughness coefficient of 0.070 was used when analyzing the channel bottom
and 0.045 on the sides which have less vegetation cover. The Cor HECRAS model determined that the
existing channel has stable velocities ranging from 0.20 fp
based on the max stable velocity of 7 fps for erosion resis his
table has been included in the appendix material. In the ev
where the Froude number exceeds the El Paso County mi
proposed channels beginning, where it ties into the existin
Reinforcement Mats (TRMs) will be placed along these stretches to mitigate erosion risks and provide
long term protection to the existing channel. In the proposed section of the channel, velocities in the
channel reach 8.46 fps and a Froude max of 1. These sections will be lined with type L riprap along
bottom of the proposed channel and lined with erosion control blankets; this will mitigate the erosion risk
associated with these higher velocities and Froude's. Riprap adequacy calculations can be found in
appendix C.

.06 still in model?

JR Response: TRM lining is proposed only in areas outside of channel improvements. This area will be riprap with ECB on the side, please refer to the typical section in the CDs.

TRM or riprap? Address grade control also

provide specifications; appears to be needed in larger areas than shown on plans

Shear stresses present in the channel in its existing condition are approximately 0.50 lbs/sf on
average, below tress of 1.2 lbs/sf per Table 8-3. In the proposed
condition, the a eled sections is roughly 0.52 lbs/sf on average, though in
two small sectio ear stress is exceeded. One of these locations is just
upstream of the nel, while another is located at the outlet of the culvert
running below S let is designed with Type-H riprap which will prevent soil
erosion, and she the next modeled section, which is also lined with Type H
riprap. The area just upstream of the proposed channel improvement will be lined in a TRM that will
mitigate the potential for erosion due to the excess shear. Both of the areas where maximum shear stress
is exceeded are isolated, and not sustained for a long stretch within the reach. A table showing shear
stresses within the channel can be found in Appendix E.

JR Response: TRM area has been increased, and is now proposed in all areas needed per HEC RAS analysis.

Table 4: Channel Design Parameters

Design Parameter	Erosive Soils or Poor Vegetation	Erosion Resistant Soils and Vegetation
Max Low-flow Velocity (ft/sec)	3.5 ft/sec	5.0 ft/sec
Max 100-year Velocity (ft/sec)	5.0 ft/sec	7.0 ft/sec
Froude No. Low-flow	0.5	0.7
Froude No. 100-year	0.6	0.9

As compared to the prior HECRAS model of MS-06 completed with the Haegler Ranch DBPS, this model differs with higher velocities and flow depths and a smaller top width of channel, see table 5 for a comparison on values between the models. These differences are most likely due to updated survey data for the topography of the channel that was used for the model completed with this report, showing a

deeper channel than what was used in the Haegler Ranch DBPS. The analysis of the proposed conditions of Drainageway MS-06 shows that the majority of the channel is stable. Appendix Letter evaluating how the proposed channel improvements will not adversely affe and water surface elevation.

JR Response: Yes, additional clarification of this added to this table.

maximum values?

Table 5: Haegler Ranch Model Comparison

HEC RAS Model Comparison for MS-06 @ Judge Orr Road		
Values for 100yr Storm	Haegler Ranch DBPS	JR GeoHECRAS Model
Channel Velocity (ft/s)	3.48	8.46
Water Surface Depth in Channel (ft)	1.35	3.70
Top Width (ft)	539.34	329.3
Shear Stress (lb/sq ft)	N/A	1.67

DRAINAGE DESIGN CRITERIA

Development Criteria Reference

Storm drainage analysis and design criteria for the project were taken from the "*City of Colorado Spring/El Paso County Drainage Criteria Manual*" Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the "*Urban Storm Drainage Criteria Manual"* Volumes 1 - 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the "Colorado Springs Drainage Criteria Manual (CCSDCM), dated May 2014, as adopted by El Paso County.

Hydrologic Criteria

All hydrologic data was obtained from the "El Paso Drainage Criteria Manual" Volumes 1 and 2, and the "Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual" Volumes 1, 2, and 3. Onsite drainage improvements were designed based on the 5 year (minor) storm event and the 100-year (major) storm event. Rational Method calculations were prepared, in accordance with Section 13.3.2.1. of the CCSDCM, for the sub-basins that directly impact the sizing of ditches and local street culverts. Rational method calculations are presented in Appendix B.

Urban Drainage and Flood Control District's UD-Detention, Version 4.04 workbook was used for pond sizing. Required detention volumes and allowable release rates were designed per USDCM and CCS/EPCDCM. Pond sizing spreadsheets are presented in Appendix D.

Hydraulic Criteria

Autodesk Inc.'s Hydraflow Express Extension (Volume 10.5) was used for roadside ditch design. Ditches were checked for velocity and capacity per the CCS/EPCDCM Section 12.3.2.2. In order to check both capacity and velocity, a cross section analysis was performed on the roadside swales using the basin's maximum runoff Q and the proposed uniform slope of the swale. Swale cross sections have been presented in Appendix C.

CivilGeo HECRAS was used for local road crossing culvert design. Culvert size was determined based on 100-year flows and hydraulic criteria from EPCDCM Chapter 9 –Culvert Design. All local road crossing culvert design reports are presented in Appendix C.

DRAINAGE FACILITY DESIGN

General Concept

The proposed stormwater conveyance system was designed to convey the developed Filing 3 runoff to one of three full spectrum detention ponds via roadside ditches and local street culverts. These full spectrum ponds were designed to release at less than historic rates to minimize adverse impacts downstream.

Improvements to Drainageway MS-06 are proposed within the Saddlehorn Filing 3 improvements. A no rise study has been conducted on the proposed Drainageway MS-06 improvements to ensure no rises to the floodplain occur as a result of the Filing 3 development. All proposed drainageway improvements, including the San Isidro culvert crossing and channel sections can be found in Appendix E. All improvements aforementioned to Drainageway WF-R7A are proposed with the Saddlehorn Filing 4 improvements. Outfall protection from Pond D is the only improvement to Drainageway WF-R7A proposed with the Filing 3 improvements. The remaining improvements to Drainageway MS-06 shall be implemented with the Filing 5 improvements.

clarify what improvements

Specific Details

Four Step Process to Minimize Adverse Im

JR Response: At this time no improvements not listed in this report are proposed. This statement was to clarify that as further analysis is done on MS-06 as it borders/relates to Saddlehorn Filing 5, improvement necessary from that analysis will be completed with that project and are not included in the scope of filing 3 improvements.

In accordance with the El Paso County Drainage four step process to minimize adverse impacts o runoff volumes, stabilizing drainageways, treati consider the need for Industrial Commercial BM

Step 1, Reducing Runoff Volumes: The develop residential lots (2.5 ac. min.) with open spaces a helps disconnect impervious areas and reduce runoff volumes. Roadways utilize soil riprap lined roadside ditches further disconnecting impervious areas. These practices will also allow for increased infiltration and reduce runoff volume.

Step 2, Stabilize Drainageways: Filing 3 utilizes roadside ditches with culvert crossings throughout. These roadside ditches direct the on-site development flows to the proposed detention ponds within the project that releases at or below historic rates into Drainageways MS-06 and WF-R7A. Based upon the proposed reduction in released flows compared to the pre-developed flows, due to over detaining of flows in the onsite ponds, no impacts to downstream Drainageway MS-06 or Drainageway WF-R7A are anticipated, as the total flows present in the channel will be reduced compared to its current stable conditions.

Step 3, Provide WQCV: Runoff from this development is treated through capture and slow release of the WQCV in a full spectrum water quality and detention ponds that are designed per current El Paso County drainage criteria.

Step 4 Consider the need for Industrial and Commercial BMP's: No industrial or commercial uses are proposed within this development. However, a site specific storm water quality and erosion control plan and narrative are prepared in conjunction with this report. Site specific temporary source control BMPs as well as permanent BMP's are detailed in this plan and narrative to protect receiving waters.

Water Quality

In accordance with Section 13.3.2.1 of the CCS/EPCDCM, full spectrum water quality and detention are provided for all developed basins. Outlet structure release rates are limited to less than historic rates to minimize adverse impacts to downstream stormwater facilities. Complete pond and outlet structure designs are presented in Appendix D.

Erosion Control Plan

The El Paso County Drainage Criteria Manual specifies an Erosion Control Plan and associated cost estimate must be submitted with each Final Drainage Report. The Erosion Control Plans for Filing 3 have been submitted concurrently with this report.

Operation & Maintenance

In order to ensure the function and effectiveness of the stormwater infrastructure, maintenance activities such as inspection, routine maintenance, restorative maintenance, rehabilitation and repair, are required. All proposed drainage structures within the any platted County ROW will be owned and maintained by El Paso County. All proposed drainage structures within easements or tracts will be owned and maintained by the Saddlehorn Ranch Metropolitan District. Vegetation in the natural and improved portions of Drainageway MS-06 with the Filing 3 improvements is the responsibility of Saddlehorn Ranch Metropolitan District. This includes all mowing, seeding and weed control activities. An Inspection & Maintenance Plan is submitted concurrently with this drainage report that details the required maintenance activities and intervals to ensure proper function of all stormwater infrastructure in the future.

Drainage and Bridge Fees

Drainage and Bridge Fees are due at time of final platting. An estimate of basin fees for the proposed development within Haegler Ranch drainage basin is provided below. Fee reduction for low density lots are applied to the overall basin fees in the next section. Additionally, reimbursable expenses are detailed below.

Total Filing 3 Platted Acres: 175.98 ac
Total Filing 3 Open Space Area: 38.77 ac
Total Filing 3 Impervious Acres = 13.72 ac ((175.98-38.77) ac x 10%)

Filing 3 Fee Totals (Prior to Reductions):

Bridge Fees **Drainage Fees**

$ 1,916/ac x 13.72 ac = $26,288

$12,985/ac x 13.72 ac = $178,154

Filing 3 Drainage Fee Reduction: 25% Reduction for Low Density Lots: $178,154 x 25% = $44,539

Filing 3 Fee Totals (After Reductions):

JR Response: Revised to match above.

same as above

Bridge Fees
$ 1,640/ac x 13.72 ac = $22,501

Drainage Fees
$178,154 - $44,539 = $133,615

Construction Cost Opinion

Cost opinion has been presented in Appendix A.

SUMMARY

The proposed development remains consistent with pre-development drainage conditions with the construction of the recommended drainage improvements, including ditches, culverts, detention ponds and drainage channel improvements. The proposed development will not adversely affect the offsite major drainageways or surrounding development. This report meets the latest El Paso County Drainage Criteria requirements for this site and is in accordance with the PDR/MDDP for Saddlehorn Ranch.

REFERENCES:

1. City of Colorado Springs Drainage Criteria Manual Volume 1, City of Colorado Springs, CO, May 2014.

2. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, Latest Revision.

3. Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch, JR Engineering, May 2020.

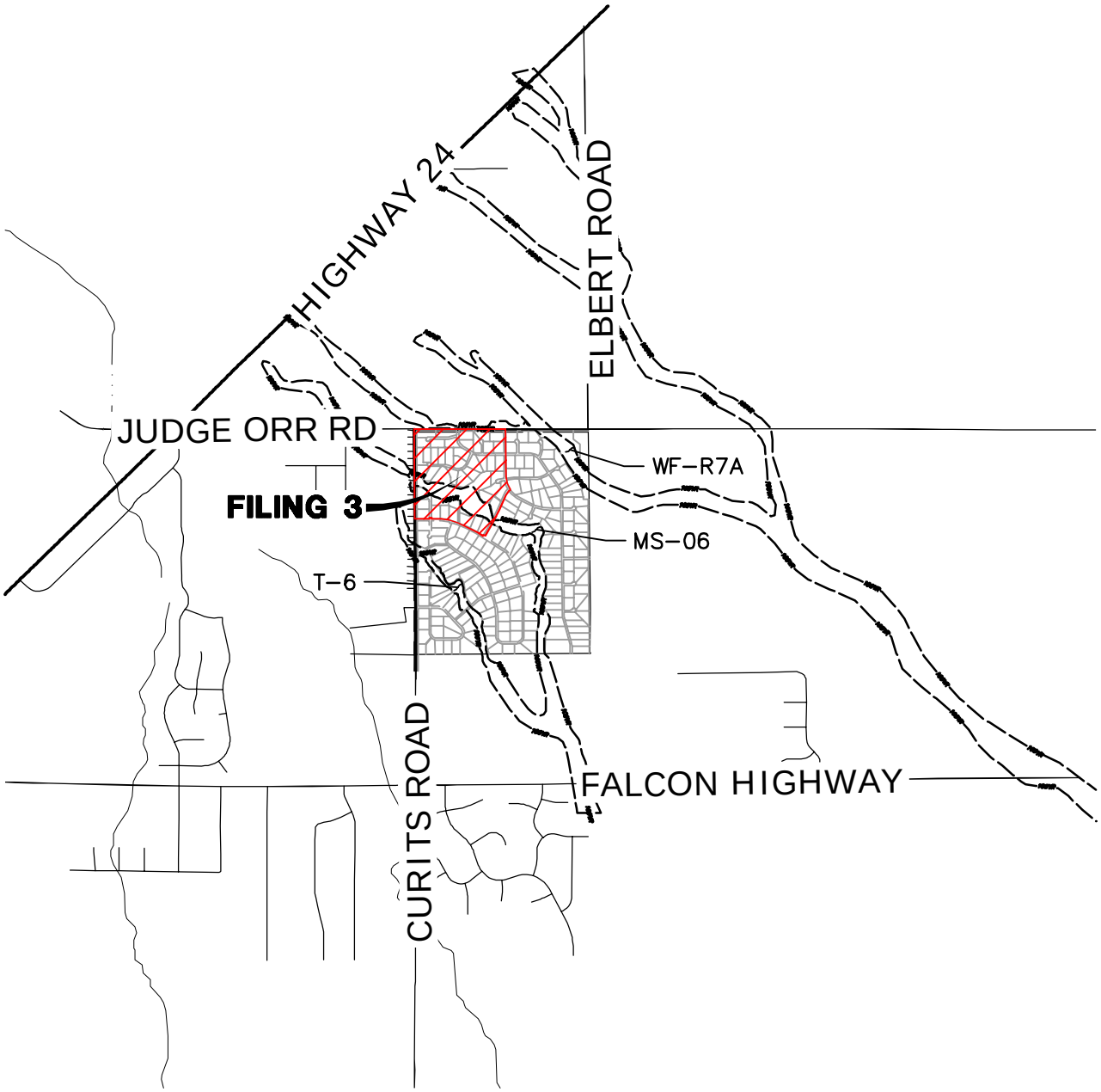
4. Haegler Ranch Drainage Basin Planning Study, URS Corporation, May 2009.

5. The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR, Federal Emergency Management Agency, October 20, 2004.

6. Final Drainage Report for Saddlehorn Ranch – Filing 2, JR Engineering, January 4, 2022

APPENDIX A

FIGURES AND EXHIBITS



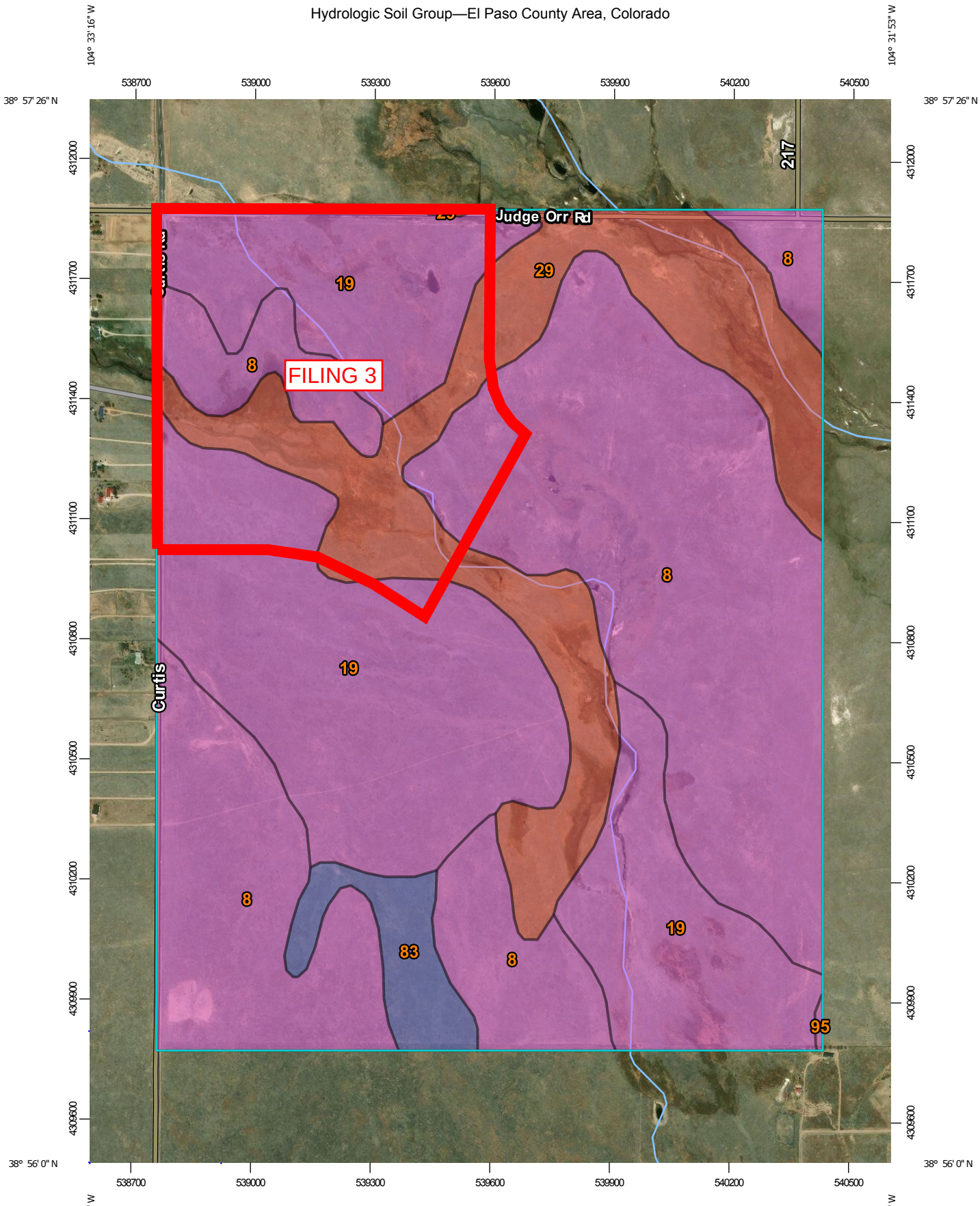
5000 2500 0 5000 10000

ORIGINAL SCALE: 1" = 5000'

VICINITY MAP
SADDLEHORN RANCH FILING 3
25142.05
12/6/21
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com



Map Scale: 1:13,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 16, Sep 10, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2016—Aug 17, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	388.3	44.6%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	307.3	35.3%
29	Fluvaquentic Haplaquolls, nearly level	D	150.0	17.2%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	24.6	2.8%
95	Truckton loamy sand, 1 to 9 percent slopes	A	0.6	0.1%
Totals for Area of Interest			**870.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

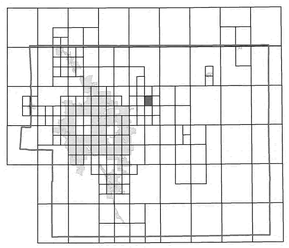
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

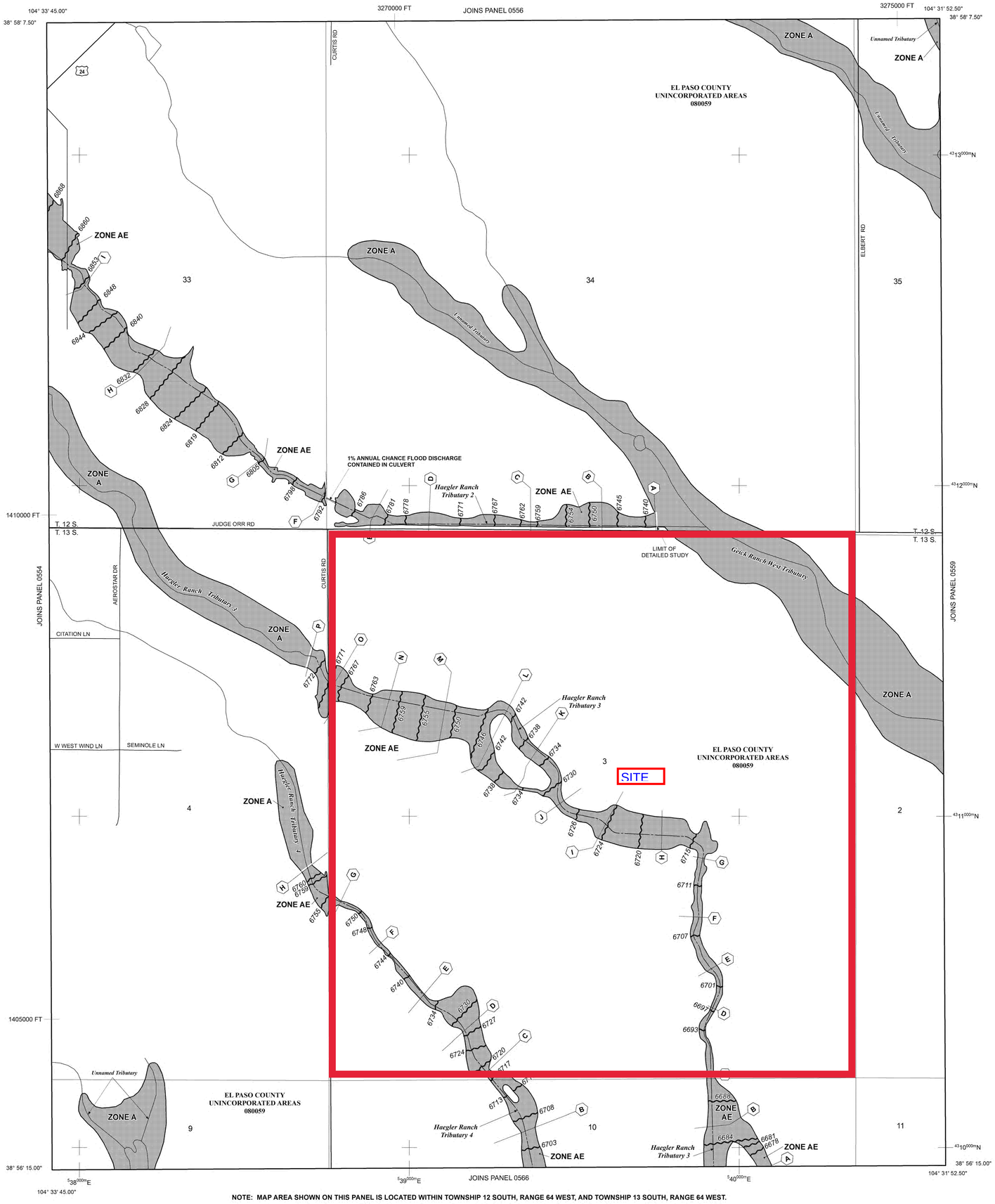
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 64 WEST, AND TOWNSHIP 13 SOUTH, RANGE 64 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D Boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 — 23	Transect line
97° 07' 30.00" 32° 22' 30.00"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT	5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0558G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 558 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0558	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0558G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

2024 Financial Assurance Estimate Form
(with pre-plat construction)

Updated: 03/01/24

PROJECT INFORMATION		
Saddlehorn Filing 3	3/1/2024	SF-23-004
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining	
SECTION 1 - GRADING AND EROSION CONTROL (Construction and Permanent BMPs)								
Earthwork								*
less than 1,000; $5,300 min		CY	$ 8.00	=	$ -		$ -	*
1,000-5,000; $8,000 min		CY	$ 6.00	=	$ -		$ -	*
5,001-20,000; $30,000 min		CY	$ 5.00	=	$ -		$ -	*
20,001-50,000; $100,000 min		CY	$ 3.50	=	$ -		$ -	*
50,001-200,000; $175,000 min	139190.	CY	$ 2.50	=	$ 347,975.00		$ 347,975.00	*
greater than 200,000; $500,000 min		CY	$ 2.00	=	$ -		$ -	*
Permanent Erosion Control Blanket	11656.	SY	$ 9.00	=	$ 104,904.00		$ 104,904.00	*
Permanent Seeding (inc. noxious weed mgmnt.) & Mulching	25.59	AC	$ 2,018.00	=	$ 51,640.62		$ 51,640.62	*
Permanent Pond/BMP (provide engineer's estimate)	See Below	EA		=	$ -		$ -	*
Pond C Detention Outlet Structure	1.	EA	$ 15,000.00	=	$ 15,000.00		$ 15,000.00	
Pond C Detention Emergency Spillway	1.	EA	$ 5,000.00	=	$ 5,000.00		$ 5,000.00	
Pond C Concrete/Riprap Forebay	1.	EA	$ 3,000.00	=	$ 3,000.00		$ 3,000.00	
Pond C Concrete Trickle Channel	55.	CY	$ 95.00	=	$ 5,225.00		$ 5,225.00	
Pond D Detention Outlet Structure	1.	EA	$ 15,000.00	=	$ 15,000.00		$ 15,000.00	
Pond D Detention Emergency Spillway	1.	EA	$ 5,000.00	=	$ 5,000.00		$ 5,000.00	
Pond D Concrete/Riprap Forebay	1.	EA	$ 3,000.00	=	$ 3,000.00		$ 3,000.00	
Pond D Concrete Trickle Channel	65.	CY	$ 95.00	=	$ 6,175.00		$ 6,175.00	
Pond E Detention Outlet Structure	1.	EA	$ 10,000.00	=	$ 10,000.00		$ 10,000.00	
Pond E Detention Emergency Spillway	1.	EA	$ 4,000.00	=	$ 4,000.00		$ 4,000.00	
Pond E Concrete/Riprap Forebay	1.	EA	$ 3,000.00	=	$ 3,000.00		$ 3,000.00	
Pond E Concrete Trickle Channel	10.	CY	$ 95.00	=	$ 950.00		$ 950.00	
Drianageway riprap, d50 size from 6" to 24"	3000.	Tons	$ 83.00	=	$ 249,000.00		$ 249,000.00	
Concrete Washout Basin	1.	EA	$ 1,172.00	=	$ 1,172.00		$ 1,172.00	
Inlet Protection	19.	EA	$ 217.00	=	$ 4,123.00		$ 4,123.00	
Outlet Protection	19.	EA	$ 217.00	=	$ 4,123.00		$ 4,123.00	
Rock Check Dam	107.	EA	$ 651.00	=	$ 69,657.00		$ 69,657.00	
Safety Fence	11061.	LF	$ 3.00	=	$ 33,183.00		$ 33,183.00	
Sediment Basin	3.	EA	$ 2,294.00	=	$ 6,882.00		$ 6,882.00	
Sediment Trap		EA	$ 538.00	=	$ -		$ -	
Silt Fence	22874.	LF	$ 3.00	=	$ 68,622.00		$ 68,622.00	
Slope Drain	157.	LF	$ 43.00	=	$ 6,751.00		$ 6,751.00	
Straw Bale		EA	$ 33.00	=	$ -		$ -	
Straw Wattle/Rock Sock	112.	LF	$ 8.00	=	$ 896.00		$ 896.00	
Surface Roughening		AC	$ 269.00	=	$ -		$ -	
Temporary Erosion Control Blanket		SY	$ 3.00	=	$ -		$ -	
Temporary Seeding and Mulching		AC	$ 1,793.00	=	$ -		$ -	
Vehicle Tracking Control	4.	EA	$ 3,085.00	=	$ 12,340.00		$ 12,340.00	
*Gravel Maintenance Access Road	3486.	SY	$ 50.00	=	$ 174,300.00		$ 174,300.00	
[insert items not listed but part of construction plans]				=	$ -		$ -	
MAINTENANCE (35% of Construction BMPs)				=	$ 133,306.95		$ 133,306.95	
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)			**Section 1 Subtotal**	=	$ 1,344,225.57		$ 1,344,225.57	
SECTION 2 - PUBLIC IMPROVEMENTS *								
ROADWAY IMPROVEMENTS								*
Construction Traffic Control	1.	LS	$ 50,000.00	=	$ 50,000.00		$ 50,000.00	*
Removal of Asphalt (Full Depth)	515.	SY	$ 10.00	=	$ 5,150.00		$ 5,150.00	*
Removal of Asphalt (Planing-2")	2524.	SY	$ 5.00		$ 12,620.00		$ 12,620.00	
Removal of Striping	7096.74	LF	$ 1.00		$ 7,096.74		$ 7,096.74	
Removal of Fencing	3020.	LF	$ 5.00		$ 15,100.00		$ 15,100.00	
Aggregate Base Course (133 lbs/cf) 4" thick	12595.	Tons	$ 37.00	=	$ 466,015.00		$ 466,015.00	*
Aggregate Base Course (135 lbs/cf)		CY	$ 66.00	=	$ -		$ -	*
Asphalt Pavement (3" thick)		SY	$ 18.00	=	$ -		$ -	*
Asphalt Pavement (4" thick)		SY	$ 25.00	=	$ -		$ -	*
Asphalt Pavement (6" thick)		SY	$ 38.00	=	$ -		$ -	*
Asphalt Pavement (115 lb/cy-in) 3-5 " thick	14852.	Tons	$ 114.00	=	$ 1,693,128.00		$ 1,693,128.00	*
Raised Median, Paved		SF	$ 11.00	=	$ -		$ -	*
Regulatory Sign/Advisory Sign	32.	EA	$ 392.00	=	$ 12,544.00		$ 12,544.00	*
Guide/Street Name Sign	26.	EA	$ 250.00	=	$ 6,500.00		$ 6,500.00	*
Epoxy Pavement Marking	8228.	SF	$ 17.00	=	$ 139,876.00		$ 139,876.00	*
Thermoplastic Pavement Marking	209.	SF	$ 30.00	=	$ 6,270.00		$ 6,270.00	*
Barricade - Type 3	6.	EA	$ 259.00	=	$ 1,554.00		$ 1,554.00	*
Delineator - Type I		EA	$ 31.00	=	$ -		$ -	*
Curb and Gutter, Type A (6" Vertical)		LF	$ 38.00	=	$ -		$ -	*
Curb and Gutter, Type B (Median)		LF	$ 38.00	=	$ -		$ -	*
Curb and Gutter, Type C (Ramp)		LF	$ 38.00	=	$ -		$ -	*
4" Sidewalk (common areas only)		SY	$ 62.00	=	$ -		$ -	*
5" Sidewalk		SY	$ 77.00	=	$ -		$ -	*
6" Sidewalk		SY	$ 94.00	=	$ -		$ -	*

PROJECT INFORMATION		
Saddlehorn Filing 3	3/1/2024	SF-23-004
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining	
8" Sidewalk		SY	$ 125.00	=	$ -		$ -	*
Pedestrian Ramp		EA	$ 1,496.00	=	$ -		$ -	*
Cross Pan, local (8" thick, 6' wide to include return)		LF	$ 79.00	=	$ -		$ -	*
Cross Pan, collector (9" thick, 8' wide to include return)		LF	$ 119.00	=	$ -		$ -	*
Curb Opening with Drainage Chase		EA	$ 1,926.00	=	$ -		$ -	*
Guardrail Type 3 (W-Beam)		LF	$ 65.00	=	$ -		$ -	*
Guardrail Type 7 (Concrete)		LF	$ 94.00	=	$ -		$ -	*
Guardrail End Anchorage		EA	$ 2,731.00	=	$ -		$ -	*
Guardrail Impact Attenuator		EA	$ 4,902.00	=	$ -		$ -	*
Sound Barrier Fence (CMU block, 6' high)		LF	$ 102.00	=	$ -		$ -	*
Sound Barrier Fence (panels, 6' high)		LF	$ 104.00	=	$ -		$ -	*
Electrical Conduit, Size =		LF	$ 22.00	=	$ -		$ -	*
Traffic Signal, (provide engineer's estimate)		EA		=	$ -		$ -	*
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	*
STORM DRAIN IMPROVEMENTS								*
Concrete Box Culvert (M Standard), Size (W x H)		LF		=	$ -		$ -	*
18" Reinforced Concrete Pipe	328.	LF	$ 82.00	=	$ 26,896.00		$ 26,896.00	*
24" Reinforced Concrete Pipe	127.	LF	$ 98.00	=	$ 12,446.00		$ 12,446.00	*
30" Reinforced Concrete Pipe	81.	LF	$ 123.00	=	$ 9,963.00		$ 9,963.00	*
36" Reinforced Concrete Pipe	30.	LF	$ 151.00	=	$ 4,530.00		$ 4,530.00	*
42" Reinforced Concrete Pipe		LF	$ 201.00	=	$ -		$ -	*
48" Reinforced Concrete Pipe		LF	$ 245.00	=	$ -		$ -	*
54" Reinforced Concrete Pipe		LF	$ 320.00	=	$ -		$ -	*
60" Reinforced Concrete Pipe		LF	$ 374.00	=	$ -		$ -	*
66" Reinforced Concrete Pipe		LF	$ 433.00	=	$ -		$ -	*
14" x 23" HERCP	23.56	LF	$ 155.16	=	$ 3,655.57		$ 3,655.57	
19" x 30" HERCP	186.06	LF	$ 185.60	=	$ 34,532.74		$ 34,532.74	
24" x 38" HERCP	43.81	LF	$ 222.02	=	$ 9,726.70		$ 9,726.70	
12' x 4' RCBC	156.	LF	$ 1,100.00	=	$ 171,600.00		$ 171,600.00	
72" Reinforced Concrete Pipe		LF	$ 495.00	=	$ -		$ -	*
18" Corrugated Steel Pipe		LF	$ 105.00	=	$ -		$ -	*
24" Corrugated Steel Pipe	7.	LF	$ 121.00	=	$ 847.00		$ 847.00	*
30" Corrugated Steel Pipe		LF	$ 154.00	=	$ -		$ -	*
36" Corrugated Steel Pipe		LF	$ 184.00	=	$ -		$ -	*
42" Corrugated Steel Pipe		LF	$ 212.00	=	$ -		$ -	*
48" Corrugated Steel Pipe		LF	$ 223.00	=	$ -		$ -	*
54" Corrugated Steel Pipe		LF	$ 327.00	=	$ -		$ -	*
60" Corrugated Steel Pipe		LF	$ 353.00	=	$ -		$ -	*
66" Corrugated Steel Pipe		LF	$ 427.00	=	$ -		$ -	*
72" Corrugated Steel Pipe		LF	$ 502.00	=	$ -		$ -	*
78" Corrugated Steel Pipe		LF	$ 578.00	=	$ -		$ -	*
84" Corrugated Steel Pipe		LF	$ 691.00	=	$ -		$ -	*
Flared End Section (FES) RCP Size = 18" RCP (unit cost = 6x pipe unit cost)	13.	EA	$ 402.00	=	$ 5,226.00		$ 5,226.00	*
Flared End Section (FES) CSP Size = 24" RCP (unit cost = 6x pipe unit cost)	6.	EA	$ 486.00	=	$ 2,916.00		$ 2,916.00	*
Flared End Section (FES) CSP Size = 30" RCP (unit cost = 6x pipe unit cost)	3.	EA	$ 600.00		$ 1,800.00		$ 1,800.00	
Flared End Section (FES) CSP Size = 36" RCP (unit cost = 6x pipe unit cost)	1.	EA	$ 840.00		$ 840.00		$ 840.00	
Flared End Section (FES) CSP Size = 14" X 23" HERCP (unit cost = 6x pipe unit cost)	2.	EA	$ 930.96		$ 1,861.92		$ 1,861.92	
Flared End Section (FES) CSP Size = 19" X 30" HERCP (unit cost = 6x pipe unit cost)	4.	EA	$ 1,113.60		$ 4,454.40		$ 4,454.40	
Flared End Section (FES) CSP Size = 24" X 38" HERCP (unit cost = 6x pipe unit cost)	2.	EA	$ 1,332.12		$ 2,664.24		$ 2,664.24	
End Treatment- Headwall	1.	EA	$ 10,000.00	=	$ 10,000.00		$ 10,000.00	*
End Treatment- Wingwall	1.	EA	$ 10,000.00	=	$ 10,000.00		$ 10,000.00	*
End Treatment - Cutoff Wall	12.	CY	$ 560.00	=	$ 6,720.00		$ 6,720.00	*
Curb Inlet (Type R) L=5', Depth < 5'		EA	$ 7,212.00	=	$ -		$ -	*
Curb Inlet (Type R) L=5', 5' ≤ Depth < 10'		EA	$ 9,377.00	=	$ -		$ -	*
Curb Inlet (Type R) L =5', 10' ≤ Depth < 15'		EA	$ 10,859.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', Depth < 5'		EA	$ 9,925.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', 5' ≤ Depth < 10'		EA	$ 10,230.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', 10' ≤ Depth < 15'		EA	$ 12,805.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', Depth < 5'		EA	$ 12,907.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', 5' ≤ Depth < 10'		EA	$ 13,835.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', 10' ≤ Depth < 15'		EA	$ 15,130.00	=	$ -		$ -	*
Curb Inlet (Type R) L =20', Depth < 5'		EA	$ 13,755.00	=	$ -		$ -	*
Curb Inlet (Type R) L =20', 5' ≤ Depth < 10'		EA	$ 15,181.00	=	$ -		$ -	*
Grated Inlet (Type C), Depth < 5'		EA	$ 6,037.00	=	$ -		$ -	*
Grated Inlet (Type D), Depth < 5'		EA	$ 7,458.00	=	$ -		$ -	*
Storm Sewer Manhole, Box Base		EA	$ 15,130.00	=	$ -		$ -	*
Storm Sewer Manhole, Slab Base		EA	$ 8,322.00	=	$ -		$ -	*
Geotextile (Erosion Control)		SY	$ 9.00	=	$ -		$ -	*
Rip Rap, d50 size from 6" to 24"	558.	Tons	$ 104.00	=	$ 58,032.00		$ 58,032.00	*
Rip Rap, Grouted		Tons	$ 124.00	=	$ -		$ -	*

PROJECT INFORMATION		
Saddlehorn Filing 3	3/1/2024	SF-23-004
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	(with Pre-Plat Construction) Remaining	
Drainage Channel Construction, Size (W x H)		LF		=	$ -		$ -	*
Drainage Channel Lining, Concrete		CY	$ 741.00	=	$ -		$ -	*
Drainage Channel Lining, Rip Rap		CY	$ 145.00	=	$ -		$ -	*
Drainage Channel Lining, Grass		AC	$ 1,911.00	=	$ -		$ -	*
Drainage Channel Lining, Turf Reinforcment Mat (TRM)	207.	SY	$ 50.00	=	$ 10,350.00		$ 10,350.00	*
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)		**Section 2 Subtotal**		=	$ 2,804,915.30		$ 2,804,915.30	
SECTION 3 - COMMON DEVELOPMENT IMPROVEMENTS (Private or District and NOT Maintained by EPC)**								
ROADWAY IMPROVEMENTS								
WATER SYSTEM IMPROVEMENTS								
Water Main Pipe (PVC), Size 8"	10232.	LF	$ 84.00	=	$ 859,488.00		$ 859,488.00	
Water Main Pipe (Ductile Iron), Size 8"		LF	$ 98.00	=	$ -		$ -	
Water Main Pipe (Ductile Iron), Size 6"	349.6	LF	$ 94.59	=	$ 33,068.66		$ 33,068.66	
Gate Valves, 8"	35.	EA	$ 2,418.00	=	$ 84,630.00		$ 84,630.00	
Fire Hydrant Assembly, w/ all valves	24.	EA	$ 8,584.00	=	$ 206,016.00		$ 206,016.00	
Water Service Line Installation, inc. tap and valves	40.	EA	$ 1,723.00	=	$ 68,920.00		$ 68,920.00	
Fire Cistern Installation, complete		EA		=	$ -		$ -	
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	
SANITARY SEWER IMPROVEMENTS								
Sewer Main Pipe (PVC), Size 8"		LF	$ 84.00	=	$ -		$ -	
Sanitary Sewer Manhole, Depth < 15 feet		EA	$ 5,708.00	=	$ -		$ -	
Sanitary Service Line Installation, complete		EA	$ 1,825.00	=	$ -		$ -	
Sanitary Sewer Lift Station, complete		EA		=	$ -		$ -	
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	
LANDSCAPING IMPROVEMENTS	(For subdivision specific condition of approval, or PUD)							
		EA		=	$ -		$ -	
		EA		=	$ -		$ -	
		EA		=	$ -		$ -	
		EA		=	$ -		$ -	
		EA		=	$ -		$ -	
** - Section 3 is not subject to defect warranty requirements		**Section 3 Subtotal**		=	$ 1,252,122.66		$ 1,252,122.66	
LETTERS OF MAP REVISION		LS	$ 8,000.00	=	$ 8,000.00		$ 8,000.00	
AS-BUILT PLANS (Public Improvements inc. Permanent WQCV BMPs)		LS	$ 10,000.00	=	$ 10,000.00		$ 10,000.00	
POND/BMP CERTIFICATION (inc. elevations and volume calculations)		LS	$ 10,000.00	=	$ 10,000.00		$ 10,000.00	

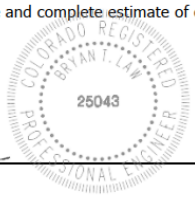
Total Construction Financial Assurance $ 5,429,263.53
(Sum of all section subtotals plus as-builts and pond/BMP certification)

Total Remaining Construction Financial Assurance (with Pre-Plat Construction) $ 5,421,263.53
(Sum of all section totals less credit for items complete plus as-builts and pond/BMP certification)

Total Defect Warranty Financial Assurance $ 661,886.98
(20% of all items identified as (*). To be collateralized at time of preliminary acceptance)

Approvals

I hereby certify that this is an accurate and complete estimate of costs for the work as shown on the Grading and Erosion Control Plan and Construction Drawings associated with the Project.



Engineer * (P.E. Seal Required)

Nathan Steele
Approved by Owner / Applicant

March 8, 2024
Date

Approved by El Paso County Engineer / ECM Administrator

Date

APPENDIX B

HYDROLOGIC CALCULATIONS

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 1/4/22

Basin ID	Total Area (ac)	Paved Roads			2.5 Acre Rural Lots			Lawns			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
C1	6.04	45%	1.07	8.0%	6.2%	4.97	5.1%	2%	0.00	0.0%	13.1%
C2	3.35	45%	1.50	20.1%	6.2%	1.85	3.4%	2%	0.00	0.0%	23.6%
C3	23.44	45%	1.63	3.1%	6.2%	21.81	5.8%	2%	0.00	0.0%	8.9%
C4	10.94	45%	3.40	14.0%	6.2%	7.54	4.3%	2%	0.00	0.0%	18.3%
C5	2.35	45%	0.83	15.9%	6.2%	1.52	4.0%	2%	0.00	0.0%	19.9%
C6	3.95	45%	1.59	18.1%	6.2%	2.36	3.7%	2%	0.00	0.0%	21.8%
C7	2.14	45%	1.00	21.0%	6.2%	1.14	3.3%	2%	0.00	0.0%	24.3%
C8	22.55	45%	2.21	4.4%	6.2%	20.34	5.6%	2%	0.00	0.0%	10.0%
C9	2.63	45%	1.98	33.9%	6.2%	0.65	1.5%	2%	0.00	0.0%	35.4%
C10	16.38	45%	2.47	6.8%	6.2%	11.85	4.5%	2%	2.06	0.3%	11.5%
D1	9.11	45%	1.51	7.5%	6.2%	7.60	5.2%	2%	0.00	0.0%	12.6%
D2	8.49	45%	1.49	7.9%	6.2%	7.00	5.1%	2%	0.00	0.0%	13.0%
D3	3.21	45%	0.19	2.7%	6.2%	3.02	5.8%	2%	0.00	0.0%	8.5%
D4	10.01	45%	0.35	1.6%	6.2%	8.21	5.1%	2%	1.45	0.3%	6.9%
D5	9.56	45%	2.78	13.1%	6.2%	6.78	4.4%	2%	0.00	0.0%	17.5%
D6	0.34	45%	0.34	45.0%	6.2%	0.00	0.0%	2%	0.00	0.0%	45.0%
D7	33.94	45%	7.65	10.1%	6.2%	24.05	4.4%	2%	2.24	0.1%	14.7%
E1	17.12	45%	0.71	1.9%	6.2%	13.22	4.8%	2%	3.19	0.4%	7.0%
E2	0.37	45%	0.37	45.0%	6.2%	0.00	0.0%	2%	0.00	0.0%	45.0%
E3	0.20	45%	0.20	45.0%	6.2%	0.00	0.0%	2%	0.00	0.0%	45.0%
E4	0.68	45%	0.00	0.0%	6.2%	0.19	1.7%	2%	0.49	1.4%	3.2%
UD1	7.48	45%	0.00	0.0%	6.2%	7.48	6.2%	2%	0.00	0.0%	6.2%
UD2	9.17	45%	0.00	0.0%	6.2%	9.17	6.2%	2%	0.00	0.0%	6.2%
UD3	2.23	45%	0.00	0.0%	6.2%	2.23	6.2%	2%	0.00	0.0%	6.2%
UD4	34.90	45%	0.00	0.0%	6.2%	0.00	0.0%	2%	34.90	2.0%	2.0%
UD5	17.63	45%	0.00	0.0%	6.2%	17.63	6.2%	2%	0.00	0.0%	6.2%
OS1	2.37	100%	1.35	57.0%	6.2%	0.00	0.0%	2%	1.02	0.9%	57.8%
OS2	0.70	100%	0.21	30.0%	6.2%	0.00	0.0%	2%	0.49	1.4%	31.4%
OS3	2.28	100%	1.35	59.2%	6.2%	0.00	0.0%	2%	0.93	0.8%	60.0%
OS4	1.08	100%	0.58	53.7%	6.2%	0.00	0.0%	2%	0.50	0.9%	54.6%
OS5	2.92	100%	0.59	20.2%	6.2%	0.94	2.0%	2%	1.39	1.0%	23.2%
F1	1.35	100%	0.53	39.3%	6.2%	0.00	0.0%	2%	0.82	1.2%	40.5%
F2	7.67	45%	0.98	5.7%	6.2%	6.69	5.4%	2%	0.00	0.0%	11.2%
F3	5.44	45%	2.37	19.6%	6.2%	3.07	3.5%	2%	3.07	1.1%	24.2%
F4	2.93	45%	2.93	45.0%	6.2%	0.00	0.0%	2%	0.00	0.0%	45.0%
TOTAL	284.95										12.4%

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis--Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

2.5 Acre Rural Lots - Comp. % Impervious Calculation			
Total Area (ac)	Area (ac) - Roofs (90%)	Area (ac)- Drives (100%)	Area (ac) - Lawns (2%)
2.50	0.068	0.046	2.39
Comp % Imperviousness	6.20%		

Roads w/ Roadside Ditches - Comp. % Impervious Calculation		
Area* (ac)	Area - Ditch (5%)	Area - Roads (100%)
0.2124	0.1320	0.0804
Comp % Imperviousness	0.41	

*Area based on 250 LF roadway from CL to outside edge of roadside ditch

The above conservatively rounded to 45%.

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

bdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 1/4/22

Basin ID	Total Area (ac)	Basins Total Weighted % Imp.	Hydrologic Soil Group			Hydrologic Soil Group			Minor Coefficients			Major Coefficients			Basins Total Weighted C_5	Basins Total Weighted C_{100}
			Area A (ac)	Area B (ac)	Area C/D (ac)	% A (ac)	% B (ac)	% C/D (ac)	$C_{5,A}$	$C_{5,B}$	$C_{5,C/D}$	$C_{100,A}$	$C_{100,B}$	$C_{100,C/D}$		
C1	6.04	13.1%	6.04	0.00	0.00	100%	0%	0%	0.06	0.09	0.14	0.21	0.49	0.54	0.06	0.21
C2	3.35	23.6%	3.35	0.00	0.00	100%	0%	0%	0.14	0.18	0.23	0.29	0.54	0.58	0.14	0.29
C3	23.44	8.9%	23.44	0.00	0.00	100%	0%	0%	0.04	0.06	0.11	0.18	0.47	0.52	0.04	0.18
C4	10.94	18.3%	5.12	0.00	5.82	47%	0%	53%	0.10	0.14	0.19	0.25	0.51	0.56	0.14	0.42
C5	2.35	19.9%	2.35	0.00	0.00	100%	0%	0%	0.11	0.15	0.20	0.26	0.52	0.57	0.11	0.26
C6	3.95	21.8%	3.95	0.00	0.00	100%	0%	0%	0.12	0.16	0.21	0.28	0.53	0.57	0.12	0.28
C7	2.14	24.3%	1.55	0.00	0.59	72%	0%	28%	0.14	0.19	0.23	0.30	0.54	0.58	0.17	0.38
C8	22.55	10.0%	22.55	0.00	0.00	100%	0%	0%	0.05	0.07	0.12	0.19	0.47	0.52	0.05	0.19
C9	2.63	35.4%	2.63	0.00	0.00	100%	0%	0%	0.23	0.28	0.32	0.39	0.59	0.63	0.23	0.39
C10	16.38	11.5%	16.38	0.00	0.00	100%	0%	0%	0.05	0.08	0.13	0.20	0.48	0.53	0.05	0.20
D1	9.11	12.6%	9.11	0.00	0.00	100%	0%	0%	0.06	0.09	0.14	0.21	0.49	0.54	0.06	0.21
D2	8.49	13.0%	7.40	0.00	1.09	87%	0%	13%	0.06	0.09	0.14	0.21	0.49	0.54	0.07	0.25
D3	3.21	8.5%	3.21	0.00	0.00	100%	0%	0%	0.04	0.06	0.10	0.18	0.47	0.52	0.04	0.18
D4	10.01	6.9%	3.16	0.00	6.85	32%	0%	68%	0.03	0.05	0.09	0.16	0.46	0.51	0.07	0.40
D5	9.56	17.5%	3.76	0.00	5.80	39%	0%	61%	0.09	0.13	0.18	0.25	0.51	0.56	0.14	0.43
D6	0.34	45.0%	0.17	0.00	0.17	50%	0%	50%	0.31	0.36	0.40	0.46	0.64	0.67	0.36	0.57
D7	33.94	14.7%	24.82	0.00	9.12	73%	0%	27%	0.07	0.11	0.16	0.22	0.50	0.54	0.10	0.31
E1	17.12	7.0%	14.17	0.00	2.95	83%	0%	17%	0.03	0.05	0.09	0.17	0.46	0.51	0.04	0.22
E2	0.37	45.0%	0.37	0.00	0.00	100%	0%	0%	0.31	0.36	0.40	0.46	0.64	0.67	0.31	0.46
E3	0.20	45.0%	0.18	0.00	0.02	90%	0%	10%	0.31	0.36	0.40	0.46	0.64	0.67	0.32	0.48
E4	0.68	3.2%	0.67	0.00	0.01	99%	0%	1%	0.01	0.02	0.06	0.14	0.44	0.50	0.01	0.14
UD1	7.48	6.2%	7.48	0.00	0.00	100%	0%	0%	0.03	0.04	0.09	0.16	0.46	0.51	0.03	0.16
UD2	9.17	6.2%	9.14	0.00	0.03	100%	0%	0%	0.03	0.04	0.09	0.16	0.46	0.51	0.03	0.16
UD3	2.23	6.2%	1.71	0.00	0.52	77%	0%	23%	0.03	0.04	0.09	0.16	0.46	0.51	0.04	0.24
UD4	34.90	2.0%	9.50	0.00	25.40	27%	0%	73%	0.01	0.01	0.05	0.13	0.44	0.49	0.04	0.39

UD5	17.63	6.2%	12.32	0.00	5.31	70%	0%	30%	0.03	0.04	0.09	0.16	0.46	0.51	0.04	0.26
OS1	2.37	57.8%	2.37	0.00	0.00	100%	0%	0%	0.43	0.47	0.51	0.56	0.70	0.72	0.43	0.56
OS2	0.70	31.4%	0.70	0.00	0.00	100%	0%	0%	0.20	0.24	0.29	0.35	0.57	0.61	0.20	0.35
OS3	2.28	60.0%	2.28	0.00	0.00	100%	0%	0%	0.45	0.49	0.53	0.58	0.71	0.73	0.45	0.58
OS4	1.08	54.6%	0.51	0.00	0.57	47%	0%	53%	0.40	0.44	0.48	0.54	0.68	0.71	0.44	0.63
OS5	2.92	23.2%	1.61	0.00	1.31	55%	0%	45%	0.13	0.17	0.22	0.29	0.54	0.58	0.17	0.42
F1	1.35	40.5%	1.35	0.00	0.00	100%	0%	0%	0.27	0.32	0.37	0.43	0.62	0.65	0.27	0.43
F2	7.67	11.2%	7.67	0.00	0.00	100%	0%	0%	0.05	0.08	0.13	0.20	0.48	0.53	0.05	0.20
F3	5.44	24.2%	2.00	0.00	3.44	37%	0%	63%	0.14	0.18	0.23	0.30	0.54	0.58	0.20	0.48
F4	2.93	45.0%	2.12	0.00	0.81	72%	0%	28%	0.31	0.36	0.40	0.46	0.64	0.67	0.34	0.52
TOTAL	284.95	12.4%	215.14	0.00	69.81	76%	0%	24%	---	---	---	---	---	---	0.08	0.29

Table 6-4. Runoff coefficient equations based on NRCS soil group and storm return period

NRCS Soil Group	Storm Return Period						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
A	$C_A = 0.84i^{1.302}$	$C_A = 0.86i^{1.276}$	$C_A = 0.87i^{1.232}$	$C_A = 0.84i^{1.124}$	$C_A = 0.85i+0.025$	$C_A = 0.78i+0.110$	$C_A = 0.65i+0.254$
B	$C_B = 0.84i^{1.169}$	$C_B = 0.86i^{1.088}$	$C_B = 0.81i+0.057$	$C_B = 0.63i+0.249$	$C_B = 0.56i+0.328$	$C_B = 0.47i+0.426$	$C_B = 0.37i+0.536$
C/D	$C_{C/D} = 0.83i^{1.122}$	$C_{C/D} = 0.82i+0.035$	$C_{C/D} = 0.74i+0.132$	$C_{C/D} = 0.56i+0.319$	$C_{C/D} = 0.49i+0.393$	$C_{C/D} = 0.41i+0.484$	$C_{C/D} = 0.32i+0.588$

Where:

i = % imperviousness (expressed as a decimal)

C_A = Runoff coefficient for Natural Resources Conservation Service (NRCS) HSG A soils

C_B = Runoff coefficient for NRCS HSG B soils

$C_{C/D}$ = Runoff coefficient for NRCS HSG C and D soils.

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 1/4/22

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
C1	6.04	A	13%	0.06	0.21	300	2.1%	25.4	940	1.0%	15.0	1.5	10.4	35.8	1240.0	38.2	35.8
C2	3.35	A	24%	0.14	0.29	155	1.9%	17.5	1661	1.8%	15.0	2.0	14.0	31.5	1816.0	39.0	31.5
C3	23.44	A	9%	0.04	0.18	268	2.5%	23.2	1620	1.0%	15.0	1.5	18.0	41.2	1888.0	50.8	41.2
C4	10.94	D	18%	0.14	0.42	26	33.0%	2.8	3375	1.0%	15.0	1.5	37.5	40.3	3401.0	71.6	40.3
C5	2.35	A	20%	0.11	0.26	300	2.7%	22.3	190	2.1%	15.0	2.2	1.5	23.8	490.0	24.5	23.8
C6	3.95	A	22%	0.12	0.28	97	1.4%	15.5	997	1.0%	15.0	1.5	11.1	26.6	1094.0	36.1	26.6
C7	2.14	A	24%	0.17	0.38	52	7.5%	6.2	689	1.0%	15.0	1.5	7.7	13.9	741.0	31.1	13.9
C8	22.55	A	10%	0.05	0.19	300	1.9%	26.7	630	1.0%	15.0	1.5	7.0	33.7	930.0	34.4	33.7
C9	2.63	A	35%	0.23	0.39	136	1.2%	17.2	1374	1.5%	15.0	1.8	12.5	29.6	1510.0	33.4	29.6
C10	16.38	A	12%	0.05	0.20	147	3.7%	14.9	1406	1.5%	15.0	1.8	12.8	27.6	1553.0	42.1	27.6
D1	9.11	A	13%	0.06	0.21	300	2.7%	23.4	448	1.3%	15.0	1.7	4.4	27.8	748.0	30.0	27.8
D2	8.49	A	13%	0.07	0.25	300	2.7%	23.1	1095	1.1%	15.0	1.6	11.6	34.7	1395.0	39.9	34.7
D3	3.21	A	8%	0.04	0.18	100	1.0%	19.2	170	1.0%	15.0	1.5	1.9	21.1	270.0	27.3	21.1
D4	10.01	D	7%	0.07	0.40	300	1.8%	26.5	1201	1.0%	15.0	1.5	13.3	39.8	1501.0	44.9	39.8
D5	9.56	D	17%	0.14	0.43	266	2.3%	21.4	1463	1.0%	15.0	1.5	16.3	37.6	1729.0	44.3	37.6
D6	0.34	A	45%	0.36	0.57	46	8.0%	4.6	332	1.0%	15.0	1.5	3.7	8.3	378.0	22.0	8.3
D7	33.94	A	15%	0.10	0.31	300	3.9%	20.0	1645	1.0%	15.0	1.5	18.3	38.3	1945.0	48.3	38.3
E1	17.12	A	7%	0.04	0.22	300	1.3%	30.4	1486	1.3%	7.0	0.8	31.0	61.4	1786.0	46.6	46.6
E2	0.37	A	45%	0.31	0.46	24	9.7%	3.3	402	1.0%	15.0	1.5	4.5	7.8	426.0	22.7	7.8
E3	0.20	A	45%	0.32	0.48	24	9.7%	3.3	185	1.1%	15.0	1.6	2.0	5.2	209.0	20.3	5.2
E4	0.68	A	3%	0.01	0.14	95	3.3%	12.9	97	1.8%	7.0	0.9	1.7	14.6	192.0	26.7	14.6
UD1	7.48	A	6%	0.03	0.16	300	1.9%	27.2	683	1.8%	7.0	0.9	12.1	39.3	983.0	33.5	33.5
UD2	9.17	A	6%	0.03	0.16	300	1.8%	27.7	445	1.9%	7.0	1.0	7.7	35.4	745.0	30.4	30.4
UD3	2.23	A	6%	0.04	0.24	300	2.0%	26.4	171	2.0%	7.0	1.0	2.9	29.3	471.0	27.0	27.0
UD4	34.90	D	2%	0.04	0.39	300	1.1%	32.2	2602	1.7%	15.0	2.0	22.2	54.3	2902.0	61.5	54.3
UD5	17.63	A	6%	0.04	0.26	300	1.7%	27.7	1230	1.5%	7.0	0.9	23.9	51.6	1530.0	41.9	41.9
OS1	2.37	A	58%	0.43	0.56	59	2.0%	7.4	1216	1.1%	15.0	1.6	12.9	20.3	1275.0	27.5	20.3
OS2	0.70	A	31%	0.20	0.35	59	3.3%	8.5	421	1.0%	15.0	1.5	4.7	13.1	480.0	25.9	13.1
OS3	2.28	A	60%	0.45	0.58	66	8.5%	4.7	1326	1.0%	15.0	1.5	14.7	19.5	1392.0	28.5	19.5
OS4	1.08	D	55%	0.44	0.63	66	8.5%	4.8	636	1.0%	15.0	1.5	7.1	11.8	702.0	23.1	11.8
OS5	2.92	A	23%	0.17	0.42	55	3.4%	8.3	857	1.0%	15.0	1.5	9.5	17.8	912.0	33.7	17.8

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 1/4/22

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
F1	1.35	A	40%	0.27	0.43	55	3.4%	7.4	754	2.5%	15.0	2.4	5.3	12.7	809.0	24.5	12.7
F2	7.67	A	11%	0.05	0.20	300	1.7%	27.5	690	1.0%	15.0	1.5	7.7	35.2	990.0	35.0	35.0
F3	5.44	A	24%	0.20	0.48	48	2.0%	9.0	2354	1.4%	15.0	1.8	22.1	31.1	2402.0	48.6	31.1
F4	2.93	A	45%	0.34	0.52	12	22.0%	1.7	3016	1.2%	15.0	1.6	30.6	32.3	3028.0	48.3	32.3

NOTES:

$$t_c = t_i + t_t$$

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

Equation 6-2

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Equation 6-4

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Equation 6-3

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

Equation 6-5

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County
Design Storm: 5-Year

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 1/4/22

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	OS1	OS1	2.37	0.43	20.3	1.01	3.07	3.1					3.1	1.01	2.5					114	3.2	0.6	Roadside Swale Swale conveyance to DP 1.0
	1	C1	6.04	0.06	35.8	0.39	2.22	0.9					0.9	0.39	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.0
	1.0								35.8	1.40	2.22	3.1	3.1	1.40	2.1					752	2.9	4.3	Sum of DP OS1 and DP 1 Swale conveyance to DP 1.1
	2	C2	3.35	0.14	31.5	0.46	2.41	1.1					1.1	0.46	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.1
	3	C3	23.44	0.04	41.2	0.91	2.01	1.8					1.8	0.91	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.1
	1.1								41.2	2.77	2.01	5.6	5.6	2.77	1.0					1716	2.0	14.3	Sum of DP 1.0, DP 2, & DP 3 Swale conveyance to DP 1.2
	4	C4	10.94	0.14	40.3	1.58	2.04	3.2					3.2	1.58	0.5					0	1.4	0.0	Roadside Swale Swale conveyance to DP 1.2
	1.2								55.5	4.35	1.56	6.8	6.8	4.35	1.0					344	2.0	2.9	Sum of DP 1.1 and DP 4 Swale conveyance to DP 1.3
	5	C5	2.35	0.11	23.8	0.26	2.83	0.7					0.7	0.26	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.3
	1.3								58.3	4.61	1.48	6.8	6.8	4.61	1.0					1147	2.0	9.6	Sum of DP 1.2 and DP 5 Culvert conveyance to DP 1.4
	6	C6	3.95	0.12	26.6	0.49	2.66	1.3					1.3	0.49	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.4
	1.4								58.3	5.10	1.48	7.6				7.6	5.10	1.0	24	59	6.5	0.2	Sum of DP 1.3 and DP 6 Culvert conveyance to DP 1.6
	7	C7	2.14	0.17	13.9	0.36	3.64	1.3					1.3	0.36	1.0					1214	2.0	10.1	Roadside Swale Swale conveyance to DP 1.5
	8	C8	22.55	0.05	33.7	1.04	2.31	2.4					2.4	1.04	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.5
	1.5								33.7	1.40	2.31	3.2	3.2	1.40	1.0					278	2.0	2.3	Sum of DP 7 and DP 8 Swale conveyance to DP 1.6
	9	C9	2.63	0.23	29.6	0.60	2.50	1.5					1.5	0.60	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.6
	1.6								58.5	7.10	1.48	10.5	10.5	7.10	0.75					388	1.7	3.7	Sum of DP 1.4, DP 1.5, and DP 9 Swale/ Pond conveyance to DP 1.7
	10	C10	16.38	0.05	27.6	0.90	2.61	2.3					2.3	0.90	1.0					0	2.0	0.0	Proposed Pond C, future Filing 4 Lots, and Filing 4 roadways Overland flow, future road swales, and pond conveyance to DP 1.7
	1.7								62.2	8.00	1.39	11.1											Sum of DP 1.6 and DP 10 Outlet structure release into Drainageway MS-06
	11	D1	9.11	0.06	27.8	0.56	2.59	1.5					1.5	0.56	1.0					682	2.0	5.7	Roadside Swale Swale conveyance to DP 2.0

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County
Design Storm: 5-Year

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 1/4/22

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	12	D2	8.49	0.07	34.7	0.63	2.26	1.4					1.4	0.63	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 2.0
	2.0								34.7	1.19	2.26	2.7	2.7	1.19	1.0					1492	2.0	12.4	Sum of DP 11 & DP 12 Swale conveyance to DP 2.3
	OS3	OS3	2.28	0.45	19.5	1.02	3.13	3.2					3.2	1.02	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.0
	13	D3	3.21	0.04	21.1	0.12	3.01	0.4					0.4	0.12	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.0
	2.1								21.1	1.14	3.01	3.4	3.4	1.14	1.0					730	2.0	6.1	Sum of DP OS3 and DP 13 Swale conveyance to DP 2.2
	OS4	OS4	1.08	0.44	11.8	0.48	3.88	1.9					1.9	0.48	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 2.2
	2.2								27.2	1.62	2.63	4.3	4.3	1.62	1.0					895	2.0	7.5	Sum of DP 2.1 and DP OS4 Swale conveyance to DP 2.4
	15	D5	9.56	0.14	37.6	1.38	2.14	3.0					3.0	1.38	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 2.3
	16	D6	0.34	0.36	8.3	0.12	4.41	0.5					0.5	0.12	1.0					59	2.0	0.5	Roadside Swale Swale conveyance to DP 2.3
	2.3								47.2	2.69	1.80	4.8	4.8	2.69	1.0					117	2.0	1.0	Sum of DP 2.0, DP 15 and DP 16 Swale conveyance to DP 2.4
	14	D4	10.01	0.07	39.8	0.72	2.06	1.5					1.5	0.72	1.0					0	2.0	0.0	Drainage Swale Swale conveyance to DP 2.4
	2.4								48.1	5.03	1.77	8.9	8.9	5.03	1.0					623	2.0	5.2	Sum of DP 14, DP 2.2 and DP 2.3 Swale/ Pond conveyance to DP 2.5
	17	D7	33.94	0.10	38.3	3.25	2.11	6.9					6.9	3.25	1.0					0	2.0	0.0	Proposed Pond D, future Filing 4 Lots, and Filing 4 roadways Overland flow, future road swales, and pond conveyance to DP 2.5
	2.5								53.3	8.28	1.62	13.4	13.4	8.28	1.0					1147	2.0	9.6	Sum of DP 2.4 and DP 17 Outlet structure release into Drainageway WF-R7A
	21	E1	17.12	0.04	46.6	0.69	1.82	1.3								1.3	0.69	1.0	24	48	3.9	0.2	Roadside Swale Culvert conveyance to DP 3.0
	22	E2	0.37	0.31	7.8	0.11	4.51	0.5					0.5	0.11	1.0					185	2.0	1.5	Roadside Swale Swale conveyance to DP 3.0
	23	E3	0.20	0.32	5.2	0.06	5.10	0.3					0.3	0.06	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 3.0
	3.0								46.8	0.86	1.82	1.6	1.6	0.86	2.1					217	2.9	1.2	Sum of DP 21, DP 22, and DP 23 Swale/ Pond conveyance to DP 3.1
	24	E4	0.68	0.01	14.6	0.01	3.56	0.04					0.04	0.01	0.5					0	1.4	0.0	Overland Flow Pond Conveyance
	3.1								48.0	0.87	1.78	1.5	1.5	0.87	1.0					1147	2.0	9.6	Sum of DP 3.0 and DP 24 Outlet structure release into Drainageway WF-R7A

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County
Design Storm: 5-Year

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 1/4/22

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	UD1	UD1	7.48	0.03	33.5	0.19	2.31	0.4															Overland Flow Sheet flow into Drainageway MS-06
	UD2	UD2	9.17	0.03	30.4	0.23	2.46	0.6															Overland Flow Sheet flow into Drainageway MS-06
	UD3	UD3	2.23	0.04	27.0	0.09	2.64	0.2															Overland Flow Sheet flow into Drainageway MS-06
	UD4	UD4	34.90	0.04	54.3	1.35	1.59	2.1															Overland Flow Sheet flow into Drainageway MS-06
	UD5	UD5	17.63	0.04	41.9	0.76	1.98	1.5															Overland Flow Sheet flow into Drainageway MS-06
	OS5	OS5	2.92	0.17	17.8	0.51	3.26	1.7															Overland Flow Sheet flow into Drainageway MS-06
	OS2	OS2	0.70	0.20	13.1	0.14	3.72	0.5															Roadside Swale Swale conveyance to OS2
	F1	F1	1.35	0.27	12.7	0.37	3.77	1.4															Roadside Swale to Pond F See OS1 of Filing 2 Drainage Report
	F2	F2	7.67	0.05	35.0	0.40	2.25	0.9															Roadside Swale to Pond F See DP06 of Filing 2 Drainage Report
	25	F2	7.67	0.05	35.0	0.40	2.25	0.90					0.90	0.40	1.0					0	2.0	0.0	Roadside Swale Swale Conveyance for DP25
	F3	F3	5.44	0.20	31.1	1.09	2.43	2.6															Roadside Swale to Pond F See DP07 of Filing 2 Drainage Report
	F4	F4	2.93	0.34	32.3	0.98	2.37	2.3															Roadside Swale to Pond F See DP08 of Filing 2 Drainage Report

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County
Design Storm: 100-Year

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 1/4/22

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C* A (ac)	I (in/hr)	Q (cfs)	tc (min)	C* A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C* A (ac)	Slope (%)	Q_{pipe} (cfs)	C* A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	OS1	OS1	2.37	0.56	20.3	1.33	5.15	6.8					6.8	1.33	2.5					114	3.2	0.6	Roadside Swale
																							Swale conveyance to DP 1.0
	1	C1	6.04	0.21	35.8	1.28	3.72	4.8					4.8	1.28	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.0
	1.0								35.8	2.61	3.72	9.7	9.7	2.61	2.1					752	2.9	4.3	Sum of DP OS1 and DP 1
																							Swale conveyance to DP 1.1
	2	C2	3.35	0.29	31.5	0.98	4.04	4.0					4.0	0.98	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.1
	3	C3	23.44	0.18	41.2	4.20	3.37	14.1					14.1	4.20	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.1
	1.1								41.2	7.79	3.37	26.2	26.2	7.79	1.0					1716	2.0	14.3	Sum of DP 1.0, DP 2, & DP 3
																							Swale conveyance to DP 1.2
	4	C4	10.94	0.42	40.3	4.54	3.42	15.5					15.5	4.54	0.5					0	1.4	0.0	Roadside Swale
																							Swale conveyance to DP 1.2
	1.2								55.5	12.33	2.61	32.2	32.2	12.33	1.0					344	2.0	2.9	Sum of DP 1.1 and DP 4
																							Swale conveyance to DP 1.3
	5	C5	2.35	0.26	23.8	0.62	4.75	2.9					2.9	0.62	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.3
	1.3								58.3	12.95	2.49	32.2	32.2	12.95	1.0					1147	2.0	9.6	Sum of DP 1.2 and DP 5
																							Culvert conveyance to DP 1.4
	6	C6	3.95	0.28	26.6	1.11	4.46	5.0					5.0	1.11	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.4
	1.4								58.3	14.06	2.49	35.0				35.0	14.06	1.0	24	59	11.1	0.1	Sum of DP 1.3 and DP 6
																							Culvert conveyance to DP 1.6
	7	C7	2.14	0.38	13.9	0.81	6.10	4.9					4.9	0.81	1.0					1214	2.0	10.1	Roadside Swale
																							Swale conveyance to DP 1.5
	8	C8	22.55	0.19	33.7	4.24	3.87	16.4					16.4	4.24	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.5
	1.5								33.7	5.05	3.87	19.6	19.6	5.05	1.0					278	2.0	2.3	Sum of DP 7 and DP 8
																							Swale conveyance to DP 1.6
	9	C9	2.63	0.39	29.6	1.02	4.19	4.3					4.3	1.02	1.0					0	2.0	0.0	Roadside Swale
																							Swale conveyance to DP 1.6
	1.6								58.4	20.13	2.48	50.0	50.0	20.13	0.75					388	1.7	3.7	Sum of DP 1.4, DP 1.5, and DP 9
																							Swale/ Pond conveyance to DP 1.7
	10	C10	16.38	0.20	27.6	3.28	4.37	14.3					14.3	3.28	1.0					0	2.0	0.0	Proposed Pond C, future Filing 4 Lots, and Filing 4 roadways
																							Overland flow, future road swales, and pond conveyance to DP 1.7
	1.7								58.4	23.41	2.48	58.1											Sum of DP 1.6 and DP 10
																							Outlet structure release into Drainageway MS-06
	11	D1	9.11	0.21	27.8	1.90	4.35	8.3					8.3	1.90	1.0					682	2.0	5.7	Roadside Swale
																							Swale conveyance to DP 2.0

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County
Design Storm: 100-Year

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 1/4/22

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C* A (ac)	I (in/hr)	Q (cfs)	tc (min)	C* A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C* A (ac)	Slope (%)	Q_{pipe} (cfs)	C* A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	12	D2	8.49	0.25	34.7	2.15	3.80	8.2					8.2	2.15	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 2.0
	2.0								34.7	4.05	3.80	15.4	15.4	4.05	1.0					1492	2.0	12.4	Sum of DP 11 & DP 12 Swale conveyance to DP 2.3
	OS3	OS3	2.28	0.58	19.5	1.32	5.26	6.9					6.9	1.32	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.0
	13	D3	3.21	0.18	21.1	0.56	5.05	2.8					2.8	0.56	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 1.0
	2.1								21.1	1.88	5.05	9.5	9.5	1.88	1.0					730	2.0	6.1	Sum of DP OS3 and DP 13 Swale conveyance to DP 2.2
	OS4	OS4	1.08	0.63	11.8	0.68	6.51	4.4					4.4	0.68	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 2.2
	2.2								27.2	2.56	4.41	11.3	11.3	2.56	1.0					895	2.0	7.5	Sum of DP 2.1 and DP OS4 Swale conveyance to DP 2.4
	15	D5	9.56	0.43	37.6	4.15	3.59	14.9					14.9	4.15	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 2.3
	16	D6	0.34	0.57	8.3	0.19	7.41	1.4					1.4	0.19	1.0					59	2.0	0.5	Roadside Swale Swale conveyance to DP 2.3
	2.3								37.6	8.39	3.59	30.1	30.1	8.39	1.0					117	2.0	1.0	Sum of DP 2.0, DP 15 and DP 16 Swale conveyance to DP 2.4
	14	D4	10.01	0.40	39.8	4.03	3.45	13.9					13.9	4.03	1.0					0	2.0	0.0	Drainage Swale Swale conveyance to DP 2.4
	2.4								39.8	14.98	3.45	51.7	51.7	14.98	1.0					623	2.0	5.2	Sum of DP 2.2 and DP 2.3 Swale/ Pond conveyance to DP 2.5
	17	D7	33.94	0.31	38.3	10.52	3.55	37.3					37.3	10.52	1.0					0	2.0	0.0	Proposed Pond D, future Filing 4 Lots, and Filing 4 roadways Overland flow, future road swales, and pond conveyance to DP 2.5
	2.5								45.0	25.50	3.14	80.1	80.1	25.50	1.0					1147	2.0	9.6	Sum of DP 2.4 and DP 17 Outlet structure release into Drainageway WF-R7A
	21	E1	17.12	0.22	46.6	3.85	3.06	11.8								11.8	3.85	1.0	24	48	7.2	0.1	Roadside Swale Culvert conveyance to DP 3.0
	22	E2	0.37	0.46	7.8	0.17	7.57	1.3					1.3	0.17	1.0					185	2.0	1.5	Roadside Swale Swale conveyance to DP 3.0
	23	E3	0.20	0.48	5.2	0.10	8.57	0.9					0.9	0.10	1.0					0	2.0	0.0	Roadside Swale Swale conveyance to DP 3.0
	3.0								46.7	4.12	3.05	12.6	12.6	4.12	2.1					217	2.9	1.2	Sum of DP 21, DP 22, and DP 23 Swale/ Pond conveyance to DP 3.1
	24	E4	0.68	0.14	14.6	0.10	5.97	0.6					0.6	0.10	0.5					0	1.4	0.0	Overland Flow Pond Conveyance
	3.1								47.9	4.22	2.98	12.6	12.6	4.22	1.0					1147	2.0	9.6	Sum of DP 3.0 and DP 24 Outlet structure release into Drainageway WF-R7A

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County
Design Storm: 100-Year

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 1/4/22

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	UD1	UD1	7.48	0.16	33.5	1.18	3.88	4.6															Overland Flow Sheet flow into Drainageway MS-06
	UD2	UD2	9.17	0.16	30.4	1.46	4.13	6.0															Overland Flow Sheet flow into Drainageway MS-06
	UD3	UD3	2.23	0.24	27.0	0.53	4.43	2.3															Overland Flow Sheet flow into Drainageway MS-06
	UD4	UD4	34.90	0.39	54.3	13.69	2.67	36.5															Overland Flow Sheet flow into Drainageway MS-06
	UD5	UD5	17.63	0.26	41.9	4.65	3.32	15.4															Overland Flow Sheet flow into Drainageway MS-06
	OS5	OS5	2.92	0.42	17.8	1.23	5.48	6.7															Overland Flow Sheet flow into Drainageway MS-06
	OS2	OS2	0.70	0.35	13.1	0.25	6.25	1.6															Roadside Swale Swale conveyance to OS2
	F1	F1	1.35	0.43	12.7	0.58	6.33	3.7															Roadside Swale to Pond F See OS1 of Filing 2 Drainage Report
	F2	F2	7.67	0.20	35.0	1.51	3.78	5.7															Roadside Swale to Pond F See DP06 of Filing 2 Drainage Report
	25	F2	7.67	0.20	35.0	1.51	3.78	5.7					5.7	1.51	1.0					0	2.0	0.0	Roadside Swale Swale Conveyance for DP25
	F3	F3	5.44	0.48	31.1	2.60	4.08	10.6															Roadside Swale to Pond F See DP07 of Filing 2 Drainage Report
	F4	F4	2.93	0.52	32.3	1.52	3.98	6.0															Roadside Swale to Pond F See DP08 of Filing 2 Drainage Report

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

Colorado Urban Hydrograph Procedure

Version 2.0.0 - Release Date: 9/9/2016

Urban Drainage and Flood Control District
Denver, Colorado
email: udfcd@udfcd.org

Purpose:	This program produces hydrographs using the Colorado Unit Hydrograph Procedure (CUHP)
Functions:	
Edit Raingages	Add/Remove Raingages and change names
Edit Subcatchments	Edit subcatchment parameters
Edit Multiple Run Options	Edit the Multiple Run options (Advanced User Features)
Import CUHP 2005 File	Import an older CUHP 2005 workbook into this updated version of CUHP
Check Subcatchments	Check whether subcatchment inputs conform to UDFCD guidelines
Check SWMM Nodes	Check whether all subcatchment target nodes are included in the SWMM .inp file
Run CUHP	Calculate effective precipitation and generate hydrographs for each subcatchment

Settings:

Fill in the blue cells to begin:

Project Title:	Saddlehorn Ranch
Project Comment:	Ex. Conditions Analysis
Time Step Between Computations:	5 Minute(s); typically 5 or 1 (peak flow rate will differ slightly).
	☐ Use Relative Path Names
Output Workbook Filename:	X:\2510000.all\2514200\CUHP-SWMM\Existing_CUHP_2002.xlsm.xlsx
CUHP/SWMM Interface Filename (Optional):	X:\2510000.all\2514200\CUHP-SWMM\Existing_CUHP_2002.xlsm.txt
EPA SWMM 5 Input Filename (Optional):	X:\2510000.all\2514200\CUHP-SWMM\Ex. Conditions Model.inp
EPA SWMM 5 Application File (Optional):	
SWMM Hydrograph Start Time (Optional):	

Acknowledgements: Thanks to Ben Urbonas, P.E., D.WRE and James C.Y.Guo, PhD, P.E., for the development of the CUHP project.

CUHP SUBCATCHMENTS

Columns with this color heading are for required user-input
Columns with this color heading are for optional override values
Columns with this color heading are for program-calculated values

								Maximum Depression Storage (Watershed inches)		Horton's Infiltration Parameters			DCIA
Subcatchment Name	EPA SWMM Target Node	Raingage	Area (mi^2)	Length to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Decay Coefficient (1/seconds)	Final Rate (in/hr)	Level 0, 1, or 2
CH1	CH1	EPC	0.0373438	0.210994318	0.4289773	0.01	2	0.4	0	3	0.0018	0.5	2
CH2	CH2	EPC	0.1318594	0.930530303	1.4477273	0.015	2	0.4	0	4	0.0013	0.75	2
CH3	CH3	EPC	0.0329219	0.420583333	0.7320076	0.015	2	0.4	0	4.81	0.0011	0.85	2
H1	H1	EPC	0.2601406	0.229166666	0.821917	0.01	2	0.4	0	5	0.0007	1	2
H2	H2	EPC	0.1735781	0.129545454	0.4912879	0.025	2	0.4	0	5	0.0007	1	2
H3	H3	EPC	0.18325	0.490719697	0.932197	0.015	2	0.4	0	4.64	0.0009	0.73	2
H4	H4	EPC	0.0988906	0.085984848	0.5267045	0.0225	2	0.4	0	3.82	0.0008	0.74	2
H5	H5	EPC	0.0831875	0.236931818	0.7267045	0.02	2	0.4	0	4.93	0.0009	0.94	2
H6	H6	EPC	0.1367969	0.046022727	0.4	0.04	2	0.4	0	5	0.0007	1	2
G1	G1	EPC	0.01575	0.210606061	0.3015152	0.018	2	0.4	0	5	0.00007	1	2
G2	G2	EPC	0.1368125	0.235606061	0.6857955	0.02	2	0.4	0	4.32	0.0011	0.83	2

RUN MULTIPLE CUHP AND SWMM SCENARIOS

Columns with this color heading are for required user-input
Columns with this color heading are for program-calculated values

SWMM Run Wait Time (sec)
5

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
CH1	2	2
CH2	2	2
CH3	2	2
H1	2	2
H2	2	2
H3	2	2
H4	2	2
H5	2	2
H6	2	2
G1	2	2
G2	2	2

Raingage	Return Period (Years)	1 Hr Depths (in)	6 Hr Depths (in)
EPC	WQ	0.6	N/A
	2	1.19	2.1
	5	1.5	2.7
	10	1.75	3.2
	25	2	3.6
	50	2.25	4.2
	100	2.52	4.6

Enter "X" to Run Scenario	Scenario ID	Land Use (E or F)	Return Period (yr)	Correction Area (Sq.Mi.)
X	WQ	E	WQ	0
	2-YR	E	2	1
X	5-YR	E	5	1
	10-YR	E	10	1
	25-YR	E	25	1
	50-YR	E	50	1
X	100-YR	E	100	1

(Optional) SWMM Time Series Inflow "Modification Type" (LU, RP, or LU&RP)

(Optional) SWMM Time Series Inflow Table "NAME"

Comment	El Paso County Rainfall Depths				
1Hr Depth	2.52	inches	2hr Depth	2.86	inches
6Hr Depth	3.5	inches	3hr Depth	3.11	inches
Correction Area	1	Sq. Mi.			
Return Period	100	Years			

NOAA Atlas 14 Point Precipitation Frequency

Time	Adjusted Depth	Unadjusted Depth
0:05	0.0252	0.0252
0:10	0.0756	0.0756
0:15	0.1159	0.1159
0:20	0.2016	0.2016
0:25	0.3528	0.3528
0:30	0.6300	0.6300
0:35	0.3528	0.3528
0:40	0.2016	0.2016
0:45	0.1562	0.1562
0:50	0.1260	0.1260
0:55	0.1008	0.1008
1:00	0.1008	0.1008
1:05	0.1008	0.1008
1:10	0.0504	0.0504
1:15	0.0504	0.0504
1:20	0.0302	0.0302
1:25	0.0302	0.0302
1:30	0.0302	0.0302
1:35	0.0302	0.0302
1:40	0.0302	0.0302
1:45	0.0302	0.0302
1:50	0.0302	0.0302
1:55	0.0302	0.0302
2:00	0.0302	0.0302
2:05	0.0000	0.0000
2:10	0.0000	0.0000
2:15	0.0000	0.0000
2:20	0.0000	0.0000
2:25	0.0000	0.0000
2:30	0.0000	0.0000
2:35	0.0000	0.0000
2:40	0.0000	0.0000
2:45	0.0000	0.0000
2:50	0.0000	0.0000
2:55	0.0000	0.0000
3:00	0.0000	0.0000
3:05	0.0000	0.0000
3:10	0.0000	0.0000
3:15	0.0000	0.0000
3:20	0.0000	0.0000
3:25	0.0000	0.0000
3:30	0.0000	0.0000
3:35	0.0000	0.0000
3:40	0.0000	0.0000
3:45	0.0000	0.0000
3:50	0.0000	0.0000

SADDLEHORN RANCH - EX. 5-YEAR FLOW RESULTS

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
CH1	JUNCTION	5.40	5.40	0	00:50	0.232	0.232	0.000
CH2	JUNCTION	2.58	2.58	0	01:00	0.176	0.176	0.000
CH3	JUNCTION	0.11	0.11	0	00:45	0.00701	0.00701	0.000
DP1	JUNCTION	0.00	6.79	0	00:46	0	0.268	0.000
DP2	JUNCTION	0.00	1.46	0	00:40	0	0.0359	0.000
DP3	JUNCTION	0.00	0.13	0	00:40	0	0.00379	0.000
DP4	JUNCTION	0.00	0.16	0	00:35	0	0.00252	0.000
DP5	JUNCTION	0.00	0.90	0	00:45	0	0.0334	0.000
DP6	JUNCTION	0.00	1.35	0	00:35	0	0.0209	0.000
DP7	JUNCTION	0.00	4.06	0	01:05	0	0.237	0.000
DP8	JUNCTION	0.00	0.21	0	00:30	0	0.00194	0.000
DP9	JUNCTION	0.00	0.43	0	00:40	0	0.0172	0.000
G1	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
G2	JUNCTION	1.46	1.46	0	00:40	0.0359	0.0359	0.000
H1	JUNCTION	0.13	0.13	0	00:40	0.00379	0.00379	0.000
H2	JUNCTION	0.16	0.16	0	00:35	0.00252	0.00252	0.000
H3	JUNCTION	0.90	0.90	0	00:45	0.0334	0.0334	0.000

SADDLEHORN RANCH - EX. 5-YEAR FLOW RESULTS

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
H4	JUNCTION	1.35	1.35	0	00:35	0.0209	0.0209	0.000
H5	JUNCTION	0.33	0.33	0	00:40	0.0102	0.0102	0.000
H6	JUNCTION	0.21	0.21	0	00:30	0.00194	0.00194	0.000
J13	JUNCTION	0.00	0.07	0	01:50	0	0.00485	0.000
J14	JUNCTION	0.00	0.06	0	02:28	0	0.00242	0.000
J15	JUNCTION	0.00	0.83	0	01:03	0	0.0333	0.000
J16	JUNCTION	0.00	0.09	0	00:49	0	0.00188	0.000

SADDLEHORN RANCH - EX. 100-YR FLOW RESULTS

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
CH1	JUNCTION	1038.04	1038.04	0	00:55	165	165	0.000
CH2	JUNCTION	485.11	485.11	0	01:15	75.2	75.2	0.000
CH3	JUNCTION	127.25	127.25	0	01:10	19.9	19.9	0.000
DP1	JUNCTION	0.00	1114.02	0	00:51	0	167	0.000
DP2	JUNCTION	0.00	76.38	0	00:50	0	2.23	0.000
DP3	JUNCTION	0.00	80.97	0	00:45	0	2.08	0.000
DP4	JUNCTION	0.00	91.06	0	00:40	0	1.38	0.000
DP5	JUNCTION	0.00	64.08	0	01:00	0	2.67	0.000
DP6	JUNCTION	0.00	73.15	0	00:40	0	1.47	0.000
DP7	JUNCTION	0.00	704.90	0	01:08	0	83	0.000
DP8	JUNCTION	0.00	110.05	0	00:35	0	1.06	0.000
DP9	JUNCTION	0.00	248.10	0	00:45	0	21.9	0.000
G1	JUNCTION	0.09	0.09	0	00:40	0.00364	0.00364	0.000
G2	JUNCTION	76.38	76.38	0	00:50	2.23	2.23	0.000
H1	JUNCTION	80.97	80.97	0	00:45	2.08	2.08	0.000
H2	JUNCTION	91.06	91.06	0	00:40	1.38	1.38	0.000
H3	JUNCTION	64.08	64.08	0	01:00	2.67	2.67	0.000
H4	JUNCTION	73.15	73.15	0	00:40	1.47	1.47	0.000
H5	JUNCTION	28.20	28.20	0	00:50	0.959	0.959	0.000
H6	JUNCTION	110.05	110.05	0	00:35	1.06	1.06	0.000

SADDLEHORN RANCH - EX. 100-YR FLOW RESULTS

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
J13	JUNCTION	0.00	69.43	0	01:03	0	2.18	0.000
J14	JUNCTION	0.00	68.26	0	01:09	0	2.19	0.000
J15	JUNCTION	0.00	63.63	0	01:07	0	2.68	0.000
J16	JUNCTION	0.00	103.79	0	00:38	0	1.08	0.000

SADDLEHORN RANCH - EX. CONDITIONS SWMM MODEL

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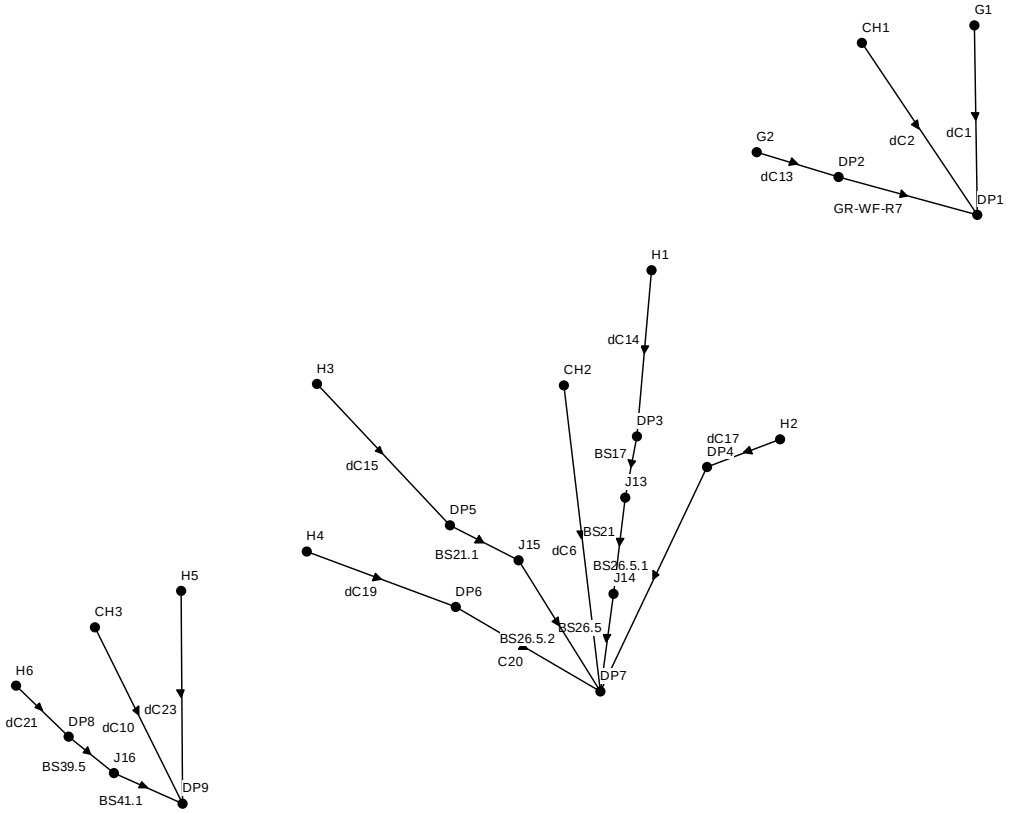


APPENDIX C

HYDRAULIC CALCULATIONS

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP1.0 Design Point 1.0 (Q5=3.1 cfs Q100=9.7 cfs)

Invert Elev Dn (ft)	=	6760.92
Pipe Length (ft)	=	62.81
Slope (%)	=	0.49
Invert Elev Up (ft)	=	6761.23
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

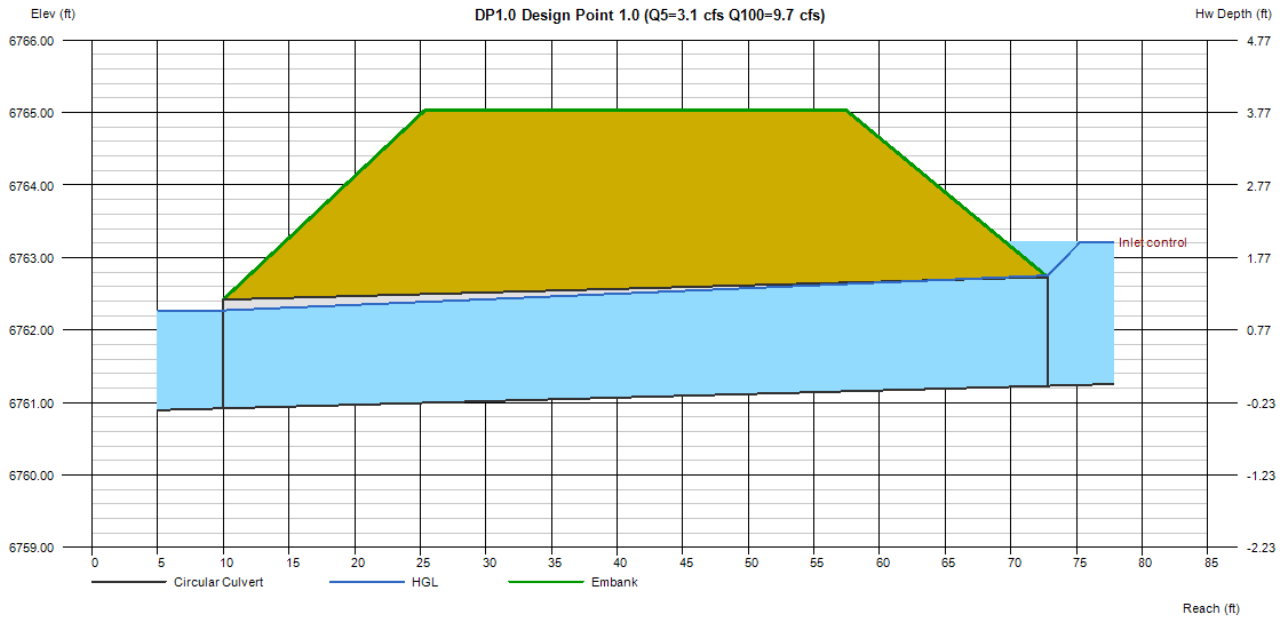
Top Elevation (ft)	=	6765.04
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	3.10
Qmax (cfs)	=	9.70
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	9.70
Qpipe (cfs)	=	9.70
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.79
Veloc Up (ft/s)	=	5.49
HGL Dn (ft)	=	6762.27
HGL Up (ft)	=	6762.75
Hw Elev (ft)	=	6763.22
Hw/D (ft)	=	1.32
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP1.1 Design Point 1.1 (Q5=5.6 cfs Q100=26.2 cfs)

Invert Elev Dn (ft)	=	6746.82
Pipe Length (ft)	=	56.00
Slope (%)	=	0.59
Invert Elev Up (ft)	=	6747.15
Rise (in)	=	24.0
Shape	=	Elliptical
Span (in)	=	38.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Groove end projecting (H)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

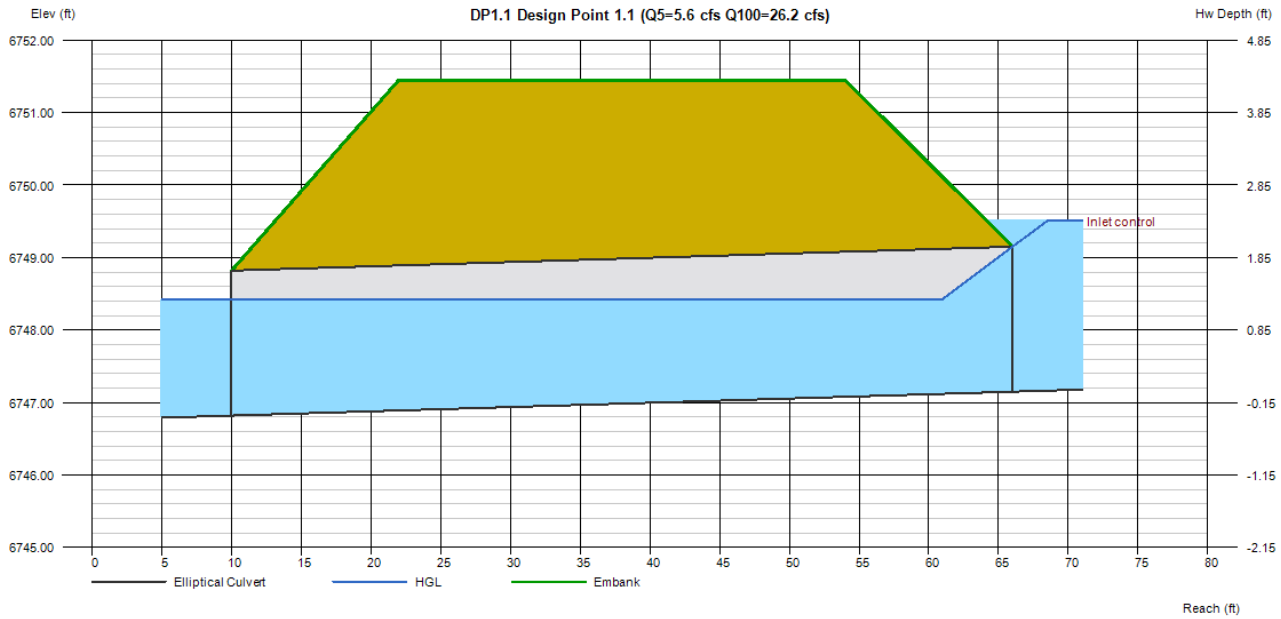
Top Elevation (ft)	=	6751.45
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	5.60
Qmax (cfs)	=	26.20
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	26.20
Qpipe (cfs)	=	26.20
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.82
Veloc Up (ft/s)	=	7.52
HGL Dn (ft)	=	6748.42
HGL Up (ft)	=	6748.43
Hw Elev (ft)	=	6749.51
Hw/D (ft)	=	1.18
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP11 Design Point 11 (Q5=4.20 cfs Q100=13.50 cfs)

Invert Elev Dn (ft)	=	6742.46
Pipe Length (ft)	=	57.17
Slope (%)	=	0.51
Invert Elev Up (ft)	=	6742.75
Rise (in)	=	19.0
Shape	=	Elliptical
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Groove end projecting (H)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

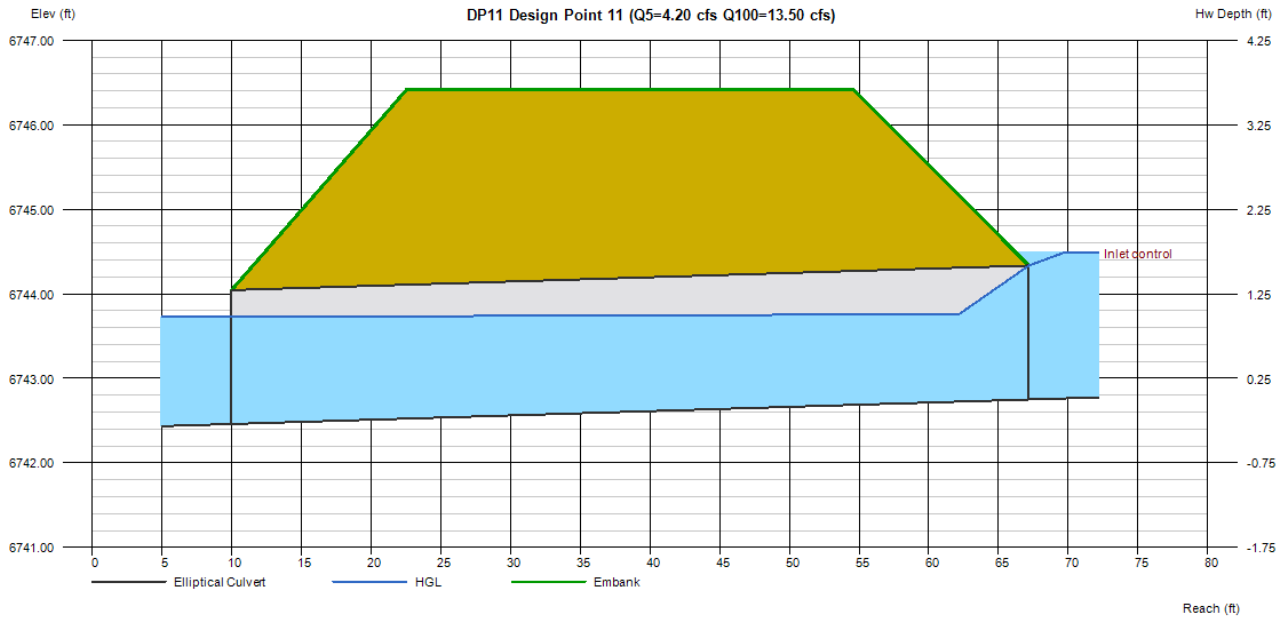
Top Elevation (ft)	=	6746.42
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	4.20
Qmax (cfs)	=	13.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	13.50
Qpipe (cfs)	=	13.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.99
Veloc Up (ft/s)	=	6.20
HGL Dn (ft)	=	6743.73
HGL Up (ft)	=	6743.76
Hw Elev (ft)	=	6744.49
Hw/D (ft)	=	1.10
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP2.0 Design Point 2.0 (Q5=5.0 cfs Q100=19.6 cfs)

Invert Elev Dn (ft)	=	6734.52
Pipe Length (ft)	=	60.86
Slope (%)	=	0.49
Invert Elev Up (ft)	=	6734.82
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

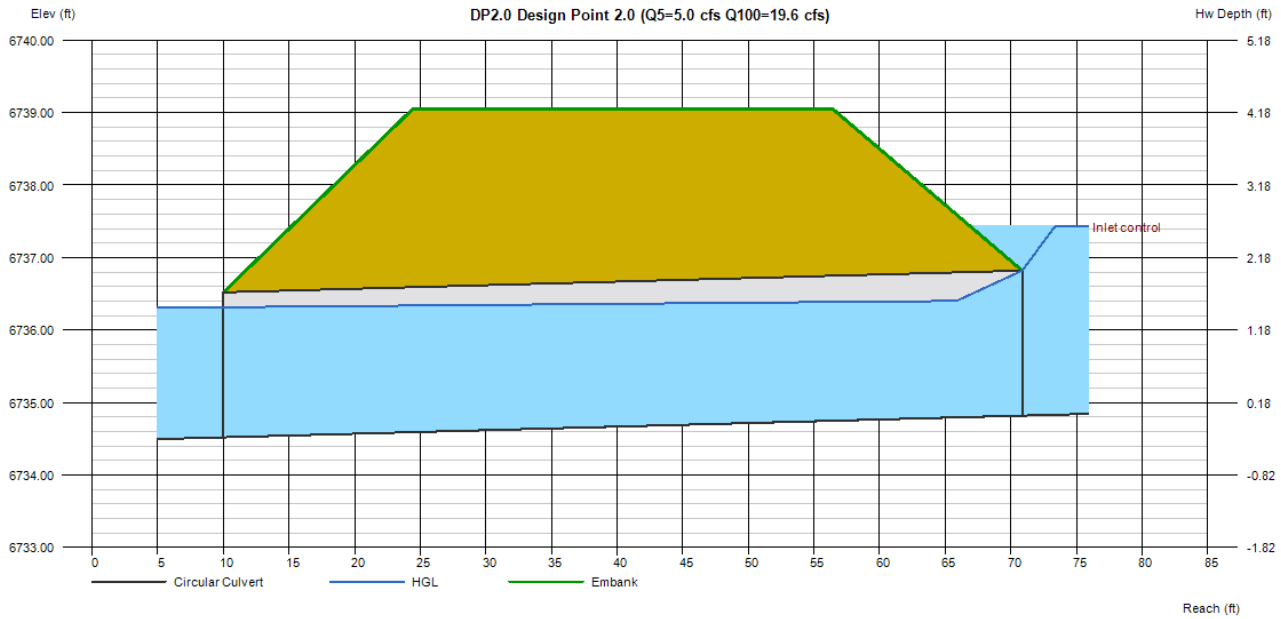
Top Elevation (ft)	=	6739.05
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	5.00
Qmax (cfs)	=	19.60
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	19.60
Qpipe (cfs)	=	19.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.59
Veloc Up (ft/s)	=	7.32
HGL Dn (ft)	=	6736.32
HGL Up (ft)	=	6736.41
Hw Elev (ft)	=	6737.43
Hw/D (ft)	=	1.30
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP1.2 Design Point 1.2 (Q5=6.8 cfs Q100=32.2 cfs)

Invert Elev Dn (ft)	=	6727.23
Pipe Length (ft)	=	57.98
Slope (%)	=	0.79
Invert Elev Up (ft)	=	6727.69
Rise (in)	=	19.0
Shape	=	Elliptical
Span (in)	=	30.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Groove end projecting (H)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

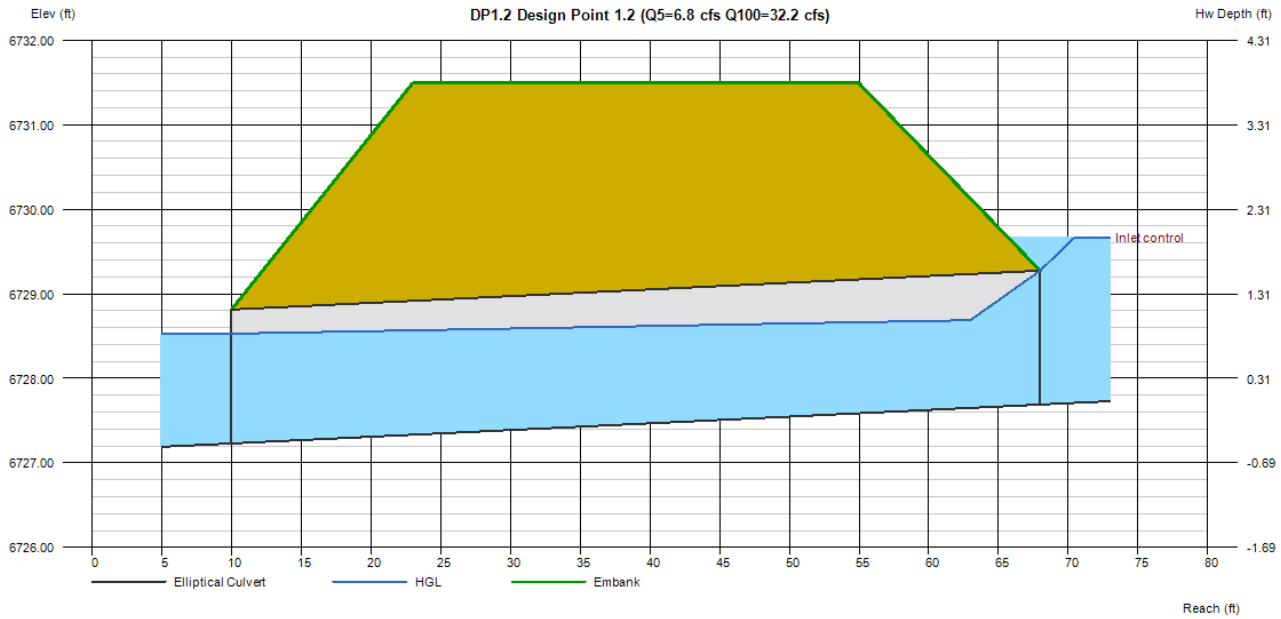
Top Elevation (ft)	=	6731.49
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	6.80
Qmax (cfs)	=	32.20
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	32.20
Qpipe (cfs)	=	32.20
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.72
Veloc Up (ft/s)	=	7.40
HGL Dn (ft)	=	6728.53
HGL Up (ft)	=	6728.70
Hw Elev (ft)	=	6729.67
Hw/D (ft)	=	1.25
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP7 Design Point 7 (Q5=1.3 cfs Q100=4.9 cfs)

Invert Elev Dn (ft)	=	6727.28
Pipe Length (ft)	=	64.87
Slope (%)	=	0.80
Invert Elev Up (ft)	=	6727.80
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

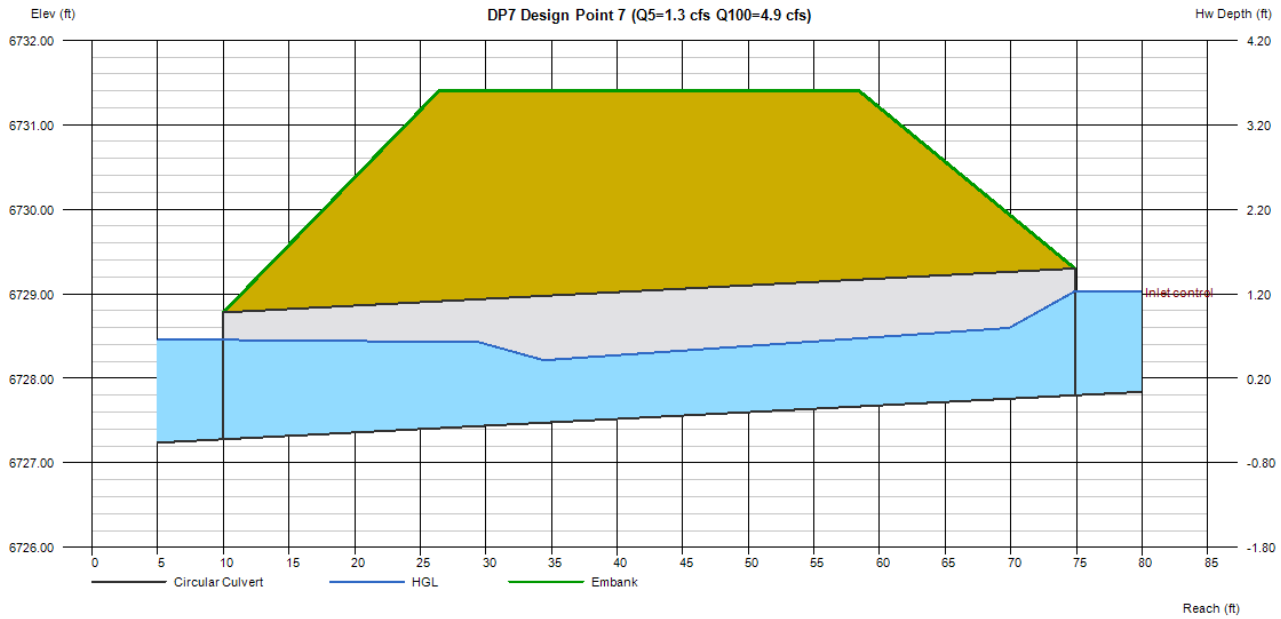
Top Elevation (ft)	=	6731.40
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	1.30
Qmax (cfs)	=	4.90
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	4.90
Qpipe (cfs)	=	4.90
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.30
Veloc Up (ft/s)	=	4.74
HGL Dn (ft)	=	6728.46
HGL Up (ft)	=	6728.65
Hw Elev (ft)	=	6729.03
Hw/D (ft)	=	0.82
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP1.3 Design Point 1.3 (Q5=6.8 cfs Q100=32.2 cfs)

Invert Elev Dn (ft)	=	6725.39
Pipe Length (ft)	=	58.18
Slope (%)	=	0.64
Invert Elev Up (ft)	=	6725.76
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

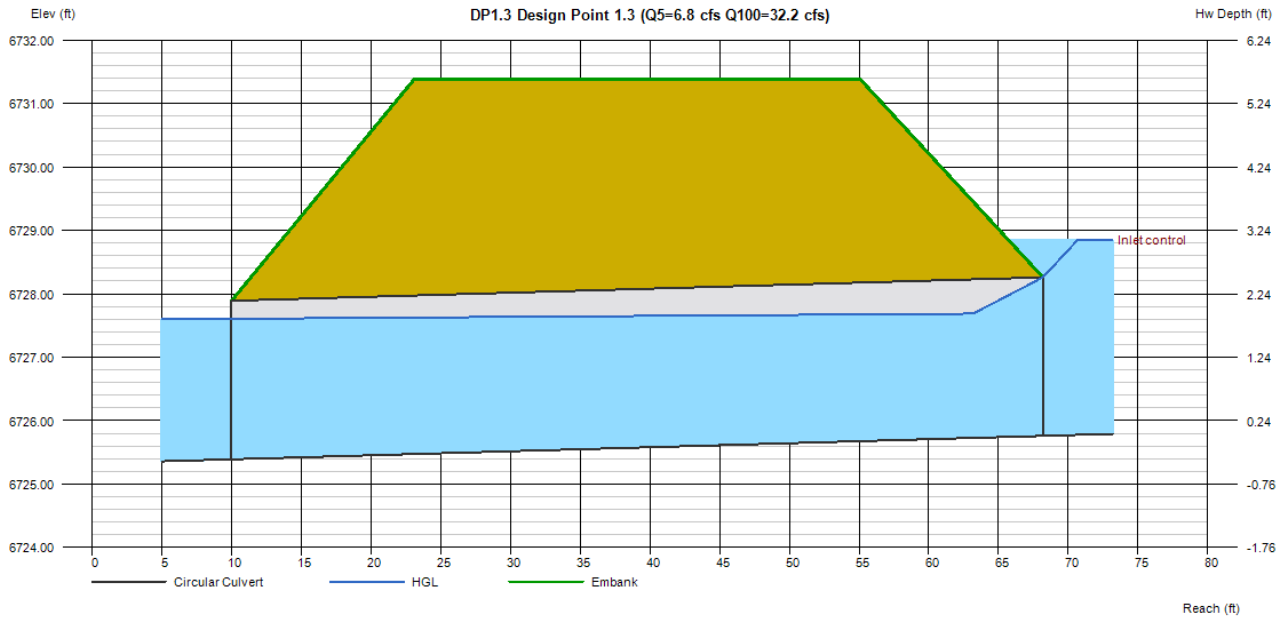
Top Elevation (ft)	=	6731.38
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	6.80
Qmax (cfs)	=	32.20
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	32.20
Qpipe (cfs)	=	32.20
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.00
Veloc Up (ft/s)	=	7.90
HGL Dn (ft)	=	6727.61
HGL Up (ft)	=	6727.70
Hw Elev (ft)	=	6728.85
Hw/D (ft)	=	1.24
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP1.5 Design Point 1.5 (Q5=3.2 cfs Q100=19.6 cfs)

Invert Elev Dn (ft)	=	6717.17
Pipe Length (ft)	=	55.50
Slope (%)	=	0.63
Invert Elev Up (ft)	=	6717.52
Rise (in)	=	19.0
Shape	=	Elliptical
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Groove end projecting (H)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

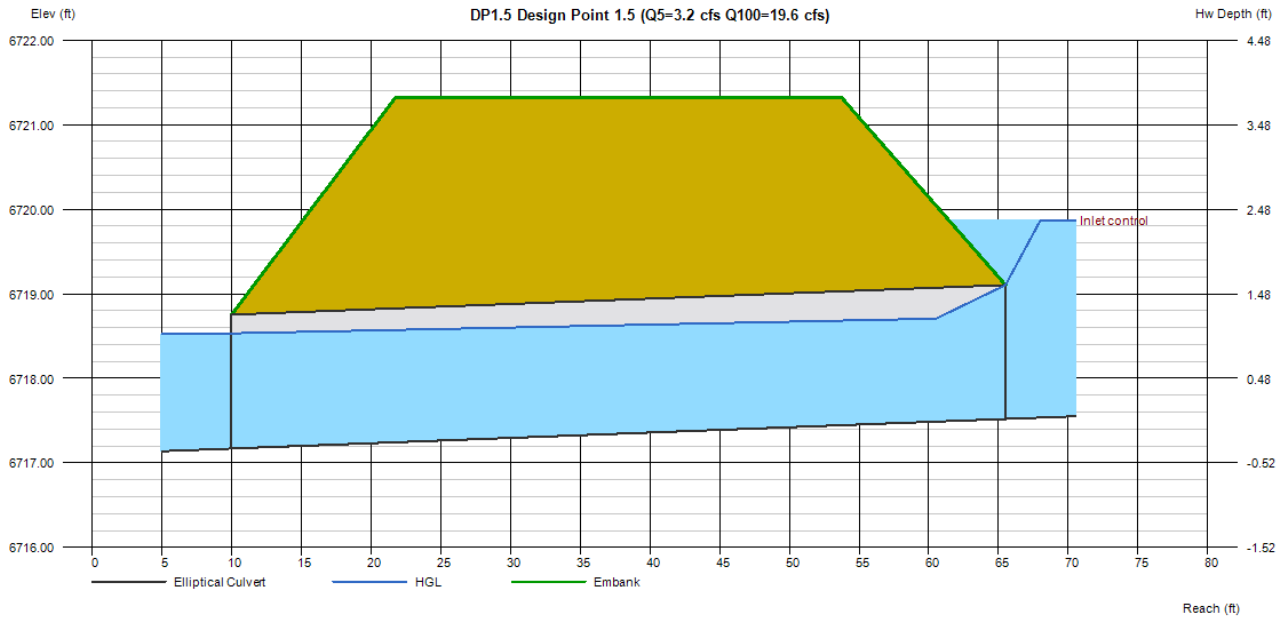
Top Elevation (ft)	=	6721.32
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	3.20
Qmax (cfs)	=	19.60
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	19.60
Qpipe (cfs)	=	19.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.74
Veloc Up (ft/s)	=	7.55
HGL Dn (ft)	=	6718.53
HGL Up (ft)	=	6718.72
Hw Elev (ft)	=	6719.87
Hw/D (ft)	=	1.48
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP1.4 Design Point 1.4 (Q5=7.6 cfs Q100=35.0 cfs)

Invert Elev Dn (ft)	=	6714.75
Pipe Length (ft)	=	59.38
Slope (%)	=	0.50
Invert Elev Up (ft)	=	6715.05
Rise (in)	=	19.0
Shape	=	Elliptical
Span (in)	=	30.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Groove end projecting (H)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

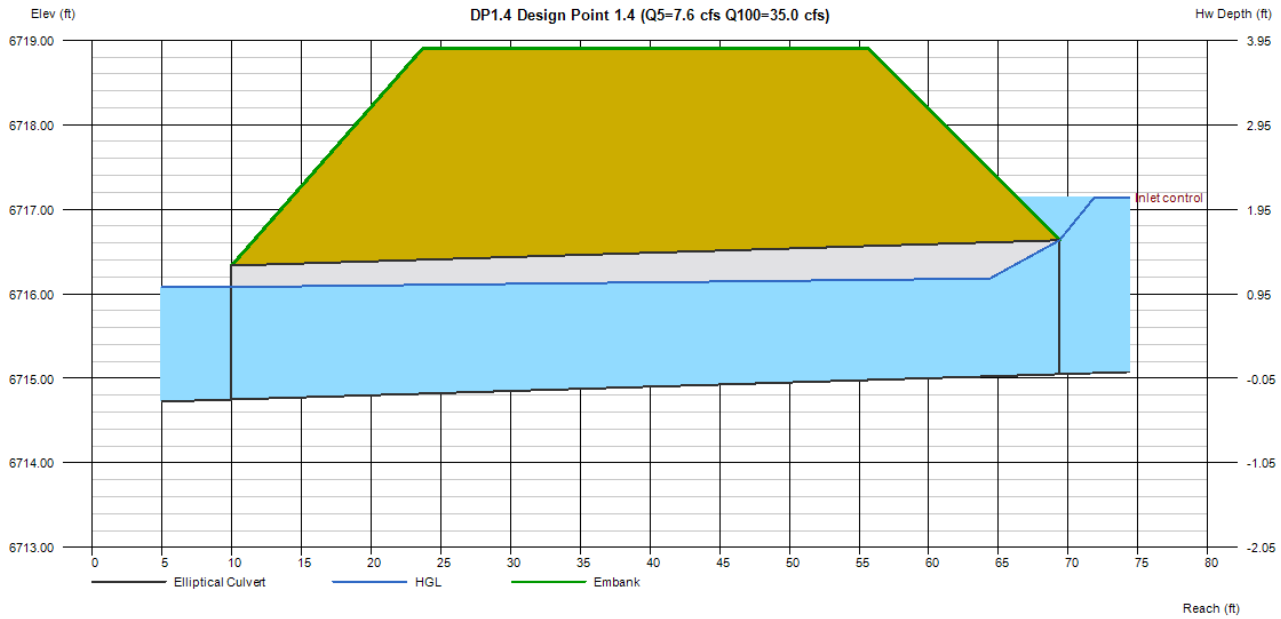
Top Elevation (ft)	=	6718.90
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	7.60
Qmax (cfs)	=	35.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	35.00
Qpipe (cfs)	=	35.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.02
Veloc Up (ft/s)	=	7.08
HGL Dn (ft)	=	6716.08
HGL Up (ft)	=	6716.19
Hw Elev (ft)	=	6717.14
Hw/D (ft)	=	1.32
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP22 Design Point 22 (Q5=0.5 cfs Q100=1.3 cfs)

Invert Elev Dn (ft)	=	6726.29
Pipe Length (ft)	=	35.77
Slope (%)	=	1.01
Invert Elev Up (ft)	=	6726.65
Rise (in)	=	14.0
Shape	=	Elliptical
Span (in)	=	23.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Groove end projecting (H)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

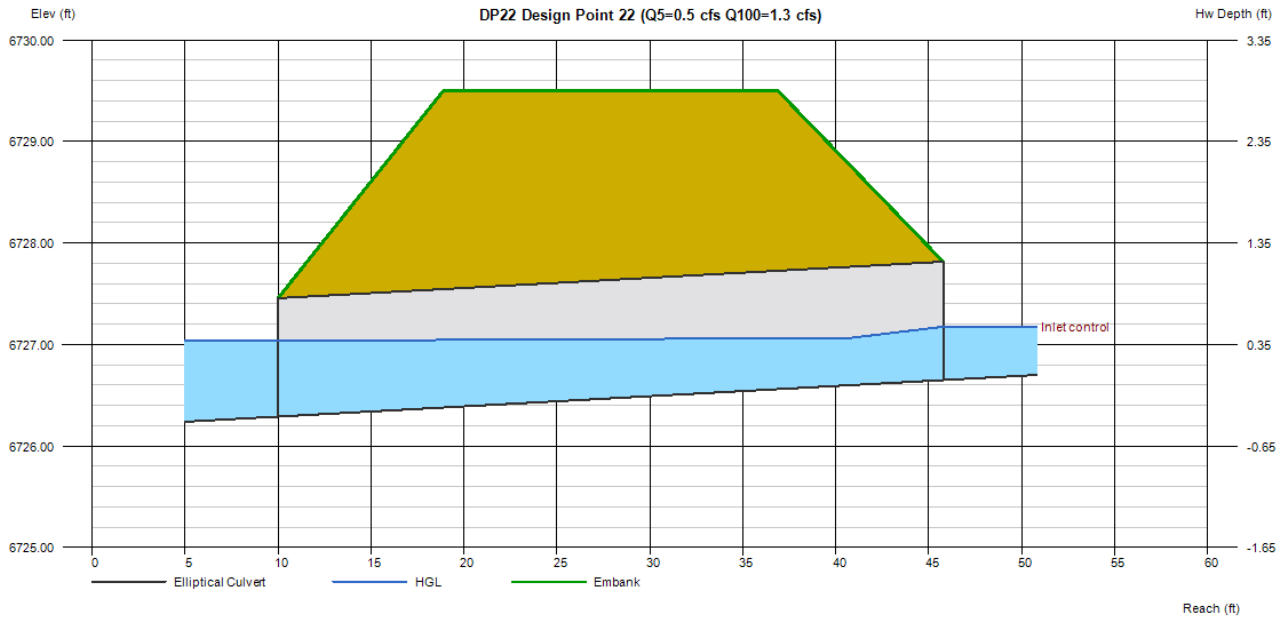
Top Elevation (ft)	=	6729.50
Top Width (ft)	=	18.00
Crest Width (ft)	=	15.00

Calculations

Qmin (cfs)	=	0.50
Qmax (cfs)	=	1.30
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	1.30
Qpipe (cfs)	=	1.30
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.06
Veloc Up (ft/s)	=	2.47
HGL Dn (ft)	=	6727.04
HGL Up (ft)	=	6727.07
Hw Elev (ft)	=	6727.18
Hw/D (ft)	=	0.45
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP21 Design Point 21 (Q5=1.3 cfs Q100=11.8 cfs)

Invert Elev Dn (ft)	=	6723.71
Pipe Length (ft)	=	48.02
Slope (%)	=	0.50
Invert Elev Up (ft)	=	6723.95
Rise (in)	=	19.0
Shape	=	Elliptical
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Groove end projecting (H)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

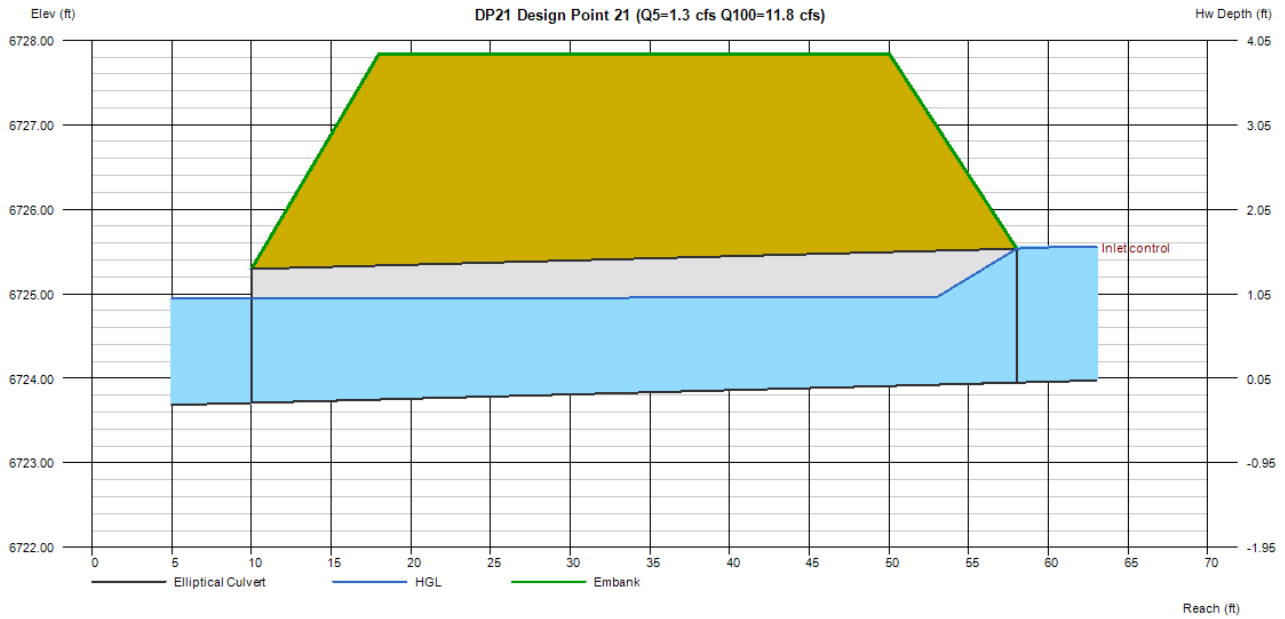
Top Elevation (ft)	=	6727.84
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	1.30
Qmax (cfs)	=	11.80
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	11.80
Qpipe (cfs)	=	11.80
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.36
Veloc Up (ft/s)	=	5.42
HGL Dn (ft)	=	6724.95
HGL Up (ft)	=	6724.96
Hw Elev (ft)	=	6725.55
Hw/D (ft)	=	1.01
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP9 Design Point 9 (Q5=1.5 cfs Q100=4.3 cfs)

Invert Elev Dn (ft)	=	6716.31
Pipe Length (ft)	=	36.00
Slope (%)	=	0.50
Invert Elev Up (ft)	=	6716.49
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

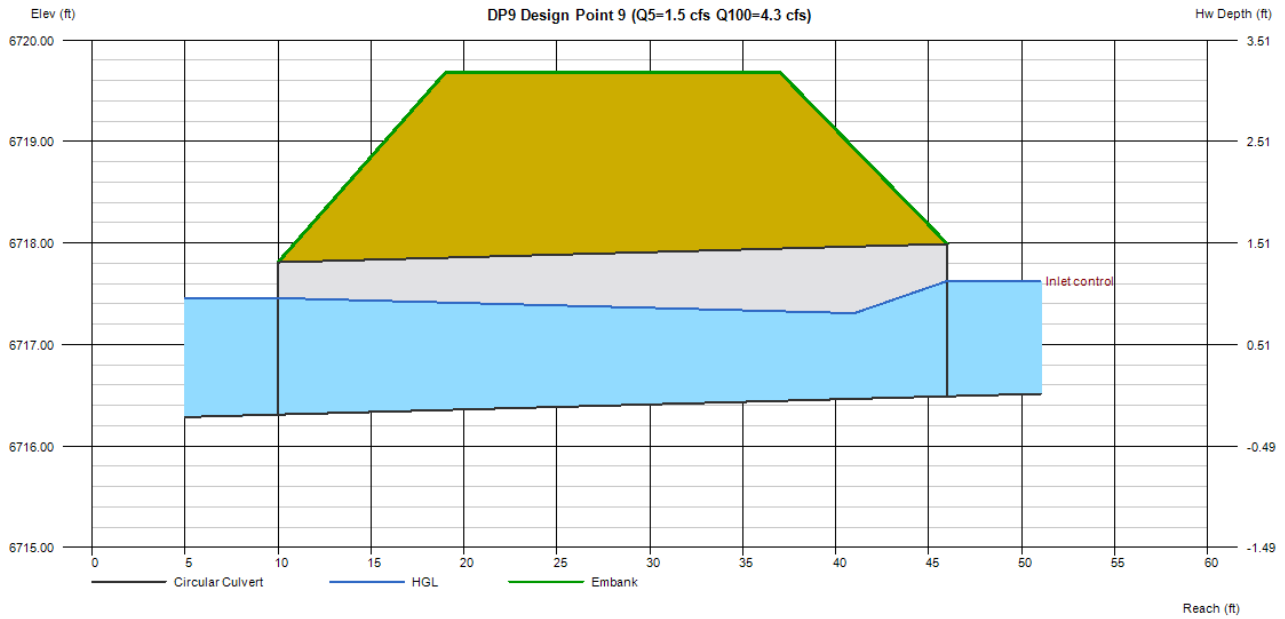
Top Elevation (ft)	=	6719.68
Top Width (ft)	=	18.00
Crest Width (ft)	=	15.00

Calculations

Qmin (cfs)	=	1.50
Qmax (cfs)	=	4.30
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	4.30
Qpipe (cfs)	=	4.30
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	2.97
Veloc Up (ft/s)	=	4.53
HGL Dn (ft)	=	6717.46
HGL Up (ft)	=	6717.29
Hw Elev (ft)	=	6717.63
Hw/D (ft)	=	0.76
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP16 Design Point 16 (Q5=0.5 cfs Q100=1.4 cfs)

Invert Elev Dn (ft)	=	6715.05
Pipe Length (ft)	=	36.00
Slope (%)	=	1.97
Invert Elev Up (ft)	=	6715.76
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

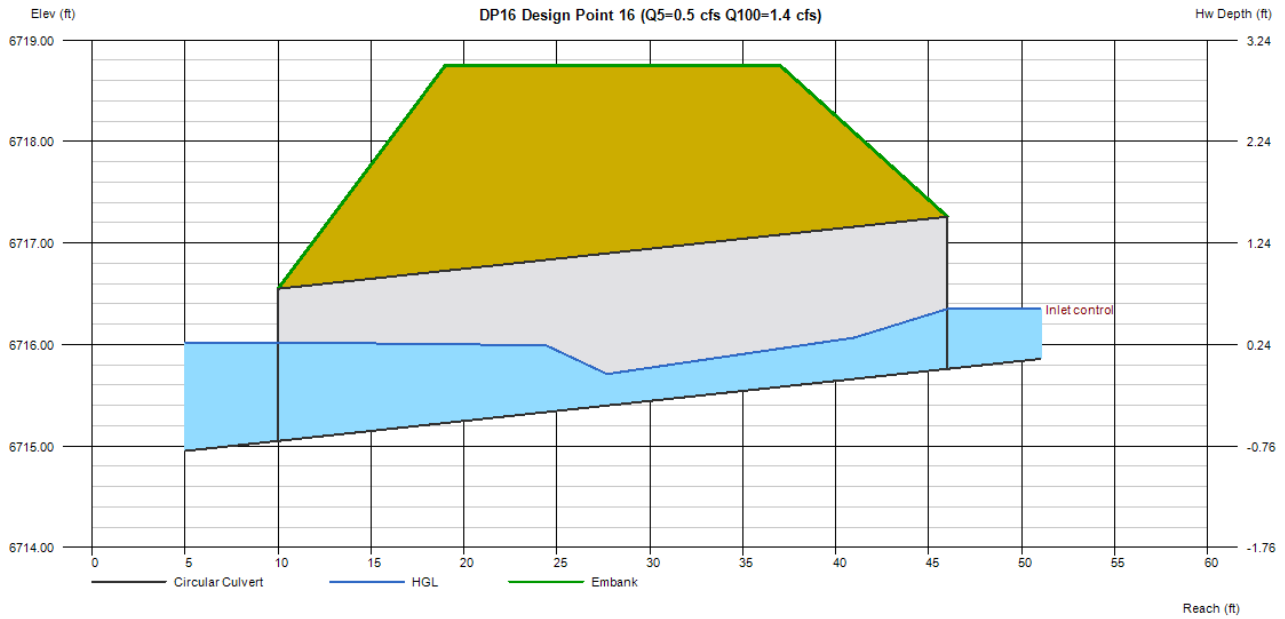
Top Elevation (ft)	=	6718.75
Top Width (ft)	=	18.00
Crest Width (ft)	=	15.00

Calculations

Qmin (cfs)	=	0.50
Qmax (cfs)	=	1.40
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	1.40
Qpipe (cfs)	=	1.40
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.16
Veloc Up (ft/s)	=	3.21
HGL Dn (ft)	=	6716.02
HGL Up (ft)	=	6716.20
Hw Elev (ft)	=	6716.35
Hw/D (ft)	=	0.39
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 31 2024

DP2.1 Design Point 2.1 (Q5=3.4 cfs Q100=9.5 cfs)

Invert Elev Dn (ft)	=	6739.05
Pipe Length (ft)	=	72.38
Slope (%)	=	0.70
Invert Elev Up (ft)	=	6739.56
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

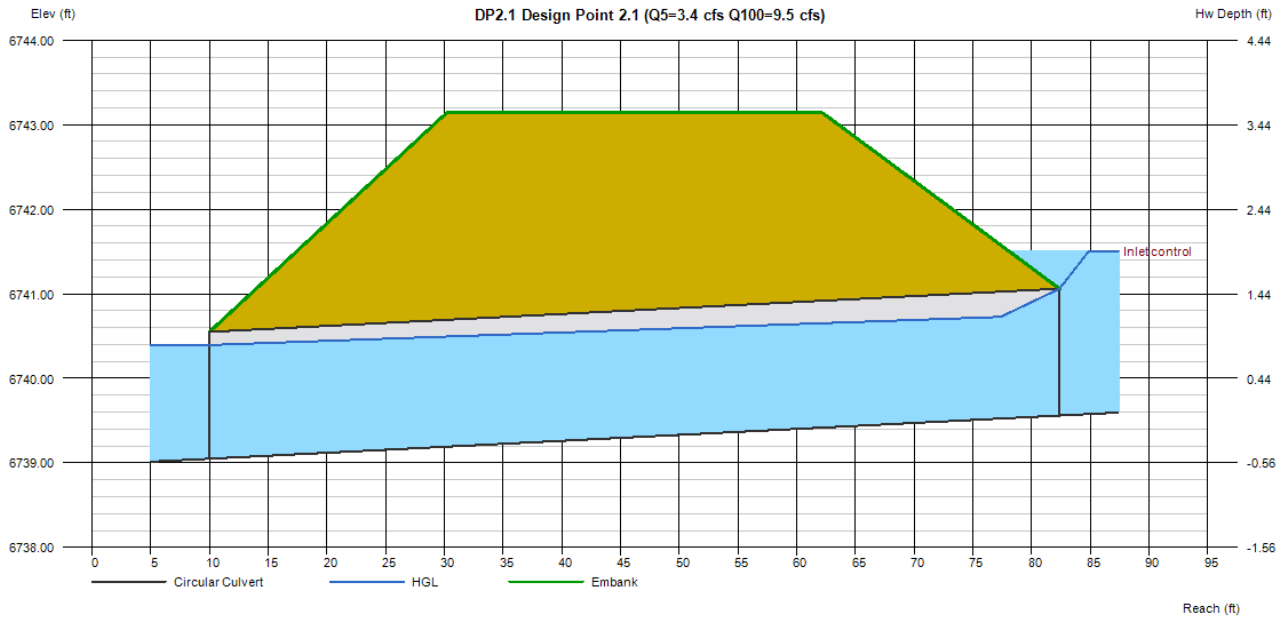
Top Elevation (ft)	=	6743.14
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	3.40
Qmax (cfs)	=	9.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	9.50
Qpipe (cfs)	=	9.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.69
Veloc Up (ft/s)	=	6.31
HGL Dn (ft)	=	6740.40
HGL Up (ft)	=	6740.75
Hw Elev (ft)	=	6741.51
Hw/D (ft)	=	1.30
Flow Regime	=	Inlet Control



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 1.0 Swale (5-Year) (FR:0.52)

Triangular

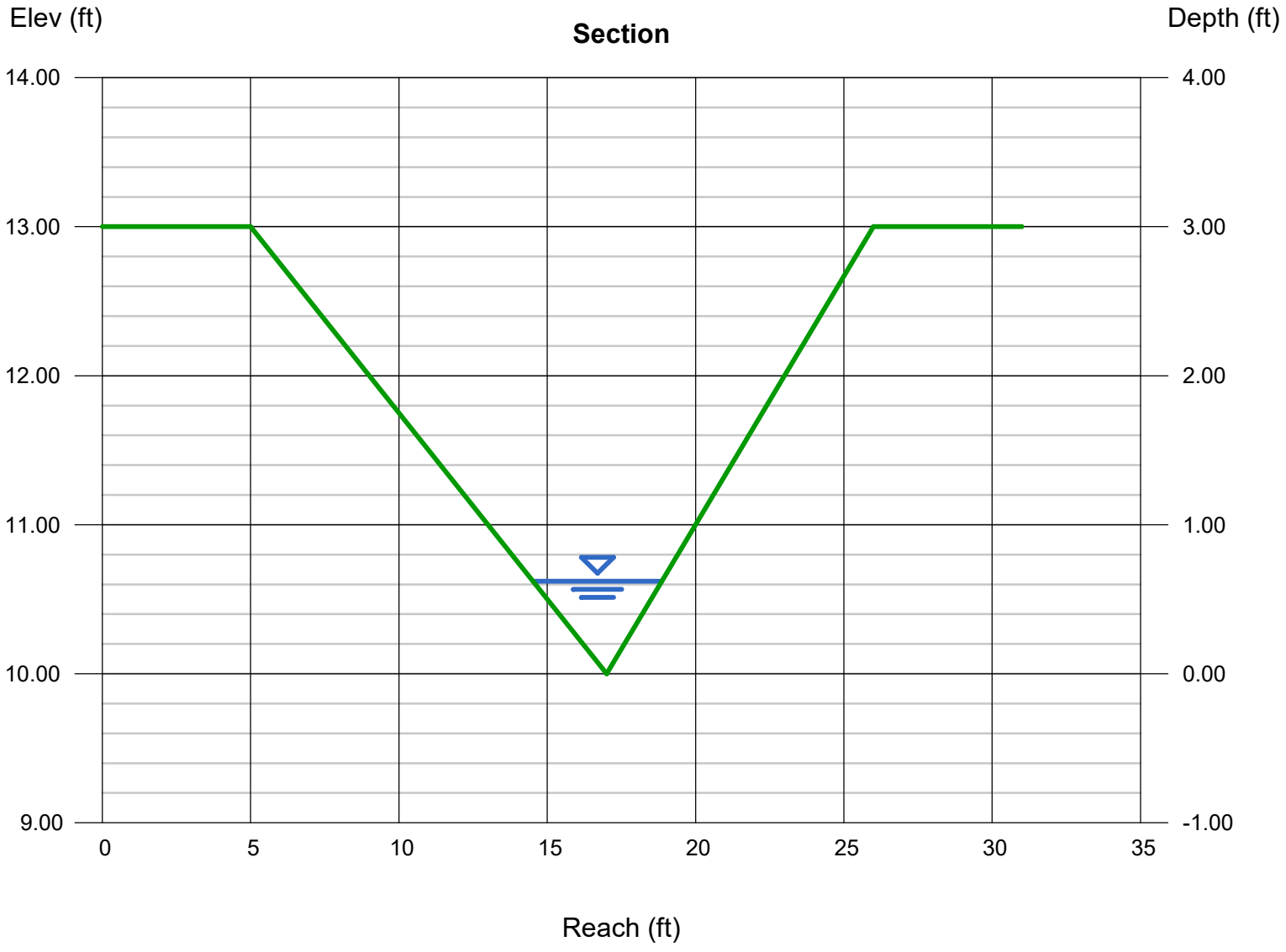
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.12
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.10

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 3.100
Area (sqft)	= 1.35
Velocity (ft/s)	= 2.30
Wetted Perim (ft)	= 4.52
Crit Depth, Yc (ft)	= 0.55
Top Width (ft)	= 4.34
EGL (ft)	= 0.70



Channel Report

DP 1.0 Swale (100-Year) (FR:0.56)

Triangular

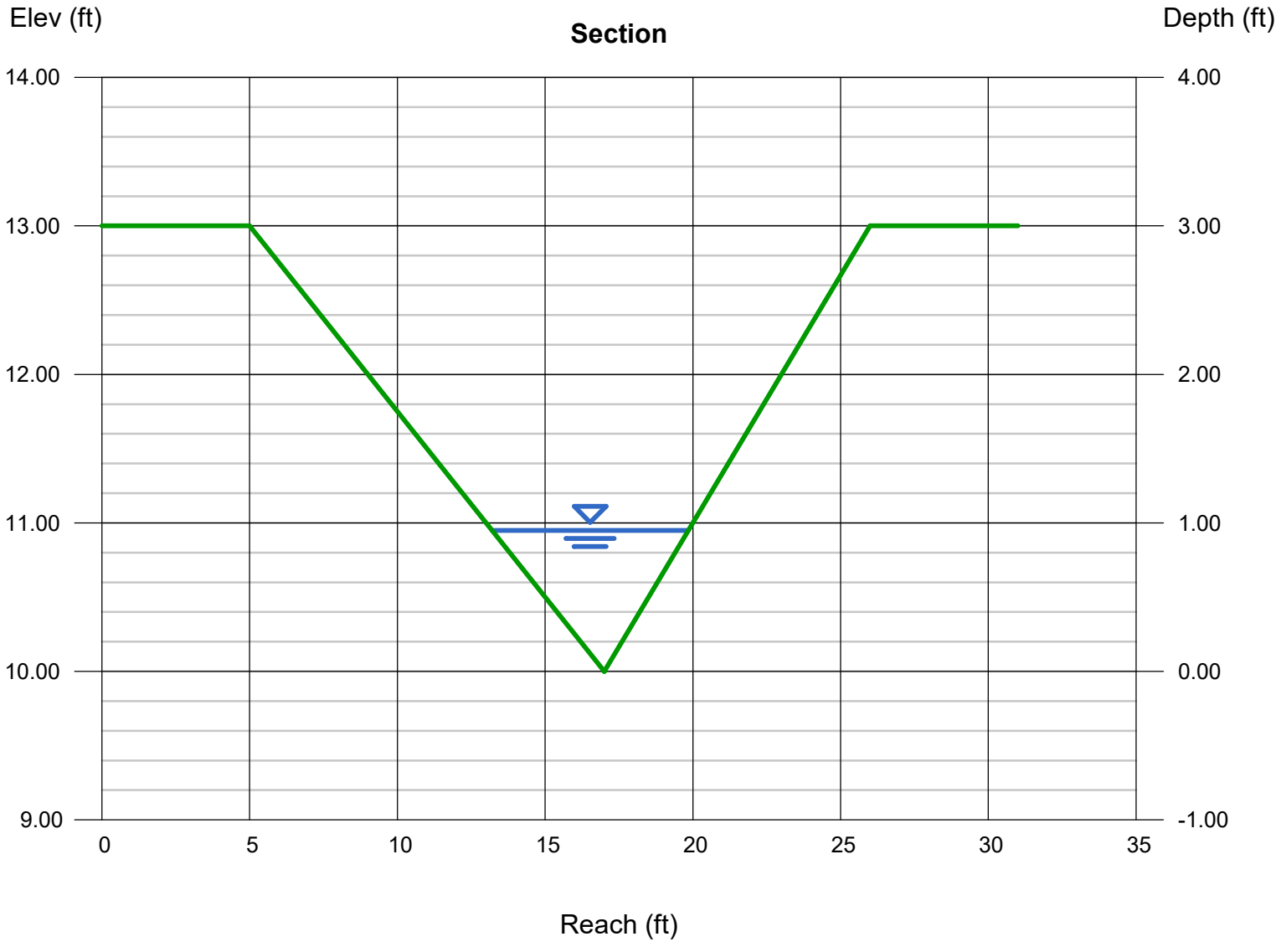
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.12
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 9.70

Highlighted

Depth (ft)	= 0.95
Q (cfs)	= 9.700
Area (sqft)	= 3.16
Velocity (ft/s)	= 3.07
Wetted Perim (ft)	= 6.92
Crit Depth, Yc (ft)	= 0.87
Top Width (ft)	= 6.65
EGL (ft)	= 1.10



Channel Report

DP 1.1 Swale (5-Year)(FR:0.51)

Triangular

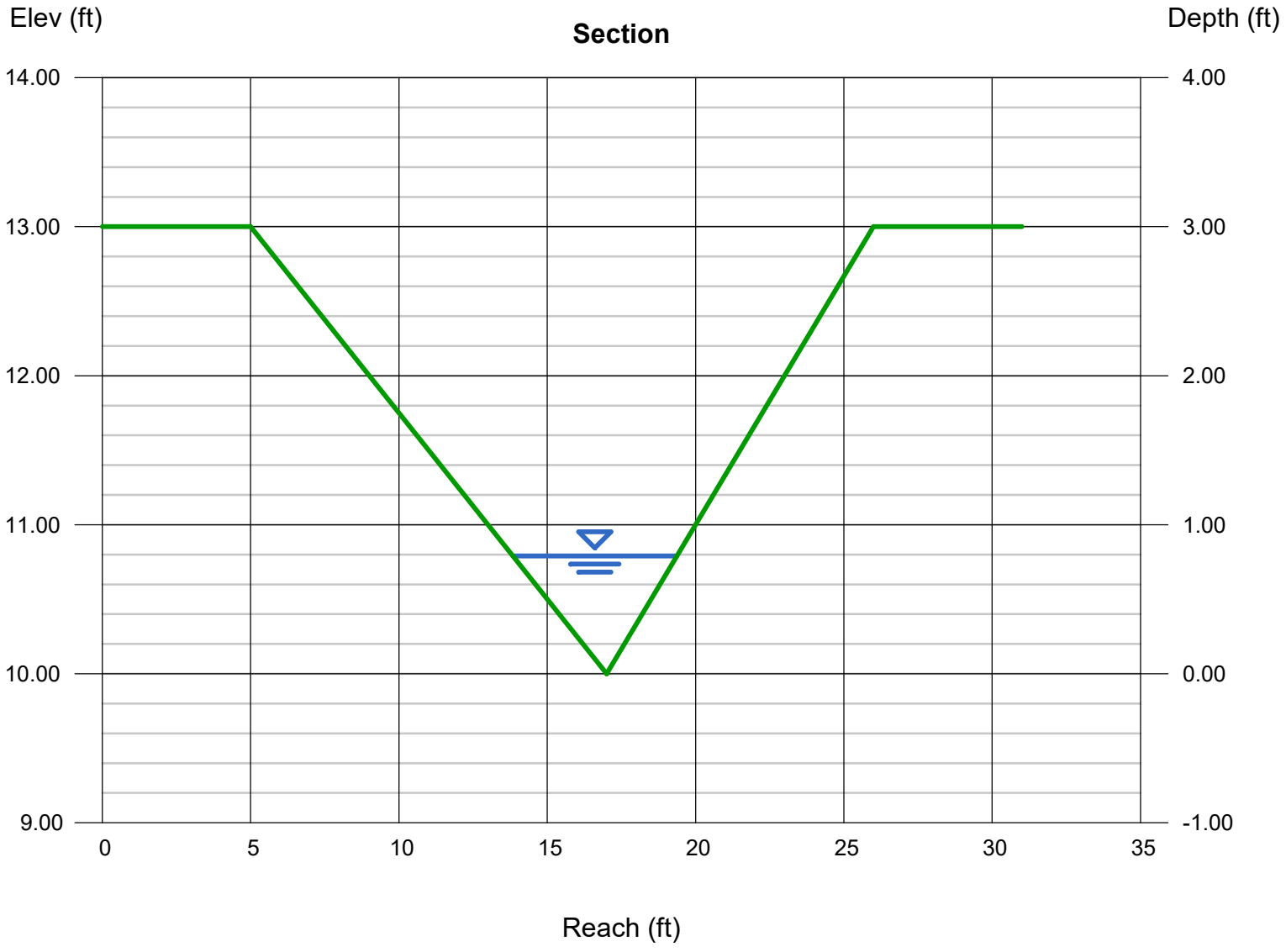
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.60

Highlighted

Depth (ft)	= 0.79
Q (cfs)	= 5.600
Area (sqft)	= 2.18
Velocity (ft/s)	= 2.56
Wetted Perim (ft)	= 5.76
Crit Depth, Yc (ft)	= 0.70
Top Width (ft)	= 5.53
EGL (ft)	= 0.89



Channel Report

DP 1.1 Swale (100-Year)(FR:0.56)

Triangular

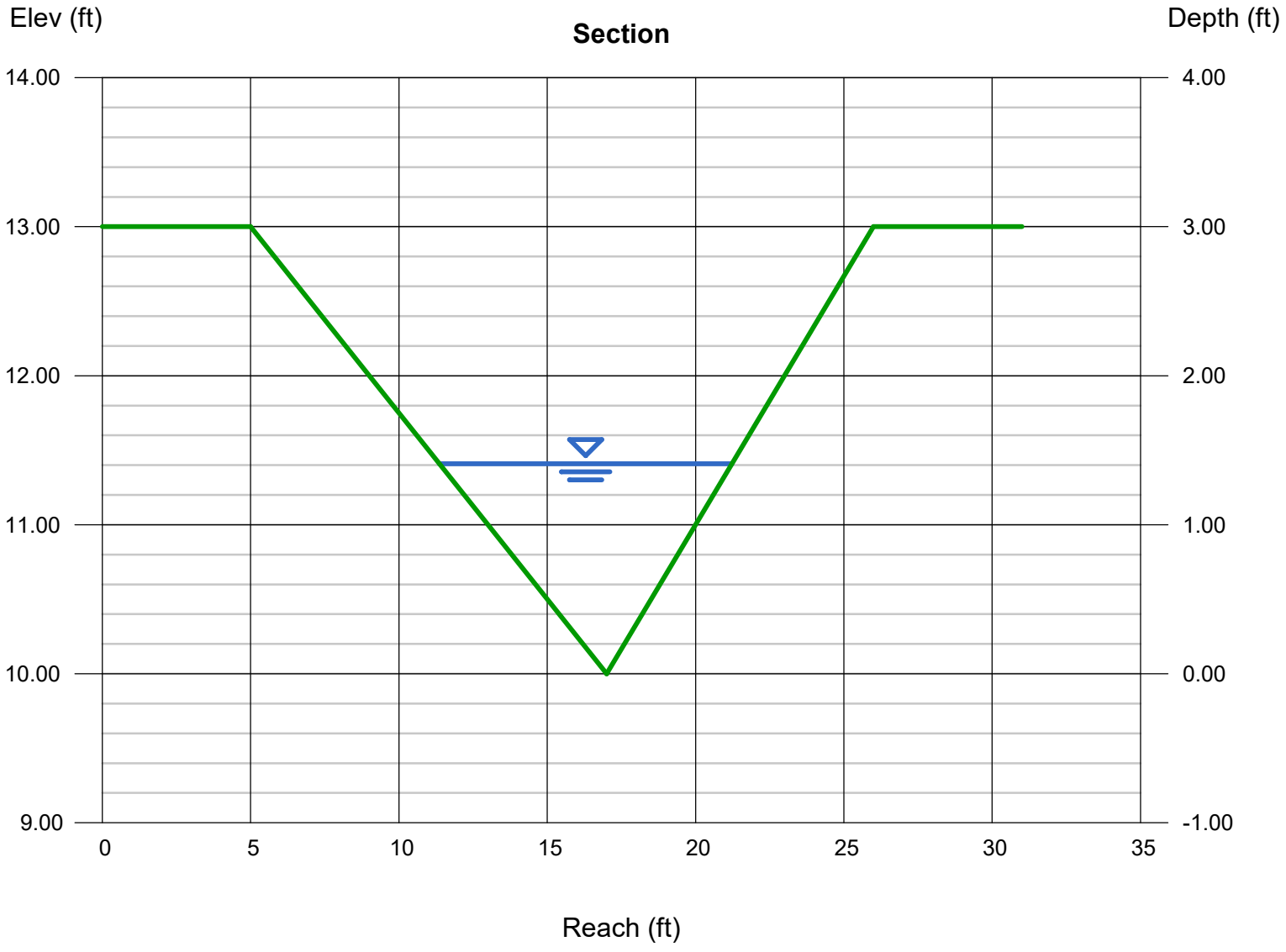
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 26.20

Highlighted

Depth (ft)	= 1.41
Q (cfs)	= 26.20
Area (sqft)	= 6.96
Velocity (ft/s)	= 3.77
Wetted Perim (ft)	= 10.27
Crit Depth, Yc (ft)	= 1.29
Top Width (ft)	= 9.87
EGL (ft)	= 1.63



Channel Report

DP 1.2 Swale (5-Year) (FR:0.51)

Triangular

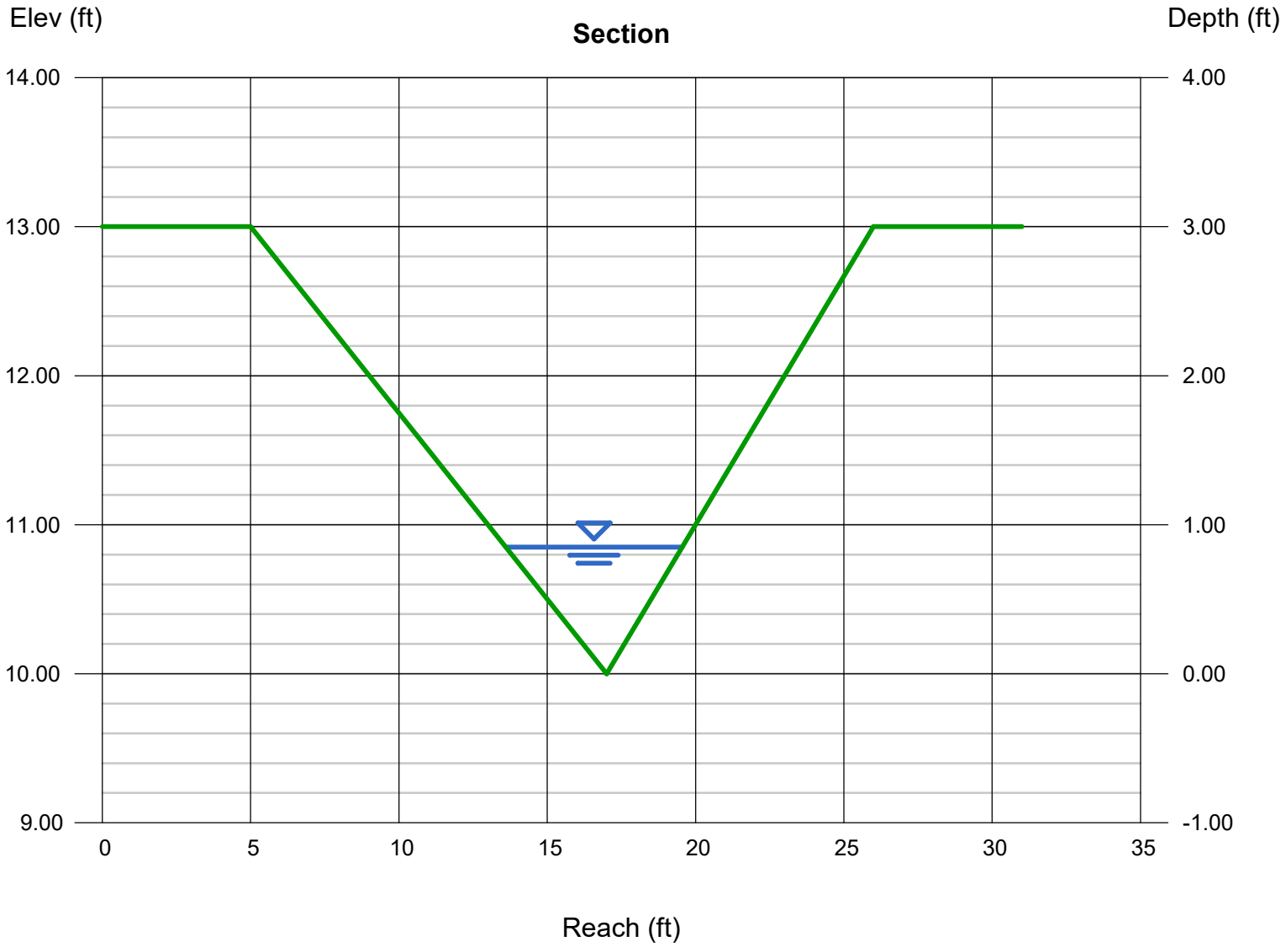
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.80

Highlighted

Depth (ft)	= 0.85
Q (cfs)	= 6.800
Area (sqft)	= 2.53
Velocity (ft/s)	= 2.69
Wetted Perim (ft)	= 6.19
Crit Depth, Yc (ft)	= 0.75
Top Width (ft)	= 5.95
EGL (ft)	= 0.96



Channel Report

DP 1.2 Swale (100-Year) (FR:0.57)

Triangular

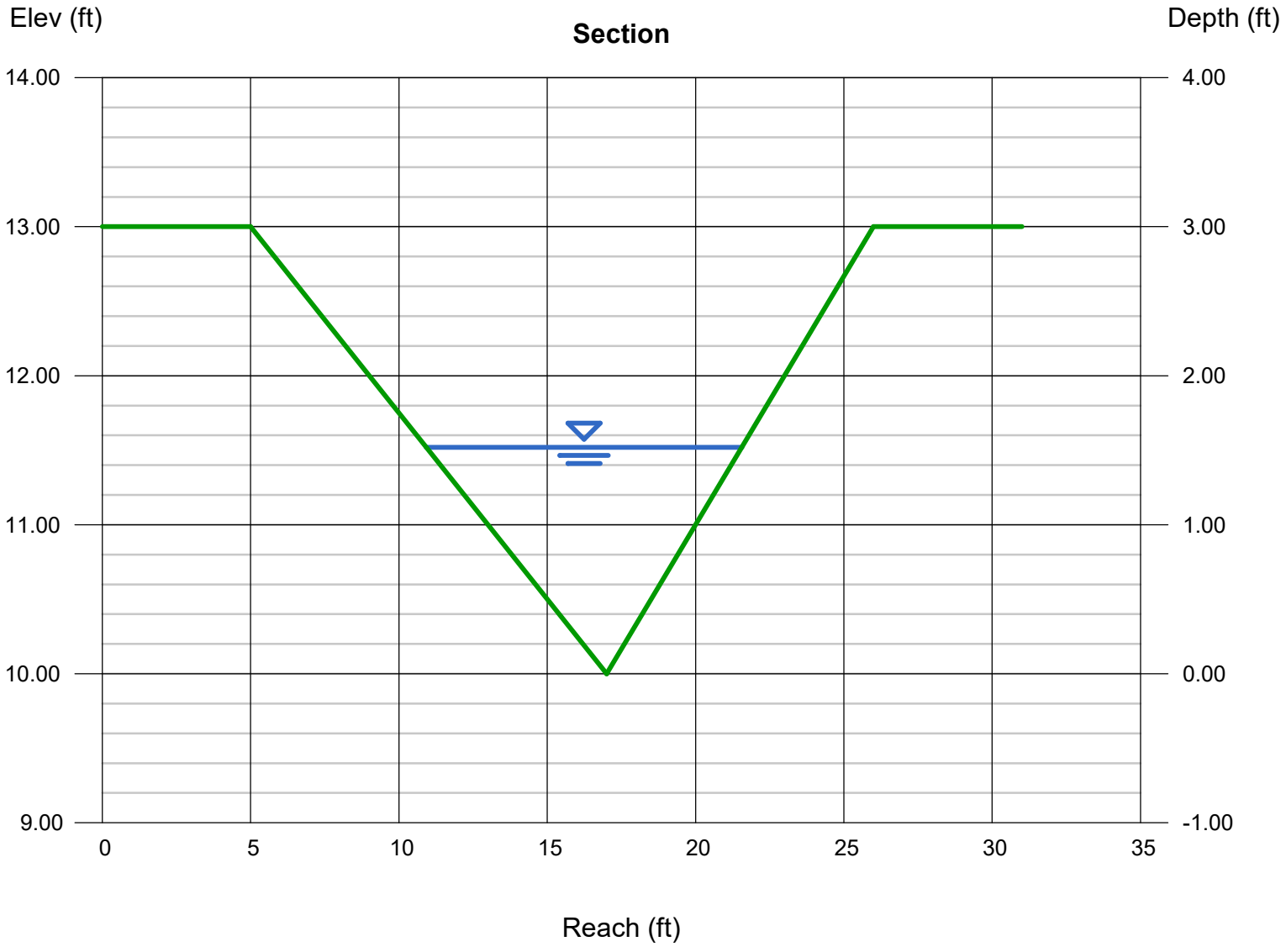
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 32.20

Highlighted

Depth (ft)	= 1.52
Q (cfs)	= 32.20
Area (sqft)	= 8.09
Velocity (ft/s)	= 3.98
Wetted Perim (ft)	= 11.07
Crit Depth, Yc (ft)	= 1.40
Top Width (ft)	= 10.64
EGL (ft)	= 1.77



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 1.3 Swale (5-Year) (FR:0.37)

Triangular

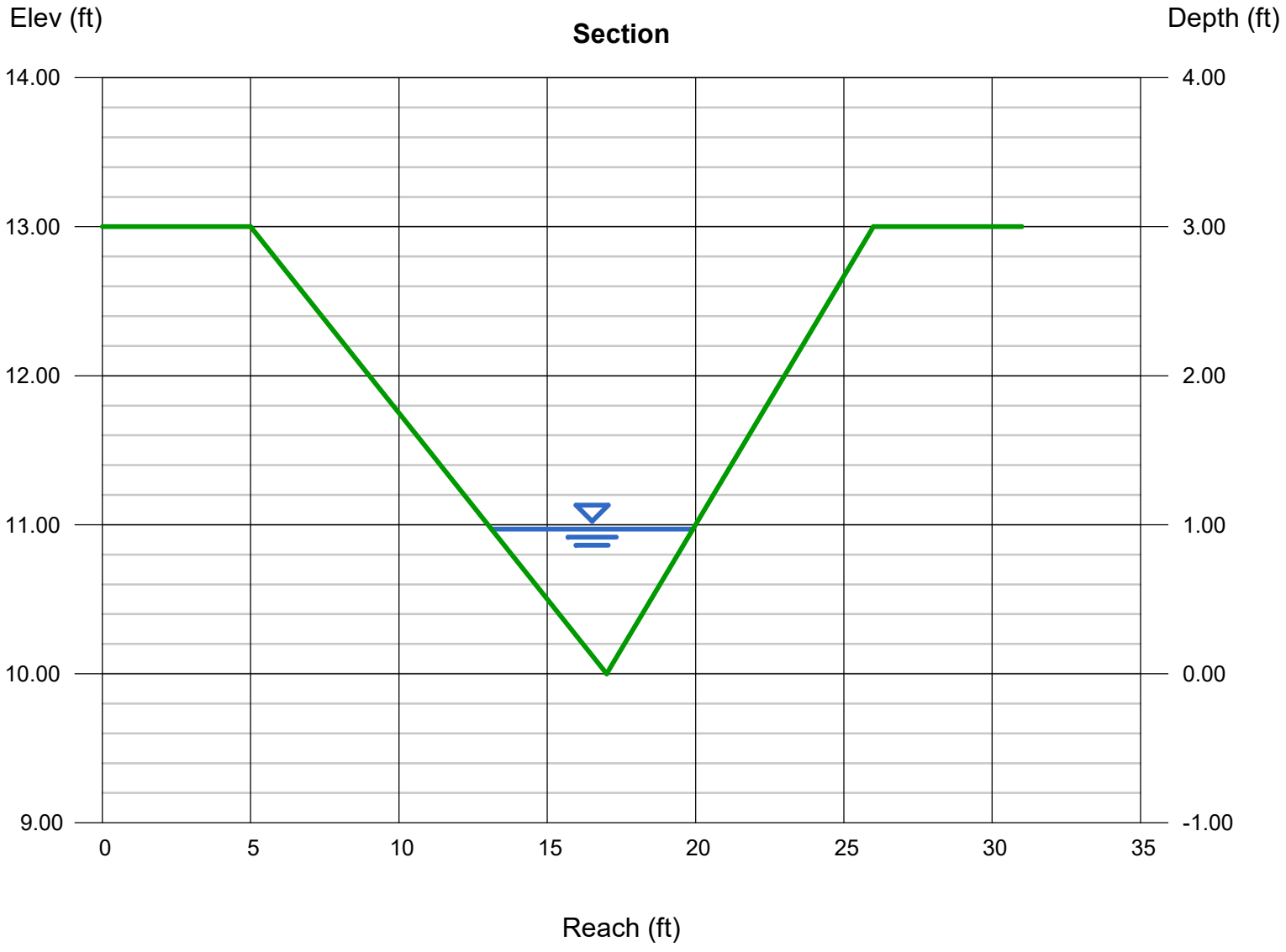
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 0.50
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.80

Highlighted

Depth (ft)	= 0.97
Q (cfs)	= 6.800
Area (sqft)	= 3.29
Velocity (ft/s)	= 2.06
Wetted Perim (ft)	= 7.07
Crit Depth, Yc (ft)	= 0.75
Top Width (ft)	= 6.79
EGL (ft)	= 1.04



Channel Report

DP 1.3 Swale (100-Year) (FR:0.41)

Triangular

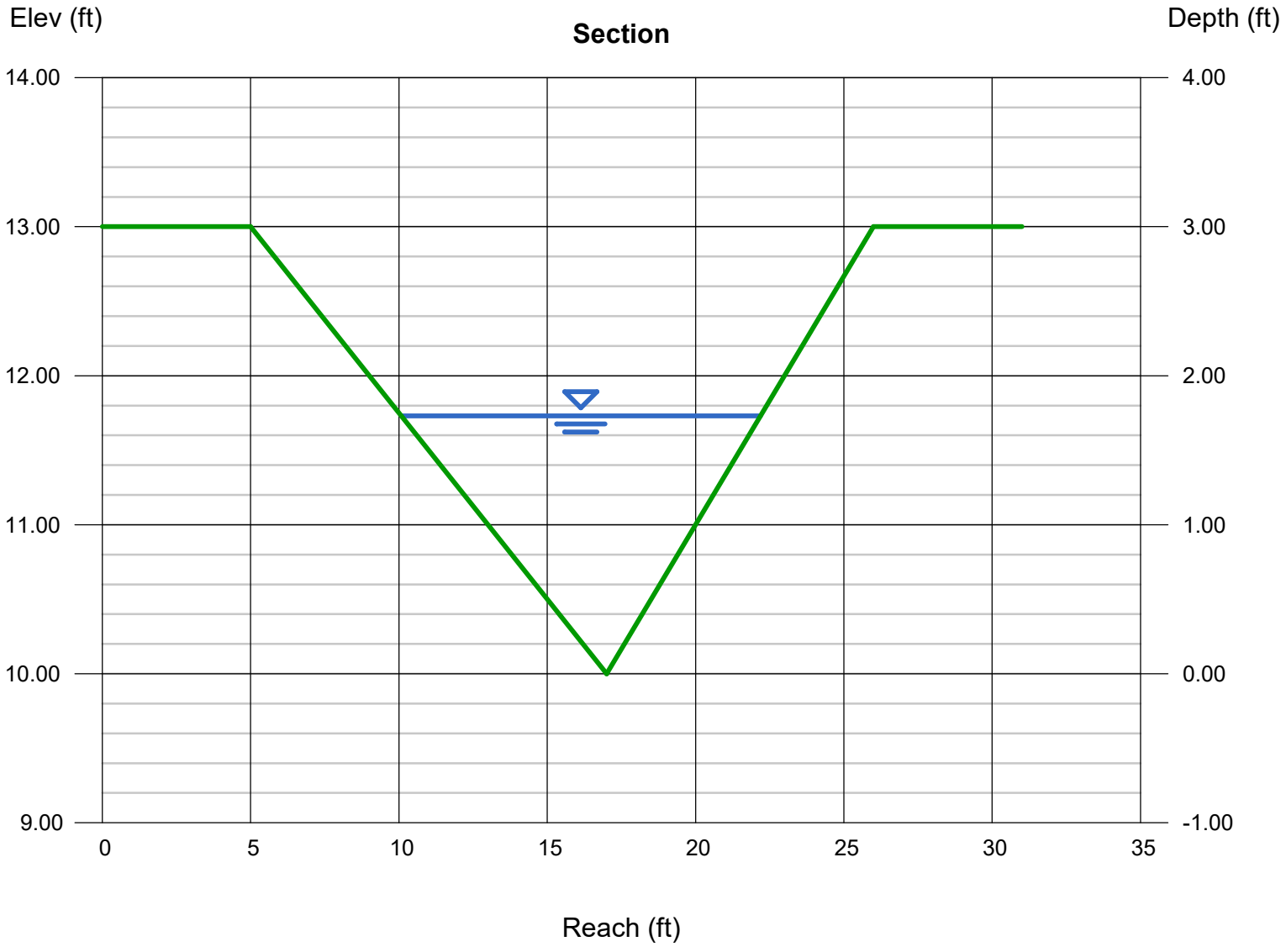
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 0.50
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 32.20

Highlighted

Depth (ft)	= 1.73
Q (cfs)	= 32.20
Area (sqft)	= 10.48
Velocity (ft/s)	= 3.07
Wetted Perim (ft)	= 12.60
Crit Depth, Yc (ft)	= 1.40
Top Width (ft)	= 12.11
EGL (ft)	= 1.88



Channel Report

DP 1.4 Swale (5-Year) (FR:0.51)

Triangular

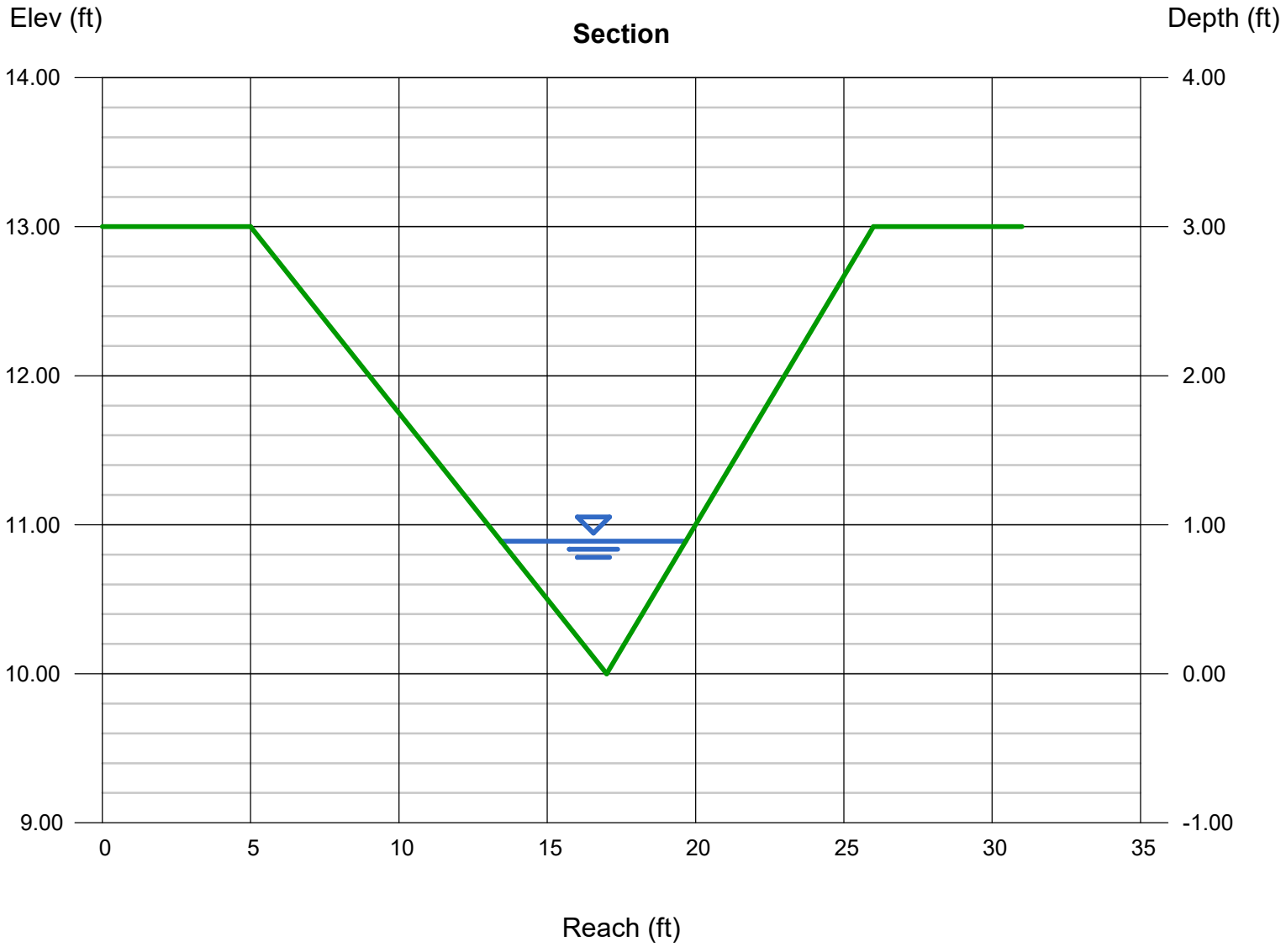
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 7.60

Highlighted

Depth (ft)	= 0.89
Q (cfs)	= 7.600
Area (sqft)	= 2.77
Velocity (ft/s)	= 2.74
Wetted Perim (ft)	= 6.48
Crit Depth, Yc (ft)	= 0.79
Top Width (ft)	= 6.23
EGL (ft)	= 1.01



Channel Report

DP 1.4 Swale (100-Year) (FR:0.57)

Triangular

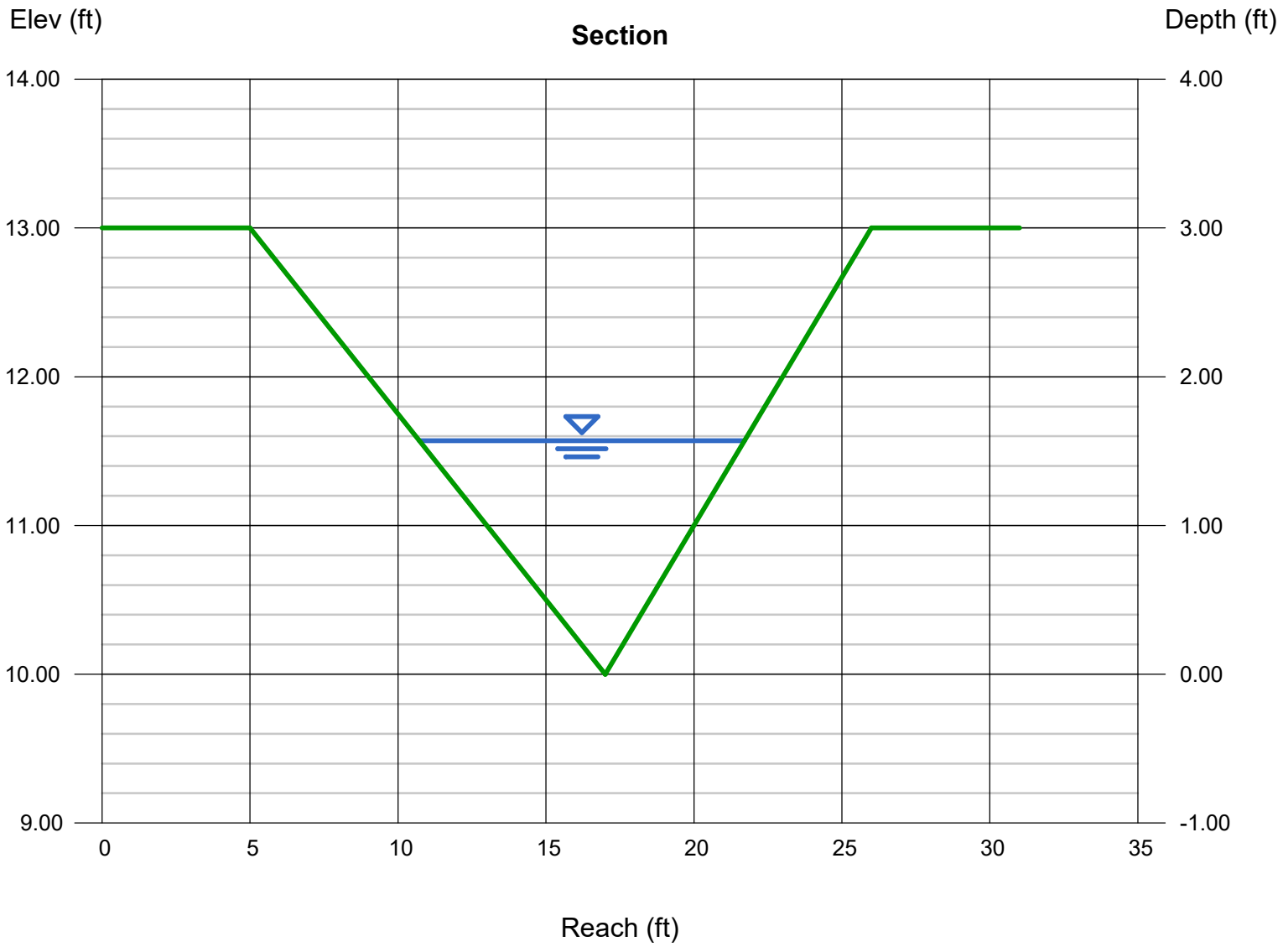
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 35.00

Highlighted

Depth (ft)	= 1.57
Q (cfs)	= 35.00
Area (sqft)	= 8.63
Velocity (ft/s)	= 4.06
Wetted Perim (ft)	= 11.44
Crit Depth, Yc (ft)	= 1.45
Top Width (ft)	= 10.99
EGL (ft)	= 1.83



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 1.5 Swale (5-Year) (FR:0.49)

Triangular

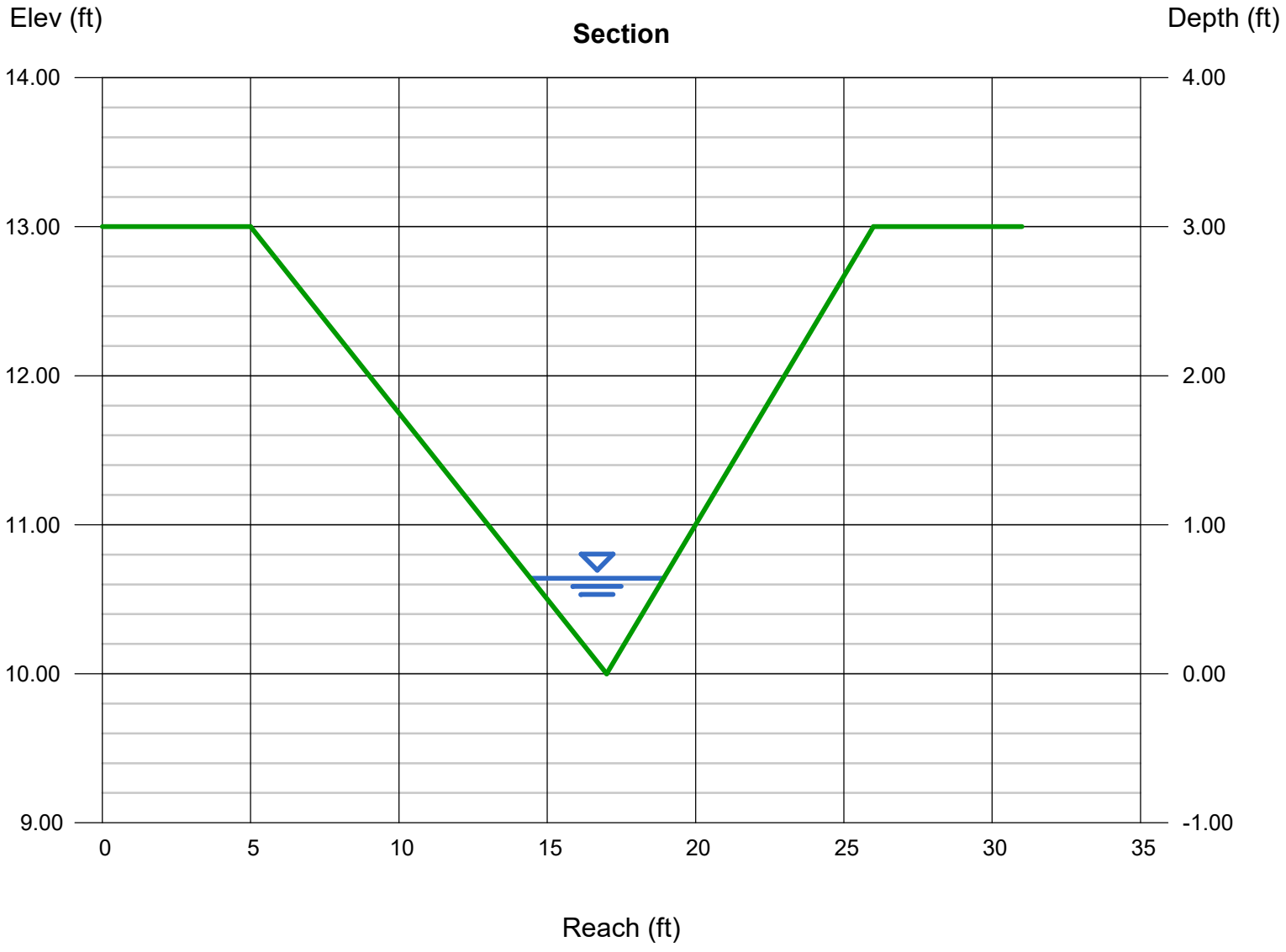
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.20

Highlighted

Depth (ft)	= 0.64
Q (cfs)	= 3.200
Area (sqft)	= 1.43
Velocity (ft/s)	= 2.23
Wetted Perim (ft)	= 4.66
Crit Depth, Yc (ft)	= 0.56
Top Width (ft)	= 4.48
EGL (ft)	= 0.72



Channel Report

DP 1.5 Swale (100-Year) (FR:0.56)

Triangular

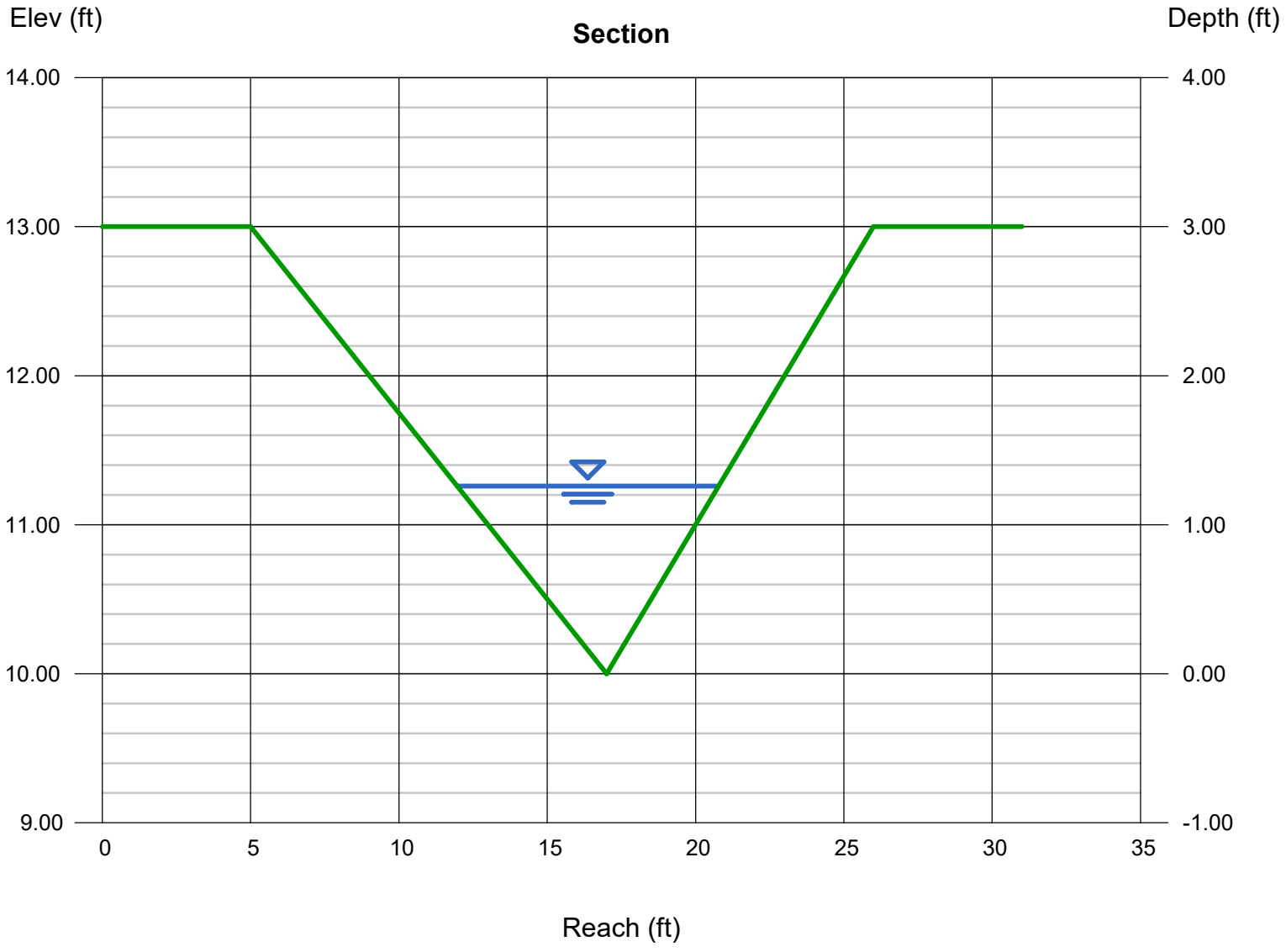
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 19.60

Highlighted

Depth (ft)	= 1.26
Q (cfs)	= 19.60
Area (sqft)	= 5.56
Velocity (ft/s)	= 3.53
Wetted Perim (ft)	= 9.18
Crit Depth, Yc (ft)	= 1.15
Top Width (ft)	= 8.82
EGL (ft)	= 1.45



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 1.6 Swale (5-Year) (FR:0.44)

Triangular

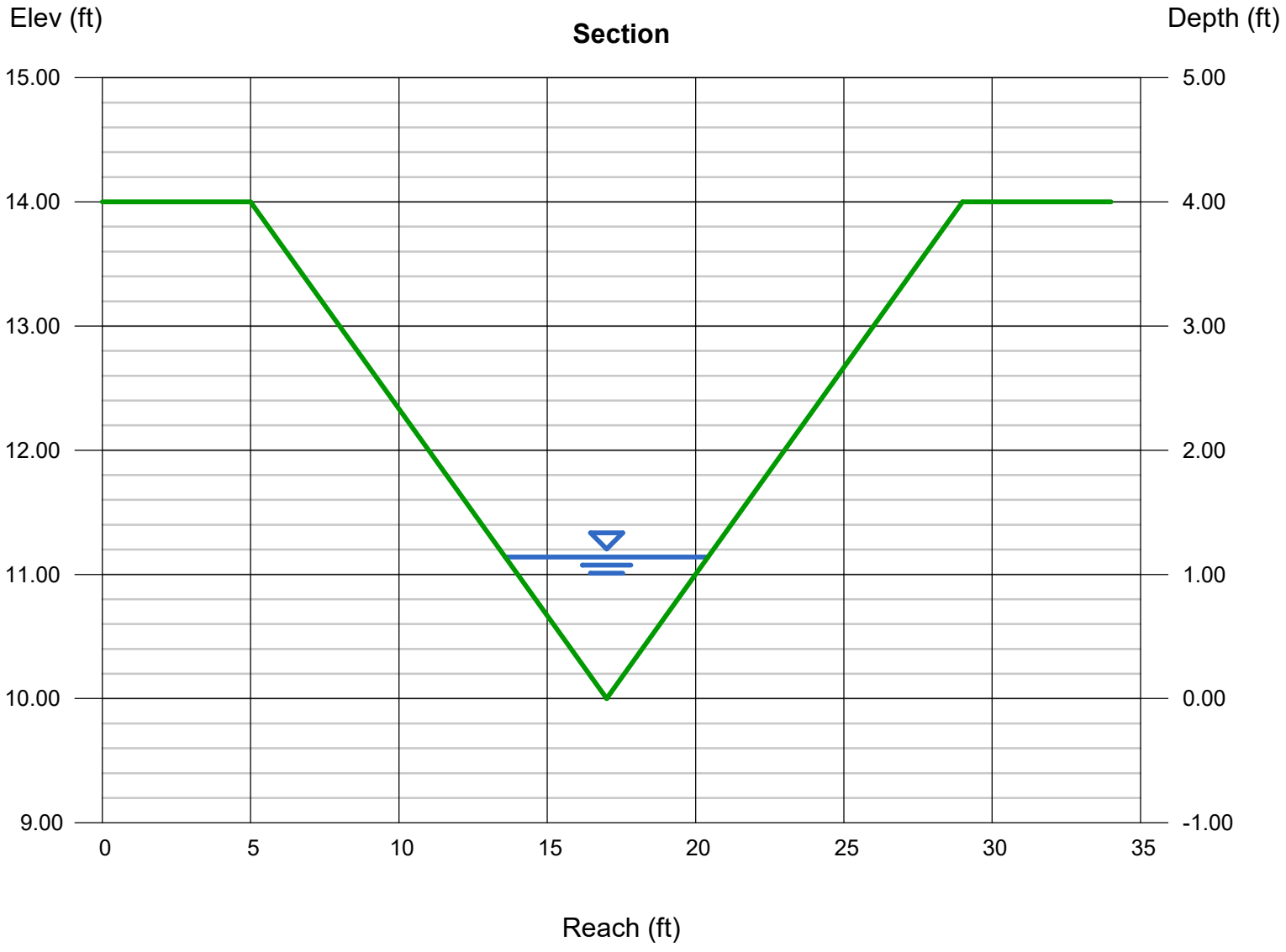
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 10.00
Slope (%)	= 0.70
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.50

Highlighted

Depth (ft)	= 1.14
Q (cfs)	= 10.50
Area (sqft)	= 3.90
Velocity (ft/s)	= 2.69
Wetted Perim (ft)	= 7.21
Crit Depth, Yc (ft)	= 0.95
Top Width (ft)	= 6.84
EGL (ft)	= 1.25



Channel Report

DP 1.6 Swale (100-Year) (FR:0.49)

Triangular

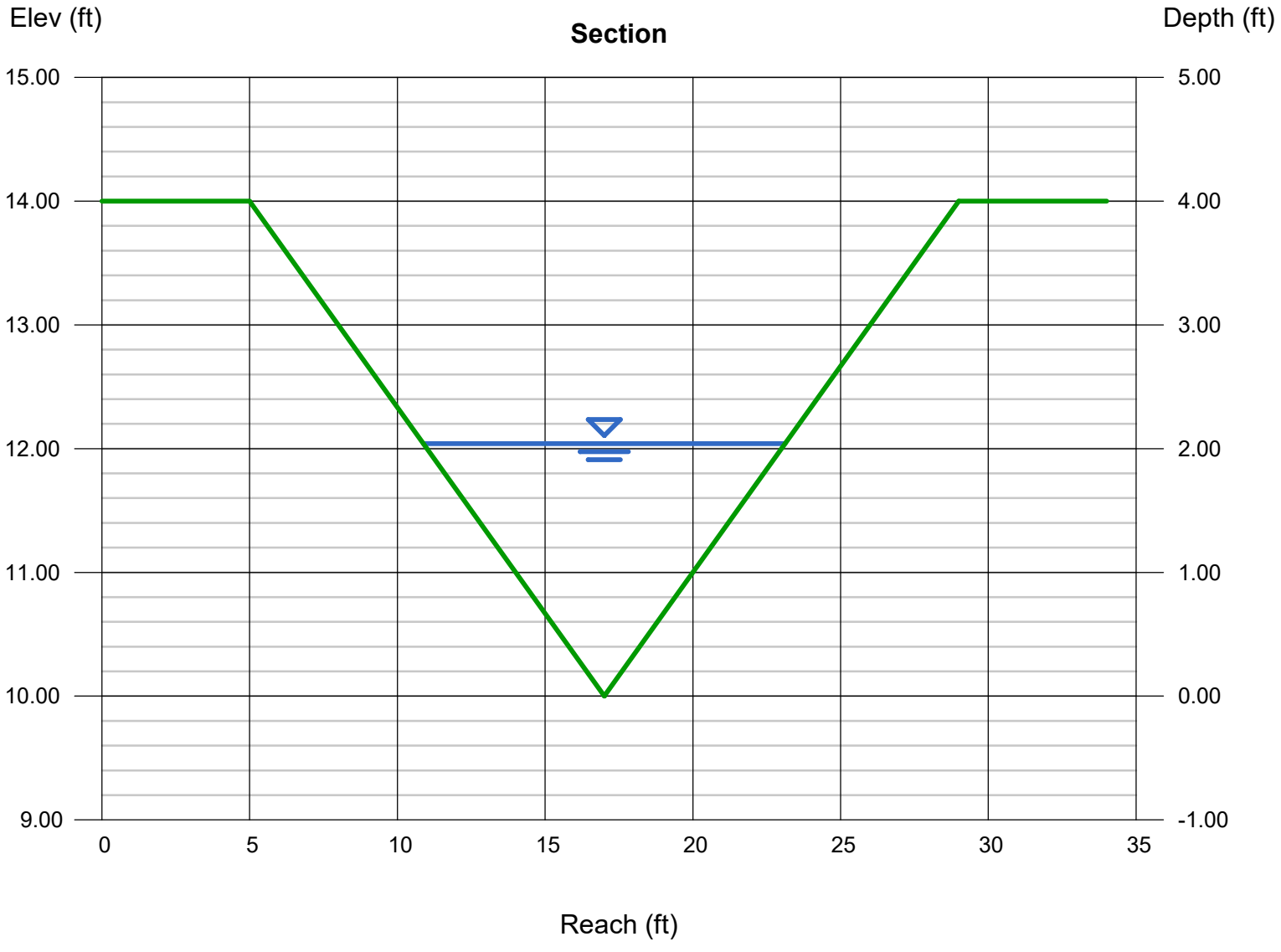
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 10.00
Slope (%)	= 0.70
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 50.00

Highlighted

Depth (ft)	= 2.04
Q (cfs)	= 50.00
Area (sqft)	= 12.48
Velocity (ft/s)	= 4.00
Wetted Perim (ft)	= 12.90
Crit Depth, Yc (ft)	= 1.77
Top Width (ft)	= 12.24
EGL (ft)	= 2.29



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Jun 16 2023

DP 2.0 Swale (5-Year)(FR:0.50)

Triangular

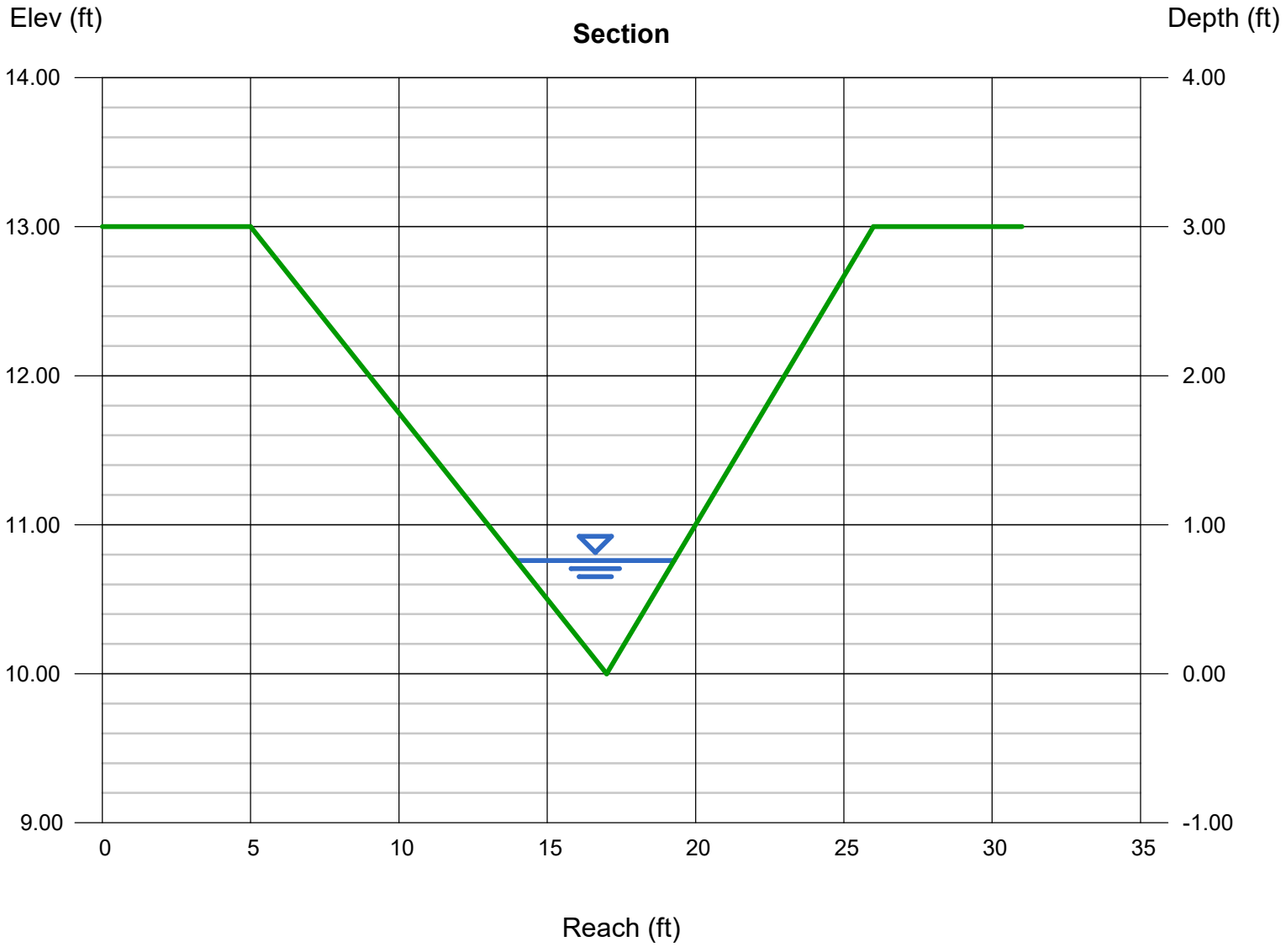
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.00

Highlighted

Depth (ft)	= 0.76
Q (cfs)	= 5.000
Area (sqft)	= 2.02
Velocity (ft/s)	= 2.47
Wetted Perim (ft)	= 5.54
Crit Depth, Yc (ft)	= 0.67
Top Width (ft)	= 5.32
EGL (ft)	= 0.86



Channel Report

DP 2.0 Swale (100-Year)(FR:0.55)

Triangular

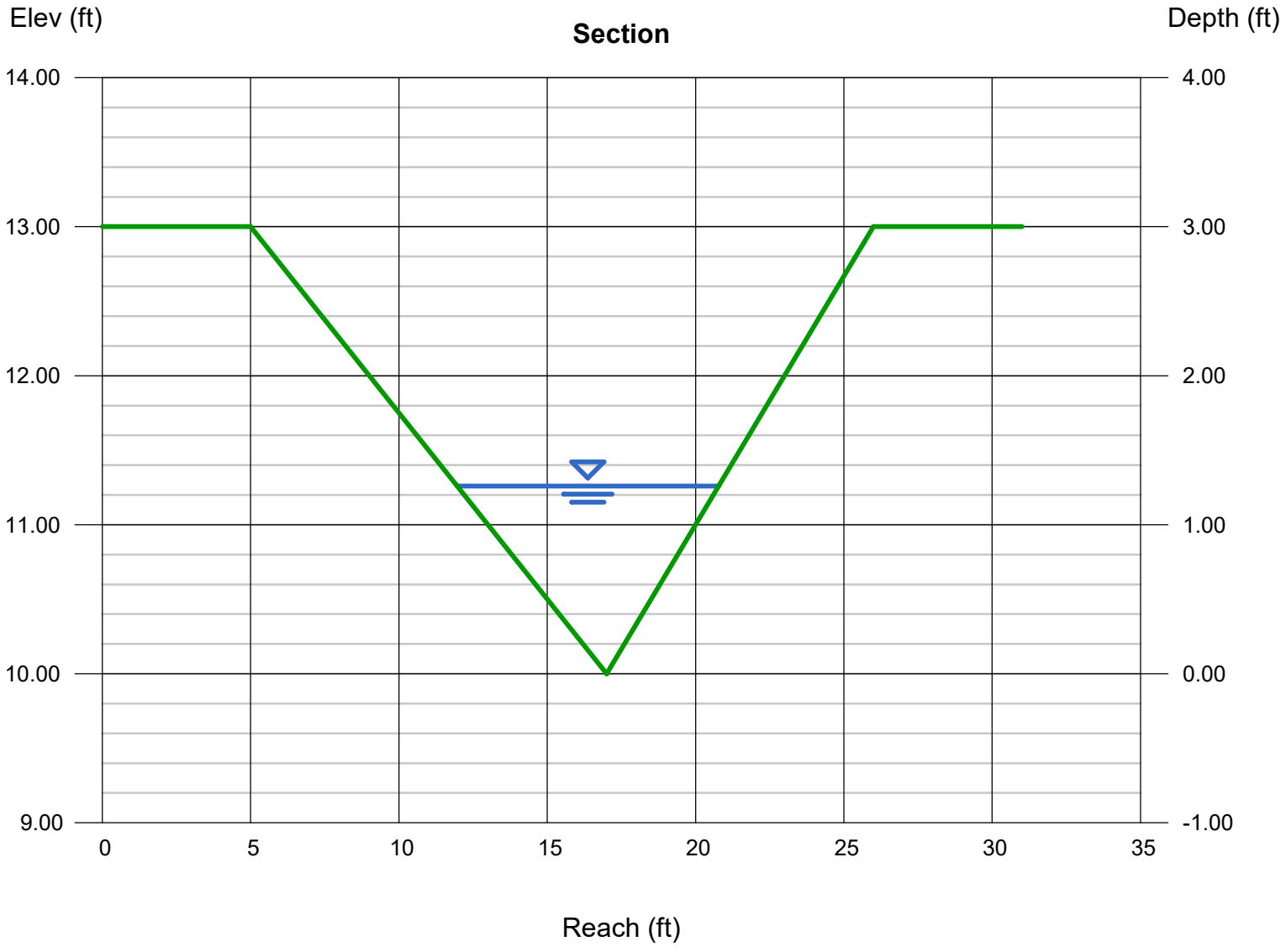
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 19.60

Highlighted

Depth (ft)	= 1.26
Q (cfs)	= 19.60
Area (sqft)	= 5.56
Velocity (ft/s)	= 3.53
Wetted Perim (ft)	= 9.18
Crit Depth, Yc (ft)	= 1.15
Top Width (ft)	= 8.82
EGL (ft)	= 1.45



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DP 2.1 Swale (5-Year)(FR:0.57)

Triangular

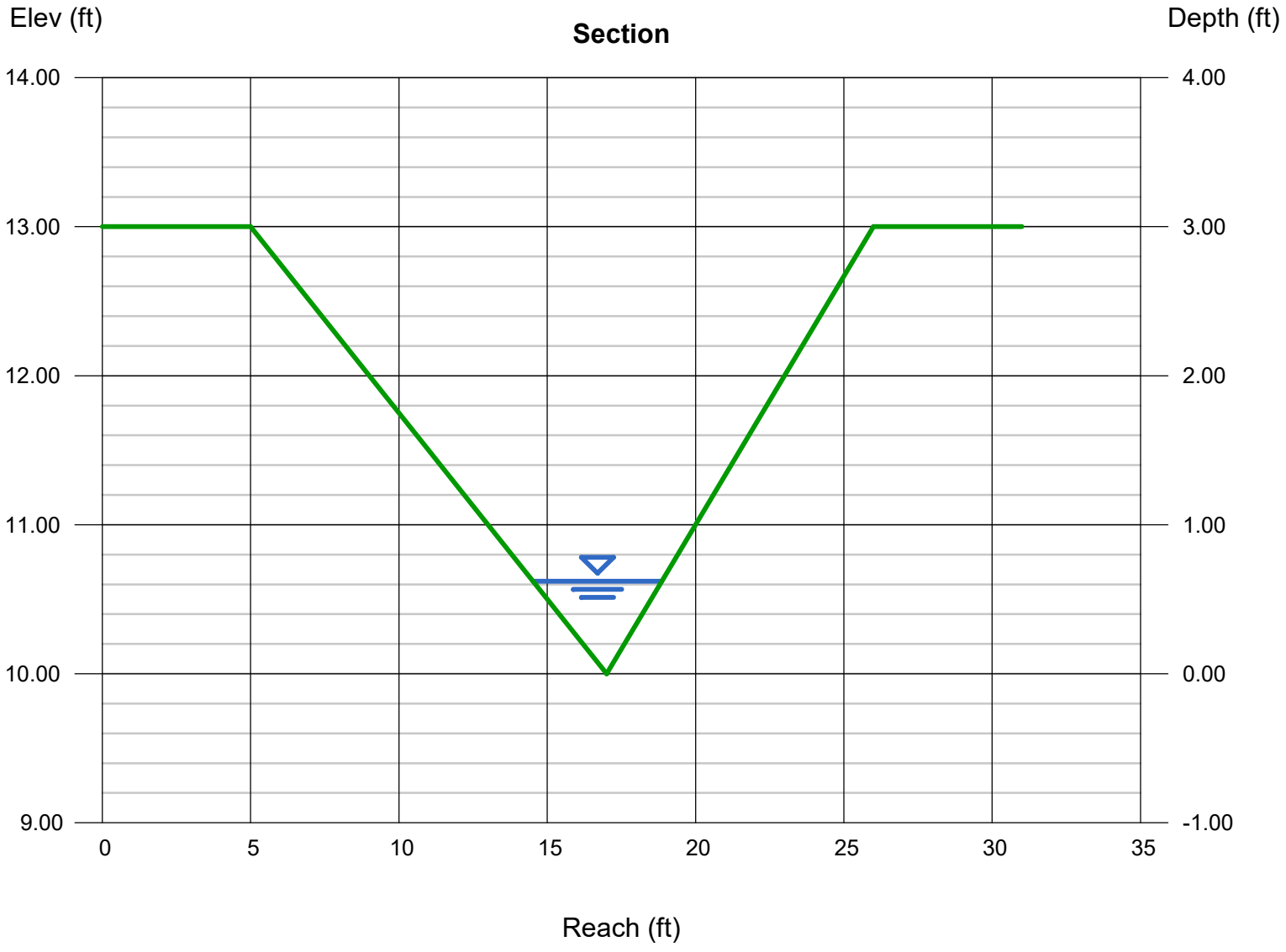
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.34
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.40

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 3.400
Area (sqft)	= 1.35
Velocity (ft/s)	= 2.53
Wetted Perim (ft)	= 4.52
Crit Depth, Yc (ft)	= 0.57
Top Width (ft)	= 4.34
EGL (ft)	= 0.72



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DP 2.1 Swale (100-Year)(FR:0.61)

Triangular

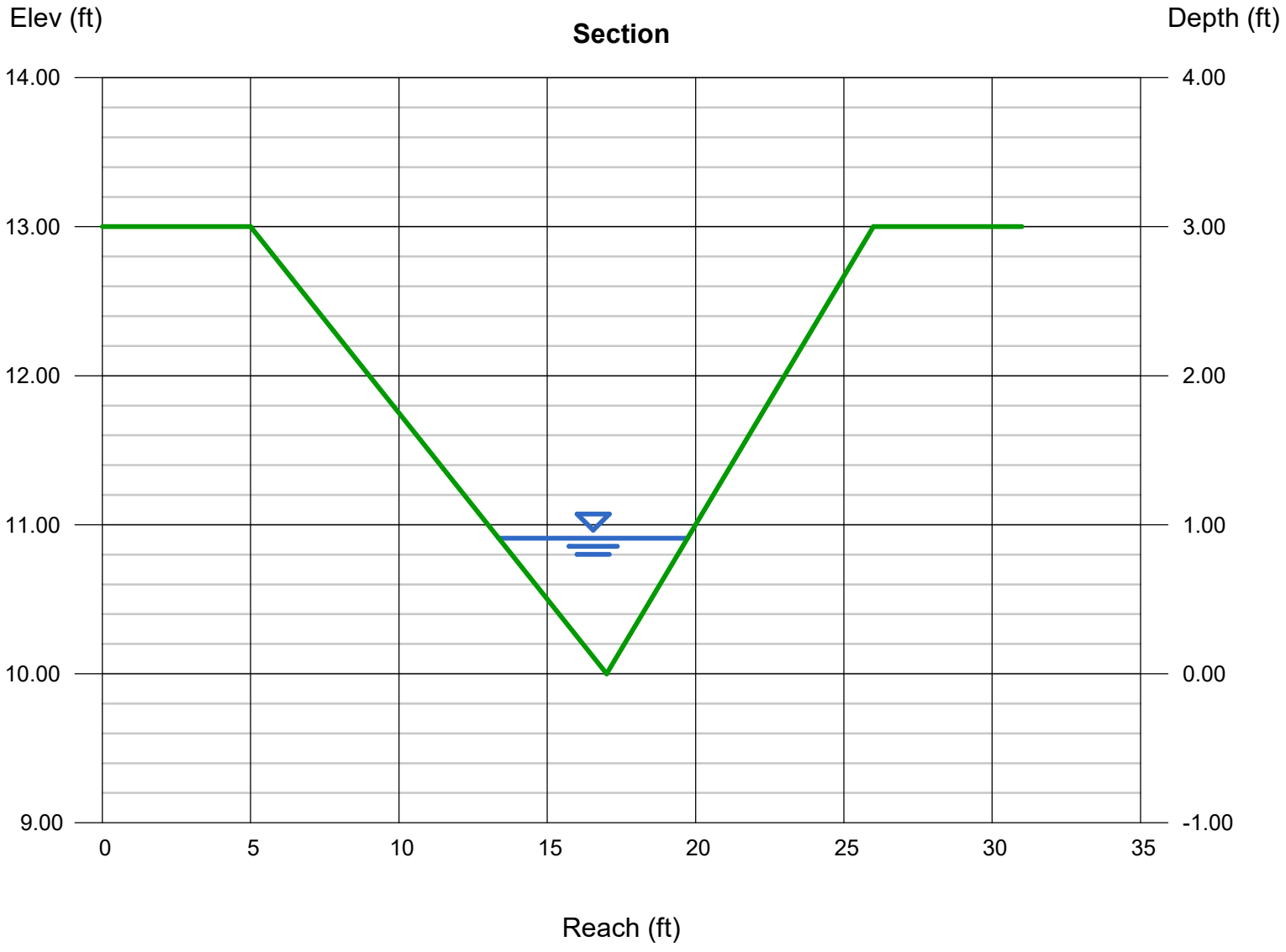
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.34
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 9.50

Highlighted

Depth (ft)	= 0.91
Q (cfs)	= 9.500
Area (sqft)	= 2.90
Velocity (ft/s)	= 3.28
Wetted Perim (ft)	= 6.63
Crit Depth, Yc (ft)	= 0.86
Top Width (ft)	= 6.37
EGL (ft)	= 1.08



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 2.2 Swale (5-Year) (FR:0.66)

Triangular

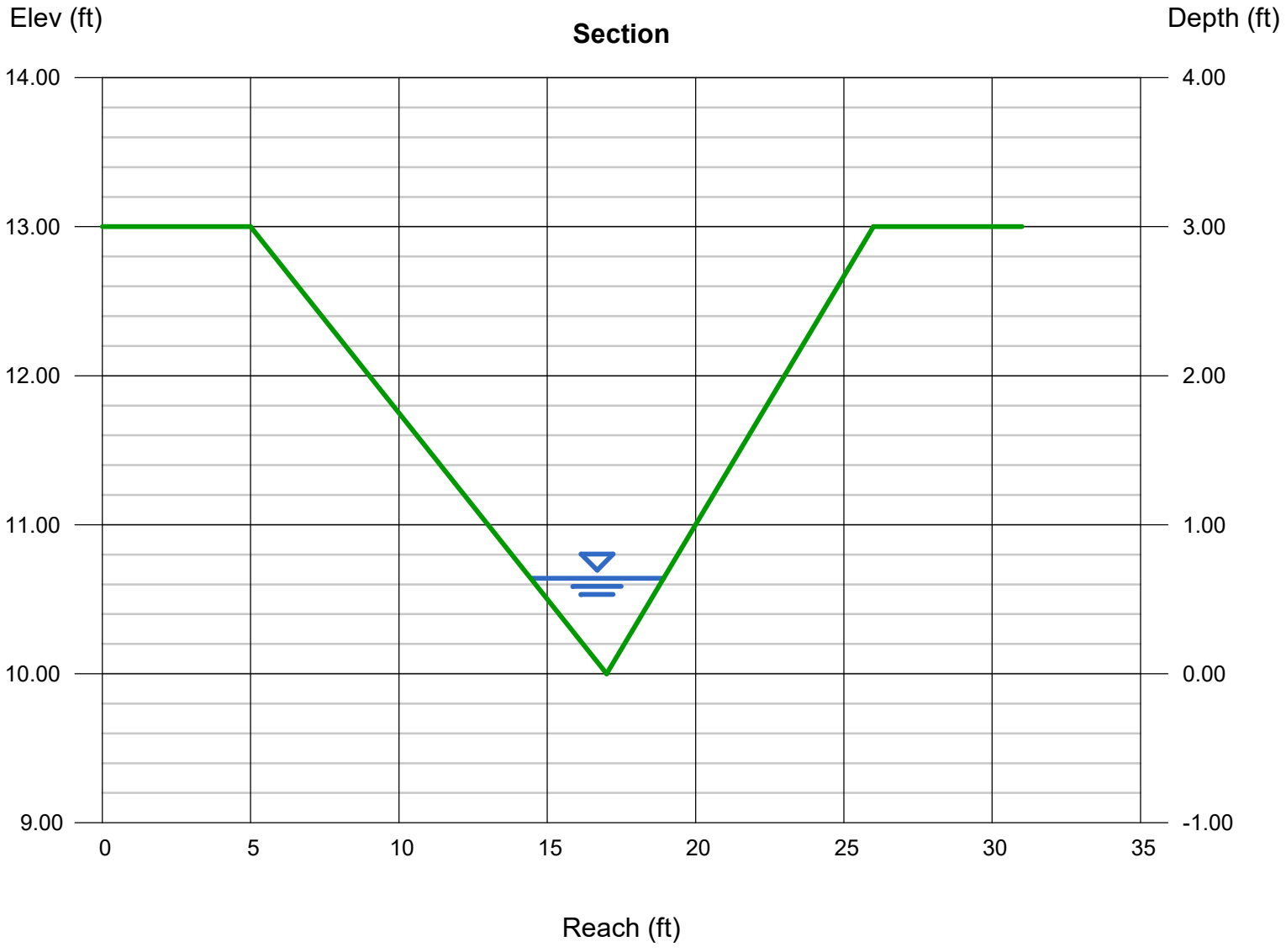
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.83
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.30

Highlighted

Depth (ft)	= 0.64
Q (cfs)	= 4.300
Area (sqft)	= 1.43
Velocity (ft/s)	= 3.00
Wetted Perim (ft)	= 4.66
Crit Depth, Yc (ft)	= 0.63
Top Width (ft)	= 4.48
EGL (ft)	= 0.78



Channel Report

DP 2.2 Swale (100-Year) (FR:0.70)

Triangular

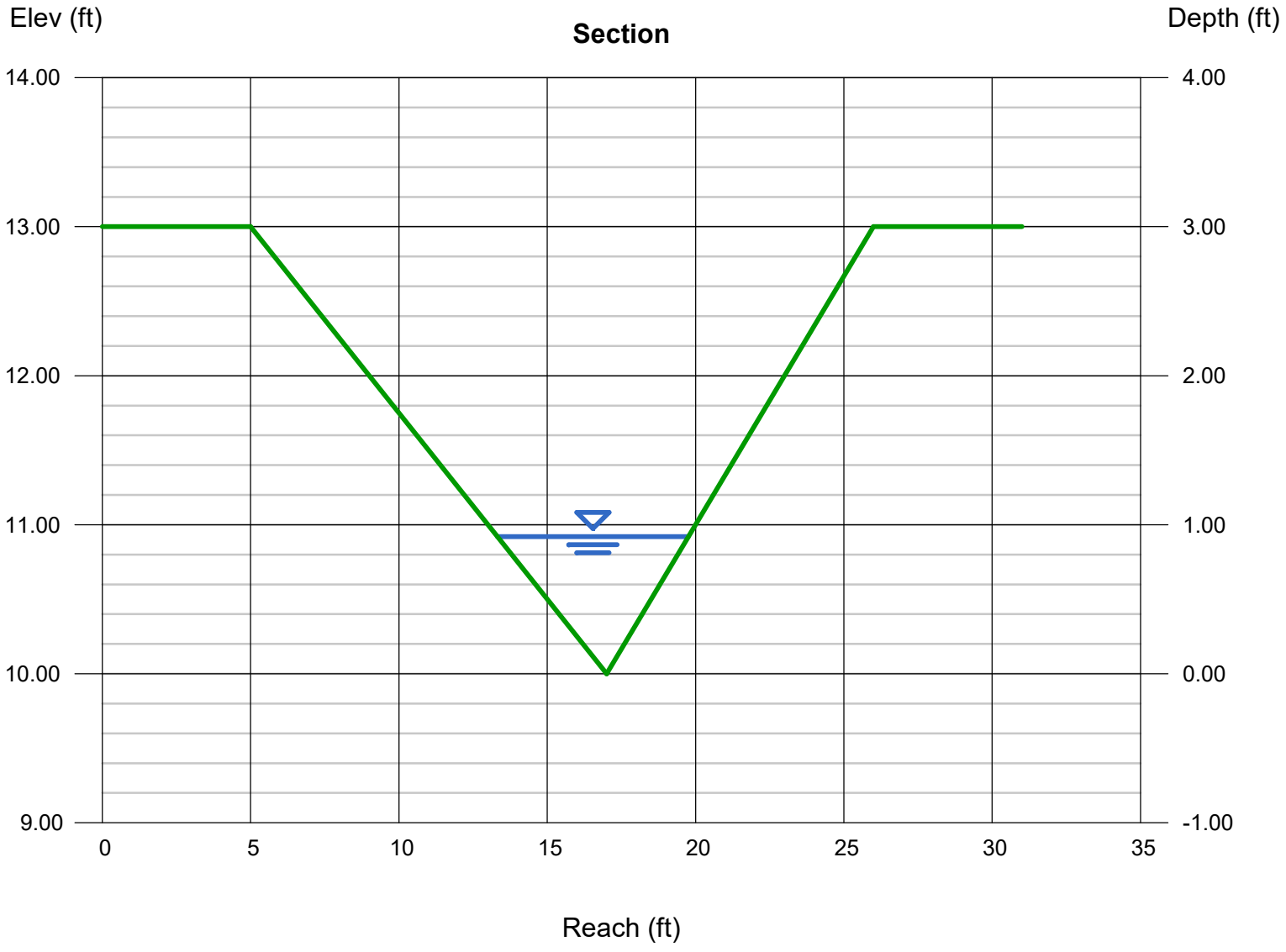
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.83
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 11.30

Highlighted

Depth (ft)	= 0.92
Q (cfs)	= 11.30
Area (sqft)	= 2.96
Velocity (ft/s)	= 3.81
Wetted Perim (ft)	= 6.70
Crit Depth, Yc (ft)	= 0.92
Top Width (ft)	= 6.44
EGL (ft)	= 1.15



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Jun 16 2023

DP 2.3 Swale (5-Year)(FR:0.51)

Triangular

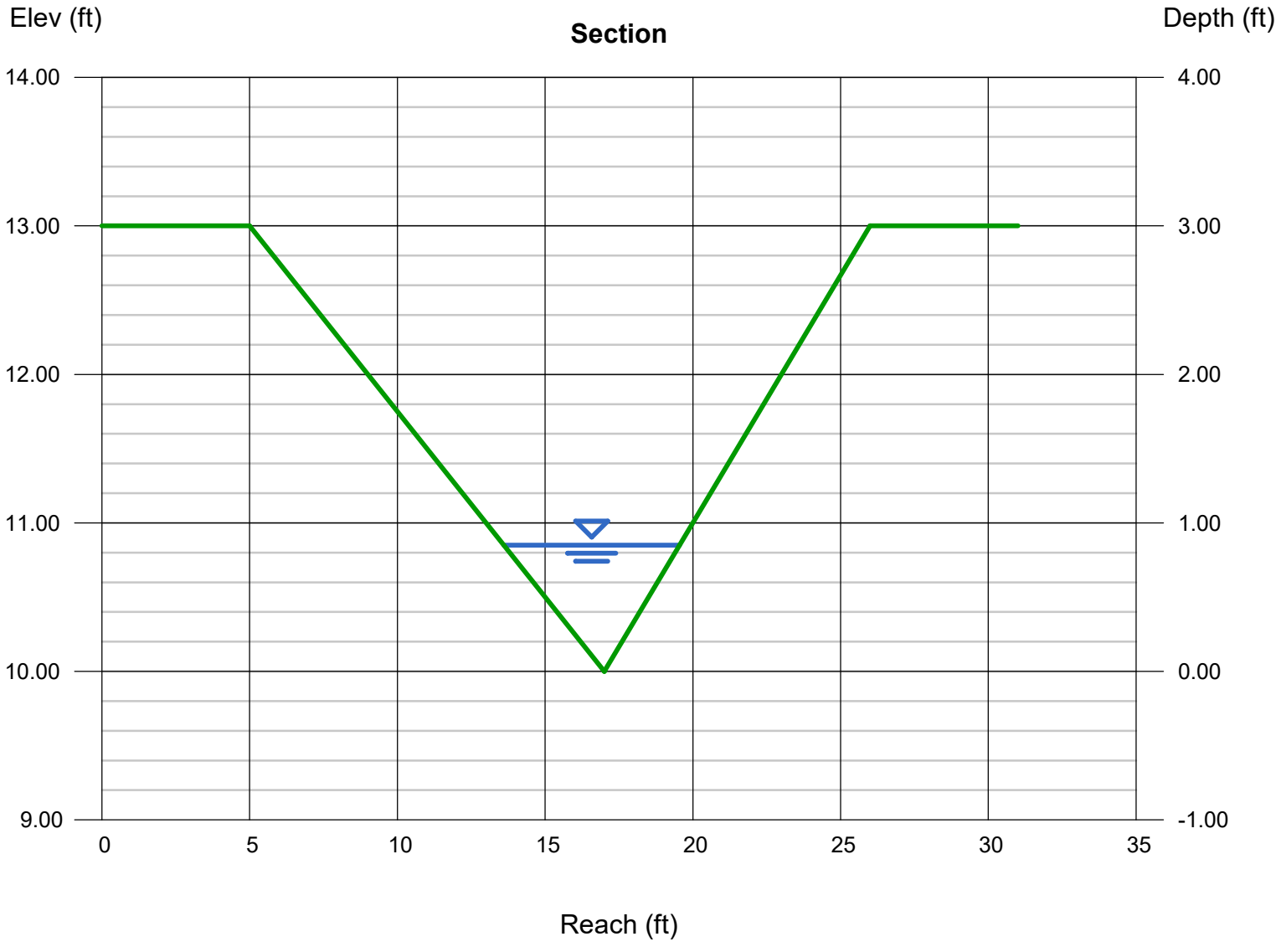
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.70

Highlighted

Depth (ft)	= 0.85
Q (cfs)	= 6.700
Area (sqft)	= 2.53
Velocity (ft/s)	= 2.65
Wetted Perim (ft)	= 6.19
Crit Depth, Yc (ft)	= 0.75
Top Width (ft)	= 5.95
EGL (ft)	= 0.96



Channel Report

DP 2.3 Swale (100-Year)(FR:0.57)

Triangular

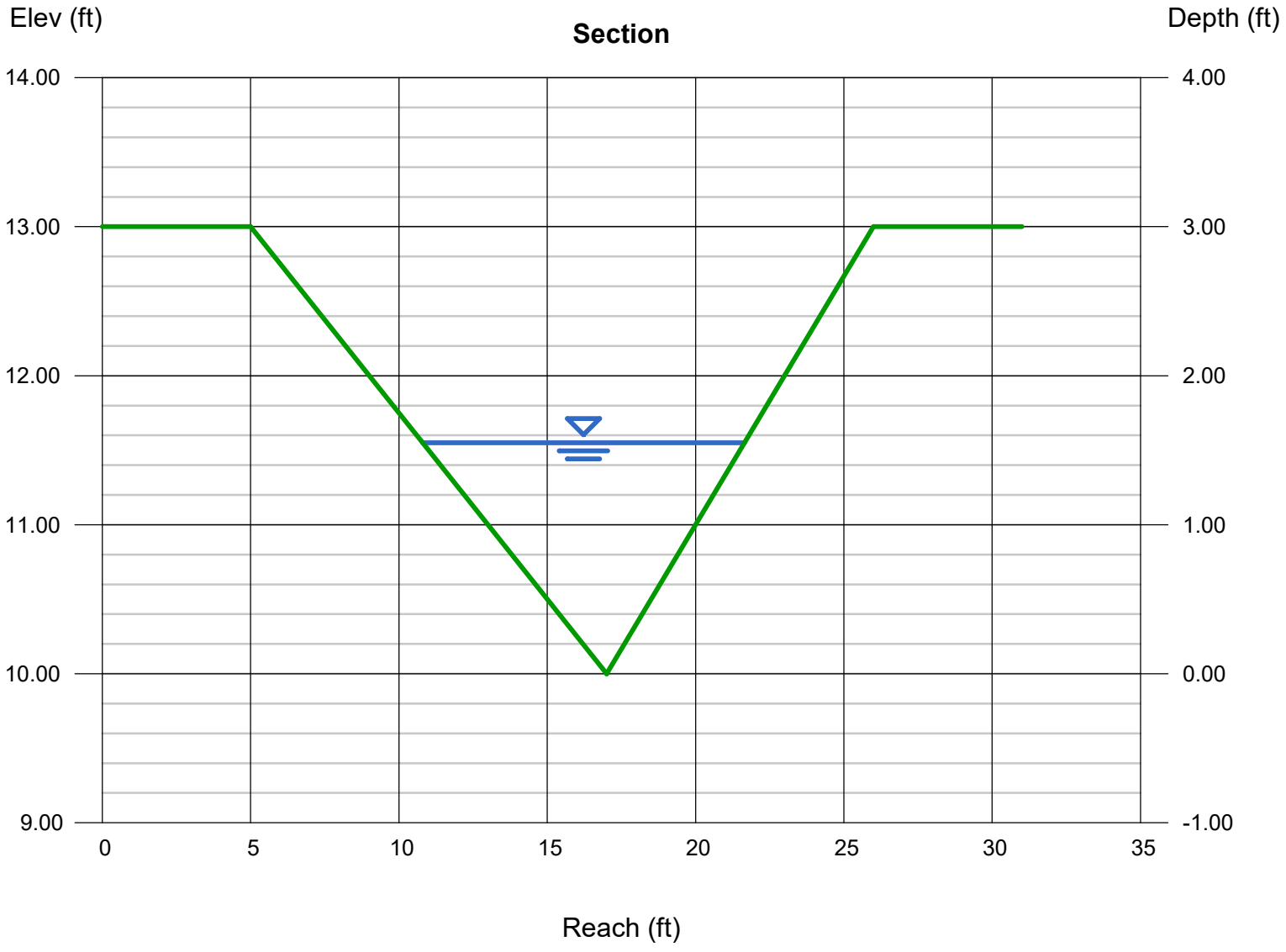
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 34.10

Highlighted

Depth (ft)	= 1.55
Q (cfs)	= 34.10
Area (sqft)	= 8.41
Velocity (ft/s)	= 4.06
Wetted Perim (ft)	= 11.29
Crit Depth, Yc (ft)	= 1.43
Top Width (ft)	= 10.85
EGL (ft)	= 1.81



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 3 Swale (5-Year) (FR:0.46)

Triangular

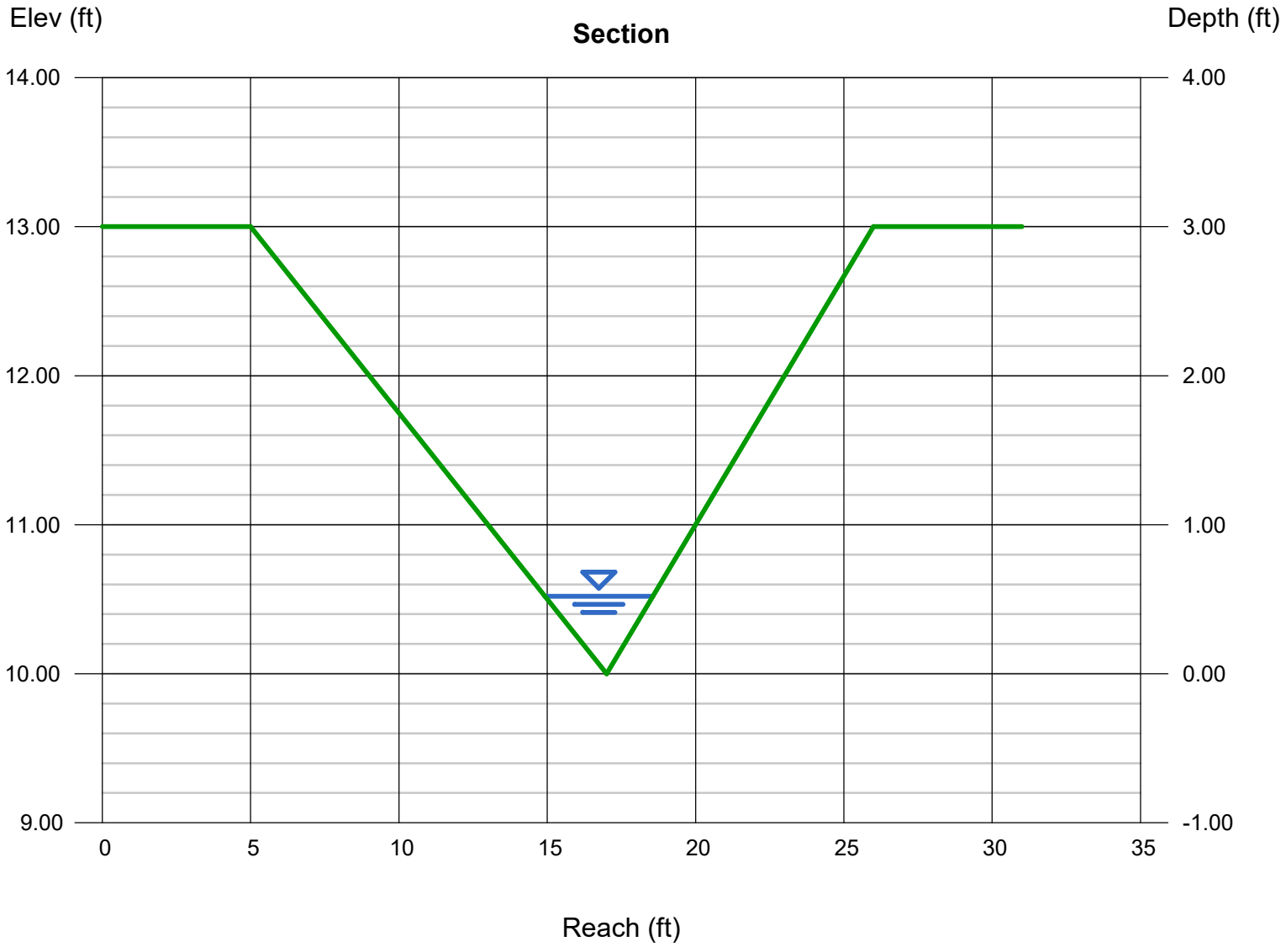
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.80

Highlighted

Depth (ft)	= 0.52
Q (cfs)	= 1.800
Area (sqft)	= 0.95
Velocity (ft/s)	= 1.90
Wetted Perim (ft)	= 3.79
Crit Depth, Yc (ft)	= 0.44
Top Width (ft)	= 3.64
EGL (ft)	= 0.58



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 3 Swale (100-Year) (FR:0.53)

Triangular

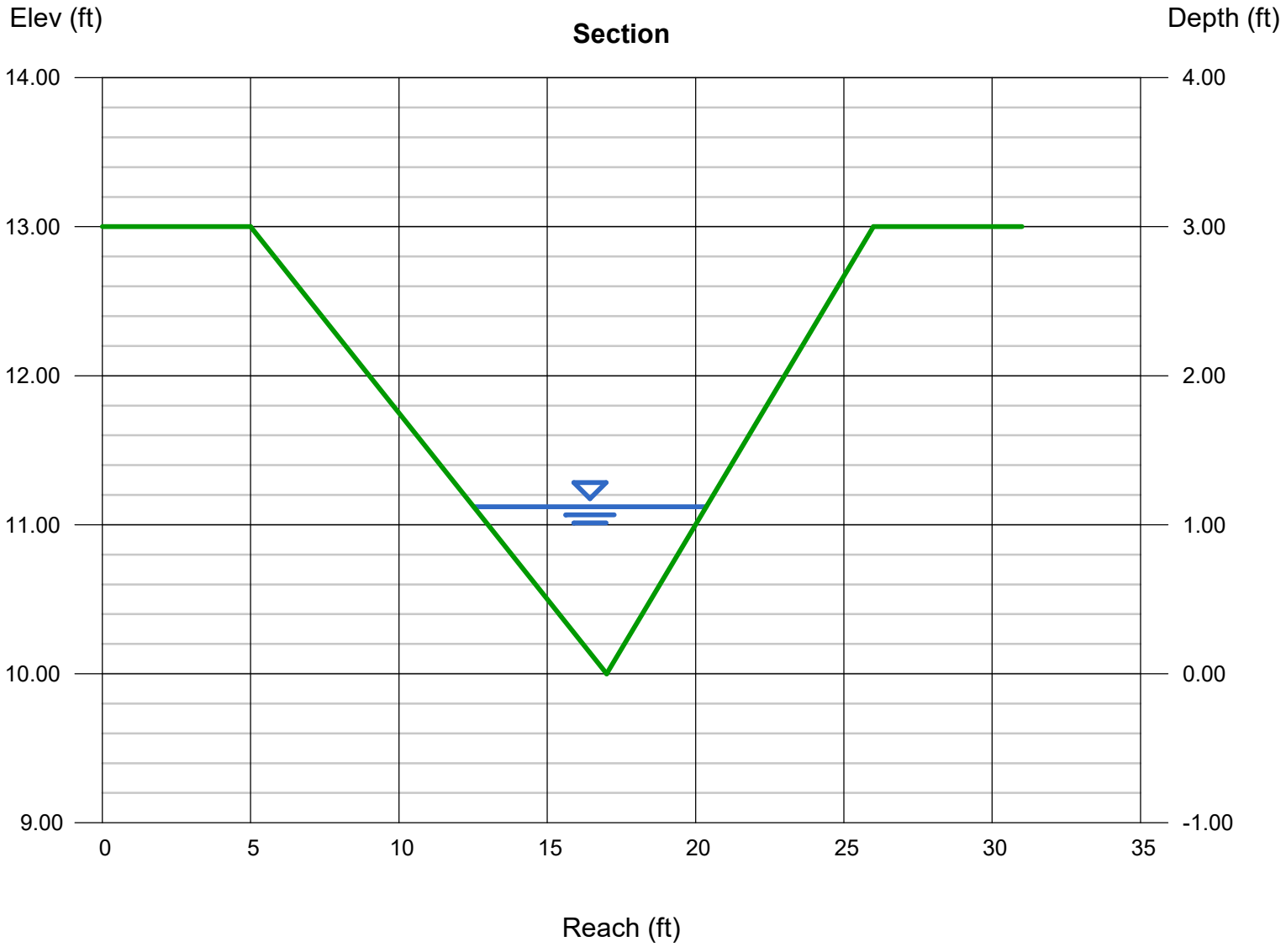
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.10

Highlighted

Depth (ft)	= 1.12
Q (cfs)	= 14.10
Area (sqft)	= 4.39
Velocity (ft/s)	= 3.21
Wetted Perim (ft)	= 8.16
Crit Depth, Yc (ft)	= 1.01
Top Width (ft)	= 7.84
EGL (ft)	= 1.28



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 7 Swale (5-Year) (FR:0.46)

Triangular

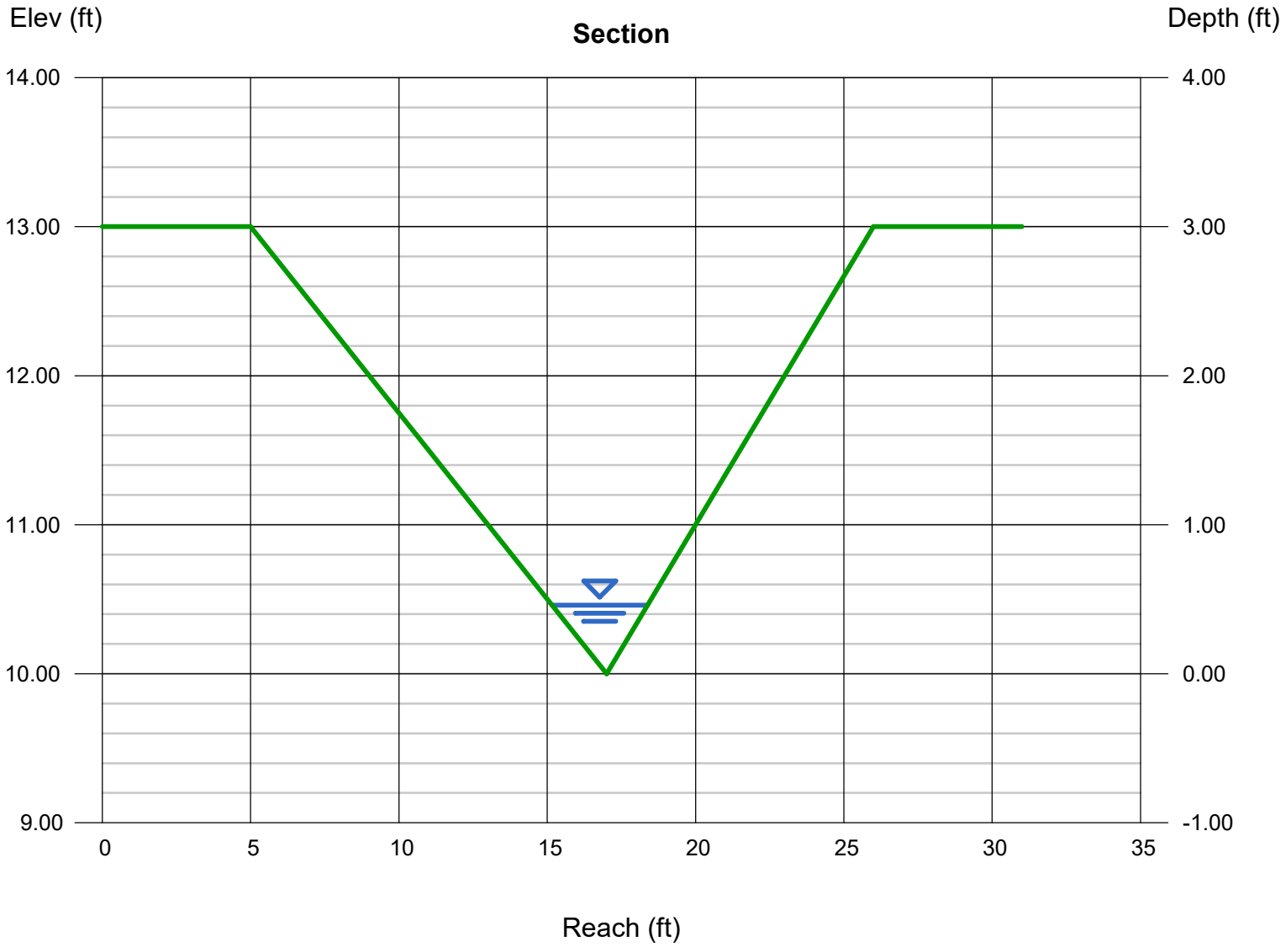
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.30

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 1.300
Area (sqft)	= 0.74
Velocity (ft/s)	= 1.76
Wetted Perim (ft)	= 3.35
Crit Depth, Yc (ft)	= 0.39
Top Width (ft)	= 3.22
EGL (ft)	= 0.51



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 7 Swale (100-Year) (FR:0.51)

Triangular

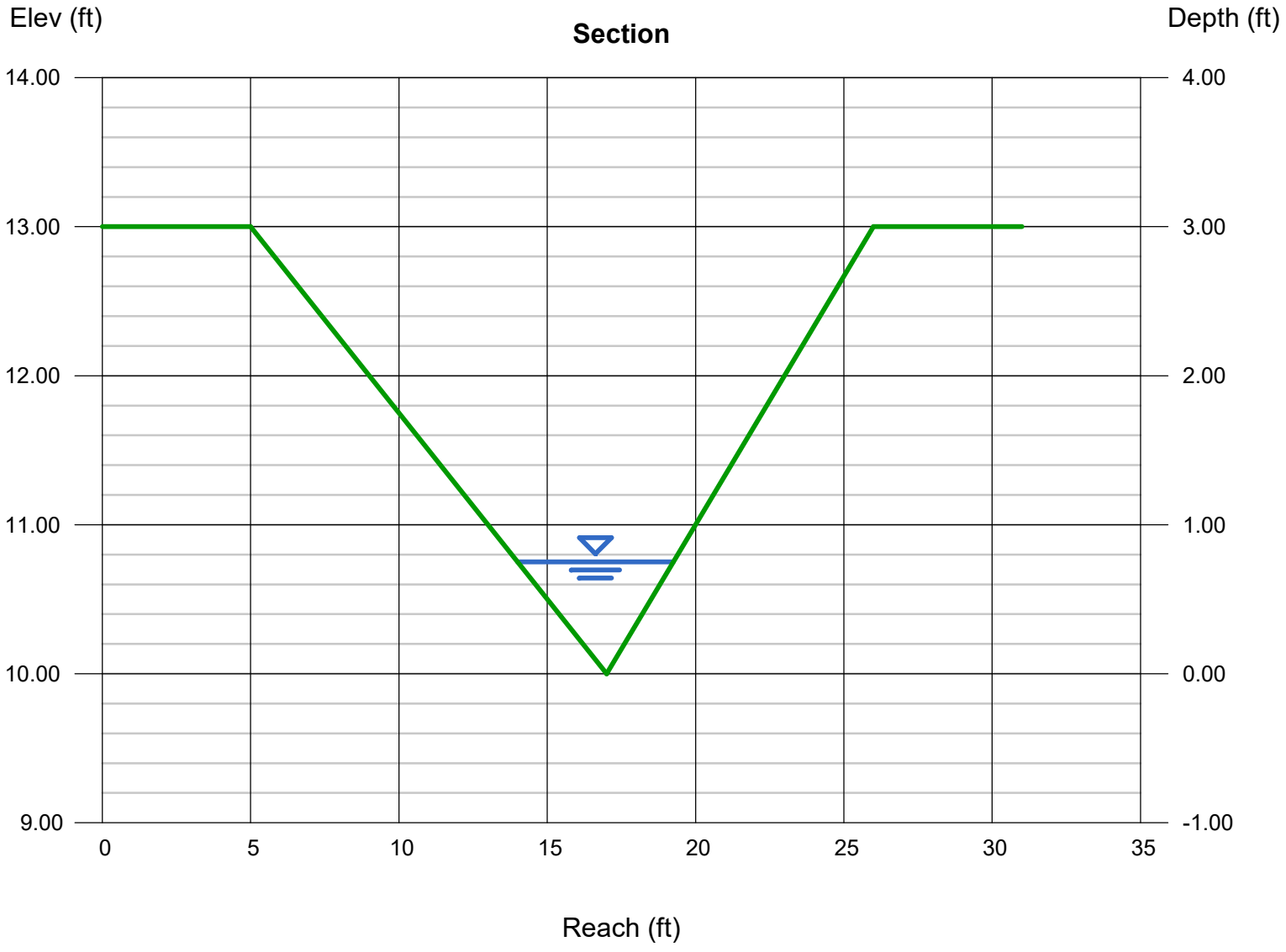
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.90

Highlighted

Depth (ft)	= 0.75
Q (cfs)	= 4.900
Area (sqft)	= 1.97
Velocity (ft/s)	= 2.49
Wetted Perim (ft)	= 5.46
Crit Depth, Yc (ft)	= 0.66
Top Width (ft)	= 5.25
EGL (ft)	= 0.85



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Jun 16 2023

DP 11 Swale (5-Year)(FR:0.52)

Triangular

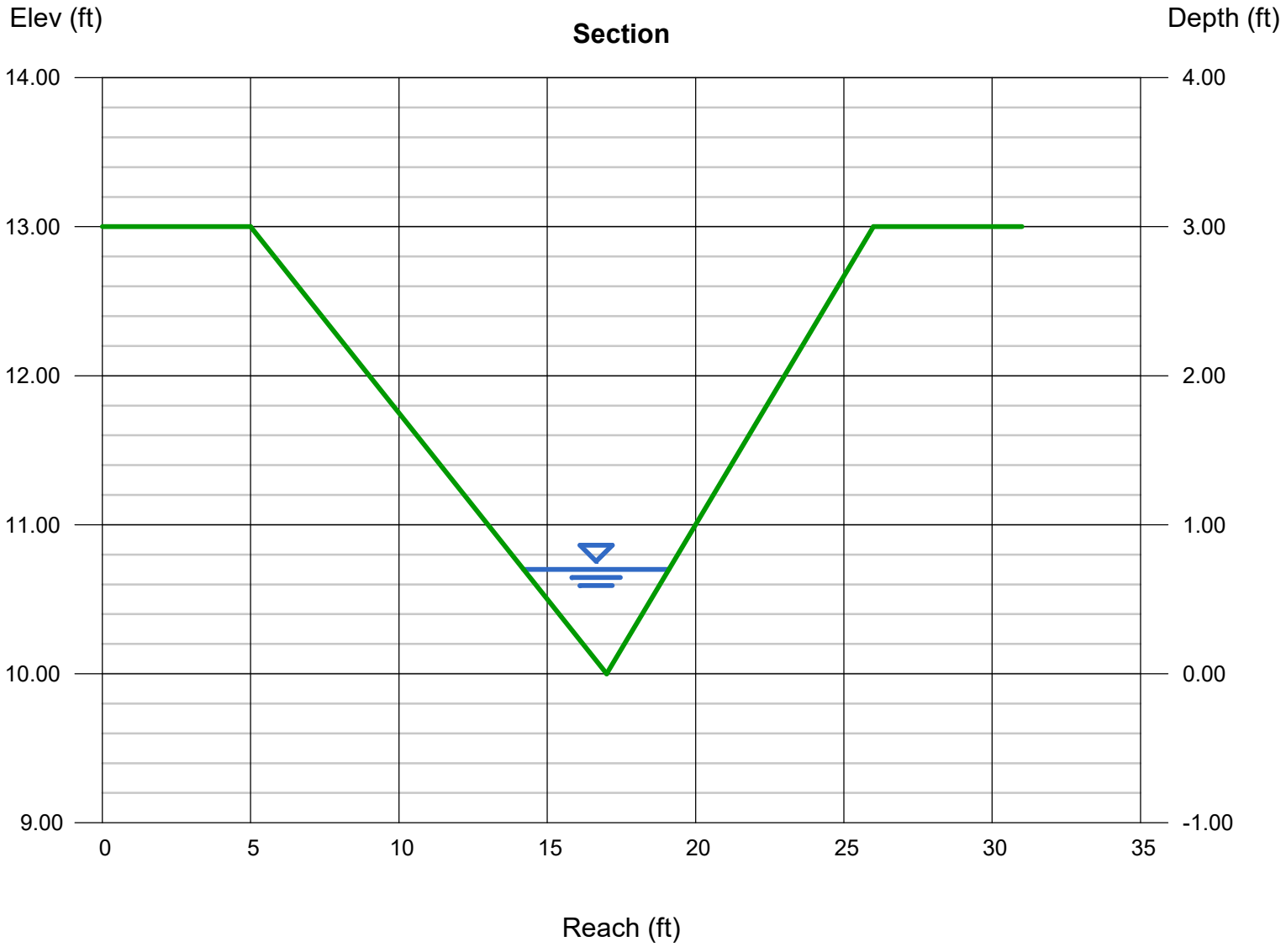
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.06
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.20

Highlighted

Depth (ft)	= 0.70
Q (cfs)	= 4.200
Area (sqft)	= 1.71
Velocity (ft/s)	= 2.45
Wetted Perim (ft)	= 5.10
Crit Depth, Yc (ft)	= 0.62
Top Width (ft)	= 4.90
EGL (ft)	= 0.79



Channel Report

DP 11 Swale (5-Year)(FR:0.55)

Triangular

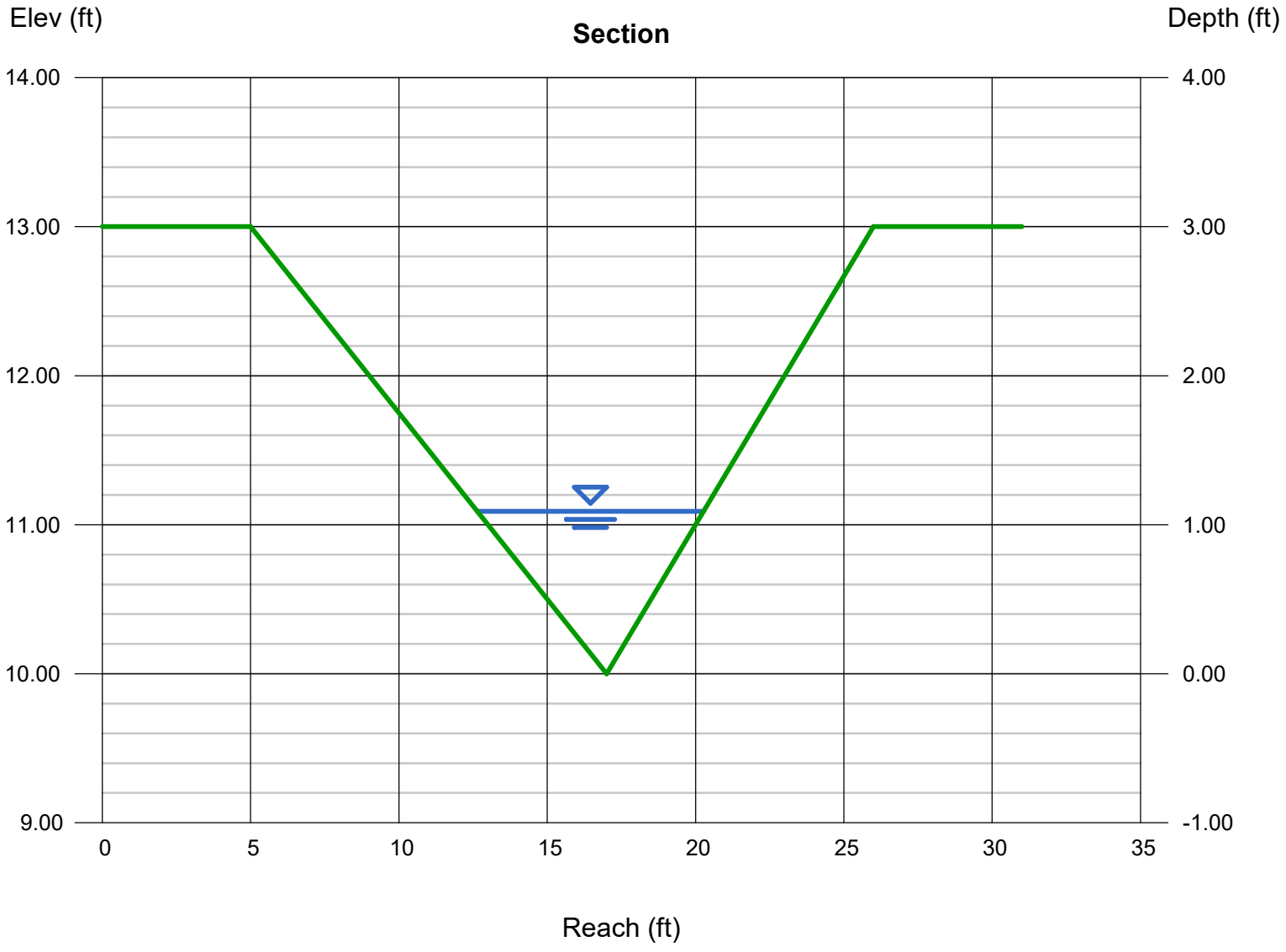
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.06
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 13.50

Highlighted

Depth (ft)	= 1.09
Q (cfs)	= 13.50
Area (sqft)	= 4.16
Velocity (ft/s)	= 3.25
Wetted Perim (ft)	= 7.94
Crit Depth, Yc (ft)	= 0.99
Top Width (ft)	= 7.63
EGL (ft)	= 1.25



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jun 28 2023

DP 11A Swale (5-Year)(FR:0.50)

Triangular

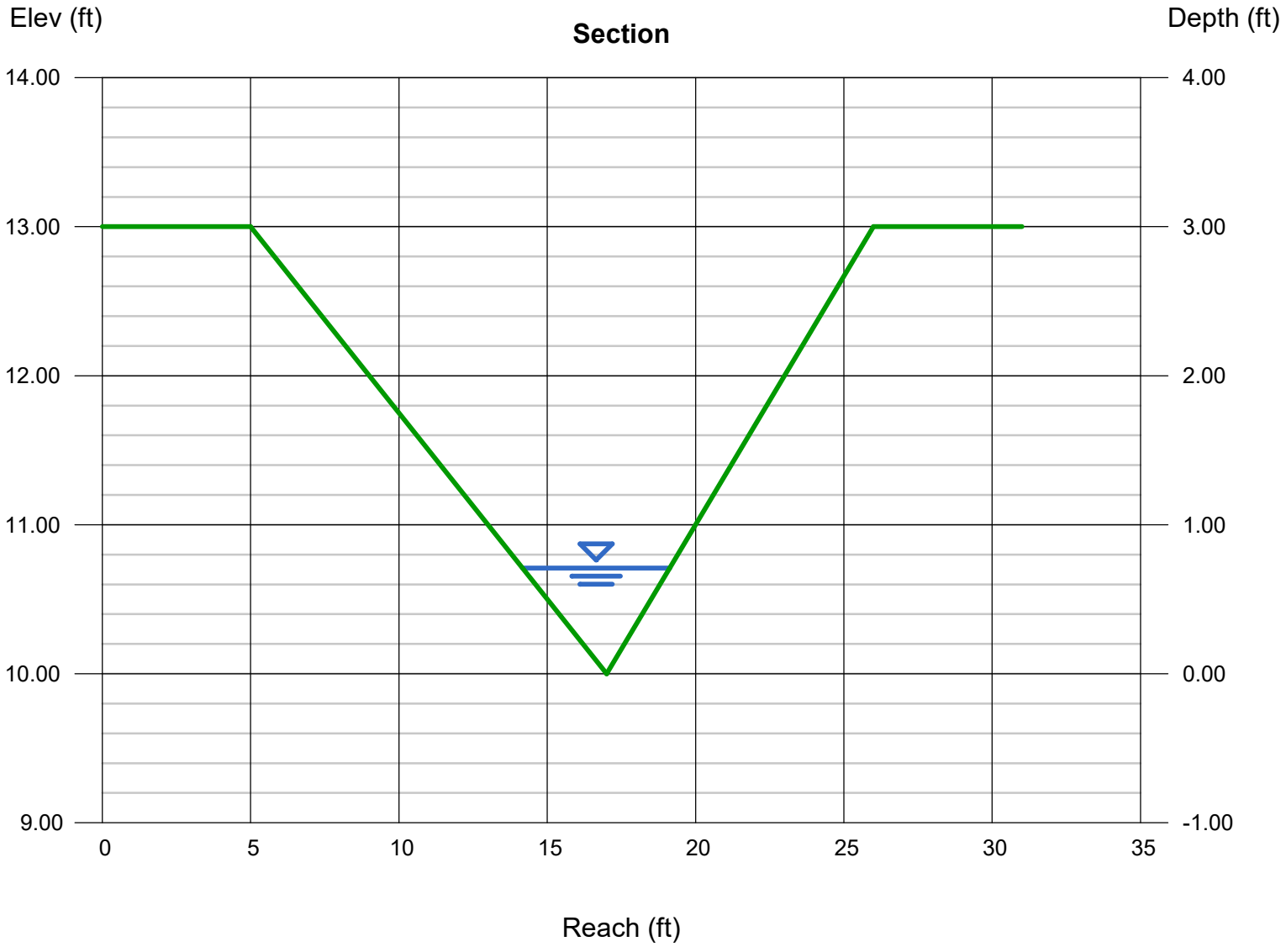
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.20

Highlighted

Depth (ft)	= 0.71
Q (cfs)	= 4.200
Area (sqft)	= 1.76
Velocity (ft/s)	= 2.38
Wetted Perim (ft)	= 5.17
Crit Depth, Yc (ft)	= 0.62
Top Width (ft)	= 4.97
EGL (ft)	= 0.80



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jun 28 2023

DP 11A Swale (100-Year)(FR:0.54)

Triangular

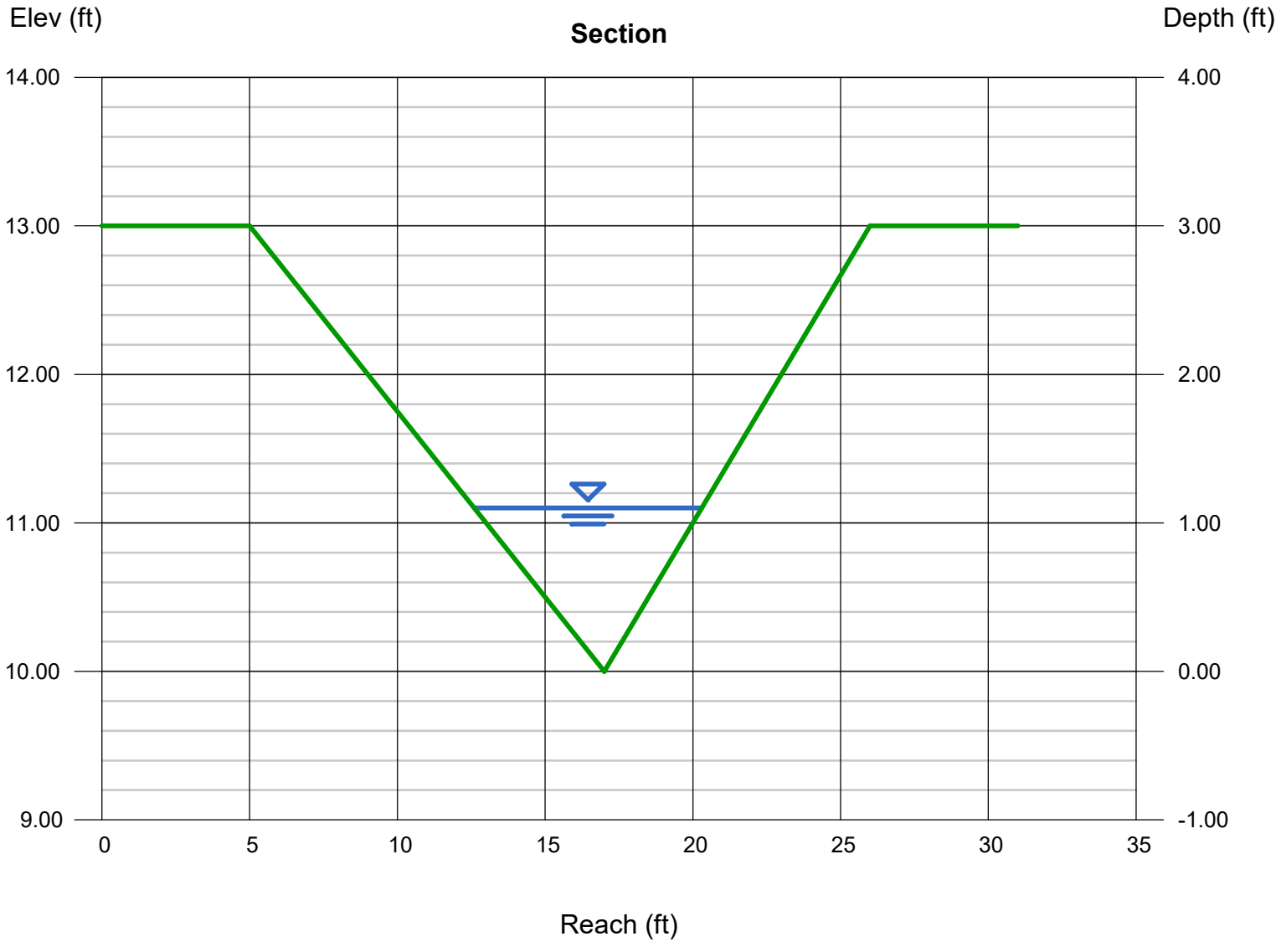
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 13.50

Highlighted

Depth (ft)	= 1.10
Q (cfs)	= 13.50
Area (sqft)	= 4.23
Velocity (ft/s)	= 3.19
Wetted Perim (ft)	= 8.01
Crit Depth, Yc (ft)	= 0.99
Top Width (ft)	= 7.70
EGL (ft)	= 1.26



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 16 Swale (5-Year) (FR:0.58)

Triangular

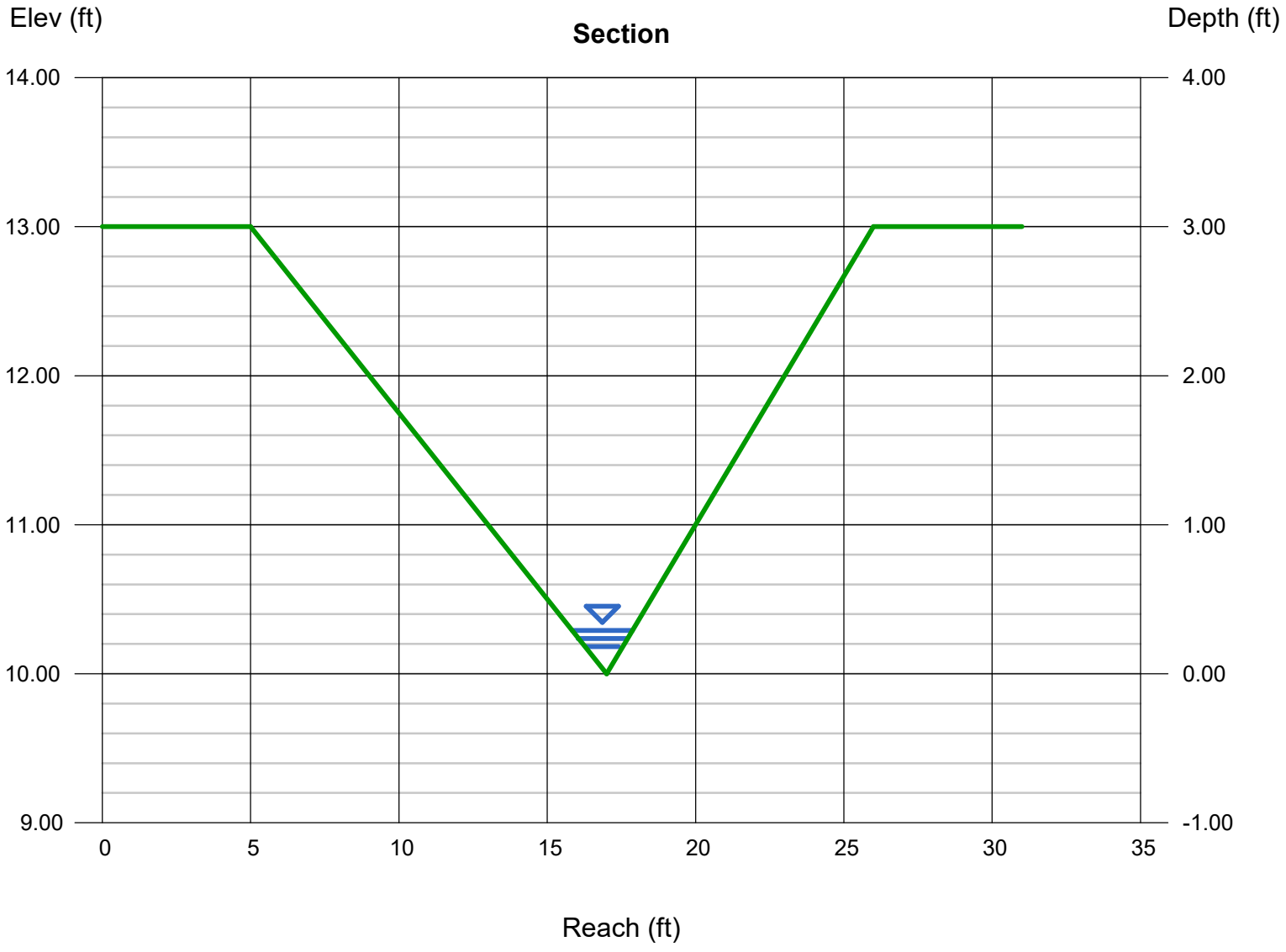
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.74
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.50

Highlighted

Depth (ft)	= 0.29
Q (cfs)	= 0.500
Area (sqft)	= 0.29
Velocity (ft/s)	= 1.70
Wetted Perim (ft)	= 2.11
Crit Depth, Yc (ft)	= 0.27
Top Width (ft)	= 2.03
EGL (ft)	= 0.33



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 31 2021

DP 16 Swale (100-Year) (FR:0.58)

Triangular

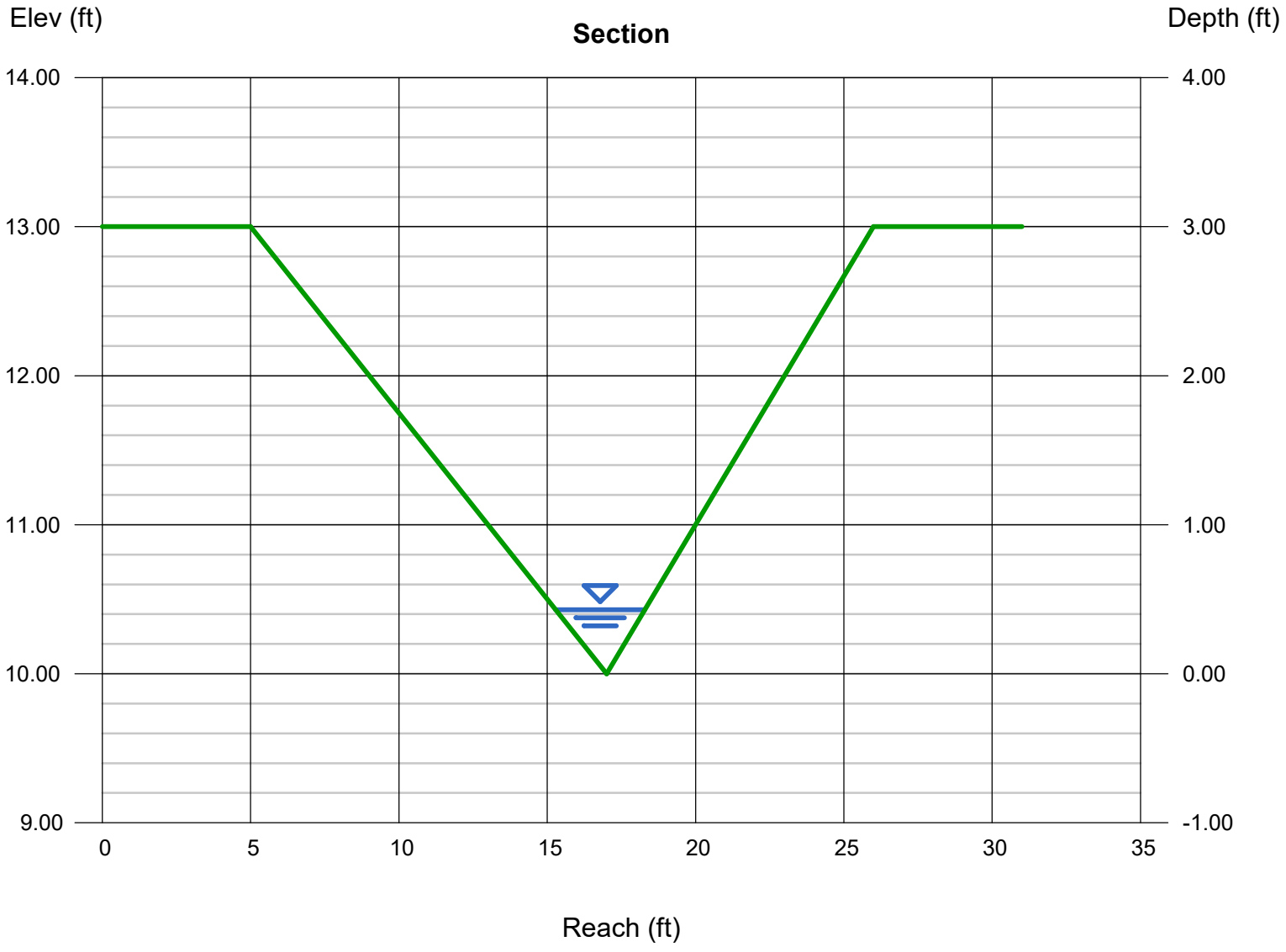
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.74
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.40

Highlighted

Depth (ft)	= 0.43
Q (cfs)	= 1.400
Area (sqft)	= 0.65
Velocity (ft/s)	= 2.16
Wetted Perim (ft)	= 3.13
Crit Depth, Yc (ft)	= 0.40
Top Width (ft)	= 3.01
EGL (ft)	= 0.50



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DP 25 Swale (5-Year)(FR:0.45)

Triangular

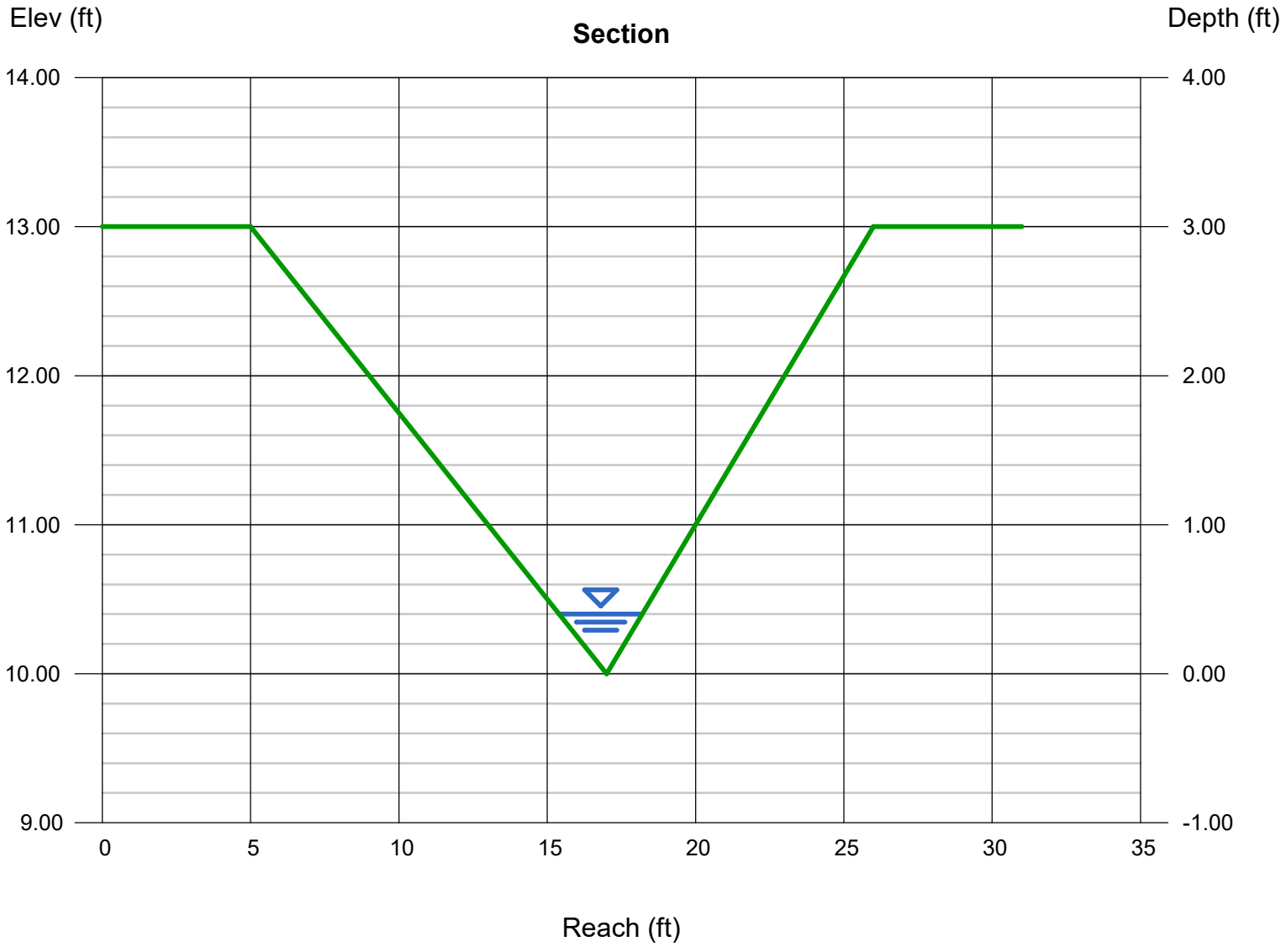
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.90

Highlighted

Depth (ft)	= 0.40
Q (cfs)	= 0.900
Area (sqft)	= 0.56
Velocity (ft/s)	= 1.61
Wetted Perim (ft)	= 2.91
Crit Depth, Yc (ft)	= 0.34
Top Width (ft)	= 2.80
EGL (ft)	= 0.44



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DP 25 Swale (100-Year)(FR:0.50)

Triangular

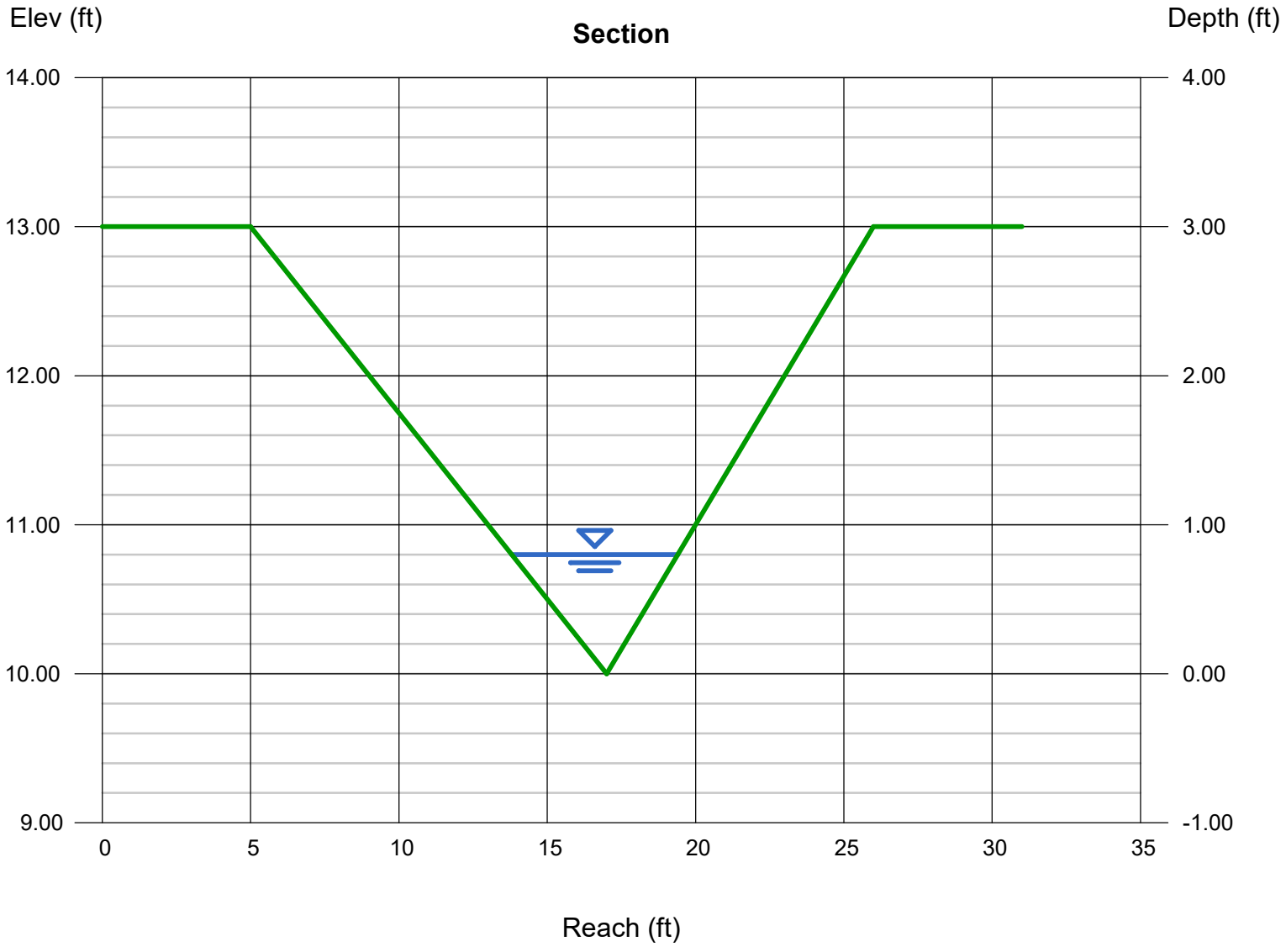
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.70

Highlighted

Depth (ft)	= 0.80
Q (cfs)	= 5.700
Area (sqft)	= 2.24
Velocity (ft/s)	= 2.54
Wetted Perim (ft)	= 5.83
Crit Depth, Yc (ft)	= 0.70
Top Width (ft)	= 5.60
EGL (ft)	= 0.90



PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 11/28/23

	STORM DRAIN SYSTEM			
	Culvert DP1.0 (1.0)	**Culvert DP1.1 (1.1)**	**Culvert DP11 (11)**	**Notes**
Q_{100} (cfs):	9.7	26.2	13.5	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	18	30	24	19"x34" HERCP equiv.
W, Box Width (ft):	N/A	N/A	N/A	
H, Box Height (ft):	N/A	N/A	N/A	
Y_t, Tailwater Depth (ft):	1.25	1.60	1.20	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.83	0.64	0.60	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	3.52	2.65	2.39	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:	0.00	0.00	0.00	
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	1.81	3.13	2.43	
Required Riprap Size:	**L**	**L**	**L**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**9**	
Expansion Factor, $1/(2\tan\theta)$:	6.75	6.75	6.75	Read from Fig. 9-35 or 9-36
θ:	0.07	0.07	0.07	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	1.39	3.74	1.93	$A_t=Q/V$
Length of Protection, L_p (ft):	-2.6	-1.1	-2.7	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	4.5	7.5	6.0	Min L=3D or 3H
Max Length (ft)	15.0	25.0	20.0	Max L=10D or 10H
Min Bottom Width, T (ft):	1.1	2.3	1.6	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**4.5**	**7.5**	**6.0**	
Design Width (ft)	**1.1**	**2.3**	**1.6**	
Riprap Depth (in)	**18**	**18**	**18**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

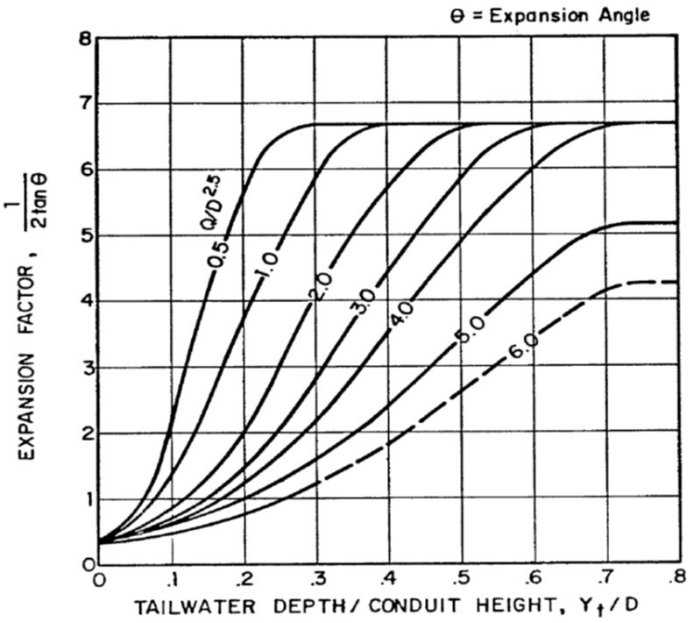


Figure 9-35. Expansion factor for circular conduits

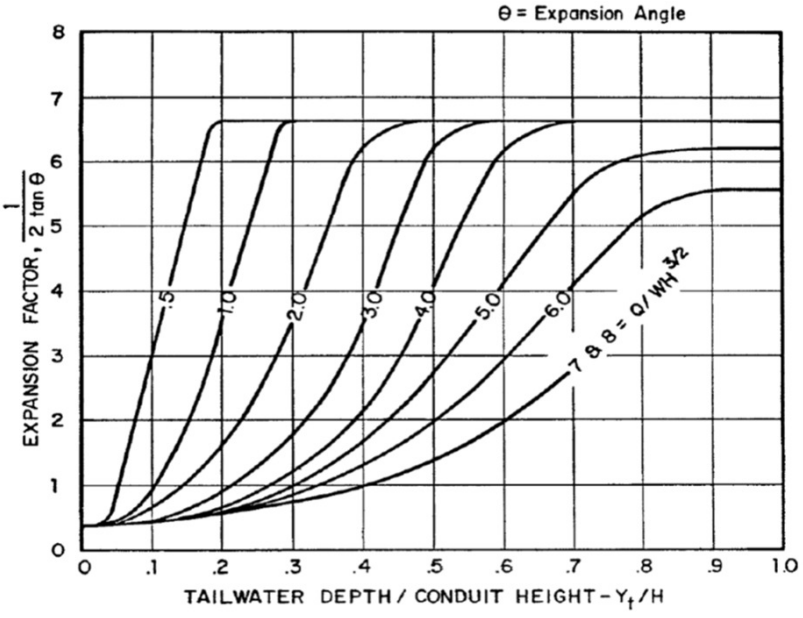


Figure 9-36. Expansion factor for rectangular conduits

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 11/28/23

	STORM DRAIN SYSTEM			
	Culvert DP2.0 (2.0)	**Cuvlert DP1.2 (1.2)**	**Culvert DP7 (7)**	**Notes**
Q_{100} (cfs):	19.6	32.2	4.9	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	24	24	18	
W, Box Width (ft):	N/A	N/A	N/A	
H, Box Height (ft):	N/A	N/A	N/A	
Y_t, Tailwater Depth (ft):	1.80	1.30	0.82	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.90	0.65	0.55	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	3.46	5.69	1.78	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:	0.00	0.00	0.00	
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	2.17	5.27	1.52	
Required Riprap Size:	**L**	**L**	**L**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**9**	
Expansion Factor, $1/(2\tan\theta)$:	6.75	4.50	6.75	Read from Fig. 9-35 or 9-36
θ:	0.07	0.11	0.07	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	2.80	4.60	0.70	$A_t=Q/V$
Length of Protection, L_p (ft):	-3.0	6.9	-4.4	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	6.0	6.0	4.5	Min L=3D or 3H
Max Length (ft)	20.0	20.0	15.0	Max L=10D or 10H
Min Bottom Width, T (ft):	1.6	3.5	0.9	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**6.0**	**7.0**	**4.5**	
Design Width (ft)	**1.6**	**3.5**	**0.9**	
Riprap Depth (in)	**18**	**18**	**18**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 11/28/23

	STORM DRAIN SYSTEM			
	Cuvlert DP1.3 (1.3)	**Culvert DP1.5 (1.5)**	**Culvert D1.4 (1.4)**	**Notes**
Q_{100} (cfs):	32.2	19.6	35.0	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	30	24	24	
W, Box Width (ft):	N/A	N/A	N/A	
H, Box Height (ft):	N/A	N/A	N/A	
Y_t, Tailwater Depth (ft):	2.25	1.80	1.30	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.90	0.90	0.65	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	3.26	3.46	6.19	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:	0.00	0.00	0.00	
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	2.55	2.17	5.73	
Required Riprap Size:	**L**	**L**	**L**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**9**	
Expansion Factor, $1/(2\tan\theta)$:	6.75	6.75	3.25	Read from Fig. 9-35 or 9-36
θ:	0.07	0.07	0.15	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	4.60	2.80	5.00	$A_t=Q/V$
Length of Protection, L_p (ft):	-3.1	-3.0	6.0	$L=(1/(2\tan\theta))(At/Yt - D)$
Min Length (ft)	7.5	6.0	6.0	Min L=3D or 3H
Max Length (ft)	25.0	20.0	20.0	Max L=10D or 10H
Min Bottom Width, T (ft):	2.0	1.6	3.8	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**7.5**	**6.0**	**6.0**	
Design Width (ft)	**2.0**	**1.6**	**3.8**	
Riprap Depth (in)	**18**	**18**	**18**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 11/28/23

	STORM DRAIN SYSTEM			
	Culvert DP22 (22)	**Culvert DP21 (21)**	**Culvert DP9 (9)**	**Notes**
Q_{100} (cfs):	1.3	11.8	4.3	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	18	24	18	
W, Box Width (ft):	N/A	N/A	N/A	
H, Box Height (ft):	N/A	N/A	N/A	
Y_t, Tailwater Depth (ft):	1.00	1.60	1.25	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.67	0.80	0.83	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	0.47	2.09	1.56	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:	0.00	0.00	0.00	
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	0.32	1.51	0.80	
Required Riprap Size:	**L**	**L**	**L**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**9**	
Expansion Factor, $1/(2\tan\theta)$:	6.75	6.75	6.75	Read from Fig. 9-35 or 9-36
θ:	0.07	0.07	0.07	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	0.19	1.69	0.61	$A_t=Q/V$
Length of Protection, L_p (ft):	-8.9	-6.4	-6.8	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	4.5	6.0	4.5	Min L=3D or 3H
Max Length (ft)	15.0	20.0	15.0	Max L=10D or 10H
Min Bottom Width, T (ft):	0.2	1.1	0.5	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**4.5**	**6.0**	**4.5**	
Design Width (ft)	**0.2**	**1.1**	**0.5**	
Riprap Depth (in)	**18**	**18**	**18**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 11/28/23

	STORM DRAIN SYSTEM			
	Culvert DP16 (16)	**Culvert DP2.1 (2.1)**	**Pond D Outfall**	**Notes**
Q_{100} (cfs):	1.4	9.5	10.8	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	18	18	36	
W, Box Width (ft):	N/A	N/A	N/A	
H, Box Height (ft):	N/A	N/A	N/A	
Y_t, Tailwater Depth (ft):	0.90	1.10	0.58	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.60	0.73	0.19	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	0.51	3.45	0.69	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:	0.00	0.00	0.00	
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	0.39	2.07	4.12	
Required Riprap Size:	**L**	**L**	**L**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**9**	
Expansion Factor, $1/(2\tan\theta)$:	6.75	6.75	6.75	Read from Fig. 9-35 or 9-36
θ:	0.07	0.07	0.07	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	0.20	1.36	1.54	$A_t=Q/V$
Length of Protection, L_p (ft):	-8.6	-1.8	-2.4	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	4.5	4.5	9.0	Min L=3D or 3H
Max Length (ft)	15.0	15.0	30.0	Max L=10D or 10H
Min Bottom Width, T (ft):	0.2	1.2	2.7	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**4.5**	**4.5**	**9.0**	
Design Width (ft)	**0.2**	**1.2**	**2.7**	
Riprap Depth (in)	**18**	**18**	**18**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 11/28/23

	STORM DRAIN SYSTEM			
	Pond C Outfall	**Pond E Outfall**	**Culvert DP UD4**	**Notes**
Q_{100} (cfs):	1.5	0.3	541.5	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Box	
D_c, Pipe Diameter (in):	30	18	N/A	
W, Box Width (ft):	N/A	N/A	12	
H, Box Height (ft):	N/A	N/A	4	
Y_t, Tailwater Depth (ft):	0.18	0.13	1.01	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.07	0.09	0.25	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	0.15	0.11	5.64	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:	0.00	0.00	0.00	
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	2.46	0.85	15.01	
Required Riprap Size:	**L**	**L**	**H**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**15**	
Expansion Factor, $1/(2\tan\theta)$:	5.75	2.00	6.75	Read from Fig. 9-35 or 9-36
θ:	0.09	0.24	0.07	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	0.21	0.04	77.36	$A_t=Q/V$
Length of Protection, L_p (ft):	-7.5	-2.3	436.0	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	7.5	4.5	36.0	Min L=3D or 3H
Max Length (ft)	25.0	15.0	40.0	Max L=10D or 10H
Min Bottom Width, T (ft):	1.2	0.4	68.5	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**7.5**	**4.5**	**40.0**	
Design Width (ft)	**1.2**	**0.4**	**68.5**	
Riprap Depth (in)	**18**	**18**	**30**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	8	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Saddlehorn Ranch Filing 3
Location: El Paso County

Project Name: Saddlehorn Ranch
Project No.: 25142.05
Calculated By: AAM
Checked By: TBD
Date: 11/28/23

	STORM DRAIN SYSTEM			
	Culvert DPOS5			**Notes**
Q_{100} (cfs):	16.0			Flows are the greater of proposed vs. future
Conduit	Pipe			
D_c, Pipe Diameter (in):	24			
W, Box Width (ft):	N/A			
H, Box Height (ft):	N/A			
Y_t, Tailwater Depth (ft):	1.50			If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.75			
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	2.83			
Supercritical?	No			
Y_n, Normal Depth (ft) [Supercritical]:	0.00			
D_a, H_a (in) [Supercritical]:	N/A		N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A			
Riprap d_{50} (in) [Subcritical]:	2.21			
Required Riprap Size:	**L**			**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**			
Expansion Factor, $1/(2\tan\theta)$:	6.75			Read from Fig. 9-35 or 9-36
θ:	0.07			
Erosive Soils?	No			
Area of Flow, A_t (ft^2):	2.29			$A_t=Q/V$
Length of Protection, L_p (ft):	-3.2			L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	6.0			Min L=3D or 3H
Max Length (ft)	20.0			Max L=10D or 10H
Min Bottom Width, T (ft):	1.5			$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**6.0**			
Design Width (ft)	**1.5**			
Riprap Depth (in)	**18**			Depth=2(d_{50})
Type II Bedding Depth (in)*	6			*Not used if Soil Riprap
Cutoff Wall	No			
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jun 27 2023

Pond E Outlet Channel

User-defined

Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.040

Calculations

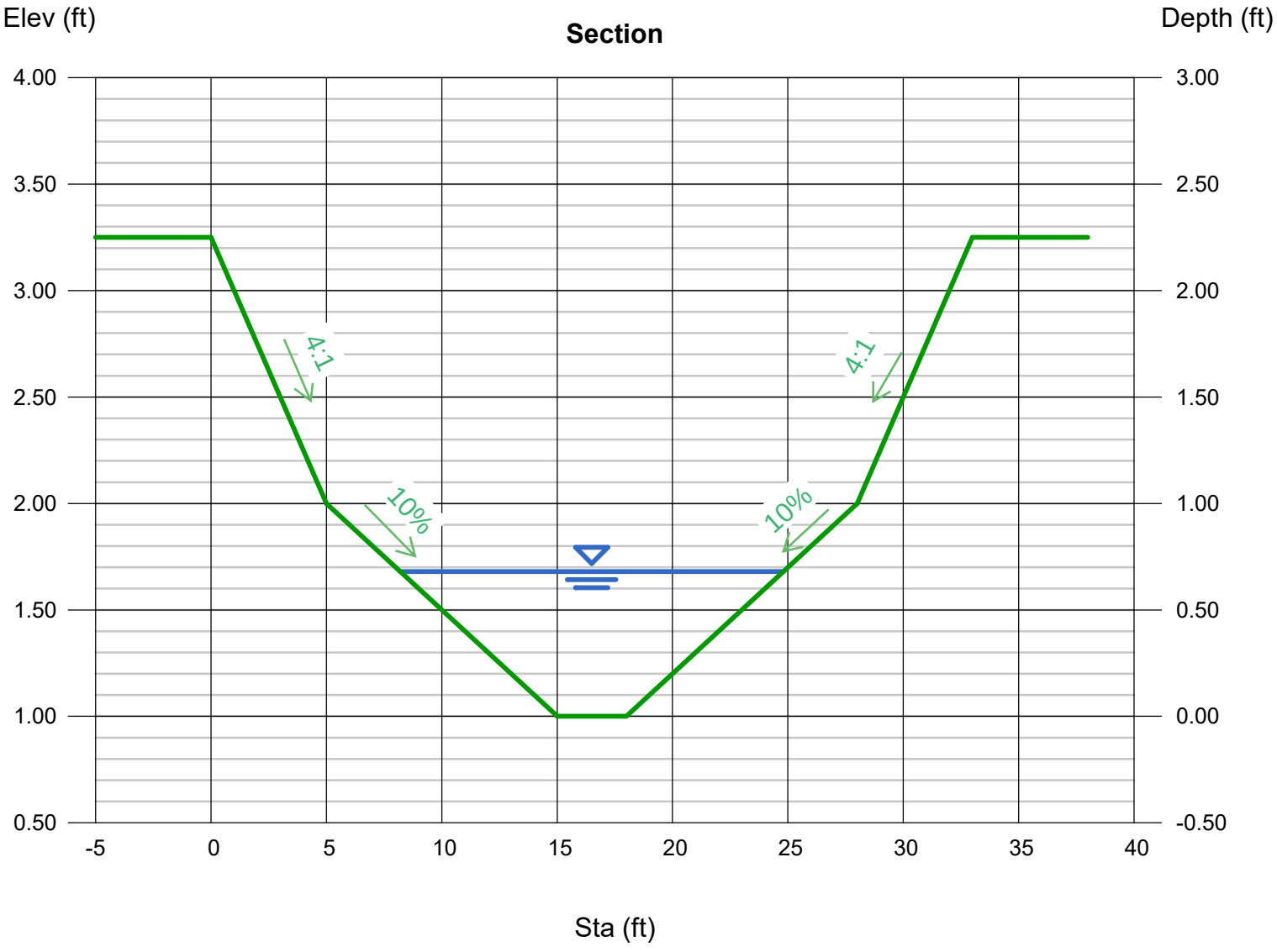
Compute by:	Known Q
Known Q (cfs)	= 9.20

Highlighted

Depth (ft)	= 0.68
Q (cfs)	= 9.200
Area (sqft)	= 6.66
Velocity (ft/s)	= 1.38
Wetted Perim (ft)	= 16.67
Crit Depth, Yc (ft)	= 0.43
Top Width (ft)	= 16.60
EGL (ft)	= 0.71

(Sta, El, n)-(Sta, El, n)...

(0.00, 3.25)-(5.00, 2.00, 0.040)-(15.00, 1.00, 0.040)-(18.00, 1.00, 0.040)-(28.00, 2.00, 0.040)-(33.00, 3.25, 0.040)



HEC-RAS HEC-RAS 6.3.1 September 2022
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X     X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X      X    X        X
X     X  X        X    X      X   X     X    X        X
X     X  XXXXXX    XXXX       X    X    X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS Model
Project File : Revised Filing 3 Channel Model.prj
Run Date and Time: 3/12/2024 3:13:42 PM

Project in English units

Project Description:
CRS Info=<SpatialReference> <CoordinateSystem
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84",DATUM["WGS_1984",SPHEROID["WGS
84",6378137,298.257223563,AUTHORITY["EPSG","7030"]],AUT
HORITY["EPSG","6326"]],PRIMEM["Greenwich",0],UNIT[
"Degree",0.0174532925199433]],PROJECTION["Winkel_Tripel"],PA
RAMETER["central_meridian",0],PARAMETER["standard_parallel_1&quot
;,50.467],PARAMETER["false_easting",0],PARAMETER["false_northing&
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Foot",0.3048],AXIS["Easting",EAST],AXIS["Northing",NORT
H]]" AcadCode="" /> <Registration OffsetX="0" OffsetY="0" OffsetZ="0"
ScaleX="1" ScaleY="1" ScaleZ="1" /></SpatialReference>

PLAN DATA

Plan Title: Default Scenario
Plan File : X:\2510000.all\2514205\HEC-RAS\Revised Filing 3 Channel Model.p01

Geometry Title: Default Geometry
Geometry File : X:\2510000.all\2514205\HEC-RAS\Revised Filing 3 Channel Model.g01

Flow Title   : Default Steady Flow
Flow File   : X:\2510000.all\2514205\HEC-RAS\Revised Filing 3 Channel Model.f01

Plan Description:
Default Scenario

Plan Summary Information:
Number of: Cross Sections =   94   Multiple Openings =   0
Culverts   =   3   Inline Structures =   0
Bridges   =   0   Lateral Structures =   5

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations   = 40
Maximum difference tolerance   = 0.33
Flow tolerance factor   = 0.001

Computation Options
Critical depth computed at all cross sections
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Program Selects Appropriate method
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Default Steady Flow
Flow File : X:\2510000.all\2514205\HEC-RAS\Revised Filing 3 Channel Model.f01

Flow Data (cfs)

River	Reach	RS	100 yr
MS-06	2nd Culvert	1000	.001
MS-06	Downstream Ov	1009	.01
MS-06	Main Channel	1000	505
MS-06	Main Channel-0	6421.55	505
MS-06	Main Channel-0-2	1007	505
MS-06	Overflow 1-DS-0	1007	.001

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
MS-06	Main Channel	100 yr	Normal S = 0.011654	
MS-06	Overflow 1-DS-0	100 yr	Normal S = 0.018914	
MS-06	2nd Culvert	100 yr	Normal S = 0.015093	
MS-06	Downstream Ov	100 yr	Normal S = 0.013402	Normal S = 0.013898
MS-06	Main Channel-0	100 yr		Normal S = 0.013163

GEOMETRY DATA

Geometry Title: Default Geometry
Geometry File : X:\2510000.all\2514205\HEC-RAS\Revised Filing 3 Channel Model.g01

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
MS-06	Main Channel		JS-1
MS-06	Overflow 1-DS-0		Junc-DS01
MS-06	2nd Culvert		JS-1
MS-06	Downstream Ov		
MS-06	Main Channel-0-2	JS-1	Junc-DS01
MS-06	Main Channel-0	Junc-DS01	

JUNCTION INFORMATION

Name: Junc-DS01
Description:
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
MS-06	Overflow 1-DS-0 to MS-06	MS-06	Main Channel-0	66.37	0
MS-06	Main Channel-0-2 to MS-06	MS-06	Main Channel-0	163.21	0

Name: JS-1
Description:
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
MS-06	Main Channel	to MS-06	Main Channel-0-2	196.26	0
MS-06	2nd Culvert	to MS-06	Main Channel-0-2	112.99	0

CROSS SECTION

RIVER: MS-06
REACH: Main Channel   RS: 1000

INPUT
Description:
Station Elevation Data   num=   92

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6773	5.07	6773	9.44	6772.9	13.81	6772.8	18.18	6772.7
22.55	6772.6	26.92	6772.5	31.29	6772.4	35.74	6772.3	40.3	6772.2
44.85	6772.1	49.41	6772	52.68	6771.9	55.95	6771.8	59.22	6771.7
62.49	6771.6	65.76	6771.5	69.03	6771.4	72.31	6771.3	75.58	6771.2
78.85	6771.1	82.12	6771	85.81	6770.9	89.5	6770.8	93.19	6770.7
96.88	6770.6	100.57	6770.5	104.26	6770.4	107.95	6770.3	111.65	6770.2
115.34	6770.1	120.32	6770	123.84	6769.9	127.35	6769.8	130.87	6769.7
134.39	6769.6	137.9	6769.5	141.42	6769.4	144.93	6769.3	148.45	6769.2
151.97	6769.1	155.52	6769	162.59	6768.9	169.66	6768.8	176.02	6768.71
176.73	6768.7	183.8	6768.6	190.87	6768.5	197.94	6768.4	205.01	6768.3
212.08	6768.2	219.15	6768.1	225.29	6768	228.2	6767.9	231.11	6767.8
234.03	6767.7	236.94	6767.6	239.86	6767.5	242.77	6767.4	245.68	6767.3
248.59	6767.2	255.28	6767.1	258.62	6767	262.57	6766.9	267.13	6766.8
273.48	6766.7	279.83	6766.6	301.05	6766.5	326.02	6766.4	326.12	6766.4
343.28	6766.3	360.45	6766.2	377.61	6766.1	394.77	6766	403.9	6765.9
404.09	6765.9	409.14	6766	423.25	6766.1	437.35	6766.2	451.46	6766.3
465.27	6766.4	476.02	6766.48	478.25	6766.5	491.24	6766.6	491.38	6766.6
498.08	6766.5	501.22	6766.4	504.36	6766.3	506.71	6766.3	510.3	6766.4
513.89	6766.5	515.85	6766.5						

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	176.02	.045	476.02	.045

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
176.02 476.02   24.7   24.7   24.7   .1   .3

LATERAL STRUCTURE

RIVER: MS-06
REACH: Main Channel   RS: 999.9

INPUT
Description:
Lateral structure position   = Right overbank
Distance from Upstream XS =
Deck/Roadway Width   =   10

```
Weir Coefficient          =      .4
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =       11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6766.7    3.63  6766.7    8.88  6766.6   14.13  6766.5   19.38  6766.4
   24.63  6766.3   29.89  6766.2   37.76 6766.45   41.85 6766.43   43.89 6766.41
   45.94  6766.1

Weir crest shape                          = Broad Crested


Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular     1.5
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
                     33.9     .021     .021       0                   .5
      1
Upstream   Elevation =  6764.82
           Centerline Station =  37.8
Downstream Elevation =  6764.4
           Centerline Station =  37.17

CROSS SECTION


RIVER: MS-06
REACH: Main Channel       RS: 999

INPUT
Description:
Station Elevation Data    num=     101
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6772.9    7.59  6772.9    8.36  6772.8    9.14  6772.7    9.92  6772.6
   12.87  6772.5   19.11  6772.4   25.36  6772.3   29.88  6772.2   33.54  6772.1
   38.38    6772   41.38  6771.9   44.38  6771.8   47.27  6771.7   49.41  6771.6
   51.54  6771.5   53.67  6771.4    55.8  6771.3   57.94  6771.2   69.43  6771.1
   75.91    6771   77.26  6770.9   78.61  6770.8   79.96  6770.7   81.31  6770.6
   82.66  6770.5   84.01  6770.4   85.36  6770.3  103.38  6770.2  110.14  6770.1
  113.82    6770  116.28  6769.9  118.74  6769.8   121.2  6769.7  123.67  6769.6
  126.13  6769.5  128.59  6769.4  137.49  6769.3  141.02  6769.2  144.54  6769.1
  148.06    6769  155.14  6768.9  162.22  6768.8   169.3  6768.7  177.85 6768.65
  185.56  6768.6  214.71  6768.5  217.99  6768.4  221.28  6768.3  224.56  6768.2
  227.84  6768.1  231.13    6768  234.04  6767.9  236.48  6767.8  238.72  6767.7
  258.37  6767.6   261.7  6767.5  265.03  6767.4  268.36  6767.3   271.7  6767.2
  275.03  6767.1  278.36    6767   282.3  6766.9  286.23  6766.8  290.17  6766.7
   294.1  6766.6  298.04  6766.5  301.97  6766.4  305.91  6766.3  311.04  6766.2
  327.85 6766.11  330.42  6766.1  353.26    6766  365.94  6765.9   387.6  6765.8
  396.77  6765.7  405.94  6765.6  415.11  6765.5  424.29  6765.4  436.52  6765.4
  437.36  6765.6  440.68  6765.5  444.17  6765.6  447.65  6765.7  454.62  6765.7
  459.99  6765.8  473.34  6765.7  477.67  6765.6  477.85  6765.6  485.04  6765.5
  487.84  6765.6  496.64  6765.5  501.17  6765.6  513.39  6765.7  514.36  6765.8
  515.33  6765.9   516.3    6766  520.09  6766.1  521.81  6766.2  524.14  6766.3
  526.12  6766.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045  177.85    .045  477.85    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
        177.85  477.85            .1       .3
Right Levee     Station=   459.6      Elevation= 6765.87

CULVERT


RIVER: MS-06
REACH: Main Channel       RS: 998.53

INPUT
Description:
Distance from Upstream XS =      10
Deck/Roadway Width        =      24
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      71
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
    1.14  6773.4       0    1.56  6773.4       0    6.79  6773.3       0
   12.03  6773.2       0   17.26  6773.1       0   22.49    6773       0
   27.76  6772.9       0   33.01  6772.8       0   38.27  6772.7       0
   43.52  6772.6       0   48.78  6772.5       0   54.03  6772.4       0
   59.29  6772.3       0   64.54  6772.2       0    69.8  6772.1       0
   75.05    6772       0   80.39  6771.9       0   85.98  6771.8       0
   91.57  6771.7       0   97.17  6771.6       0  102.76  6771.5       0
  108.35  6771.4       0  113.94  6771.3       0  119.54  6771.2       0
  125.13  6771.1       0  130.72    6771       0  137.92  6770.9       0
  145.12  6770.8       0  152.33  6770.7       0  159.53  6770.6       0
  166.74  6770.5       0  173.94  6770.4       0  181.14  6770.3       0
  188.35  6770.2       0  195.51  6770.1       0  202.63    6770       0
  218.87  6769.9       0  232.68  6769.8       0   242.1  6769.7       0
  251.53  6769.6       0  260.95  6769.5       0  270.84  6769.4       0
  281.83  6769.3       0  292.83  6769.2       0  303.82  6769.1       0
  313.71    6769       0   322.3  6768.9       0  329.99  6768.8       0
   336.9  6768.7       0  343.79  6768.6       0  350.68  6768.5       0
  357.27  6768.4       0  363.14  6768.3       0  369.01  6768.2       0
  374.88  6768.1       0  380.75    6768       0  386.62  6767.9       0
  392.49  6767.8       0  398.74  6767.7       0  405.92  6767.6       0
  413.09  6767.5       0  419.84  6767.4       0  426.55  6767.3       0
  433.27  6767.2       0  440.05  6767.1       0  449.46    6767       0
  459.02  6766.9       0  468.59  6766.8       0   478.3  6766.7       0
  497.37  6766.6       0  515.39  6766.6       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=     101
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6772.9    7.59  6772.9    8.36  6772.8    9.14  6772.7    9.92  6772.6
   12.87  6772.5   19.11  6772.4   25.36  6772.3   29.88  6772.2   33.54  6772.1
   38.38    6772   41.38  6771.9   44.38  6771.8   47.27  6771.7   49.41  6771.6
   51.54  6771.5   53.67  6771.4    55.8  6771.3   57.94  6771.2   69.43  6771.1
   75.91    6771   77.26  6770.9   78.61  6770.8   79.96  6770.7   81.31  6770.6
   82.66  6770.5   84.01  6770.4   85.36  6770.3  103.38  6770.2  110.14  6770.1
  113.82    6770  116.28  6769.9  118.74  6769.8   121.2  6769.7  123.67  6769.6
  126.13  6769.5  128.59  6769.4  137.49  6769.3  141.02  6769.2  144.54  6769.1
  148.06    6769  155.14  6768.9  162.22  6768.8   169.3  6768.7 177.85 6768.65
  185.56  6768.6  214.71  6768.5  217.99  6768.4  221.28  6768.3  224.56  6768.2
  227.84  6768.1  231.13    6768  234.04  6767.9  236.48  6767.8  238.72  6767.7
  258.37  6767.6   261.7  6767.5  265.03  6767.4  268.36  6767.3   271.7  6767.2
  275.03  6767.1  278.36    6767   282.3  6766.9  286.23  6766.8  290.17  6766.7
   294.1  6766.6  298.04  6766.5  301.97  6766.4  305.91  6766.3  311.04  6766.2
  327.85 6766.11  330.42  6766.1  353.26    6766  365.94  6765.9   387.6  6765.8
  396.77  6765.7  405.94  6765.6  415.11  6765.5  424.29  6765.4  436.52  6765.4
  437.36  6765.6  440.68  6765.5  444.17  6765.6  447.65  6765.7  454.62  6765.7
  459.99  6765.8  473.34  6765.7  477.67  6765.6  477.85  6765.6  485.04  6765.5
  487.84  6765.6  496.64  6765.5  501.17  6765.6  513.39  6765.7  514.36  6765.8
  515.33  6765.9   516.3    6766  520.09  6766.1  521.81  6766.2  524.14  6766.3
  526.12  6766.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045  177.85    .045  477.85    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
        177.85  477.85            .1       .3
Right Levee     Station=   459.6      Elevation= 6765.87

Downstream  Deck/Roadway Coordinates
    num=      71
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
 -185.07  6773.4       0 -184.65  6773.4       0 -179.42  6773.3       0
 -174.18  6773.2       0 -168.95  6773.1       0 -163.72    6773       0
 -158.45  6772.9       0  -153.2  6772.8       0 -147.94  6772.7       0
 -142.69  6772.6       0 -137.43  6772.5       0 -132.18  6772.4       0
 -126.92  6772.3       0 -121.67  6772.2       0 -116.41  6772.1       0
 -111.16    6772       0 -105.82  6771.9       0 -100.23  6771.8       0
  -94.64  6771.7       0  -89.04  6771.6       0  -83.45  6771.5       0
  -77.86  6771.4       0  -72.27  6771.3       0  -66.67  6771.2       0
  -61.08  6771.1       0  -55.49    6771       0  -48.29  6770.9       0
  -41.09  6770.8       0  -33.88  6770.7       0  -26.68  6770.6       0
  -19.47  6770.5       0  -12.27  6770.4       0   -5.07  6770.3       0
    2.14  6770.2       0     9.3  6770.1       0   16.42    6770       0
   32.66  6769.9       0   46.47  6769.8       0   55.89  6769.7       0
   65.32  6769.6       0   74.74  6769.5       0   84.63  6769.4       0
   95.62  6769.3       0  106.62  6769.2       0  117.61  6769.1       0
   127.5    6769       0  136.09  6768.9       0  143.78  6768.8       0
  150.69  6768.7       0  157.58  6768.6       0  164.47  6768.5       0
  171.06  6768.4       0  176.93  6768.3       0   182.8  6768.2       0
  188.67  6768.1       0  194.54    6768       0  200.41  6767.9       0
  206.28  6767.8       0  212.53  6767.7       0  219.71  6767.6       0
  226.88  6767.5       0  233.63  6767.4       0  240.34  6767.3       0
  247.06  6767.2       0  253.84  6767.1       0  263.25    6767       0
  272.81  6766.9       0  282.38  6766.8       0  292.09  6766.7       0
  311.16  6766.6       0  329.18  6766.6       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      61
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6767.9     .47  6767.9    6.92  6767.8   14.53  6767.7   22.22  6767.6
   29.92  6767.5   36.01  6767.4   40.56  6767.3   45.11  6767.2   49.66  6767.1
   53.87    6767   58.04  6766.9   62.21  6766.8   66.38  6766.7   68.54  6766.6
   70.92  6766.5   73.93  6766.4   79.66  6766.3   91.14  6766.2   94.17  6766.1
   95.71    6766   97.15  6765.9   98.59  6765.8  100.03  6765.7  101.47  6765.6
  102.91  6765.5  104.35  6765.4  108.07  6765.3   110.6  6765.2  112.65  6765.1
  120.61    6765   125.1  6764.9  129.58  6764.8  134.07  6764.7  138.56  6764.6
  140.77 6764.55  143.05  6764.5  148.24 6764.42  149.23  6764.4   193.9  6764.4
  195.89  6764.5  197.88  6764.6  199.86  6764.7  201.85  6764.8  206.58  6764.8
  214.19  6764.7  220.58  6764.7  225.25  6764.8  229.92  6764.9  249.01  6764.9
  252.48  6764.8  255.95  6764.7  259.41  6764.6  262.88  6764.5  266.35  6764.4
  269.82  6764.3  273.28  6764.2  276.75  6764.1   293.6    6764     300    6764
  303.44    6764

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045  112.65     .07     300     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
        112.65     300            .1       .3

Upstream Embankment side slope             =       3 horiz. to 1.0 vertical
Downstream Embankment side slope           =       3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins        =
Energy head used in spillway design        =
Spillway height used in design             =
Weir crest shape                           = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       2
FHWA Chart # 1 - Concrete Pipe Culvert
```

FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
1	25.33	38.29	.021	.021	0	.5	

Upstream Elevation = 6766
Centerline Station = 327.95
Downstream Elevation = 6764.9
Centerline Station = 141.53

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 998

INPUT
Description:
Station Elevation Data num= 61

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6767.9	.47	6767.9	6.92	6767.8	14.53	6767.7	22.22	6767.6
29.92	6767.5	36.01	6767.4	40.56	6767.3	45.11	6767.2	49.66	6767.1
53.87	6767	58.04	6766.9	62.21	6766.8	66.38	6766.7	68.54	6766.6
70.92	6766.5	73.93	6766.4	79.66	6766.3	91.14	6766.2	94.17	6766.1
95.71	6766	97.15	6765.9	98.59	6765.8	100.03	6765.7	101.47	6765.6
102.91	6765.5	104.35	6765.4	108.07	6765.3	110.6	6765.2	112.65	6765.1
120.61	6765	125.1	6764.9	129.58	6764.8	134.07	6764.7	138.56	6764.6
140.77	6764.55	143.05	6764.5	148.24	6764.42	149.23	6764.4	193.9	6764.4
195.89	6764.5	197.88	6764.6	199.86	6764.7	201.85	6764.8	206.58	6764.8
214.19	6764.7	220.58	6764.7	225.25	6764.8	229.92	6764.9	249.01	6764.9
252.48	6764.8	255.95	6764.7	259.41	6764.6	262.88	6764.5	266.35	6764.4
269.82	6764.3	273.28	6764.2	276.75	6764.1	293.6	6764	300	6764
303.44	6764								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	112.65	.07	300	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
112.65	300	82.74	82.74	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 997

INPUT
Description:
Station Elevation Data num= 62

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6766.9	10.95	6766.9	15.5	6766.86	22.08	6766.8	28.61	6766.7
35.13	6766.6	39.25	6766.5	43.11	6766.4	47.04	6766.3	51.19	6766.2
55.34	6766.1	59.49	6766	63.64	6765.9	67.67	6765.8	70.52	6765.7
73.36	6765.6	76.21	6765.5	79.05	6765.4	81.9	6765.3	84.74	6765.2
88.26	6765.1	95.37	6765	102.48	6764.9	109.59	6764.8	121.02	6764.7
122.56	6764.6	123.97	6764.5	125.09	6764.4	126.21	6764.3	127.33	6764.2
128.45	6764.1	129.57	6764	130.69	6763.9	131.81	6763.8	133.11	6763.7
197.38	6763.7	208.63	6763.8	219.08	6763.9	222.89	6764	226.69	6764.1
230.5	6764.2	234.31	6764.3	238.12	6764.4	254.08	6764.4	257.55	6764.3
261.02	6764.2	264.49	6764.1	267.96	6764	287.42	6763.9	295.34	6763.8
301.58	6763.7	307.82	6763.6	314.06	6763.5	315.5	6763.48	320.3	6763.4
336.65	6763.4	339.47	6763.3	342.3	6763.2	345.12	6763.1	346.12	6763.1
346.12	6763.3	351.02	6763.3						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	15.5	.045	315.5	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
15.5	315.5	109.75	109.75	.1	.3

Left Levee Station= 67.15 Elevation= 6765.81
Right Levee Station= 255.07 Elevation= 6764.41

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 996

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6764.7	16.36	6764.7	34.07	6764.6	40.05	6764.5	46.03	6764.4
52.01	6764.3	57.61	6764.2	62.95	6764.1	68.3	6764	73.64	6763.9
78.9	6763.8	84.17	6763.7	89.43	6763.6	94.7	6763.5	99.96	6763.4
105.23	6763.3	118.63	6763.2	119.82	6763.1	121	6763	122.04	6762.9
123.06	6762.8	124.09	6762.7	125.11	6762.6	126.14	6762.5	127.16	6762.4
167.8	6762.4	170.47	6762.5	272.66	6762.5	278.09	6762.6	283.52	6762.7
288.95	6762.8	294.38	6762.9	298.33	6762.9				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	298.33	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	298.33	103.04	103.04	.1	.3

Left Levee Station= 118.39 Elevation= 6763.21
Right Levee Station= 294.29 Elevation= 6762.9

LATERAL STRUCTURE

RIVER: MS-06
REACH: Main Channel RS: 995.2

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS =
Deck/Roadway Width = 10
Weir Coefficient = .4
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 257

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6762.3	5.22	6762.3	13.24	6762.2	21.27	6762.1	29.3	6762
34.32	6762	37.32	6762.1	40.33	6762.2	50.46	6762.2	55.4	6762.1
60.35	6762	65.29	6761.9	70.23	6761.8	75.18	6761.7	79.57	6761.6
82.72	6761.5	85.87	6761.4	87.25	6761.36	89	6761.3	92.1	6761.2
95.2	6761.1	98.31	6761	101.41	6760.9	104.51	6760.8	107.62	6760.7
111.8	6760.6	118.5	6760.6	143.14	6760.7	147.14	6760.7	148.78	6760.6
150.42	6760.5	152.06	6760.4	153.71	6760.3	155.35	6760.2	156.99	6760.1
158.63	6760	160.27	6759.9	161.91	6759.8	163.55	6759.7	165.19	6759.6
166.83	6759.5	168.47	6759.4	177.27	6759.3	177.44	6759.3	184.39	6759.4
191.34	6759.5	198.28	6759.6	202.05	6759.66	204.28	6759.7	209.15	6759.8
214.02	6759.9	215.72	6759.9	217.18	6759.8	218.63	6759.7	220.08	6759.6
221.54	6759.5	227.24	6759.5	231.51	6759.6	235.79	6759.7	236.49	6759.7
238.58	6759.6	240.67	6759.5	242.75	6759.4	244.84	6759.3	246.93	6759.2
249.97	6759.1	253.39	6759	262.57	6759	271.29	6759.1	284.03	6759.1
287.05	6759	290.25	6758.9	293.46	6758.8	296.66	6758.7	299.86	6758.6
303.07	6758.5	306.27	6758.4	309.47	6758.3	312.68	6758.2	315.88	6758.1
315.98	6758.1	321.01	6758	328.44	6757.9	336.25	6757.8	344.05	6757.7
351.86	6757.6	358.14	6757.5	363.1	6757.4	366.94	6757.4	401.14	6757.4
403.68	6757.3	405.53	6757.2	407.39	6757.1	409.24	6757	411.09	6756.9
412.95	6756.8	414.8	6756.7	416.65	6756.6	418.51	6756.5	423.83	6756.5
425.98	6756.5	429.67	6756.6	433.36	6756.7	437.06	6756.8	440.75	6756.9
444.44	6757	444.75	6757	447.77	6756.9	450.79	6756.8	453.45	6756.7
455.5	6756.6	457.54	6756.5	459.59	6756.4	461.52	6756.31	461.64	6756.3
463.74	6756.2	465.84	6756.1	467.94	6756	470.04	6755.9	472.14	6755.8
474.24	6755.7	476.33	6755.6	478.43	6755.5	480.69	6755.4	486.25	6755.3
491.81	6755.2	497.36	6755.1	504.64	6755	515.98	6754.9	529.23	6754.8
547.4	6754.7	549.85	6754.6	550.02	6754.5	554.98	6754.4	560.76	6754.3
566.72	6754.3	568.52	6754.4	570.85	6754.4	579.35	6754.3	587.84	6754.2
596.33	6754.1	604.83	6754	610.72	6753.9	622.52	6753.8	642.15	6753.7
659.48	6753.6	665.46	6753.53	667.89	6753.5	676.22	6753.4	684.54	6753.3
692.16	6753.2	697.15	6753.1	702.14	6753	708.5	6752.9	716.13	6752.8
723.76	6752.7	731.39	6752.6	737	6752.5	741.31	6752.4	745.62	6752.3
750.25	6752.2	756.15	6752.1	762.05	6752	767.94	6751.9	773.84	6751.8
784.47	6751.7	804.91	6751.61	806.28	6751.6	818.41	6751.5	830.53	6751.4
837.75	6751.3	840.78	6751.2	843.82	6751.1	846.86	6751	849.89	6750.9
852.93	6750.8	855.96	6750.7	859	6750.6	862.03	6750.5	865.07	6750.4
879.89	6750.35	891.73	6750.3	896.53	6750.2	901.33	6750.1	906.13	6750
910.93	6749.9	915.78	6749.8	920.68	6749.7	925.58	6749.6	930.49	6749.5
935.49	6749.4	943.93	6749.3	952.37	6749.2	959.68	6749.1	965.44	6749
971.21	6748.9	976.97	6748.8	982.59	6748.7	987.97	6748.6	993.35	6748.5
998.73	6748.4	1004.19	6748.3	1010.18	6748.2	1016.18	6748.1	1022.17	6748
1028.16	6747.9	1033.77	6747.8	1038.26	6747.7	1042.76	6747.6	1047.25	6747.5
1051.73	6747.4	1056.16	6747.3	1060.6	6747.2	1065.03	6747.1	1069.47	6747
1073.9	6746.9	1077.03	6746.83	1078.3	6746.8	1082.59	6746.7	1086.4	6746.6
1090.1	6746.5	1094.83	6746.4	1103.88	6746.3	1112.93	6746.2	1121.97	6746.1
1129.87	6746	1136.84	6745.9	1143.8	6745.8	1150.77	6745.7	1157.73	6745.6
1166.48	6745.5	1176.34	6745.4	1181.53	6745.3	1186.72	6745.2	1191.91	6745.1
1197.11	6745	1202.3	6744.9	1207.8	6744.8	1214.48	6744.7	1221.15	6744.6
1239.94	6744.51	1242.93	6744.5	1247.41	6744.4	1251.9	6744.3	1256.38	6744.2
1260.87	6744.1	1265.35	6744	1269.84	6743.9	1274.33	6743.8	1278.81	6743.7
1283.3	6743.6	1287.78	6743.5	1293.11	6743.4	1298.89	6743.3	1304.1	6743.2
1308.47	6743.1	1312.27	6743.1						

Weir crest shape = Broad Crested

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 995

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6763.8	3.86	6763.8	11.57	6763.7	19.28	6763.6	26.99	6763.5
34.98	6763.4	42.52	6763.3	50.06	6763.2	57.6	6763.1	65.14	6763
72.68	6762.9	80.22	6762.8	87.76	6762.7	94.15	6762.6	99.74	6762.5
109.53	6762.4	131.36	6762.3	133.21	6762.2	135.06	6762.1	136.79	6762
138.52	6761.9	140.24	6761.8	141.96	6761.7	143.68	6761.6	151.3	6761.5
162.9	6761.5	172.38	6761.6	174.05	6761.7	175.73	6761.8	177.4	6761.9
178.31	6762	183.76	6762						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	183.76	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	183.76	201.02	201.02	.1	.3

Left Levee Station= 131 Elevation= 6762.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 993

INPUT
Description:
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6760.8	78.11	6760.8	85.48	6760.7	92.85	6760.6	99.88	6760.5
106.88	6760.4	113.87	6760.3	118.97	6760.3	125.87	6760.4	132.86	6760.5
139.98	6760.6	147.88	6760.6	149.34	6760.5	150.41	6760.4	151.47	6760.3
152.54	6760.2	153.61	6760.1	154.68	6760	155.75	6759.9	156.82	6759.8
157.88	6759.7	158.95	6759.6	160.02	6759.5	161.09	6759.4	162.98	6759.3
165.51	6759.2	168.31	6759.1	171.23	6759	174.15	6758.9	177.07	6758.8
179.99	6758.7	205.02	6758.7	206.23	6758.8	207.44	6758.9	208.65	6759
209.86	6759.1	211	6759.2	211.98	6759.3	212.97	6759.4	213.96	6759.5
214.94	6759.6	215.93	6759.7	217.99	6759.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.07	217.99	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	217.99	198.66	198.66	198.66	.1	.3

Left Levee Station= 139.07 Elevation= 6760.58
Right Levee Station= 215.93 Elevation= 6759.71

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 992

INPUT
Description:
Station Elevation Data num= 59

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6759.5	12.02	6759.5	16.84	6759.4	21.66	6759.3	26.48	6759.2
31.3	6759.1	36.12	6759	40.94	6758.9	46.27	6758.8	57.73	6758.7
61.58	6758.6	65.42	6758.5	68.2	6758.4	70.92	6758.3	73.64	6758.2
76.36	6758.1	79.09	6758	81.81	6757.9	84.53	6757.8	87.26	6757.7
89.98	6757.6	92.7	6757.5	95.43	6757.4	98.15	6757.3	100.87	6757.2
102.8	6757.1	104.58	6757	106.37	6756.9	108.15	6756.8	109.93	6756.7
111.71	6756.6	115.86	6756.6	119.02	6756.7	120.53	6756.8	120.74	6756.9
120.95	6757	121.16	6757.1	121.72	6757.1	122.93	6757	124.13	6756.9
125.34	6756.8	126.54	6756.7	127.75	6756.6	128.98	6756.5	130.33	6756.4
131.68	6756.3	133.03	6756.2	152.52	6756.2	158.86	6756.1	166.54	6756.1
168.48	6756.2	170.43	6756.3	172.4	6756.4	174.37	6756.5	176.34	6756.6
178.31	6756.7	180.28	6756.8	182.25	6756.9	186.82	6756.9		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.07	186.82	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	186.82	100.79	100.79	100.79	.1	.3

Left Levee Station= 121.92 Elevation= 6757.11

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 991

INPUT
Description:
Station Elevation Data num= 44

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6756.8	3.82	6756.8	8.54	6756.7	13.25	6756.6	17.99	6756.5
22.74	6756.4	27.48	6756.3	32.23	6756.2	36.98	6756.1	42.51	6756
50.58	6755.9	58.66	6755.8	64.91	6755.7	70.85	6755.6	76.79	6755.5
79.68	6755.5	84.26	6755.6	88.85	6755.7	90.45	6755.7	96.04	6755.6
98.75	6755.6	104.57	6755.7	106.69	6755.7	108.61	6755.6	110.54	6755.5
112.46	6755.4	114.39	6755.3	115.71	6755.2	116.8	6755.1	117.88	6755
118.97	6754.9	120.06	6754.8	121.15	6754.7	122.24	6754.6	125.43	6754.5
131.17	6754.4	153.87	6754.4	158.15	6754.3	163.28	6754.3	166.04	6754.4
168.8	6754.5	171.93	6754.6	175.08	6754.7	175.6	6754.7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.07	175.6	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	175.6	99.55	99.55	99.55	.1	.3

Left Levee Station= 105.82 Elevation= 6755.72

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 990

INPUT
Description:
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6755.3	1.57	6755.3	8.45	6755.2	14.58	6755.1	19.89	6755
24.69	6754.9	29.5	6754.8	34.31	6754.7	39.12	6754.6	50.3	6754.5
64.04	6754.4	77.76	6754.3	90.87	6754.2	94.03	6754.2	98.19	6754.3
102.5	6754.4	111.3	6754.4	112.46	6754.3	113.63	6754.2	114.8	6754.1
115.96	6754	117.13	6753.9	118.29	6753.8	119.46	6753.7	120.62	6753.6
121.79	6753.5	123.18	6753.4	124.61	6753.3	130.55	6753.2	143.33	6753.1
154.83	6753.02	158.31	6753	168.16	6753	170.52	6753.1	172.87	6753.2
175.23	6753.3	177.58	6753.4	179.94	6753.5	182.29	6753.6	184.74	6753.7
190.85	6753.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.07	190.85	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	190.85	100.24	100.24	100.24	.1	.3

Left Levee Station= 111.87 Elevation= 6754.39

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 989

INPUT
Description:
Station Elevation Data num= 40

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6753.5	2.88	6753.5	7.65	6753.4	12.43	6753.3	17.2	6753.2
21.97	6753.1	33.23	6753	45.4	6752.9	60.81	6752.8	79.75	6752.7
97.5	6752.6	126.32	6752.5	170.59	6752.5	187.83	6752.6	191.79	6752.7
195.74	6752.8	199.7	6752.9	204.8	6752.9	206.52	6752.8	208.24	6752.7
209.95	6752.6	211.67	6752.5	213.39	6752.4	215.11	6752.3	216.82	6752.2
218.52	6752.1	228.38	6752	248.2	6751.94	258.95	6751.9	262.2	6751.9
268.14	6752	270.58	6752.1	272.59	6752.2	274.6	6752.3	276.61	6752.4
278.62	6752.5	280.63	6752.6	287.87	6752.6	294.33	6752.5	298.18	6752.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.07	298.18	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	298.18	99.54	99.54	99.54	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	199.28	6752.9	F

Left Levee Station= 200.12 Elevation= 6752.89

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 988

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6751.7	49.17	6751.7	54.59	6751.6	59.07	6751.5	63.56	6751.4
68.04	6751.3	72.53	6751.2	76.13	6751.1	77.57	6751	79.01	6750.9
80.44	6750.8	81.88	6750.7	83.32	6750.6	85.27	6750.5	87.51	6750.4
89.74	6750.3	95.15	6750.2	109.31	6750.1	125.37	6750.1	135.09	6750.2
141.34	6750.3	147.59	6750.4	153.85	6750.5	160.1	6750.6	167.44	6750.7
168.75	6750.8	170.55	6750.9	172.35	6751	174.15	6751.1	175.95	6751.2
177.76	6751.3	179.56	6751.4	180.72	6751.4				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.07	180.72	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	180.72	99.8	99.8	99.8	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 987

INPUT
Description:
Station Elevation Data num= 44

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6751.1	.09	6751.1	11.41	6751	15.04	6750.9	18.67	6750.8
22.31	6750.7	25.94	6750.6	29.57	6750.5	33.21	6750.4	36.84	6750.3
40.47	6750.2	45.65	6750.1	57.84	6750	74.78	6749.9	82.15	6749.8
87.14	6749.7	90.13	6749.6	91.77	6749.5	93.4	6749.4	95	6749.3
96.55	6749.2	98.1	6749.1	99.66	6749	101.21	6748.9	102.76	6748.8
108.12	6748.7	113.78	6748.6	119.43	6748.5	124.1	6748.4	128.76	6748.3
133.42	6748.2	147.55	6748.2	159.19	6748.3	160.57	6748.4	161.96	6748.5
163.35	6748.6	164.74	6748.7	166.13	6748.8	167.52	6748.9	169.49	6749
171.53	6749.1	173.57	6749.2	189.92	6749.3	190.56	6749.3		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	190.56	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	190.56	101.26	101.26	101.26	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel RS: 986

INPUT
Description:
Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6750.5	2.48	6750.5	6.08	6750.4	9.47	6750.3	12.85	6750.2

```
   16.23  6750.1   19.62    6750   22.95  6749.9   25.64  6749.8   28.33  6749.7
   31.01  6749.6    33.7  6749.5   36.39  6749.4   39.08  6749.3   41.76  6749.2
   47.35  6749.1   53.36    6749   59.36  6748.9   63.91  6748.8   66.77  6748.7
   69.64  6748.6    72.5  6748.5   75.36  6748.4   78.23  6748.3   80.98  6748.2
   83.39  6748.1   85.81    6748   88.15  6747.9   89.71  6747.8   91.27  6747.7
   92.83  6747.6    94.4  6747.5   95.96  6747.4   97.53  6747.3   99.09  6747.2
  100.66  6747.1  102.22    6747  105.47  6746.9  108.93  6746.8  112.38  6746.7
  115.83  6746.6  119.37  6746.5  123.07  6746.4  126.77  6746.3  130.46  6746.2
  139.96  6746.2  144.92 6746.25  150.78  6746.3  156.73  6746.4  158.62  6746.5
  160.51  6746.6  162.39  6746.7  164.28  6746.8  166.16  6746.9  168.05    6747
  169.94  6747.1  171.82  6747.2  173.71  6747.3  175.59  6747.4  184.94  6747.4

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045       0    .045  184.94    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0  184.94           100.01  100.01  100.01             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel       RS: 985

INPUT
Description:
Station Elevation Data    num=      56
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6749    4.86    6749    9.91  6748.9   12.71  6748.8   15.52  6748.7
   18.33  6748.6   21.13  6748.5   23.94  6748.4   26.75  6748.3   29.55  6748.2
   32.23  6748.1   34.86    6748   37.48  6747.9   40.11  6747.8   42.73  6747.7
   45.36  6747.6   47.98  6747.5    50.6  6747.4   53.23  6747.3   55.85  6747.2
   59.11  6747.1   63.26    6747    67.4  6746.9   71.54  6746.8   75.69  6746.7
   79.83  6746.6   83.47  6746.5   87.01  6746.4   89.82  6746.3   91.34  6746.2
   92.86  6746.1   94.51    6746   96.51  6745.9   98.52  6745.8  100.52  6745.7
  102.52  6745.6  104.52  6745.5  106.73  6745.4  112.95  6745.3  119.18  6745.2
  124.18  6745.1  128.77    6745  133.36  6744.9  137.94  6744.8  149.43  6744.8
  164.89  6744.9  166.55    6745   168.2  6745.1  169.86  6745.2  171.52  6745.3
  173.13  6745.4  174.74  6745.5  176.36  6745.6  177.97  6745.7  179.58  6745.8
  187.88  6745.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045       0    .045  187.88    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0  187.88            98.95   98.95   98.95             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Overflow 1-DS-0    RS: 1007

INPUT
Description:
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6746.3    4.87  6746.3   15.18  6746.2   25.49  6746.1   37.68    6746
   60.48  6745.9   87.61 6745.83  100.94  6745.8  115.27  6745.7   132.4  6745.6
  153.77  6745.5  178.65  6745.4   295.2  6745.3     300 6745.24  302.89  6745.2
   307.2  6745.1   311.5    6745  311.72    6745

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045       0    .045     300    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0     300            97.29   97.29   97.29             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Overflow 1-DS-0    RS: 1006.6

INPUT
Description:
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -15.12  6744.7  -11.89  6744.7   -1.19  6744.6    9.51  6744.5    24.5  6744.4
   44.76  6744.3   72.93  6744.2   99.26  6744.1  107.65 6744.07  124.63    6744
  144.69    6744  156.94  6743.9  169.19  6743.8  181.73  6743.7  195.63  6743.6
  210.79  6743.5  240.46  6743.4  243.15  6743.4  284.88 6743.47  304.48  6743.5
  308.92  6743.5  319.03  6743.4  328.58  6743.4

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -15.12    .045  -15.12    .045  284.88    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -15.12  284.88           123.93  123.93  123.93             .1       .3
Right Levee     Station=  305.46      Elevation=  6743.5

CROSS SECTION


RIVER: MS-06
REACH: Overflow 1-DS-0    RS: 1006

INPUT


RIVER: MS-06
REACH: Main Channel       RS: 984

INPUT
Description:
Station Elevation Data    num=      50
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6746.4    4.47  6746.4    9.9  6746.3   15.92  6746.2   21.94  6746.1
   27.96    6746   32.37  6745.9   35.58  6745.8   38.79  6745.7   42.01  6745.6
   45.22  6745.5   48.43  6745.4   51.64  6745.3   54.85  6745.2   58.07  6745.1
   61.45    6745   66.72  6744.9   71.99  6744.8      77  6744.7   81.62  6744.6
   86.23  6744.5   90.85  6744.4   95.46  6744.3  100.08  6744.2  104.69  6744.1
  109.31    6744  118.26  6743.9  129.43  6743.8  140.73  6743.7  152.02  6743.6
  152.74 6743.59   161.7  6743.5  167.42  6743.5  168.61  6743.6   169.8  6743.7
  170.99  6743.8  172.18  6743.9  173.37    6744  174.56  6744.1  175.94  6744.2
  177.34  6744.3  178.74  6744.4  180.14  6744.5  181.54  6744.6  182.94  6744.7
  182.99  6744.7  185.49  6744.6  187.99  6744.5  190.48  6744.4  190.58  6744.4

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045       0    .045  190.58    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0  190.58           116.52  116.52  116.52             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Main Channel       RS: 983

INPUT
Description:
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -40.76  6742.3  -28.11  6742.3   -5.07  6742.2    7.37 6742.18   45.82  6742.1
   48.85  6742.1   50.05 6742.11   64.77  6742.2    80.6  6742.3   91.23 6742.37
   96.05  6742.4  157.02  6742.4  167.09  6742.5  177.16  6742.6  187.23  6742.7
  197.31  6742.8  207.38  6742.9  217.67    6743  231.78  6743.1  247.74  6743.2
  249.17  6743.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -40.76    .045   91.23     .07  249.17     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         91.23  249.17                0       0       0             .1       .3

CROSS SECTION


Description:
Station Elevation Data    num=      33
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6740.2   23.83  6740.2   33.47  6740.3   45.42  6740.4   57.38  6740.5
   69.33  6740.6   81.29  6740.7   93.39  6740.8  102.49 6740.87  105.93  6740.9
  118.48    6741  131.02  6741.1  143.57  6741.2  154.53  6741.3  204.64  6741.3
  222.77  6741.4  252.49 6741.48  258.02  6741.5  279.06  6741.6  352.48  6741.7
  376.17  6741.8  397.09  6741.9  402.49 6741.95  408.65    6742  418.27  6742.1
  424.51  6742.2  430.74  6742.3  436.98  6742.4  443.22  6742.5  449.46  6742.6
  457.79  6742.7  466.32  6742.8     500  6742.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045  102.49    .045  402.49    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       102.49  402.49           147.13  147.13  147.13             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Overflow 1-DS-0    RS: 1005

INPUT
Description:
Station Elevation Data    num=      39
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   36.82  6738.6   42.08  6738.6    61.4  6738.5   71.72  6738.4   82.04  6738.3
     100 6738.28  156.36  6738.2  170.36  6738.1  184.37    6738  203.74  6737.9
  223.56  6737.8   235.7  6737.8     250 6737.89  251.86  6737.9  268.02    6738
  284.19  6738.1  327.55  6738.2  347.54  6738.3  356.38  6738.4  365.23  6738.5
  374.07  6738.6  382.91  6738.7  391.75  6738.8  399.89  6738.9     400  6738.9
  406.27    6739  411.72  6739.1  417.05  6739.2  422.37  6739.3  427.69  6739.4
  433.01  6739.5  438.33  6739.6  443.66  6739.7  448.98  6739.8   454.3  6739.9
  459.62    6740  468.45  6740.1  488.66  6740.2     500  6740.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   36.82    .045     100    .045     400    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         100     400            146.6   146.6   146.6             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: Overflow 1-DS-0    RS: 1004

INPUT
```

Description:
Station Elevation Data num= 52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
57.1	6737.1	70.25	6737.1	84	6737	95.26	6736.9	100	6736.86
106.52	6736.8	117.65	6736.7	126.98	6736.6	136.31	6736.5	144.58	6736.4
151.66	6736.3	158.73	6736.2	166.88	6736.1	177.61	6736	188.33	6735.9
199.06	6735.8	212.69	6735.7	231.71	6735.6	250	6735.5	256.79	6735.5
263.84	6735.6	270.89	6735.7	278.17	6735.8	288.75	6735.9	299.34	6736
309.92	6736.1	318.62	6736.2	327.1	6736.3	335.57	6736.4	344.66	6736.5
354.44	6736.6	364.22	6736.7	373.47	6736.8	382.04	6736.9	390.62	6737
400	6737.1	400.13	6737.1	414.43	6737.2	426.77	6737.3	433.37	6737.4
439.96	6737.5	446.55	6737.6	453.14	6737.7	459.73	6737.8	466.27	6737.9
470.67	6738	475.07	6738.1	479.48	6738.2	483.88	6738.3	488.46	6738.4
494.26	6738.5	500	6738.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
57.1	.045	100	.045	400	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

	100	400		146.6	146.6	146.6	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1003

INPUT
Description:
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43.2	6735.9	46.4	6735.9	64.81	6735.8	79.35	6735.7	85.92	6735.6
92.5	6735.5	99.08	6735.4	100	6735.39	110.25	6735.3	122.08	6735.2
133.91	6735.1	143.08	6735	150.74	6734.9	158.41	6734.8	166.07	6734.7
171.88	6734.6	177.13	6734.5	182.39	6734.4	187.64	6734.3	193.04	6734.2
202.06	6734.1	211.08	6734	222.9	6733.9	235.17	6733.8	247.44	6733.7
256.65	6733.7	261.96	6733.8	267.28	6733.9	272.6	6734	278.53	6734.1
286.08	6734.2	293.72	6734.3	302.73	6734.4	311.73	6734.5	320.73	6734.6
329.74	6734.7	338.73	6734.8	347.65	6734.9	367.75	6735	372.21	6735
400	6734.9	401.37	6734.9	421.66	6734.9	471.27	6735	480.59	6735.1
489.91	6735.2	500	6735.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
43.2	.045	100	.045	400	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

	100	400		146.6	146.6	146.6	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1002

INPUT
Description:
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
45.32	6734	50.4	6734	59.92	6733.9	69.95	6733.8	80.98	6733.7
91.98	6733.6	99.67	6733.5	100	6733.5	107.35	6733.4	115.04	6733.3
123.32	6733.2	133.43	6733.1	139.17	6733	149.07	6732.9	158.97	6732.8
168.86	6732.7	178.3	6732.6	186.1	6732.5	193.91	6732.4	201.71	6732.3
209.52	6732.2	216.04	6732.1	220.62	6732	221.78	6731.9	222.95	6731.8
228.01	6731.7	234.5	6731.6	240.99	6731.5	244.83	6731.5	245.37	6731.6
246.87	6731.7	248.37	6731.8	249.87	6731.9	250	6731.91	251.38	6732
260.68	6732.1	273	6732.2	287.88	6732.3	305.33	6732.4	316.74	6732.5
327.85	6732.6	342.74	6732.7	352.35	6732.8	361.96	6732.9	371.57	6733
400	6733.08	408.75	6733.1	429.04	6733.2	463.3	6733.3	481.15	6733.4
500	6733.4								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
45.32	.045	100	.045	400	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

	100	400		146.61	146.61	146.61	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1001

INPUT
Description:
Station Elevation Data num= 67

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
114.16	6730.5	123	6730.5	142.78	6730.4	162.57	6730.3	183.53	6730.2
199.56	6730.1	204.25	6730	206.71	6729.9	209.17	6729.8	211.64	6729.7
214.1	6729.6	216.63	6729.5	219.35	6729.4	222.06	6729.3	224.77	6729.2
227.49	6729.1	230.2	6729	232.92	6728.9	235.63	6728.8	238.34	6728.7
241.06	6728.6	243.77	6728.5	246.48	6728.4	249.2	6728.3	251.79	6728.3
257.86	6728.4	263.93	6728.5	268.24	6728.6	274.32	6728.7	280.97	6728.8
287.62	6728.9	294.26	6729	299.43	6729.1	303.93	6729.2	308.43	6729.3
312.93	6729.4	317.42	6729.5	321.92	6729.6	326.42	6729.7	330.91	6729.8
335.41	6729.9	339.91	6730	344.4	6730.1	348.9	6730.2	353.4	6730.3
357.89	6730.4	362.39	6730.5	366.89	6730.6	371.38	6730.7	375.88	6730.8
380.38	6730.9	384.88	6731	391.18	6731.1	397.48	6731.2	403.79	6731.3
410.09	6731.4	414.16	6731.46	416.4	6731.5	422.7	6731.6	430.57	6731.7
437.77	6731.8	446.73	6731.9	455.68	6732	470.73	6732.1	485.31	6732.2

497.47 6732.3 500 6732.3

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
114.16	.045	114.16	.045	414.16	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

	114.16	414.16		148.42	148.42	148.42	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Overflow 1-DS-0 RS: 1000

INPUT
Description:
Station Elevation Data num= 109

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
188.32	6724.6	188.55	6724.6	193.54	6724.5	198.54	6724.4	203.53	6724.3
208.52	6724.2	213.48	6724.1	218.17	6724	218.81	6723.9	219.45	6723.8
220.09	6723.7	220.72	6723.6	221.35	6723.5	221.97	6723.9	221.99	6723.4
222.62	6723.3	223.26	6723.2	223.89	6723.1	224.52	6723	225.65	6722.9
226.52	6723.4	232.2	6723.1	232.79	6722.9	233.56	6723	234.34	6723.1
234.65	6723.5	235.11	6723.2	235.89	6723.3	236.66	6723.4	237.44	6723.5
238.22	6723.6	238.99	6723.7	239.86	6723.7	251.52	6723.6	252.8	6723.6
256.24	6723.57	263.3	6723.5	273.99	6723.5	275.4	6723.6	286.77	6723.6
290.07	6723.7	291.04	6723.8	291.35	6723.9	291.62	6724	291.67	6724.2
291.89	6724.1	292.86	6724.2	293.89	6724.3	295.28	6724.4	297.25	6724.5
299.22	6724.6	301.68	6724.7	304	6724.8	304.02	6725.1	306.33	6724.9
308.66	6725	310.98	6725.1	313.31	6725.2	314.89	6725.4	315.64	6725.3
317.96	6725.4	320.17	6725.8	320.29	6725.5	322.63	6725.6	324.96	6725.7
350.08	6725.7	360.39	6725.9	363.45	6726.5	364.91	6725.7	365.47	6725.8
366.02	6725.9	366.58	6726	367.02	6726.4	367.13	6726.1	367.69	6726.2
368.25	6726.3	368.8	6726.4	369.36	6726.5	369.91	6726.6	370.47	6726.7
370.99	6726.8	371.03	6726.8	371.58	6726.9	378.58	6727	386.53	6727.1
389.72	6727.1	398.24	6727.2	406.49	6727.3	414.74	6727.4	422.99	6727.5
431.24	6727.6	435.68	6727.8	436.39	6727.7	439.5	6727.7	447.75	6727.8
453.98	6727.9	459.23	6728	464.48	6728.1	469.73	6728.2	474.98	6728.3
480.23	6728.4	485.47	6728.5	488.32	6728.55	490.72	6728.6	495.97	6728.7
496.97	6728.7	496.97	6728.75	499.59	6728.8	500.01	6728.8		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
188.32	.045	188.32	.045	488.32	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

	188.32	488.32		0	0	0	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: 2nd Culvert RS: 1000

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6766.5	.6	6766.5	4.17	6766.6	7.73	6766.7	10.33	6766.8
13.43	6766.8	14.83	6766.7	16.72	6766.6	18.62	6766.5	20.51	6766.4
22.41	6766.3	24.3	6766.2	26.2	6766.1	28.09	6766	31.85	6765.9
48.63	6765.8	96.65	6765.8	99.94	6765.83	106.07	6765.9	109.56	6765.9
122.48	6766	167.39	6766	179.12	6765.9	190.85	6765.8	202.58	6765.7
219.93	6765.7	221.83	6765.8	223.74	6765.9	225.64	6766	233.98	6766.1
242.31	6766.2	243.27	6766.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	0	.045	243.27	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

	0	243.27		30.51	30.51	30.51	.1	.3

Left Levee Station= 12.96 Elevation= 6766.8
Right Levee Station= 167.39 Elevation= 6766

CROSS SECTION

RIVER: MS-06
REACH: 2nd Culvert RS: 999

INPUT
Description:
Station Elevation Data num= 40

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
38.25	6766.2	45.76	6766.2	46.96	6766.1	47.79	6766	48.13	6765.9
48.47	6765.8	53.05	6765.8	57.82	6765.7	61.57	6765.6	65.33	6765.5
69.08	6765.4	72.84	6765.3	80.57	6765.2	114.54	6765.2	125.08	6765.26
133	6765.3	142.59	6765.3	156.69	6765.4	163.14	6765.4	167.96	6765.5
168.6	6765.6	169.23	6765.7	169.87	6765.8	170.51	6765.9	171.14	6766
186.85	6766	194.07	6765.9	201.28	6765.8	208.5	6765.7	215.71	6765.6
222.93	6765.5	230.14	6765.4	240.25	6765.3	256.98	6765.3	266	6765.4
289.63	6765.4	293.8	6765.5	295.69	6765.5	296.67	6765.6	299.79	6765.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
38.25	.045	38.25	.045	299.79	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

	38.25	299.79		80.49	80.49	80.49	.1	.3

Left Levee Station= 45.76 Elevation= 6766.21

```
Right Levee     Station=  171.14      Elevation= 6766.01

CULVERT


RIVER: MS-06
REACH: 2nd Culvert        RS: 998.52

INPUT
Description:
Distance from Upstream XS =      10
Deck/Roadway Width        =      24
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   26.61  6766.5       0   28.14  6766.5       0   78.13  6766.5       0
  162.64  6766.6       0  216.04  6766.7       0     242  6766.8       0
  264.14  6766.9       0  293.63    6767       0   294.8    6767       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   38.25  6766.2   45.76  6766.2   46.95  6766.1   47.78    6766   48.12  6765.9
   48.46  6765.8   53.05  6765.8   57.81  6765.7   61.57  6765.6   65.32  6765.5
   69.08  6765.4   72.83  6765.3   80.56  6765.2   90.79  6764.2  104.44 6763.84
  125.32 6763.41  136.56 6764.24  151.02 6764.58  156.69  6765.4  163.14  6765.4
  167.96  6765.5  168.59  6765.6  169.23  6765.7  169.87  6765.8   170.5  6765.9
  171.14    6766  186.85    6766  194.06  6765.9  201.28  6765.8  208.49  6765.7
  215.71  6765.6  222.92  6765.5  230.14  6765.4  240.25  6765.3  256.98  6765.3
  265.99  6765.4  289.62  6765.4  293.79  6765.5  295.69  6765.5  296.67  6765.6
  299.79  6765.6

Manning's n Values        num=       2
     Sta   n Val     Sta   n Val
   38.25    .045  299.79    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
         38.25  299.79            .1       .3
Left Levee      Station=   45.76      Elevation= 6766.21
Right Levee     Station=  171.14      Elevation= 6766.01

Downstream  Deck/Roadway Coordinates
    num=       9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   37.01  6766.5       0   38.54  6766.5       0   88.53  6766.5       0
  173.04  6766.6       0  226.44  6766.7       0   252.4  6766.8       0
  274.54  6766.9       0  304.03    6767       0   305.2    6767       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6764    6.84    6764   27.93  6763.9   36.23  6763.8   42.52  6763.7
    48.8  6763.6   55.08  6763.5   75.35  6763.5    78.2  6763.4   81.05  6763.3
   83.89  6763.2   86.74  6763.1   89.74  6763.1   97.27  6763.2   104.8  6763.3
  112.33  6763.4  122.71  6763.5   125.9  6763.6   129.1  6763.7  132.91  6763.7
  135.48 6763.62  136.27  6763.6  139.62  6763.5  142.47  6763.4  145.15  6763.3
   147.7  6763.3  164.25  6763.4  178.21  6763.4  188.51  6763.3  198.82  6763.2
   213.9  6763.2  239.34  6763.3  271.73  6763.4  276.62  6763.5  281.52  6763.6
  286.42  6763.7  291.32  6763.8  296.21  6763.9   299.6  6763.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .07       0    .07   299.6    .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            0   299.6            60.66   60.66   60.66             .1       .3
Left Levee      Station=   129.1      Elevation=  6763.7
Right Levee     Station=  178.21      Elevation=  6763.4

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 997

INPUT
Description:
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6762.1   92.16  6762.1  106.31  6762.2  120.46  6762.3  134.61  6762.4
  145.78  6762.5  149.62  6762.6  153.45  6762.7  156.81 6762.75  161.21  6762.8
  185.19  6762.9  190.05    6763  194.91  6763.1  199.78  6763.2  204.64  6763.3
   209.5  6763.4  214.36  6763.5  219.22  6763.6  224.08  6763.7  228.62  6763.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045       0    .045  228.62    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            0  228.62            91.43   91.43   91.43             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 996

INPUT
Description:
Station Elevation Data    num=      36
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -5.85  6762.1    2.61  6762.1     8.7    6762   14.19  6761.9   19.68  6761.8
   25.16  6761.7   30.65  6761.6   36.14  6761.5   41.62  6761.4   66.45  6761.3
  100.29  6761.2  133.52  6761.2  142.03  6761.3  152.87  6761.4   163.7  6761.5
  174.54  6761.6  185.38  6761.7  196.21  6761.8  207.05  6761.9  215.38    6762
  219.56  6762.1  223.75  6762.2  227.94  6762.3  232.13  6762.4  236.31  6762.5
   240.5  6762.6  244.69  6762.7  248.88  6762.8  253.06  6762.9  257.25    6763
  261.44  6763.1  265.63  6763.2  269.81  6763.3     274  6763.4   278.6  6763.5
  282.28  6763.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -5.85    .07   -5.85    .07   163.7    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -5.85  163.7            99.23   99.23   99.23             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 995

INPUT
Description:
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   10.57  6760.6   93.42  6760.6  104.39  6760.5  115.36  6760.4  126.33  6760.3
  131.87 6760.25   137.3  6760.2  139.97  6760.2  144.69  6760.3   149.4  6760.4
  154.12  6760.5  158.83  6760.6  163.55  6760.7  168.27  6760.8  172.98  6760.9
   177.7    6761  182.42  6761.1  187.13  6761.2  191.86  6761.3  196.73  6761.4
   201.6  6761.5  206.47  6761.6  211.35  6761.7  216.22  6761.8  222.34  6761.9
  230.02    6762  238.7   6762.1  251.43  6762.2  262.29  6762.3  273.16  6762.4
  284.03  6762.5  288.34  6762.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   10.57    .07   10.57    .07  131.87    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         10.57  131.87           203.06  203.06  203.06             .1       .3

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 994

INPUT
Description:
Station Elevation Data    num=     165
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   17.27  6759.1   17.68  6759.1   21.18    6759   23.49  6758.9   25.81  6758.8
```

```
   28.12  6758.7   30.51  6758.6   33.15  6758.5   35.78  6758.4   38.42  6758.3
   41.05  6758.2   43.68  6758.1   55.63    6758   77.87  6757.9   88.04  6757.8
   93.39  6757.7   98.74  6757.6  104.09  6757.5  109.43  6757.4  114.78  6757.3
  119.53  6757.3   125.3  6757.4  131.07  6757.5  136.84  6757.6   142.6  6757.7
  146.07 6757.76  148.37  6757.8  154.14  6757.9  159.91    6758  165.68  6758.1
  176.77 6758.44  180.67 6758.44  183.53 6758.48     189 6758.46  199.14 6758.39
  209.53  6758.2  226.93  6758.1  257.35    6758  299.01    6758  299.32  6758.1
  299.63  6758.2  299.93  6758.3     300 6758.32  300.26  6758.4  300.59  6758.5
  300.93  6758.6  301.26  6758.7  301.59  6758.8  301.92  6758.9  302.25    6759
  302.58  6759.1  302.92  6759.2  303.25  6759.3  303.58  6759.4  303.91  6759.5
  304.25  6759.6  304.59  6759.7  304.93  6759.8  305.27  6759.9  305.61    6760
  305.95  6760.1  306.29  6760.2  306.63  6760.3  306.97  6760.4  307.31  6760.5
  307.66  6760.6  310.35  6760.6   310.7  6760.5  311.05  6760.4   311.4  6760.3
  311.76  6760.2  312.11  6760.1  312.46    6760  312.82  6759.9  313.17  6759.8
  313.53  6759.7  313.88  6759.6  314.24  6759.5  314.59  6759.4  314.95  6759.3
   315.3  6759.2  315.66  6759.1  316.01    6759  316.37  6758.9  316.75  6758.8
  317.12  6758.7  317.19  6758.7  317.27 6758.72  317.67  6758.8  318.15  6758.9
  318.63    6759  319.11  6759.1  319.59  6759.2  320.07  6759.3  320.55  6759.4
  321.02  6759.5   321.5  6759.6  321.98  6759.7  322.46  6759.8  322.94  6759.9
  323.42    6760   323.9  6760.1  324.38  6760.2  324.86  6760.3  325.36  6760.4
  325.86  6760.5  326.37  6760.6  326.89  6760.7  329.56  6760.8  333.05  6760.8
  343.92  6760.7  350.91  6760.6  358.78  6760.5  367.82  6760.4  378.05  6760.3
  388.76  6760.2  399.27  6760.1  406.78    6760  407.67  6759.9  408.18  6759.8
  408.68  6759.7  409.19  6759.6  409.7   6759.5  410.18  6759.4  410.66  6759.3
  411.14  6759.2  411.62  6759.1  412.1     6759  412.58  6758.9  413.06  6758.8
  413.54  6758.7  414.02  6758.6  414.5   6758.5  414.97  6758.4  415.45  6758.3
  415.93  6758.2  416.41  6758.1  416.89    6758  417.44    6758   417.8  6758.1
  418.15  6758.2  418.51  6758.3  418.86  6758.4  419.22  6758.5  419.58  6758.6
  419.93  6758.7  420.29  6758.8  420.64  6758.9     421    6759  421.36  6759.1
  421.71  6759.2  422.07  6759.3  422.42  6759.4  422.78  6759.5  423.14  6759.6
  423.49  6759.7  423.85  6759.8   424.2  6759.9  425.45  6759.9  425.45 6759.09
  426.05  6759.1  435.77  6759.2  445.49  6759.3  454.57  6759.4  459.66  6759.4

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   17.27     .07   35.78    .045     189    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         35.78     189          297.82  297.82  297.82            .1       .3
Right Levee     Station=  184.31      Elevation= 6758.49

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 991

INPUT
Description:
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
```

```
   17.74  6753.9   64.15  6753.9   72.88    6754   82.17  6754.1   91.46  6754.2
  100.75  6754.3  108.06  6754.4  135.37  6754.4  148.92  6754.3  215.67  6754.3
   235.4  6754.2  255.14  6754.1  274.88    6754  297.44    6754   300.5 6754.02
  317.74  6754.1  317.88  6754.1  338.23  6754.2  358.08  6754.3  369.47  6754.4
  380.86  6754.5  392.74  6754.6  404.67  6754.7  416.59  6754.8  428.52  6754.9
  440.44    6755  446.91    6755

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   17.74    .045   17.74    .045  317.74    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         17.74  317.74          100.37  100.37  100.37            .1       .3
Left Levee      Station=  135.36      Elevation= 6754.41
Right Levee     Station=  440.44      Elevation= 6755.01

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 990

INPUT
Description:
Station Elevation Data    num=      24
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   25.19  6752.6   28.13  6752.6    34.2  6752.5   43.68  6752.4      47  6752.3
   55.15  6752.2    64.8  6752.1   74.45    6752   86.68    6752  101.74  6752.1
  122.62  6752.2  150.22  6752.3  161.33 6752.37  166.17  6752.4  174.03  6752.5
   182.2  6752.6  192.26  6752.7  202.33  6752.8  269.13  6752.9  306.35    6753
  325.19 6753.06  338.25  6753.1   349.5  6753.2  350.96  6753.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   25.19    .045   25.19    .045  325.19    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         25.19  325.19          98.36   98.36   98.36            .1       .3
Right Levee     Station=  202.33      Elevation=  6752.8

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 989

INPUT
Description:
Station Elevation Data    num=      33
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   33.73  6750.8   44.94  6750.8   48.22  6750.7    51.5  6750.6   54.78  6750.5
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```
   83.72  6750.4  102.65  6750.3  132.42  6750.2  168.01  6750.2  176.14  6750.3
  180.71 6750.36  184.27  6750.4  190.81  6750.5  194.52  6750.6  198.23  6750.7
  201.67  6750.8  205.06  6750.9  208.45    6751  211.85  6751.1  217.48  6751.2
  223.45  6751.3  229.43  6751.4   235.4  6751.5  241.38  6751.6  247.35  6751.7
  258.97  6751.8  288.03  6751.9  305.88    6752  321.51  6752.1  333.73 6752.15
  345.76  6752.2   353.1  6752.3  359.49  6752.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   33.73     .07  205.06    .045  333.73    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        205.06  333.73          98.35   98.35   98.35            .1       .3
Right Levee     Station=  288.03      Elevation= 6751.88

CROSS SECTION


RIVER: MS-06
REACH: 2nd Culvert        RS: 988

INPUT
Description:
Station Elevation Data    num=      77
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -83.89  6748.1  -78.16  6748.1  -76.69  6748.2  -75.22  6748.3  -73.74  6748.4
  -72.27  6748.5  -70.79  6748.6  -69.32  6748.7  -67.84  6748.8  -66.37  6748.9
   -64.7    6749  -28.93    6749  -24.91  6748.9  -20.89  6748.8  -16.88  6748.7
  -12.86  6748.6   -8.85  6748.5   -4.83  6748.4    -.81  6748.3     3.2  6748.2
    7.09  6748.1   10.92    6748   13.47 6747.94   15.02  6747.9   19.67  6747.8
   29.64  6747.8   30.89 6747.82   37.51  6747.9   45.38    6748   52.86  6748.1
   59.61  6748.2   66.36  6748.3   73.69  6748.4   82.55  6748.5    91.4  6748.6
  107.42  6748.7  125.24  6748.7   138.4  6748.6  151.56  6748.5  160.28  6748.5
  170.33  6748.6  180.38  6748.7  180.89  6748.7  191.32  6748.8  194.89  6748.9
  198.46    6749  202.03  6749.1  205.61  6749.2  209.25  6749.3  212.89  6749.4
  216.53  6749.5  220.17  6749.6  223.81  6749.7  227.45  6749.8  231.09  6749.9
  234.73    6750  238.37  6750.1  242.01  6750.2  245.66  6750.3   249.3  6750.4
  252.94  6750.5  256.58  6750.6  261.28  6750.7  270.61  6750.8  279.93  6750.9
   289.1    6751  296.42  6751.1  303.75  6751.2  311.07  6751.3   318.4  6751.4
  325.72  6751.5  330.89 6751.59  331.79  6751.6  337.75  6751.7  343.71  6751.8
  349.67  6751.9   355.2  6751.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -83.89    .045   30.89    .045  330.89    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         30.89  330.89          105.21  105.21  105.21            .1       .3
Right Levee     Station=  106.98      Elevation= 6748.72

CROSS SECTION
```

```
RIVER: MS-06
REACH: 2nd Culvert        RS: 987

INPUT
Description:
Station Elevation Data    num=      42
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -83.8  6748.9  -60.67  6748.9  -56.65  6748.8  -52.64  6748.7  -48.62  6748.6
   -44.6  6748.5  -40.59  6748.4  -36.57  6748.3  -32.56  6748.2  -28.69  6748.1
  -24.86    6748   -21.3 6747.91  -20.97  6747.9  -16.33  6747.8    7.54  6747.8
   43.08  6747.8   55.96  6747.7   68.84  6747.6   82.39  6747.5  174.82  6747.5
  186.19  6747.6  191.02  6747.7  201.07  6747.8  205.99  6747.9   210.9    6748
  215.82  6748.1  220.73  6748.2  225.65  6748.3  230.56  6748.4  235.47  6748.5
  240.39  6748.6   245.3  6748.7  250.22  6748.8  255.13  6748.9  260.04    6749
  265.48  6749.1  280.14  6749.1  288.32    6749  296.49  6748.9  304.66  6748.8
  307.54  6748.8  350.35  6748.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -83.8    .045    7.54    .045  307.54    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          7.54  307.54          197.8   197.8   197.8            .1       .3
Right Levee     Station=  264.36      Elevation= 6749.11

LATERAL STRUCTURE


RIVER: MS-06
REACH: 2nd Culvert        RS: 986.3

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =
Deck/Roadway Width        =      10
Weir Coefficient          =      .4
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =       35
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    6746    2.52    6746    8.22  6745.9   13.92  6745.8   19.62  6745.7
   25.33  6745.6   31.03  6745.5   36.73  6745.4   42.43  6745.3   48.08  6745.2
   53.26  6745.1   58.44    6745   63.62  6744.9    68.8  6744.8   73.99  6744.7
   79.17  6744.6   84.35  6744.5   89.53  6744.4   95.61  6744.3  100.83  6744.2
  105.59  6744.1  110.37    6744  115.32  6743.9  120.27  6743.8  125.21  6743.7
  130.16  6743.6  135.11  6743.5  140.05  6743.4     145  6743.3  149.95  6743.2
  154.09  6743.1  158.16    6743  162.24  6742.9  166.46  6742.8   169.4  6742.8

Weir crest shape                        = Broad Crested
```

CROSS SECTION

RIVER: MS-06
REACH: 2nd Culvert RS: 985

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-64.02	6746.1	-60.81	6746.1	-55.61	6746	-50.42	6745.9	-45.23	6745.8
-40.03	6745.7	-34.97	6745.6	-34.84	6745.6	-27.42	6745.5	-18.81	6745.4
-7.58	6745.3	3.65	6745.2	15.27	6745.1	42.51	6745	115.03	6744.91
120.16	6744.9	138.9	6744.9	265.03	6745	268.58	6745	277.83	6745.1
287.08	6745.2	296.33	6745.3	305.58	6745.4	314.84	6745.5	325.96	6745.6
339.39	6745.7	352.82	6745.8	356.21	6745.8				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-64.02	.045	-34.97	.07	265.03	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-34.97	265.03	99.12	99.12	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: 2nd Culvert RS: 984

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-62.04	6744.5	-53.65	6744.5	-19.71	6744.5	-13.47	6744.4	-6.4	6744.3
1.66	6744.2	9.72	6744.1	17.79	6744	25.85	6743.9	33.91	6743.8
48.27	6743.7	60.43	6743.6	72.59	6743.5	84.75	6743.4	96.35	6743.38
153.4	6743.3	246.35	6743.3	302.2	6743.3	311.19	6743.2	320.15	6743.1
323.64	6743.1								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-62.04	.045	-53.65	.07	246.35	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-53.65	246.35	100.58	100.58	.1	.3

CROSS SECTION

673.07	6683.1	675.87	6683.2	678.66	6683.3	681.46	6683.4	684.25	6683.5
687.05	6683.6	690.11	6683.7	693.7	6683.8	697.29	6683.9	700.88	6684
703.59	6684.1	706.3	6684.2	709.02	6684.3	711.73	6684.4	714.44	6684.5
717.15	6684.6	721.31	6684.7	725.68	6684.8	730.05	6684.9	734.42	6685
740.37	6685.1	746.32	6685.2	752.26	6685.3	758.21	6685.4	764.15	6685.5
769.91	6685.6	775.54	6685.7	781.17	6685.8	786.8	6685.9	792.43	6686
799.73	6686.1	807.26	6686.2	815.07	6686.3	822.96	6686.4	830.85	6686.5
838.63	6686.6	846.4	6686.7	854.17	6686.8	861.94	6686.9	869.71	6687
920.67	6687	988.74	6686.9	1000	6686.9				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.1	151.1	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1008

INPUT
Description:
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6682.7	1.3	6682.7	6.72	6682.6	12.05	6682.5	17.38	6682.4
22.71	6682.3	28.05	6682.2	33.38	6682.1	38.71	6682	44.17	6681.9
69.17	6681.8	141.23	6681.8	159.17	6681.9	170.43	6682	177.83	6682.1
185.23	6682.2	192.63	6682.3	200.32	6682.4	208.11	6682.5	215.9	6682.6
223.69	6682.7	231.48	6682.8	239.16	6682.9	246.41	6682.99	247.06	6683
255.57	6683.1	264.09	6683.2	272.6	6683.3	281.11	6683.4	289.63	6683.5
298.51	6683.6	307.57	6683.7	316.89	6683.8	341.62	6683.8	374.98	6683.7
380.77	6683.6	386.56	6683.5	391.81	6683.4	396.68	6683.3	401.55	6683.2
406.43	6683.1	411.3	6683	416.1	6682.9	420.9	6682.8	425.71	6682.7
430.51	6682.6	435.31	6682.5	440.11	6682.4	444.92	6682.3	449.72	6682.2
454.52	6682.1	462.43	6682.1	477.69	6682.2	500	6682.27	509.57	6682.3
528.87	6682.4	546.41	6682.4						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	246.41	.06	546.41	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
246.41	546.41	151.09	151.09	.1	.3

Left Levee Station= 341.71 Elevation= 6683.81

CROSS SECTION

RIVER: MS-06
REACH: 2nd Culvert RS: 983

INPUT
Description:
Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-35.67	6742.4	-31.58	6742.4	-27.43	6742.3	-23.28	6742.2	-19.13	6742.1
-14.99	6742	-10.84	6741.9	-6.69	6741.8	1.33	6741.7	11.45	6741.6
12.55	6741.6	25.03	6741.5	27.15	6741.49	41.32	6741.4	58	6741.3
72.1	6741.3	88.54	6741.37	95.91	6741.4	117.28	6741.5	128.42	6741.6
139.57	6741.7	150.13	6741.8	160.25	6741.9	170.37	6742	180.49	6742.1
190.61	6742.2	200.73	6742.3	209.66	6742.4	218.4	6742.5	232.97	6742.6
245.15	6742.7	257.33	6742.8	264.33	6742.86	269.51	6742.9	270.29	6742.9
281.17	6742.93	307.43	6743	312.2	6743				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-35.67	.045	-35.67	.07	264.33	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-35.67	264.33	0	0	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1009

INPUT
Description:
Station Elevation Data num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6687.7	1.53	6687.7	4.32	6687.6	7.11	6687.5	9.9	6687.4
12.69	6687.3	15.61	6687.2	22.23	6687.1	28.85	6687	35.48	6686.9
42.1	6686.8	48.72	6686.7	55.34	6686.6	61.96	6686.5	68.58	6686.4
74.77	6686.3	78.33	6686.2	81.89	6686.1	85.44	6686	89.15	6685.9
92.85	6685.8	100.75	6685.7	108.64	6685.6	115.4	6685.5	122.16	6685.4
129.75	6685.3	141.75	6685.2	153.76	6685.1	165.77	6685	179.78	6684.9
265.9	6684.9	292.53	6685	326	6685.1	339.15	6685.2	350	6685.29
350.92	6685.3	363.1	6685.4	377.67	6685.5	391.06	6685.5	399.44	6685.4
407.83	6685.3	419.46	6685.3	422.05	6685.2	424.63	6685.1	427.21	6685
430.41	6684.9	433.62	6684.8	436.82	6684.7	440.02	6684.6	443.22	6684.5
446.42	6684.4	449.62	6684.3	452.83	6684.2	456.03	6684.1	459.23	6684
468.13	6683.9	477.95	6683.8	488.87	6683.7	511.75	6683.7	524.57	6683.8
536.72	6683.9	548.86	6684	555.96	6684.1	563.05	6684.2	571.24	6684.2
577.19	6684.1	583.14	6684	588.37	6683.9	593.39	6683.8	596.95	6683.7
600.51	6683.6	604.07	6683.5	607.64	6683.4	611.2	6683.3	614.76	6683.2
618.32	6683.1	621.88	6683	623.41	6682.9	626.55	6682.8	646.31	6682.7
647.86	6682.7	650	6682.73	655.75	6682.8	664.75	6682.9	670.28	6683

RIVER: MS-06
REACH: Downstream Ov RS: 1007

INPUT
Description:
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6679.7	4.66	6679.7	10.03	6679.6	15.4	6679.5	20.5	6679.4
25.51	6679.3	30.52	6679.2	35.53	6679.1	40.54	6679	45.55	6678.9
50.56	6678.8	55.57	6678.7	60.59	6678.6	78.1	6678.6	94.7	6678.7
138.7	6678.79	144.04	6678.8	148.99	6678.9	153.94	6679	158.89	6679.1
163.84	6679.2	168.79	6679.3	174.21	6679.4	180.26	6679.5	186.31	6679.6
192.36	6679.7	198.41	6679.8	204.46	6679.9	210.51	6680	219.05	6680.1
239.63	6680.2	256.64	6680.3	267.11	6680.4	283.42	6680.5	299.24	6680.53
330.57	6680.6	350.42	6680.63	368.32	6680.6	389.41	6680.5	410.25	6680.4
431.08	6680.3	462.01	6680.3	470.81	6680.2	508.76	6680.2	521.21	6680.3
531.2	6680.4	541.78	6680.5	556.34	6680.6	570.81	6680.7	585.27	6680.8
597.67	6680.8								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	299.24	.06	585.27	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
299.24	585.27	151.1	151.1	.1	.3

Left Levee Station= 349.58 Elevation= 6680.65

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1006

INPUT
Description:
Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6679.6	.94	6679.6	6.3	6679.5	11.67	6679.4	16.79	6679.3
21.8	6679.2	26.81	6679.1	31.82	6679	36.83	6678.9	41.84	6678.8
46.85	6678.7	51.86	6678.6	56.87	6678.5	68.72	6678.5	85.32	6678.6
101.93	6678.7	139.62	6678.7	148.23	6678.8	156.84	6678.9	165.45	6679
175.49	6679.1	185.54	6679.2	195.58	6679.3	207.97	6679.4	217.92	6679.4
239.94	6679.3	261.85	6679.2	279.27	6679.1	294.15	6679	302.68	6678.9
311.2	6678.8	319.73	6678.7	328.25	6678.6	336.78	6678.5	345.31	6678.4
350	6678.35	354.17	6678.3	364.76	6678.2	374.33	6678.1	383.66	6678
394.41	6677.9	405.17	6677.8	419.98	6677.7	431.66	6677.6	443.89	6677.5
456.29	6677.4	479.4	6677.4	496.23	6677.5	500	6677.51	550.69	6677.6
568.99	6677.7	584.13	6677.8	597.1	6677.9	617.33	6678	649.65	6678.1
650	6678.1	678.43	6678.2	708.48	6678.3	741.45	6678.4	754.77	6678.4

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.1	151.1	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1005

INPUT
Description:
Station Elevation Data num= 68

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6678.1	1.95	6678.1	4.67	6678	7.75	6677.9	10.83	6677.8
13.9	6677.7	16.88	6677.6	19.54	6677.5	22.2	6677.4	24.86	6677.3
27.52	6677.2	30.18	6677.1	32.84	6677	35.83	6676.9	38.82	6676.8
42.08	6676.7	45.74	6676.6	63.75	6676.5	72.09	6676.4	85.73	6676.3
105.42	6676.2	111.53	6676.1	117.65	6676	122.28	6675.9	126.92	6675.8
136.39	6675.8	151.36	6675.9	166.34	6676	291.18	6676	299.94	6675.9
308.69	6675.8	322.11	6675.7	346.62	6675.6	350	6675.58	363.62	6675.5
371.05	6675.4	378.47	6675.3	385.89	6675.2	393.31	6675.1	400.74	6675
408.16	6674.9	416.99	6674.8	425.96	6674.7	449.59	6674.6	501.71	6674.6
515.13	6674.7	529.31	6674.8	537.24	6674.9	545.17	6675	553.88	6675.1
562.98	6675.2	574.45	6675.3	584.6	6675.4	594.46	6675.5	604.31	6675.6
616.65	6675.7	629.35	6675.8	642.05	6675.9	650	6675.96	654.75	6676
671.07	6676.1	687.39	6676.2	703.71	6676.3	719.18	6676.4	737.54	6676.5
762.38	6676.6	828.12	6676.7	856.43	6676.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	302.19	302.19	.1	.3

Left Levee Station= 288.99 Elevation= 6676.02

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1003

INPUT
Description:
Station Elevation Data num= 103

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6668.5	13.99	6668.5	28.93	6668.4	45.3	6668.3	55.68	6668.3
66.32	6668.4	74.67	6668.5	82.89	6668.6	90.93	6668.7	99.07	6668.8
107.76	6668.9	116.45	6669	126.15	6669.1	139.02	6669.2	149.51	6669.3
160.01	6669.4	170.5	6669.5	191.35	6669.6	209.08	6669.7	225.98	6669.8
246.45	6669.9	262.26	6670	275.05	6670.1	283.18	6670.1	302.35	6670
316.78	6670	322.43	6670.1	328.08	6670.2	333.72	6670.3	339.37	6670.4
345.02	6670.5	350	6670.5	354.93	6670.5	363.73	6670.4	372.53	6670.3
381.32	6670.2	390.12	6670.1	399.83	6670	412.15	6669.9	425.56	6669.8
469.14	6669.7	492.32	6669.6	502.69	6669.6	508.9	6669.7	515.1	6669.8
521.31	6669.9	527.52	6670	536.61	6670.1	545.7	6670.2	554.79	6670.3
563.88	6670.4	571.78	6670.5	578.64	6670.6	585.5	6670.7	592.36	6670.8
599.22	6670.9	606.08	6671	613.31	6671.1	620.54	6671.2	627.76	6671.3
634.25	6671.4	640.67	6671.5	647.08	6671.6	650	6671.65	653.5	6671.7
659.91	6671.8	666.33	6671.9	672.74	6672	678.54	6672.1	684.43	6672.2
690.33	6672.3	696.22	6672.4	702.12	6672.5	708.02	6672.6	713.96	6672.7
720.08	6672.8	726.21	6672.9	732.34	6673	738.27	6673.1	744.21	6673.2
750.15	6673.3	756.11	6673.4	762.12	6673.5	768.13	6673.6	774.14	6673.7
780.15	6673.8	786.16	6673.9	792.22	6674	801.1	6674.1	809.99	6674.2
818.88	6674.3	827.99	6674.4	837.12	6674.5	846.24	6674.6	855.37	6674.7
863.96	6674.8	871.96	6674.9	879.95	6675	891.49	6675.1	905.62	6675.2
919.57	6675.3	933.6	6675.4	950.62	6675.4				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.1	151.1	.1	.3

Left Levee Station= 335.13 Elevation= 6671.1

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1002

INPUT
Description:
Station Elevation Data num= 86

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6668.3	11.22	6668.3	21.99	6668.2	31.71	6668.1	41.44	6668
52.06	6667.9	70.11	6667.9	79.15	6668	89.8	6668.1	100.96	6668.2
110.95	6668.3	120.83	6668.4	131.14	6668.5	141.54	6668.6	151.93	6668.7
163.32	6668.8	171.69	6668.9	180.06	6669	197.26	6669.1	238.31	6669.1
273.02	6669	287.25	6668.9	294.56	6668.8	301.57	6668.7	310.58	6668.6
319.77	6668.5	328.95	6668.4	338.14	6668.3	347.33	6668.2	350	6668.17
356.51	6668.1	370.61	6668	388.09	6667.9	396.43	6667.8	402.33	6667.7
408.23	6667.6	414.13	6667.5	420.02	6667.4	425.92	6667.3	451.27	6667.3
500	6667.39	506.57	6667.4	513.55	6667.5	520.53	6667.6	527.51	6667.7
534.49	6667.8	541.47	6667.9	548.45	6668	555.22	6668.1	565.16	6668.2
574.02	6668.3	584.95	6668.4	598.02	6668.5	610.41	6668.6	623.23	6668.7
636.13	6668.8	650	6668.9	650.7	6668.9	666.36	6669	679.04	6669.1
691.1	6669.2	703.47	6669.3	715.84	6669.4	732.85	6669.5	750.32	6669.6
767.38	6669.7	783.79	6669.8	800.26	6669.9	812.97	6670	820.48	6670.1
827.02	6670.2	833.24	6670.3	839.47	6670.4	845.69	6670.5	851.91	6670.6
858.14	6670.7	864.36	6670.8	870.58	6670.9	876.81	6671	889	6671.1
903.7	6671.2	915.69	6671.3	927.67	6671.4	939.66	6671.5	957.86	6671.6
999.41	6671.6								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.09	151.09	.1	.3

Left Levee Station= 202.29 Elevation= 6669.13

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1001

INPUT
Description:
Station Elevation Data num= 66

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6668	2.94	6668	9.53	6667.9	16.11	6667.8	22.7	6667.7
29.28	6667.6	41.95	6667.5	56.2	6667.4	70.44	6667.3	84.69	6667.2
98.94	6667.1	119.84	6667.1	129.23	6667.2	138.61	6667.3	148	6667.4
157.38	6667.5	166.77	6667.6	176.16	6667.7	261.62	6667.7	266.64	6667.6
271.65	6667.5	276.67	6667.4	281.69	6667.3	286.7	6667.2	291.72	6667.1
296.73	6667	301.78	6666.9	306.83	6666.8	311.87	6666.7	316.92	6666.6
322.38	6666.5	327.98	6666.4	336.09	6666.3	341.97	6666.2	347.31	6666.1
350	6666.05	352.65	6666	362.5	6665.9	372.34	6665.8	382.18	6665.7
392.02	6665.6	401.87	6665.5	493.99	6665.5	500	6665.52	528.71	6665.6
556.36	6665.7	579.05	6665.8	604.1	6665.9	624.45	6666	643.46	6666.1
650	6666.13	662.79	6666.2	681.11	6666.3	700.1	6666.4	718.82	6666.4
758.83	6666.5	784.81	6666.5	789.15	6666.6	796.15	6666.7	804.53	6666.8
812.92	6666.9	821.3	6667	831.24	6667.1	841.18	6667.2	845.91	6667.25
1000	6667.25								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.1	151.1	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Downstream Ov RS: 1000

INPUT
Description:
Station Elevation Data num= 63

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6663.9	1.31	6663.9	13.03	6663.8	24.74	6663.7	36.46	6663.6
48.22	6663.5	59.96	6663.4	93.57	6663.4	133.36	6663.5	145.03	6663.6
149.81	6663.7	154.59	6663.8	159.37	6663.9	164.15	6664	169.15	6664.1
174.15	6664.2	179.15	6664.3	184.15	6664.4	189.15	6664.5	194.15	6664.6
199.34	6664.7	205.01	6664.8	210.69	6664.9	220.32	6665	297.84	6665
306.8	6664.9	315.76	6664.8	324.01	6664.7	328.77	6664.6	333.53	6664.5
338.29	6664.4	343.05	6664.3	347.8	6664.2	350	6664.15	352.56	6664.1
357.32	6664	360.97	6663.9	364.63	6663.8	368.11	6663.8	383.73	6663.9
399.35	6664	442.77	6664.1	457.83	6664.1	500	6664	510.45	6664.1
520.9	6664.2	531.34	6664.3	541.79	6664.4	552.24	6664.5	562.69	6664.6
573.14	6664.7	583.58	6664.8	594.03	6664.9	604.48	6665	614.93	6665.1
625.38	6665.2	635.83	6665.3	646.27	6665.4	650	6665.44	656.72	6665.5
667.17	6665.6	673.87	6665.66	1000	6665.66				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	0	0	0	.1	.3

Left Levee Station= 220.42 Elevation= 6665

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0-2 RS: 1007

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6740.6	27.12	6740.6	66.08	6740.5	80.46	6740.47	122.02	6740.4
169.54	6740.3	177.5	6740.2	185.46	6740.1	193.42	6740	271.01	6740
305.83	6740.1	335.43	6740.2	348.9	6740.3	358.89	6740.4	367.68	6740.5
376.96	6740.6	380.46	6740.63	388.54	6740.7	400.13	6740.8	411.71	6740.9
417.66	6740.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	80.46	.07	380.46	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
80.46	380.46	89.62	89.62	89.62	.1	.3

LATERAL STRUCTURE

RIVER: MS-06
REACH: Main Channel-0-2   RS: 1006.8

INPUT
Description:
Lateral structure position   = Right overbank
Distance from Upstream XS =
Deck/Roadway Width   =   10
Weir Coefficient   =   .4
Weir Flow Reference   = Water Surface
 Weir Embankment Coordinates   num =   128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6740.3	3	6740.3	9.52	6740.2	16.05	6740.1	22.57	6740
26.53	6739.94	29.13	6739.9	35.74	6739.8	42.35	6739.7	48.97	6739.6
53.74	6739.5	57.97	6739.4	62.69	6739.3	70.01	6739.2	77.33	6739.1
84.23	6739	89.02	6738.9	93.81	6738.8	98.6	6738.7	103.4	6738.6
107.92	6738.6	142.95	6738.6	155.98	6738.6	165.44	6738.5	174.91	6738.4
183.53	6738.3	191.57	6738.2	199.61	6738.1	207.65	6738	215.68	6737.9
223.72	6737.8	234.37	6737.7	243.96	6737.6	252.63	6737.5	260.61	6737.41
261.29	6737.4	269.74	6737.3	278.2	6737.2	286.65	6737.1	294.78	6737
300.4	6736.92	301.45	6736.9	310.43	6736.8	319.56	6736.7	328.69	6736.6
337.72	6736.5	345.89	6736.4	354.07	6736.3	362.25	6736.2	370.42	6736.1
378.26	6736	383.93	6735.9	389.61	6735.8	395.29	6735.7	400.97	6735.6
406.65	6735.5	411.32	6735.41	412.06	6735.4	417.38	6735.3	422.69	6735.2
428	6735.1	433.32	6735	437.98	6734.9	442.6	6734.8	447.22	6734.7
451.84	6734.6	456.47	6734.5	461.09	6734.4	465.71	6734.3	470.33	6734.2
475.69	6734.1	487.08	6734	491.34	6733.9	495.76	6733.8	500.17	6733.7
504.38	6733.6	508.6	6733.5	512.82	6733.4	517.04	6733.3	519.2	6733.25
521.19	6733.2	525.26	6733.1	529.32	6733	534.13	6732.9	538.93	6732.8
543.29	6732.7	547.63	6732.6	551.98	6732.5	556.32	6732.4	560.67	6732.3
565.01	6732.2	569.36	6732.1	573.7	6732	578.5	6731.9	583.3	6731.8
588.1	6731.7	592.9	6731.6	598.97	6731.5	605.6	6731.4	612.24	6731.3
618.87	6731.2	625.51	6731.1	630.91	6731	633.97	6730.95	636.49	6730.9
642.1	6730.8	647.7	6730.7	653.13	6730.6	658.56	6730.5	663.99	6730.4
669.42	6730.3	674.85	6730.2	680.28	6730.1	685.71	6730	690.15	6729.9
694.59	6729.8	699.04	6729.7	703.48	6729.6	707.58	6729.5	711.69	6729.4
715.8	6729.3	719.9	6729.2	724.38	6729.1	730.14	6729	734.15	6728.9
738.15	6728.8	742.15	6728.7	746.16	6728.6				

Weir crest shape   = Broad Crested

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0-2   RS: 1006

INPUT

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6736.1	2.75	6736.1	7.86	6736	13.23	6735.9	18.6	6735.8
23.97	6735.7	29.34	6735.6	34.71	6735.5	39.24	6735.4	43.35	6735.3
47.46	6735.2	51.57	6735.1	56.91	6735	63.89	6734.9	70.87	6734.8
77.85	6734.7	84.83	6734.6	91.81	6734.5	98.39	6734.4	100	6734.37
103.98	6734.3	109.57	6734.2	124.57	6734.2	137.88	6734.3	151.18	6734.4
171.67	6734.4	192.11	6734.3	212.42	6734.2	236.6	6734.1	250	6734.01
252.14	6734	266.66	6733.9	281.18	6733.8	290.02	6733.8	294.75	6733.9
299.48	6734	304.93	6734.1	311.71	6734.2	318.48	6734.3	325.26	6734.4
332.04	6734.5	338.82	6734.6	345.59	6734.7	353.19	6734.8	368.68	6734.9
381.18	6735	393.68	6735.1	400	6735.15	406.18	6735.2	418.68	6735.3
442.09	6735.3								

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	100	.07	400	.07

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
          100   400   137.83 137.83 137.83   .1   .3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0-2   RS: 1003

INPUT
Description:
Station Elevation Data   num=   72

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6735.9	1.65	6735.9	6.25	6735.8	12	6735.7	17.88	6735.6
23.75	6735.5	29.63	6735.4	35.51	6735.3	41.39	6735.2	47	6735.1
52.56	6735	57.11	6734.9	61.67	6734.8	66.22	6734.7	70.63	6734.6
75.01	6734.5	79.38	6734.4	83.75	6734.3	88.13	6734.2	92.5	6734.1
96.87	6734	100	6733.93	101.22	6733.9	105.6	6733.8	109.98	6733.7
114.36	6733.6	118.73	6733.5	123.11	6733.4	127.48	6733.3	131.85	6733.2
136.65	6733.1	141.68	6733	147.29	6732.9	152.9	6732.8	158.51	6732.7
164.12	6732.6	169.73	6732.5	175.34	6732.4	180.96	6732.3	183.73	6732.25
186.57	6732.2	192.18	6732.1	197.79	6732	203.4	6731.9	209.01	6731.8
214.63	6731.7	220.24	6731.6	225.85	6731.5	231.46	6731.4	237.07	6731.3
242.07	6731.2	245.2	6731.1	248.32	6731	250	6730.95	251.45	6730.9
255.18	6730.8	260.95	6730.8	274.1	6730.9	285.82	6731	294.9	6731.1
303.98	6731.2	313.44	6731.3	324.46	6731.4	334.52	6731.5	344.26	6731.6
355.12	6731.7	366.94	6731.8	378.77	6731.9	389.8	6732	398.86	6732.1
400	6732.1	419.19	6732.1						

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	183.73	.07	400	.07

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
        183.73   400   137.82 137.82 137.82   .1   .3

Description:
Station Elevation Data   num=   20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6739.6	56.47	6739.6	93.48	6739.5	100	6739.47	118.69	6739.4
150.99	6739.4	162	6739.5	200.32	6739.5	215.14	6739.4	245.2	6739.3
250	6739.29	281.74	6739.2	297.89	6739.1	314.04	6739	333.13	6739
349.83	6738.9	366.79	6738.8	385.08	6738.7	400	6738.7	403.54	6738.7

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	100	.045	400	.045

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
          100   400   137.83 137.83 137.83   .1   .3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0-2   RS: 1005

INPUT
Description:
Station Elevation Data   num=   36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6736.8	11.35	6736.8	33.93	6736.7	54.96	6736.6	100	6736.6
114.89	6736.6	120.98	6736.7	127.08	6736.8	133.17	6736.9	139.27	6737
145.37	6737.1	151.46	6737.2	157.56	6737.3	163.66	6737.4	169.39	6737.5
174.66	6737.6	179.68	6737.6	193.37	6737.5	209.21	6737.4	225.06	6737.3
240.85	6737.2	250	6737.12	251.92	6737.1	260.88	6737	269.85	6736.9
278.82	6736.8	287.78	6736.7	311.56	6736.7	324.47	6736.8	337.38	6736.9
350.28	6737	364.57	6737.1	379.76	6737.2	399.54	6737.3	400	6737.3
440.24	6737.3								

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	100	.045	400	.045

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
          100   400   137.83 137.83 137.83   .1   .3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0-2   RS: 1004

INPUT
Description:
Station Elevation Data   num=   51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0-2   RS: 1002

INPUT
Description:
Station Elevation Data   num=   60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6732.9	59.01	6732.9	63.4	6732.8	67.7	6732.7	72	6732.6
76.29	6732.5	80.58	6732.4	84.88	6732.3	89.17	6732.2	93.47	6732.1
97.76	6732	100	6731.95	102	6731.9	106.24	6731.8	110.48	6731.7
114.71	6731.6	118.95	6731.5	123.19	6731.4	127.43	6731.3	131.66	6731.2
135.9	6731.1	140.14	6731	144.38	6730.9	148.62	6730.8	152.85	6730.7
157.09	6730.6	161.33	6730.5	165.57	6730.4	169.81	6730.3	176.46	6730.2
180.88	6730.1	182.52	6730	185.16	6729.9	187.8	6729.8	190.44	6729.7
193.08	6729.6	198.01	6729.5	201.28	6729.4	204.55	6729.3	207.58	6729.3
257.24	6729.3	267.54	6729.4	299.25	6729.4	305.18	6729.5	311.11	6729.6
317.04	6729.7	322.97	6729.8	328.9	6729.9	334.83	6730	341	6730.1
347.18	6730.2	353.36	6730.3	359.98	6730.4	370.63	6730.5	378.65	6730.6
386.63	6730.7	394.57	6730.8	400	6730.87	402.52	6730.9	411.78	6730.9

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	207.58	.07	400	.07

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
        207.58   400   137.83 137.83 137.83   .1   .3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0-2   RS: 1001

INPUT
Description:
Station Elevation Data   num=   114

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6730.4	8.37	6730.4	10.94	6730.41	10.94	6730.9	12.27	6730.9
51.29	6730.8	92.85	6730.8	100	6730.74	104.76	6730.7	112.59	6730.6
119.53	6730.5	125.92	6730.4	132.31	6730.3	140.04	6730.2	148.78	6730.1
152.99	6730	155.29	6729.9	157.6	6729.8	159.9	6729.7	162.2	6729.6
164.51	6729.5	167.12	6729.4	169.72	6729.3	172.32	6729.2	174.93	6729.1
177.53	6729	180.13	6728.9	182.74	6728.8	185.34	6728.7	187.95	6728.6
190.55	6728.5	193.15	6728.4	195.76	6728.3	198.36	6728.2	200.96	6728.1
203.56	6728	205.29	6727.9	207.01	6727.8	208.74	6727.7	210.46	6727.6
212.19	6727.5	213.92	6727.4	215.64	6727.3	217.37	6727.2	219.09	6727.1
220.82	6727	221.54	6726.9	222.26	6726.8	222.99	6726.7	223.71	6726.6

224.43	6726.5	225.15	6726.4	225.87	6726.3	226.59	6726.2	227.3	6726.1
227.99	6726	228.75	6725.9	229.47	6725.8	230.19	6725.7	230.91	6725.6
231.62	6725.5	232.34	6725.4	233.06	6725.3	233.77	6725.2	234.49	6725.1
235.2	6725	236.17	6725	238.14	6725.1	240.12	6725.2	242.09	6725.3
244.07	6725.4	246.04	6725.5	246.9	6725.7	248.21	6725.6	250	6725.67
250.64	6725.7	253.08	6725.8	255.51	6725.9	257.94	6726	261.04	6726.1
264.14	6726.2	267.24	6726.3	270.34	6726.4	273.44	6726.5	276.54	6726.6
279.62	6726.7	282.69	6726.8	285.77	6726.9	288.85	6727	291.99	6727.1
295.14	6727.2	298.28	6727.3	301.43	6727.4	305.5	6727.5	307.96	6727.6
310.99	6727.6	316.48	6727.7	321.97	6727.8	327.46	6727.9	332.95	6728
339.34	6728.1	345.74	6728.2	352.14	6728.3	358.53	6728.4	364.56	6728.5
369.8	6728.6	375.04	6728.7	380.29	6728.8	385.53	6728.9	390.77	6729
396.51	6729.1	400	6729.16	402.24	6729.2	408.22	6729.2		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	100	.045	400	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	400	137.83	137.83	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0-2 RS: 1000

INPUT
Description:
Station Elevation Data num= 152

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6727.1	4.69	6727.1	4.69	6730.1	5.7	6730.1	13.18	6730.2
18.07	6730.2	22.54	6730.1	27.01	6730	31.49	6729.9	34.42	6729.8
34.88	6729.7	35.33	6729.6	35.78	6729.5	36.24	6729.4	36.69	6729.3
37.14	6729.2	37.59	6729.1	38.05	6729	38.5	6728.9	38.97	6728.8
39.45	6728.7	39.93	6728.6	40.41	6728.5	40.89	6728.4	41.36	6728.3
41.84	6728.2	42.32	6728.1	42.8	6728	43.28	6727.9	43.79	6727.8
44.3	6727.7	44.82	6727.6	45.33	6727.5	45.84	6727.4	46.33	6727.3
46.82	6727.2	47.31	6727.1	47.79	6727	48.28	6726.9	48.76	6726.8
49.25	6726.7	49.73	6726.6	50.22	6726.5	50.43	6727.2	50.71	6726.4
51.19	6726.3	51.68	6726.2	52.16	6726.1	52.65	6726	52.98	6726
53.32	6726.1	53.66	6726.2	54	6726.3	54.34	6726.4	54.53	6726.6
54.68	6726.5	55.02	6726.6	55.35	6726.7	55.69	6726.8	56.03	6726.9
56.37	6727	56.71	6727.1	57.05	6727.3	57.39	6727.3	57.73	6727.4
58.07	6727.5	58.4	6727.6	58.74	6727.7	59.08	6727.8	59.42	6727.9
65.68	6727.91	107.18	6728	130.7	6728	138.42	6727.9	146.14	6727.8
153.16	6727.7	158.14	6727.6	163.12	6727.5	168.1	6727.4	173.08	6727.3
178.06	6727.2	183.04	6727.1	188.02	6727	190.42	6726.9	192.82	6726.8
195.21	6726.7	197.61	6726.6	200.01	6726.5	202.41	6726.4	204.81	6726.3
207.1	6726.2	209.34	6726.1	211.57	6726	213.81	6725.9	216.05	6725.8
218.28	6725.7	220.52	6725.6	222.75	6725.5	224.99	6725.4	227.22	6725.3
229.46	6725.2	231.7	6725.1	233.94	6725	235.84	6724.9	237.75	6724.8
239.65	6724.7	241.56	6724.6	243.46	6724.5	245.37	6724.4	247.27	6724.3
249.18	6724.2	249.5	6724.2	250	6724.22	252.27	6724.3	255.04	6724.4
257.81	6724.5	260.53	6724.6	263.21	6724.7	265.89	6724.8	268.57	6724.9
271.26	6725	273.96	6725.1	276.66	6725.2	279.37	6725.3	282.07	6725.4
284.77	6725.5	287.48	6725.6	290.18	6725.7	292.88	6725.8	295.59	6725.9
298.29	6726	301.26	6726.1	304.22	6726.2	307.19	6726.3	310.16	6726.4
313.12	6726.5	316.09	6726.6	319.06	6726.7	322.03	6726.8	325	6726.9
327.98	6727	331.68	6727.1	335.38	6727.2	339.08	6727.3	342.78	6727.4
346.47	6727.5	350.03	6727.6	353.6	6727.7	357.16	6727.8	360.73	6727.9
364.29	6728	365.68	6728						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	65.68	.045	365.68	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
65.68	365.68	0	0	.1	.3

Left Levee Station= 130.04 Elevation= 6728.04

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 6421.55

INPUT
Description:
Station Elevation Data num= 146

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6727.8	15.19	6727.8	21.62	6727.7	28.04	6727.6	34.21	6727.5
39.95	6727.4	45.69	6727.3	51.44	6727.2	57.18	6727.1	62.92	6727
65.72	6726.9	68.53	6726.8	71.24	6726.7	71.33	6726.7	74.13	6726.6
76.94	6726.5	79.74	6726.4	82.54	6726.3	85.38	6726.2	88.46	6726.1
91.55	6726	93.45	6725.9	95.35	6725.8	97.25	6725.7	99.14	6725.6
101.04	6725.5	102.94	6725.4	104.84	6725.3	106.74	6725.2	108.64	6725.1
110.54	6725	112.43	6724.9	114.33	6724.8	116.23	6724.7	118.13	6724.6
120.03	6724.5	121.93	6724.4	123.82	6724.3	125.72	6724.2	127.62	6724.1
129.52	6724	131.52	6723.9	133.6	6723.8	135.68	6723.7	137.77	6723.6
139.85	6723.5	141.93	6723.4	144.02	6723.3	146.1	6723.2	148.18	6723.1
150.27	6723	154.9	6722.9	176.56	6722.9	184.66	6722.8	190.99	6722.7
197.35	6722.6	207.07	6722.5	215.38	6722.4	215.78	6722.3	216.18	6722.2
216.59	6722.1	216.99	6722	217.39	6721.9	217.8	6721.8	218.2	6721.7
218.54	6721.62	218.6	6721.6	219.01	6721.5	221.24	6721.44	223.01	6721.4
223.51	6721.4	223.93	6721.5	224.36	6721.6	224.78	6721.7	225.21	6721.8
225.63	6721.9	226.06	6722	226.48	6722.1	226.91	6722.2	227.33	6722.3
232.61	6722.4	247.63	6722.5	250.32	6722.6	250.89	6723.1	251.25	6722.8
252.02	6722.9	253.04	6723	254.15	6723.1	255.24	6723.2	255.6	6723.5
256.33	6723.3	257.42	6723.4	258.51	6723.5	259.6	6723.6	260.69	6723.7
261.78	6723.8	262.88	6723.9	263.97	6724	265.06	6724.1	266.15	6724.2
267.24	6724.3	268.33	6724.4	268.36	6724.4	270.59	6724.5	270.97	6724.8
272.24	6724.7	272.89	6724.6	275.19	6724.7	277.49	6724.8	279.8	6724.9
280.81	6725.2	282.1	6725	284.4	6725.1	292.8	6725.2	302.67	6725.3
318.99	6725.2	320.48	6725.4	326.4	6725.3	326.55	6725.2	327.18	6725.3
327.81	6725.4	328.24	6726.2	328.44	6725.5	329.07	6725.6	329.7	6725.7
330.32	6725.8	330.95	6725.9	331.58	6726	331.64	6726.1	332.21	6726.1
332.84	6726.2	333.47	6726.3	334.1	6726.4	341.11	6726.5	342.8	6726.6
347.77	6726.6	352.46	6726.8	353.68	6726.7	359.58	6726.8	364	6726.9
367.48	6727.1	368.19	6727	371.24	6727.06	373.41	6727.1	378.63	6727.2
383.37	6727.2								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	71.24	.025	371.24	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
71.24	371.24	100.88	100.88	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 6320.67

INPUT
Description:
Station Elevation Data num= 182

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6727.9	7.06	6727.9	30.8	6727.8	52.38	6727.7	58.38	6727.6
64.37	6727.5	70.36	6727.4	76.35	6727.3	82.34	6727.2	88.34	6727.1
96.44	6727	100.86	6726.9	105.27	6726.8	109.69	6726.7	114.1	6726.6
115.13	6726.6	118.52	6726.5	122.94	6726.4	126.47	6726.4	127.35	6726.3
128.44	6726.28	131.81	6726.2	136.41	6726.1	140.41	6726.1	140.97	6726
143.72	6725.9	146.47	6725.8	149.22	6725.7	151.97	6725.6	154.72	6725.5
157.47	6725.4	160.22	6725.3	162.97	6725.2	165.72	6725.1	168.47	6725
171.21	6724.9	173.96	6724.8	176.71	6724.7	179.46	6724.6	182.21	6724.5
184.96	6724.4	187.71	6724.3	190.46	6724.2	193.21	6724.1	196.04	6724
197.39	6723.9	198.74	6723.8	200.09	6723.7	201.44	6723.6	202.79	6723.5
204.14	6723.4	205.49	6723.3	206.84	6723.2	207.61	6723.2	208.21	6723.1
209.92	6723	211.81	6722.9	213.69	6722.8	215.58	6722.7	217.47	6722.6
219.36	6722.5	221.25	6722.4	223.14	6722.3	224.1	6722.5	225.02	6722.2
226.91	6722.1	228.8	6722	230.76	6721.9	232.88	6721.8	235	6721.7
237.12	6721.6	239.12	6721.5	240.55	6721.6	240.6	6721.4	242.08	6721.3
243.55	6721.2	245.03	6721.1	246.51	6721	247.62	6720.9	248.53	6720.8
249.44	6720.7	250.34	6720.6	251.25	6720.5	252.16	6720.4	254.21	6720.3
256.28	6720.3	274.85	6720.2	296.5	6720.2	300.72	6720.3	301.89	6720.4
303.06	6720.5	304.23	6720.6	305.4	6720.7	306.57	6720.8	307.74	6720.9
308.91	6721	310.08	6721.1	311.24	6721.2	312.41	6721.3	313.58	6721.4
314.75	6721.5	315.5	6721.7	315.92	6721.6	317.09	6721.7	318.21	6721.8
319.07	6721.9	319.94	6722	320.43	6722.5	320.8	6722.1	321.67	6722.2
322.53	6722.3	323.4	6722.4	324.26	6722.5	324.52	6722.9	325.13	6722.6
325.99	6722.7	326.86	6722.8	327.72	6722.9	328.59	6723	330.42	6723.1
332.38	6723.2	334.34	6723.3	336.31	6723.4	338.27	6723.5	339.92	6723.8
340.23	6723.6	342.19	6723.7	344.16	6723.8	345.68	6723.9	347.16	6724
348.85	6724.1	354.44	6724.2	360.02	6724.3	362.65	6724.8	365.23	6724.4
365.31	6724.7	365.56	6724.5	365.89	6724.6	366.23	6724.7	366.56	6724.8
366.89	6724.9	367.22	6725	367.56	6725.1	367.89	6725.2	368.05	6726.3
368.22	6725.3	368.56	6725.4	368.88	6725.5	369.2	6725.6	369.53	6725.7
369.85	6725.8	370.17	6725.9	370.49	6726	370.81	6726.1	371.13	6726.2
371.45	6726.3	372.56	6726.4	374.76	6726.5	376.96	6726.6	379.17	6726.7
381.37	6726.8	383.58	6726.9	385.86	6727	389.02	6727.1	392.18	6727.2
395.34	6727.3	396.84	6727.4	398.5	6727.4	401.66	6727.5	404.82	6727.6
407.98	6727.7	411.14	6727.8	414.3	6727.9	417.46	6728	420.62	6728.1
423.78	6728.2	426.94	6728.3	428.44	6728.34	430.29	6728.4	434.29	6728.5
438.29	6728.6	440.12	6728.6						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	128.44	.033	428.44	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
128.44	428.44	40.18	40.18	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 6280.5

INPUT
Description:
Station Elevation Data num= 223

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6727.7	20.09	6727.7	34.09	6727.6	40.11	6727.5	47.17	6727.4
53.85	6727.4	62.85	6727.3	78.54	6727.2	80.49	6727.2	86.39	6727.1
91.47	6727	96.55	6726.9	101.63	6726.8	113.63	6726.7	117.34	6726.7
123.01	6726.64	126.09	6726.6	135.21	6726.6	135.75	6726.5	136.58	6726.4
137.41	6726.3	137.93	6726.3	138.24	6726.2	139.07	6726.1	139.9	6726
140.73	6725.9	140.98	6725.9	141.56	6725.8	142.4	6725.7	143.23	6725.6
144.06	6725.5	144.89	6725.4	146.02	6725.3	146.15	6725.7	147.81	6725.4
148.91	6725.2	151.81	6725.1	154.71	6725	157.61	6724.9	160.51	6724.8
162.61	6724.8	163.41	6724.7	166.31	6724.6	169.21	6724.5	172.11	6724.4
175.01	6724.3	177.9	6724.2	184.88	6724.1	191.26	6724.1	191.74	6724.2
192.86	6724.2	196.86	6724.1	201.19	6724	204.53	6723.9	208.65	6723.8
211.55	6723.7	212.23	6723.8	237.66	6723.7	239.23	6723.4	239.71	6723.3
239.79	6723.4	239.83	6723.5	239.87	6723.6	239.9	6723.5	239.93	6723.4
239.96	6723.3	239.99	6723.2	240.02	6723.1	240.05	6723	240.08	6722.9
240.11	6722.8	240.14	6722.7	240.17	6722.6	240.19	6722.5	240.22	6722.4
240.25	6722.3	240.28	6722.2	240.31	6722.1	240.34	6723.2	240.37	6721.9
240.4	6721.8	240.43	6721.7	240.46	6721.6	240.49	6721.5	240.52	6721.4
240.66	6721.3	240.95	6721.2	241.25	6721.1	241.54	6721	242.43	6720.9
243.4	6720.8	244.37	6720.7	245.34	6720.6	246.31	6720.5	247.28	6720.4
248.25	6720.3	249.22	6720.2	250.19	6720.1	251.16	6720	252.14	6719.9

288.73	6719.9	289.96	6720	291.19	6720.1	292.42	6720.2	293.65	6720.3
294.88	6720.4	297.34	6720.6	298.42	6720.7	298.6	6720.8	298.74	6720.9
298.75	6721	298.77	6721.1	298.79	6721.2	298.8	6721.3	298.82	6721.4
298.83	6721.5	298.85	6721.6	298.87	6721.7	298.88	6721.8	298.9	6721.9
298.92	6724.6	298.93	6722.1	298.95	6722.2	298.96	6722.3	298.98	6722.4
299	6722.5	299.01	6722.6	299.03	6722.7	299.04	6722.8	299.06	6722.9
299.08	6723	299.09	6723.1	299.11	6723.2	299.12	6723.3	299.14	6723.4
299.16	6723.5	299.17	6723.6	299.19	6723.7	299.2	6723.8	299.22	6723.9
299.24	6724	299.25	6724.1	299.27	6724.2	299.29	6724.3	299.3	6724.4
299.32	6724.5	299.33	6724.6	299.38	6724.6	299.41	6724.5	299.43	6724.4
299.45	6724.3	300.33	6724.3	300.64	6724.5	302.53	6724.4	304.73	6724.5
306.93	6724.6	309.13	6724.7	311.32	6724.8	313.52	6724.9	315.72	6725
317.73	6725.1	317.92	6725.1	319.78	6725.5	320.12	6725.2	322.32	6725.3
324.52	6725.4	326.72	6725.5	326.94	6725.6	328.08	6725.9	328.91	6725.6
331.11	6725.7	333.42	6725.8	335.94	6725.9	338.46	6726	340.84	6726.1
341.29	6726.2	342.98	6726.2	345.12	6726.3	347.27	6726.4	349.41	6726.5
351.55	6726.6	352.64	6726.7	356.2	6726.7	356.55	6726.6	356.9	6726.5
357.24	6726.4	357.59	6726.3	357.94	6726.2	358.28	6726.1	358.63	6726
359.3	6726	361.74	6726.1	363.02	6726.3	364.18	6726.2	366.62	6726.3
369.06	6726.4	371.63	6726.5	374.25	6726.6	376.88	6726.7	379.51	6726.8
382.14	6726.9	384.77	6727	386.66	6727.1	388.73	6727.1	392.69	6727.2
396.65	6727.3	400.61	6727.4	404.57	6727.5	408.53	6727.6	412.51	6727.7
416.48	6727.8	417.22	6727.9	420.45	6727.9	423.01	6727.96	424.42	6728
428.63	6728.1	432.83	6728.2	437.03	6728.3	443.16	6728.4	448.71	6728.5
453.56	6728.6	458.42	6728.7	461.57	6728.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	123.01	.033	423.01	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

123.01	423.01	98.23	98.23	98.23	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	258.98	6723.78	F
286.2	461.57	6723.78	F

CULVERT

RIVER: MS-06
REACH: Main Channel-0 RS: 6228.06

INPUT
Description:
Distance from Upstream XS = 10
Deck/Roadway Width = 32
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 74

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-255.29	6732.1	0	-248.44	6732.1	0	-238.46	6732	0
-228.47	6731.9	0	-218.49	6731.8	0	-208.51	6731.7	0
-198.53	6731.6	0	-188.55	6731.5	0	-178.57	6731.4	0
-168.59	6731.3	0	-158.61	6731.2	0	-148.62	6731.1	0
-138.64	6731	0	-128.66	6730.9	0	-118.68	6730.8	0
-108.68	6730.7	0	-98.56	6730.6	0	-88.44	6730.5	0
-78.33	6730.4	0	-68.15	6730.3	0	-57.81	6730.2	0
-53.14	6730.15	0	-47.83	6730.1	0	-38.13	6730	0
-28.35	6729.9	0	-18.45	6729.8	0	-8.56	6729.7	0
1.34	6729.6	0	11.34	6729.5	0	21.44	6729.4	0
31.55	6729.3	0	41.65	6729.2	0	51.9	6729.1	0
62.22	6729	0	68.31	6728.94	0	72.15	6728.9	0
82.1	6728.8	0	92.05	6728.7	0	102.03	6728.6	0
112.01	6728.5	0	122	6728.4	0	135.47	6728.3	0
144.93	6728.24	0	151.67	6728.2	0	194.51	6728.2	0
209.58	6728.3	0	222.62	6728.4	0	232.68	6728.5	0
240.55	6728.58	0	242.81	6728.6	0	252.69	6728.7	0
262.58	6728.8	0	272.6	6728.9	0	282.71	6729	0
292.71	6729.1	0	302.72	6729.2	0	312.73	6729.3	0
322.74	6729.4	0	332.74	6729.5	0	342.75	6729.6	0
352.76	6729.7	0	362.77	6729.8	0	372.77	6729.9	0
382.78	6730	0	392.79	6730.1	0	402.8	6730.2	0
412.8	6730.3	0	422.81	6730.4	0	432.82	6730.5	0
442.83	6730.6	0	455.15	6730.7	0	468.49	6730.8	0
523.26	6730.8	0	524.73	6730.8	0			

Upstream Bridge Cross Section Data
Station Elevation Data num= 236

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6727.7	20.09	6727.7	34.09	6727.6	40.11	6727.5	47.17	6727.4
53.85	6727.4	62.85	6727.3	78.54	6727.2	80.49	6727.2	86.39	6727.1
91.47	6727	96.55	6726.9	101.63	6726.8	113.63	6726.7	117.34	6726.7
123.01	6726.64	126.09	6726.6	135.21	6726.6	135.75	6726.5	136.58	6726.4
137.41	6726.3	137.93	6726.3	138.24	6726.2	139.07	6726.1	139.9	6726
140.73	6725.9	140.98	6725.9	141.56	6725.8	142.4	6725.7	143.23	6725.6
144.06	6725.5	144.89	6725.4	146.02	6725.3	146.15	6725.7	147.81	6725.4
148.91	6725.2	151.81	6725.1	154.71	6725	157.61	6724.9	160.51	6724.8
162.61	6724.8	163.41	6724.7	166.31	6724.6	169.21	6724.5	172.11	6724.4
175.01	6724.3	177.9	6724.2	184.88	6724.1	191.26	6724.1	191.74	6724.2
192.86	6724.2	196.86	6724.1	201.19	6724	204.53	6723.9	205.42	6724.1
208.65	6723.8	210.15	6723.9	211.55	6723.7	212.23	6723.8	213.38	6723.7
215.21	6723.6	221.94	6723.5	222.52	6723.5	225.04	6723.4	227.8	6723.3
230.05	6723.6	230.55	6723.2	231.47	6723.3	234.06	6723.2	234.13	6723.1
237.66	6723.7	239.23	6723.4	239.71	6723.3	239.79	6723.4	239.83	6723.5
239.87	6723.6	239.9	6723.5	239.93	6723.4	239.96	6723.3	239.99	6723.2
240.02	6723.1	240.05	6723	240.08	6722.9	240.11	6722.8	240.14	6722.7
240.17	6722.6	240.19	6722.5	240.22	6722.4	240.25	6722.3	240.28	6722.2
240.31	6722.1	240.34	6723.2	240.37	6721.9	240.4	6721.8	240.43	6721.7
240.46	6721.6	240.49	6721.5	240.52	6721.4	240.66	6721.3	240.95	6721.2
241.25	6721.1	241.54	6721	242.43	6720.9	243.4	6720.8	244.37	6720.7
245.34	6720.6	246.31	6720.5	247.28	6720.4	248.25	6720.3	249.22	6720.2

250.19	6720.1	251.16	6720	252.14	6719.9	288.73	6719.9	289.96	6720
291.19	6720.1	292.42	6720.2	293.65	6720.3	294.88	6720.4	297.34	6720.6
298.42	6720.7	298.6	6720.8	298.74	6720.9	298.75	6721	298.77	6721.1
298.79	6721.2	298.8	6721.3	298.82	6721.4	298.83	6721.5	298.85	6721.6
298.87	6721.7	298.88	6721.8	298.9	6721.9	298.92	6724.6	298.93	6722.1
298.95	6722.2	298.96	6722.3	298.98	6722.4	299	6722.5	299.01	6722.6
299.03	6722.7	299.04	6722.8	299.06	6722.9	299.08	6723	299.09	6723.1
299.11	6723.2	299.12	6723.3	299.14	6723.4	299.16	6723.5	299.17	6723.6
299.19	6723.7	299.2	6723.8	299.22	6723.9	299.24	6724	299.25	6724.1
299.27	6724.2	299.29	6724.3	299.3	6724.4	299.32	6724.5	299.33	6724.6
299.38	6724.6	299.41	6724.5	299.43	6724.4	299.45	6724.3	300.33	6724.3
300.64	6724.5	302.53	6724.4	304.73	6724.5	306.93	6724.6	309.13	6724.7
311.32	6724.8	313.52	6724.9	315.72	6725	317.73	6725.1	317.92	6725.1
319.78	6725.5	320.12	6725.2	322.32	6725.3	324.52	6725.4	326.72	6725.5
326.94	6725.6	328.08	6725.9	328.91	6725.6	331.11	6725.7	333.42	6725.8
335.94	6725.9	338.46	6726	340.84	6726.1	341.29	6726.2	342.98	6726.2
345.12	6726.3	347.27	6726.4	349.41	6726.5	351.55	6726.6	352.64	6726.7
356.2	6726.7	356.55	6726.6	356.9	6726.5	357.24	6726.4	357.59	6726.3
357.94	6726.2	358.28	6726.1	358.63	6726	359.3	6726	361.74	6726.1
363.02	6726.3	364.18	6726.2	366.62	6726.3	369.06	6726.4	371.63	6726.5
374.25	6726.6	376.88	6726.7	379.51	6726.8	382.14	6726.9	384.77	6727
386.66	6727.1	388.73	6727.1	392.69	6727.2	396.65	6727.3	400.61	6727.4
404.57	6727.5	408.53	6727.6	412.51	6727.7	416.48	6727.8	417.22	6727.9
420.45	6727.9	423.01	6727.96	424.42	6728	428.63	6728.1	432.83	6728.2
437.03	6728.3	443.16	6728.4	448.71	6728.5	453.56	6728.6	458.42	6728.7
461.57	6728.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	123.01	.025	423.01	.045

Bank Sta: Left Right Coeff Contr. Expan.

123.01	423.01	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	258.98	6723.78	F
286.2	461.57	6723.78	F

Downstream Deck/Roadway Coordinates
num= 74

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-274.56	6732.1	0	-267.71	6732.1	0	-257.73	6732	0
-247.74	6731.9	0	-237.76	6731.8	0	-227.78	6731.7	0
-217.8	6731.6	0	-207.82	6731.5	0	-197.84	6731.4	0
-187.86	6731.3	0	-177.88	6731.2	0	-167.89	6731.1	0
-157.91	6731	0	-147.93	6730.9	0	-137.95	6730.8	0
-127.95	6730.7	0	-117.83	6730.6	0	-107.71	6730.5	0
-97.6	6730.4	0	-87.42	6730.3	0	-77.08	6730.2	0
-72.41	6730.15	0	-67.1	6730.1	0	-57.4	6730	0
-47.62	6729.9	0	-37.72	6729.8	0	-27.83	6729.7	0
-17.93	6729.6	0	-7.93	6729.5	0	2.17	6729.4	0

12.28	6729.3	0	22.38	6729.2	0	32.63	6729.1	0	
42.95	6729	0	49.04	6728.94	0	52.88	6728.9	0	
62.83	6728.8	0	72.78	6728.7	0	82.76	6728.6	0	
92.74	6728.5	0	102.73	6728.4	0	116.2	6728.3	0	
125.66	6728.24	0	132.4	6728.2	0	175.24	6728.2	0	
190.31	6728.3	0	203.35	6728.4	0	213.41	6728.5	0	
221.28	6728.58	0	223.54	6728.6	0	233.42	6728.7	0	
243.31	6728.8	0	253.33	6728.9	0	263.44	6729	0	
273.44	6729.1	0	283.45	6729.2	0	293.46	6729.3	0	
303.47	6729.4	0	313.47	6729.5	0	323.48	6729.6	0	
333.49	6729.7	0	343.5	6729.8	0	353.5	6729.9	0	
363.51	6730	0	373.52	6730.1	0	383.53	6730.2	0	
393.53	6730.3	0	403.54	6730.4	0	413.55	6730.5	0	
423.56	6730.6	0	435.88	6730.7	0	449.22	6730.8	0	
503.99	6730.8	0	505.46	6730.8	0				

Downstream Bridge Cross Section Data
Station Elevation Data num= 313

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6728.4	2.79	6728.4	12.53	6728.3	22.27	6728.2	25.56	6728.1
34.31	6728	43.05	6727.9	51.79	6727.8	74.15	6727.7	82.32	6727.6
90.49	6727.5	98.67	6727.4	103.73	6727.4	103.95	6727.4	114.02	6727.3
124.44	6727.2	125.11	6727.1	125.78	6727	126.45	6726.9	127.12	6726.8
127.79	6726.7	128.45	6726.6	129.12	6726.5	129.79	6726.4	130.46	6726.3
131.13	6726.2	131.8	6726.1	132.48	6726	133.23	6725.9	133.96	6725.8
134.57	6725.7	135.19	6725.6	135.79	6725.5	136.33	6725.4	136.86	6725.3
137.4	6725.2	137.93	6725.1	138.42	6725	138.9	6724.9	139.38	6724.8
139.86	6724.7	140.34	6724.6	140.81	6724.5	141.29	6724.4	141.95	6724.3
142.97	6724.2	143.99	6724.1	144.88	6724	145.55	6723.9	145.83	6723.9
146.28	6724	146.73	6724.1	147.19	6724.2	147.64	6724.3	148.09	6724.4
148.55	6724.5	149.01	6724.6	149.47	6724.7	149.93	6724.8	150.4	6724.9
150.86	6725	151.32	6725.1	151.78	6725.2	152.25	6725.3	152.71	6725.4
153.17	6725.5	153.63	6725.6	154.1	6725.7	154.56	6725.8	155.02	6725.9
155.48	6726	155.95	6726.1	156.41	6726.2	156.87	6726.3	157.33	6726.4
157.8	6726.5	158.26	6726.6	158.72	6726.7	159.18	6726.8	159.65	6726.9
160.11	6727	160.57	6727.1	161.03	6727.2	161.5	6727.3	161.96	6727.4
162.42	6727.5	162.88	6727.6	163.35	6727.7	166.36	6727.7	166.57	6727.6
166.77	6727.5	166.98	6727.4	167.19	6727.3	167.39	6727.2	167.6	6727.1
167.81	6727	168.01	6726.9	168.22	6726.8	168.43	6726.7	168.63	6726.6
168.84	6726.5	169.04	6726.4	169.23	6726.3	169.43	6726.2	169.62	6726.1
169.82	6726	170.02	6725.9	170.21	6725.8	170.41	6725.7	170.6	6725.6
170.8	6725.5	171	6725.4	171.19	6725.3	171.39	6725.2	171.58	6725.1
171.77	6725	171.96	6724.9	172.15	6724.8	172.34	6724.7	172.53	6724.6
172.72	6724.5	172.91	6724.4	173.11	6724.3	173.29	6724.2	173.48	6724.1
173.66	6724	173.85	6723.9	174.04	6723.8	174.22	6723.7	174.41	6723.6
174.67	6723.5	176.5	6723.4	178.33	6723.3	180.16	6723.2	181.96	6723.1
183.75	6723	185.55	6722.9	187.32	6722.8	189.08	6722.7	190.84	6722.6
191.78	6722.6	195.11	6722.7	198.44	6722.8	201.77	6722.9	205.1	6723
208.44	6723.1	218.27	6723.2	221.91	6723.3	225.54	6723.4	229.18	6723.5
229.68	6723.6	229.72	6723.7	229.75	6723.8	229.8	6723.9	229.84	6723.9
229.87	6723.8	229.9	6723.7	229.92	6723.6	229.95	6723.5	229.97	6723.4

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    230  6723.3  230.03  6723.2  230.05  6723.1  230.08    6723   230.1  6722.9
 230.13  6722.8  230.16  6722.7  230.18  6722.6  230.21  6722.5  230.23  6722.4
 230.26  6722.3  230.28  6722.2  230.31  6722.1  230.34    6722  230.36  6721.9
 230.39  6721.8  230.41  6721.7  230.44  6721.6  230.47  6721.5  230.49  6721.4
 230.52  6721.3  230.54  6721.2  230.57  6721.1   230.6    6721  230.62  6720.9
 230.65  6720.8  230.67  6720.7   230.7  6720.6  230.73  6720.5  230.75  6720.4
 230.78  6720.3   230.8  6720.2  230.83  6720.1  230.86    6720  230.88  6719.9
 231.09  6719.8  231.49  6719.7  232.81  6719.6  234.13  6719.5  235.45  6719.4
 236.77  6719.3  271.11  6719.3  272.55  6719.4  273.99  6719.5  275.43  6719.6
 276.87  6719.7  278.31  6719.8  279.76  6719.9   281.2    6720   282.1  6720.1
 282.42  6720.2  282.74  6720.3  282.97  6720.4     283  6720.5  283.04  6720.6
 283.07  6720.7   283.1  6720.8  283.14  6720.9  283.17    6721   283.2  6721.1
 283.24  6721.2  283.27  6721.3   283.3  6721.4  283.34  6721.5  283.37  6721.6
  283.4  6721.7  283.43  6721.8  283.47  6721.9   283.5    6722  283.53  6722.1
 283.57  6722.2   283.6  6722.3  283.63  6722.4  283.67  6722.5   283.7  6722.6
 283.73  6722.7  283.77  6722.8   283.8  6722.9  283.83    6723  283.92  6722.9
 283.98  6722.8  284.02  6722.7  286.31  6722.6  299.24  6722.5  302.38  6722.5
 303.09  6722.6  303.81  6722.7  304.52  6722.8   305.2  6722.9  305.87    6723
 306.53  6723.1   307.2  6723.2  307.86  6723.3  308.52  6723.4  309.19  6723.5
 309.85  6723.6  310.52  6723.7  311.18  6723.8  311.83  6723.9  312.47    6724
 313.11  6724.1  313.75  6724.2  314.39  6724.3  315.03  6724.4  315.67  6724.5
 316.31  6724.6  316.95  6724.7  317.59  6724.8  318.23  6724.9  318.87    6725
  319.5  6725.1  320.14  6725.2  320.78  6725.3  321.42  6725.4  322.06  6725.5
  322.7  6725.6  324.04  6725.7  327.79  6725.8  331.54  6725.9  335.29    6726
 338.59    6726  339.01  6725.9  339.42  6725.8  339.83  6725.7  340.25  6725.6
 340.66  6725.5  341.07  6725.4  341.49  6725.3   341.9  6725.2  343.19  6725.2
 345.54  6725.3   347.9  6725.4  350.26  6725.5  351.82  6725.6  353.33  6725.7
 354.85  6725.8  356.37  6725.9  357.89    6726  360.84  6726.1   363.8  6726.2
 366.75  6726.3  369.71  6726.4  375.23  6726.5  381.15  6726.6  387.07  6726.7
 392.98  6726.8   398.9  6726.9  403.73 6726.98  404.82    6727  413.08  6727.1
 424.25  6727.2   438.9  6727.3  449.55  6727.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045  174.41    .033  302.38    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
       174.41  302.38            .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  240.45 6723.23       F
  266.43  449.55 6723.29       F

Upstream Embankment side slope              =    6.67 horiz. to 1.0 vertical
Downstream Embankment side slope            =    6.67 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested
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Number of Culverts =  2

Culvert Name     Shape      Rise    Span
Culvert #1           Box       4      12
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
             13.02   79.33     .013     .013        0                   .5
      1
Upstream   Elevation =  6719.69
           Centerline Station =  265.87
Downstream Elevation =  6719.29
           Centerline Station =  246.65

Culvert Name     Shape      Rise    Span
Culvert #2           Box       4      12
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef
Exit Loss Coef
             13.35      78     .013     .013        0                   .5
      1
Upstream   Elevation =  6719.69
           Centerline Station =  279.82
Downstream Elevation =  6719.29
           Centerline Station =  260.59

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0     RS: 6182.26

INPUT
Description:
Station Elevation Data    num=     313
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6728.4    2.79  6728.4   12.53  6728.3   22.27  6728.2   25.56  6728.1
   34.31    6728   43.05  6727.9   51.79  6727.8   74.15  6727.7   82.32  6727.6
   90.49  6727.5   98.67  6727.4  103.73  6727.4  103.95  6727.4  114.02  6727.3
  124.44  6727.2  125.11  6727.1  125.78    6727  126.45  6726.9  127.12  6726.8
  127.79  6726.7  128.45  6726.6  129.12  6726.5  129.79  6726.4  130.46  6726.3
  131.13  6726.2   131.8  6726.1  132.48    6726  133.23  6725.9  133.96  6725.8
  134.57  6725.7  135.19  6725.6  135.79  6725.5  136.33  6725.4  136.86  6725.3
   137.4  6725.2  137.93  6725.1  138.42    6725   138.9  6724.9  139.38  6724.8
  139.86  6724.7  140.34  6724.6  140.81  6724.5  141.29  6724.4  141.95  6724.3
  142.97  6724.2  143.99  6724.1  144.88    6724  145.55  6723.9  145.83  6723.9
  146.28    6724  146.73  6724.1  147.19  6724.2  147.64  6724.3  148.09  6724.4
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  148.55  6724.5  149.01  6724.6  149.47  6724.7  149.93  6724.8   150.4  6724.9
  150.86    6725  151.32  6725.1  151.78  6725.2  152.25  6725.3  152.71  6725.4
  153.17  6725.5  153.63  6725.6   154.1  6725.7  154.56  6725.8  155.02  6725.9
  155.48    6726  155.95  6726.1  156.41  6726.2  156.87  6726.3  157.33  6726.4
   157.8  6726.5  158.26  6726.6  158.72  6726.7  159.18  6726.8  159.65  6726.9
  160.11    6727  160.57  6727.1  161.03  6727.2   161.5  6727.3  161.96  6727.4
  162.42  6727.5  162.88  6727.6  163.35  6727.7  166.36  6727.7  166.57  6727.6
  166.77  6727.5  166.98  6727.4  167.19  6727.3  167.39  6727.2   167.6  6727.1
  167.81    6727  168.01  6726.9  168.22  6726.8  168.43  6726.7  168.63  6726.6
  168.84  6726.5  169.04  6726.4  169.23  6726.3  169.43  6726.2  169.62  6726.1
  169.82    6726  170.02  6725.9  170.21  6725.8  170.41  6725.7   170.6  6725.6
   170.8  6725.5     171  6725.4  171.19  6725.3  171.39  6725.2  171.58  6725.1
  171.77    6725  171.96  6724.9  172.15  6724.8  172.34  6724.7  172.53  6724.6
  172.72  6724.5  172.91  6724.4  173.11  6724.3  173.29  6724.2  173.48  6724.1
  173.66    6724  173.85  6723.9  174.04  6723.8  174.22  6723.7  174.41  6723.6
  174.67  6723.5   176.5  6723.4  178.33  6723.3  180.16  6723.2  181.96  6723.1
  183.75    6723  185.55  6722.9  187.32  6722.8  189.08  6722.7  190.84  6722.6
  191.78  6722.6  195.11  6722.7  198.44  6722.8  201.77  6722.9   205.1    6723
  208.44  6723.1  218.27  6723.2  221.91  6723.3  225.54  6723.4  229.18  6723.5
  229.68  6723.6  229.72  6723.7  229.75  6723.8   229.8  6723.9  229.84  6723.9
  229.87  6723.8   229.9  6723.7  229.92  6723.6  229.95  6723.5  229.97  6723.4
     230  6723.3  230.03  6723.2  230.05  6723.1  230.08    6723   230.1  6722.9
 230.13  6722.8  230.16  6722.7  230.18  6722.6  230.21  6722.5  230.23  6722.4
 230.26  6722.3  230.28  6722.2  230.31  6722.1  230.34    6722  230.36  6721.9
 230.39  6721.8  230.41  6721.7  230.44  6721.6  230.47  6721.5  230.49  6721.4
 230.52  6721.3  230.54  6721.2  230.57  6721.1   230.6    6721  230.62  6720.9
 230.65  6720.8  230.67  6720.7   230.7  6720.6  230.73  6720.5  230.75  6720.4
 230.78  6720.3   230.8  6720.2  230.83  6720.1  230.86    6720  230.88  6719.9
 231.09  6719.8  231.49  6719.7  232.81  6719.6  234.13  6719.5  235.45  6719.4
 236.77  6719.3  271.11  6719.3  272.55  6719.4  273.99  6719.5  275.43  6719.6
 276.87  6719.7  278.31  6719.8  279.76  6719.9   281.2    6720   282.1  6720.1
 282.42  6720.2  282.74  6720.3  282.97  6720.4     283  6720.5  283.04  6720.6
 283.07  6720.7   283.1  6720.8  283.14  6720.9  283.17    6721   283.2  6721.1
 283.24  6721.2  283.27  6721.3   283.3  6721.4  283.34  6721.5  283.37  6721.6
  283.4  6721.7  283.43  6721.8  283.47  6721.9   283.5    6722  283.53  6722.1
 283.57  6722.2   283.6  6722.3  283.63  6722.4  283.67  6722.5   283.7  6722.6
 283.73  6722.7  283.77  6722.8   283.8  6722.9  283.83    6723  283.92  6722.9
 283.98  6722.8  284.02  6722.7  286.31  6722.6  299.24  6722.5  302.38  6722.5
 303.09  6722.6  303.81  6722.7  304.52  6722.8   305.2  6722.9  305.87    6723
 306.53  6723.1   307.2  6723.2  307.86  6723.3  308.52  6723.4  309.19  6723.5
 309.85  6723.6  310.52  6723.7  311.18  6723.8  311.83  6723.9  312.47    6724
 313.11  6724.1  313.75  6724.2  314.39  6724.3  315.03  6724.4  315.67  6724.5
 316.31  6724.6  316.95  6724.7  317.59  6724.8  318.23  6724.9  318.87    6725
  319.5  6725.1  320.14  6725.2  320.78  6725.3  321.42  6725.4  322.06  6725.5
  322.7  6725.6  324.04  6725.7  327.79  6725.8  331.54  6725.9  335.29    6726
 338.59    6726  339.01  6725.9  339.42  6725.8  339.83  6725.7  340.25  6725.6
 340.66  6725.5  341.07  6725.4  341.49  6725.3   341.9  6725.2  343.19  6725.2
 345.54  6725.3   347.9  6725.4  350.26  6725.5  351.82  6725.6  353.33  6725.7
 354.85  6725.8  356.37  6725.9  357.89    6726  360.84  6726.1   363.8  6726.2
 366.75  6726.3  369.71  6726.4  375.23  6726.5  381.15  6726.6  387.07  6726.7
 392.98  6726.8   398.9  6726.9  403.73 6726.98  404.82    6727  413.08  6727.1
```

```
  424.25  6727.2   438.9  6727.3  449.55  6727.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045  174.41    .033  302.38    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       174.41  302.38          250.19  250.19  250.19             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  240.45 6723.23       F
  266.43  449.55 6723.29       F

CROSS SECTION


RIVER: MS-06
REACH: Main Channel-0     RS: 5932.07

INPUT
Description:
Station Elevation Data    num=     118
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  6722.5   19.03  6722.5   34.09  6722.4   47.95  6722.3   71.53  6722.2
   80.22  6722.1   87.76    6722   96.14  6721.9  107.75  6721.8  119.76 6721.73
  124.07  6721.7  137.89  6721.6  145.46  6721.5  154.84  6721.4   166.1  6721.3
  178.34  6721.2  188.91  6721.1  199.09    6721  206.79  6720.9  209.82  6720.8
     211  6720.7  212.18  6720.6  213.35  6720.5  214.35  6720.4   215.3  6720.3
  216.25  6720.2  217.21  6720.1  218.17    6720  219.13  6719.9  220.09  6719.8
  221.05  6719.7  222.01  6719.6  222.97  6719.5  223.92  6719.4  224.88  6719.3
  225.84  6719.2   226.8  6719.1  227.76    6719  228.72  6718.9   233.9  6718.8
   243.3  6718.7   252.6  6718.6  261.87  6718.5   263.9  6718.4  264.31  6718.3
  264.71  6718.2  265.11  6718.1  265.51    6718  265.92  6717.9  266.32  6717.8
  266.72  6717.7  267.12  6717.6  267.52  6717.5  271.77  6717.5  272.17  6717.6
  272.58  6717.7  272.98  6717.8  273.39  6717.9  273.79    6718   274.2  6718.1
   274.6  6718.2  275.01  6718.3  275.42  6718.4  278.94  6718.5  290.05  6718.6
  301.17  6718.7   310.2  6718.8  310.79  6718.9  311.38    6719  311.98  6719.1
  312.57  6719.2  313.16  6719.3  313.76  6719.4  314.35  6719.5  314.94  6719.6
  315.54  6719.7  316.13  6719.8  316.73  6719.9  317.32    6720  317.91  6720.1
  318.51  6720.2  319.11  6720.3  319.72  6720.4  320.34  6720.5  320.95  6720.6
   321.6  6720.7  322.26  6720.8  322.92  6720.9  323.58    6721  324.25  6721.1
  324.91  6721.2  325.57  6721.3  326.23  6721.4   326.9  6721.5  327.56  6721.6
  328.23  6721.7  328.89  6721.8  329.56  6721.9  330.22    6722  334.87  6722.1
  340.12  6722.2  345.36  6722.3  350.61  6722.4  355.85  6722.5  364.73  6722.6
  370.38  6722.7  375.52  6722.8  380.66  6722.9   385.8    6723  392.78  6723.1
  401.17  6723.2  409.28  6723.3  417.39  6723.4  419.76 6723.42  427.86  6723.5
  444.77  6723.6  460.96  6723.7  472.11  6723.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .045  228.72    .033  310.2    .045
```

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
228.72 310.2 242.15 242.15 242.15 .1 .3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 5689.93

INPUT
Description:
Station Elevation Data num= 82

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6720.4	.93	6720.4	10.87	6720.3	20.81	6720.2	30.75	6720.1
40.7	6720	49.09	6719.9	57.47	6719.8	65.86	6719.7	75.14	6719.6
83.31	6719.54	88.95	6719.5	96.87	6719.4	110.73	6719.3	126.5	6719.2
142.45	6719.1	159.17	6719	173.36	6718.9	174.33	6718.8	175.31	6718.7
176.28	6718.6	177.25	6718.5	178.22	6718.4	179.19	6718.3	180.16	6718.2
181.13	6718.1	182.1	6718	183.51	6717.9	185.31	6717.8	187.11	6717.7
188.91	6717.6	190.71	6717.5	192.51	6717.4	199.19	6717.3	209.23	6717.2
219.27	6717.1	227.33	6717	227.73	6716.9	228.13	6716.8	228.53	6716.7
228.93	6716.6	229.33	6716.5	229.73	6716.4	230.13	6716.3	230.53	6716.2
230.93	6716.1	235.56	6716.1	235.96	6716.2	236.36	6716.3	236.76	6716.4
237.16	6716.5	237.56	6716.6	237.96	6716.7	238.36	6716.8	238.76	6716.9
239.16	6717	247.11	6717.1	257.07	6717.2	267.03	6717.3	273.89	6717.4
275.61	6717.5	277.33	6717.6	279.06	6717.7	280.78	6717.8	282.5	6717.9
284.22	6718	285.94	6718.1	287.66	6718.2	289.38	6718.3	290.79	6718.4
292.18	6718.5	312.26	6718.6	330.8	6718.7	366.83	6718.8	383.31	6718.86
396.47	6718.9	416.77	6719	424.72	6719.1	432.66	6719.2	440.61	6719.3
448.55	6719.4	449.46	6719.4						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	192.51	.033	273.89	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
192.51 273.89 191.89 191.89 191.89 .1 .3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 5498.04

INPUT
Description:
Station Elevation Data num= 74

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6717.9	6.96	6717.9	15.66	6717.8	24.36	6717.7	33.06	6717.6
41.77	6717.5	50.37	6717.4	50.47	6717.4	59.44	6717.3	68.41	6717.2
77.09	6717.1	83.93	6717	100.83	6716.98	192.01	6716.9	194.82	6716.8
197.63	6716.7	200.44	6716.6	203.2	6716.5	205.94	6716.4	208.68	6716.3
211.9	6716.2	221.83	6716.1	231.77	6716	241.7	6715.9	244.97	6715.8
245.37	6715.7	245.77	6715.6	246.17	6715.5	246.57	6715.4	246.97	6715.3
247.37	6715.2	247.77	6715.1	248.17	6715	248.57	6714.9	252.82	6714.9
253.22	6715	253.62	6715.1	254.02	6715.2	254.42	6715.3	254.82	6715.4
255.22	6715.5	255.62	6715.6	256.02	6715.7	256.42	6715.8	259.81	6715.9
269.88	6716	279.95	6716.1	290.02	6716.2	293.06	6716.3	295.94	6716.4
298.66	6716.5	301.38	6716.6	304.1	6716.7	306.82	6716.8	309.54	6716.9
317.07	6717	327.06	6717.1	337.22	6717.2	359.26	6717.3	362.2	6717.3
365.17	6717.2	367.82	6717.1	374.64	6717	384.5	6716.9	394.36	6716.8
400.83	6716.73	404.22	6716.7	414.07	6716.6	423.93	6716.5	433.79	6716.4
434.81	6716.4	434.81	6717.16	439.81	6717.2	454.81	6717.2		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	211.9	.033	290.02	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
211.9 290.02 180.12 180.12 180.12 .1 .3
Right Levee Station= 357.97 Elevation= 6717.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 5317.92

INPUT
Description:
Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6715.4	9.3	6715.4	17.63	6715.3	23.22	6715.2	28.8	6715.1
34.39	6715	41.27	6714.9	52.65	6714.8	64.23	6714.7	73.12	6714.62
75.89	6714.6	85.07	6714.6	226.15	6714.6	230.07	6714.5	230.47	6714.4
230.87	6714.3	231.27	6714.2	231.67	6714.1	232.08	6714	232.48	6713.9
232.88	6713.8	236.98	6713.8	237.38	6713.9	237.78	6714	238.18	6714.1
238.58	6714.2	238.98	6714.3	239.38	6714.4	239.78	6714.5	243.75	6714.6
268.93	6714.7	302.99	6714.8	309.01	6714.9	315.02	6715	320.77	6715.1
326.58	6715.2	333.53	6715.3	340.47	6715.4	347.42	6715.5	385.07	6715.56
408.46	6715.6	431.13	6715.6	438.84	6715.5	448.98	6715.5	451.38	6715.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	226.15	.033	243.75	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
226.15 243.75 155.33 155.33 155.33 .1 .3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 5162.59

INPUT
Description:
Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6720.5	1.13	6720.5	4.49	6720.4	7.85	6720.3	11.21	6720.2
14.58	6720.1	17.94	6720	21.3	6719.9	24.66	6719.8	28.02	6719.7
31.4	6719.6	34.81	6719.5	38.22	6719.4	41.63	6719.3	45.04	6719.2
48.44	6719.1	51.85	6719	56.31	6718.9	60.76	6718.8	65.22	6718.7
69.68	6718.6	74.1	6718.5	78.53	6718.4	82.95	6718.3	87.37	6718.2
91.8	6718.1	96.22	6718	100.69	6717.9	105.15	6717.8	109.61	6717.7
114.08	6717.6	118.54	6717.5	123.01	6717.4	127.44	6717.3	131.74	6717.2
136.04	6717.1	140.34	6717	144.64	6716.9	148.93	6716.8	153.23	6716.7
157.53	6716.6	161.83	6716.5	166.12	6716.4	170.42	6716.3	174.72	6716.2
179.02	6716.1	183.31	6716	188.23	6715.9	193.15	6715.8	198.07	6715.7
202.93	6715.6	207.77	6715.5	212.62	6715.4	217.47	6715.3	222.32	6715.2
227.17	6715.1	232.02	6715	237.29	6714.9	242.56	6714.8	247.82	6714.7
253.09	6714.6	258.13	6714.5	262.98	6714.4	267.83	6714.3	272.68	6714.2
277.54	6714.1	282.39	6714	287.24	6713.9	292.09	6713.8	296.94	6713.7
301.79	6713.6	306.64	6713.5	311.49	6713.4	316.35	6713.3	321.2	6713.2
326.05	6713.1	330.9	6713	335	6712.94	337.62	6712.9	344.34	6712.8
353.18	6712.7	362.43	6712.6	371.68	6712.5	526.88	6712.5	555.37	6712.6
581.28	6712.7	605.45	6712.8	626.23	6712.9	635	6712.93	652.68	6713
653.68	6713	653.68	6713.03	673.83	6713.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	335	.06	635	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
335 635 154.96 154.96 154.96 .1 .3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 5007.63

INPUT
Description:
Station Elevation Data num= 168

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6716.4	5.69	6716.4	5.69	6717.3	6.78	6717.3	7.08	6717.2
7.39	6717.1	7.69	6717	8	6716.9	8.3	6716.8	8.61	6716.7
8.91	6716.6	9.21	6716.5	9.52	6716.4	9.82	6716.3	10.13	6716.2
10.43	6716.1	10.74	6716	11.04	6715.9	11.35	6715.8	11.65	6715.7
11.95	6715.6	12.26	6715.5	12.56	6715.4	12.87	6715.3	13.17	6715.2
13.48	6715.1	13.78	6715	14.09	6714.9	14.39	6714.8	14.69	6714.7
15	6714.6	15.3	6714.5	15.61	6714.4	15.91	6714.3	16.22	6714.2
16.52	6714.1	16.9	6714.1	17.2	6714.2	17.5	6714.3	17.81	6714.4
18.11	6714.5	18.42	6714.6	18.72	6714.7	19.02	6714.8	19.33	6714.9
19.63	6715	19.93	6715.1	20.24	6715.2	20.54	6715.3	20.84	6715.4
21.15	6715.5	21.45	6715.6	21.75	6715.7	22.06	6715.8	22.36	6715.9
22.66	6716	22.97	6716.1	23.27	6716.2	23.57	6716.3	23.88	6716.4
24.18	6716.5	24.48	6716.6	24.79	6716.7	25.09	6716.8	25.39	6716.9
25.7	6717	26	6717.1	26.3	6717.2	26.61	6717.3	26.95	6717.4
29.59	6717.5	34.35	6717.6	39.14	6717.7	43.93	6717.8	45.76	6717.8
51.1	6717.7	57.26	6717.6	77.63	6717.5	90.73	6717.4	103.43	6717.3
116.21	6717.2	129.97	6717.1	140.78	6717	148.01	6716.9	155.24	6716.8
162.47	6716.7	205.82	6716.7	209.18	6716.6	210.03	6716.5	210.49	6716.4
210.89	6716.3	211.29	6716.2	211.69	6716.1	212.09	6716	212.49	6715.9
212.89	6715.8	213.29	6715.7	213.69	6715.6	214.09	6715.5	214.49	6715.4
214.89	6715.3	215.29	6715.2	215.69	6715.1	216.09	6715	216.49	6714.9
216.89	6714.8	217.29	6714.7	217.69	6714.6	218.09	6714.5	218.49	6714.4
218.89	6714.3	219.29	6714.2	219.69	6714.1	220.09	6714	220.49	6713.9
224.08	6713.8	229.8	6713.7	235.51	6713.6	241.23	6713.5	246.95	6713.4
252.66	6713.3	258.38	6713.2	264.1	6713.1	269.81	6713	275.53	6712.9
281.25	6712.8	286.96	6712.7	292.68	6712.6	297.55	6712.5	302.26	6712.4
306.96	6712.3	311.66	6712.2	316.37	6712.1	321.07	6712	325.64	6711.9
330.22	6711.8	334.8	6711.7	339.37	6711.6	343.95	6711.5	348.26	6711.4
350	6711.36	352.54	6711.3	356.83	6711.2	361.11	6711.1	365.39	6711
378.62	6710.9	393.16	6710.8	410.73	6710.7	474.63	6710.6	506.62	6710.6
511.66	6710.7	516.71	6710.8	521.75	6710.9	526.79	6711	535.01	6711.1
544.74	6711.2	554.52	6711.3	563.93	6711.4	573.34	6711.5	584.6	6711.6
596.74	6711.7	609.47	6711.8	623.51	6711.9	637.32	6712	650	6712.1
650.65	6712.1	667.53	6712.2	670.86	6712.2				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
350 650 153.44 153.44 153.44 .1 .3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 4854.19

INPUT
Description:
Station Elevation Data num= 201

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6714	6.48	6714	6.48	6713.6	7.66	6713.6	17.48	6713.5
19.97	6713.4	22.45	6713.3	24.94	6713.2	27.42	6713.1	29.91	6713
32.39	6712.9	34.88	6712.8	37.36	6712.7	39.85	6712.6	42.33	6712.5
42.51	6712.4	42.61	6712.3	42.71	6712.2	42.81	6712.1	42.91	6712
48.95	6712	49.05	6712.1	49.15	6712.2	49.26	6712.3	49.36	6712.4

49.62	6712.5	52.17	6712.6	54.71	6712.7	57.26	6712.8	59.8	6712.9
62.2	6713	62.35	6713	64.89	6713.1	67.44	6713.2	69.98	6713.3
72.53	6713.4	76.37	6713.5	85.63	6713.6	94.88	6713.7	103.93	6713.8
112.96	6713.9	121.99	6714	131.01	6714.1	132.42	6714.2	133.16	6714.3
133.9	6714.4	134.65	6714.5	135.42	6714.6	136.18	6714.7	136.95	6714.8
137.72	6714.9	138.49	6715	139.26	6715.1	140.03	6715.2	140.8	6715.3
141.56	6715.4	142.33	6715.5	143.1	6715.6	143.87	6715.7	144.64	6715.8
145.41	6715.9	146.18	6716	146.94	6716.1	147.71	6716.2	148.48	6716.3
149.25	6716.4	160.64	6716.4	161.05	6716.3	161.47	6716.2	161.88	6716.1
162.29	6716	162.7	6715.9	163.11	6715.8	163.53	6715.7	163.94	6715.6
164.35	6715.5	164.76	6715.4	165.18	6715.3	165.59	6715.2	166	6715.1
166.41	6715	166.82	6714.9	167.24	6714.8	167.65	6714.7	168.06	6714.6
168.47	6714.5	168.89	6714.4	169.3	6714.3	169.71	6714.2	170.12	6714.1
170.53	6714	170.95	6713.9	171.36	6713.8	171.77	6713.7	172.18	6713.6
172.59	6713.5	173.01	6713.4	173.42	6713.3	173.84	6713.2	174.26	6713.1
174.67	6713	175.09	6712.9	175.51	6712.8	175.93	6712.7	176.34	6712.6
176.76	6712.5	177.18	6712.4	177.6	6712.3	178.01	6712.2	178.43	6712.1
178.85	6712	179.27	6711.9	179.68	6711.8	180.1	6711.7	180.52	6711.6
180.98	6711.5	183.9	6711.4	190.36	6711.3	197.35	6711.2	206.28	6711.1
215.24	6711	220.54	6710.9	225.83	6710.8	231.13	6710.7	236.42	6710.6
241.72	6710.5	246.98	6710.4	252.25	6710.3	257.52	6710.2	262.78	6710.1
268.05	6710	270.68	6709.9	273.32	6709.8	275.95	6709.7	278.59	6709.6
281.22	6709.5	283.86	6709.4	286.49	6709.3	290.13	6709.2	297.87	6709.2
301.3	6709.3	304.73	6709.4	308.37	6709.5	309.32	6709.5	314.51	6709.4
323.29	6709.4	331.18	6709.5	350	6709.56	361.28	6709.6	376.95	6709.7
380.93	6709.7	391.49	6709.6	399.78	6709.5	406.66	6709.4	415.3	6709.3
424.93	6709.2	432.13	6709.1	439.02	6709	446.51	6708.9	454	6708.8
463.21	6708.7	472.03	6708.6	480.28	6708.5	489.16	6708.4	503.79	6708.4
508.7	6708.5	514.32	6708.6	519.46	6708.7	524.57	6708.8	529.67	6708.9
534.78	6709	538.81	6709.1	542.84	6709.2	546.87	6709.3	551.38	6709.4
556.11	6709.5	560.85	6709.6	565.58	6709.7	570.32	6709.8	573.01	6709.87
574.6	6709.9	578.53	6710	583.5	6710.1	588.47	6710.2	593.44	6710.3
598.41	6710.4	603.38	6710.5	608.35	6710.6	613.32	6710.7	618.28	6710.8
623.25	6710.9	628.22	6711	637.28	6711.1	646.34	6711.2	650	6711.24
655.39	6711.3	664.45	6711.4	673.51	6711.5	682.57	6711.6	696.6	6711.7
703.79	6711.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	153.44	153.44 153.44	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 4700.74

INPUT

Description:
Station Elevation Data num= 181

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6719.1	2.99	6719.1	6.53	6719	9.22	6718.9	11.9	6718.8
14.58	6718.7	17.27	6718.6	19.95	6718.5	22.64	6718.4	25.32	6718.3
28.11	6718.2	31.15	6718.1	34.18	6718	35.41	6717.96	37.15	6717.9
40.22	6717.8	43.28	6717.7	46.35	6717.6	49.41	6717.5	52.48	6717.4
55.54	6717.3	58.61	6717.2	61.67	6717.1	64.74	6717	68.16	6716.9
71.58	6716.8	75	6716.7	78.42	6716.6	81.84	6716.5	85.26	6716.4
88.68	6716.3	92.11	6716.2	95.53	6716.1	98.95	6716	102.37	6715.9
105.79	6715.8	109.21	6715.7	112.63	6715.6	116.05	6715.5	119.47	6715.4
122.88	6715.3	125.83	6715.2	128.78	6715.1	131.73	6715	135.86	6714.9
140.04	6714.8	144.22	6714.7	148.41	6714.6	152.59	6714.5	156.77	6714.4
160.95	6714.3	165.14	6714.2	169.32	6714.1	173.5	6714	177.8	6713.9
182.23	6713.8	186.65	6713.7	191.07	6713.6	195.5	6713.5	199.92	6713.4
204.34	6713.3	208.77	6713.2	213.19	6713.1	217.61	6713	222.29	6712.9
226.5	6712.8	230.65	6712.7	234.8	6712.6	238.94	6712.5	243.09	6712.4
247.24	6712.3	251.38	6712.2	255.53	6712.1	259.68	6712	267.52	6711.9
275.36	6711.8	282.88	6711.7	290.33	6711.6	297.79	6711.5	305.25	6711.4
312.7	6711.3	320.16	6711.2	327.62	6711.1	335.07	6711	339.75	6710.9
344.43	6710.8	349.1	6710.7	350	6710.68	353.78	6710.6	358.45	6710.5
363.13	6710.4	367.8	6710.3	372.48	6710.2	376.8	6710.1	380.8	6710
383.33	6709.9	391.62	6709.8	396.51	6709.7	401.4	6709.6	406.3	6709.5
432.02	6709.4	441.24	6709.3	450.46	6709.2	459.68	6709.1	468.9	6709
470.29	6708.9	471.68	6708.8	473.07	6708.7	474.47	6708.6	475.86	6708.5
477.25	6708.4	478.65	6708.3	480.06	6708.2	481.46	6708.1	482.86	6708
484.27	6707.9	485.67	6707.8	487.07	6707.7	488.48	6707.6	489.88	6707.5
491.28	6707.4	492.69	6707.3	494.09	6707.2	495.49	6707.1	496.9	6707
498.11	6706.9	498.89	6706.8	499.66	6706.7	501.01	6706.7	503.29	6706.8
505.13	6706.9	509.95	6707	512.02	6707.1	514.08	6707.2	516.15	6707.3
518.21	6707.4	520.28	6707.5	522.34	6707.6	524.41	6707.7	526.48	6707.8
528.54	6707.9	530.61	6708	532.67	6708.1	534.74	6708.2	536.8	6708.3
538.87	6708.4	540.93	6708.5	543	6708.6	545.07	6708.7	548.41	6708.8
553.24	6708.9	558.08	6709	565.36	6709.1	572.63	6709.2	579.76	6709.3
586.75	6709.4	593.92	6709.5	601.09	6709.6	608.01	6709.7	614.86	6709.8
620.14	6709.89	621.05	6709.9	624.98	6710	630.08	6710.1	635.05	6710.2
640.02	6710.3	644.99	6710.4	649.96	6710.5	650	6710.5	654.93	6710.6
659.9	6710.7	664.87	6710.8	669.84	6710.9	674.8	6711	683.86	6711.1
692.92	6711.2	701.98	6711.3	711.03	6711.4	720.09	6711.5	729.15	6711.6
741.28	6711.6								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	153.79	153.79 153.79	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 4546.95

INPUT
Description:
Station Elevation Data num= 211

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6720	3.75	6720	7.73	6719.9	11.72	6719.8	15.7	6719.7
19.69	6719.6	23.68	6719.5	27.66	6719.4	31.65	6719.3	35.63	6719.2
39.62	6719.1	43.33	6719	46.01	6718.9	48.69	6718.8	51.38	6718.7
54.06	6718.6	56.74	6718.5	59.43	6718.4	62.11	6718.3	64.8	6718.2
67.67	6718.1	70.71	6718	73.16	6717.91	73.53	6717.9	76.23	6717.8
78.93	6717.7	81.61	6717.6	84.25	6717.5	86.88	6717.4	89.52	6717.3
92.15	6717.2	94.79	6717.1	97.43	6717	100.4	6716.9	103.38	6716.8
106.36	6716.7	109.34	6716.6	112.32	6716.5	115.29	6716.4	118.27	6716.3
121.25	6716.2	124.23	6716.1	127.21	6716	130.39	6715.9	133.56	6715.8
136.68	6715.7	139.8	6715.6	142.91	6715.5	146.03	6715.4	149.15	6715.3
152.26	6715.2	155.38	6715.1	158.5	6715	162.3	6714.9	166.1	6714.8
169.9	6714.7	173.65	6714.6	177.36	6714.5	181.07	6714.4	184.79	6714.3
188.5	6714.2	192.21	6714.1	195.93	6714	199.95	6713.9	203.98	6713.8
208.01	6713.7	212.03	6713.6	215.88	6713.5	219.73	6713.4	223.58	6713.3
227.43	6713.2	231.28	6713.1	235.13	6713	239.7	6712.9	244.26	6712.8
248.82	6712.7	253.44	6712.6	258.06	6712.5	262.68	6712.4	267.3	6712.3
271.92	6712.2	276.54	6712.1	281.16	6712	286.3	6711.9	291.45	6711.8
296.59	6711.7	301.65	6711.6	306.62	6711.5	311.6	6711.4	316.58	6711.3
321.55	6711.2	328.55	6711.1	337.07	6711	344.19	6710.9	350	6710.82
351.31	6710.8	358.41	6710.7	365.28	6710.6	369.58	6710.5	373.87	6710.4
378.17	6710.3	382.46	6710.2	386.76	6710.1	391.05	6710	393.35	6709.9
395.64	6709.8	397.94	6709.7	400.23	6709.6	402.52	6709.5	404.82	6709.4
407.11	6709.3	409.4	6709.2	412.1	6709.1	416.58	6709	421.06	6708.9
425.54	6708.8	430.02	6708.7	434.5	6708.6	438.98	6708.5	443.38	6708.4
446.69	6708.3	450	6708.2	453.3	6708.1	456.61	6708	458.24	6707.9
459.88	6707.8	461.51	6707.7	463.14	6707.6	464.78	6707.5	466.41	6707.4
468.04	6707.3	469.68	6707.2	471.31	6707.1	472.95	6707	474.58	6706.9
476.21	6706.8	477.85	6706.7	479.48	6706.6	481.11	6706.5	482.75	6706.4
484.38	6706.3	485.27	6706.2	486.15	6706.1	487.02	6706	487.89	6705.9
488.76	6705.8	489.63	6705.7	490.5	6705.6	491.37	6705.5	492.24	6705.4
493.11	6705.3	493.98	6705.2	494.85	6705.1	495.72	6705	496.22	6704.9
501.1	6704.9	504.55	6705	505.95	6705.1	507.35	6705.2	508.75	6705.3
510.14	6705.4	511.54	6705.5	512.94	6705.6	514.34	6705.7	515.73	6705.8
517.13	6705.9	518.53	6706	519.93	6706.1	521.33	6706.2	522.72	6706.3
524.12	6706.4	525.52	6706.5	526.92	6706.6	528.31	6706.7	529.71	6706.8
531.11	6706.9	532.51	6707	533.91	6707.1	535.3	6707.2	536.7	6707.3
538.1	6707.4	539.19	6707.5	540.17	6707.6	541.15	6707.7	542.13	6707.8
543.11	6707.9	544.09	6708	548.43	6708.1	552.78	6708.2	557.34	6708.3
562.19	6708.4	567.05	6708.5	571.9	6708.6	574.66	6708.66	578.35	6708.7
590.58	6708.8	595.21	6708.9	599.84	6709	607.06	6709.1	614.28	6709.2
621.5	6709.3	628.71	6709.4	647.04	6709.4	650	6709.47	651.2	6709.5
655.37	6709.6	659.53	6709.7	663.7	6709.8	680.44	6709.9	682.54	6710
687.93	6710								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.57	151.57 151.57	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 4395.39

INPUT
Description:
Station Elevation Data num= 189

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6717.4	1.79	6717.4	5.49	6717.3	9.2	6717.2	12.38	6717.1
15.54	6717	19.35	6716.9	23.16	6716.8	26.97	6716.7	30.78	6716.6
34.59	6716.5	38.4	6716.4	42.21	6716.3	46.02	6716.2	49.83	6716.1
53.64	6716	57.49	6715.9	61.34	6715.8	65.19	6715.7	69.04	6715.6
72.89	6715.5	76.74	6715.4	80.59	6715.3	84.43	6715.2	88.33	6715.1
92.23	6715	96.8	6714.9	101.37	6714.8	105.94	6714.7	110.51	6714.6
115.08	6714.5	119.64	6714.4	124.21	6714.3	128.78	6714.2	133.35	6714.1
137.78	6714	142.55	6713.9	147.32	6713.8	152.09	6713.7	156.86	6713.6
161.64	6713.5	166.31	6713.4	170.9	6713.3	175.5	6713.2	180.09	6713.1
184.69	6713	193.43	6712.9	202.16	6712.8	208.8	6712.7	215.16	6712.6
221.51	6712.5	227.87	6712.4	234.22	6712.3	240.68	6712.2	247.68	6712.1
253.18	6712	258.64	6711.9	264.08	6711.8	269.53	6711.7	274.97	6711.6
280.41	6711.5	285.85	6711.4	291.29	6711.3	296.73	6711.2	302.18	6711.1
307.62	6711	312.37	6710.9	317.13	6710.8	321.88	6710.7	326.64	6710.6
331.39	6710.5	336.15	6710.4	341.49	6710.3	349.31	6710.2	350	6710.19
350.01	6710.19	357.2	6710.1	365.11	6710	373.45	6709.9	381.15	6709.8
387.85	6709.7	394.34	6709.6	399.95	6709.5	405.56	6709.4	411.17	6709.3
416.78	6709.2	422.39	6709.1	428	6709	429.3	6708.9	430.59	6708.8
431.89	6708.7	433.18	6708.6	434.48	6708.5	435.77	6708.4	437.07	6708.3
438.32	6708.2	439.57	6708.1	440.82	6708	442.07	6707.9	443.32	6707.8
444.57	6707.7	445.82	6707.6	447.07	6707.5	448.32	6707.4	449.58	6707.3
450.83	6707.2	452.08	6707.1	453.33	6707	454.58	6706.9	455.83	6706.8
457.08	6706.7	458.33	6706.6	459.58	6706.5	460.83	6706.4	462.08	6706.3
463.33	6706.2	464.58	6706.1	465.83	6706	467.09	6705.9	468.34	6705.8
469.59	6705.7	470.84	6705.6	472.09	6705.5	473.34	6705.4	474.59	6705.3
475.84	6705.2	476.89	6705.1	477.78	6705	480.12	6704.9	482.46	6704.8
484.79	6704.7	487.13	6704.6	489.47	6704.5	491.81	6704.4	494.14	6704.3
496.48	6704.2	498.82	6704.1	501.1	6704.1	502.08	6704.2	503.06	6704.3
504.49	6704.4	505.92	6704.5	507.35	6704.6	508.78	6704.7	510.22	6704.8
511.65	6704.9	513.08	6705	514.82	6705.1	516.56	6705.2	518.29	6705.3
520.03	6705.4	521.77	6705.5	523.51	6705.6	525.25	6705.7	526.98	6705.8
528.72	6705.9	530.46	6706	532.2	6706.1	533.94	6706.2	535.67	6706.3
537.41	6706.4	539.15	6706.5	540.89	6706.6	542.63	6706.7	544.36	6706.8
546.1	6706.9	547.84	6707	550.13	6707.1	552.42	6707.2	554.71	6707.3

557	6707.4	559.29	6707.5	561.58	6707.6	563.87	6707.7	566.16	6707.8
567.95	6707.9	569.68	6708	576.79	6708.1	582.52	6708.16	590.15	6708.2
604.2	6708.3	630.38	6708.4	643.05	6708.5	650.01	6708.6	650.12	6708.6
664.33	6708.7	683.08	6708.8	690.5	6708.9	695.18	6708.9		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350.01	.06	650.01	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350.01	650.01	151.93	151.93	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 4243.45

INPUT
Description:
Station Elevation Data num= 160

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6716.7	1.93	6716.7	5.31	6716.6	8.68	6716.5	12.07	6716.4
15.47	6716.3	18.86	6716.2	22.25	6716.1	25.65	6716	30.34	6715.9
35.03	6715.8	39.72	6715.7	44.41	6715.6	49.11	6715.5	53.8	6715.4
58.49	6715.3	63.18	6715.2	67.87	6715.1	71.94	6715	76.51	6714.9
81.06	6714.8	85.61	6714.7	90.16	6714.6	94.7	6714.5	99.25	6714.4
103.8	6714.3	108.34	6714.2	112.89	6714.1	117.44	6714	124.59	6713.9
131.75	6713.8	138.9	6713.7	146.06	6713.6	153.21	6713.5	165.25	6713.4
179.65	6713.3	189.82	6713.2	199.99	6713.1	210.15	6713	216.59	6712.9
222.12	6712.8	227.65	6712.7	233.17	6712.6	238.68	6712.5	244.2	6712.4
249.71	6712.3	255.23	6712.2	260.74	6712.1	266.37	6712	270.6	6711.9
274.84	6711.8	279.46	6711.7	284.08	6711.6	288.7	6711.5	293.33	6711.4
297.95	6711.3	302.57	6711.2	307.19	6711.1	311.81	6711	314.48	6710.9
317.16	6710.8	319.83	6710.7	322.51	6710.6	325.18	6710.5	325.44	6710.49
327.86	6710.4	330.53	6710.3	333.2	6710.2	335.79	6710.1	338.33	6710
341.28	6709.9	344.23	6709.8	347.18	6709.7	350	6709.6	350.13	6709.6
353.09	6709.5	356.05	6709.4	359.01	6709.3	361.96	6709.2	364.92	6709.1
367.88	6709	370.49	6708.9	373.09	6708.8	375.7	6708.7	378.31	6708.6
380.91	6708.5	383.52	6708.4	386.13	6708.3	388.73	6708.2	391.3	6708.1
393.84	6708	396.04	6707.9	398.23	6707.8	400.42	6707.7	402.61	6707.6
404.81	6707.5	407	6707.4	409.19	6707.3	411.38	6707.2	413.58	6707.1
415.77	6707	417.96	6706.9	420.16	6706.8	422.35	6706.7	424.54	6706.6
426.73	6706.5	428.93	6706.4	431.12	6706.3	433.31	6706.2	435.51	6706.1
437.7	6706	439.77	6705.9	441.85	6705.8	443.92	6705.7	445.99	6705.6
448.07	6705.5	449.91	6705.4	451.59	6705.3	453.28	6705.2	454.96	6705.1
456.65	6705	460.01	6704.9	463.36	6704.8	466.72	6704.7	470.62	6704.6
477.68	6704.5	484.75	6704.4	491.81	6704.3	498.87	6704.2	500.03	6704.17
503.45	6704.1	508.63	6704.1	510.88	6704.2	512.56	6704.3	514.45	6704.4
516.4	6704.5	518.35	6704.6	520.3	6704.7	522.24	6704.8	524.19	6704.9
526.14	6705	527.43	6705.1	528.72	6705.2	530.01	6705.3	531.29	6705.4
532.58	6705.5	533.87	6705.6	535.16	6705.7	536.45	6705.8	536.94	6705.82
539	6705.9	542.33	6706	548.86	6706.1	555.96	6706.2	564.16	6706.3
572.36	6706.4	584.37	6706.5	598.57	6706.6	612.77	6706.7	625.44	6706.7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	325.44	.06	625.44	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
325.44	625.44	156.48	156.48	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 4086.97

INPUT
Description:
Station Elevation Data num= 247

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6717	7.43	6717	16.05	6716.9	24.66	6716.8	33.28	6716.7
41.85	6716.6	50.3	6716.5	58.75	6716.4	67.2	6716.3	75.64	6716.2
84.11	6716.1	92.54	6716	99.23	6715.9	105.92	6715.8	112.61	6715.7
119.29	6715.6	125.99	6715.5	132.95	6715.4	139.91	6715.3	146.87	6715.2
153.83	6715.1	160.79	6715	165.06	6714.9	169.33	6714.8	173.56	6714.7
177.74	6714.6	181.93	6714.5	186.11	6714.4	190.3	6714.3	194.48	6714.2
198.66	6714.1	202.85	6714	206.57	6713.9	210.34	6713.8	214.48	6713.7
218.63	6713.6	222.77	6713.5	226.92	6713.4	231.06	6713.3	235.21	6713.2
239.35	6713.1	243.5	6713	246.26	6712.9	249.02	6712.8	251.78	6712.7
255.31	6712.6	258.83	6712.5	262.36	6712.4	265.88	6712.3	269.41	6712.2
272.94	6712.1	276.46	6712	280.57	6711.9	284.67	6711.8	288.78	6711.7
292.89	6711.6	296.99	6711.5	301.1	6711.4	305.2	6711.3	309.12	6711.2
313.03	6711.1	316.93	6711	319.32	6710.9	321.72	6710.8	324.11	6710.7
326.5	6710.6	328.89	6710.5	331.28	6710.4	333.68	6710.3	336.2	6710.2
338.77	6710.1	341.33	6710	343.9	6709.9	346.47	6709.8	349.04	6709.7
350	6709.66	351.6	6709.6	354.17	6709.5	356.74	6709.4	359.3	6709.3
361.87	6709.2	364.44	6709.1	367	6709	369.55	6708.9	372.1	6708.8
374.65	6708.7	377.19	6708.6	379.74	6708.5	382.29	6708.4	384.83	6708.3
387.36	6708.2	389.9	6708.1	392.43	6708	394.84	6707.9	397.24	6707.8
399.65	6707.7	402.05	6707.6	404.46	6707.5	406.82	6707.4	408.55	6707.3
410.29	6707.2	412.03	6707.1	413.77	6707	415.5	6706.9	417.24	6706.8
418.98	6706.7	420.72	6706.6	422.45	6706.5	424.19	6706.4	425.93	6706.3
427.67	6706.2	429.4	6706.1	431.14	6706	432.88	6705.9	434.62	6705.8
436.36	6705.7	438.09	6705.6	439.83	6705.5	441.57	6705.4	443.31	6705.3
445.04	6705.2	446.78	6705.1	448.52	6705	450.26	6704.9	451.99	6704.8
453.73	6704.7	455.49	6704.6	457.25	6704.5	459.01	6704.4	460.77	6704.3
462.53	6704.2	464.3	6704.1	466.06	6704	468.1	6703.9	470.14	6703.8
472.18	6703.7	474.15	6703.6	475.44	6703.5	476.74	6703.4	478.03	6703.3
479.33	6703.2	480.62	6703.1	481.92	6703	483.14	6702.9	485.02	6702.8
487.23	6702.7	489.45	6702.6	495.52	6702.5	496.32	6702.5	497.02	6702.6
497.72	6702.7	498.41	6702.8	499.11	6702.9	500	6702.98	500.2	6703
504.58	6703.1	509.36	6703.2	514.13	6703.3	518.91	6703.4	523.68	6703.5
528.46	6703.6	533.23	6703.7	538.01	6703.8	542.78	6703.9	547.56	6704
550.69	6704.1	553.83	6704.2	556.96	6704.3	560.1	6704.4	563.23	6704.5
567.43	6704.6	573.69	6704.7	579.95	6704.8	586.22	6704.9	592.48	6705
595.5	6705.1	598.51	6705.2	601.53	6705.3	604.54	6705.4	607.55	6705.5
610.57	6705.6	613.58	6705.7	616.6	6705.8	619.61	6705.9	622.63	6706
625.64	6706.1	628.66	6706.2	632.41	6706.3	637.81	6706.4	643.22	6706.5
648.62	6706.6	650	6706.63	654.02	6706.7	658.7	6706.8	663.21	6706.9
670.22	6707	678.02	6707.1	685.82	6707.2	693.62	6707.3	699.66	6707.4
701.95	6707.5	704.25	6707.6	706.54	6707.7	708.84	6707.8	711.14	6707.9
713.43	6708	720.35	6708.1	727.27	6708.2	734.2	6708.3	741.05	6708.4
747.41	6708.5	753.78	6708.6	760.14	6708.7	766.51	6708.8	772.88	6708.9
779.24	6709	785.8	6709.1	792.36	6709.2	798.91	6709.3	805.47	6709.4
812.03	6709.5	818.58	6709.6	825.14	6709.7	831.7	6709.8	838.29	6709.9
844.93	6710	852.28	6710.1	859.39	6710.2	866.44	6710.3	873.5	6710.4
880.56	6710.5	887.61	6710.6	894.67	6710.7	901.73	6710.8	908.78	6710.9
915.84	6711	923.88	6711.1	931.91	6711.2	939.95	6711.3	947.99	6711.4
956.02	6711.5	964.06	6711.6	971.92	6711.7	979.49	6711.8	987.06	6711.9
994.64	6712	1000	6712						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	200	200	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 3886.97

INPUT
Description:
Station Elevation Data num= 267

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6716.7	1.42	6716.7	9.95	6716.6	18.4	6716.5	26.84	6716.4
35.29	6716.3	43.74	6716.2	44.64	6716.19	55.41	6716.1	67.18	6716
76.6	6715.9	86.02	6715.8	93.41	6715.7	99.15	6715.6	104.89	6715.5
110.62	6715.4	116.36	6715.3	122.09	6715.2	127.83	6715.1	133.57	6715
137.81	6714.9	142.05	6714.8	146.3	6714.7	150.54	6714.6	154.79	6714.5
159.03	6714.4	163.28	6714.3	167.52	6714.2	171.77	6714.1	176.01	6714
179.9	6713.9	182.94	6713.8	185.97	6713.7	189.01	6713.6	192.05	6713.5
195.09	6713.4	198.12	6713.3	201.16	6713.2	204.2	6713.1	207.24	6713
209.94	6712.9	212.64	6712.8	215.22	6712.7	217.8	6712.6	220.38	6712.5
222.96	6712.4	225.54	6712.3	228.12	6712.2	230.7	6712.1	233.28	6712
235.73	6711.9	238.33	6711.8	240.93	6711.7	243.52	6711.6	246.12	6711.5
248.72	6711.4	251.32	6711.3	253.91	6711.2	256.49	6711.1	259.07	6711
261.01	6710.9	262.95	6710.8	264.89	6710.7	266.83	6710.6	268.85	6710.5
270.9	6710.4	272.94	6710.3	274.99	6710.2	277.03	6710.1	279.08	6710
281.09	6709.9	283.1	6709.8	285.11	6709.7	287.12	6709.6	289.13	6709.5
291.14	6709.4	293.15	6709.3	295.16	6709.2	297.17	6709.1	299.18	6709
301.19	6708.9	303.2	6708.8	305.21	6708.7	307.22	6708.6	309.23	6708.5
311.24	6708.4	313.25	6708.3	315.26	6708.2	317.27	6708.1	319.28	6708
321.3	6707.9	323.31	6707.8	325.32	6707.7	327.33	6707.6	329.34	6707.5
331.35	6707.4	333.36	6707.3	335.37	6707.2	337.38	6707.1	339.39	6707
342.09	6706.9	344.79	6706.8	347.49	6706.7	350	6706.61	350.3	6706.6
353.17	6706.5	356.05	6706.4	358.92	6706.3	361.25	6706.2	363.34	6706.1
365.43	6706	367.51	6705.9	369.6	6705.8	371.69	6705.7	373.77	6705.6
375.86	6705.5	377.95	6705.4	380.04	6705.3	382.12	6705.2	384.21	6705.1
386.3	6705	388.38	6704.9	390.47	6704.8	392.56	6704.7	394.64	6704.6
396.73	6704.5	398.82	6704.4	400.91	6704.3	402.99	6704.2	405.08	6704.1
407.17	6704	409.48	6703.9	411.78	6703.8	414.09	6703.7	416.4	6703.6
418.71	6703.5	421.01	6703.4	423.32	6703.3	425.63	6703.2	427.94	6703.1
430.37	6703	432.85	6702.9	435.32	6702.8	437.8	6702.7	440.28	6702.6
442.76	6702.5	445.24	6702.4	447.71	6702.3	450.19	6702.2	452.67	6702.1
455.15	6702	457.62	6701.9	460.1	6701.8	462.58	6701.7	465.06	6701.6
467.54	6701.5	470.01	6701.4	472.49	6701.3	475.66	6701.2	479.49	6701.1
483.32	6701	487.2	6700.9	491.07	6700.8	494.94	6700.7	498.82	6700.6
500.7	6700.6	503.33	6700.7	520.45	6700.8	528.84	6700.9	534.21	6701
535.6	6701.1	536.52	6701.2	537.44	6701.3	538.36	6701.4	539.27	6701.5
540.19	6701.6	541.11	6701.7	542.03	6701.8	542.95	6701.9	543.87	6702
546.3	6702.1	548.73	6702.2	551.17	6702.3	553.6	6702.4	556.04	6702.5
558.47	6702.6	560.9	6702.7	563.34	6702.8	564.73	6702.9	565.8	6703
568.59	6703.1	571.37	6703.2	574.16	6703.3	576.94	6703.4	579.35	6703.5
581.52	6703.6	583.7	6703.7	585.87	6703.8	588.04	6703.9	590.21	6704
592.34	6704.1	594.47	6704.2	596.63	6704.3	598.79	6704.4	600.95	6704.5
603.11	6704.6	605.27	6704.7	607.43	6704.8	609.59	6704.9	611.75	6705
613.9	6705.1	616.05	6705.2	618.21	6705.3	620.36	6705.4	622.52	6705.5
624.68	6705.6	626.84	6705.7	629	6705.8	631.15	6705.9	633.31	6706
637.28	6706.1	641.24	6706.2	645.2	6706.3	649.16	6706.4	650	6706.42
653.27	6706.5	659.92	6706.6	666.58	6706.7	673.23	6706.8	679.88	6706.9
686.53	6707	703.64	6707.1	745.18	6707.2	859.78	6707.2	866.93	6707.1
874.09	6707	881.25	6706.9	888.4	6706.8	895.56	6706.7	902.35	6706.6
907.34	6706.5	911.45	6706.4	915.56	6706.3	922.87	6706.2	924.61	6706.2
928.05	6706.3	931.62	6706.4	935.18	6706.5	938.75	6706.6	942.31	6706.7
945.88	6706.8	949.44	6706.9	953.01	6707	956.58	6707.1	960.14	6707.2
963.71	6707.3	967.28	6707.4	970.85	6707.5	974.42	6707.6	977.98	6707.7
981.56	6707.8	985.13	6707.9	988.71	6708	991.86	6708.1	995.01	6708.2
998.16	6708.3	1000	6708.3						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 3735.02

INPUT
Description:
Station Elevation Data num= 267

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6716.7	4.55	6716.7	23.09	6716.6	41.52	6716.5	54.11	6716.4
61.31	6716.3	68.51	6716.2	75.7	6716.1	82.9	6716	87.79	6715.9
92.69	6715.8	97.58	6715.7	102.47	6715.6	107.37	6715.5	112.26	6715.4
117.15	6715.3	121.23	6715.2	124.73	6715.1	128.22	6715	132.31	6714.9
136.4	6714.8	140.49	6714.7	144.57	6714.6	148.66	6714.5	152.75	6714.4
156.72	6714.3	160.6	6714.2	164.48	6714.1	168.36	6714	171.29	6713.9
174.22	6713.8	177.16	6713.7	180.09	6713.6	183.02	6713.5	185.95	6713.4
188.88	6713.3	191.82	6713.2	194.75	6713.1	197.68	6713	200.37	6712.9
203.05	6712.8	205.73	6712.7	208.42	6712.6	211.1	6712.5	213.79	6712.4
216.47	6712.3	219.05	6712.2	221.62	6712.1	224.2	6712	226.38	6711.9
228.56	6711.8	230.74	6711.7	232.92	6711.6	235.1	6711.5	237.28	6711.4
239.46	6711.3	241.64	6711.2	243.8	6711.1	245.95	6711	247.89	6710.9
249.84	6710.8	251.78	6710.7	253.73	6710.6	255.67	6710.5	257.61	6710.4
259.56	6710.3	261.5	6710.2	263.45	6710.1	265.39	6710	267.33	6709.9
269.28	6709.8	271.22	6709.7	273.17	6709.6	275.11	6709.5	277.06	6709.4
279	6709.3	280.95	6709.2	282.89	6709.1	284.84	6709	286.78	6708.9
288.73	6708.8	290.67	6708.7	292.62	6708.6	294.57	6708.5	296.51	6708.4
298.46	6708.3	300.41	6708.2	302.36	6708.1	304.31	6708	306.27	6707.9
308.22	6707.8	310.18	6707.7	312.14	6707.6	314.09	6707.5	316.05	6707.4
318	6707.3	319.96	6707.2	321.91	6707.1	323.87	6707	325.85	6706.9
327.81	6706.8	329.76	6706.7	331.71	6706.6	333.66	6706.5	335.61	6706.4
337.53	6706.3	339.36	6706.2	341.19	6706.1	343.03	6706	344.86	6705.9
346.69	6705.8	348.53	6705.7	350	6705.62	350.36	6705.6	352.2	6705.5
354.03	6705.4	355.86	6705.3	357.7	6705.2	359.53	6705.1	361.36	6705
363.61	6704.9	365.85	6704.8	368.1	6704.7	370.34	6704.6	372.59	6704.5
374.83	6704.4	377.08	6704.3	379.31	6704.2	381.53	6704.1	383.75	6704
386.1	6703.9	388.46	6703.8	390.81	6703.7	393.16	6703.6	395.52	6703.5
397.87	6703.4	400.22	6703.3	402.58	6703.2	404.93	6703.1	407.28	6703
409.64	6702.9	411.99	6702.8	414.46	6702.7	416.96	6702.6	419.47	6702.5
421.97	6702.4	424.48	6702.3	426.98	6702.2	429.49	6702.1	431.99	6702
434.5	6701.9	437	6701.8	439.51	6701.7	442.01	6701.6	444.52	6701.5
447.02	6701.4	449.53	6701.3	452.03	6701.2	454.54	6701.1	457.04	6701
459.55	6700.9	462.05	6700.8	464.56	6700.7	467.06	6700.6	469.57	6700.5
471.62	6700.4	473.31	6700.3	475	6700.2	476.69	6700.1	478.38	6700
480.49	6699.9	482.59	6699.8	484.7	6699.7	486.81	6699.6	489.2	6699.5
491.6	6699.4	494	6699.3	496.4	6699.2	498.8	6699.1	500	6699.05
501.2	6699	510.01	6699	512.05	6699.1	514.08	6699.2	516.11	6699.3
518.15	6699.4	520.18	6699.5	522.21	6699.6	524.25	6699.7	526.28	6699.8
528.31	6699.9	530.35	6700	532.38	6700.1	534.41	6700.2	536.45	6700.3
538.48	6700.4	540.51	6700.5	542.55	6700.6	544.58	6700.7	546.61	6700.8
548.65	6700.9	550.68	6701	552.71	6701.1	554.75	6701.2	556.78	6701.3
558.81	6701.4	560.85	6701.5	562.88	6701.6	564.91	6701.7	566.95	6701.8
568.98	6701.9	571.04	6702	574.07	6702.1	577.1	6702.2	580.13	6702.3
583.16	6702.4	586.19	6702.5	589.22	6702.6	592.25	6702.7	595.28	6702.8
601.26	6702.9	610.54	6703	619.58	6703.1	628.63	6703.2	637.67	6703.3
646.71	6703.4	650	6703.44	655.75	6703.5	672.36	6703.5	681.22	6703.4
692.72	6703.3	714.11	6703.2	735.5	6703.1	754.57	6703.1	790.73	6703.2
809.89	6703.3	816.55	6703.4	836.18	6703.5	840.25	6703.6	844.31	6703.7
848.38	6703.8	852.45	6703.9	856.52	6704	860.59	6704.1	864.66	6704.2
868.73	6704.3	872.79	6704.4	876.86	6704.5	880.93	6704.6	885	6704.7
889.07	6704.8	893.14	6704.9	900.07	6705	912.16	6705.1	917.87	6705.2
923.58	6705.3	929.29	6705.4	935	6705.5	940.71	6705.6	946.42	6705.7
953.19	6705.8	960.27	6705.9	967.35	6706	974.89	6706.1	982.43	6706.2
993.16	6706.3	1000	6706.3						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.94	151.94	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 3583.08

INPUT
Description:
Station Elevation Data num= 302

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6718.2	2.72	6718.2	9.78	6718.1	16.85	6718	25.29	6717.9
35.01	6717.8	40.49	6717.7	45.97	6717.6	51.12	6717.5	55.19	6717.4
59.26	6717.3	63.34	6717.2	67.41	6717.1	71.48	6717	75.11	6716.9
78.74	6716.8	82.37	6716.7	85.92	6716.6	89.4	6716.5	92.88	6716.4
96.37	6716.3	99.85	6716.2	103.33	6716.1	106.81	6716	109.87	6715.9
112.94	6715.8	116	6715.7	119.06	6715.6	122.13	6715.5	125.17	6715.4
128.17	6715.3	131.17	6715.2	134.17	6715.1	137.17	6715	140.17	6714.9
143.17	6714.8	146.17	6714.7	149.17	6714.6	152.17	6714.5	155.17	6714.4
158.17	6714.3	161.17	6714.2	164.17	6714.1	167.14	6714	169.53	6713.9
171.92	6713.8	174.31	6713.7	176.7	6713.6	179.09	6713.5	181.48	6713.4
183.87	6713.3	186.26	6713.2	188.65	6713.1	191.04	6713	193.43	6712.9
195.82	6712.8	198.21	6712.7	200.6	6712.6	202.99	6712.5	205.38	6712.4
207.78	6712.3	210.17	6712.2	212.56	6712.1	214.95	6712	217.34	6711.9
219.73	6711.8	222.12	6711.7	224.51	6711.6	226.9	6711.5	229.29	6711.4
231.83	6711.3	234.41	6711.2	237	6711.1	239.59	6711	241.44	6710.9
243.3	6710.8	245.15	6710.7	247.01	6710.6	248.82	6710.5	250.57	6710.4
252.33	6710.3	254.08	6710.2	255.83	6710.1	257.59	6710	259.34	6709.9
261.1	6709.8	262.85	6709.7	264.61	6709.6	266.36	6709.5	268.12	6709.4
269.87	6709.3	271.63	6709.2	273.38	6709.1	275.13	6709	277.02	6708.9
278.93	6708.8	280.85	6708.7	282.76	6708.6	284.68	6708.5	286.59	6708.4
288.51	6708.3	290.42	6708.2	292.33	6708.1	294.25	6708	296.16	6707.9
298.08	6707.8	299.99	6707.7	301.91	6707.6	303.82	6707.5	305.73	6707.4
307.65	6707.3	309.56	6707.2	311.48	6707.1	313.39	6707	314.69	6706.9
315.98	6706.8	317.27	6706.7	318.57	6706.6	319.86	6706.5	321.15	6706.4
322.44	6706.3	323.74	6706.2	325.03	6706.1	326.55	6706	327.46	6705.9
329.05	6705.8	330.84	6705.7	332.63	6705.6	334.42	6705.5	336.21	6705.4
338.01	6705.3	339.8	6705.2	341.59	6705.1	343.38	6705	345.18	6704.9
346.97	6704.8	348.76	6704.7	350	6704.63	350.55	6704.6	352.35	6704.5
354.14	6704.4	355.93	6704.3	357.72	6704.2	359.51	6704.1	361.31	6704
363.1	6703.9	364.89	6703.8	366.68	6703.7	368.48	6703.6	370.27	6703.5
372.06	6703.4	373.85	6703.3	375.65	6703.2	377.44	6703.1	379.23	6703
381.02	6702.9	382.81	6702.8	384.61	6702.7	386.4	6702.6	388.19	6702.5
389.98	6702.4	391.78	6702.3	393.57	6702.2	395.36	6702.1	397.64	6702
400.08	6701.9	402.51	6701.8	404.95	6701.7	407.38	6701.6	409.82	6701.5
412.26	6701.4	414.69	6701.3	417.13	6701.2	419.57	6701.1	422	6701
424.44	6700.9	426.87	6700.8	429.31	6700.7	431.75	6700.6	434.18	6700.5
436.62	6700.4	439.05	6700.3	441.49	6700.2	443.93	6700.1	446.36	6700
448.8	6699.9	451.24	6699.8	453.67	6699.7	456.11	6699.6	458.54	6699.5
460.98	6699.4	463.51	6699.3	466.14	6699.2	468.77	6699.1	471.4	6699
474.03	6698.9	476.66	6698.8	479.29	6698.7	481.92	6698.6	484.55	6698.5
487.18	6698.4	489.81	6698.3	492.44	6698.2	495.07	6698.1	497.47	6698
498.52	6697.9	499.57	6697.8	502.85	6697.8	504.04	6697.9	505.24	6698
507.46	6698.1	509.69	6698.2	511.91	6698.3	514.14	6698.4	516.36	6698.5
518.59	6698.6	520.81	6698.7	524.01	6698.8	529.42	6698.9	534.84	6699
540.25	6699.1	545.67	6699.2	551.09	6699.3	556.5	6699.4	561.92	6699.5
567.33	6699.6	571.19	6699.7	574.53	6699.8	577.88	6699.9	581.23	6700
585.96	6700.1	590.68	6700.2	595.3	6700.3	598.92	6700.4	602.54	6700.5
606.16	6700.6	609.78	6700.7	613.4	6700.8	617.02	6700.9	620.64	6701
623.68	6701.1	626.72	6701.2	629.77	6701.3	632.81	6701.4	635.85	6701.5
638.89	6701.6	641.93	6701.7	644.44	6701.8	646.52	6701.9	648.6	6702
650	6702	650.45	6702	658	6701.9	665.54	6701.8	673.08	6701.7
680.63	6701.6	688.17	6701.5	695.71	6701.4	703.25	6701.3	710.8	6701.2
718.34	6701.1	746.67	6701.1	755.12	6701	764.62	6700.9	774.12	6700.8
783.62	6700.7	793.12	6700.6	798.83	6700.6	807.65	6700.7	816.47	6700.8
825.29	6700.9	834.11	6701	839.51	6701.1	844.9	6701.2	850.3	6701.3
855.69	6701.4	861.09	6701.5	866.48	6701.6	871.87	6701.7	877.27	6701.8
881	6701.9	884.36	6702	890.04	6702.1	895.72	6702.2	901.4	6702.3
907.08	6702.4	912.76	6702.5	918.44	6702.6	924.12	6702.7	929.8	6702.8
935.53	6702.9	941.27	6703	945.51	6703.1	949.76	6703.2	954	6703.3
958.25	6703.4	962.49	6703.5	966.74	6703.6	974.13	6703.7	982.84	6703.8
991.55	6703.9	1000	6703.9						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.95	151.95	.1	.3

Right Levee Station= 648.79 Elevation= 6702.1

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 3431.13

INPUT
Description:
Station Elevation Data num= 319

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6719.3	2.94	6719.3	6.28	6719.2	9.63	6719.1	12.97	6719
16.13	6718.9	19.29	6718.8	22.45	6718.7	25.61	6718.6	28.77	6718.5
31.93	6718.4	35.09	6718.3	38.25	6718.2	41.41	6718.1	44.57	6718
47.9	6717.9	51.23	6717.8	54.56	6717.7	57.89	6717.6	61.22	6717.5
64.55	6717.4	67.88	6717.3	71.21	6717.2	74.49	6717.1	77.76	6717
81.78	6716.9	85.86	6716.8	90.02	6716.7	94.18	6716.6	98.34	6716.5
102.49	6716.4	106.65	6716.3	110.81	6716.2	114.97	6716.1	119.13	6716
123.13	6715.9	127.14	6715.8	131.14	6715.7	135.14	6715.6	139.15	6715.5
143.15	6715.4	147.17	6715.3	151.23	6715.2	155.29	6715.1	159.34	6715
163.11	6714.9	166.87	6714.8	170.6	6714.7	174.23	6714.6	177.86	6714.5
181.48	6714.4	185.11	6714.3	188.74	6714.2	192.36	6714.1	195.99	6714
199.59	6713.9	202.79	6713.8	205.99	6713.7	209.2	6713.6	212.4	6713.5
215.6	6713.4	218.8	6713.3	222	6713.2	225.2	6713.1	228.4	6713
231.6	6712.9	234.8	6712.8	238.05	6712.7	241.36	6712.6	244.67	6712.5
247.98	6712.4	251.29	6712.3	254.6	6712.2	257.91	6712.1	261.22	6712
264.66	6711.9	268.1	6711.8	271.54	6711.7	274.98	6711.6	278.42	6711.5
281.86	6711.4	285.3	6711.3	288.74	6711.2	292.18	6711.1	295.62	6711
299.06	6710.9	302.42	6710.8	305.05	6710.7	307.68	6710.6	310.31	6710.5
312.94	6710.4	315.57	6710.3	318.2	6710.2	320.83	6710.1	323.47	6710
325.62	6709.9	327.78	6709.8	329.94	6709.7	332.09	6709.6	334.13	6709.5
336.17	6709.4	338.21	6709.3	340.25	6709.2	342.28	6709.1	344.32	6709
346.1	6708.9	347.88	6708.8	349.66	6708.7	350	6708.68	351.43	6708.6
353.21	6708.5	354.99	6708.4	356.77	6708.3	358.55	6708.2	360.32	6708.1
362.1	6708	363.88	6707.9	365.66	6707.8	367.43	6707.7	369.21	6707.6
370.99	6707.5	372.77	6707.4	374.55	6707.3	376.32	6707.2	378.1	6707.1
379.88	6707	381.66	6706.9	383.43	6706.8	385.21	6706.7	386.99	6706.6
388.77	6706.5	390.55	6706.4	392.32	6706.3	394.1	6706.2	395.88	6706.1
397.66	6706	399.54	6705.9	401.42	6705.8	403.3	6705.7	405.18	6705.6
407.06	6705.5	408.95	6705.4	410.83	6705.3	412.71	6705.2	414.49	6705.1
416.23	6705	417.27	6704.9	418.31	6704.8	419.35	6704.7	420.4	6704.6
421.39	6704.5	422.31	6704.4	423.22	6704.3	424.14	6704.2	425.06	6704.1
425.98	6704	426.89	6703.9	427.81	6703.8	428.73	6703.7	429.65	6703.6
430.56	6703.5	431.24	6703.4	431.83	6703.3	432.41	6703.2	433	6703.1
433.59	6703	434.17	6702.9	434.76	6702.8	435.34	6702.7	436.12	6702.6
437.05	6702.5	437.99	6702.4	438.93	6702.3	439.86	6702.2	440.8	6702.1
441.74	6702	442.67	6701.9	443.61	6701.8	444.55	6701.7	445.48	6701.6
446.42	6701.5	447.45	6701.4	448.73	6701.3	450.01	6701.2	451.29	6701.1
452.57	6701	453.85	6700.9	455.12	6700.8	456.4	6700.7	457.68	6700.6
458.96	6700.5	460.24	6700.4	461.52	6700.3	462.79	6700.2	464.07	6700.1
465.35	6700	466.63	6699.9	467.88	6699.8	468.79	6699.7	469.7	6699.6
470.61	6699.5	471.52	6699.4	472.43	6699.3	473.34	6699.2	474.25	6699.1
475.16	6699	476.07	6698.9	476.98	6698.8	477.89	6698.7	478.8	6698.6
479.71	6698.5	480.62	6698.4	481.53	6698.3	482.45	6698.2	483.36	6698.1
484.27	6698	485.18	6697.9	486.09	6697.8	487	6697.7	487.91	6697.6

488.82	6697.5	489.73	6697.4	490.64	6697.3	491.55	6697.2	492.46	6697.1
493.37	6697	493.88	6696.9	494.4	6696.8	494.91	6696.7	495.43	6696.6
495.94	6696.5	497.75	6696.4	504.05	6696.4	504.88	6696.5	505.7	6696.6
507.08	6696.7	509.24	6696.8	511.39	6696.9	513.54	6697	515.76	6697.1
517.98	6697.2	520.21	6697.3	522.43	6697.4	524.65	6697.5	526.88	6697.6
529.1	6697.7	531.31	6697.8	533.46	6697.9	535.61	6698	537.77	6698.1
539.92	6698.2	542.07	6698.3	544.22	6698.4	546.37	6698.5	548.53	6698.6
550.68	6698.7	552.83	6698.8	554.98	6698.9	557.14	6699	560.47	6699.1
563.81	6699.2	567.14	6699.3	570.48	6699.4	573.82	6699.5	579.1	6699.6
593.56	6699.7	630.84	6699.7	637.42	6699.6	643.99	6699.5	650	6699.41
650.56	6699.4	657.14	6699.3	663.71	6699.2	670.29	6699.1	677.1	6699
700.53	6699	707.49	6699.1	714.44	6699.2	721.39	6699.3	728.34	6699.4
735.29	6699.5	742.25	6699.6	749.2	6699.7	765.33	6699.7	777.79	6699.6
836.77	6699.6	846.66	6699.7	856.56	6699.8	866.45	6699.9	876.34	6700
888.7	6700.1	905.5	6700.1	908.67	6700.2	911.83	6700.3	915	6700.4
918.16	6700.5	921.33	6700.6	924.49	6700.7	927.66	6700.8	930.82	6700.9
933.99	6701	937.15	6701.1	940.32	6701.2	943.48	6701.3	946.65	6701.4
949.81	6701.5	952.98	6701.6	956.14	6701.7	959.31	6701.8	962.47	6701.9
965.64	6702	970.25	6702.1	974.87	6702.2	979.48	6702.3	984.1	6702.4
988.71	6702.5	993.32	6702.6	997.94	6702.7	1000	6702.7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.94	151.94	151.94	.1	.3

Right Levee Station= 595.74 Elevation= 6699.71

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 3279.19

INPUT
Description:
Station Elevation Data num= 270

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6710.1	.32	6710.1	2.9	6710	5.49	6709.9	8.07	6709.8
10.66	6709.7	13.25	6709.6	15.83	6709.5	18.42	6709.4	21	6709.3
23.59	6709.2	26.17	6709.1	28.76	6709	31.39	6708.9	34.02	6708.8
36.65	6708.7	39.28	6708.6	41.87	6708.5	44.43	6708.4	47	6708.3
49.56	6708.2	52.13	6708.1	54.7	6708	59.35	6707.9	64.35	6707.8
72.7	6707.7	84.38	6707.6	96.19	6707.5	108.03	6707.4	119.88	6707.3
131.71	6707.2	146.02	6707.1	160.54	6707	175	6706.9	189.45	6706.8
203.91	6706.7	247.04	6706.7	259.45	6706.8	271.85	6706.9	285.45	6706.9
287.84	6706.8	290.23	6706.7	292.61	6706.6	295	6706.5	297.39	6706.4
299.78	6706.3	302.17	6706.2	304.56	6706.1	306.95	6706	309.34	6705.9
311.72	6705.8	314.11	6705.7	316.5	6705.6	318.89	6705.5	321.28	6705.4
323.67	6705.3	326.06	6705.2	328.45	6705.1	330.83	6705	333.22	6704.9
335.61	6704.8	338	6704.7	340.39	6704.6	342.78	6704.5	345.17	6704.4
347.56	6704.3	349.94	6704.2	350	6704.2	352.33	6704.1	354.72	6704
357.11	6703.9	359.5	6703.8	361.89	6703.7	364.28	6703.6	366.67	6703.5
369.05	6703.4	371.44	6703.3	373.83	6703.2	376.22	6703.1	378.61	6703
381	6702.9	383.39	6702.8	385.78	6702.7	388.16	6702.6	390.55	6702.5
392.94	6702.4	395.33	6702.3	397.72	6702.2	400.11	6702.1	402.5	6702
404.89	6701.9	407.27	6701.8	409.66	6701.7	412.05	6701.6	414.44	6701.5
416.83	6701.4	419.22	6701.3	427.09	6701.2	428.13	6701.1	429.17	6701
430.21	6700.9	431.25	6700.8	432.29	6700.7	433.33	6700.6	434.37	6700.5
435.41	6700.4	436.46	6700.3	437.5	6700.2	438.54	6700.1	439.58	6700
440.62	6699.9	441.66	6699.8	442.7	6699.7	443.74	6699.6	444.78	6699.5
445.82	6699.4	446.86	6699.3	447.9	6699.2	448.94	6699.1	449.98	6699
451.02	6698.9	452.07	6698.8	453.11	6698.7	454.15	6698.6	455.19	6698.5
456.23	6698.4	457.27	6698.3	458.31	6698.2	459.35	6698.1	460.39	6698
461.43	6697.9	462.47	6697.8	463.51	6697.7	464.55	6697.6	465.59	6697.5
466.63	6697.4	467.67	6697.3	468.72	6697.2	469.76	6697.1	470.8	6697
471.84	6696.9	472.88	6696.8	473.92	6696.7	474.96	6696.6	476	6696.5
477.04	6696.4	478.08	6696.3	479.12	6696.2	480.16	6696.1	481.2	6696
482.24	6695.9	483.28	6695.8	484.32	6695.7	485.37	6695.6	486.41	6695.5
487.45	6695.4	488.49	6695.3	489.53	6695.2	490.57	6695.1	491.61	6695
492.68	6694.9	493.63	6694.8	494.57	6694.7	495.5	6694.6	496.43	6694.5
497.36	6694.4	498.29	6694.3	499.22	6694.2	500.66	6694.2	501.93	6694.3
503.2	6694.4	504.47	6694.5	505.74	6694.6	506.81	6694.7	507.81	6694.8
508.8	6694.9	509.8	6695	510.81	6695.1	511.82	6695.2	512.84	6695.3
513.85	6695.4	514.86	6695.5	515.87	6695.6	516.89	6695.7	517.9	6695.8
518.91	6695.9	519.92	6696	520.94	6696.1	521.95	6696.2	522.96	6696.3
523.97	6696.4	524.98	6696.5	526	6696.6	527.26	6696.7	528.76	6696.8
530.27	6696.9	531.77	6697	535.53	6697.1	539.29	6697.2	543.05	6697.3
546.81	6697.4	550.57	6697.5	554.33	6697.6	558.09	6697.7	561.86	6697.8
565.62	6697.9	569.38	6698	571.83	6698.1	574.51	6698.2	579.16	6698.3
583.81	6698.4	586.82	6698.5	589.45	6698.6	592.08	6698.7	596.57	6698.8
599.64	6698.8	608.74	6698.7	617.04	6698.6	629.81	6698.6	644.81	6698.7
650	6698.73	659.8	6698.8	667.99	6698.83	684.96	6698.9	691.91	6699
698.86	6699.1	705.82	6699.2	712.77	6699.3	719.72	6699.4	726.67	6699.5
733.62	6699.6	759.7	6699.6	772.16	6699.5	818.49	6699.5	828.38	6699.6
838.27	6699.7	848.17	6699.8	858.06	6699.9	867.95	6700	880.31	6700.1
893.41	6700.1	896.57	6700.2	899.74	6700.3	902.9	6700.4	906.07	6700.5
909.23	6700.6	912.4	6700.7	915.56	6700.8	918.73	6700.9	921.89	6701
925.06	6701.1	928.22	6701.2	931.39	6701.3	934.55	6701.4	937.72	6701.5
940.88	6701.6	944.05	6701.7	947.21	6701.8	950.38	6701.9	953.54	6702
958.16	6702.1	962.77	6702.2	967.39	6702.3	972	6702.4	976.62	6702.5
981.23	6702.6	985.84	6702.7	990.46	6702.8	995.1	6702.9	1000	6702.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.95	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 3127.24

INPUT
Description:
Station Elevation Data num= 254

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6702.1	33.16	6702.1	37.25	6702.2	41.33	6702.3	45.42	6702.4
49.5	6702.5	53.59	6702.6	57.67	6702.7	61.76	6702.8	65.84	6702.9
69.93	6703	77.35	6703.1	84.77	6703.2	92.2	6703.3	99.62	6703.4
111.21	6703.5	112.01	6703.5	122.56	6703.4	131.09	6703.3	139.62	6703.2
148.14	6703.1	151.85	6703.1	156.67	6703	161.49	6702.9	166.31	6702.8
171.13	6702.7	175.95	6702.6	180.77	6702.5	185.59	6702.4	190.41	6702.3
195.23	6702.2	199.44	6702.1	203.3	6702	207.15	6701.9	211	6701.8
214.85	6701.7	218.7	6701.6	222.55	6701.5	226.41	6701.4	230.26	6701.3
234.11	6701.2	237.96	6701.1	241.81	6701	245.66	6700.9	249.51	6700.8
253.36	6700.7	257.21	6700.6	261.06	6700.5	264.91	6700.4	268.76	6700.3
272.61	6700.2	276.46	6700.1	280.31	6700	284.75	6699.9	291.09	6699.8
297.43	6699.7	303.77	6699.6	310.11	6699.5	316.44	6699.4	322.78	6699.3
329.12	6699.2	335.46	6699.1	341.8	6699	348.29	6698.9	350	6698.87
354.78	6698.8	370.42	6698.7	373.93	6698.6	377.93	6698.5	382.2	6698.4
386.47	6698.3	391.78	6698.2	399.58	6698.1	407.39	6698	412.21	6697.9
417.02	6697.8	419.96	6697.7	421.5	6697.6	423.04	6697.5	424.58	6697.4
426.12	6697.3	427.66	6697.2	429.2	6697.1	430.74	6697	431.75	6696.9
432.76	6696.8	433.77	6696.7	434.77	6696.6	435.78	6696.5	436.79	6696.4
437.8	6696.3	438.81	6696.2	439.82	6696.1	440.83	6696	441.83	6695.9
442.84	6695.8	443.85	6695.7	444.86	6695.6	445.87	6695.5	446.88	6695.4
447.89	6695.3	448.89	6695.2	449.9	6695.1	451.24	6695	452.61	6694.9
453.98	6694.8	455.34	6694.7	456.71	6694.6	458.08	6694.5	459.44	6694.4
460.81	6694.3	462.18	6694.2	463.55	6694.1	464.91	6694	465.99	6693.9
467.06	6693.8	468.14	6693.7	469.21	6693.6	470.29	6693.5	471.36	6693.4
472.44	6693.3	473.51	6693.2	474.59	6693.1	475.66	6693	477.79	6692.9
480.78	6692.8	483.76	6692.7	486.75	6692.6	489.74	6692.5	492.73	6692.4
495.72	6692.3	496.71	6692.2	499.68	6692.2	500	6692.22	501.69	6692.3
503.8	6692.4	505.77	6692.5	507.58	6692.6	509.39	6692.7	511.02	6692.8
511.8	6692.9	512.58	6693	513.4	6693.1	514.22	6693.2	515.05	6693.3
515.87	6693.4	516.7	6693.5	517.52	6693.6	518.35	6693.7	519.17	6693.8
519.99	6693.9	520.82	6694	521.64	6694.1	522.47	6694.2	523.29	6694.3
524.12	6694.4	524.94	6694.5	525.76	6694.6	526.59	6694.7	527.41	6694.8
528.24	6694.9	529.06	6695	529.89	6695.1	530.71	6695.2	531.53	6695.3
532.36	6695.4	533.18	6695.5	534.01	6695.6	534.83	6695.7	535.72	6695.8
536.63	6695.9	537.53	6696	538.44	6696.1	539.34	6696.2	540.25	6696.3
541.15	6696.4	542.06	6696.5	542.96	6696.6	543.87	6696.7	544.78	6696.8
545.68	6696.9	546.59	6697	551.1	6697.1	555.62	6697.2	560.14	6697.3
564.66	6697.4	569.17	6697.5	573.69	6697.6	578.46	6697.7	584.24	6697.8
597.51	6697.8	618.41	6697.9	639.32	6698	650	6698.05	659.98	6698.1
680.31	6698.2	692.71	6698.3	705.1	6698.4	718.19	6698.5	730.69	6698.6
747.67	6698.7	758.68	6698.8	769.69	6698.9	778.04	6699	783.79	6699.1
789.55	6699.2	795.3	6699.3	801.05	6699.4	806.8	6699.5	812.55	6699.6
818.3	6699.7	824.06	6699.8	829.81	6699.9	830.73	6699.91	839.04	6700
851.39	6700.1	852.41	6700.1	858.74	6700	859.47	6700	862.64	6700.1
865.8	6700.2	868.97	6700.3	872.13	6700.4	875.3	6700.5	878.46	6700.6
881.63	6700.7	884.79	6700.8	887.96	6700.9	891.12	6701	894.29	6701.1
897.45	6701.2	900.62	6701.3	903.78	6701.4	906.95	6701.5	910.11	6701.6
913.28	6701.7	916.44	6701.8	919.61	6701.9	922.78	6702	927.39	6702.1
932	6702.2	936.62	6702.3	941.23	6702.4	945.85	6702.5	950.46	6702.6
955.08	6702.7	959.69	6702.8	964.31	6702.9	969.16	6703	975.06	6703.1
981.94	6703.2	988.82	6703.3	995.7	6703.4	1000	6703.4		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.94	151.94	151.94	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 2975.3

INPUT
Description:
Station Elevation Data num= 252

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6700.3	5.18	6700.3	10.36	6700.4	15.54	6700.5	20.72	6700.6
49	6700.7	80.11	6700.7	83.46	6700.6	86.82	6700.5	90.17	6700.4
90.51	6700.39	94.36	6700.3	98.65	6700.2	102.93	6700.1	107.21	6700
110.75	6699.9	114.29	6699.8	117.83	6699.7	121.37	6699.6	124.84	6699.5
128.01	6699.4	131.17	6699.3	134.34	6699.2	137.51	6699.1	140.68	6699
143.85	6698.9	147.02	6698.8	150.2	6698.7	153.49	6698.6	157.3	6698.5
161.11	6698.4	164.92	6698.3	168.73	6698.2	172.54	6698.1	176.35	6698
180.16	6697.9	183.96	6697.8	187.77	6697.7	191.58	6697.6	195.39	6697.5
199.2	6697.4	203.01	6697.3	206.82	6697.2	210.63	6697.1	214.44	6697
219.62	6696.9	224.81	6696.8	230.59	6696.7	236.98	6696.6	242.85	6696.5
248.53	6696.4	254.22	6696.3	259.9	6696.2	265.59	6696.1	271.21	6696
276.62	6695.9	282.04	6695.8	287.45	6695.7	292.86	6695.6	298.27	6695.5
304.2	6695.4	309.7	6695.3	310.94	6695.3	322.85	6695.4	350	6695.47
359.47	6695.5	384.94	6695.6	399.71	6695.7	406.07	6695.8	411.64	6695.9
415.58	6696	416.3	6696.1	421.96	6696.2	447.01	6696.3	452.22	6696.3
452.65	6696.2	453.02	6696.1	453.38	6696	453.86	6695.9	454.35	6695.8
454.84	6695.7	455.34	6695.6	455.83	6695.5	456.33	6695.4	456.82	6695.3
457.31	6695.2	457.81	6695.1	458.3	6695	458.77	6694.9	459.24	6694.8
459.73	6694.7	460.22	6694.6	460.71	6694.5	461.2	6694.4	461.69	6694.3
462.18	6694.2	462.67	6694.1	463.17	6694	463.63	6693.9	464.09	6693.8
464.55	6693.7	465.03	6693.6	465.52	6693.5	466.01	6693.4	466.5	6693.3
466.99	6693.2	467.47	6693.1	467.96	6693	468.45	6692.9	468.94	6692.8
469.43	6692.7	469.92	6692.6	470.4	6692.5	470.86	6692.4	471.27	6692.3
471.68	6692.2	472.09	6692.1	472.5	6692	472.94	6691.9	473.38	6691.8

473.82	6691.7	477.05	6691.6	480.54	6691.5	482.91	6691.4	485.28	6691.3
487.65	6691.2	488.88	6691.1	489.77	6691	515.07	6691	515.85	6691.1
516.62	6691.2	517.4	6691.3	518.18	6691.4	518.95	6691.5	519.73	6691.6
520.51	6691.7	521.29	6691.8	522.06	6691.9	522.84	6692	523.62	6692.1
524.39	6692.2	525.17	6692.3	525.95	6692.4	526.73	6692.5	527.72	6692.6
528.71	6692.7	529.7	6692.8	530.7	6692.9	531.69	6693	532.68	6693.1
533.67	6693.2	534.66	6693.3	535.66	6693.4	536.65	6693.5	537.64	6693.6
538.63	6693.7	539.62	6693.8	540.62	6693.9	541.64	6694	544.39	6694.1
547.17	6694.2	549.95	6694.3	552.73	6694.4	555.51	6694.5	558.28	6694.6
561.06	6694.7	567	6694.8	578.42	6694.9	589.84	6695	605.63	6695.1
614.98	6695.2	624.14	6695.3	633.3	6695.4	642.46	6695.5	650	6695.58
651.62	6695.6	661.67	6695.7	672.26	6695.8	682.84	6695.9	693.43	6696
700.54	6696.1	707.64	6696.2	714.75	6696.3	721.86	6696.4	728.96	6696.5
736.07	6696.6	746.14	6696.6	749.46	6696.7	752.77	6696.8	756.09	6696.9
759.4	6697	763.01	6697.1	766.62	6697.2	770.23	6697.3	773.84	6697.4
777.45	6697.5	781.06	6697.6	784.68	6697.7	788.29	6697.8	791.9	6697.9
795.51	6698	798.87	6698.1	802.17	6698.2	805.27	6698.3	808.36	6698.4
811.46	6698.5	814.55	6698.6	817.65	6698.7	820.74	6698.8	823.84	6698.9
826.93	6699	830.21	6699.1	833.5	6699.2	836.78	6699.3	840.06	6699.4
843.34	6699.5	846.62	6699.6	849.95	6699.7	853.31	6699.8	856.66	6699.9
860.02	6700	863.88	6700.1	867.46	6700.2	871.04	6700.3	874.62	6700.4
878.2	6700.5	881.78	6700.6	885.36	6700.7	888.94	6700.8	892.51	6700.9
896.09	6701	900.62	6701.1	905.14	6701.2	909.67	6701.3	914.19	6701.4
918.88	6701.5	923.59	6701.6	928.3	6701.7	933.01	6701.8	937.72	6701.9
942.43	6702	947.52	6702.1	952.79	6702.2	958.3	6702.3	963.81	6702.4
969.31	6702.5	974.82	6702.6	980.33	6702.7	985.84	6702.8	991.34	6702.9
996.85	6703	1000	6703						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel		Right	Coeff Contr.	Expan.
350	650	151.95	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 2823.35

INPUT
Description:
Station Elevation Data num= 296

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6700.5	3.99	6700.5	32.33	6700.6	61.01	6700.7	62.02	6700.7
65.37	6700.6	68.73	6700.5	72.09	6700.4	75.44	6700.3	75.82	6700.29
78.33	6700.2	81.17	6700.1	84	6700	86.35	6699.9	88.73	6699.8
91.11	6699.7	93.48	6699.6	95.86	6699.5	98.24	6699.4	100.62	6699.3
102.99	6699.2	105.37	6699.1	107.75	6699	109.93	6698.9	112.12	6698.8
114.3	6698.7	116.49	6698.6	118.68	6698.5	120.86	6698.4	123.05	6698.3
125.23	6698.2	127.42	6698.1	129.6	6698	131.78	6697.9	133.97	6697.8
136.17	6697.7	138.65	6697.6	141.13	6697.5	143.61	6697.4	146.09	6697.3
148.57	6697.2	151.05	6697.1	153.53	6697	156.01	6696.9	158.49	6696.8
160.97	6696.7	163.45	6696.6	165.93	6696.5	168.41	6696.4	171.39	6696.3
174.6	6696.2	177.81	6696.1	181.02	6696	185.16	6695.9	189.31	6695.8
193.45	6695.7	197.59	6695.6	201.74	6695.5	205.88	6695.4	210.02	6695.3
213.61	6695.2	217.15	6695.1	220.69	6695	224.23	6694.9	227.77	6694.8
231.32	6694.7	234.86	6694.6	238.41	6694.5	241.95	6694.4	245.49	6694.3
249.04	6694.2	257.05	6694.1	270.18	6694	337.21	6693.9	350	6693.85
363.57	6693.8	370.35	6693.7	374.33	6693.6	378.32	6693.5	382.3	6693.4
391.33	6693.3	395.9	6693.2	397.07	6693.1	398.23	6693	399.4	6692.9
400.56	6692.8	401.73	6692.7	402.89	6692.6	404.06	6692.5	405.23	6692.4
406.39	6692.3	407.56	6692.2	408.72	6692.1	409.89	6692	411.76	6691.9
414.2	6691.8	416.64	6691.7	419.08	6691.6	421.51	6691.5	423.95	6691.4
426.39	6691.3	428.83	6691.2	431.26	6691.1	433.7	6691	436.1	6690.9
438.5	6690.8	442.14	6690.7	446.55	6690.6	450.95	6690.5	454.06	6690.4
455.31	6690.3	456.57	6690.2	457.82	6690.1	459.07	6690	459.88	6689.9
460.7	6689.8	461.51	6689.7	462.32	6689.6	463.13	6689.5	463.94	6689.4
464.75	6689.3	465.57	6689.2	466.38	6689.1	467.19	6689	468	6688.9
468.81	6688.8	470.34	6688.7	472.44	6688.6	474.53	6688.5	476.63	6688.4
478.73	6688.3	480.83	6688.2	482.92	6688.1	485.02	6688	486.06	6687.9
487.09	6687.8	488.13	6687.7	491.82	6687.6	495.56	6687.5	498.09	6687.4
500	6687.32	500.55	6687.3	501.56	6687.3	505.39	6687.4	516.31	6687.4
519.35	6687.5	523.44	6687.6	526.26	6687.7	526.69	6687.8	527.13	6687.9
527.56	6688	529.16	6688.1	530.76	6688.2	532.36	6688.3	533.95	6688.4
535.4	6688.5	536.2	6688.6	537.01	6688.7	537.81	6688.8	538.62	6688.9
539.43	6689	539.89	6689.1	540.35	6689.2	540.81	6689.3	541.27	6689.4
541.74	6689.5	542.2	6689.6	542.66	6689.7	543.12	6689.8	543.59	6689.9
544.05	6690	544.51	6690.1	544.97	6690.2	545.43	6690.3	545.9	6690.4
546.36	6690.5	546.82	6690.6	547.28	6690.7	547.74	6690.8	548.21	6690.9
548.67	6691	549.13	6691.1	549.59	6691.2	550.05	6691.3	550.52	6691.4
550.98	6691.5	551.44	6691.6	551.9	6691.7	552.37	6691.8	552.83	6691.9
553.29	6692	553.75	6692.1	554.21	6692.2	554.68	6692.3	555.14	6692.4
555.6	6692.5	556.06	6692.6	556.52	6692.7	556.99	6692.8	557.45	6692.9
557.91	6693	558.37	6693.1	558.83	6693.2	559.3	6693.3	559.82	6693.4
560.34	6693.5	560.86	6693.6	561.39	6693.7	561.91	6693.8	562.43	6693.9
562.96	6694	563.47	6694.1	563.99	6694.2	564.51	6694.3	565.03	6694.4
565.55	6694.5	566.07	6694.6	566.59	6694.7	567.11	6694.8	567.64	6694.9
568.16	6695	573.96	6695.1	576.74	6695.2	578.02	6695.2	585.71	6695.1
593.39	6695	599.57	6694.9	605.74	6694.8	611.91	6694.7	618.08	6694.6
624.25	6694.5	630.42	6694.4	636.59	6694.3	642.76	6694.2	648.92	6694.1
650	6694.08	655.09	6694	665.4	6693.9	675.7	6693.8	686.01	6693.7
696.31	6693.6	705.67	6693.5	714	6693.4	722.32	6693.3	731.92	6693.2
734.96	6693.2	739.93	6693.3	744.91	6693.4	749.88	6693.5	754.86	6693.6
759.83	6693.7	764.81	6693.8	769.78	6693.9	774.76	6694	780.35	6694.1
785.95	6694.2	791.38	6694.3	796.7	6694.4	802.03	6694.5	807.35	6694.6
812.68	6694.7	818	6694.8	823.33	6694.9	828.65	6695	832.11	6695.1
835.57	6695.2	839.03	6695.3	842.49	6695.4	845.95	6695.5	849.41	6695.6
852.87	6695.7	856.33	6695.8	859.79	6695.9	862.77	6696	865.6	6696.1
868.43	6696.2	871.26	6696.3	874.09	6696.4	876.92	6696.5	879.75	6696.6
882.58	6696.7	886.34	6696.8	891.98	6696.9	897.62	6697	905.63	6697.1

913.64	6697.2	921.64	6697.3	929.65	6697.4	937.23	6697.5	943.58	6697.6
949.94	6697.7	956.29	6697.8	962.64	6697.9	975.35	6698	993.18	6698.1
1000	6698.1								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel		Right	Coeff Contr.	Expan.
350	650	151.95	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 2671.4

INPUT
Description:
Station Elevation Data num= 261

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6700	5.85	6700	13.13	6699.9	20.42	6699.8	26.8	6699.7
32.49	6699.6	38.18	6699.5	53.23	6699.4	65.86	6699.3	78.48	6699.2
91.36	6699.1	103.73	6699	112.58	6698.9	121.42	6698.8	126.96	6698.7
128.93	6698.6	130.89	6698.5	132.86	6698.4	134.82	6698.3	136.78	6698.2
138.75	6698.1	140.71	6698	142.68	6697.9	144.64	6697.8	146.61	6697.7
148.57	6697.6	150.54	6697.5	152.5	6697.4	154.46	6697.3	156.43	6697.2
158.39	6697.1	160.36	6697	162.32	6696.9	164.29	6696.8	166.25	6696.7
168.22	6696.6	170.18	6696.5	172.14	6696.4	174.11	6696.3	176.07	6696.2
178.04	6696.1	180	6696	181.97	6695.9	183.93	6695.8	185.89	6695.7
187.86	6695.6	189.82	6695.5	191.79	6695.4	193.75	6695.3	195.72	6695.2
197.71	6695.1	199.85	6695	203.61	6694.9	207.29	6694.8	210.81	6694.7
214.33	6694.6	217.85	6694.5	221.37	6694.4	224.9	6694.3	228.42	6694.2
231.94	6694.1	235.46	6694	238.97	6693.9	242.48	6693.8	245.98	6693.7
249.47	6693.6	252.97	6693.5	256.46	6693.4	259.95	6693.3	263.45	6693.2
266.94	6693.1	270.44	6693	276.55	6692.9	285.05	6692.8	296.89	6692.7
308.67	6692.6	320.76	6692.5	333.07	6692.4	344.99	6692.3	350	6692.29
386.64	6692.2	425.28	6692.1	436.53	6692	441.61	6691.9	447.41	6691.8
456.91	6691.7	461.64	6691.6	462.97	6691.5	464.31	6691.4	465.64	6691.3
466.97	6691.2	468.3	6691.1	469.64	6691	470.12	6690.9	470.61	6690.8
471.09	6690.7	471.58	6690.6	472.06	6690.5	472.54	6690.4	473.03	6690.3
473.51	6690.2	474	6690.1	474.49	6690	474.98	6689.9	475.47	6689.8
475.95	6689.7	476.44	6689.6	476.92	6689.5	477.41	6689.4	477.89	6689.3
478.38	6689.2	478.86	6689.1	479.35	6689	479.85	6688.9	480.33	6688.8
480.82	6688.7	481.3	6688.6	481.79	6688.5	482.27	6688.4	482.76	6688.3
483.25	6688.2	483.73	6688.1	484.22	6688	484.7	6687.9	485.19	6687.8
485.67	6687.7	486.16	6687.6	486.64	6687.5	487.13	6687.4	487.61	6687.3
488.1	6687.2	488.62	6687.1	489.19	6687	489.67	6686.9	490.16	6686.8
490.65	6686.7	491.14	6686.6	491.62	6686.5	492.11	6686.4	492.6	6686.3
493.08	6686.2	493.58	6686.1	494.1	6686	494.55	6685.9	495	6685.8
495.74	6685.7	496.6	6685.6	497.46	6685.5	498.33	6685.4	500.27	6685.4
500.32	6685.5	500.38	6685.6	500.44	6685.7	500.65	6685.8	501.41	6685.9
502.16	6686	502.94	6686.1	503.73	6686.2	504.51	6686.3	505.3	6686.4
506.09	6686.5	506.87	6686.6	507.66	6686.7	508.44	6686.8	509.23	6686.9
510.03	6687	510.73	6687.1	511.49	6687.2	512.28	6687.3	513.07	6687.4
513.86	6687.5	514.65	6687.6	515.43	6687.7	516.22	6687.8	517.01	6687.9
517.8	6688	518.59	6688.1	519.37	6688.2	520.16	6688.3	520.95	6688.4
521.74	6688.5	522.53	6688.6	523.32	6688.7	524.1	6688.8	524.89	6688.9
525.66	6689	526.45	6689.1	527.24	6689.2	528.03	6689.3	528.82	6689.4
529.61	6689.5	530.4	6689.6	531.19	6689.7	531.98	6689.8	532.76	6689.9
533.54	6690	536.19	6690.1	538.79	6690.2	541.4	6690.3	544	6690.4
546.61	6690.5	549.21	6690.6	551.82	6690.7	554.42	6690.8	557.03	6690.9
559.63	6691	564.05	6691.1	568.47	6691.2	572.88	6691.3	577.37	6691.4
582.5	6691.5	587.64	6691.6	598.85	6691.7	611.31	6691.8	629.31	6691.9
650	6691.9	681.12	6691.9	687.73	6691.8	694.33	6691.7	706.02	6691.6
744.56	6691.5	761.11	6691.4	772.27	6691.3	780.04	6691.2	785.6	6691.1
791.17	6691	796.74	6690.9	802.31	6690.8	807.88	6690.7	817.16	6690.7
825.82	6690.6	834.48	6690.5	842.84	6690.5	865.59	6690.6	881.44	6690.7
917.21	6690.8	933.14	6690.9	940.33	6691	943.56	6691.1	946.78	6691.2
950.01	6691.3	953.23	6691.4	956.07	6691.5	958.64	6691.6	961.22	6691.7
963.79	6691.8	966.37	6691.9	968.94	6692	971.52	6692.1	974.09	6692.2
976.67	6692.3	979.24	6692.4	981.82	6692.5	984.39	6692.6	986.97	6692.7
989.54	6692.8	992.12	6692.9	994.69	6693	997.27	6693.1	999.84	6693.2
1000	6693.2								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel		Right	Coeff Contr.	Expan.
350	650	151.94	151.94	151.94	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 2519.46

INPUT
Description:
Station Elevation Data num= 246

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6694.9	1.41	6694.9	6.76	6694.8	18.49	6694.7	26.22	6694.6
33.02	6694.5	39.98	6694.4	49.24	6694.3	55.33	6694.2	61.42	6694.1
67.51	6694	73.6	6693.9	79.41	6693.8	82.48	6693.7	85.56	6693.6
88.64	6693.5	91.71	6693.4	94.79	6693.3	97.87	6693.2	100.95	6693.1
104.02	6693	107.41	6692.9	110.79	6692.8	114.16	6692.7	117.52	6692.6
120.89	6692.5	124.26	6692.4	127.62	6692.3	130.99	6692.2	134.35	6692.1
137.72	6692	141.25	6691.9	144.78	6691.8	148.3	6691.7	151.83	6691.6
155.55	6691.5	159.85	6691.4	164.15	6691.3	168.46	6691.2	172.76	6691.1
177.06	6691	182.61	6690.9	188.16	6690.8	195.07	6690.7	202	6690.6
208.79	6690.5	215.14	6690.4	221.49	6690.3	227.83	6690.2	297.17	6690.2

319.42	6690.1	336.02	6690	350	6689.92	354.31	6689.9	372.59	6689.8
389.97	6689.7	405.74	6689.6	421.35	6689.5	436.71	6689.4	444.48	6689.3
451.72	6689.2	458.14	6689.1	464.4	6689	464.96	6688.9	465.51	6688.8
466.07	6688.7	466.63	6688.6	467.18	6688.5	467.74	6688.4	468.3	6688.3
468.85	6688.2	469.41	6688.1	469.99	6688	470.55	6687.9	471.11	6687.8
471.67	6687.7	472.23	6687.6	472.79	6687.5	473.34	6687.4	473.9	6687.3
474.46	6687.2	475.02	6687.1	475.57	6687	476.14	6686.9	476.7	6686.8
477.26	6686.7	477.82	6686.6	478.38	6686.5	478.93	6686.4	479.49	6686.3
480.05	6686.2	480.61	6686.1	481.17	6686	481.74	6685.9	482.3	6685.8
482.86	6685.7	483.42	6685.6	483.98	6685.5	484.54	6685.4	485.09	6685.3
485.65	6685.2	486.21	6685.1	486.77	6685	487.35	6684.9	487.92	6684.8
488.48	6684.7	489.04	6684.6	489.6	6684.5	490.15	6684.4	490.71	6684.3
491.27	6684.2	491.83	6684.1	492.39	6684	492.98	6683.9	493.56	6683.8
494.15	6683.7	494.73	6683.6	495.32	6683.5	495.96	6683.5	498.28	6683.4
501.05	6683.4	501.25	6683.5	501.45	6683.6	501.65	6683.7	501.85	6683.8
502.05	6683.9	502.25	6684	503.31	6684.1	504.37	6684.2	505.43	6684.3
506.5	6684.4	507.56	6684.5	508.62	6684.6	509.68	6684.7	510.74	6684.8
511.8	6684.9	512.86	6685	513.92	6685.1	514.99	6685.2	516.05	6685.3
517.11	6685.4	518.17	6685.5	519.23	6685.6	520.29	6685.7	521.35	6685.8
522.42	6685.9	523.48	6686	524.54	6686.1	525.6	6686.2	526.66	6686.3
527.72	6686.4	528.78	6686.5	529.85	6686.6	530.91	6686.7	531.97	6686.8
533.03	6686.9	534.09	6687	535.15	6687.1	536.21	6687.2	537.28	6687.3
538.34	6687.4	539.4	6687.5	540.46	6687.6	541.52	6687.7	542.58	6687.8
543.64	6687.9	544.7	6688	545.72	6688.1	546.73	6688.2	547.93	6688.3
551.05	6688.4	557.78	6688.5	560.24	6688.6	562.7	6688.7	565.16	6688.8
569.91	6688.9	580.49	6689	589.71	6689.1	601.82	6689.2	612.73	6689.3
623.48	6689.4	631.92	6689.4	636.78	6689.3	641.64	6689.2	646.5	6689.1
650	6689.03	651.36	6689	656.22	6688.9	661.43	6688.8	668.53	6688.7
675.63	6688.6	682.72	6688.5	689.82	6688.4	696.91	6688.3	704.01	6688.2
704.88	6688.2	716.18	6688.3	750.98	6688.4	758.82	6688.4	777.66	6688.3
779.03	6688.3	784.36	6688.4	789.68	6688.5	795.01	6688.6	800.33	6688.7
805.66	6688.8	810.98	6688.9	816.31	6689	826.88	6689.1	837.83	6689.2
850.46	6689.3	855.15	6689.3	861.91	6689.2	868.67	6689.1	875.43	6689
884.33	6688.9	893.22	6688.8	899.43	6688.8	926.28	6688.9	929.98	6689
932.8	6689.1	935.62	6689.2	938.44	6689.3	941.27	6689.4	944.09	6689.5
946.91	6689.6	949.73	6689.7	952.55	6689.8	955.38	6689.9	958.2	6690
960.93	6690.1	963.66	6690.2	966.39	6690.3	969.12	6690.4	971.85	6690.5
974.58	6690.6	977.31	6690.7	980.04	6690.8	982.87	6690.9	985.71	6691
988.09	6691.1	990.47	6691.2	992.85	6691.3	995.23	6691.4	997.61	6691.5
999.99	6691.6								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 2367.51

INPUT
Description:
Station Elevation Data num= 162

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6690.8	4.47	6690.8	8.99	6690.7	13.51	6690.6	17.91	6690.5
22.27	6690.4	26.64	6690.3	31	6690.2	35.37	6690.1	39.74	6690
44.15	6689.9	48.6	6689.8	53.05	6689.7	57.49	6689.6	61.94	6689.5
66.39	6689.4	70.84	6689.3	75.28	6689.2	79.73	6689.1	84.18	6689
90.14	6688.9	98.25	6688.8	105.68	6688.7	113.96	6688.6	123.96	6688.5
134.35	6688.4	145	6688.3	155.65	6688.2	168.69	6688.1	248.87	6688.1
281	6688.2	311.02	6688.3	320.79	6688.3	331.43	6688.2	342.06	6688.1
350	6688.02	352.43	6688	359.22	6687.9	366.02	6687.8	372.81	6687.7
379.61	6687.6	386.41	6687.5	393.2	6687.4	399.48	6687.3	405.6	6687.2
413.92	6687.1	421.06	6687	424.68	6686.9	428.31	6686.8	431.93	6686.7
436.7	6686.6	442.56	6686.5	448.42	6686.4	454.28	6686.3	460.14	6686.2
466	6686.1	471.86	6686	478.39	6686	479.17	6685.9	479.95	6685.8
480.73	6685.7	481.4	6685.6	482	6685.5	482.59	6685.4	483.18	6685.3
483.77	6685.2	484.36	6685.1	484.96	6685	485.55	6684.9	486.14	6684.8
486.73	6684.7	487.32	6684.6	487.92	6684.5	488.51	6684.4	489.1	6684.3
489.69	6684.2	490.29	6684.1	490.88	6684	491.47	6683.9	492.06	6683.8
492.65	6683.7	493.25	6683.6	493.84	6683.5	494.43	6683.4	495.02	6683.3
495.62	6683.2	496.21	6683.1	496.8	6683	506.43	6683	507.81	6683.1
509.24	6683.2	510.67	6683.3	512.1	6683.4	513.53	6683.5	514.96	6683.6
516.39	6683.7	517.83	6683.8	519.26	6683.9	520.69	6684	521.87	6684.1
523.05	6684.2	524.24	6684.3	525.42	6684.4	526.61	6684.5	527.79	6684.6
528.98	6684.7	530.16	6684.8	531.34	6684.9	532.53	6685	533.72	6685.1
534.91	6685.2	545.53	6685.3	550.16	6685.4	554.93	6685.5	577.59	6685.6
589.48	6685.7	591.47	6685.7	637.77	6685.6	648.73	6685.6	650	6685.61
659.26	6685.7	669.19	6685.8	678.94	6685.9	688.69	6686	693.51	6686.1
698.32	6686.2	703.14	6686.3	707.95	6686.4	712.77	6686.5	724.13	6686.6
735.84	6686.7	755.44	6686.8	775.52	6686.9	788.92	6687	803.61	6687.1
818.29	6687.2	840.27	6687.2	846.38	6687.3	851.01	6687.4	855.46	6687.5
859.91	6687.6	864.36	6687.7	868.81	6687.8	873.27	6687.9	877.72	6688
880.78	6688.1	883.84	6688.2	889.66	6688.3	896.32	6688.4	902.71	6688.5
908.69	6688.6	914.68	6688.7	920.67	6688.8	926.66	6688.9	932.64	6689
938.43	6689.1	944.21	6689.2	949.99	6689.3	961.59	6689.4	968.82	6689.5
976.81	6689.6	1000	6689.6						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.94	151.94	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 2215.57

INPUT
Description:
Station Elevation Data num= 121

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6686.4	6.38	6686.4	14.83	6686.3	21.92	6686.2	28.92	6686.1
39.26	6686	51.13	6685.9	70.11	6685.8	85.53	6685.7	198.17	6685.7
230.75	6685.8	248.38	6685.9	266.01	6686	279.47	6686.1	299.1	6686.1
305.99	6686	309.22	6685.9	312.45	6685.8	315.67	6685.7	318.9	6685.6
322.13	6685.5	325.35	6685.4	328.58	6685.3	331.81	6685.2	335.03	6685.1
338.26	6685	341.49	6684.9	344.9	6684.8	349.37	6684.7	350	6684.69
353.84	6684.6	358.31	6684.5	362.78	6684.4	367.25	6684.3	371.72	6684.2
373.57	6684.2	380.83	6684.3	388.08	6684.4	395.34	6684.5	402.6	6684.6
409.86	6684.7	417	6684.8	426.26	6684.8	428.48	6684.7	431.97	6684.6
436.72	6684.5	441.48	6684.4	446.23	6684.3	450.98	6684.2	455.73	6684.1
460.48	6684	461.73	6683.9	462.98	6683.8	464.23	6683.7	465.48	6683.6
466.73	6683.5	467.98	6683.4	469.22	6683.3	470.47	6683.2	471.94	6683.1
475.75	6683	512.04	6683	514.88	6683.1	517.71	6683.2	520.55	6683.3
523.38	6683.4	526.22	6683.5	529.05	6683.6	531.88	6683.7	534.72	6683.8
537.55	6683.9	540.39	6684	543.22	6684.1	546.05	6684.2	548.89	6684.3
551.84	6684.4	554.86	6684.5	557.89	6684.6	560.91	6684.7	563.36	6684.8
565.53	6684.9	567.7	6685	571.7	6685.1	575.7	6685.2	579.7	6685.3
583.71	6685.4	587.71	6685.5	591.71	6685.6	595.71	6685.7	599.71	6685.8
605.42	6685.9	611.59	6686	616.8	6686.1	622.02	6686.2	627.23	6686.3
632.44	6686.4	638.54	6686.5	645.43	6686.6	650	6686.67	652.32	6686.7
659.21	6686.8	666.33	6686.9	673.64	6687	685.4	6687.1	697.17	6687.2
708.93	6687.3	720.69	6687.4	732.46	6687.5	744.22	6687.6	755.98	6687.7
769.08	6687.7	835.31	6687.8	865.48	6687.9	906.02	6687.9	930.54	6687.8
945.63	6687.7	966.77	6687.7	976.37	6687.8	985.98	6687.9	995.59	6688
1000	6688								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	151.95	151.95	.1	.3

LATERAL STRUCTURE

RIVER: MS-06
REACH: Main Channel-0 RS: 2098

INPUT
Description:
Lateral structure position = Left overbank
Distance from Upstream XS =
Deck/Roadway Width = 10

Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 130

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6683.5	1.18	6683.5	10.41	6683.4	19.64	6683.3	28.87	6683.2
38.09	6683.1	47.32	6683	55.22	6682.9	62.96	6682.8	70.7	6682.7
78.44	6682.6	86.18	6682.5	93.92	6682.4	101.66	6682.3	109.4	6682.2
117.14	6682.1	120.95	6682.05	124.76	6682	134.33	6681.9	143.9	6681.8
153.47	6681.7	163.04	6681.6	172.79	6681.5	182.65	6681.4	192.52	6681.3
202.26	6681.2	211.24	6681.1	211.3	6681.1	220.62	6681	229.94	6680.9
239.26	6680.8	248.57	6680.7	258.09	6680.6	262.77	6680.55	267.65	6680.5
277.18	6680.4	286.71	6680.3	298.75	6680.2	311.01	6680.1	323.26	6680
332.67	6679.9	342.08	6679.8	351.49	6679.7	366.54	6679.6	368.87	6679.58
378.83	6679.5	390.31	6679.4	401.78	6679.3	413.26	6679.2	424.74	6679.1
436.21	6679	448.2	6678.9	460.5	6678.8	473.22	6678.7	485.93	6678.6
498.64	6678.5	511.36	6678.4	523.53	6678.3	524	6678.3	535.1	6678.2
546.19	6678.1	557.28	6678	568.52	6677.9	578.71	6677.8	587.53	6677.7
596.36	6677.6	605.18	6677.5	614.01	6677.4	622.83	6677.3	631.66	6677.2
640.48	6677.1	649.31	6677	657.14	6676.9	664.83	6676.8	672.39	6676.7
679.95	6676.6	687.51	6676.5	691.22	6676.45	694.86	6676.4	702.01	6676.3
709.16	6676.2	716.31	6676.1	723.47	6676	731.02	6675.9	737.85	6675.8
744.69	6675.7	751.52	6675.6	758.35	6675.5	765.18	6675.4	772.02	6675.3
778.85	6675.2	785.68	6675.1	792.51	6675	799.34	6674.9	806.17	6674.8
813	6674.7	819.82	6674.6	826.65	6674.5	829.59	6674.46	833.45	6674.4
840.24	6674.3	847.03	6674.2	853.82	6674.1	860.61	6674	868.17	6673.9
875.73	6673.8	883.28	6673.7	890.84	6673.6	898.4	6673.5	905.96	6673.4
913.52	6673.3	921.05	6673.2	928.57	6673.1	936.09	6673	943.48	6672.9
950.87	6672.8	958.26	6672.7	965.66	6672.6	973.05	6672.5	980.45	6672.4
987.85	6672.3	995.24	6672.2	1002.64	6672.1	1010.03	6672	1015.85	6671.9
1021.67	6671.8	1028.9	6671.7	1036.35	6671.6	1043.81	6671.5	1047.05	6671.5

Weir crest shape = Broad Crested

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 2063.62

INPUT
Description:
Station Elevation Data num= 66

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
402.55	6683.1	407.45	6683.1	420.06	6683.1	441.47	6683	451.36	6682.9
460.63	6682.8	469.91	6682.7	478.95	6682.6	486.13	6682.5	490.67	6682.4
492.19	6682.3	499.99	6682.3	504.14	6682.3	510.31	6682.4	514.83	6682.5
520.22	6682.6	528.22	6682.7	536.21	6682.8	544.21	6682.9	552.2	6683
556.16	6683.1	560.83	6683.2	565.75	6683.3	570.66	6683.4	575.58	6683.5
580.48	6683.6	585.39	6683.7	590.3	6683.8	595.23	6683.9	600.16	6684
605.28	6684.1	610.39	6684.2	615.5	6684.3	620.62	6684.4	625.73	6684.5

630.35	6684.6	634.67	6684.7	638.98	6684.8	643.3	6684.9	647.62	6685
652.55	6685.1	657.48	6685.2	662.41	6685.3	667.33	6685.4	672.32	6685.5
677.68	6685.6	683.04	6685.7	688.4	6685.8	693.76	6685.9	699.12	6686
707.45	6686.02	747.32	6686.1	822.18	6686.2	856.42	6686.2	898.91	6686.1
921.44	6686.1	930.78	6686.2	939.3	6686.3	947.77	6686.4	956.24	6686.5
964.71	6686.6	973.17	6686.7	981.64	6686.8	990.11	6686.9	998.57	6687
999.99	6687								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
402.55	.045	407.45	.06	707.45	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
407.45	707.45	151.95	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 1911.67

INPUT
Description:
Station Elevation Data num= 71

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
373.54	6681.1	379.43	6681.1	380.6	6681.1	382.67	6681.1	425.01	6681
500.01	6681	525.56	6681	530.35	6681.1	535.13	6681.2	539.91	6681.3
544.69	6681.4	549.47	6681.5	554.25	6681.6	559.03	6681.7	563.82	6681.8
568.6	6681.9	573.38	6682	577.87	6682.1	582.35	6682.2	586.84	6682.3
591.33	6682.4	595.81	6682.5	600.3	6682.6	604.79	6682.7	609.27	6682.8
613.76	6682.9	618.25	6683	622.59	6683.1	626.94	6683.2	631.28	6683.3
635.63	6683.4	639.98	6683.5	644.32	6683.6	648.67	6683.7	653.01	6683.8
657.36	6683.9	661.71	6684	668.5	6684.1	675.3	6684.2	680.6	6684.28
682.09	6684.3	688.88	6684.4	695.68	6684.5	702.47	6684.6	710.48	6684.7
725.77	6684.8	744.29	6684.9	798.92	6684.9	826.79	6685	857.21	6685.1
889.49	6685.2	895.44	6685.3	917.14	6685.4	920.46	6685.5	923.78	6685.6
927.11	6685.7	930.43	6685.8	933.75	6685.9	937.08	6686	943.49	6686.1
949.9	6686.2	956.32	6686.3	962.73	6686.4	969.14	6686.5	975.49	6686.6
980.44	6686.7	985.39	6686.8	990.33	6686.9	995.28	6687	997.78	6687.1
1000.01	6687.1								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
373.54	.045	380.6	.06	680.6	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
380.6	680.6	151.94	151.94	151.94	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 1759.73

INPUT
Description:
Station Elevation Data num= 104

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
415.32	6679.7	420.54	6679.7	422.69	6679.7	429.97	6679.7	454.1	6679.6
477.64	6679.5	500.01	6679.5	512.34	6679.5	519.45	6679.6	526.55	6679.7
533.56	6679.8	540.2	6679.9	546.85	6680	553.1	6680.1	559.35	6680.2
565.61	6680.3	571.86	6680.4	578.12	6680.5	584.37	6680.6	590.69	6680.7
597.2	6680.8	603.7	6680.9	610.21	6681	615.88	6681.1	621.56	6681.2
627.23	6681.3	632.9	6681.4	638.57	6681.5	644.25	6681.6	649.92	6681.7
655.72	6681.8	661.69	6681.9	667.66	6682	673.59	6682.1	679.51	6682.2
685.43	6682.3	694.61	6682.4	704.85	6682.5	715.56	6682.6	722.69	6682.69
723.54	6682.7	734.58	6682.8	754.43	6682.9	774.79	6683	792.91	6683.1
810.69	6683.2	827.57	6683.3	838.52	6683.4	849.47	6683.5	860.4	6683.6
871.23	6683.7	881	6683.8	886.13	6683.9	891.26	6684	893.24	6684.1
895.23	6684.2	897.23	6684.3	899.6	6684.4	901.97	6684.5	904.35	6684.6
906.72	6684.7	909.09	6684.8	911.46	6684.9	913.83	6685	916.2	6685.1
918.58	6685.2	920.95	6685.3	923.32	6685.4	925.69	6685.5	928.06	6685.6
930.44	6685.7	932.81	6685.8	935.18	6685.9	937.55	6686	939.92	6686.1
942.3	6686.2	944.67	6686.3	947.04	6686.4	949.41	6686.5	951.78	6686.6
954.16	6686.7	956.53	6686.8	958.9	6686.9	961.27	6687	963.22	6687.1
965.16	6687.2	967.11	6687.3	969.05	6687.4	971	6687.5	972.95	6687.6
974.89	6687.7	976.84	6687.8	978.78	6687.9	980.87	6688	982.93	6688.1
984.99	6688.2	987.04	6688.3	989.1	6688.4	991.16	6688.5	993.22	6688.6
995.27	6688.7	997.33	6688.8	999.39	6688.9	1000.01	6688.9		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
415.32	.045	422.69	.06	722.69	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
422.69	722.69	151.95	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 1607.78

INPUT
Description:
Station Elevation Data num= 142

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
419.39	6678.4	423.25	6678.4	423.31	6678.4	424.6	6678.4	432.84	6678.4
442.84	6678.3	452.83	6678.2	473.99	6678.1	500	6678.01	503.43	6678
505.48	6678	512.11	6678.1	518.74	6678.2	525.36	6678.3	531.99	6678.4
538.61	6678.5	545.24	6678.6	551.87	6678.7	558.46	6678.8	565.04	6678.9
571.63	6679	577.1	6679.1	582.57	6679.2	588.04	6679.3	593.5	6679.4

598.97	6679.5	604.44	6679.6	609.63	6679.7	614.36	6679.8	619.08	6679.9
623.81	6680	629.01	6680.1	634.22	6680.2	639.42	6680.3	646.19	6680.4
656.82	6680.5	667.44	6680.6	678.06	6680.7	688.07	6680.8	698.63	6680.9
709.93	6681	721.77	6681.1	724.6	6681.12	733.61	6681.2	747.43	6681.3
762.92	6681.4	774.63	6681.5	782.33	6681.6	789.81	6681.7	797.62	6681.8
805.43	6681.9	813.24	6682	815.6	6682.1	817.96	6682.2	820.56	6682.3
823.44	6682.4	826.32	6682.5	829.21	6682.6	832.09	6682.7	834.97	6682.8
837.85	6682.9	840.74	6683	843.62	6683.1	846.5	6683.2	849.38	6683.3
852.27	6683.4	855.15	6683.5	858.03	6683.6	860.91	6683.7	863.8	6683.8
866.68	6683.9	869.56	6684	872.04	6684.1	874.52	6684.2	876.99	6684.3
879.47	6684.4	881.95	6684.5	884.42	6684.6	886.9	6684.7	889.38	6684.8
891.85	6684.9	894.4	6685	896.23	6685.1	898.1	6685.2	899.98	6685.3
901.85	6685.4	903.72	6685.5	905.6	6685.6	907.47	6685.7	909.35	6685.8
911.22	6685.9	913.1	6686	914.95	6686.1	916.81	6686.2	918.66	6686.3
920.52	6686.4	922.37	6686.5	924.23	6686.6	926.08	6686.7	927.94	6686.8
929.79	6686.9	931.65	6687	933.5	6687.1	935.36	6687.2	937.21	6687.3
939.07	6687.4	940.93	6687.5	942.78	6687.6	944.64	6687.7	946.49	6687.8
948.35	6687.9	950.2	6688	952	6688.1	953.8	6688.2	955.59	6688.3
957.39	6688.4	959.19	6688.5	960.99	6688.6	962.78	6688.7	964.58	6688.8
966.52	6688.9	968.54	6689	970.17	6689.1	971.8	6689.2	973.44	6689.3
975.07	6689.4	976.71	6689.5	978.34	6689.6	979.98	6689.7	981.61	6689.8
983.25	6689.9	984.88	6690	986.52	6690.1	988.15	6690.2	989.78	6690.3
991.42	6690.4	993.05	6690.5	994.69	6690.6	996.32	6690.7	997.96	6690.8
999.59	6690.9	1000	6690.9						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
419.39	.045	424.6	.06	724.6	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
424.6	724.6	151.94	151.94	151.94	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 1455.84

INPUT
Description:
Station Elevation Data num= 161

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
417.79	6676.9	420.01	6676.9	423.25	6676.9	424.81	6676.9	429.47	6676.9
444.11	6676.8	457.75	6676.7	466.4	6676.6	475.04	6676.5	483.69	6676.4
492.33	6676.3	499.99	6676.3	507.13	6676.3	515.29	6676.4	527.49	6676.5
538.32	6676.6	544.8	6676.7	551.29	6676.8	557.77	6676.9	564.26	6677
569.07	6677.1	573.88	6677.2	580.26	6677.3	587.27	6677.4	594.28	6677.5
601.29	6677.6	609.13	6677.7	618.18	6677.8	627.22	6677.9	636.27	6678
644.67	6678.1	653.06	6678.2	659.12	6678.3	664.56	6678.4	670	6678.5
675.44	6678.6	680.88	6678.7	687.01	6678.8	699.19	6678.9	711.37	6679
722.86	6679.1	724.81	6679.14	728.29	6679.2	730.53	6679.3	732.77	6679.4

735	6679.5	737.24	6679.6	739.48	6679.7	741.71	6679.8	743.95	6679.9
746.18	6680	748.42	6680.1	750.66	6680.2	752.89	6680.3	755.14	6680.4
757.38	6680.5	759.63	6680.6	761.87	6680.7	764.12	6680.8	766.36	6680.9
768.6	6681	771.82	6681.1	775.04	6681.2	778.26	6681.3	781.48	6681.4
784.7	6681.5	787.92	6681.6	791.14	6681.7	794.09	6681.8	796.76	6681.9
799.42	6682	801.86	6682.1	804.3	6682.2	806.73	6682.3	809.17	6682.4
811.61	6682.5	814.05	6682.6	816.49	6682.7	818.93	6682.8	821.37	6682.9
823.81	6683	826.24	6683.1	828.68	6683.2	831.12	6683.3	833.55	6683.4
835.99	6683.5	838.42	6683.6	840.86	6683.7	843.29	6683.8	845.73	6683.9
848.16	6684	850.6	6684.1	853.04	6684.2	855.47	6684.3	857.91	6684.4
860.26	6684.5	862.57	6684.6	864.88	6684.7	867.19	6684.8	869.51	6684.9
871.82	6685	873.86	6685.1	875.91	6685.2	877.95	6685.3	879.99	6685.4
882.04	6685.5	884.08	6685.6	886.13	6685.7	888.18	6685.8	890.22	6685.9
892.27	6686	894.29	6686.1	896.31	6686.2	898.33	6686.3	900.35	6686.4
902.38	6686.5	904.4	6686.6	906.42	6686.7	908.44	6686.8	910.46	6686.9
912.48	6687	914.51	6687.1	916.53	6687.2	918.55	6687.3	920.57	6687.4
922.59	6687.5	924.61	6687.6	926.64	6687.7	928.66	6687.8	930.68	6687.9
932.7	6688	934.82	6688.1	936.95	6688.2	939.07	6688.3	941.19	6688.4
943.32	6688.5	945.44	6688.6	947.56	6688.7	949.53	6688.8	951.45	6688.9
953.37	6689	955.72	6689.1	958.07	6689.2	960.42	6689.3	962.78	6689.4
965.13	6689.5	967.48	6689.6	969.83	6689.7	972.19	6689.8	974.54	6689.9
976.89	6690	979.24	6690.1	981.59	6690.2	983.95	6690.3	986.3	6690.4
988.66	6690.5	991.1	6690.6	993.55	6690.7	995.99	6690.8	998.43	6690.9
999.99	6690.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
417.79	.045	424.81	.06	724.81	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
424.81	724.81	151.95	151.95	151.95	.1	.3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 1303.89

INPUT
Description:
Station Elevation Data num= 169

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
393.13	6674.5	396.63	6674.5	400.37	6674.5	448.61	6674.5	469.15	6674.4
490.54	6674.3	500	6674.3	514.49	6674.3	528.55	6674.4	535.57	6674.5
540.87	6674.6	546.17	6674.7	551.46	6674.8	556.76	6674.9	562.06	6675
567.7	6675.1	573.52	6675.2	579.36	6675.3	585.15	6675.4	590.92	6675.5
596.69	6675.6	602.46	6675.7	608.22	6675.8	613.86	6675.9	619.5	6676
625	6676.1	630.5	6676.2	636	6676.3	641.47	6676.4	646.82	6676.5
652.17	6676.6	657.52	6676.7	662.87	6676.8	668.22	6676.9	673.57	6677
676.5	6677.1	679.43	6677.2	682.37	6677.3	685.3	6677.4	688.23	6677.5
691.16	6677.6	694.1	6677.7	697.03	6677.8	700.01	6677.9	700.37	6677.91

704.28	6678	706.67	6678.1	709.06	6678.2	711.45	6678.3	713.84	6678.4
716.23	6678.5	718.62	6678.6	721.01	6678.7	723.4	6678.8	725.79	6678.9
728.18	6679	730.4	6679.1	732.62	6679.2	734.84	6679.3	737.07	6679.4
739.34	6679.5	741.62	6679.6	743.89	6679.7	746.17	6679.8	748.44	6679.9
750.71	6680	753.39	6680.1	756.06	6680.2	758.74	6680.3	761.41	6680.4
764.09	6680.5	766.76	6680.6	769.09	6680.7	771.34	6680.8	773.59	6680.9
775.83	6681	778.7	6681.1	781.56	6681.2	784.43	6681.3	787.29	6681.4
790.16	6681.5	793.02	6681.6	795.89	6681.7	798.75	6681.8	801.62	6681.9
804.48	6682	807.08	6682.1	809.68	6682.2	812.29	6682.3	814.92	6682.4
817.55	6682.5	820.18	6682.6	822.81	6682.7	825.44	6682.8	828.07	6682.9
830.7	6683	832.81	6683.1	834.92	6683.2	837.03	6683.3	839.14	6683.4
841.25	6683.5	843.36	6683.6	845.51	6683.7	848.07	6683.8	850.62	6683.9
853.17	6684	855.2	6684.1	857.23	6684.2	859.26	6684.3	861.28	6684.4
863.31	6684.5	865.34	6684.6	867.37	6684.7	869.39	6684.8	871.42	6684.9
873.45	6685	875.5	6685.1	877.54	6685.2	879.59	6685.3	881.64	6685.4
883.69	6685.5	885.73	6685.6	887.78	6685.7	889.84	6685.8	891.9	6685.9
893.97	6686	896.06	6686.1	898.14	6686.2	900.23	6686.3	902.32	6686.4
904.41	6686.5	906.49	6686.6	908.58	6686.7	910.67	6686.8	912.75	6686.9
914.84	6687	917.4	6687.1	919.95	6687.2	922.51	6687.3	925.26	6687.4
928.08	6687.5	930.9	6687.6	933.72	6687.7	936.54	6687.8	939.35	6687.9
942.17	6688	944.88	6688.1	947.59	6688.2	950.3	6688.3	953.01	6688.4
955.71	6688.5	958.42	6688.6	961.13	6688.7	963.84	6688.8	966.54	6688.9
969.23	6689	971.6	6689.1	973.97	6689.2	976.34	6689.3	978.71	6689.4
981.08	6689.5	983.45	6689.6	985.82	6689.7	988.19	6689.8	990.55	6689.9
992.92	6690	995.45	6690.1	998.01	6690.2	1000	6690.2		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
393.13	.045	400.37	.06	700.37	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
400.37	700.37	151.94	151.94	151.94	.1 .3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 1151.95

INPUT
Description:
Station Elevation Data num= 175

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
374.3	6672.5	379.85	6672.5	384.09	6672.5	443.2	6672.5	469.56	6672.4
497.05	6672.3	500	6672.3	506.46	6672.3	518.46	6672.4	530.47	6672.5
543.73	6672.6	554.77	6672.7	563.26	6672.8	571.12	6672.9	577.94	6673
581.36	6673.1	584.78	6673.2	588.2	6673.3	591.62	6673.4	595.04	6673.5
598.46	6673.6	601.88	6673.7	605.3	6673.8	608.72	6673.9	612.14	6674
615.56	6674.1	618.98	6674.2	622.4	6674.3	625.82	6674.4	629.24	6674.5
632.66	6674.6	636.08	6674.7	639.5	6674.8	642.92	6674.9	646.34	6675
650.38	6675.1	653.18	6675.2	655.99	6675.3	658.79	6675.4	661.59	6675.5

664.4	6675.6	667.2	6675.7	670	6675.8	672.8	6675.9	675.61	6676
678.38	6676.1	681.15	6676.2	683.92	6676.3	684.09	6676.31	686.69	6676.4
689.46	6676.5	692.23	6676.6	695	6676.7	697.77	6676.8	700.54	6676.9
703.31	6677	705.95	6677.1	708.58	6677.2	711.24	6677.3	713.99	6677.4
716.75	6677.5	719.5	6677.6	722.26	6677.7	725.02	6677.8	727.77	6677.9
730.53	6678	733.24	6678.1	735.95	6678.2	738.66	6678.3	741.38	6678.4
744.09	6678.5	746.8	6678.6	749.51	6678.7	752.23	6678.8	754.94	6678.9
757.65	6679	760.36	6679.1	763.07	6679.2	765.79	6679.3	768.5	6679.4
771.21	6679.5	773.92	6679.6	776.63	6679.7	779.35	6679.8	782.06	6679.9
784.77	6680	787.57	6680.1	789.97	6680.2	792.37	6680.3	794.77	6680.4
797.17	6680.5	799.57	6680.6	801.97	6680.7	804.37	6680.8	806.77	6680.9
809.17	6681	811.02	6681.1	812.87	6681.2	814.72	6681.3	816.57	6681.4
818.42	6681.5	820.27	6681.6	822.12	6681.7	823.96	6681.8	825.81	6681.9
827.66	6682	829.51	6682.1	831.36	6682.2	833.21	6682.3	835.06	6682.4
836.91	6682.5	838.76	6682.6	840.61	6682.7	842.45	6682.8	844.3	6682.9
846.15	6683	848	6683.1	849.85	6683.2	851.7	6683.3	853.55	6683.4
855.4	6683.5	857.25	6683.6	859.1	6683.7	860.94	6683.8	862.79	6683.9
864.64	6684	866.55	6684.1	868.46	6684.2	870.37	6684.3	872.28	6684.4
874.2	6684.5	876.12	6684.6	878.04	6684.7	879.96	6684.8	881.88	6684.9
883.79	6685	886.34	6685.1	888.88	6685.2	891.42	6685.3	893.96	6685.4
896.5	6685.5	899.05	6685.6	901.59	6685.7	904.13	6685.8	906.67	6685.9
909.22	6686	911.76	6686.1	914.3	6686.2	916.84	6686.3	919.38	6686.4
921.93	6686.5	924.47	6686.6	927.01	6686.7	929.55	6686.8	932.1	6686.9
934.64	6687	937.23	6687.1	939.83	6687.2	942.43	6687.3	945.02	6687.4
947.62	6687.5	950.24	6687.6	952.89	6687.7	955.55	6687.8	958.21	6687.9
960.86	6688	965.46	6688.1	970.06	6688.2	974.65	6688.3	979.25	6688.4
983.85	6688.5	988.45	6688.6	993.04	6688.7	997.64	6688.8	1000	6688.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
374.3	.045	384.09	.06	684.09	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
384.09	684.09	151.95	151.95	151.95	.1 .3

CROSS SECTION

RIVER: MS-06
REACH: Main Channel-0 RS: 1000

INPUT
Description:
Station Elevation Data num= 204

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6666.2	8.62	6666.2	16.74	6666.3	25.11	6666.4	33.65	6666.5
42.2	6666.6	50.74	6666.7	59.28	6666.8	67.82	6666.9	76.37	6667
88.71	6667.1	101.4	6667.2	108.04	6667.3	114.44	6667.4	121.64	6667.5
130.28	6667.6	139.82	6667.7	149.35	6667.8	158.89	6667.9	168.43	6668
180.61	6668.1	187.17	6668.2	191.09	6668.3	196.07	6668.4	201.65	6668.5
208.67	6668.6	217.47	6668.7	226.47	6668.8	235.47	6668.9	244.47	6669

253.78	6669.1	262.09	6669.2	270.9	6669.3	279.71	6669.4	288.52	6669.5
296.86	6669.6	304.94	6669.7	312.97	6669.8	320.75	6669.9	329.76	6670
342.33	6670.1	350	6670.16	354.9	6670.2	370.93	6670.3	384.65	6670.4
424.78	6670.4	450.83	6670.3	467.51	6670.2	476.28	6670.1	482.66	6670
517.05	6670	521.02	6670.1	525.05	6670.2	529.35	6670.3	533.67	6670.4
537.98	6670.5	542.3	6670.6	546.68	6670.7	551.08	6670.8	555.48	6670.9
559.88	6671	564.13	6671.1	568.39	6671.2	572.64	6671.3	576.89	6671.4
581.21	6671.5	585.61	6671.6	589.59	6671.7	593.35	6671.8	597.11	6671.9
600.87	6672	603.88	6672.1	606.89	6672.2	609.9	6672.3	612.91	6672.4
615.92	6672.5	618.92	6672.6	621.93	6672.7	624.94	6672.8	627.95	6672.9
630.96	6673	633.97	6673.1	636.98	6673.2	639.99	6673.3	643	6673.4
646.01	6673.5	649.03	6673.6	650	6673.63	652.04	6673.7	655.05	6673.8
658.07	6673.9	661.08	6674	663.93	6674.1	666.78	6674.2	669.63	6674.3
672.48	6674.4	675.33	6674.5	678.18	6674.6	681.02	6674.7	683.86	6674.8
686.7	6674.9	689.54	6675	692.38	6675.1	695.21	6675.2	698.04	6675.3
700.88	6675.4	703.71	6675.5	706.55	6675.6	709.38	6675.7	712.21	6675.8
715.05	6675.9	717.88	6676	720.67	6676.1	723.15	6676.2	725.31	6676.3
727.48	6676.4	729.64	6676.5	731.81	6676.6	733.98	6676.7	736.14	6676.8
738.31	6676.9	740.48	6677	742.42	6677.1	744.36	6677.2	746.3	6677.3
748.24	6677.4	750.18	6677.5	752.12	6677.6	754.06	6677.7	756	6677.8
757.95	6677.9	759.91	6678	761.79	6678.1	763.68	6678.2	765.57	6678.3
767.46	6678.4	769.35	6678.5	771.24	6678.6	773.13	6678.7	775.02	6678.8
776.9	6678.9	778.79	6679	780.69	6679.1	782.59	6679.2	784.49	6679.3
786.39	6679.4	788.29	6679.5	790.19	6679.6	792.09	6679.7	793.99	6679.8
795.89	6679.9	797.89	6680	799.96	6680.1	802.02	6680.2	804.08	6680.3
806.14	6680.4	808.2	6680.5	810.27	6680.6	812.33	6680.7	814.39	6680.8
816.45	6680.9	818.51	6681	821.97	6681.1	825.43	6681.2	828.89	6681.3
832.35	6681.4	835.8	6681.5	839.26	6681.6	842.72	6681.7	846.18	6681.8
849.64	6681.9	853.14	6682	855.62	6682.1	858.04	6682.2	860.46	6682.3
862.87	6682.4	865.29	6682.5	867.71	6682.6	870.13	6682.7	872.55	6682.8
874.97	6682.9	877.39	6683	880.32	6683.1	883.27	6683.2	888.72	6683.3
894.16	6683.4	899.61	6683.5	905.05	6683.6	910.49	6683.7	915.94	6683.8
921.38	6683.9	926.82	6684	931.74	6684.1	936.66	6684.2	941.19	6684.3
945.36	6684.4	949.53	6684.5	953.7	6684.6	957.87	6684.7	962.04	6684.8
966.21	6684.9	979.98	6685	994.64	6685.1	1000	6685.1		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	350	.06	650	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
350	650	0	0	0	.1 .3

Left Levee Station= 381.28 Elevation= 6670.45

SUMMARY OF MANNING'S N VALUES

River:MS-06

Reach	River Sta.	n1	n2	n3
Main Channel	1000	.045	.045	.045
Main Channel	999.9	Lat Struct		
Main Channel	999	.045	.045	.045
Main Channel	998.53	Culvert		
Main Channel	998	.045	.07	.07
Main Channel	997	.045	.045	.045
Main Channel	996	.045	.045	.045
Main Channel	995.2	Lat Struct		
Main Channel	995	.045	.045	.045
Main Channel	993	.045	.07	.045
Main Channel	992	.045	.07	.045
Main Channel	991	.045	.07	.045
Main Channel	990	.045	.07	.045
Main Channel	989	.045	.07	.045
Main Channel	988	.045	.07	.045
Main Channel	987	.045	.045	.045
Main Channel	986	.045	.045	.045
Main Channel	985	.045	.045	.045
Main Channel	984	.045	.045	.045
Main Channel	983	.045	.07	.07
Overflow 1-DS-0	1007	.045	.045	.045
Overflow 1-DS-0	1006.6	.045	.045	.045
Overflow 1-DS-0	1006	.045	.045	.045
Overflow 1-DS-0	1005	.045	.045	.045
Overflow 1-DS-0	1004	.045	.045	.045
Overflow 1-DS-0	1003	.045	.045	.045
Overflow 1-DS-0	1002	.045	.045	.045
Overflow 1-DS-0	1001	.045	.045	.045
Overflow 1-DS-0	1000	.045	.045	.045
2nd Culvert	1000	.045	.045	.045
2nd Culvert	999	.045	.045	.045
2nd Culvert	998.52	Culvert		
2nd Culvert	998	.07	.07	.07
2nd Culvert	997	.045	.045	.045
2nd Culvert	996	.07	.07	.045
2nd Culvert	995	.07	.07	.045
2nd Culvert	994	.07	.045	.045
2nd Culvert	991	.045	.045	.045
2nd Culvert	990	.045	.045	.045
2nd Culvert	989	.07	.045	.045
2nd Culvert	988	.045	.045	.045
2nd Culvert	987	.045	.045	.045
2nd Culvert	986.3	Lat Struct		
2nd Culvert	985	.045	.07	.045
2nd Culvert	984	.045	.07	.045
2nd Culvert	983	.045	.07	.045
Downstream Ov	1009	.045	.06	.045
Downstream Ov	1008	.045	.06	.045
Downstream Ov	1007	.045	.06	.045
Downstream Ov	1006	.045	.06	.045

Downstream Ov	1005	.045	.06	.045
Downstream Ov	1003	.045	.06	.045
Downstream Ov	1002	.045	.06	.045
Downstream Ov	1001	.045	.06	.045
Downstream Ov	1000	.045	.06	.045
Main Channel-0-2	1007	.07	.07	.07
Main Channel-0-2	1006.8	Lat Struct		
Main Channel-0-2	1006	.045	.045	.045
Main Channel-0-2	1005	.045	.045	.045
Main Channel-0-2	1004	.07	.07	.07
Main Channel-0-2	1003	.045	.07	.07
Main Channel-0-2	1002	.045	.07	.07
Main Channel-0-2	1001	.045	.045	.045
Main Channel-0-2	1000	.045	.045	.045
Main Channel-0	6421.55	.045	.025	.045
Main Channel-0	6320.67	.045	.033	.045
Main Channel-0	6280.5	.045	.033	.045
Main Channel-0	6228.06	Culvert		
Main Channel-0	6182.26	.045	.033	.045
Main Channel-0	5932.07	.045	.033	.045
Main Channel-0	5689.93	.045	.033	.045
Main Channel-0	5498.04	.045	.033	.045
Main Channel-0	5317.92	.045	.033	.045
Main Channel-0	5162.59	.045	.06	.045
Main Channel-0	5007.63	.045	.06	.045
Main Channel-0	4854.19	.045	.06	.045
Main Channel-0	4700.74	.045	.06	.045
Main Channel-0	4546.95	.045	.06	.045
Main Channel-0	4395.39	.045	.06	.045
Main Channel-0	4243.45	.045	.06	.045
Main Channel-0	4086.97	.045	.06	.045
Main Channel-0	3886.97	.045	.06	.045
Main Channel-0	3735.02	.045	.06	.045
Main Channel-0	3583.08	.045	.06	.045
Main Channel-0	3431.13	.045	.06	.045
Main Channel-0	3279.19	.045	.06	.045
Main Channel-0	3127.24	.045	.06	.045
Main Channel-0	2975.3	.045	.06	.045
Main Channel-0	2823.35	.045	.06	.045
Main Channel-0	2671.4	.045	.06	.045
Main Channel-0	2519.46	.045	.06	.045
Main Channel-0	2367.51	.045	.06	.045
Main Channel-0	2215.57	.045	.06	.045
Main Channel-0	2098	Lat Struct		
Main Channel-0	2063.62	.045	.06	.045
Main Channel-0	1911.67	.045	.06	.045
Main Channel-0	1759.73	.045	.06	.045
Main Channel-0	1607.78	.045	.06	.045
Main Channel-0	1455.84	.045	.06	.045
Main Channel-0	1303.89	.045	.06	.045
Main Channel-0	1151.95	.045	.06	.045
Main Channel-0	1000	.045	.06	.045

SUMMARY OF REACH LENGTHS

River: MS-06

Reach	River Sta.	Left	Channel	Right
Main Channel	1000	24.7	24.7	24.7
Main Channel	999.9	Lat Struct		
Main Channel	999	86.6	86.6	86.6
Main Channel	998.53	Culvert		
Main Channel	998	82.74	82.74	82.74
Main Channel	997	109.75	109.75	109.75
Main Channel	996	103.04	103.04	103.04
Main Channel	995.2	Lat Struct		
Main Channel	995	201.02	201.02	201.02
Main Channel	993	198.66	198.66	198.66
Main Channel	992	100.79	100.79	100.79
Main Channel	991	99.55	99.55	99.55
Main Channel	990	100.24	100.24	100.24
Main Channel	989	99.54	99.54	99.54
Main Channel	988	99.8	99.8	99.8
Main Channel	987	101.26	101.26	101.26
Main Channel	986	100.01	100.01	100.01
Main Channel	985	98.95	98.95	98.95
Main Channel	984	116.52	116.52	116.52
Main Channel	983	0	0	0
Overflow 1-DS-0	1007	97.29	97.29	97.29
Overflow 1-DS-0	1006.6	123.93	123.93	123.93
Overflow 1-DS-0	1006	147.13	147.13	147.13
Overflow 1-DS-0	1005	146.6	146.6	146.6
Overflow 1-DS-0	1004	146.6	146.6	146.6
Overflow 1-DS-0	1003	146.6	146.6	146.6
Overflow 1-DS-0	1002	146.61	146.61	146.61
Overflow 1-DS-0	1001	148.42	148.42	148.42
Overflow 1-DS-0	1000	0	0	0
2nd Culvert	1000	30.51	30.51	30.51
2nd Culvert	999	80.49	80.49	80.49
2nd Culvert	998.52	Culvert		
2nd Culvert	998	60.66	60.66	60.66
2nd Culvert	997	91.43	91.43	91.43
2nd Culvert	996	99.23	99.23	99.23
2nd Culvert	995	203.06	203.06	203.06
2nd Culvert	994	297.82	297.82	297.82
2nd Culvert	991	100.37	100.37	100.37
2nd Culvert	990	98.36	98.36	98.36
2nd Culvert	989	98.35	98.35	98.35
2nd Culvert	988	105.21	105.21	105.21
2nd Culvert	987	197.8	197.8	197.8
2nd Culvert	986.3	Lat Struct		
2nd Culvert	985	99.12	99.12	99.12
2nd Culvert	984	100.58	100.58	100.58
2nd Culvert	983	0	0	0
Downstream Ov	1009	151.1	151.1	151.1
Downstream Ov	1008	151.09	151.09	151.09
Downstream Ov	1007	151.1	151.1	151.1
Downstream Ov	1006	151.1	151.1	151.1
Downstream Ov	1005	302.19	302.19	302.19
Downstream Ov	1003	151.1	151.1	151.1
Downstream Ov	1002	151.09	151.09	151.09
Downstream Ov	1001	151.1	151.1	151.1
Downstream Ov	1000	0	0	0
Main Channel-0-2	1007	89.62	89.62	89.62
Main Channel-0-2	1006.8	Lat Struct		
Main Channel-0-2	1006	137.83	137.83	137.83
Main Channel-0-2	1005	137.83	137.83	137.83
Main Channel-0-2	1004	137.83	137.83	137.83
Main Channel-0-2	1003	137.82	137.82	137.82
Main Channel-0-2	1002	137.83	137.83	137.83
Main Channel-0-2	1001	137.83	137.83	137.83
Main Channel-0-2	1000	0	0	0
Main Channel-0	6421.55	100.88	100.88	100.88
Main Channel-0	6320.67	40.18	40.18	40.18
Main Channel-0	6280.5	98.23	98.23	98.23
Main Channel-0	6228.06	Culvert		
Main Channel-0	6182.26	250.19	250.19	250.19
Main Channel-0	5932.07	242.15	242.15	242.15
Main Channel-0	5689.93	191.89	191.89	191.89
Main Channel-0	5498.04	180.12	180.12	180.12
Main Channel-0	5317.92	155.33	155.33	155.33
Main Channel-0	5162.59	154.96	154.96	154.96
Main Channel-0	5007.63	153.44	153.44	153.44
Main Channel-0	4854.19	153.44	153.44	153.44
Main Channel-0	4700.74	153.79	153.79	153.79
Main Channel-0	4546.95	151.57	151.57	151.57
Main Channel-0	4395.39	151.93	151.93	151.93
Main Channel-0	4243.45	156.48	156.48	156.48
Main Channel-0	4086.97	200	200	200
Main Channel-0	3886.97	151.95	151.95	151.95
Main Channel-0	3735.02	151.94	151.94	151.94
Main Channel-0	3583.08	151.95	151.95	151.95
Main Channel-0	3431.13	151.94	151.94	151.94
Main Channel-0	3279.19	151.95	151.95	151.95
Main Channel-0	3127.24	151.94	151.94	151.94
Main Channel-0	2975.3	151.95	151.95	151.95
Main Channel-0	2823.35	151.95	151.95	151.95
Main Channel-0	2671.4	151.94	151.94	151.94
Main Channel-0	2519.46	151.95	151.95	151.95
Main Channel-0	2367.51	151.94	151.94	151.94
Main Channel-0	2215.57	151.95	151.95	151.95
Main Channel-0	2098	Lat Struct		
Main Channel-0	2063.62	151.95	151.95	151.95
Main Channel-0	1911.67	151.94	151.94	151.94
Main Channel-0	1759.73	151.95	151.95	151.95
Main Channel-0	1607.78	151.94	151.94	151.94
Main Channel-0	1455.84	151.95	151.95	151.95
Main Channel-0	1303.89	151.94	151.94	151.94
Main Channel-0	1151.95	151.95	151.95	151.95
Main Channel-0	1000	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: MS-06

Reach	River Sta.	Contr.	Expan.
Main Channel	1000	.1	.3
Main Channel	999.9	Lat Struct	
Main Channel	999	.1	.3
Main Channel	998.53	Culvert	
Main Channel	998	.1	.3
Main Channel	997	.1	.3
Main Channel	996	.1	.3
Main Channel	995.2	Lat Struct	
Main Channel	995	.1	.3
Main Channel	993	.1	.3
Main Channel	992	.1	.3
Main Channel	991	.1	.3
Main Channel	990	.1	.3
Main Channel	989	.1	.3
Main Channel	988	.1	.3
Main Channel	987	.1	.3
Main Channel	986	.1	.3
Main Channel	985	.1	.3
Main Channel	984	.1	.3
Main Channel	983	.1	.3
Overflow 1-DS-0	1007	.1	.3
Overflow 1-DS-0	1006.6	.1	.3
Overflow 1-DS-0	1006	.1	.3
Overflow 1-DS-0	1005	.1	.3
Overflow 1-DS-0	1004	.1	.3
Overflow 1-DS-0	1003	.1	.3
Overflow 1-DS-0	1002	.1	.3
Overflow 1-DS-0	1001	.1	.3
Overflow 1-DS-0	1000	.1	.3
2nd Culvert	1000	.1	.3

2nd Culvert	999		.1	.3
2nd Culvert	998.52	Culvert		
2nd Culvert	998		.1	.3
2nd Culvert	997		.1	.3
2nd Culvert	996		.1	.3
2nd Culvert	995		.1	.3
2nd Culvert	994		.1	.3
2nd Culvert	991		.1	.3
2nd Culvert	990		.1	.3
2nd Culvert	989		.1	.3
2nd Culvert	988		.1	.3
2nd Culvert	987		.1	.3
2nd Culvert	986.3	Lat Struct		
2nd Culvert	985		.1	.3
2nd Culvert	984		.1	.3
2nd Culvert	983		.1	.3
Downstream Ov	1009		.1	.3
Downstream Ov	1008		.1	.3
Downstream Ov	1007		.1	.3
Downstream Ov	1006		.1	.3
Downstream Ov	1005		.1	.3
Downstream Ov	1003		.1	.3
Downstream Ov	1002		.1	.3
Downstream Ov	1001		.1	.3
Downstream Ov	1000		.1	.3
Main Channel-0-2	1007		.1	.3
Main Channel-0-2	1006.8	Lat Struct		
Main Channel-0-2	1006		.1	.3
Main Channel-0-2	1005		.1	.3
Main Channel-0-2	1004		.1	.3
Main Channel-0-2	1003		.1	.3
Main Channel-0-2	1002		.1	.3
Main Channel-0-2	1001		.1	.3
Main Channel-0-2	1000		.1	.3
Main Channel-0	6421.55		.1	.3
Main Channel-0	6320.67		.1	.3
Main Channel-0	6280.5		.1	.3
Main Channel-0	6228.06	Culvert		
Main Channel-0	6182.26		.1	.3
Main Channel-0	5932.07		.1	.3
Main Channel-0	5689.93		.1	.3
Main Channel-0	5498.04		.1	.3
Main Channel-0	5317.92		.1	.3
Main Channel-0	5162.59		.1	.3
Main Channel-0	5007.63		.1	.3
Main Channel-0	4854.19		.1	.3
Main Channel-0	4700.74		.1	.3
Main Channel-0	4546.95		.1	.3
Main Channel-0	4395.39		.1	.3
Main Channel-0	4243.45		.1	.3
Main Channel-0	4086.97		.1	.3
Main Channel-0	3886.97		.1	.3
Main Channel-0	3735.02		.1	.3
Main Channel-0	3583.08		.1	.3
Main Channel-0	3431.13		.1	.3
Main Channel-0	3279.19		.1	.3
Main Channel-0	3127.24		.1	.3
Main Channel-0	2975.3		.1	.3
Main Channel-0	2823.35		.1	.3
Main Channel-0	2671.4		.1	.3
Main Channel-0	2519.46		.1	.3
Main Channel-0	2367.51		.1	.3
Main Channel-0	2215.57		.1	.3
Main Channel-0	2098	Lat Struct		
Main Channel-0	2063.62		.1	.3
Main Channel-0	1911.67		.1	.3
Main Channel-0	1759.73		.1	.3
Main Channel-0	1607.78		.1	.3
Main Channel-0	1455.84		.1	.3
Main Channel-0	1303.89		.1	.3
Main Channel-0	1151.95		.1	.3
Main Channel-0	1000		.1	.3

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

Culvert CH1 (Q5=1.40 cfs, Q100=4.50 cfs)

Invert Elev Dn (ft)	=	6750.26
Pipe Length (ft)	=	58.66
Slope (%)	=	2.69
Invert Elev Up (ft)	=	6751.84
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

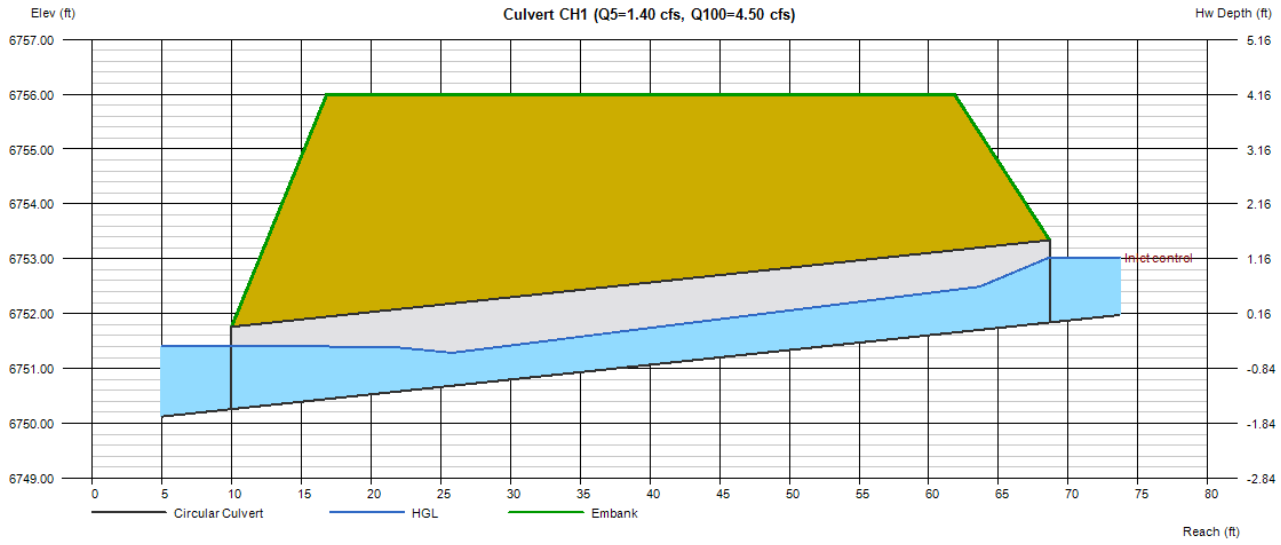
Top Elevation (ft)	=	6756.00
Top Width (ft)	=	45.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	1.40
Qmax (cfs)	=	4.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	4.50
Qpipe (cfs)	=	4.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.08
Veloc Up (ft/s)	=	4.60
HGL Dn (ft)	=	6751.42
HGL Up (ft)	=	6752.65
Hw Elev (ft)	=	6753.03
Hw/D (ft)	=	0.79
Flow Regime	=	Inlet Control



This culvert will be constructed by a different contractor alongside construction of the church site. The estimated flow being captured by this culvert is estimated to be 33% of the flow generated by Basin D1. This flow estimate is larger than what will actually flow to this culvert given where the culvert is placed in relation to the basin.

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jun 29 2023

Culvert CH2 (Q5=2.81 cfs, Q100=9.05 cfs)

Invert Elev Dn (ft)	=	6755.18
Pipe Length (ft)	=	62.61
Slope (%)	=	2.78
Invert Elev Up (ft)	=	6756.92
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

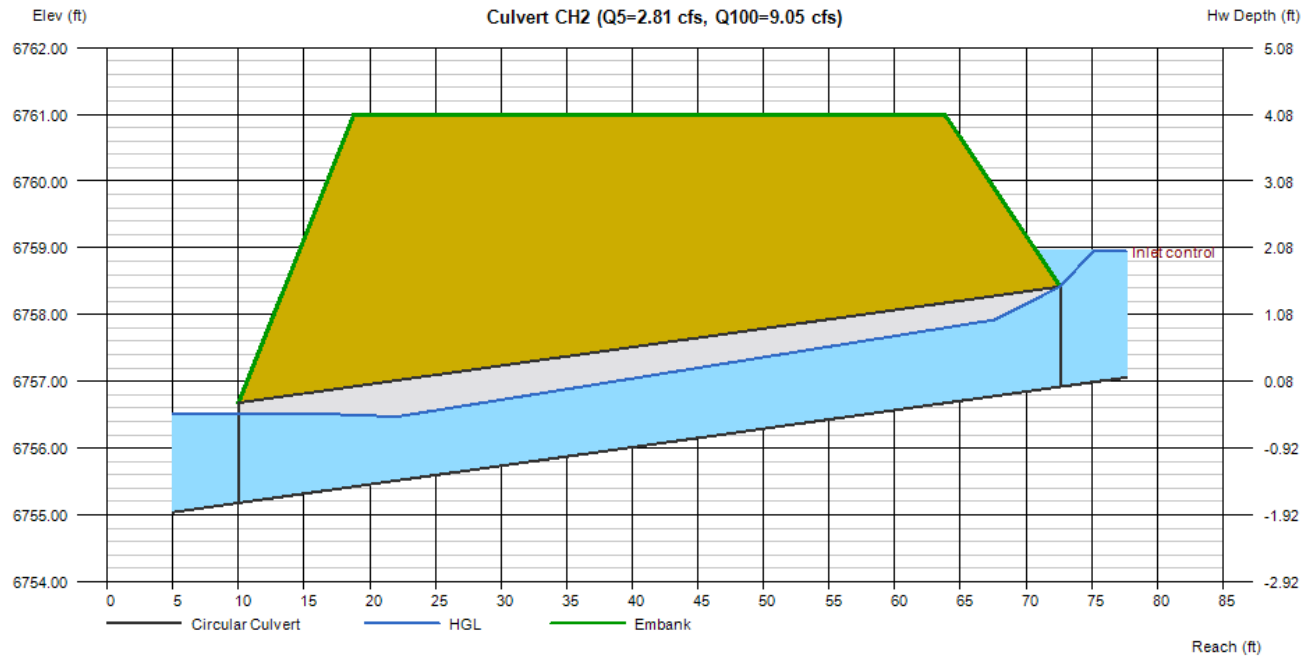
Top Elevation (ft)	=	6761.00
Top Width (ft)	=	45.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	2.81
Qmax (cfs)	=	9.05
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	9.05
Qpipe (cfs)	=	9.05
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.46
Veloc Up (ft/s)	=	6.16
HGL Dn (ft)	=	6756.51
HGL Up (ft)	=	6758.08
Hw Elev (ft)	=	6758.95
Hw/D (ft)	=	1.35
Flow Regime	=	Inlet Control



This culvert will be constructed by a different contractor alongside construction of the church site. The estimated flow being captured by this culvert is estimated to be 67% of the flow generated by Basin D1. This flow estimate is larger than what will actually flow to this culvert given where the culvert is placed in relation to the basin.

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DPF3 Swale (5-Year)(FR:0.49)

Triangular

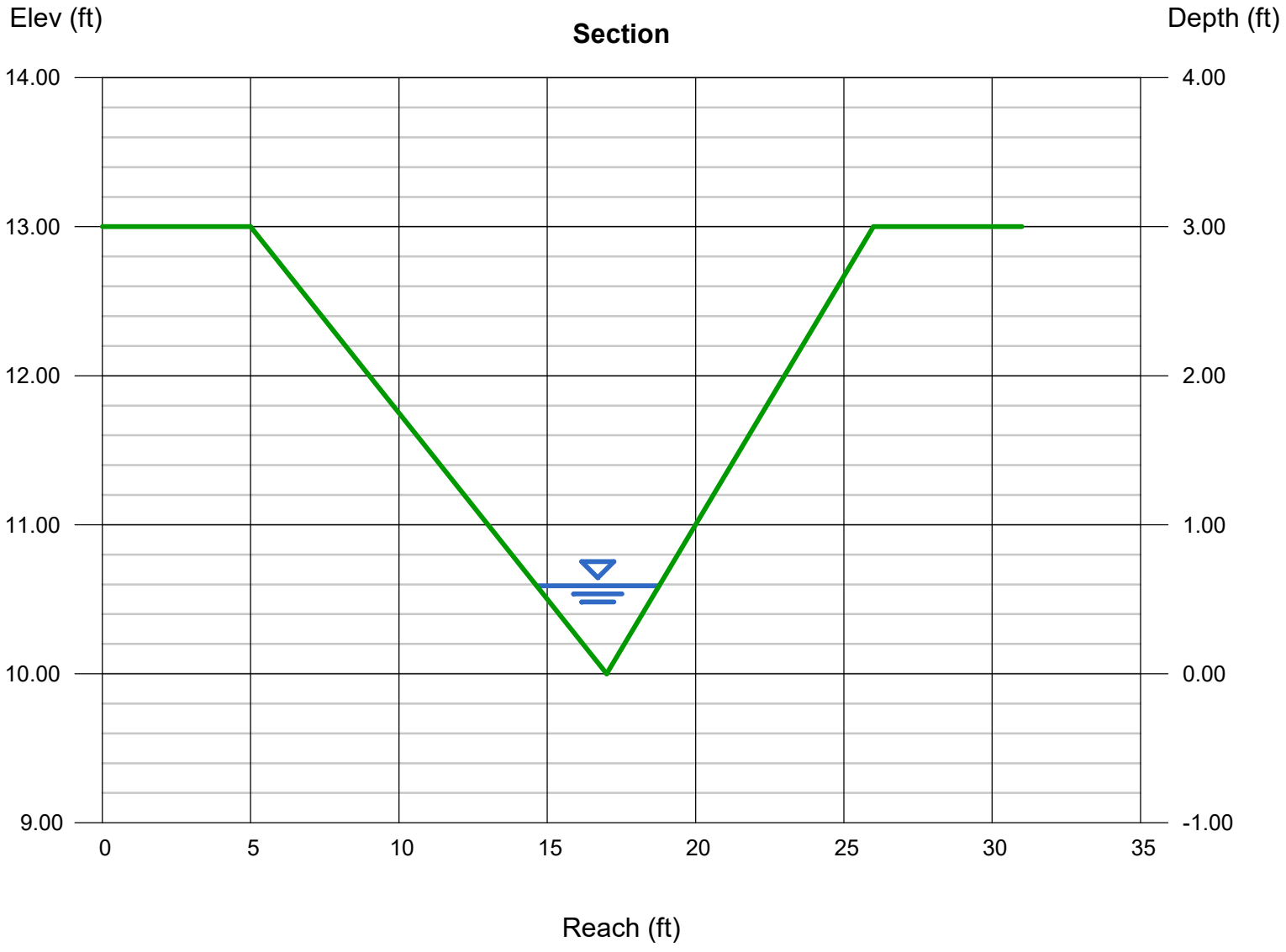
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.60

Highlighted

Depth (ft)	= 0.59
Q (cfs)	= 2.600
Area (sqft)	= 1.22
Velocity (ft/s)	= 2.13
Wetted Perim (ft)	= 4.30
Crit Depth, Yc (ft)	= 0.51
Top Width (ft)	= 4.13
EGL (ft)	= 0.66



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DPF3 Swale (100-Year)(FR:0.53)

Triangular

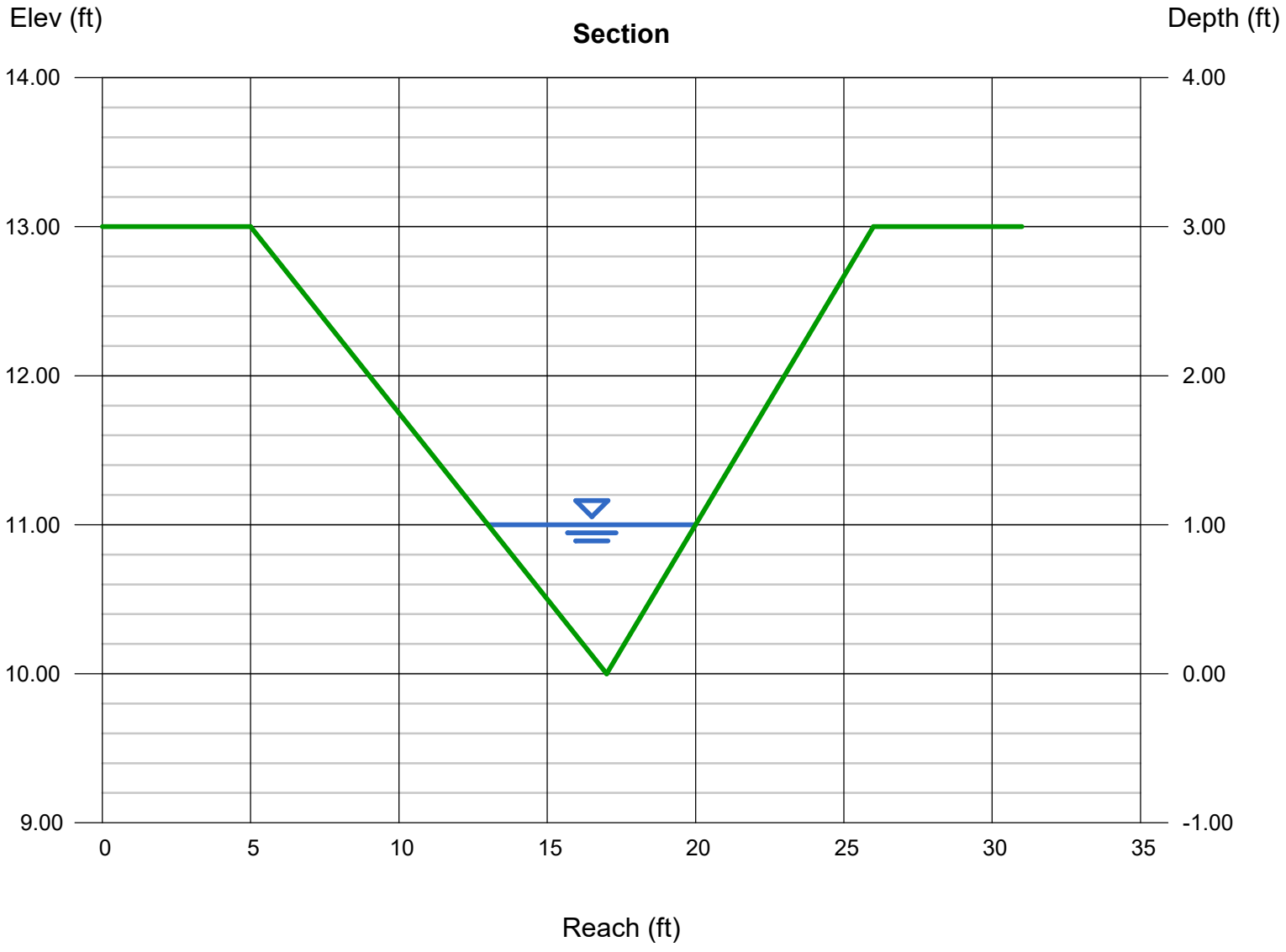
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.60

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 10.60
Area (sqft)	= 3.50
Velocity (ft/s)	= 3.03
Wetted Perim (ft)	= 7.29
Crit Depth, Yc (ft)	= 0.90
Top Width (ft)	= 7.00
EGL (ft)	= 1.14



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DPOS1 Swale (5-Year)(FR:0.51)

Triangular

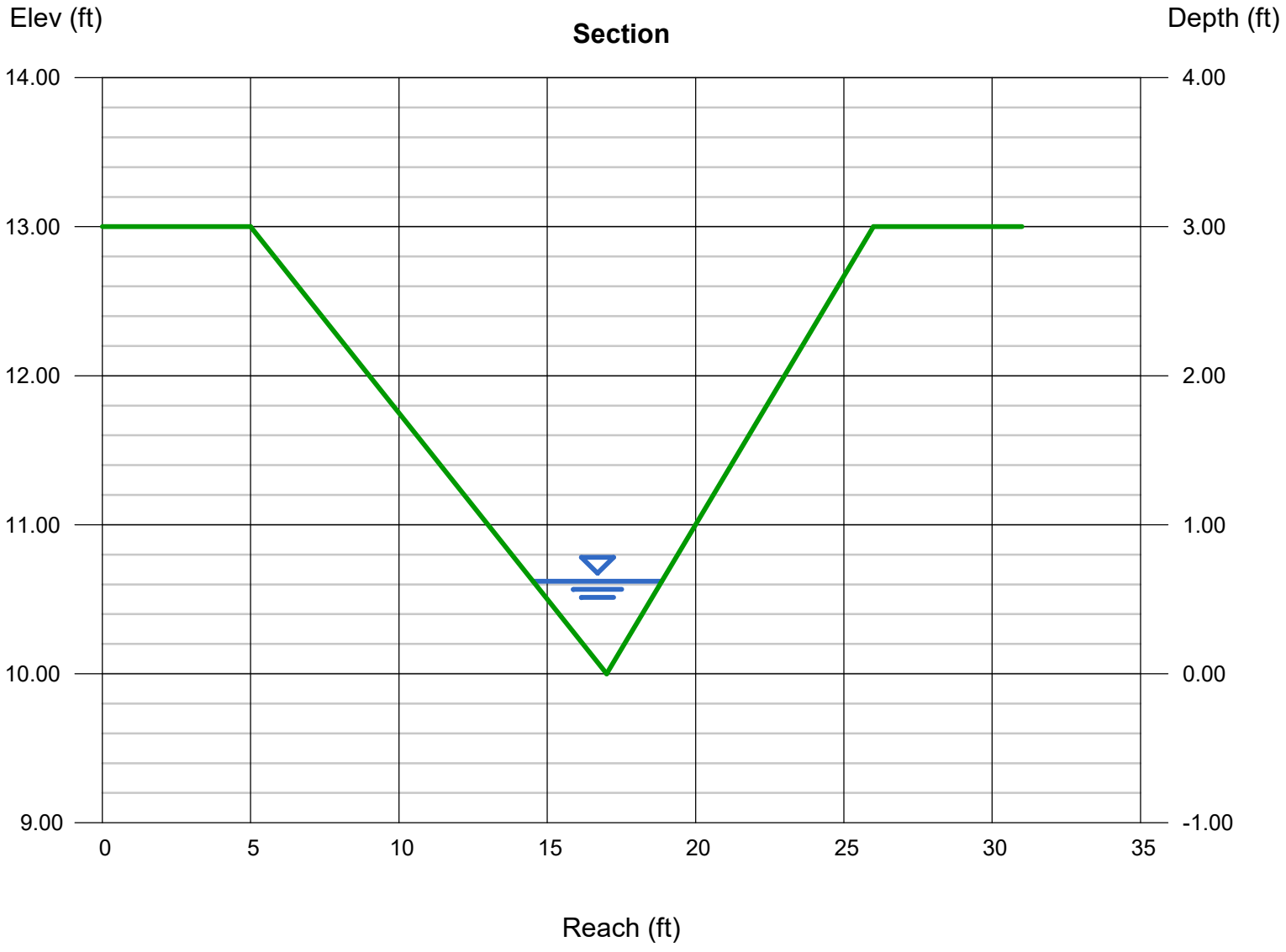
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.17
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.10

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 3.100
Area (sqft)	= 1.35
Velocity (ft/s)	= 2.30
Wetted Perim (ft)	= 4.52
Crit Depth, Yc (ft)	= 0.55
Top Width (ft)	= 4.34
EGL (ft)	= 0.70



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jun 26 2023

DPOS1 Swale (100-Year)(FR:0.55)

Triangular

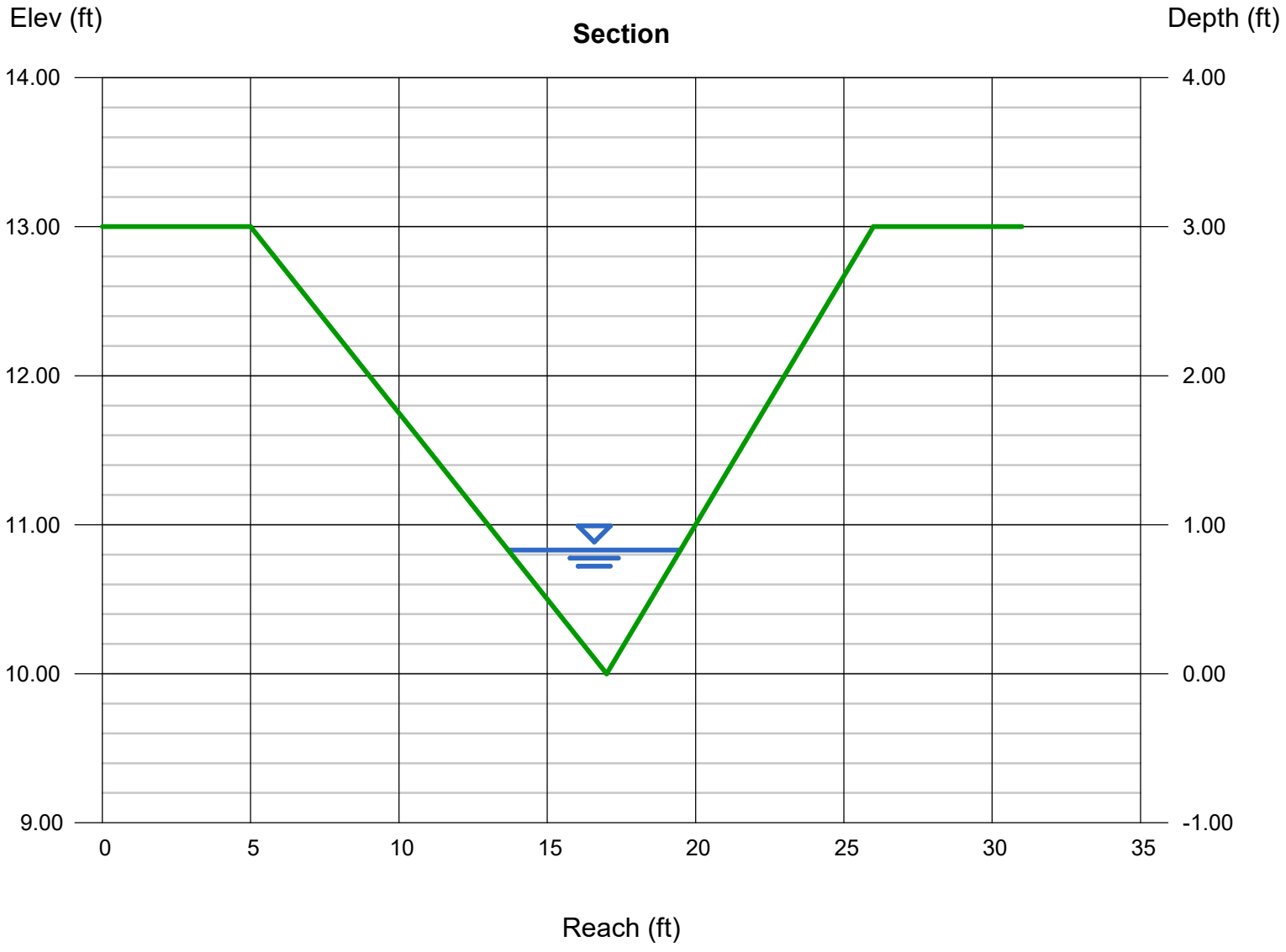
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 10.00
Slope (%)	= 1.17
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.80

Highlighted

Depth (ft)	= 0.83
Q (cfs)	= 6.800
Area (sqft)	= 2.41
Velocity (ft/s)	= 2.82
Wetted Perim (ft)	= 6.05
Crit Depth, Yc (ft)	= 0.75
Top Width (ft)	= 5.81
EGL (ft)	= 0.95



SADDLEHORN FILING 3

MS-06 GEO-HECRAS PROPOSED MODEL RESULTS

GEO HECRAS DATA

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)	Froude # Chl	Shear Total (lb/sq ft)
Main Channel	1000	505	6765.9	6768.16	1.03	0.14	0.05
	999	486.12	6765.4	6768.15	0.8	0.1	0.03
	998	486.12	6764	6765.58	2.44	0.42	0.78
	997	486.12	6763.48	6764.55	2.57	0.56	0.49
	996	486.12	6762.4	6763.9	1.83	0.3	0.18
	995	475.08	6761.5	6763.35	3.34	0.6	0.65
	993	333.2	6758.7	6760.9	2.11	0.44	0.69
	992	223.95	6756.1	6757.43	2.74	0.51	1.08
	991	182.38	6754.3	6755.57	2.74	0.48	1.05
	990	155.56	6753	6754.26	2.08	0.38	0.61
	989	147.13	6751.9	6752.89	2.3	0.49	0.83
	988	151.69	6750.1	6751.07	2.2	0.46	0.76
	987	153.81	6748.2	6749.09	3.43	0.77	0.79
	986	153.96	6746.2	6747.18	3.26	0.71	0.7
	985	153.44	6744.8	6745.85	2.56	0.55	0.43
	984	152.85	6743.5	6744.39	3.26	0.78	0.75
	983	148.91	6742.37	6742.73	0.78	0.26	0.2
Overflow 1-DS-0	1007	0	6745.24	6745.02		0	0
	1006.6	0.17	6743.4	6743.42	0.63	1.01	0.1
	1006	16.2	6740.87	6740.5		0	0.18
	1005	49.84	6737.8	6738.2	1.49	0.59	0.22
	1004	53.18	6735.5	6736.01	1.54	0.52	0.21
	1003	53.18	6733.7	6734.26	1.66	0.52	0.23
	1002	53.18	6731.5	6732.32	1.87	0.59	0.29
	1001	56.49	6728.3	6728.92	3.2	1	0.86
	1000	56.49	6722.9	6724.24	1.03	0.23	0.07
2nd Culvert	1000	0	6765.7	6766.02	0	0	0
	999	18.88	6765.2	6766.02	0.13	0.03	0
	998	18.88	6763.1	6763.46	1	0.47	0.26
	997	18.88	6762.1	6762.29	0.94	0.4	0.09
	996	37.36	6761.2	6761.66	0.77	0.23	0.11
	995	74.34	6760.25	6760.85	1.14	0.36	0.28
	994	201.15	6757.76	6758.42	1.6	0.49	0.29
	991	342.05	6753.9	6754.58	2.42	0.66	0.42
	990	356.98	6752	6753.04	2.42	0.6	0.42
	989	353.3	6750.9	6751.07	1.19	0.71	1.4
	988	351.04	6747.82	6749.15	1.95	0.43	0.25
	987	351.04	6747.5	6748.25	2.5	0.57	0.4
	985	351.39	6744.9	6745.58	1.9	0.45	0.56
	984	339.95	6743.3	6743.91	1.68	0.42	0.53
	983	339.89	6741.3	6742.4	2.01	0.43	0.63
Main Channel-0-2	1007	488.8	6740	6741	1.84	0.37	0.43
	1006	468.2	6738.7	6739.71	2.92	0.73	0.51
	1005	451.82	6736.6	6737.39	2.15	0.59	0.4
	1004	451.82	6733.8	6734.9	2.54	0.56	0.97
	1003	449.6	6730.8	6732.47	2.07	0.37	0.54
	1002	448.51	6729.3	6730.35	3.11	0.61	1.35
	1001	448.51	6725	6727.89	3.07	0.49	0.51
	1000	448.51	6724.2	6726.11	5.15	0.94	1.55
PROPOSED CROSSING SECTIONS	6421.55	505	6721.4	6723.94	3.27	0.53	0.18
	6320.67	505	6720.2	6723.88	1.49	0.17	0.05
	6280.5	505	6719.9	6723.81	2.29	0.26	0.12
	6182.26	505	6719.3	6721.6	8.46	0.98	1.67
	5932.07	505	6717.5	6719.89	4.43	0.67	0.49
	5689.93	505	6716.1	6718.46	4.18	0.63	0.4
	5498.04	505	6714.9	6717.13	4.69	0.75	0.29
Main Channel-0	5317.92	505	6713.8	6715.22	5.62	1	0.55
	5162.59	505	6712.5	6713.42	1.96	0.38	0.38
	5007.63	505	6710.6	6711.71	2.61	0.52	0.72
	4854.19	505	6708.4	6710.39	1.35	0.22	0.16
	4700.74	505	6706.7	6709.73	2.4	0.43	0.59
	4546.95	505	6704.9	6708.42	2.76	0.39	0.67
	4395.39	505	6704.1	6707.53	2.51	0.33	0.53
	4243.45	505	6704.1	6706.62	2.45	0.4	0.58
	4086.97	505	6702.5	6705	3.09	0.51	0.93

GEO HECRAS REACHES

- MS-06 – Main Channel
- MS-06 – Main Channel-0
- MS-06 – Main Channel-0-2
- MS-06 – Overflow 1-DS-0
- MS-06 – 2nd Culvert

JR Response: The riprap and TRM called out on this sheet is the additional stabilization.

Based on modeling, additional stabilization is needed in these areas due to supercritical flows

150 75 0 150 300

ORIGINAL SCALE: 1" = 150'

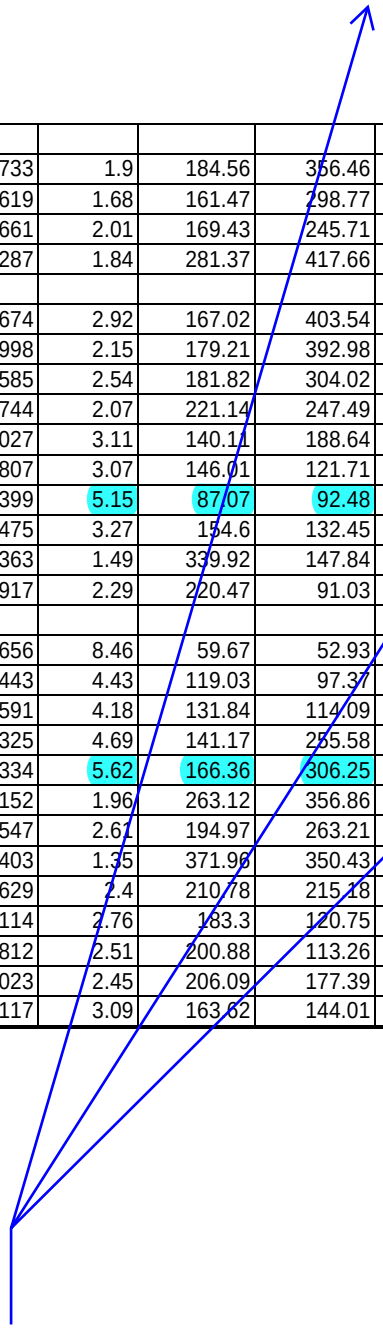
MS-06 GEO-HECRAS PROPOSED MODEL RESULTS
SADDLEHORN FILING 3
JOB NO. 25142.05
03/12/24
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

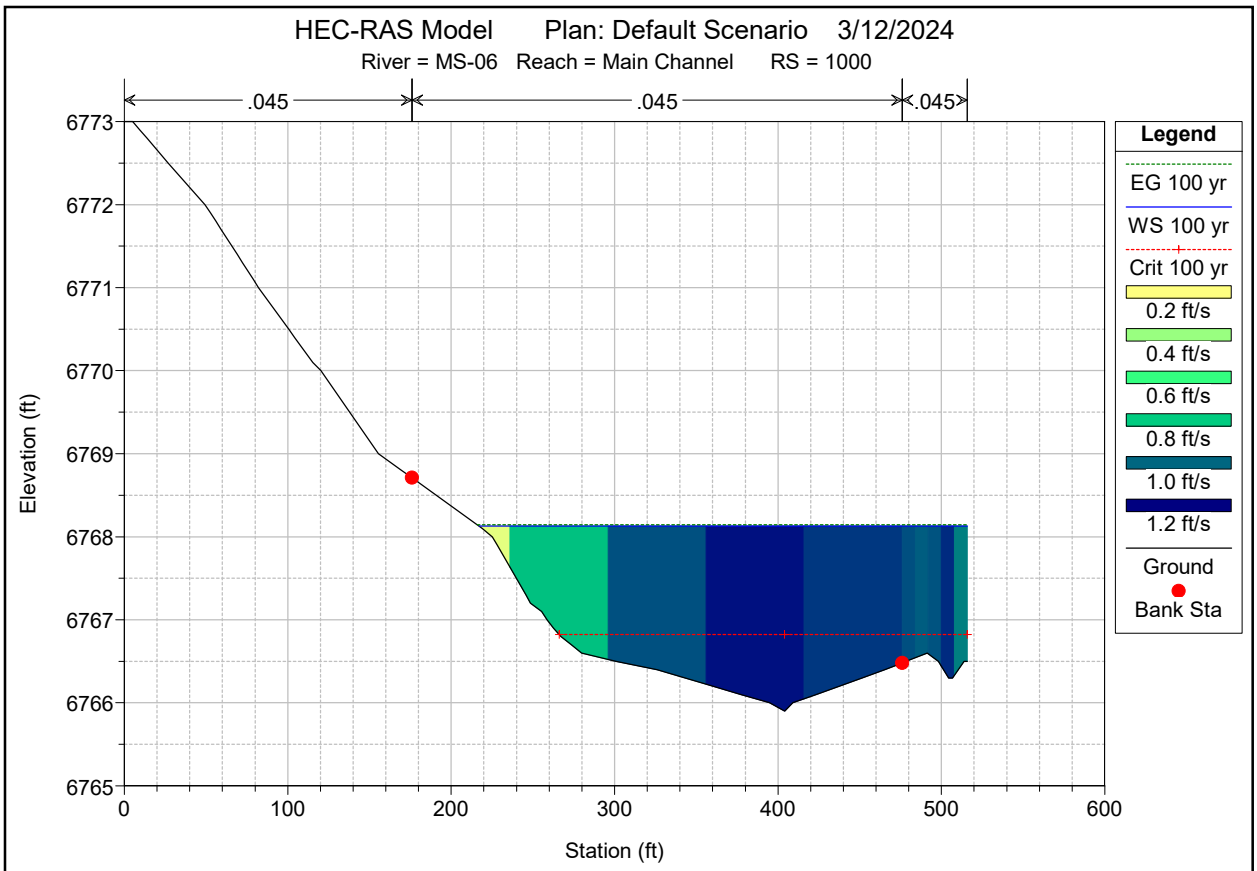
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Shear Total (lb/sq ft)	Stabalization Action
Main Channel	1000	100 yr	505	6765.9	6768.16	6766.82	6768.18	0.000505	1.03	492.08	300.84	0.14	0.05	N/A
Main Channel	999.9		Lat Struct											N/A
Main Channel	999	100 yr	486.12	6765.4	6768.15	6766.33	6768.16	0.00025	0.8	592.41	300.02	0.1	0.03	N/A
Main Channel	998.53		Culvert											N/A
Main Channel	998	100 yr	486.12	6764	6765.58	6765.14	6765.67	0.012753	2.44	200.33	201.68	0.42	0.78	N/A
Main Channel	997	100 yr	486.12	6763.48	6764.55	6764.42	6764.7	0.010625	2.57	169.27	227.81	0.56	0.49	N/A
Main Channel	996	100 yr	486.12	6762.4	6763.9	6763.15	6763.95	0.002478	1.83	265.48	224.72	0.3	0.18	N/A
Main Channel	995.2		Lat Struct											N/A
Main Channel	995	100 yr	475.08	6761.5	6763.35	6763	6763.53	0.010691	3.34	142.11	145.29	0.6	0.65	N/A
Main Channel	993	100 yr	333.2	6758.7	6760.9	6759.97	6760.97	0.015348	2.11	157.83	217.99	0.44	0.69	N/A
Main Channel	992	100 yr	223.95	6756.1	6757.43	6757.12	6757.54	0.019681	2.74	81.82	92.12	0.51	1.08	N/A
Main Channel	991	100 yr	182.38	6754.3	6755.57	6755.15	6755.69	0.016991	2.74	66.47	66.41	0.48	1.05	N/A
Main Channel	990	100 yr	155.56	6753	6754.26	6753.77	6754.32	0.010299	2.08	74.66	77.87	0.38	0.61	N/A
Main Channel	989	100 yr	147.13	6751.9	6752.89	6752.62	6752.97	0.019493	2.3	63.97	93.14	0.49	0.83	N/A
Main Channel	988	100 yr	151.69	6750.1	6751.07	6750.76	6751.15	0.017096	2.2	68.81	97.15	0.46	0.76	N/A
Main Channel	987	100 yr	153.81	6748.2	6749.09	6748.97	6749.27	0.020576	3.43	44.9	72.94	0.77	0.79	N/A
Main Channel	986	100 yr	153.96	6746.2	6747.18	6747.03	6747.35	0.017189	3.26	47.21	72.17	0.71	0.7	N/A
Main Channel	985	100 yr	153.44	6744.8	6745.85	6745.56	6745.95	0.010335	2.56	60.05	90.34	0.55	0.43	N/A
Main Channel	984	100 yr	152.85	6743.5	6744.39	6744.29	6744.55	0.022217	3.26	46.94	87.19	0.78	0.75	N/A
Main Channel	983	100 yr	148.91	6742.37	6742.73	6742.54	6742.78	0.007629	0.78	95.74	230.86	0.26	0.2	N/A
Overflow 1-DS-0	1007	100 yr	0	6745.24	6745.02	6745.02	6745.02	0.002244		0.01	1.06	0	0	N/A
Overflow 1-DS-0	1006.6	100 yr	0.17	6743.4	6743.42	6743.42	6743.43	0.12914	0.63	0.27	22.24	1.01	0.1	N/A Flow is <1 cfs
Overflow 1-DS-0	1006	100 yr	16.2	6740.87	6740.5	6740.41	6740.53	0.013759		11.95	57.38	0	0.18	N/A
Overflow 1-DS-0	1005	100 yr	49.84	6737.8	6738.2	6738.11	6738.23	0.017867	1.49	33.41	170.07	0.59	0.22	N/A
Overflow 1-DS-0	1004	100 yr	53.18	6735.5	6736.01	6735.88	6736.05	0.012016	1.54	34.43	123.5	0.52	0.21	N/A
Overflow 1-DS-0	1003	100 yr	53.18	6733.7	6734.26	6734.12	6734.31	0.011723	1.66	32.02	101.09	0.52	0.23	N/A
Overflow 1-DS-0	1002	100 yr	53.18	6731.5	6732.32	6732.16	6732.37	0.015132	1.87	28.47	91.22	0.59	0.29	N/A
Overflow 1-DS-0	1001	100 yr	56.49	6728.3	6728.92	6728.92	6729.07	0.043678	3.2	17.68	56.07	1	0.86	ECB Lining
Overflow 1-DS-0	1000	100 yr	56.49	6722.9	6724.24	6723.76	6724.26	0.001855	1.03	54.64	86.73	0.23	0.07	N/A
2nd Culvert	1000	100 yr	0	6765.7	6766.02	6765.83	6766.02	0	0	29.97	199.55	0	0	N/A
2nd Culvert	999	100 yr	18.88	6765.2	6766.02	6765.36	6766.02	0.000036	0.13	140.72	252.16	0.03	0	N/A
2nd Culvert	998.52		Culvert											N/A
2nd Culvert	998	100 yr	18.88	6763.1	6763.46	6763.41	6763.47	0.029637	1	18.97	133.53	0.47	0.26	N/A
2nd Culvert	997	100 yr	18.88	6762.1	6762.29	6762.21	6762.31	0.008601	0.94	20.17	119.21	0.4	0.09	N/A
2nd Culvert	996	100 yr	37.36	6761.2	6761.66	6761.42	6761.67	0.005382	0.77	48.94	153.37	0.23	0.11	N/A
2nd Culvert	995	100 yr	74.34	6760.25	6760.85	6760.76	6760.89	0.013773	1.14	52.79	160.25	0.36	0.28	N/A
2nd Culvert	994	100 yr	201.15	6757.76	6758.42	6758.18	6758.46	0.010149	1.6	125.17	269.09	0.49	0.29	N/A
2nd Culvert	991	100 yr	342.05	6753.9	6754.58	6754.49	6754.67	0.017134	2.42	146.05	372.45	0.66	0.42	N/A
2nd Culvert	990	100 yr	356.98	6752	6753.04	6752.79	6753.13	0.013541	2.42	147.26	293.41	0.6	0.42	N/A
2nd Culvert	989	100 yr	353.3	6750.9	6751.07	6750.91	6751.22	0.033874	1.19	117.24	177.24	0.71	1.1	N/A
2nd Culvert	988	100 yr	351.04	6747.82	6749.15	6748.85	6749.21	0.006364	1.95	181.58	287.72	0.43	0.25	N/A
2nd Culvert	987	100 yr	351.04	6747.5	6748.25	6748.06	6748.34	0.011284	2.5	144.8	257.76	0.57	0.4	N/A

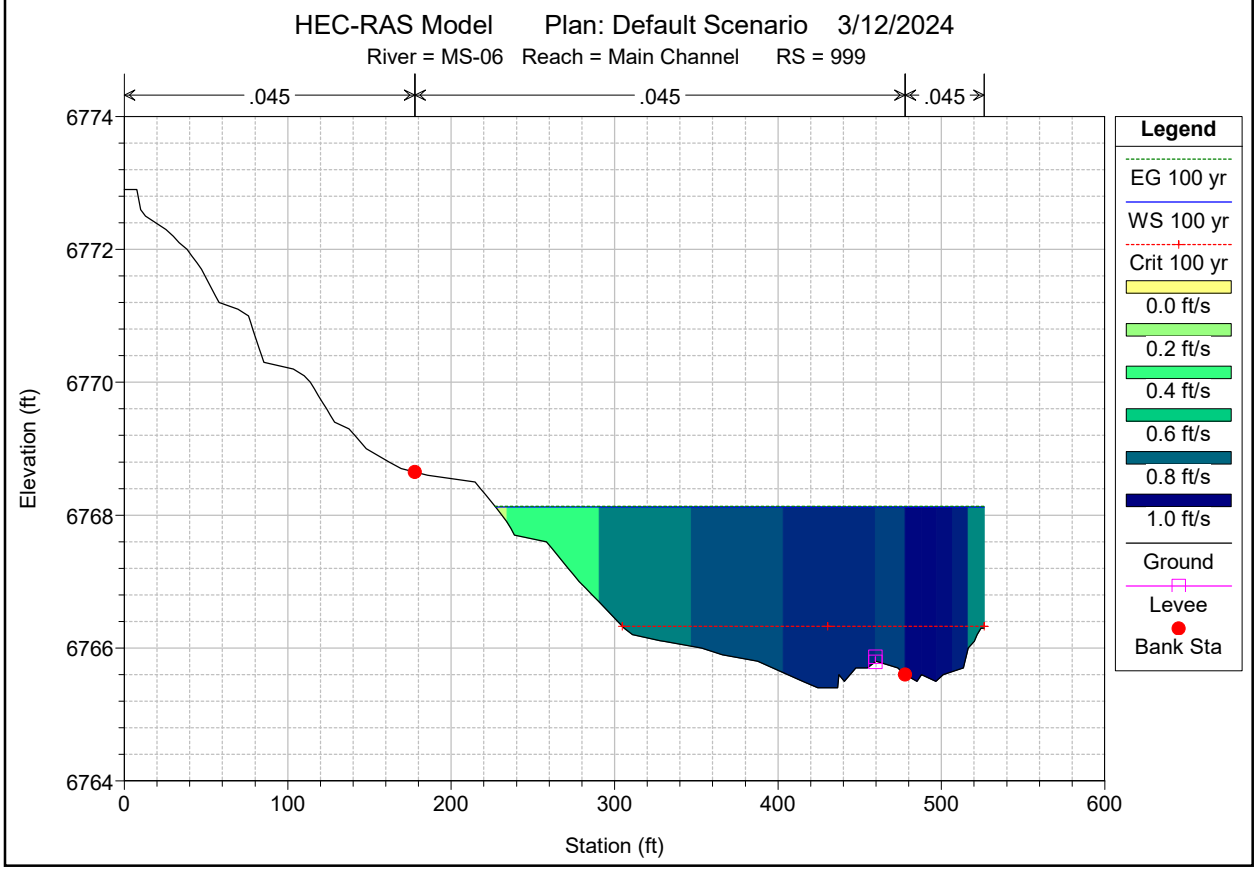
2nd Culvert	986.3		Lat Struct											N/A
2nd Culvert	985	100 yr	351.39	6744.9	6745.58	6745.33	6745.63	0.01733	1.9	184.56	356.46	0.45	0.56	N/A
2nd Culvert	984	100 yr	339.95	6743.3	6743.91	6743.74	6744	0.015619	1.68	161.47	298.77	0.42	0.53	N/A
2nd Culvert	983	100 yr	339.89	6741.3	6742.4	6742.03	6742.47	0.014661	2.01	169.43	245.71	0.43	0.63	N/A
Main Channel-0-2	1007	100 yr	488.8	6740	6741	6740.65	6741.05	0.010287	1.84	281.37	417.66	0.37	0.43	N/A
Main Channel-0-2	1006.8		Lat Struct											N/A
Main Channel-0-2	1006	100 yr	468.2	6738.7	6739.71	6739.63	6739.84	0.019674	2.92	167.02	403.54	0.73	0.51	N/A
Main Channel-0-2	1005	100 yr	451.82	6736.6	6737.39	6737.25	6737.5	0.013998	2.15	179.21	392.98	0.59	0.4	N/A
Main Channel-0-2	1004	100 yr	451.82	6733.8	6734.9	6734.67	6735	0.02585	2.54	181.82	304.02	0.56	0.97	N/A
Main Channel-0-2	1003	100 yr	449.6	6730.8	6732.47	6731.94	6732.53	0.009744	2.07	221.14	247.49	0.37	0.54	N/A
Main Channel-0-2	1002	100 yr	448.51	6729.3	6730.35	6730.13	6730.51	0.029027	3.11	140.11	188.64	0.61	1.17	N/A
Main Channel-0-2	1001	100 yr	448.51	6725	6727.89	6727.19	6728.04	0.006807	3.07	146.01	121.71	0.49	0.51	N/A
Main Channel-0-2	1000	100 yr	448.51	6724.2	6726.11	6726.07	6726.52	0.026399	5.15	87.07	92.48	0.94	1.55	ECB Lining
Main Channel-0	6421.55	100 yr	505	6721.4	6723.94	6723.47	6724.1	0.002475	3.27	154.6	132.45	0.53	0.18	Riprap Lining
Main Channel-0	6320.67	100 yr	505	6720.2	6723.88	6721.62	6723.92	0.000363	1.49	339.92	147.84	0.17	0.05	Riprap Lining
Main Channel-0	6280.5	100 yr	505	6719.9	6723.81	6722.09	6723.89	0.000917	2.29	220.47	91.03	0.26	0.12	Riprap Lining
Main Channel-0	6228.06		Culvert											Riprap Lining
Main Channel-0	6182.26	100 yr	505	6719.3	6721.6	6721.6	6722.71	0.011656	8.46	59.67	52.93	0.98	1.67	Riprap Lining
Main Channel-0	5932.07	100 yr	505	6717.5	6719.89	6719.57	6720.18	0.006443	4.43	119.03	97.37	0.67	0.49	Riprap Lining
Main Channel-0	5689.93	100 yr	505	6716.1	6718.46	6718.13	6718.72	0.005591	4.18	131.84	114.09	0.63	0.4	Riprap Lining
Main Channel-0	5498.04	100 yr	505	6714.9	6717.13	6716.89	6717.44	0.008325	4.69	141.17	255.58	0.75	0.29	Riprap Lining
Main Channel-0	5317.92	100 yr	505	6713.8	6715.22	6715.17	6715.41	0.016334	5.62	166.36	306.25	1	0.55	Riprap Lining
Main Channel-0	5162.59	100 yr	505	6712.5	6713.42	6713.05	6713.48	0.008152	1.96	263.12	356.86	0.38	0.38	Riprap Lining
Main Channel-0	5007.63	100 yr	505	6710.6	6711.71	6711.39	6711.81	0.015547	2.61	194.97	263.21	0.52	0.72	Riprap Lining
Main Channel-0	4854.19	100 yr	505	6708.4	6710.39	6709.62	6710.42	0.002403	1.35	371.96	350.43	0.22	0.16	Riprap Lining
Main Channel-0	4700.74	100 yr	505	6706.7	6709.73	6708.85	6709.82	0.009629	2.4	210.78	215.18	0.43	0.59	Riprap Lining
Main Channel-0	4546.95	100 yr	505	6704.9	6708.42	6707.23	6708.54	0.007114	2.76	183.3	120.75	0.39	0.67	Riprap Lining
Main Channel-0	4395.39	100 yr	505	6704.1	6707.53	6706.23	6707.63	0.004812	2.51	200.88	113.26	0.33	0.53	Riprap Lining
Main Channel-0	4243.45	100 yr	505	6704.1	6706.62	6705.66	6706.71	0.008023	2.45	206.09	177.39	0.4	0.58	Riprap Lining
Main Channel-0	4086.97	100 yr	505	6702.5	6705	6704.41	6705.15	0.013117	3.09	163.62	144.01	0.51	0.93	Riprap Lining

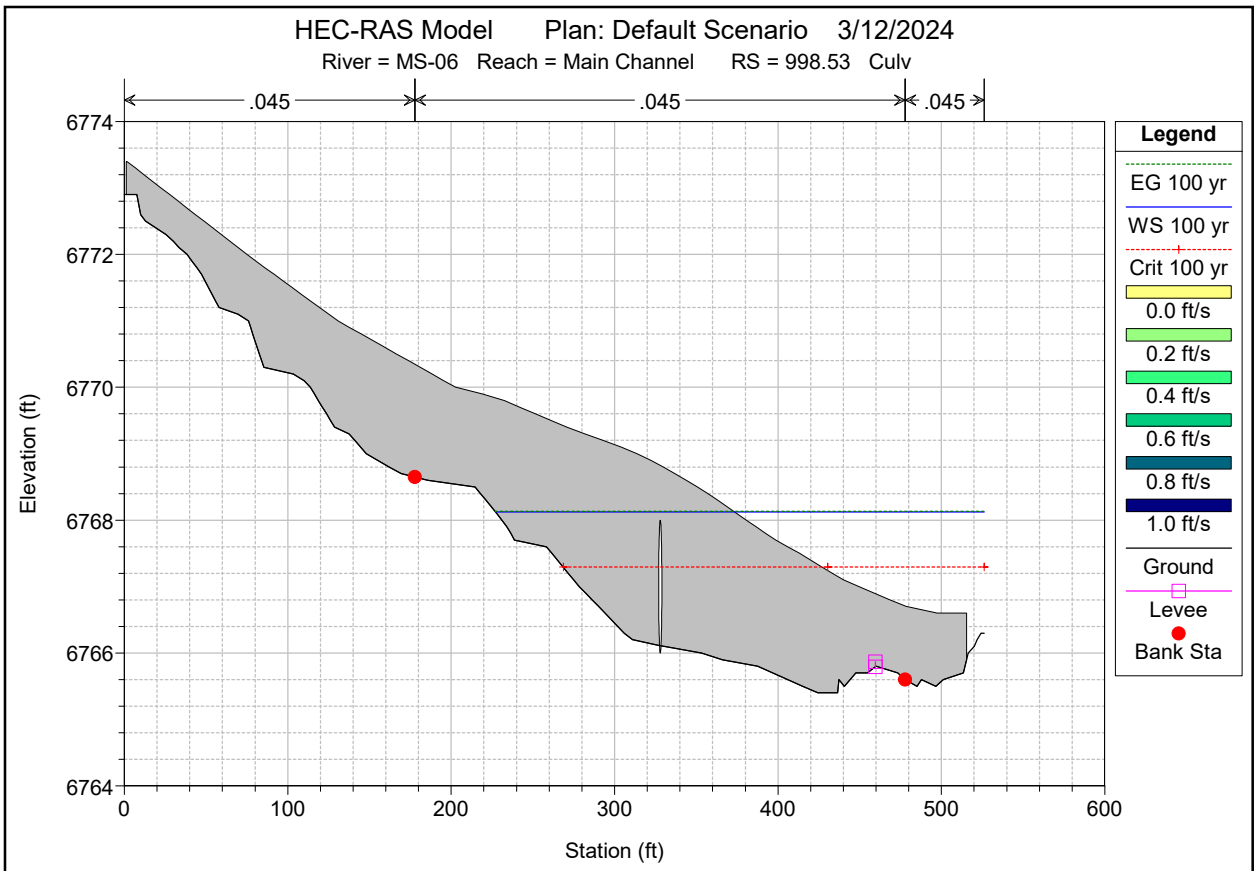


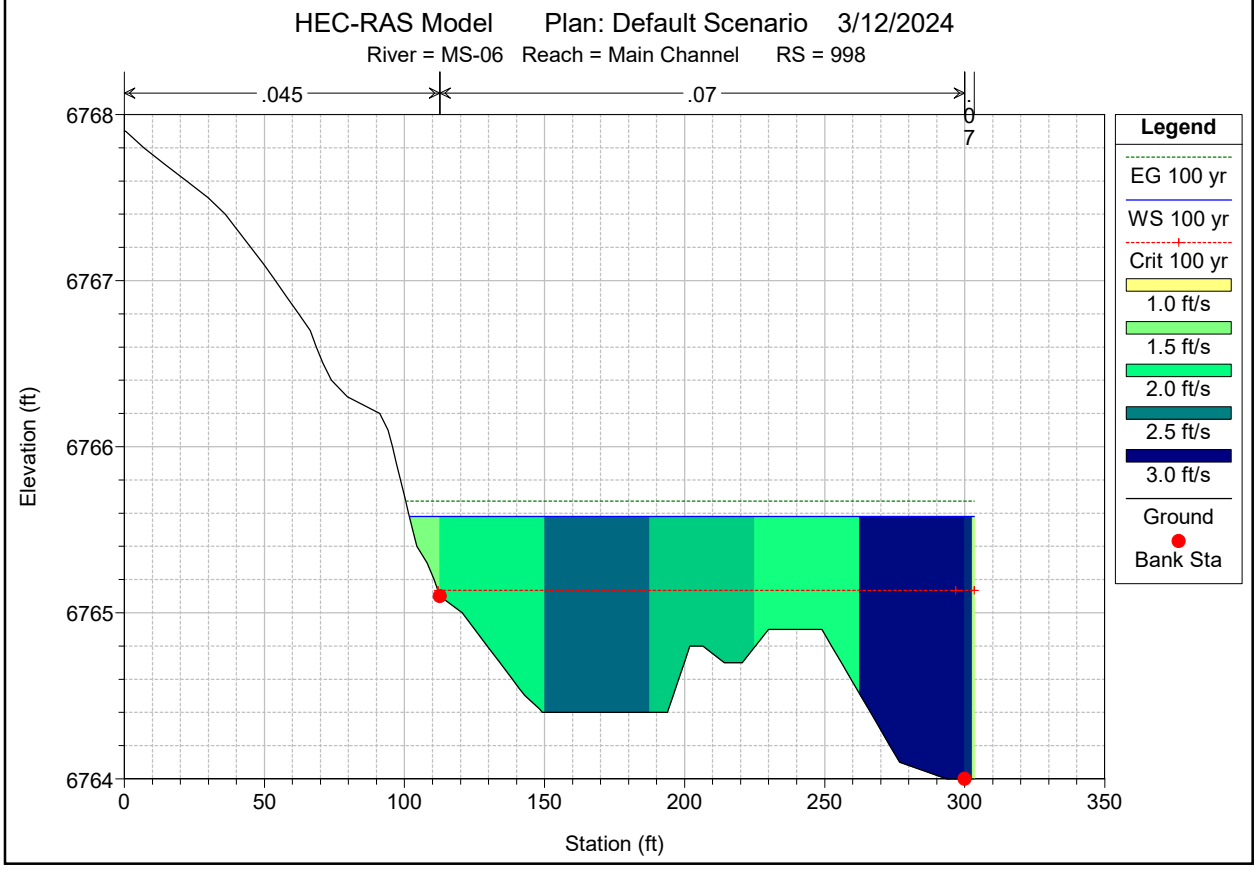
JR Response: **The riprap and TRM (mistakenly called out as ECB on this sheet) is the additional stabilization as listed in the far right column.**

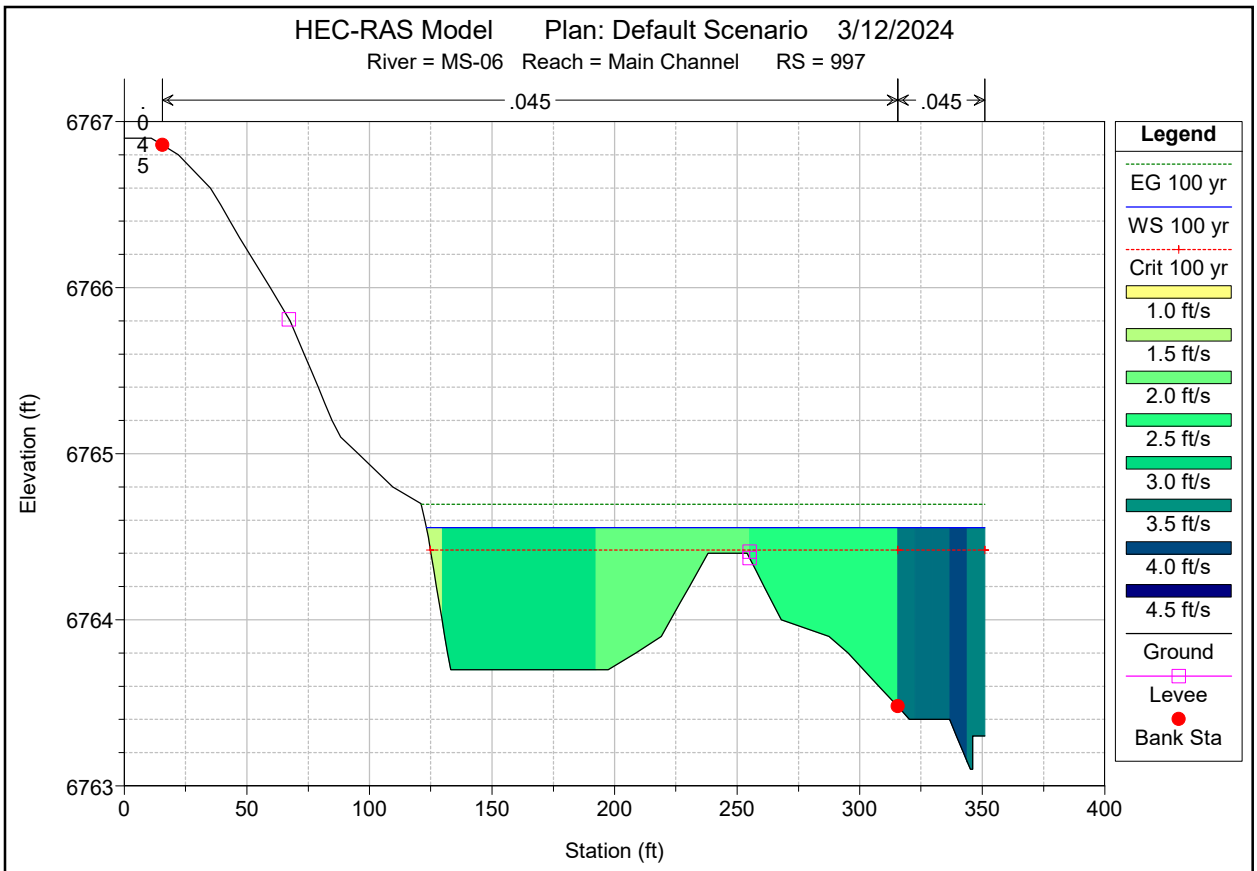
Based on modeling, additional stabilization is needed in these areas due to supercritical flows

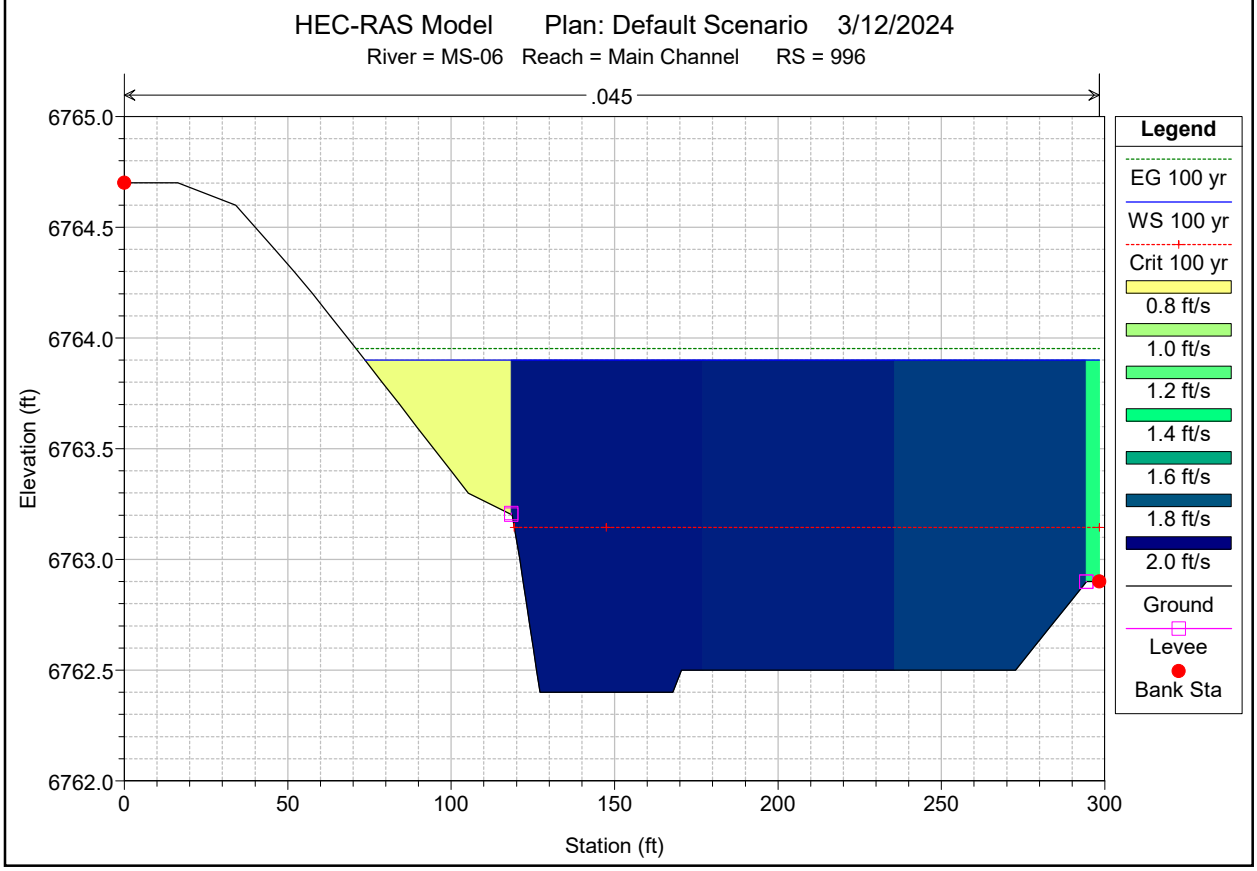

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 1000
.045
.045
.045
Elevation (ft)
6773
6772
6771
6770
6769
6768
6767
6766
6765
0
100
200
300
400
500
600
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
Ground
Bank Sta

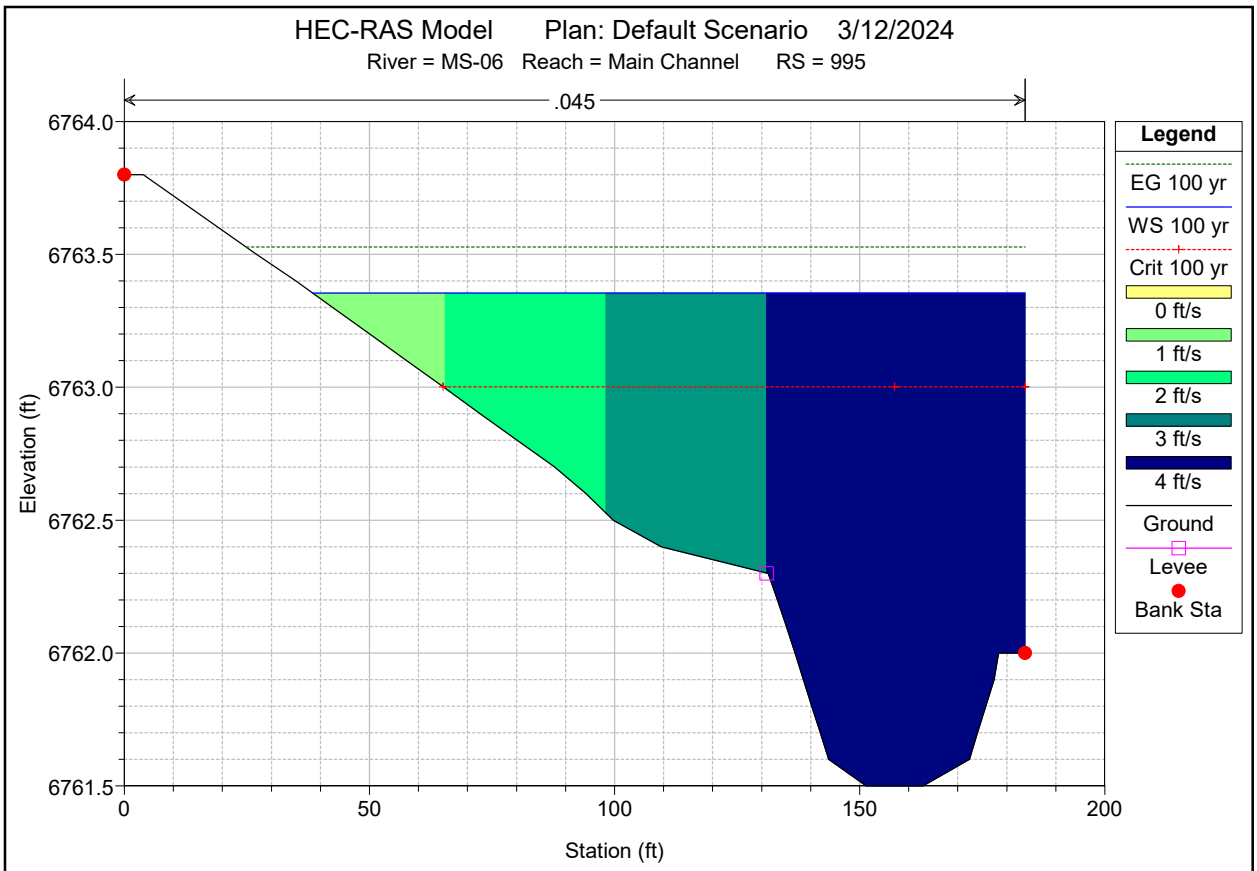

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 999
.045
.045
.045
Elevation (ft)
6774
6772
6770
6768
6766
6764
0
100
200
300
400
500
600
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Levee
Bank Sta

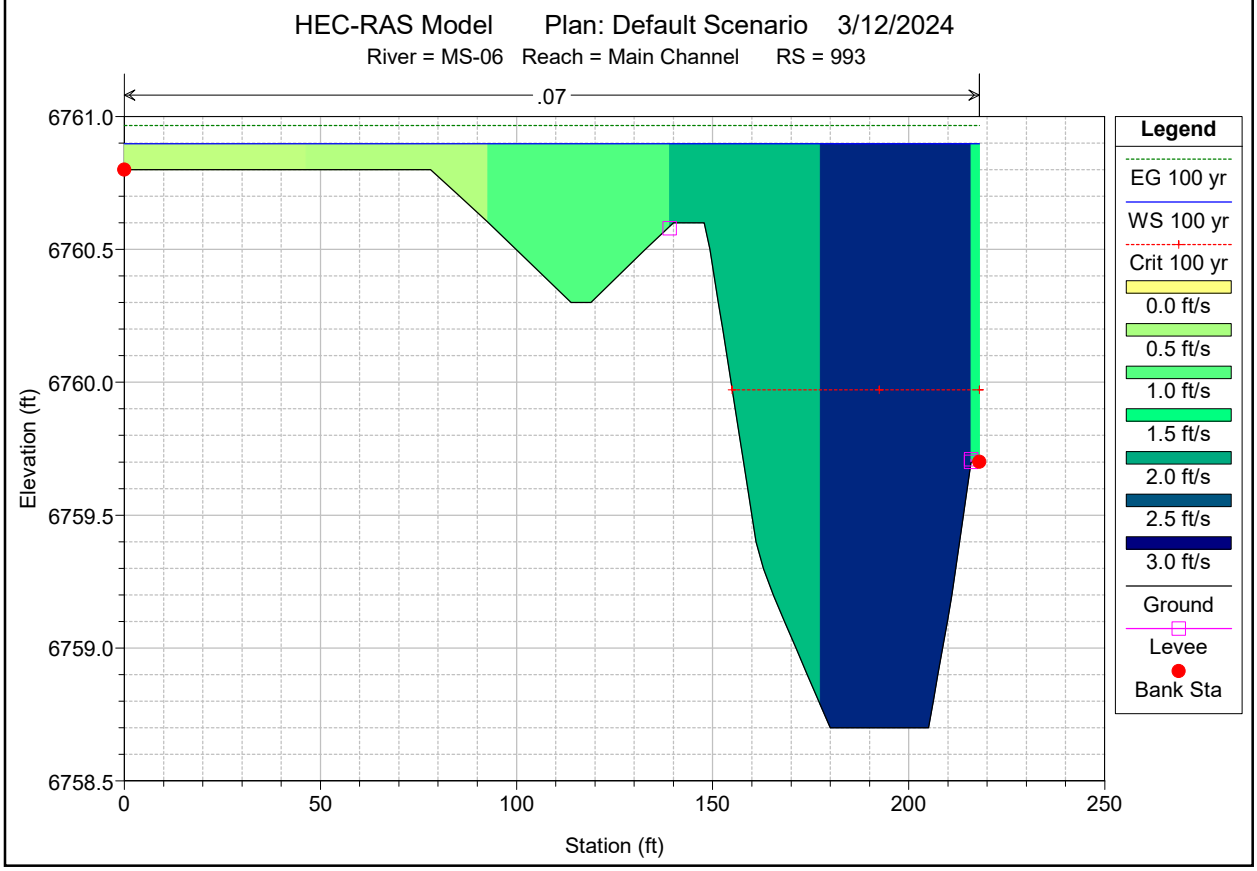

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 998.53 Culv
.045
.045
.045
6774
6772
6770
6768
6766
6764
Elevation (ft)
0
100
200
300
400
500
600
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Levee
Bank Sta

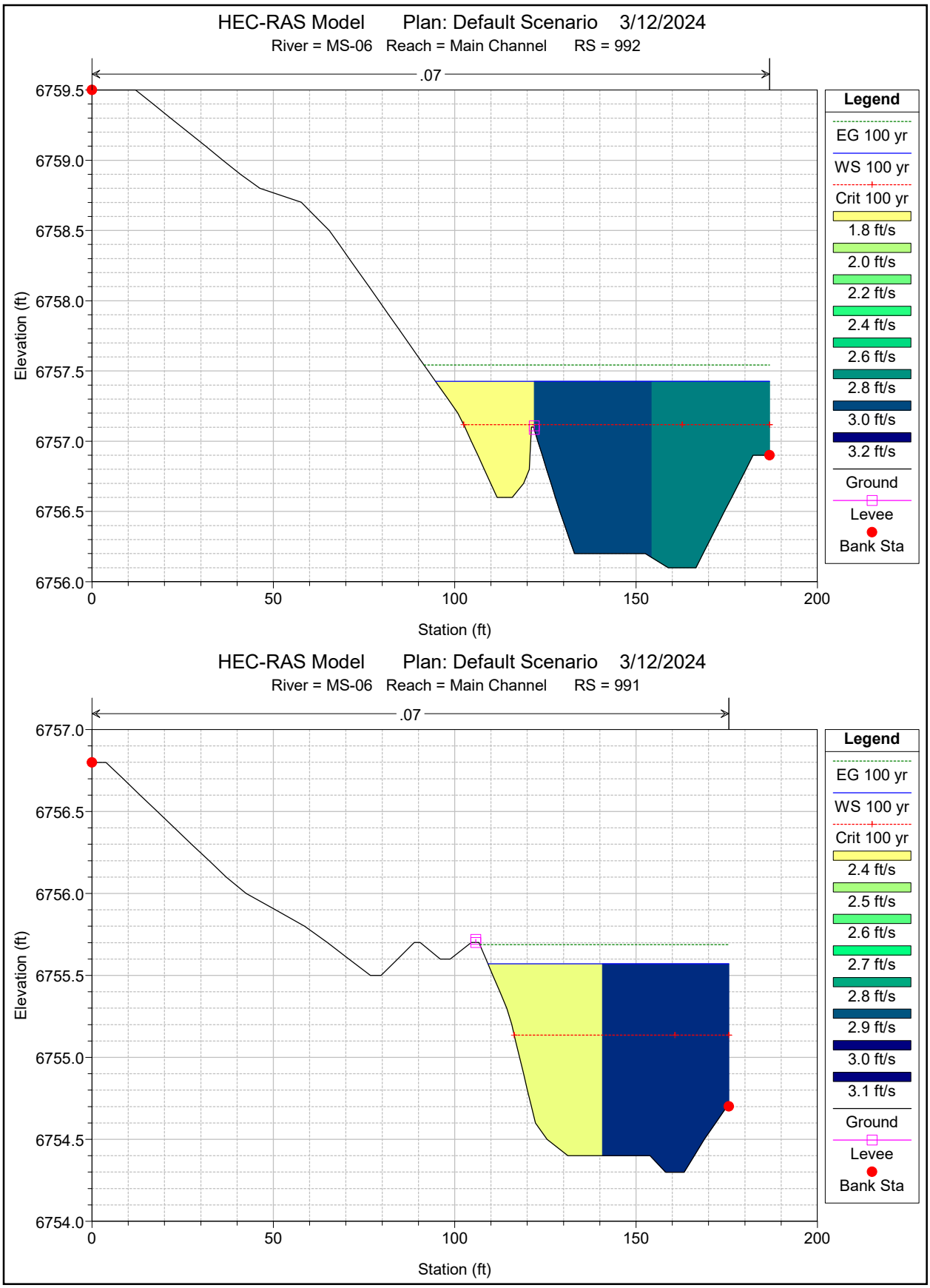

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 998
.045
.07
6768
6767
6766
6765
6764
Elevation (ft)
0
50
100
150
200
250
300
350
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta

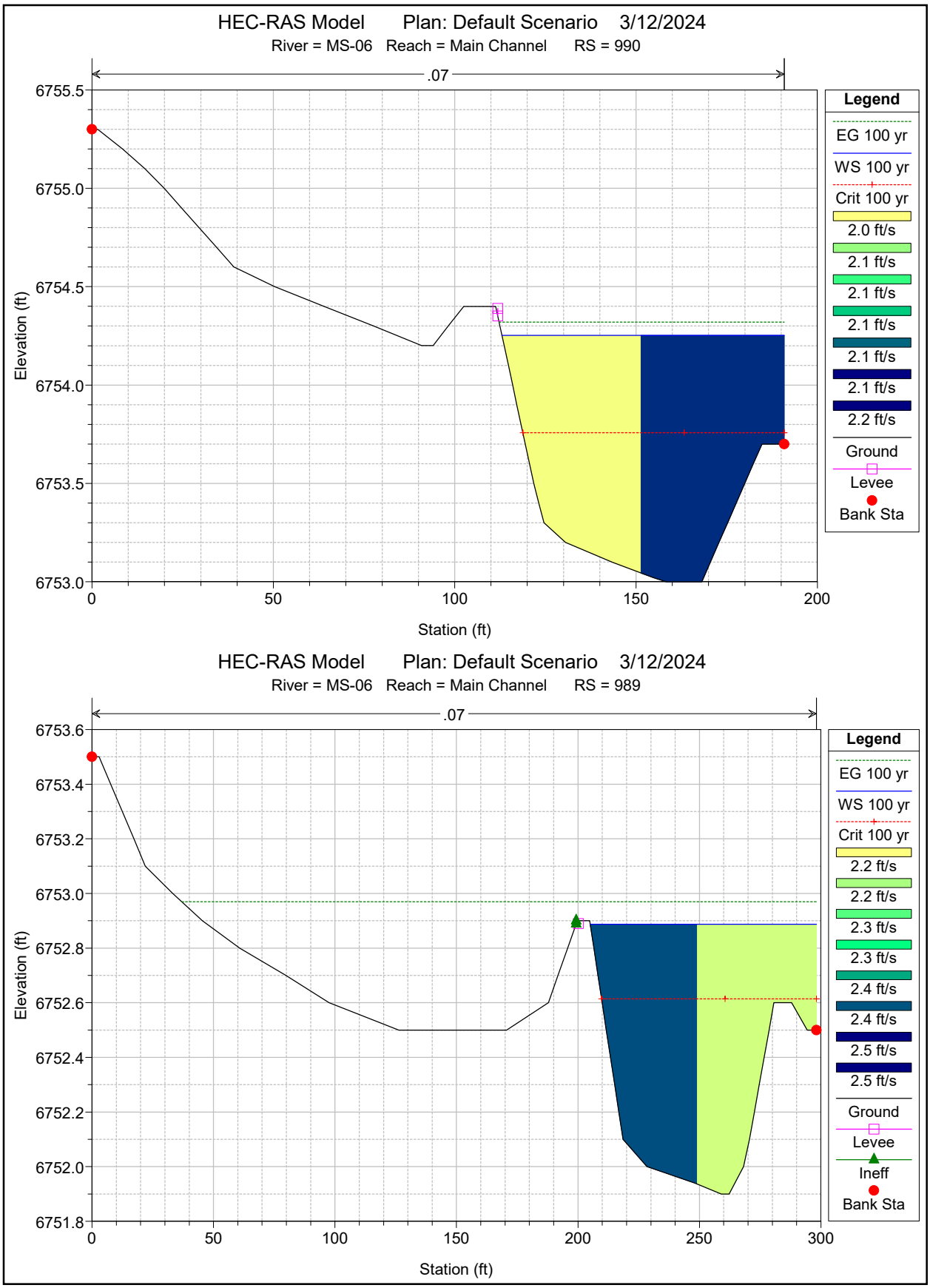

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 997
.045
.045
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Levee
Bank Sta
Elevation (ft)
6767
6766
6765
6764
6763
0
50
100
150
200
250
300
350
400
Station (ft)

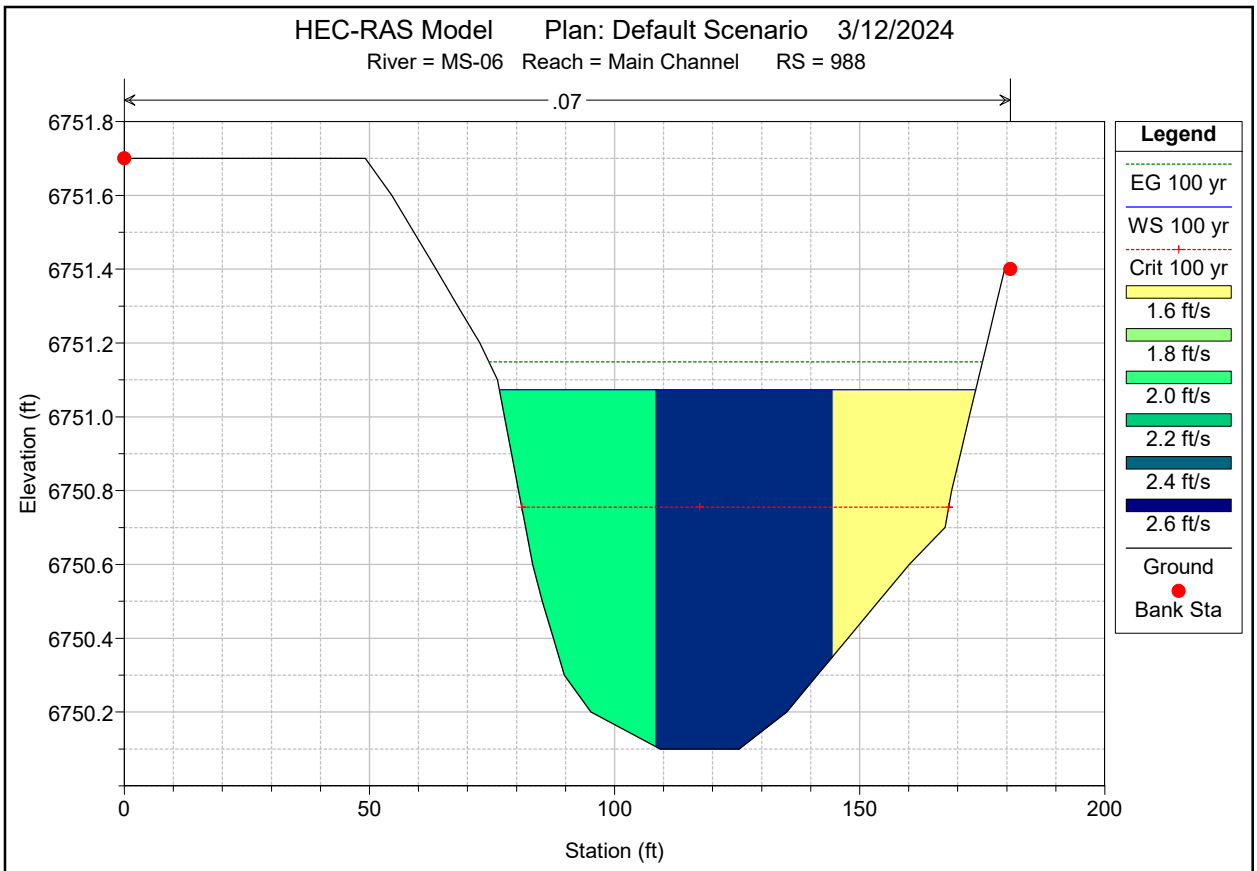

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 996
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
Ground
Levee
Bank Sta
Elevation (ft)
6765.0
6764.5
6764.0
6763.5
6763.0
6762.5
6762.0
0
50
100
150
200
250
300
Station (ft)

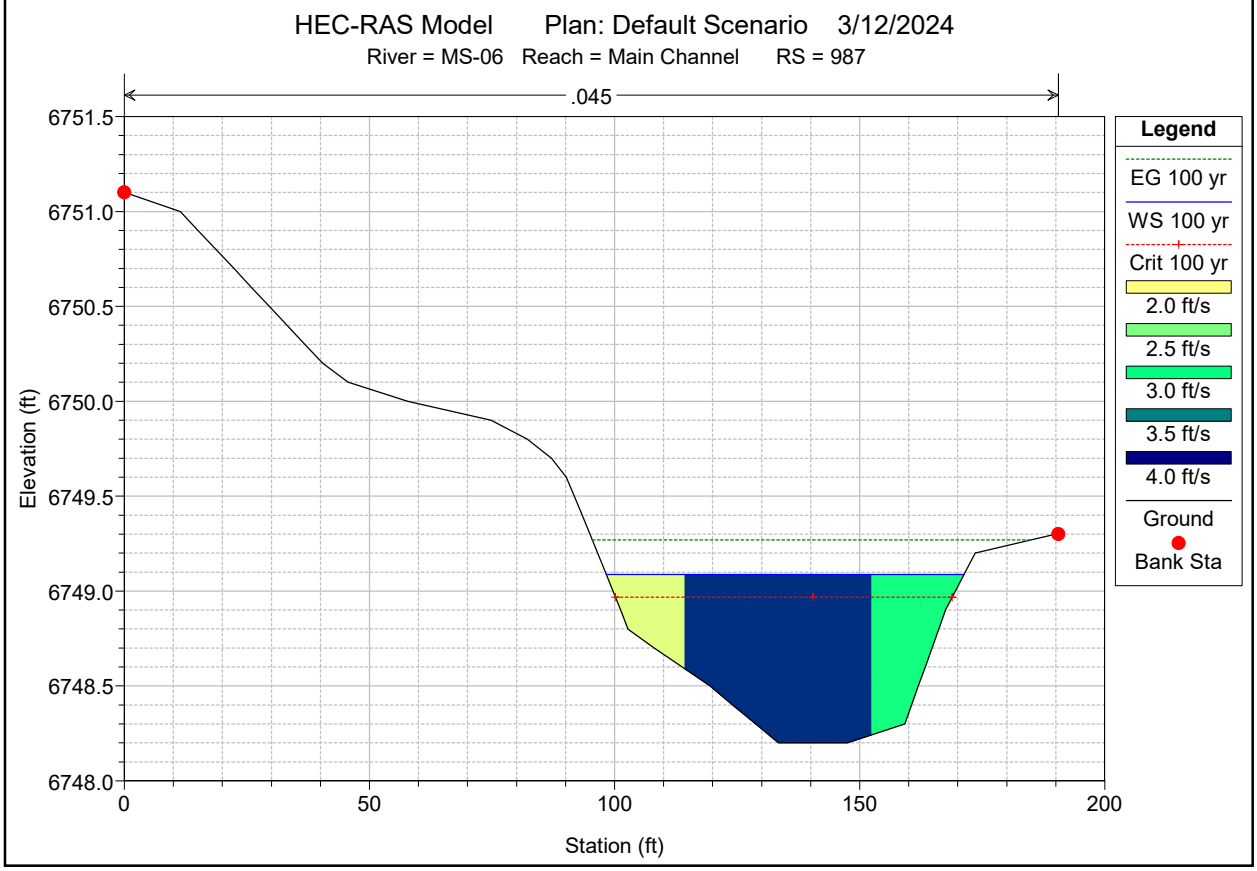

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 995
.045
6764.0
6763.5
6763.0
6762.5
6762.0
6761.5
Elevation (ft)
0
50
100
150
200
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Levee
Bank Sta

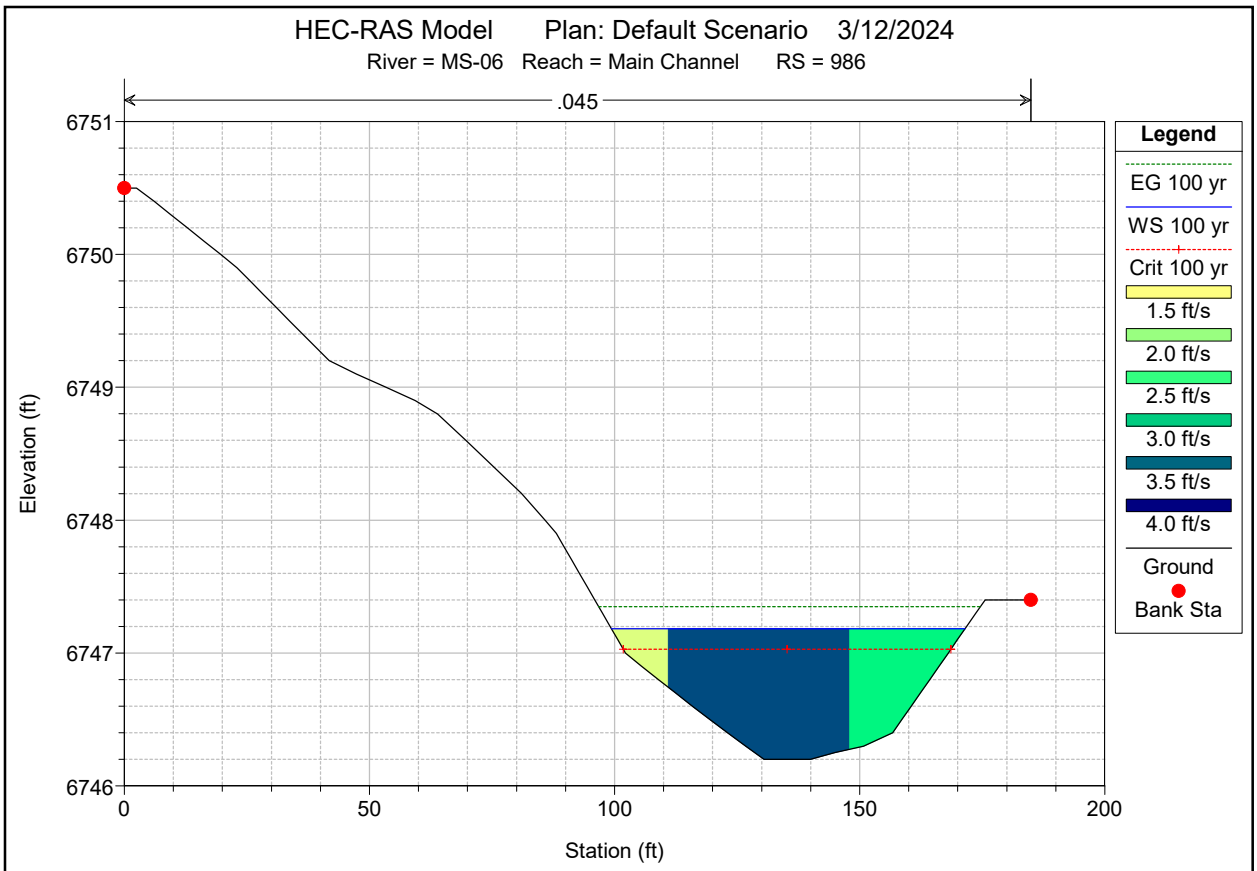

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 993
.07
6761.0
6760.5
6760.0
6759.5
6759.0
6758.5
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Levee
Bank Sta

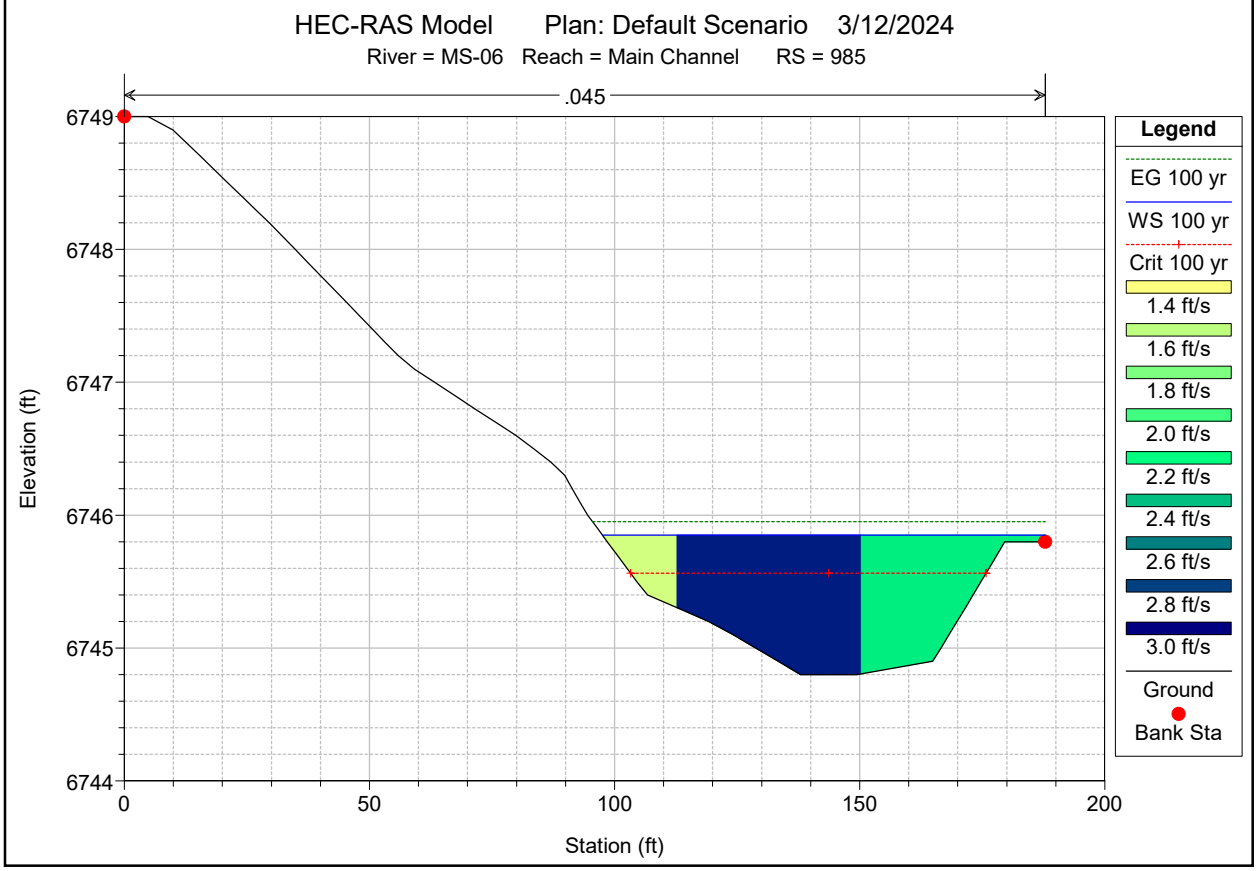

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 992
.07
Elevation (ft)
6759.5
6759.0
6758.5
6758.0
6757.5
6757.0
6756.5
6756.0
0
50
100
150
200
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
3.2 ft/s
Ground
Levee
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 991
.07
Elevation (ft)
6757.0
6756.5
6756.0
6755.5
6755.0
6754.5
6754.0
0
50
100
150
200
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
2.4 ft/s
2.5 ft/s
2.6 ft/s
2.7 ft/s
2.8 ft/s
2.9 ft/s
3.0 ft/s
3.1 ft/s
Ground
Levee
Bank Sta

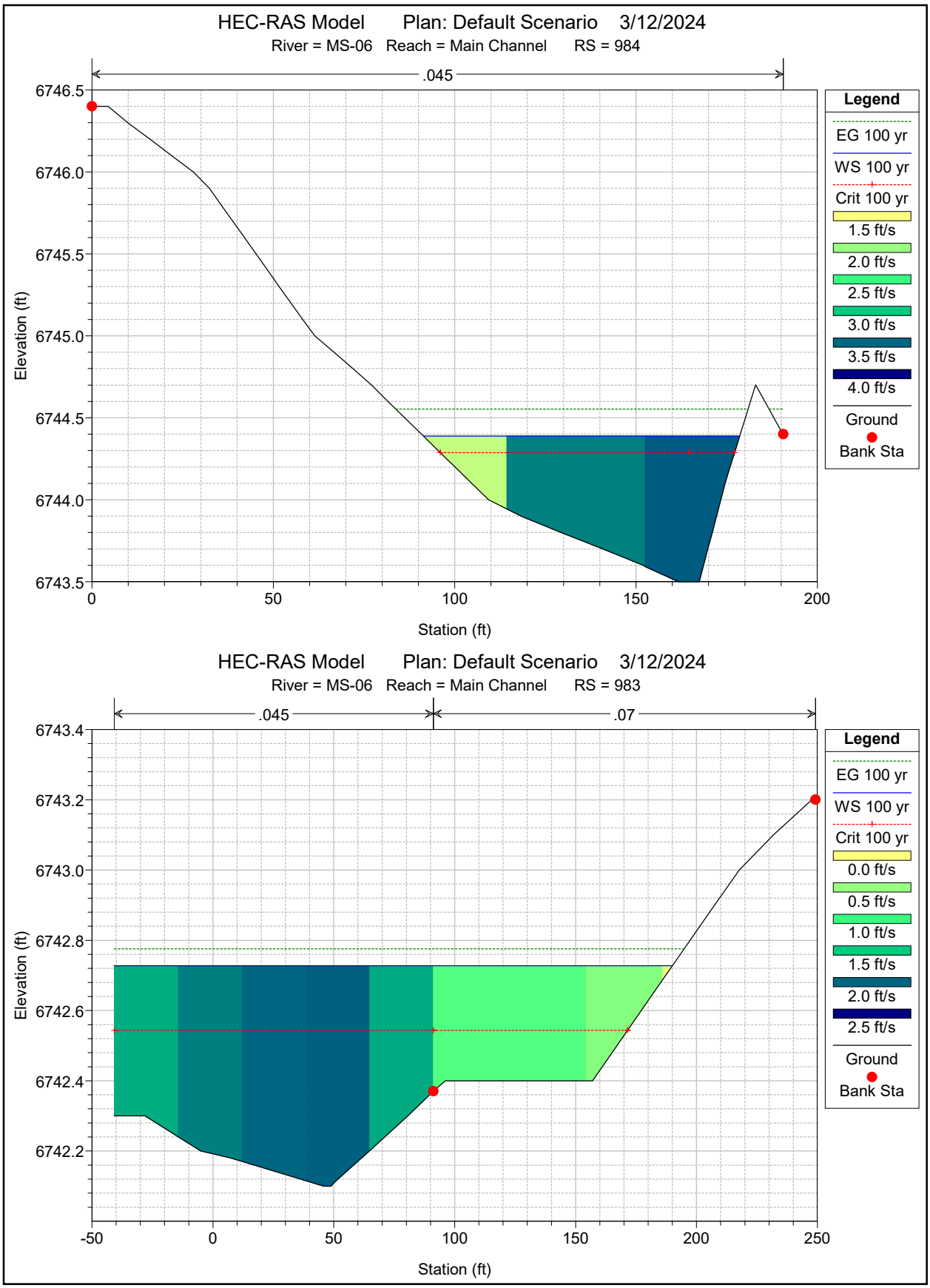

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 990
.07
6755.5
6755.0
6754.5
6754.0
6753.5
6753.0
Elevation (ft)
0
50
100
150
200
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
2.0 ft/s
2.1 ft/s
2.1 ft/s
2.1 ft/s
2.1 ft/s
2.1 ft/s
2.2 ft/s
Ground
Levee
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 989
.07
6753.6
6753.4
6753.2
6753.0
6752.8
6752.6
6752.4
6752.2
6752.0
6751.8
Elevation (ft)
0
50
100
150
200
250
300
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
2.2 ft/s
2.2 ft/s
2.3 ft/s
2.3 ft/s
2.4 ft/s
2.4 ft/s
2.5 ft/s
2.5 ft/s
Ground
Levee
Ineff
Bank Sta

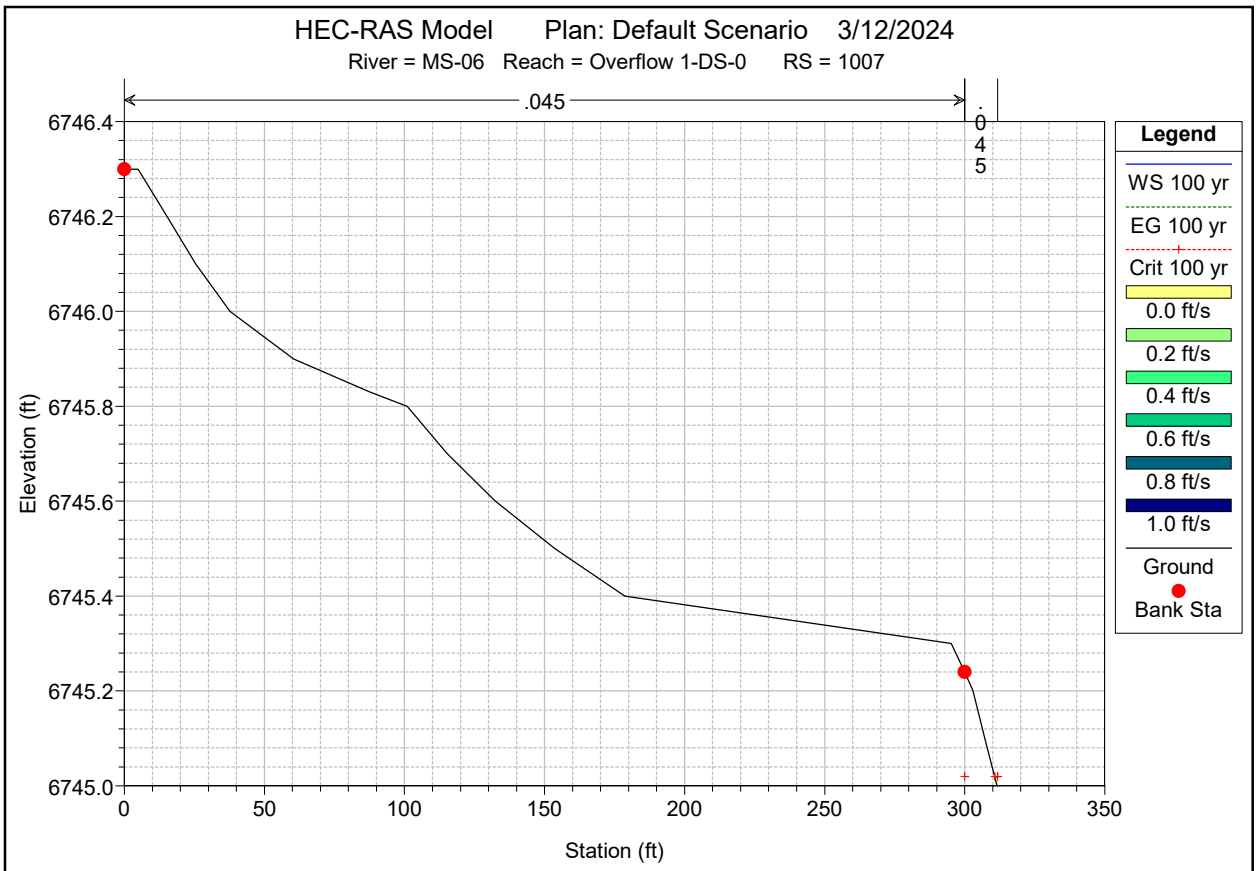

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 988
.07
6751.8
6751.6
6751.4
6751.2
6751.0
6750.8
6750.6
6750.4
6750.2
Elevation (ft)
0
50
100
150
200
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
Ground
Bank Sta

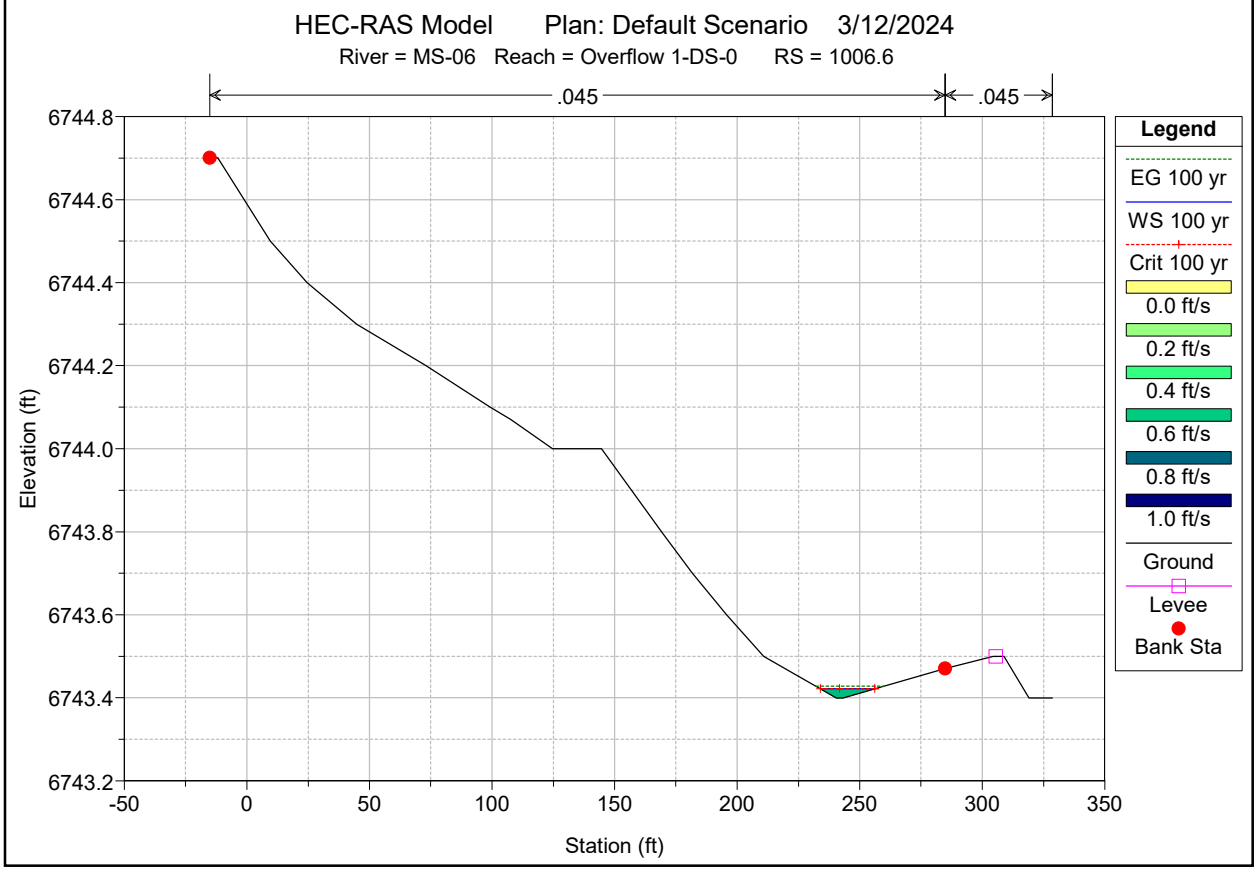

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 987
.045
6751.5
6751.0
6750.5
6750.0
6749.5
6749.0
6748.5
6748.0
Elevation (ft)
0
50
100
150
200
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

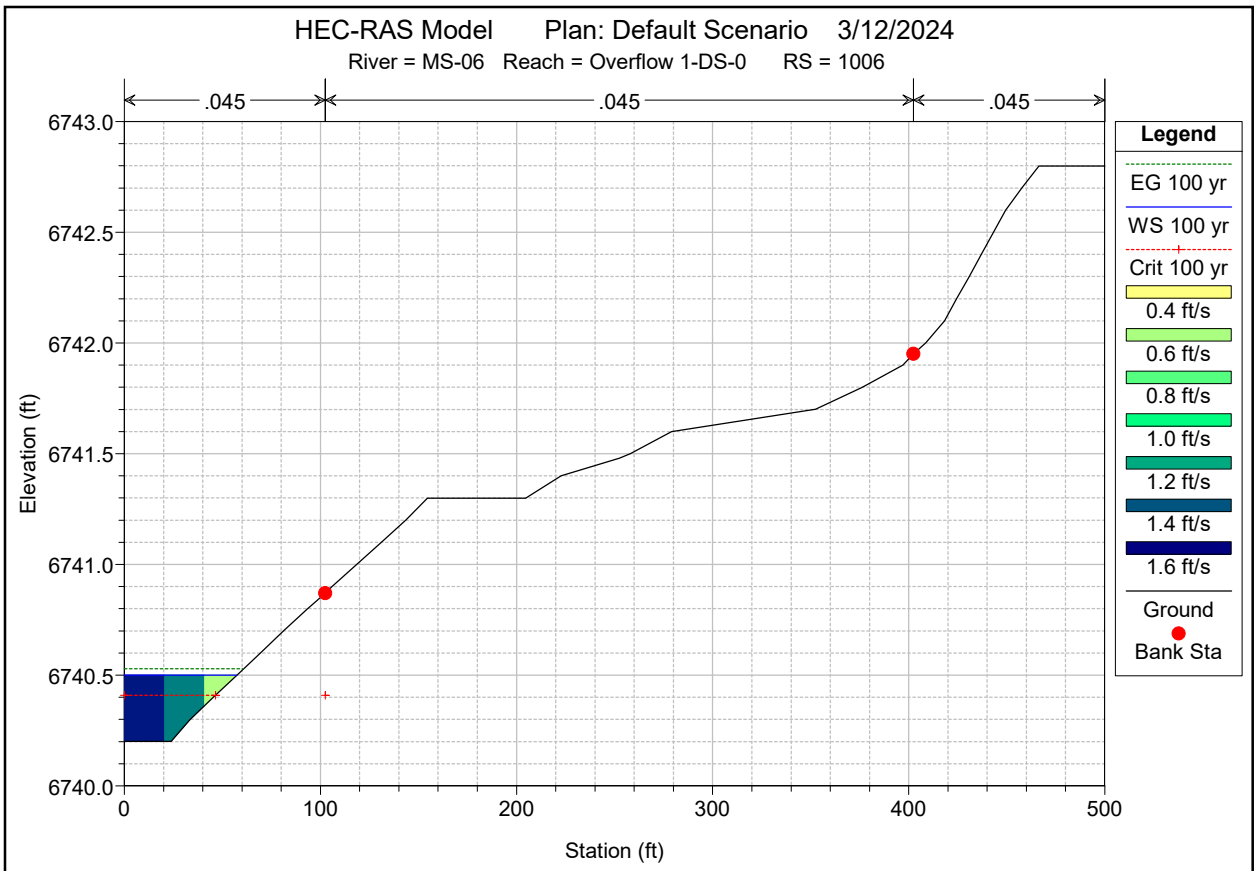

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 986
.045
Elevation (ft)
6751
6750
6749
6748
6747
6746
0
50
100
150
200
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

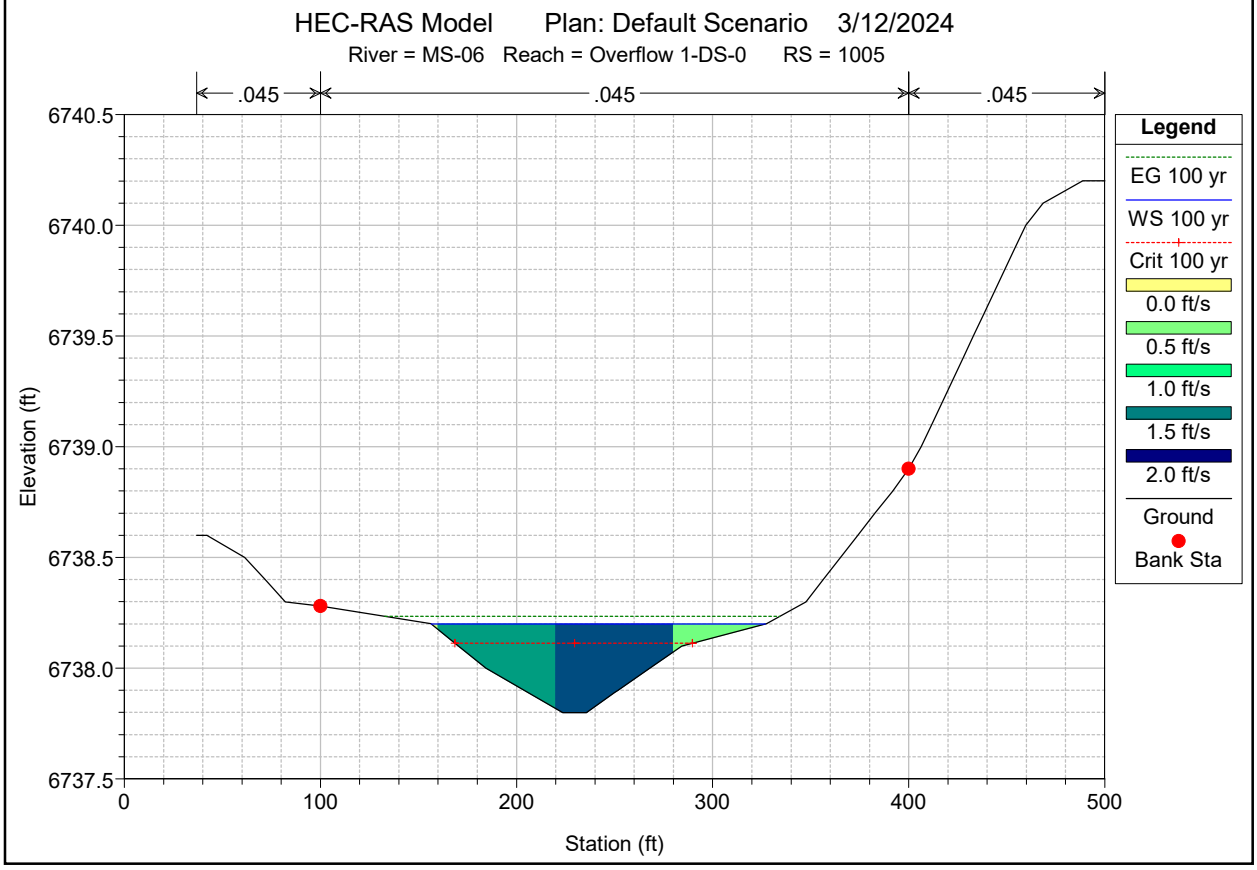

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 985
.045
Elevation (ft)
6749
6748
6747
6746
6745
6744
0
50
100
150
200
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
2.2 ft/s
2.4 ft/s
2.6 ft/s
2.8 ft/s
3.0 ft/s
Ground
Bank Sta

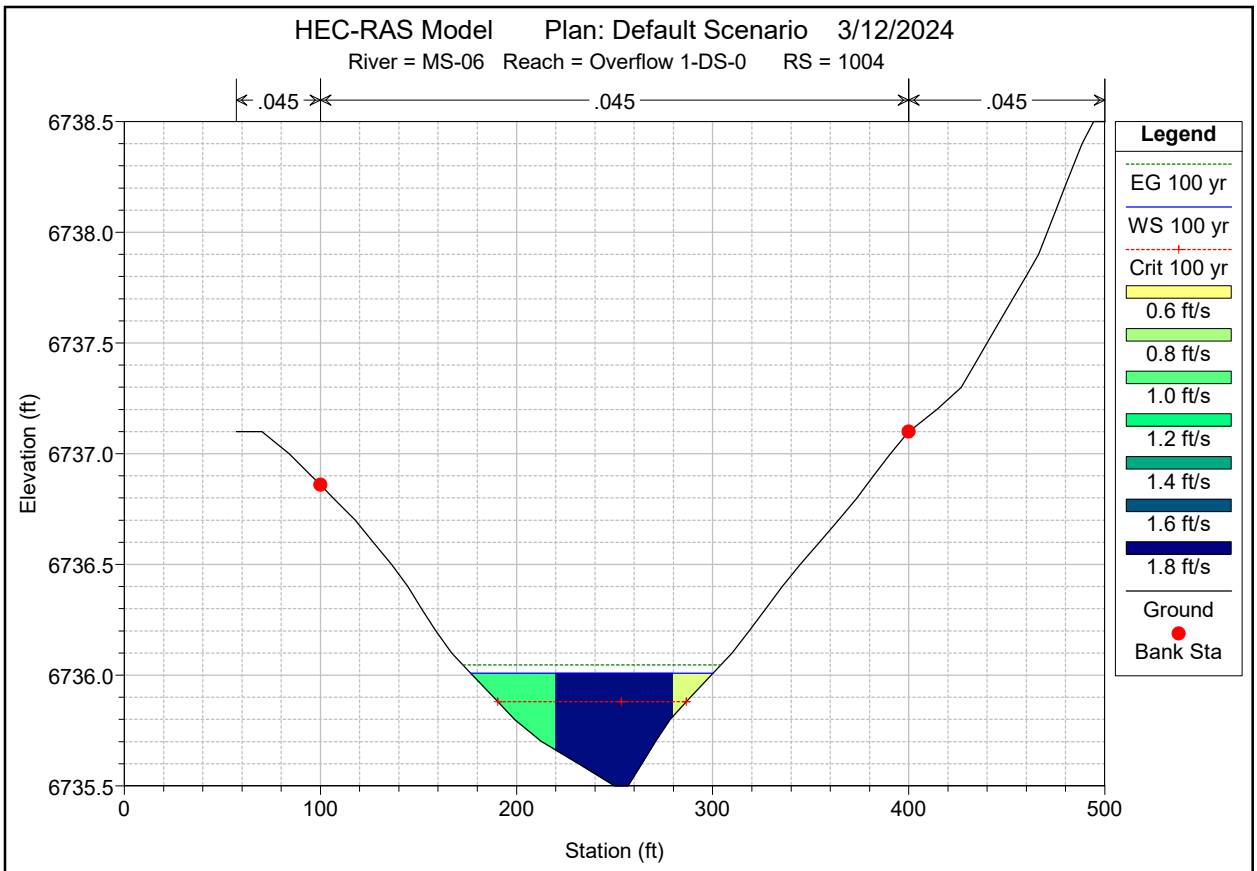

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 984
.045
6746.5
6746.0
6745.5
6745.0
6744.5
6744.0
6743.5
Elevation (ft)
0
50
100
150
200
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel RS = 983
.045
.07
6743.4
6743.2
6743.0
6742.8
6742.6
6742.4
6742.2
Elevation (ft)
-50
0
50
100
150
200
250
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta

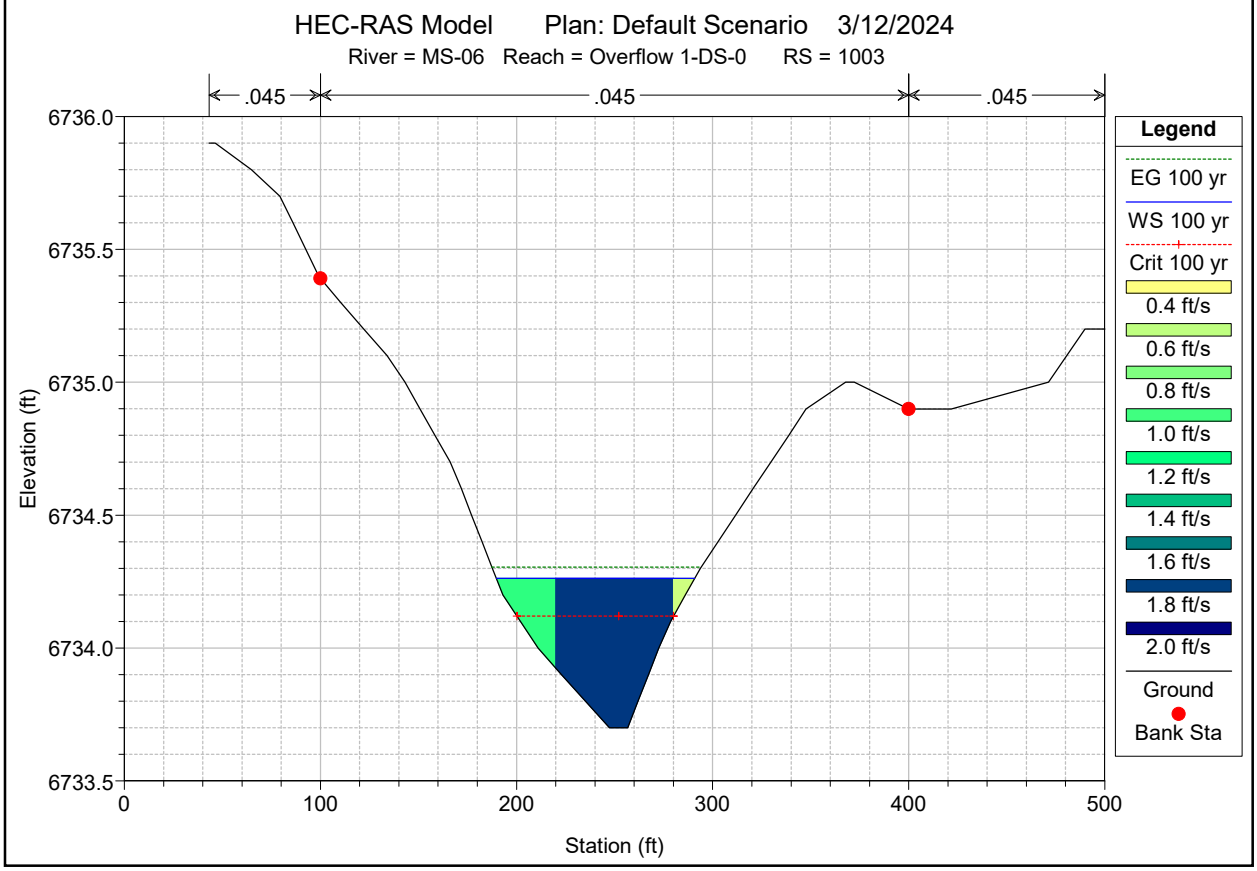

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Overflow 1-DS-0 RS = 1007
.045
.045
Elevation (ft)
6746.4
6746.2
6746.0
6745.8
6745.6
6745.4
6745.2
6745.0
0
50
100
150
200
250
300
350
Station (ft)
Legend
WS 100 yr
EG 100 yr
Crit 100 yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

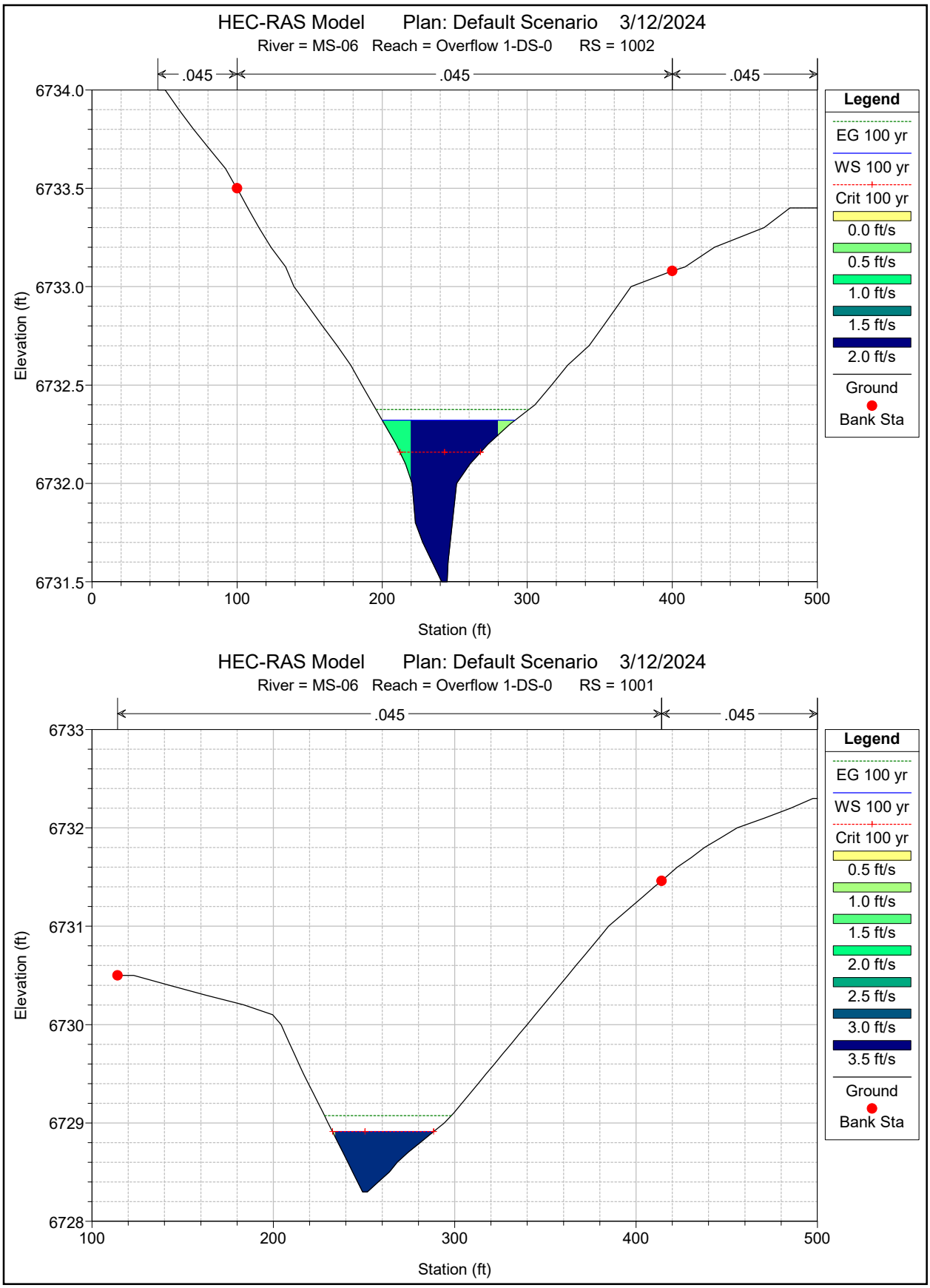

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Overflow 1-DS-0 RS = 1006.6
.045
.045
Elevation (ft)
6744.8
6744.6
6744.4
6744.2
6744.0
6743.8
6743.6
6743.4
6743.2
-50
0
50
100
150
200
250
300
350
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Levee
Bank Sta

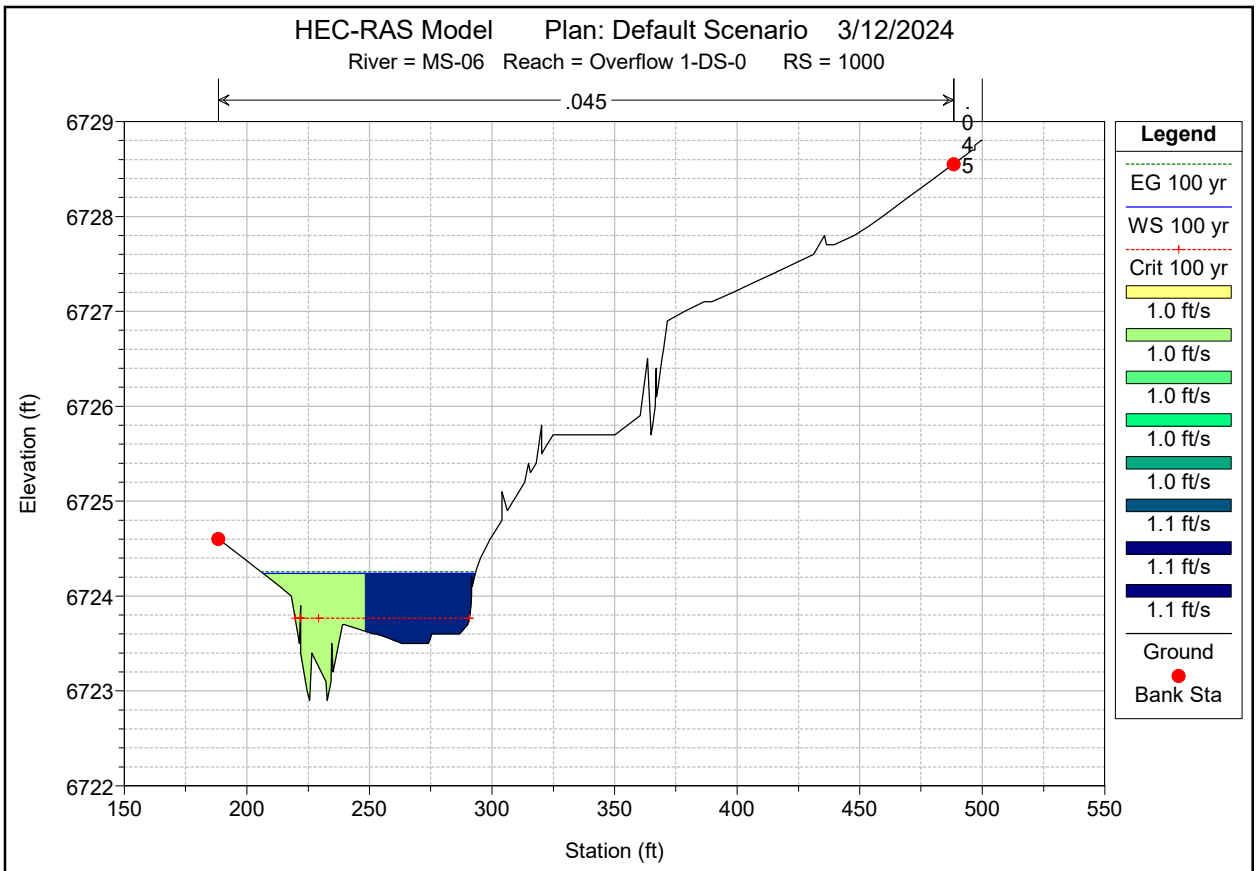

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Overflow 1-DS-0 RS = 1006
.045
.045
.045
6743.0
6742.5
6742.0
6741.5
6741.0
6740.5
6740.0
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
Ground
Bank Sta

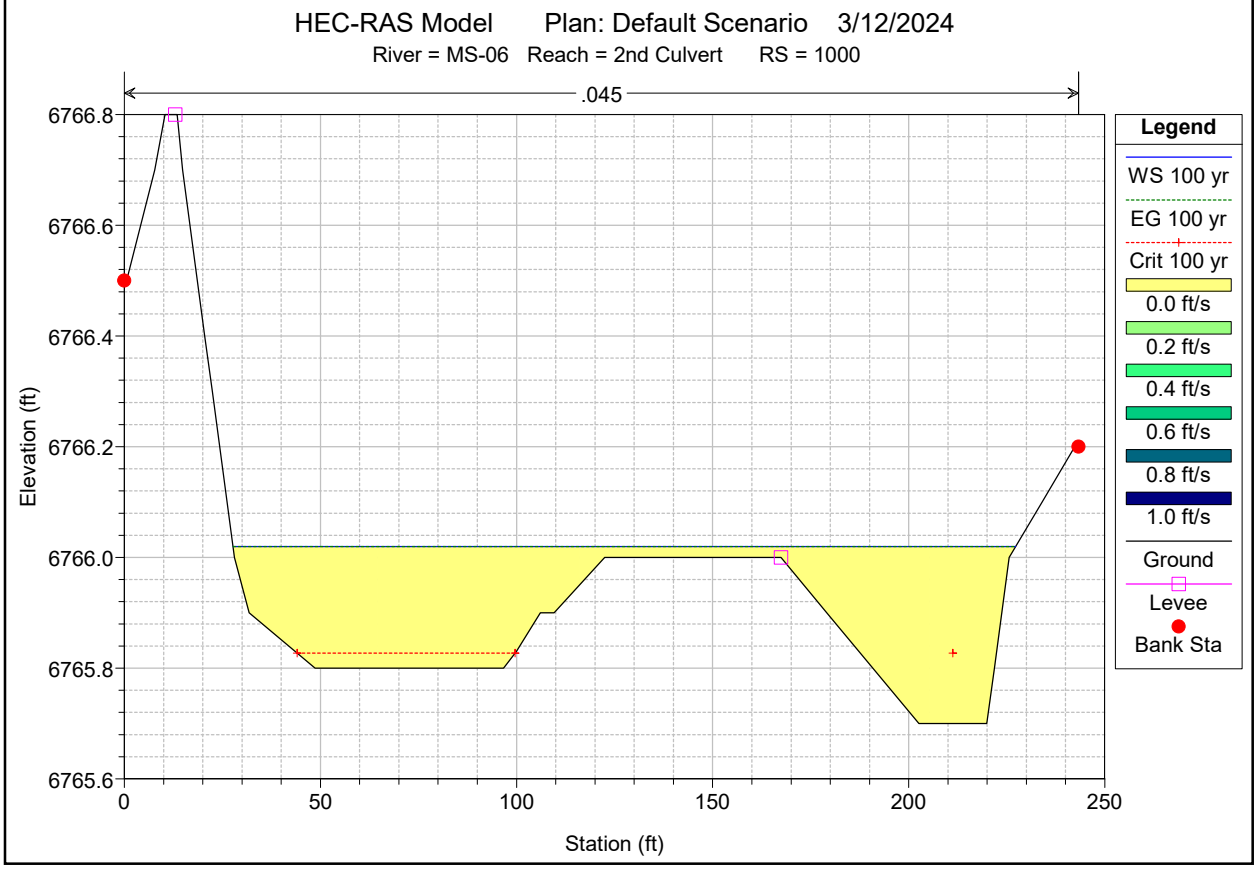

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Overflow 1-DS-0 RS = 1005
.045
.045
.045
6740.5
6740.0
6739.5
6739.0
6738.5
6738.0
6737.5
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
Ground
Bank Sta

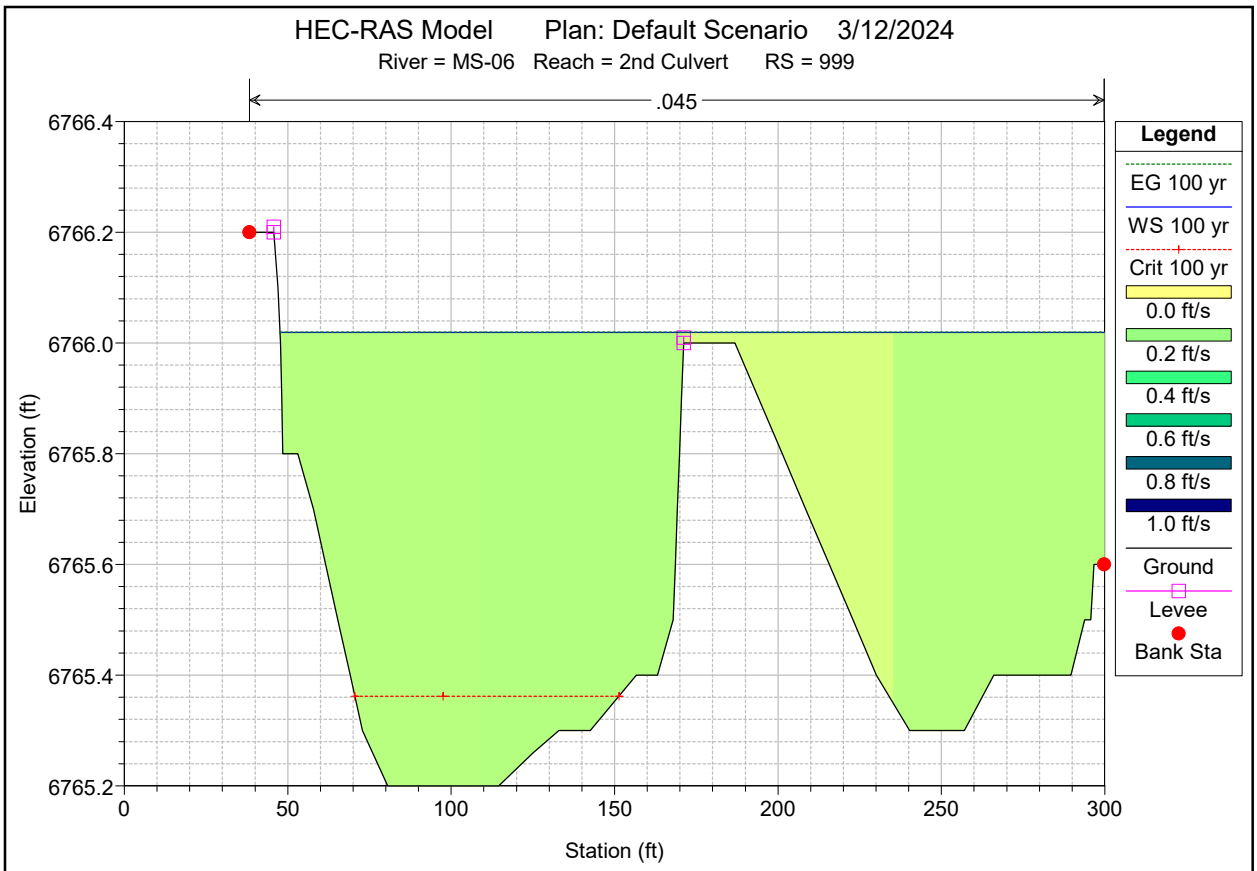

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Overflow 1-DS-0 RS = 1004
.045
.045
.045
6738.5
6738.0
6737.5
6737.0
6736.5
6736.0
6735.5
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
Ground
Bank Sta

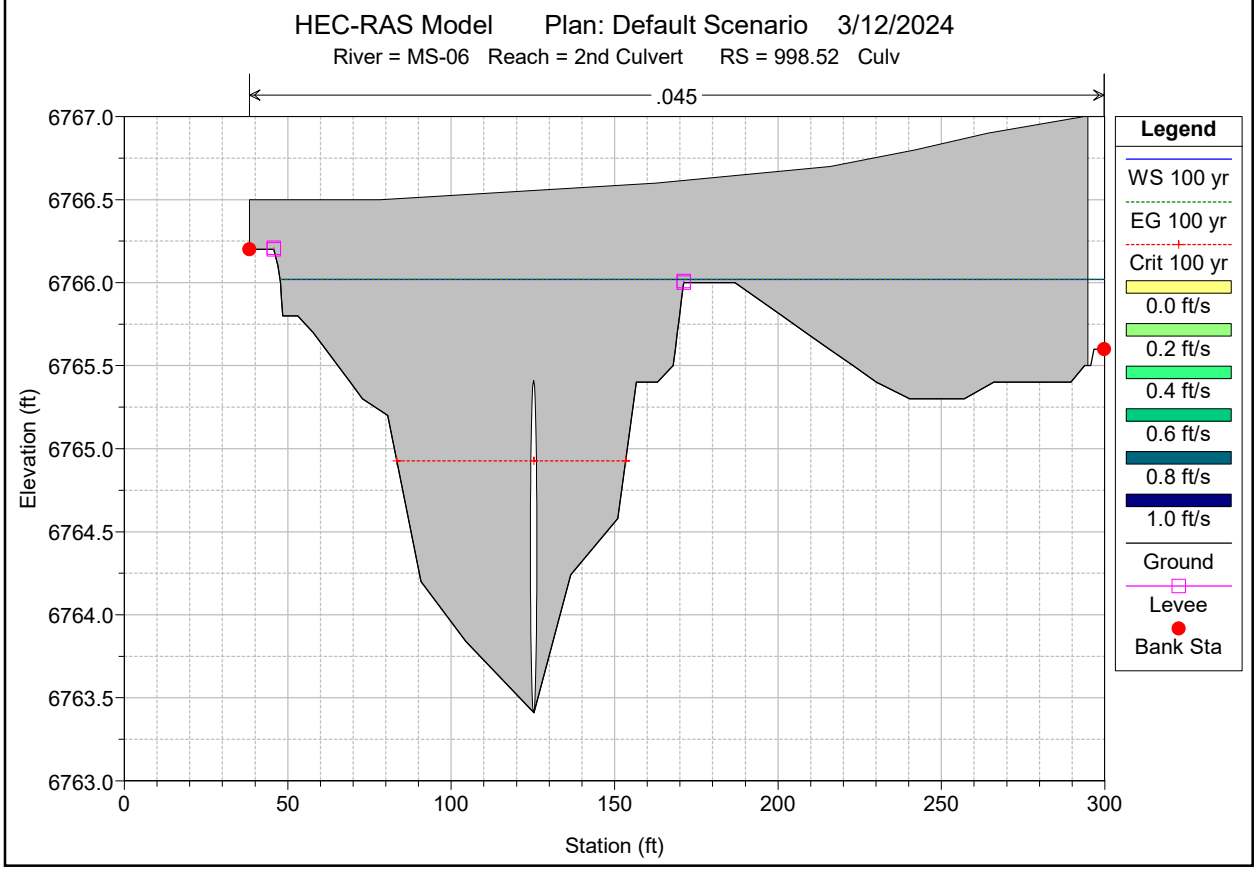

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Overflow 1-DS-0 RS = 1003
.045
.045
.045
6736.0
6735.5
6735.0
6734.5
6734.0
6733.5
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
2.0 ft/s
Ground
Bank Sta

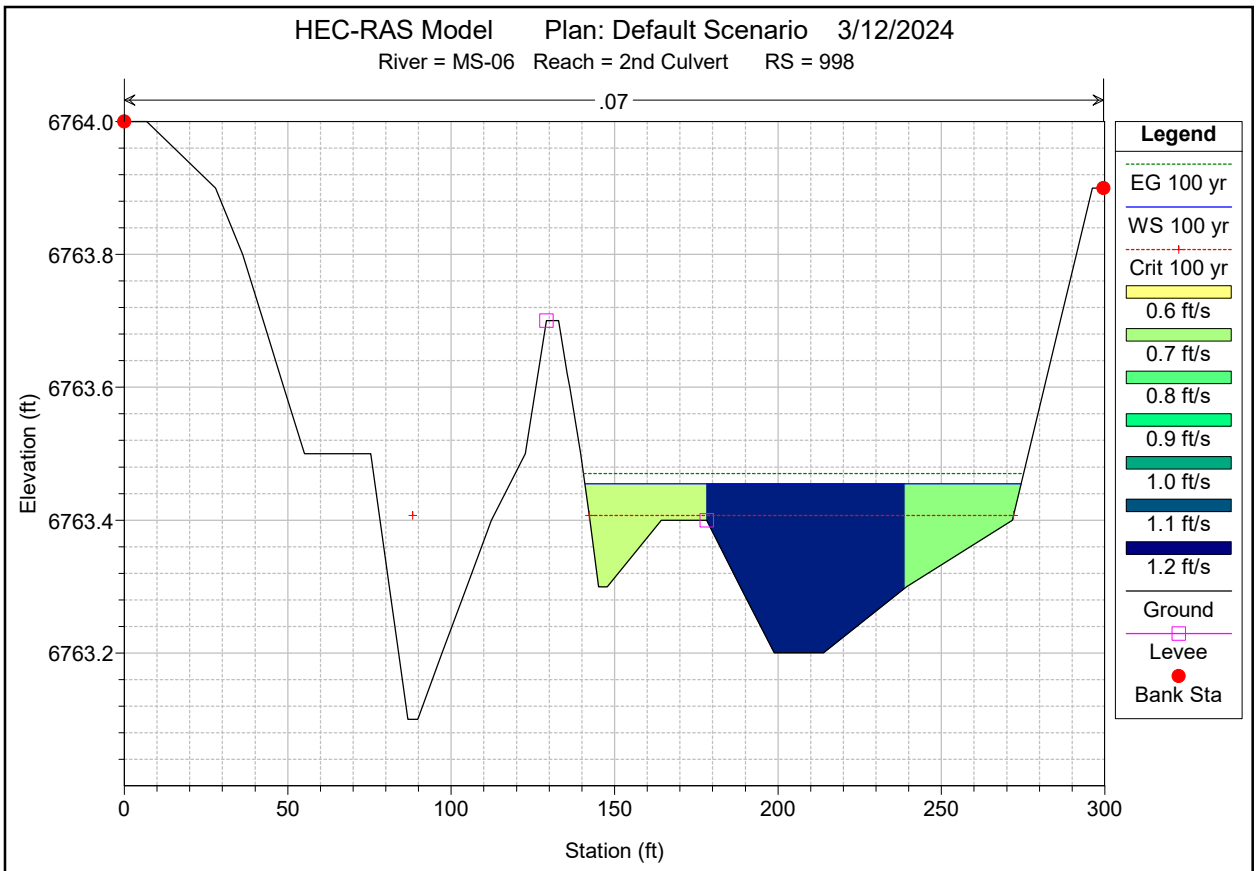

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Overflow 1-DS-0 RS = 1002
.045
.045
.045
6734.0
6733.5
6733.0
6732.5
6732.0
6731.5
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Overflow 1-DS-0 RS = 1001
.045
.045
6733
6732
6731
6730
6729
6728
Elevation (ft)
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

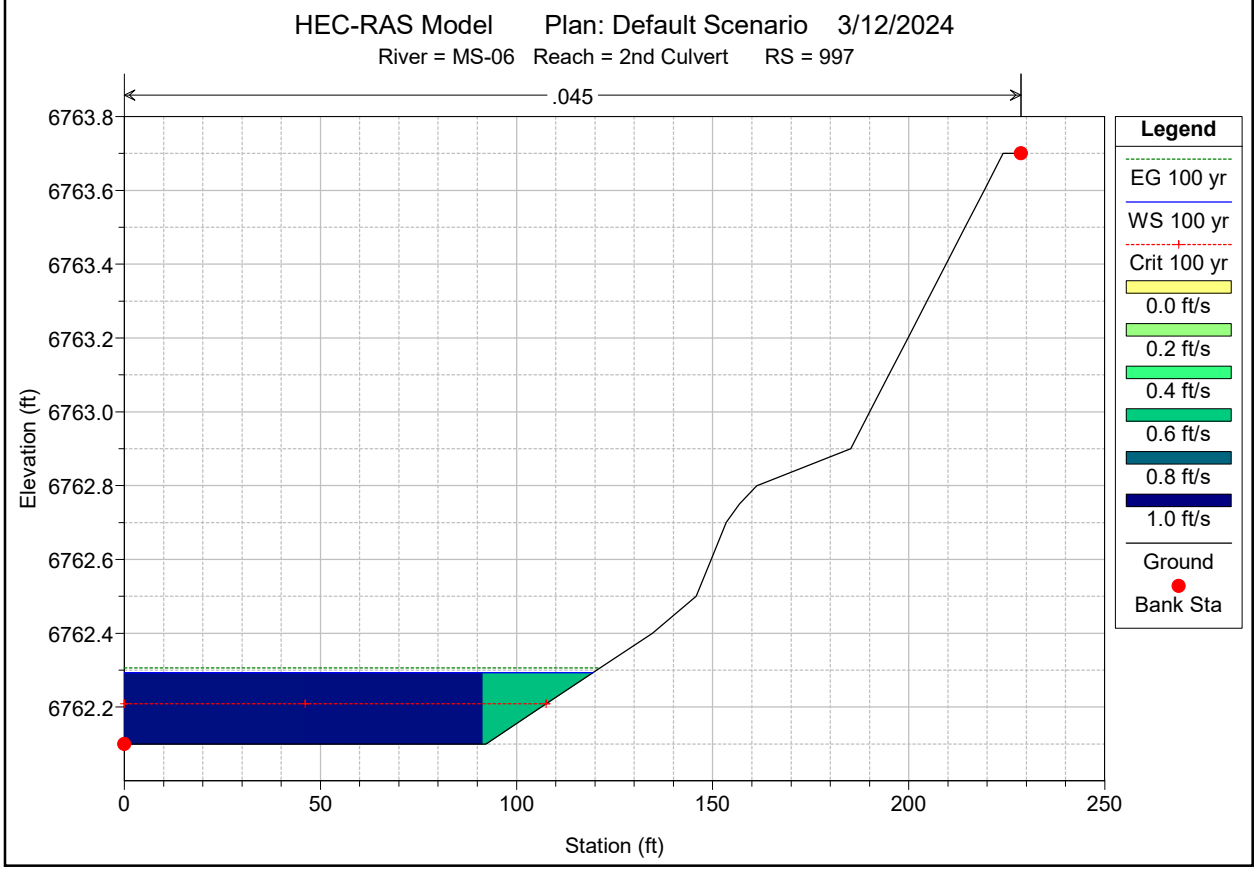

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Overflow 1-DS-0 RS = 1000
.045
.045
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.0 ft/s
1.0 ft/s
1.0 ft/s
1.0 ft/s
1.0 ft/s
1.1 ft/s
1.1 ft/s
1.1 ft/s
Ground
Bank Sta

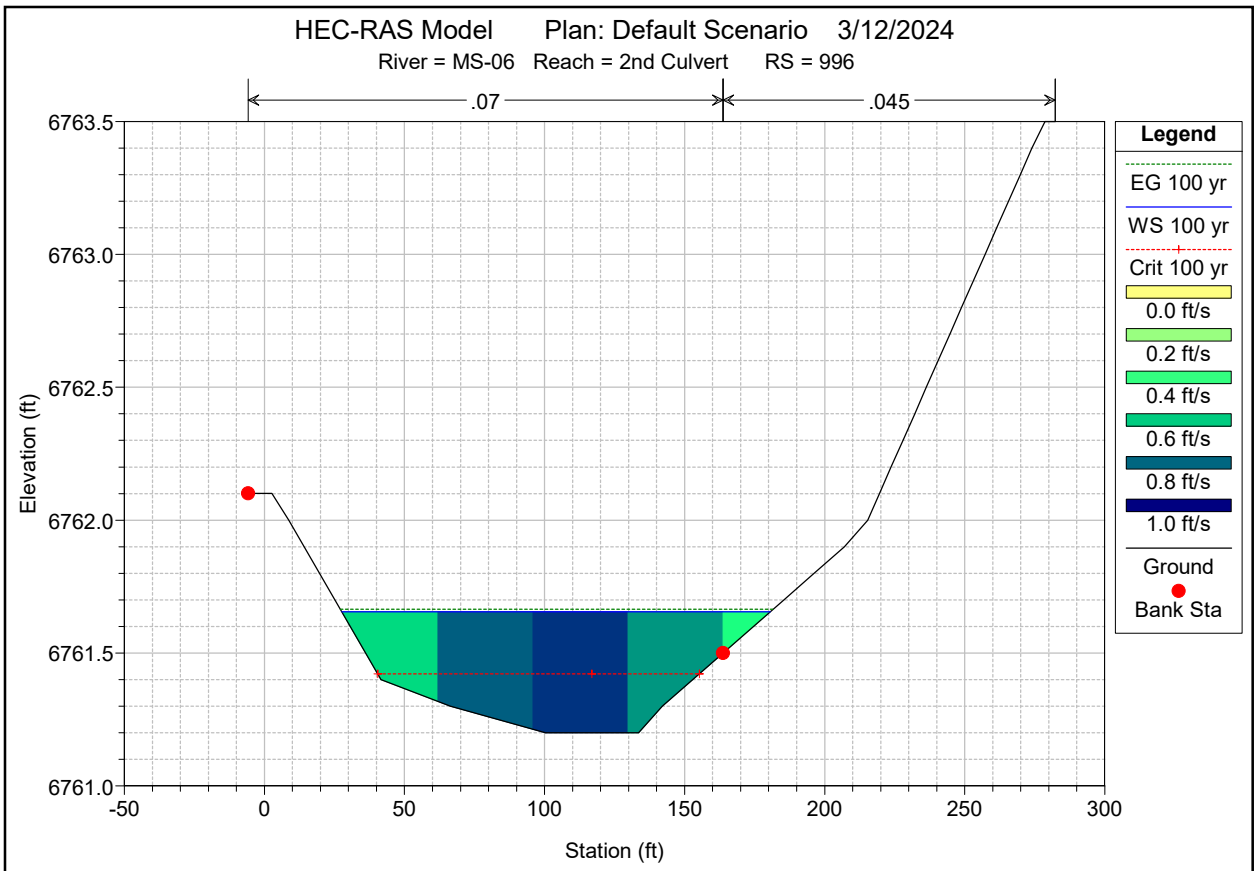

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 1000
.045
Elevation (ft)
Station (ft)
Legend
WS 100 yr
EG 100 yr
Crit 100 yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Levee
Bank Sta

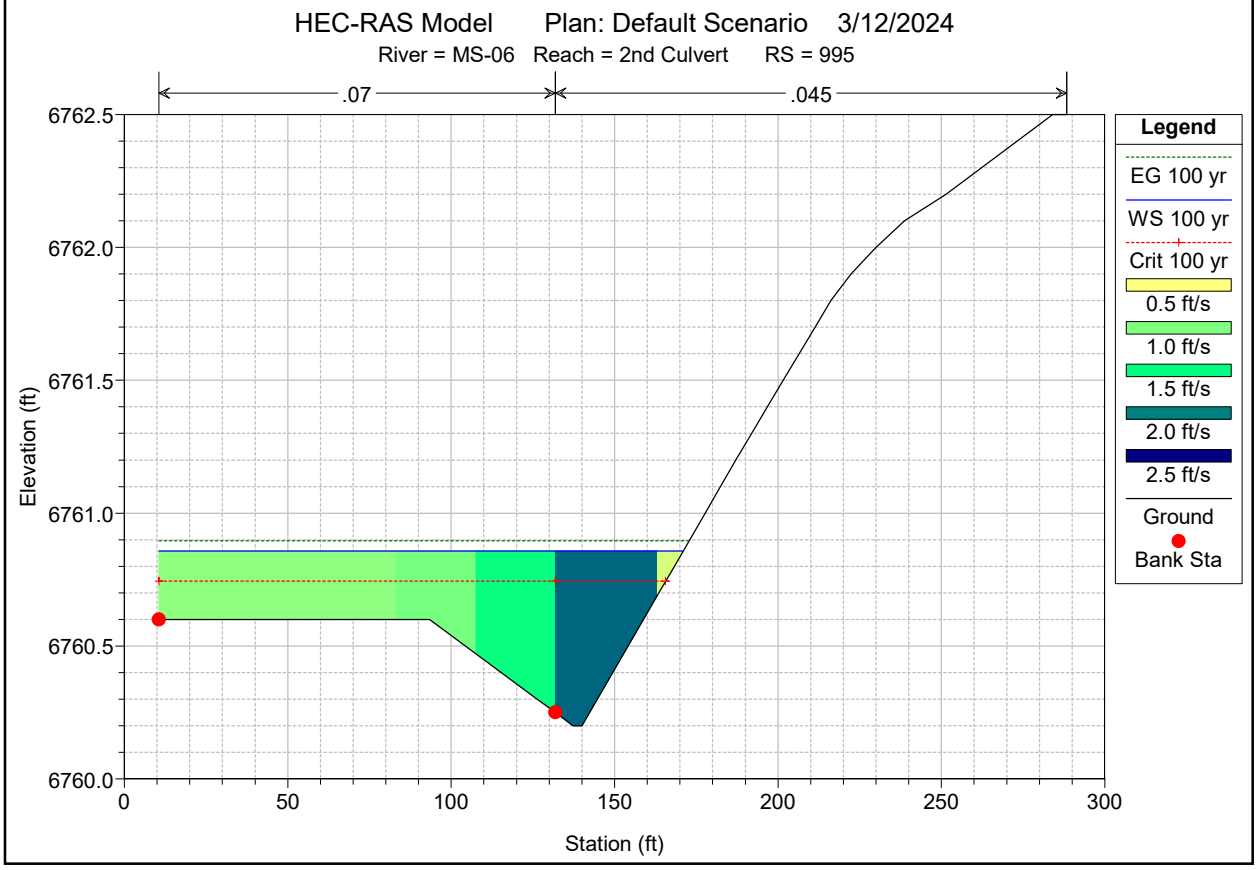

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 999
.045
6766.4
6766.2
6766.0
6765.8
6765.6
6765.4
6765.2
Elevation (ft)
0
50
100
150
200
250
300
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Levee
Bank Sta

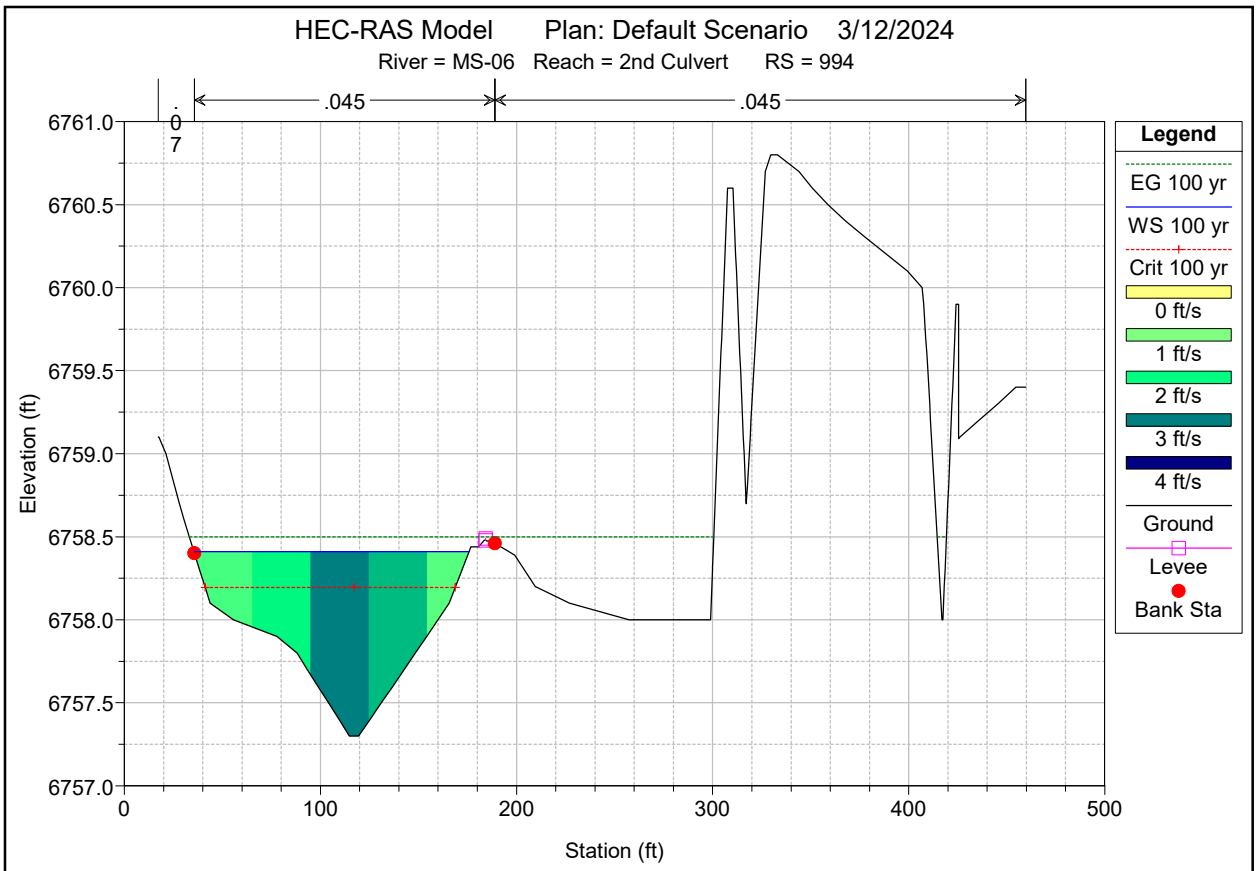

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 998.52 Culv
.045
6767.0
6766.5
6766.0
6765.5
6765.0
6764.5
6764.0
6763.5
6763.0
Elevation (ft)
0
50
100
150
200
250
300
Station (ft)
Legend
WS 100 yr
EG 100 yr
Crit 100 yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Levee
Bank Sta

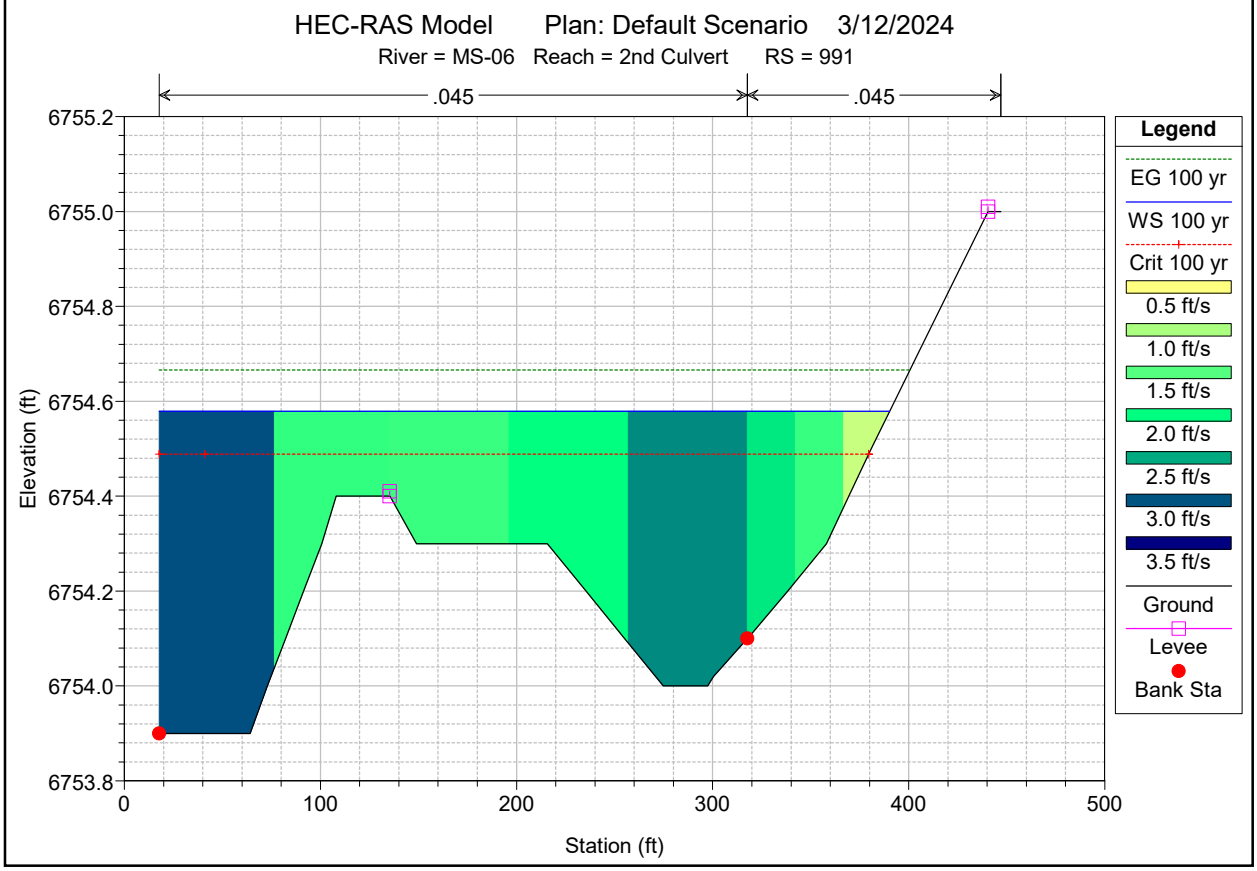

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 998
.07
6764.0
6763.8
6763.6
6763.4
6763.2
Elevation (ft)
0
50
100
150
200
250
300
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.6 ft/s
0.7 ft/s
0.8 ft/s
0.9 ft/s
1.0 ft/s
1.1 ft/s
1.2 ft/s
Ground
Levee
Bank Sta

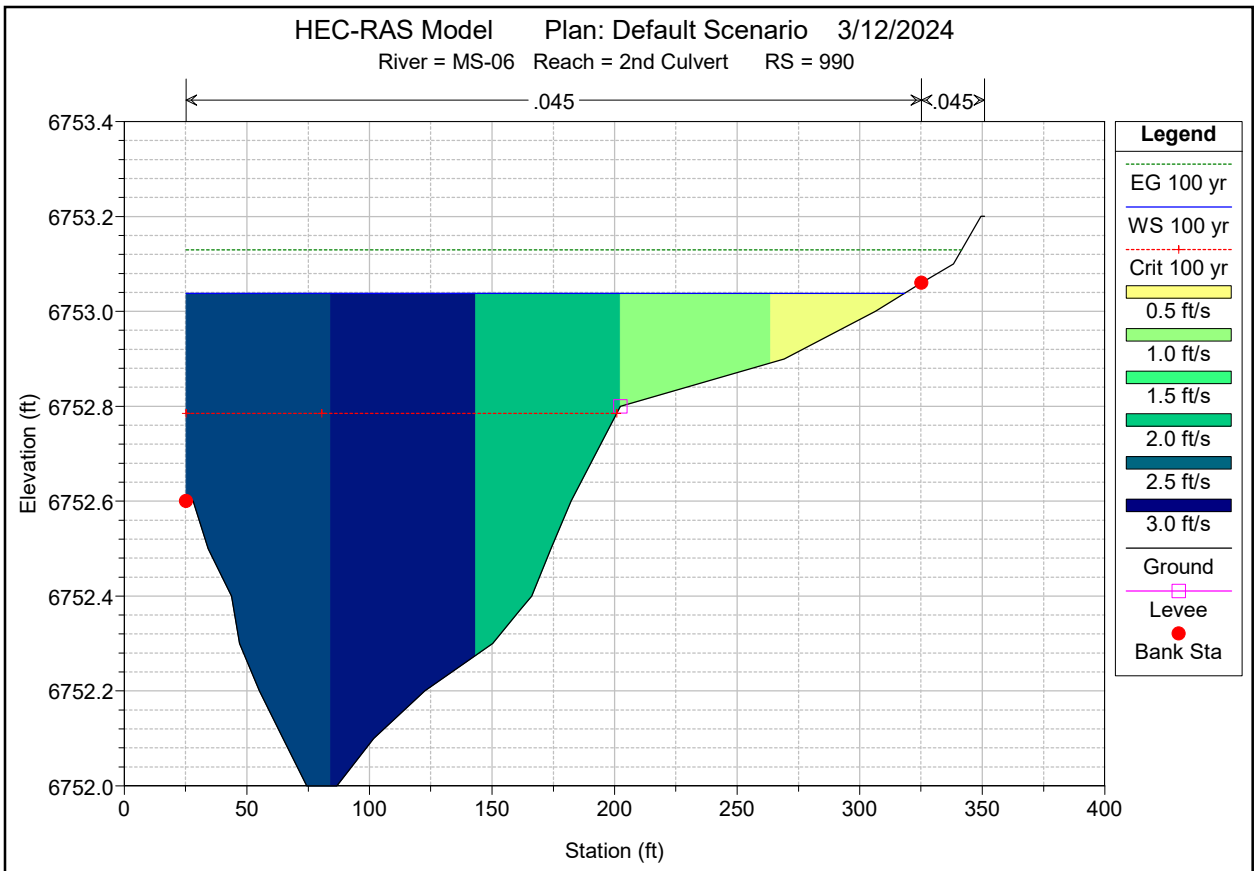

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 997
.045
6763.8
6763.6
6763.4
6763.2
6763.0
6762.8
6762.6
6762.4
6762.2
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

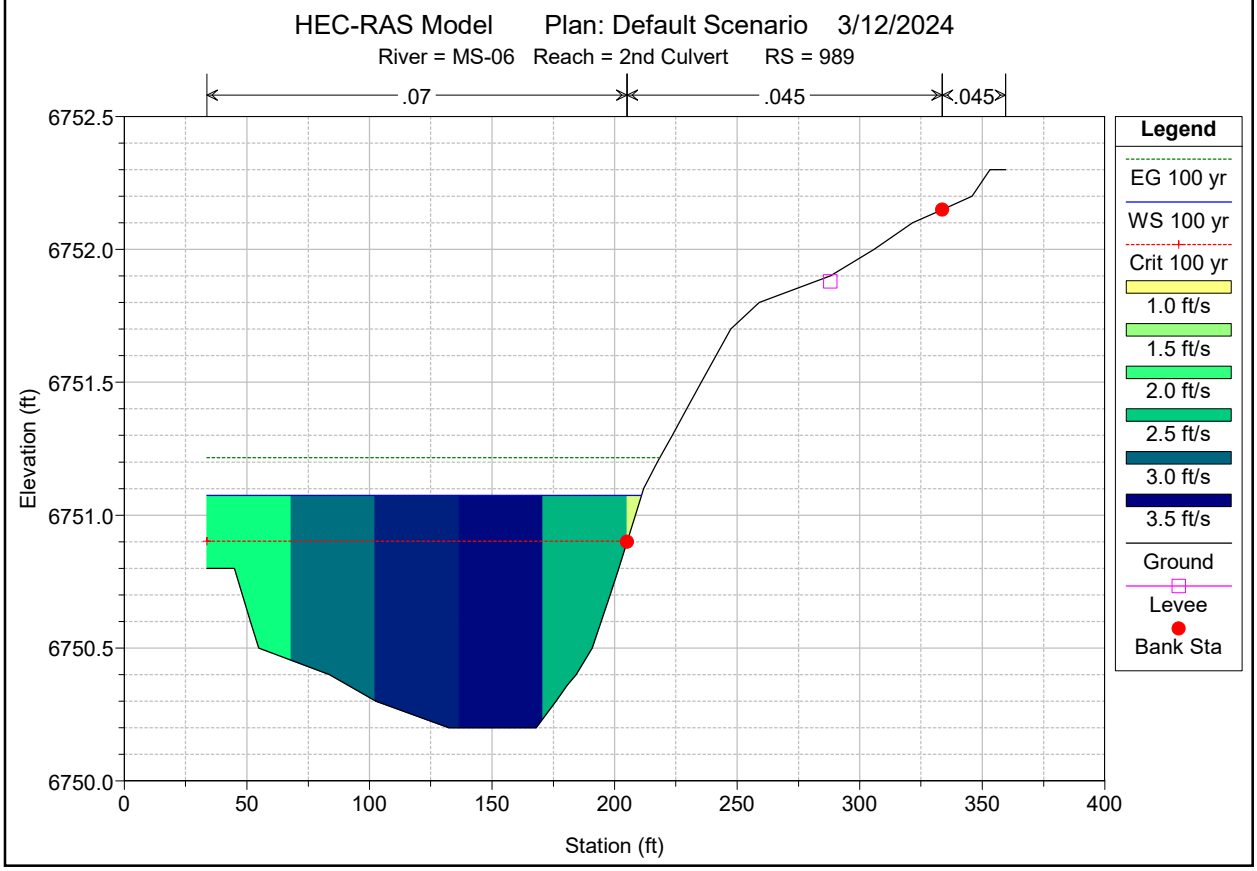

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 996
.07
.045
6763.5
6763.0
6762.5
6762.0
6761.5
6761.0
Elevation (ft)
-50
0
50
100
150
200
250
300
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

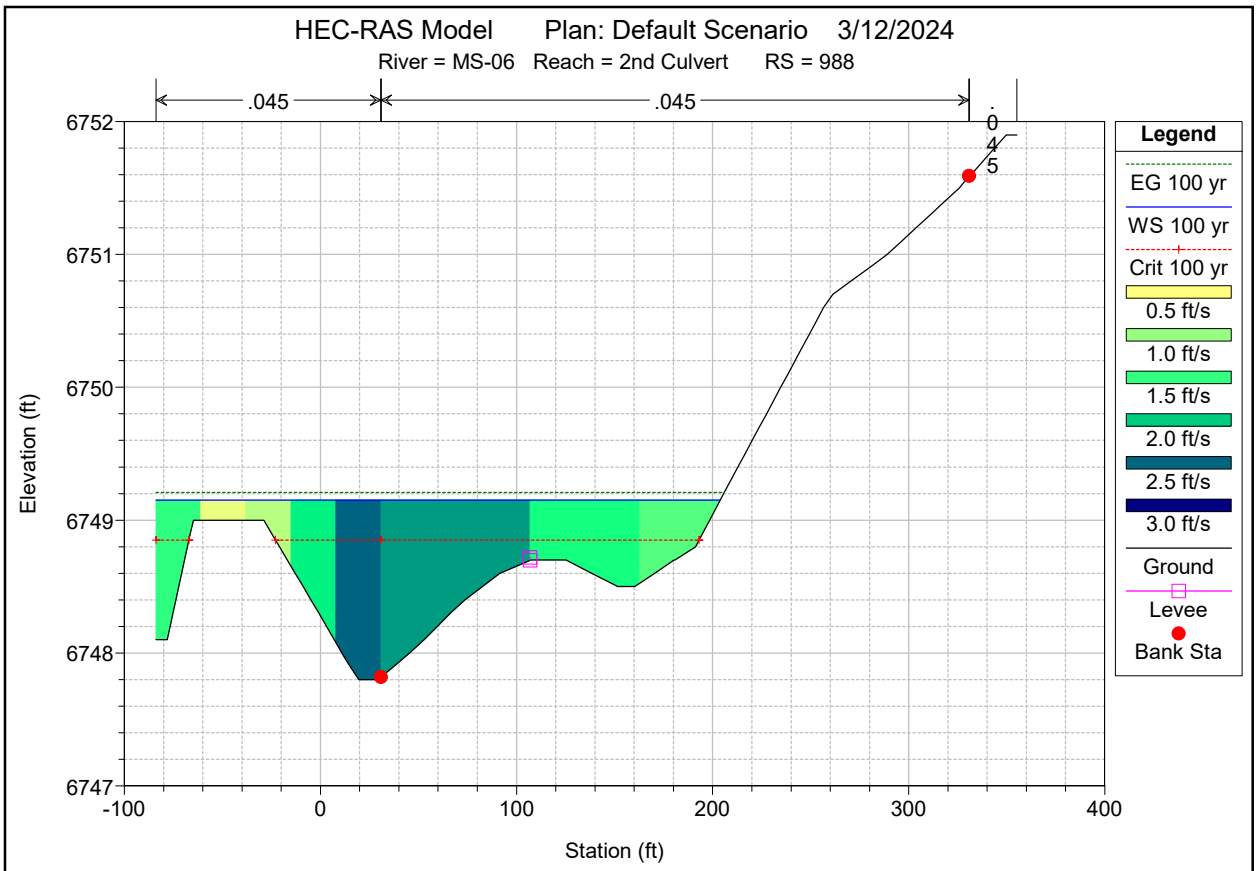

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 995
.07
.045
6762.5
6762.0
6761.5
6761.0
6760.5
6760.0
Elevation (ft)
0
50
100
150
200
250
300
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta

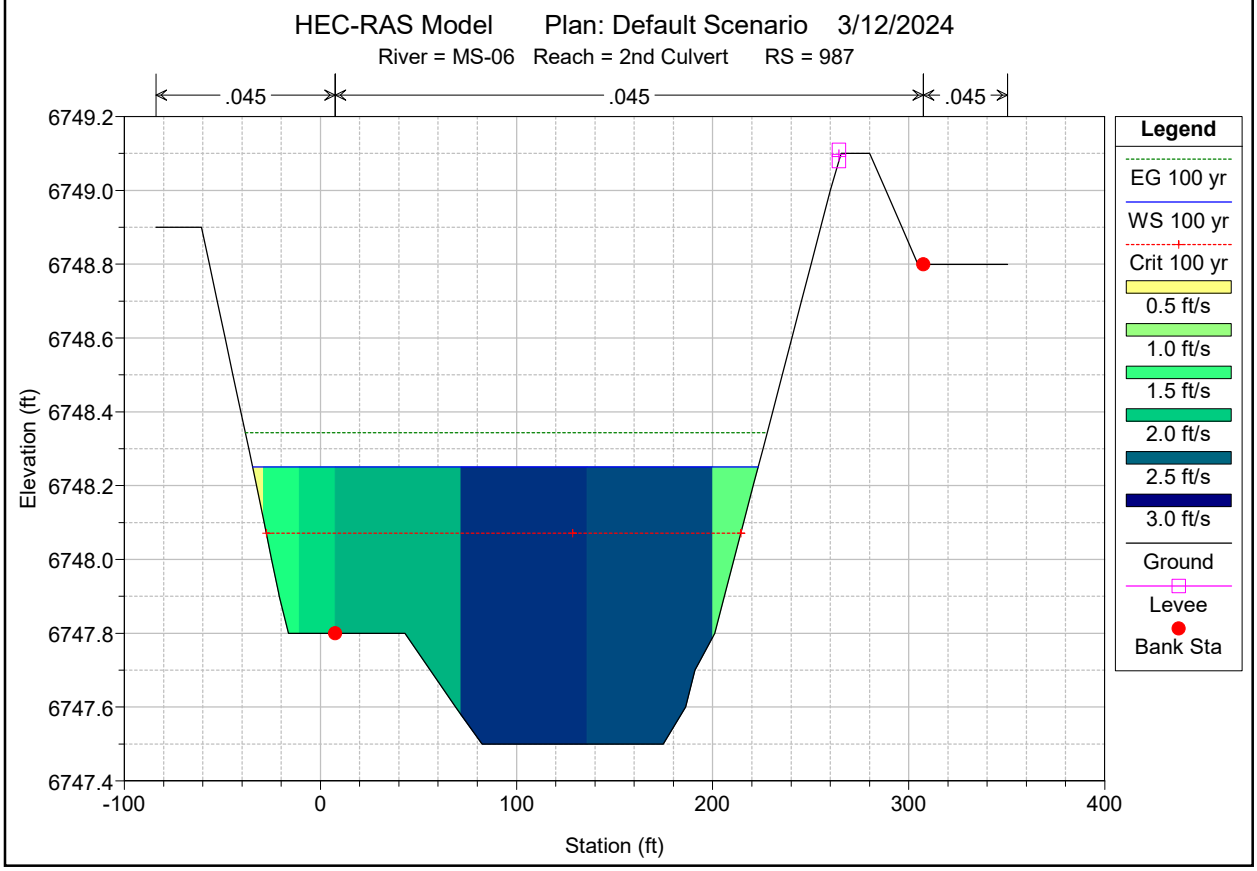

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 994
.045
.045
.07
6761.0
6760.5
6760.0
6759.5
6759.0
6758.5
6758.0
6757.5
6757.0
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Levee
Bank Sta

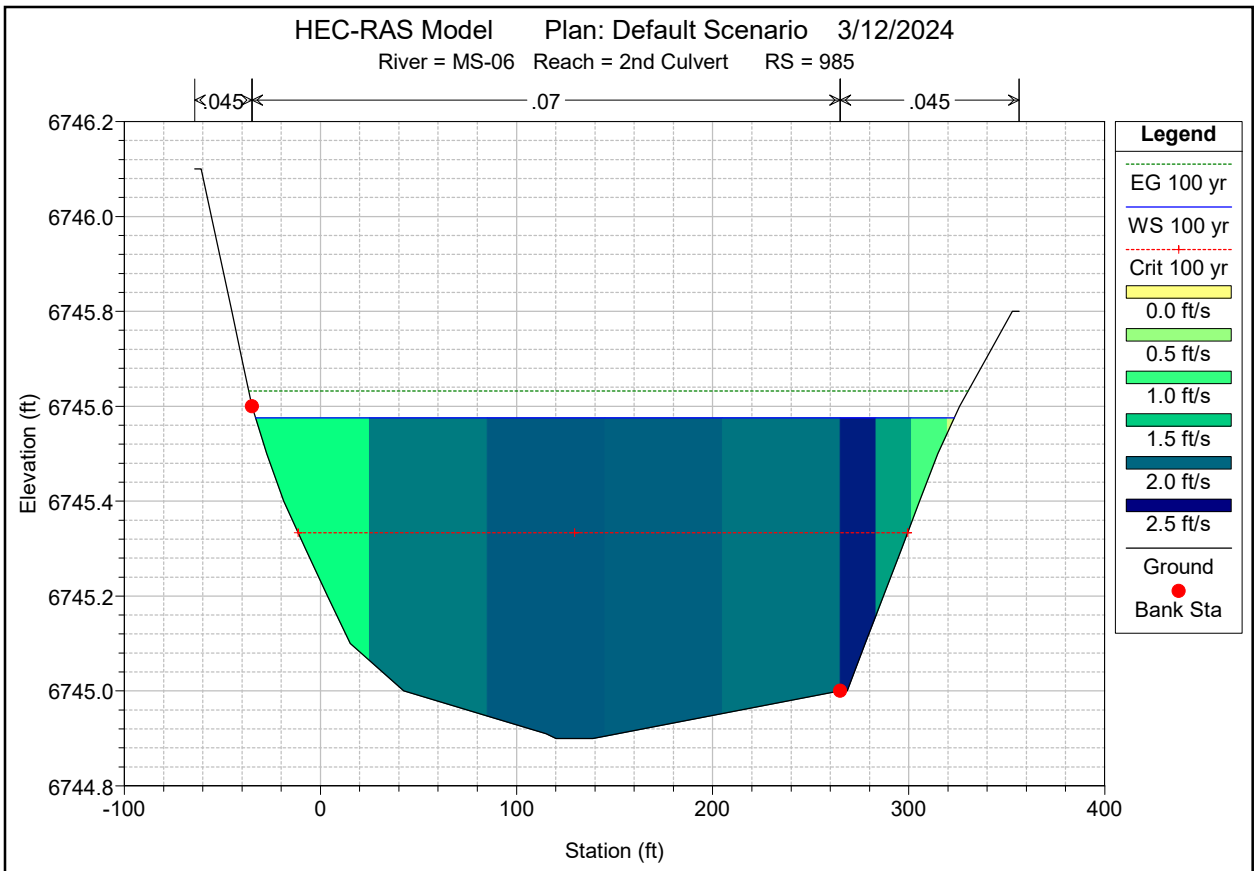

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 991
.045
.045
6755.2
6755.0
6754.8
6754.6
6754.4
6754.2
6754.0
6753.8
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Levee
Bank Sta

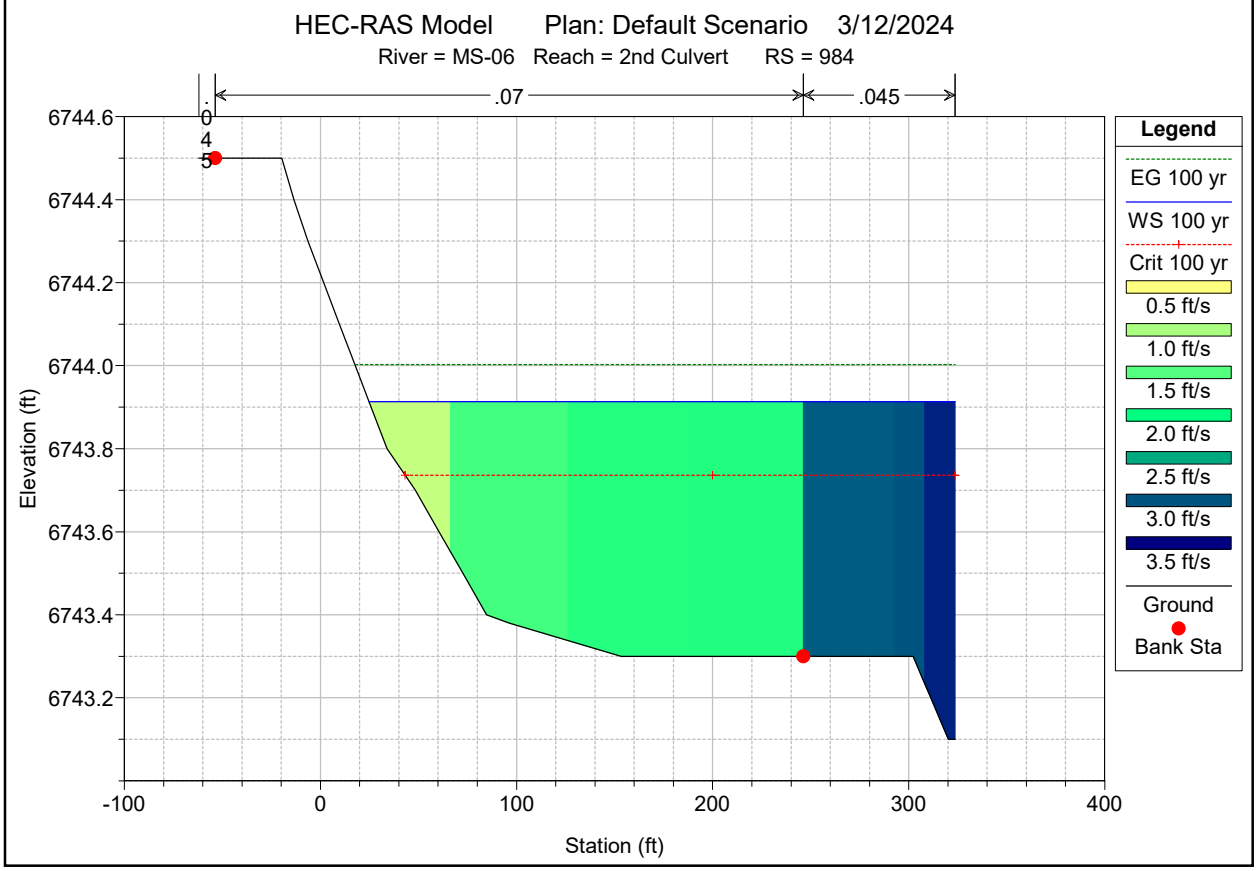

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 990
.045
.045
6753.4
6753.2
6753.0
6752.8
6752.6
6752.4
6752.2
6752.0
Elevation (ft)
0
50
100
150
200
250
300
350
400
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Levee
Bank Sta

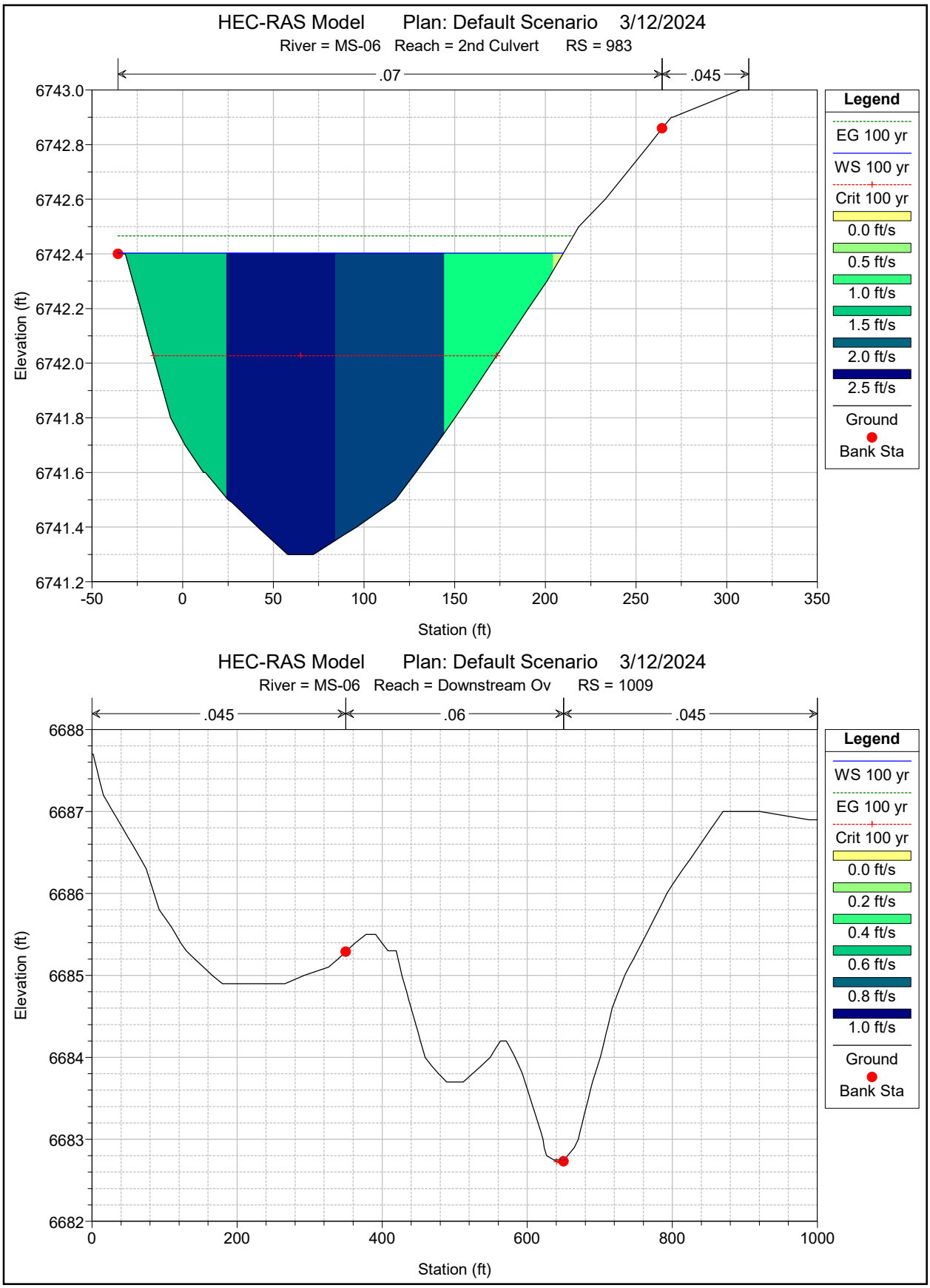

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 989
.07
.045
.045
6752.5
6752.0
6751.5
6751.0
6750.5
6750.0
Elevation (ft)
0
50
100
150
200
250
300
350
400
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Levee
Bank Sta

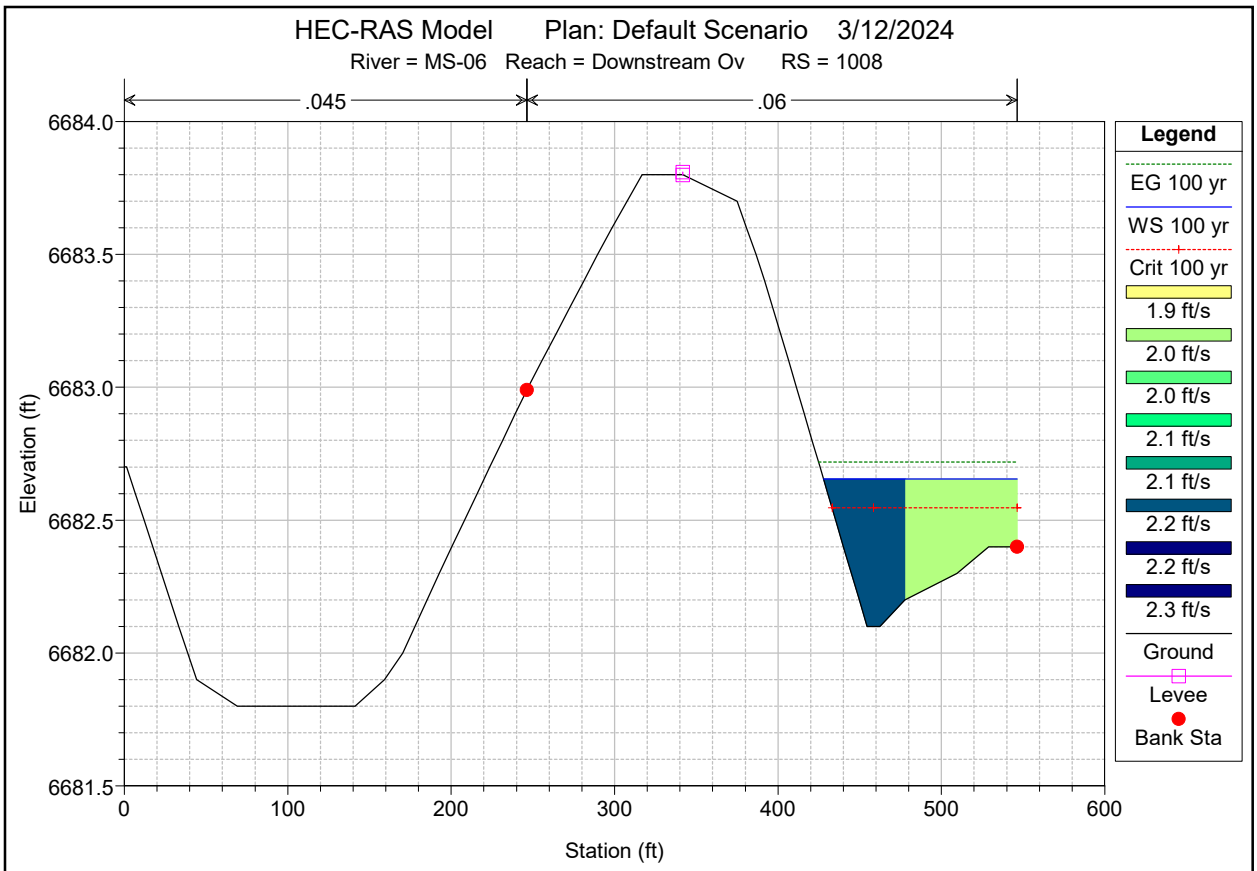

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 988
.045
.045
.045
6752
6751
6750
6749
6748
6747
Elevation (ft)
-100
0
100
200
300
400
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Levee
Bank Sta

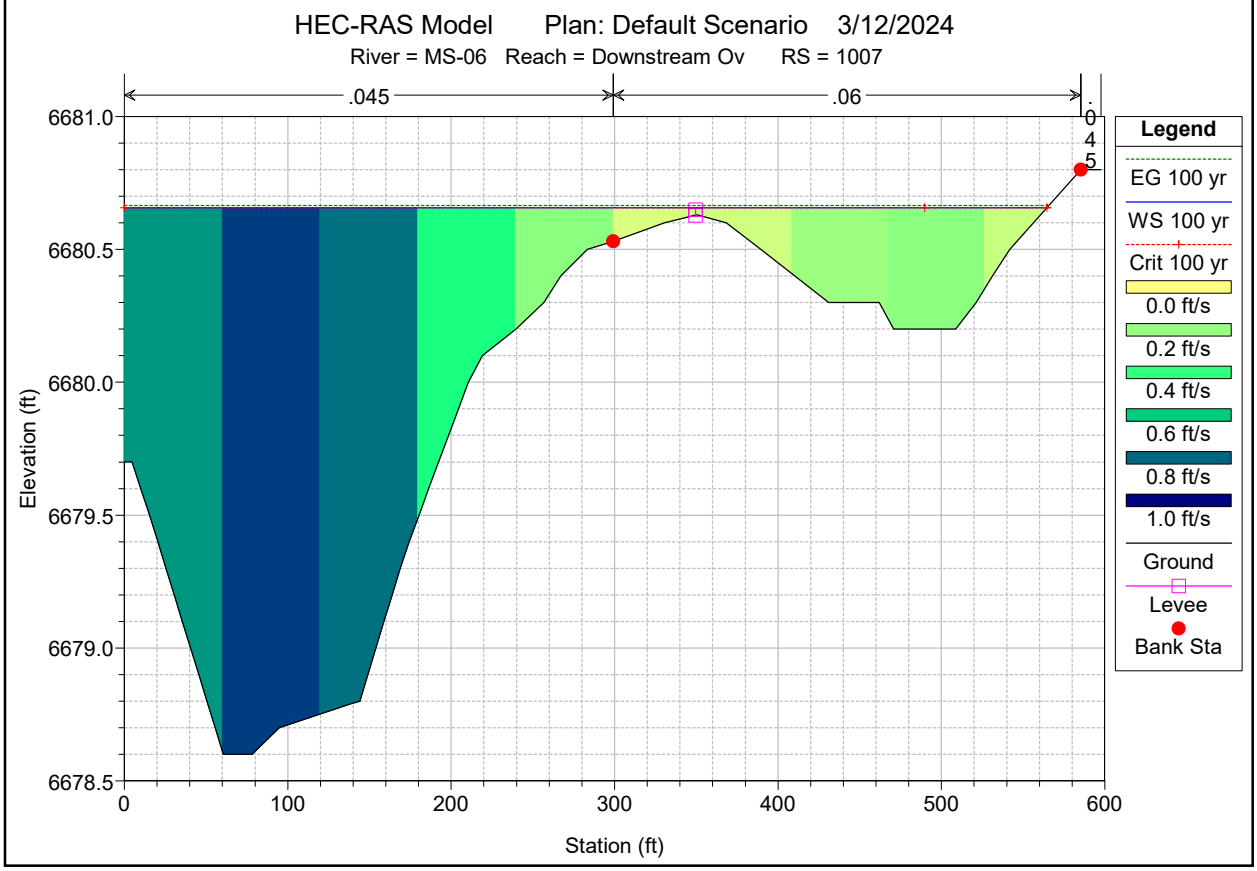

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 987
.045
.045
.045
6749.2
6749.0
6748.8
6748.6
6748.4
6748.2
6748.0
6747.8
6747.6
6747.4
Elevation (ft)
-100
0
100
200
300
400
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Levee
Bank Sta

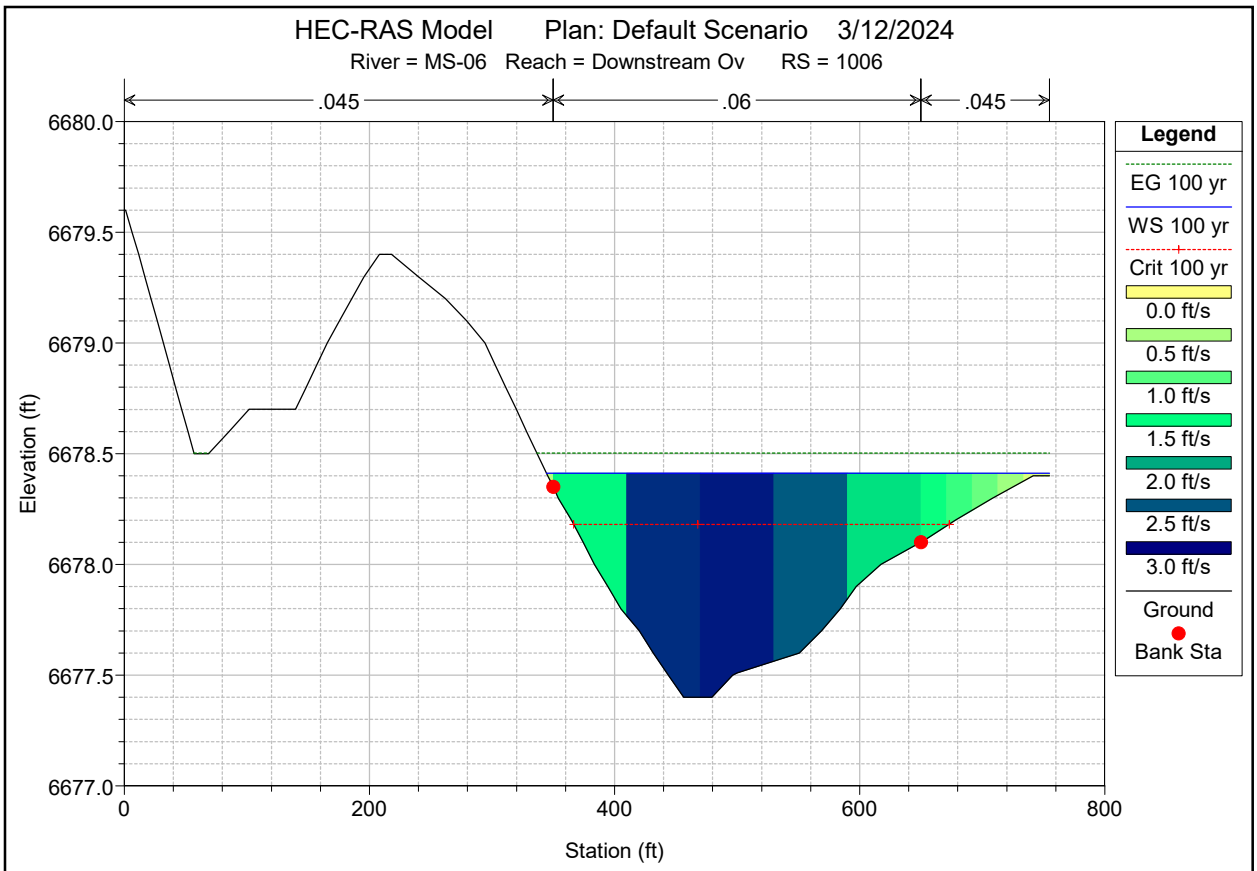

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 985
.045
.07
.045
6746.2
6746.0
6745.8
6745.6
6745.4
6745.2
6745.0
6744.8
Elevation (ft)
-100
0
100
200
300
400
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta

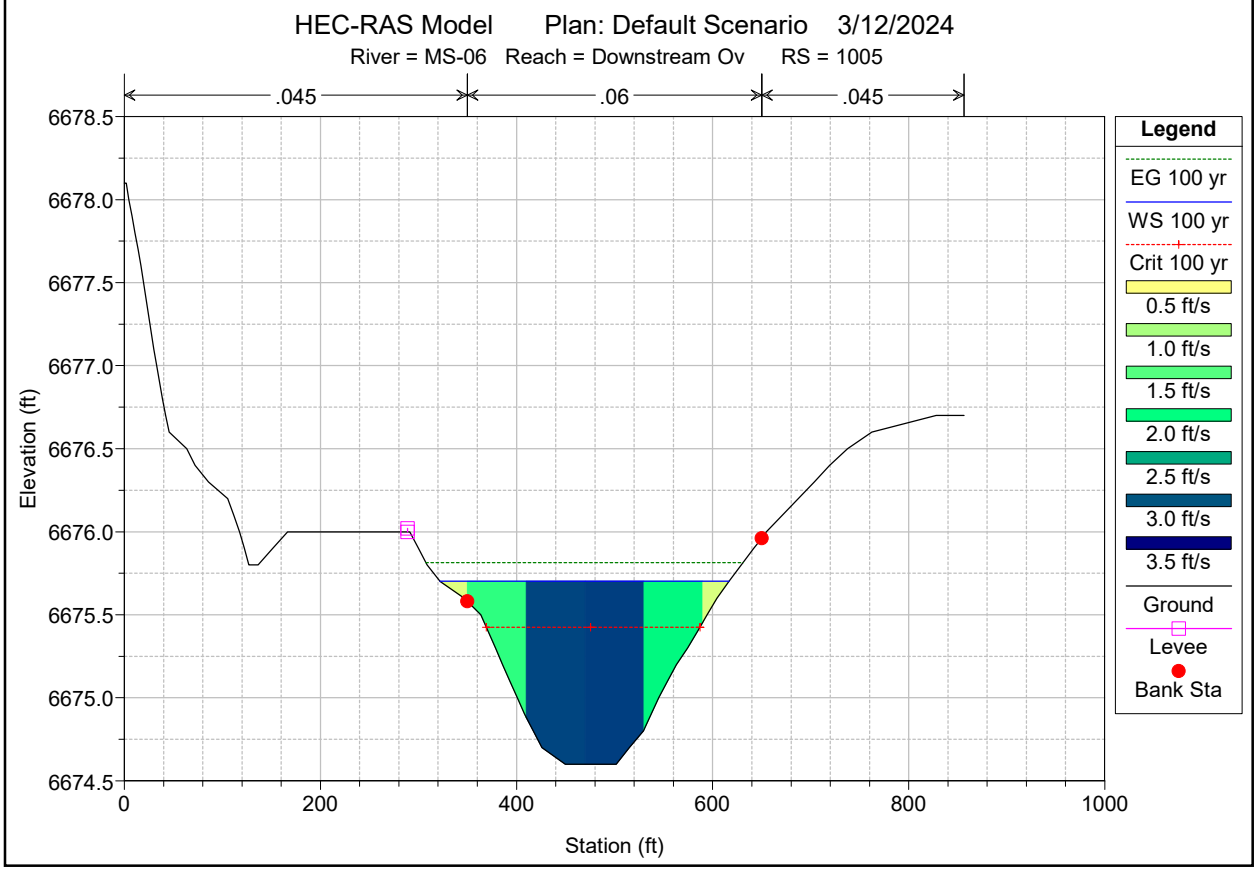

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 984
.07
.045
6744.6
6744.4
6744.2
6744.0
6743.8
6743.6
6743.4
6743.2
Elevation (ft)
-100
0
100
200
300
400
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

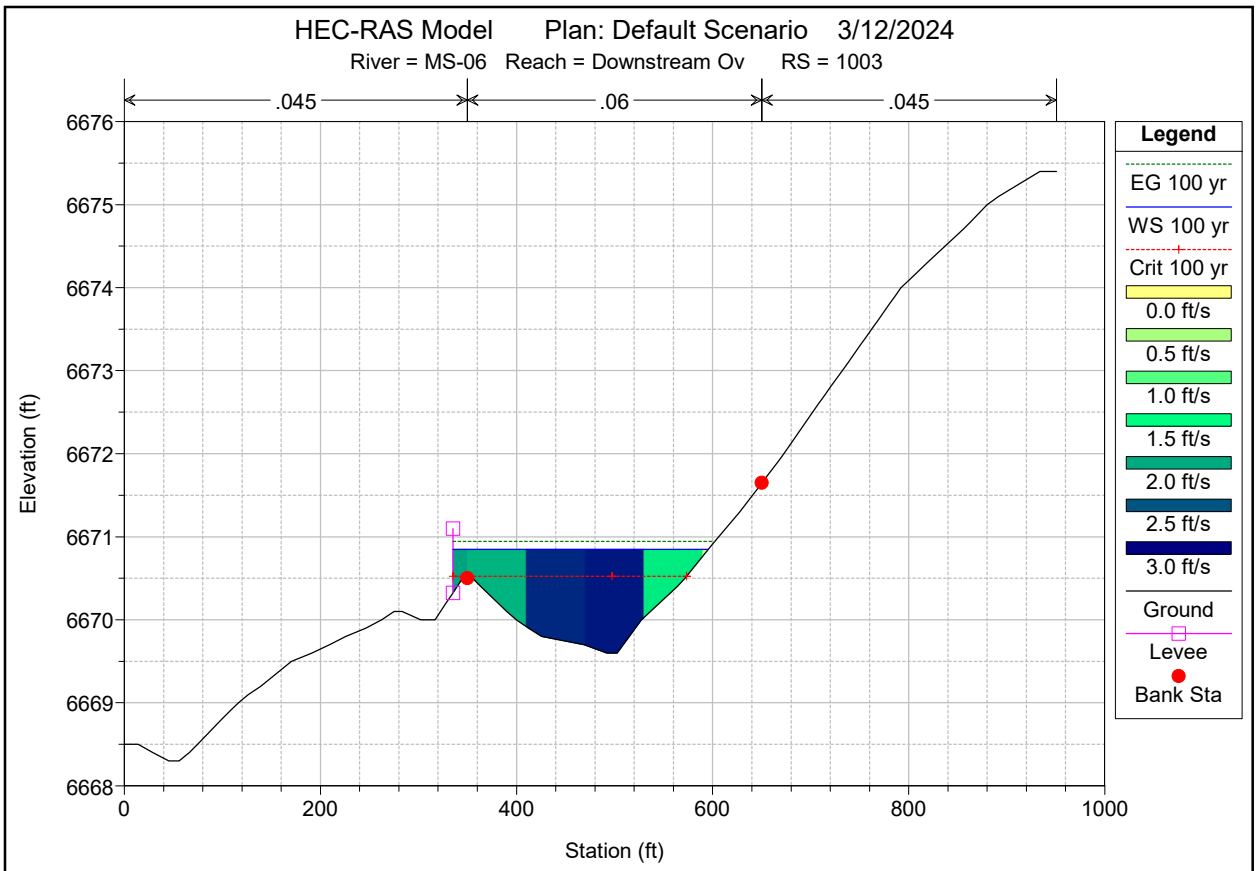

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = 2nd Culvert RS = 983
.07
.045
6743.0
6742.8
6742.6
6742.4
6742.2
6742.0
6741.8
6741.6
6741.4
6741.2
Elevation (ft)
-50
0
50
100
150
200
250
300
350
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Downstream Ov RS = 1009
.045
.06
.045
6688
6687
6686
6685
6684
6683
6682
Elevation (ft)
0
200
400
600
800
1000
Station (ft)
Legend
WS 100 yr
EG 100 yr
Crit 100 yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

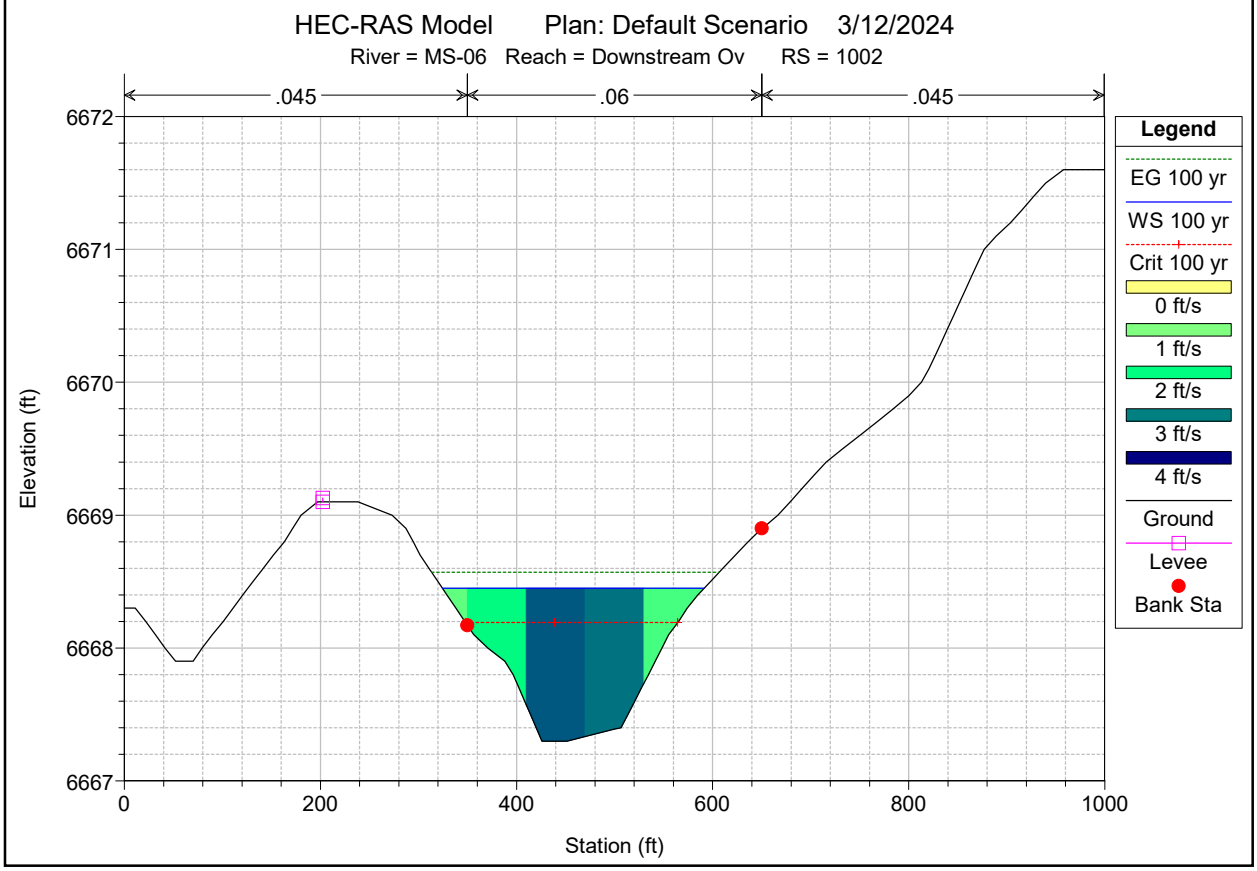

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Downstream Ov RS = 1008
.045
.06
6684.0
6683.5
6683.0
6682.5
6682.0
6681.5
Elevation (ft)
0
100
200
300
400
500
600
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.9 ft/s
2.0 ft/s
2.0 ft/s
2.1 ft/s
2.1 ft/s
2.2 ft/s
2.2 ft/s
2.3 ft/s
Ground
Levee
Bank Sta

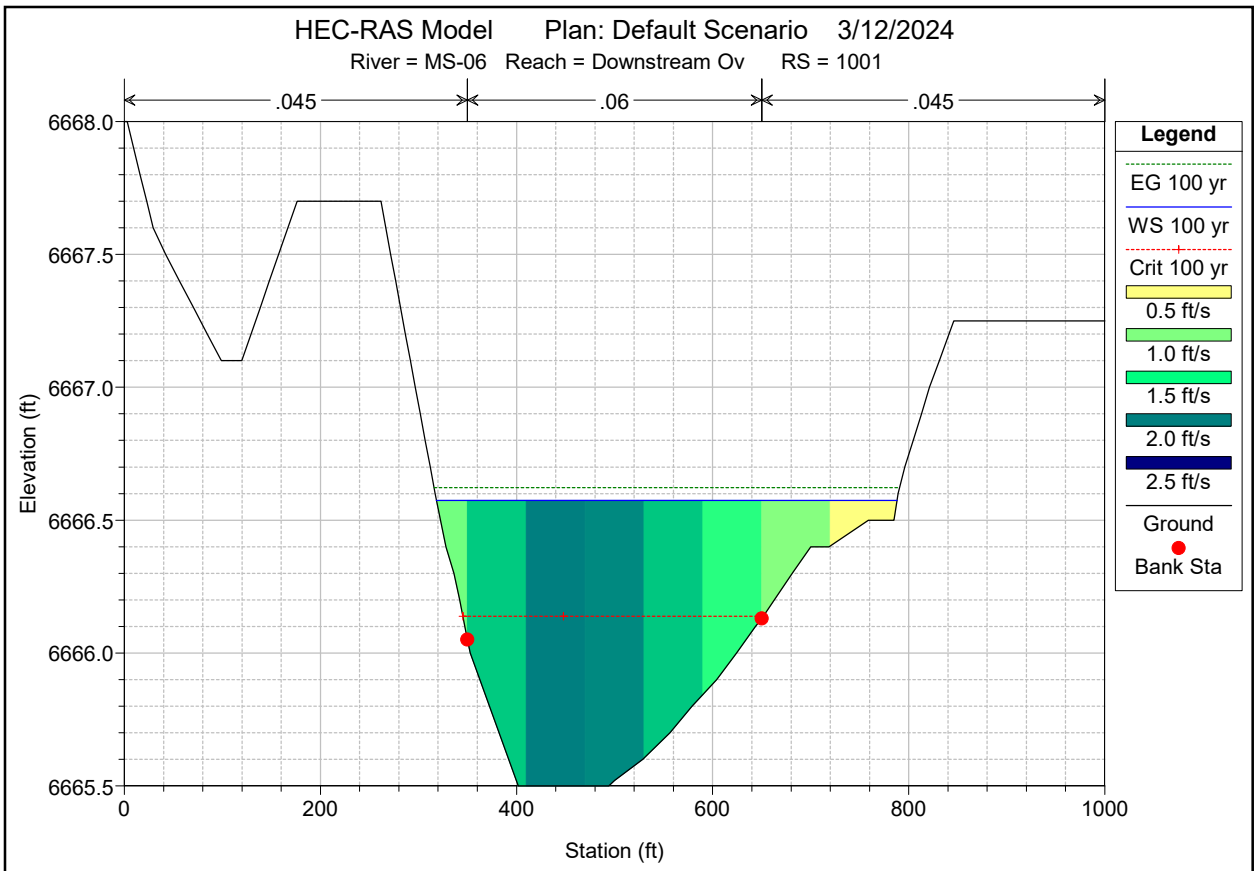

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Downstream Ov RS = 1007
.045
.06
6681.0
6680.5
6680.0
6679.5
6679.0
6678.5
Elevation (ft)
0
100
200
300
400
500
600
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Levee
Bank Sta

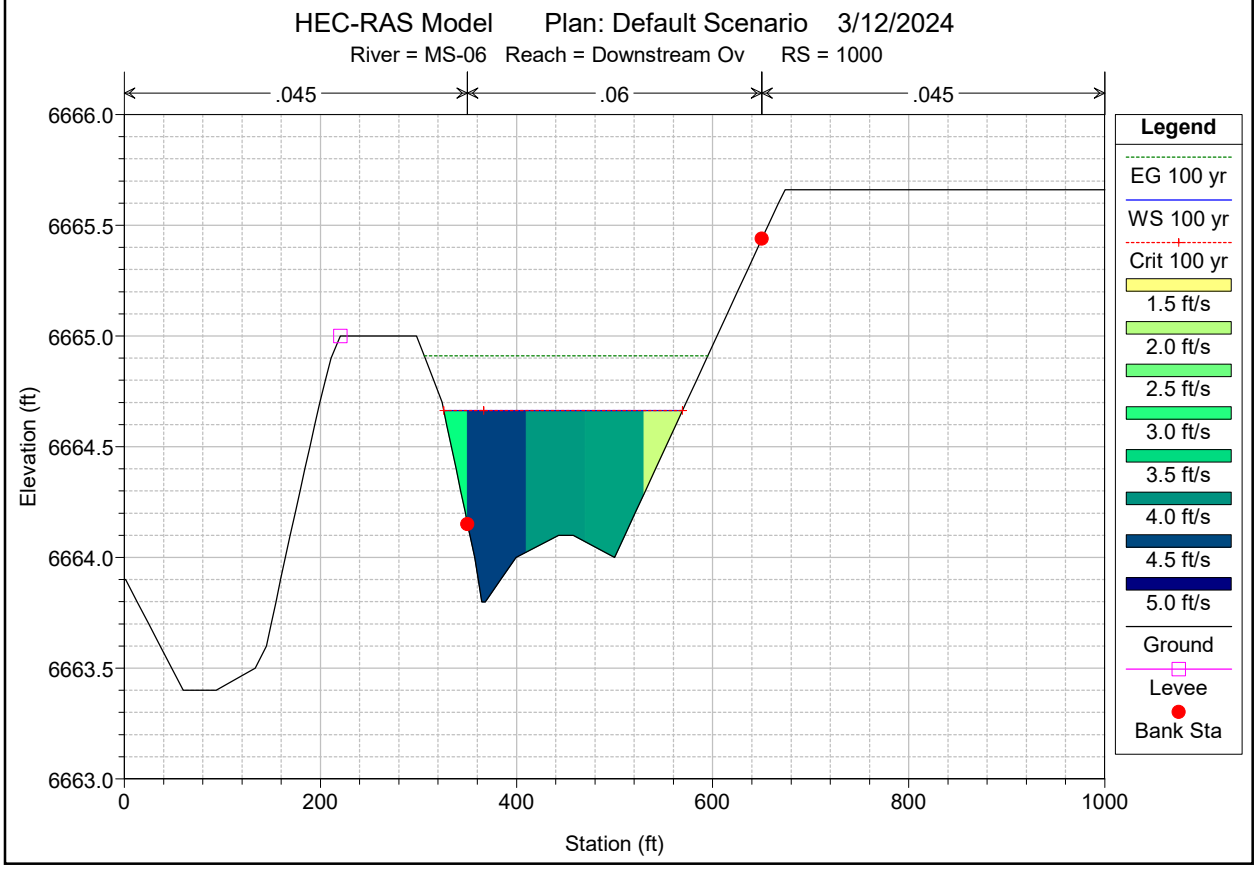

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Downstream Ov RS = 1006
.045
.06
.045
6680.0
6679.5
6679.0
6678.5
6678.0
6677.5
6677.0
Elevation (ft)
0
200
400
600
800
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta

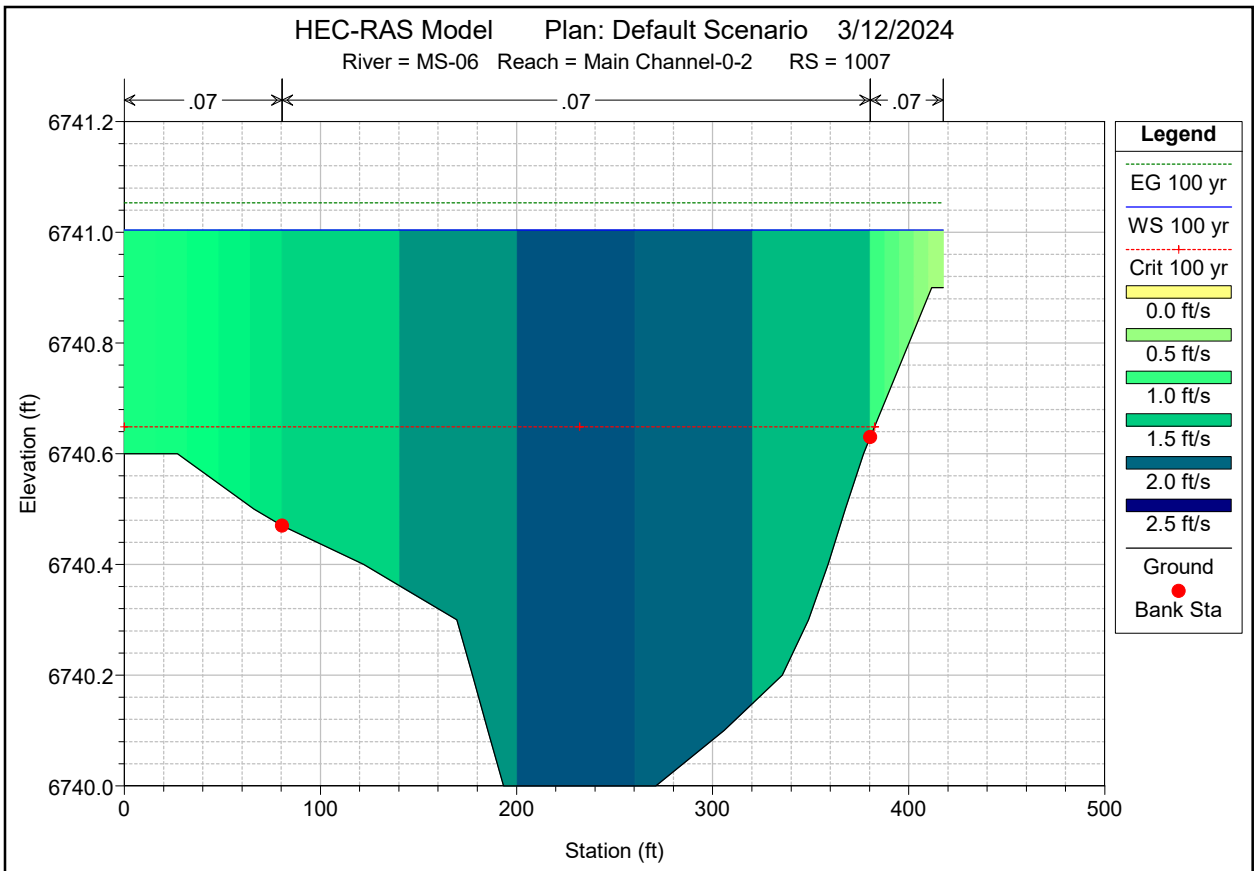

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Downstream Ov RS = 1005
.045
.06
.045
6678.5
6678.0
6677.5
6677.0
6676.5
6676.0
6675.5
6675.0
6674.5
Elevation (ft)
0
200
400
600
800
1000
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Levee
Bank Sta

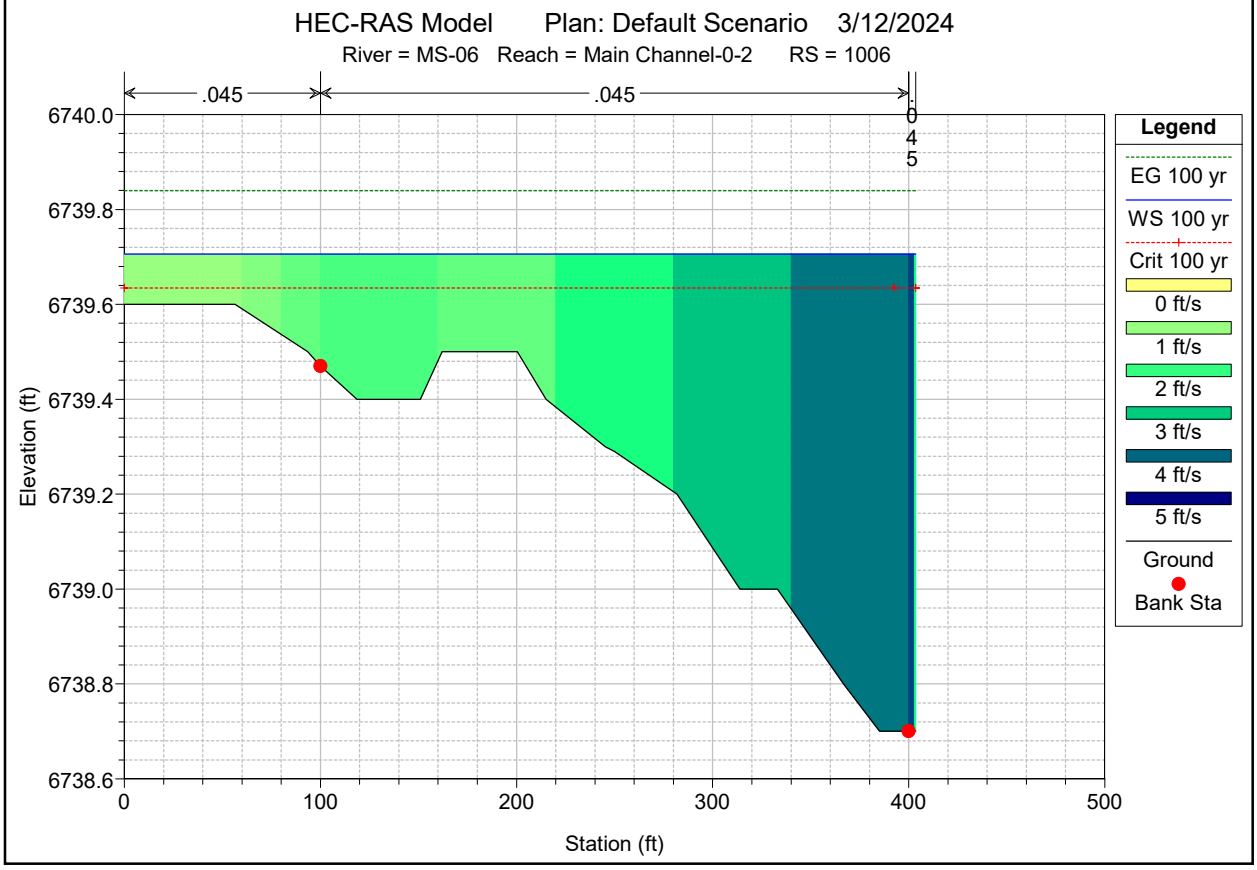

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Downstream Ov RS = 1003
.045
.06
.045
6676
6675
6674
6673
6672
6671
6670
6669
6668
Elevation (ft)
0
200
400
600
800
1000
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Levee
Bank Sta

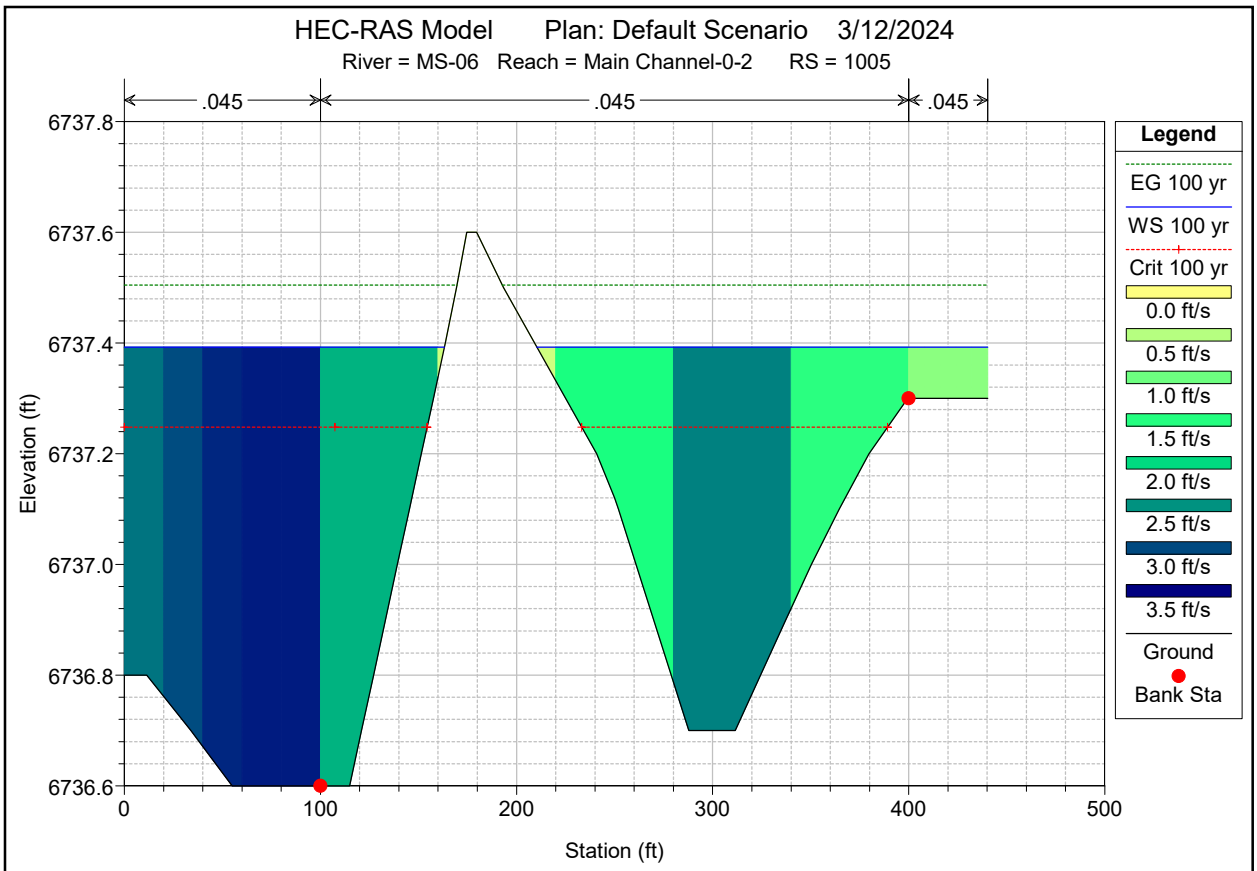

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Downstream Ov RS = 1002
.045
.06
.045
6672
6671
6670
6669
6668
6667
Elevation (ft)
0
200
400
600
800
1000
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Levee
Bank Sta

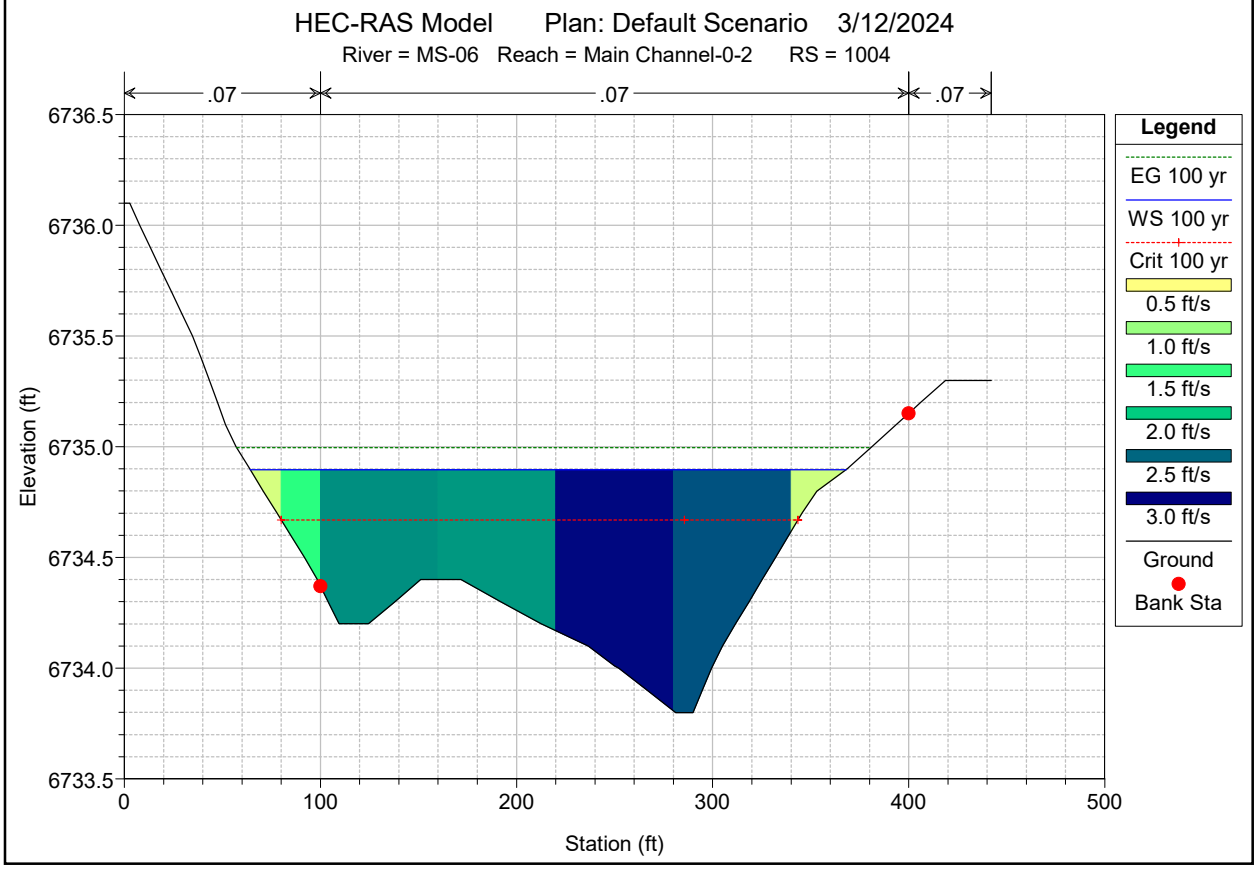

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Downstream Ov RS = 1001
.045
.06
.045
6668.0
6667.5
6667.0
6666.5
6666.0
6665.5
Elevation (ft)
0
200
400
600
800
1000
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta

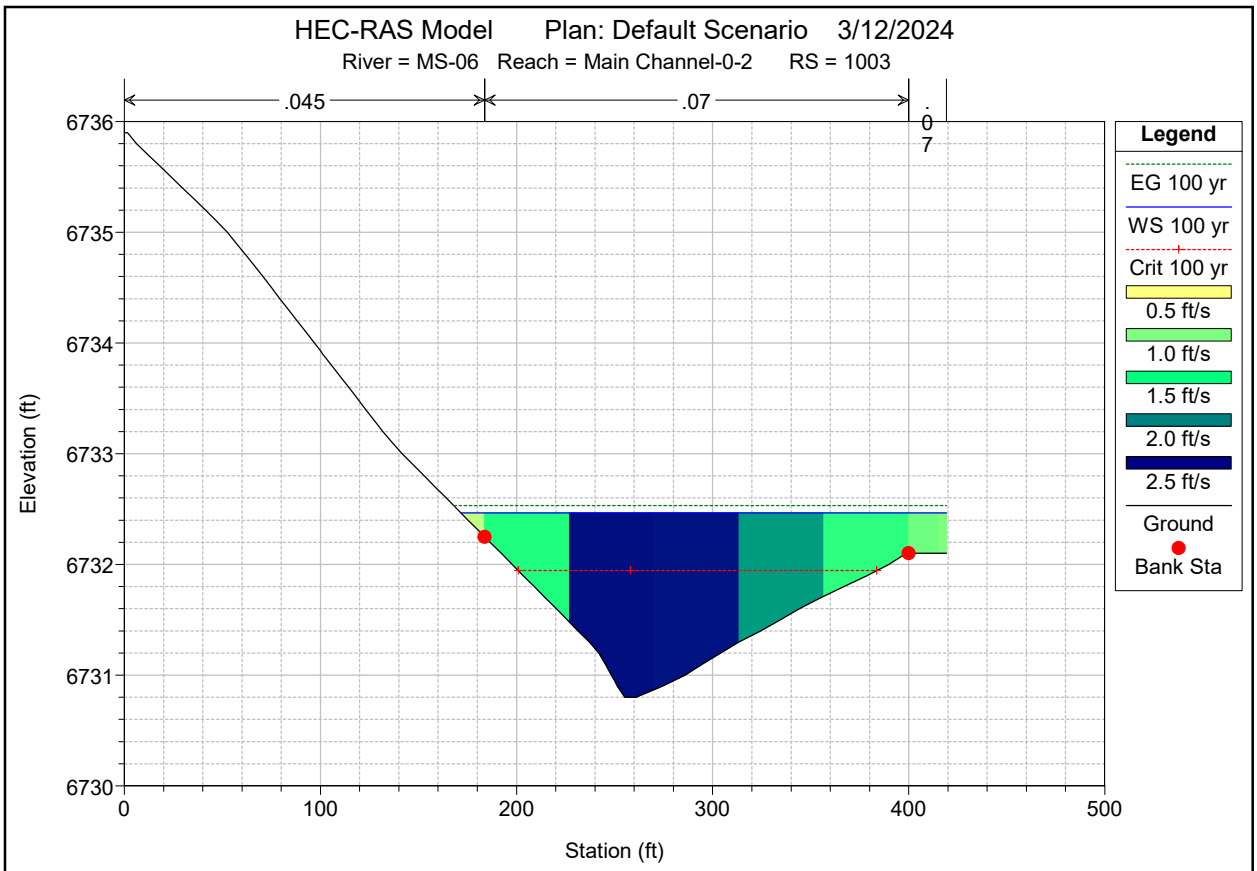

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Downstream Ov RS = 1000
.045
.06
.045
6666.0
6665.5
6665.0
6664.5
6664.0
6663.5
6663.0
Elevation (ft)
0
200
400
600
800
1000
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
5.0 ft/s
Ground
Levee
Bank Sta

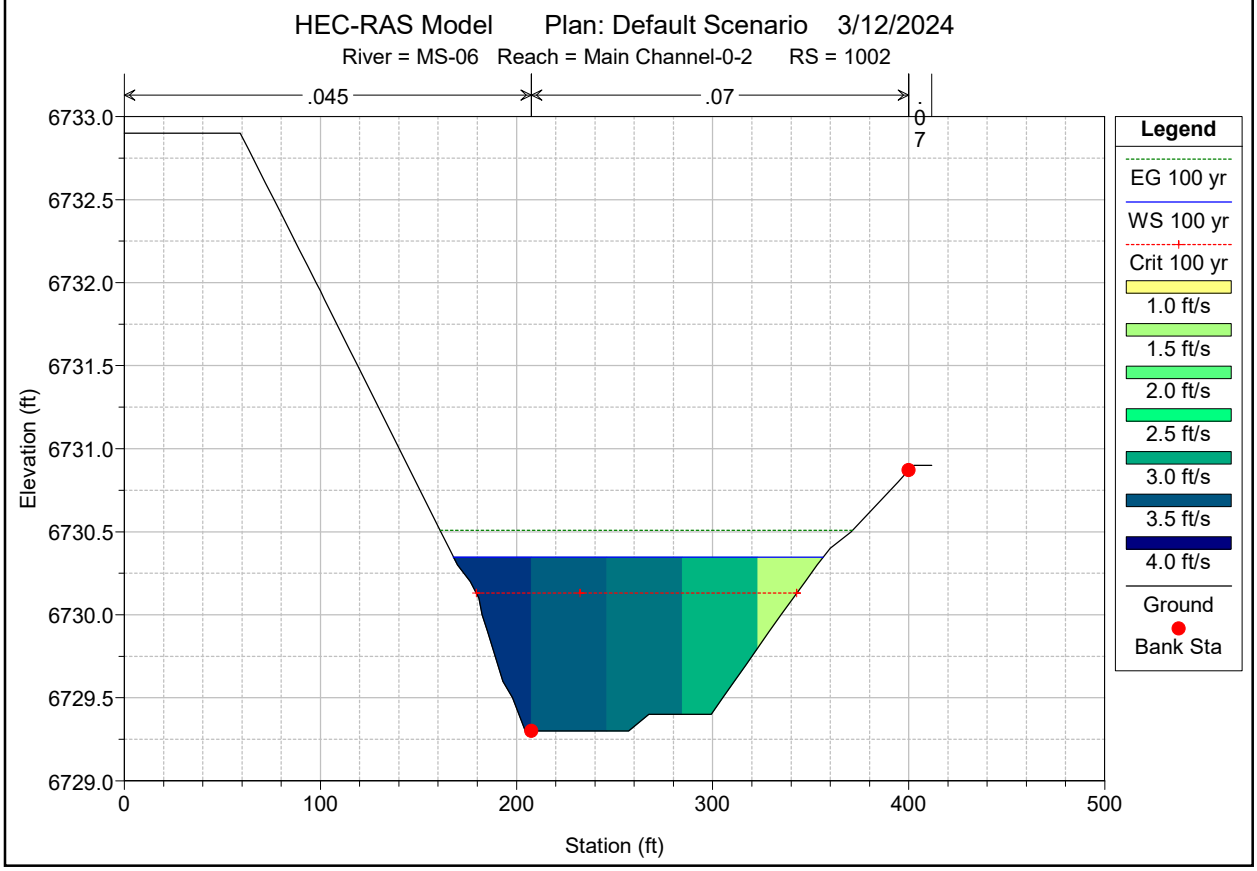

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0-2 RS = 1007
.07
.07
.07
6741.2
6741.0
6740.8
6740.6
6740.4
6740.2
6740.0
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta

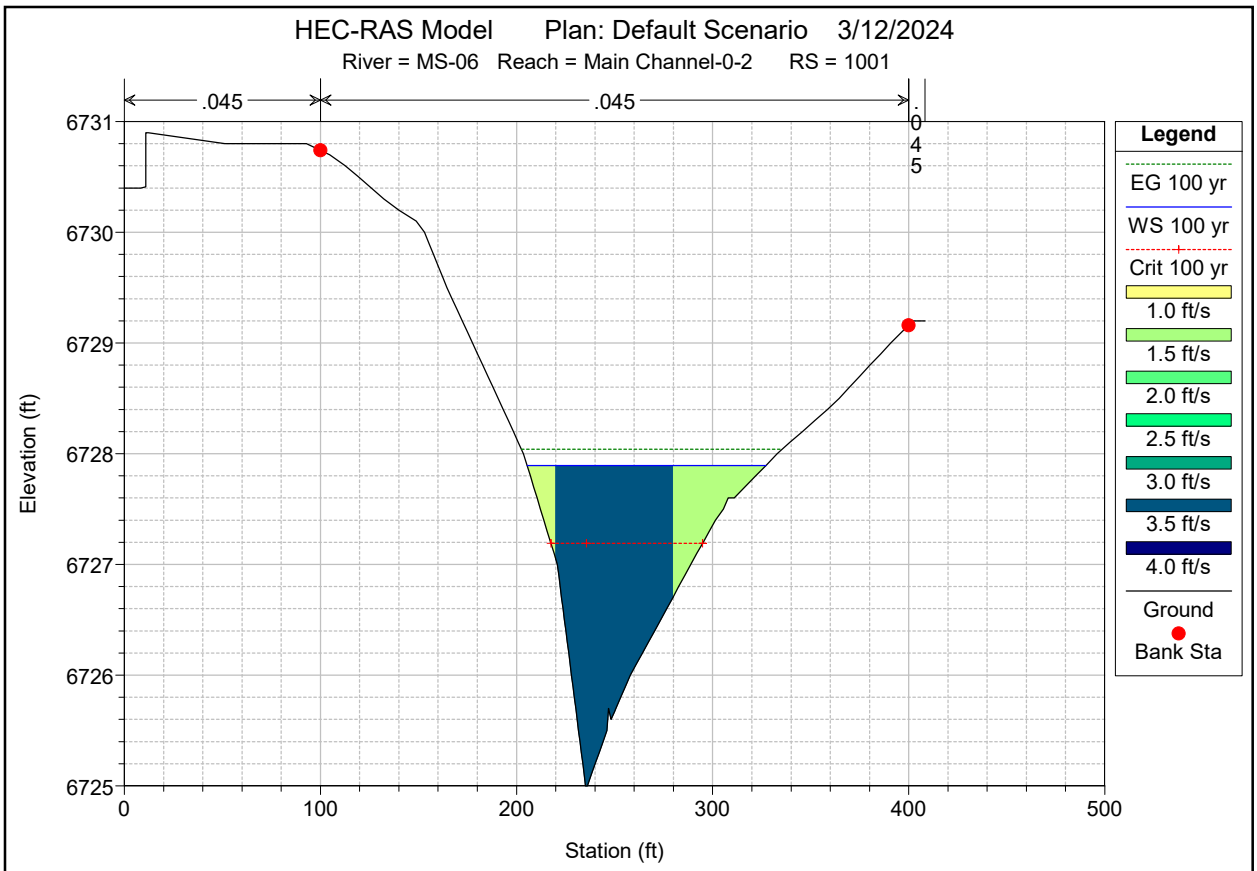

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0-2 RS = 1006
.045
.045
.045
6740.0
6739.8
6739.6
6739.4
6739.2
6739.0
6738.8
6738.6
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta

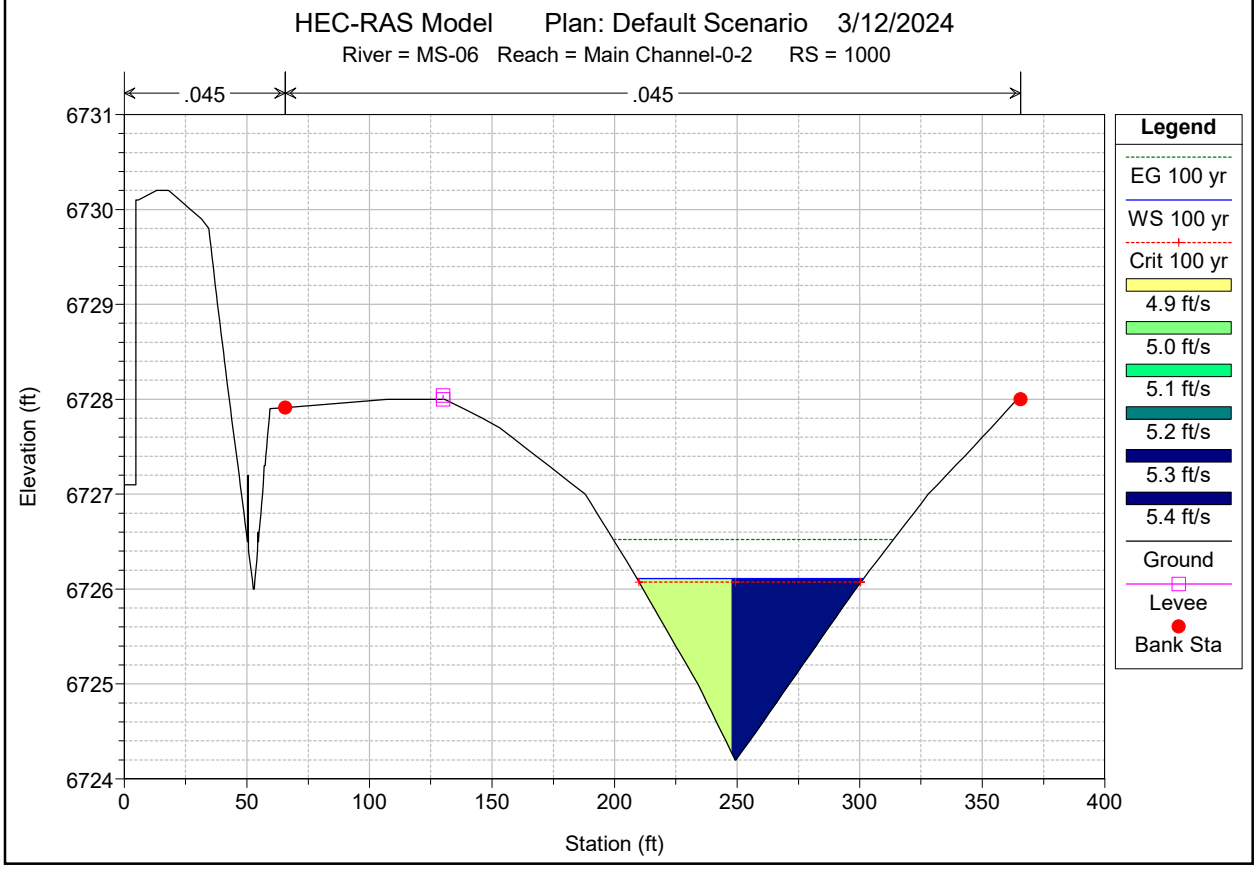

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0-2 RS = 1005
.045
.045
.045
6737.8
6737.6
6737.4
6737.2
6737.0
6736.8
6736.6
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

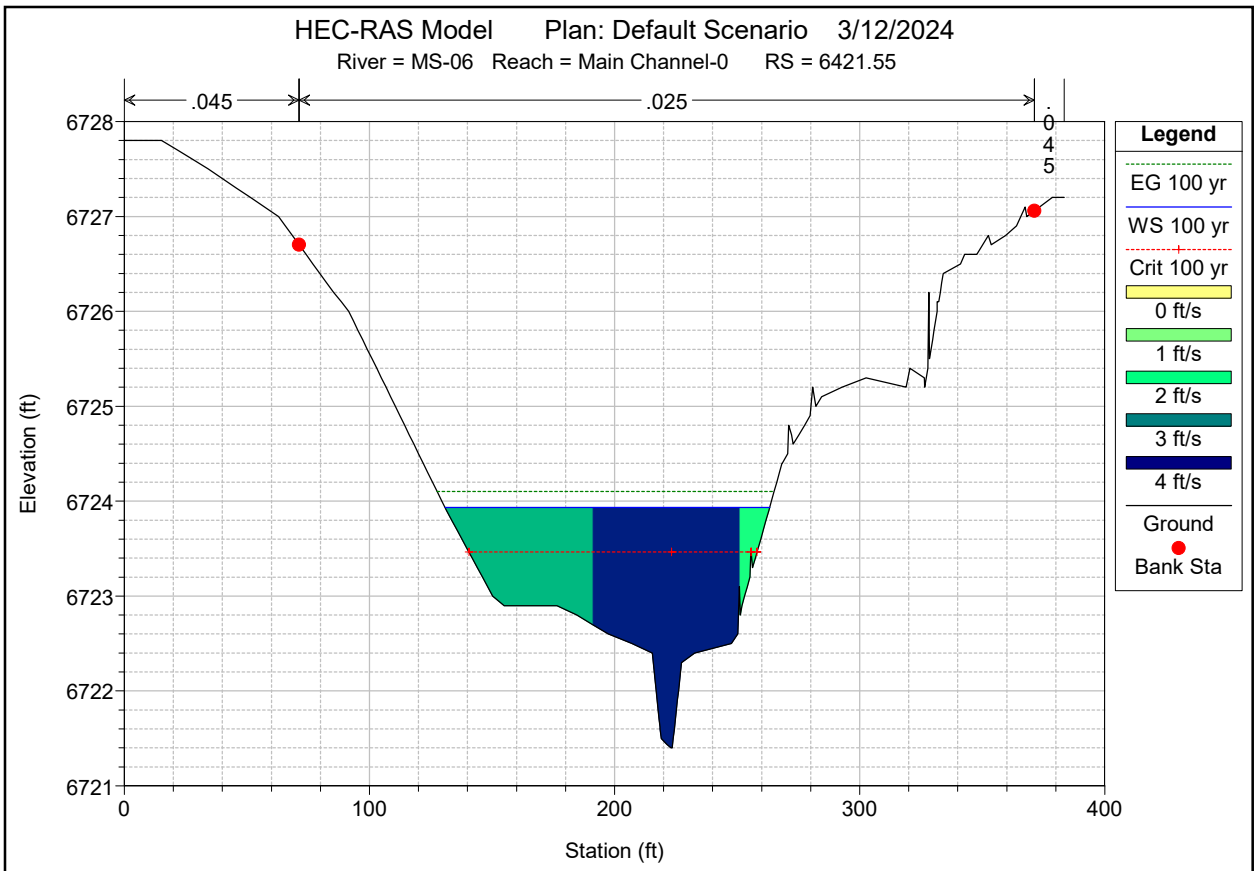

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0-2 RS = 1004
.07
.07
.07
6736.5
6736.0
6735.5
6735.0
6734.5
6734.0
6733.5
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta

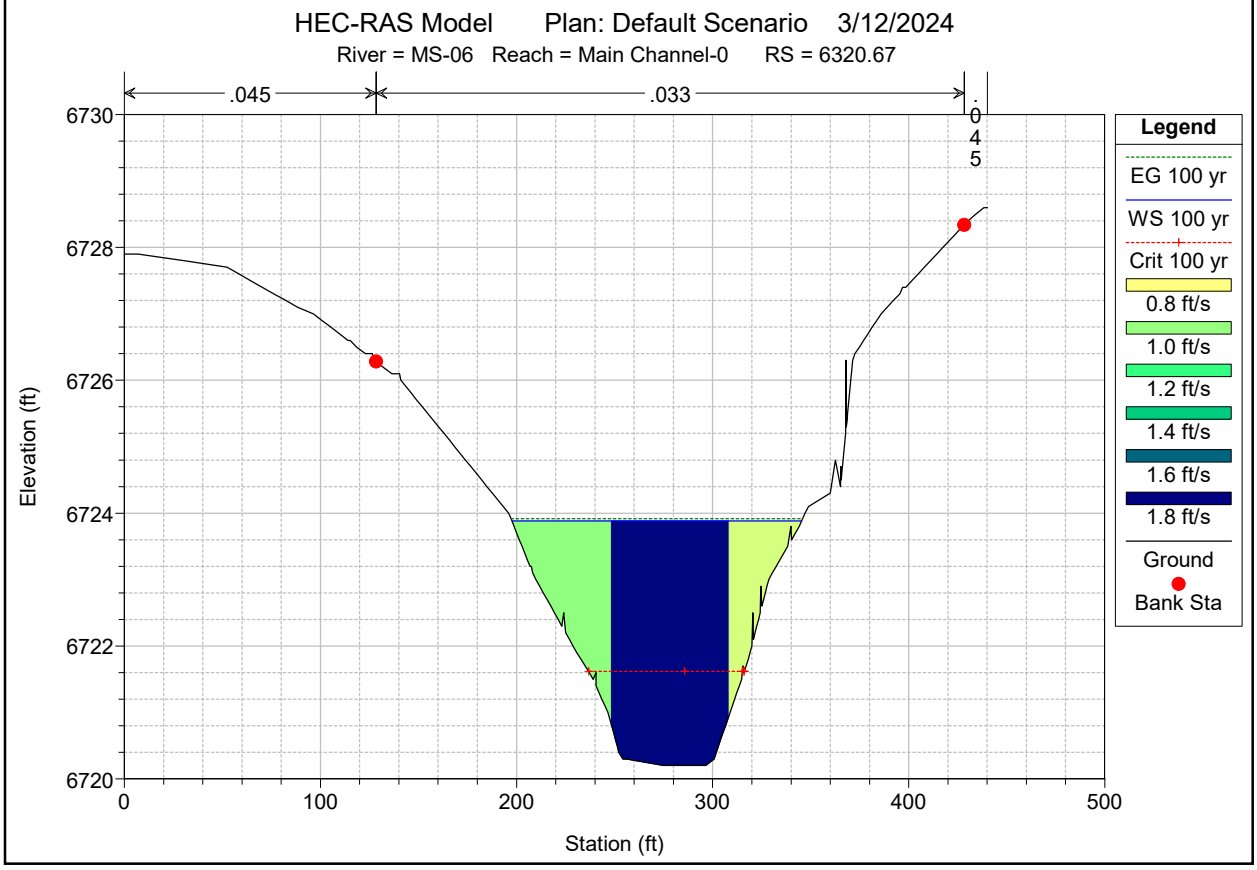

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0-2 RS = 1003
.045
.07
.07
Elevation (ft)
6736
6735
6734
6733
6732
6731
6730
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta

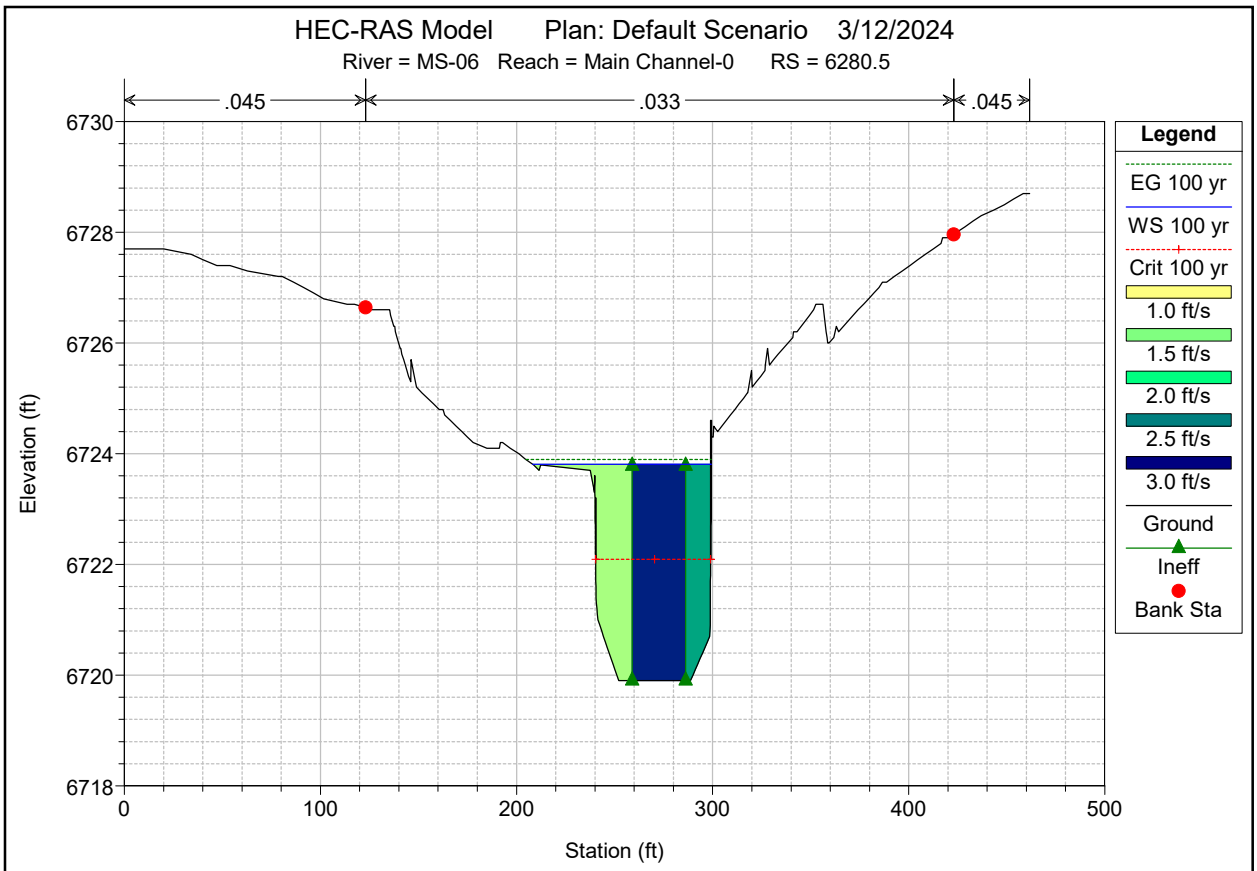

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0-2 RS = 1002
.045
.07
.07
Elevation (ft)
6733.0
6732.5
6732.0
6731.5
6731.0
6730.5
6730.0
6729.5
6729.0
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

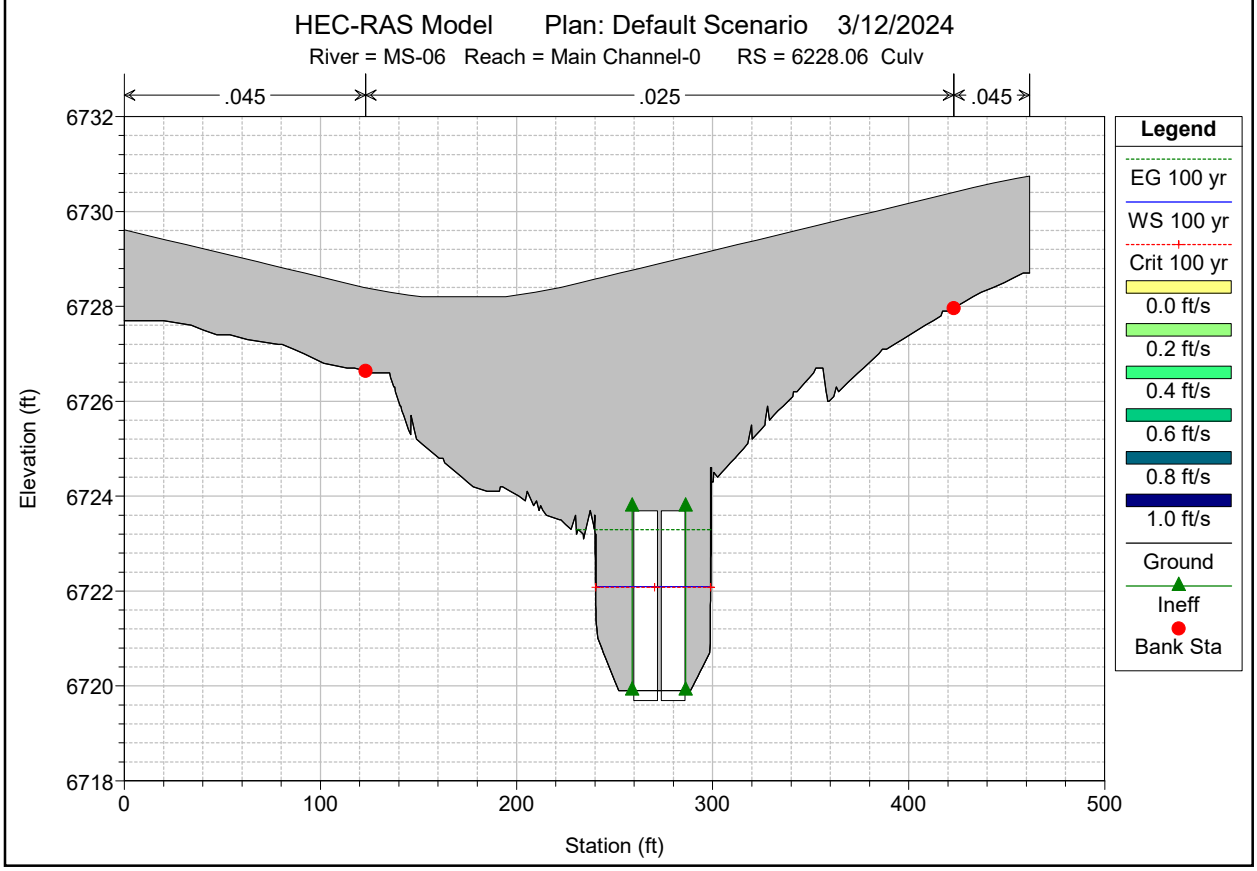

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0-2 RS = 1001
.045
.045
.045
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

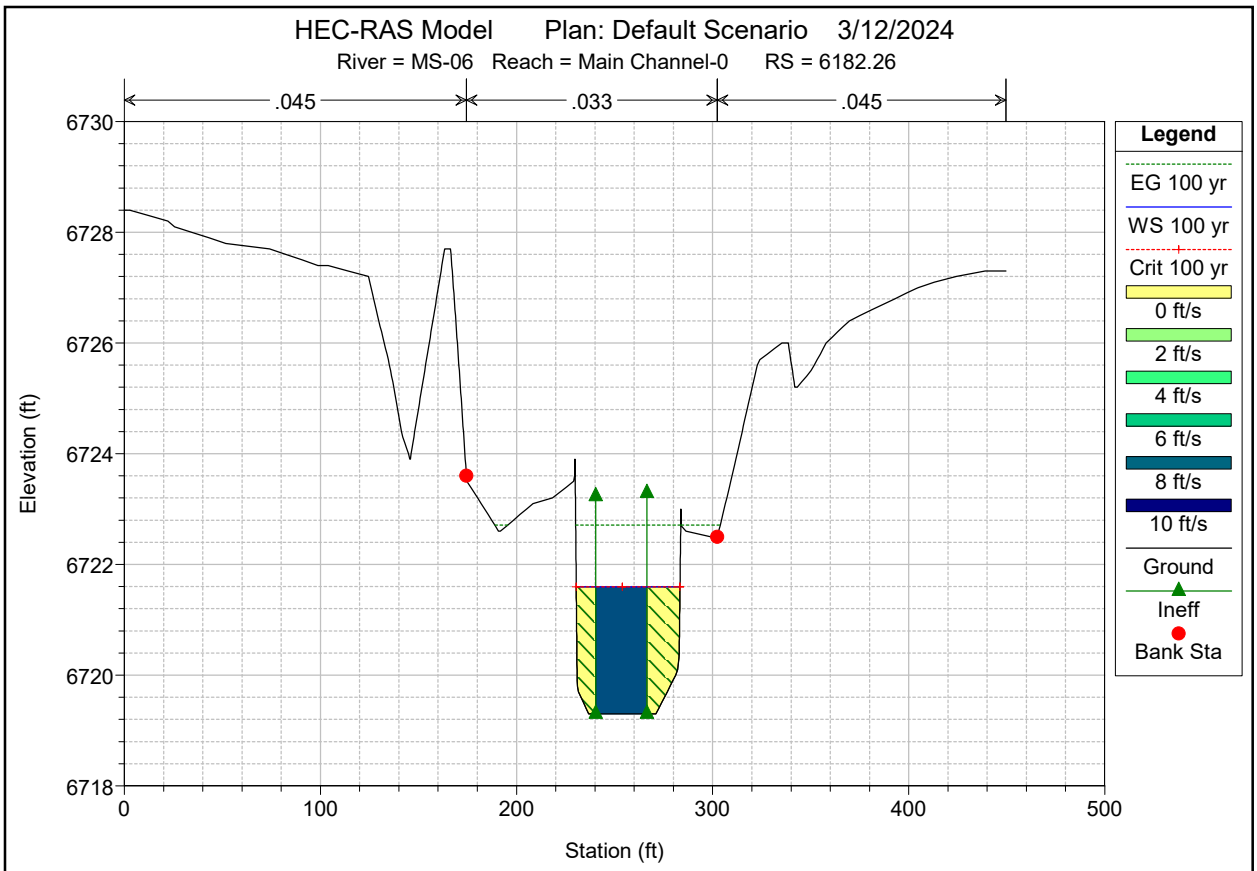

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0-2 RS = 1000
.045
.045
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
4.9 ft/s
5.0 ft/s
5.1 ft/s
5.2 ft/s
5.3 ft/s
5.4 ft/s
Ground
Levee
Bank Sta

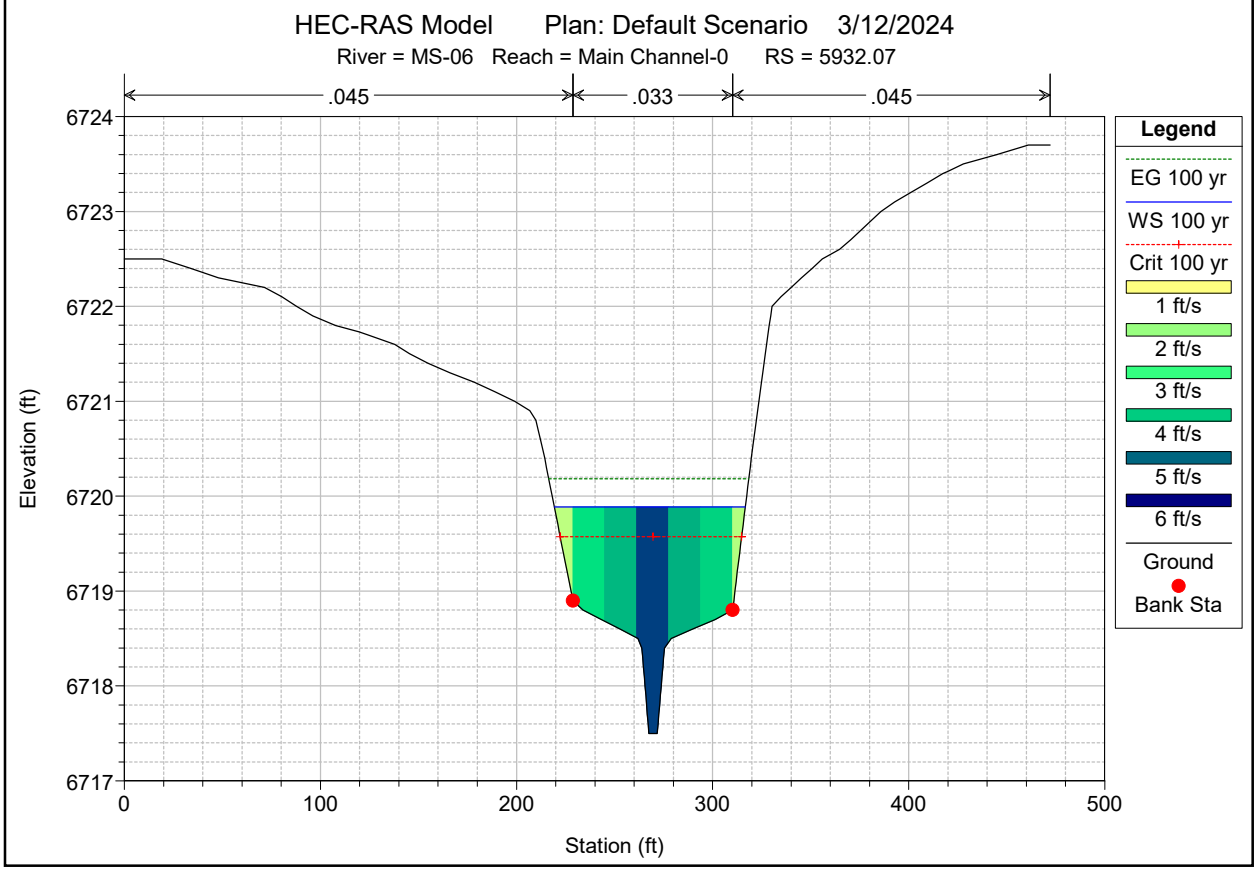

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 6421.55
.045
.025
.045
Elevation (ft)
6728
6727
6726
6725
6724
6723
6722
6721
0
100
200
300
400
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta

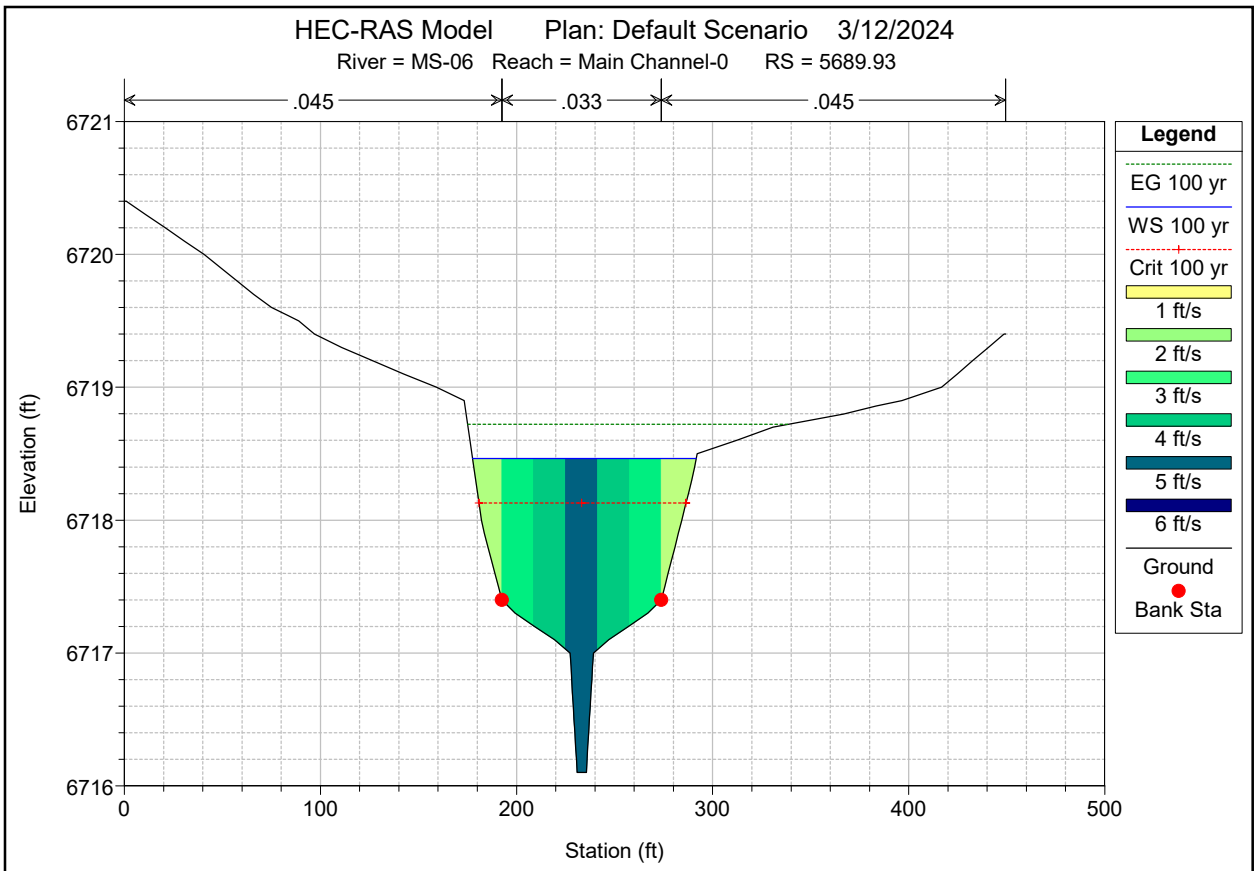

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 6320.67
.045
.033
.045
Elevation (ft)
6730
6728
6726
6724
6722
6720
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.8 ft/s
1.0 ft/s
1.2 ft/s
1.4 ft/s
1.6 ft/s
1.8 ft/s
Ground
Bank Sta

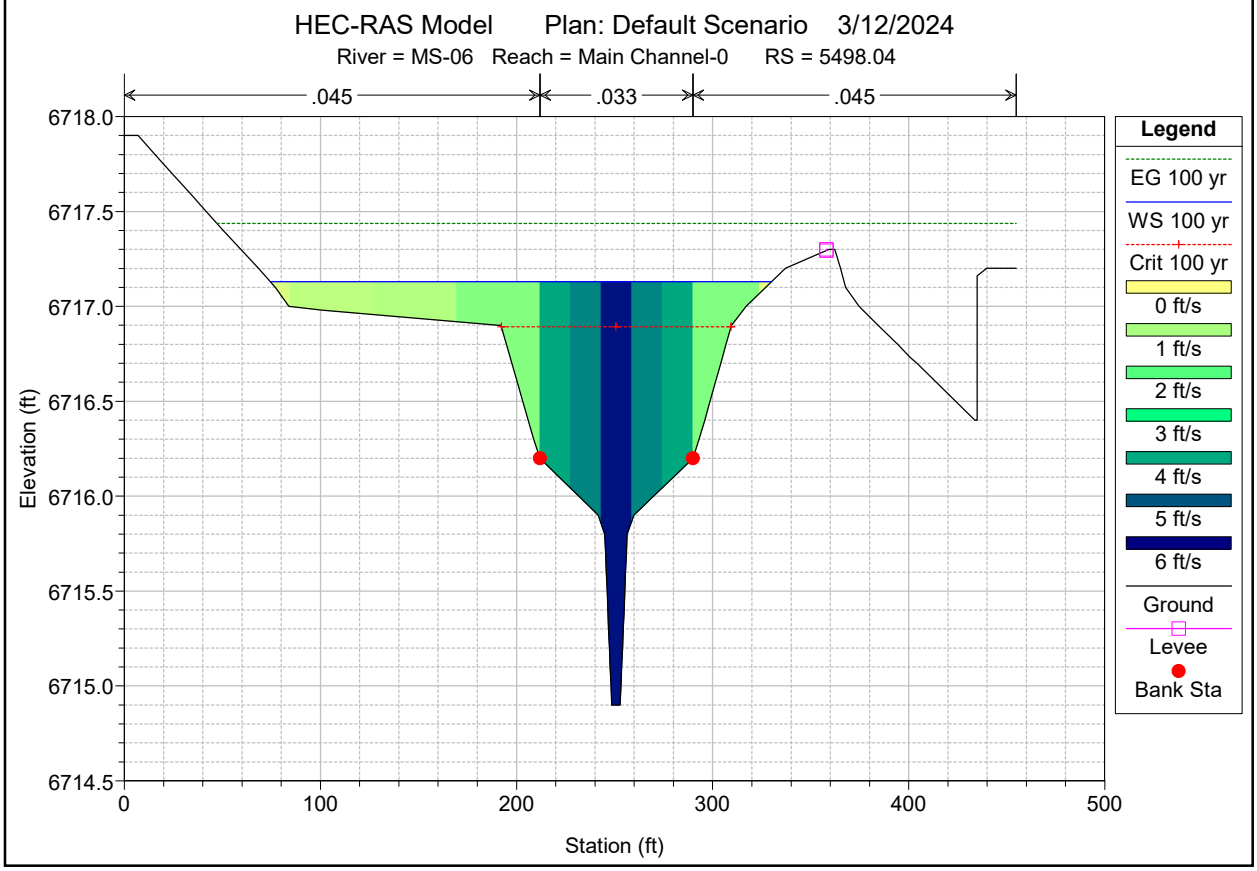

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 6280.5
.045
.033
.045
6730
6728
6726
6724
6722
6720
6718
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Ineff
Bank Sta

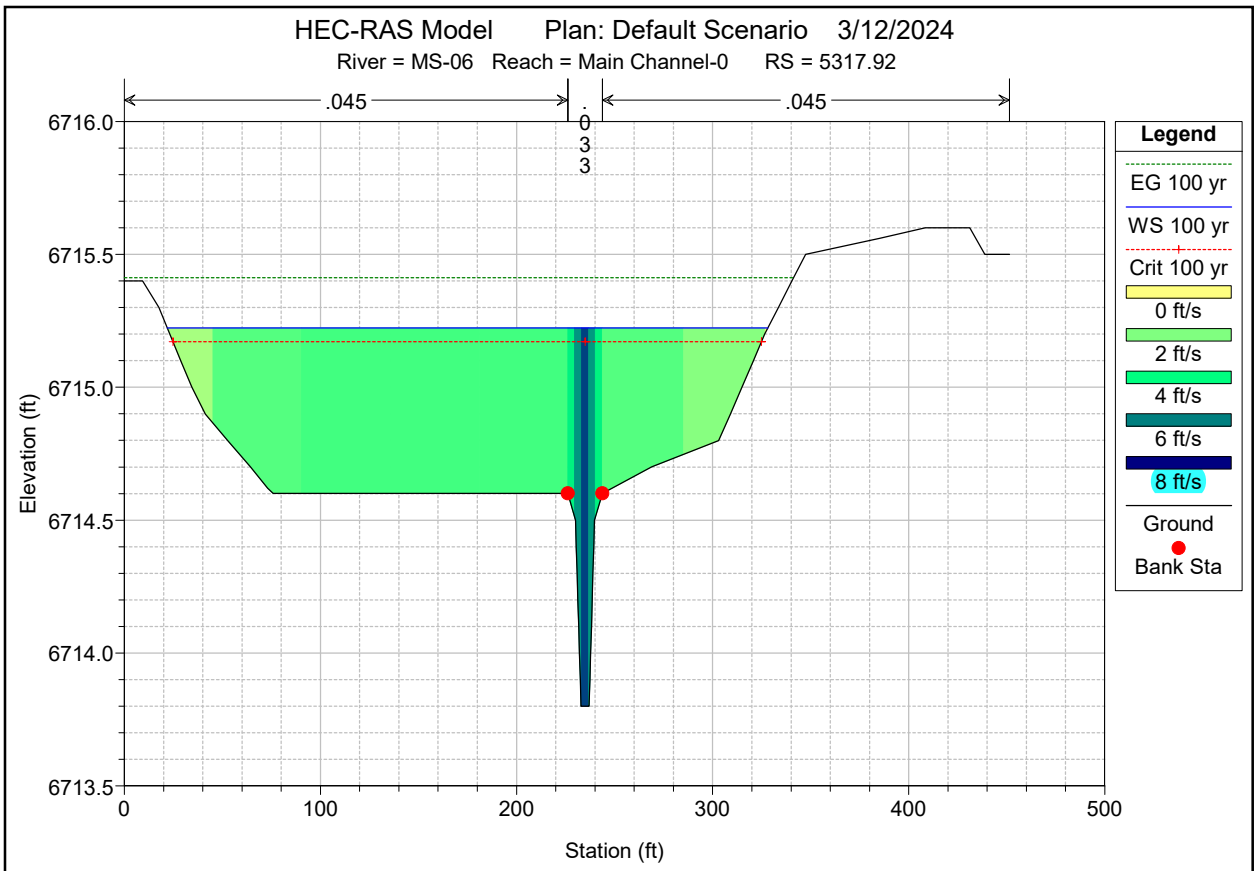

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 6228.06 Culv
.045
.025
.045
6732
6730
6728
6726
6724
6722
6720
6718
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta

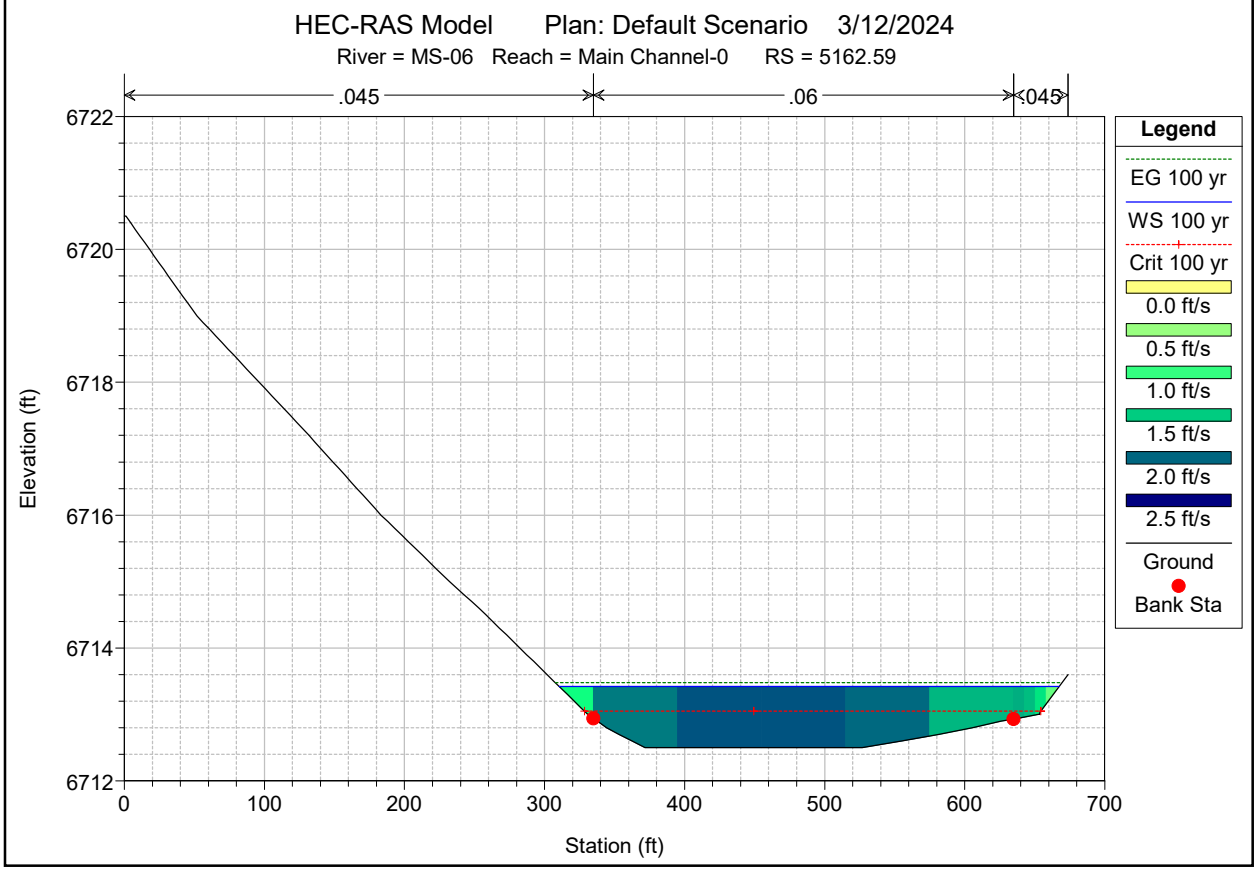

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 6182.26
.045
.033
.045
Elevation (ft)
6730
6728
6726
6724
6722
6720
6718
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta

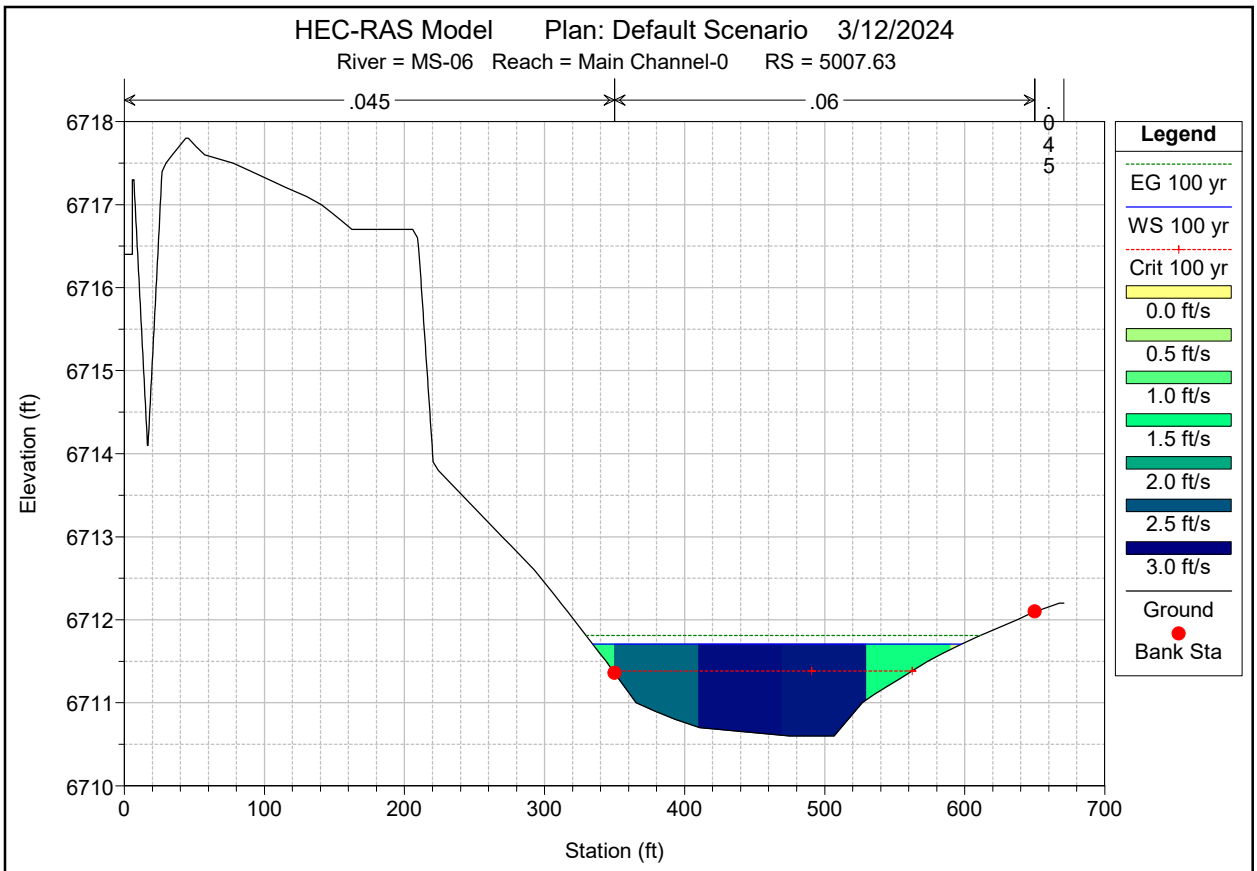

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 5932.07
.045
.033
.045
Elevation (ft)
6724
6723
6722
6721
6720
6719
6718
6717
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta

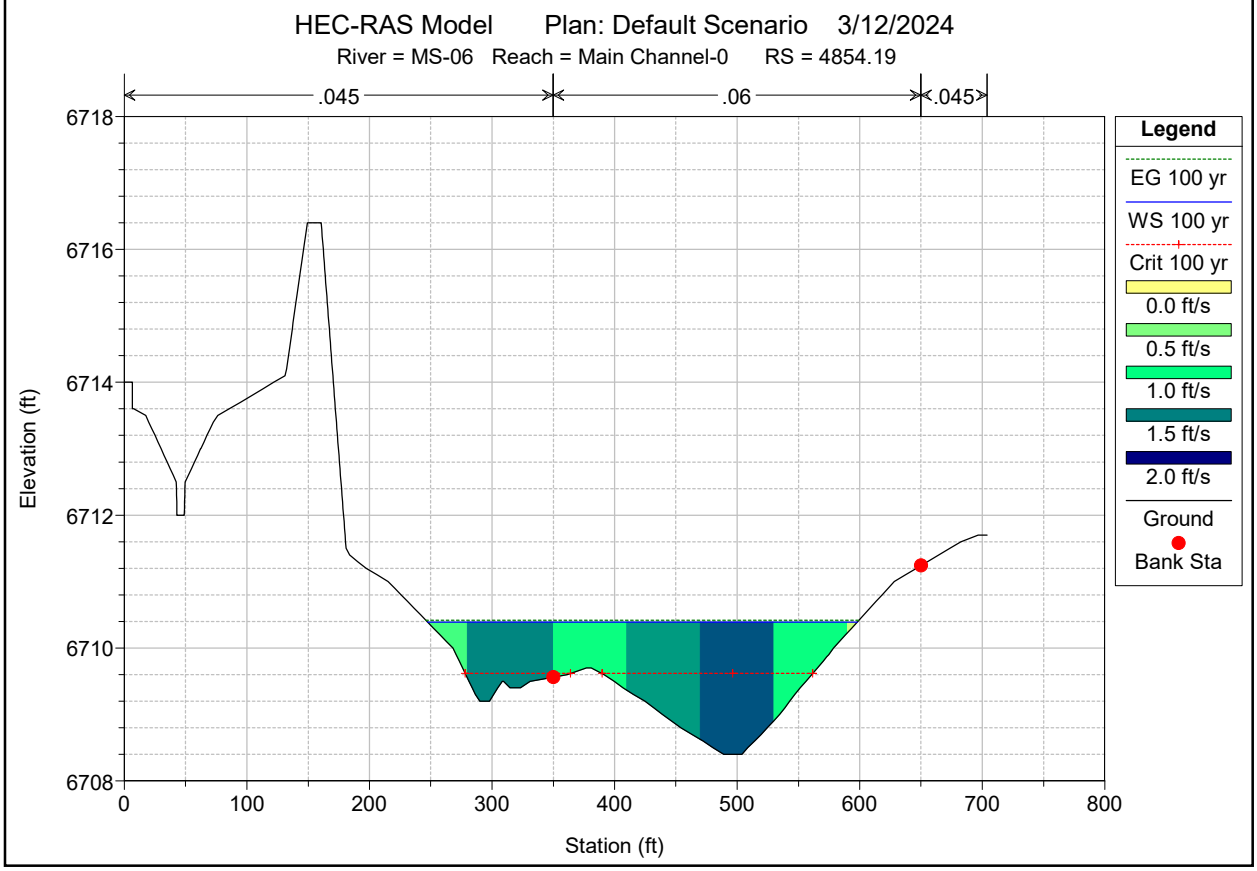

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 5689.93
.045
.033
.045
6721
6720
6719
6718
6717
6716
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta

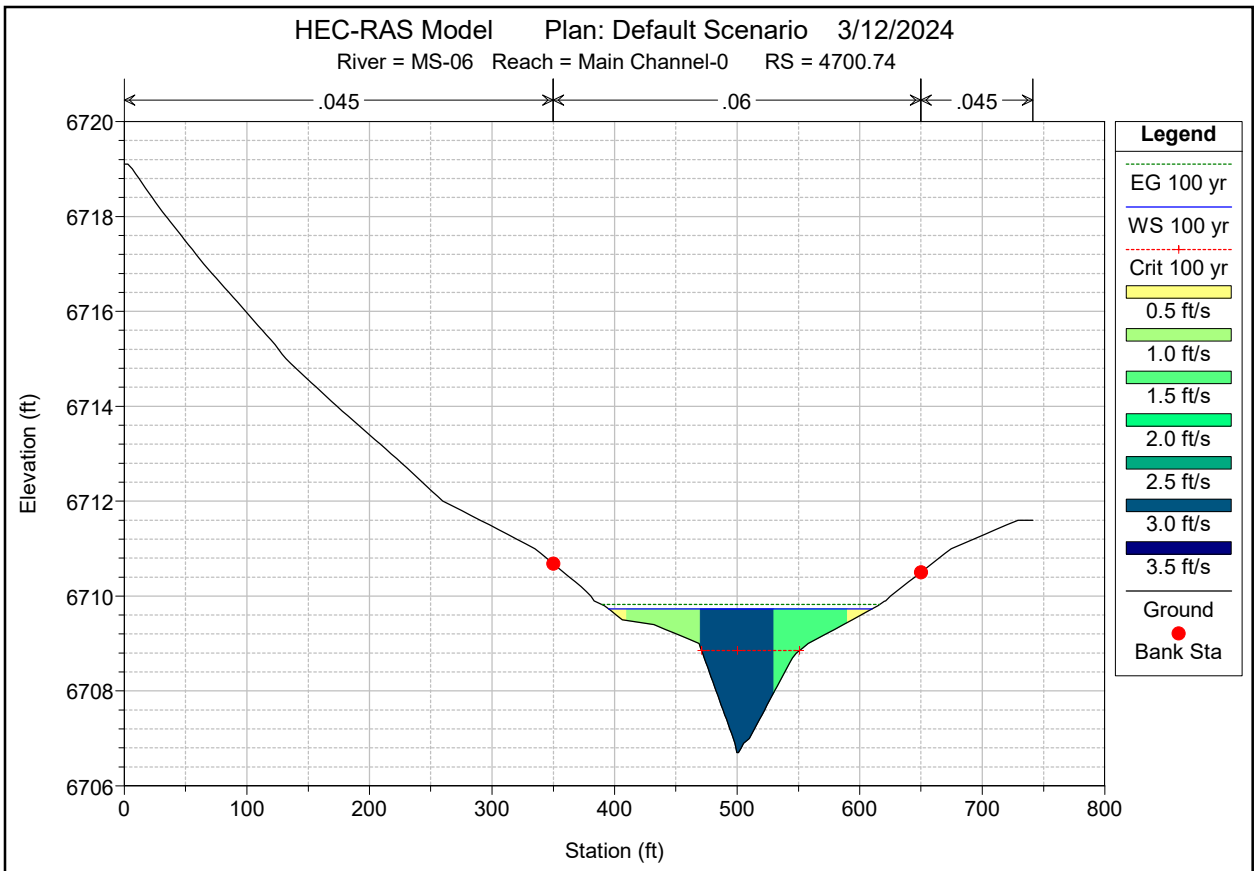

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 5498.04
.045
.033
.045
6718.0
6717.5
6717.0
6716.5
6716.0
6715.5
6715.0
6714.5
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Levee
Bank Sta

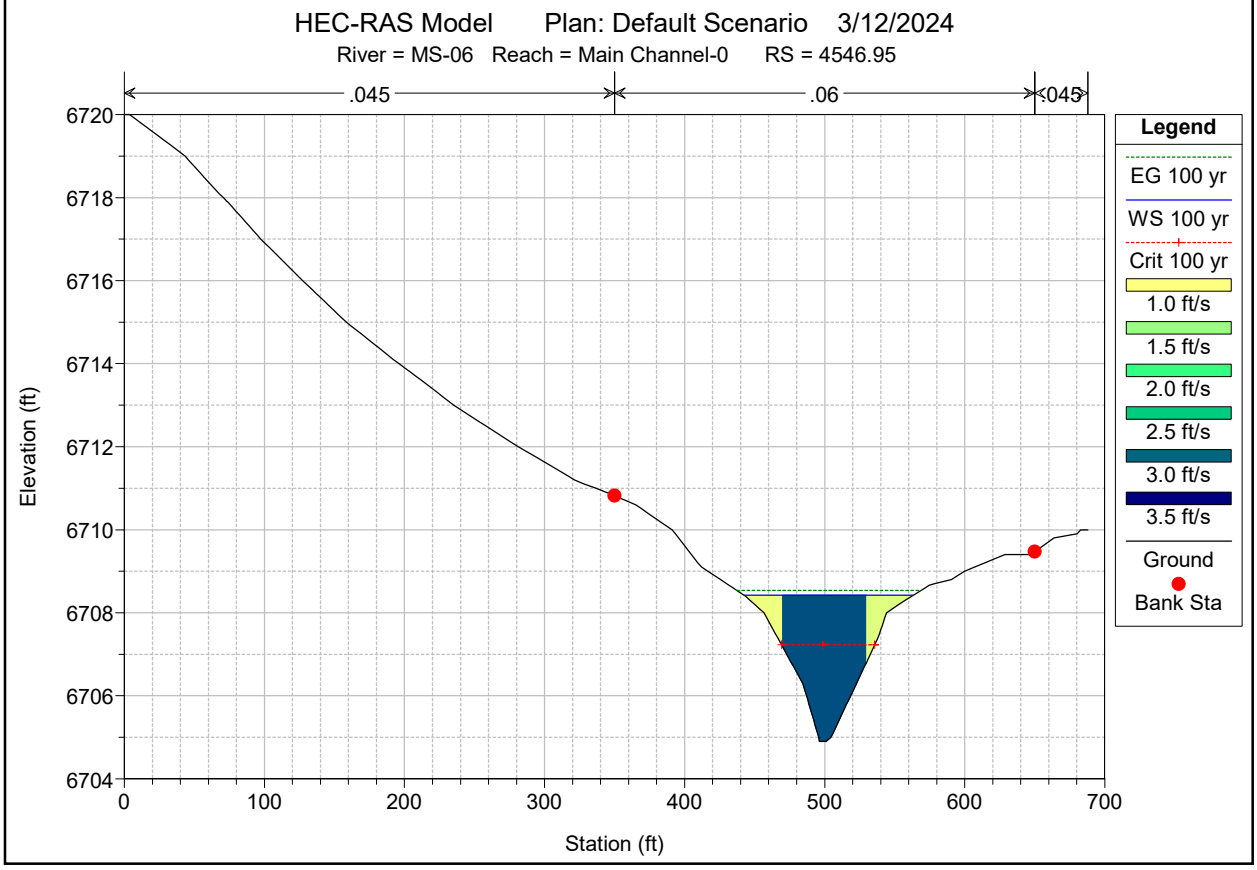

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 5317.92
.045
.033
.045
6716.0
6715.5
6715.0
6714.5
6714.0
6713.5
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta

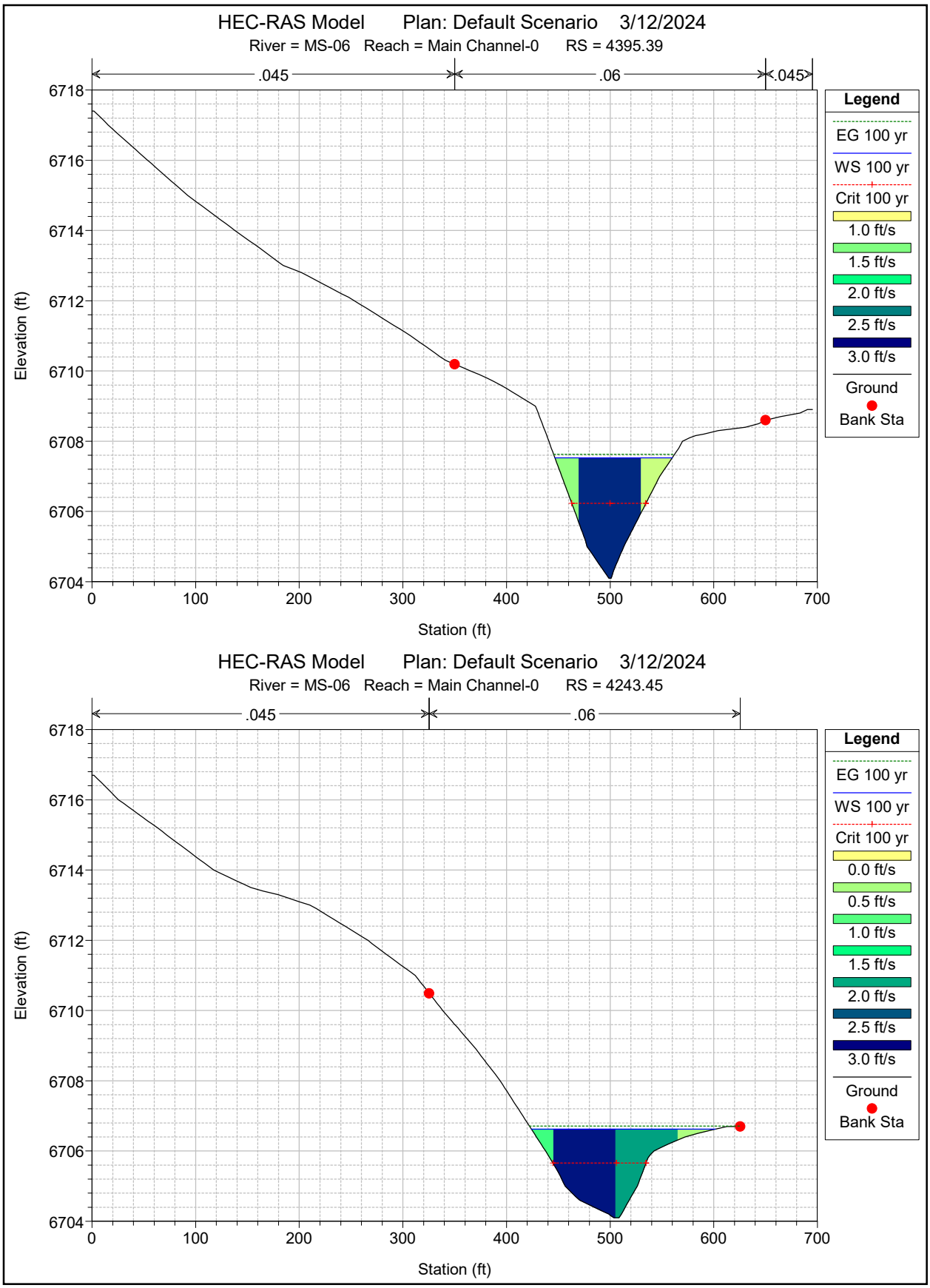

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 5162.59
.045
.06
.045
6722
6720
6718
6716
6714
6712
Elevation (ft)
0
100
200
300
400
500
600
700
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta

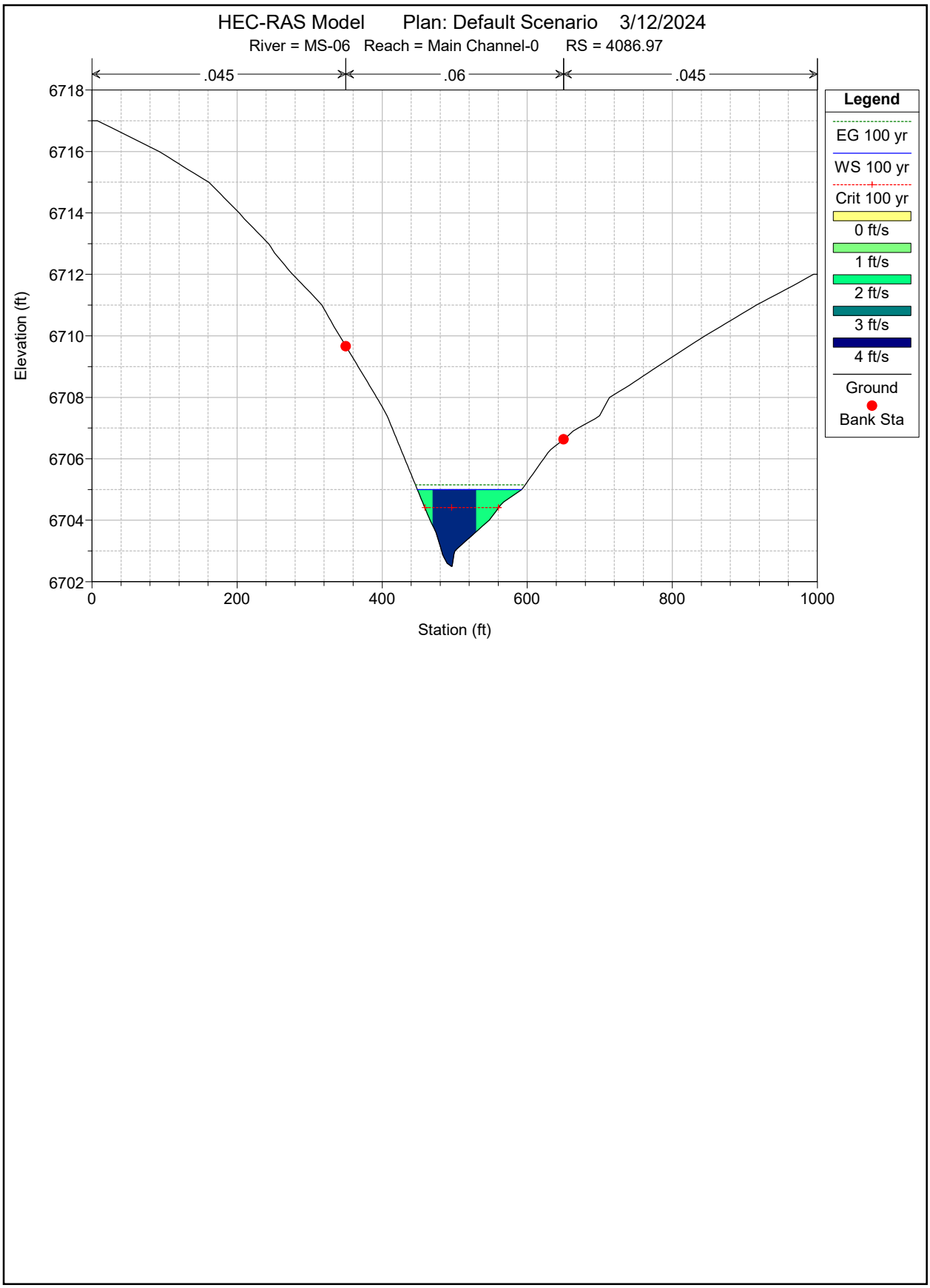

HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 5007.63
.045
.06
.045
Elevation (ft)
6718
6717
6716
6715
6714
6713
6712
6711
6710
0
100
200
300
400
500
600
700
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 4854.19
.045
.06
.045
Elevation (ft)
6718
6716
6714
6712
6710
6708
0
100
200
300
400
500
600
700
800
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 4700.74
.045
.06
.045
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 4546.95
.045
.06
.045
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 4395.39
.045
.06
.045
Elevation (ft)
6718
6716
6714
6712
6710
6708
6706
6704
0
100
200
300
400
500
600
700
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 4243.45
.045
.06
Elevation (ft)
6718
6716
6714
6712
6710
6708
6706
6704
0
100
200
300
400
500
600
700
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta


HEC-RAS Model Plan: Default Scenario 3/12/2024
River = MS-06 Reach = Main Channel-0 RS = 4086.97
.045
.06
.045
6718
6716
6714
6712
6710
6708
6706
6704
6702
Elevation (ft)
0
200
400
600
800
1000
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta

Culvert Report

EX DP25 DESIGN POINT 25 (Q5=0.9 CFS Q100=5.7 CFS)

Invert Elev Dn (ft)	=	6750.98
Pipe Length (ft)	=	68.00
Slope (%)	=	1.40
Invert Elev Up (ft)	=	6751.93
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

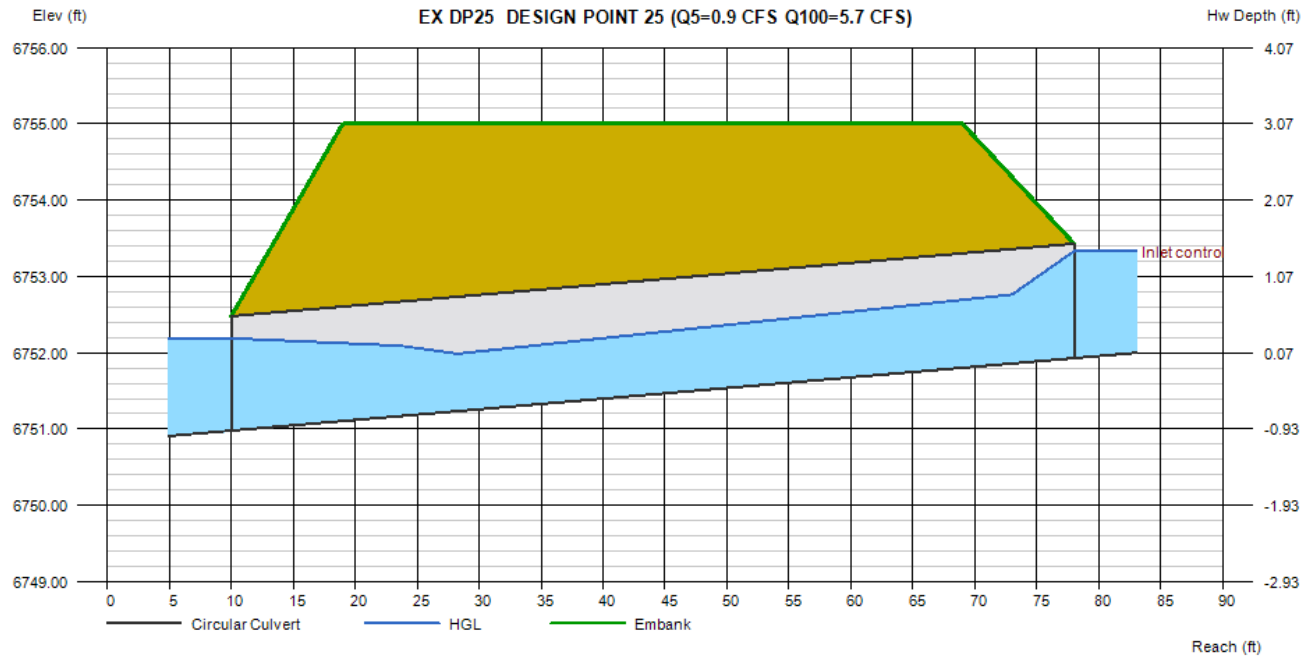
Top Elevation (ft)	=	6755.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	0.90
Qmax (cfs)	=	5.71
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	5.70
Qpipe (cfs)	=	5.70
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.73
Veloc Up (ft/s)	=	5.01
HGL Dn (ft)	=	6752.19
HGL Up (ft)	=	6752.85
Hw Elev (ft)	=	6753.33
Hw/D (ft)	=	0.94
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Jun 30 2023

EX DPF3 DESIGN POINT F3 (Q5=2.6 CFS Q100=10.6 CFS)

Invert Elev Dn (ft)	=	6724.65
Pipe Length (ft)	=	68.00
Slope (%)	=	1.00
Invert Elev Up (ft)	=	6725.33
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

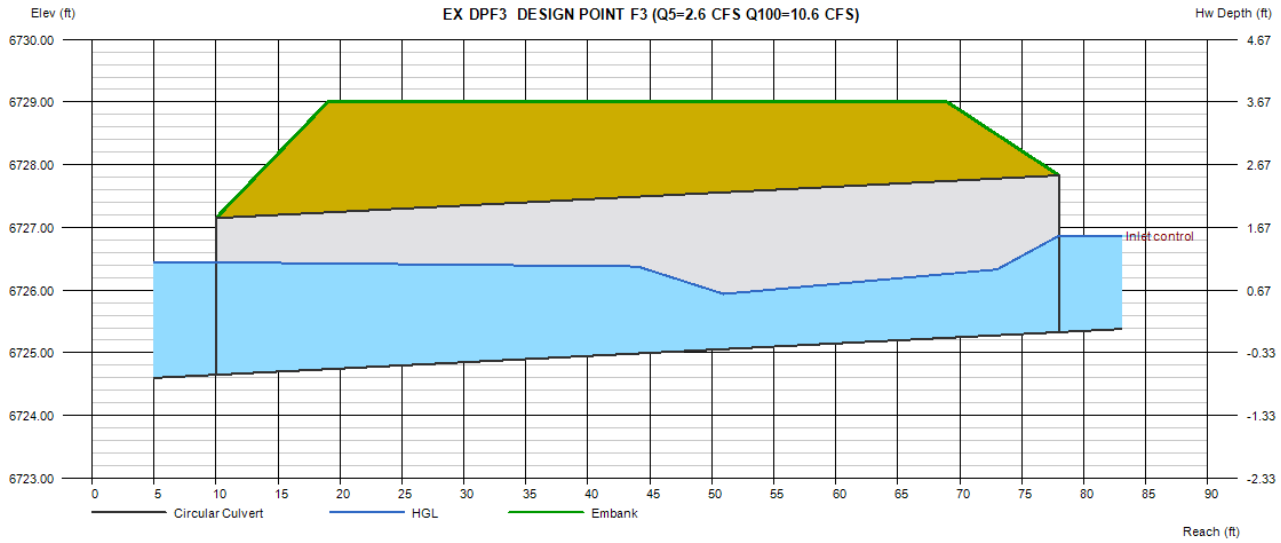
Top Elevation (ft)	=	6729.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	2.60
Qmax (cfs)	=	10.60
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	10.60
Qpipe (cfs)	=	10.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	2.81
Veloc Up (ft/s)	=	5.17
HGL Dn (ft)	=	6726.44
HGL Up (ft)	=	6726.42
Hw Elev (ft)	=	6726.87
Hw/D (ft)	=	0.61
Flow Regime	=	Inlet Control



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 3 2023

Pond C Outfall Channel (Q10=1.5 cfs)

Trapezoidal

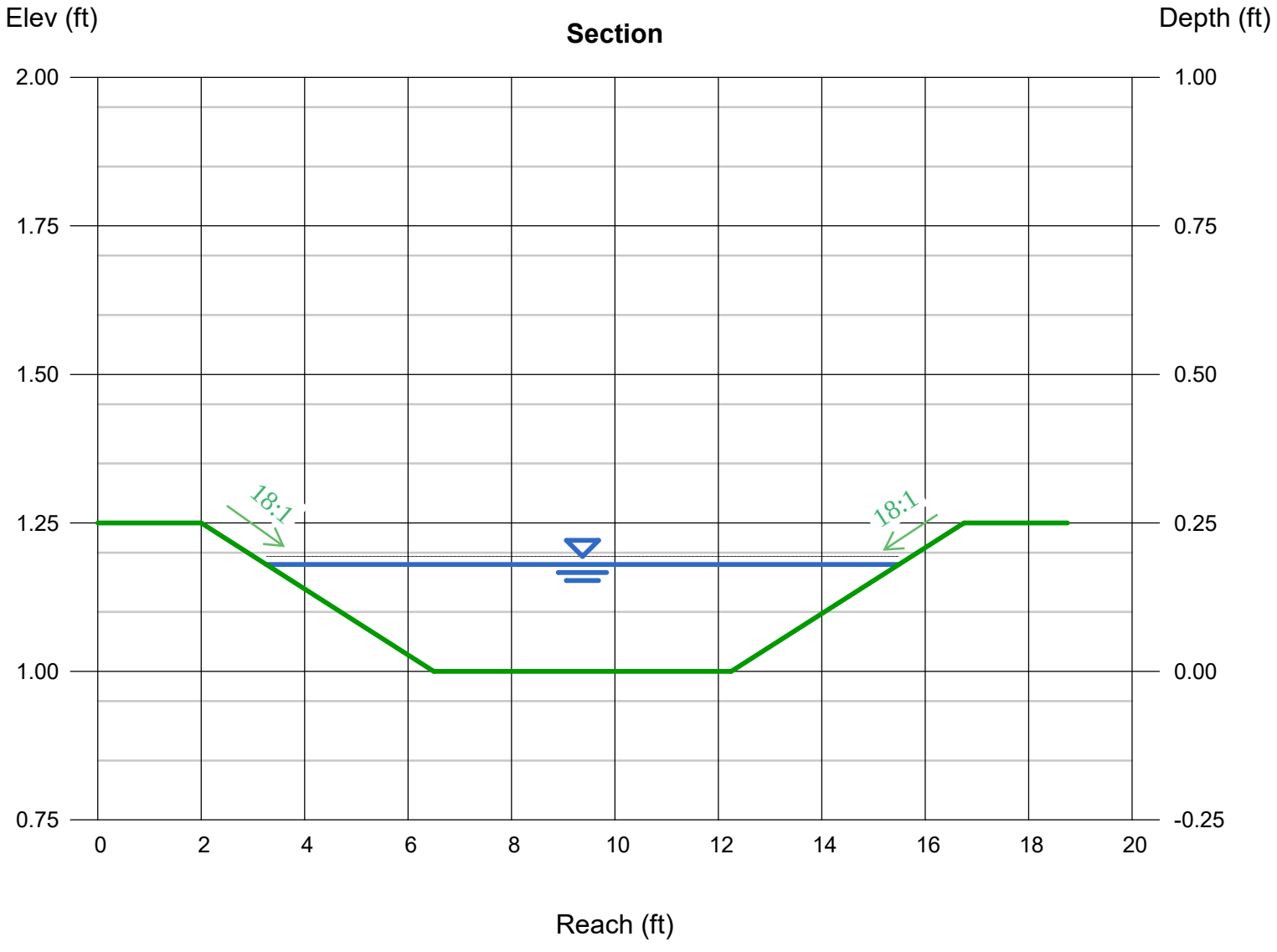
Bottom Width (ft)	= 5.75
Side Slopes (z:1)	= 18.00, 18.00
Total Depth (ft)	= 0.25
Invert Elev (ft)	= 1.00
Slope (%)	= 1.00
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.50

Highlighted

Depth (ft)	= 0.18
Q (cfs)	= 1.500
Area (sqft)	= 1.62
Velocity (ft/s)	= 0.93
Wetted Perim (ft)	= 12.24
Crit Depth, Yc (ft)	= 0.12
Top Width (ft)	= 12.23
EGL (ft)	= 0.19



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 3 2023

Pond D Outfall Channel (Q10=10.8 cfs)

Trapezoidal

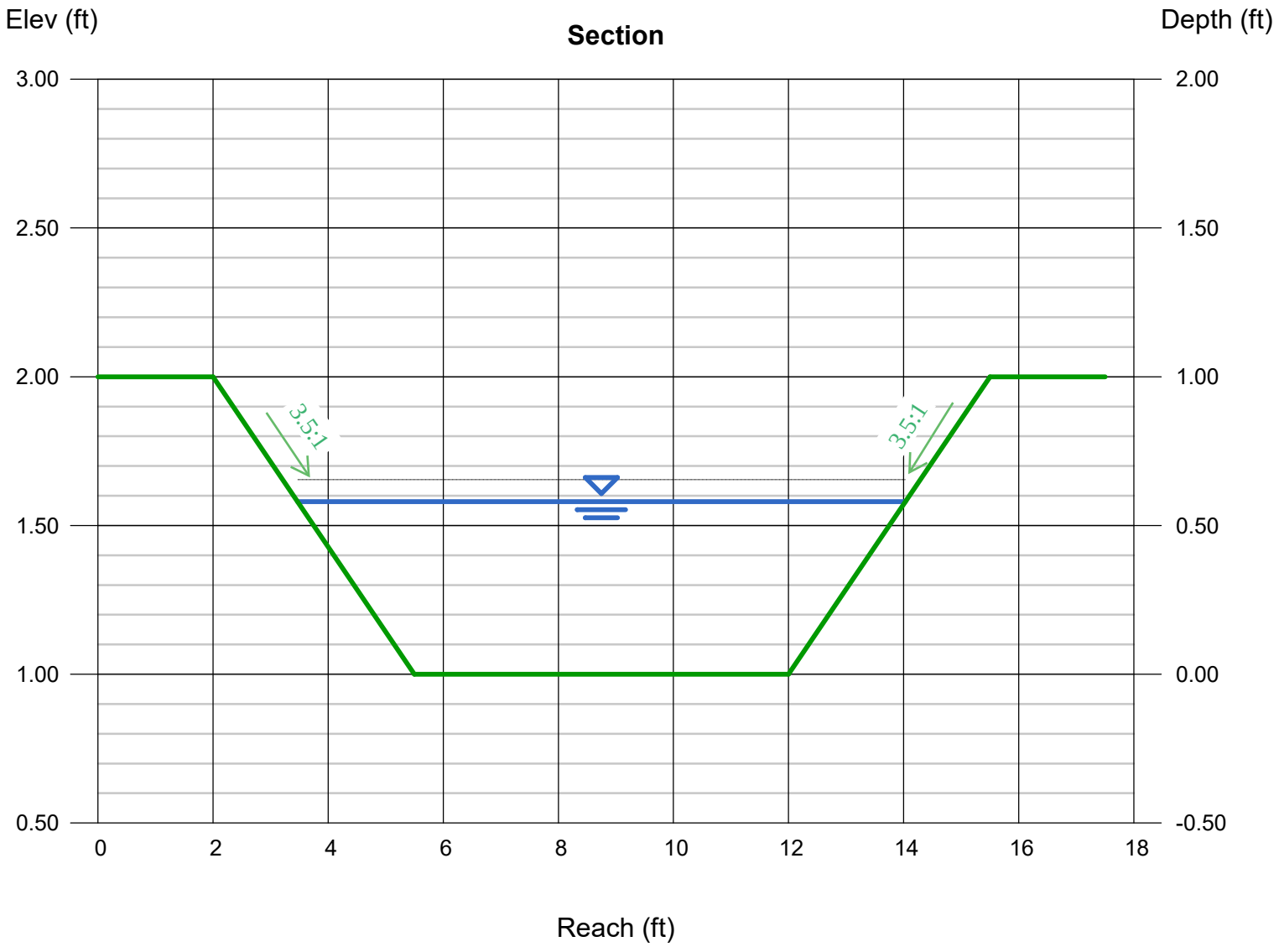
Bottom Width (ft)	= 6.50
Side Slopes (z:1)	= 3.50, 3.50
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.00
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.80

Highlighted

Depth (ft)	= 0.58
Q (cfs)	= 10.80
Area (sqft)	= 4.95
Velocity (ft/s)	= 2.18
Wetted Perim (ft)	= 10.72
Crit Depth, Yc (ft)	= 0.41
Top Width (ft)	= 10.56
EGL (ft)	= 0.65



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 3 2023

Pond E Outlet Channel (Q10=0.3 cfs)

User-defined

Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.040

Calculations

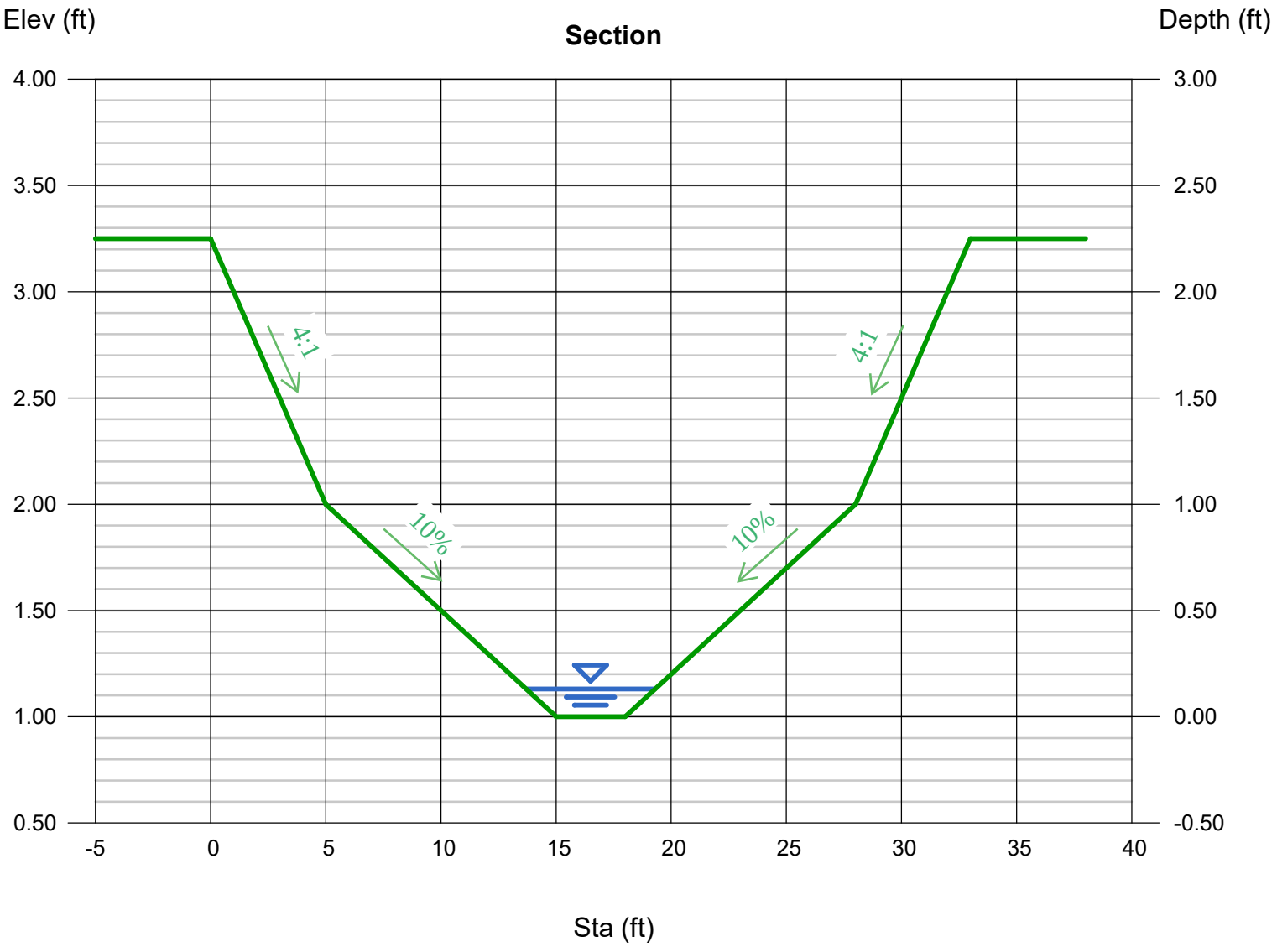
Compute by:	Known Q
Known Q (cfs)	= 0.30

Highlighted

Depth (ft)	= 0.13
Q (cfs)	= 0.300
Area (sqft)	= 0.56
Velocity (ft/s)	= 0.54
Wetted Perim (ft)	= 5.61
Crit Depth, Yc (ft)	= 0.07
Top Width (ft)	= 5.60
EGL (ft)	= 0.13

(Sta, El, n)-(Sta, El, n)...

(0.00, 3.25)-(5.00, 2.00, 0.040)-(15.00, 1.00, 0.040)-(18.00, 1.00, 0.040)-(28.00, 2.00, 0.040)-(33.00, 3.25, 0.040)



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 3 2023

DP UD4 DESIGN POINT UD4 (Q5=N/A, Q100=541.5)

Invert Elev Dn (ft)	=	6719.29
Pipe Length (ft)	=	80.00
Slope (%)	=	0.50
Invert Elev Up (ft)	=	6719.69
Rise (in)	=	48.0
Shape	=	Box
Span (in)	=	144.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

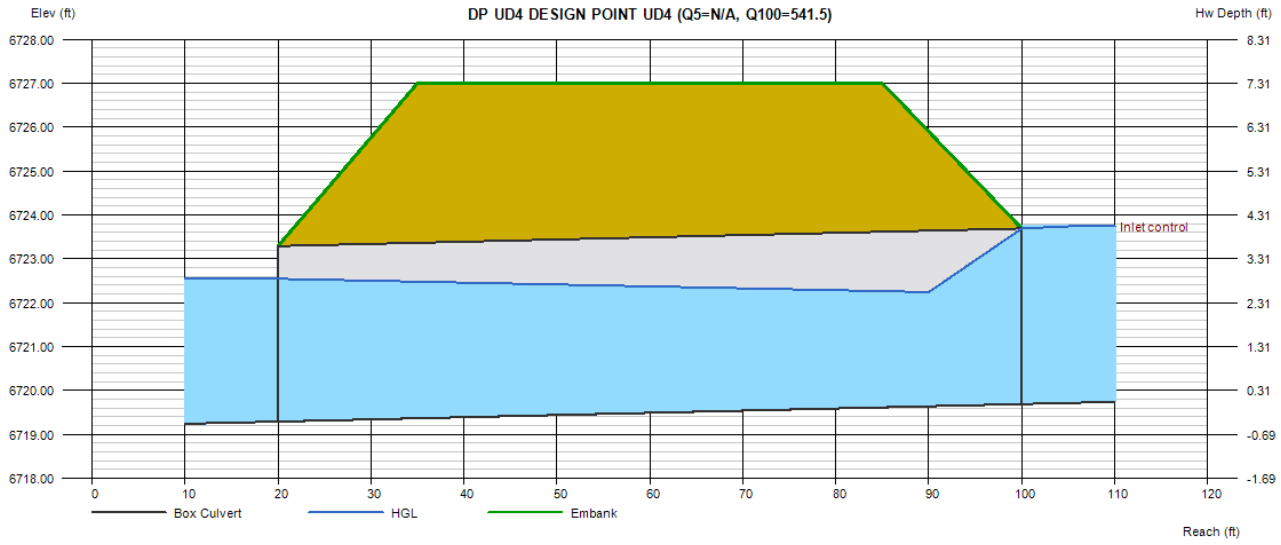
Top Elevation (ft)	=	6727.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	0.00

Calculations

Qmin (cfs)	=	500.00
Qmax (cfs)	=	541.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	541.50
Qpipe (cfs)	=	541.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.93
Veloc Up (ft/s)	=	9.00
HGL Dn (ft)	=	6722.54
HGL Up (ft)	=	6722.20
Hw Elev (ft)	=	6723.74
Hw/D (ft)	=	1.01
Flow Regime	=	Inlet Control



The Q100 for Culvert UD4 was approximated by direct adding the Q100 from Design Point UD4 (representative of the runoff generated by Basin UD4), and the Q100=505 cfs of flow in Major Drainageway MS-06 per the Santa Fe Spring LOMR. This direct-added flow of 541.5 cfs being directed through Culvert UD4 is likely an overestimate of the flow that will actually be generated in the 100-year event.

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 28 2023

DPOS5 Design Point OS5 (Q5=N/A, Q100-505 CFS)*

Invert Elev Dn (ft)	=	6762.54
Pipe Length (ft)	=	52.07
Slope (%)	=	1.67
Invert Elev Up (ft)	=	6763.41
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.020
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

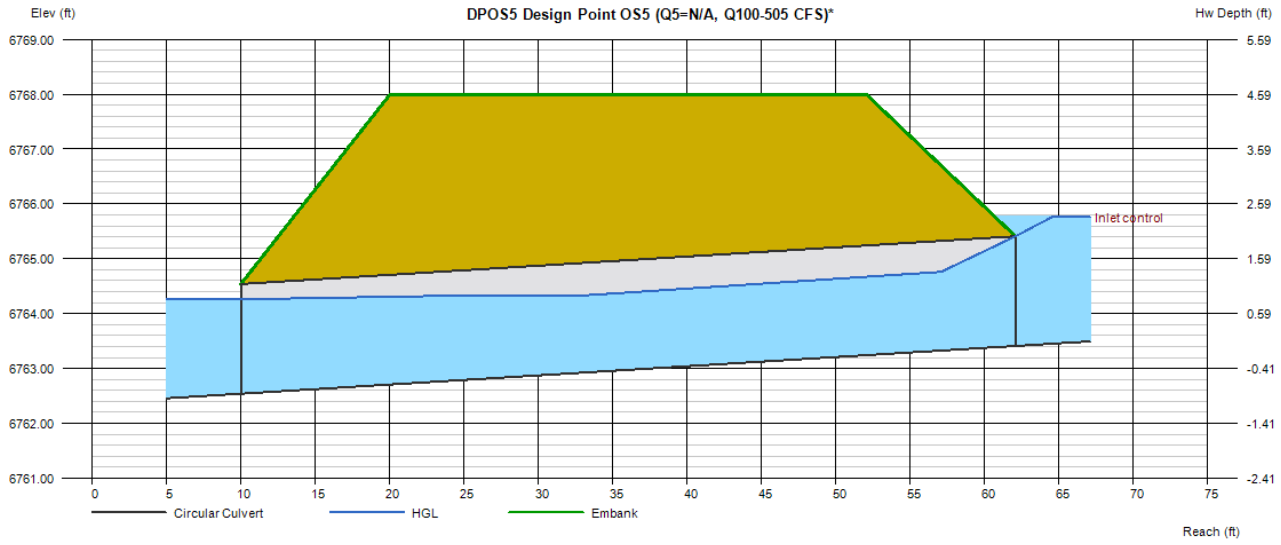
Top Elevation (ft)	=	6768.00
Top Width (ft)	=	32.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	16.00
Qmax (cfs)	=	16.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	16.00
Qpipe (cfs)	=	16.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.56
Veloc Up (ft/s)	=	6.60
HGL Dn (ft)	=	6764.26
HGL Up (ft)	=	6764.85
Hw Elev (ft)	=	6765.77
Hw/D (ft)	=	1.18
Flow Regime	=	Inlet Control



*This model is solely meant to analyze full flow conditions of the culvert in order to size the proposed riprap. Existing culvert is modeled with the 100-year event flows in the GeoHECRAS map & associated table shown on page 140 of this report.

1: Channel Riprap Sizing (Based on Equation 8-11 from MHFD Chapter 8)

$$d_{50} \geq \left[\frac{VS^{0.17}}{4.5(G_s - 1)^{0.66}}\right]^2$$ Equation 8-11

Where:

V = mean channel velocity (ft/sec)

S = longitudinal channel slope (ft/ft)

d_{50} = mean rock size (ft)

Gs = specific gravity of stone (minimum = 2.50, typically 2.5 to 2.7), Note: In this equation (Gs -1) considers the buoyancy of the water, in that the specific gravity of water is subtracted from the specific gravity of the rock.

Channel Velocity=	8.46	fps
Channel Slope=	1.75	%
D50 size=	6.27609	inches
Use Type	L	Riprap

Additional grade control appears to be needed

JR Response: HEC RAS Analysis shows stable velocities and froudes w/o any grade control structures. Grade structures appear unwarranted and would further disturb the existing conditions of the now stable channel.

APPENDIX D

WATER QUALITY AND DETENTION CALCULATIONS

Pond Summary Table

Pond C

Tributary Sub-basin	Area (acres)	Percent Impervious
C1	6.04	13.1%
C2	3.35	23.6%
C3	23.44	8.9%
C4	10.94	18.3%
C5	2.35	19.9%
C6	3.95	21.8%
C7	2.14	24.3%
C8	22.55	10.0%
C9	2.63	35.4%
C10	16.38	11.5%
OS1	2.37	57.8%
OS2	0.70	31.4%
Total	96.84	14.4%

Pond D

Tributary Sub-basin	Area (acres)	Percent Impervious
D1	9.11	28.1%
D2	8.49	13.0%
D3	3.21	8.5%
D4	10.01	6.9%
D5	9.56	17.5%
D6	0.34	45.0%
D7	33.94	14.7%
OS3	2.28	60.0%
OS4	1.08	54.6%
Total	78.02	17.2%

Pond E

Tributary Sub-basin	Area (acres)	Percent Impervious
E1	17.12	7.0%
E2	0.37	45.0%
E3	0.20	45.0%
E4	0.68	3.2%
Total	18.37	8.1%

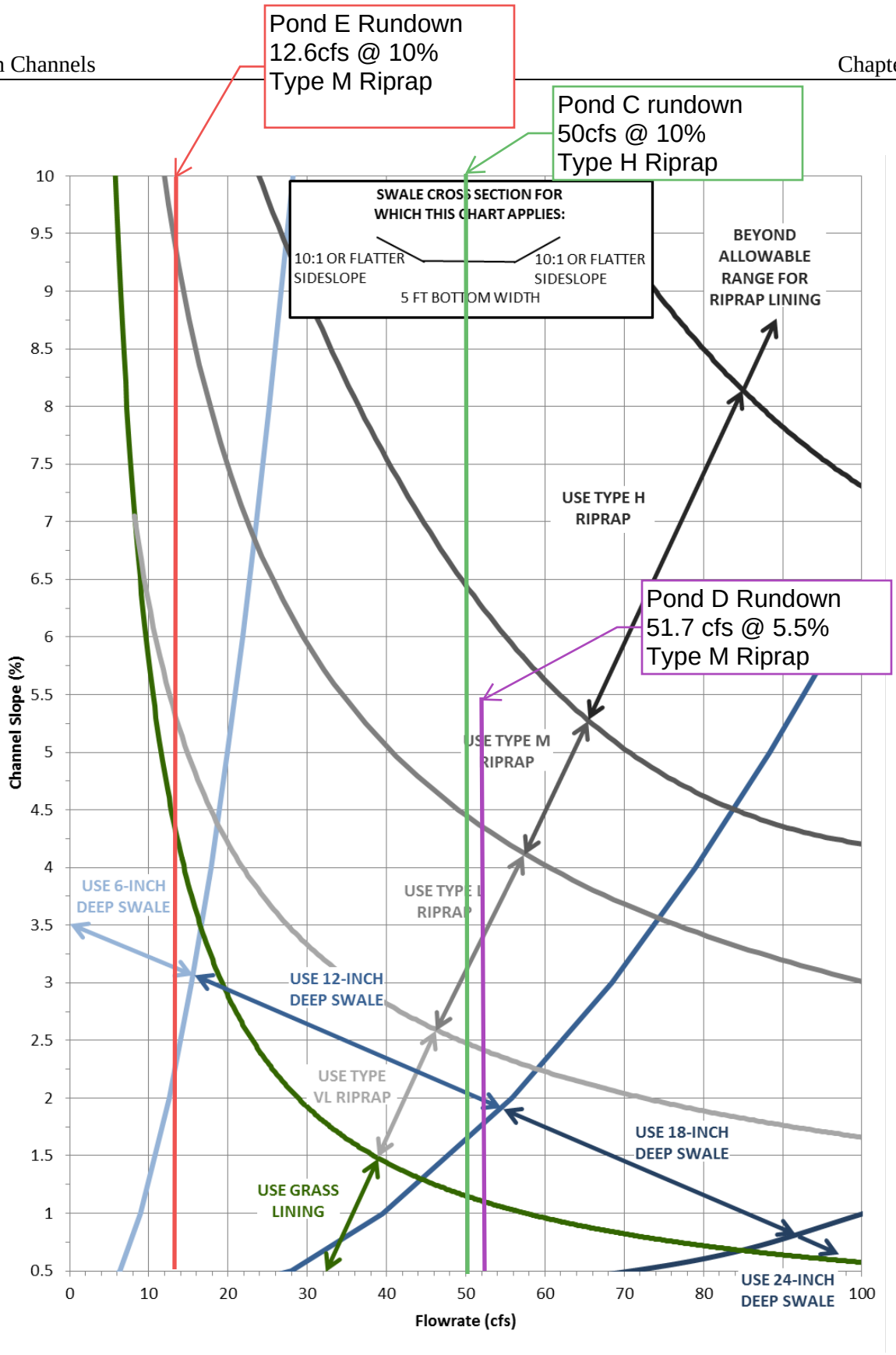


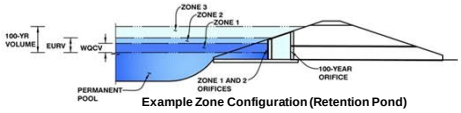
Figure 8-25. Swale stability chart: greater than 4-foot bottom width and 10:1 (or flatter) side slopes (Note: Riprap classifications refer to gradation for riprap used in soil riprap or void-filled riprap. See Figure 8-34 for gradations.) (Source: Muller Engineering Company)

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Saddlehorn Filing 3

Basin ID: Pond C



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	96.84	acres
Watershed Length =	5,370	ft
Watershed Length to Centroid =	1,383	ft
Watershed Slope =	0.012	ft/ft
Watershed Imperviousness =	14.60%	percent
Percentage Hydrologic Soil Group A =	93.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	7.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.737	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	1.159	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.711	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.074	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.450	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	3.279	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.653	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	6.705	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	11.187	acre-feet	inches
Approximate 2-yr Detention Volume =	0.724	acre-feet	
Approximate 5-yr Detention Volume =	1.034	acre-feet	
Approximate 10-yr Detention Volume =	1.331	acre-feet	
Approximate 25-yr Detention Volume =	1.735	acre-feet	
Approximate 50-yr Detention Volume =	2.136	acre-feet	
Approximate 100-yr Detention Volume =	3.064	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.737	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.422	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.906	acre-feet
Total Detention Basin Volume =	3.064	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

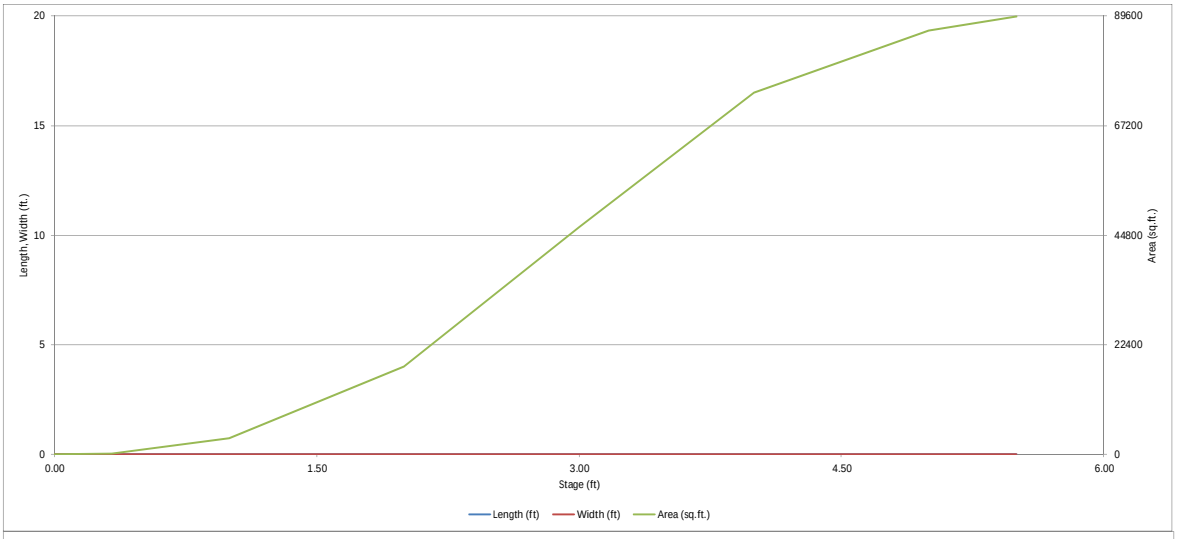
Depth Increment = ft

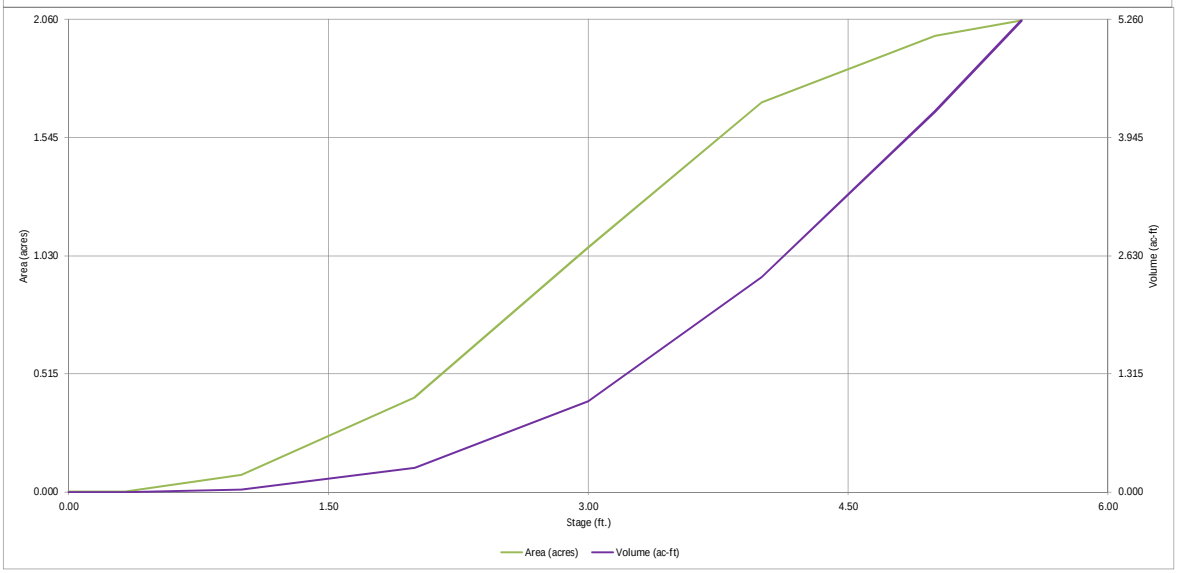
6710.67

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	32	0.001		
6711	--	0.33	--	--	--	50	0.001	14	0.000
6712	--	1.00	--	--	--	3,260	0.075	1,122	0.026
6713	--	2.00	--	--	--	17,980	0.413	11,742	0.270
6714	--	3.00	--	--	--	46,439	1.066	43,952	1.009
6715	--	4.00	--	--	--	73,964	1.698	104,153	2.391
6716	--	5.00	--	--	--	86,681	1.990	184,476	4.235
6716.5	--	5.50	--	--	--	89,520	2.055	228,526	5.246

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



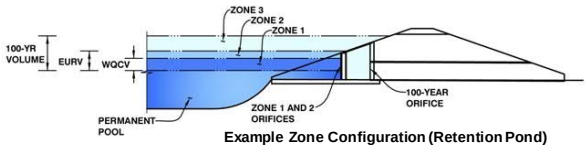


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Saddlehorn Filing 3

Basin ID: Pond C



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.73	0.737	Orifice Plate
Zone 2 (EURV)	3.14	0.422	Orifice Plate
Zone 3 (100-year)	4.39	1.906	Weir&Pipe (Restrict)
Total (all zones)		3.064	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.694E-02	ft²
Depth at top of Zone using Orifice Plate =	3.14	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.44	sq. inches (diameter = 1-3/4 inches)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.91	1.82					
Orifice Area (sq. inches)	2.44	2.44	2.44					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.17	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.17	N/A	feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	5.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	4.25	N/A	
Horiz. Length of Weir Sides =	5.00	N/A	feet	Overflow Grate Open Area w/o Debris =	20.88	N/A	ft²
Overflow Grate Type =	Type C Grate	Type C Grate		Overflow Grate Open Area w/ Debris =	20.88	N/A	ft²
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.39	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.91	N/A	ft²
Outlet Pipe Diameter =	30.00	N/A	inches	Outlet Orifice Centroid =	1.25	N/A	feet
Restrictor Plate Height Above Pipe Invert =	30.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.33	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.47	feet
Spillway Crest Length =	60.00	feet	Stage at Top of Freeboard =	5.80	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	2.06	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	5.25	acre-ft

Calculated Parameters for Spillway

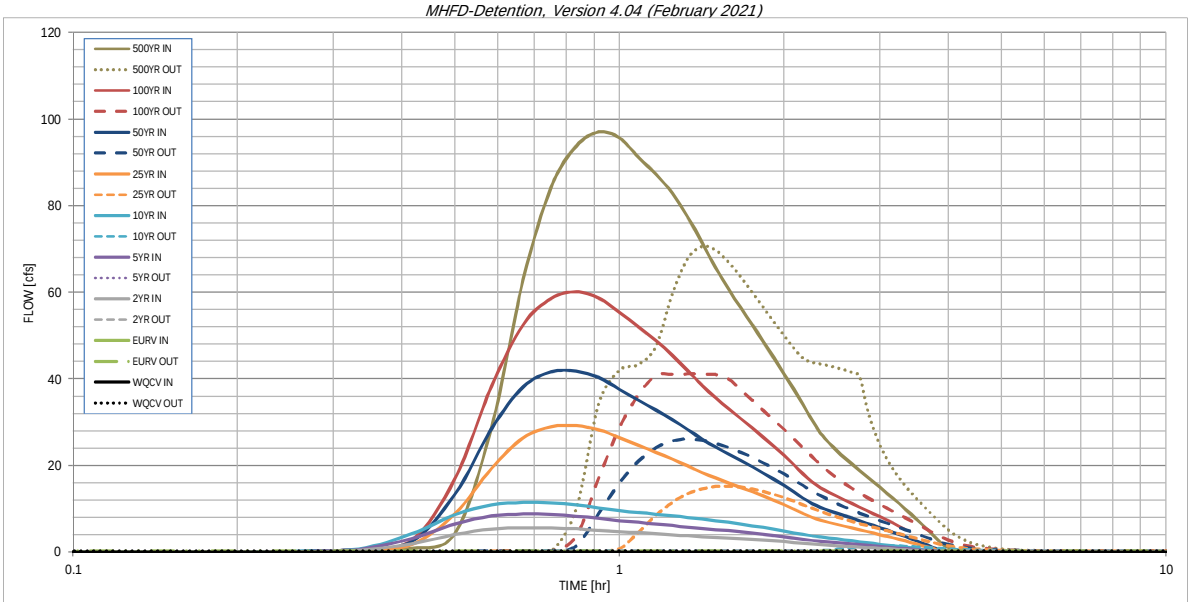
Routed Hydrograph Results

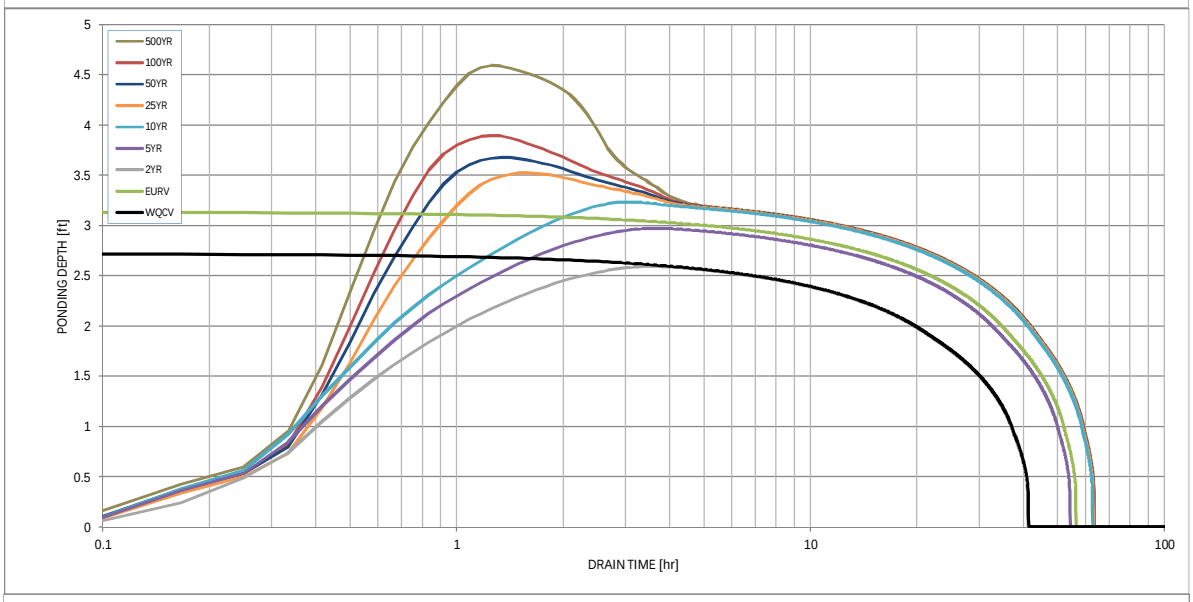
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

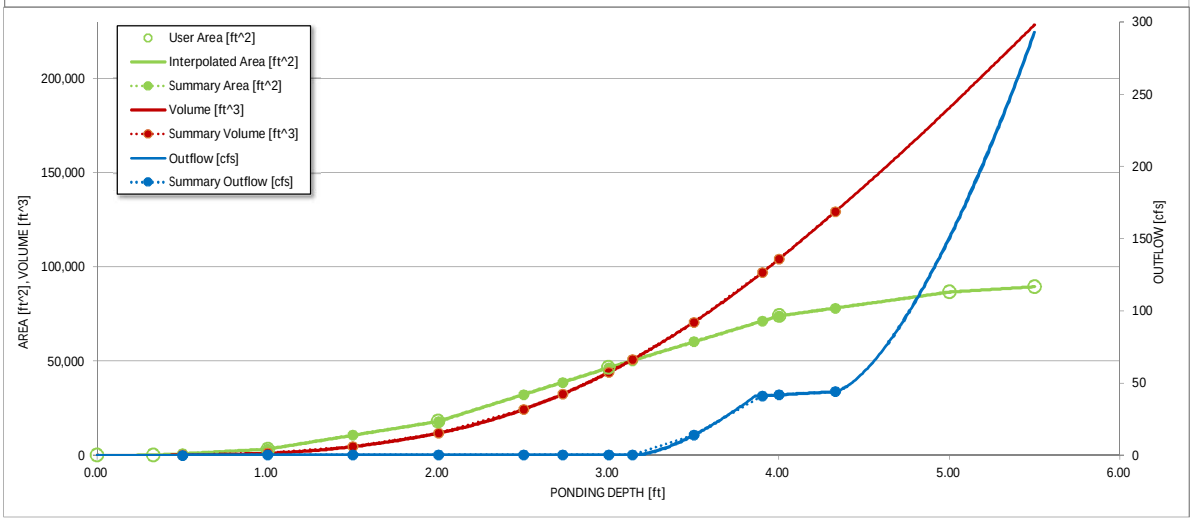
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.737	1.159	0.711	1.074	1.450	3.279	4.653	6.705	11.187
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.711	1.074	1.450	3.279	4.653	6.705	11.187
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.6	1.0	1.4	17.2	29.1	46.2	81.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.01	0.18	0.30	0.48	0.84
Peak Inflow Q (cfs) =	N/A	N/A	5.7	8.8	11.5	29.2	41.8	60.2	97.1
Peak Outflow Q (cfs) =	0.3	0.4	0.3	0.3	1.5	15.3	26.2	41.2	70.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	1.1	0.9	0.9	0.9	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.7	1.2	2.0	2.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	51	38	49	57	53	50	46	39
Time to Drain 99% of Inflow Volume (hours) =	40	54	40	52	60	58	57	55	52
Maximum Ponding Depth (ft) =	2.73	3.14	2.59	2.97	3.23	3.52	3.68	3.90	4.60
Area at Maximum Ponding Depth (acres) =	0.89	1.15	0.80	1.05	1.21	1.39	1.49	1.63	1.87
Maximum Volume Stored (acre-ft) =	0.745	1.164	0.627	0.977	1.271	1.649	1.865	2.208	3.444

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.04
	0:15:00	0.00	0.00	0.10	0.17	0.21	0.14	0.19	0.18	0.30
	0:20:00	0.00	0.00	0.49	0.68	0.82	0.53	0.64	0.66	0.91
	0:25:00	0.00	0.00	1.97	3.17	4.25	1.80	2.42	2.78	4.35
	0:30:00	0.00	0.00	4.09	6.54	8.67	8.92	13.39	17.00	28.89
	0:35:00	0.00	0.00	5.34	8.37	10.93	19.40	28.58	38.34	63.01
	0:40:00	0.00	0.00	5.67	8.81	11.51	26.43	38.22	52.58	84.28
	0:45:00	0.00	0.00	5.63	8.71	11.43	28.97	41.67	58.62	93.78
	0:50:00	0.00	0.00	5.41	8.36	10.97	29.22	41.84	60.17	97.06
	0:55:00	0.00	0.00	5.09	7.81	10.24	28.29	40.33	58.73	95.68
	1:00:00	0.00	0.00	4.78	7.31	9.62	26.48	37.63	55.34	91.22
	1:05:00	0.00	0.00	4.53	6.90	9.18	24.70	35.08	52.05	87.27
	1:10:00	0.00	0.00	4.30	6.53	8.80	23.10	32.81	48.89	82.89
	1:15:00	0.00	0.00	4.05	6.16	8.46	21.54	30.61	45.46	77.40
	1:20:00	0.00	0.00	3.80	5.77	8.05	19.95	28.35	41.94	71.50
	1:25:00	0.00	0.00	3.60	5.48	7.67	18.40	26.11	38.52	65.69
	1:30:00	0.00	0.00	3.45	5.23	7.28	17.12	24.29	35.66	60.79
	1:35:00	0.00	0.00	3.29	4.98	6.89	16.01	22.68	33.19	56.44
	1:40:00	0.00	0.00	3.14	4.72	6.50	14.98	21.19	30.91	52.44
	1:45:00	0.00	0.00	2.98	4.45	6.11	13.97	19.72	28.72	48.62
	1:50:00	0.00	0.00	2.83	4.16	5.72	12.98	18.28	26.58	44.92
	1:55:00	0.00	0.00	2.66	3.88	5.34	12.00	16.85	24.45	41.27
	2:00:00	0.00	0.00	2.46	3.59	4.94	11.02	15.43	22.36	37.68
	2:05:00	0.00	0.00	2.25	3.28	4.51	10.01	13.99	20.25	34.12
	2:10:00	0.00	0.00	2.04	2.97	4.09	8.98	12.52	18.13	30.57
	2:15:00	0.00	0.00	1.88	2.75	3.78	8.07	11.25	16.28	27.54
	2:20:00	0.00	0.00	1.75	2.56	3.53	7.40	10.34	14.92	25.29
	2:25:00	0.00	0.00	1.63	2.39	3.28	6.89	9.63	13.86	23.44
	2:30:00	0.00	0.00	1.52	2.22	3.05	6.43	9.00	12.92	21.80
	2:35:00	0.00	0.00	1.41	2.06	2.83	6.01	8.41	12.06	20.29
	2:40:00	0.00	0.00	1.30	1.91	2.62	5.60	7.83	11.24	18.86
	2:45:00	0.00	0.00	1.20	1.77	2.41	5.20	7.27	10.44	17.49
	2:50:00	0.00	0.00	1.11	1.62	2.21	4.81	6.73	9.67	16.20
	2:55:00	0.00	0.00	1.02	1.49	2.03	4.44	6.20	8.92	14.95
	3:00:00	0.00	0.00	0.93	1.36	1.85	4.07	5.67	8.18	13.71
	3:05:00	0.00	0.00	0.84	1.23	1.67	3.70	5.16	7.44	12.48
	3:10:00	0.00	0.00	0.75	1.10	1.50	3.33	4.64	6.71	11.26
	3:15:00	0.00	0.00	0.67	0.97	1.33	2.97	4.13	5.97	10.03
	3:20:00	0.00	0.00	0.59	0.85	1.17	2.61	3.62	5.24	8.81
	3:25:00	0.00	0.00	0.51	0.73	1.00	2.25	3.11	4.51	7.60
	3:30:00	0.00	0.00	0.43	0.61	0.84	1.89	2.61	3.79	6.38
	3:35:00	0.00	0.00	0.35	0.49	0.68	1.54	2.10	3.06	5.17
	3:40:00	0.00	0.00	0.27	0.38	0.53	1.19	1.60	2.34	3.96
	3:45:00	0.00	0.00	0.20	0.27	0.39	0.85	1.12	1.63	2.78
	3:50:00	0.00	0.00	0.16	0.21	0.30	0.53	0.66	0.96	1.70
	3:55:00	0.00	0.00	0.13	0.17	0.25	0.33	0.41	0.58	1.10
	4:00:00	0.00	0.00	0.11	0.15	0.21	0.23	0.29	0.39	0.75
	4:05:00	0.00	0.00	0.10	0.13	0.18	0.18	0.22	0.27	0.52
	4:10:00	0.00	0.00	0.08	0.11	0.16	0.14	0.17	0.20	0.35
	4:15:00	0.00	0.00	0.07	0.09	0.13	0.11	0.14	0.14	0.24
	4:20:00	0.00	0.00	0.06	0.08	0.11	0.09	0.11	0.10	0.15
	4:25:00	0.00	0.00	0.05	0.06	0.08	0.07	0.08	0.07	0.10
	4:30:00	0.00	0.00	0.04	0.05	0.07	0.06	0.07	0.06	0.08
	4:35:00	0.00	0.00	0.03	0.04	0.05	0.05	0.05	0.05	0.06
	4:40:00	0.00	0.00	0.03	0.03	0.04	0.04	0.04	0.04	0.05
	4:45:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	4:50:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	4:55:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	5:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	5:05:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.50	864	0.020	91	0.002	0.06
	1.00	3,260	0.075	1,122	0.026	0.11
	1.50	10,620	0.244	4,592	0.105	0.16
	2.00	17,980	0.413	11,742	0.270	0.24
	2.50	32,209	0.739	24,289	0.558	0.30
WQCV	2.73	38,755	0.890	32,450	0.745	0.32
	3.00	46,439	1.066	43,952	1.009	0.35
EURV	3.14	50,292	1.155	50,723	1.164	0.36
	3.50	60,201	1.382	70,612	1.621	13.83
100-YR	3.90	71,211	1.635	96,894	2.224	41.21
	4.00	73,964	1.698	104,153	2.391	41.88
Spillway	4.33	78,161	1.794	129,254	2.967	44.03

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

POND C FOREBAY VOLUME REQUIREMENTS

Equation 3-1 $WQCV = a(0.91I^3 - 1.19I^2 + 0.781I)$

a=1 (40 hour drain time)

PROPOSED FOREBAY	*I=.153*	*WQCV=*	0.094743
FUTURE FOREBAY	*I=.115*	*WQCV=*	0.075346

Equation 3-3 $V=(WQCV/12)A$

PROPOSED FOREBAY	A= 80.46 Acres	V=	0.611
FUTURE FOREBAY	A= 16.38 Acres	V=	0.103

3% OF WQCV

FOREBAY TOTAL VOLUME= .03(V)

VOLUME REQUIRED FOR PROPOSED FOREBAY =	0.018	AC-FT	798 CF
VOLUME REQUIRED FOR FUTURE FOREBAY=	0.003	AC-FT	134 CF
VOLUME PROVIDED FOR PROPOSED FOREBAY =	0.020	AC-FT	883 CF

Q_{100} DISCHARGES	2% OF Q_{100}
Q_{100} PROPOSED FOREBAY=	.02*50.0 CFS= 1.00 CFS
Q_{100} FUTURE FOREBAY=	.02*14.3 CFS= 0.29 CFS

Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Nov 3 2023

Pond C Forebay 1 Notch

V-Notch Weir

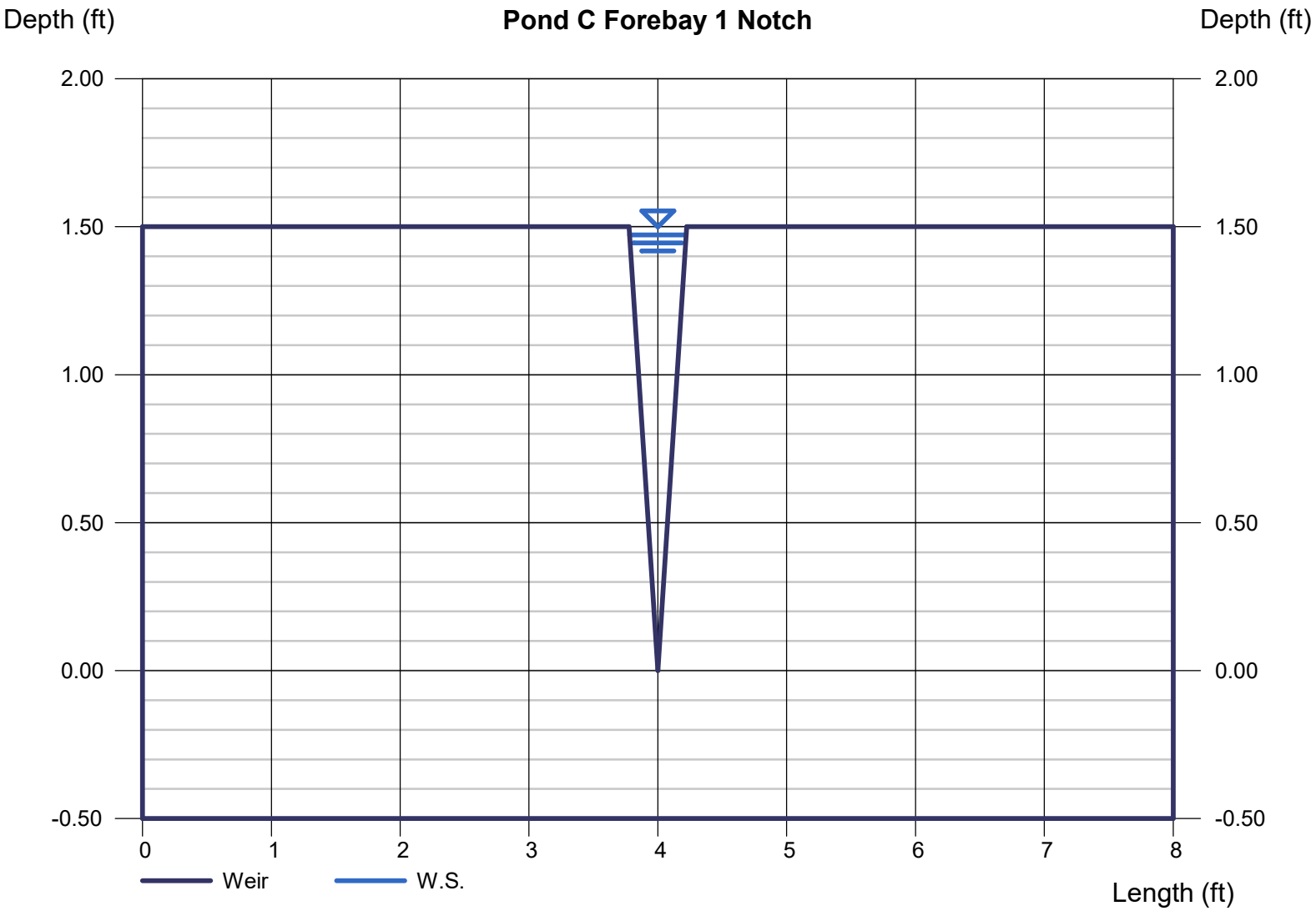
Crest	= Sharp
Angle (Deg)	= 17
Total Depth (ft)	= 1.50

Calculations

Weir Coeff. Cw	= 0.38
Compute by:	Known Q
Known Q (cfs)	= 1.00

Highlighted

Depth (ft)	= 1.47
Q (cfs)	= 1.000
Area (sqft)	= 0.32
Velocity (ft/s)	= 3.09
Top Width (ft)	= 0.44



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Dec 13 2021

Pond C Trickle Channel

Rectangular

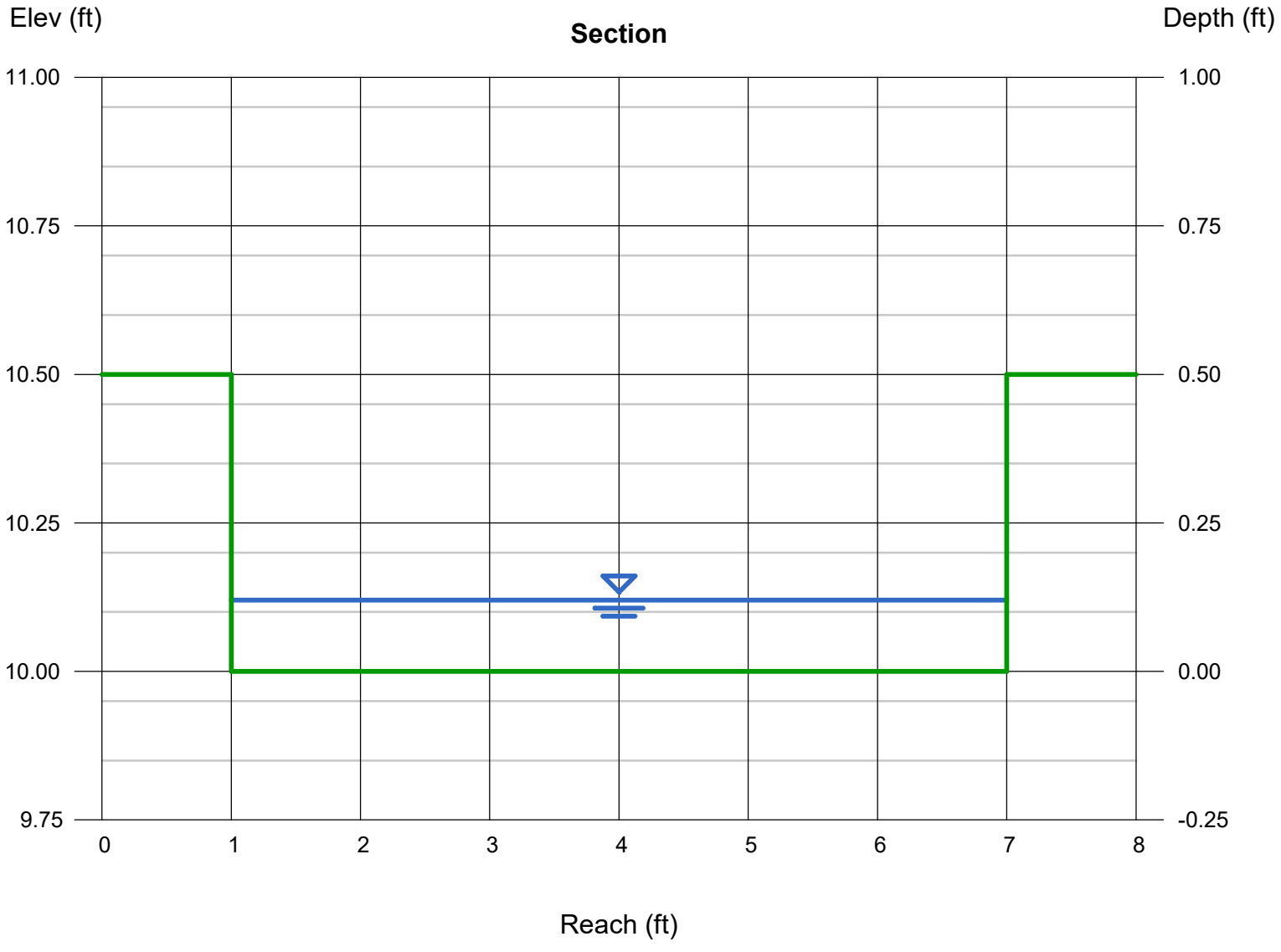
Bottom Width (ft)	= 6.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 10.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.29

Highlighted

Depth (ft)	= 0.12
Q (cfs)	= 1.290
Area (sqft)	= 0.72
Velocity (ft/s)	= 1.79
Wetted Perim (ft)	= 6.24
Crit Depth, Yc (ft)	= 0.12
Top Width (ft)	= 6.00
EGL (ft)	= 0.17



Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Dec 14 2021

Pond C Spillway

Trapezoidal Weir

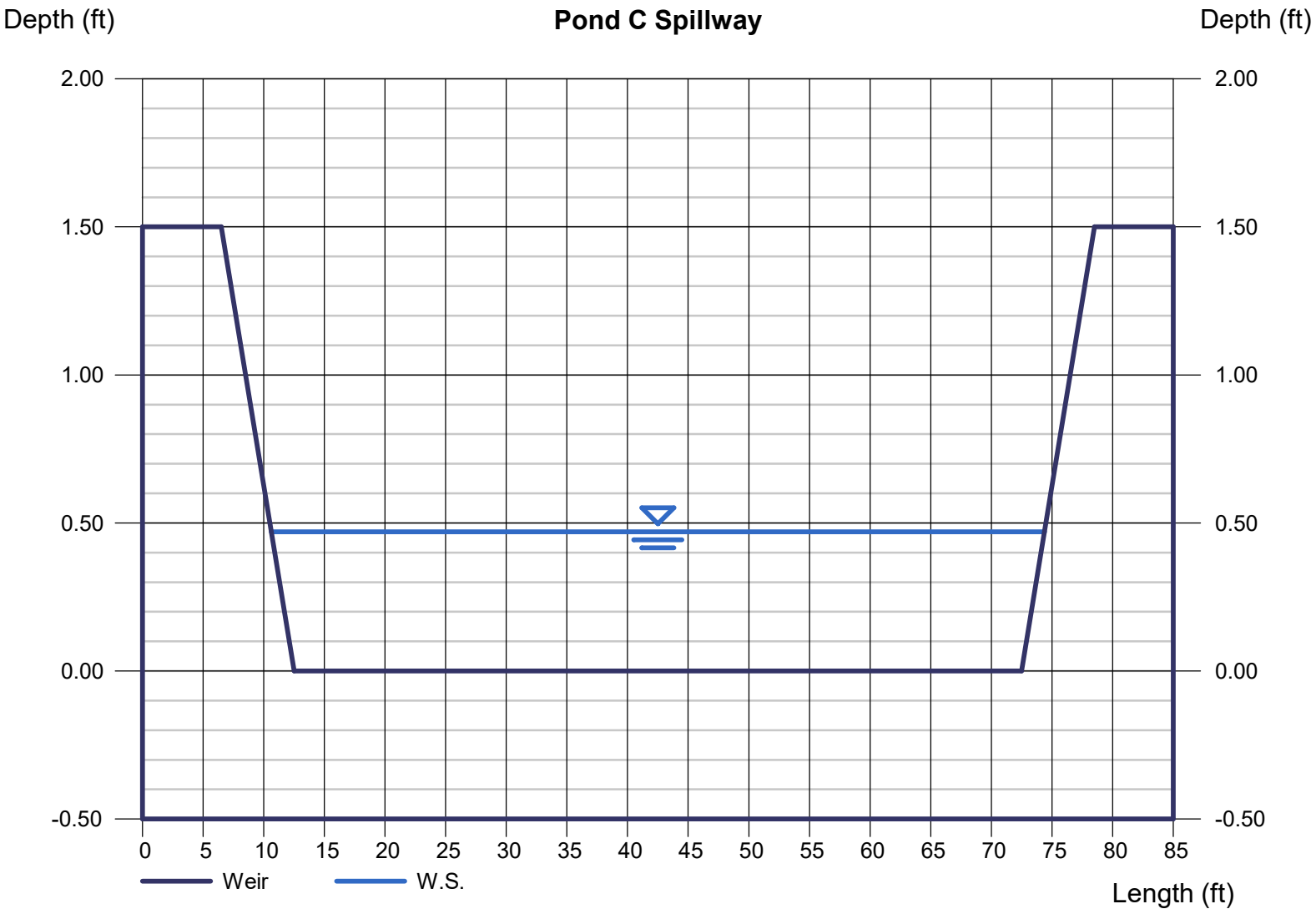
Crest	= Sharp
Bottom Length (ft)	= 60.00
Total Depth (ft)	= 1.50
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 60.20

Highlighted

Depth (ft)	= 0.47
Q (cfs)	= 60.20
Area (sqft)	= 29.08
Velocity (ft/s)	= 2.07
Top Width (ft)	= 63.76

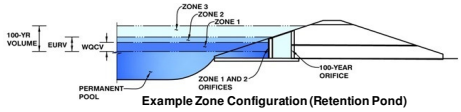


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Saddlehorn Filing 3

Basin ID: Pond D



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	78.02	acres
Watershed Length =	3,473	ft
Watershed Length to Centroid =	970	ft
Watershed Slope =	0.012	ft/ft
Watershed Imperviousness =	17.20%	percent
Percentage Hydrologic Soil Group A =	70.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	30.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.673 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.153 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.875 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.354 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.302 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.114 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	5.422 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	7.551 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	11.394 acre-feet		inches
Approximate 2-yr Detention Volume =	0.784 acre-feet		
Approximate 5-yr Detention Volume =	1.236 acre-feet		
Approximate 10-yr Detention Volume =	1.554 acre-feet		
Approximate 25-yr Detention Volume =	1.939 acre-feet		
Approximate 50-yr Detention Volume =	2.232 acre-feet		
Approximate 100-yr Detention Volume =	3.026 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.673	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.480	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.873	acre-feet
Total Detention Basin Volume =	3.026	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

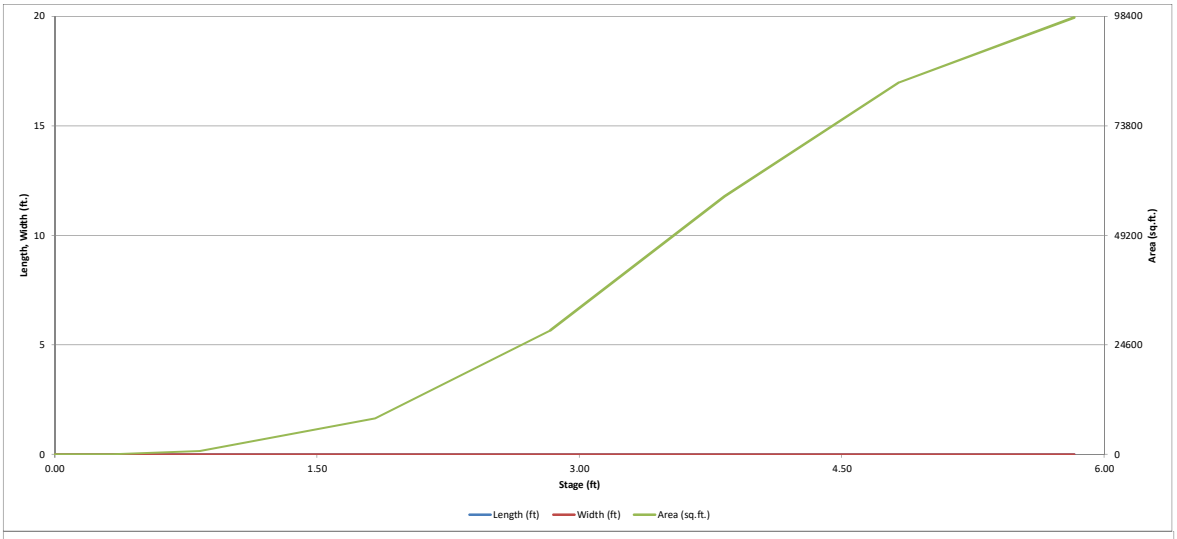
6709.17

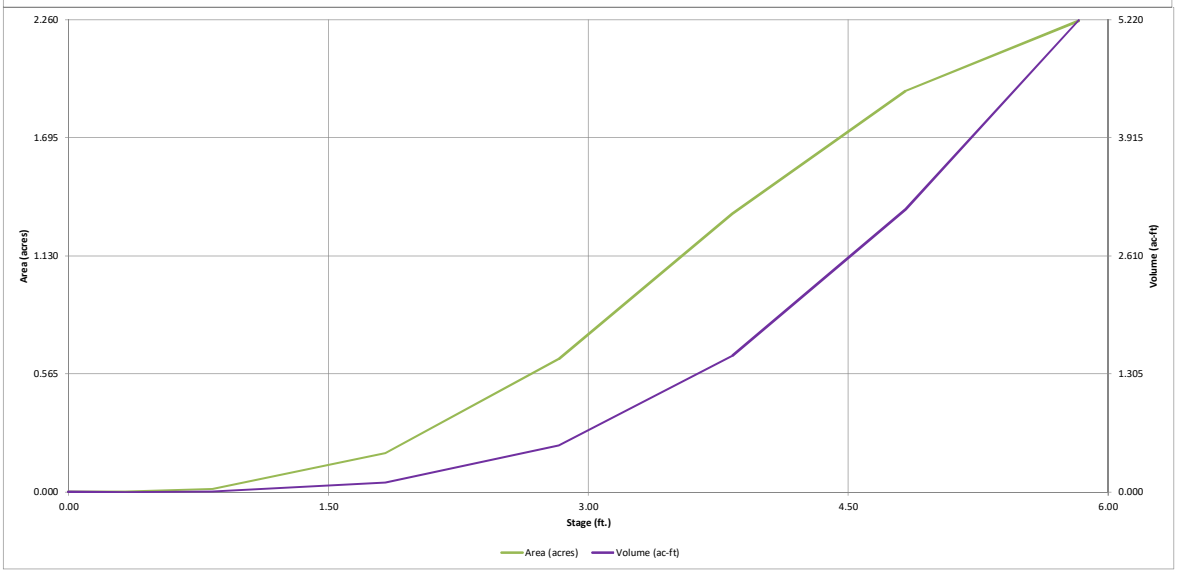
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	32	0.001		
6709.5	--	0.33	--	--	--	50	0.001	14	0.000
6710	--	0.83	--	--	--	699	0.016	201	0.005
6711	--	1.83	--	--	--	8,089	0.186	4,595	0.105
6712	--	2.83	--	--	--	27,770	0.638	22,524	0.517
6713	--	3.83	--	--	--	58,037	1.332	65,427	1.502
6714	--	4.83	--	--	--	83,546	1.918	136,219	3.127
6715	--	5.83	--	--	--	98,172	2.254	227,078	5.213

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



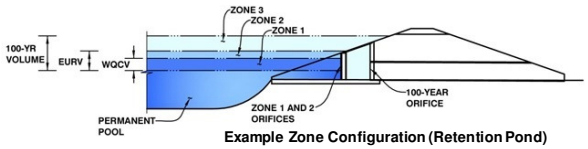


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **Saddlehorn Filing 3**

Basin ID: **Pond D**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.05	0.673	Orifice Plate
Zone 2 (EURV)	3.55	0.480	Orifice Plate
Zone 3 (100-year)	4.78	1.873	Weir&Pipe (Restrict)
Total (all zones)		3.026	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	3.55	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	2.40					
Orifice Area (sq. inches)	2.25	2.25	2.25					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.55	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.55	N/A	feet
Overflow Weir Front Edge Length =	12.00	N/A	feet	Overflow Weir Slope Length =	5.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	5.91	N/A	
Horiz. Length of Weir Sides =	5.00	N/A	feet	Overflow Grate Open Area w/o Debris =	41.76	N/A	ft²
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	41.76	N/A	ft²
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.40	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	7.07	N/A	ft²
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.50	N/A	feet
Restrictor Plate Height Above Pipe Invert =	36.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.33	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.49	feet
Spillway Crest Length =	75.00	feet	Stage at Top of Freeboard =	5.82	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	2.25	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	5.19	acre-ft

Calculated Parameters for Spillway

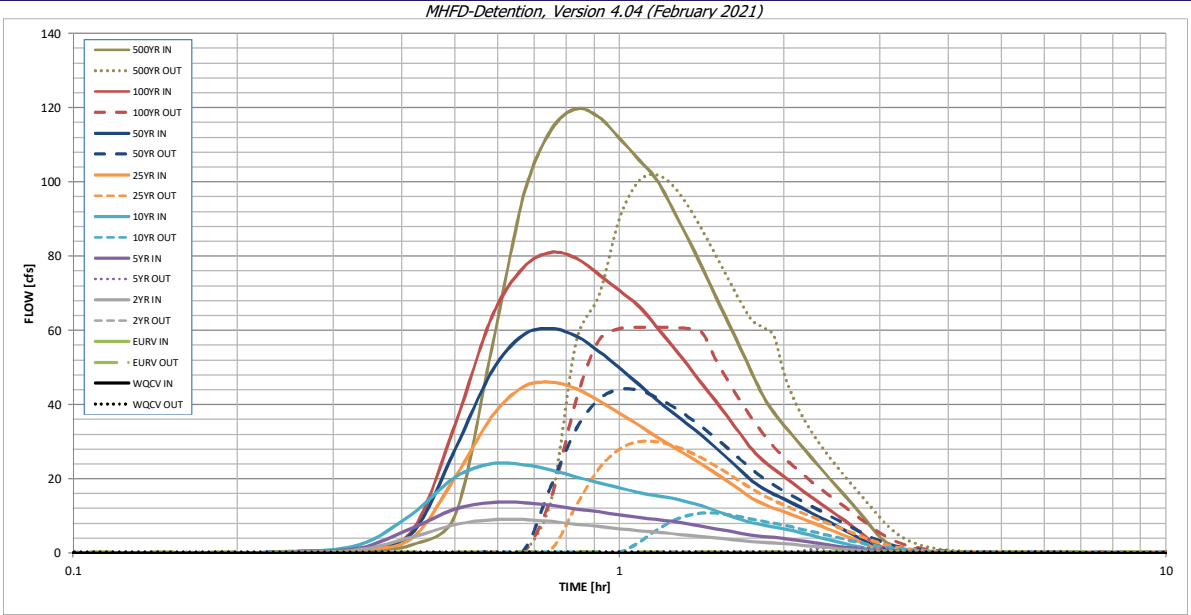
Routed Hydrograph Results

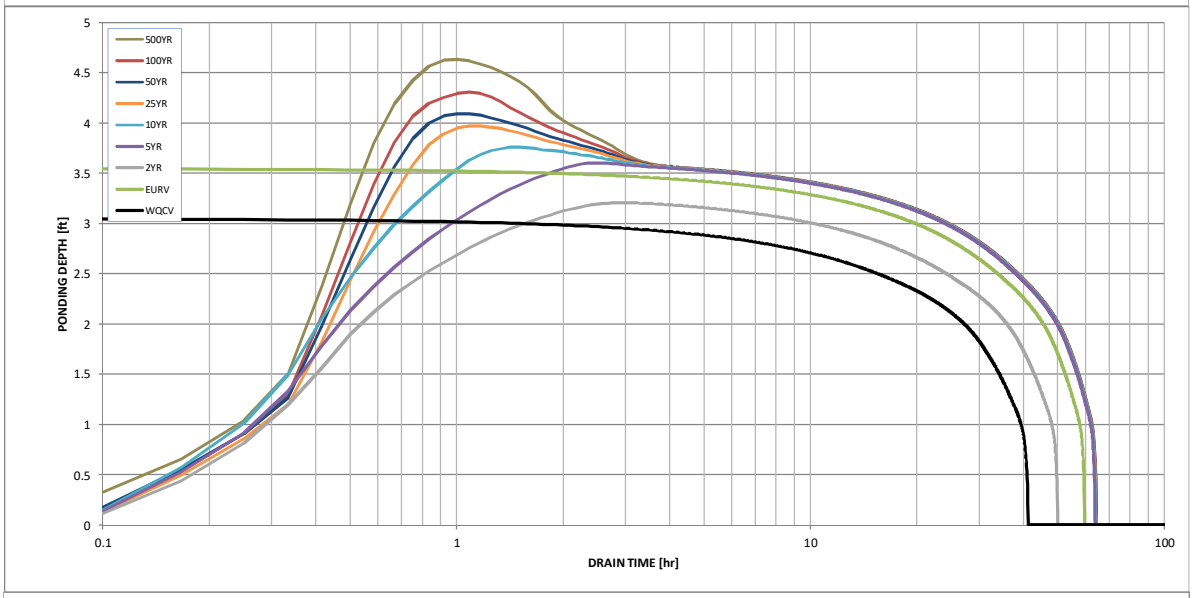
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

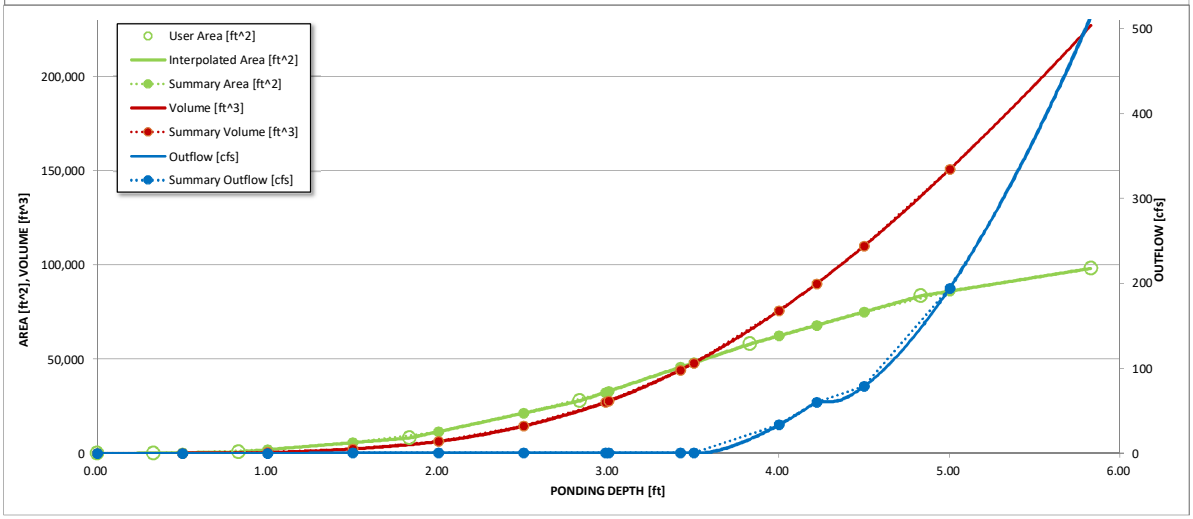
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.673	1.153	0.875	1.354	2.302	4.114	5.422	7.551	11.394
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.875	1.354	2.302	4.114	5.422	7.551	11.394
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.9	2.0	11.4	32.5	46.1	66.0	103.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.03	0.15	0.42	0.59	0.85	1.32
Peak Inflow Q (cfs) =	N/A	N/A	9.1	13.6	24.1	46.1	60.5	81.1	119.7
Peak Outflow Q (cfs) =	0.3	0.3	0.3	1.7	10.8	30.1	44.2	60.9	102.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.9	0.9	1.0	0.9	1.0
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.3	0.7	1.0	1.5	1.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	54	46	58	56	52	49	45	38
Time to Drain 99% of Inflow Volume (hours) =	**40**	57	48	61	60	58	57	55	52
Maximum Ponding Depth (ft) =	3.05	3.55	3.21	3.60	3.76	3.97	4.09	4.31	4.63
Area at Maximum Ponding Depth (acres) =	0.79	1.14	0.89	1.17	1.28	1.41	1.48	1.61	1.80
Maximum Volume Stored (acre-ft) =	0.674	1.156	0.801	1.214	1.398	1.680	1.868	2.193	2.755

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.09
	0:15:00	0.00	0.00	0.24	0.39	0.48	0.33	0.42	0.40	0.63
	0:20:00	0.00	0.00	0.99	1.36	2.26	1.03	1.23	1.29	2.26
	0:25:00	0.00	0.00	4.30	6.75	10.48	4.03	5.26	5.93	10.16
	0:30:00	0.00	0.00	7.70	11.88	20.49	20.41	27.93	34.66	54.89
	0:35:00	0.00	0.00	9.00	13.62	24.10	36.71	48.91	63.48	96.02
	0:40:00	0.00	0.00	9.10	13.64	23.83	44.83	58.80	76.92	114.10
	0:45:00	0.00	0.00	8.57	12.87	22.42	46.08	60.55	81.06	119.72
	0:50:00	0.00	0.00	7.84	11.98	20.57	44.30	58.51	79.50	117.49
	0:55:00	0.00	0.00	7.20	11.15	19.00	41.11	54.43	75.14	111.84
	1:00:00	0.00	0.00	6.63	10.35	17.65	37.69	49.89	70.73	106.17
	1:05:00	0.00	0.00	6.10	9.62	16.42	34.55	45.63	66.71	100.84
	1:10:00	0.00	0.00	5.67	9.10	15.49	31.42	41.44	61.25	92.94
	1:15:00	0.00	0.00	5.27	8.56	14.78	28.80	38.00	55.88	84.89
	1:20:00	0.00	0.00	4.89	7.94	13.88	26.35	34.78	50.74	77.03
	1:25:00	0.00	0.00	4.51	7.29	12.72	23.95	31.64	45.71	69.31
	1:30:00	0.00	0.00	4.13	6.64	11.46	21.57	28.48	40.97	62.06
	1:35:00	0.00	0.00	3.76	6.01	10.22	19.24	25.37	36.42	55.13
	1:40:00	0.00	0.00	3.40	5.38	9.06	16.95	22.30	32.00	48.44
	1:45:00	0.00	0.00	3.15	4.92	8.21	14.80	19.42	27.88	42.32
	1:50:00	0.00	0.00	2.99	4.58	7.64	13.28	17.44	24.93	37.97
	1:55:00	0.00	0.00	2.81	4.28	7.12	12.14	15.91	22.63	34.48
	2:00:00	0.00	0.00	2.62	3.99	6.60	11.19	14.63	20.63	31.41
	2:05:00	0.00	0.00	2.40	3.65	6.01	10.21	13.32	18.72	28.45
	2:10:00	0.00	0.00	2.16	3.28	5.39	9.25	12.06	16.88	25.61
	2:15:00	0.00	0.00	1.92	2.92	4.79	8.30	10.83	15.12	22.90
	2:20:00	0.00	0.00	1.70	2.57	4.22	7.38	9.62	13.45	20.35
	2:25:00	0.00	0.00	1.49	2.24	3.67	6.50	8.46	11.88	17.96
	2:30:00	0.00	0.00	1.28	1.93	3.14	5.63	7.32	10.34	15.61
	2:35:00	0.00	0.00	1.09	1.63	2.64	4.78	6.21	8.81	13.29
	2:40:00	0.00	0.00	0.89	1.34	2.16	3.95	5.11	7.29	10.99
	2:45:00	0.00	0.00	0.71	1.05	1.68	3.12	4.02	5.79	8.70
	2:50:00	0.00	0.00	0.53	0.79	1.24	2.31	2.95	4.30	6.45
	2:55:00	0.00	0.00	0.38	0.58	0.89	1.54	1.94	2.88	4.33
	3:00:00	0.00	0.00	0.30	0.46	0.69	0.98	1.23	1.87	2.89
	3:05:00	0.00	0.00	0.25	0.37	0.57	0.66	0.83	1.26	2.01
	3:10:00	0.00	0.00	0.21	0.31	0.47	0.48	0.60	0.87	1.40
	3:15:00	0.00	0.00	0.18	0.26	0.39	0.36	0.44	0.60	0.97
	3:20:00	0.00	0.00	0.15	0.21	0.32	0.28	0.34	0.42	0.67
	3:25:00	0.00	0.00	0.13	0.17	0.25	0.22	0.26	0.28	0.44
	3:30:00	0.00	0.00	0.11	0.14	0.20	0.17	0.20	0.19	0.29
	3:35:00	0.00	0.00	0.09	0.11	0.15	0.13	0.16	0.14	0.22
	3:40:00	0.00	0.00	0.07	0.09	0.12	0.10	0.12	0.11	0.17
	3:45:00	0.00	0.00	0.06	0.07	0.09	0.08	0.09	0.08	0.14
	3:50:00	0.00	0.00	0.04	0.05	0.07	0.06	0.07	0.07	0.11
	3:55:00	0.00	0.00	0.03	0.04	0.05	0.05	0.05	0.05	0.08
	4:00:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.06
	4:05:00	0.00	0.00	0.02	0.02	0.03	0.02	0.03	0.03	0.04
	4:10:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	4:15:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.00	32	0.001	0	0.000	0.00
	0.50	271	0.006	41	0.001	0.05
	1.00	1,955	0.045	426	0.010	0.08
	1.50	5,650	0.130	2,328	0.053	0.13
	2.00	11,435	0.263	6,254	0.144	0.17
	2.50	21,275	0.488	14,432	0.331	0.23
WQCV	2.98	32,310	0.742	27,030	0.621	0.29
	3.00	32,915	0.756	27,682	0.635	0.29
EURV	3.42	45,628	1.047	44,176	1.014	0.33
	3.50	48,049	1.103	47,923	1.100	0.33
	4.00	62,374	1.432	75,662	1.737	33.44
100-YR	4.22	67,986	1.561	90,002	2.066	60.12
	4.50	75,128	1.725	110,038	2.526	78.64
	5.00	86,032	1.975	150,633	3.458	194.14

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

POND D FOREBAY VOLUME REQUIREMENTS

Equation 3-1 $WQCV = a(0.91I^3 - 1.19I^2 + 0.781I)$

a=1 (40 hour drain time)

Proposed Forebay	*I=.124*	*WQCV=*	0.080158
Future Forebay	*I=.147*	*WQCV=*	0.091836

Equation 3-3 $V=(WQCV/12)A$

Proposed Forebay	A= 40.72 Acres	V=	0.272
Future Forebay	A= 33.94 Acres	V=	0.260

3% OF WQCV

FOREBAY TOTAL VOLUME= .03(V)

VOLUME REQUIRED FOR PROPOSED FOREBAY=	0.008 AC-FT	355 CF
VOLUME REQUIRED FOR FUTURE FOREBAY =	0.008 AC-FT	339 CF
VOLUME PROVIDED FOR PROPOSED FOREBAY =	0.009 AC-FT	386 CF

Q_{100} Discharges	2% OF Q_{100}
Q_{100} Proposed Forebay 1=	.02*51.7 CFS= 1.03 CFS
Q_{100} Future Forebay=	.02*37.3 CFS= 0.75 CFS

Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Mar 7 2024

Pond D Forebay 1 Notch

V-Notch Weir

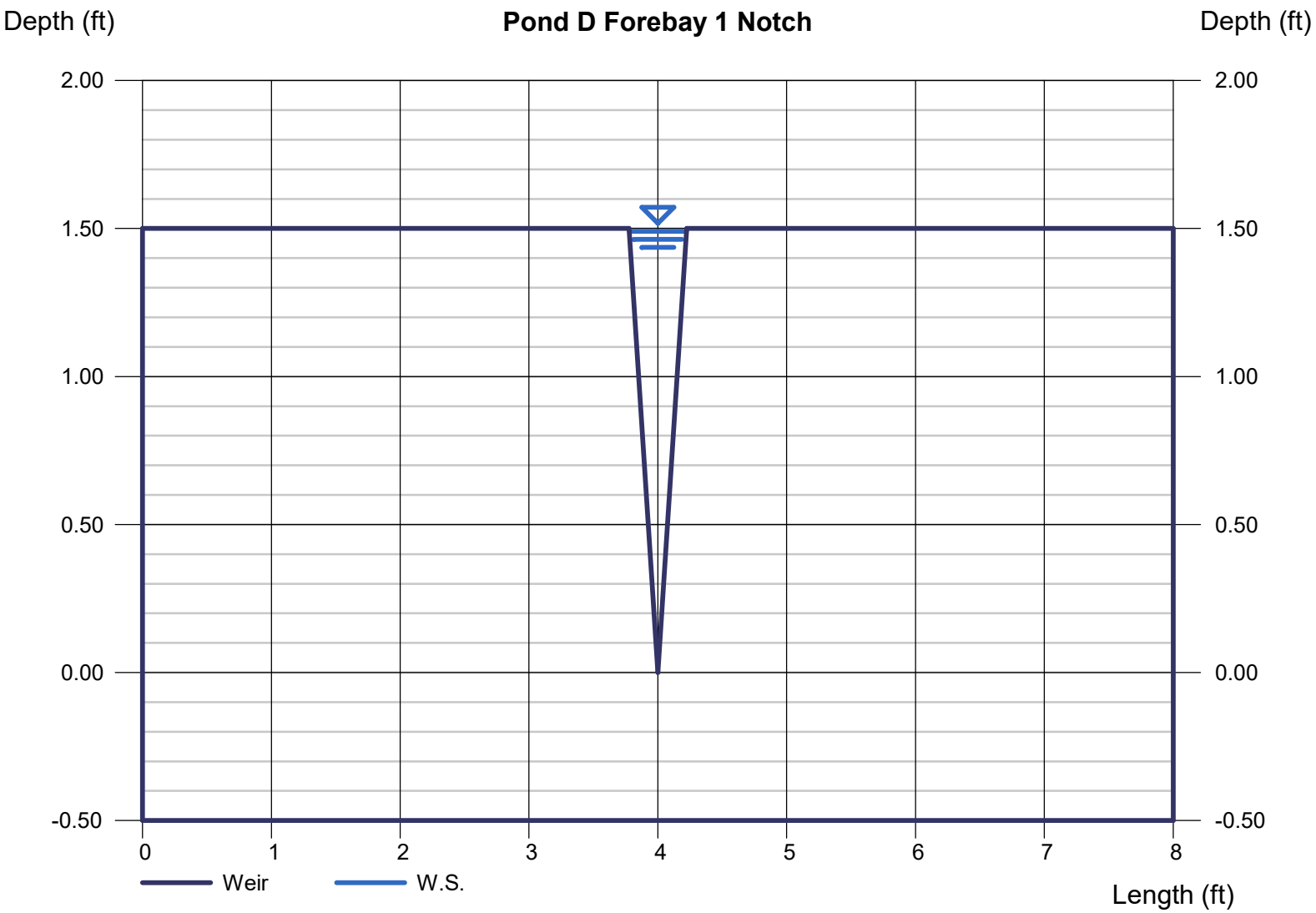
Crest	= Sharp
Angle (Deg)	= 17
Total Depth (ft)	= 1.50

Calculations

Weir Coeff. Cw	= 0.38
Compute by:	Known Q
Known Q (cfs)	= 1.03

Highlighted

Depth (ft)	= 1.49
Q (cfs)	= 1.030
Area (sqft)	= 0.33
Velocity (ft/s)	= 3.10
Top Width (ft)	= 0.45



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Dec 13 2021

Pond D Trickle Channel

Rectangular

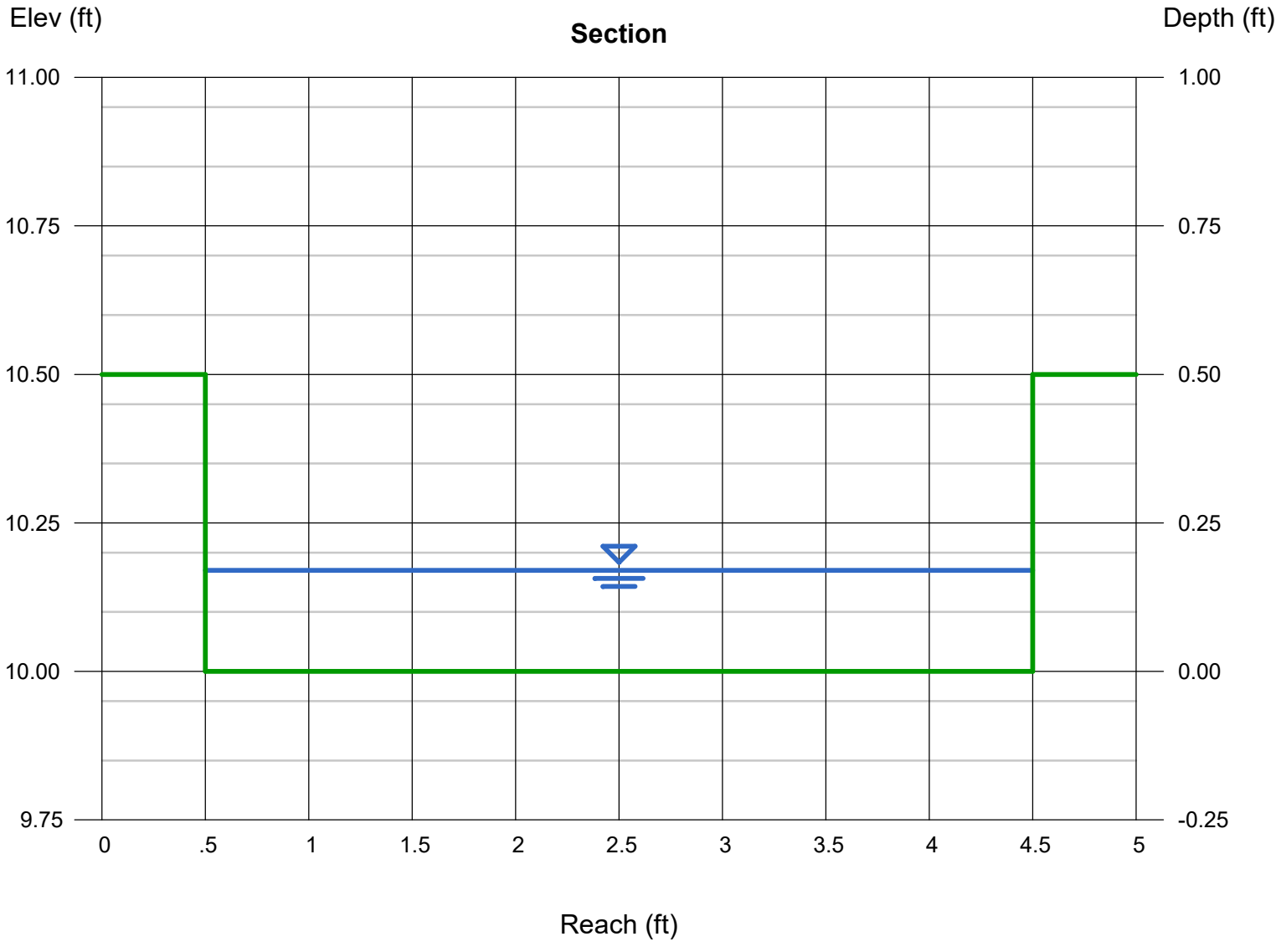
Bottom Width (ft)	= 4.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 10.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.52

Highlighted

Depth (ft)	= 0.17
Q (cfs)	= 1.520
Area (sqft)	= 0.68
Velocity (ft/s)	= 2.24
Wetted Perim (ft)	= 4.34
Crit Depth, Yc (ft)	= 0.17
Top Width (ft)	= 4.00
EGL (ft)	= 0.25



Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jun 27 2023

Pond D Spillway

Trapezoidal Weir

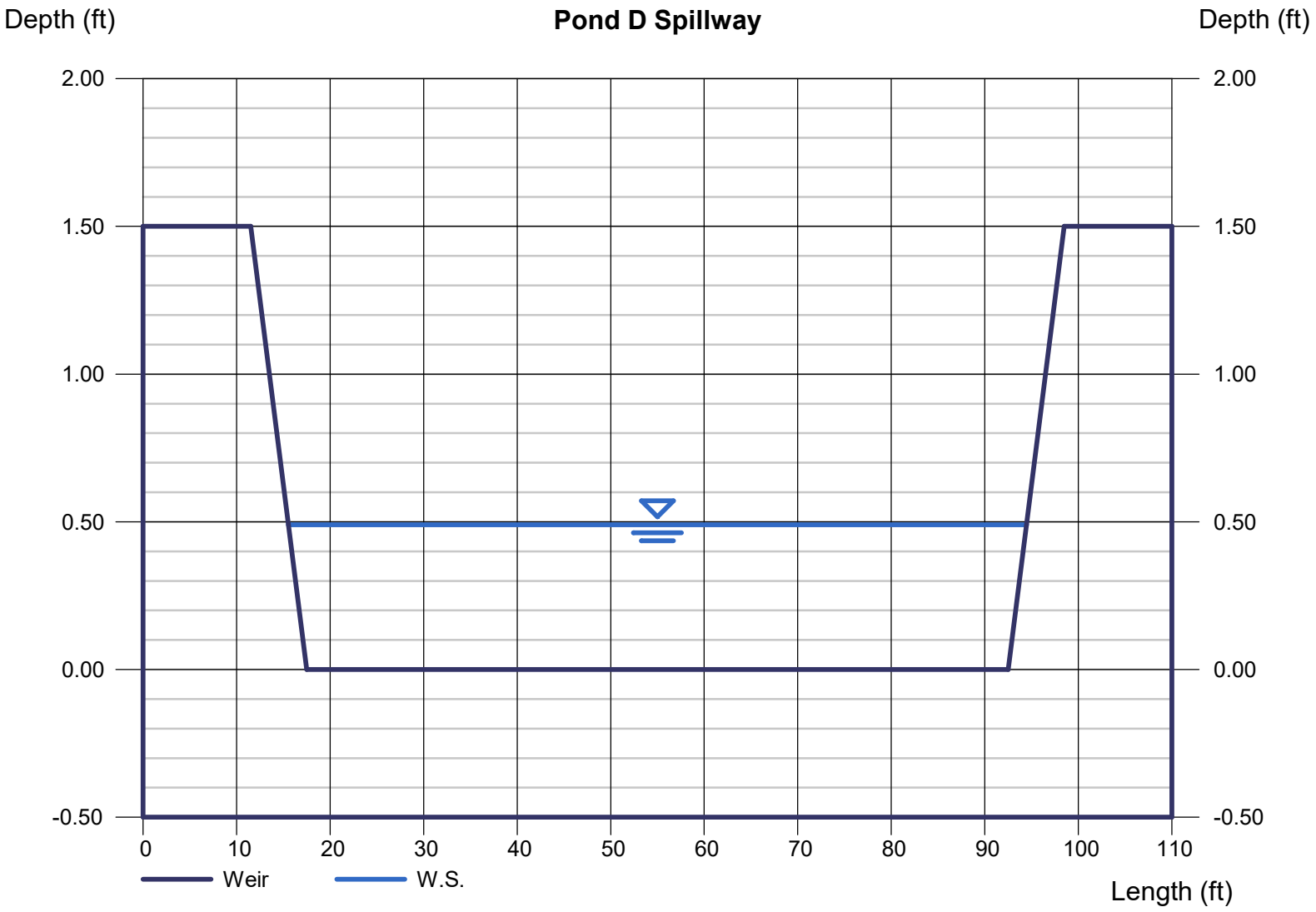
Crest	= Sharp
Bottom Length (ft)	= 75.00
Total Depth (ft)	= 1.50
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 81.10

Highlighted

Depth (ft)	= 0.49
Q (cfs)	= 81.10
Area (sqft)	= 37.71
Velocity (ft/s)	= 2.15
Top Width (ft)	= 78.92

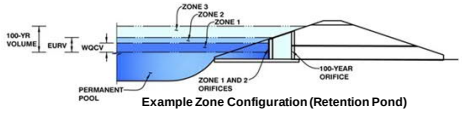


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Saddlehorn Filing 3

Basin ID: Pond E



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	18.37	acres
Watershed Length =	1,810	ft
Watershed Length to Centroid =	803	ft
Watershed Slope =	0.012	ft/ft
Watershed Imperviousness =	8.10%	percent
Percentage Hydrologic Soil Group A =	83.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	17.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

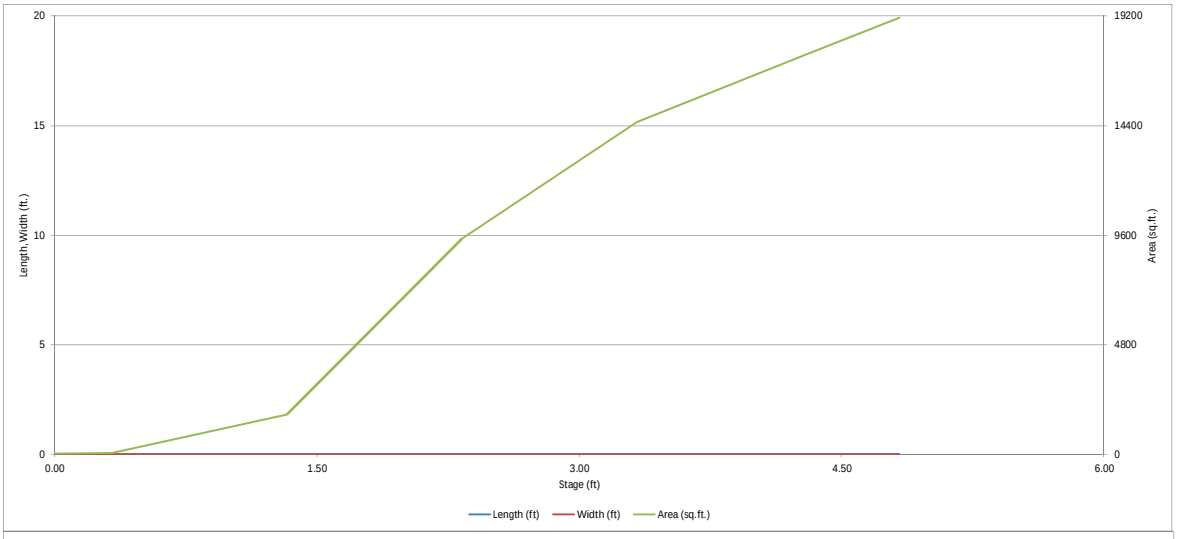
			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.086	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.106	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.065	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.106	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.204	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	0.592	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.859	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.292	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	2.174	acre-feet	inches
Approximate 2-yr Detention Volume =	0.067	acre-feet	
Approximate 5-yr Detention Volume =	0.113	acre-feet	
Approximate 10-yr Detention Volume =	0.153	acre-feet	
Approximate 25-yr Detention Volume =	0.199	acre-feet	
Approximate 50-yr Detention Volume =	0.254	acre-feet	
Approximate 100-yr Detention Volume =	0.419	acre-feet	

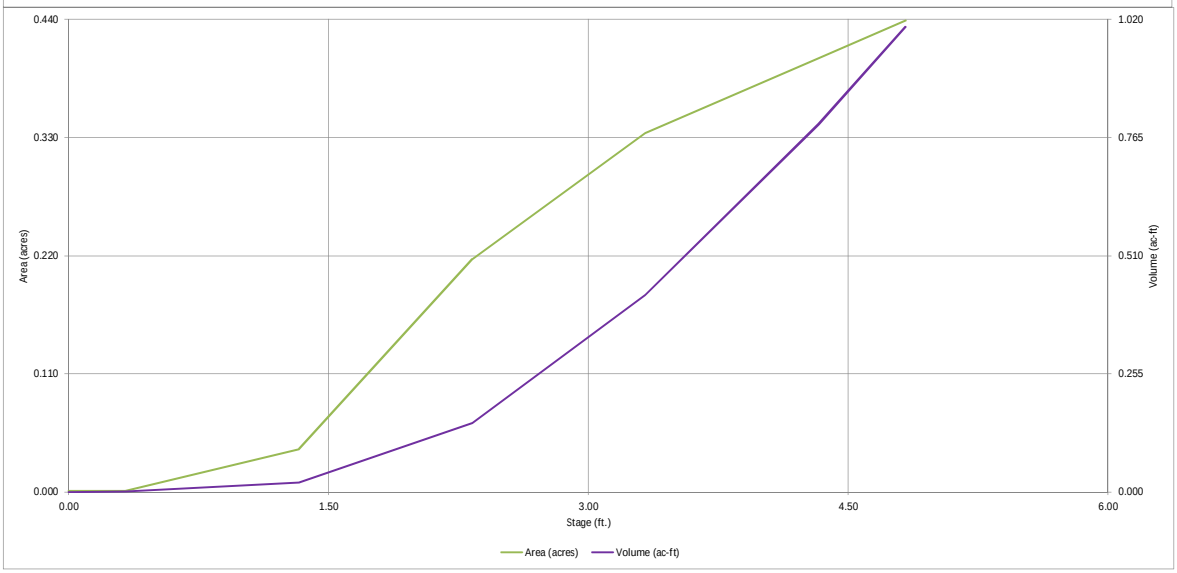
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.086	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.021	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.313	acre-feet
Total Detention Basin Volume =	0.419	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio (R_{LW}) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
6720.67 Top of Micropool	--	0.00	--	--	--	32	0.001		
6721	--	0.33	--	--	--	50	0.001	14	0.000
6722	--	1.33	--	--	--	1,723	0.040	900	0.021
6723	--	2.33	--	--	--	9,446	0.217	6,484	0.149
6724	--	3.33	--	--	--	14,566	0.334	18,490	0.424
6725	--	4.33	--	--	--	17,600	0.404	34,573	0.794
6725.5	--	4.83	--	--	--	19,121	0.439	43,754	1.004


20
15
10
5
0
Length, Width (ft.)
19200
14400
9600
4800
0
Area (sq.ft.)
0.00
1.50
3.00
4.50
6.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

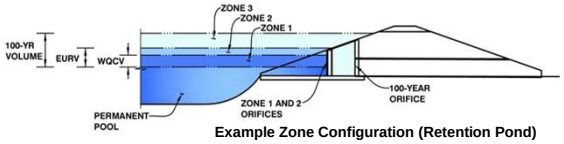

0.440
0.330
0.220
0.110
0.000
Area (acres)
1.020
0.765
0.510
0.255
0.000
Volume (ac-ft)
0.00
1.50
3.00
4.50
6.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Saddlehorn Filing 3

Basin ID: Pond E



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.00	0.086	Orifice Plate
Zone 2 (EURV)	2.12	0.021	Orifice Plate
Zone 3 (100-year)	3.32	0.313	Weir&Pipe (Restrict)
Total (all zones)		0.419	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.153E-03	ft^2
Depth at top of Zone using Orifice Plate =	2.12	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.31	sq. inches (diameter = 5/8 inch)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.60	1.20					
Orifice Area (sq. inches)	0.31	0.31	0.31					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected				
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A feet
Vertical Orifice Diameter =	N/A	N/A	inches			

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected				
Overflow Weir Front Edge Height, Ho =	2.30	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.55	N/A feet
Overflow Weir Front Edge Length =	5.00	N/A	feet	Overflow Weir Slope Length =	5.15	N/A feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	10.15	N/A
Horiz. Length of Weir Sides =	5.00	N/A	feet	Overflow Grate Open Area w/o Debris =	17.94	N/A ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	17.94	N/A ft^2
Debris Clogging % =	0%	N/A	%			

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected				
Depth to Invert of Outlet Pipe =	1.15	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	N/A ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75	N/A feet
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.33	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.38	feet
Spillway Crest Length =	15.00	feet	Stage at Top of Freeboard =	4.71	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.43	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.95	acre-ft

Calculated Parameters for Spillway

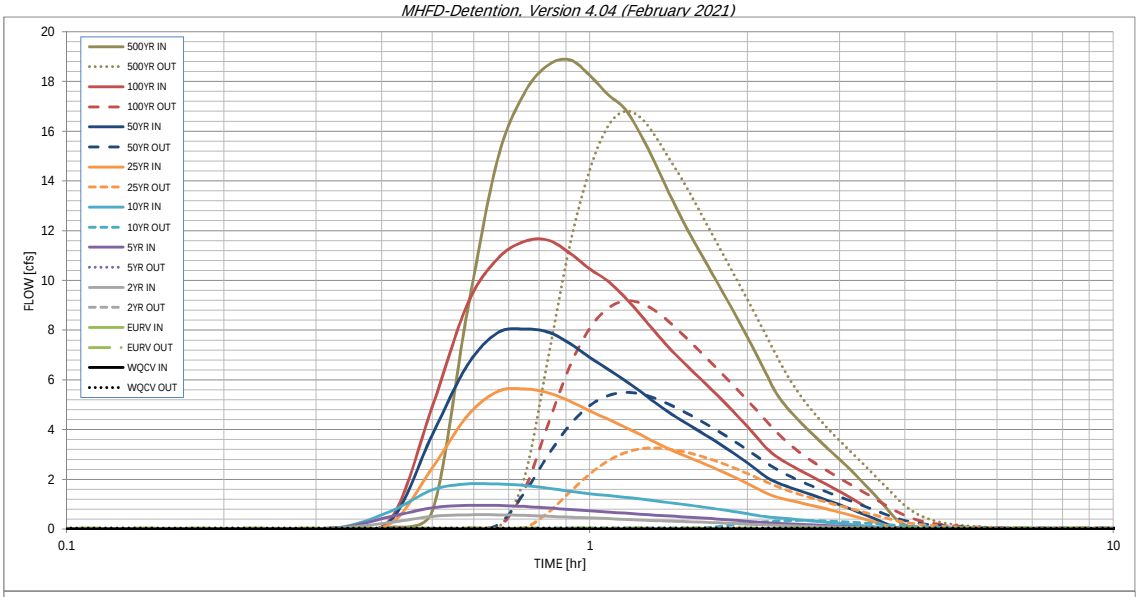
Routed Hydrograph Results

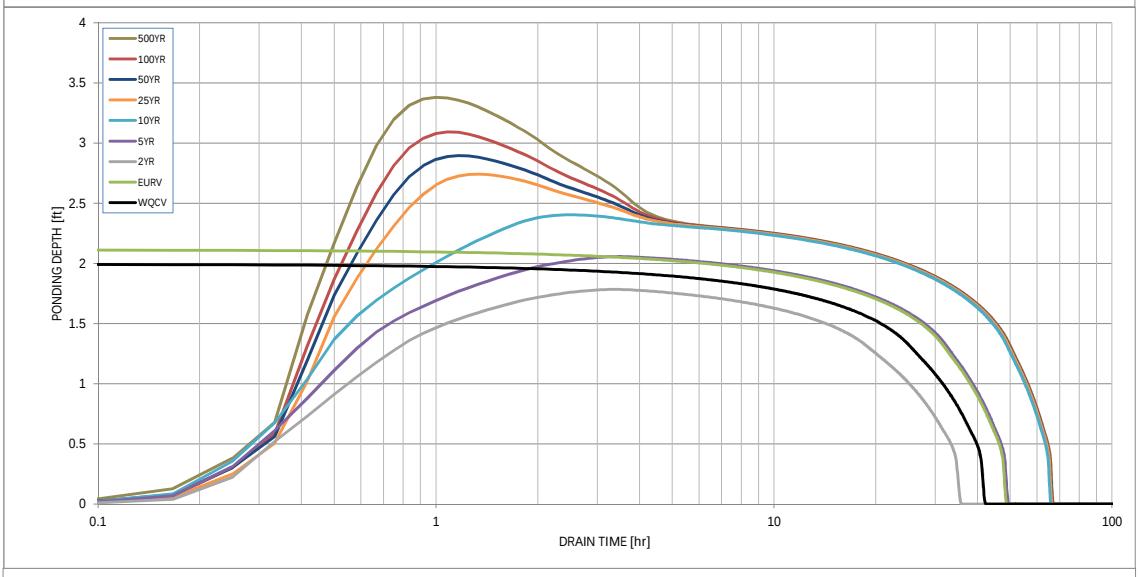
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

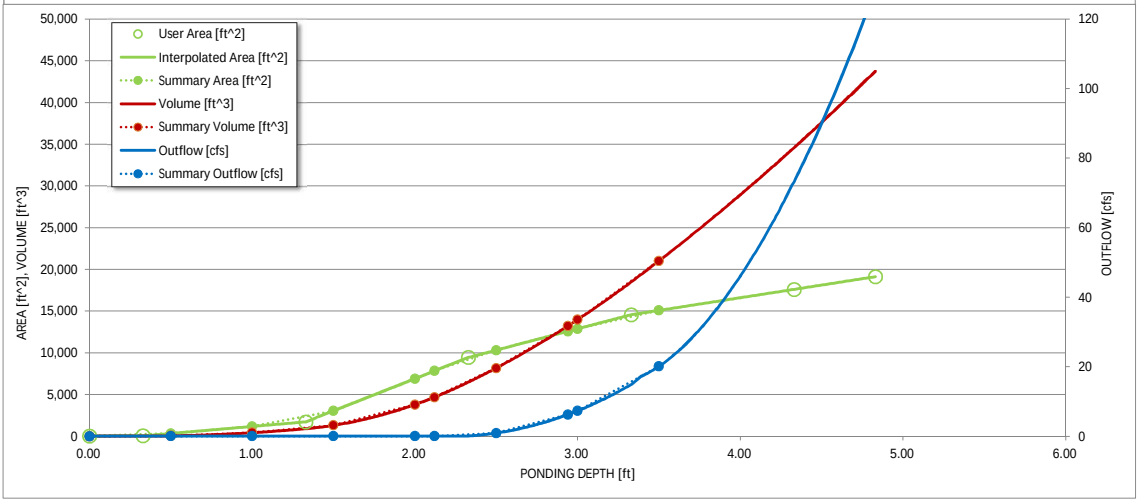
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.086	0.106	0.065	0.106	0.204	0.592	0.859	1.292	2.174
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.065	0.106	0.204	0.592	0.859	1.292	2.174
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.9	4.6	7.0	10.5	17.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.05	0.25	0.38	0.57	0.96
Peak Inflow Q (cfs) =	N/A	N/A	0.6	1.0	1.8	5.6	8.0	11.6	18.9
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.0	0.3	3.3	5.5	9.2	16.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.4	0.7	0.8	0.9	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.2	0.3	0.5	0.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	44	32	44	58	51	47	42	32
Time to Drain 99% of Inflow Volume (hours) =	40	46	34	47	62	59	57	54	49
Maximum Ponding Depth (ft) =	2.00	2.12	1.78	2.06	2.40	2.74	2.90	3.09	3.38
Area at Maximum Ponding Depth (acres) =	0.16	0.18	0.12	0.17	0.23	0.27	0.28	0.31	0.34
Maximum Volume Stored (acre-ft) =	0.087	0.107	0.056	0.095	0.164	0.248	0.289	0.348	0.438

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:15:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	0:20:00	0.00	0.00	0.04	0.06	0.07	0.04	0.05	0.06	0.07
	0:25:00	0.00	0.00	0.27	0.50	0.72	0.23	0.34	0.41	0.72
	0:30:00	0.00	0.00	0.51	0.86	1.57	2.46	3.79	4.91	8.73
	0:35:00	0.00	0.00	0.57	0.95	1.81	4.55	6.58	9.03	14.87
	0:40:00	0.00	0.00	0.57	0.95	1.81	5.53	7.89	10.87	17.53
	0:45:00	0.00	0.00	0.55	0.91	1.75	5.64	8.05	11.57	18.66
	0:50:00	0.00	0.00	0.52	0.85	1.64	5.48	7.92	11.61	18.87
	0:55:00	0.00	0.00	0.48	0.78	1.52	5.14	7.46	11.09	18.24
	1:00:00	0.00	0.00	0.45	0.73	1.42	4.75	6.90	10.46	17.47
	1:05:00	0.00	0.00	0.42	0.69	1.35	4.42	6.43	9.97	16.90
	1:10:00	0.00	0.00	0.39	0.64	1.28	4.11	5.98	9.32	15.88
	1:15:00	0.00	0.00	0.37	0.60	1.21	3.80	5.54	8.62	14.71
	1:20:00	0.00	0.00	0.34	0.56	1.14	3.49	5.08	7.92	13.52
	1:25:00	0.00	0.00	0.32	0.53	1.06	3.22	4.69	7.30	12.46
	1:30:00	0.00	0.00	0.31	0.50	1.00	2.99	4.36	6.76	11.55
	1:35:00	0.00	0.00	0.29	0.47	0.93	2.79	4.06	6.28	10.72
	1:40:00	0.00	0.00	0.27	0.44	0.87	2.60	3.77	5.83	9.94
	1:45:00	0.00	0.00	0.26	0.41	0.81	2.41	3.49	5.40	9.19
	1:50:00	0.00	0.00	0.24	0.38	0.74	2.22	3.22	4.97	8.45
	1:55:00	0.00	0.00	0.22	0.35	0.68	2.03	2.94	4.54	7.72
	2:00:00	0.00	0.00	0.20	0.31	0.62	1.84	2.66	4.12	7.01
	2:05:00	0.00	0.00	0.18	0.28	0.55	1.65	2.38	3.70	6.31
	2:10:00	0.00	0.00	0.16	0.26	0.50	1.46	2.11	3.29	5.61
	2:15:00	0.00	0.00	0.15	0.24	0.47	1.32	1.92	2.99	5.12
	2:20:00	0.00	0.00	0.14	0.22	0.44	1.23	1.78	2.77	4.73
	2:25:00	0.00	0.00	0.13	0.21	0.41	1.15	1.67	2.57	4.40
	2:30:00	0.00	0.00	0.12	0.20	0.38	1.08	1.56	2.40	4.09
	2:35:00	0.00	0.00	0.12	0.18	0.35	1.01	1.46	2.24	3.81
	2:40:00	0.00	0.00	0.11	0.17	0.33	0.94	1.36	2.09	3.54
	2:45:00	0.00	0.00	0.10	0.16	0.30	0.87	1.27	1.94	3.28
	2:50:00	0.00	0.00	0.09	0.14	0.28	0.81	1.17	1.80	3.04
	2:55:00	0.00	0.00	0.08	0.13	0.25	0.74	1.07	1.65	2.80
	3:00:00	0.00	0.00	0.08	0.12	0.23	0.68	0.98	1.51	2.57
	3:05:00	0.00	0.00	0.07	0.11	0.21	0.61	0.89	1.37	2.33
	3:10:00	0.00	0.00	0.06	0.09	0.18	0.55	0.79	1.23	2.09
	3:15:00	0.00	0.00	0.05	0.08	0.16	0.48	0.70	1.09	1.85
	3:20:00	0.00	0.00	0.04	0.07	0.14	0.42	0.60	0.95	1.62
	3:25:00	0.00	0.00	0.04	0.06	0.11	0.35	0.51	0.81	1.38
	3:30:00	0.00	0.00	0.03	0.05	0.09	0.29	0.42	0.67	1.14
	3:35:00	0.00	0.00	0.02	0.03	0.07	0.22	0.32	0.53	0.91
	3:40:00	0.00	0.00	0.02	0.02	0.05	0.16	0.23	0.39	0.67
	3:45:00	0.00	0.00	0.01	0.01	0.03	0.10	0.14	0.25	0.44
	3:50:00	0.00	0.00	0.01	0.01	0.02	0.05	0.07	0.14	0.27
	3:55:00	0.00	0.00	0.01	0.01	0.02	0.03	0.04	0.08	0.17
	4:00:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.05	0.11
	4:05:00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.07
	4:10:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.04
	4:15:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	4:20:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.00	32	0.001	0	0.000	0.00
	0.50	334	0.008	46	0.001	0.01
	1.00	1,171	0.027	423	0.010	0.02
	1.50	3,036	0.070	1,304	0.030	0.03
WQCV	2.00	6,897	0.158	3,788	0.087	0.04
EURV	2.12	7,824	0.180	4,671	0.107	0.04
	2.50	10,316	0.237	8,164	0.187	0.91
100-YR	2.94	12,569	0.289	13,199	0.303	6.22
	3.00	12,876	0.296	13,962	0.321	7.30
	3.50	15,082	0.346	21,011	0.482	20.07

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

POND E FOREBAY VOLUME REQUIREMENTS

Equation 3-1 $WQCV = a(0.91I^3 - 1.19I^2 + 0.781I)$

a=1 (40 hour drain time)

Forebay 1 *I=.082* *WQCV=* 0.05646

Equation 3-3 V=(WQCV/12)A

Forebay 1 A= 17.69 Acres V= 0.083

3% OF WQCV

FOREBAY TOTAL VOLUME= .03(V)

VOLUME REQUIRED FOR FOREBAY 1 = 0.002 AC-FT 109 CF

VOLUME PROVIDED FOR FOREBAY 1 = 0.003 AC-FT 137 CF

Q_{100} Discharges 2% OF Q_{100}

Q_{100} Forebay 1= .02*12.6 CFS= 0.25 CFS

Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Nov 3 2023

Pond E Forebay Notch

V-Notch Weir

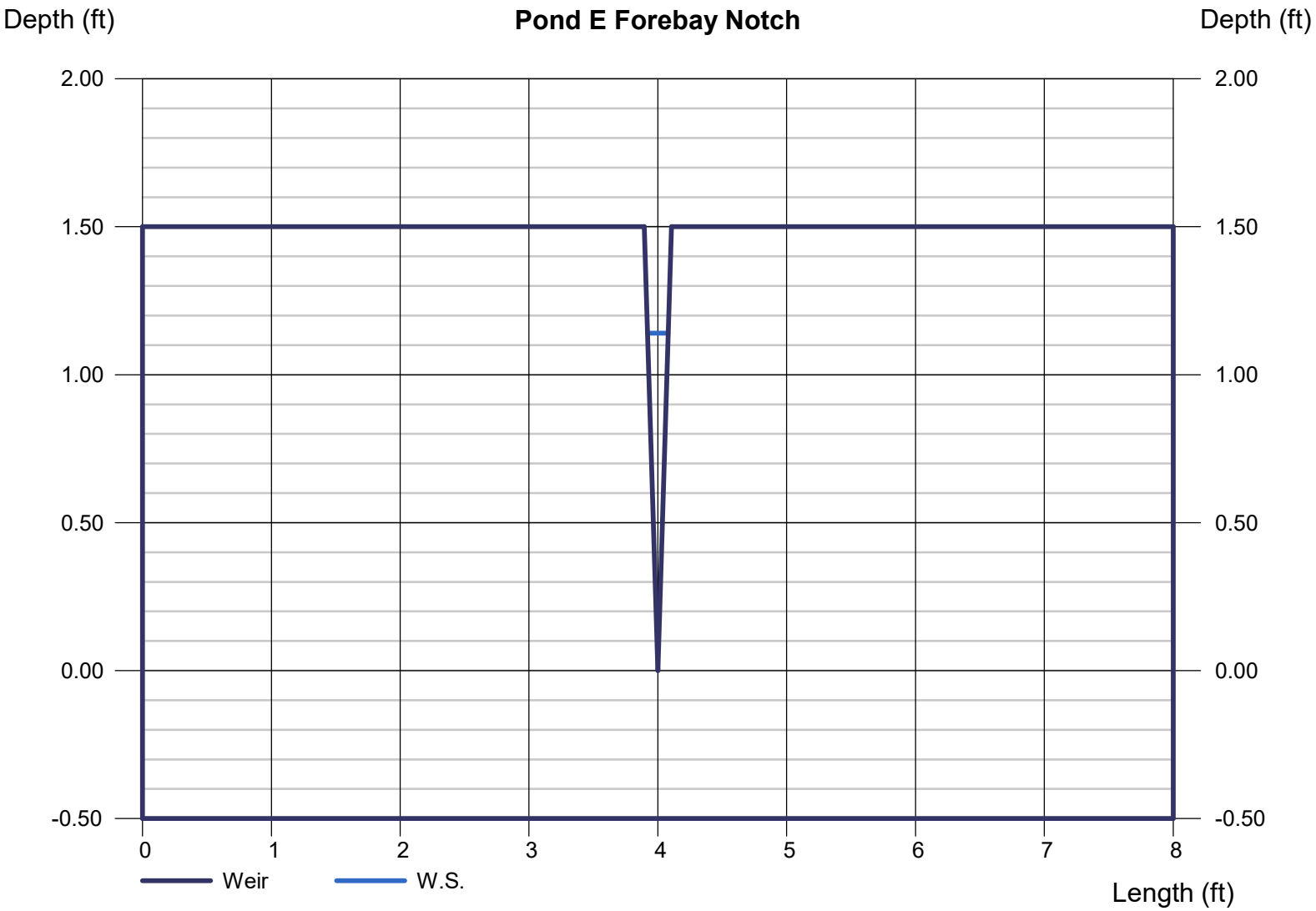
Crest	= Sharp
Angle (Deg)	= 8
Total Depth (ft)	= 1.50

Calculations

Weir Coeff. Cw	= 0.18
Compute by:	Known Q
Known Q (cfs)	= 0.25

Highlighted

Depth (ft)	= 1.14
Q (cfs)	= 0.250
Area (sqft)	= 0.09
Velocity (ft/s)	= 2.75
Top Width (ft)	= 0.16



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Dec 13 2021

Pond E Trickle Channel

Rectangular

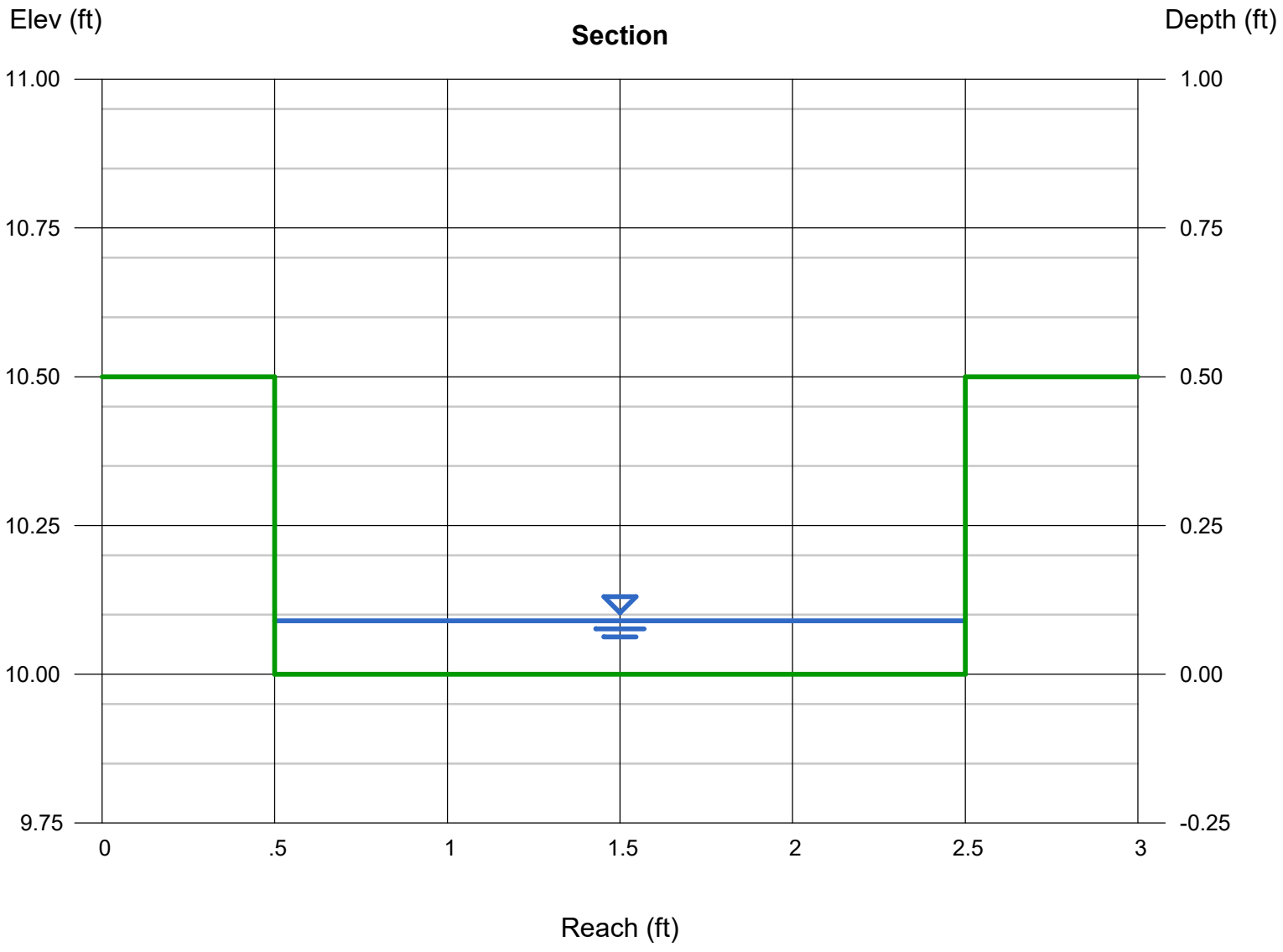
Bottom Width (ft)	= 2.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 10.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.25

Highlighted

Depth (ft)	= 0.09
Q (cfs)	= 0.250
Area (sqft)	= 0.18
Velocity (ft/s)	= 1.39
Wetted Perim (ft)	= 2.18
Crit Depth, Yc (ft)	= 0.08
Top Width (ft)	= 2.00
EGL (ft)	= 0.12



Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Dec 13 2021

Pond E Spillway

Trapezoidal Weir

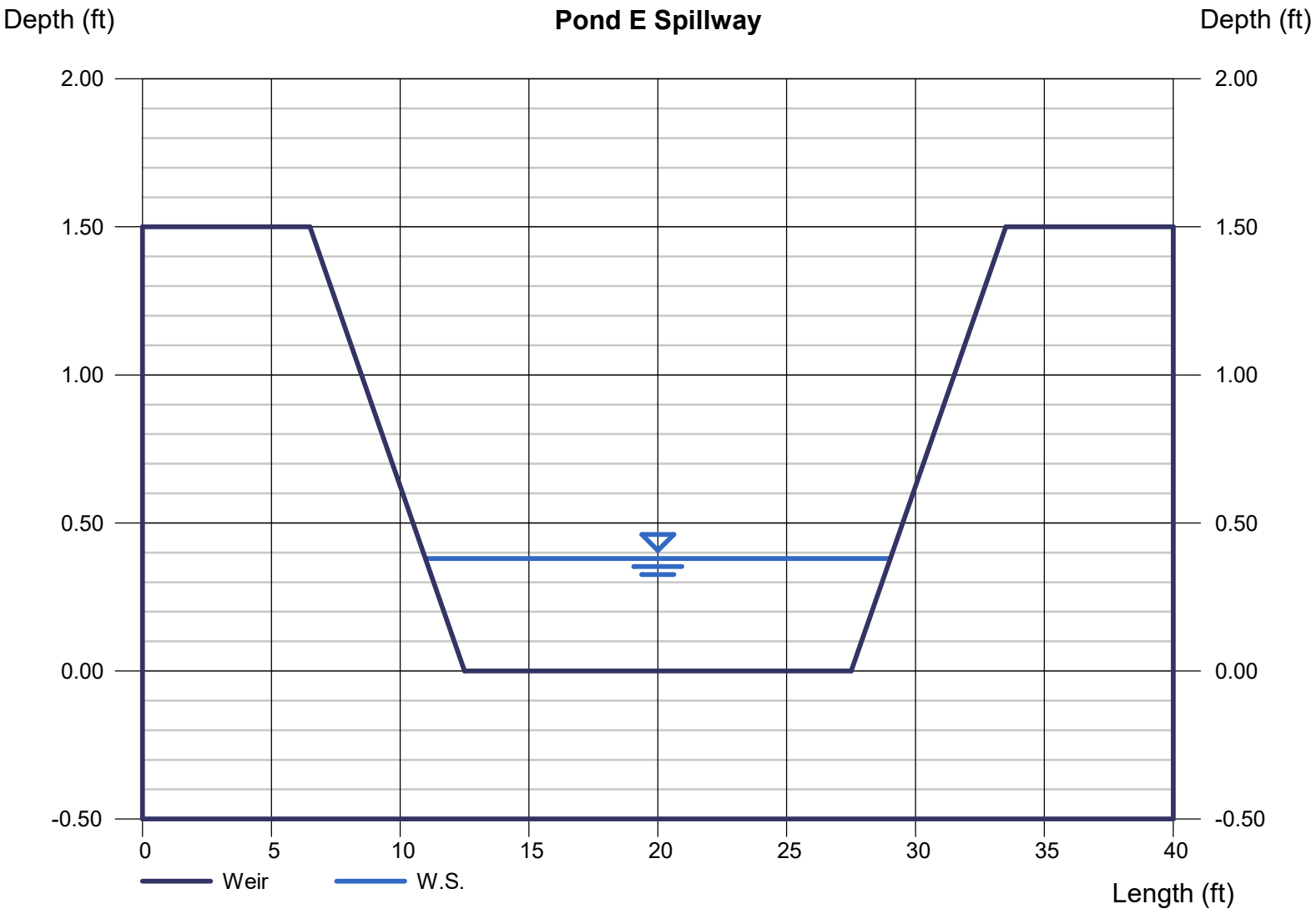
Crest	= Sharp
Bottom Length (ft)	= 15.00
Total Depth (ft)	= 1.50
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 11.60

Highlighted

Depth (ft)	= 0.38
Q (cfs)	= 11.60
Area (sqft)	= 6.28
Velocity (ft/s)	= 1.85
Top Width (ft)	= 18.04



Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected Worksheet Protected

Stormwater Facility Name: Saddlehorn Filing 3 - Pond C

Facility Location & Jurisdiction: El Paso County - Saddlehorn Ranch Metropolitan District

User Input: Watershed Characteristics

Watershed Slope =	0.012	ft/ft
Watershed Length =	5370	ft
Watershed Area =	96.84	acres
Watershed Imperviousness =	14.6%	percent
Percentage Hydrologic Soil Group A =	93.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	7.0%	percent

Location for 1-hr Rainfall Depths (use dropdown): User Input

WQCV Treatment Method = Extended Detention

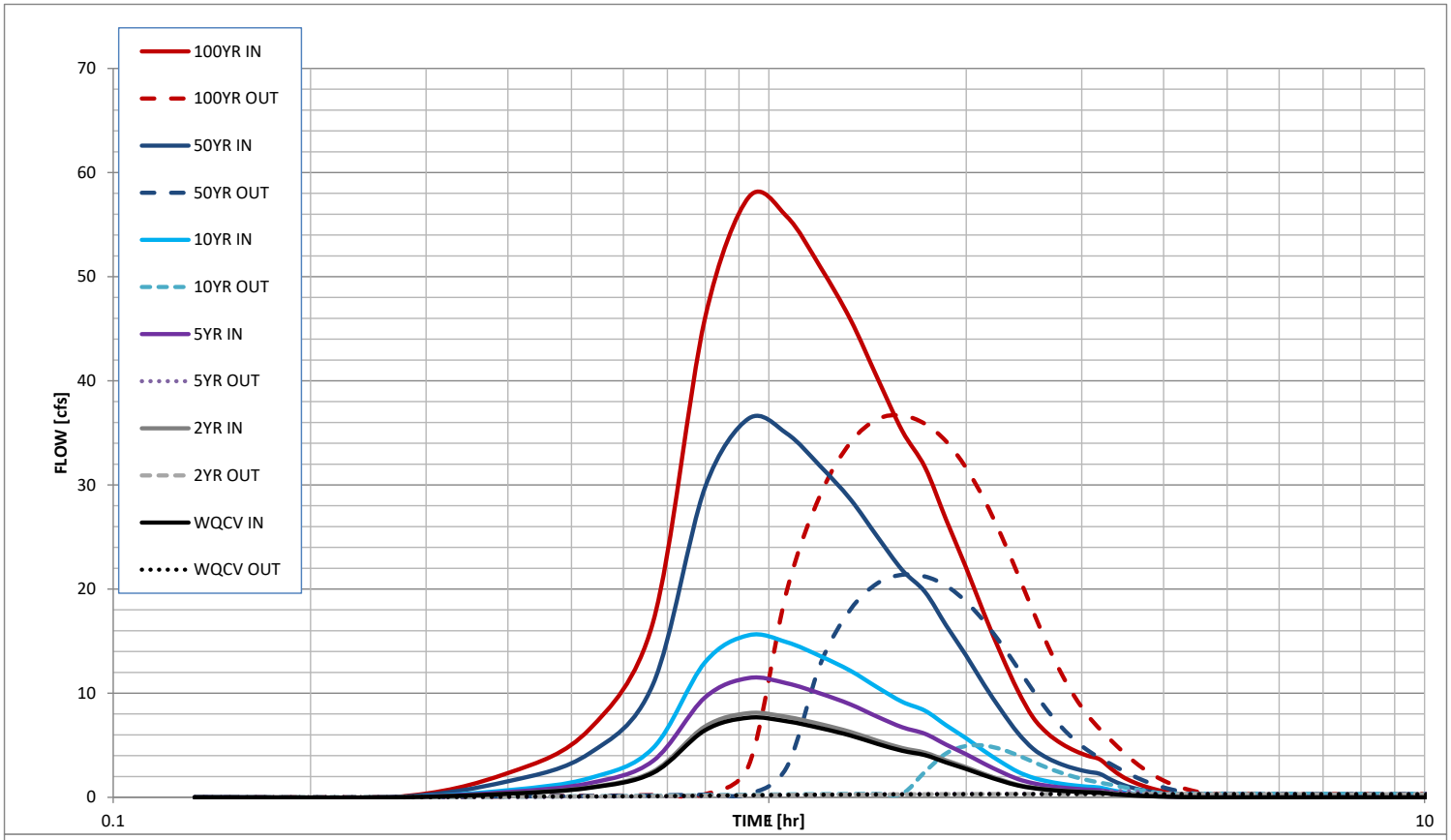
User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	32	0.00	0.00
0.33	50	0.33	0.05
1.00	3,260	1.00	0.11
2.00	17,980	2.00	0.24
3.00	46,439	3.00	0.35
4.00	73,964	4.00	41.88
5.00	86,681	5.00	237.69
5.50	89,520	5.50	408.05

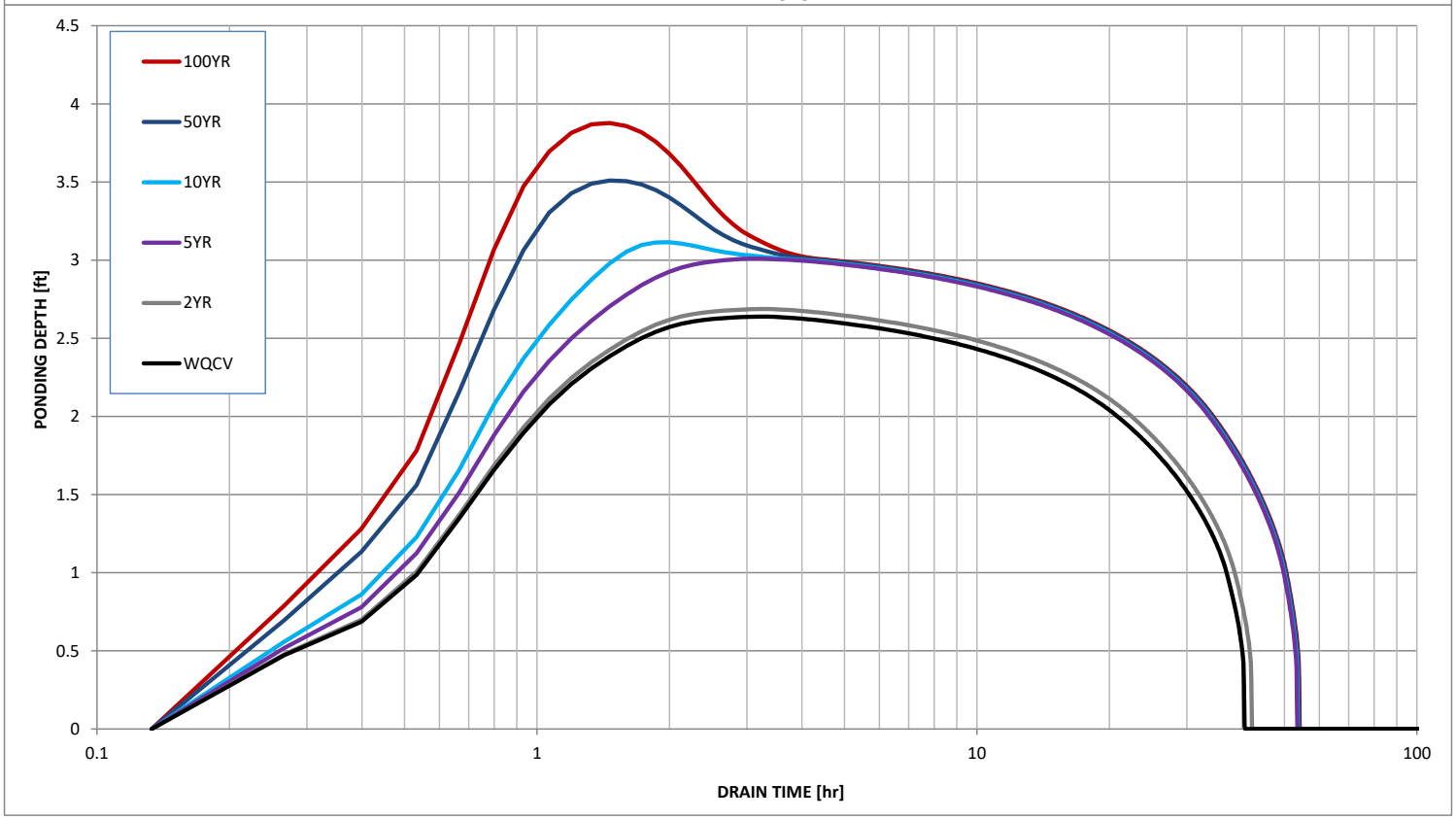
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.25	2.52	in
Calculated Runoff Volume =	0.737	0.780	1.110	1.513	3.577	5.724	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	0.736	0.779	1.109	1.513	3.577	5.722	acre-ft
Time to Drain 97% of Inflow Volume =	37.4	38.9	**49.0**	48.1	43.7	39.8	hours
Time to Drain 99% of Inflow Volume =	39.3	40.9	51.6	51.2	49.4	**47.7**	hours
Maximum Ponding Depth =	2.64	2.69	3.01	3.11	3.51	3.88	ft
Maximum Ponded Area =	0.83	0.86	1.07	1.13	1.38	**1.62**	acres
Maximum Volume Stored =	0.662	0.702	1.014	1.127	1.624	2.180	acre-ft

Stormwater Detention and Infiltration Design Data Sheet





Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected Worksheet Protected

Stormwater Facility Name: Saddlehorn Ranch Filing 3 - Pond D

Facility Location & Jurisdiction: El Paso County - Saddlehorn Ranch Metropolitan District

User Input: Watershed Characteristics

Watershed Slope =	0.012	ft/ft
Watershed Length =	3473	ft
Watershed Area =	78.02	acres
Watershed Imperviousness =	15.4%	percent
Percentage Hydrologic Soil Group A =	70.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	30.0%	percent

Location for 1-hr Rainfall Depths (use dropdown): User Input

WQCV Treatment Method = Extended Detention

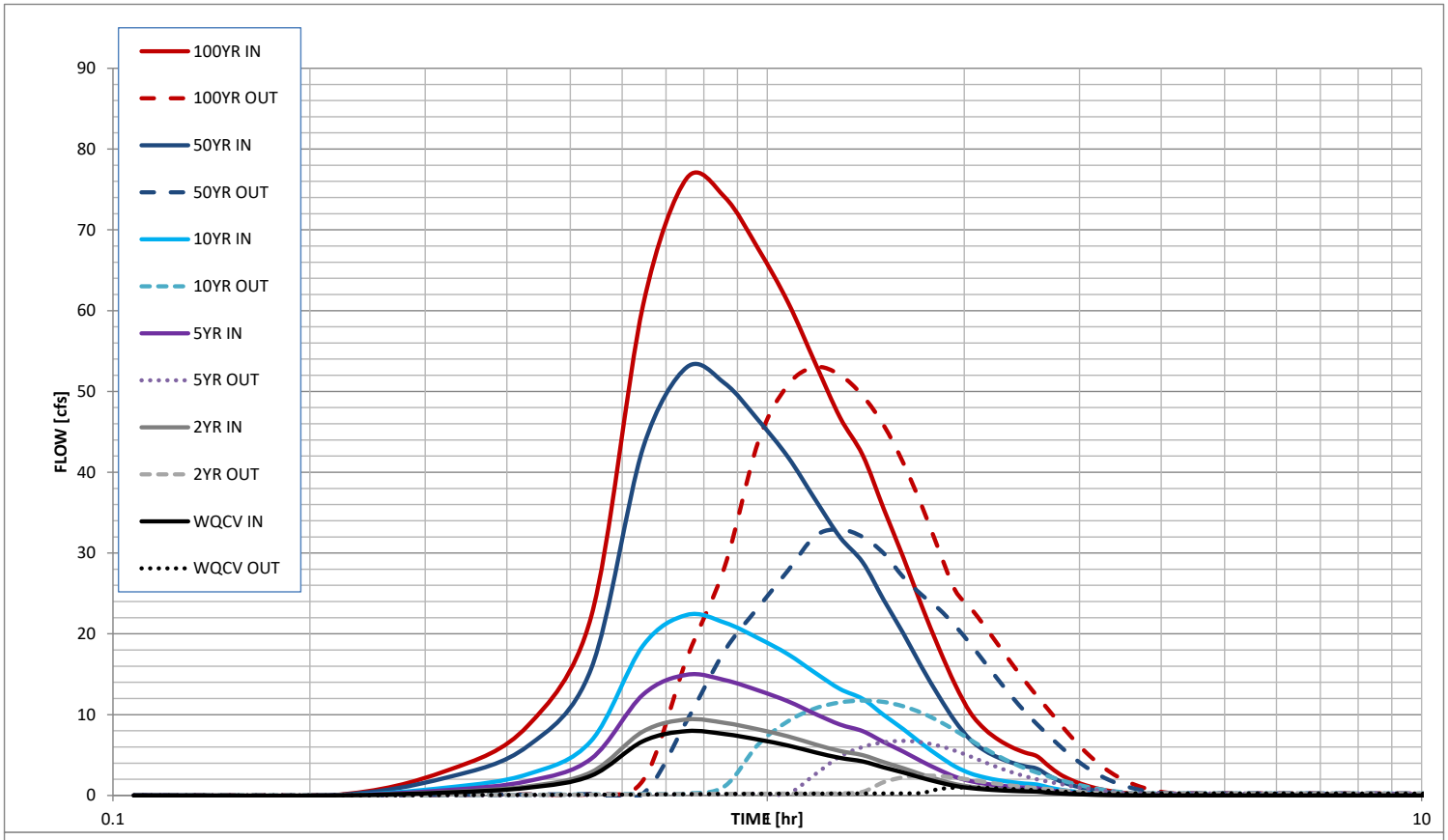
User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	32	0.00	0.00
0.33	50	0.33	0.04
0.83	699	0.83	0.06
1.83	8,089	1.83	0.15
2.83	27,770	2.83	0.26
3.83	58,037	3.83	25.71
4.33	70,791	4.33	61.17
4.83	83,546	4.83	146.98
5.83	98,172	5.83	513.83

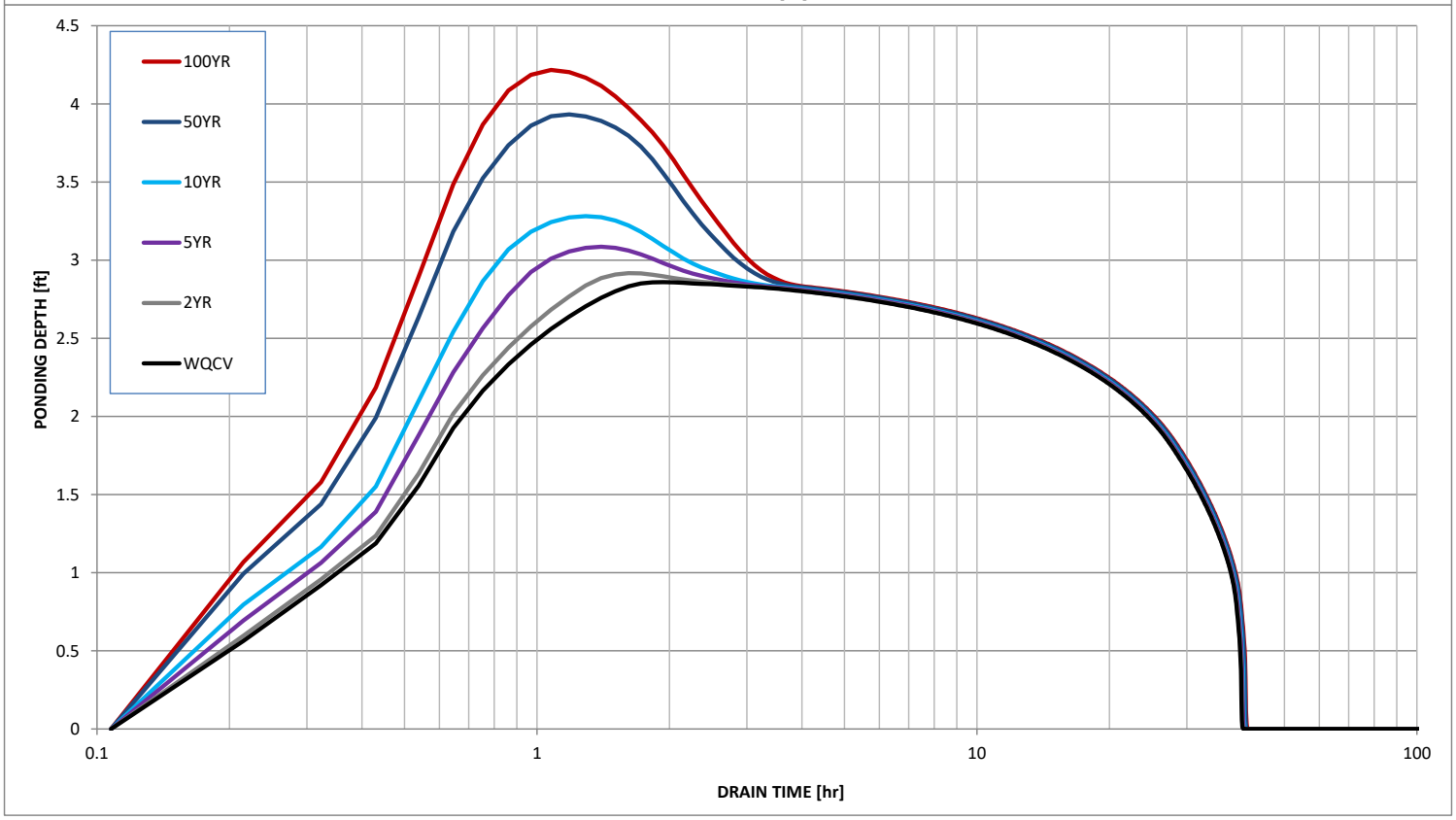
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.25	2.52	in
Calculated Runoff Volume =	0.619	0.733	1.170	1.758	4.226	6.144	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	0.619	0.733	1.170	1.758	4.226	6.142	acre-ft
Time to Drain 97% of Inflow Volume =	36.5	36.0	**34.5**	32.7	26.5	22.5	hours
Time to Drain 99% of Inflow Volume =	38.5	38.3	37.8	37.0	34.2	**32.4**	hours
Maximum Ponding Depth =	2.86	2.92	3.09	3.28	3.93	4.22	ft
Maximum Ponded Area =	0.65	0.70	0.81	0.95	1.39	**1.56**	acres
Maximum Volume Stored =	0.533	0.573	0.701	0.872	1.637	2.055	acre-ft

Stormwater Detention and Infiltration Design Data Sheet





Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected Worksheet Protected

Stormwater Facility Name: Saddlehorn Ranch Filing 3 - Pond E

Facility Location & Jurisdiction: El Paso County - Saddlehorn Ranch Metropolitan District

User Input: Watershed Characteristics

Watershed Slope =	0.012	ft/ft
Watershed Length =	1810	ft
Watershed Area =	18.37	acres
Watershed Imperviousness =	8.1%	percent
Percentage Hydrologic Soil Group A =	83.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	17.0%	percent

Location for 1-hr Rainfall Depths (use dropdown): User Input

WQCV Treatment Method = Extended Detention

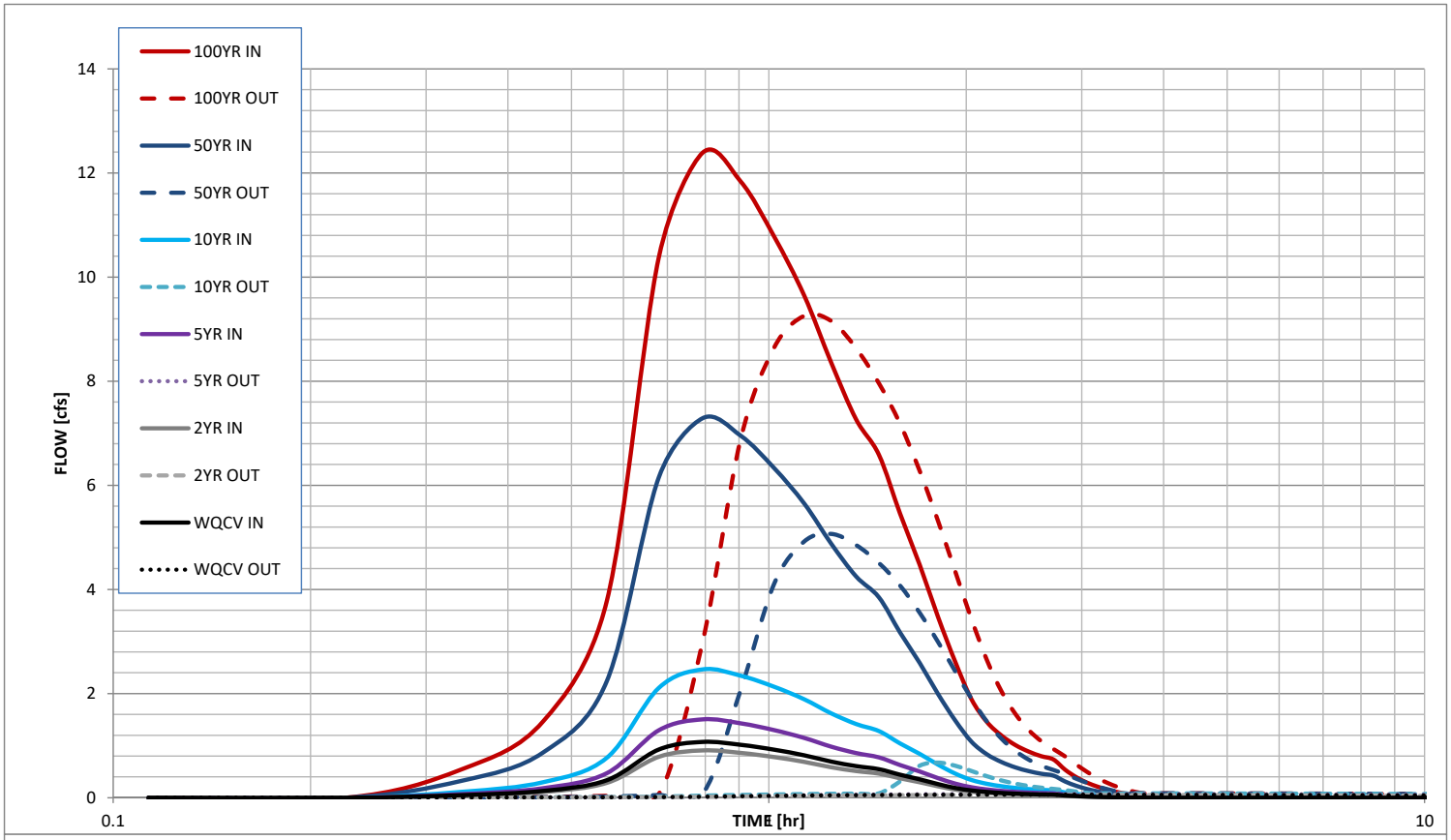
User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	32	0.00	0.00
0.33	50	0.33	0.01
0.83	887	0.83	0.01
1.33	1,723	1.33	0.02
2.33	9,446	2.33	0.09
3.33	14,566	3.33	14.90
3.83	16,083	3.83	35.11
4.33	17,600	4.33	73.11
4.83	19,121	4.83	128.58

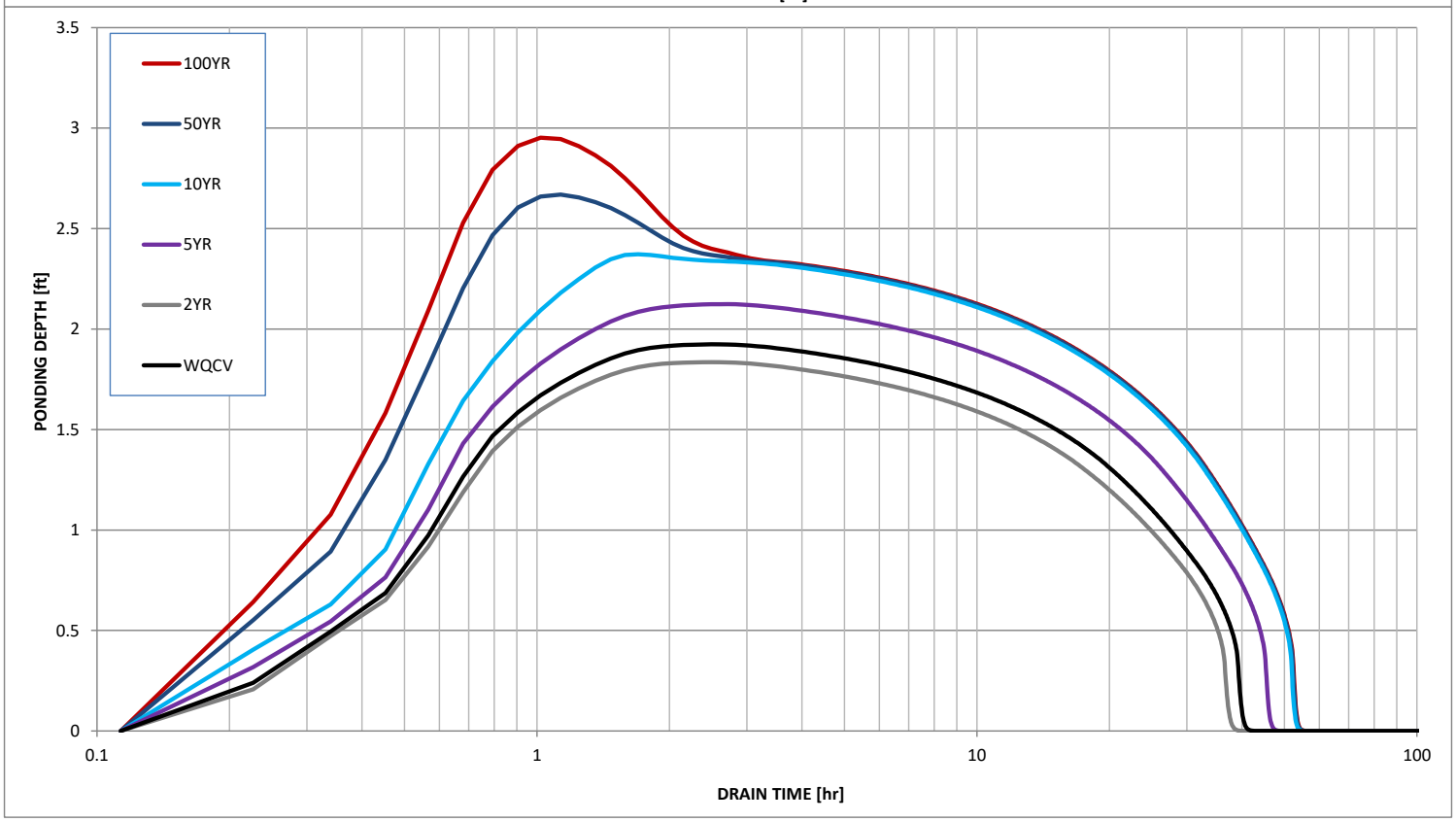
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.25	2.52	in
Calculated Runoff Volume =	0.086	0.073	0.121	0.199	0.596	1.019	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	0.085	0.072	0.120	0.199	0.596	1.019	acre-ft
Time to Drain 97% of Inflow Volume =	35.7	33.6	**40.3**	43.9	34.3	28.1	hours
Time to Drain 99% of Inflow Volume =	38.3	35.9	43.8	49.1	44.3	**40.2**	hours
Maximum Ponding Depth =	1.92	1.84	2.12	2.37	2.67	2.95	ft
Maximum Ponded Area =	0.14	0.13	0.18	0.22	0.26	**0.29**	acres
Maximum Volume Stored =	0.075	0.063	0.107	0.157	0.228	0.305	acre-ft

Stormwater Detention and Infiltration Design Data Sheet





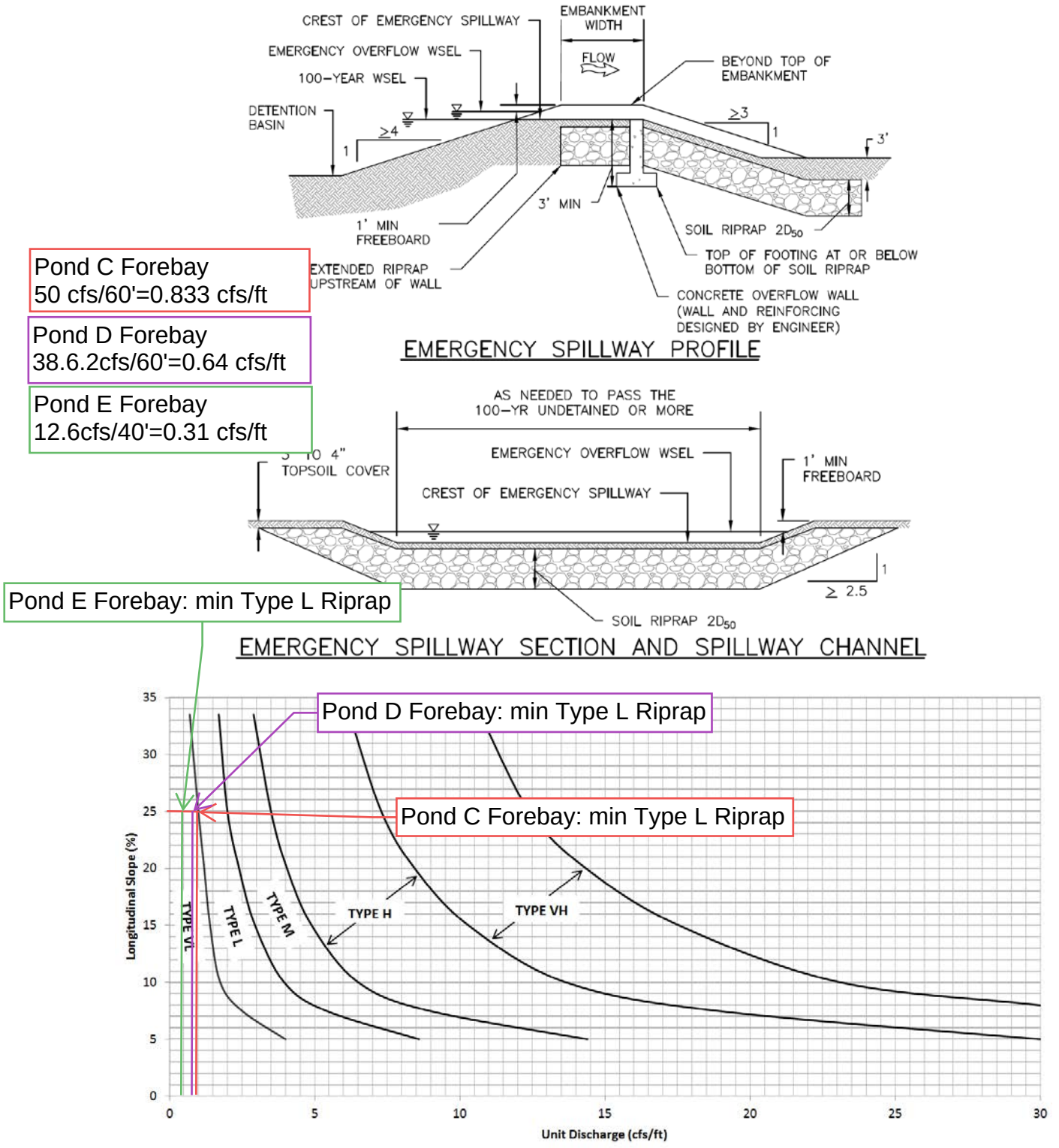


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

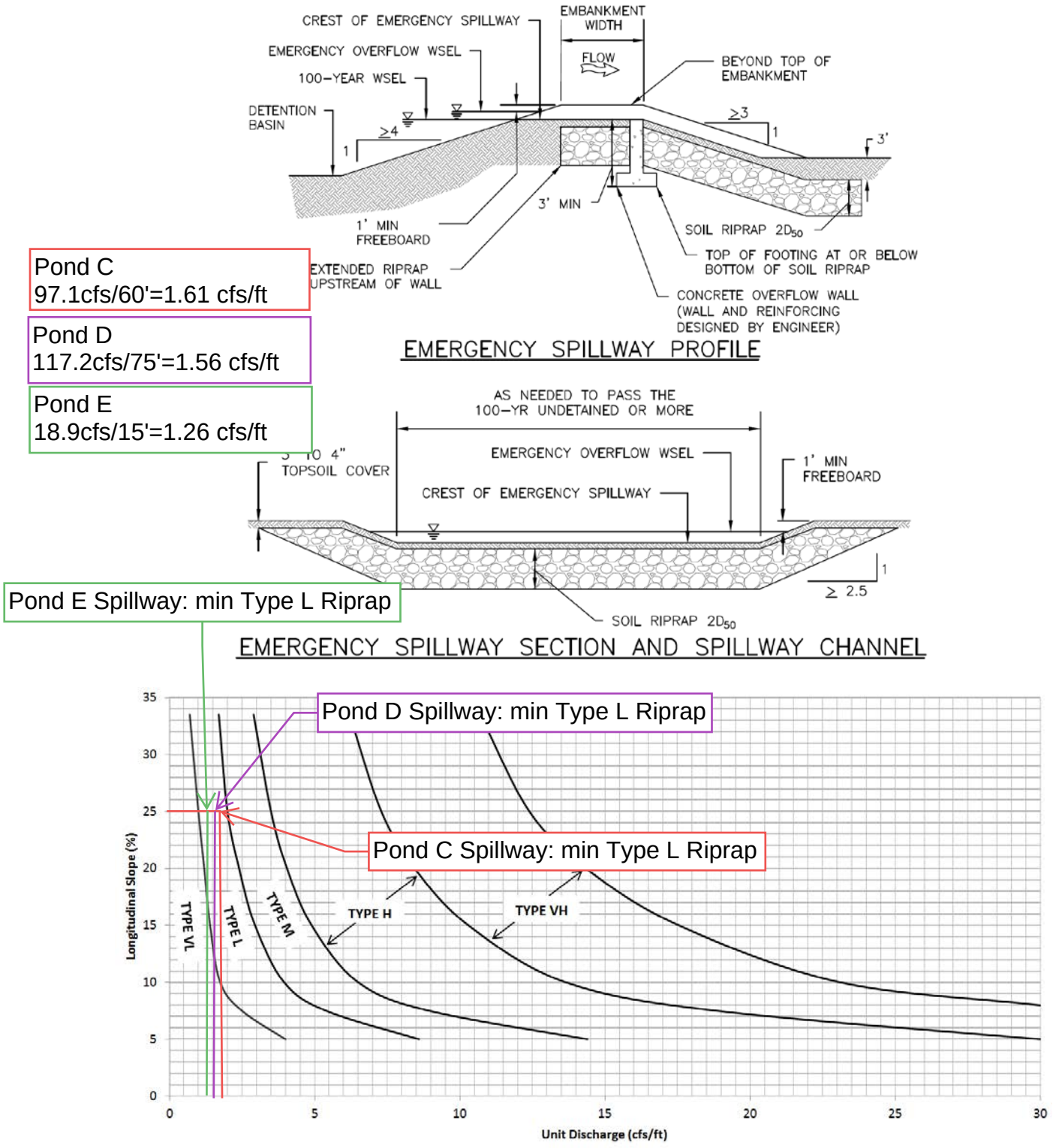


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

APPENDIX E

REFERENCE MATERIALS

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

Within 90 days of the second publication in the local newspaper, a citizen may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised BFEs presented in this LOMR may be changed.

A notice of changes will be published in the *Federal Register*. This information also will be published in your local newspaper on or about the dates listed below.

LOCAL NEWSPAPER
Name: *El Paso County News*
Dates: 11/10/2004 11/17/2004

PUBLIC NOTIFICATION

FLOODING SOURCE	LOCATION OF REFERENCED ELEVATION	BFE (FEET NGVD) EFFECTIVE	BFE (FEET NGVD) REVISED	MAP PANEL NUMBER(S)
Haegler Ranch Tributary 2	Approximately 310 feet upstream of confluence with Geick Ranch West Tributary	None	6,735	08041C0575 F
	Approximately 3,140 feet upstream of confluence with Geick Ranch West Tributary	None	6,779	08041C0575 F
Haegler Ranch Tributary 3	Approximately 8,100 feet downstream of Curtis Road	None	6,672	08041C0575 F
	Approximately 300 feet upstream of Curtis Road	None	6,769	08041C0575 F
Haegler Ranch Tributary 4	Approximately 4,000 feet downstream of Curtis Road	None	6,688	08041C0575 F
	Approximately 300 feet upstream of Curtis Road	None	6,758	08041C0575 F

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2677 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C Long

Kevin C. Long, CFM, Project Engineer
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate

102929 101104080587 102IAC

CHANGES ARE MADE IN DETERMINATIONS OF BASE FLOOD ELEVATIONS FOR THE UNINCORPORATED AREAS OF EL PASO COUNTY, COLORADO, UNDER THE NATIONAL FLOOD INSURANCE PROGRAM

On March 17, 1997, the Department of Homeland Security's Federal Emergency Management Agency identified Special Flood Hazard Areas (SFHAs) in the unincorporated areas of El Paso County, Colorado, through issuance of a Flood Insurance Rate Map (FIRM). The Mitigation Division has determined that modification of the elevations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) for certain locations in this community is appropriate. The modified Base Flood Elevations (BFEs) revise the FIRM for the community.

The changes are being made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65.

A hydraulic analysis was performed to incorporate new hydrologic, hydraulic, and topographic data for Haegler Ranch Tributary 2 from approximately 310 feet upstream to approximately 3,140 feet upstream of the confluence with Geick Ranch West Tributary; for Haegler Ranch Tributary 3 from approximately 8,100 feet downstream to approximately 400 feet upstream of Curtis Road; and for Haegler Ranch Tributary 4 from approximately 4,100 feet downstream to approximately 400 feet upstream of Curtis Road. This has resulted in increases and decreases in SFHA width and increased BFEs for the above-mentioned tributaries. The table below indicates existing and modified BFEs for selected locations along the affected lengths of the flooding source(s) cited above.

Location	Existing BFE (feet)*	Modified BFE (feet)*
Haegler Ranch Tributary 2:		
Approximately 310 feet upstream of confluence with Geick Ranch West Tributary	None	6,735
Approximately 3,140 feet upstream of confluence with Geick Ranch West Tributary	None	6,779
Haegler Ranch Tributary 3:		
Approximately 8,100 feet downstream of Curtis Road	None	6,672
Approximately 300 feet upstream of Curtis Road	None	6,769
Haegler Ranch Tributary 4:		
Approximately 4,000 feet downstream of Curtis Road	None	6,688
Approximately 300 feet upstream of Curtis Road	None	6,758

*National Geodetic Vertical Datum, rounded to nearest whole foot

Under the above-mentioned Acts of 1968 and 1973, the Mitigation Division must develop criteria for floodplain management. To participate in the National Flood Insurance Program (NFIP), the community must use the modified BFEs to administer the floodplain management measures of the NFIP. These modified BFEs will also be used to calculate the appropriate flood insurance premium rates for new buildings and their contents and for the second layer of insurance on existing buildings and contents.

Upon the second publication of notice of these changes in this newspaper, any person has 90 days in which he or she can request, through the Chief Executive Officer of the community, that the Mitigation Division reconsider the determination. Any request for reconsideration must be based on knowledge of changed conditions or new scientific or technical data. All interested parties are on notice that until the 90-day period elapses, the Mitigation Division's determination to modify the BFEs may itself be changed.

Any person having knowledge or wishing to comment on these changes should immediately notify:

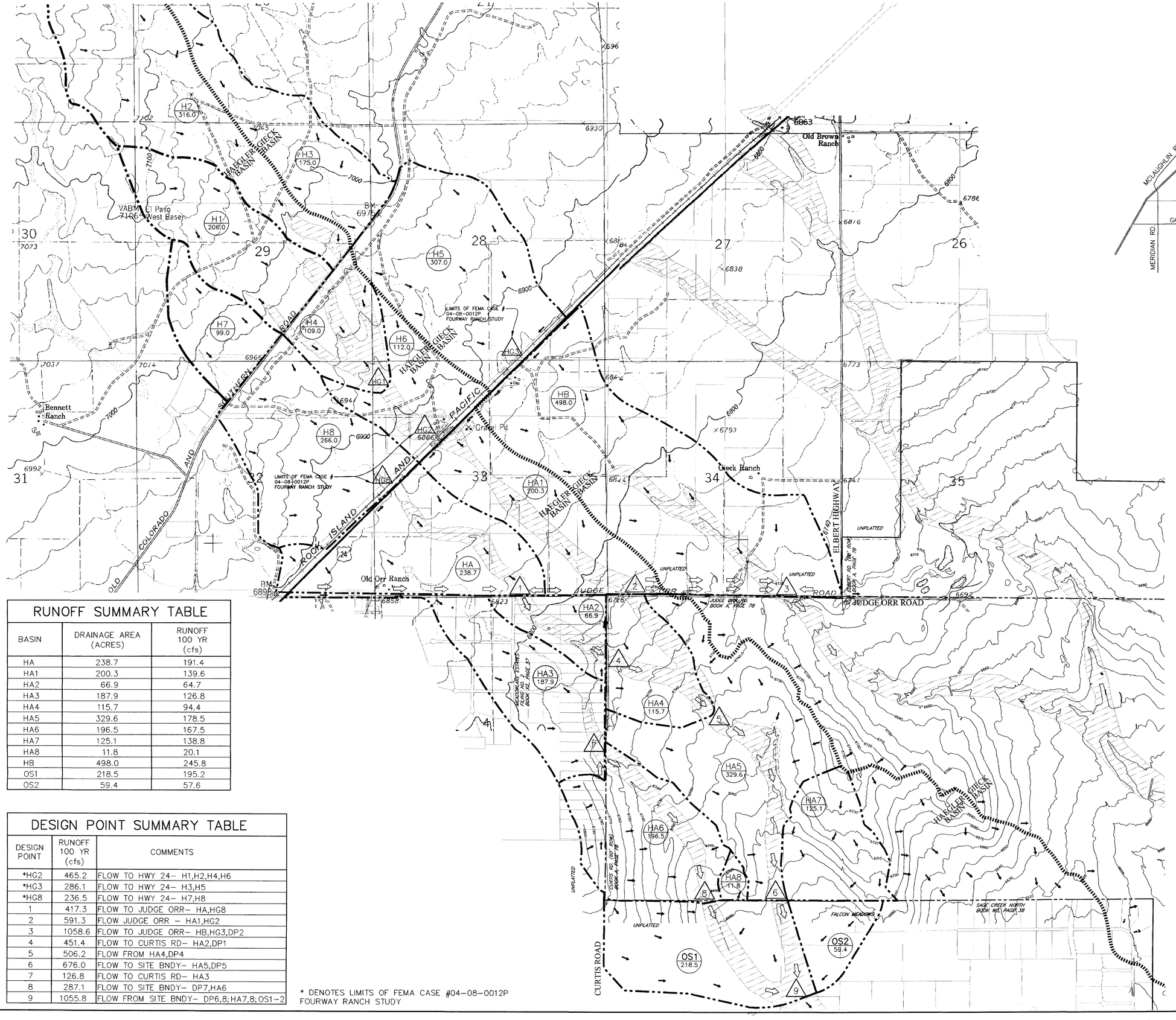
The Honorable Chuck Brown
Chairman, El Paso County
Board of Commissioners
27 Vermijo Avenue
Colorado Springs, CO 80903-2208

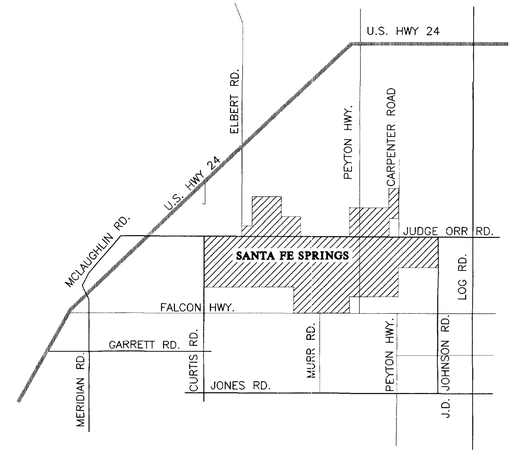
Table 3. Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Year	50-Year	100-Year	500-Year
Haegler Ranch Tributary 2					
At the confluence with Geick Ranch West Tributary	1.47	__1	__1	592	__1
Haegler Ranch Tributary 3					
At approximately 2,300 feet upstream of the confluence with Haegler Ranch Tributary 4	1.09	__1	__1	505	__1
Haegler Ranch Tributary 4					
At approximately 3,700 feet upstream of the confluence with Haegler Ranch Tributary 3	0.60	__1	__1	130	__1

1 Data Not Available

REVISED TO
REFLECT LOMR
DATED FEB 16 2005





VICINTY MAP

1"=5000'

LEGEND

- EX. MAJOR CONTOUR 6420
- DRAINAGE BASIN BOUNDARY .....
- OVERLAND FLOW DIRECTION .....
- CHANNELIZED FLOW DIRECTION .....
- HAEGLER/GIECK BASIN BOUNDARY .....
- DESIGN POINT 1
- 100-YEAR FLOODPLAIN PER FIRM MAPS .....
- BASIN I.D. / BASIN AREA (Acres) — HA3 / 187.9

RUNOFF SUMMARY TABLE

BASIN	DRAINAGE AREA (ACRES)	RUNOFF 100 YR (cfs)
HA	238.7	191.4
HA1	200.3	139.6
HA2	66.9	64.7
HA3	187.9	126.8
HA4	115.7	94.4
HA5	329.6	178.5
HA6	196.5	167.5
HA7	125.1	138.8
HA8	11.8	20.1
HB	498.0	245.8
OS1	218.5	195.2
OS2	59.4	57.6

DESIGN POINT SUMMARY TABLE

DESIGN POINT	RUNOFF 100 YR (cfs)	COMMENTS
*HG2	465.2	FLOW TO HWY 24- H1,H2,H4,H6
*HG3	286.1	FLOW TO HWY 24- H3,H5
*HG8	236.5	FLOW TO HWY 24- H7,H8
1	417.3	FLOW TO JUDGE ORR- HA,HG8
2	591.3	FLOW JUDGE ORR - HA1,HG2
3	1058.6	FLOW TO JUDGE ORR- HB,HG3,DP2
4	451.4	FLOW TO CURTIS RD- HA2,DP1
5	506.2	FLOW FROM HA4,DP4
6	676.0	FLOW TO SITE BNDY- HA5,DP5
7	126.8	FLOW TO CURTIS RD- HA3
8	287.1	FLOW TO SITE BNDY- DP7,HA6
9	1055.8	FLOW FROM SITE BNDY- DP6,8;HA7,8;OS1-2

* DENOTES LIMITS OF FEMA CASE #04-08-0012P FOURWAY RANCH STUDY

GRAPHIC SCALE
1000 0 500 1000
1 inch = 1000 ft.

NO.	DESCRIPTION	REV BY	CKD BY	DATE
	REVISION			

TRI-CORE ENGINEERING
5526 N. ACADEMY BLVD., SUITE 204
COLORADO SPRINGS, CO 80918
PHONE (719) 264-1560
FAX (719) 264-1193

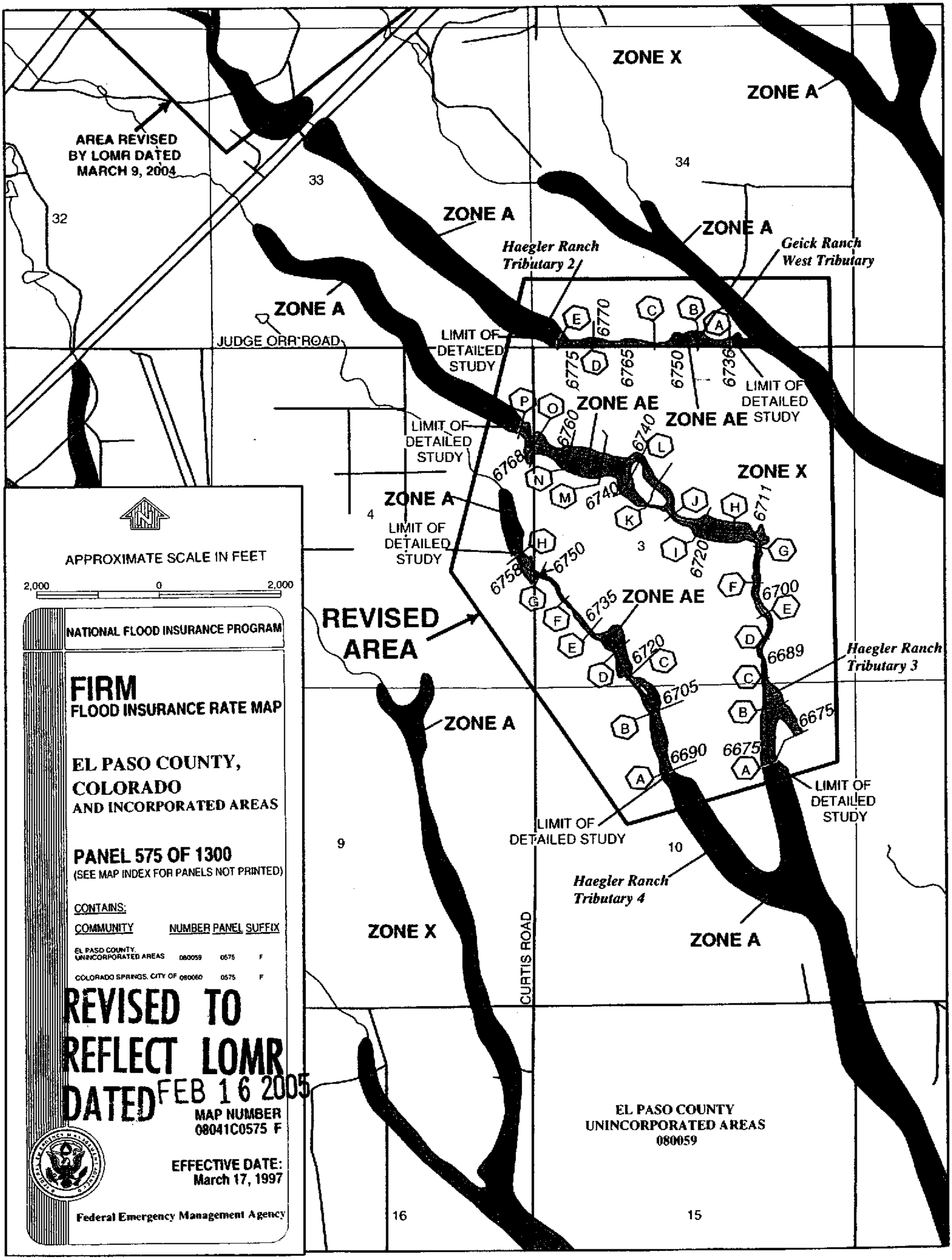
SCALE (H): 1"=1000'
SCALE (V): N/A
DRAWN BY: DMM
DESIGNED BY: RLS
CHECKED BY: RLS
DATE: 05/21/04

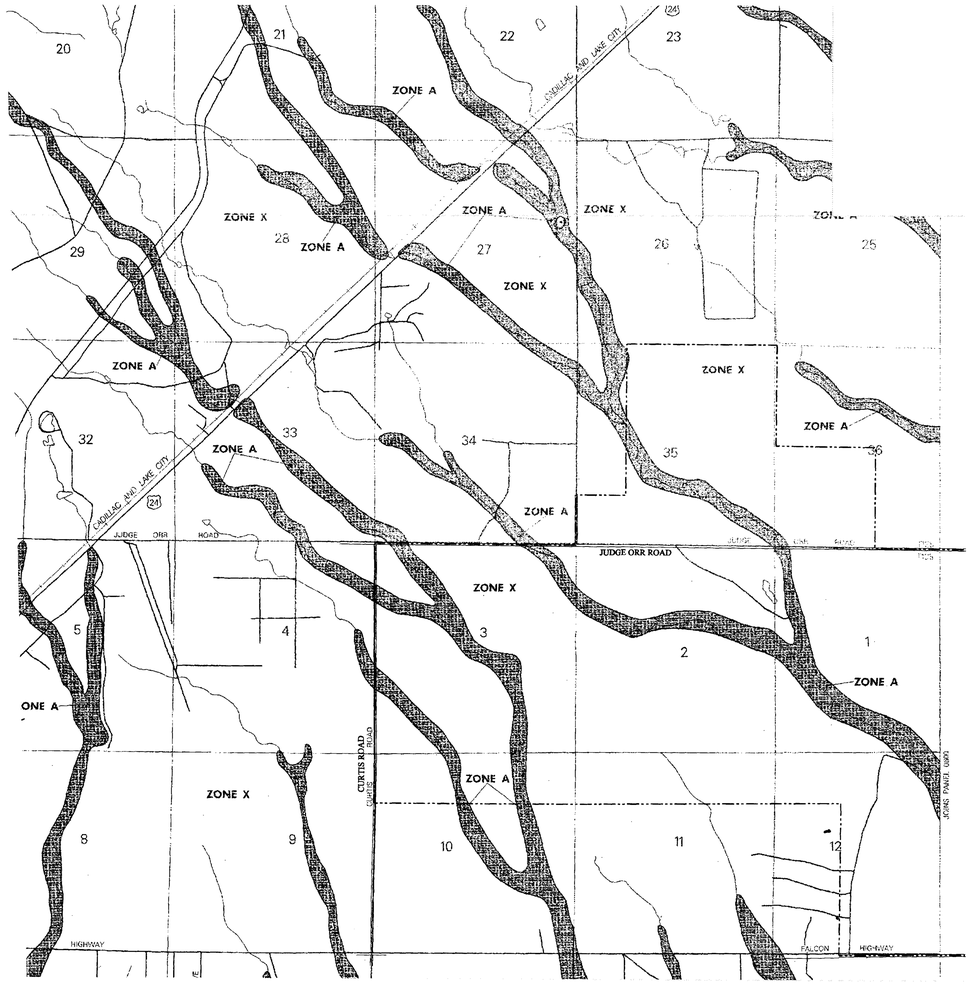
SANTA FE SPRINGS
HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO, COUNTY

REALTY DEVELOPMENT SERVICES
25 NORTH TEJON
SUITE 300

EXHIBIT 1
HYDROLOGIC SUBBASIN MAP

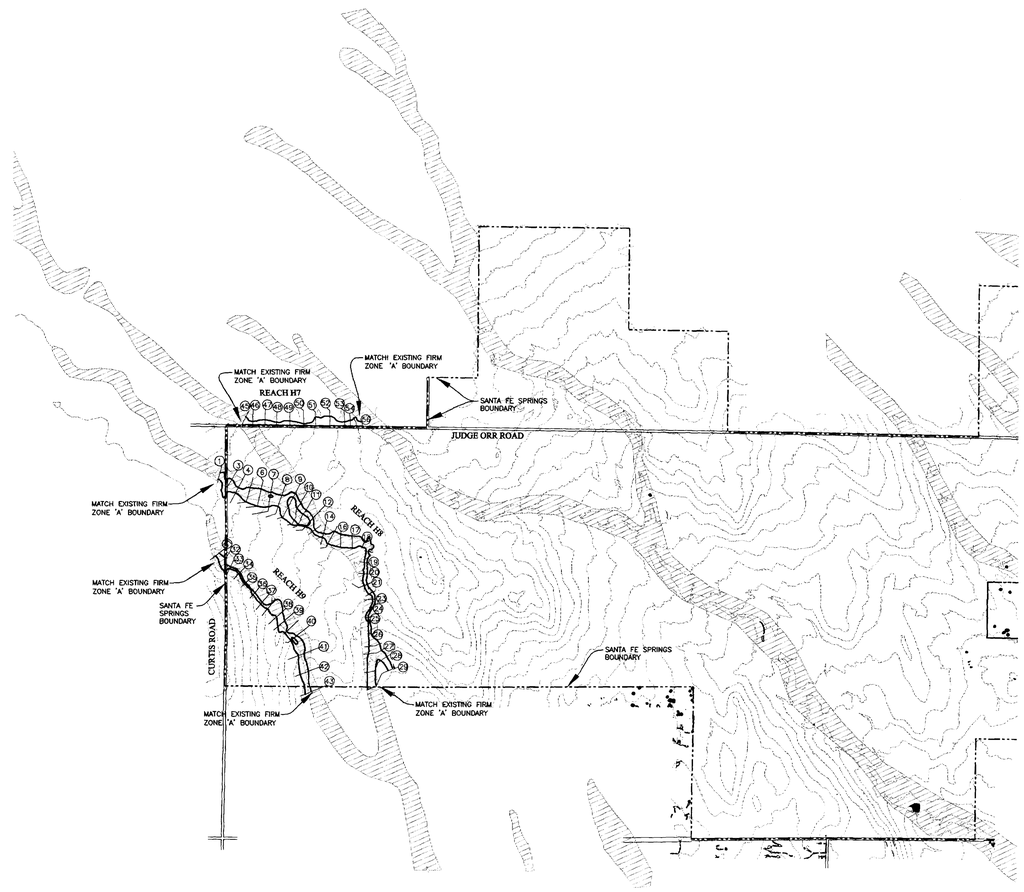
PROJECT NO. 6005-0001
FILENAME 01DR_HIST.DWG
DRAWING NO. EXH. 1


ZONE X
ZONE A
AREA REVISED
BY LOMR DATED
MARCH 9, 2004
33
34
32
ZONE A
ZONE A
Haegler Ranch
Tributary 2
Geick Ranch
West Tributary
ZONE A
JUDGE ORR ROAD
LIMIT OF
DETAILED
STUDY
6770
6775
6765
6750
6736
LIMIT OF
DETAILED STUDY
ZONE AE
ZONE AE
LIMIT OF
DETAILED
STUDY
6760
6740
6768
ZONE X
ZONE A
4
LIMIT OF
DETAILED
STUDY
6740
6711
3
6720
6758
6750
6735
ZONE AE
6700
REVISED
AREA
6720
6689
Haegler Ranch
Tributary 3
ZONE A
6705
6675
6690
6675
LIMIT OF
DETAILED STUDY
9
10
Haegler Ranch
Tributary 4
ZONE X
ZONE A
CURTIS ROAD
16
15
EL PASO COUNTY
UNINCORPORATED AREAS
080059
APPROXIMATE SCALE IN FEET
2,000
0
2,000
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY,
COLORADO
AND INCORPORATED AREAS
PANEL 575 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY
NUMBER
PANEL
SUFFIX
EL PASO COUNTY, UNINCORPORATED AREAS
080059
0575
F
COLORADO SPRINGS, CITY OF
080060
0575
F
REVISED TO
REFLECT LOMR
DATED FEB 16 2005
MAP NUMBER
08041C0575 F
EFFECTIVE DATE:
March 17, 1997
Federal Emergency Management Agency



EFFECTIVE CONDITION

MAP PANEL NO. 0575F



REVISED EFFECTIVE CONDITION

APPROXIMATE SCALE IN FEET
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 575 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0575	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0575	F

MAP NUMBER
08041C0575 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

GRAPHIC SCALE
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1 inch = 2000 ft

REVISION NO.	DESCRIPTION	REV BY	CKD BY	DATE

TRI-CORE ENGINEERING
5526 N. ACADEMY BLVD., SUITE 204
COLORADO SPRINGS, CO 80918
PHONE (719) 264-1560
FAX (719) 264-1193

SCALE (H): 1"=2000'
SCALE (V): N/A

DRAWN BY: DMM
DESIGNED BY: RLS
CHECKED BY: RLS

DATE: 05/21/04

SANTA FE SPRINGS
HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO, COUNTY

REALTY DEVELOPMENT SERVICES
25 NORTH TEJON
SUITE 300

EXHIBIT 2
REVISED FLOOD INSURANCE RATE MAP

PROJECT NO.
6005-0001

FILENAME
RATE_MAP_LOMR.DWG

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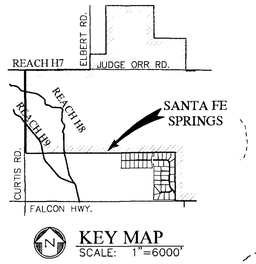
EXH. 2



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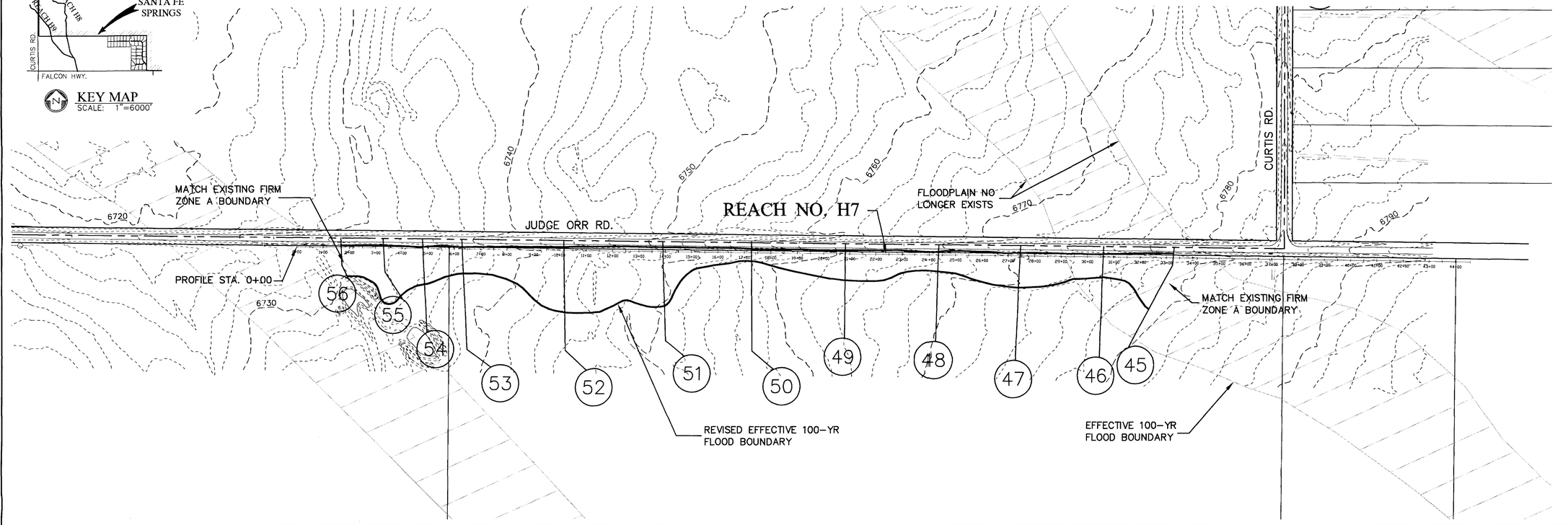

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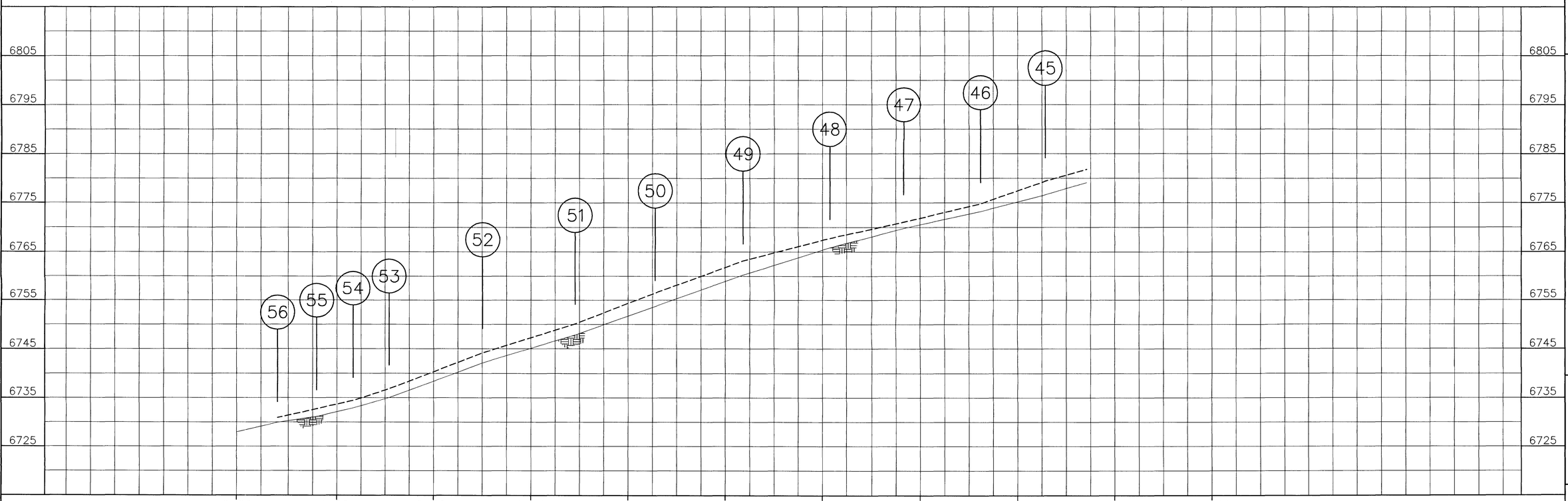

NO.	DESCRIPTION	REV BY	CKD BY	DATE
	REVISION			

TRI-CORE ENGINEERING
5526 N. ACADEMY BLVD., SUITE 204
COLORADO SPRINGS, CO 80918
PHONE (719) 264-1560
FAX (719) 264-1193

SCALE (H): 1"=200'
SCALE (V): 1"=10'
DRAWN BY: KMV
DESIGNED BY: RLS
CHECKED BY: RLS
DATE: 06/04/04

SANTA FE SPRINGS
HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO COUNTY

REALTY DEVELOPMENT SERVICES
25 NORTH TEJON, SUITE 300
COLORADO SPRINGS, CO 80903

EXHIBIT 3 100-YEAR FLOODPLAIN BOUNDARY & PROFILE WORKMAP

PROJECT NO.
6005.0001
FILENAME
PP-LOMR.DWG
DRAWING NO.
EXH. 3

KEY MAP
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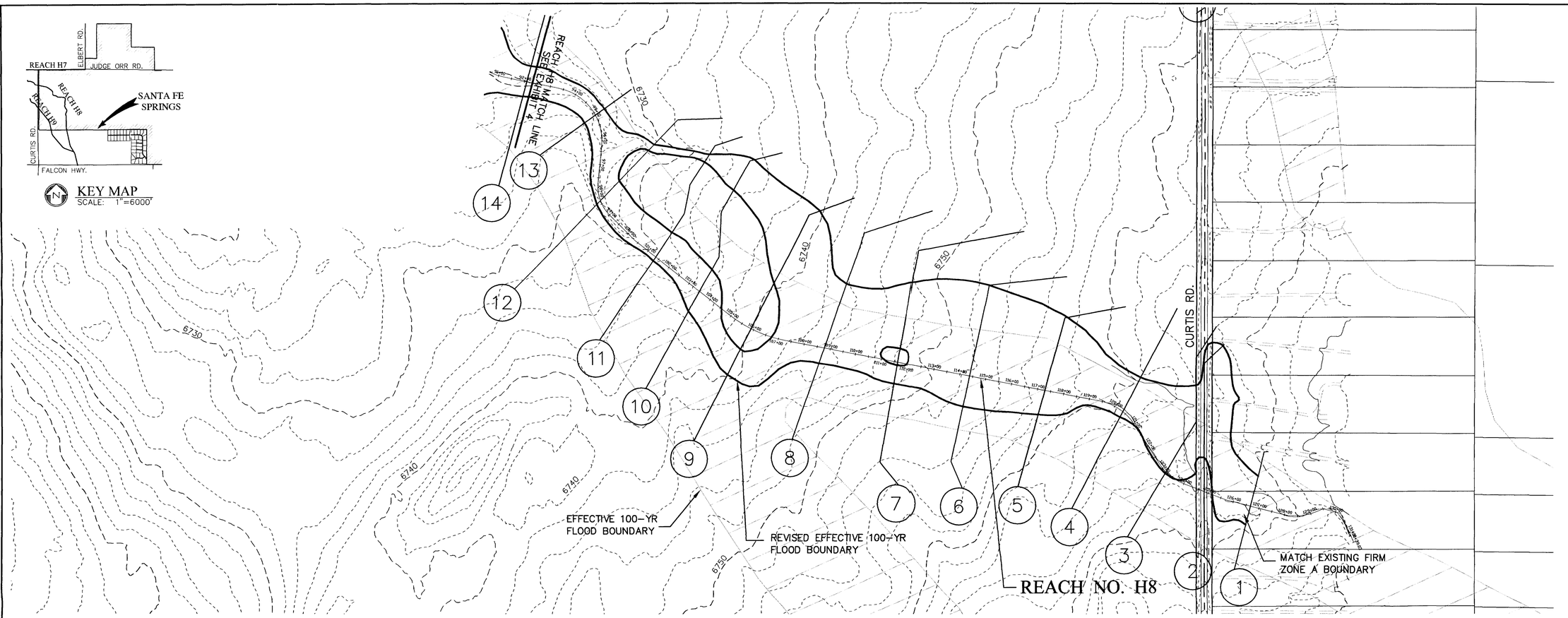

GRAPHIC SCALE
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1 inch = 200 ft.

REVISION				
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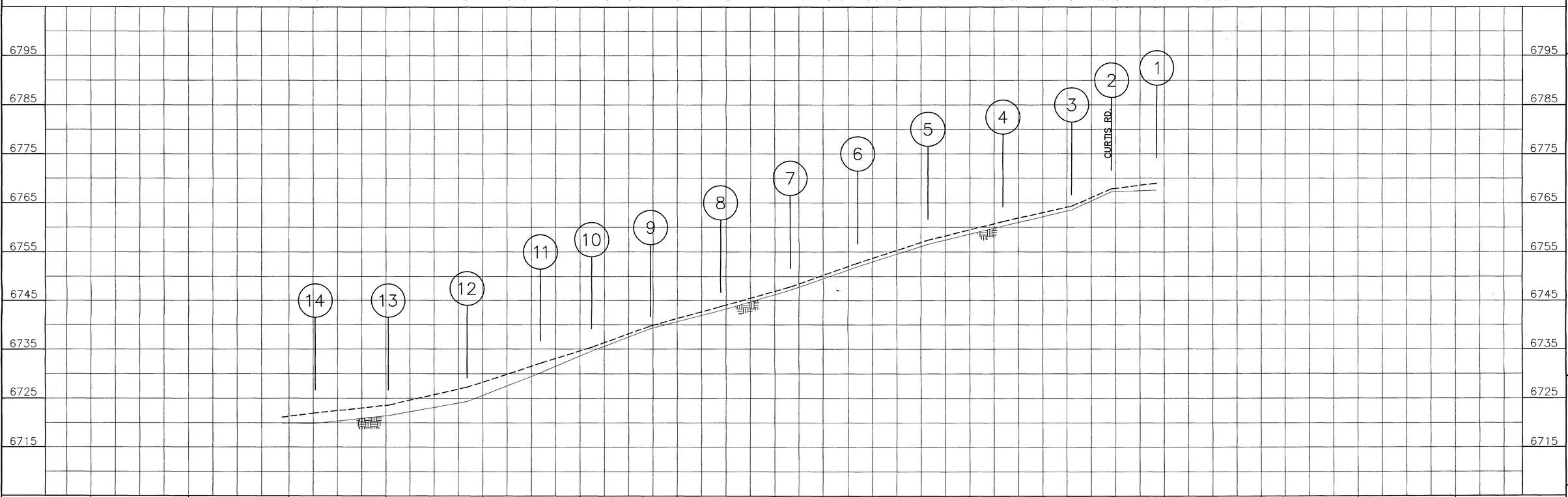

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DRAWN BY: KMV
DESIGNED BY: RLS
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EL PASO COUNTY

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COLORADO SPRINGS, CO 80903

EXHIBIT 4 100-YEAR FLOODPLAIN BOUNDARY & PROFILE WORKMAP

PROJECT NO.
6005.0001
FILENAME
PP-LOMR.DWG
DRAWING NO.
EXH. 4

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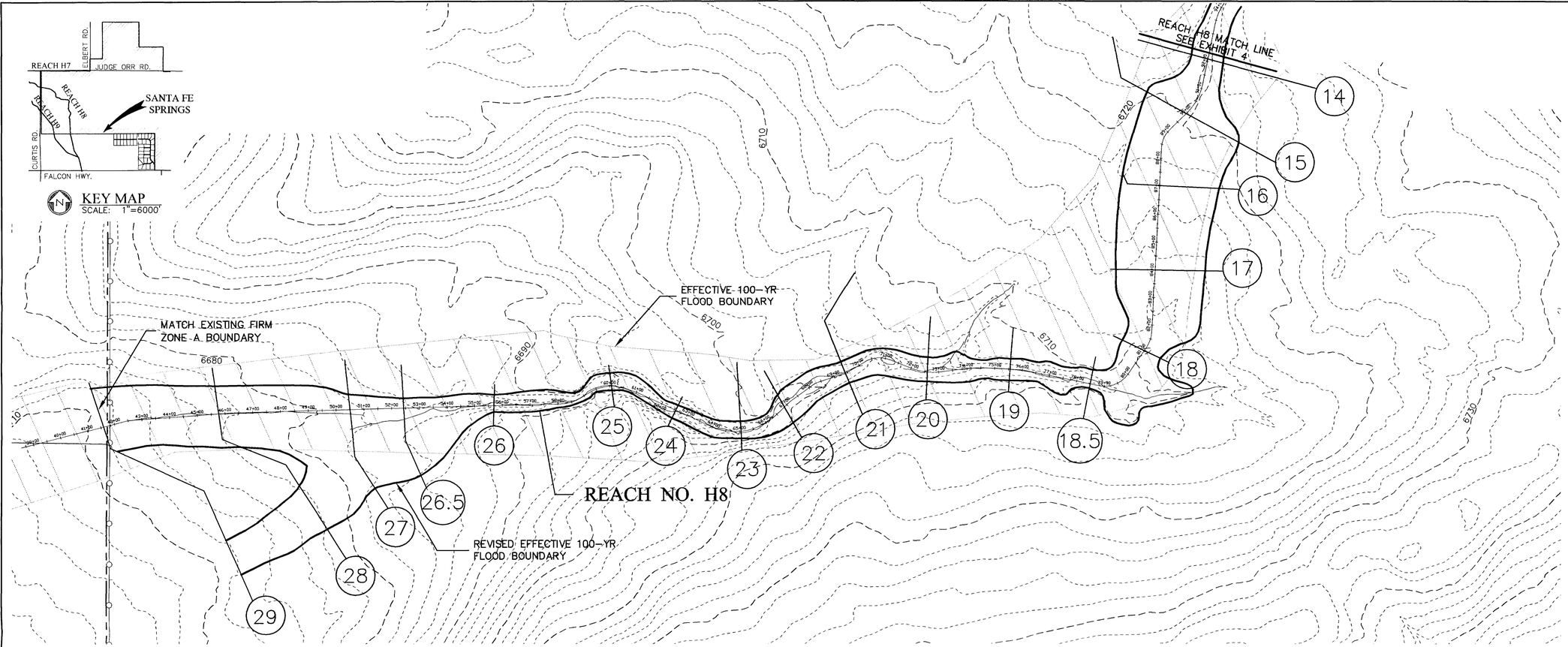

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GRAPHIC SCALE
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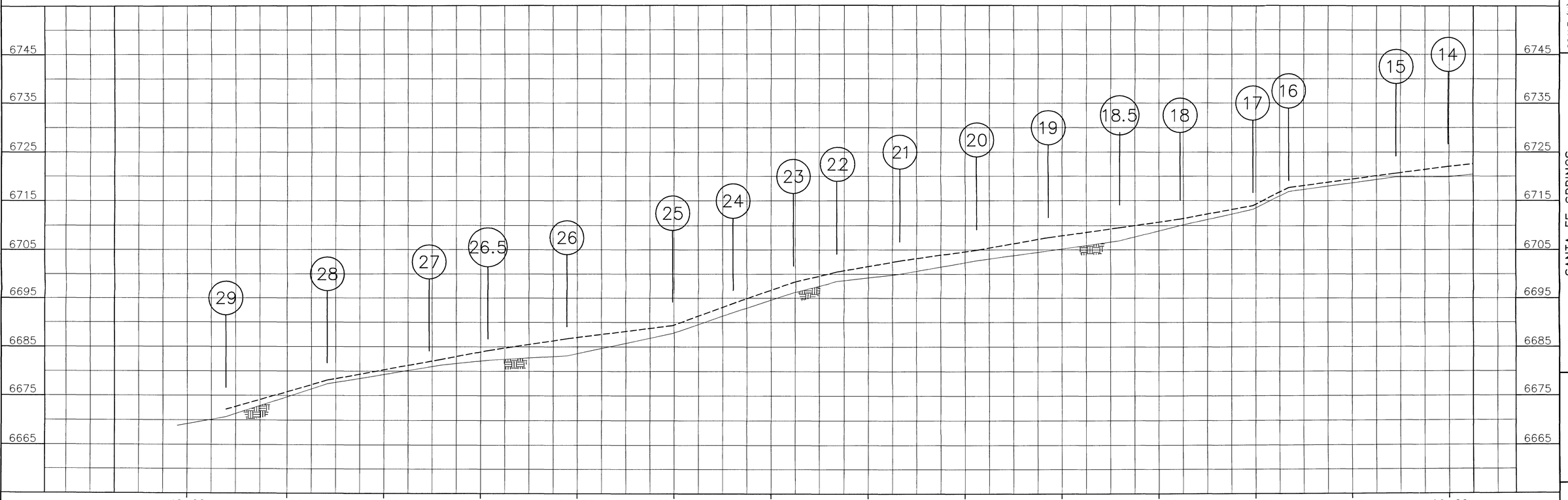

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SCALE (V): 1"=10'
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EL PASO COUNTY

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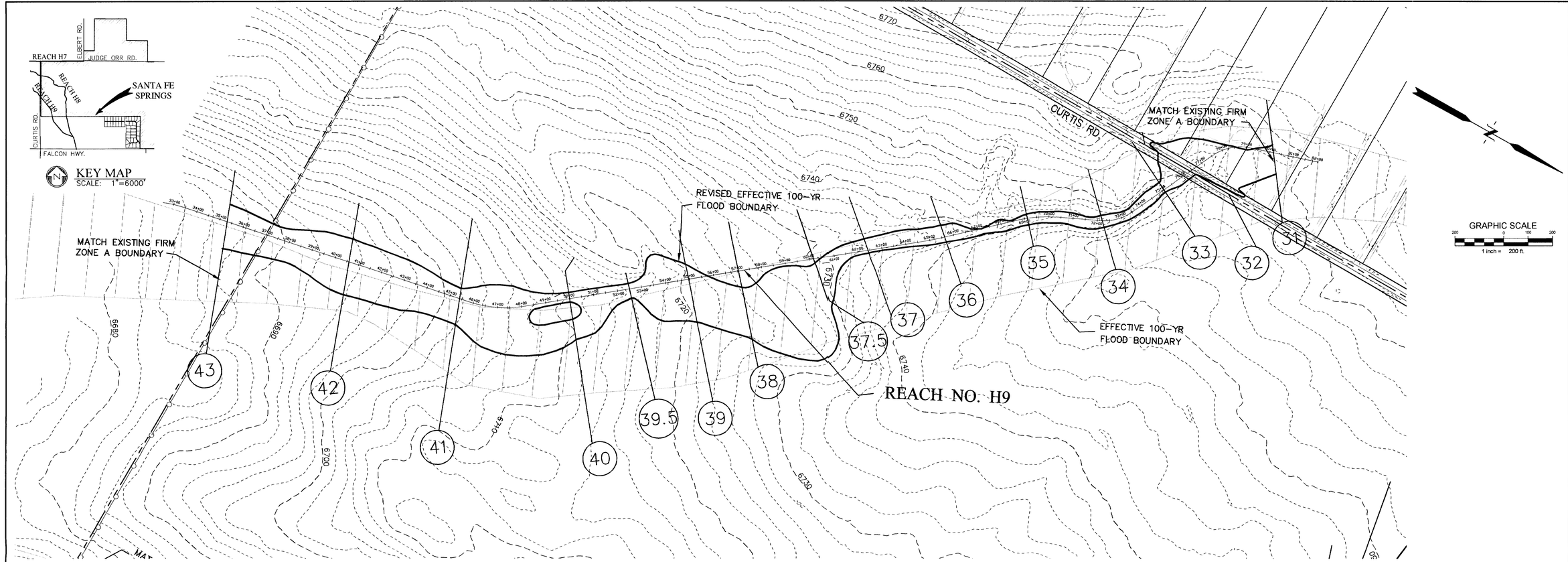
COLORADO SPRINGS, CO 80903

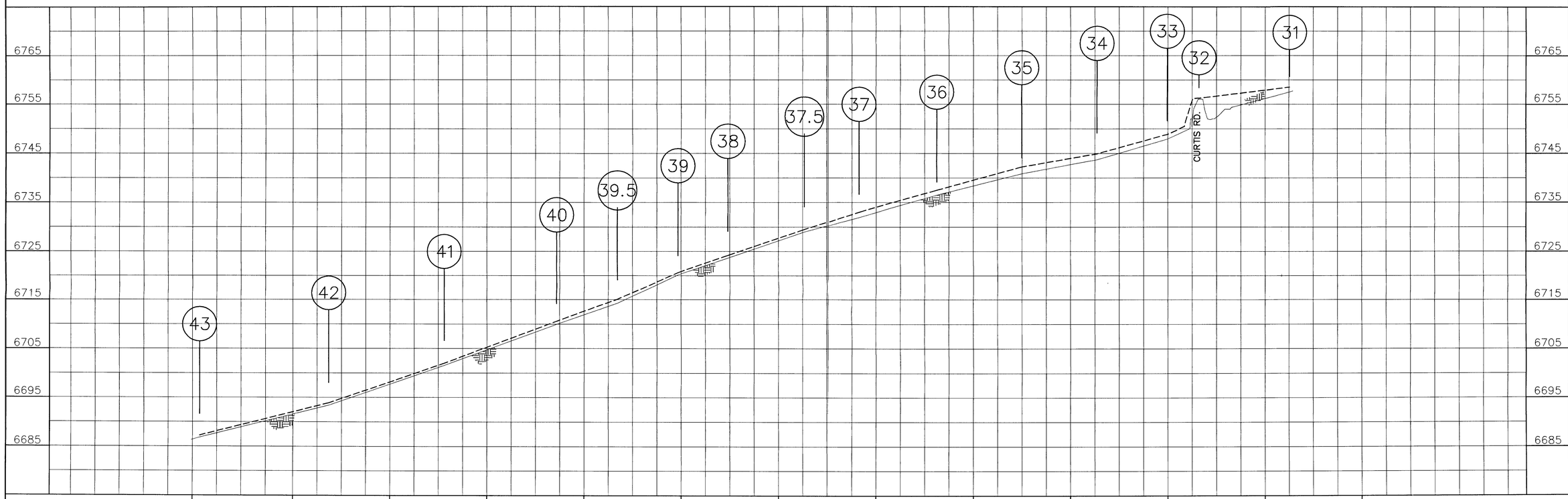
EXHIBIT 5 100-YEAR FLOODPLAIN BOUNDARY & PROFILE WORKMAP

PROJECT NO.
6005.0001

PP-LOMR.DWG

DRAWING NO.
EXH. 5





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	REVISION			

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SCALE (V): 1"=10'

DRAWN BY: KMV
DESIGNED BY: RLS
CHECKED BY: RLS

DATE: 06/04/04

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HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO COUNTY

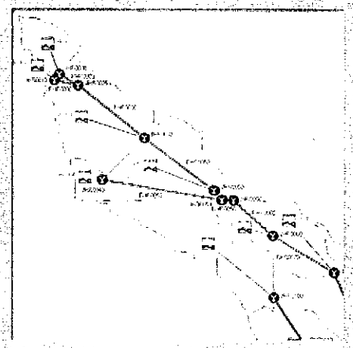
REALTY DEVELOPMENT SERVICES
25 NORTH TEJON, SUITE 300
COLORADO SPRINGS, CO 80903

EXHIBIT 6 100-YEAR FLOODPLAIN BOUNDARY & PROFILE WORKMAP

PROJECT NO.
6005.0001

PP-LOMR.DWG

DRAWING NO.
EXH. 6



Fountain Creek Basin

Drainage Basin Planning Study

May 2009

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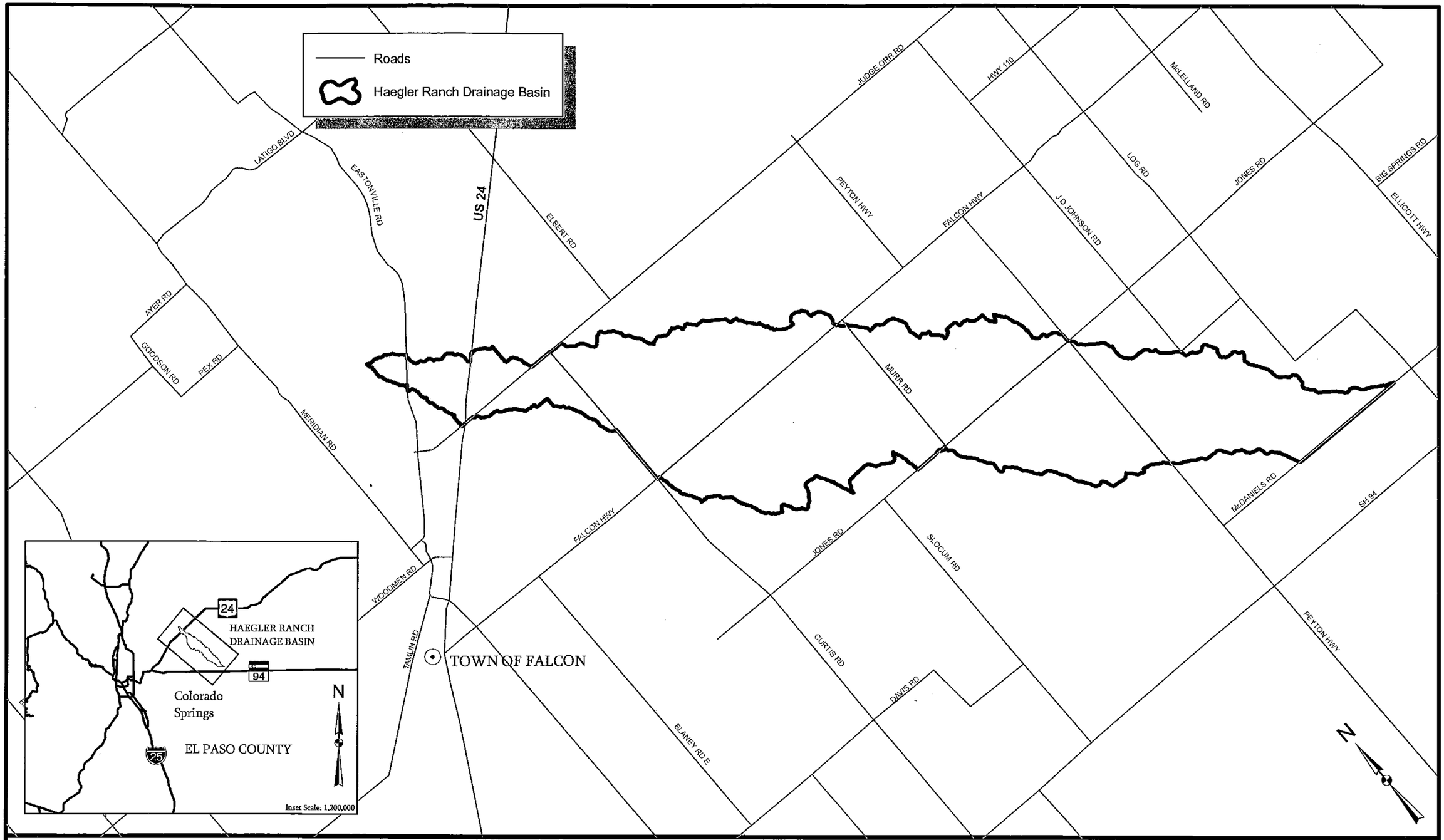

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6,000 3,000 0 6,000 Feet

1" = 6,000'

DATE: 05/08

HAEGLER RANCH DRAINAGE BASIN

VICINITY MAP
FIGURE 1-1

URS NO. 21711039

Haegler Ranch Drainage Basin Boundary
Subbasin Boundaries
Diverted to Geick
Stream Reach
Roads

LATIGO BLVD
EASTONVILLE RD
US 24
ELBERT RD
MERIDIAN RD
WOODMEN RD
TAMLIN RD
FALCON HWY
BLANEY RD E
JUDGE ORR RD
HWY 110
PEYTON HWY
McLELLAND RD
LOG RD
J D JOHNSON RD
JONES RD
ELLICOTT HWY
BIG SPRINGS RD
SLOCUM RD
CURTIS RD
DAVIS RD
SH 94

HR0010 HR0020 HR0030 HR0040 HR0050 HR0060 HR0070 HR0080 HR0090 HR0100 HR0110 HR0120 HR0130 HR0140 HR0150 HR0160 HR0170 HR0180 HR0190 HR0200 HR0210 HR0220 HR0230 HR0240 HR0250 HR0260 HR0270 HR0280 HR0290 HR0300 HR0310 HR0320 HR0330 HR0340 HR0350 HR0360 HR0370 HR0380 HR0390 HR0400 HR0410 HR0420 HR0430 HR0440 HR0450 HR0460 HR0470 HR0480 HR0490 HR0500 HR0510 HR0520 HR0530 HR0540 HR0550 HR0560 HR0570 HR0580 HR0590 HR0600 HR0610 HR0620 HR0630 HR0640 HR0650 HR0660 HR0670 HR0680

T1 T2 T3 - 01 T3 - 02 T4 T5 T6 T7

MS - 01 MS - 02 MS - 03 MS - 04 MS - 05 MS - 06 MS - 07

N

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5,000 2,500 0 5,000 Feet
1" = 5,000'

DATE: 09/08

HAEGLER RANCH DRAINAGE BASIN
SUBBASIN DELINEATION
FIGURE 4-1

URS NO. 21711039

Table 5-3 Existing Hydraulic Deficiencies

Facility Number	Road Crossing	Channel	Existing Size	Existing 100-yr Flow (cfs)	Deficiency
633	Sagecreek Road	N/A	24" CMP	N/A	N/A
634	Sagecreek Road	N/A	24" CMP	N/A	N/A
701	Curtis Road	N/A	18" CMP	N/A	N/A
702	Curtis Road	Tributary 6 (T6)	36" CMP	120	Overtops
703	Curtis Road	Main Stem (MS-06)	24" CMP	590	Overtops
704	Judge Orr Road	Main Stem (MS-06)	Blocked Culvert	540	Overtops
705	Judge Orr Road	N/A	18" CMP	N/A	N/A
706	US 24	N/A	20" Steel Pipe	N/A	N/A
707	US 24	N/A	24" CMP	N/A	N/A
801	Pedestrain Bridge	Main Stem (MS-06)	Bridge	350	Meets Capacity
802	US24	Main Stem (MS-06)	2-66" CMPs	350	Meets Capacity
803	Eastonville Road	Main Stem (MS-07)	27"X21" CMP	25	Overtops
804	Eastonville Road	Tributary 7 (T7)	18" CMP	99	Overtops

Note. 69 Structures were cataloged and located. N/A indicates that the structure was not analyzed because it was not on one of the main channels.

5.14. Results

Hydraulic conditions from the hydraulic model results are summarized in Table 5-4. This includes channel velocity, flow depth, and top width for existing conditions at key locations. Water surface profiles for Haegler Ranch Drainage Basin for the 100-year recurrence interval flood for the existing conditions are presented in Figure 5-4 the HEC-RAS model for Haegler Ranch Drainage Basin for the existing conditions is provided in Appendix B.

The approximate 100-year floodplain as seen in Figure 5-4 varies from a contained floodplain with in a defined channel to a wide floodplain with shallow flooding. Three areas were designated as flooding: 1) the approximate 100-year floodplain as delineated by HEC-RAS, 2) split flow flooding that was estimated from HEC-RAS elevation upstream and contours, and 3) shallow areas connected to the floodplain with less than 1 foot of flooding.

Table 5-4 Existing Conditions HEC-RAS Model

Key Location	Reach and Station	HEC-RAS Result	Recurrence Intervals			
			2-yr	5-yr	10-yr	100-yr
Main stem at US 24	MS-06 72276	Channel velocity (ft/sec)	1.1	1.63	1.98	2.92
		Water surface depth in channel (ft)	1.36	2.44	3.24	6.49
		Top width (ft)	18.23	24.85	29.7	255.62
Main stem at Judge Orr Road	MS-06 67666	Channel velocity (ft/sec)	3.33	4.09	1.76	3.48
		Water surface depth in channel (ft)	0.52	1.04	1.05	1.35
		Top width (ft)	174.53	534.34	535.52	569.34
Main stem at Falcon Highway	MS-05 52353	Channel velocity (ft/sec)	1.05	1.6	2.04	3.59
		Water surface depth in channel (ft)	1.79	3.69	4.96	5.74
		Top width (ft)	31.42	83.76	556.41	592.33
Main stem at Jones Road	MS-03 33189	Channel velocity (ft/sec)	2.45	3.7	1.27	2.51
		Water surface depth in channel (ft)	3.2	5.83	9.25	10.46
		Top width (ft)	47.98	105.51	580.28	667.17
Main stem at Peyton Highway	MS-02 18474	Channel velocity (ft/sec)	0.16	0.4	0.59	1.43
		Water surface depth in channel (ft)	4.14	4.35	4.51	5.15
		Top width (ft)	813.21	871.68	882.22	925.27
Southeast Tributary at Jones Road	T1 22297	Channel velocity (ft/sec)	0.62	1.02	1.47	3.2
		Water surface depth in channel (ft)	2.45	3.52	3.59	3.82
		Top width (ft)	197.35	345.68	351.74	372.17
Southeast Tributary at Peyton Highway	T1 16611	Channel velocity (ft/sec)	1.67	2.25	2.65	4.05
		Water surface depth in channel (ft)	0.08	0.17	0.24	0.51
		Top width (ft)	239.82	241.36	242.51	247.41
Southeast Tributary at Confluence with Main stem	T1 410	Channel velocity (ft/sec)	3.44	0.11	0.18	0.67
		Water surface depth in channel (ft)	1.69	2.01	2.01	2.01
		Top width (ft)	31.89	1169.3	1169.3	1169.3
At Confluence with Geick Basin	MS-01 82	Channel velocity (ft/sec)	2.68	3.85	19.89	17.33
		Water surface depth in channel (ft)	1.45	2.17	1.11	2.36
		Top width (ft)	75.88	255.32	60.67	262.84

Grass channels are designed for depths and velocities to be within the limits of allowable shear stress. Grass lined channels are limited to 1.0 psf shear stress. If calculated shear stress is above this, drop structures must be added to flatten the natural slope of the channel.

Using these criteria, several channel sections were developed to accommodate a range of future flow rates from 100 cfs to 3500 cfs, as shown in Table 6-2. The approximate channel sections were used in the alternatives to accommodate future flows as necessary,

Table 6-2 Channel Dimensions based on Flow Rates

Q (cfs)	Grass		
	Sideslope (h:v)	Bottom (ft)	Depth (ft)
300	4	6	5
500	4	8	5
600	4	15	5
800	4	20	5
900	4	25	5
1000	4	30	5
1500	4	50	5
2000	4	80	5
3000	4	120	5
3500	4	140	5

6.2.2. Culvert Design

Culvert sizes for use in alternative evaluation were estimated based on full flow capacity of reinforced concrete pipe with a minimum slope of 0.50% and concrete end sections. For flows up to 300 cfs single RC pipe culverts with a maximum of 72" diameter were used. For greater flows, multiple RC pipes or 6-foot by 6-foot concrete box culverts with headwalls and flared wingwalls were used. Proposed culverts sizes based on existing flow rates are listed in Table 6-3.

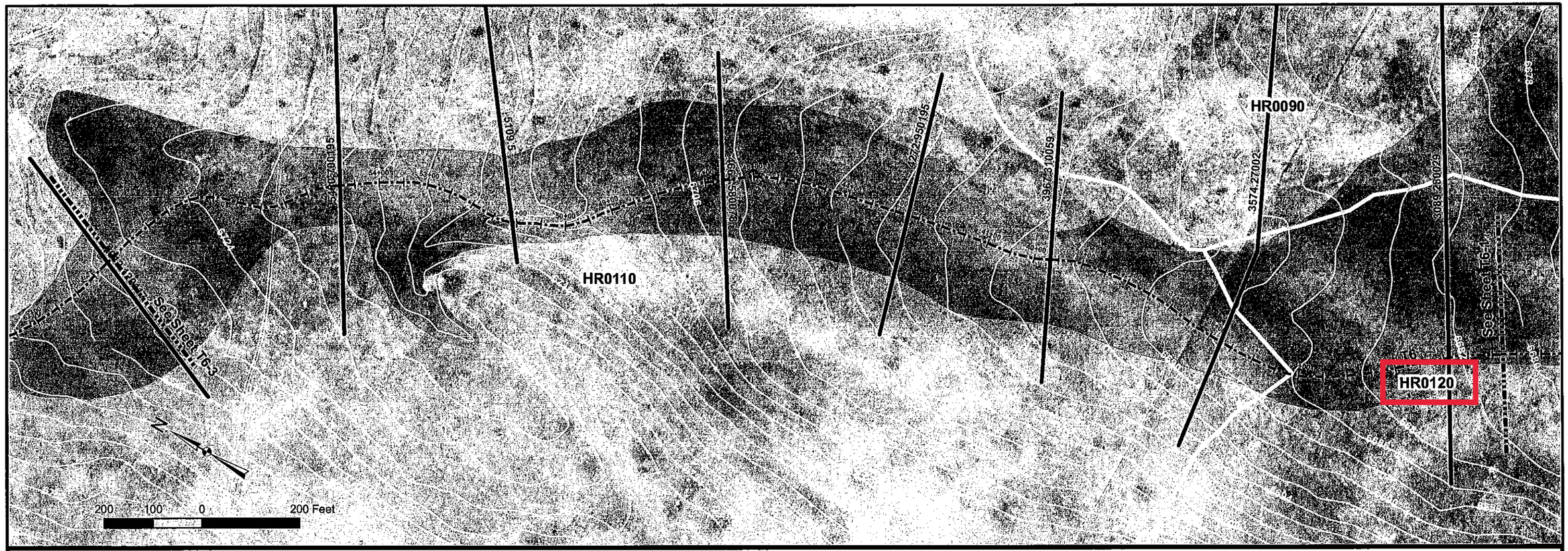
Table 6-3 Existing Conditions Culvert Design

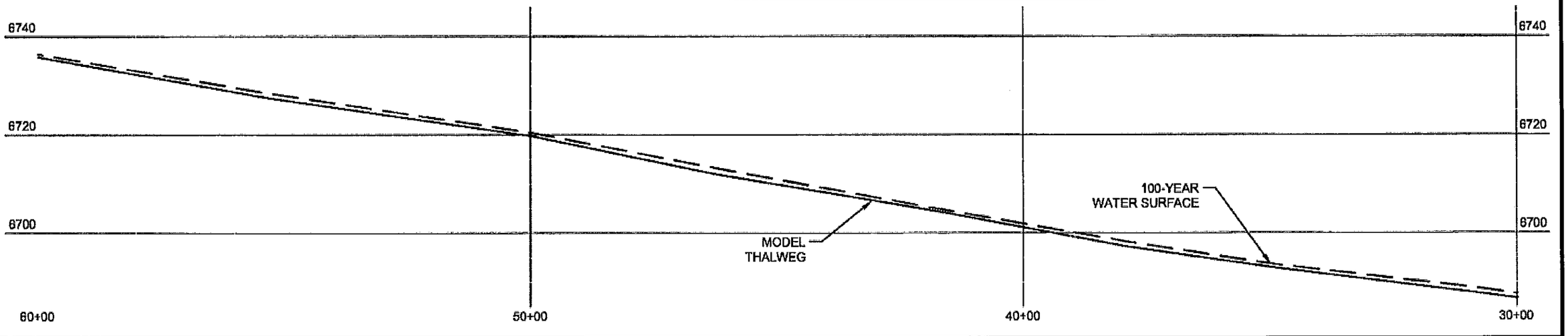
Facility Number	Road Crossing	Channel	Existing Size	Existing 100-yr Flow (cfs)	Deficiency	Necessary Facility
N/A	Peyton Highway	Tributary 1 (T1)	No Culvert	500	Overtops	2-72" RCPs
N/A	Falcon Highway	Tributary 1 (T1)	No Culvert	33	Overtops	36" RCP
301	Peyton Highway	Main Stem (MS-02)	2-33"X48" CMPs	2,500	Overtops	7-6'X6' RCBs
401	Jones Road	Tributary 1 (T1)	2-24" CMPs	370	Overtops	6'X6' RCB
403	Jones Road	Main Stem (MS-03)	3-60" CMPs	2,300	Overtops	6-6'X6' RCBs
405	Murr Road	Main Stem (MS-04)	66" RCP	1,700	Overtops	5-6'X6' RCBs
407	Murr Road	Tributary 3 (T3-01)	66" RCP	670	Overtops	2-6'X6' RCBs
507	Peerless Farms Road	Tributary 3 (T3-01)	60" CMP	600	Overtops	2-6'X6' RCBs
509	Murr Road	Tributary 1 (T1)	2-15" RCPs	220	Overtops	66" RCP
601	Whiting Way	Tributary 1 (T1)	24" CMP	220	Overtops	66" RCP
604	Max Road	Tributary 1 (T1)	18" CMP	220	Overtops	66" RCP
609	Falcon Highway	Tributary 3 (T3-02)	18" CMP	180	Overtops	66" RCP
610	Falcon Highway	Tributary 4 (T4)	24" CMP	200	Overtops	66" RCP
612	Falcon Highway	Tributary 5 (T5)	24" CMP	150	Overtops	60" RCP
628	Falcon Highway	Main Stem (MS-05)	2-60" CMPs	1,000	Overtops	3-6'X6' RCBs
702	Curtis Road	Tributary 6 (T6)	36" CMP	120	Overtops	54" RCP
703	Curtis Road	Main Stem (MS-06)	24" CMP	590	Overtops	2-6'X6' RCBs
704	Judge Orr Road	Main Stem (MS-06)	Blocked Culvert	540	Overtops	2-72" RCPs
801	Pedestrain Bridge	Main Stem (MS-06)	Bridge	350	Meets Capacity	Existing Bridge
802	US24	Main Stem (MS-06)	2-66" CMPs	350	Meets Capacity	Existing Culvert
803	Eastonville Road	Main Stem (MS-07)	27"X21" CMP	25	Overtops	30" RCP
804	Eastonville Road	Tributary 7 (T7)	18" CMP	99	Overtops	48" RCP

6.2.3. Detention Design

All detention pond design is based on Chapter 10, Storage, of the UDFCD SDCM. All ponds were assumed to be "full spectrum" per the SDCM. For final design to be performed later, some of the ponds may be separated into a water quality pond and an off-line major detention pond.

For the Regional Detention Alternative, either the simplified full spectrum sizing method or the hydrograph method was used to size the facility. If the contributing area is less than 160 acres and no





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Subbasin Boundaries
Approximate 100-Year Floodplain
Thalweg
Cross Sections
2' Contours

DATE: 05/08

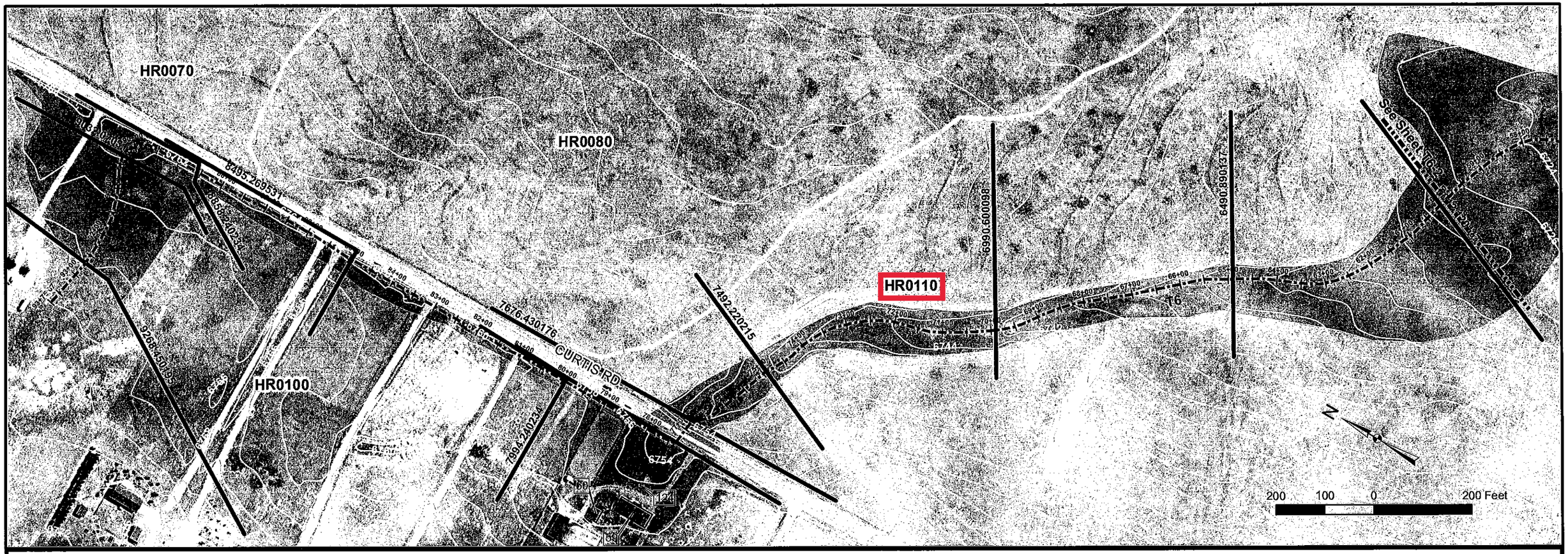
HAEGLER RANCH DRAINAGE BASIN

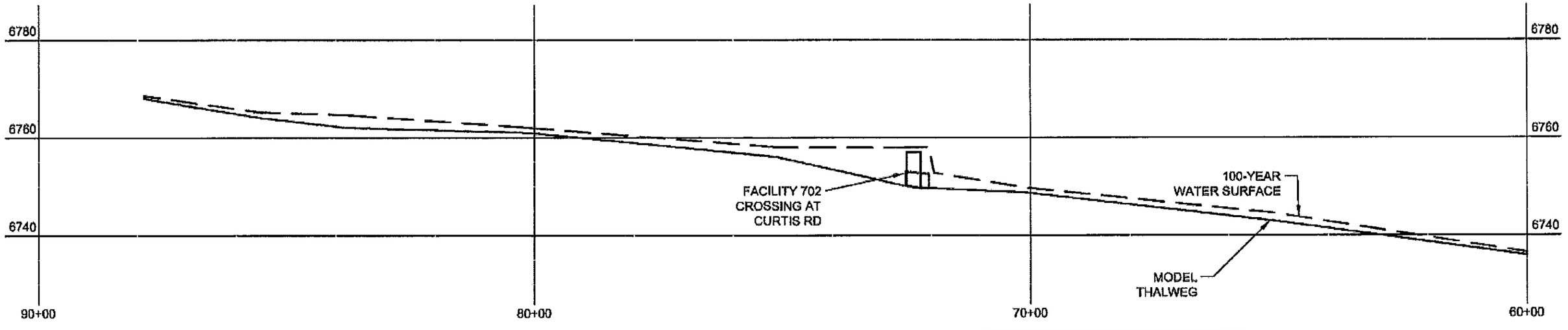
APPROXIMATE 100-YEAR FLOOD LIMITS

SHEET T6-2

FIGURE 5-4

URS NO. 21711039





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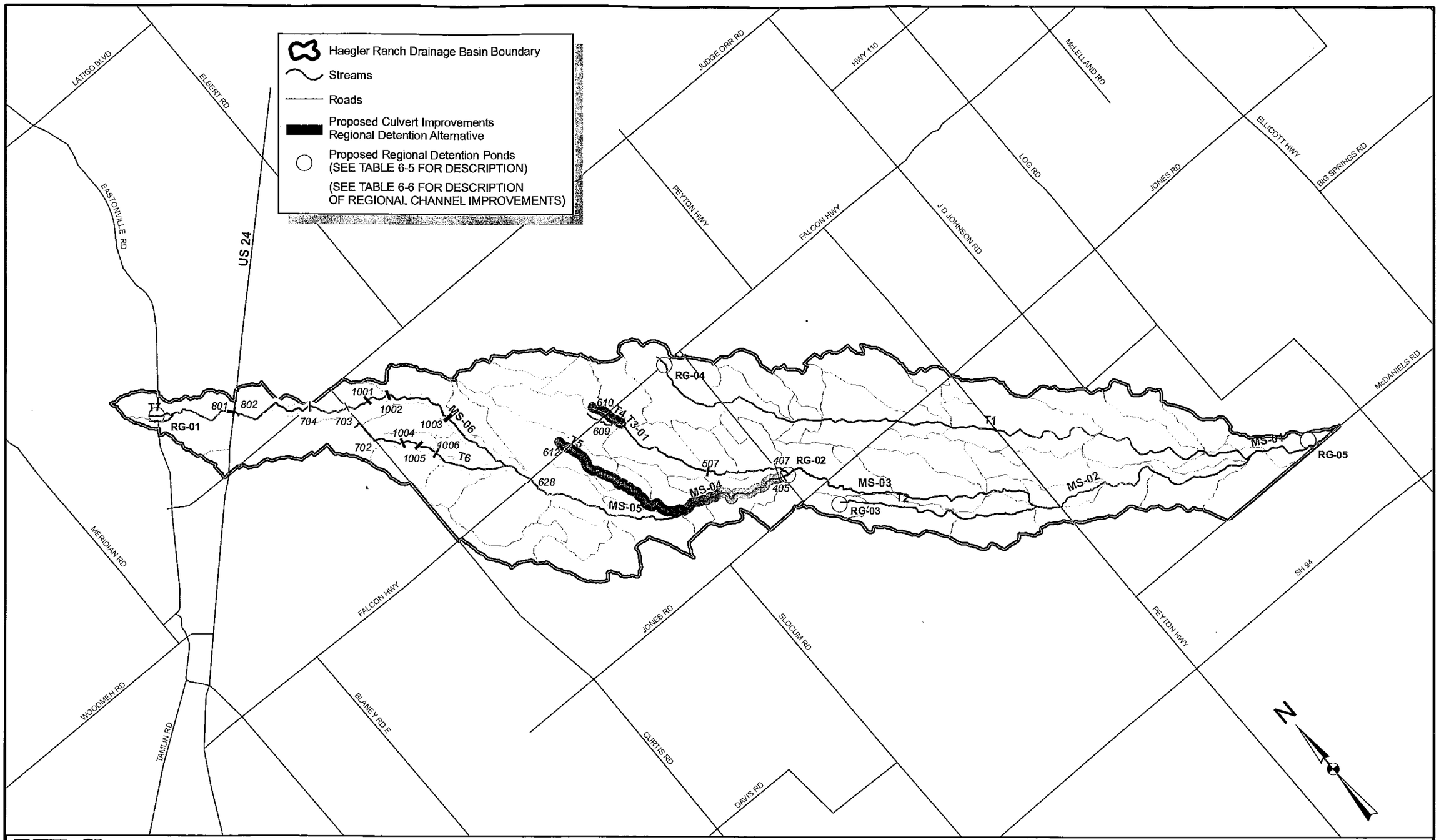
Subbasin Boundaries
Approximate 100-Year Floodplain
Thalweg
Cross Sections
2' Contours

HAEGLER RANCH DRAINAGE BASIN

APPROXIMATE 100-YEAR FLOOD LIMITS
SHEET T6-3
FIGURE 5-4

DATE: 09/08

URS NO. 21711039



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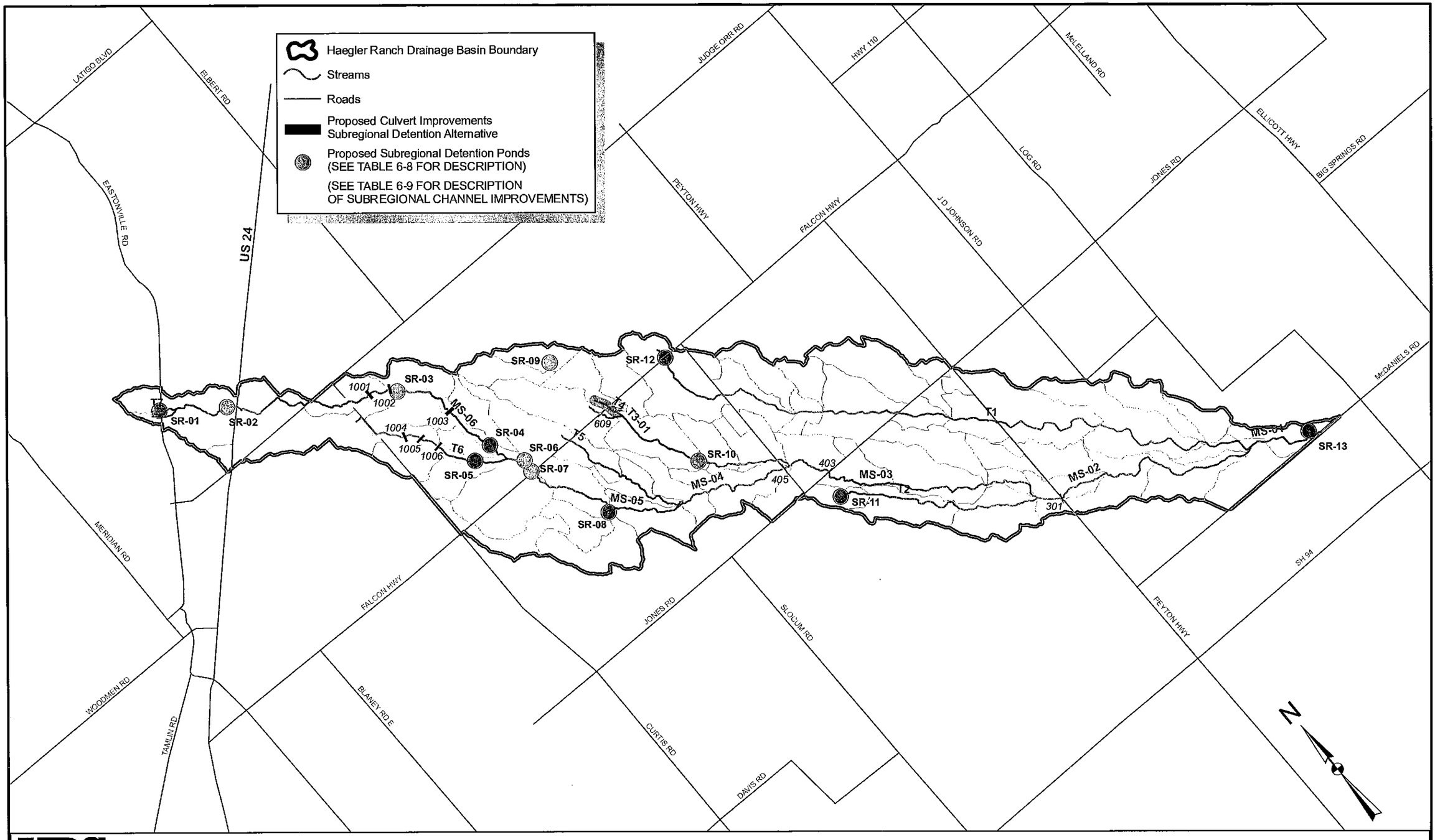
5,000 2,500 0 5,000 Feet

1" = 5,000'

DATE: 05/08

HAEGLER RANCH DRAINAGE BASIN
REGIONAL DETENTION
ALTERNATIVES
FIGURE 6-1

URS NO. 21711039



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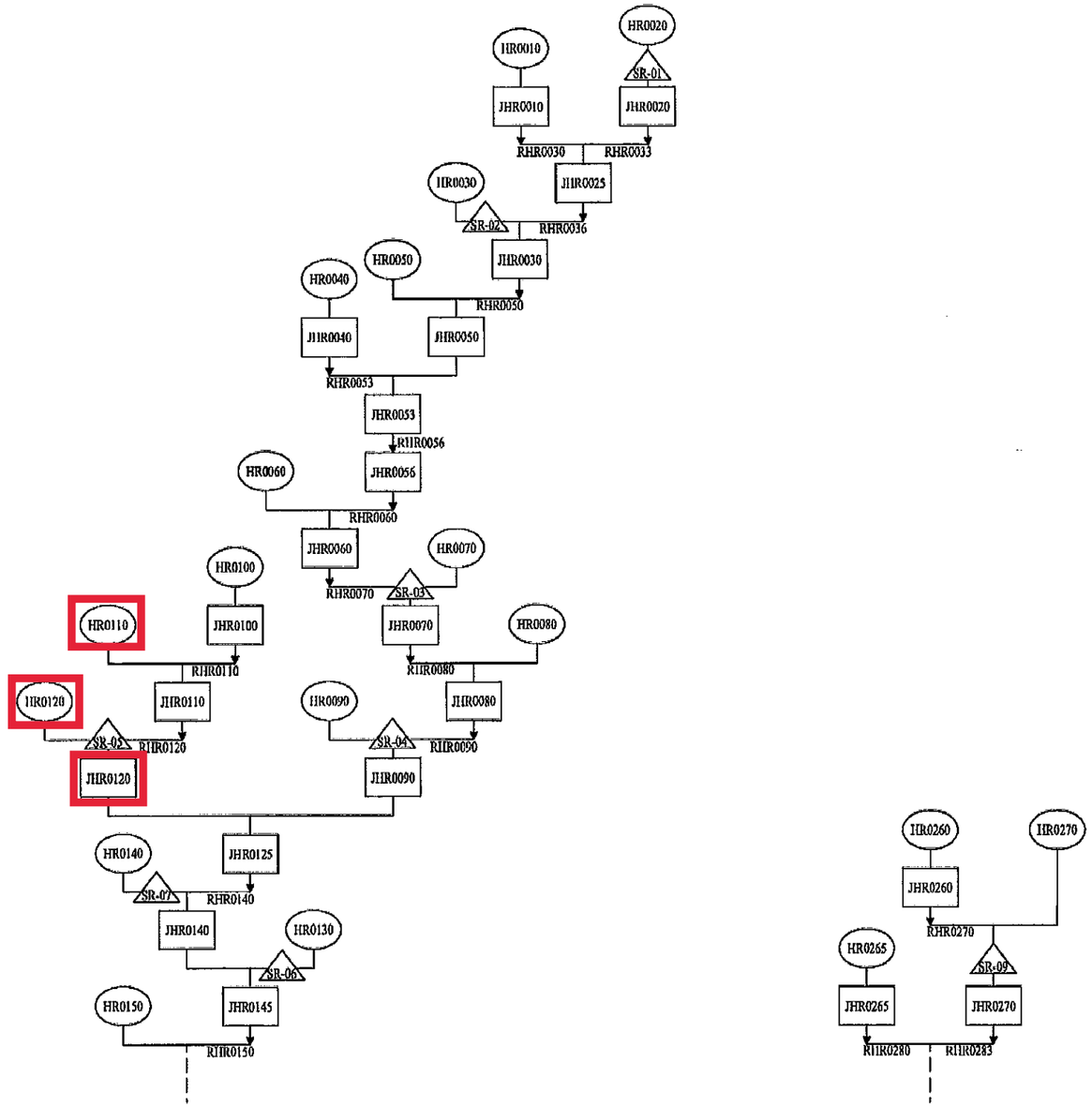
5,000 2,500 0 5,000 Feet

1" = 5,000'

DATE: 05/08

HAEGLER RANCH DRAINAGE BASIN
SUBREGIONAL DETENTION ALTERNATIVES
FIGURE 6-2

URS NO. 21711039



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HAEGLER RANCH DRAINAGE BASIN

SUBREGIONAL DETENTION ALTERNATIVE

SHEET 1

FIGURE 6-3

6.4.1. Channel & Culvert Costs

Channel costs for each alternative are based on cubic yards of excavation, plus the cost of the channel lining and drop structures. These costs are presented in Table 6-13 and Table 6-14.

Table 6-13 Regional Detention Alternative Channel Cost Estimates

Channel	Design Flow (cfs)	Channel Length (ft)	Total Cost	Drop Structure Cost
Main Stem (MS-04)	3,500	7,140	$1,626,000	none
Main Stem (MS-05)	3,000	11,100	$2,216,000	$2,539,000
Main Stem (MS-06)	900	7,330	$482,000	$589,000
Main Stem (MS-06)	1,000	3,170	$231,000	$268,000
Main Stem (MS-06)	1,500	4,450	$450,000	$548,000
Main Stem (MS-06)	2,000	3,330	$477,000	$636,000
Tributary 3 (T3-01)	1,500	6,710	$1,082,000	$1,302,000
Tributary 4 (T4)	600	1,840	$96,000	$127,000
Tributary 5 (T5)	300	930	$37,000	$36,000
Tributary 5 (T5)	500	7,770	$325,000	$370,000
Tributary 6 (T6)	500	4,270	$179,000	$222,000
Tributary 6 (T6)	600	3,940	$204,000	$253,000
Sub-Total			$7,405,000	$6,888,000
30% Construction Contingency			$2,222,000	$2,066,000
15% Engineering Contingency			$1,110,000	$1,033,000
Total			$10,737,000	$9,988,000

(See Tables C6 and C7 in Appendix C for details)

Table 6-14 Sub-Regional Detention Alternative Channel Cost Estimates

Channel	Design Flow (cfs)	Channel Length (ft)	Total Cost	Drop Structure Cost
Main Stem (MS-05)	2,000	1,560	$224,000	$367,000
Main Stem (MS-06)	600	3,120	$162,000	$295,000
Main Stem (MS-06)	1,000	4,535	$331,000	$375,000
Main Stem (MS-06)	800	3,190	$188,000	$368,000
Tributary 3 (T3-01)	600	5,000	$259,000	$422,000
Tributary 3 (T3-02)	500	420	$18,000	$37,000
Tributary 4 (T4)	500	940	$40,000	$74,000
Tributary 6 (T6)	500	4,280	$179,000	$333,000
Tributary 6 (T6)	300	1,400	$55,000	$107,000
Sub-Total			$1,456,000	$2,374,000
30% Construction Contingency			$430,000	$712,000
15% Engineering Contingency			$218,000	$356,000
Total			$2,111,000	$3,442,000

(See Tables C6 and C8 in Appendix C for details)

Culverts costs are based on a per linear foot of pipe with two flared end sections or two wing walls, as appropriate, complete-in-place. Culvert costs for each alternative are presented in Table 6-15 and Table 6-16.

Table 6-15 Regional Detention Alternative Roadway Crossing Cost Estimate Sumary

Facility Number	Road Crossing	Channel	Existing Size	Proposed 100-yr Flow (cfs)	Necessary Facility for Proposed 100-year Flow	Estimated Cost
405	Murr Road	Main Stem (MS-04)	66" RCP	3,400	9-6'X6' RCBs	$256,000
507	Peerless Farms Road	Tributary 3 (T3-01)	60" CMP	1200	4-6'X6' RCBs	$139,000
609	Falcon Highway	Tributary 3 (T3-02)	18" CMP	460	2-66" RCPs	$51,600
610	Falcon Highway	Tributary 4 (T4)	24" CMP	570	2-72" RCPs	$51,000
612	Falcon Highway	Tributary 5 (T5)	24" CMP	240	72" RCP	$26,000
628	Falcon Highway	Main Stem (MS-05)	2-60" CMPs	2,200	6-6'X6' RCBs	$243,000
702	Curtis Road	Tributary 6 (T6)	36" CMP	140	60" RCP	$29,000
703	Curtis Road	Main Stem (MS-06)	24" CMP	890	3-6'X6' RCBs	$142,000
704	Judge Orr Road	Main Stem (MS-06)	Blocked Culvert	830	3-6'X6' RCBs	$185,000
1001	Future Pastura Street	Main Stem (MS-06)	N/A	930	3-6'X6' RCBs	$99,000
1002	Future Arroyo Hondo Blvd. N.	Main Stem (MS-06)	N/A	930	3-6'X6' RCBs	$99,000
1003	Future Arroyo Hondo Blvd. N	Main Stem (MS-06)	N/A	1500	4-6'X6' RCBs	$143,000
1004	Future Pastura Strect	Tributary 6 (T6)	N/A	440	2-66" RCPs	$43,000
1005	Future El Vado Road	Tributary 6 (T6)	N/A	440	2-66" RCPs	$43,000
1006	Future Socorro Trail	Tributary 6 (T6)	N/A	440	2-66" RCPs	$43,000
Sub-Total						$1,591,000
30% Construction Contingency						$477,000
15% Engineering Contingency						$239,000
Total						$2,307,000

(See Table C4 in Appendix C for details)

Table 6-16 Sub-Regional Detention Roadway Crossing Cost Estimate Summary

Facility Number	Road Crossing	Channel	Proposed 100-yr Flow (cfs)	Necessary Facility for Proposed 100-year Flow	Estimated Cost
301	Peyton Highway	Main Stem (MS-02)	3,370	9-6'X6' RCBs	$402,000
403	Jones Road	Main Stem (MS-03)	2,970	8-6'X6' RCBs	$358,000
405	Murr Road	Main Stem (MS-04)	2,870	8-6'X6' RCBs	$283,000
609	Falcon Highway	Tributary 3 (T3-02)	460	2-6'X6' RCBs	$106,000
N/A	Falcon Highway	Tributary 1 (T1)	110	2 - 36" RCP	$20,000
1001	Future Pastura Street	Main Stem (MS-06)	610	2-6'X6' RCBs	$107,000
1002	Future Arroyo Hondo Blvd. N.	Main Stem (MS-06)	610	2-6'X6' RCBs	$87,000
1003	Future Arroyo Hondo Blvd. N.	Main Stem (MS-06)	530	2-6'X6' RCBs	$87,000
1004	Future Pastura Street	Tributary 6 (T6)	440	2-66" RCPs	$43,000
1005	Future El Vado Road	Tributary 6 (T6)	440	2-66" RCPs	$43,000
1006	Future Socorro Trail	Tributary 6 (T6)	440	2-66" RCPs	$43,000
Sub-Total					$1,582,000
30% Construction Contingency					$475,000
15% Engineering Contingency					$237,000
Total					$2,294,000

(See Tables C5 in Appendix C for details)

6.4.2. Detention Pond Costs

The cost of detention ponds, both regional and subregional, is based on the cubic yards of excavation, an estimated outlet structure, and the cost of the land required for the facility. These costs are presented in Table 6-17 and Table 6-18.

Table 6-17 Regional Detention Pond Cost Summary

Facility	Storage (AF)	Total Cost Including Construction and Engineering Contingencies
RG-01 9.02	9.02	$542,000
RG-02 64.52	64.52	$4,053,000
RG-03 0.04	0.04	$146,000
RG-04 1.07	1.07	$160,000
RG-05 0.03	0.03	$146,000
Total		$5,048,000

(See Tables C1 in Appendix C for details)

Table 6-18 Sub-Regional Detention Pond Cost Summary

Facility	Storage (AF)	Total Cost Including Construction and Engineering Contingencies
SR-01	10	$899,000
SR-02	5	$640,000
SR-03	16	$868,000
SR-04	25	$1,453,000
SR-05	24	$1,557,000
SR-06	9	$547,000
SR-07	5	$524,000
SR-08	5	$326,000
SR-09	20	$861,000
SR-10	23	$1,069,000
SR-11	2	$182,000
SR-12	9	$477,000
SR-13	3	$376,000
Total		$9,780,000

(See Table C1 in Appendix C for details)

6.4.3. Other Costs

Design Engineering costs are also included as 15% of the construction costs. Construction contingencies (30%) include such items as utility relocations, mobilization, temporary erosion control, and construction engineering.

6.4.4. Conceptual Alternative Costs

The total estimated capital costs for each alternative are based on the sum of the cost of the proposed facilities, plus costs for engineering and construction contingencies. These costs are listed in Table 6-19.

Table 6-19 Conceptual Alternative Costs

	Regional Alternative	Subregional Alternative
Detention Ponds	$5,048,000	$9,780,000
Channel Improvements	$10,737,000	$2,110,000
Drop Structures	$9,988,000	$3,442,000
Roadway Crossing Culverts	$2,307,000	$2,294,000
Total	$28,080,000	$17,627,000

impacted by site development, utility, roadway and landscape construction activities have in some cases negatively affected downstream areas.

El Paso County has enacted an erosion control ordinance to address these problems. In general, it is the responsibility of the entity conducting any land disturbance activity to properly control surface runoff, erosion and sedimentation during and after the activity. Technical criteria identifying measures which help mitigate the impacts of erosion and sedimentation are available and being used throughout the region. Minimum requirements must be developed to properly control erosion.

Erosion control is necessary to prevent environmental degradation caused by wind or water-borne soil. The following minimum criteria and standards are intended to prevent excessive erosion. El Paso County as well as other affected agencies will enforce the Clean Water Act standards if the planned erosion control measures fail to perform satisfactorily. Proper installation and maintenance is necessary to achieve the desired function of erosion control measures. By paying attention to quality, reinstallation can be avoided. General requirements for erosion control are as follows:

1. Any land disturbing activity shall be conducted so as to effectively reduce unacceptable erosion and resulting sedimentation.

2. All land disturbing activities shall be designed, constructed, and completed in such a manner that the exposure time of disturbed land shall be limited to the shortest possible period of time.

3. Sediment caused by accelerated soil erosion and runoff shall be intercepted by erosion control measures such as hay bales, silt fences and / or sediment ponds, and contained within the site.

4. Any facility designed and constructed to convey storm runoff shall be designed to be non-erosive.

5. Erosion control measures will be used prior to and during construction.

Temporary erosion control measures are required during construction, and permanent erosion control measures are required for all developments. Maintenance of erosion control measures is the responsibility of the property owner.

Various structures have been proposed in this plan to help control localized erosion and sedimentation problems. It is important that the erosion control plan for any land disturbing activity be strictly adhered to and maintained so that the above minimum criteria can be achieved in the Haegler Ranch Basin.

7.4. Operations and Maintenance

Maintenance of drainage way facilities is essential in preventing long term degradation of the creek and overbank areas. Along the drainageway, clearing of debris and dead vegetation should be considered within the low flow area of the creek and its tributaries. On the overbanks, limited maintenance of the existing vegetative cover is recommended. Semi-annual clearing of trash and debris at roadway crossings is also recommended to increase the effectiveness of the crossings. Sediments cleared from the channel or culvert should not be left on the overbank. This disturbs the native vegetation, creates a potential water quality concern if the dredgings are subsequently washed into the drainageway by natural erosion, and reduces the capacity of the overbank. In those reaches designated to be selectively lined and the floodplain preserved, maintenance activities should be carried out with the least disturbances to native vegetation that is practical.

Similar practices should be employed when removing sediment from detention basins. Although some channels degrade and others agrade, all detention basins will collect sediment and agrade. The use of an easily accessible concrete lined forebay in the final design of a detention facility can make the cleaning of the larger debris and trash more easily accomplished with motorized equipment. If forebays are provided, they will need clearing semi-annually and after major storm events. More frequent routine maintenance may be required depending on the type of development upstream and the access provided to the public. Plan for annual removal of sediment and debris from the detention area of a facility with a forebay.

Deposition in drainage facilities of wind-blown trash and debris, should be expected in this region. This means that regular maintenance, even without rainfall events, should be performed.

7.5. Drainage and Bridge Fee Calculations

The cost estimates and basin fee calculation for the major drainageways, tributary drainageways, roadway culverts, regional detention basins, and related improvements for the Sub-Regional Detention Facilities are presented in Table 7-2. The sub-regional detention capital construction cost estimates include the cost for the construction of the embankment, water quality, and outlet structures. Bridges in the Sub-Regional Detention Alternative are presented in Table 7-3. The cost estimates include engineering and construction costs for the entire Haegler Ranch Basin as presented on the Conceptual Design Drawings in Appendix D. These estimates do not include costs for local or initial systems, and therefore no costs attributable to local or minor drainage systems have been computed in the estimation of the drainage basin fee. These systems are expected to be provided with proposed development. Costs associated with utility relocations have not been estimated but would be included in construction contingencies. A review of utility maps indicates that the majority of the potential relocations occur at the roadway crossings. Land acquisition costs for the detention facilities were not included for calculation of fees per Appendix L of the El Paso County Criteria Manual.

Unplatted acreage within Haegler Ranch was obtained from El Paso County, and is shown in Figure 7-I. A total of 8,953 acres is estimated to be currently unplatted and subject to future development. This unplatted land is projected to have an average imperviousness of approximately 15%, corresponding to approximately 1,343 unplatted impervious acres. All drainage and bridge fees are calculated per *impervious* acre. (See Appendix D for an unplatted area breakdown by subbasin and average imperviousness calculations.)

Reimbursable costs calculated for the Haegler Ranch Basin are listed in Table 7-4. These costs are based on improvements required under existing conditions. The term "reimbursable costs" used on Table 7-4 means those costs that have been used in estimation of drainage basin fees. Costs considered "non-reimbursable" are costs for the replacement of existing, undersized culverts, or costs to rehabilitate or maintain an existing lined segment of drainageway. For the most part, all of the drainageway costs for Haegler Ranch Basin are considered reimbursable.

The calculated drainage basin fee presented in Table 7-2 is $ 7,633 per impervious acre, and the bridge fee is $1,126 per impervious acre, as shown in Table 7-3.

Table 7-2 Drainage Basin Fee Calculations

Channel Improvements					
Channel	**Basins**	**Channel Construction Cost**	**Drop Structure Construction Cost**	**Contingency Cost**	**Total Cost**
Main Stem (MS-05)	HR0200	$224,000	$363,600	$264,420	$852,020
Main Stem (MS-06)	HR0070	$162,000	$295,400	$205,830	$633,230
Main Stem (MS-06)	HR0080	$331,000	$374,500	$317,475	$1,022,975
Main Stem (MS-06)	HR0090	$188,000	$368,000	$250,200	$806,200
Tributary 3 (T3-01)	HR0330	$259,000	$422,000	$306,450	$987,450
Tributary 3 (T3-02)	HR0300	$18,000	$37,000	$24,750	$79,750
Tributary 4 (T4)	HR0300	$40,000	$74,000	$51,300	$165,300
Tributary 6 (T6)	HR0110	$179,000	$333,000	$230,400	$742,400
Tributary 6 (T6)	HR0120	$55,000	$106,500	$72,675	$234,175
Subtotal Channel Costs					$5,553,500

Culvert Improvements					
Culvert	**Road Crossing**	**Channel**	**Culvert Construction Cost**	**Contingency Cost**	**Total Cost**
609	Falcon Highway	Tributary 3 (T3-02)	$106,301	$47,836	$154,137
N/A	Falcon Highway	Tributary 1 (T1)	$19,500	$8,775	$28,275
1001	Future Pastura Street	Main Stem (MS-06)	$106,301	$47,836	$154,137
1002	Future Arroyo Hondo Blvd. N.	Main Stem (MS-06)	$87,301	$39,286	$126,587
1003	Future Arroyo Hondo Blvd. N.	Main Stem (MS-06)	$87,301	$39,286	$126,587
1004	Future Pasture Street	Tributary 6 (T6)	$51,000	$22,950	$73,950
1005	Future El Vado Road	Tributary 6 (T6)	$19,500	$8,775	$28,275
1006	Future Socorro Trail	Tributary 6 (T6)	$42,800	$19,260	$62,060
Subtotal Culvert Costs					$754,007

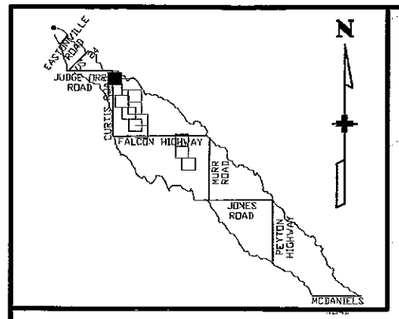
Detention Improvements					
Facility	**Storage (AF)**	**Construction Cost**		**Contingency Cost**	**Total Cost**
SR-01	10	$296,701		$133,516	$430,217
SR-02	5	$207,949		$93,577	$301,525
SR-03	16	$186,252		$83,814	$270,066
SR-04	25	$390,182		$175,582	$565,764
SR-05	24	$455,235		$204,856	$660,091
SR-06	9	$140,670		$63,301	$203,971
SR-07	5	$162,046		$72,921	$234,967
SR-08	5	$87,489		$39,370	$126,860
SR-09	20	$188,250		$84,713	$272,963
SR-10	23	$331,635		$149,236	$480,871
SR-11	2	$56,880		$25,596	$82,476
SR-12	9	$108,987		$49,044	$158,031
SR-13	3	$107,812		$48,515	$156,327
Subtotal Detention Costs					$3,944,129
Total Cost					**$10,251,636**
Total Unplatted Impervious Acres					**1,343**
Fee Per Impervious Acre					**$7,633**

Table 7-3 Bridge Fee Calculation

301	Peyton Highway	Main Stem (MS-02)	401,710	$180,770	$582,480
403	Jones Road	Main Stem (MS-03)	358,123	$161,155	$519,278
405	Murr Road	Main Stem (MS-04)	282,941	$127,323	$410,264
Subtotal Bridge Costs					$1,512,022
Total Cost					**$1,512,022**
Total Unplatted Impervious Acres					**1,343**
Bridge Fee Per Impervious Acre					**$1,126**

Table 7-4 Reimbursable Costs

Reimbursable Culvert Improvements					
Culvert	**Road Crossing**	**Channel**	**Culvert Construction Cost**	**Contingency Cost**	**Total Cost**
N/A	Peyton Highway	Tributary 1 (T1)	$51,000	$22,950	$73,950
N/A	Falcon Highway	Tributary 1 (T1)	$9,7580	$4,388	$14,138
301	Peyton Highway	Main Stem (MS-02)	$314,535	$141,541	$456,076
401	Jones Road	Tributary 1 (T1)	$53,111	$23,900	$77,011
403	Jones Road	Main Stem (MS-03)	$270,947	$121,926	$392,874
405	Murr Road	Main Stem (MS-04)	$180,371	$81,167	$261,538
407	Murr Road	Tributary 3 (T3-01)	$77,801	$35,011	$112,812
507	Peerless Farms Road	Tributary 3 (T3-01)	$115,801	$52,111	$167,912
509	Murr Road	Tributary 1 (T1)	$19,300	$8,685	$27,985
601	Whiting Way	Tributary 1 (T1)	$23,500	$10,575	$34,075
604	Max Road	Tributary 1 (T1)	$19,300	$8,685	$27,985
609	Falcon Highway	Tributary 3 (T3-02)	$25,600	$11,520	$37,120
610	Falcon Highway	Tributary 4 (T4)	$23,500	$10,575	$34,075
612	Falcon Highway	Tributary 5 (T5)	$21,200	$9,540	$30,740
628	Falcon Highway	Main Stem (MS-05)	$154,741	$69,633	$224,375
702	Curtis Road	Tributary 6 (T6)	$23,150	$10,418	$33,568
703	Curtis Road	Main Stem (MS-06)	$125,301	$56,386	$181,687
704	Judge Orr Road	Main Stem (MS-06)	$83,200	$37,440	$120,640
803	Eastonville Road	Main Stem (MS-07)	$9,680	$4,356	$14,036
804	Eastonville Road	Tributary 7 (T7)	$14,980	$6,741	$21,721
Subtotal Channel Costs					$2,344,315
Reimbursable Detention Improvements					
Facility	**Storage (AF)**	**Construction Cost**		**Contingency Cost**	**Total Cost**
SR-01	10	$296,701		$133,516	$430,217
SR-02	5	$207,949		$93,577	$301,525
SR-03	16	$186,252		$83,814	$270,066
SR-04	25	$390,182		$175,582	$565,764
SR-05	24	$455,235		$204,856	$660,091
SR-06	9	$140,670		$63,301	$203,971
SR-07	5	$162,046		$72,921	$234,967
SR-08	5	$87,489		$39,370	$126,860
SR-09	20	$188,250		$84,713	$272,963
SR-10	23	$331,635		$149,236	$480,871
SR-11	2	$56,880		$25,596	$82,476
SR-12	9	$108,987		$49,044	$158,031
SR-13	3	$107,812		$48,515	$156,327
Subtotal Detention Costs					$3,944,129
Total Reimbursable Cost					**$6,288,444**



HR0060

HR0070

HR0100

HR0070

CURTIS ROAD

BEGIN PROPOSED IMPROVEMENTS

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MAIN STEM MS-06
(SEE PROFILE MS-06)

6780 6770 6760 6750

MATCHLINE MS-06 PG 2

LEGEND

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	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

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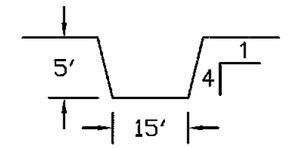

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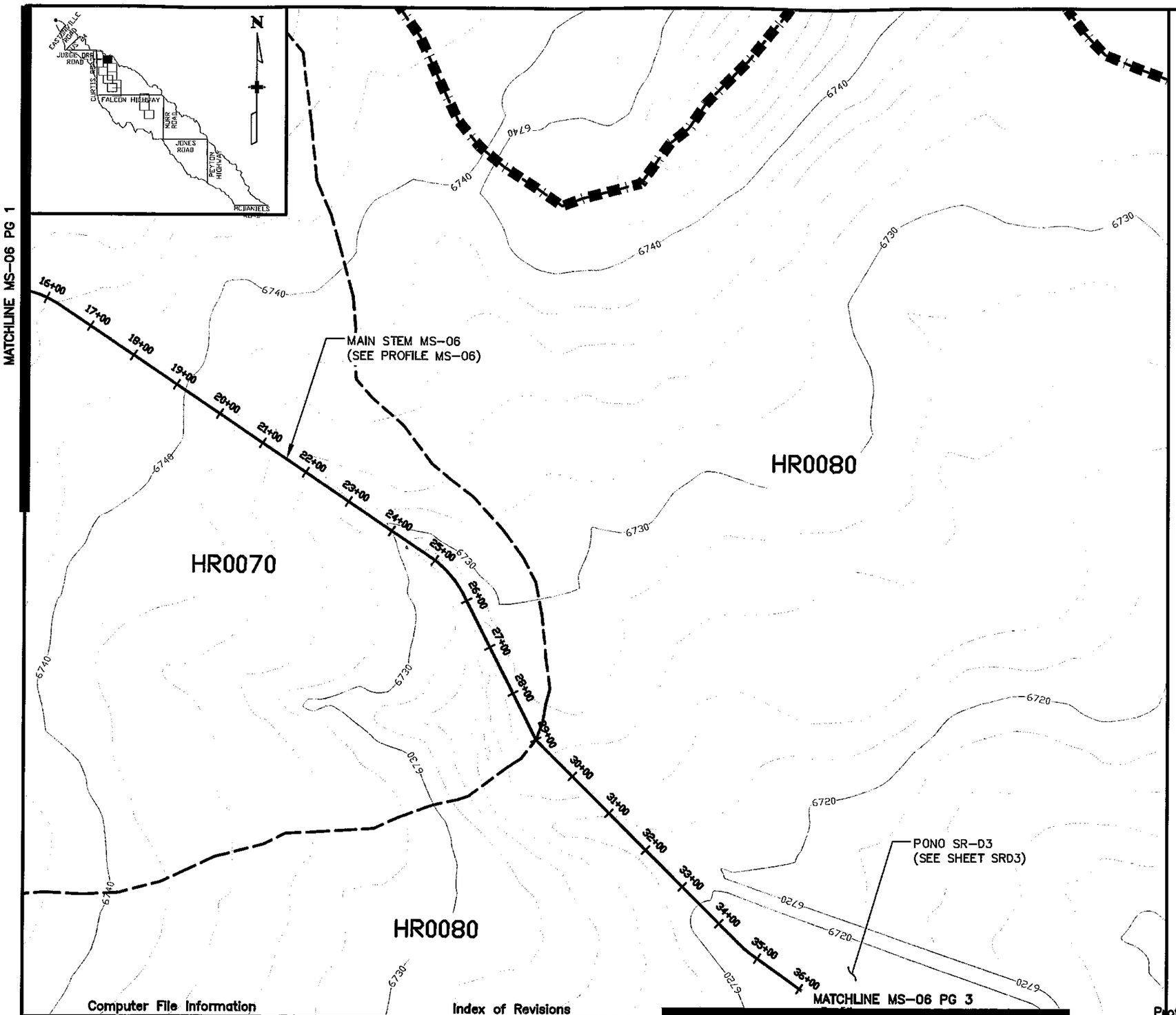
Designed by: KAP
Detailed by: DRM
Checked by: JAJ

Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number MAIN STEM PG 1



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- CONTOURS – MINOR ELEVATION
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- ROADS
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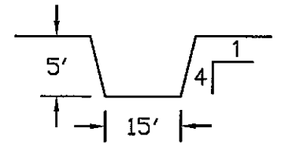

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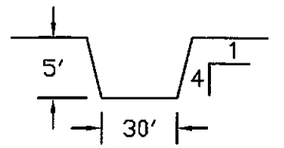

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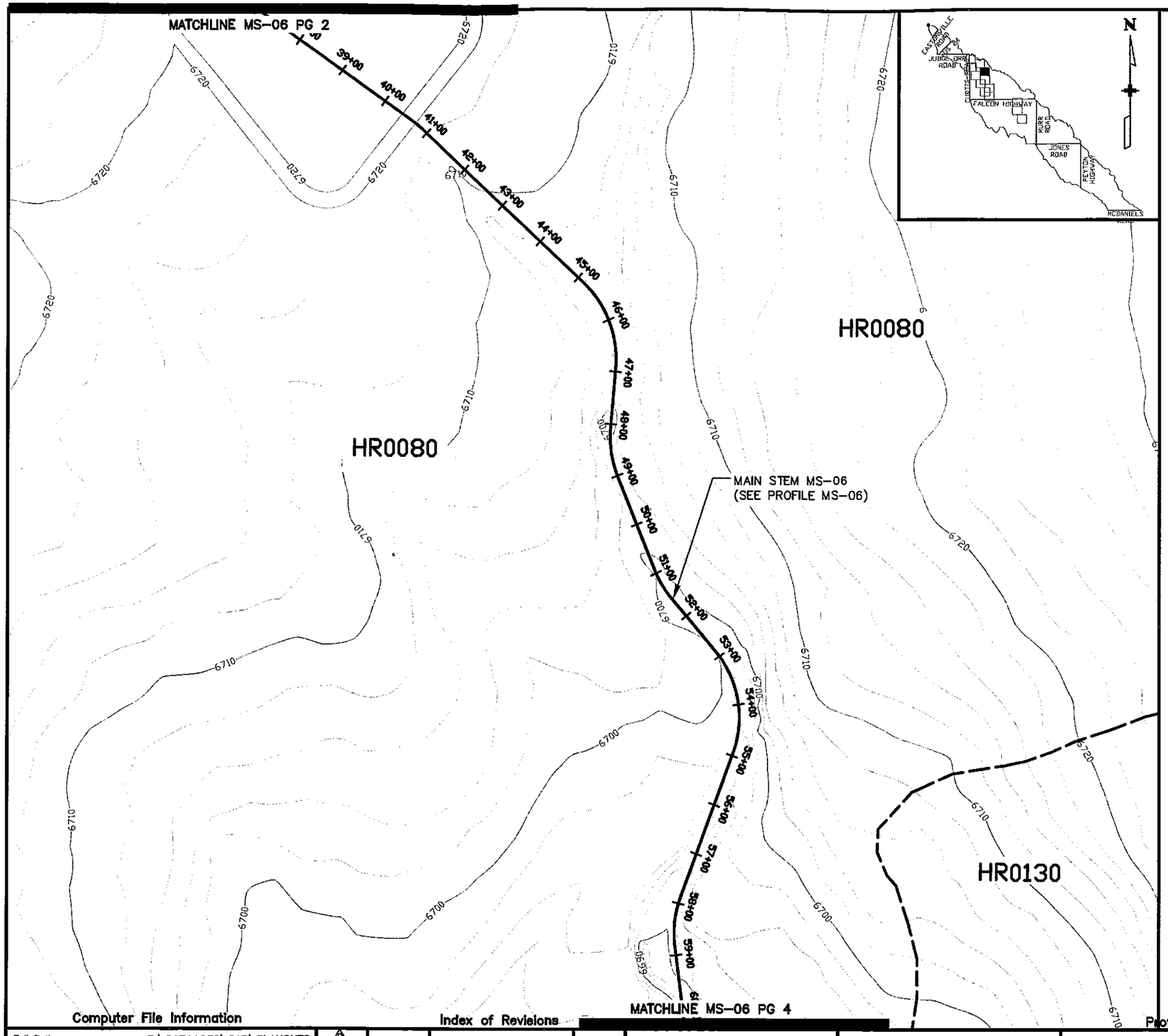
Detailed by: DRM
Checked by: JAJ

Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number MAIN STEM PG 2



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	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

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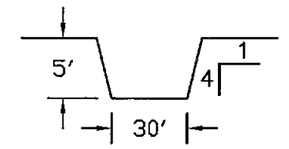

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Detailed by: DRM
Checked by: JAJ

Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number MAIN STEM PG 3

MATCHLINE MS-06 PG 3

HR0110

HR0080

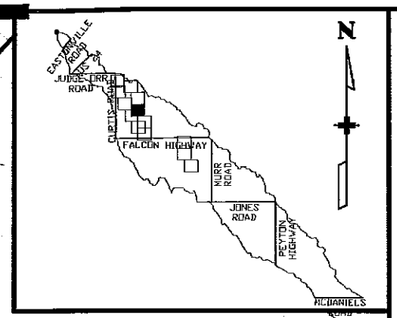
HR0130

HR0090

HR0090

MAIN STEM MS-06
(SEE PROFILE MS-06)

MATCHLINE MS-06 PG 5



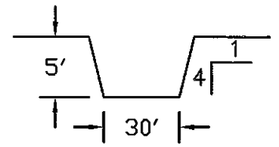
LEGEND

6630	CONTOURS – MAJOR ELEVATION
	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

1"=200'

200 0 200 400

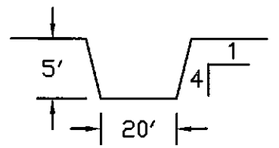
CHANNEL: MAIN STEM (MS-06)
BASIN: HR0080



STA: 31+34 TO STA: 74+61

Q: 1000 CFS

CHANNEL: MAIN STEM (MS-06)
BASIN: HR0090



STA: 74+61 TO STA: 103+62

Q: 800 CFS

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS
Drawing File Name: CHANNEL.DWG
Acad. Ver. 2006 Scale: 1"=200' Units: Feet

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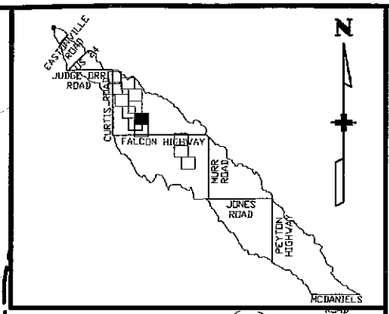
Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number MAIN STEM PG 4

MATCHLINE MS-06 PG 4



MAIN STEM MS-06
(SEE PROFILE MS-06)

HR0090

HR0130

HR0210

HR0140

POND SR-05
(SEE SHEET SR05)

POND SR-04
(SEE SHEET SR04)

MAIN STEM MS-06
(SEE MAINSTEM PAGE 5)

TRIBUTARY 6 (T6)
(SEE PROFILE TRIBUTARY 6)

MATCHLINE MS-06 PG 6

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Profiles

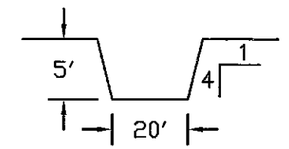
LEGEND

6630	CONTOURS – MAJOR ELEVATION
	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

1"=200'

200 0 200 400

CHANNEL: MAIN STEM (MS-06)
BASIN: HR0090



STA: 74+61 TO STA: 103+62

Q: 800 CFS

Computer File Information

Full Path:	P:\21711039\CAD\PLANSHTS
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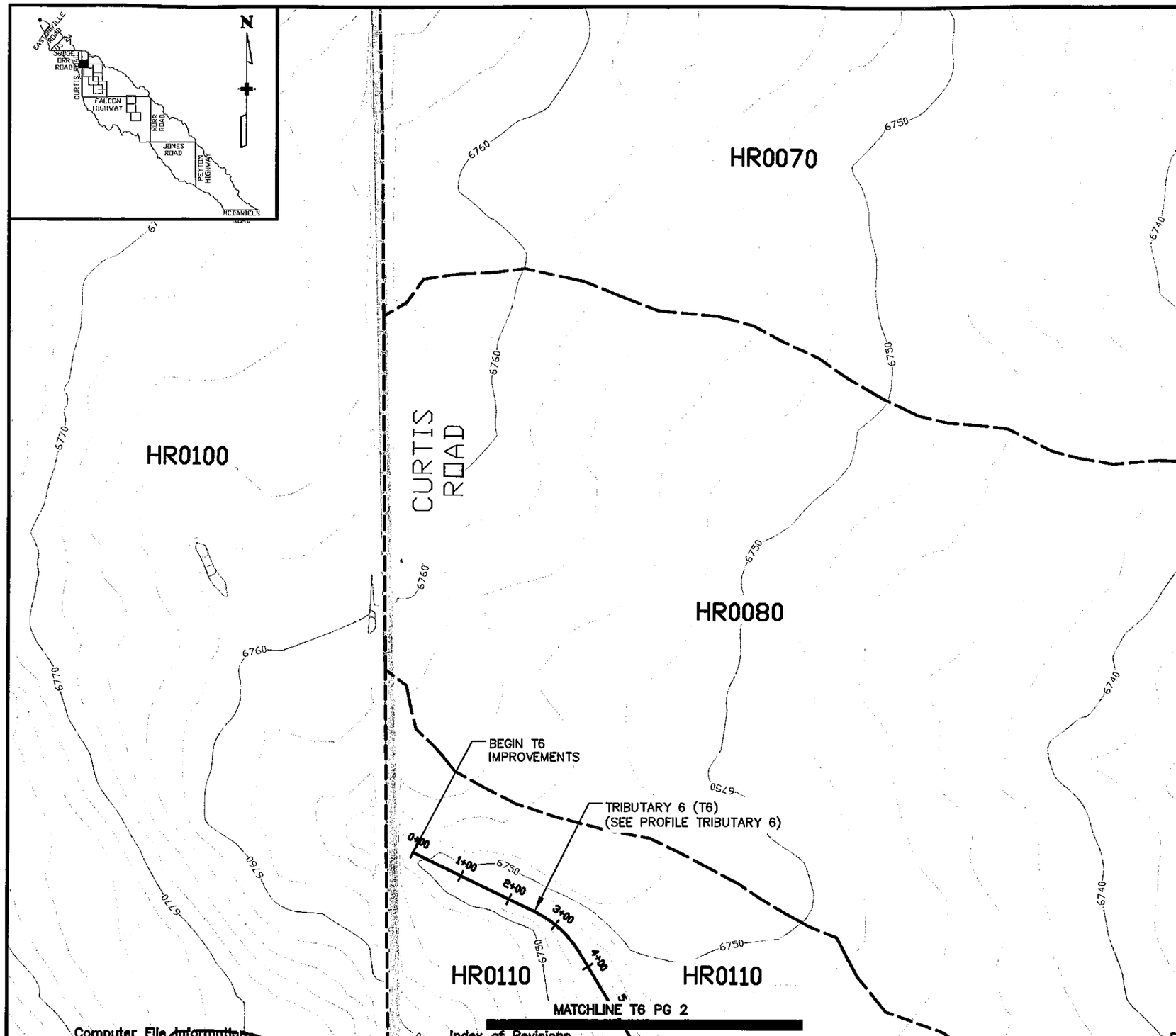
Detailed by:	DRM
Checked by:	JAJ

Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number MAIN STEM PG 5



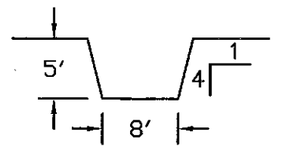
LEGEND

6630	CONTOURS – MAJOR ELEVATION
	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

1"=200'

200 0 200 400

CHANNEL: TRIBUTARY 6 (T6)
BASIN: HR0110



STA: 0+00 TO STA: 41+73

Q: 500 CFS

Computer File Information

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Drawing File Name:	CHANNEL.DWG	△				Detailed by: DRM	
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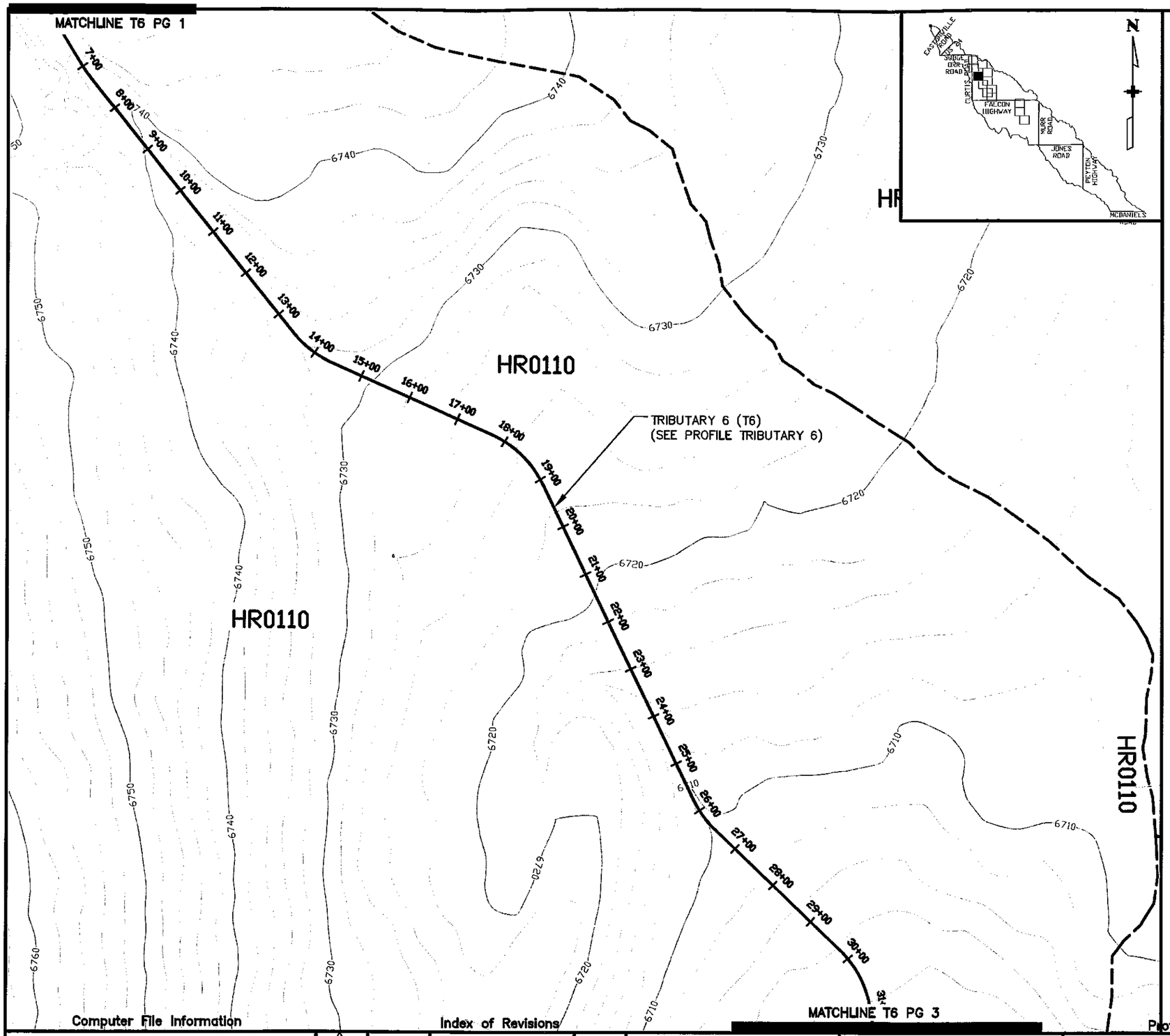
HAEGLER RANCH SUB-REGIONAL DETENTION ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number TRIBUTARY 6 PG 1



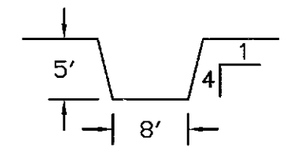
LEGEND

6630	CONTOURS – MAJOR ELEVATION
	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

1"=200'

200 0 200 400

CHANNEL: TRIBUTARY 6 (T6)
BASIN: HR0110



STA: 0+00 TO STA: 41+73

Q: 500 CFS

Computer File Information

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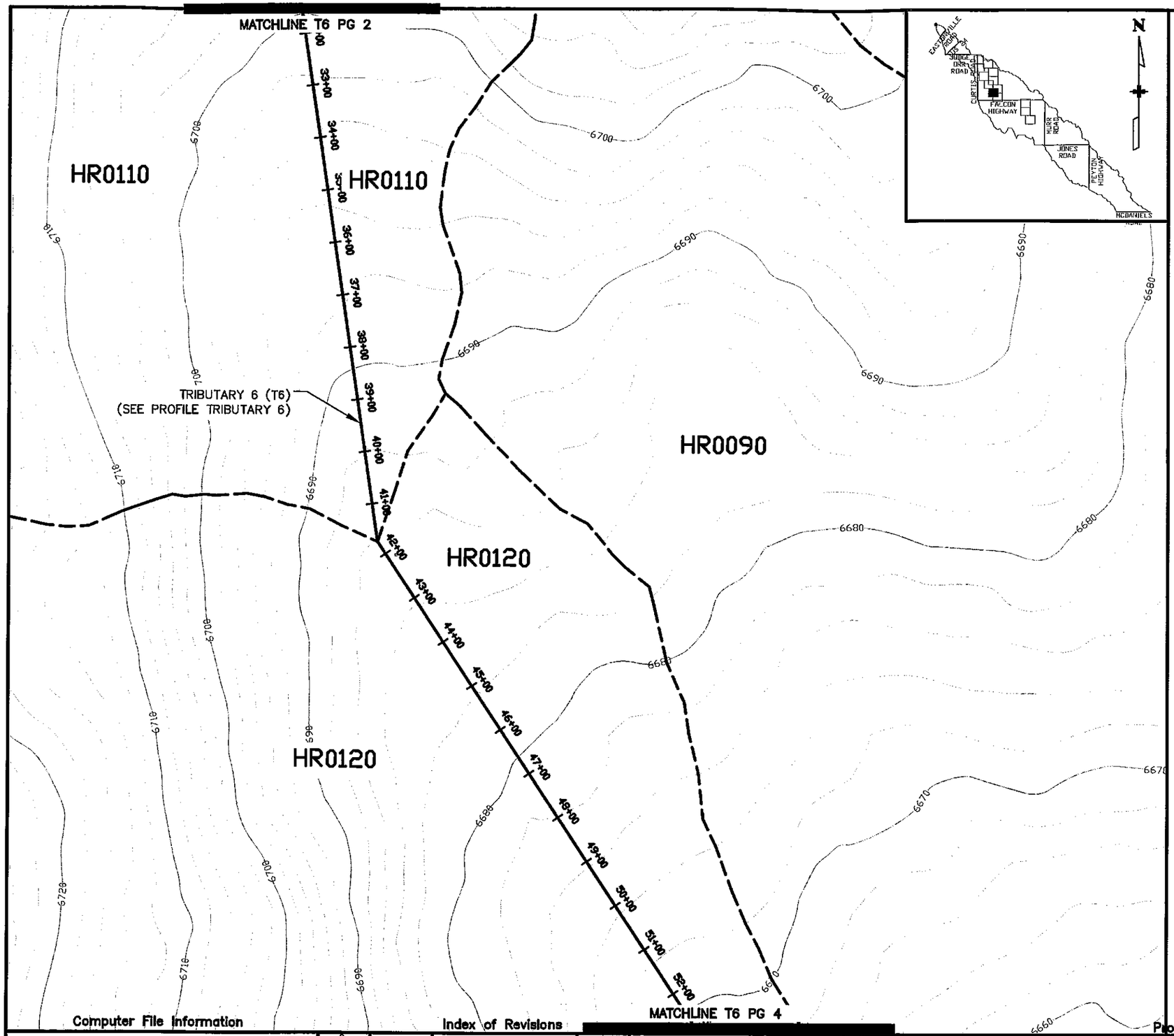
HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number TRIBUTARY 6 PG 2



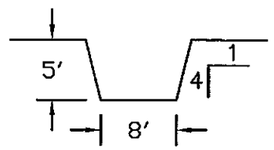
LEGEND

6630	CONTOURS – MAJOR ELEVATION
	CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	BASIN BOUNDARY
	ROADS
20+00	RIVER AND ALIGNMENT

1"=200'

200 0 200 400

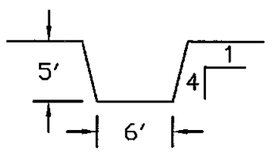
CHANNEL: TRIBUTARY 6 (T6)
BASIN: HR0110



STA: 0+00 TO STA: 41+73

Q: 500 CFS

CHANNEL: TRIBUTARY 6 (T6)
BASIN: HR0120



STA: 41+73 TO STA: 75+50

Q: 300 CFS

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS
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Detailed by: DRM
Checked by: JAJ

Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number TRIBUTARY 6 PG 3

MATCHLINE MS-06 PG 2

TRIBUTARY 6 (T6)
(SEE PROFILE TRIBUTARY 6)

HR0120

POND SR-05
(SEE SHEET SR05)

POND SR-04
(SEE SHEET SR04)

HR0090

MAIN STEM MS-06
(SEE MAINSTEM PAGE 5)

HR0120

TRIBUTARY 6 (T6)
(SEE PROFILE TRIBUTARY 6)

MATCHLINE MS-06 PG 6

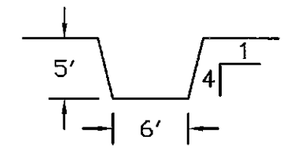
LEGEND

- 6630 — CONTOURS – MAJOR ELEVATION
- CONTOURS – MINOR ELEVATION
- WATERSHED BOUNDARY
- BASIN BOUNDARY
- ROADS
- 20+00 — RIVER AND ALIGNMENT

1"=200'

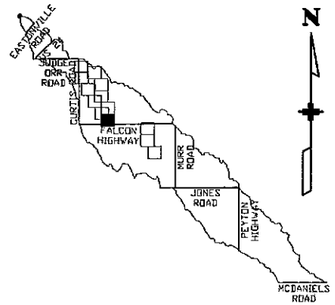
200 0 200 400

CHANNEL: TRIBUTARY 6 (T6)
BASIN: HR0120



STA: 41+73 TO STA: 75+50

Q: 300 CFS



Computer File Information

Full Path:	P:\21711039\CAD\PLANSHTS
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Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION
ALTERNATIVE CONCEPTUAL CHANNELS

Sheet Number TRIBUTARY 6 PG 4

PROFILE MAIN STEM (MS-06 & MS-05)

MS-06 HR0070

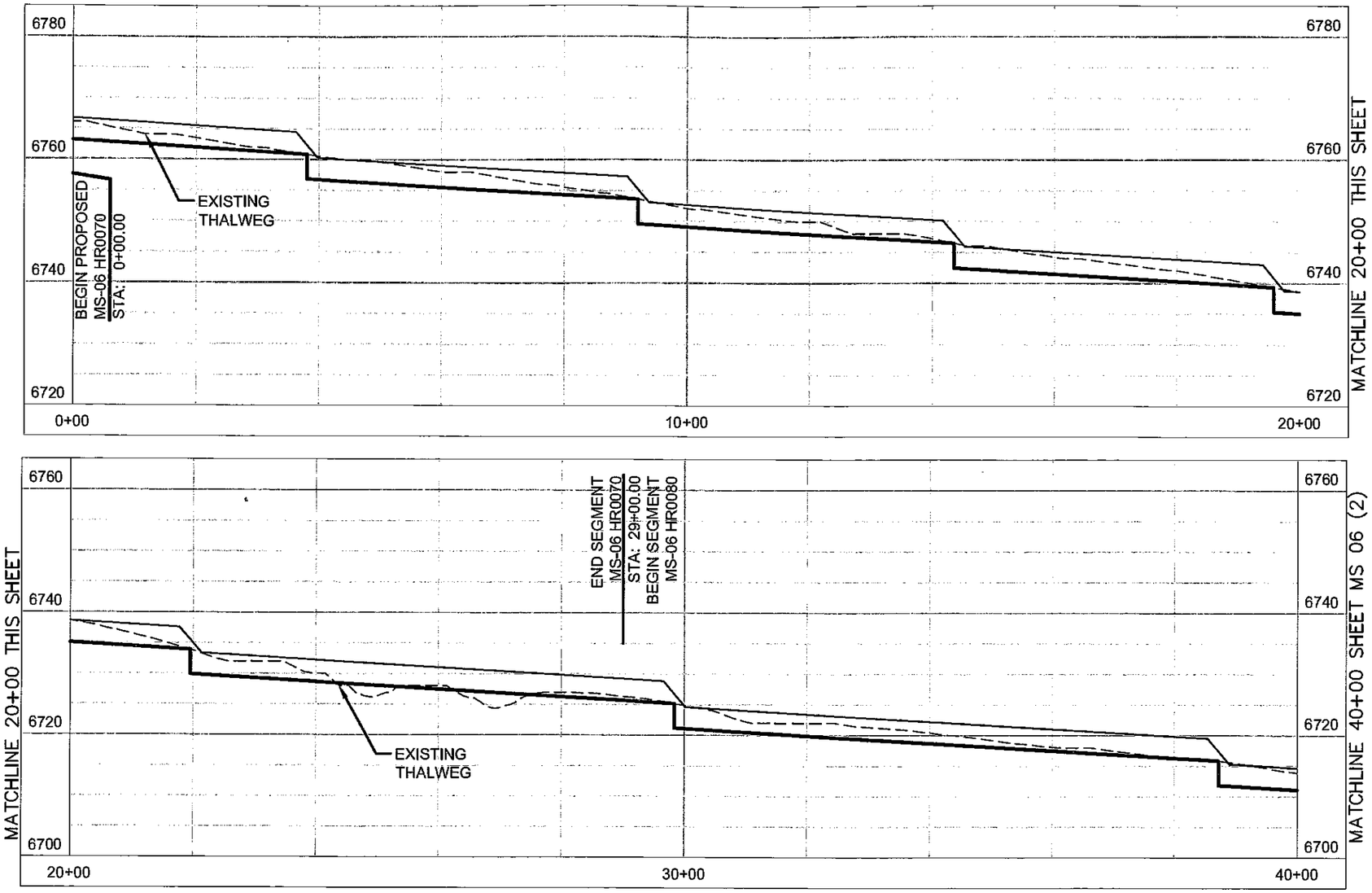
SLOPE = 0.60%

(7) 4' DROPS

MS-06 HR0080

SLOPE = 0.60%

(7) 4' DROPS



LEGEND

- PROPOSED DROP STRUCTURE
- EXISTING THALWEG
- HYDRAULIC GRADE LINE

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS

Drawing File Name: MAINSTEM PROFILES_PRDPOSED.DWG

Acad. Ver. 2006 Scale: 1"=2D' Units: Feet

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Checked by:

Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION ALTERNATIVE CONCEPTUAL PROFILES

Sheet Number MS 06

MS–06 HR0080

SLOPE = 0.60%

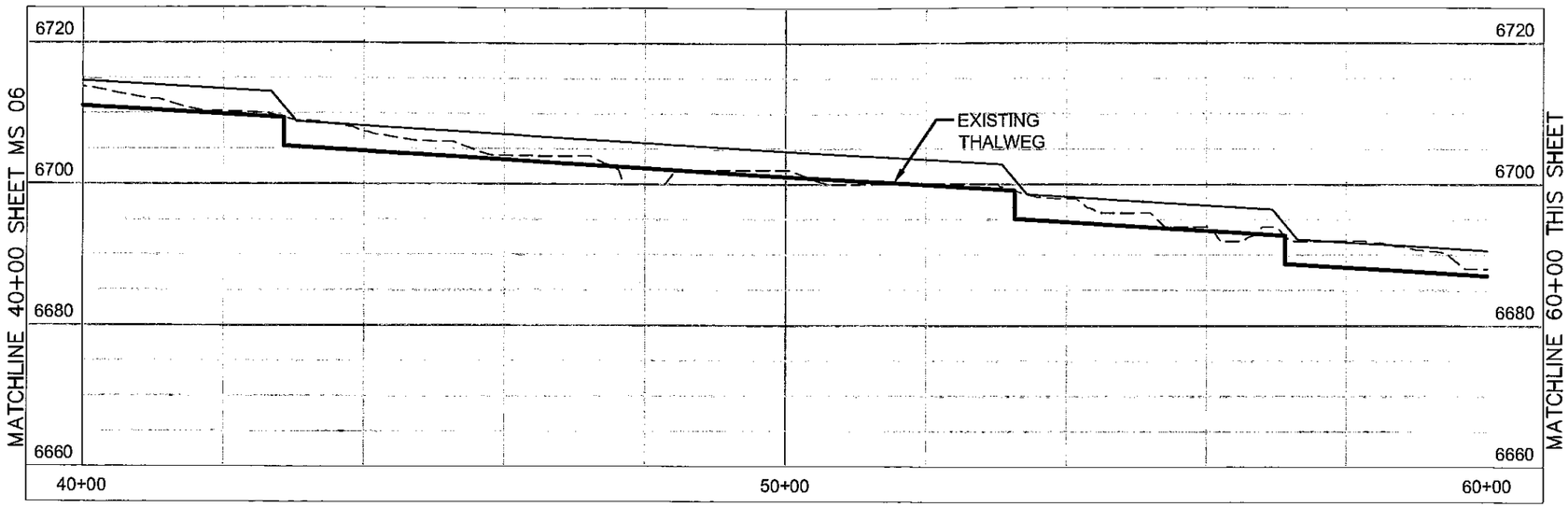
(7) 4' DROPS

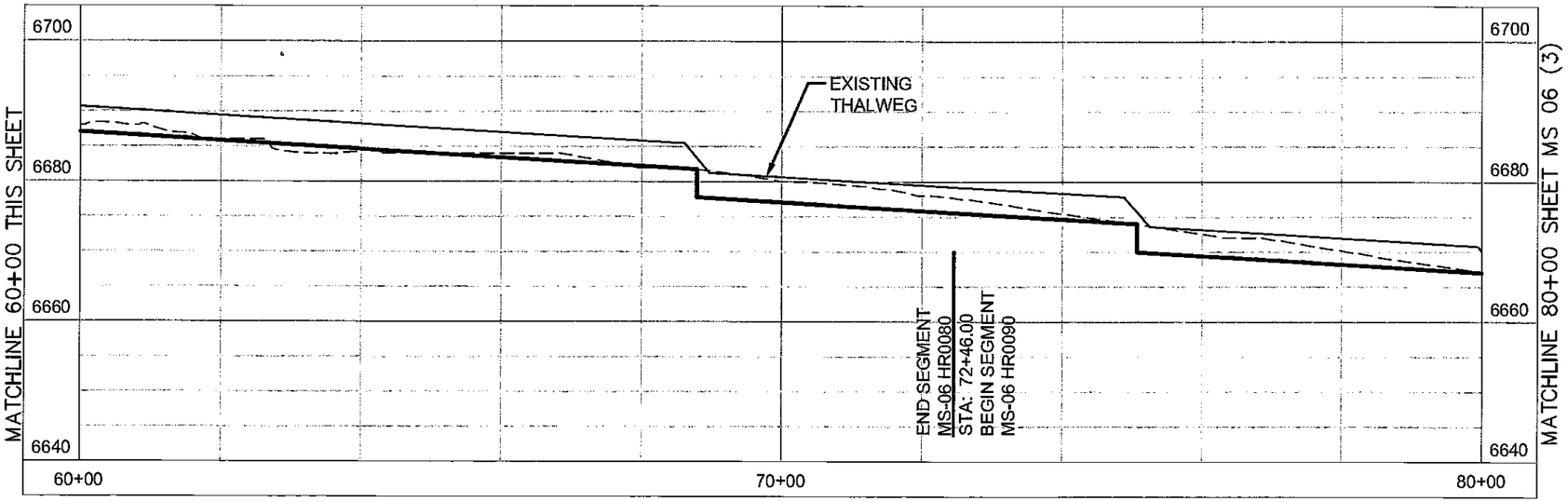
MS–06 HR0090

SLOPE = 0.60%

(8) 4' DROPS

PROFILE MAIN STEM (MS–06 & MS–05)





LEGEND

- PROPOSED DROP STRUCTURE
- EXISTING THALWEG
- HYDRAULIC GRADE LINE

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS

Drawing File Name: MAINSTEM PROFILES_PROPOSED.DWG

Acad. Ver. 2006 Scale: 1"=20' Units: Feet

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Structure Numbers

HAEGLER RANCH SUB-REGIONAL DETENTION ALTERNATIVE CONCEPTUAL PROFILES

Sheet Number MS06 (2)

MS–06 HR0090

SLOPE = 0.60%

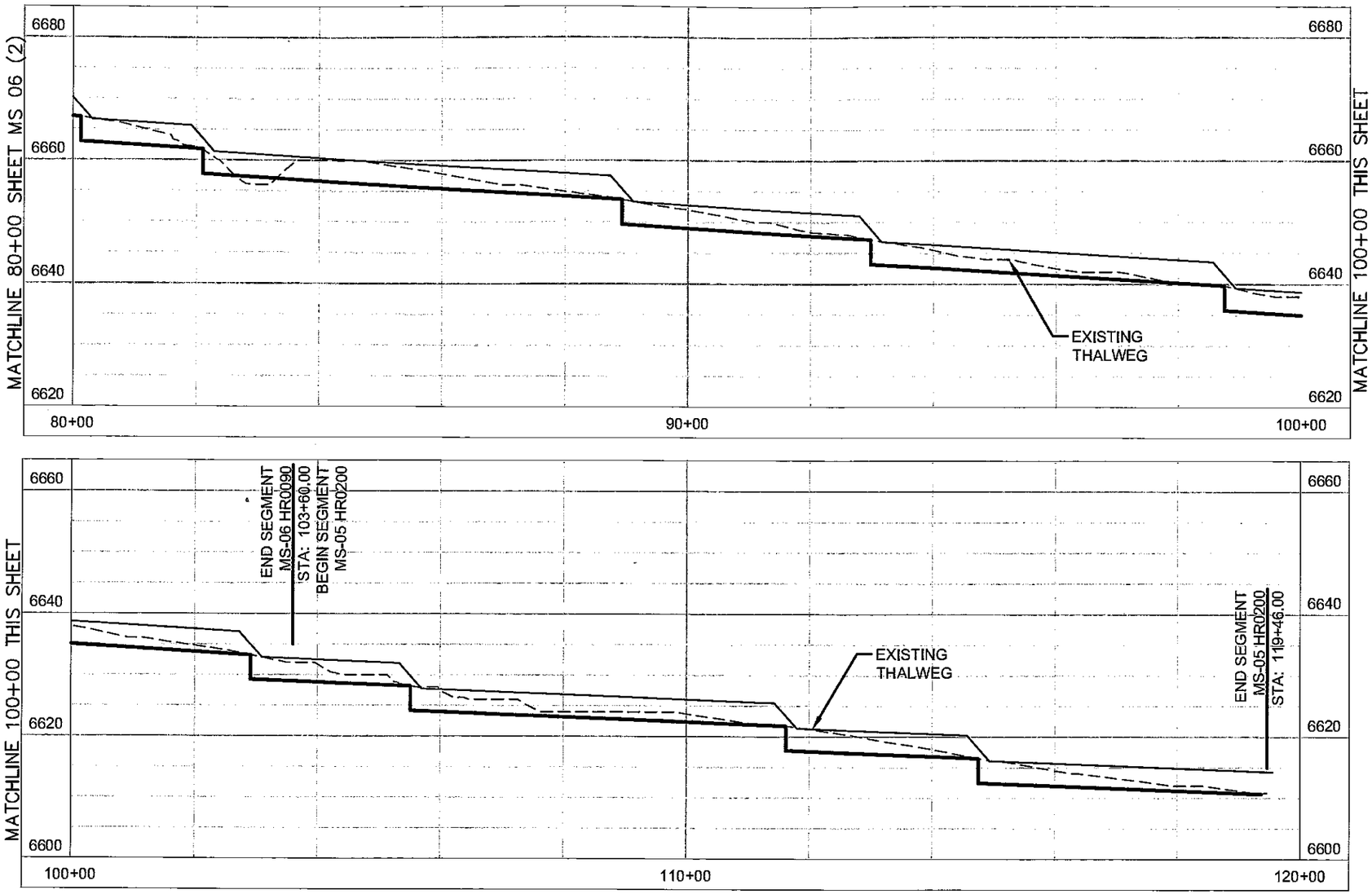
(8) 4' DROPS

MS–05 HR0200

SLOPE = 0.40%

(4) 4' DROPS

PROFILE MAIN STEM (MS–06 & MS–05)



LEGEND

- PROPOSED DROP STRUCTURE
- EXISTING THALWEG
- HYDRAULIC GRADE LINE

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS

Drawing File Name: MAINSTEM PROFILES_PROPOSED.DWG

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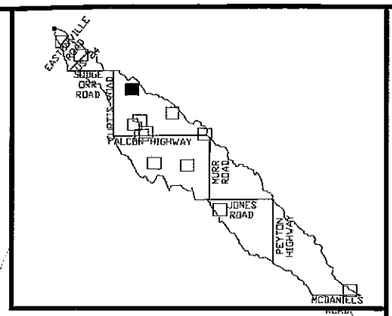
HAEGLER RANCH SUB-REGIONAL DETENTION ALTERNATIVE CONCEPTUAL PROFILES

Sheet Number MS06 & MS05 (3)

POND SR-03



MAIN STEM MS-06
(SEE MAINSTEM PG 2 & 3)
(SEE PROFILE MS-06)

TOP OF BERM
6724'

100 YEAR
WS 6721'

LOW POINT

6730 6720 6710

LEGEND

6630	PROPOSED CONTOURS – MAJOR ELEVATION
	PROPOSED CONTOURS – MINOR ELEVATION
6630	EXISTING CONTOURS – MAJOR ELEVATION
	EXISTING CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	ROADS
	RIVER
	100 YEAR WATER SURFACE ELEVATION
⊠	OUTLET

POND SR-03
DISCHARGE

Q100	530 CFS
Q2	29 CFS
POND VOLUME AC FT	16
BERM WIDTH	10'
SIDESLOPES	8:1

N

1"=200'

200 0 200 400

Computer File Information

Full Path:	P:\21711039\CAD\PLANSHTS
Drawing File Name:	PONDS.DWG
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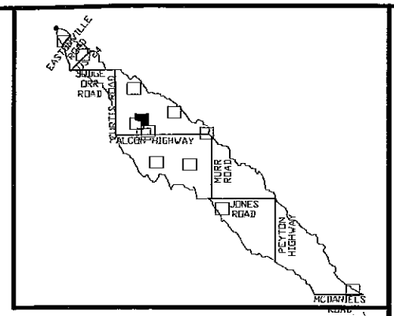
Structure Numbers

HAEGLER RANCH DRAINAGE BASIN

Sheet Number SR03

POND SR-04



MAIN STEM MS-06
(SEE MAINSTEM PG 5)
(SEE PROFILE MS-06)

100 YEAR
WS 6653.25'

TOP OF BERM
6656.25'

LOW POINT

MAIN STEM MS-06
(SEE MAINSTEM PG 5)
(SEE PROFILE MS-06)

6670 6660 6650 6640

LEGEND

- 6630 — PROPOSED CONTOURS - MAJOR ELEVATION
- PROPOSED CONTOURS - MINOR ELEVATION
- 6630 — EXISTING CONTOURS - MAJOR ELEVATION
- EXISTING CONTOURS - MINOR ELEVATION
- WATERSHED BOUNDARY
- ROADS
- RIVER
- 100 YEAR WATER SURFACE ELEVATION
- ⊠ OUTLET

POND SR-04
DISCHARGE

Q100	740 CFS
Q2	33 CFS
POND VOLUME AC FT	25
BERM WIDTH	10'
SIDESLOPES	8:1

N

1"=200'

200 0 200 400

Computer File Information

Full Path:	P:\21711039\CAD\PLANSHTS
Drawing File Name:	PONDS.DWG
Acad. Ver. 2006	Scale: 1"=200' Units: Feet

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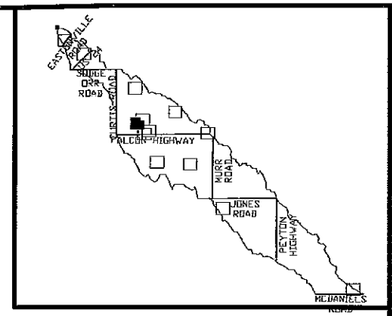
Checked by:	JAJ

Structure Numbers

HAEGLER RANCH DRAINAGE BASIN

Sheet Number SR04

POND SR-05



TRIBUTARY 6 (T6)
(SEE TRIBUTARY 6 PG 4)
(SEE PROFILE TRIBUTARY 6)

LOW POINT

100 YEAR
WS 6655.50'

TOP OF BERM
6658.50'

TRIBUTARY 6 (T6)
(SEE TRIBUTARY 6 PG 4)
(SEE PROFILE TRIBUTARY 6)

LEGEND

6630	PROPOSED CONTOURS – MAJOR ELEVATION
	PROPOSED CONTOURS – MINOR ELEVATION
6630	EXISTING CONTOURS – MAJOR ELEVATION
	EXISTING CONTOURS – MINOR ELEVATION
	WATERSHED BOUNDARY
	ROADS
	RIVER
	100 YEAR WATER SURFACE ELEVATION
⊠	OUTLET

POND SR-05
DISCHARGE

Q100	250 CFS
Q2	9 CFS
POND VOLUME AC FT	24
BERM WIDTH	10'
SIDESLOPES	8:1

N

1"=200'

200 0 200 400

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS
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Structure Numbers

HAEGLER RANCH DRAINAGE BASIN

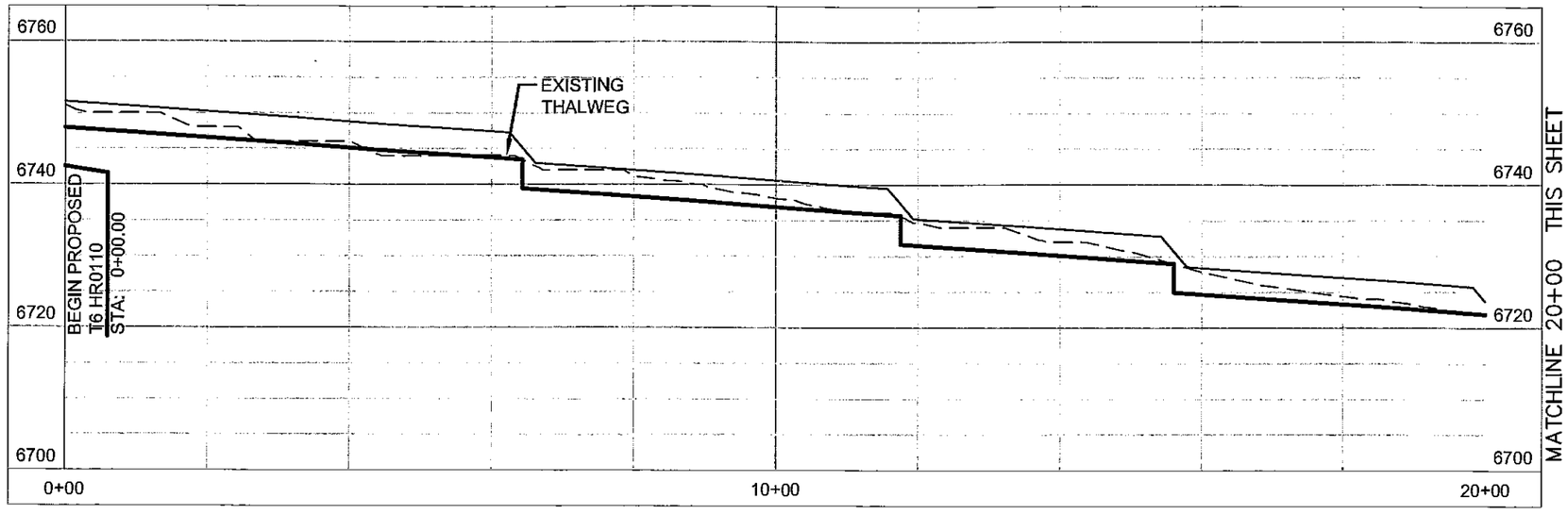
Sheet Number SR05

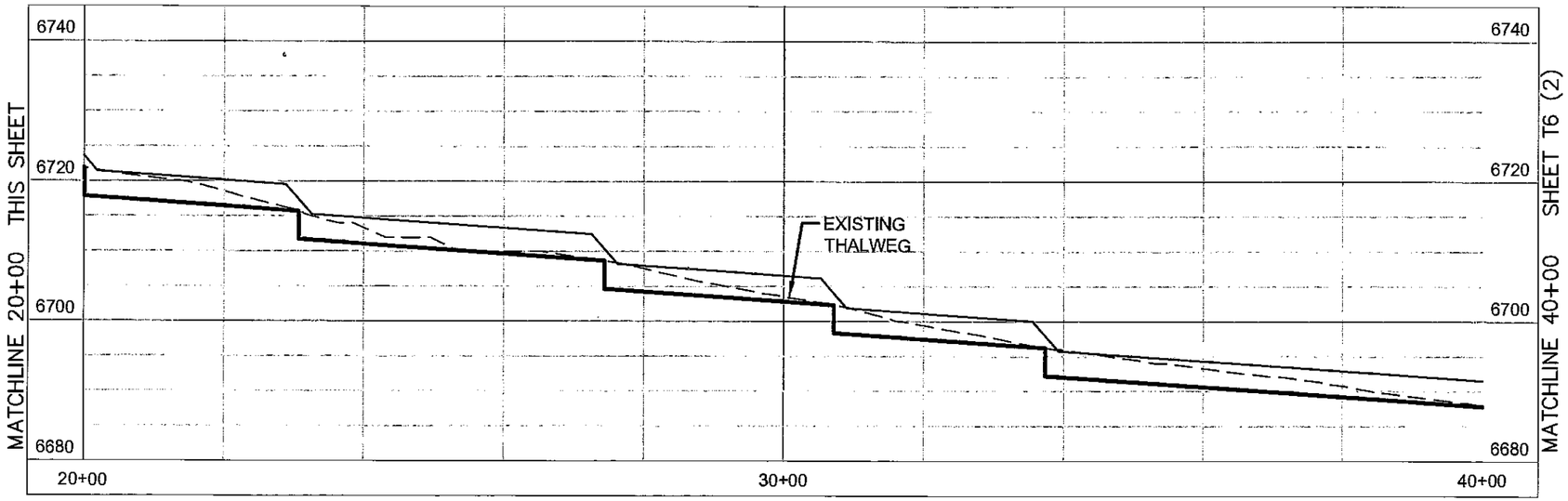
T6 HR0110

SLOPE = 0.70%

(9) 4' DROPS

PROFILE TRIBUTARY 6 (T6)





LEGEND

- PROPOSED DROP STRUCTURE
- EXISTING THALWEG
- HYDRAULIC GRADE LINE

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS

Drawing File Name: T_PROFILE_SHEETS 6_PROPOSED.DWG

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Structure Numbers:

HAEGLER RANCH SUB-REGIONAL DETENTION ALTERNATIVE CONCEPTUAL PROFILES

Sheet Number T6

T6 HR0110

SLOPE = 0.70%

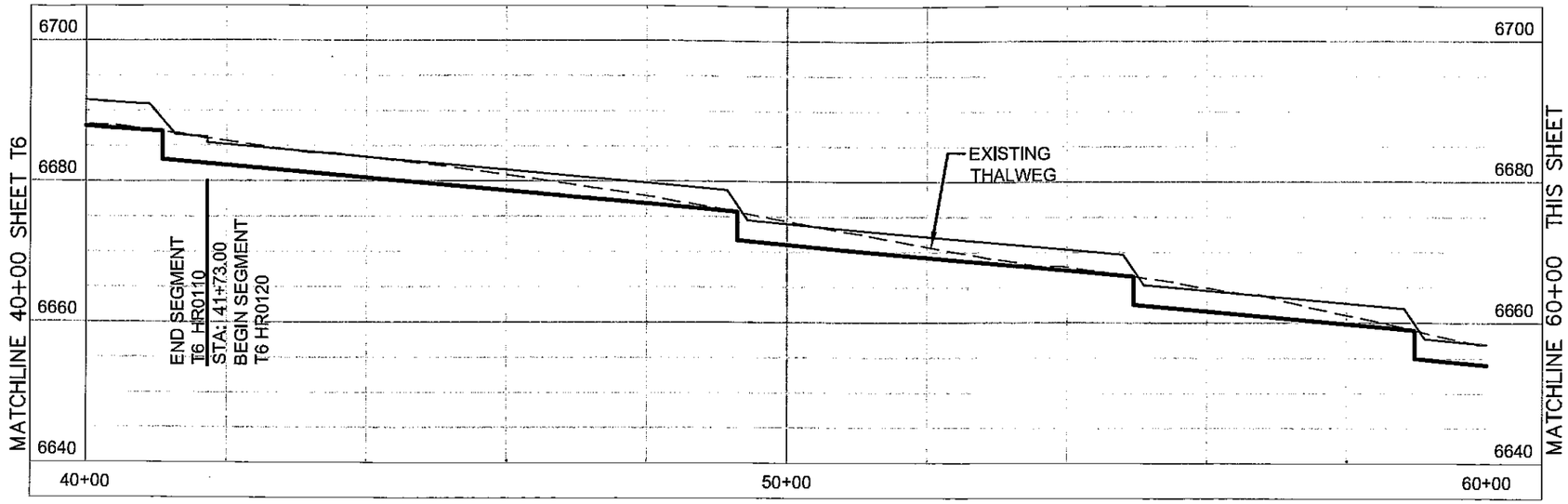
(9) 4' DROPS

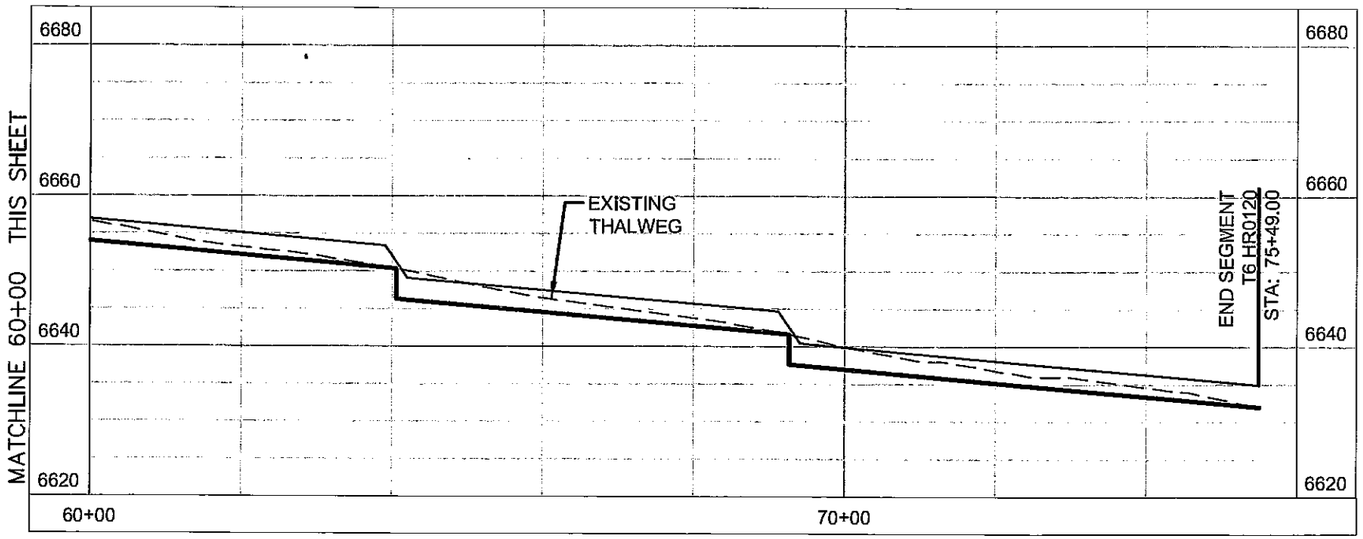
T6 HR0120

SLOPE = 0.90%

(6) 4' DROPS

PROFILE TRIBUTARY 6 (T6)





LEGEND

- PROPOSED DROP STRUCTURE
- EXISTING THALWEG
- HYDRAULIC GRADE LINE

Computer File Information

Full Path: P:\21711039\CAD\PLANSHTS

Drawing File Name: T PROFILE SHEETS 6_PROPOSED.DWG

Acad. Ver. 2006 Scale: 1"=20' Units: Feet

Index of Revisions

Profiles

Designed by: KAP

Detailed by: DRM

Checked by:

Structure Numbers

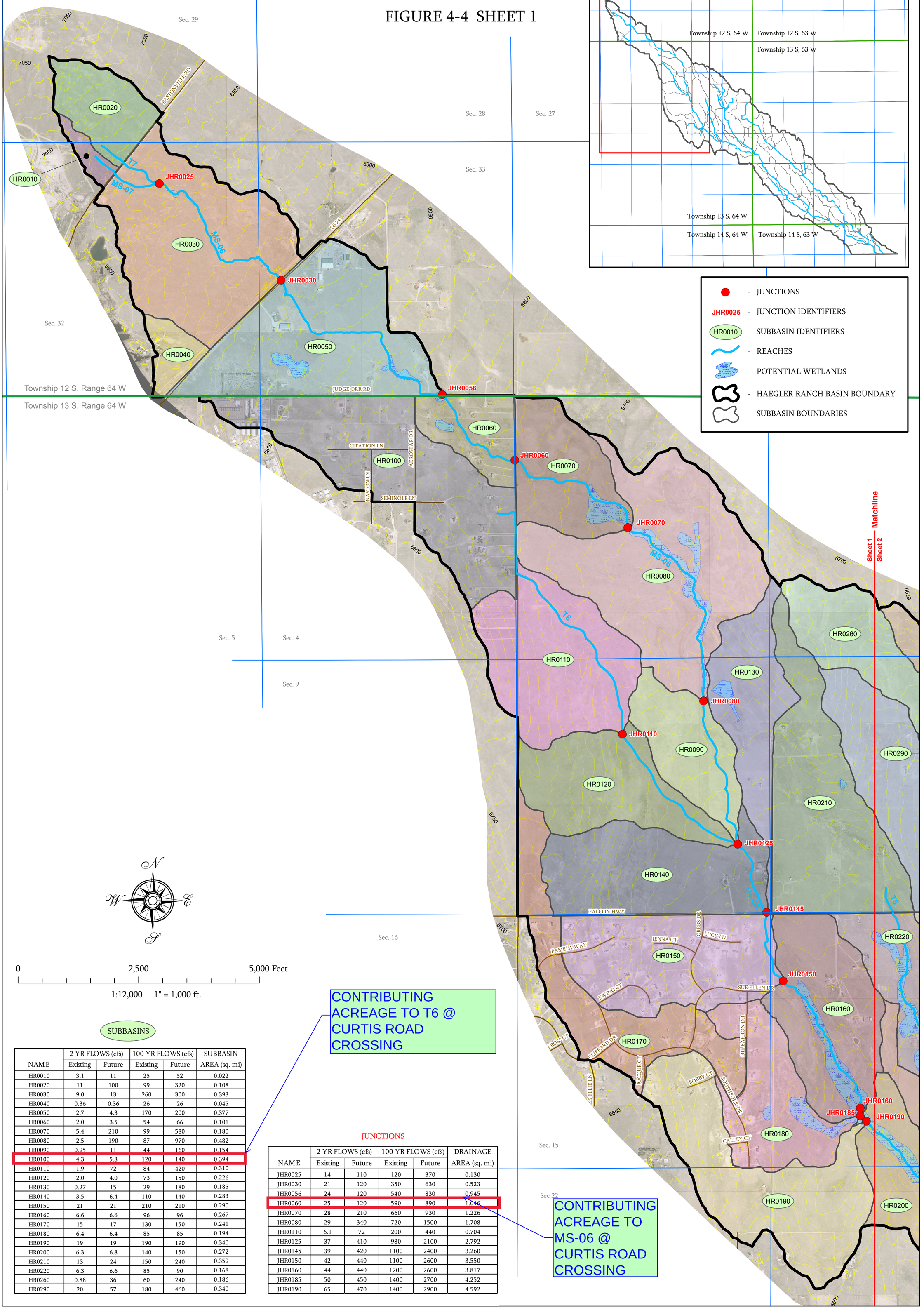
EL PASO COUNTY DEPARTMENT OF TRANSPORTATION

URS 9950 Federal Drive, Suite 300 Colorado Springs, CO. 80921 (719) 531-0001 Fax (719) 531-0007

HAEGLER RANCH SUB-REGIONAL DETENTION ALTERNATIVE CONCEPTUAL PROFILES

Sheet Number T6 (2)

FIGURE 4-4 SHEET 1



0 2,500 5,000 Feet

1:12,000 1" = 1,000 ft.

SUBBASINS

NAME	2 YR FLOWS (cfs) Existing	2 YR FLOWS (cfs) Future	100 YR FLOWS (cfs) Existing	100 YR FLOWS (cfs) Future	SUBBASIN AREA (sq. mi)
HR0010	3.1	11	25	52	0.022
HR0020	11	100	99	320	0.108
HR0030	9.0	13	260	300	0.393
HR0040	0.36	0.36	26	26	0.045
HR0050	2.7	4.3	170	200	0.377
HR0060	2.0	3.5	54	66	0.101
HR0070	5.4	210	99	580	0.180
HR0080	2.5	190	87	970	0.482
HR0090	0.95	11	44	160	0.154
HR0100	4.3	5.8	120	140	0.394
HR0110	1.9	72	84	420	0.310
HR0120	2.0	4.0	73	150	0.226
HR0130	0.27	15	29	180	0.185
HR0140	3.5	6.4	110	140	0.283
HR0150	21	21	210	210	0.290
HR0160	6.6	6.6	96	96	0.267
HR0170	15	17	130	150	0.241
HR0180	6.4	6.4	85	85	0.194
HR0190	19	19	190	190	0.340
HR0200	6.3	6.8	140	150	0.272
HR0210	13	24	150	240	0.359
HR0220	6.3	6.6	85	90	0.168
HR0260	0.88	36	60	240	0.186
HR0290	20	57	180	460	0.340

CONTRIBUTING ACREAGE TO T6 @ CURTIS ROAD CROSSING

JUNCTIONS

NAME	2 YR FLOWS (cfs) Existing	2 YR FLOWS (cfs) Future	100 YR FLOWS (cfs) Existing	100 YR FLOWS (cfs) Future	DRAINAGE AREA (sq. mi)
JHR0025	14	110	120	370	0.130
JHR0030	21	120	350	630	0.523
JHR0056	24	120	540	830	0.945
JHR0060	25	120	590	890	1.046
JHR0070	28	210	660	930	1.226
JHR0080	29	340	720	1500	1.708
JHR0110	6.1	72	200	440	0.704
JHR0125	37	410	980	2100	2.792
JHR0145	39	420	1100	2400	3.260
JHR0150	42	440	1100	2600	3.550
JHR0160	44	440	1200	2600	3.817
JHR0185	50	450	1400	2700	4.252
JHR0190	65	470	1400	2900	4.592

CONTRIBUTING ACREAGE TO MS-06 @ CURTIS ROAD CROSSING

URS

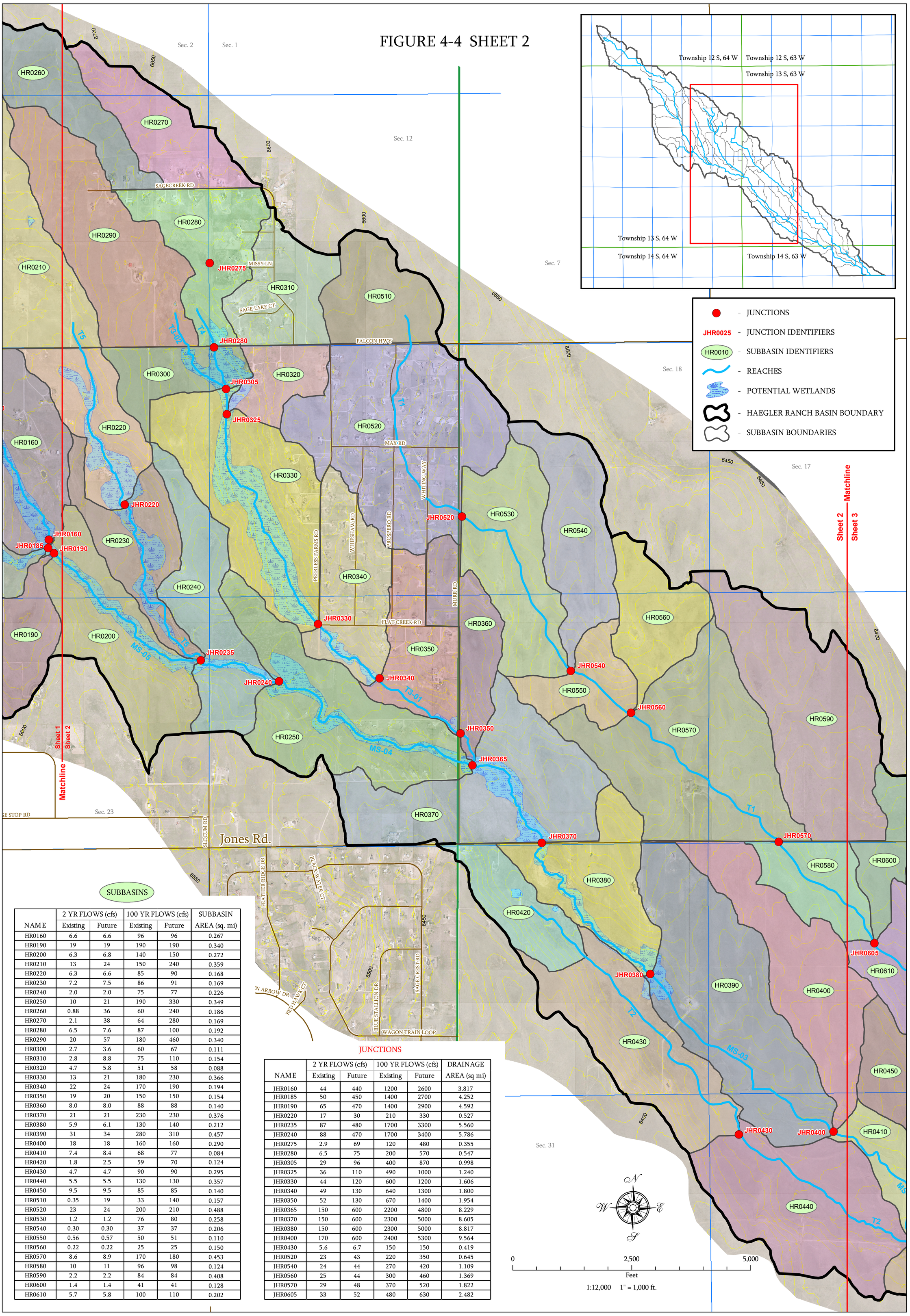
HAEGLER RANCH DRAINAGE BASIN

EXISTING AND FUTURE CONDITIONS HYDROLOGIC MODEL

URS NO. 21711039

DATE: 09/08

FIGURE 4-4 SHEET 2



SUBBASINS

NAME	2 YR FLOWS (cfs) Existing	2 YR FLOWS (cfs) Future	100 YR FLOWS (cfs) Existing	100 YR FLOWS (cfs) Future	SUBBASIN AREA (sq. mi)
HR0160	6.6	6.6	96	96	0.267
HR0190	19	19	190	190	0.340
HR0200	6.3	6.8	140	150	0.272
HR0210	13	24	150	240	0.359
HR0220	6.3	6.6	85	90	0.168
HR0230	7.2	7.5	86	91	0.169
HR0240	2.0	2.0	75	77	0.226
HR0250	10	21	190	330	0.349
HR0260	0.88	36	60	240	0.186
HR0270	2.1	38	64	280	0.169
HR0280	6.5	7.6	87	100	0.192
HR0290	20	57	180	460	0.340
HR0300	2.7	3.6	60	67	0.111
HR0310	2.8	8.8	75	110	0.154
HR0320	4.7	5.8	51	58	0.088
HR0330	13	21	180	230	0.366
HR0340	22	24	170	190	0.194
HR0350	19	20	150	150	0.154
HR0360	8.0	8.0	88	88	0.140
HR0370	21	21	230	230	0.376
HR0380	5.9	6.1	130	140	0.212
HR0390	31	34	280	310	0.457
HR0400	18	18	160	160	0.290
HR0410	7.4	8.4	68	77	0.084
HR0420	1.8	2.5	59	70	0.124
HR0430	4.7	4.7	90	90	0.295
HR0440	5.5	5.5	130	130	0.357
HR0450	9.5	9.5	85	85	0.140
HR0510	0.35	19	33	140	0.157
HR0520	23	24	200	210	0.488
HR0530	1.2	1.2	76	80	0.258
HR0540	0.30	0.30	37	37	0.206
HR0550	0.56	0.57	50	51	0.110
HR0560	0.22	0.22	25	25	0.150
HR0570	8.6	8.9	170	180	0.453
HR0580	10	11	96	98	0.124
HR0590	2.2	2.2	84	84	0.408
HR0600	1.4	1.4	41	41	0.128
HR0610	5.7	5.8	100	110	0.202

JUNCTIONS

NAME	2 YR FLOWS (cfs) Existing	2 YR FLOWS (cfs) Future	100 YR FLOWS (cfs) Existing	100 YR FLOWS (cfs) Future	DRAINAGE AREA (sq mi)
JHR0160	44	440	1200	2600	3.817
JHR0185	50	450	1400	2700	4.252
JHR0190	65	470	1400	2900	4.592
JHR0220	17	30	210	330	0.527
JHR0235	87	480	1700	3300	5.560
JHR0240	88	470	1700	3400	5.786
JHR0275	2.9	69	120	480	0.355
JHR0280	6.5	75	200	570	0.547
JHR0305	29	96	400	870	0.998
JHR0325	36	110	490	1000	1.240
JHR0330	44	120	600	1200	1.606
JHR0340	49	130	640	1300	1.800
JHR0350	52	130	670	1400	1.954
JHR0365	150	600	2200	4800	8.229
JHR0370	150	600	2300	5000	8.605
JHR0380	150	600	2300	5000	8.817
JHR0400	170	600	2400	5300	9.564
JHR0430	5.6	6.7	150	150	0.419
JHR0520	23	43	220	350	0.645
JHR0540	24	44	270	420	1.109
JHR0560	25	44	300	460	1.369
JHR0570	29	48	370	520	1.822
JHR0605	33	52	480	630	2.482

URS

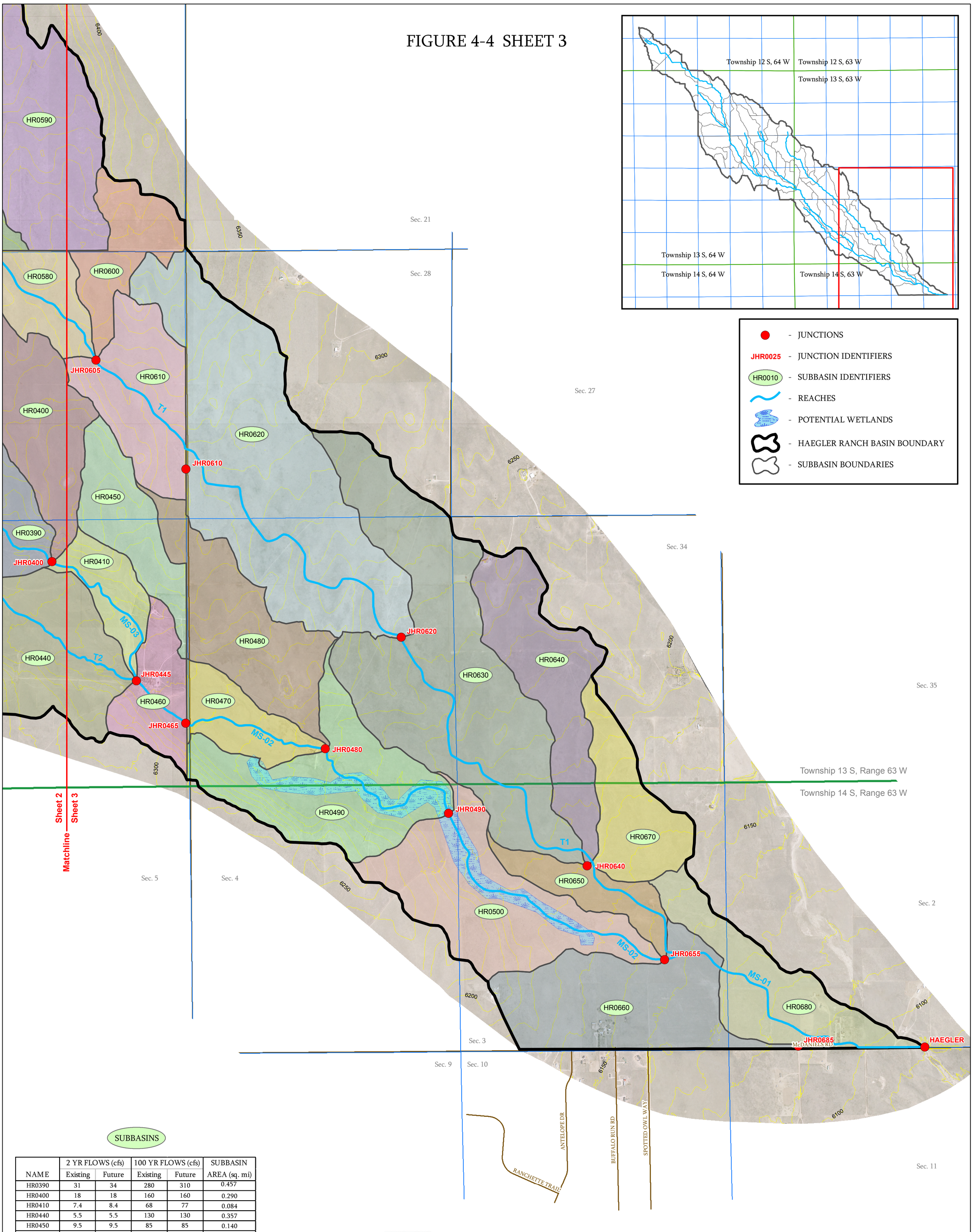
HAEGLER RANCH DRAINAGE BASIN

EXISTING AND FUTURE CONDITIONS HYDROLOGIC MODEL

URS NO. 21711039

DATE: 09/08

FIGURE 4-4 SHEET 3



SUBBASINS

NAME	2 YR FLOWS (cfs) Existing	2 YR FLOWS (cfs) Future	100 YR FLOWS (cfs) Existing	100 YR FLOWS (cfs) Future	SUBBASIN AREA (sq. mi)
HR0390	31	34	280	310	0.457
HR0400	18	18	160	160	0.290
HR0410	7.4	8.4	68	77	0.084
HR0440	5.5	5.5	130	130	0.357
HR0450	9.5	9.5	85	85	0.140
HR0460	4.0	4.0	76	76	0.109
HR0470	7.3	7.6	73	77	0.102
HR0480	0.86	0.86	34	34	0.244
HR0490	9.2	9.8	210	220	0.312
HR0500	3.3	3.4	140	150	0.326
HR0580	10	11	96	98	0.124
HR0590	2.2	2.2	84	84	0.408
HR0600	1.4	1.4	41	41	0.128
HR0610	5.7	5.8	100	110	0.202
HR0620	1.9	1.9	110	120	0.647
HR0630	2.2	2.2	86	86	0.616
HR0640	0.88	0.88	37	37	0.237
HR0650	4.2	4.3	45	46	0.092
HR0660	0.87	0.87	52	52	0.296
HR0670	0.63	0.63	31	31	0.153
HR0680	11	12	110	120	0.206

JUNCTIONS

NAME	2 YR FLOWS (cfs) Existing	2 YR FLOWS (cfs) Future	100 YR FLOWS (cfs) Existing	100 YR FLOWS (cfs) Future	DRAINAGE AREA (sq. mi)
JHR0400	170	600	2400	5300	9.564
JHR0445	180	590	2500	5400	10.424
JHR0465	180	570	2600	5400	10.673
JHR0480	180	570	2600	5400	11.019
JHR0490	180	570	2600	5500	11.331
JHR0605	33	52	480	630	2.482
JHR0610	34	52	500	650	2.684
JHR0620	35	53	560	700	3.331
JHR0640	38	54	670	780	4.184
JHR0655	190	570	3200	5600	15.933
JHR0685	190	550	3200	5600	16.588
HAEGLER	190	550	3200	5600	16.588

N W E S

0 2,500 5,000
Feet

1:12,000 1" = 1,000 ft.

URS

HAEGLER RANCH DRAINAGE BASIN

EXISTING AND FUTURE CONDITIONS HYDROLOGIC MODEL

URS NO. 21711039

DATE: 09/08

MASTER DEVELOPMENT DRAINAGE PLAN
and PRELIMINARY DRAINAGE REPORT
FOR
SADDLEHORN RANCH

Prepared For:
ROI Property Group, LLC
2495 Rigdon Street
Napa, CA 94558
(707) 365-6891

May 8, 2020
Project No. 25142.00

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive
Colorado Springs, CO 80919
719-593-2593

El Paso County PCD File No.
SP-19-006

ENGINEER'S STATEMENT:
The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by El Paso County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

Mike Bramlett, Colorado P.E. # 32314 Date
For and On Behalf of JR Engineering, LLC

DEVELOPER'S STATEMENT:
I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

Business Name: ROI Property Group, LLC

By:

Title:
Address: 2495 Rigdon Street
Napa, CA 94558

El Paso County:
Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volumes 1 and 2 and Engineering Criteria Manual, as amended.

Jennifer Irvine, P.E. Date
County Engineer/ ECM Administrator

Conditions:

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2. Major Drainageway Naming Conventions
3. Major Drainageway Flow Comparison
4. Pond Summary
5. Site Composite Percent Imperviousness
6. Drainage & Bridge Fees

PURPOSE

This document is the Master Development Drainage Plan (MDDP)/Preliminary Drainage Report (PDR) for the proposed Saddlehorn Ranch. The purpose of this report is to:

1. Identify on-site and off-site drainage patterns.
2. Recommend preliminary storm water facilities to collect and convey storm runoff from the proposed development to appropriate discharge and/or detention locations.
3. Recommend preliminary water quality and detention facilities to control discharge release rates to below historic.
4. Demonstrate compliance with surrounding major drainage basin planning studies, master plan and flood insurance studies.

GENERAL LOCATION AND DESCRIPTION

Location

The proposed Saddlehorn Ranch, known as "the site" from herein, is a parcel of land located in Section 3 and 10, Township 13 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The proposed 824 acre, rural, single family-development is bound by Judge Orr Road to the North and Curtis Road to the West. To the East, the site is bound by undeveloped land owned by Brent Houser Enterprises, LLC. To the south, the site is bound by undeveloped properties owned by 7120 Sudiev, LLC and Faye Reyonlds. A vicinity map and property owner map is presented in Appendix A.

Currently, there are three major drainageways that run through the site: Haegler Ranch Main Stem 6 (MS-06), Haegler Ranch Tributary 6 (T-6), and Gieck Ranch West Fork – Reach 7A (WF-R7A). These drainageways were analyzed, both hydrologically and hydraulically, in the following reports:

1. Geick Ranch Drainage Basin Planning Study (DBPS), October 2007
2. Haegler Ranch Basin DBPS, May 2009
3. Sante Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision (LOMR), October 2004

The impact of these drainageways and planning studies on the proposed development will be discussed later in the report.

Description of Property

The proposed development contains approximately 824 acres and will be comprised of 227 rural 2.5 – 5 acre lots. The site is currently unoccupied and undeveloped. The existing ground cover is sparse vegetation and open space, typical of a Colorado rolling range land condition. In general, the site slopes from northwest to southeast and the existing drainageways follow this topography.

Per a NRCS web soil survey of the area, the site is made up of Type A, B and D soils. Type A soils cover roughly 80% of the site while Type B soils cover 3% and Type D cover the remaining 17% of the site. Group A soils have a high infiltration rate when thoroughly wet. Type B soils have a moderate infiltration when thoroughly wet. Type D soils have a very slow infiltration rate when thoroughly wet and have a high shrink-swell potential. A NRCS soil survey map has been presented in Appendix A.

Two existing wells are located in the southwest corner of the site. A 12" Cherokee Metropolitan District waterline runs through the site just south of the northern property line. Approximately a mile south of the Curtis Road and Judge Orr Road intersection, a two lane dirt road proceeds from Curtis Road east towards approximate center of the site. A water tank, pond and windmill are located within Major Drainageway MS-06 at the end of the dirt road.

Floodplain Statement

Based on the FEMA FIRM Map number 08041C0558G, dated December 7, 2018, the site lies within Zone A, Zone AE, and Zone X. Zone A is defined as areas subject to inundation by the 1-percent-annual-chance flood determined using approximate methodologies because BFEs have not been established. Zone AE is defined as area subject to inundation by the 1-percent-annual-chance flood event. Zone X is defined as area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. All proposed development within the site will occur in Zone X.

In the northeast corner of the site, proposed development borders the Zone A boundary of the Geick Ranch West Tributary (WF-R7). At time of Final Drainage Report for this future phase of the development, a LOMR will be presented to establish base flood elevations (BFEs) for all lots that border the current Zone A boundary. The current FIRM Map has been presented in Appendix A.

DRAINAGE BASINS AND SUBBASINS

Major Basin Descriptions

The site lies within two major drainage basins: the Gieck Ranch Drainage Basin based on the "*Gieck Ranch Drainage Basin Planning Study*" (DBPS) prepared by Drexel, Barrell & Co. in October, 2007 and revised in February 2010 and the Haegler Ranch Drainage Basin based on the "*Haegler Ranch Drainage Basin Planning Study*" prepared by URS Corporation in May 2009.

The Gieck Ranch Drainage Basin covers approximately 22 square miles and begins approximately five miles northeast of the Town of Falcon and travels approximately 15 miles to the southeast. The Gieck Ranch Drainage Basin is tributary to Black Squirrel Creek which drains south to the Arkansas River near the city of Pueblo, Colorado. The majority of the area within the basin is undeveloped and is characterized as rolling range land typically associated with Colorado's semi-arid climates.

Anticipated land use for the basin includes residential, industrial, agricultural and commercial development. Residential developments will range from 0.125 – 5 acre lots with a mix of low, medium and high density developments.

The Haegler Ranch Drainage Basin covers approximately 16.6 square miles in unincorporated El Paso County, CO. The Haegler Ranch Drainage Basin is tributary to Black Squirrel Creek. In its existing condition, the basin is comprised of rolling rangeland with poor vegetative cover associated with Colorado's semi-arid climate. The natural drainageways within the basin are typically shallow and wide with poorly defined flow paths in most areas. Anticipated land use for the basin includes residential and commercial development. Residential developments will range from 0.125 – 5 acre lots with a mix of low, medium and high density developments.

As part of its drainage research, JR Engineering reviewed the following drainage studies, reports and LOMRs:

- Gieck Ranch Drainage Basin Planning Study prepared by Drexel, Barrell & Co. in October, 2007 and revised in February 2010. (Not adopted by El Paso County as of July 2019)
- Haegler Ranch Drainage Basin Planning Study prepared by URS Corporation in May 2009
- Santa Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision prepared by Tri-Core Engineering in June 2004.

Existing Gieck Ranch Drainage Basin

The "*Gieck Ranch Drainage Basin Planning Study"* evaluated existing and future drainage conditions, identified future improvements, and established basin and bridge fees for the Gieck Ranch Drainage Basin. It should be noted that as of today the "*Gieck Ranch Drainage Basin Planning Study"* has not yet been approved and adopted by the County. All referenced information from the aforementioned report is presented for information purposes only.

Based upon provided drainage maps and analysis, Gieck Ranch discharges a total of 1,017 cfs onto the site within Major Drainageway Gieck Ranch West Fork Reach 7A (WF-R7A). An existing 66" CMP and 36" CMP convey the offsite flow across Judge Orr Road onto the site. The existing culverts at Judge Orr Road are undersized for existing and future flows resulting in localized overtopping. The DBPS recommends the culvert be upsized to four –12' x 5' box culverts. The culvert will not be upsized within the context of this report and development. The culvert is owned by El Paso County and timing of the recommended improvements will be controlled by the County. The overtopping at the intersection of WF-R7A is not contained within the 100-year floodplain. Therefore, at time of Final Drainage Report, berming will be provided that will protect proposed lots from overtopping flows. An overtopping analysis is presented in Appendix D and the limits of overtopping are presented on the existing and proposed drainage maps in Appendix F.

Based on existing channel analysis, the *Gieck Ranch DBPS* recommends WF-R7A channel improvements approximately 200' upstream and 300' downstream of the culvert crossing at Judge Orr Road (50' bottom width, 10:1 side slopes and vegetative augmentation). The recommended

channel improvements result from upsizing the culvert at Judge Orr Road, requiring the channel to be lowered. The channel improvements were not recommended due to existing channel instability. Existing velocities in the channel were found to be 2.19 ft/s, as presented in Appendix E. Per the MS4 permit requirements, the onsite reach of WF-R7A will be analyzed for channel stability with the corresponding Final Drainage Report for that phase of the development. At the time of Final Drainage Report, any necessary improvements to WF-R7A to satisfy the MS4 permit will be evaluated. It should be noted that the onsite reach of WF-R7A, where the aforementioned channel improvements were recommended, is comprised of jurisdictional wetlands which will limit the allowable improvements. Coordination with the Army Corps of Engineers will be required to grant permission to disturb the jurisdictional wetlands. Recommended channel improvements from the *Gieck Ranch DBPS* are presented in Appendix E.

Existing Haegler Ranch Drainage Basin

The "*Haegler Ranch Drainage Basin Planning Study*" was used to establish a stormwater management plan for the existing and future stormwater infrastructure needs within the Haegler Ranch Drainage Basin. Based on provided drainage maps and analysis, in the existing condition Haegler Ranch contributes a total of 710 cfs onto the site. Of the 710 cfs, 590 cfs crosses Curtis Road in an existing 24" CMP onto the site. Major Drainageway MS-06 conveys the stormwater through the site and to its off-site confluence with Major Drainageway MS-05. The remaining 210 cfs crosses Curtis Road in an existing 36" CMP onto the site. Major Drainageway T-6 conveys the stormwater through the site and to its off-site confluence with Major Drainageway MS-05. Both Curtis Road culverts are undersized for existing and future flows and overtopping occurs locally near the culvert crossings. Overtopping at the intersection of Curtis Road and T-6 is contained within the 100-year floodplain and will not affect proposed lots. The overtopping at the intersection of MS-06 and Curtis Road is not contained within the 100-year floodplain limits. Therefore, at time of Final Drainage Report, berming will be provided that will protect proposed lots from overtopping flows. An overtopping analysis is presented in Appendix D and the limits of overtopping are presented on the existing and proposed drainage maps in Appendix F.

The culverts are not proposed to be upsized within the context of this report and development. The culverts are owned by El Paso County and timing of the recommended improvements will be controlled by the County.

Furthermore, the *Haegler Ranch DBPS* recommends channel improvements within drainageways MS-06 and T-6. Per the *Haegler Ranch DBPS*, all recommended channel sections are trapezoidal with side slopes of 4:1 and a maximum depth of five feet. Within the limits of the site, three (3) channel bottom widths are recommended for MS-06. The first reach, from station 0+00 – 31+34, is proposed with a 15' bottom width, the second reach from 31+34 to 74+61, MS-06 is proposed with a 30' bottom width, and the last reach from station 74+61 - 103+62 is proposed with a 20' channel bottom. The *Haegler Ranch DBPS* recommends Major Drainageway T-6 be improved to a trapezoidal channel with an 8' bottom width, 4:1 side slopes and depth of 5'. Drop structures have

also been recommended within MS-06 and T-6. These improvements will not occur within the context of this report or development. However, due to the addition of culvert crossings within MS-06 and T-6, channel improvements are anticipated up and downstream of the proposed culverts. The extent of these channel improvements will be addressed with corresponding Final Drainage Reports for those phases of the development. At that time, channel stability will be evaluated and any necessary improvements will be proposed. Recommended channel improvements from the *Haegler Ranch DBPS* are presented in Appendix E.

Based on flood impacts, stream stability and cost effectiveness, this study recommended a sub-regional detention approach. This allows future development anywhere in the basin with the construction of an associated sub-regional pond. Within the boundary of Saddlehorn Ranch, the DBPS recommended a total of three (3) sub-regional ponds. Based on discussion with El Paso County, the site will utilize full spectrum water quality and detention ponds instead. These full spectrum detention ponds will limit developed discharge into the drainageways to less than historic rates. Future, upstream development will also require full spectrum detention in accordance with current El Paso County criteria, which is an effective alternative to the sub-regional pond approach.

The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR was executed on Haegler Ranch Tributary 2, 3, and 4. The LOMR revised the onsite effective flood zones from Zone A to Zone AE for the three drainageways. Upstream stretches of Tributary 3 and 4 are classified Zone A but those channel reaches are off site. All stretches of Tributary 3 and 4 onsite are Zone AE. See FIRM Map Panel 080059-0575G for limits of LOMR study and revised flood zones, presented in Appendix E.

Existing Sub-basin Drainage

On-site, existing drainage patterns are generally from northwest to southeast by way of existing, natural drainageways (MS-06, T-6, WF-R7A). On-site areas flow directly into these drainageways which also bypass off-site flows through the site. Offsite flows within the major drainageways that pass through the site will influence the on-site culvert designs and any channel improvements.

On-site, existing drainage basins were established based upon existing topography and the limits of 100-year floodplain. The site was divided into eleven existing sub-basins. See Table 1 below for summary of existing drainage sub-basins and corresponding peak flows. An existing drainage map is provided in Appendix F.

Table 1: Existing Drainage Basin Summary

EXISTING BASIN SUMMARY TABLE				
Tributary Sub-Basin	Area (acres)	Percent Impervious	Q_5 (cfs)	Q_{100} (cfs)
G1	10.1	2.0%	0.00	0.1
G2	87.6	2.0%	1.5	76.4
H1	166.5	2.0%	0.1	81.0
H2	111.1	2.0%	0.2	91.1
H3	118.9	2.0%	0.9	64.1
H4	63.3	2.0%	1.4	73.2
H5	53.2	2.0%	0.3	28.2
H6	87.6	2.0%	0.2	110.1
CH1	23.9	2.0%	5.4	21.0
CH2	84.2	2.0%	2.6	33.7
CH3	19.1	2.0%	0.1	6.5
Total	825.4	N/A	12.7	585.4

The existing condition of the three major drainageways are discussed below;

Existing Geick Ranch West Fork Reach 7A (WF-R7A)

The first major drainageway is the Gieck Ranch West Fork Reach 7A (WF-R7A), per the *Gieck Ranch DBPS*. WF-R7A crosses onto the site along Judge Orr Road, approximately ¼ mile west of the intersection with Elbert Road. Discharge from the developed site into this drainageway will be limited to historic rates via a full spectrum detention pond prior to discharge. This drainageway includes jurisdictional wetlands and the entire drainageway onsite is classified Zone A. Access to the drainage way will be provided from internal roadways and along an equestrian trail will be constructed adjacent to the drainageway. The equestrian train can be utilized for maintenance equipment as well.

Existing Haegler Ranch Main Stem (MS-06)

The second drainageway is the Haegler Ranch Main Stem (MS-06), per the *Haegler Ranch DBPS*, which crosses onto the site along Curtis Road, approximately 1,600' south of the intersection with Judge Orr Road. MS-06 flows south towards its offsite confluence with Black Squirrel Creek. MS-06 exits the site along the southern property line. Discharge from the developed site into this drainageway will be limited to historic rates via a full spectrum detention pond prior to discharge. This drainageway includes non-jurisdiction wetlands and the entire drainageway is classified Zone AE. Access to the channel will be provided at the culvert crossing of MS-06 and San Isidro Trail via

a 15' wide maintenance and access road that will proceed from San Isidro trail to the channel bottom. From here, access through the channel is achievable with existing grades within the channel. Furthermore, an equestrian trail will be constructed adjacent to the drainageway that can be utilized for maintenance equipment as well. The road alignments are displayed on the proposed drainage map presented in Appendix F.

Existing Haegler Ranch Tributary 6 (T-6)

The third drainageway is the Haegler Ranch Tributary 6 (T-6), per the *Haegler Ranch DBPS*, which crosses onto the site along Curtis Road, approximately ¾ mile south of the intersection with Judge Orr Road. T-6 conveys flows south through the site and towards its off-site confluence with Black Squirrel Creek. Discharge from the developed site into this drainageway will be limited to historic rates via a full spectrum detention pond prior to discharge. This drainageway is absent of any on-site wetlands and the entire drainageway is classified Zone AE. Access to the channel will be provided at the culvert crossing of T-6 and Del Cerro Trail via a 15' wide maintenance and access road that will proceed from Del Cerro Trail to the channel bottom. From here, access through the channel is achievable with existing grades within the channel. Furthermore, an equestrian trail will be constructed adjacent to the drainageway that can be utilized for maintenance equipment as well. The road alignments are displayed on the proposed drainage map presented in Appendix F.

The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR was executed on three Haegler Ranch basin drainageways. Two of the drainageways that were evaluated pass through the proposed development. These drainageways are the: Haegler Ranch Tributary 3 & 4. Within the boundary of the proposed development, Haegler Ranch Tributary 3 and 4 are synonymous with Main Stem 6 and Tributary 6 from the *Haegler Ranch DBPS*. The purpose of the LOMR was to revise the flood hazard depicted in the current Flood Insurance Study. Additionally, the LOMR provided existing, 100-year velocities within the drainageways that will be utilized in the design of any potential channel improvements. A FIRM panel with the limits of the detailed study as well as BFEs has been presented in Appendix E.

See Table 2 for comparison of drainageway identification and the naming convention used within the context of this report. See Table 3 for a comparison of 100-year flows as calculated in the aforementioned DBPS' and LOMR. An existing conditions drainage map is presented in Appendix F.

Table 2: Major Drainageways

Major Drainageway Naming Conventions			
Saddlehorn Ranch MDDP/PDR:	Per Haegler Ranch DBPS:	Per Geick Ranch DBPS:	Per Sante Fe Springs LOMR:
WF-R7A	N/A*	West Fork (Middle)/WF-R7A	N/A*
MS-06	Main Stem (MS-06)	N/A*	Haegler Ranch Tributary 3
T-6	Tributary 6 (T-6)	N/A*	Haegler Ranch Tributary 4

Table 3: Major Drainageways – Ex. 100-Year Flow Comparison

Major Drainageways: 100-Year Flow Comparison				
Drainageway Name	Contributing Area (sq. mi.)	Q_{100} Per Haegler Ranch DBPS:	Q_{100} Per Geick Ranch DBPS:	Q_{100} Per Sante Fe Springs LOMR:
WF-R7A @ Judge Orr Road	1.50	N/A*	1,017 cfs	N/A*
MS-06 @ Curtis Road	1.05	451 cfs	N/A*	505 cfs
T-6 @ Curtis Road	0.39	120 cfs	N/A*	130 cfs

*N/A: Flow regime outside limits of study.

Proposed Sub-basin Drainage

The proposed basin delineation is as follows;

Basin A is approximately 9.2 acres and in its existing condition is rolling rangeland. Runoff generally flows southeast away from Drainageway MS-06. In the proposed condition, Basin A will be rural 2.5 acre lots and roadway. Runoff from this basin will be collected in road side swales and conveyed south along Barrosito Drive to Pond A. Pond A, while considered temporary in this MDDP, will need to meet Full Spectrum Detention Criteria unless deviations are approved in the Final Drainage Report for this future filing. It is anticipated that Barrosito Drive will be extended south as part of the development of the adjacent parcel to the south. The most logical place for a permanent Full Spectrum pond is located approximately 1,000 feet south at the future road crossing with MS-06. When that pond is constructed, the Saddlehorn Metropolitan District No. 1 will remove Pond A. The peak flow rate for Basin A in the 5 and 100-year storm are 9.5 cfs and 20.7 cfs, respectively. However, Pond A will discharge at less than historic rates.

Basin B is approximately 60.4 acres and in its existing condition is rolling rangeland. Runoff generally flows southwest across the basin towards Drainageway MS-06. In the proposed condition, Basin B will be rural 2.5 acre lots, paved roadway and will include Pond B. Runoff from this basin will be collected in road side swales and conveyed south along Barrosito Drive to Pond B. The peak flow rate for Basin B in the 5 and 100-year storm are 9.9 cfs and 46.3 cfs, respectively. However, Pond B will discharge at less than historic rates. A portion of Basin B is inundated by the existing 100-year floodplain, however; at time of final platting berming will be constructed to reduce the floodplain limits within the drainageway tract and a corresponding LOMR will be executed on this stretch of channel to establish the revised floodplain.

Basin C is approximately 102.5 acres and in its existing condition is rolling rangeland. Runoff generally flows southwest across the basin towards Drainageway MS-06. In the proposed condition, Basin C will be rural 2.5 acre lots, paved roadway and will include Pond C. Runoff from this basin will be collected in road side swales and conveyed south along Barrosito Drive and Del Cambre Drive to Pond C. The peak flow rate for Basin C in the 5 and 100-year storm are 15.8 cfs and 69.4 cfs, respectively. However, Pond C will discharge at less than historic rates.

Basin D is approximately 99.2 acres and in its existing condition is rolling rangeland. Runoff generally flows east across the basin towards Drainageway WF-R7A. In the proposed condition, Basin D will be rural 2.5 acre lots, paved roadway and will include Pond D. Runoff from this basin will be collected in road side swales and conveyed east along Barrosito drive to Pond D. The peak flow rate for Basin D in the 5 and 100-year storm are 29.4 cfs and 95.4 cfs, respectively. However, Pond D will discharge at less than historic rates. A portion of Basin D is inundated by the existing 100-year floodplain, however; at time of final platting berming will be constructed to reduce the floodplain limits within the drainageway tract and a corresponding LOMR will be executed on this stretch of channel to establish the base flood elevations.

Basin E is approximately 11.6 acres and in its existing condition is rolling rangeland. Runoff generally flows east across the basin towards Drainageway MS-06. In the proposed condition, Basin E will be rural 2.5 acre lots, paved roadway and will include Pond E. Runoff from this basin will be collected in road side swales and conveyed southwest along San Isidro Trail to Pond E. The peak flow rate for Basin E in the 5 and 100-year storm are 2.0 cfs and 9.9 cfs, respectively. However, Pond E will discharge at less than historic rates.

Basin F is approximately 117.4 acres and in its existing condition is rolling rangeland. Runoff generally flows southeast across the basin towards Drainageway MS-06. In the proposed condition, Basin F will be rural 2.5 acre lots, paved roadway and will include Pond F. Runoff from this basin will be collected in road side swales and conveyed southwest along Benito Wells Trail to Pond F. The peak flow rate for Basin F in the 5 and 100-year storm are 17.0 cfs and 69.9 cfs, respectively. However, Pond F will discharge at less than historic rates.

Basin G is approximately 39.9 acres and in its existing condition is rolling rangeland. Runoff generally flows south across the basin towards Drainageway T-6. In the proposed condition, Basin G will be rural 2.5 acre lots, paved roadway and will include Pond G. Runoff from this basin will be collected in road side swales and conveyed southwest along El Raiceno Trail to Pond G. The peak flow rate for Basin G in the 5 and 100-year storm are 6.1 cfs and 25.3, respectively. However, Pond G will discharge at less than historic rates.

Basin H is approximately 30.7 acres and in its existing condition is rolling rangeland. Runoff generally flows east across the basin towards Drainageway T-6. In the proposed condition, Basin H will be rural 2.5 acre lots, paved roadway and will include Pond H. Runoff from this basin will be collected in road side swales and conveyed north along Rosalia Place to Pond H. The peak flow rate for Basin H in the 5 and 100-year storm are 3.7 cfs and 17.9 cfs, respectively. However, Pond H will discharge at less than historic rates.

Basin I is approximately 46.6 acres and in its existing condition is rolling rangeland. Runoff generally flows east across the basin towards Drainageway T-6. In the proposed condition, Basin I will be rural 2.5 acre lots, paved roadway and will include Pond I. Runoff from this basin will be collected in road side swales and conveyed south down Carrizo Springs Trail and east down Zaragoza Trail to Pond I. The peak flow rate for Basin I in the 5 and 100-year storm are 15.9 cfs and 63.1 cfs, respectively. However, Pond I will discharge at less than historic rates.

Basin J is approximately 10.1 acres and in its existing condition is rolling rangeland. This basin will not be developed and will remain in its existing condition, per Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedures this basin will not be detained in a full spectrum water quality and detention pond. Runoff generally flows east across the basin towards Drainageway T-6. In the proposed condition, Basin J will be an undeveloped tract. Undeveloped runoff from this basin will follow existing drainage patterns and sheet flow into Drainageway WF-R7A. The peak flow rate for Basin J in the 5 and 100-year storm are 3.0 cfs and 10.5 cfs, respectively.

Basins CH1, CH2 and CH3 are existing drainageway basins that will remain undeveloped in the proposed condition. There will be no development within Basin CH1-CH3, however; Basin CH2 & CH3 will require channel grading to accommodate proposed culverts. The scope of this grading will leave the channels in an undeveloped condition per Section I.7.1.B.7 and therefore will be excluded from permanent stormwater management. Basin CH1 contains jurisdictional wetlands. Basin CH2 contains non-jurisdictional wetlands. There are no wetlands located in Basin CH3. Peak flow rates for proposed undeveloped basins are presented in Appendix B.

Basins UD1-UD11 acre comprised of rural 2.5+ acre residential lots and will follow existing drainage patterns in the proposed condition. Development in these basins will be limited to a maximum of 10% impervious development via a plat covenant. Therefore, these basins can be excluded from permanent stormwater detention per Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedures (2.5+ acre lots with imperviousness less than 10% can be excluded from

permanent stormwater management practices). Therefore, Basins UD1-UD11 will not be included in the developments permanent stormwater management facilities. A Permanent BMP applicability form is presented in Appendix D to justify these exclusions. A map detailing each development site and any exclusion is presented in Appendix F. Basin UD1 flows directly into Major Drainageway WF-R7A. Basins UD2, UD2.1, UD2.2, UD3, UD4, UD5 and UD8 flow directly into Major Drainageway MS-06. Basins UD6, UD7, UD9, and UD9.1 flow directly into Major Drainageway T-6. Basins UD8.1, UD10, and UD11 follow existing drainage patterns as well but flow directly off-site prior to being captured in major drainageways. A portion of Basin UD2.2 is inundated by the existing 100-yr floodplain. However, at time of final drainage report, lot lines will be adjusted outside floodplain limits. Furthermore, a portion of Basin UD10 is inundated by the existing 100-year floodplain, however; at time of final platting berming will be constructed to reduce the floodplain limits within the drainageway tract and a corresponding LOMR will be executed on this stretch of channel to establish the revised floodplain.

In addition to undeveloped lot areas, a small portion of Del Cerro Trail (portion of Basins UD9 & UD9.1) and San Isidro Trail (a portion of Basin UD5) will be allowed to directly discharge into Drainageway T-6 and MS-06, respectively, and excluded from the developments permanent stormwater management facilities. Per Section I.7.1.C.1, the County may exclude up to 20 percent, not to exceed 1 acre, of the applicable development site area from permanent stormwater management. Approximately, 16,240 ft^2 of Del Cerro Drive and 14,000 ft^2 square feet of San Isidro Trail, totaling 0.08% of the total development area, will be excluded from stormwater management, which is significantly less than the 20% limit.

A summary of all basin parameters has been presented in Appendix B.

Developed basin's runoff will be captured in roadside ditches and conveyed to a full spectrum water quality and detention pond per El Paso County DCM Volume 1. Each full spectrum pond will release treated flows at less than historic rates to minimize adverse impacts downstream. Pond D will discharge into Major Drainageway WF-7A, Pond B, C, E, and F will discharge into Major Drainageway MS-06 and Ponds G, H, and I will discharge into Major Drainageway T-6. Due to existing topography, Pond A will discharge into open space south of the site. Based on existing topography in the area, this flow will eventually be captured off-site by Major Drainageway MS-06.

See Table 4 for comparison of proposed pond parameters including a comparison of proposed basin discharge versus existing discharge.

Table 4: Pond Summary

POND SUMMARY TABLE							
Tributary Sub-Basin	Pond Name	Tributary Acres	WQ Volume (ac-ft)	100-Year Volume (ac-ft)	Provided Volume (ac-ft)	100-Year Peak Discharge (cfs)	Ex. 100-Year Peak Discharge (cfs)
A	POND A	9.2	0.20	1.14	1.14	2.5	2.8
B	POND B	60.4	0.35	1.46	2.17	18.9	21.0
C	POND C	102.5	0.64	2.69	2.77	26.0	28.9
D	POND D	99.2	0.59	2.86	2.97	47.7	53.0
E	POND E	11.6	0.05	0.23	0.39	4.7	5.2
F	POND F	117.4	0.65	3.20	3.35	50.7	56.3
G	POND G	39.9	0.34	1.36	1.62	10.1	11.2
H	POND H	30.7	0.16	0.70	1.18	10.5	11.7
I	POND I	46.6	0.25	1.09	1.41	26.8	29.8

DRAINAGE DESIGN CRITERIA

Development Criteria Reference

Storm drainage analysis and design criteria for the project were taken from the "*City of Colorado Spring/El Paso County Drainage Criteria Manual*" Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the "*Urban Storm Drainage Criteria Manual"* Volumes 1 - 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the "Colorado Springs Drainage Criteria Manual (CCSDCM), dated May 2014, as adopted by El Paso County, as well as the July 2019 El Paso County Engineering Criteria Manual update.

Hydrologic Criteria

All hydrologic data was obtained from the "El Paso Drainage Criteria Manual" Volumes 1 and 2, and the "Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual" Volumes 1, 2, and 3. Onsite drainage improvements were designed based on the 5 year (minor) storm event and the 100-year (major) storm event. Runoff was calculated using CUHP Version 2.0.0, developed by Urban Drainage and Flood Control District. The model utilizes the raingage classified as "a design storm by temporal distribution of one-hour rain depths with area correction factors". The following Colorado Springs rainfall depths were utilized in the model: 2.52 inches for 1-hour 100-year depth and 3.5 inches for 6-hour 100-year depth. EPA SWMM 5.1 was utilized to route runoff flow rates for the sizing of stormwater storage facilities. The CUHP calculations and SWMM model are presented in Appendix B.

Urban Drainage and Flood Control District's UD-Detention, Version 3.07 workbook was used for preliminary pond sizing. Required detention volumes and allowable release rates were designed per USDCM and CCS/EPCDCM. Pond sizing spreadsheets are presented in Appendix D.

Hydraulic Criteria

The Federal Highway Administration's HY-8 program (Volume 7.50) was used to analyze the proposed box culvert within Major Drainageways MS-06 and T-6. Per Section 14.3.2 of the CCS/EPCDCM, a maximum headwater-to-rise ratio of 1.5 was used for the sizing of box culverts. Furthermore, box culverts will be designed in conjunction with channel improvements to maintain the current floodplain and base flood elevations. Culvert sizing and corresponding channel improvements will be revised as roadway geometry becomes better defined. Preliminary culvert design sheets are presented in Appendix C.

Autodesk Inc.'s Hydraflow Express Extension (Volume 10.5) was used for preliminary roadside ditch design. For the purposes of this PDR/MDDP, the maximum roadside ditch size was determined based on peak 100-year flows and minimum roadway slopes within each basin. Swales were checked for velocity and Froude number per the EPC DCM Chapter 10, Section 10-7 and Table 10-4. Swale cross sections with a 100-year velocity greater than 5 ft/s or a Froude number greater than 0.9 will be lined with erosion control blanket and native grasses, or another approved method of stabilization, to limit erosive potential. Final swale designs and cross section details will be included with the Final Drainage Report. Preliminary swale design sheets are presented in Appendix C.

Autodesk Inc.'s Hydraflow Express Extension (Volume 10.5) will be used for final local road crossing culvert design with in the Final Drainage Report. All onsite, local road crossing culverts are assumed to be 18" or 24" CMP based on preliminary calculations. Culvert size was determined based on 100-year flows and hydraulic criteria from EPCDCM Chapter 9 –Culvert Design. The Final Drainage Report will provide final local road crossing culvert designs.

DRAINAGE FACILITY DESIGN

General Concept

The proposed stormwater conveyance system was designed to convey the developed Saddlehorn Ranch flows to full spectrum water quality and detention ponds. Water quality and detention ponds will be designed to release at less than historic rates to minimize adverse impacts downstream. All full spectrum water quality and detention ponds have been sized such that State Engineer review or approval is not required. Undeveloped basins are allowed to follow existing drainage patterns and discharge directly into major drainageways or off-site.

The undeveloped portion of developed lots will be allowed to discharge directly into Drainageways MS-06, T-6 and WF-R7A. Per the "Jurisdictional Determination Request for the 824 Acres Curtis Road subdivision Project" completed by Ecosystem System Services in October 2018, MS-06 and T-

6 are not waters of the state and WF-R7A is a water of the state however, any direct discharge into this drainageway will be historic, undeveloped flows. The direct discharge into drainageway situation occurs anywhere a lot naturally drains toward a drainageway rather than the street. It was determined for these lots that all development (i.e. house and driveway) will occur in the first 200' of the lot, measured from the street into the lot. The 200' developed region of the lot will drain towards the road and be conveyed to a full spectrum water quality pond, however; the remainder of the lot (undeveloped) will be allowed to follow historic drainage patterns and flow directly into the drainageways. Furthermore, at time of platting, a covenant will be established for the development that will limit imperviousness to 10% for areas draining directly to the drainageways in order to satisfy Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedures.

A box culvert will be proposed within Major Drainageway MS-06 and T-6 to convey existing, off site and developed, on-site flows underneath proposed roadways and through the site, in accordance with the *Haegler Ranch DBPS*. Culverts will not be required in Major Drainageway WF-R7A to maintain the drainage patterns established in the *Gieck Ranch DBPS.*

Channel improvements will be proposed immediately up and downstream of culvert improvements in order to maintain the current floodplain. Further channel improvements may be required within the major drainageways and the need for these potential improvements will be evaluated in the Final Drainage Report for each Filing. Access roads will be provided from local roadways down into the drainageways to provide culvert and drainageway maintenance access. A proposed drainage map is presented in Appendix F showing locations of culvert improvements, approximate channel improvements and access roads.

Specific Details

Four Step Process to Minimize Adverse Impacts of Urbanization

In accordance with the El Paso County Drainage Criteria Manual, Volume 2 this site has implemented the four step process to minimize adverse impacts of urbanization. The four step process includes reducing runoff volumes; stabilizing drainageways, treating the water quality capture volume (WQCV), and consider the need for Industrial Commercial BMP's.

Step 1, Reducing Runoff Volumes: The development of the project site is proposed as single family residential (2.5 ac. min.) with open spaces and lawn areas interspersed within the development which helps disconnect impervious areas and reduce runoff volumes. Roadways will utilize roadside ditches further disconnecting impervious areas. These practices will also allow for increased infiltration and reduce runoff volume.

Step 2, Stabilize Drainageways: This site will utilize roadside ditches with culvert crossings throughout the site. These roadside ditches will then direct the on-site development flows to the multiple detention ponds within the project that will be designed to release at or below historic rates in the natural channels. The natural channels will be stabilized in reaches with high velocity by the

use of drop structures incorporated at each roadway culvert crossing and isolated grade control structures where warranted. Based upon the proposed reduction in released flows compared to the pre-developed flows, no impact to downstream drainageways is anticipated.

Step 3, Provide WQCV: Runoff from this development will be treated through capture and slow release of the WQCV in multiple permanent detention basins that will be designed per current El Paso County drainage criteria.

Step 4 Consider the need for Industrial and Commercial BMP's: No industrial or commercial uses are proposed within this development. However, a site specific storm water quality and erosion control plan and narrative will be prepared for each future Filing. Site specific temporary source control BMPs as well as permanent BMP's will be detailed in this plan and narrative to protect receiving waters.

Water Quality

In accordance with Section 13.3.2.1 of the CCS/EPCDCM, full spectrum water quality and detention will be provided for all of the development site not meeting exclusions present in the ECM - Stormwater Quality Policy and Procedures Section I.7.1.B and C. Any areas of the development site not being included in the site's permeant stormwater management are presented on the MS4 Development Site Map with their specific exclusion, presented in Appendix F. Outlet structure release rates will be limited to less than historic rates to minimize adverse impacts to downstream stormwater facilities. Complete pond and outlet structure designs will be provided with the Final Drainage Report. Preliminary pond design parameters are presented in Appendix D.

Erosion Control Plan

The El Paso County Drainage Criteria Manual specifies an Erosion Control Plan and associated cost estimate must be submitted with each Final Drainage Report. We respectfully request that the Erosion Control Plan and Cost Estimate be submitted in conjunction with the grading and erosion control plans and construction assurances posted prior to obtaining a grading permit.

Operation & Maintenance

In order to ensure the function and effectiveness of the stormwater infrastructure, maintenance activities such as inspection, routine maintenance, restorative maintenance, rehabilitation and repair, are required. All proposed drainage structures within the any platted County ROW (roadside ditches and local road culverts) will be owned and maintained by El Paso County. All proposed drainage structures within easements or tracts (full spectrum water quality ponds, drainageway culverts and drainageway improvements) will be owned and maintained by the Saddlehorn Ranch Metropolitan District No.1. Inspection access for El Paso County will be provided through a maintenance easement.

Drainage and Bridge Fees

An estimate of total basin fees for the proposed development within Haegler Ranch Drainage Basin is provided in Table 6. A portion of Saddlehorn Ranch (Basin J and CH1) is not within an approved

drainage basin, therefore; no drainage or bridge fees will be required for this area. Drainage and Bridge fees are for informational purposes only and do not include reductions for rural lots, permanent water quality facilities or reimbursable channel improvements. Final drainage reports for each phase of development will establish official drainage and bridge fees to be paid at time of platting.

Table 5: Site Composite Percent Imperviousness

Total Site Composite % Impervious for Basin Fees			
Basin	Area (ac)	% Imperviousness	(Area) * (% Imp.)
A	9.2	67%	6.13
B	60.4	10%	6.28
C	102.5	11%	11.69
D	99.2	11%	10.71
E	11.6	12%	1.35
F	117.4	10%	11.62
G	39.9	17%	6.70
H	30.7	9%	2.89
I	46.6	9%	4.38
J	10.1	9%	0.89
UD1	12.4	2%	0.25
UD2	12.8	2%	0.26
UD2.1	14.8	2%	0.30
UD2.2	7.2	2%	0.14
UD3	13.4	2%	0.27
UD4	4.8	2%	0.10
UD5	36.4	2%	0.73
UD6	22.1	2%	0.44
UD7	9.3	2%	0.19
UD8	4.6	2%	0.09
UD8.1	5.3	2%	0.11
UD9	4.8	2%	0.10
UD9.1	6.4	2%	0.13
UD10	10.4	2%	0.21
UD11	6.0	2%	0.12
CH1	23.9	2%	0.48
CH2	84.2	2%	1.68
CH3	19.0	2%	0.38
Total	825.4	-	68.59
Comp. % Imp. = 68.59%*ac/825.4 ac = 8.31%			

Table 6: Drainage Basin Fees

El Paso County - Haegler Ranch Drainage Basin Fees						
Area (acre)	Composite % Impervious	Total Impervious Acreage	2019 Drainage Fee (per Impervious Acre)	2019 Bridge Fee (per Impervious Acre)	Saddlehorn Ranch Drainage Fee	Saddlehorn Ranch Bridge Fee
825.4	8.31%	68.59	$10,324	$1,524	$708,123	$104,531

Construction Cost Opinion

(For Information Only / Non-Reimbursable)
Cost opinion to be provided with Final Drainage Report.

SUMMARY

The proposed development remains consistent with pre-development drainage conditions with the construction of the recommended drainage improvements, including ditches, culverts, detention ponds and drainage channel improvements. The proposed development will not adversely affect the offsite major drainageways or surrounding development. This report meets the latest El Paso County Drainage Criteria requirements for this site.

REFERENCES:

1. City of Colorado Springs Drainage Criteria Manual Volume 1, City of Colorado Springs, CO, May 2014.

2. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, Latest Revision.

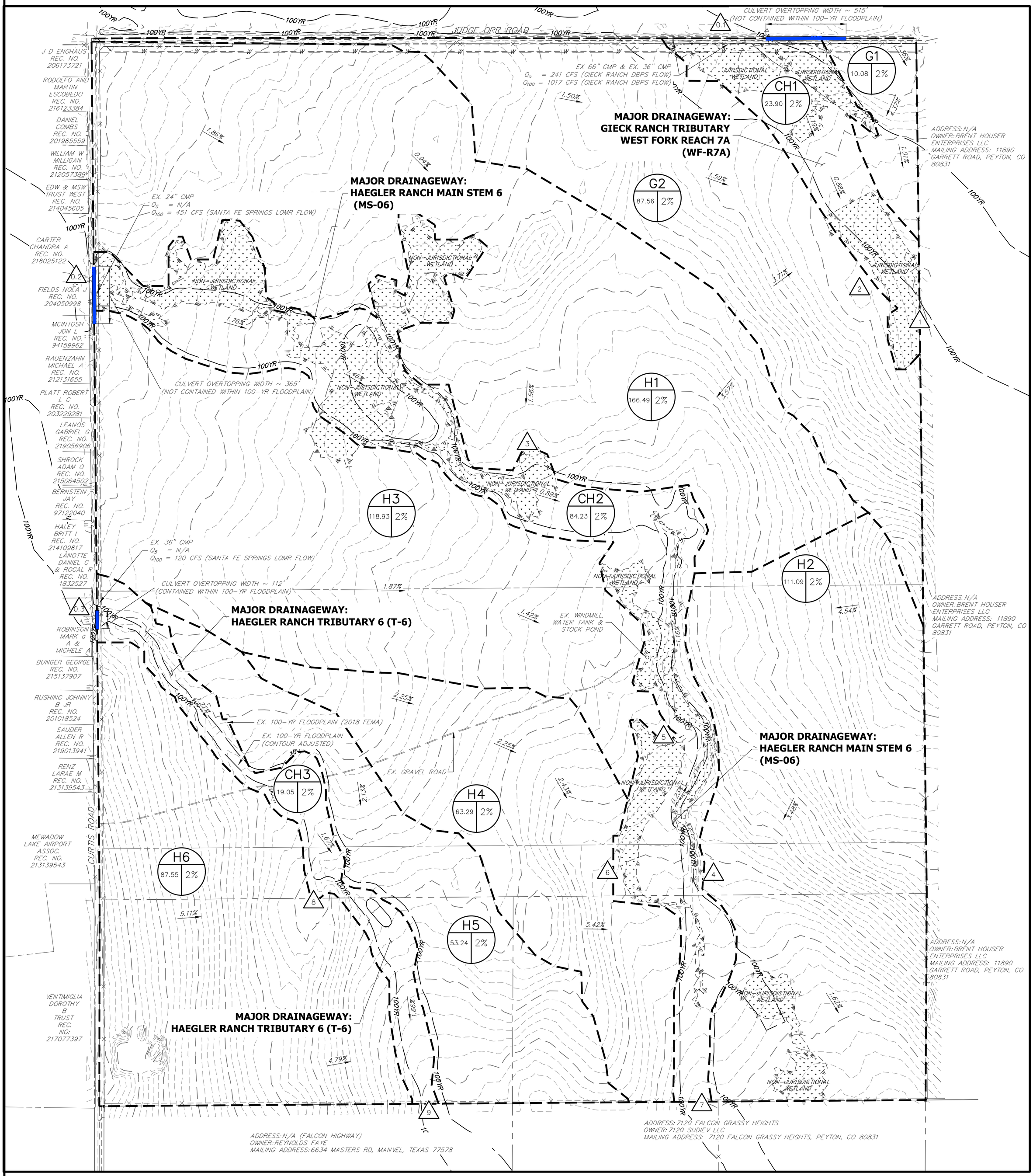
3. Gieck Ranch Drainage Basin Planning Study, Drexel, Barrell & Co., October 2007 and revised in February 2010.

4. Haegler Ranch Drainage Basin Planning Study, URS Corporation, May 2009.

5. The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR, Federal Emergency Management Agency, October 20, 2004.

824 ACRE CURTIS ROAD SUBDIVISION

EX. CONDITIONS DRAINAGE MAP



LEGEND

- I.D. (A | B): BASIN DESIGNATION
  - I.D.: BASIN IDENTIFIER
  - A: BASIN AREA
  - B: % IMPERVIOUS
- X: DESIGN POINT
- BASIN DELINEATION
- --6100-- EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION

BASIN SUMMARY TABLE

Tributary Sub-Basin	Area (acres)	Percent Impervious	Q_5 (cfs)	Q_{100} (cfs)
G1	10.1	2.0%	0.00	0.1
G2	87.6	2.0%	1.5	76.4
H1	166.5	2.0%	0.1	81.0
H2	111.1	2.0%	0.2	91.1
H3	118.9	2.0%	0.9	64.1
H4	63.3	2.0%	1.4	73.2
H5	53.2	2.0%	0.3	28.2
H6	87.6	2.0%	0.2	110.1
CH1	23.9	2.0%	5.4	21.0
CH2	84.2	2.0%	2.6	33.7
CH3	19.1	2.0%	0.1	6.5
Total	825.4	N/A	12.7	585.4

DESIGN POINT SUMMARY TABLE

Tributary Sub-	Q_5 (cfs)	Q_{100} (cfs)
0.1	241.00	1017.0
0.2	-	451.0
0.3	-	120.0
1	6.9	1114.0
2	1.5	76.4
3	0.1	80.9
4	0.1	91.1
5	0.9	64.1
6	1.4	73.2
7	4.1	704.9
8	0.2	110.1
9	0.4	248.1

300 150 0 300 600

ORIGINAL SCALE: 1" = 300'

EX. DRAINAGE MAP
824 CURTIS ROAD
25142.00
5/8/20
SHEET 1 OF 1

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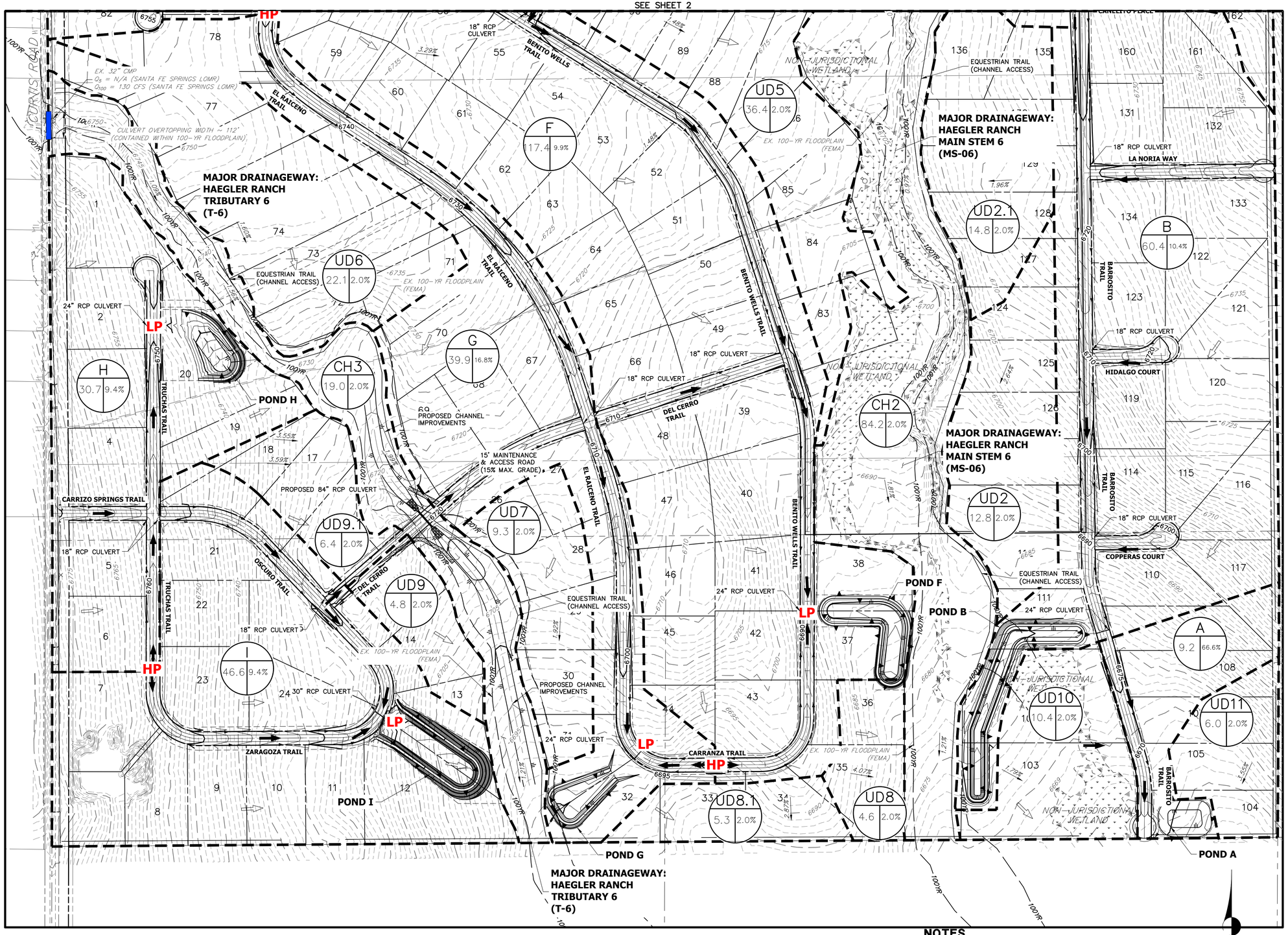
Fort Collins 970-491-9888 • www.jrengineering.com

X:\25100\00.all\25142\00\Drawings\Sheet Dwgs_Drainage\2018-10-09_Ex.Drainage Map.dwg, EX. DR01, 5/8/2020 12:25:28 PM, ClarkD

SADDLEHORN RANCH SUBDIVISION

PROPOSED DRAINAGE MAP

SEE SHEET 2



BASIN SUMMARY TABLE

Tributary Sub-Basin	Area (acres)	Composite Percent Impervious	Q_5 (cfs)	Q_{100} (cfs)
A	9.2	66.6%	9.5	20.7
B	60.4	10.4%	9.9	46.3
C	102.5	11.4%	15.8	69.4
D	99.2	10.8%	29.4	95.4
E	11.6	11.6%	2.0	9.9
F	117.4	9.9%	17.0	69.9
G	39.9	16.8%	6.1	25.3
H	30.7	9.4%	3.7	17.9
I	46.6	9.4%	15.9	63.1
J	10.1	2.0%	3.0	10.5
UD1	12.4	2.0%	0.3	13.9
UD2	12.8	2.0%	0.1	7.7
UD2.1	14.8	2.0%	0.1	14.7
UD2.2	7.2	2.0%	0.1	5.5
UD3	13.4	2.0%	0.2	13.1
UD4	4.8	2.0%	0.03	3.4
UD5	36.4	2.0%	4.1	27.4
UD6	22.1	2.0%	0.1	12.4
UD7	9.3	2.0%	0.7	7.4
UD8	4.6	2.0%	0.03	3.3
UD8.1	5.3	2.0%	0.1	5.6
UD9	4.8	2.0%	0.1	4.2
UD9.1	6.4	2.0%	0.2	8.1
UD10	10.4	2.0%	0.1	6.7
UD11	6	2.0%	0.02	4.3
CH1	23.9	2.0%	5.4	21.0
CH2	84.2	2.0%	2.6	33.7
CH3	19.0	2.0%	0.1	6.5
Total	825.4	N/A	126.7	627.3

POND SUMMARY TABLE

Tributary Sub-Basin	Pond Name	Tributary Acres	WQ Volume (ac-ft)	100-Year Volume (ac-ft)	Provided Volume (ac-ft)	100-Year Peak Discharge (cfs)	Ex. 100-Year Peak Discharge (cfs)
A	POND A	9.2	0.20	1.14	1.14	2.5	2.8
B	POND B	60.4	0.35	1.46	2.17	18.9	21.0
C	POND C	102.5	0.64	2.69	2.77	26.0	28.9
D	POND D	99.2	0.59	2.86	2.97	47.7	53.0
E	POND E	11.6	0.05	0.23	0.39	4.7	5.2
F	POND F	117.4	0.65	3.20	3.35	50.7	56.3
G	POND G	39.9	0.34	1.36	1.62	10.1	11.2
H	POND H	30.7	0.16	0.70	1.18	10.5	11.7
I	POND I	46.6	0.25	1.09	1.41	26.8	29.8

LEGEND

- I.D. / A / B — BASIN DESIGNATION
  - I.D.: BASIN IDENTIFIER
  - A: BASIN AREA
  - B: COMP. % IMPERVIOUS
- X — DESIGN POINT
- BASIN DELINEATION
- 6100 — EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6100 — PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP — PROPOSED HIGH POINT
- LP — PROPOSED LOW POINT

SADDLEHORN RANCH
SUBDIVISION
MDDP DRAINAGE MAP
25142.00
12/18/19
SHEET 1 OF 3

NOTES

1. ALL CULVERT SIZES ARE PRELIMINARY AND SUBJECT TO CHANGE WITH FINAL DRAINAGE REPORTS.

200 100 0 200 400

ORIGINAL SCALE: 1" = 200'

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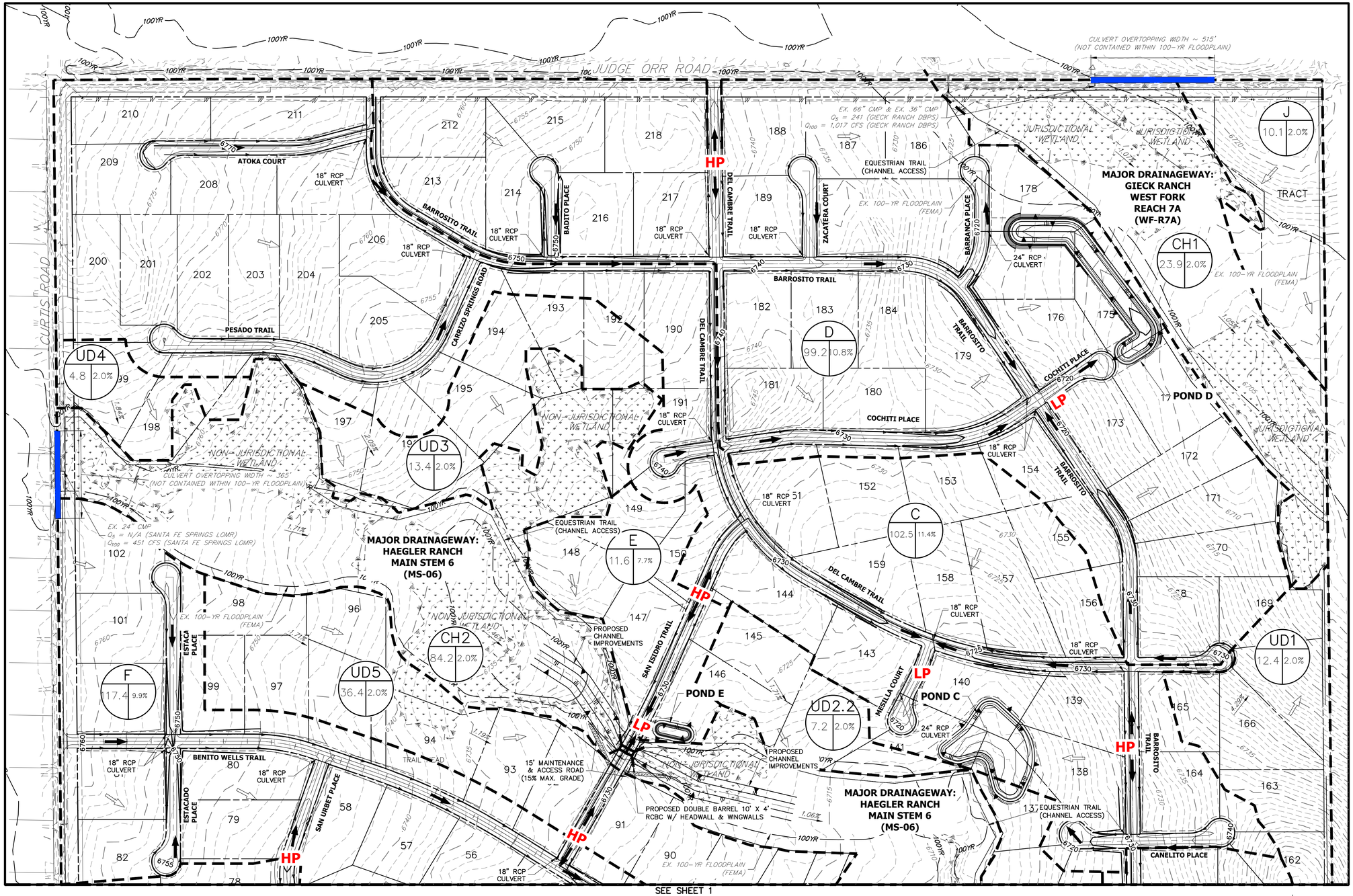
X:\25100\00 all\25142\00\Drawings\Sheet Dwgs\L Drainage\Pr Drainage Map.dwg, DRB1_200, 5/8/2020 12:31:16 PM, ClarkD

SADDLEHORN RANCH SUBDIVISION
PROPOSED DRAINAGE MAP



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UD2.2	7.2	2.0%	0.1	5.5
UD3	13.4	2.0%	0.2	13.1
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UD6	22.1	2.0%	0.1	12.4
UD7	9.3	2.0%	0.7	7.4
UD8	4.6	2.0%	0.03	3.3
UD8.1	5.3	2.0%	0.1	5.6
UD9	4.8	2.0%	0.1	4.2
UD9.1	6.4	2.0%	0.2	8.1
UD10	10.4	2.0%	0.1	6.7
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LEGEND

- I.D. (A | B): BASIN DESIGNATION — I.D.: BASIN IDENTIFIER; A: BASIN AREA; B: COMP. % IMPERVIOUS
- X: DESIGN POINT
- BASIN DELINEATION
- —6100— EXISTING INDEX CONTOURS
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- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP PROPOSED HIGH POINT
- LP PROPOSED LOW POINT

NOTES

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SADDLEHORN RANCH
MDDP DRAINAGE MAP
25142.00
12/18/19
SHEET 2 OF 3

200 100 0 200 400
ORIGINAL SCALE: 1" = 200'

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X:\25100\000_all\25142\00\Drawings\Sheet Dwgs_Drainage\Pr Drainage Map.dwg, DR01_20(1), 5/9/2020 12:31:44 PM, ClarkD

J·R ENGINEERING

April 25, 2023

Keith Curtis, PE, CFM
Floodplain Administrator, PPRBD
2880 International Circle
Colorado Springs, CO 80910

Re: Engineer's Certification of No Impact
Case No. :

Dear Mr. Curtis,

This letter serves as Certification of No Impact to the Floodplain for the project entitled "Saddlehorn Ranch – Filing 3." The project is located in the unincorporated El Paso County and involves a proposed rural 2.5 acre lot subdivision.

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) shows the project area located on Panel No. 08041C0558G for El Paso County, Colorado dated December 7, 2018. The project area is located along Haegler Ranch MS-06 and is within a designated Zone AE Special Flood Hazard Area (SFHA).

JR Engineering has evaluated the effects of the proposed development on the Haegler Ranch floodplain using the effective modeling as a baseline. The HEC-RAS modeling was obtained in PDF format from the "*Santa Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision (LOMR)*" by Tri-Core Engineering, dated October 20, 2004, from the Federal Emergency Management Agency (FEMA). The effective model is the "Santa Fe Springs – Haegler DB. – Letter of Map Revision" prepared for FEMA by Tri-Core Engineering. The effective model was pared down to the stretch between Cross Sections 4 and 19 along Reach H8 (Haegler Ranch Tributary 3) for purposes of analysis within the context of this project.

JR Engineering utilized the calculated 100-year water surface from the aforementioned model to establish the existing 100-year floodplain. Proposed channel and culvert improvements were modeled utilizing the 100-year flow of 505 cfs established in the "*Santa Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision (LOMR)".* Cross sections for the proposed channel improvements were modeled using the CivilGeo HECRAS program. The program models the projects proposed dual 12'x4' RCBC, this also took into hydraulic head built at the culvert crossing to establish an accurate base flood elevation. The computed water surface elevation at each cross section was compared to the effective model to ensure a no rise scenario.

Select results of the analysis are presented in Table 1, on the following page:

Table 1: Base Flood Elevation Comparison

	Base Flood Elevation (ft)	
Cross Section	Ex. 100-Year	Pr. 100-Year
13	6723.61	6723.60
14	6722.03	6719.68
15	6720.65	6718.33
16	6717.71	6717.56
17	6714.03	6714.03

Based on the results of the CivilGeo HECRAS Analysis, no increase to either the floodplain width or water surface elevation will result from the proposed site development.

Sincerely,

Bryan Law PE
Colorado P.E. #25043

No Rise Certification

I certify that I am a duly qualified registered Professional Engineer in the State of Colorado.

I certify the proposed project, Saddlehorn Ranch Filing No. 3, as detailed on the following sheets and calculations will result in zero rise in the FEMA designated 100 year flood heights, and no increase in the 100-year discharge and no increase in the 100-year floodplain width, at published and unpublished cross sections of the current FEMA floodplain of Haegler Ranch MS-06 as shown on FEMA map 08041C0558G. This certification is intended as proof of meeting the requirements set forth in the Pikes Peak Regional Building Code RBC313.20.1.

I further certify that the design conditions needed to meet the zero rise, box culvert and wing walls, are detailed in sufficient nature to allow for field confirmation and included among the supporting documentation.

I further certify that the structure in question will be securely anchored to prevent flotation, collapse or lateral movement in order to withstand the velocity of floodwaters as required by RCB313.18.1 and RBC313.21.2.

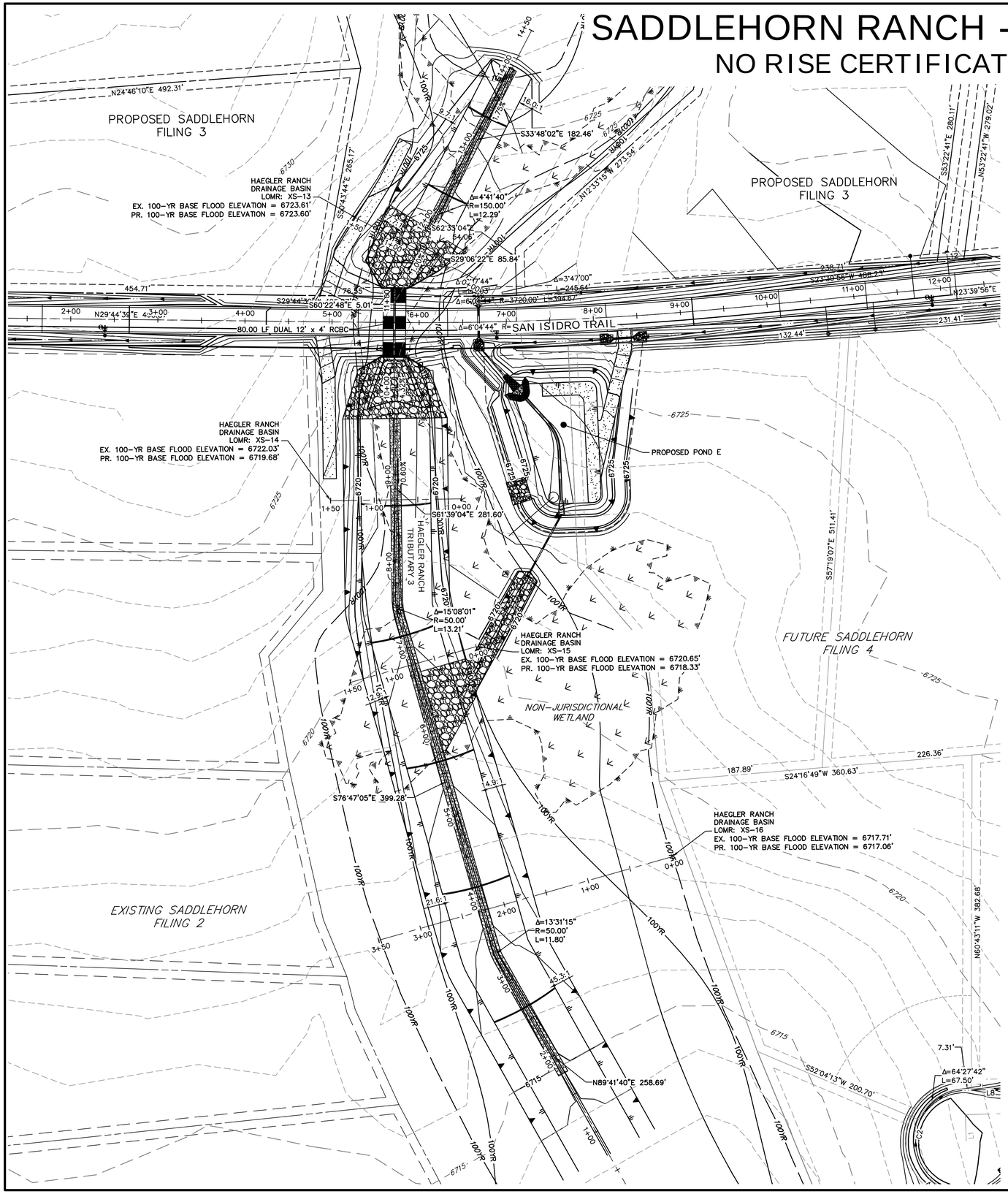
Replace signed version

JR Response: Signed version has been added.

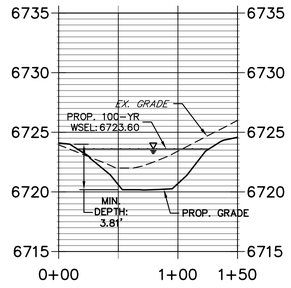
Bryan Law PE
Colorado P.E. #25043

SADDLEHORN RANCH - FILING 3

NO RISE CERTIFICATION



CROSS SECTION 13 PROFILE
STA 0+00.00 TO 1+50.00



CROSS SECTION 14 PROFILE
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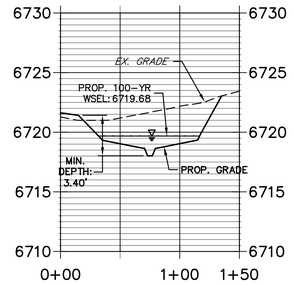

CROSS SECTION 15 PROFILE
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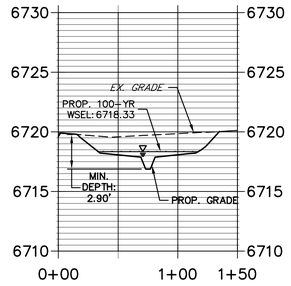

CROSS SECTION 16 PROFILE
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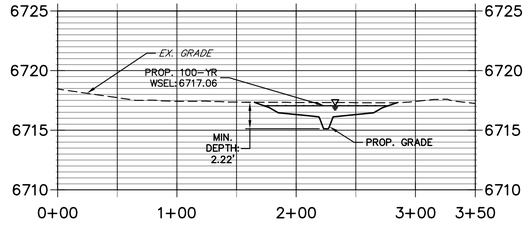

NO RISE CERTIFICATION
SADDLEHORN RANCH – FILING 3
JOB NO. 25142.05
4/24/23
SHEET 1 OF 1

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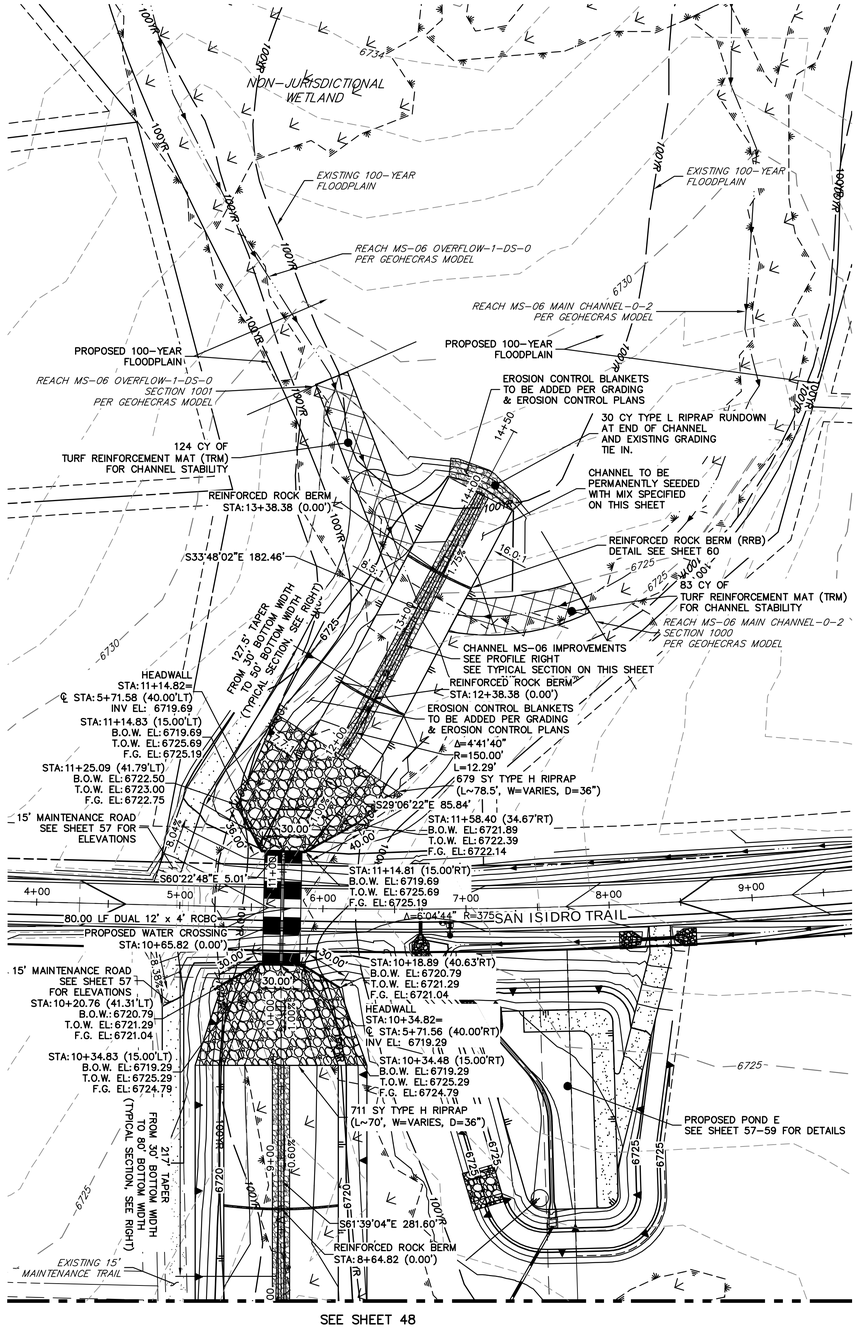
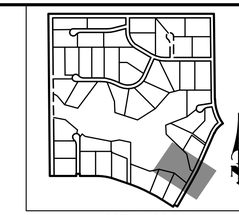
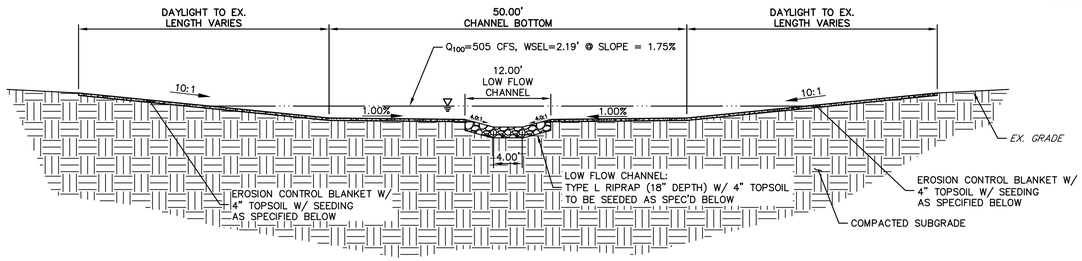


SEE SHEET 48



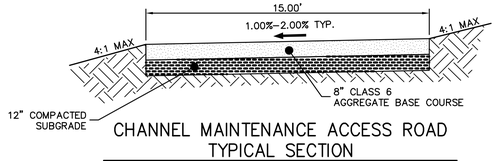
KEY MAP
1" = 1200'



MS-06 CHANNEL IMPROVEMENTS - TYPICAL SECTION

SCALE: 1"=10'
TYPICAL SECTION FOR CHANNEL WEST OF SAN ISIDRO TRAIL
CHANNEL SEED MIX: EROSION CONTROL BLANKET WITH PAWNEE BUTTES SEED INC. – "LOW GROW NATIVE MIX"
–IDAHO FESCUE
–SANDBERG BLUEGRASS
–ROCKY MOUNTAIN FESCUE
–BIG BLUEGRASS

MS-06 PROFILE (1)
STA 8+00.00 TO 14+50.00



CHANNEL MAINTENANCE ACCESS ROAD
TYPICAL SECTION
N.T.S.

50 25 0 50 100
HORIZONTAL
ORIGINAL SCALE: 1" = 50'
VERTICAL
ORIGINAL SCALE: 1" = 5'

Know what's **below.** **Call** before you dig.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF JR ENGINEERING

BRYAN T. LAW, P.E.
COLORADO P.E. 25043
FOR AND ON BEHALF OF JR ENGINEERING, LLC

COLORADO REGISTERED PROFESSIONAL ENGINEER 25043

2/1/24
DATE

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ROI PROPERTY GROUP, LLC
2495 RIGDON STREET
NAPA, CALIFORNIA
(707) 365-6891
BRADY WILLIAMS

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

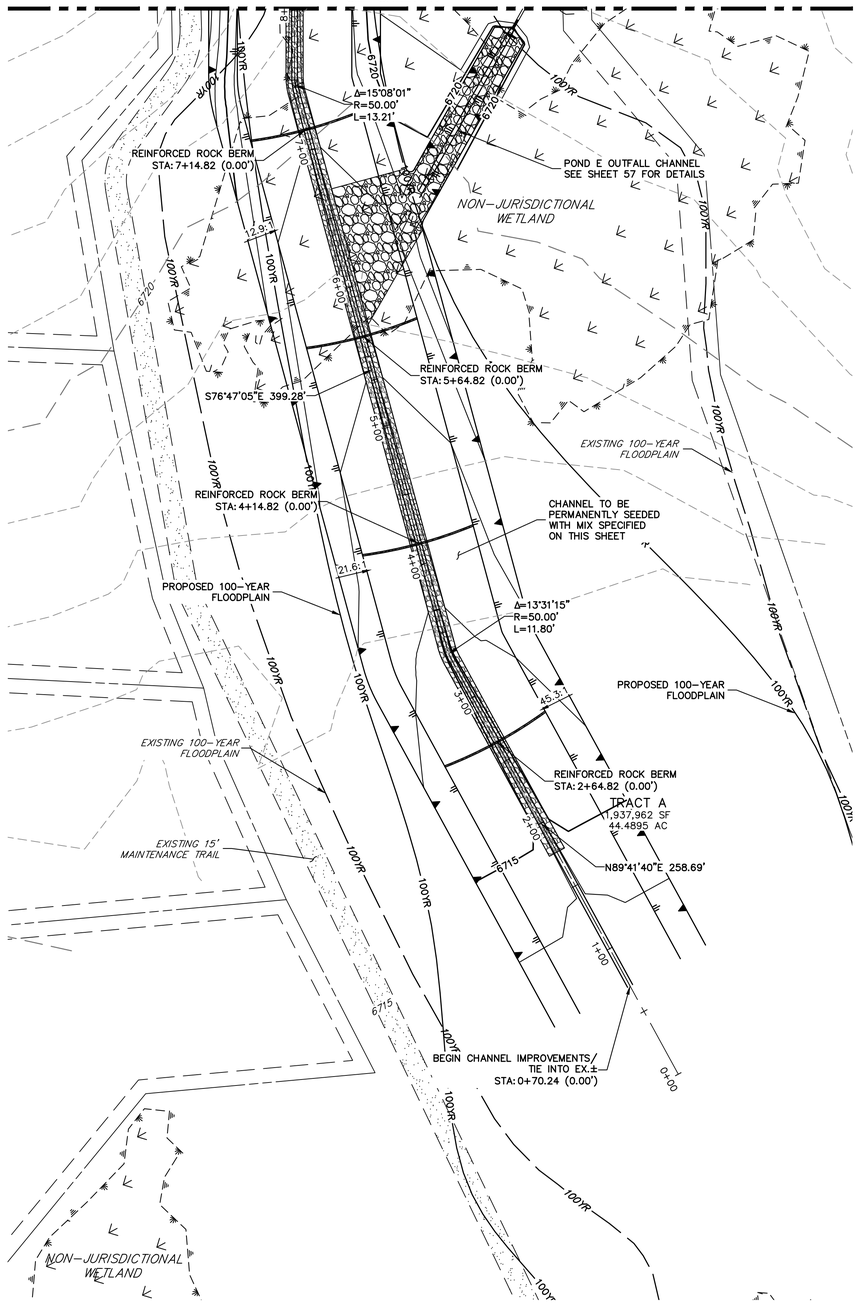
H-SCALE	1"=50'
V-SCALE	1"=5'
DATE	2/1/24
DESIGNED BY	AAM
DRAWN BY	AAM
CHECKED BY	

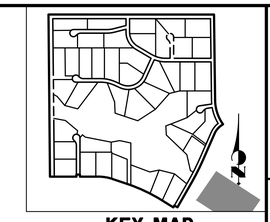
SADDLEHORN RANCH – FILING 3

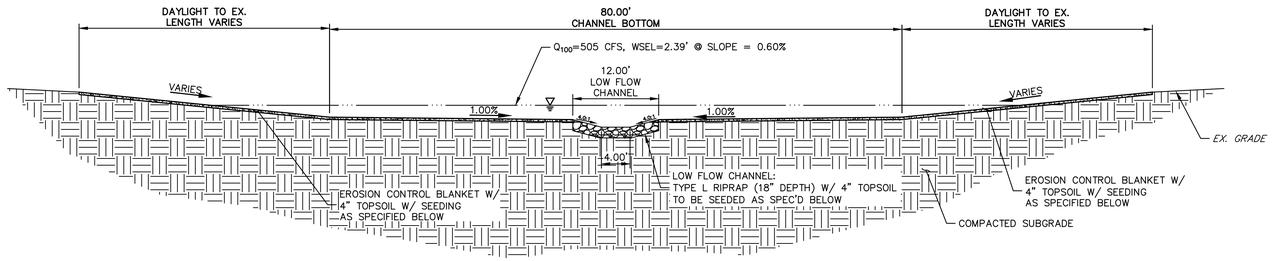
CHANNEL IMPROVEMENT PLANS

SHEET 47 OF 63

JOB NO. 25142.05







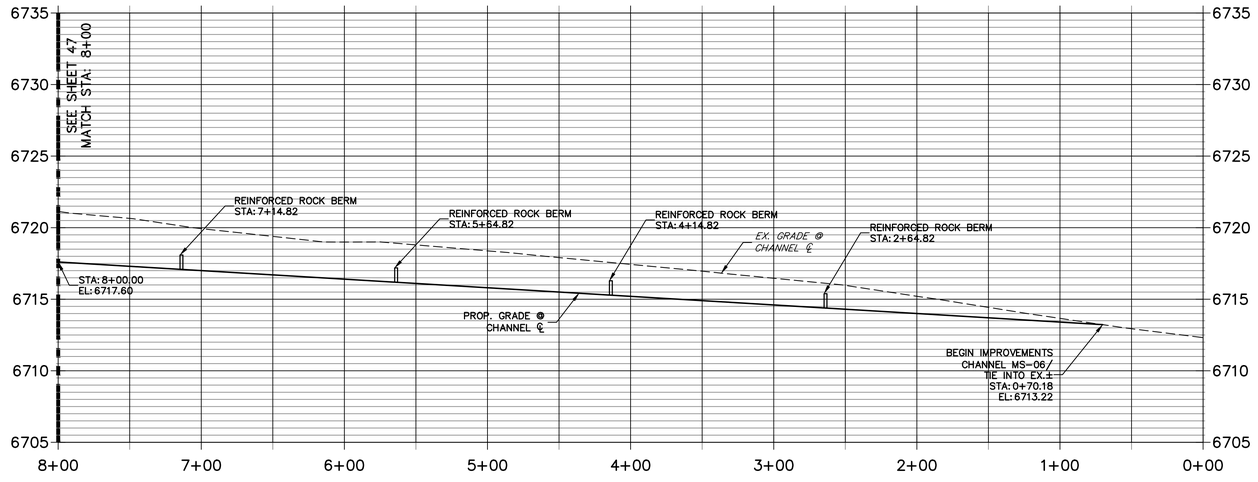
MS-06 CHANNEL IMPROVEMENTS - TYPICAL SECTION

SCALE: 1"=10'

TYPICAL SECTION FOR CHANNEL EAST OF SAN ISIDRO TRAIL

CHANNEL SEED MIX: EROSION CONTROL BLANKET WITH PAWNEE BUTTES SEED INC. – "LOW GROW NATIVE MIX"
- –IDAHO FESCUE
- –SANDBERG BLUEGRASS
- –ROCKY MOUNTAIN FESCUE
- –BIG BLUEGRASS

MS-06 PROFILE
STA 0+00.00 TO 8+00.00



811 Know what's below. Call before you dig.

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BRADY WILLIAMS

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No.	REVISION	BY	DATE

H-SCALE	1"=50'	DESIGNED BY	AAM
V-SCALE	1"=5'	DRAWN BY	AAM
DATE	2/1/24	CHECKED BY	

SADDLEHORN RANCH – FILING 3

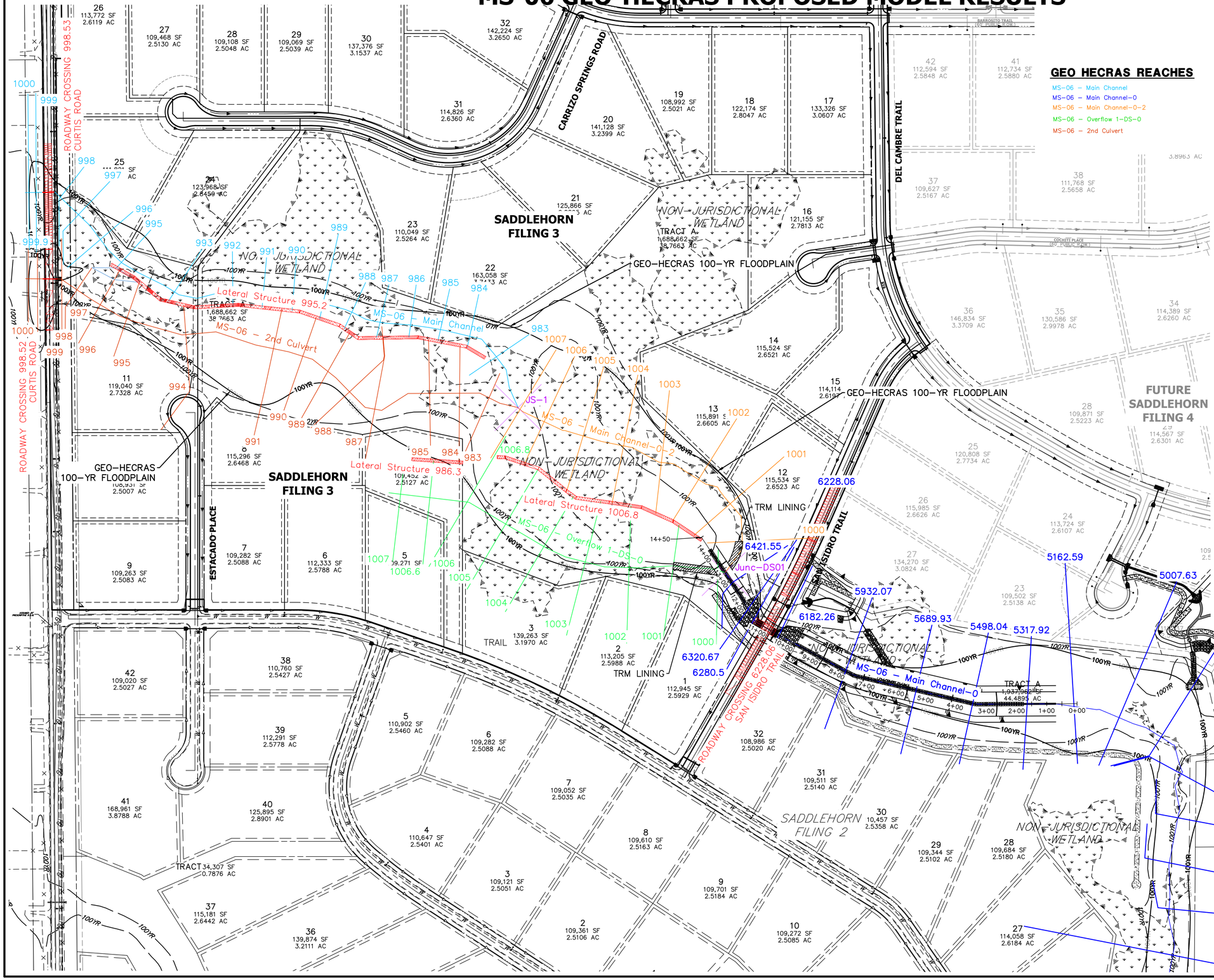
CHANNEL IMPROVEMENT PLANS

SHEET 48 OF 63

JOB NO. 25142.05

SADDLEHORN FILING 3

MS-06 GEO-HECRAS PROPOSED MODEL RESULTS



GEO HECRAS DATA

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)	Froude # Chl	Shear Total (lb/sq ft)
Main Channel	1000	505	6765.9	6768.16	1.03	0.14	0.05
	999	486.12	6765.4	6768.15	0.8	0.1	0.03
	998	486.12	6764	6765.58	2.44	0.42	0.78
	997	486.12	6763.48	6764.55	2.57	0.56	0.49
	996	486.12	6762.4	6763.9	1.83	0.3	0.18
	995	475.08	6761.5	6763.35	3.34	0.6	0.65
	993	333.2	6758.7	6760.9	2.11	0.44	0.69
	992	223.95	6756.1	6757.43	2.74	0.51	1.08
	991	182.38	6754.3	6755.57	2.74	0.48	1.05
	990	155.56	6753	6754.26	2.08	0.38	0.61
	989	147.13	6751.9	6752.89	2.3	0.49	0.83
	988	151.69	6750.1	6751.07	2.2	0.46	0.76
	987	153.81	6748.2	6749.09	3.43	0.77	0.79
	986	153.96	6746.2	6747.18	3.26	0.71	0.7
	985	153.44	6744.8	6745.85	2.56	0.55	0.43
	984	152.85	6743.5	6744.39	3.26	0.78	0.75
	983	148.91	6742.37	6742.73	0.78	0.26	0.2
Overflow 1-DS-0	1007	0	6745.24	6745.02		0	0
	1006.6	0.17	6743.4	6743.42	0.63	1.01	0.1
	1006	16.2	6740.87	6740.5		0	0.18
	1005	49.84	6737.8	6738.2	1.49	0.59	0.22
	1004	53.18	6735.5	6736.01	1.54	0.52	0.21
	1003	53.18	6733.7	6734.26	1.66	0.52	0.23
	1002	53.18	6731.5	6732.32	1.87	0.59	0.29
	1001	56.49	6728.3	6728.92	3.2	1	0.86
	1000	56.49	6722.9	6724.24	1.03	0.23	0.07
2nd Culvert	1000	0	6765.7	6766.02	0	0	0
	999	18.88	6765.2	6766.02	0.13	0.03	0
	998	18.88	6763.1	6763.46	1	0.47	0.26
	997	18.88	6762.1	6762.29	0.94	0.4	0.09
	996	37.36	6761.2	6761.66	0.77	0.23	0.11
	995	74.34	6760.25	6760.85	1.14	0.36	0.28
	994	201.15	6757.76	6758.42	1.6	0.49	0.29
	991	342.05	6753.9	6754.58	2.42	0.66	0.42
	990	356.98	6752	6753.04	2.42	0.6	0.42
	989	353.3	6750.9	6751.07	1.19	0.71	1.4
	988	351.04	6747.82	6749.15	1.95	0.43	0.25
	987	351.04	6747.5	6748.25	2.5	0.57	0.4
	985	351.39	6744.9	6745.58	1.9	0.45	0.56
	984	339.95	6743.3	6743.91	1.68	0.42	0.53
	983	339.89	6741.3	6742.4	2.01	0.43	0.63
Main Channel-0-2	1007	488.8	6740	6741	1.84	0.37	0.43
	1006	468.2	6738.7	6739.71	2.92	0.73	0.51
	1005	451.82	6736.6	6737.39	2.15	0.59	0.4
	1004	451.82	6733.8	6734.9	2.54	0.56	0.97
	1003	449.6	6730.8	6732.47	2.07	0.37	0.54
	1002	448.51	6729.3	6730.35	3.11	0.61	1.35
	1001	448.51	6725	6727.89	3.07	0.49	0.51
	1000	448.51	6724.2	6726.11	5.15	0.94	1.55
PROPOSED CROSSING SECTIONS	6421.55	505	6721.4	6723.94	3.27	0.53	0.18
	6320.67	505	6720.2	6723.88	1.49	0.17	0.05
	6280.5	505	6719.9	6723.81	2.29	0.26	0.12
	6182.26	505	6719.3	6721.6	8.46	0.98	1.67
	5932.07	505	6717.5	6719.89	4.43	0.67	0.49
	5689.93	505	6716.1	6718.46	4.18	0.63	0.4
	5498.04	505	6714.9	6717.13	4.69	0.75	0.29
	5317.92	505	6713.8	6715.22	5.62	1	0.55
Main Channel-0	5162.59	505	6712.5	6713.42	1.96	0.38	0.38
	5007.63	505	6710.6	6711.71	2.61	0.52	0.72
	4854.19	505	6708.4	6710.39	1.35	0.22	0.16
	4700.74	505	6706.7	6709.73	2.4	0.43	0.59
	4546.95	505	6704.9	6708.42	2.76	0.39	0.67
	4395.39	505	6704.1	6707.53	2.51	0.33	0.53
	4243.45	505	6704.1	6706.62	2.45	0.4	0.58
	4086.97	505	6702.5	6705	3.09	0.51	0.93

MS-06 GEO-HECRAS PROPOSED MODEL RESULTS
SADDLEHORN FILING 3
JOB NO. 25142.05
03/12/24
SHEET 1 OF 1

J·R ENGINEERING
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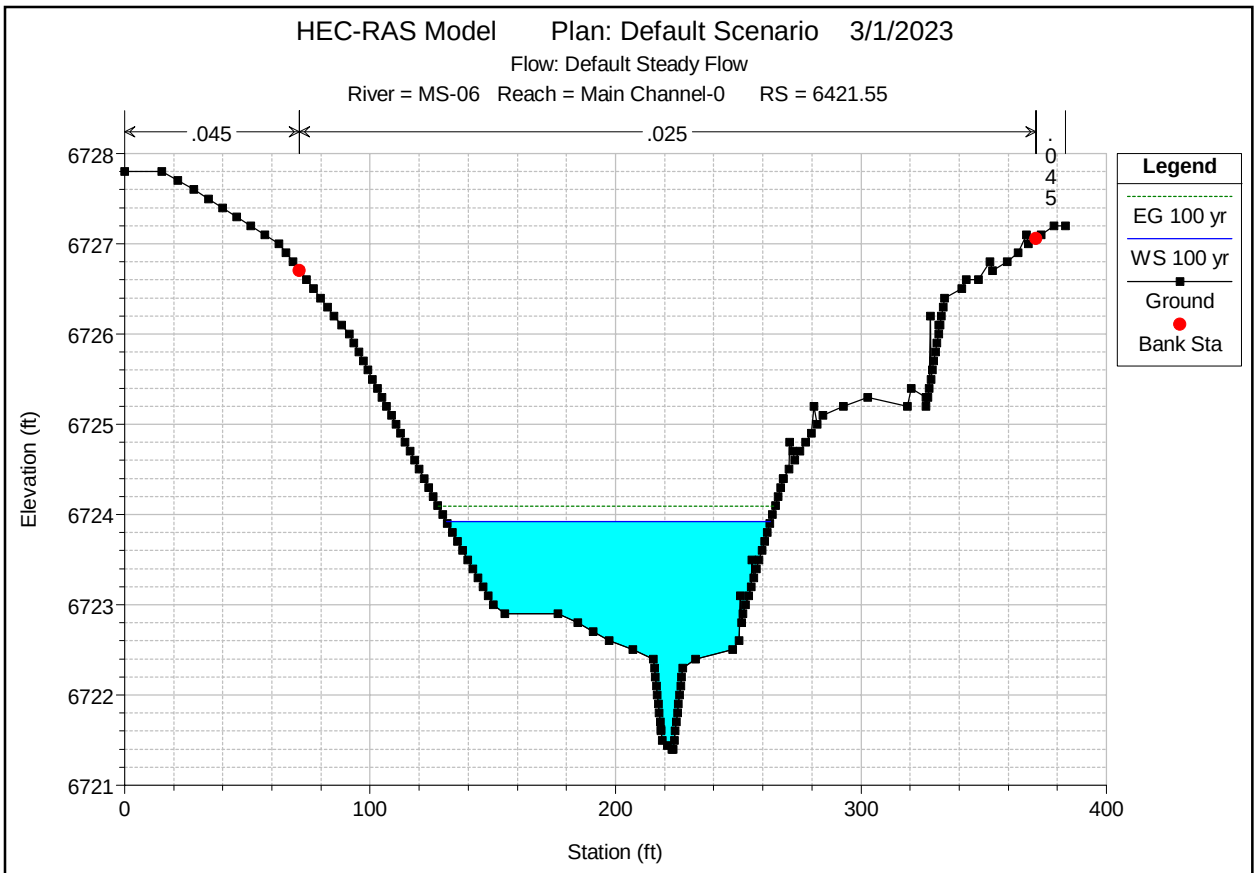
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com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.025
.045
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Elevation (ft)
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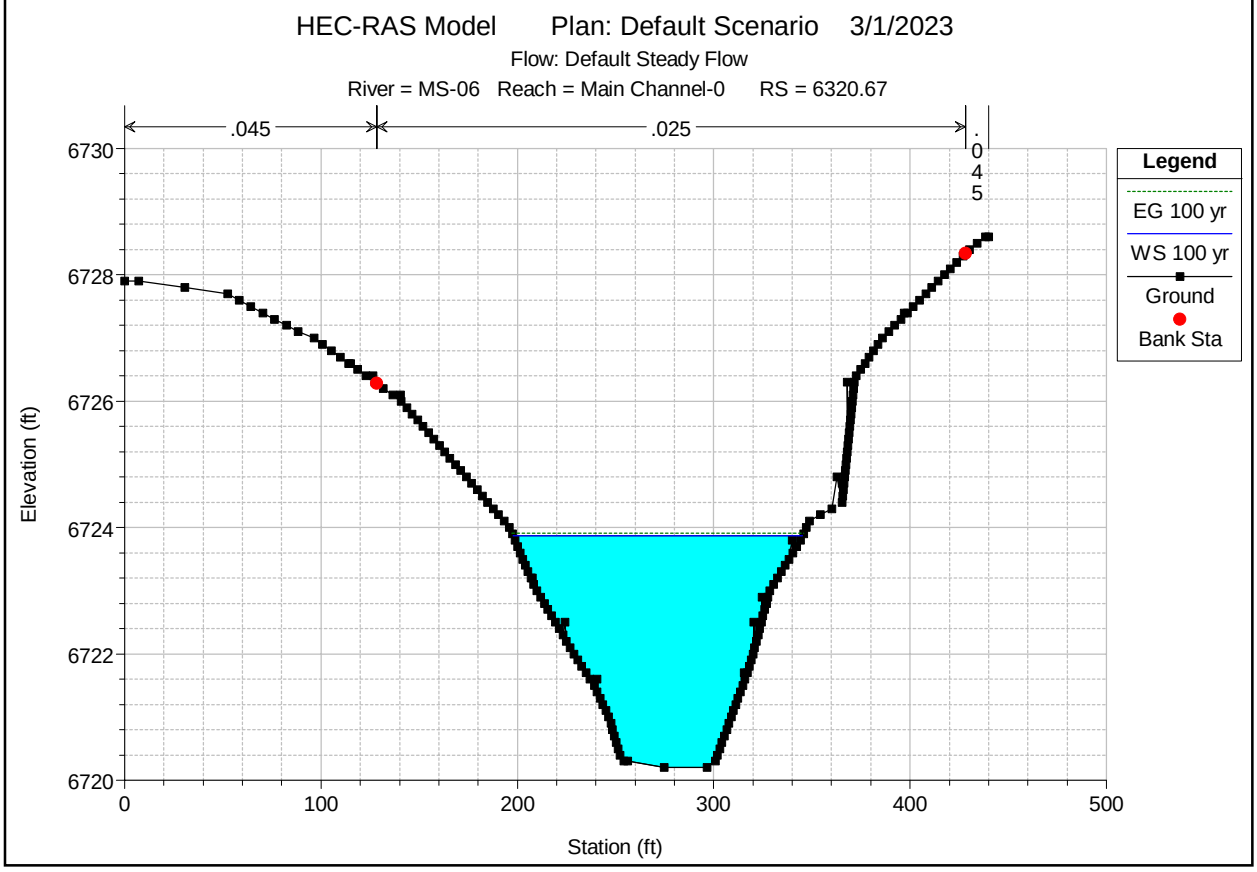
6727
6726
6725
6724
6723
6722
6721
0
100
200
300
400
Station (ft)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Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
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6728
6726
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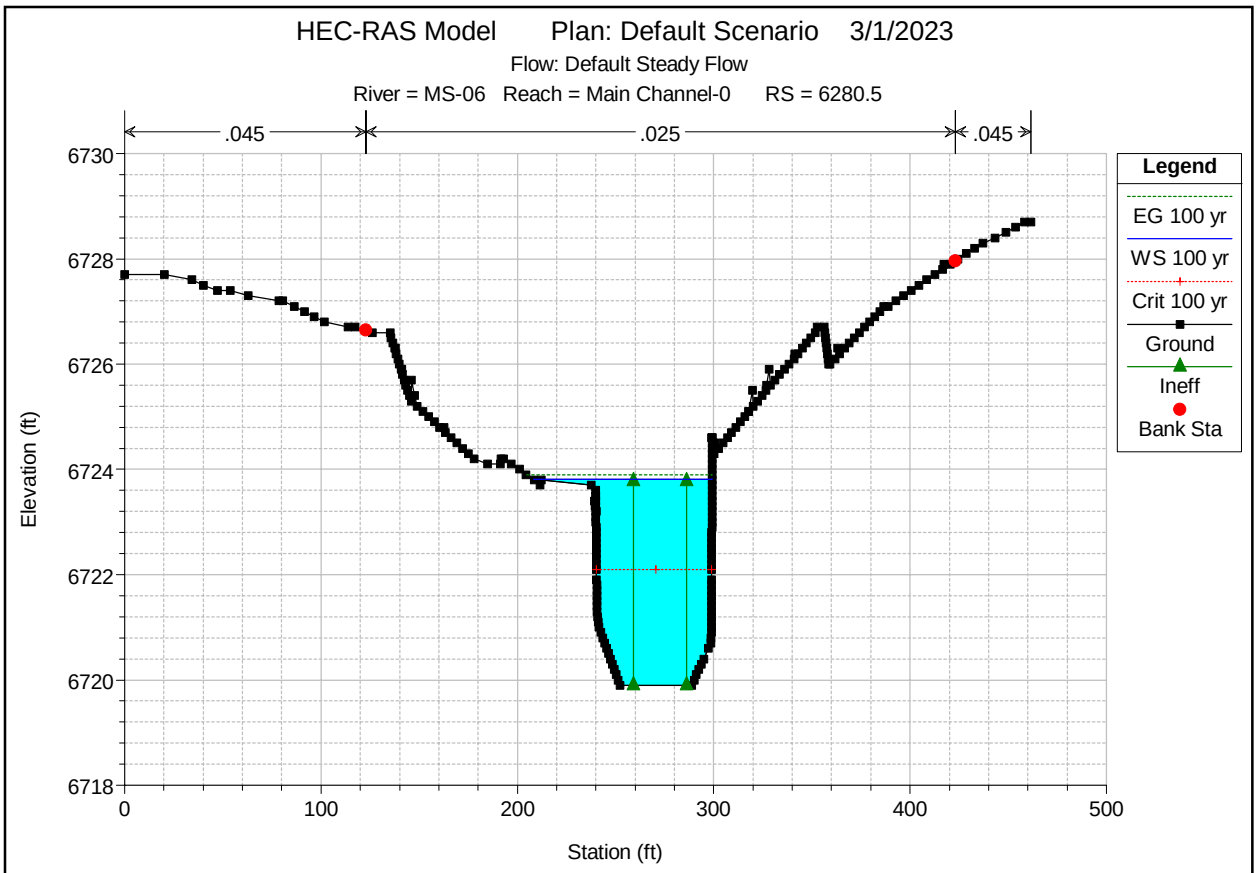
6722
6720
0
100
200
300
400
500
Station (ft)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.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Ineff
Bank Sta
Elevation (ft)
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6728
6726
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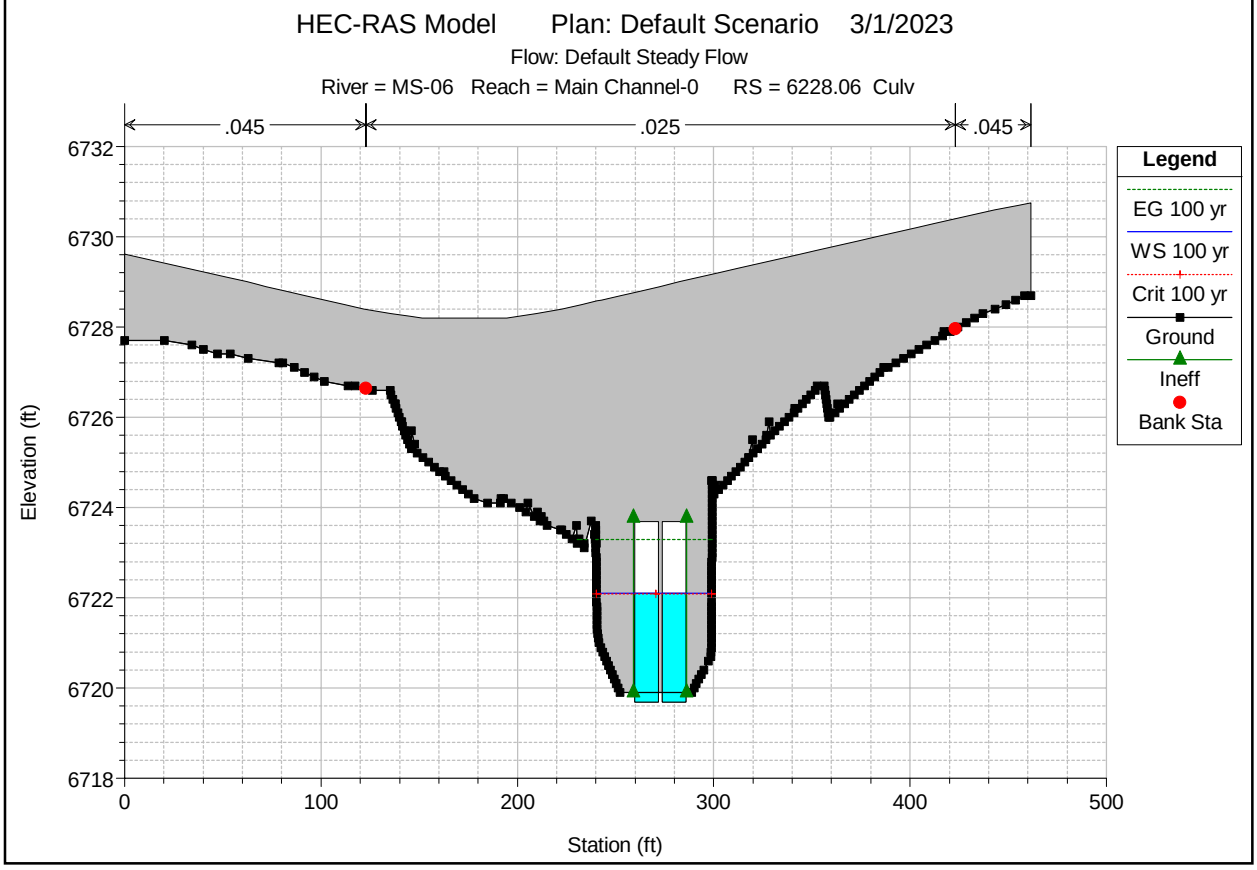
6722
6720
6718
0
100
200
300
400
500
Station (ft)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.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Ineff
Bank Sta
Elevation (ft)
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6722
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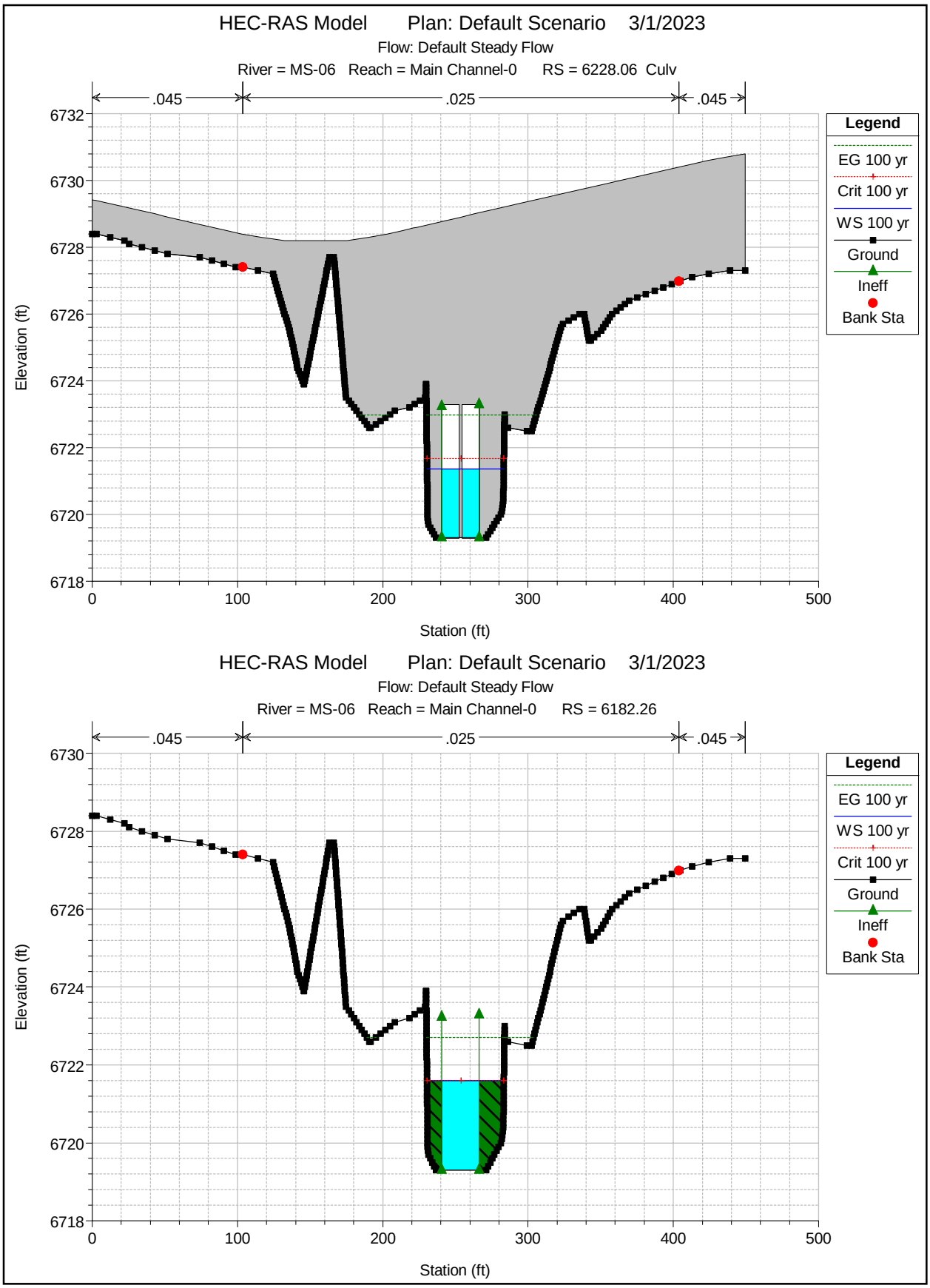
0
100
200
300
400
500
Station (ft)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.025
.045
Legend
EG 100 yr
Crit 100 yr
WS 100 yr
Ground
Ineff
Bank Sta
Elevation (ft)
6732
6730
6728
6726
6724
6722
6720
6718
0
100
200
300
400
500
Station (ft)
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Flow: Default Steady Flow
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.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Ineff
Bank Sta
Elevation (ft)
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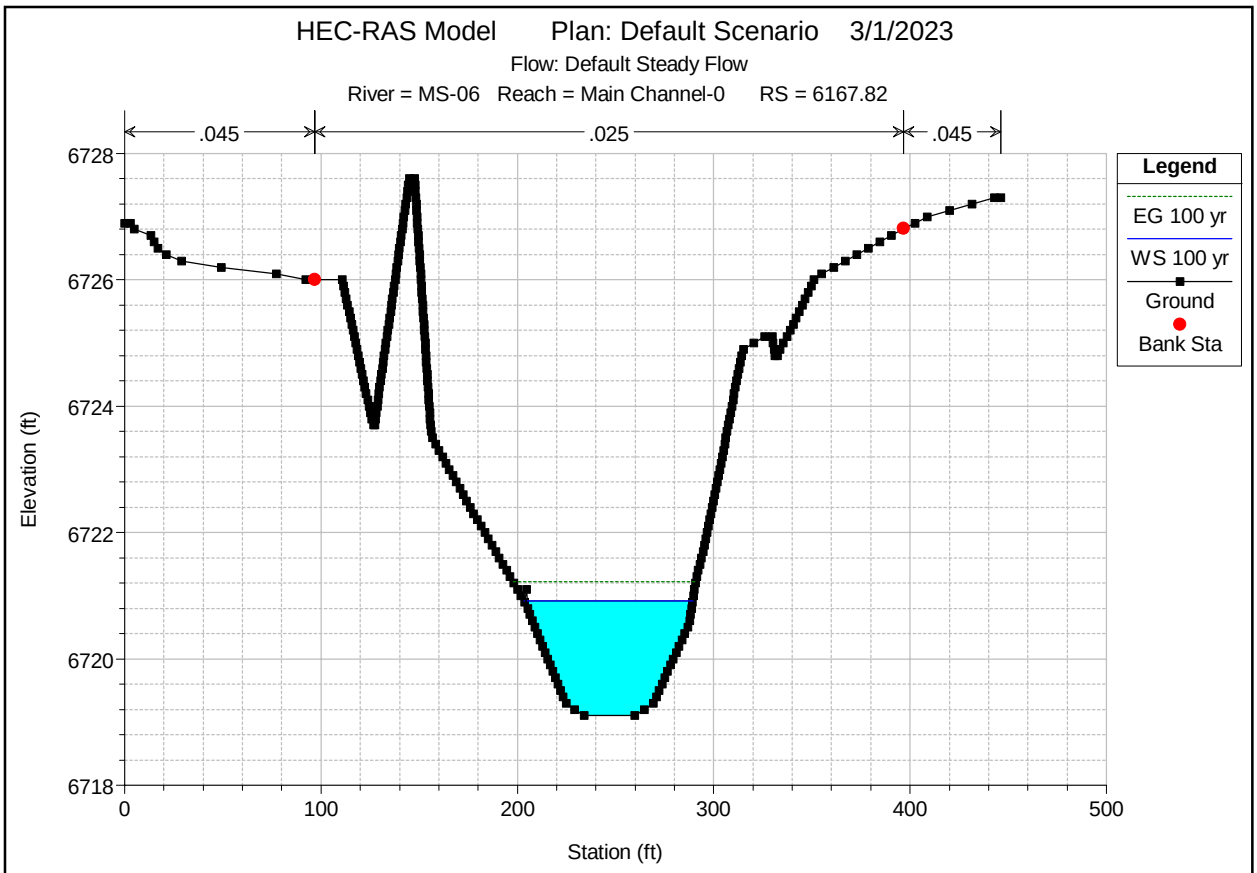
6720
6718
0
100
200
300
400
500
Station (ft)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Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
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Station (ft)
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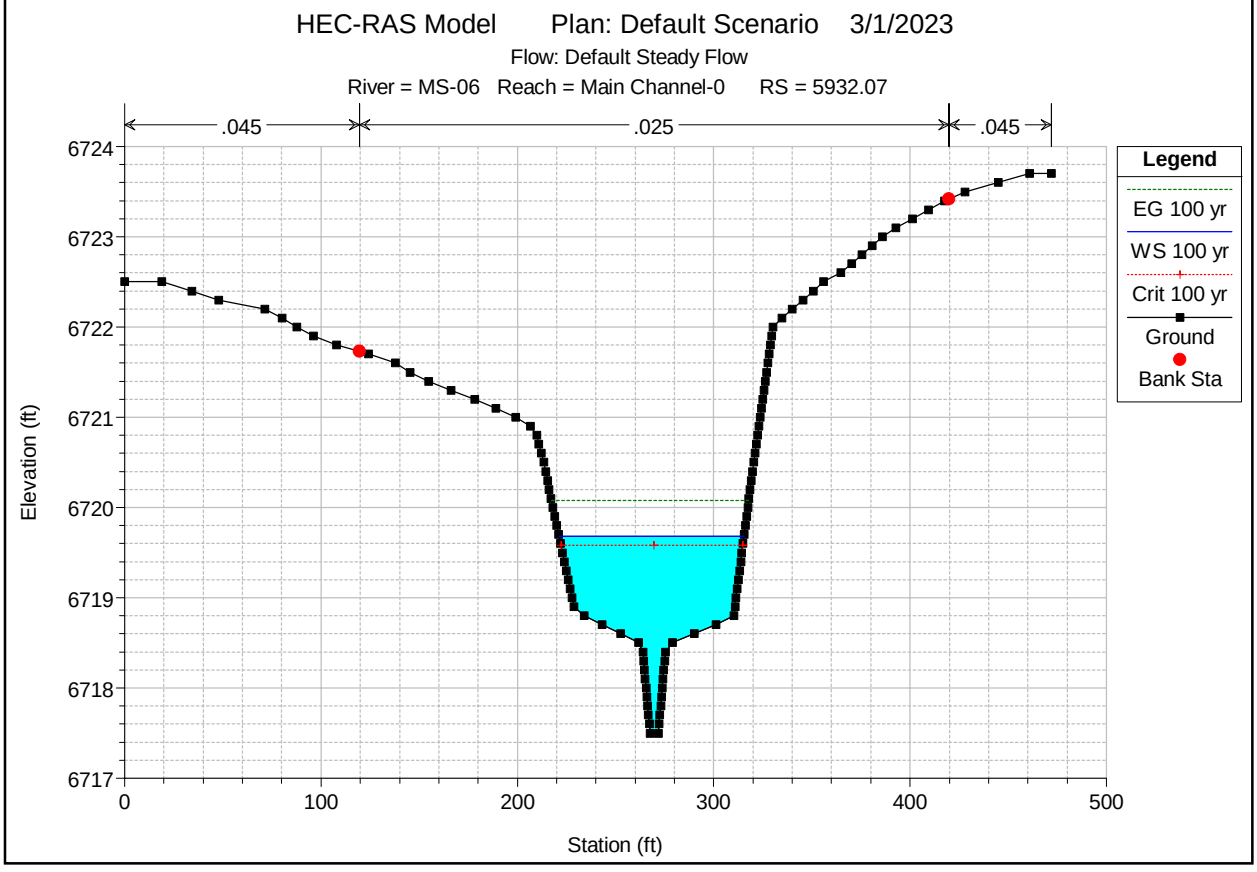
6720
6718
0
100
200
300
400
500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.045
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EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
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6719
6718
6717
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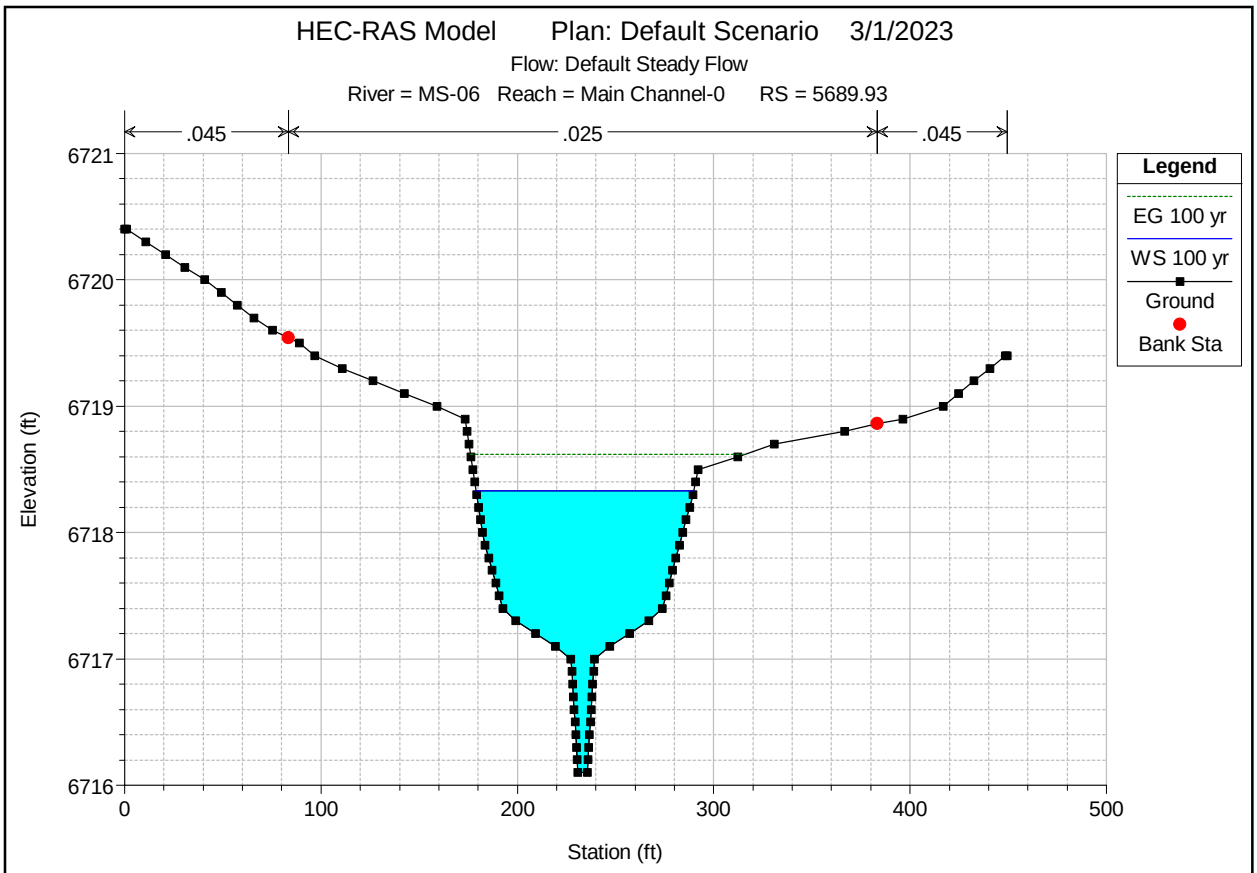
100
200
300
400
500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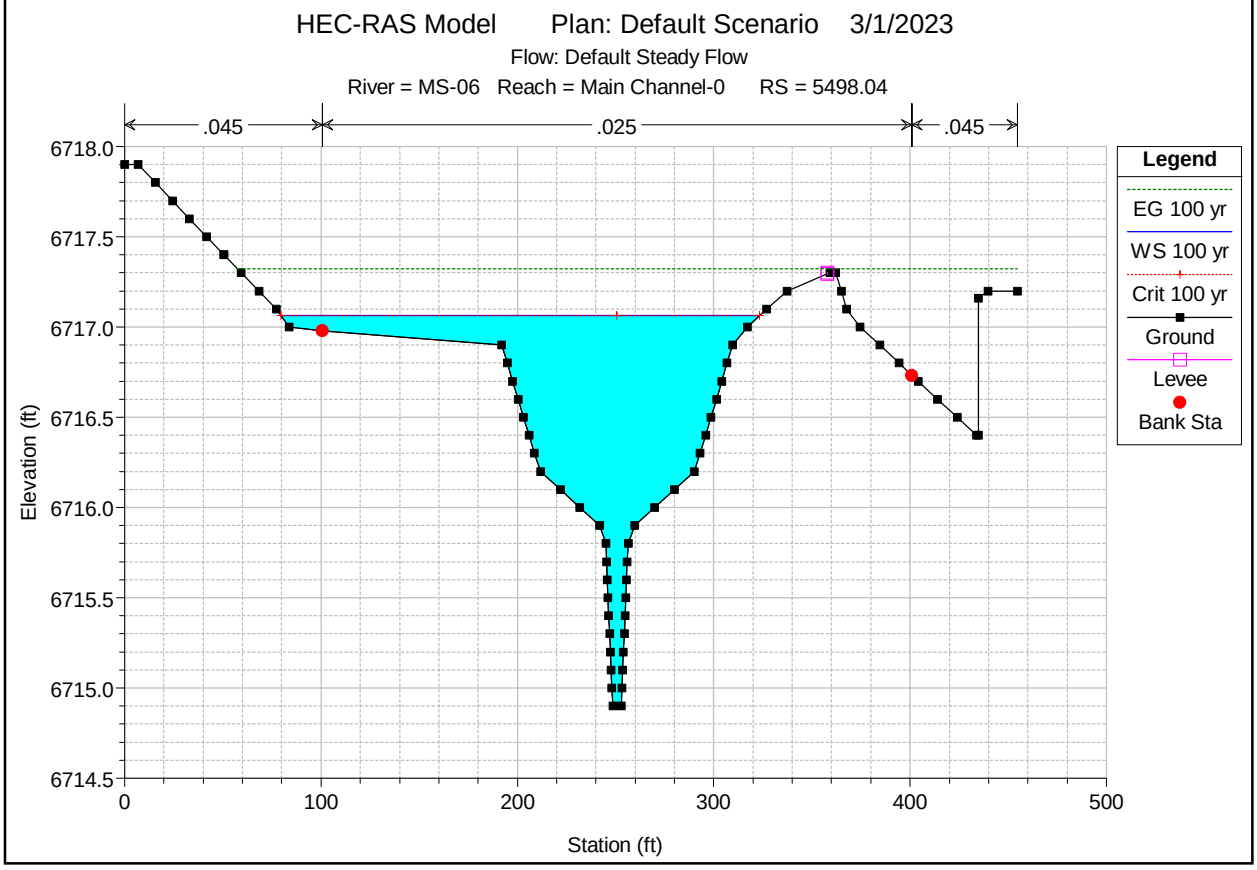
.025
.045
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)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.025
.045
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

CURTIS ROAD - NORTH CULVERT - EX 24" CMP - Q_100 = 451 CFS

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 400 cfs

Design Flow: 451 cfs

Maximum Flow: 500 cfs

Table 10 - Summary of Culvert Flows at Crossing: North Curtis Road

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6766.93	400.00	20.40	379.08	7
6766.94	410.00	20.45	389.44	3
6766.95	420.00	20.49	398.64	2
6766.96	430.00	20.54	409.36	3
6766.97	440.00	20.58	418.71	2
6766.98	450.00	20.62	429.31	3
6766.98	451.00	20.62	430.26	2
6767.00	470.00	20.70	448.42	2
6767.01	480.00	20.74	458.27	2
6767.01	490.00	20.78	468.29	2
6767.02	500.00	20.81	478.44	2
6766.00	14.84	14.84	0.00	Overtopping

Rating Curve Plot for Crossing: North Curtis Road

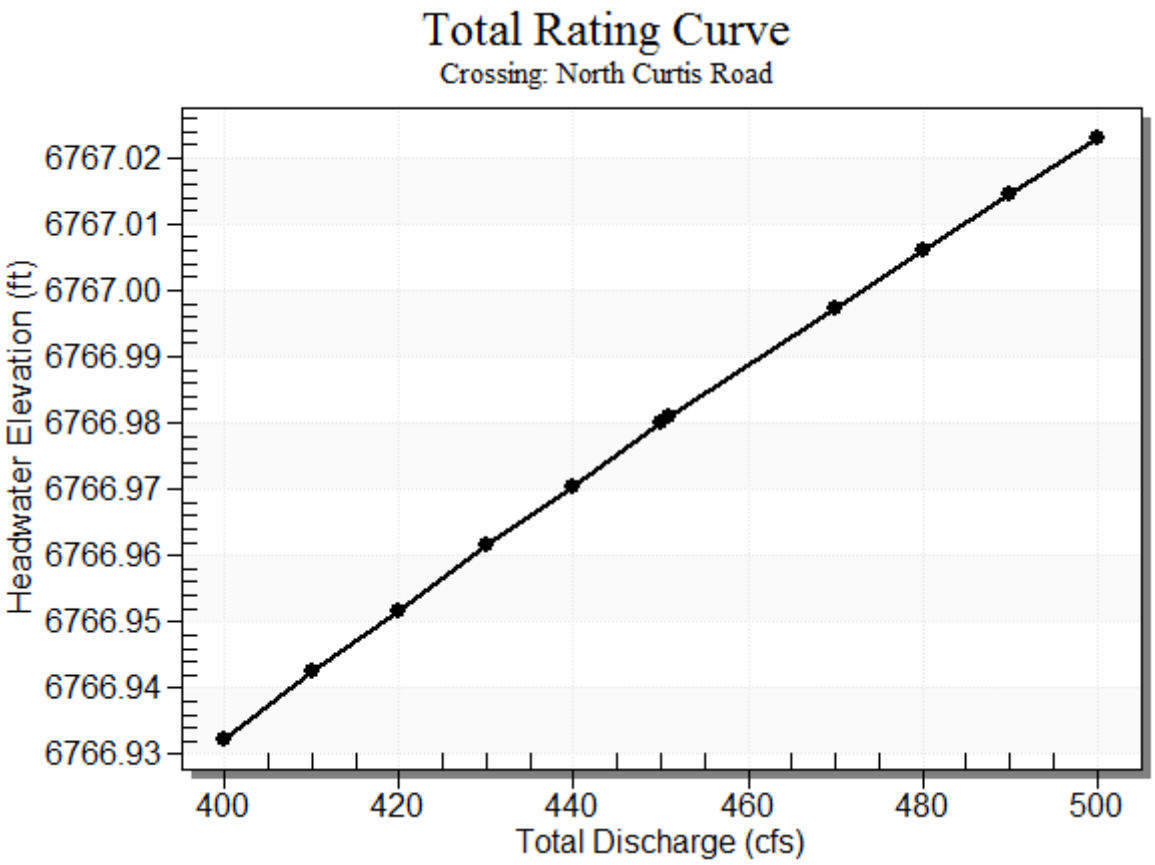
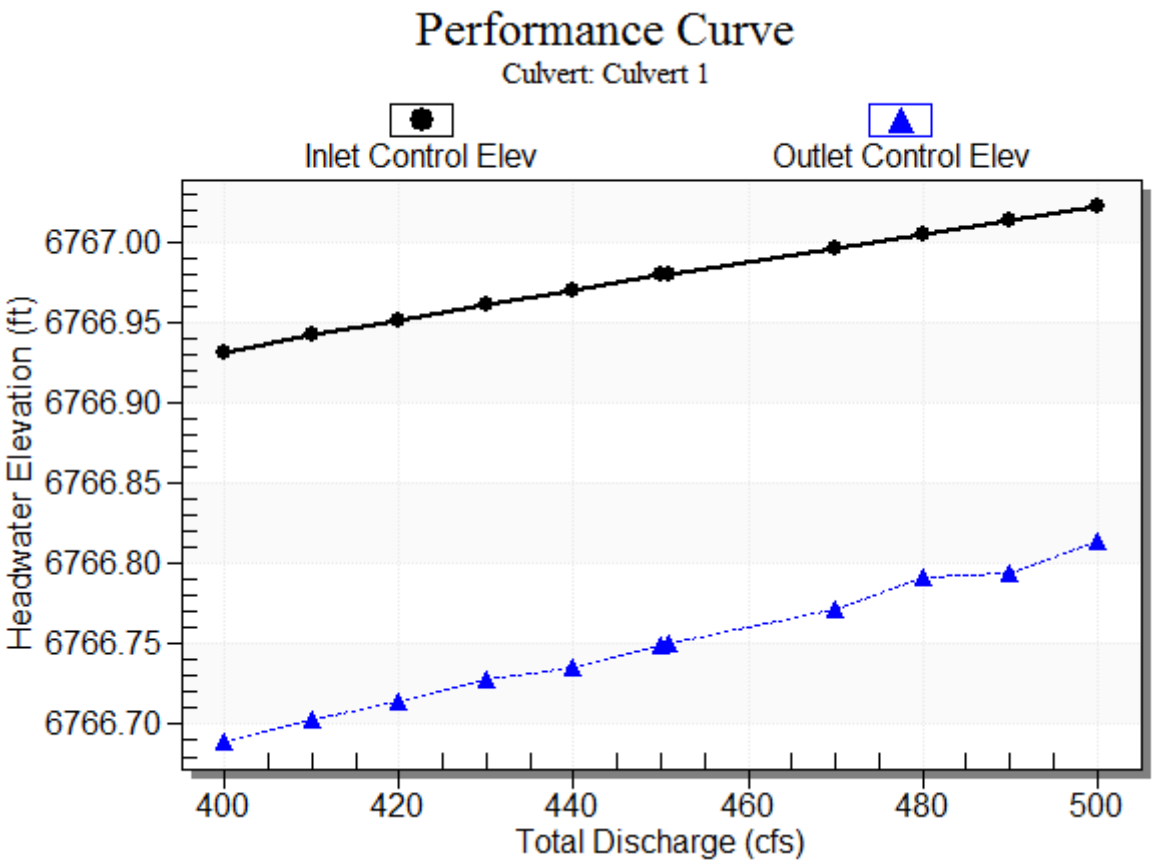


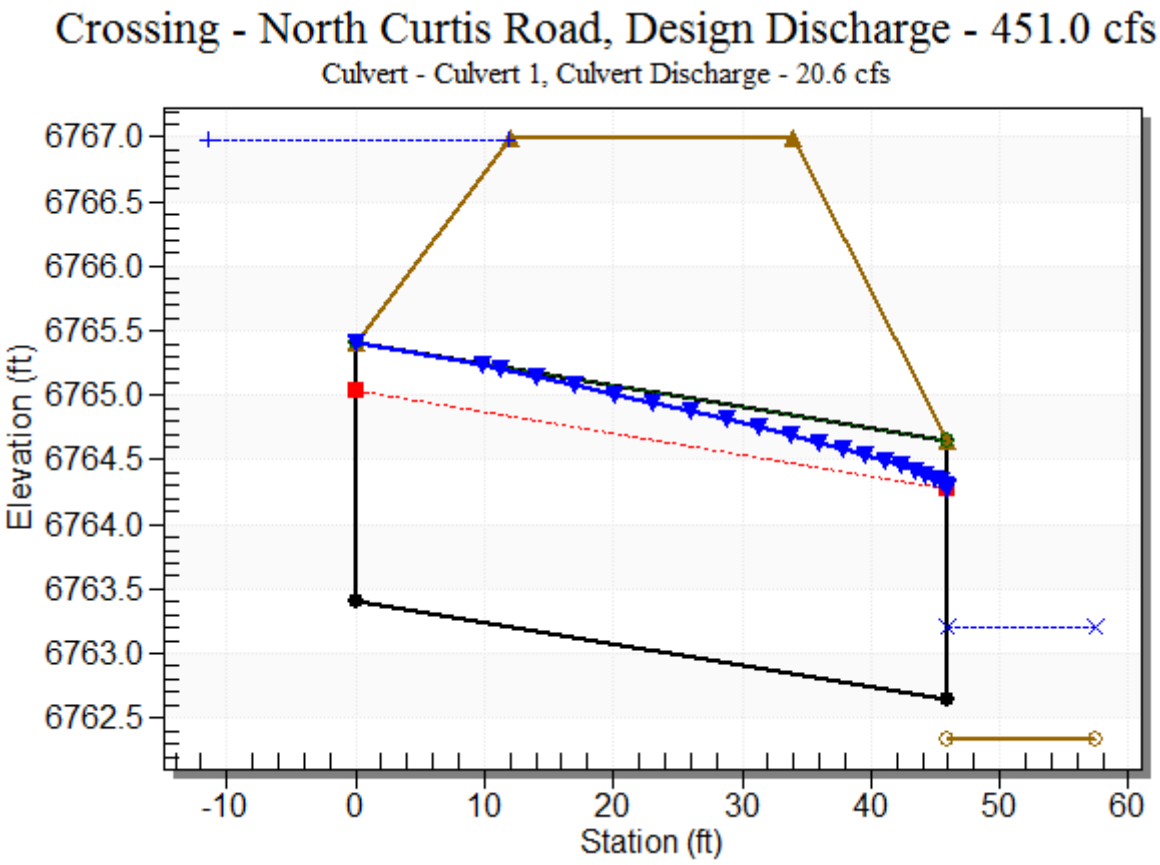
Table 11 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
400.00	20.40	6766.93	3.521	3.279	7-M2c	2.000	1.619	1.619	0.818	7.488	2.820
410.00	20.45	6766.94	3.532	3.293	7-M2c	2.000	1.621	1.621	0.827	7.498	2.843
420.00	20.49	6766.95	3.540	3.305	7-M2c	2.000	1.622	1.622	0.836	7.507	2.866
430.00	20.54	6766.96	3.551	3.318	7-M2c	2.000	1.624	1.624	0.845	7.517	2.888
440.00	20.58	6766.97	3.559	3.326	7-M2c	2.000	1.625	1.625	0.853	7.525	2.910
450.00	20.62	6766.98	3.569	3.339	7-M2c	2.000	1.627	1.627	0.862	7.535	2.932
451.00	20.62	6766.98	3.570	3.340	7-M2c	2.000	1.627	1.627	0.863	7.536	2.934
470.00	20.70	6767.00	3.586	3.362	7-M2c	2.000	1.630	1.630	0.879	7.551	2.974
480.00	20.74	6767.01	3.595	3.382	7-M2c	2.000	1.631	1.631	0.887	7.560	2.995
490.00	20.78	6767.01	3.604	3.384	7-M2c	2.000	1.632	1.632	0.895	7.568	3.015
500.00	20.81	6767.02	3.612	3.404	7-M2c	2.000	1.634	1.634	0.904	7.576	3.035

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6763.41 ft

Outlet Station: 46.00 ft

Outlet Elevation: 6762.64 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

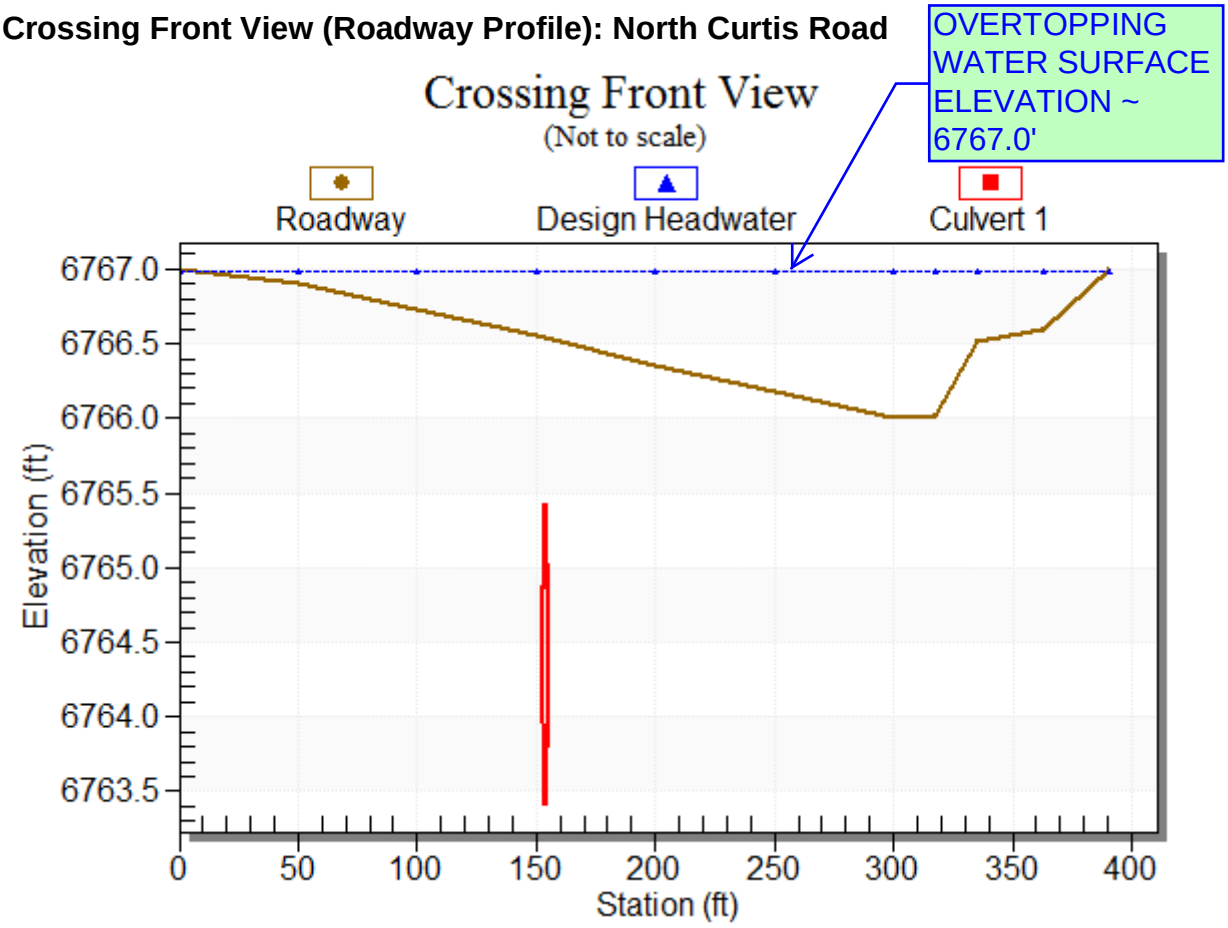
Barrel Manning's n: 0.0220

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Crossing Front View (Roadway Profile): North Curtis Road



GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
El Paso County, Colorado

Volume 1 – Final Report

October 1, 2007
Revised: February 10, 2010

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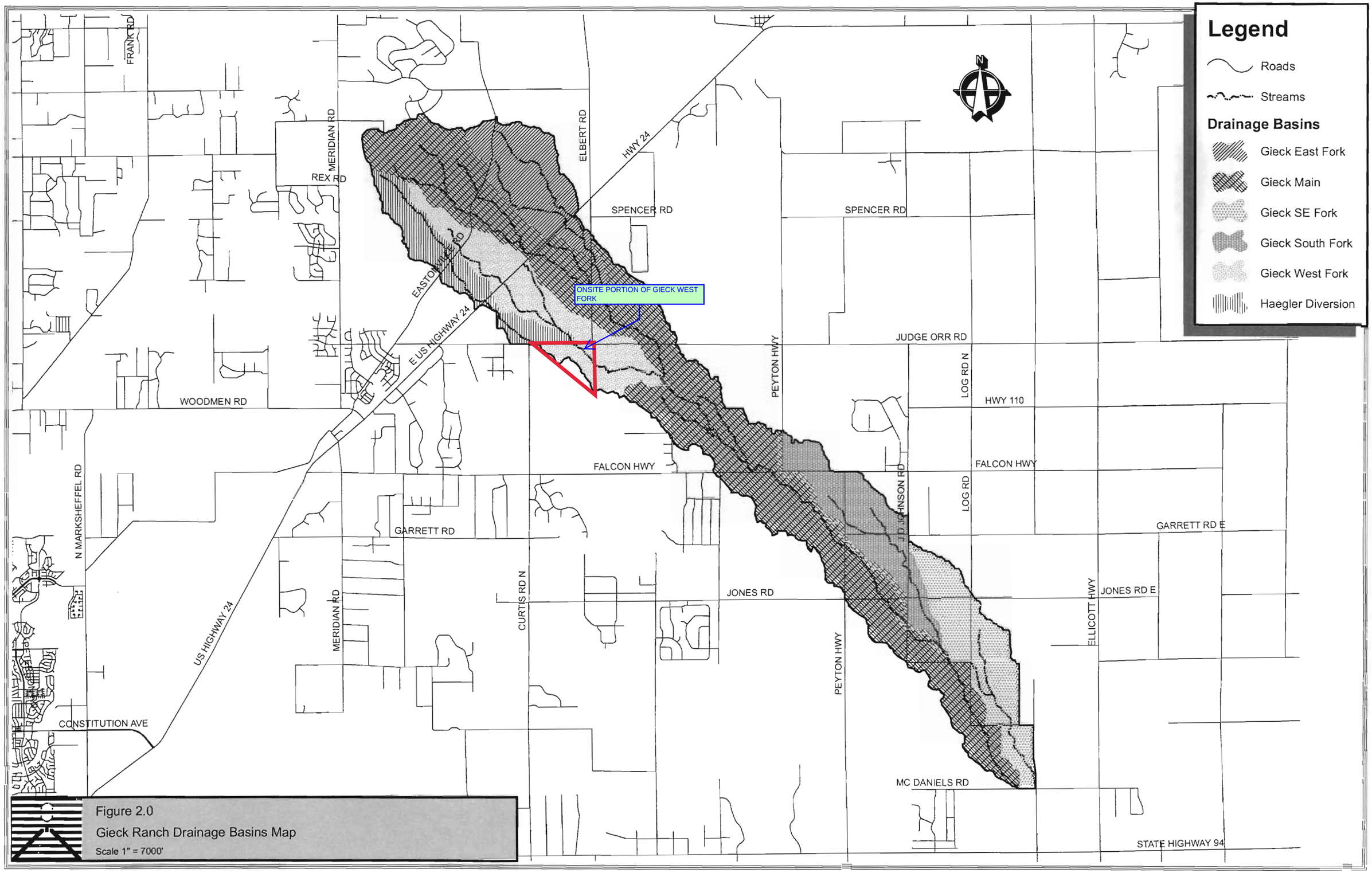


Figure 2.0
Gieck Ranch Drainage Basins Map
Scale 1" = 7000'

Table 6.4: Summary of Flows at Selected Design Points – 100-year Storm Event

Design Point ID	Design Point Location	Hydrologic Element	Accumulative Area (mi^2)	Existing Peak Flow (cfs)	Future Peak Flow (cfs)	% Difference Peak Flow	Existing Volume (ac-ft)	Future Volume (ac-ft)	% Difference Volume
1	Haegler Diversion at Eastonville Road	HD-J2	0.8	431	1060	146%	77	96	25%
2	West Fork at Eastonville Road	WF-J1	0.3	146	389	166%	29	39	33%
3	Main Channel at Eastonville Road	MS-J4	1.3	730	1233	69%	112	135	20%
4	Haegler Diversion at Highway 24	HD-J4	1.3	521	1223	135%	97	121	24%
5	West Fork at Highway 24	WF-J3	0.4	224	605	170%	49	62	26%
6	Main Channel at Highway 24	MS-J6	2.5	997	1896	90%	194	225	16%
7	East Fork at Highway 24	EF-J4	1.2	1054	1113	6%	124	126	1%
8	Main Channel at Elbert Road	MS-J7	3.0	1010	1896	88%	220	253	15%
9	East Fork at Elbert Road	EF-J6	2.1	1120	1172	5%	183	187	2%
10	West Fork at Judge Orr Road	WF-J6	1.5	1017	2213	117%	244	291	19%
11	Confluence of East Fork and Main Channel	MS-J9	5.7	1817	3068	69%	429	467	9%
12	Main Channel at Judge Orr Road	MS-J11	6.7	1968	3383	72%	487	564	16%
13	Confluence of West Fork and Main Channel	MS-J12	11.2	2732	6104	123%	805	993	23%
14	Main Channel at Falcon Highway	MS-J16	13.4	3045	6784	123%	936	1191	27%
15	Main Channel at Peyton Highway	MS-J19	15.1	3200	6946	117%	1012	1269	25%
16	Main Channel at Jones Road	MS-J20	15.6	3250	7056	117%	1040	1308	26%
17	South Fork at Jones Road	SF-J4	1.3	454	454	0%	133	133	0%
18	Confluence of South Fork and Main Channel	MS-J22	17.9	3650	7392	103%	1210	1489	23%
19	Southeast Fork at McDaniels Road	SE-J3	2.4	547	546	0%	210	210	0%
20	Main Channel at McDaniels Road	MS-J29	19.6	3791	7525	99%	1293	1597	23%
21	Total Combined Outfall	SE-J3 plus MS-J29	22.0	4326	7687	78%	1503	1807	20%

CONTRIBUTING ACREAGE TO WF-R7A @ JUDGE ORR ROAD CROSSING

The 100-year storm event future undetained peak flow is estimated to increase by 78% over the existing peak flow while the future volume of runoff is estimated to increase by 20%.

During the hydrologic analysis it was observed that the Black Squirrel Creek lies very close to the eastern boundary of the Gieck Ranch Basin from Falcon Highway downstream to Log Road. It is possible that flow from Black Squirrel Creek could spill into the Gieck Ranch Basin during extreme storm events. The flows in Black Squirrel Creek in this area are expected to be more than 5,000 cfs for the 100-year event. If the Black Squirrel Creek were to overflow its' banks and flow into the Gieck Ranch Basin it could increase the flows shown in the above tables. Possible improvements to address this potential problem include channel improvements to increase the Black Squirrel Creek conveyance in this area or constructing berms on the east bank to prevent overflow.

Table 8.0: Structure Inventory and Evaluation Summary (Cont.)

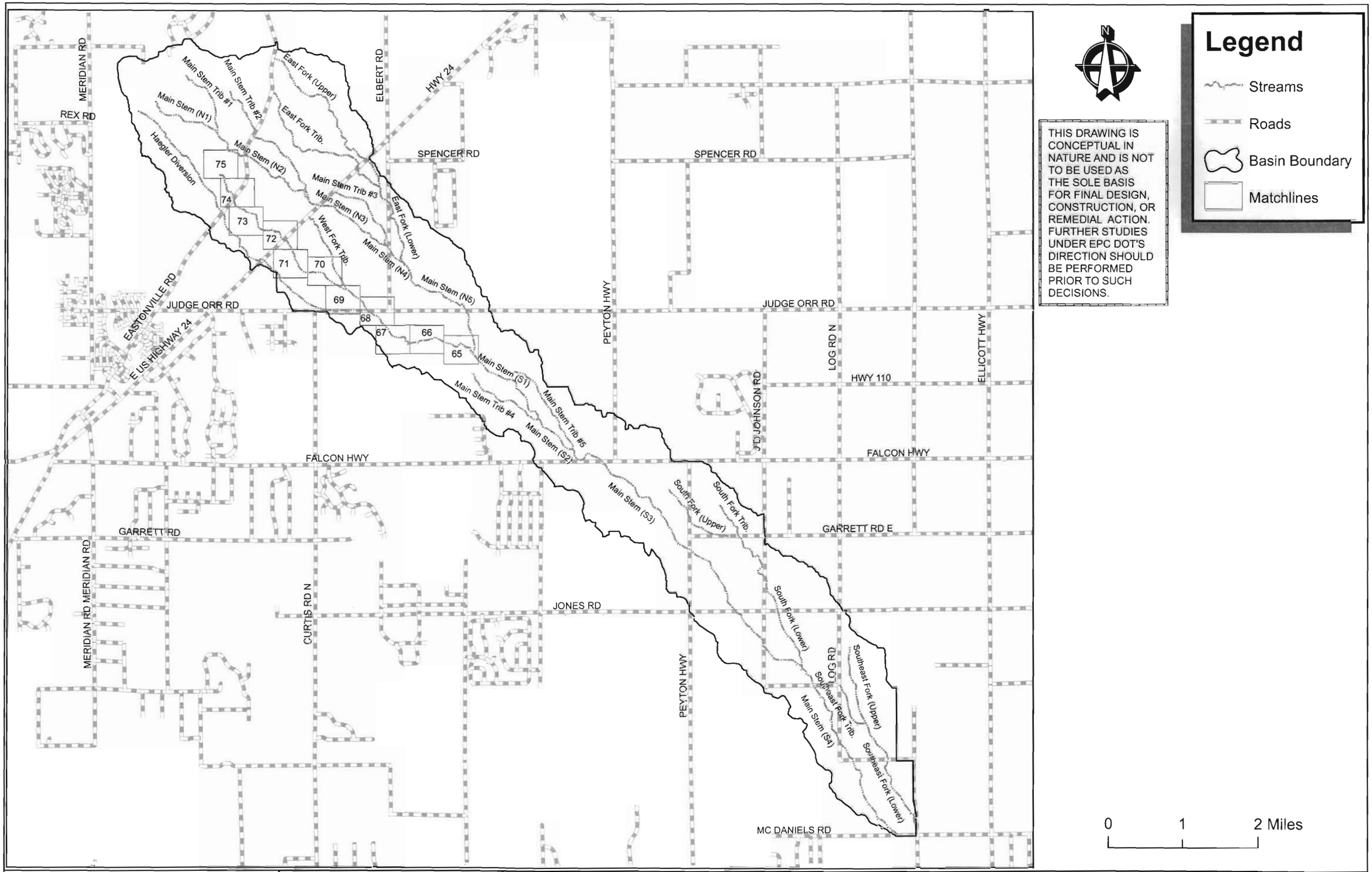
35	Elbert Road south of structure 34	24" CMP	Good	100%	Y	---
36	Elbert Road at Main Channel	2 - 48" CMP	Good	19%	N	3 - 12' x 4' CBC
37	Elbert Road south of structure 36	24" CMP	Poor	55%	Y	---
38	Judge Orr Road at West Fork	67" x 95" CMP	Good	20%	N	4 - 12' x 5' CBC
39	Judge Orr Road east of structure 38	36" CMP	Good	100%	Y	---
40	Judge Orr Road west of structure 41	24" CMP	Poor	90%	Y	---
41	Judge Orr Road at Main Channel	Bridge	Good	100%	Y	---
42	Falcon Hwy at Main Channel	Bridge	Good	57%	N	85' Span
43	Peyton Road at headwaters of South Fork	24" CMP	Fair	75%	Y	---
44	Peyton Road at Main Channel	4 - 24" RCP	Good	2%	N	5 - 12' x 7' CBC
45	Peyton Road south of structure 44	36" CMP	Poor	100%	Y	---
46	Peyton Road south of structure 45	24" CMP	Good	100%	Y	---
47	East Garrett Road west of structure 48	24" CMP	Poor	100%	Y	---
48	East Garrett Road at South Fork	48" CMP	Good	14%	N	2 - 5' x 4' CBC
49	J.D. Johnson Road at South Fork	4 - 42" RCP	Good	63%	N	2 - 12' x 4' CBC
50	J.D. Johnson Road south of structure 49	30" CMP	Fair	56%	N	36" CMP
51	J.D. Johnson Road south of structure 50	30" CMP	Fair	100%	Y	---
52	Jones Road at Main Channel	60" CMP	Fair	4%	N	6 - 12' x 7' CBC
53	J.D. Johnson Road at Jones Road	30" CMP	Fair	55%	Y	---
54	Jones Road east of J.D. Johnson Road	30" CMP	Good	73%	Y	---
55	Jones Road at South Fork	36" CMP	Good	6%	N	2 - 7' x 5' CBC
56	Jones Road east of structure 55	30" CMP	Fair	67%	Y	---
57	J.D. Johnson Road at Main Channel US of structure 58	3 - 60" RCP	Good	14%	N	85' Span
58	J.D. Johnson Road at Main Channel	30" CMP	Good	1%	N	120' Span
59	J.D. Johnson Road and Log Road	24" CMP	Fair	23%	N	2 - 6' x 3' CBC
60	Main Channel at private driveway	48" CMP (est.)	Unknown	2%	N.E.	---
61	Log Road at Main Channel	Bridge	Good	36%	N	120' Span
62	McDaniel Road at Main Channel	30" x 48" Oval CMP	Good	1%	N	120' Span
63	Log Road and McDaniels Road	24" CMP	Good	2%	N	5 - 6' x 3' CBC

* Road over-topping not included

** Allowable road over-topping included in adequacy analysis

*** Based on proposed (with selected drainage basin plan) flows

N.E. Not Evaluated, not EPCDOT responsibility



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Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

0 1 2 Miles

PREPARED BY:
Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET
3 S 7TH STREET
6513 W 4TH STREET
CONTACT: ROBERT BENNETT
BOULDER, COLORADO 80301 (303) 442-4338
COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
GREELEY, COLORADO 80634 (970) 351-0645

PREPARED FOR:
REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

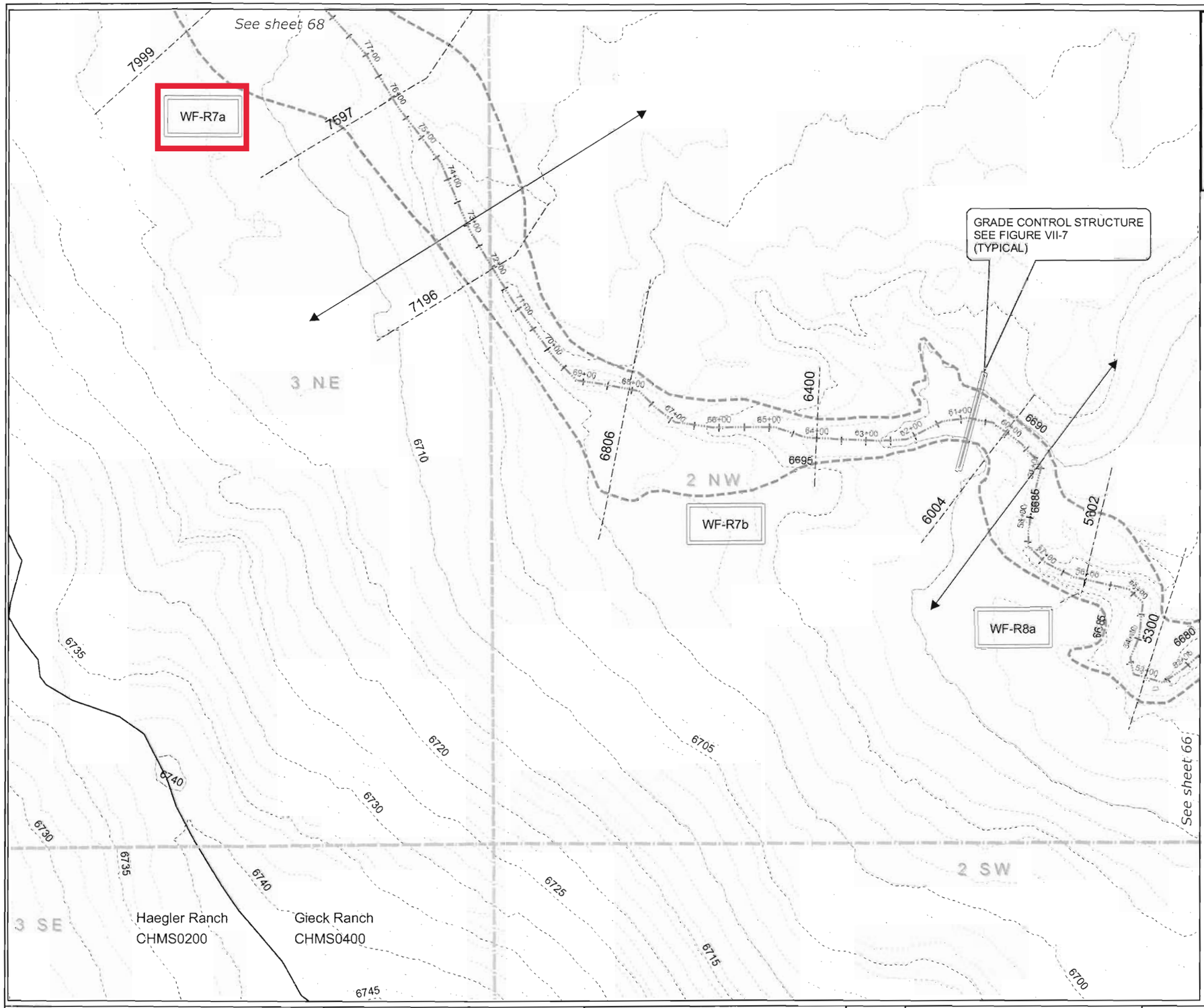
PROJECT INFO:
GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY:	RJB
DRAWN BY:	BLF
CHECKED BY:	RJB

REVISION DESCRIPTIONS	DATE

DRAWING INFO:
GIECK RANCH
KEY MAP
WEST FORK

DATE:	AUGUST 2007	JOB NO:	C7706-1	SET	PL
SCALE: H:	1" = 6000'	DRAWING NO.:	6D 038	SHEET	K8
V:					



Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- *Proposed Future Conditions 100-yr Flood Limits*
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
WF-R7a	1.18	753	2.19
WF-R7b	1.14	753	4.21
WF-R8a	1.36	753	4.05

RECOMMENDED PLAN IMPROVEMENTS

Reach	
WF-R7a	Vegetation Augmentation
WF-R7b	Vegetation Augmentation
WF-R8a	Selective Stabilization

Note:
See Technical Addenda for grade control data.

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PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
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CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

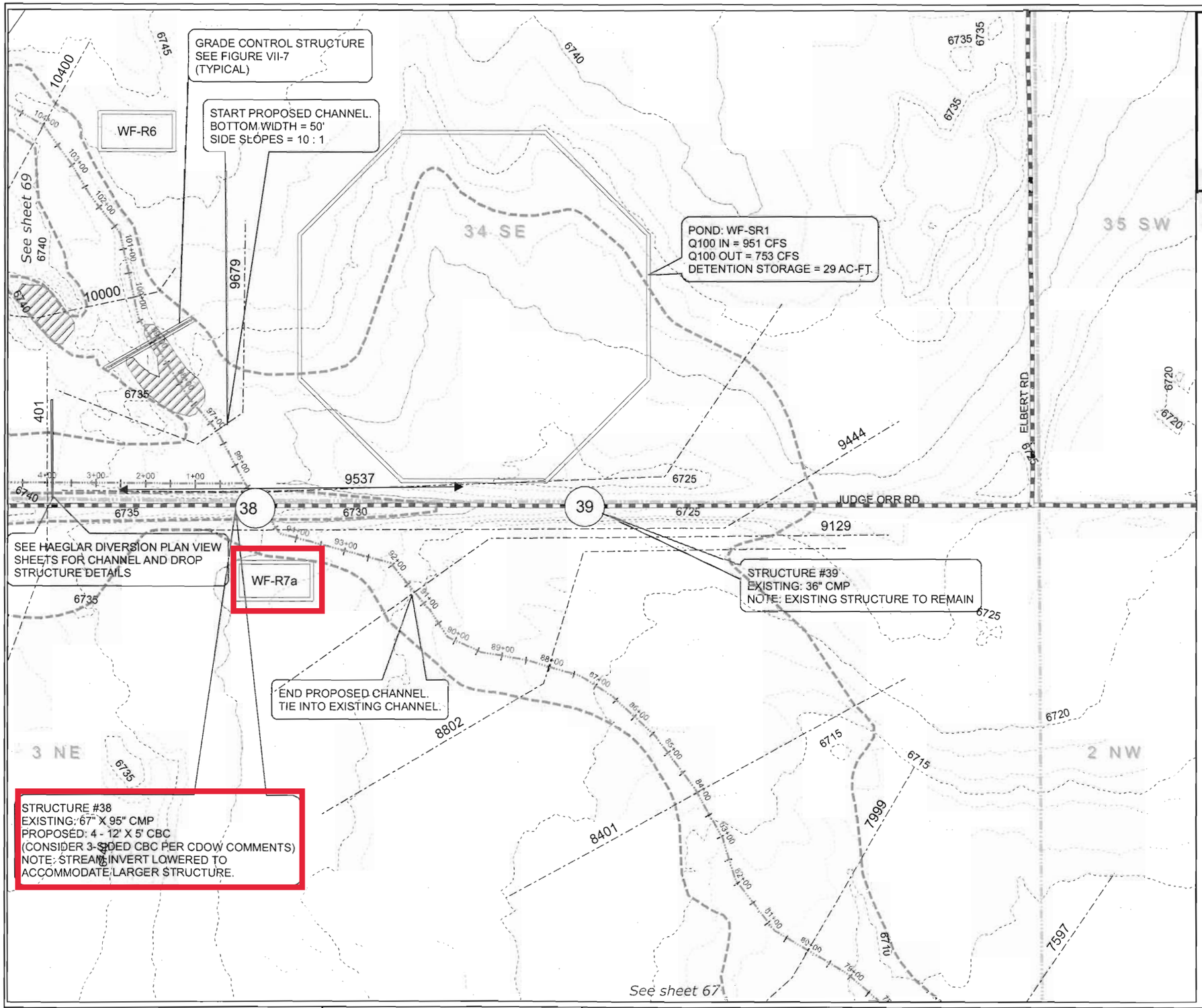
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF/MLM
CHECKED BY: RJB/TML

REVISION DESCRIPTIONS	DATE
PER EPCDOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
WEST FORK #3

DATE: AUGUST 2007
SCALE: H: 1" = 200' V: NONE
JOB NO: C7706-2
DRAWING NO.: 6D 038
SET PL
SHEET 67



Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- *Proposed Future Conditions 100-yr Flood Limits*
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
WF-R6	1.04	698	3.45
WF-R7a	1.18	753	2.19

RECOMMENDED PLAN IMPROVEMENTS

Reach	
WF-R6	Selective Stabilization
WF-R7a	Vegetation Augmentation

THIS DRAWING IS CONCEPTUAL IN NATURE AND IS NOT TO BE USED AS THE SOLE BASIS FOR FINAL DESIGN, CONSTRUCTION, OR REMEDIAL ACTION. FURTHER STUDIES UNDER EPC DOT'S DIRECTION SHOULD BE PERFORMED PRIOR TO SUCH DECISIONS.

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1800 38TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
631 3 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF/MLM
CHECKED BY: RJB/TML

REVISION DESCRIPTIONS	DATE
PER EPCDOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
WEST FORK #4

DATE: AUGUST 2007
SCALE: H: 1" = 200' V: NONE
JOB NO: C7706-2
DRAWING NO.: 6D 038
SET PL
SHEET 68

APPENDIX F

DRAINAGE MAPS & PLANS

SADDLEHORN RANCH FILING 3

EXISTING CONDITIONS MAP

LEGEND

- BASIN DESIGNATION (I.D.: A | B)
  - I.D.: BASIN IDENTIFIER
  - A: BASIN AREA
  - B: % IMPERVIOUS
- DESIGN POINT
- MAJOR BASIN DELINEATION
- MINOR BASIN DELINEATION
- EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- BASE FLOOD ELEVATION

BASIN SUMMARY TABLE

Tributary Sub-Basin	Area (acres)	Percent Impervious	Q_5 (cfs)	Q_{100} (cfs)
G1	10.1	2.0%	0.00	0.1
G2	87.6	2.0%	1.5	76.4
H1	166.5	2.0%	0.1	81.0
H2	111.1	2.0%	0.2	91.1
H3	117.3	2.0%	0.9	64.1
CH1	23.9	2.0%	5.4	1038.0
CH2	84.2	2.0%	2.6	485.1
Total	600.6	N/A	10.7	1835.8

DESIGN POINT SUMMARY TABLE

Tributary Sub-	Q_5 (cfs)	Q_{100} (cfs)
0.1	241.00	1017.0
0.2	-	451.0
1	6.9	1114.0
2	1.5	76.4
3	0.1	80.9

NOTE

DESIGN POINT INFORMATION FOR DP 0.1 AND DP 0.2 WERE OBTAINED RESPECTIVELY FROM THE GEICK RANCH AND SANTA FE SPRINGS LOMR REPORTS.

200 100 0 200 400

ORIGINAL SCALE: 1" = 200'

EXISTING CONDITIONS MAP
SADDLEHORN RANCH FILING 3
JOB NO. 25142.05
11/28/23
SHEET 1 OF 1

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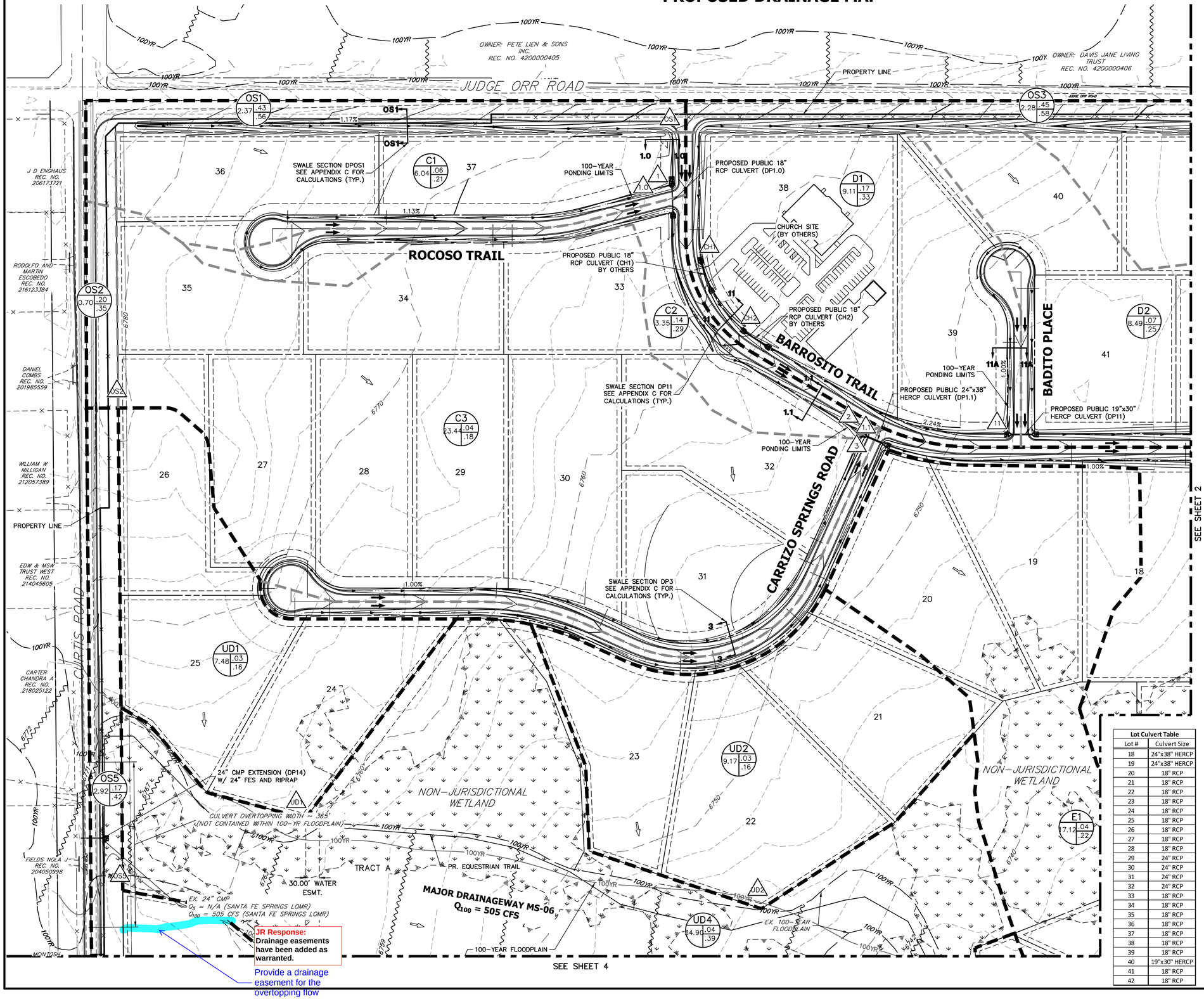
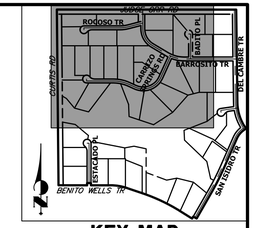
SADDLEHORN RANCH - FILING 3

PROPOSED DRAINAGE MAP



JR Response: Drainage easements have been added as warranted.

Provide a drainage easement for the overtopping flow



KEY MAP
N.T.S

FILING 3 - SUB-BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
C1	6.04	13%	0.06	0.21	35.8	0.9	4.8
C2	3.35	24%	0.14	0.29	31.5	1.1	4.0
C3	23.44	9%	0.04	0.18	41.2	1.8	14.1
C4	10.94	18%	0.14	0.42	40.3	3.2	15.5
C5	2.35	20%	0.11	0.26	23.8	0.7	2.9
C6	3.95	22%	0.12	0.28	26.6	1.3	5.0
C7	2.14	24%	0.17	0.38	13.9	1.3	4.9
C8	22.55	10%	0.05	0.19	33.7	2.4	16.4
C9	2.63	35%	0.23	0.39	29.6	1.5	4.3
C10	16.38	12%	0.05	0.20	27.6	2.3	14.3
D1	9.11	28%	0.17	0.33	26.4	4.2	13.5
D2	8.49	13%	0.07	0.25	34.7	1.4	8.2
D3	3.21	8%	0.04	0.18	21.1	0.4	2.8
D4	10.01	7%	0.07	0.40	39.8	1.5	13.9
D5	9.56	17%	0.14	0.43	37.6	3.0	14.9
D6	0.34	45%	0.36	0.57	8.3	0.5	1.4
D7	33.94	15%	0.10	0.31	38.3	6.9	37.3
E1	17.12	7%	0.04	0.22	46.6	1.3	11.8
E2	0.37	45%	0.31	0.46	7.8	0.5	1.3
E3	0.20	45%	0.32	0.48	5.2	0.3	0.8
E4	0.68	3%	0.01	0.14	14.6	0.04	0.6
UD1	7.48	6%	0.03	0.16	33.5	0.4	4.6
UD2	9.17	6%	0.03	0.16	30.4	0.6	6.0
UD3	2.23	6%	0.04	0.24	27.0	0.2	2.3
UD4	34.90	2%	0.04	0.39	54.3	2.2	36.5
UD5	17.63	6%	0.04	0.26	41.9	1.5	15.4
OS1	2.37	58%	0.43	0.56	20.3	3.1	6.8
OS2	0.70	31%	0.20	0.35	13.1	0.5	1.6
OS3	2.28	60%	0.45	0.58	19.5	3.2	6.9
OS4	1.08	55%	0.44	0.63	11.8	1.9	4.4
OS5	2.92	23%	0.17	0.42	17.8	1.7	6.7
F1	1.35	40%	0.27	0.43	12.7	1.4	3.6
F2	7.67	11%	0.05	0.20	35.0	0.9	5.7
F3	5.44	24%	0.20	0.48	31.1	2.6	10.6
F4	2.93	45%	0.34	0.52	32.3	2.3	6.0

FILING 3 - DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (Cfs)
1	0.9	4.8
2	1.1	4.0
3	1.8	14.1
4	3.2	15.5
5	0.7	2.9
6	1.3	5.0
7	1.3	4.9
8	2.4	16.4
9	1.5	4.3
10	2.3	14.3
11	4.2	13.5
12	1.4	8.2
13	0.4	2.8
14	1.5	13.9
15	3.0	14.9
16	0.5	1.4
17	6.9	37.3
21	1.3	11.8
22	0.5	1.3
23	0.3	0.8
24	0.04	0.6
25	0.90	5.7
OS1	3.1	6.8
OS2	0.5	1.6
OS3	3.2	6.9
OS4	1.9	4.4
OS5	1.7	6.7
UD1	0.4	4.6
UD2	0.6	6.0
UD3	0.2	2.3
UD4	2.2	36.5
UD5	1.5	15.4
1.0	3.1	9.7
1.1	5.8	27.1
1.2	7.0	32.9
1.3	7.0	32.8
1.4	7.8	35.6
1.5	3.2	19.6
1.6	10.7	50.6
1.7	11.3	58.8
2.0	5.0	19.6
2.1	3.4	9.5
2.2	4.3	11.3
2.3	6.7	34.1
2.4	10.7	55.5
2.5	15.0	83.6
3.0	1.6	12.6
3.1	1.5	12.6

Lot Culvert Table

Lot #	Culvert Size
18	24"x38" HERCP
19	24"x38" HERCP
20	18" RCP
21	18" RCP
22	18" RCP
23	18" RCP
24	18" RCP
25	18" RCP
26	18" RCP
27	18" RCP
28	18" RCP
29	24" RCP
30	24" RCP
31	24" RCP
32	24" RCP
33	18" RCP
34	18" RCP
35	18" RCP
36	18" RCP
37	18" RCP
38	18" RCP
39	18" RCP
40	19"x30" HERCP
41	18" RCP
42	18" RCP

LEGEND

- I.D. (A: BASIN AREA, B: C_5, C: C_{100}) — BASIN DESIGNATION
- I.D.: BASIN IDENTIFIER
- DESIGN POINT
- MAJOR BASIN DELINEATION
- SUB-BASIN DELINEATION
- 6700 — EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6700 — PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP — PROPOSED HIGH POINT
- LP — PROPOSED LOW POINT
- WETLANDS HATCH
- SETBACK LINE

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

SADDLEHORN RANCH-FILING 3
PROPOSED DRAINAGE MAP
JOB NO. 25142.05
11/28/23
SHEET 1 OF 4

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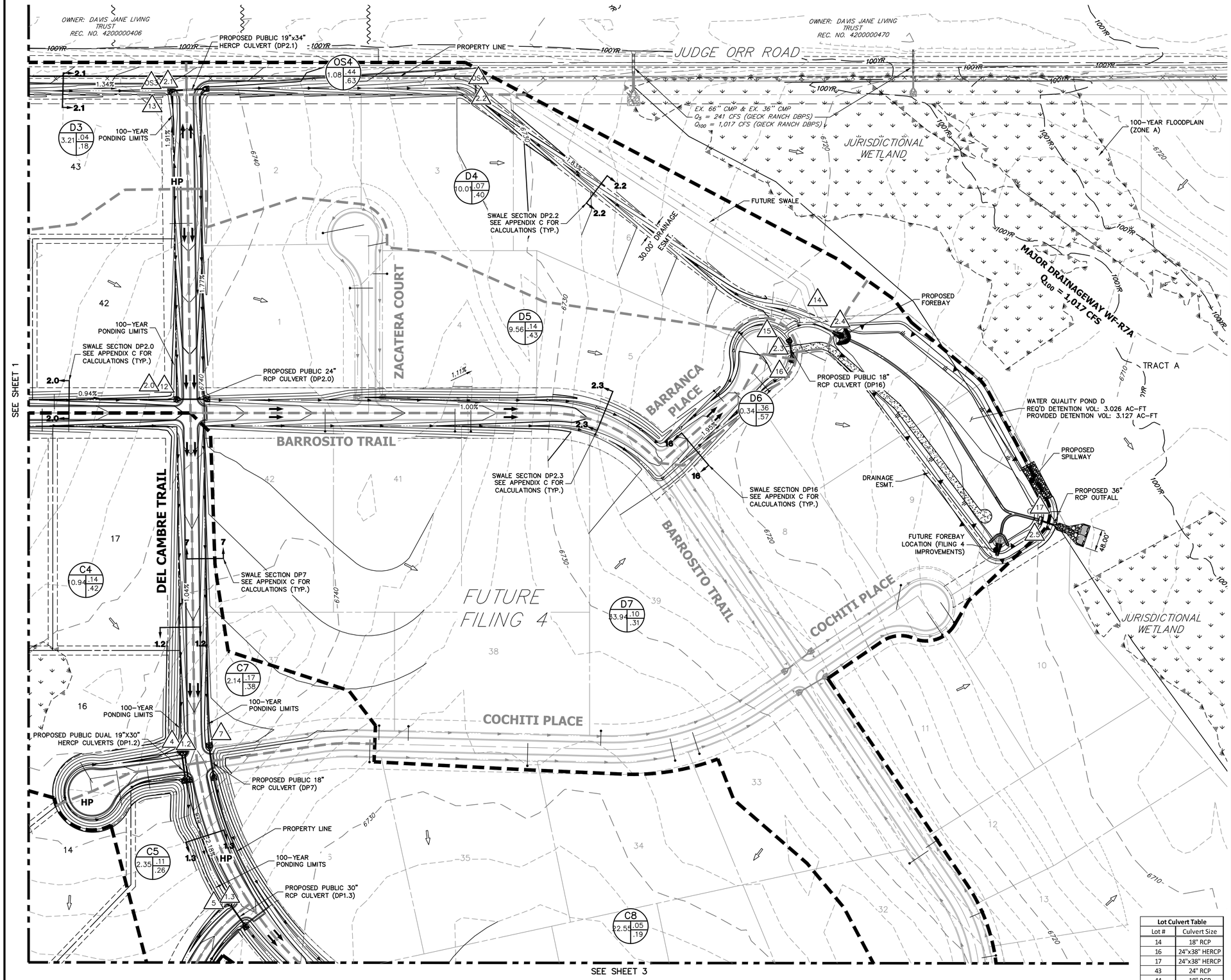
SADDLEHORN RANCH - FILING 3

PROPOSED DRAINAGE MAP



FILING 3 - SUB-BASIN SUMMARY TABLE							
Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
C1	6.04	13%	0.06	0.21	35.8	0.9	4.8
C2	3.35	24%	0.14	0.29	31.5	1.1	4.0
C3	23.44	9%	0.04	0.18	41.2	1.8	14.1
C4	10.94	18%	0.14	0.42	40.3	3.2	15.5
C5	2.35	20%	0.11	0.26	23.8	0.7	2.9
C6	3.95	22%	0.12	0.28	26.6	1.3	5.0
C7	2.14	24%	0.17	0.38	13.9	1.3	4.9
C8	22.55	10%	0.05	0.19	33.7	2.4	16.4
C9	2.63	35%	0.23	0.39	29.6	1.5	4.3
C10	16.38	12%	0.05	0.20	27.6	2.3	14.3
D1	9.11	28%	0.17	0.33	26.4	4.2	13.5
D2	8.49	13%	0.07	0.25	34.7	1.4	8.2
D3	3.21	8%	0.04	0.18	21.1	0.4	2.8
D4	10.01	7%	0.07	0.40	39.8	1.5	13.9
D5	9.56	17%	0.14	0.43	37.6	3.0	14.9
D6	0.34	45%	0.36	0.57	8.3	0.5	1.4
D7	33.94	15%	0.10	0.31	38.3	6.9	37.3
E1	17.12	7%	0.04	0.22	46.6	1.3	11.8
E2	0.37	45%	0.31	0.46	7.8	0.5	1.3
E3	0.20	45%	0.32	0.48	5.2	0.3	0.8
E4	0.68	3%	0.01	0.14	14.6	0.04	0.6
UD1	7.48	6%	0.03	0.16	33.5	0.4	4.6
UD2	9.17	6%	0.03	0.16	30.4	0.6	6.0
UD3	2.23	6%	0.04	0.24	27.0	0.2	2.3
UD4	34.90	2%	0.04	0.39	54.3	2.2	36.5
UD5	17.63	6%	0.04	0.26	41.9	1.5	15.4
OS1	2.37	58%	0.43	0.56	20.3	3.1	6.8
OS2	0.70	31%	0.20	0.35	13.1	0.5	1.6
OS3	2.28	60%	0.45	0.58	19.5	3.2	6.9
OS4	1.08	55%	0.44	0.63	11.8	1.9	4.4
OS5	2.92	23%	0.17	0.42	17.8	1.7	6.7
F1	1.35	40%	0.27	0.43	12.7	1.4	3.6
F2	7.67	11%	0.05	0.20	35.0	0.9	5.7
F3	5.44	24%	0.20	0.48	31.1	2.6	10.6
F4	2.93	45%	0.34	0.52	32.3	2.3	6.0

FILING 3 - DESIGN POINT SUMMARY TABLE		
Design Point	Q_5 (cfs)	Q_{100} (Cfs)
1	0.9	4.8
2	1.1	4.0
3	1.8	14.1
4	3.2	15.5
5	0.7	2.9
6	1.3	5.0
7	1.3	4.9
8	2.4	16.4
9	1.5	4.3
10	2.3	14.3
11	4.2	13.5
12	1.4	8.2
13	0.4	2.8
14	1.5	13.9
15	3.0	14.9
16	0.5	1.4
17	6.9	37.3
21	1.3	11.8
22	0.5	1.3
23	0.3	0.8
24	0.04	0.6
25	0.90	5.7
OS1	3.1	6.8
OS2	0.5	1.6
OS3	3.2	6.9
OS4	1.9	4.4
OS5	1.7	6.7
UD1	0.4	4.6
UD2	0.6	6.0
UD3	0.2	2.3
UD4	2.2	36.5
UD5	1.5	15.4
1.0	3.1	9.7
1.1	5.8	27.1
1.2	7.0	32.9
1.3	7.0	32.8
1.4	7.8	35.6
1.5	3.2	19.6
1.6	10.7	50.6
1.7	11.3	58.8
2.0	5.0	19.6
2.1	3.4	9.5
2.2	4.3	11.3
2.3	6.7	34.1
2.4	10.7	55.5
2.5	15.0	83.6
3.0	1.6	12.6
3.1	1.5	12.6

Lot Culvert Table	
Lot #	Culvert Size
14	18" RCP
16	24"x38" HERCP
17	24"x38" HERCP
43	24" RCP
44	18" RCP

LEGEND

- I.D. (A: BASIN AREA, B: C_5, C: C_{100}) — BASIN DESIGNATION
- X — DESIGN POINT
- MAJOR BASIN DELINEATION
- SUB-BASIN DELINEATION
- 6700 — EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6700 — PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP — PROPOSED HIGH POINT
- LP — PROPOSED LOW POINT
- WETLANDS HATCH
- SETBACK LINE

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

SADDLEHORN RANCH-FILING 3
PROPOSED DRAINAGE MAP
JOB NO. 25142.05
11/28/23
SHEET 2 OF 4

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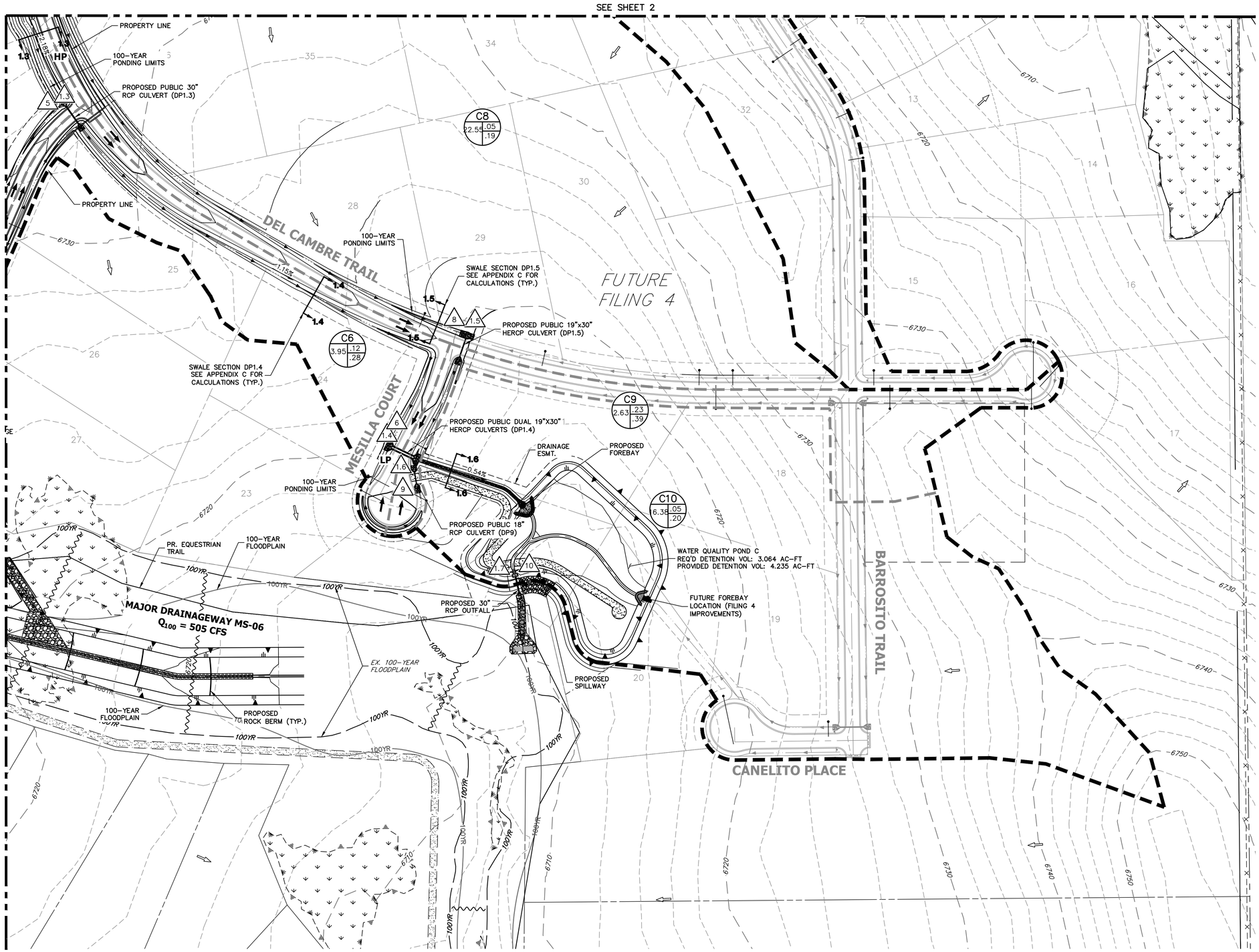
SADDLEHORN RANCH - FILING 3
PROPOSED DRAINAGE MAP



FILING 3 - SUB-BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
C1	6.04	13%	0.06	0.21	35.8	0.9	4.8
C2	3.35	24%	0.14	0.29	31.5	1.1	4.0
C3	23.44	9%	0.04	0.18	41.2	1.8	14.1
C4	10.94	18%	0.14	0.42	40.3	3.2	15.5
C5	2.35	20%	0.11	0.26	23.8	0.7	2.9
C6	3.95	22%	0.12	0.28	26.6	1.3	5.0
C7	2.14	24%	0.17	0.38	13.9	1.3	4.9
C8	22.55	10%	0.05	0.19	33.7	2.4	16.4
C9	2.63	35%	0.23	0.39	29.6	1.5	4.3
C10	16.38	12%	0.05	0.20	27.6	2.3	14.3
D1	9.11	28%	0.17	0.33	26.4	4.2	13.5
D2	8.49	13%	0.07	0.25	34.7	1.4	8.2
D3	3.21	8%	0.04	0.18	21.1	0.4	2.8
D4	10.01	7%	0.07	0.40	39.8	1.5	13.9
D5	9.56	17%	0.14	0.43	37.6	3.0	14.9
D6	0.34	45%	0.36	0.57	8.3	0.5	1.4
D7	33.94	15%	0.10	0.31	38.3	6.9	37.3
E1	17.12	7%	0.04	0.22	46.6	1.3	11.8
E2	0.37	45%	0.31	0.46	7.8	0.5	1.3
E3	0.20	45%	0.32	0.48	5.2	0.3	0.8
E4	0.68	3%	0.01	0.14	14.6	0.04	0.6
UD1	7.48	6%	0.03	0.16	33.5	0.4	4.6
UD2	9.17	6%	0.03	0.16	30.4	0.6	6.0
UD3	2.23	6%	0.04	0.24	27.0	0.2	2.3
UD4	34.90	2%	0.04	0.39	54.3	2.2	36.5
UD5	17.63	6%	0.04	0.26	41.9	1.5	15.4
OS1	2.37	58%	0.43	0.56	20.3	3.1	6.8
OS2	0.70	31%	0.20	0.35	13.1	0.5	1.6
OS3	2.28	60%	0.45	0.58	19.5	3.2	6.9
OS4	1.08	55%	0.44	0.63	11.8	1.9	4.4
OS5	2.92	23%	0.17	0.42	17.8	1.7	6.7
F1	1.35	40%	0.27	0.43	12.7	1.4	3.6
F2	7.67	11%	0.05	0.20	35.0	0.9	5.7
F3	5.44	24%	0.20	0.48	31.1	2.6	10.6
F4	2.93	45%	0.34	0.52	32.3	2.3	6.0

FILING 3 - DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	0.9	4.8
2	1.1	4.0
3	1.8	14.1
4	3.2	15.5
5	0.7	2.9
6	1.3	5.0
7	1.3	4.9
8	2.4	16.4
9	1.5	4.3
10	2.3	14.3
11	4.2	13.5
12	1.4	8.2
13	0.4	2.8
14	1.5	13.9
15	3.0	14.9
16	0.5	1.4
17	6.9	37.3
21	1.3	11.8
22	0.5	1.3
23	0.3	0.8
24	0.04	0.6
25	0.90	5.7
OS1	3.1	6.8
OS2	0.5	1.6
OS3	3.2	6.9
OS4	1.9	4.4
OS5	1.7	6.7
UD1	0.4	4.6
UD2	0.6	6.0
UD3	0.2	2.3
UD4	2.2	36.5
UD5	1.5	15.4
1.0	3.1	9.7
1.1	5.8	27.1
1.2	7.0	32.9
1.3	7.0	32.8
1.4	7.8	35.6
1.5	3.2	19.6
1.6	10.7	50.6
1.7	11.3	58.8
2.0	5.0	19.6
2.1	3.4	9.5
2.2	4.3	11.3
2.3	6.7	34.1
2.4	10.7	55.5
2.5	15.0	83.6
3.0	1.6	12.6
3.1	1.5	12.6

LEGEND

- I.D. (A: BASIN AREA, B: C_5, C: C_{100}) — BASIN DESIGNATION
- I.D.: BASIN IDENTIFIER
- X — DESIGN POINT
- MAJOR BASIN DELINEATION
- SUB-BASIN DELINEATION
- 6700 — EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6700 — PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP — PROPOSED HIGH POINT
- LP — PROPOSED LOW POINT
- WETLANDS HATCH
- SETBACK LINE

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

SADDLEHORN RANCH-FILING 3
PROPOSED DRAINAGE MAP
JOB NO. 25142.05
11/28/23
SHEET 3 OF 4

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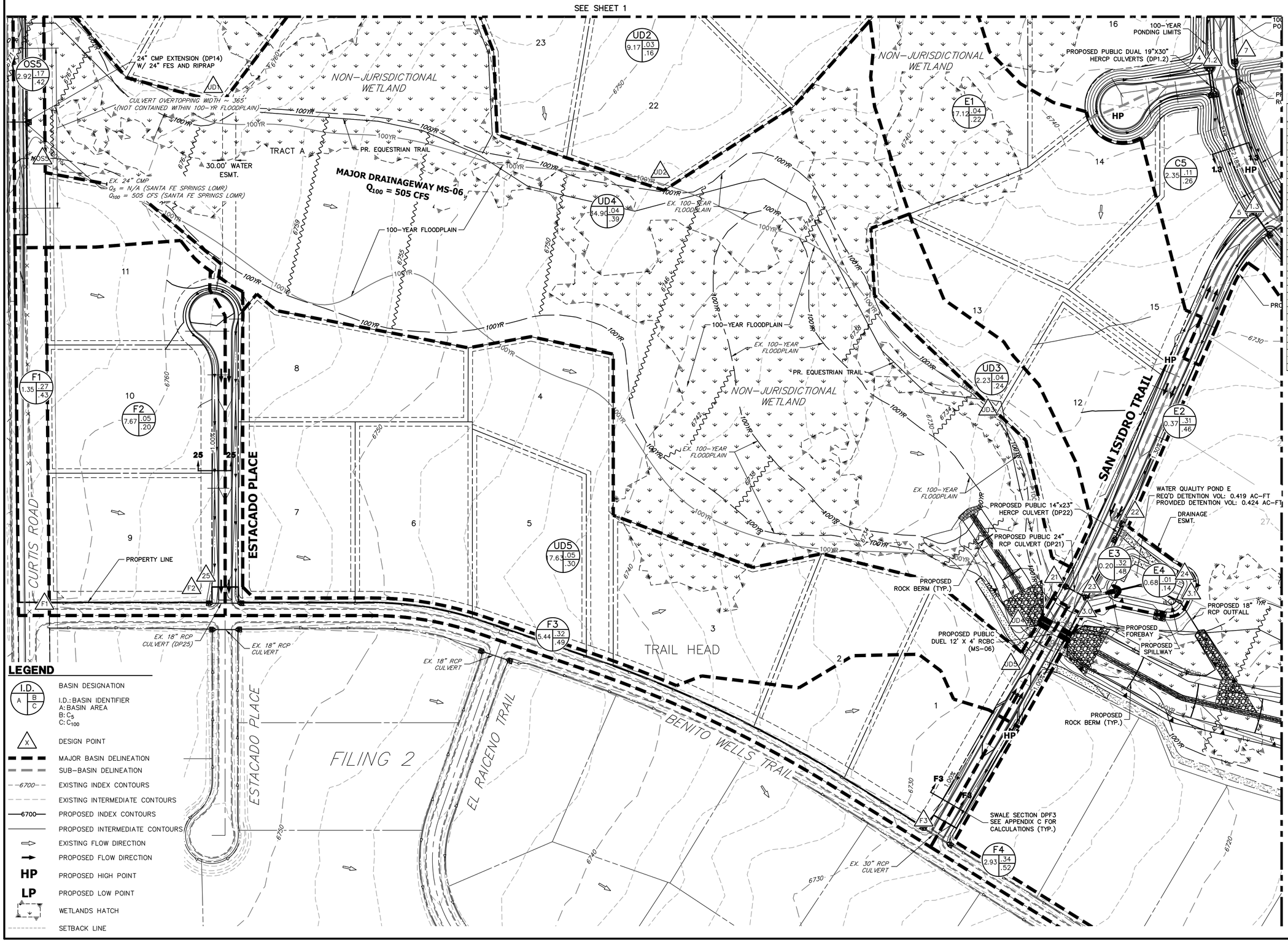
SADDLEHORN RANCH - FILING 3

PROPOSED DRAINAGE MAP



FILING 3 - SUB-BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
C1	6.04	13%	0.06	0.21	35.8	0.9	4.8
C2	3.35	24%	0.14	0.29	31.5	1.1	4.0
C3	23.44	9%	0.04	0.18	41.2	1.8	14.1
C4	10.94	18%	0.14	0.42	40.3	3.2	15.5
C5	2.35	20%	0.11	0.26	23.8	0.7	2.9
C6	3.95	22%	0.12	0.28	26.6	1.3	5.0
C7	2.14	24%	0.17	0.38	13.9	1.3	4.9
C8	22.55	10%	0.05	0.19	33.7	2.4	16.4
C9	2.63	35%	0.23	0.39	29.6	1.5	4.3
C10	16.38	12%	0.05	0.20	27.6	2.3	14.3
D1	9.11	28%	0.17	0.33	26.4	4.2	13.5
D2	8.49	13%	0.07	0.25	34.7	1.4	8.2
D3	3.21	8%	0.04	0.18	21.1	0.4	2.8
D4	10.01	7%	0.07	0.40	39.8	1.5	13.9
D5	9.56	17%	0.14	0.43	37.6	3.0	14.9
D6	0.34	45%	0.36	0.57	8.3	0.5	1.4
D7	33.94	15%	0.10	0.31	38.3	6.9	37.3
E1	17.12	7%	0.04	0.22	46.6	1.3	11.8
E2	0.37	45%	0.31	0.46	7.8	0.5	1.3
E3	0.20	45%	0.32	0.48	5.2	0.3	0.8
E4	0.68	3%	0.01	0.14	14.6	0.04	0.6
UD1	7.48	6%	0.03	0.16	33.5	0.4	4.6
UD2	9.17	6%	0.03	0.16	30.4	0.6	6.0
UD3	2.23	6%	0.04	0.24	27.0	0.2	2.3
UD4	34.90	2%	0.04	0.39	54.3	2.2	36.5
UD5	17.63	6%	0.04	0.26	41.9	1.5	15.4
OS1	2.37	58%	0.43	0.56	20.3	3.1	6.8
OS2	0.70	31%	0.20	0.35	13.1	0.5	1.6
OS3	2.28	60%	0.45	0.58	19.5	3.2	6.9
OS4	1.08	55%	0.44	0.63	11.8	1.9	4.4
OS5	2.92	23%	0.17	0.42	17.8	1.7	6.7
F1	1.35	40%	0.27	0.43	12.7	1.4	3.6
F2	7.67	11%	0.05	0.20	35.0	0.9	5.7
F3	5.44	24%	0.20	0.48	31.1	2.6	10.6
F4	2.93	45%	0.34	0.52	32.3	2.3	6.0

Lot Culvert Table

Lot #	Culvert Size
1	24" RCP
2	24" RCP
3	24" RCP
4	24" RCP
5	24" RCP
6	18" RCP
7	18" RCP
8	18" RCP
9	18" RCP
10	18" RCP
11	18" RCP
12	24" RCP
13	18" RCP
15	30" RCP

FILING 3 - DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (Cfs)
1	0.9	4.8
2	1.1	4.0
3	1.8	14.1
4	3.2	15.5
5	0.7	2.9
6	1.3	5.0
7	1.3	4.9
8	2.4	16.4
9	1.5	4.3
10	2.3	14.3
11	4.2	13.5
12	1.4	8.2
13	0.4	2.8
14	1.5	13.9
15	3.0	14.9
16	0.5	1.4
17	6.9	37.3
21	1.3	11.8
22	0.5	1.3
23	0.3	0.8
24	0.04	0.6
25	0.90	5.7
OS1	3.1	6.8
OS2	0.5	1.6
OS3	3.2	6.9
OS4	1.9	4.4
OS5	1.7	6.7
UD1	0.4	4.6
UD2	0.6	6.0
UD3	0.2	2.3
UD4	2.2	36.5
UD5	1.5	15.4
1.0	3.1	9.7
1.1	5.8	27.1
1.2	7.0	32.9
1.3	7.0	32.8
1.4	7.8	35.6
1.5	3.2	19.6
1.6	10.7	50.6
1.7	11.3	58.8
2.0	5.0	19.6
2.1	3.4	9.5
2.2	4.3	11.3
2.3	6.7	34.1
2.4	10.7	55.5
2.5	15.0	83.6
3.0	1.6	12.6
3.1	1.5	12.6

LEGEND

- I.D. (A: BASIN AREA, B: C_5, C: C_{100}) — BASIN DESIGNATION
- I.D.: BASIN IDENTIFIER
- X — DESIGN POINT
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- SUB-BASIN DELINEATION
- 6700 — EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6700 — PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP — PROPOSED HIGH POINT
- LP — PROPOSED LOW POINT
- WETLANDS HATCH
- SETBACK LINE

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

SADDLEHORN RANCH-FILING 3
PROPOSED DRAINAGE MAP
JOB NO. 25142.05
11/28/23
SHEET 4 OF 4

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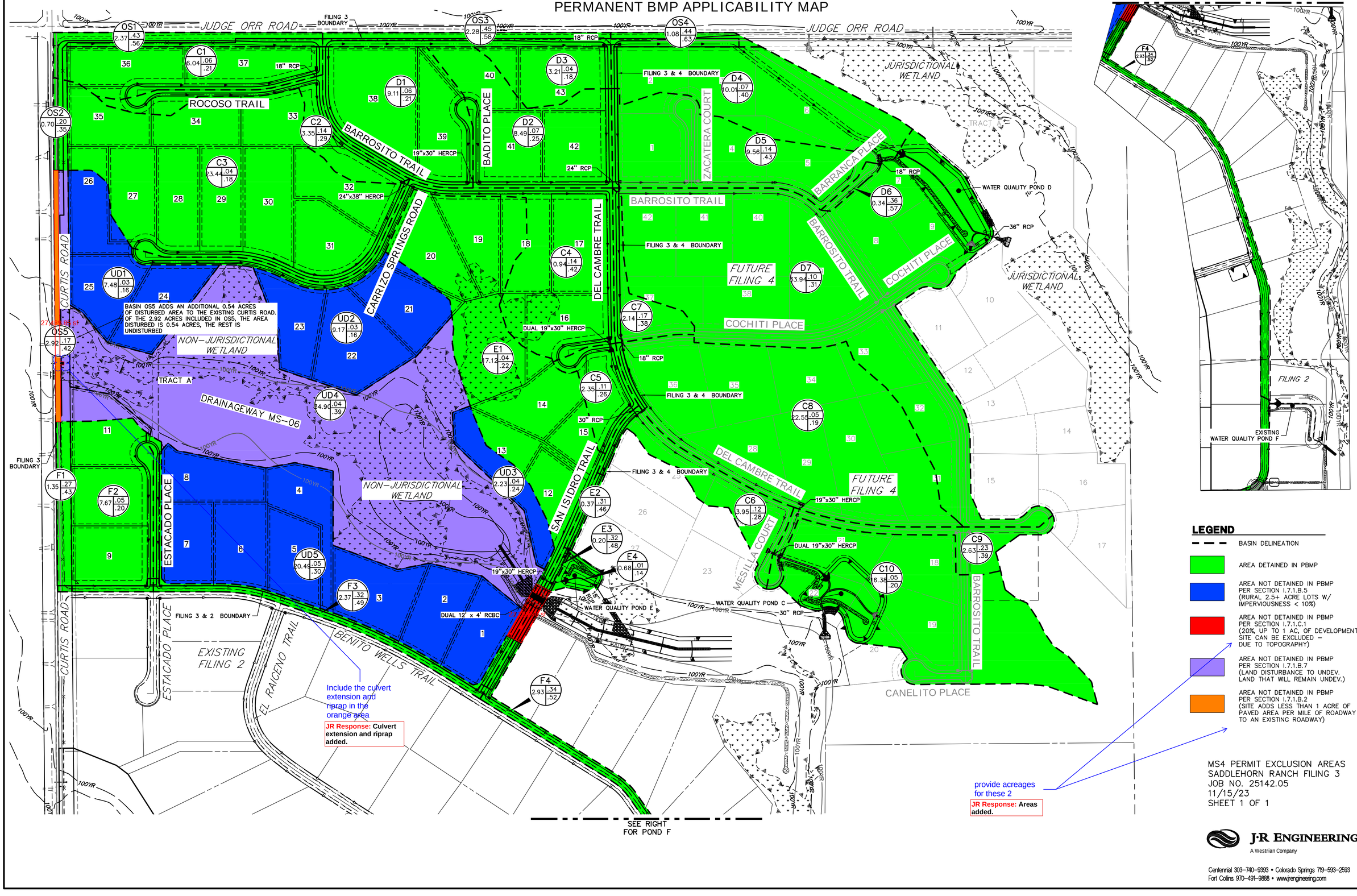
SADDLEHORN RANCH FILING - 3

PERMANENT BMP APPLICABILITY MAP



LEGEND

- BASIN DELINEATION
- AREA DETAINED IN PBMP
- AREA NOT DETAINED IN PBMP PER SECTION I.7.1.B.5 (RURAL 2.5+ ACRE LOTS W/ IMPERVIOUSNESS < 10%)
- AREA NOT DETAINED IN PBMP PER SECTION I.7.1.C.1 (20%, UP TO 1 AC, OF DEVELOPMENT SITE CAN BE EXCLUDED – DUE TO TOPOGRAPHY)
- AREA NOT DETAINED IN PBMP PER SECTION I.7.1.B.7 (LAND DISTURBANCE TO UNDEV. LAND THAT WILL REMAIN UNDEV.)
- AREA NOT DETAINED IN PBMP PER SECTION I.7.1.B.2 (SITE ADDS LESS THAN 1 ACRE OF PAVED AREA PER MILE OF ROADWAY TO AN EXISTING ROADWAY)

MS4 PERMIT EXCLUSION AREAS
SADDLEHORN RANCH FILING 3
JOB NO. 25142.05
11/15/23
SHEET 1 OF 1

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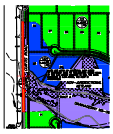
ENG-SF23004-R6_Drainage Report - Final.pdf Markup Summary

Area Measurement (2)



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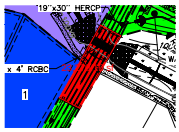

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Author: Jeff Rice - EPC Engineering Review
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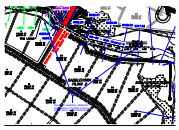

Subject: Callout
Page Label: 136
Author: Jeff Rice - EPC Engineering Review
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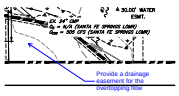
Based on modeling, additional stabilization is needed in these areas due to supercritical flows

---



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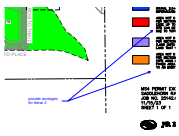
Provide a drainage easement for the overtopping flow



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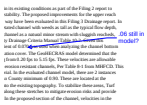
provide acreages for these 2



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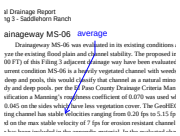
.06 still in model?



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average

Subject: Callout
Page Label: 10
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:33:06 AM
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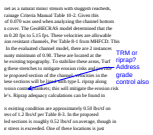
provide specifications; appears to be needed in larger areas than shown on plans

---



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Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:35:03 AM
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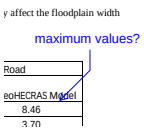
TRM or riprap? Address grade control also



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Author: Jeff Rice - EPC Engineering Review
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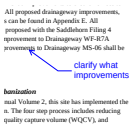
maximum values?



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Author: Jeff Rice - EPC Engineering Review
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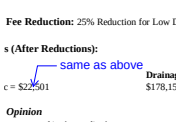
clarify what improvements



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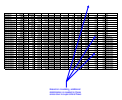

Subject: Callout
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Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:54:00 AM
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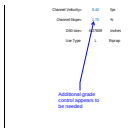
Based on modeling, additional stabilization is needed in these areas due to supercritical flows



Subject: Callout
Page Label: 185
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:55:07 AM
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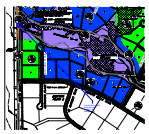
Additional grade control appears to be needed

Cloud+ (1)



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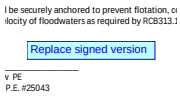
Include the culvert extension and riprap in the orange area

Text Box (2)



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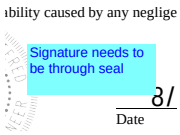
Replace signed version



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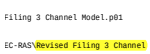
Signature needs to be through seal

(22)



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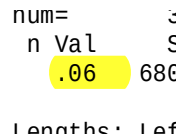
Revised Filing 3 Channel



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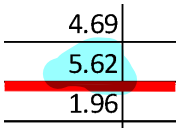

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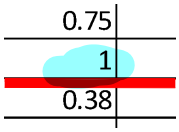

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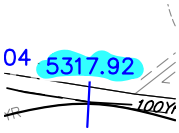

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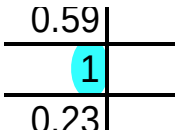

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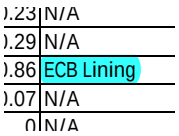

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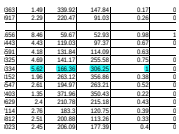
ECB Lining



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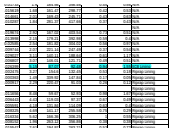

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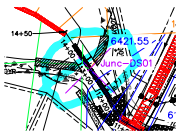

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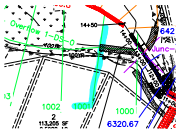

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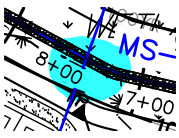

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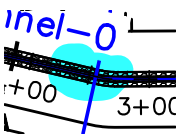

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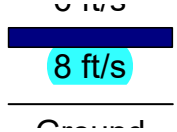

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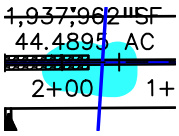

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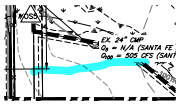

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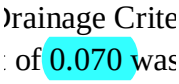

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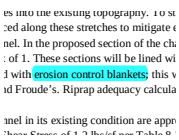

Subject:
Page Label: 10
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:33:57 AM
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erosion control blankets

Subject:
Page Label: 12
Author: Jeff Rice - EPC Engineering Review
Date: 4/5/2024 11:38:10 AM
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The remaining improvements to Drainageway MS-06 shall be
implemented with the Filing 5 improvements.

Bridge Fee
$ 1,640/ac x

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Page Label: 14
Author: Jeff Rice - EPC Engineering Review
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Author: Jeff Rice - EPC Engineering Review
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PRIVATE STORMWATER FACILITY

MAINTENANCE AGREEMENT AND EASEMENT

This PRIVATE STORMWATER FACILITY MAINTENANCE AGREEMENT AND EASEMENT (Agreement) is made by and between EL PASO COUNTY by and through THE BOARD OF COUNTY COMMISSIONERS OF EL PASO COUNTY, COLORADO (County) and GORILLA CAPITAL CO SADDLEHORN RANCH, LLC (Developer) and SADDLEHORN RANCH METROPOLITAN DISTRICT (Metro District), a quasi-municipal corporation and political subdivision of the State of Colorado. The above may occasionally be referred to herein singularly as "Party" and collectively as "Parties."

Recitals

A. WHEREAS, the Metro District provides various municipal services to certain real property in El Paso County, Colorado referred to as SADDLEHORN RANCH; and

B. WHEREAS, Developer is the owner of certain real estate (the Subject Property) in El Paso County, Colorado, which Property is legally described in Exhibit A attached hereto and incorporated herein by this reference; and

C. WHEREAS, Developer desires to plat and develop on the Subject Property a Subdivision to be known as SADDLEHORN RANCH FILING NO. 3 (the Development); and

D. WHEREAS, the development of the Subject Property will materially increase the volume and decrease the quality of stormwater runoff from the Property; therefore, it is in the best interest of the public health, safety and welfare for the County to condition approval of this Development on Developer's promise to construct adequate stormwater control facilities including permanent stormwater quality structural Best Management Practices ("BMPs") for the Development; and

E. WHEREAS, the El Paso County Land Development Code, as periodically amended, requires the construction and maintenance of detention ponds and other drainage facilities adequate to maintain historic stormwater flow patterns, protect natural and man-made drainage conveyances, and prevent property damage in connection with land development and subdivisions, and further requires that developers enter into maintenance agreements and easements with the County for such drainage facilities; and

F. WHEREAS, the El Paso County Drainage Criteria Manual, Volume 2, as amended by Appendix I of the El Paso County Engineering Criteria Manual (ECM), as each may be periodically amended, promulgated pursuant to the County's Colorado Discharge Permit System General Permit (MS4 Permit), which MS4 Permit requires that the County take measures to protect the quality of stormwater from sediment and other contaminants, requires subdividers, developers, landowners, and owners of facilities located in the County's rights-of-way or easements to provide adequate permanent stormwater quality facilities and BMPs with new development or significant redevelopment and to enter into maintenance agreements and easements with the County for such facilities and BMPs; and

G. WHEREAS, Section 2.9 of the El Paso County Drainage Criteria Manual, Volume I provides for a developer's promise to maintain a development's drainage facilities in the event the County does not assume such responsibility; and

H. WHEREAS, Developer desires to
conveyance facilities, detention basins, stormw
stormwater quality BMPs (collectively, "Stormw
adequate drainage and stormwater runoff control a
MS4 Permit, and to operate, clean, maintain and re

I. WHEREAS, Developer desires to c
as set forth on Exhibit B attached hereto and incorporated herein by this reference (the Stormwater Facilities Area); and

J. WHEREAS, Developer shall be charged with the duty of constructing the Stormwater Facilities and the Metro District shall be charged with the duties of operating, maintaining and repairing the Stormwater Facilities and any appurtenant improvements on the property described in Exhibit B; and

K. WHEREAS, the County, in order to protect the public health, safety and welfare, desires the means to access, construct, maintain, and repair the Stormwater Facilities and to recover its costs incurred in connection therewith in the event the Developer or Metro District fails to meet their obligations to do the same; and

L. WHEREAS, the County conditions approval of this Development on the Developer's promise to construct the Stormwater Facilities, and further conditions approval on the Metro District's promise to clean, maintain and repair the Stormwater Facilities, and on the Metro District's promise to reimburse the County in the event the burden falls upon the County to construct, clean, maintain or repair the Stormwater Facilities serving this Development; and

M. WHEREAS, the County, in order to secure performance of the promises contained herein, conditions approval of this Development upon Developer's grant herein of a perpetual Easement over the Stormwater Facilities Area as described in Exhibit B for the purpose of allowing the Metro District access to construct, upgrade, clean, maintain and/or repair the Stormwater Facilities, and allowing the County to periodically access and inspect the Stormwater Facilities and, when necessary, to construct, clean, maintain or repair the Stormwater Facilities; and

N. WHEREAS, Pursuant to Colorado Constitution, Article XIV, Section 18(2) and Section 29-1-203, Colorado Revised Statutes, governmental entities may cooperate and contract with each other to provide any function, services, or facilities lawfully authorized to each.

legal descriptions are properly labeled, exhibit A is the overall legal description with exhibit B being the legal descriptions for specific ponds and their corresponding plan views, reorganized for clarity

Commented [LS1]: It appears that the legal descriptions of the Stormwater Facilities Area are mistakenly labeled Exhibit A. If each of the drawings currently labeled Exhibit B correspond to one the legal descriptions, please place the drawing immediately after such legal description for ease of reference.

Agreement

NOW, THEREFORE, in consideration of the mutual Promises contained herein, the sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. Incorporation of Recitals: The Parties incorporate the Recitals above into this Agreement.

2. Covenants Running with the Land: Developer agrees that this entire Agreement and the performance thereof shall become a covenant running with the land, which land is legally described in Exhibit A attached hereto, and that this entire Agreement and the performance thereof shall be binding upon itself and its successors and assigns.

3. Construction: Developer shall construct the following Stormwater Facilities on the Stormwater Facility Areas described and shown in Exhibit B: Stormwater Detention Basin E on portions of future Lot 27, Stormwater Detention Basin C on portions of future Lots 18, 19, 20, 21, & 22, Stormwater Detention Basin D on portions of future Lots 7, 9 , & 10, and portions of Drainageway MS-06 on portions of Tracts A. Developer shall not commence construction of the Stormwater Facilities until the El Paso County Planning and Community Development Department (PCD) has approved in writing the plans and specifications for the Stormwater Facilities and this Agreement has been signed by all Parties and returned to the PCD. Developer shall complete construction of the Stormwater Facilities in substantial compliance with the County-approved plans and specifications for the Stormwater Facilities and shall provide certification from a Colorado registered Professional Engineer that the Stormwater Facilities were constructed in compliance with and provide the volume and capacity required by such plans and specifications in accordance with ECM requirements. Failure to meet these requirements shall be a material breach of this Agreement and shall entitle the County to pursue any remedies available to it at law or in equity to enforce the same. Construction of the Stormwater Facilities shall be substantially completed within one (1) year (defined as 365 days), which one-year period will commence to run on the date the Erosion and Stormwater Quality Control Permit (ESQCP) and associated Construction Permit are issued. Rough grading of the permanent stormwater BMP facilities must be completed and inspected by the PCD prior to commencing road construction, and water quality capture volume (WQCV) outlet control structures must be substantially complete prior to paving roads or parking areas.

In the event construction of the Stormwater Facilities is not substantially completed within the one (1) year period, or if the Development is in violation of its ESQCP terms and conditions and Developer has not made an effort to remedy the violation in a reasonable amount of time as determined by the County, then the County may exercise its discretion to complete the Stormwater Facilities and shall have the right to seek reimbursement from the Developer and its respective successors and assigns for its actual costs and expenses incurred in the process of completing construction.

4. Maintenance of Stormwater Facilities: The Developer and the Metro District agree for themselves and their respective successors and assigns that they will regularly and routinely inspect, clean and maintain the Stormwater Facilities in compliance with the County-reviewed Operation and Maintenance Manual, attached hereto and incorporated herein by this reference as Exhibit C, and otherwise keep the same in good repair, all at their own cost and expense in

accordance with the Operation and Maintenance Manual attached hereto as Exhibit C. No trees or shrubs that will impair the structural integrity of the Stormwater Facilities shall be planted or allowed to grow within or adjacent to the Stormwater Facilities.

Notwithstanding the foregoing, the County shall assume maintenance of the following Stormwater Facilities located on Tract A of this Development upon preliminary acceptance of such facilities: San Isidro Trail box culvert, wingwalls, energy dissipation, and the access road intersecting with San Isidro Trail. The Metro District shall retain maintenance responsibility for the remainder of Tract A, including any other Stormwater Facilities located thereon.

The Developer and the Metro District agree and covenant, for themselves and their respective successors and assigns, that they will maintain and properly manage the grasses and other vegetation in the Stormwater Facility Areas in compliance with the "Routine Maintenance Activities" specified in Exhibit C and other requirements or conditions of approval.

5. Creation of Easements: Developer hereby grants the County and the Metro District a non-exclusive perpetual easement upon and across the property described in Exhibit B. The purpose of the easement is to allow the County and the Metro District to access, inspect, clean, repair and maintain the Stormwater Facilities; however, the creation of the easement does not expressly or implicitly impose on the County a duty to so inspect, clean, repair or maintain the Stormwater Facilities or any appurtenant improvements, except as set forth in paragraph 4 above.

6. County's Rights and Obligations: Any time the County determines, in the sole exercise of its discretion, that the Stormwater Facilities have not been properly cleaned, maintained, or otherwise kept in good repair, the County shall give reasonable notice of such to the responsible Party and its successors and assigns. The notice shall provide a reasonable time to correct the problems. Should the responsible Parties fail to correct the specified problems, the County may enter upon the properties described in Exhibit B to perform the needed work and shall have the right to seek reimbursement from the responsible Parties for its actual costs and expenses in performing the work. Notice shall be effective to the above by the County's deposit of the same into the regular United States mail, postage pre-paid. Notwithstanding the foregoing, this Agreement does not expressly or implicitly impose on the County a duty to inspect, construct, clean, repair or maintain the Stormwater Facilities.

7. Actual Costs and Expenses: The Developer and the Metro District agree and covenant, for themselves and their successors and assigns, that they will reimburse the County for its actual costs and expenses incurred in the process of completing construction of, cleaning, maintaining, or repairing the Stormwater Facilities or vegetated areas pursuant to the provisions of this Agreement.

The term "actual costs and expenses" as used in this Agreement shall be liberally construed in favor of the County, and shall include, but shall not be limited to, labor costs, tools and equipment costs, supply costs, engineering and design costs, and costs to contract with specialized professionals or consultants, including but not limited to wetlands scientists, regardless of whether the County uses its own personnel, tools, equipment and supplies, etc. to perform the work. In the event the County initiates any litigation or engages the services of legal counsel in order to enforce the provisions arising herein, the County shall be entitled to its damages and costs, including

reasonable attorney's fees, regardless of whether the County contracts with outside legal counsel or utilizes in-house legal counsel for the same.

8. Contingencies of Land Use/Land Disturbance Approval: Developer's and the Metro District's execution of this Agreement is a condition of subdivision, land use, or land disturbance approval. Additional conditions of this Agreement include, but are not limited to, the following:

a. Conveyance of Tract A from Developer to the Metro District (which will include a reservation in favor of the County for purposes of accessing, inspecting, cleaning, maintaining, and repairing the Stormwater Facilities), and recording of the Deed for the same; and

b. [Reserved]

The County shall have the right, in the sole exercise of its discretion, to approve or disapprove any documentation submitted to it under the conditions of this Paragraph, including but not limited to, any separate agreement or amendment, if applicable, identifying any specific maintenance responsibilities not addressed herein. The County's rejection of any documentation submitted hereunder shall mean that the appropriate condition of this Agreement has not been fulfilled.

9. Agreement Monitored by El Paso County Planning and Community Development Department and/or El Paso County Department of Public Works: Any and all actions and decisions to be made hereunder by the County shall be made by the Executive Director of the El Paso County Planning and Community Development Department and/or the Executive Director of the El Paso County Department of Public Works. Accordingly, any and all documents, submissions, plan approvals, inspections, etc. shall be submitted to and shall be made by the Executive Director of the Planning and Community Development Department and/or the Executive Director of the El Paso County Department of Public Works.

10. Indemnification and Hold Harmless: Developer and the Metro District agree, for themselves, their successors and assigns, that they will indemnify, defend, and hold the County harmless from any and all loss, costs, damage, injury, liability, claim, lien, demand, action and causes of action whatsoever, whether at law or in equity, arising from or related to their intentional or negligent acts, errors or omissions or that of their agents, officers, servants, employees, invitees and licensees in the construction, operation, inspection, cleaning (including analyzing and disposing of any solid or hazardous wastes as defined by State and/or Federal environmental laws and regulations), maintenance, and repair of the Stormwater Facilities and such obligation arising under this Paragraph shall be joint and several. Nothing in this Paragraph shall be deemed to waive or otherwise limit the defense available to the County pursuant to the Colorado Governmental Immunity Act, Sections 24-10-101, *et seq*. C.R.S., or as otherwise provided by law.

11. Severability: In the event any Court of competent jurisdiction declares any part of this Agreement to be unenforceable, such declaration shall not affect the enforceability of the remaining parts of this Agreement.

12. Third Parties: This Agreement does not and shall not be deemed to confer upon or grant to any third party any right to claim damages or to bring any lawsuit, action or other proceeding against the County, the Developer, the Metro District, or their respective successors

and assigns, because of any breach hereof or because of any terms, covenants, agreements or conditions contained herein.

13. Solid Waste or Hazardous Materials: Should any refuse from the Stormwater Facilities be suspected or identified as solid waste or petroleum products, hazardous substances or hazardous materials (collectively referred to herein as "hazardous materials"), the Developer and the Metro District shall take all necessary and proper steps to characterize the solid waste or hazardous materials and properly dispose of it in accordance with applicable State and/or Federal environmental laws and regulations, including, but not limited to, the following: Solid Wastes Disposal Sites and Facilities Acts, §§ 30-20-100.5 – 30-20-119, C.R.S., Colorado Regulations Pertaining to Solid Waste Disposal Sites and Facilities, 6 C.C.R. 1007-2, *et seq*., Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992k, and Federal Solid Waste Regulations 40 CFR Ch. I. The County shall not be responsible or liable for identifying, characterizing, cleaning up, or disposing of such solid waste or hazardous materials. Notwithstanding the previous sentence, should any refuse cleaned up and disposed of by the County be determined to be solid waste or hazardous materials, the Developer and the Metro District, but not the County, shall be responsible and liable as the owner, generator, and/or transporter of said solid waste or hazardous materials.

14. Applicable Law and Venue: The laws, rules, and regulations of the State of Colorado and El Paso County shall be applicable in the enforcement, interpretation, and execution of this Agreement, except that Federal law may be applicable regarding solid waste or hazardous materials. Venue shall be in the El Paso County District Court.

15. Limitation on Developer's Obligation and Liability: The obligation and liability of the Developer hereunder shall only continue until such time as the Final Plat as described in the third paragraph (Paragraph C) of the Recitals set forth above is recorded (if applicable) and the Developer completes the construction of the Stormwater Facilities and transfers all applicable maintenance and operation responsibilities to the Metro District and the County. By execution of this agreement, the Metro District agrees to accept all responsibilities and to perform all duties assigned to it, including those of the Developer, as specified herein, upon transfer of maintenance responsibilities for the Stormwater Facilities from Developer to the Metro District.

Executed this _____ day of _____, 20___, by:

GORILLA CAPITAL CO SADDLEHORN RANCH, LLC

By: _____
John Helmick, CEO

The foregoing instrument was acknowledged before me this ____ day of _____, 20__, by __John Helmick_____, CEO of GORILLA CAPITAL CO SADDLEHORN RANCH, LLC.

Witness my hand and official seal.

My commission expires: _____

_____
Notary Public

Executed this _____ day of _____, 20___, by:

SADDLEHORN RANCH METROPOLITAN DISTRICT NO. 1

By: _____
Sandra Lehmann, President

Attest:

By: _____
Rob Stull, Treasurer

The foregoing instrument was acknowledged before me this _____ day of _____, 20___, by Sandra Lehman as President of SADDLEHORN RANCH METROPOLITAN DISTRICT

Witness my hand and official seal.

My commission expires: _____

_____
Notary Public

Executed this _____ day of _____, 20___, by:

BOARD OF COUNTY COMMISSIONERS
OF EL PASO COUNTY, COLORADO

By: _____
Meggan, Herington, Executive Director
Planning and Community Development Department
Authorized Signatory pursuant to LDC

The foregoing instrument was acknowledged before me this _____ day of _____, 20___, by _____, Executive Director, Planning and Community Development Department.

Witness my hand and official seal.

My commission expires: _____

_____
Notary Public

Approved as to Content and Form:

_____
Assistant County Attorney

J·R ENGINEERING
A Westrian Company

EXHIBIT A

SADDLEHORN RANCH FILING NO. 3

PROPERTY DESCRIPTION

A PARCEL OF LAND LOCATED IN SECTION 3 , TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH P.M., COUNTY OF EL PASO, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: THE WEST LINE OF SECTION 3, T3S, R64W, 6TH P.M., MONUMENTED BY A 3-1/4" ALUMINUM CAP STAMPED "PLS 17496" IN A RANGE BOX AT THE NORTHWEST CORNER OF SECTION 3 AND A NO. 6 REBAR IN A RANGE BOX AT THE SOUTHWEST CORNER OF SECTION 3, BEARING N00°32'28"W AS REFERENCED TO COLORADO STATE PLANE CENTRAL ZONE.

COMMENCING AT THE NORTHWEST CORNER OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN;

THENCE S57°37'42"E A DISTANCE OF 93.41 FEET, TO A POINT ON THE SOUTHERLY RIGHT-OF-WAY LINE OF JUDGE ORR ROAD RECORDED UNDER RECEPTION NO. 215008985 IN THE RECORDS OF THE EL PASO COUNTY CLERK AND RECORDER;

THENCE ON SAID SOUTHERLY RIGHT-OF-WAY LINE, THE FOLLOWING TWO (2) COURSES:

1. S89°59'23"E A DISTANCE OF 822.24 FEET;
2. N00°00'39"E A DISTANCE OF 20.00 FEET, TO A POINT ON THE SOUTHERLY RIGHT-OF-WAY OF JUDGE ORR ROAD RECORDED UNDER RECEPTION NO. 215008986;

THENCE ON SAID SOUTHERLY RIGHT-OF-WAY LINE, S89°59'23"E A DISTANCE OF 2,475.34 FEET;

THENCE DEPARTING SAID SOUTHERLY RIGHT-OF-WAY LINE THE FOLLOWING EIGHT (8) COURSES:

1. S00°42'27"E A DISTANCE OF 40.00 FEET;
2. N89°59'23"W A DISTANCE OF 600.05 FEET;
3. S00°42'27"E A DISTANCE OF 1366.43 FEET, TO A POINT OF CURVE;
4. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 710.00 FEET, A CENTRAL ANGLE OF 34°50'03" AND AN ARC LENGTH OF 431.66 FEET, TO A POINT OF NON-TANGENT;
5. S53°01'17"W A DISTANCE OF 50.63 FEET, TO A POINT OF CURVE;
6. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 320.00 FEET, A CENTRAL ANGLE OF 29°21'21" AND AN ARC LENGTH OF 163.95 FEET, TO A POINT OF TANGENT;
7. S23°39'56"W A DISTANCE OF 488.23 FEET, TO A POINT OF CURVE;
8. ON THE ARC OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 3,780.00 FEET, A CENTRAL ANGLE OF 02°54'45" AND AN ARC LENGTH OF 192.15 FEET, TO A POINT ON THE NORTHERLY LINE OF SADDLEHORN FILING NO.2 RECORDED UNDER RECEPTION NO. _____, SAID POINT BEING A POINT OF CURVE;

THENCE ON THE NORTHERLY LINES OF SAID SADDLEHORN RANCH FILING NO. 2, THE FOLLOWING THIRTEEN (13) COURSES:

1. ON THE ARC OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 3,780.00 FEET, A CENTRAL ANGLE OF 03°09'58" AND AN ARC LENGTH OF 208.89 FEET, TO A POINT OF TANGENT;
2. S29°44'39"W A DISTANCE OF 495.87 FEET;
3. N60°15'21"W A DISTANCE OF 60.00 FEET;

4. S29°44'39"W A DISTANCE OF 35.38 FEET;
5. N58°07'32"W A DISTANCE OF 223.80 FEET, TO A POINT OF CURVE;
6. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 2,780.00 FEET, A CENTRAL ANGLE OF 13°06'52" AND AN ARC LENGTH OF 636.31 FEET, TO A POINT OF TANGENT;
7. N71°14'24"W A DISTANCE OF 260.86 FEET, TO A POINT OF CURVE;
8. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 780.00 FEET, A CENTRAL ANGLE OF 18°44'59" AND AN ARC LENGTH OF 255.25 FEET, TO A POINT OF TANGENT;
9. N89°59'23"W A DISTANCE OF 303.52 FEET;
10. N00°00'37"E A DISTANCE OF 35.00 FEET;
11. N89°59'23"W A DISTANCE OF 60.00 FEET;
12. S00°00'37"W A DISTANCE OF 35.00 FEET;
13. N89°59'23"W A DISTANCE OF 442.27 FEET, TO A POINT ON THE WEST LINE OF SAID SECTION 3, SAID POINT ALSO BEING THE NORTHWESTERLY CORNER OF SAID SADDLEHORN RANCH FILING NO. 2;

THENCE ON SAID WEST LINE, N00°32'28"W A DISTANCE OF 836.74 FEET, TO A POINT ON THE SOUTHERLY LINE OF CURTIS ROAD RECORDED UNDER RECEPTION NO. 215008985;

THENCE ON THE SOUTHERLY AND EASTERLY RIGHT-OF-WAY LINES OF SAID CURTIS ROAD, THE FOLLOWING FIVE (5) COURSES:

1. N89°33'03"E A DISTANCE OF 30.00 FEET;
2. N00°32'28"W A DISTANCE OF 984.54 FEET;
3. N89°27'33"E A DISTANCE OF 20.00 FEET;
4. N00°32'28"W A DISTANCE OF 820.00 FEET;
5. N44°44'03"E A DISTANCE OF 40.00 FEET, TO THE POINT OF BEGINNING;

CONTAINING A CALCULATED AREA OF 7,665,666 SQUARE FEET OR 175.9795 ACRES.

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A Westrian Company

Exhibit B - Pond E

SADDLEHORN RANCH
DRAINAGE EASEMENT

PROPERTY DESCRIPTION

A PARCEL OF LAND LOCATED IN THE NORTH HALF OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF EL PASO, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: THE NORTH LINE OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, BEING MONUMENTED BY A 3-1/4" ALUMINUM CAP STAMPED "PLS 17496 1992" IN A RANGE BOX AT THE NORTHWEST CORNER AND A 3-1/4" ALUMINUM CAP STAMPED "PLS 17496 1992" IN A RANGE BOX AT THE NORTHEAST CORNER, BEARING S89°59'23"E AS REFERENCED TO COLORADO STATE PLANE CENTRAL ZONE NAD(83).

COMMENCING AT THE NORTHWEST CORNER OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN:

THENCE S43°44'50"E A DISTANCE OF 3626.18 FEET, TO THE NORTHWESTERLY CORNER OF TRACT A, SADDLEHORN RANCH FILING NO. 2 RECORDED UNDER RECEPTION NO. 223715159 IN THE RECORDS OF THE EL PASO COUNTY CLERK AND RECORDER, AND THE POINT OF BEGINNING;

THENCE ON THE ARC OF A CURVE TO THE LEFT, WHOSE CENTER BEARS N63°25'19"W, HAVING A RADIUS OF 3780.00 FEET, A CENTRAL ANGLE OF 01°18'00" AND AN ARC LENGTH OF 85.77 FEET, TO A POINT OF NON-TANGENT;

THENCE S54°14'55"E A DISTANCE OF 140.35 FEET;

THENCE S63°25'19"E A DISTANCE OF 34.72 FEET, TO A POINT OF CURVE;

THENCE ON THE ARC OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 42.00 FEET, A CENTRAL ANGLE OF 90°20'32" AND AN ARC LENGTH OF 66.22 FEET, TO A POINT OF TANGENT;

THENCE S26°55'13"W A DISTANCE OF 21.13 FEET, TO A POINT ON THE NORTHERLY LINE OF SAID TRACT A;

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THENCE ON SAID NORTHERLY LINE, N63°25'19"W A DISTANCE OF 214.17 FEET, TO THE POINT OF BEGINNING.

CONTAINING A CALCULATED AREA OF 14,759 SQUARE FEET OR 0.3388 ACRES.

PROPERTY DESCRIPTION STATEMENT

I, DEREK LEE VAGIAS, A PROFESSIONAL LAND SURVEYOR LICENSED IN THE STATE OF COLORADO, DO HEREBY STATE THAT THE ABOVE PROPERTY DESCRIPTION AND ATTACHED EXHIBIT WERE PREPARED UNDER MY RESPONSIBLE CHARGE, AND ON THE BASIS OF MY KNOWLEDGE, INFORMATION AND BELIEF, ARE CORRECT.

DEREK LEE VAGIAS, PROFESSIONAL LAND SURVEYOR
COLORADO NO. 38578
FOR AND ON BEHALF OF JR ENGINEERING, LLC

J·R ENGINEERING
A Westrian Company

Exhibit B - Pond C

SADDLEHORN RANCH
DRAINAGE EASEMENT

PROPERTY DESCRIPTION

A PARCEL OF LAND LOCATED IN THE EAST HALF OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF EL PASO, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: THE NORTH LINE OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, BEING MONUMENTED BY A 3-1/4" ALUMINUM CAP STAMPED "PLS 17496 1992" IN A RANGE BOX AT THE NORTHEAST CORNER AND BY A 3-1/4" ALUMINUM CAP STAMPED "PLS 17496 1992" IN A RANGE BOX AT THE NORTHWEST CORNER BEARING N89°59'23"W AS REFERENCED TO COLORADO STATE PLANE CENTRAL ZONE NAD(83).

COMMENCING AT THE NORTHEAST CORNER OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN:

THENCE S24°19'46"W A DISTANCE OF 3366.98 FEET, TO A POINT ON THE EASTERLY LINE OF TRACT A, SADDLEHORN RANCH FILING NO. 2 RECORDED UNDER RECEPTION NO. 223715159 IN THE RECORDS OF THE EL PASO COUNTY CLERK AND RECORDER, AND THE POINT OF BEGINNING;

THENCE ON THE EASTERLY AND NORTHERLY LINES OF SAID TRACT A, THE FOLLOWING THREE (3) COURSES:

1. N12°59'32"W A DISTANCE OF 143.85 FEET;
2. N58°21'31"W A DISTANCE OF 99.14 FEET;
3. N83°17'36"W A DISTANCE OF 80.00 FEET;

THENCE DEPARTING SAID NORTHERLY LINE, THE FOLLOWING FIFTEEN (15) COURSES:

1. N17°56'09"W A DISTANCE OF 68.38 FEET, TO A POINT OF CURVE;
2. ON THE ARC OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 40.00 FEET, A CENTRAL ANGLE OF 62°10'36" AND AN ARC LENGTH OF 43.41 FEET, TO A POINT OF TANGENT;
3. N44°14'27"E A DISTANCE OF 98.13 FEET, TO A POINT OF CURVE;
4. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 15.00 FEET, A CENTRAL ANGLE OF 115°42'18" AND AN ARC LENGTH OF 30.29 FEET, TO A POINT OF TANGENT;
5. N71°27'50"W A DISTANCE OF 142.29 FEET;
6. S80°30'52"W A DISTANCE OF 30.79 FEET, TO A POINT OF NON-TANGENT CURVE;

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7. ON THE ARC OF A CURVE TO THE RIGHT, WHOSE CENTER BEARS N74°13'58"E, HAVING A RADIUS OF 100.55 FEET, A CENTRAL ANGLE OF 38°45'02" AND AN ARC LENGTH OF 68.00 FEET, TO A POINT OF NON-TANGENT;
8. S71°27'50"E A DISTANCE OF 236.87 FEET;
9. N43°10'03"E A DISTANCE OF 64.06 FEET, TO A POINT OF CURVE;
10. ON THE ARC OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 60.00 FEET, A CENTRAL ANGLE OF 89°34'27" AND AN ARC LENGTH OF 93.80 FEET, TO A POINT OF TANGENT;
11. S47°15'30"E A DISTANCE OF 180.67 FEET, TO A POINT OF CURVE;
12. ON THE ARC OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 110.00 FEET, A CENTRAL ANGLE OF 71°10'40" AND AN ARC LENGTH OF 136.65 FEET, TO A POINT OF TANGENT;
13. S23°55'11"W A DISTANCE OF 142.34 FEET, TO A POINT OF CURVE;
14. ON THE ARC OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 70.00 FEET, A CENTRAL ANGLE OF 34°33'29" AND AN ARC LENGTH OF 42.22 FEET, TO A POINT OF TANGENT;
15. S58°28'40"W A DISTANCE OF 140.69 FEET, TO THE POINT OF BEGINNING.

CONTAINING A CALCULATED AREA OF 134,775 SQUARE FEET OR 3.0940 ACRES.

PROPERTY DESCRIPTION STATEMENT

I, DEREK LEE VAGIAS, A PROFESSIONAL LAND SURVEYOR LICENSED IN THE STATE OF COLORADO, DO HEREBY STATE THAT THE ABOVE PROPERTY DESCRIPTION AND ATTACHED EXHIBIT WERE PREPARED UNDER MY RESPONSIBLE CHARGE, AND ON THE BASIS OF MY KNOWLEDGE, INFORMATION AND BELIEF, ARE CORRECT.

DEREK LEE VAGIAS, PROFESSIONAL LAND SURVEYOR
COLORADO NO. 38578
FOR AND ON BEHALF OF JR ENGINEERING, LLC

J·R ENGINEERING
A Westrian Company

Exhibit B – **Pond D**

SADDLEHORN RANCH
DRAINAGE EASEMENT

PROPERTY DESCRIPTION

A PARCEL OF LAND LOCATED IN THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF EL PASO, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARINGS: THE NORTH LINE OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN, BEING MONUMENTED BY A 3-1/4" ALUMINUM CAP STAMPED "PLS 17496 1992" IN A RANGE BOX AT THE NORTHEAST CORNER AND BY A 3-1/4" ALUMINUM CAP STAMPED "PLS 17496 1992" IN A RANGE BOX AT THE NORTHWEST CORNER BEARING N89°59'23"W AS REFERENCED TO COLORADO STATE PLANE CENTRAL ZONE NAD(83).

COMMENCING AT THE NORTHEAST CORNER OF SECTION 3, TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH PRINCIPAL MERIDIAN:

THENCE S60°12'23"W A DISTANCE OF 1101.62 FEET, TO THE POINT OF BEGINNING;

THENCE THE FOLLOWING TWELVE (12) COURSES:

1. S50°12'00"E A DISTANCE OF 223.47 FEET;
2. S28°17'51"E A DISTANCE OF 382.99 FEET;
3. S57°53'12"W A DISTANCE OF 301.51 FEET, TO A POINT OF NON-TANGENT CURVE;
4. ON THE ARC OF A CURVE TO THE LEFT, WHOSE CENTER BEARS N88°55'58"W, HAVING A RADIUS OF 60.00 FEET, A CENTRAL ANGLE OF 49°48'09" AND AN ARC LENGTH OF 52.15 FEET, TO A POINT OF NON-TANGENT;
5. N57°53'12"E A DISTANCE OF 124.27 FEET;
6. N37°08'20"W A DISTANCE OF 456.58 FEET;
7. N46°21'06"W A DISTANCE OF 103.08 FEET, TO A POINT OF CURVE;
8. ON THE ARC OF A CURVE TO THE LEFT, HAVING A RADIUS OF 40.00 FEET, A CENTRAL ANGLE OF 51°29'31" AND AN ARC LENGTH OF 35.95 FEET, TO A POINT OF TANGENT;
9. S82°09'23"W A DISTANCE OF 56.76 FEET, TO A POINT OF NON-TANGENT CURVE;
10. ON THE ARC OF A CURVE TO THE LEFT, WHOSE CENTER BEARS N87°17'43"W, HAVING A RADIUS OF 60.00 FEET, A CENTRAL ANGLE OF 64°13'41" AND AN ARC LENGTH OF 67.26 FEET, TO A POINT OF NON-TANGENT;

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11. N28°28'35"E A DISTANCE OF 27.22 FEET;

12. N87°46'09"E A DISTANCE OF 275.39 FEET, TO THE POINT OF BEGINNING.

CONTAINING A CALCULATED AREA OF 140,100 SQUARE FEET OR 3.2163 ACRES.

PROPERTY DESCRIPTION STATEMENT

I, DEREK LEE VAGIAS, A PROFESSIONAL LAND SURVEYOR LICENSED IN THE STATE OF COLORADO, DO HEREBY STATE THAT THE ABOVE PROPERTY DESCRIPTION AND ATTACHED EXHIBIT WERE PREPARED UNDER MY RESPONSIBLE CHARGE, AND ON THE BASIS OF MY KNOWLEDGE, INFORMATION AND BELIEF, ARE CORRECT.

DEREK LEE VAGIAS, PROFESSIONAL LAND SURVEYOR
COLORADO NO. 38578
FOR AND ON BEHALF OF JR ENGINEERING, LLC

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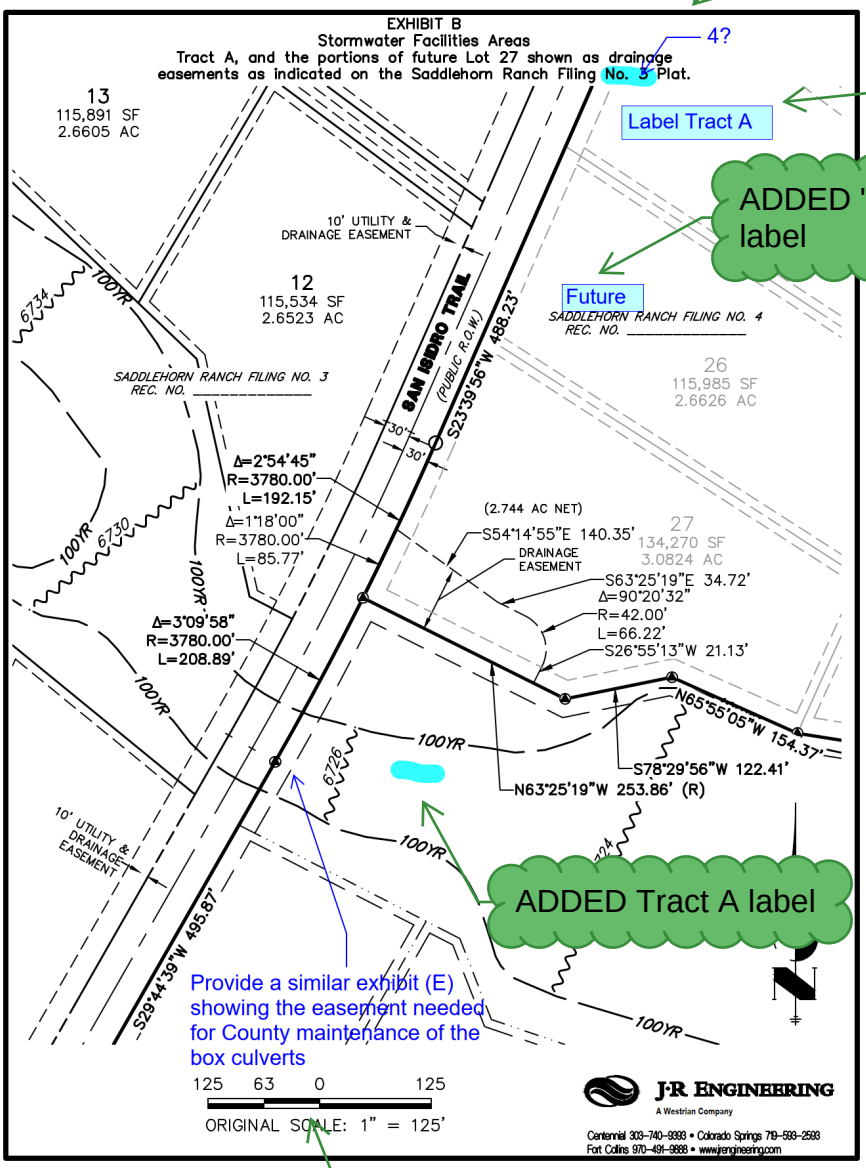

UPDATED title text

ADDED label for tract A

ADDED "future" to label

ADDED Tract A label

Provide a similar exhibit (E) showing the easement needed for County maintenance of the box culverts

ADDED exhibit E to the end for showing the easement needed for county maintenance

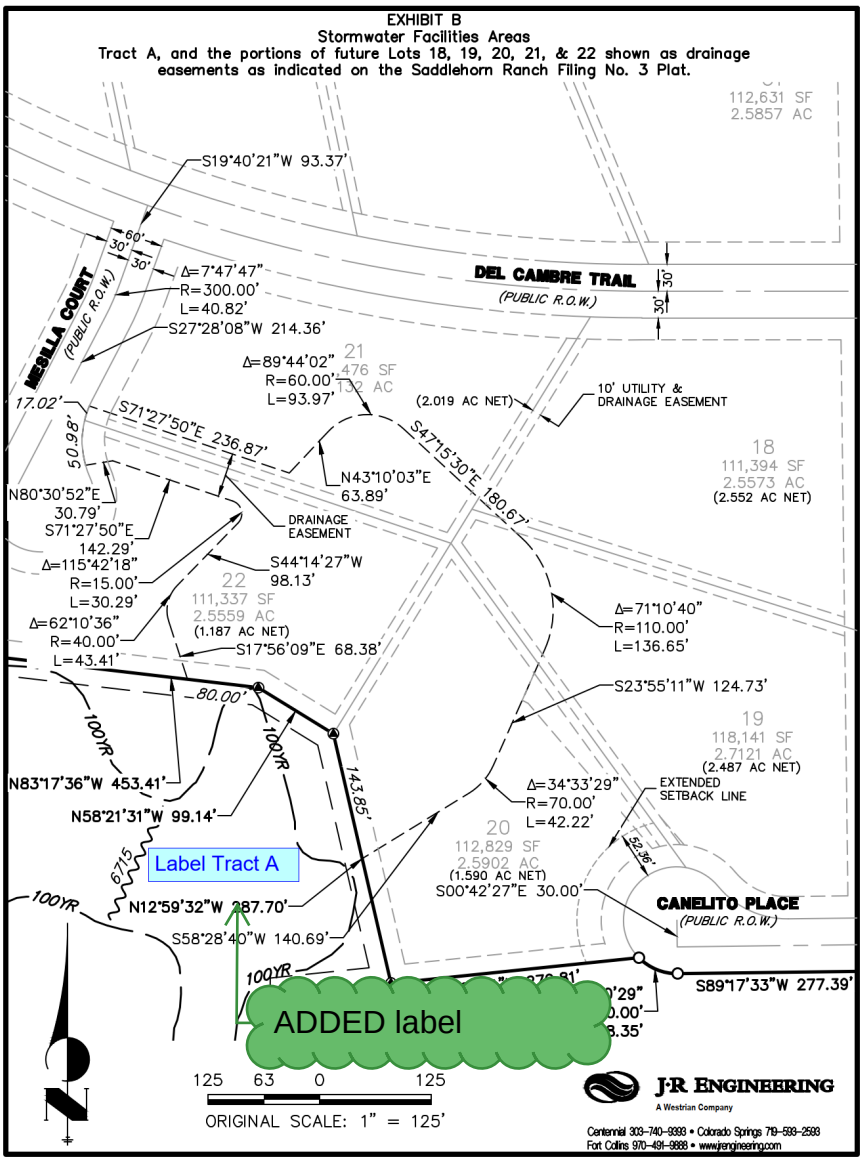
EXHIBIT B
Stormwater Facilities Areas
Tract A, and the portions of future Lots 18, 19, 20, 21, & 22 shown as drainage easements as indicated on the Saddlehorn Ranch Filing No. 3 Plat.
112,631 SF
2.5857 AC
S19°40'21"W 93.37'
60'
30'
30'
MESILLA COURT
(PUBLIC R.O.W.)
Δ=7°47'47"
R=300.00'
L=40.82'
S27°28'08"W 214.36'
DEL CAMBRE TRAIL
(PUBLIC R.O.W.)
30'
30'
21
Δ=89°44'02"
R=60.00'
L=93.97'
(2.019 AC NET)
10' UTILITY & DRAINAGE EASEMENT
17.02'
S71°27'50"E 236.87'
50.98'
N43°10'03"E
63.89'
S47°15'30"E 180.67'
18
111,394 SF
2.5573 AC
(2.552 AC NET)
N80°30'52"E
30.79'
S71°27'50"E
142.29'
DRAINAGE EASEMENT
Δ=115°42'18"
R=15.00'
L=30.29'
S44°14'27"W
98.13'
22
111,337 SF
2.5559 AC
(1.187 AC NET)
Δ=62°10'36"
R=40.00'
L=43.41'
S17°56'09"E 68.38'
Δ=71°10'40"
R=110.00'
L=136.65'
S23°55'11"W 124.73'
80.00'
100YR
100YR
19
118,141 SF
2.7121 AC
(2.487 AC NET)
N83°17'36"W 453.41'
143.85'
Δ=34°33'29"
R=70.00'
L=42.22'
EXTENDED SETBACK LINE
N58°21'31"W 99.14'
20
112,829 SF
2.5902 AC
(1.590 AC NET)
S00°42'27"E 30.00'
52.96'
67.15'
Label Tract A
100YR
N12°59'32"W 287.70'
CANELITO PLACE
(PUBLIC R.O.W.)
S58°28'40"W 140.69'
100YR
S89°17'33"W 277.39'
ADDED label
125 63 0 125
ORIGINAL SCALE: 1" = 125'
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A Westrian Company
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Fort Collins 970-491-9888 • www.jrengineering.com

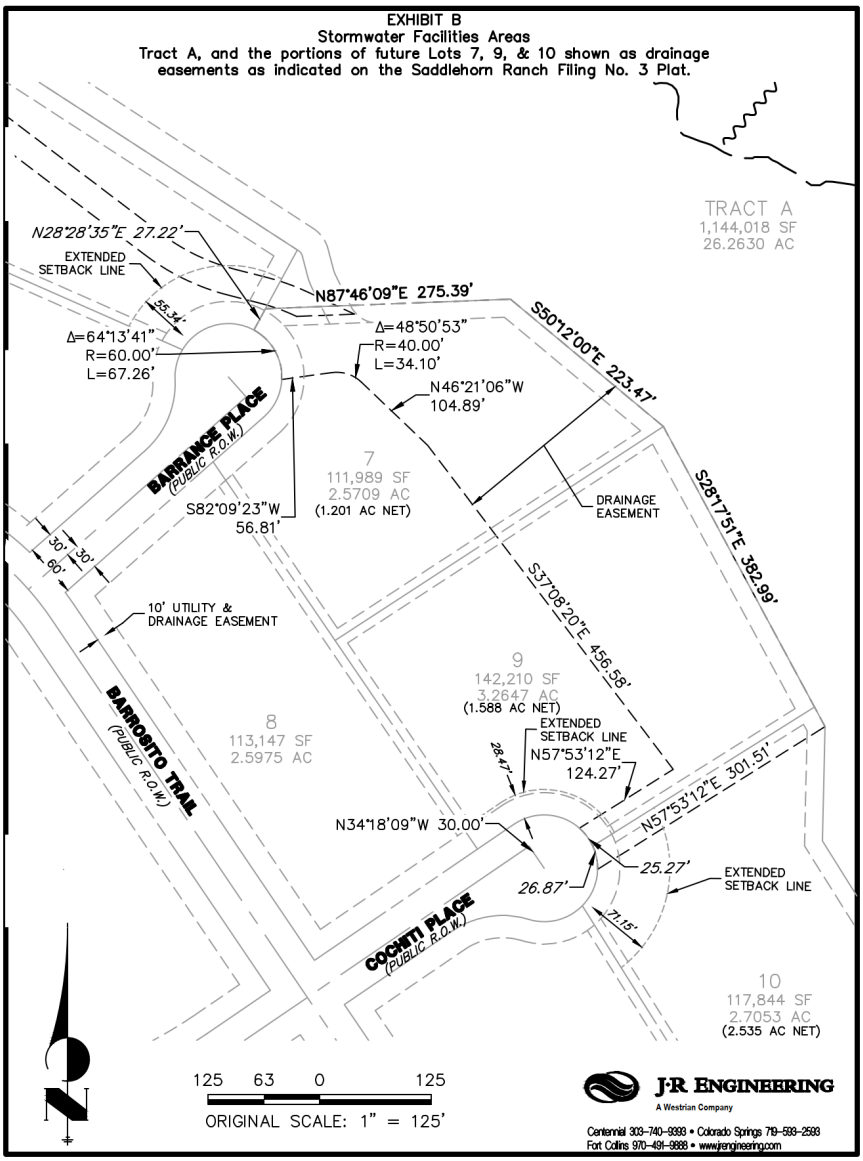
EXHIBIT B
Stormwater Facilities Areas
Tract A, and the portions of future Lots 7, 9, & 10 shown as drainage easements as indicated on the Saddlehorn Ranch Filing No. 3 Plat.
TRACT A
1,144,018 SF
26.2630 AC
N28°28'35"E 27.22'
EXTENDED SETBACK LINE
N87°46'09"E 275.39'
S50°12'00"E 223.47'
55.34'
Δ=64°13'41"
R=60.00'
L=67.26'
Δ=48°50'53"
R=40.00'
L=34.10'
N46°21'06"W
104.89'
BARRANCE PLACE
(PUBLIC R.O.W.)
7
111,989 SF
2.5709 AC
(1.201 AC NET)
S82°09'23"W
56.81'
DRAINAGE EASEMENT
S28°17'51"E 382.99'
30'
30'
90'
10' UTILITY & DRAINAGE EASEMENT
S37°08'20"E 456.58'
9
142,210 SF
3.2647 AC
(1.588 AC NET)
8
113,147 SF
2.5975 AC
BARROSITO TRAIL
(PUBLIC R.O.W.)
EXTENDED SETBACK LINE
28.47'
N57°53'12"E
124.27'
N57°53'12"E 301.51'
N34°18'09"W 30.00'
25.27'
26.87'
EXTENDED SETBACK LINE
71.15'
COCHITI PLACE
(PUBLIC R.O.W.)
10
117,844 SF
2.7053 AC
(2.535 AC NET)
125 63 0 125
ORIGINAL SCALE: 1" = 125'
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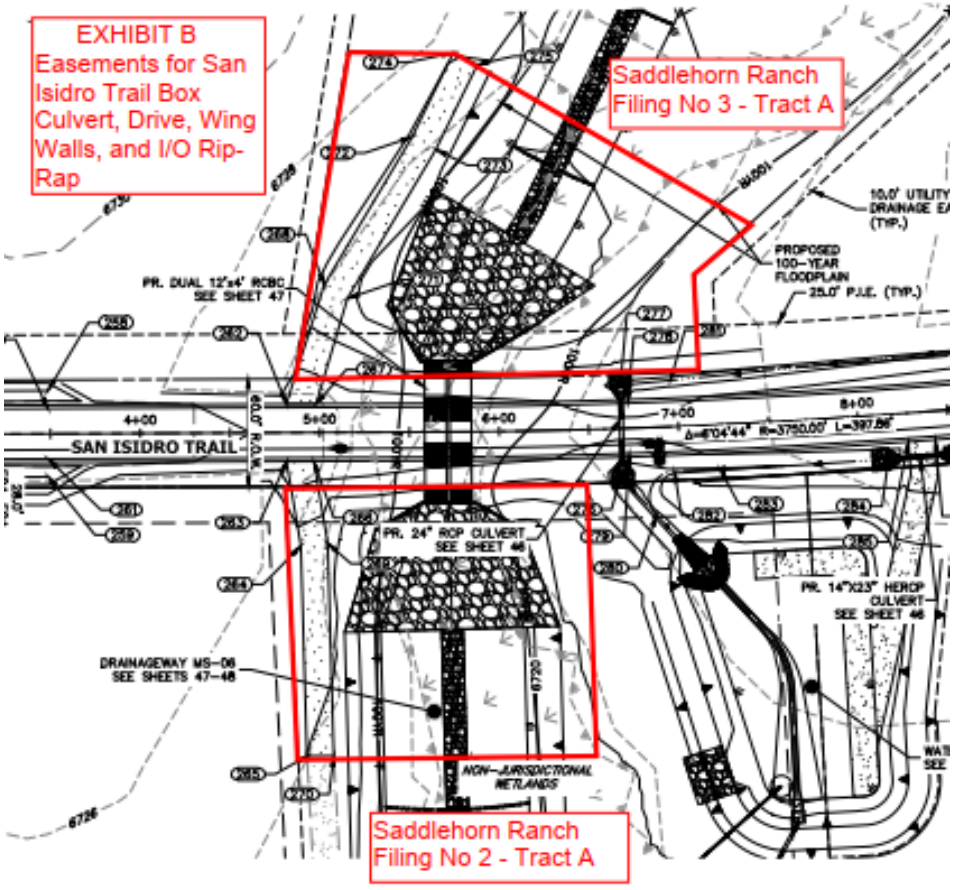
EXHIBIT B
Easements for San Isidro Trail Box Culvert, Drive, Wing Walls, and I/O Rip-Rap
Saddlehorn Ranch Filing No 3 - Tract A
Saddlehorn Ranch Filing No 2 - Tract A
SAN ISIDRO TRAIL
PR. DUAL 12'x4' RCBC SEE SHEET 47
PR. 24" RCP CULVERT SEE SHEET 46
PR. 14"X23" HERCP CULVERT SEE SHEET 46
DRAINAGEWAY MS-06 SEE SHEETS 47-48
PROPOSED 100-YEAR FLOODPLAIN
25.0' P.U.E. (TYP.)
NON-JURISDICTIONAL WETLANDS
4+00
5+00
6+00
7+00
8+00

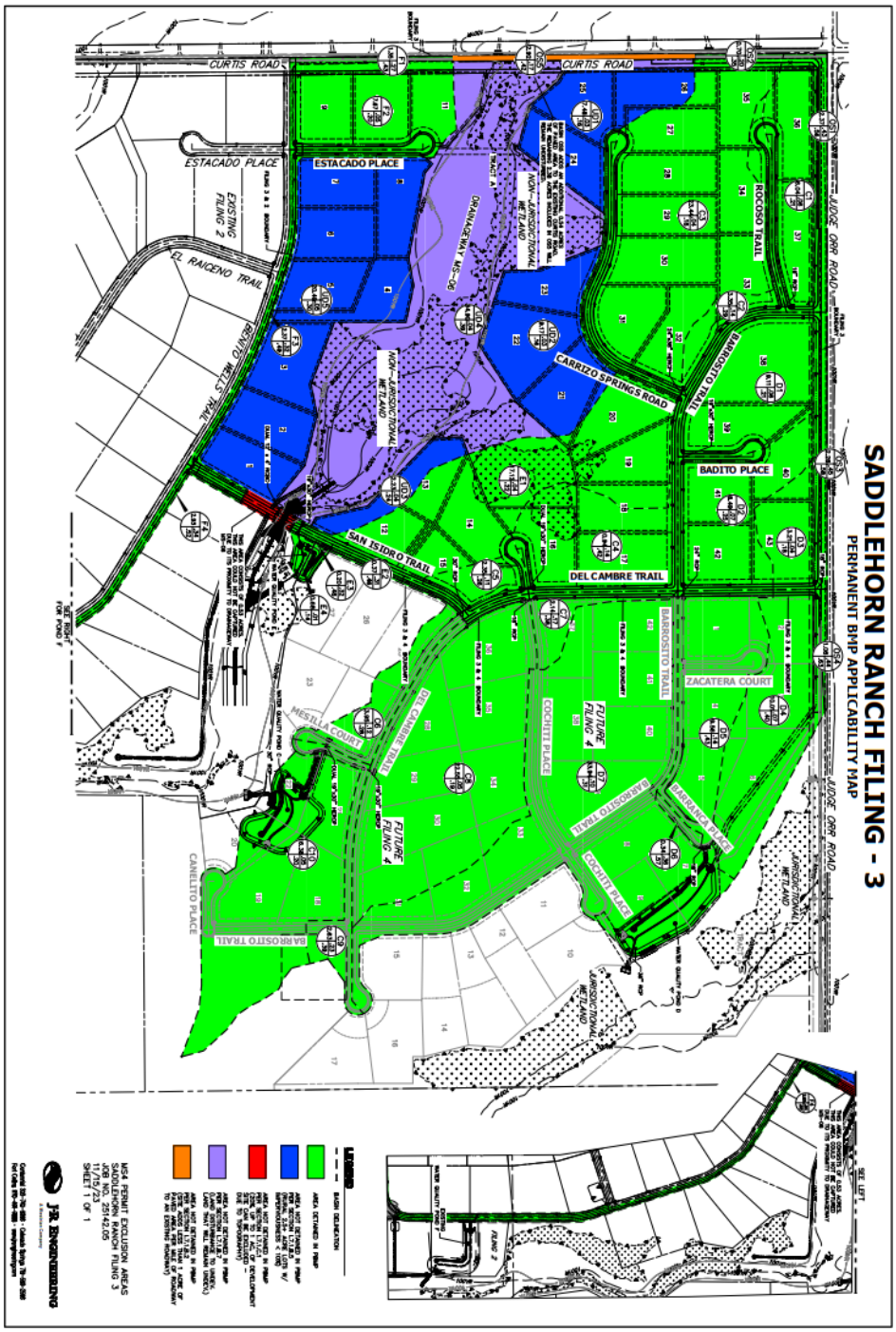
SADDLEHORN RANCH FILING - 3
PERMANENT BMP APPLICABILITY MAP
CURTIS ROAD
ESTACADO PLACE
EXISTING FILING 2
EL RAICENO TRAIL
RAINO WELLS TRAIL
DRAINAGEWAY MS-06
NON-JURISDICTIONAL WETLAND
ROCOSO TRAIL
JUDGE ORR ROAD
CARRIZO SPRINGS ROAD
BARROSITO TRAIL
BADITO PLACE
SAN ISIDRO TRAIL
DEL CAMBRE TRAIL
ZACATERA COURT
MESILLA COURT
COCHITI PLACE
FUTURE FILING 4
CANELITO PLACE
SEE LEFT
SEE RIGHT FOR POND F
MS4 PERMIT EXCLUSION AREAS
SADDLEHORN RANCH FILING 3
JOB NO. 231412.05
11/15/23
SHEET 1 OF 1
J.R. ENGINEERING

EXHIBIT C
Permanent BMP Inspections, Operations and Maintenance (O&M)
(83 pages)

EXHIBIT D

Open Drainage Channel Inspections, Operations and Maintenance (O&M)

Routine maintenance of the open drainage channel system consists of litter and debris pickup, vegetation management, erosion control, and sediment removal when necessary. Removal of excessive shrubs and trees is required to ensure that the channel will flow in conformance with the original design. Mowing and vegetation management shall be performed with care to ensure that soils remain stable and not to cause erosion. Noxious weed management shall be performed as necessary and as required under project approval conditions. All dead trees and trees growing in the flowline of a structure such as a bridge or culvert shall be removed.

Removal of sediment shall be performed with the use of equipment such as a skid steer, backhoe, and front-end loader. The removed materials shall be hauled to an acceptable landfill site unless otherwise legally permitted to be utilized elsewhere. Materials are not to be stored onsite. Equipment shall utilize the designated access roads and shall not be used in a manner to cause damage to adjacent vegetated and stable areas to the extent possible. If drainage channels contain wetlands many activities, including maintenance, may be subject to regulation and permitting.

Erosion control and restoration work such as side slope reconstruction, revegetation, riprap installation, and other stabilization methods will require the use of heavy equipment.

Maintaining altered watercourses is a minimum requirement of the National Flood Insurance Program (NFIP). In fact, failure to maintain such watercourses may result in a revision to the community's Flood Insurance Rate Map (FIRM). If a stream is altered after the community's FIRM is published, the NFIP requires the community to ensure that the channel's carrying capacity is not adversely altered. This is required in 44 CFR 60.3(b)(7) of the Federal Emergency Management Agency's (FEMA's) NFIP regulations.

Table 1 – General Channel Maintenance Guidelines

Activity	Maintenance Action	Frequency of Action
Mowing, vegetation management, and lawn care	Occasional mowing to limit unwanted vegetation. Maintain irrigated turf grass as 2 to 4 inches tall and non-irrigated native grasses at 4 to 6 inches tall.	Routine – depending on aesthetic requirements.
Debris and litter removal	Remove debris and litter from the entire channel to improve flow characteristics and aesthetics. Dispose of as appropriate.	Routine – including annual, pre-storm season (April and May) and following significant rainfall events.
Erosion and sediment control	Repair and revegetate eroded areas in the channel.	Non-routine –as necessary based on inspection.
Structural	Repair inflow structures, low flow channel linings, and energy dissipation structures as needed.	Non-routine – repair as needed based on regular inspections.
Inspections	Inspect channel to ensure continued function as initially intended. Check for erosion, slumping, excessive sedimentation, overgrowth, embankment and inflow integrity, and damage to any structural elements. Report any illicit discharge immediately.	Routine – annual inspection of hydraulic and structural facilities. Also check for obvious problems during routine maintenance visits.
Nuisance control	Address odor, insects, and other issues associated with stagnant or standing water.	Non-routine –as necessary per inspection or complaint.
Sediment removal	Remove accumulated sediment from the channel bottom.	Non-routine –as necessary per inspection.

Routine Maintenance Activities

The majority of this work consists of scheduled mowing, litter and debris pickups for the drainage channel during the growing season. It also includes activities such as weed control. These activities normally will be performed numerous times during the year. These items typically do not require any prior correspondence with EPC, however, completed inspection and maintenance forms shall be retained and submitted to EPC for each inspection and maintenance upon request. The Routine Maintenance Activities are summarized below, and further described in the following sections.

Table 2 – Summary of Routine Maintenance Activities

Activity	Maintenance Action	Look for:	Minimum Frequency
Mowing	2”-4” irrigated grass height; 4-6” natural grass height	Excessive grass height/aesthetics	Routine – twice annually
Litter / Debris Removal	Remove and dispose of litter and debris	Litter / debris in drainage channel	Routine – twice annually
Woody growth control / weed removal	Treat w/herbicide or hand pull	Noxious weeds, undesirable vegetation	Routine – minimum twice annually

Properly dispose of litter and debris materials at an approved landfill or recycling facility. It should be noted that major debris removal may require other regulatory permits prior to completing the work.

Noxious weeds and other unwanted vegetation must be treated as needed throughout the drainage channel. This activity can be performed either through mechanical means (mowing/pulling) or with herbicide. Consultation with the County Environmental Division is recommended prior to the use of herbicide. Herbicides should be utilized sparingly and as a last resort. All herbicide applications should be in accordance with the manufacturer's recommendations.

Minor Maintenance Activities

This work consists of a variety of isolated or small-scale maintenance/operational problems. Most of this work can be completed by a small crew, hand tools, and small equipment. These items may require prior approval from EPC depending on the scope of work. Completed inspection and maintenance forms shall be retained for each inspection and maintenance period. In the event that the drainage channel needs to be dewatered, care should be given to ensure sediment, filter material and other pollutants are not discharged. The appropriate permits shall be obtained prior to any dewatering activity.

Table 3 – Summary of Minor Maintenance Activities

Activity	Maintenance Action	Look for:	Minimum Frequency
Sediment/Pollutant Removal	Remove and dispose of accumulated sediment from the channel bottom.	Minor sediment and pollution build-up in channel bottom; potential decrease in channel flow rate	Non-routine – as needed based on inspection.
Erosion Repair	Repair eroded areas and revegetate; address cause.	Rills/gullies on sides of channel	Non-routine – as needed, based on inspection.

Major Maintenance Activities

This work consists of larger maintenance/operational problems and failures within the stormwater drainage facilities. This work will likely require approval from EPC Engineering to ensure the proper maintenance is performed. This work requires that Engineering Staff review the original design and construction drawings to assess the situation and necessary maintenance activities. This work may also require more specialized maintenance equipment, design plans/details, surveying, and assistance through private contractors and consultants. In the event that the drainage channel needs to be dewatered, care should be given to ensure sediment, filter material and other pollutants are not discharged. The appropriate permits shall be obtained prior to any dewatering activity.

Table 4 – Summary of Major Maintenance Activities

Activity	Maintenance Action	Look for:	Minimum Frequency
Major Sediment / Pollutant Removal	Remove and dispose of sediment. Repair vegetation as necessary	Large quantities of sediment in the channel and reduced conveyance rate/capacity	Non-routine –as necessary based on inspection.
Major Erosion Repair	Repair erosion – find cause of problem and address to avoid future erosion	Severe erosion including gullies, excessive soil displacement, unusual areas of settlement, holes	Non-routine –as necessary based on inspection.
Structural Repair	Structural repair to restore portions of the channel to its original design	Deterioration and/or damage to structural components – broken concrete, damaged pipe, drop/check structures or dissipators	Non-routine –as necessary based on inspection.
Drainage Channel Rebuild	Contact EPC Engineering	Overall channel failure	Non-routine –as needed due to complete failure of drainage channel

Inspection Procedures

Periodic inspections of drainage channels and associated stormwater control measures in developed areas are needed in every community to prevent the accumulation of debris deposited by storms, dumping, or natural processes. Inspections must be conducted at least once each year and after each storm that could adversely impact the drainage system. Inspections are also needed in response to citizen complaints.

Conduct annual visual inspections during the dry season to determine if there are problem inlets where sediment/trash or other pollutants accumulate. Inspection and maintenance records should be used to determine problem areas that may need to be checked more often. Appropriate action must be taken after an inspection identifies the need for maintenance or cleaning.

The attached form includes the typical information necessary for and during an inspection. Similar forms or electronic record keeping may be utilized if all relevant information is recorded. The entity responsible for channel maintenance is required to submit the periodic inspection reports upon request by County Staff. Inspections involving decisions about structural issues shall be signed by a licensed professional engineer.

Inspections of inflow structures including detention spillways and water quality outlet pipes discharging to the channel shall be coordinated with channel inspections.

Illicit discharges such as dumping of home goods or garbage, appliances, yard wastes, paint spills, abandoned oil containers and other pollutants shall be immediately reported to EPC Staff and other agencies as appropriate. Reference El Paso County Ordinance No. 07-01, as amended. EPC recommends that the responsible entity encourage public

reporting of improper waste disposal by posting “No Dumping” signs, neighborhood notices, and/or social media when available, with contact information to report violations.

Wetlands

If drainage channels contain wetlands many activities, including maintenance, may be subject to regulation and permitting. The responsible maintenance entity shall maintain wetlands vegetation as appropriate and in consultation with the proper authorities including the U.S. Army Corps of Engineers when applicable. The responsible maintenance entity shall ensure proper training / licensing of contractors and staff to minimize the potential for damages to the wetlands.

All applicable safety and environmental considerations with regards to the application of any pesticides or herbicides shall be verified. It is also strongly encouraged that the responsible entity employ or consult a wetlands specialist or certified arborist with the ability to identify invasive/exotic species. Due to the sensitive nature of using chemicals near water bodies, a written Quality Assurance/Quality Control (QA/QC) plan shall be implemented.

Employees shall be trained in accordance with any local, state, and federal regulations and laws prior to any application of chemicals. A copy of the QA/QC plan must be submitted to the County Environmental Division prior to any chemical applications. In addition to the QA/QC plan, copies of the Safety Data Sheets (SDS) for all the chemicals being used shall be provided upon request.

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1972.

Section 404 - establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. CWA Section 404(b)(1) Guidelines – U.S. Environmental Protection Agency (EPA) (Although they are called “guidelines,” these criteria are established in regulations (40 CFR Part 230) and are legally binding.)
https://www.epa.gov/cwa-404/clean-water-laws-regulations-and-executive-orders-related-section-404

Open Drainage Channel Inspection Report Form

Date: _____ Inspector: _____

Type of inspection: Post-Storm _____ Complaint _____ Routine _____

Location: (Identify stream or basin name, downstream and upstream streets or reference points, and location of problem. Provide sketch as needed.)

_____

_____

_____

Type of problem: Litter ___ Minor ___ Obstruction ___ Structural ___ Illicit Discharge** ___

Recommended maintenance: _____

_____

_____

Is equipment needed? _____ If so, list equipment needed: _____

_____

Date: _____ Offsite Right of entry needed? _____

Work order description: _____

_____

_____

_____

_____

State permit(s) needed? _____ Work order number: _____

Date: Crew chief: _____

Maintenance performed: _____

_____

_____

_____

Inspected by: _____

Use other side for additional recommendations for this site.

****Report illicit discharges to the County and appropriate agencies.**