CITY OF ALBUQUERQUE

Planning Department
David S. Campbell, Director

Timothy M. Keller, Mayor

April 1, 2019

David Thompson, P.E.
Thompson Engineering Consultants, Inc.
PO Box 65760
Albuquerque, NM 87122

RE: 9050 Alameda Blvd NE
Grading and Drainage Plan Stamp Date: 2/20/19
Drainage Report Stamp Date: 2/20/19
Hydrology File: C20D077

Dear Mr. Thompson:

Based upon the information provided in the submittal received on 2/20/2019 the above-referenced project cannot be approved for Building Permit or Grading Permit until the following are addressed.

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1. Frontage improvements must be shown a Site Plan and included on an Infrastructure List (IL) submitted to the DRB for approval. A Plat will be required for dedication of public right of way and granting of drainage easements for the floodplain and associated drainage infrastructure. Use the standard plat drainage easement note for the private maintenance of the infrastructure in the drainage easement.
2. The same infrastructure improvements must be shown on the G&D Plan. Only show the improvements necessary for this development on this G&D Plan and in the "Proposed" HEC-RAS model. This development may be identified as the second phase of a 2 phase development with the first phase including all of the arroyo improvements associated with Signal Village in which case both phases must be included on the G&D Plan, IL, and HEC-RAS model. Alternatively this development might be a standalone development excluding all of the offsite grading and infrastructure of Signal Village from the G&D Plan, IL, and HEC-RAS model. If this development is stand-alone then a separate "Future" HEC-RAS model is also needed to verify that these improvements will still work after the floodplain improvements on the south side of the arroyo and the future culvert on the Ventura St crossing of the La Cueva Arroyo are constructed.
3. Identify all aspects of the arroyo treatment, and show them clearly on all exhibits.
    a. Excavation is still shown on lot 15 in the HEC-RAS model even though grading is not shown on that lot on the G&D Plan. Will this development be relying on permission from the owner of lot 15 to
        i. Increase BFE
        ii. Grade on lot 15

iii. Construct grade control structures on lot 15
iv. Any other impacts or construction on lot 15.

b. Is the floodwall/ bank protection on lots 17 & 18 part of the infrastructure to be built by this project? It is shown in the HEC-RAS model but it is missing from the G&D Plan.

c. Grade control structures will be required as part of this development if this development includes grading of the arroyo as shown on the G&D Plan and as modeled in the HEC-RAS. The natural braded arroyo is being replaced with a relatively clean straight channel where the supercritical flow regime is likely and sediment transport rates may significantly exceed the amount of sediment supplied from the natural braded channel upstream. The sediment transport calculations were missing from this report (include all calculations). Use subcritical results from the HEC-RAS to calculate the bed- load transport rate east of Ventura and compare to normal depth calculations for the typical channel (n=0.02) and equilibrium slope (about 0.2%) next to this development and the existing subdivision to the west. Use a consistent partial size for all calculations. Typical sections used in the calculations must agree with the typical sections shown on the G&D Plan.

d. Correct the HEC-RAS models to agree with 'a' and 'b' above. Also:

i. In the report explain the source of topography , assumptions for encroachments, Manning's 'n' value, and improvements for each model and use FEMA titles and labels for each model such as
   1. Duplicate effective
   2. Corrected effective - "Existing Conditions"
   3. Proposed Conditions - including only what this project will actually build and include in the LOMR
   4. Future Conditions w/ north over bank encroachment (if the bank protection on Lot 16 is to be included with this project then this model may be omitted),
   5. Future Conditions w/ north over bank encroachment and bridge at Ventura.

ii. Straighten out the channel center line and make the sections perpendicular to the direction of flow adjacent to this development and provide smooth transitions at either end of this development. The channel and bank protection should be parallel.

iii. The Corrected Effective model is modeling the ineffective flow area at the contraction upstream of the existing subdivision too gradually and the encroachments are being overtopped. The contraction angle should be 45° or more measured from the new centerline above. Elevations should not be specified on the encroachments to avoid overtopping.

iv. The grades in the Proposed HEC-RAS model at section 1527 are different than what is shown on the grading plan. Both the grading plan and the HEC-RAS section must be fixed to show the grades in

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accordance with the typical section of Ventura St. Account for C&G and sidewalk whether deferred or not. Provide a profile of Ventura St existing and future road grades and a typical section through the floodwall on the east side of this lot, sidewalk and C&G. If the developable portion of the lot next to Ventura is not elevated above the 100-yr WSEL, plus freeboard, then the east property line must be designated as a levee and all design requirements of FEMA (44CFR, Ch.1, Section 65.10) must be demonstrated in this report.

v. Split flows may occur at the La Cueva Arroyo crossing of Alameda Blvd 600' east of Ventura St. The north limits floodplain at section 2035 as shown on Exhibit A (missing) don't agree with the HEC-RAS model and should spread farther into Alameda than shown. Correct the map of the floodplain and add additional sections near this location and identify the location of the ridge between the road and the arroyo in the plan view and on the sections. Then evaluate the amount of flow on the road side of the ridge in each section. The split flow may not be deep enough to be mapped as a floodplain, but the 100 year flows must be accounted for in the design of this lot and the frontage improvements. Alternatively Alameda road may be redesigned to prevent the split flow with freeboard. The frontage infrastructure must be designed to handle the 100 year peak flow rate in accordance with the DPM instead of the onsite dirt ditches currently shown.

e. Exhibit A is referenced in this report but it is missing. If you use Exhibit E from the report for Signal Village then please correct the scale of the Topo Work Map, Exhibit A, and identify the source of topography, surveyor name, registration number, date and datum of survey. Show stationing along the HEC-RAS centerline on both the Topo Work Map and on the G&D Plan with bearings, distances, and curve data. If coordinates are used to identify survey baseline control points on the HEC-RAS centerline and on the G&D Plan (Sheet C104) then a survey control sheet stamped by a registered professional surveyor must be included in the G&D Plan with ties to NM State Plane, ground to grid factor, and basis of coordinates (ground or grid). Alternatively use property corners for control points and property lines for baselines. Also show stationing control points along each cross-section (recommend 1000 at centerline)

f. On the profile of the arroyo show the existing and proposed invert, equilibrium invert, grade control structures, bank protection, and proposed water surface. Also show the future culverts at Ventura labeling the size, slope, flow rate, velocity, and invert elevations. Label proposed invert elevation, the required scour elevation, the water surface elevation, and the freeboard elevation at each HEC-RAS section. Show the proposed scour wall, and label the station and elevation of each 8" step.

g. Identify horizontal and vertical tie-in points for the SFHA and BFE on the Topo Work Map and on an Annotated FIRM and discuss in the report conclusion. Tie-in

should be as close as possible to the development. The transition may be easier to accomplish if you first add 2.7' to the downstream Duplicate Effective BFEs on NGVD '29 to convert to NAVD '88.

i. Where is the downstream tie-in point?
ii. What is the downstream limit of the new topo survey and the corrected cross-sections?
iii. Where does the Corrected Effective HEC-RAS model transition back to the previous Duplicate Effective HEC-RAS sections?
iv. Show the City Limits on the east side of Ventura St. If revisions to the BFE or SFHA are proposed in Bernalillo County then written approval from the County will be required.

h. The elevation comparison table seems to be missing. Compare the duplicate effective water surface elevations to the corrected effective elevations and compare corrected effective to proposed elevations. Add a narrative comparison of duplicate effective to corrected effective and a comparison of corrected effective to proposed elevations in a new "Conclusions" section in the report.

4. Scour Wall design calculations and details are required including scour depth calculations, freeboard calculations, and super-elevation calculations. Include all calculations computer models and excel spread sheets not merely a summary table. The HEC-RAS results in Scour Depth calculation table do not agree with the HEC-RAS tables in the report or with the computer model even when it is run mixed. The scour depths that I calculate using the HEC-RAS model mixed is about one foot deeper using the parallel flow equation. Use equation 3.88 for the wall on the east side of this lot. Revisions to the HEC-RAS model should be made before updating these calculations as there seems to be major disagreement between the Channel width measured on the plan and the top width from the HEC-RAS model because the sections are skewed instead of perpendicular to the flow.

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a. The footing of the scour wall looks too small. The footer has to support the wall after the soil is removed from the low side to the scour depth. Please provide structural calculations including loading assumptions stamped by a registered professional engineer to accompany the wall details shown on the G&D sheets.
b. Layout the scour/floodwalls, easements, and property lines on the G&D Plan to clearly demonstrate that the footings are contained in the easements and do not encroach into the right of way. Either layout all of the footers or just use the largest footer to dimension between the wall and the easement and property lines.

5. The Grading and Drainage Plan should clearly identify all of the property lines, easements, and improvements that are part of this development. It should include the arroyo profile sheet (see 3.f above), typical sections, and structural details on sheets that are numbered sequentially (for example 1 of 5, 2 of 5, etc) or place an index to sheets on the first page, so that it is clear which sheets are included in the plan.
    a. Differentiate between existing conditions (dashed line type) proposed by this development (solid line type) and future development (screened line type) and identify phasing of the improvements if necessary on the G&D Plan.

b. Show the scour wall and the easement line on the G&D Plan. Either show the footer or a dimension between the wall and the easement that will contain the widest footer.
c. The easement lines on the G&D Plan and Plat must agree with each other.
d. Individual single family detached residential building permits are exempt from Stormwater Quality Volume requirements, so the BMP pond is not required.

6. Typical sections are required at all retaining walls (not just the scour wall) at the point of maximum retainage showing existing ground, proposed grades, the ROW/property line or easement line, and dimensions. Typical sections are needed through all four sides of the property including typical sections of the proposed adjacent streets and the existing wall/fence on the west side of the property. Floodwall footings must be contained in an easement In accordance with DPM Ch.22, section 5 part B, Show that grading and wall construction near the property line does not endanger adjacent property or constrain its use.
    a. If any such encroachment is made the following must be obtained:
        i. Any private encroachment into the public ROW will require a revocable permit. (east scour wall along Ventura)
        ii. Any private encroachment into a public easement will require an encroachment agreement. (none noted)
        iii. Any private encroachment into neighboring private property will require written and signed permission from both property owners. (potentially the west retaining wall, section is missing)
    b. The retaining wall details on sheets S1 and S2 don't contain the information requested in this comment, specifically the easement and property lines. There is also no indication where each section applies.
    c. The typical section and profile of the east boundary must accommodate and show the future grade of Ventura and the grade proposed with this project. Provide a road profile showing both the existing and the future road grade after the Ventura box culverts are constructed, and then show both grades in the typical section of the east boundary. The Ventura St Right of way grading must be shown on the G&D Plan per the typical street section even if the infrastructure is deferred. The HEC-RAS model should reflect the grade of the road in the section used to determine the WSEL upstream of this lot.
7. AMAFCA approval of the G&D Plan, Drainage Report, and Plat is required.
8. A separate floodplain development permit must be obtained from Rudy Rael at rrael@cabq.gov prior to any work in the floodplain. A draft Elevation Certificate must be submitted for approval prior to approval of the floodplain development permit unless a CLOMR is issued by FEMA first.
9. If this project includes grading in waters of the US then written concurrence with the grading and drainage plan is required from the USACE indicating compliance with section 404 of the clean water act prior to approval of the Grading Permit. The limits of any Waters of the US must be shown on the Grading and Drainage Plan and conditions of the Section 404 Nationwide permits must be stated on the G&D plan.

Prior to Release of Financial Guarantee:

10. Engineer's Certification, per the DPM Chapter 22.7: *Engineer's Certification Checklist For Subdivision* is required.
11. Work Order Closeout Package for the floodplain infrastructure per DPM must be submitted.
12. Depending on the scope of the arroyo improvements associated with this lot a Letter of Map Revision (LOMR) may have to be obtained from FEMA after construction is complete. When a CLOMR has been issued by FEMA, a portion or all of the SIA and financial guarantees for the improvements may be released prior to the LOMR being issued by FEMA, but the financial guarantee for the LOMR will not be released prior to the effective date of the LOMR. Submittal of a copy of the LOMR from FEMA is required for release of the balance of the financial guarantees and IIA's when issuance is a condition of release

As a reminder, if the project total area of disturbance (including the staging area and any work within the adjacent Right-of-Way) is 1 acre or more, then an Erosion and Sediment Control (ESC) Plan and Owner's certified Notice of Intent (NOI) is required to be submitted to the Stormwater Quality Engineer (Curtis Cherne, PE, ccherne@cabq.gov, 924-3420) 14 days prior to any earth disturbance.

If you have any questions, please contact me at 924-3986 or e-mail at jhughes@cabq.gov .

Sincerely,

James D. Hughes, P.E.
Principal Engineer, Hydrology
Planning Department

PO Box 1293
Albuquerque
NM 87103
www.cabq.gov

DRAINAGE REPORT
FOR
LOT 16, BLOCK 4, TRACT 3, UNIT 3
NORTH ALBUQUERQUE ACRES

February 2019

DRAINAGE REPORT
FOR
LOT 16, BLOCK 4, TRACT 3, UNIT 3
NORTH ALBUQUERQUE ACRES

Prepared for:
LLAVES ENTERPRISES, INC.

Prepared by:
Thompson Engineering Consultants, Inc.
P.O. Box 65760
Albuquerque, NM 87193

February 2019

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INTRODUCTION AND SITE LOCATION

This Drainage Report addresses the conveyance of existing offsite runoff and developed onsite runoff from Lot 16, Block 4, Tract 3, Unit 3, North Albuquerque Acres. Lot 16 is located southwest of the Almeda/Ventura intersection. A single family home will be constructed on this lot. Currently offsite flows enter the property at the northeast corner and runs to the southwest corner of the property to the La Cueva Arroyo.

METHODOLOGY

The hydrologic and hydraulic criteria in Section 22 of the City of Albuquerque Development Process Manual (DPM), entitled "Drainage, Flood Control, and Erosion Control," was followed to perform the analyses given in this report. The design storm used for both the existing undeveloped and developed conditions of the Assisted Living Site is the 100-year, 6-hour storm event for peak flow computations. The property is located in Zone 3, which has a 100-year 6-hour storm event of 2.60 inches.

EXISTING DRAINAGE CONDITIONS

INTRODUCTION

Lot 16 generally drains from northeast to southwest in a drainage depression discharging to the La Cueva Arroyo. There are offsite flows entering the site at the northeast corner of the property and is conveyed through the property to the La Cueva Arroyo at the southwest portion of the property.

The FEMA Flood Insurance Rate Map Number 35001C0141G, effective date September 26, 2008, shown in Appendix A, indicates the presence of a Zone AO flood hazard zone with a depth of 1 foot and Zone AE with base flood elevations on the site.

OFFSITE FLOWS

As shown in Appendix A, The La Cueva Arroyo is within a FEMA Floodplain classified as Zone AE. This report uses the hydrologic analysis provided in the North Albuquerque Acres Master Drainage Plan (NAAMDP) by Resource Technology Inc. (RTI) dated October 1998. The NAAMDP should be referenced for general drainage background. The historic flow rate chosen for the La Cueva Arroyo is 3,048 cfs at Ventura and 3,094 cfs at Barstow, according to a previous LOMR done by FEMA and the NAAMDP, see Appendix B for Hydrology Background.

A hydraulic model of the La Cueva Arroyo was developed to determine if the 100-year peak flows in the arroyo overtops the north bank of the arroyo and runs west in the Alameda Right-of-Way to the northeast corner of Lot 16. La Cueva arroyo was modeled using HEC-RAS 5.0.1 for existing conditions. To better understand the arroyo's

behavior, cross sections were added and extended upstream of Lot 16 and northeast of Ventura Street to include Alameda Boulevard. The manning's coefficient for the natural arroyo was assumed to be 0.035 for the stream bed and 0.035 for the banks based of field observation of existing conditions. As shown on Exhibit A, the model run indicates that the water surface elevation does not excceed the north bank, therefore the entire 100-year peak flow remains within the main channel. Refer to Appendix C for the HEC-RAS analysis.

There is only one offsite drainage basin that drains onto Lot 16. The basin, shown on Exhibit A, starts south of the arroyo banks and continues along Alameda Blvd. to the Ventura Intersection. The 1.23-acre basin has a 100-year discharge of 3.77 CFS (refer to Appendix D for Hydrologic Analysis).

ON-SITE FLOWS

Lot 16 generally drains from northeast to southwest to the La Cueva Arroyo. The peak flow and volume that discharges to the La Cueva Arroyo are 1.1 CFS and 1,411 cubic feet. Table 1 shows the existing conditions hydrology results.

Table 1 Existing Drainage Conditions

BASINS	Area (acres)	100yr-6hr Peak Flow (cfs)	100yr- 6hr Runoff Volume (cubic feet)	Land Treatment
Offsite Basin	1.23	3.77	5,517	46%A, 32%C, 22%D
Lot 16	0.589	1.10	1,411	100%A

DEVELOPED DRAINAGE CONDITIONS

HYDROLOGIC ANALYSIS

To determine the peak flows a hydrologic analysis was performed in accordance to section 22.2 of the Development Process Manual (DPM). The 100-year 6-hour storm was the basis for determining peak flow and for determining peak volume.

The site was assigned land treatment values in accordance with Tables A-4 and A-5 of the DPM's section 22.2. Table 2 shows the Land Treatments and peak flows for the lot. See Appendix D for hydrologic calculations.

Table 2 Developed Drainage Conditions

BASINS	Area (acres)	100yr-6hr Peak Flow (cfs)	100yr- 6hr Runoff Volume (cubic feet)	Land Treatment
Lot 16	0.589	2.41	3,804	23.1%B, 23.2%C, 53.7%D

DRAINAGE CONCEPT

Description

Lot 16 will be graded to follow the existing drainage patterns. Runoff from the impervious areas will collected in swales and conveyed to first flush retention pond at the southwest corner of the developed area. The first flush pond has a volume of 390 cubic-feet with a depth of 0.7 feet. Larger infrequent flows will overflow from the pond through a rock overflow to the La Cueva Arroyo. Along the southern boundary of the developed area and the east property line a scour wall will be constructed to protect the developed area of the lot. The offsite flows will be intercepted in a rock-lined channel in the Ventura right-of-way adjacent to the east property line and conveyed to the La Cueva Arroyo.

Scour Wall Analysis

The proposed scour wall along the south side of the developed area of Lot 16 was analyzed using Sections 3.4 and 3.5 in the AMAFCA Sediment and Erosion Design Guide from 1994. Using the HEC-RAS results, the scour analysis was completed to determine the scour wall depth and height for the worst case between assuming a box culvert under Ventura and Ventura in its existing condition. The proposed parallel scour wall along the Signal Village Subdivision to the south of Lot 16 is located a distance of 104 feet to 133 feet. Since there are parallel scour walls along the arroyo the maximum lateral erosion distance is reduced per figure 3.24. Therefore, the total scour depth along the Lot 16 scour wall is due to the parallel scour along the wall as there is no impingement scour acting on the wall. See Appendix E for the scour wall calculations.

A Scour Wall is proposed along the south boundary of the developed area beginning at Ventura and continuing to the west property line. The purpose of the Scour Wall is to contain the incoming arroyo flows from the east, thus protecting the future development for this specific location. As shown in the scour analysis included in Appendix E, the total wall height varies from 12.00 to 14.00 ft and the estimated scour varies from 3.00 to 4.41 ft. The total wall height is based on the scour depth plus one foot to the sequent depth plus freeboard plus one foot. Table 3 shows the maximum height of the scour wall along Lot 16. The model run indicates that the scour wall reduces the floodplain on the property as shown in the attached Exhibit A.

Table 3 Maximum Scour Wall Height

HEC-RAS Station	Minimum Channel Elevation	Bottom Wall Elevation	Top Wall Elevation	Wall Height (ft)	Wall Depth Below Grade (ft)
1527	5565.88	5560.00	5572.00	12.00	5.88
1520	5565.65	5559.00	5572.00	13.00	6.65
1491	5564.61	5558.30	5570.50	12.20	6.31
1449	5563.16	5556.80	5569.60	12.80	6.36
1406	5561.68	5555.80	5568.30	12.50	5.88
1372	5560.50	5554.40	5567.50	13.10	6.10

Grading and Drainage Plan

Plate C101 shows the Grading and Drainage Plan for Lot 16. The grading plan shows that Lot 16 will be graded to follow the existing drainage patterns. Runoff from the impervious areas will collected in swales and conveyed to first flush retention pond at the southwest corner of the developed area. Larger infrequent flows will overflow from the pond through a rock overflow to the La Cueva Arroyo. Along the southern boundary of the developed area and the east property line a scour wall will be constructed to protect the developed area of the lot. The offsite flows will be intercepted in a rock-lined channel in the Ventura right-of-way adjacent to the east property line and conveyed to the La Cueva Arroyo.

APPENDIX A
ANNOTATED FLOOD INSURANCE RATE MAP 35001C0141G

APPENDIX B
HYDROLOGY BACKGROUND

APPENDIX C
HYDRAULICS ANALYSIS

APPENDIX D
HYDROLOGY CALCULATIONS

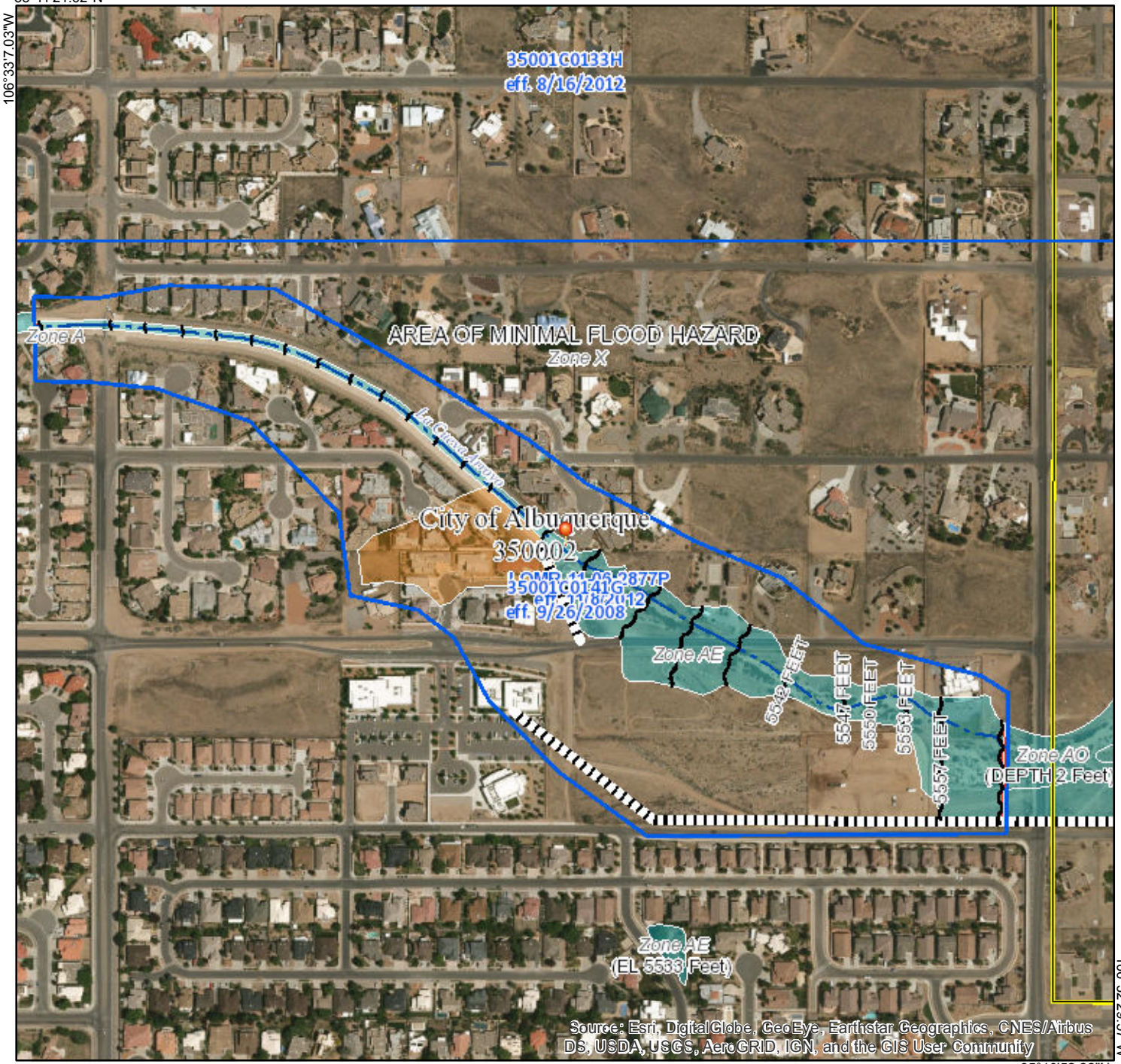
APPENDIX E
SCOUR ANALYSIS

National Flood Hazard Layer FIRMette

FEMA

35°11'21.62"N

106°33'7.03"W



106°32'29.57"W

35°10'52.22"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth
- Regulatory Floodway *Zone AE, AO, AH, VE, AR*

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/30/2018 at 1:12:52 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

D. Proposed Condition Hydrology Results

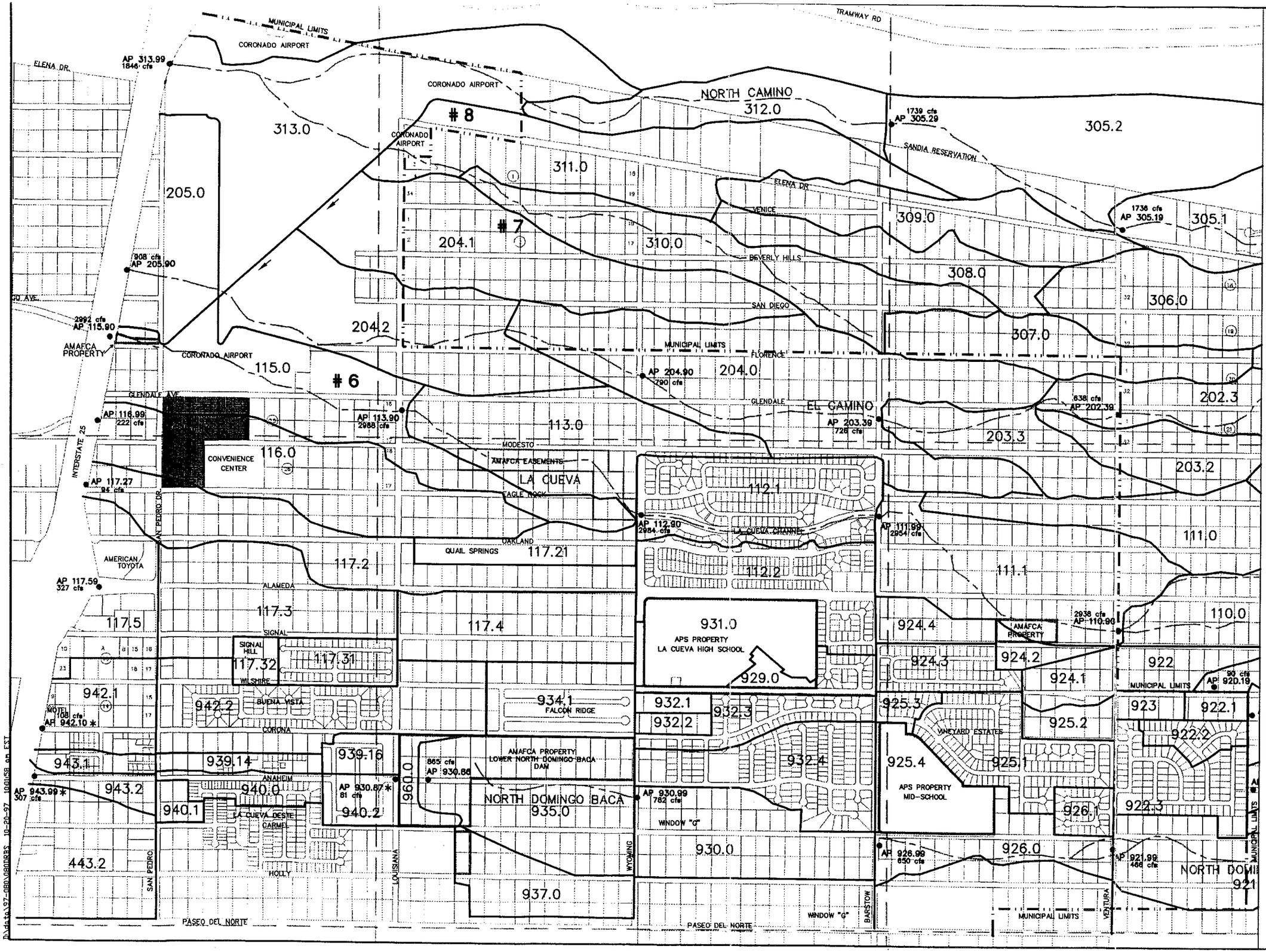
Proposed condition flow rates for future fully developed conditions from the hydrology models incorporating the above facilities are reported in Table 6. All of the interim detention ponds have been eliminated. A comparison with the hydrology results from the **1996 AMAFCA Hydrology Report** for future fully developed conditions without storm drainage or channel improvements for selected points on the main arroyos is made in Tables 7a and 7b. Except where specifically labeled as "worst case" all flow rates reported assume avulsion control.

TABLE 6a

FUTURE CONDITIONS HYDROLOGY SUMMARY (BULKED FLOW RATES)

	AREA (Sq mi)	AP #	VOL-10-YR (ac-ft)	Qp 10-YR (cfs)	VOL-100-YR (ac-ft)	Qp 100-YR (cfs)
NORTH DOMINGO BACA ARROYO						
Holbrook	3.166	919.99	129.0	305	231.1	616
Ventura	3.446	921.99	142.4	609	255.7	1171
Barstow	3.562	926.99	149.2	758	267.5	1813
Wyoming	3.870	930.99	167.4	1096	298.8	1984
Inflow to LNDB Dam	4.259	930.86	189.5	1313	337.0	2442
Out flow from LNDB Dam	4.259	930.87	189.5	170	337.0	200
I-25	4.526	943.99	205.7	400	364.7	731
LA CUEVA ARROYO[1]						
Ventura	3.766	110.90	130.0	1359	265.8	3048
Barstow	4.017	111.99	140.5	1374	284.5	3094
Wyoming	4.189	112.90	150.3	1383	301.0	3128
Louisiana	5.462	113.90	194.5	1632	390.1	3908
I-25	5.582	115.9	202.1	1640	402.6	3923
North Diversion Channel	6.871	128.90	270.8	2901	519.8	5551

[1]La Cueva and El Camino Arroyo Flow Rates reflect diversion of El Camino to the La Cueva west of Wyoming.



NORTH ALBUQUERQUE ACRES
MASTER DRAINAGE PLAN

EXISTING CONDITION

FIGURE 3A

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

CITY OF Albuquerque

Resource Technology, Inc.
Civil Engineering
Environmental Sciences
Water Resources
Landscape Architecture
Planning
1720 – B Randolph Road SE
Albuquerque, New Mexico 87106
E-mail: rti@rmsa.com
Telephone (505) 243-7300
Facsimile (505) 243-7400

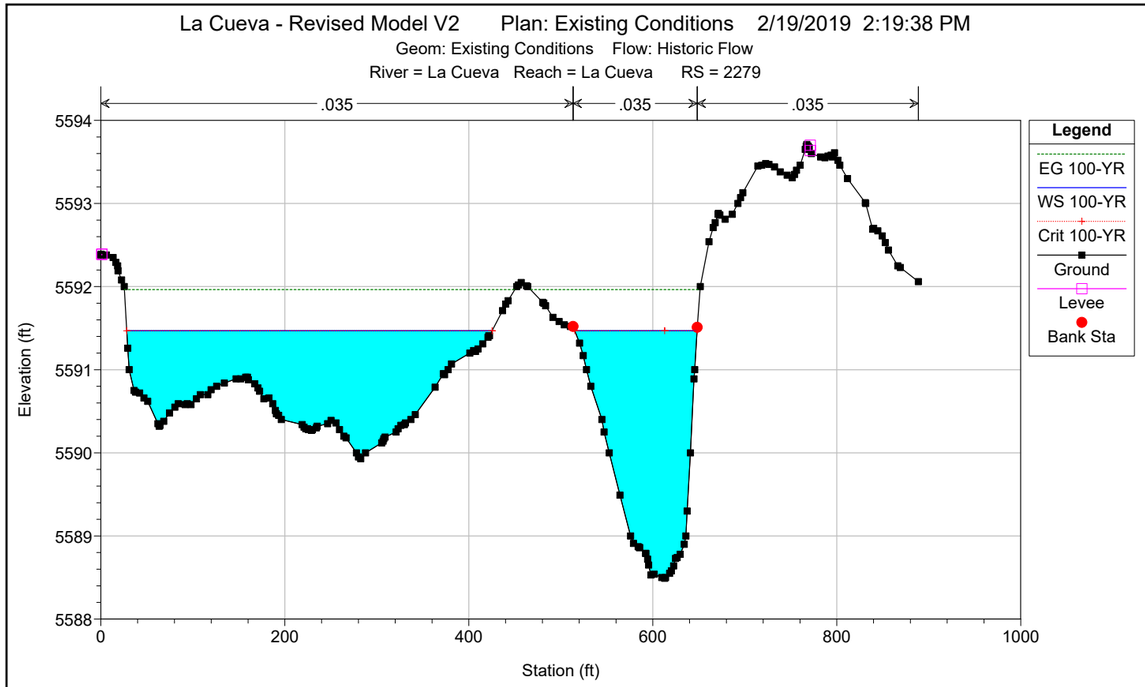
D:\data\97-080\080RBS 10-20-97 10:01:58 am EST

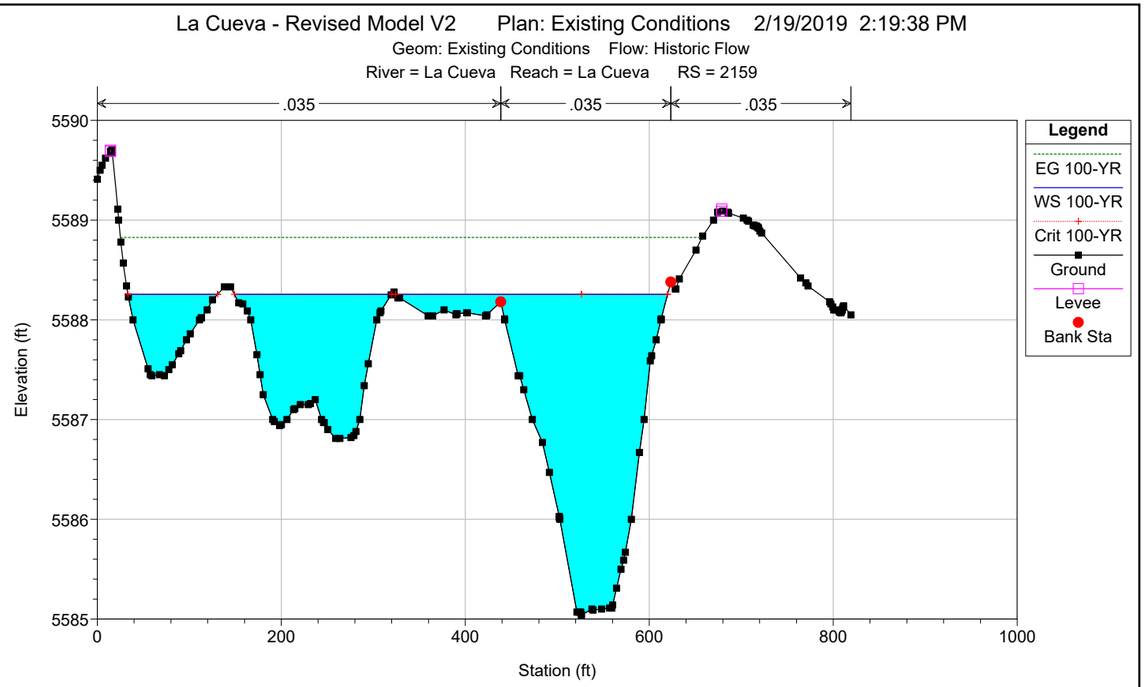
LA Cueva 100-YR FUTURE

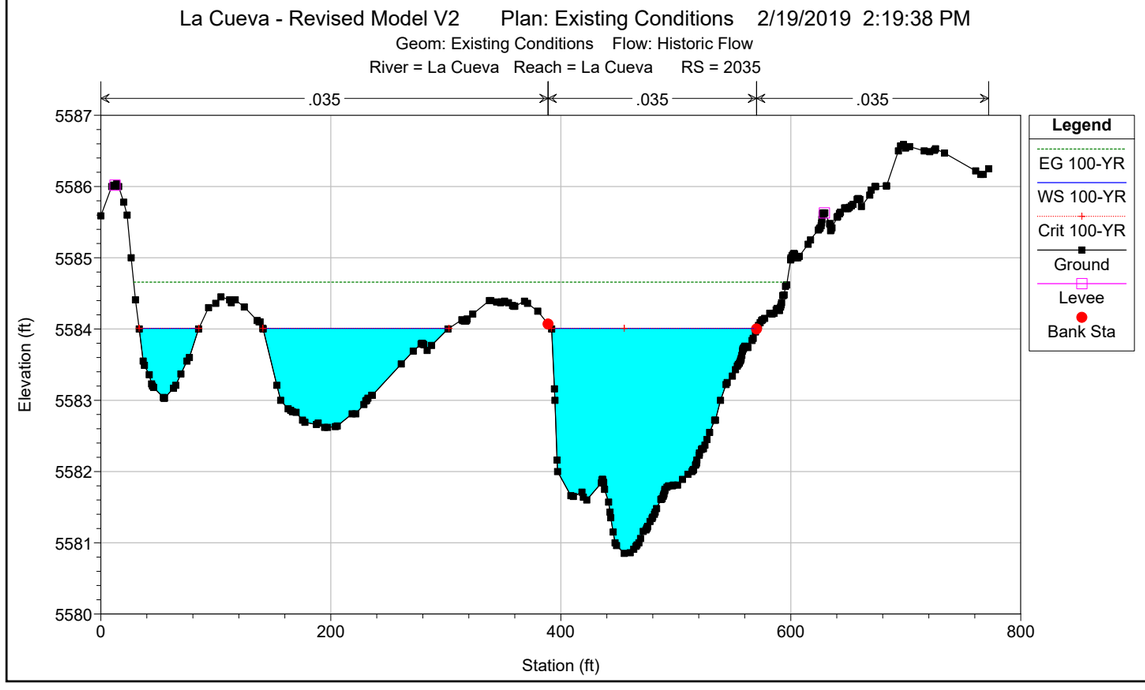
-(s16.67h8.5v0T-&18D

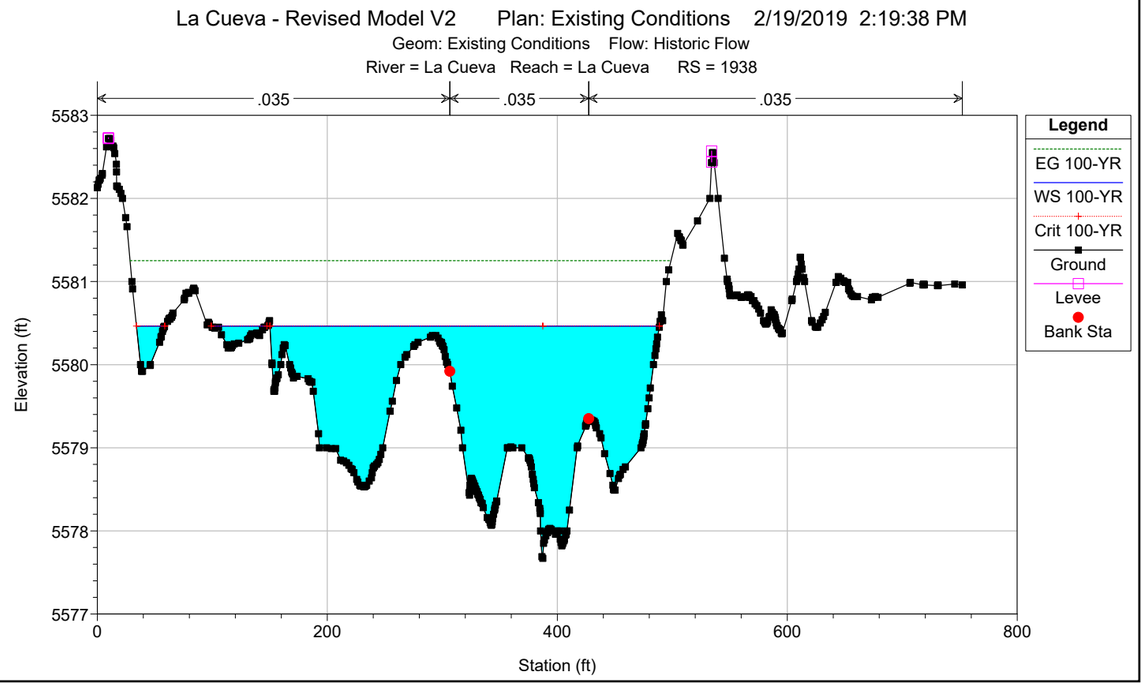
AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =06/30/1998
INPUT FILE = a:lcwyo100.fut USER NO.= RSTECHNM.STE

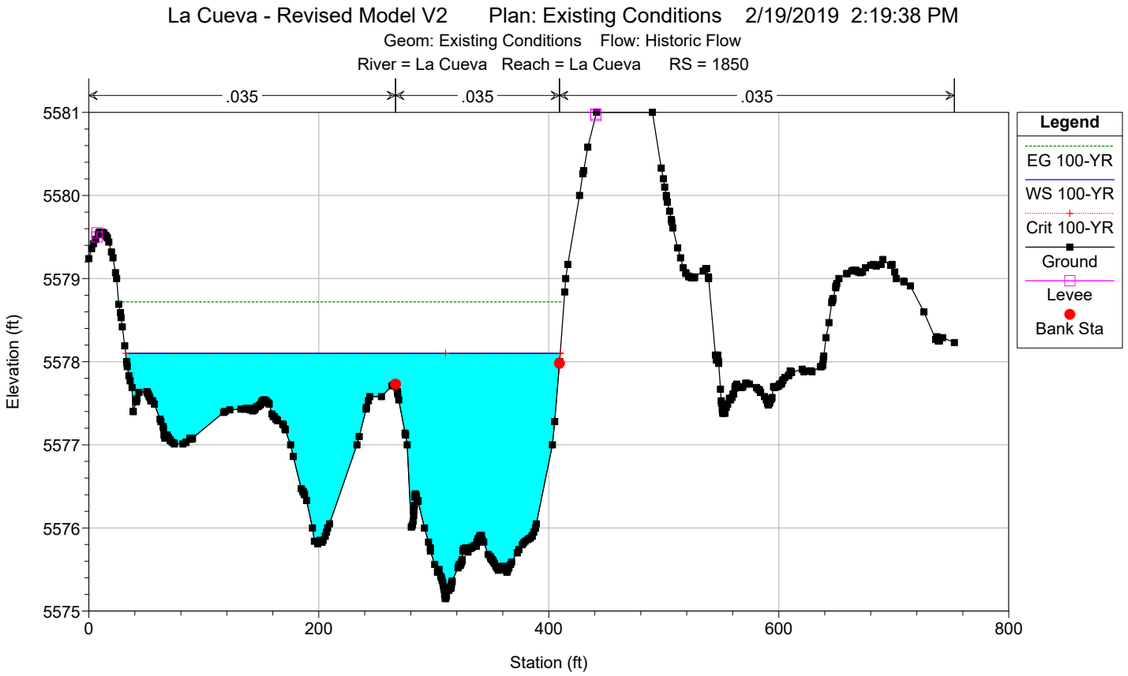
COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION	
START										TIME=	.00
RAINFALL TYPE= 2										RAIN24=	4.050
COMPUTE NM HYD	101.00	-	1	.60700	953.84	45.841	1.41600	1.650	2.455	PER IMP=	.00
ROUTE MCUNGE	101.80	1	2	.60700	912.90	45.469	1.40451	1.850	2.350	CCODE =	.1
RAINFALL TYPE= 2										RAIN24=	4.200
COMPUTE NM HYD	100.00	-	1	1.21400	1201.70	87.881	1.35730	1.850	1.547	PER IMP=	.00
ROUTE MCUNGE	100.80	1	3	1.21400	1177.21	87.700	1.35451	2.100	1.515	CCODE =	.1
ADD HYD	101.88	3& 2	5	1.82100	1882.13	133.168	1.37117	1.950	1.615		
RAINFALL TYPE= 2										RAIN24=	3.650
COMPUTE NM HYD	102.00	-	1	.87500	1033.60	54.313	1.16386	1.700	1.846	PER IMP=	.00
ADD HYD	102.90	1& 5	5	2.69600	2554.30	187.482	1.30389	1.900	1.480		
*S LA CUEVA TRIBUTARY ARROYO @ TRAMWAY BLVD. (102.9)											
ROUTE MCUNGE	102.80	5	2	2.69600	2515.07	187.100	1.30123	2.050	1.458	CCODE =	.1
RAINFALL TYPE= 2										RAIN24=	3.370
COMPUTE NM HYD	107.20	-	1	.17200	325.87	13.591	1.48157	1.550	2.960	PER IMP=	17.00
ADD HYD	107.29	1& 2	4	2.86800	2575.01	200.690	1.31205	2.050	1.403		
*S NORTH LA CUEVA AT GLENDALE AND BROWNING (107.29)											
RAINFALL TYPE= 2										RAIN24=	3.500
COMPUTE NM HYD	102.10	-	1	.09300	149.17	4.457	.89867	1.500	2.506	PER IMP=	.00
*S LA CUEVA TRIBUTARY @ TRAMWAY BLVD.											
ROUTE MCUNGE	102.18	1	2	.09300	136.20	4.395	.88600	1.700	2.288	CCODE =	.1
RAINFALL TYPE= 2										RAIN24=	3.380
COMPUTE NM HYD	107.10	-	1	.18080	399.38	14.303	1.48327	1.500	3.452	PER IMP=	17.00
ADD HYD	107.19	1& 2	5	.27380	399.38	18.697	1.28040	1.500	2.279		
*S NORTH LA CUEVA (TRIB) AT FLORENCE AND BROWNING (107.19)											
ADD HYD	107.90	5& 4	3	3.14180	2666.73	219.388	1.30929	2.000	1.326		
RAINFALL TYPE= 2										RAIN24=	3.400
COMPUTE NM HYD	106.00	-	1	.04360	95.85	3.448	1.48281	1.500	3.435	PER IMP=	17.00
ROUTE MCUNGE	106.80	1	2	.04360	86.06	3.396	1.46043	1.700	3.084	CCODE =	.1
RAINFALL TYPE= 2										RAIN24=	3.340
COMPUTE NM HYD	106.10	-	1	.11160	238.47	8.685	1.45925	1.500	3.339	PER IMP=	17.00
ADD HYD	106.19	1& 2	6	.15520	257.25	12.081	1.45958	1.550	2.590		
*S LA CUEVA TRIBUTARY ARROYO @ BROWNING (106.19)											
ADD HYD	107.99	3& 6	5	3.29700	2733.21	231.469	1.31636	2.000	1.295		
ROUTE MCUNGE	107.80	5	2	3.29700	2713.95	231.319	1.31551	2.100	1.286	CCODE =	.1
RAINFALL TYPE= 2										RAIN24=	3.230
COMPUTE NM HYD	109.00	-	1	.10060	216.30	7.552	1.40751	1.500	3.359	PER IMP=	17.00
ADD HYD	109.90	1& 2	5	3.39760	2736.13	238.871	1.31823	2.100	1.258		
RAINFALL TYPE= 2										RAIN24=	3.250
COMPUTE NM HYD	108.00	-	7	.20550	404.63	15.573	1.42091	1.550	3.077	PER IMP=	17.00
ADD HYD	109.99	5& 7	5	3.60310	2789.17	254.444	1.32409	2.100	1.210		
*S LA CUEVA ARROYO @ EUBANK (MAIN) (109.99)											
ROUTE MCUNGE	109.88	5	2	3.60310	2763.62	254.113	1.32237	2.200	1.198	CCODE =	.1
RAINFALL TYPE= 2										RAIN24=	3.130
COMPUTE NM HYD	110.00	-	1	.16340	275.61	11.738	1.34689	1.550	2.636	PER IMP=	17.00
ADD HYD	110.90	1& 2	5	3.76650	2796.05	265.851	1.32343	2.200	1.160		
*S LA CUEVA ARROYO @ VENTURA (MAIN) (110.90)- FINAL											
*S ROUTE TO BARSTOW											
ROUTE MCUNGE	110.88	5	2	3.76650	2792.08	263.889	1.31366	2.219	1.158	CCODE =	.1
RAINFALL TYPE= 2										RAIN24=	3.020
COMPUTE NM HYD	111.00	-	1	.05330	108.83	3.739	1.31526	1.500	3.190	PER IMP=	17.00
COMPUTE NM HYD	111.40	-	4	.01410	28.80	.989	1.31527	1.500	3.192	PER IMP=	17.00
*S COMBINE HYD.'S	111.0	AND	111.4	AS 111.49							
ADD HYD	111.49	1& 4	4	.06740	137.63	4.728	1.31525	1.500	3.191		
*S ROUTE TO LA CUEVA CHANEL @ OAKLAND											
*S PIPE ROUTING											
ROUTE	111.48	4	5	.06740	133.79	4.728	1.31527	1.550	3.102		
RAINFALL TYPE= 2										RAIN24=	3.050
COMPUTE NM HYD	111.10	-	1	.09690	195.97	7.699	1.48968	1.500	3.160	PER IMP=	26.00
RAINFALL TYPE= 2										RAIN24=	3.050
COMPUTE NM HYD	111.30	-	6	.04200	107.90	4.348	1.94094	1.500	4.014	PER IMP=	50.00
ADD HYD	111.39	1& 6	1	.13890	303.87	12.046	1.62612	1.500	3.418		
*S COMBINE HYD.'S	111.48	AND	111.39	AS 111.88							
ADD HYD	111.88	1& 5	1	.20630	436.39	16.774	1.52456	1.500	3.305		
*S LA CUEVA CHANNEL AT BARSTOW (111.89)-NOT FINAL											
ADD HYD	111.89	1& 2	5	3.97280	2827.78	280.143	1.32216	2.194	1.112		
*S DIVERSION FROM NDB ABOVE CARRINGTON											
COMPUTE NM HYD	924.10	-	6	.02500	64.23	2.588	1.94094	1.500	4.015	PER IMP=	50.00
COMPUTE NM HYD	924.20	-	7	.01900	48.82	1.967	1.94094	1.500	4.015	PER IMP=	50.00
*S COMBINE HYD.'S	924.10	AND	924.20	AS 924.22							

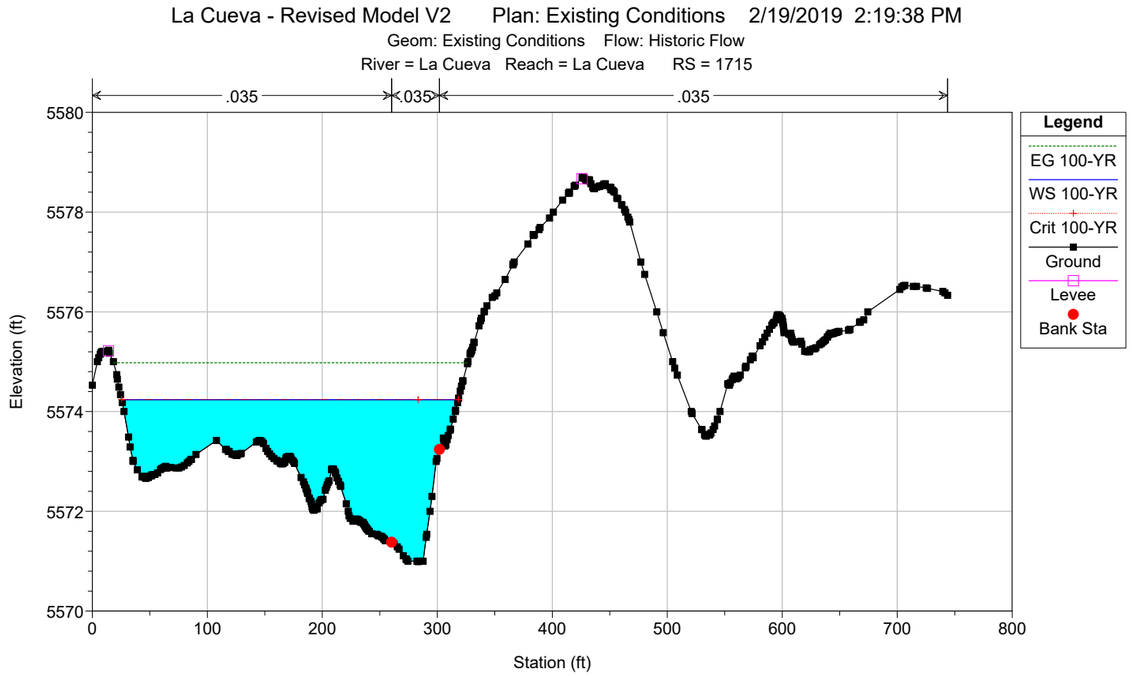

La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 2279
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

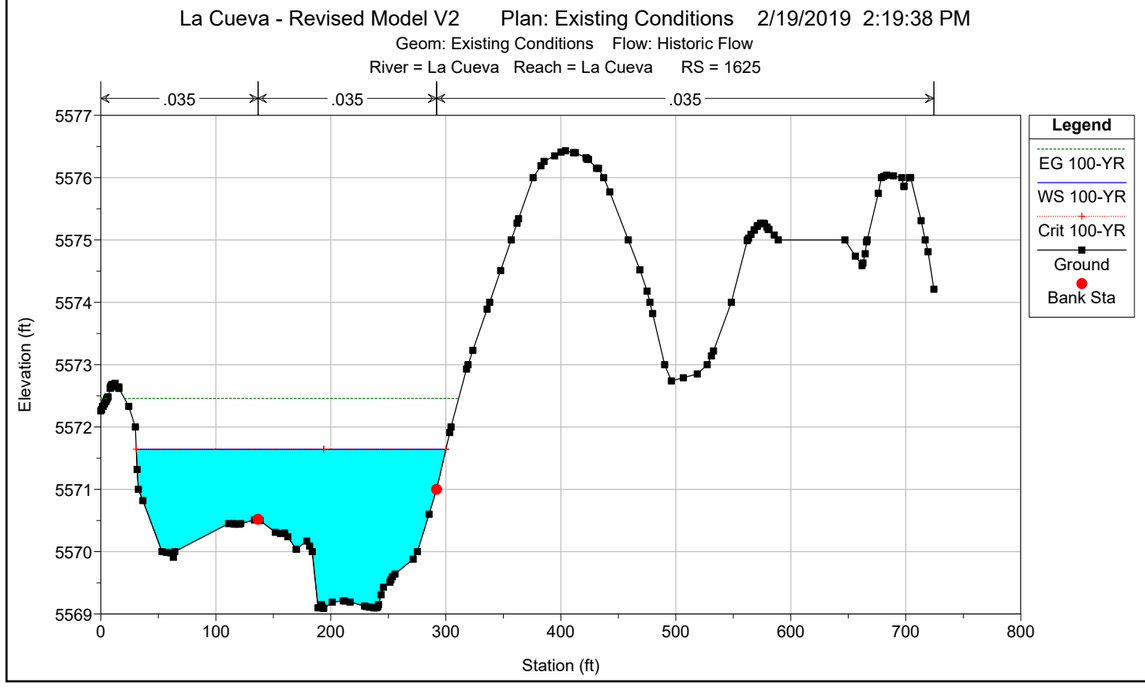

La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 2159
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

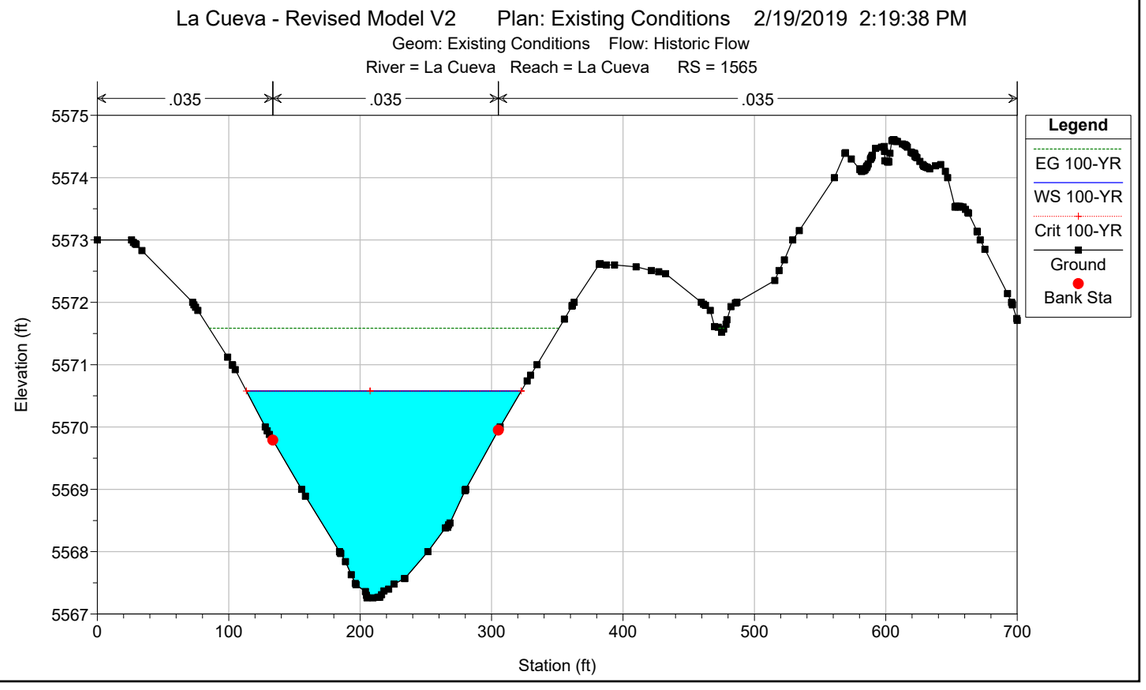

La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 2035
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1938
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1850
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1715
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

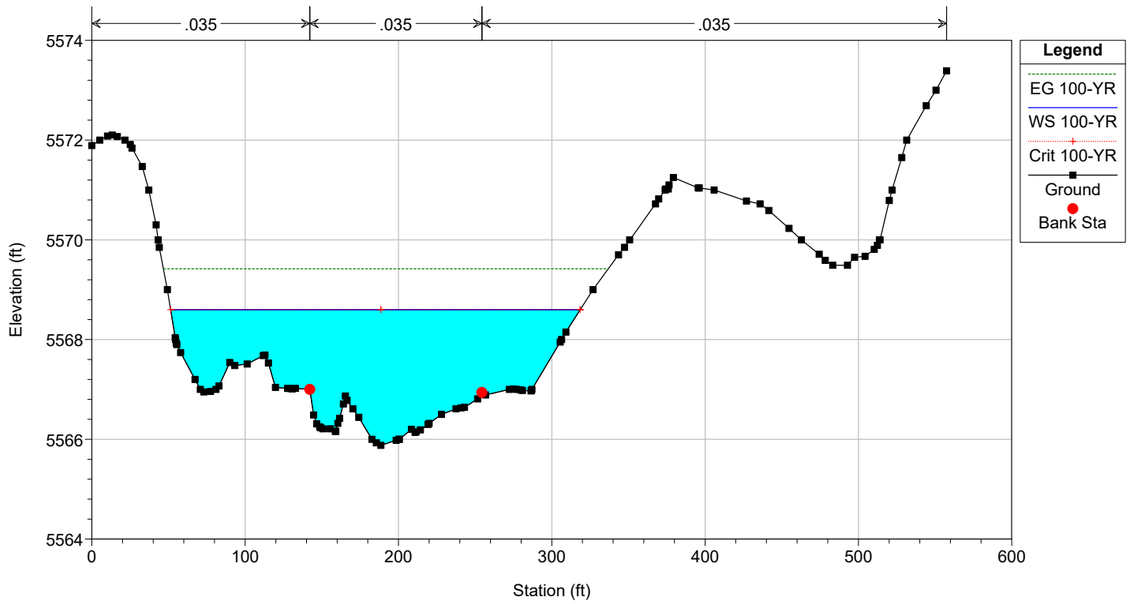

La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1625
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)


La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1565
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM

Geom: Existing Conditions Flow: Historic Flow

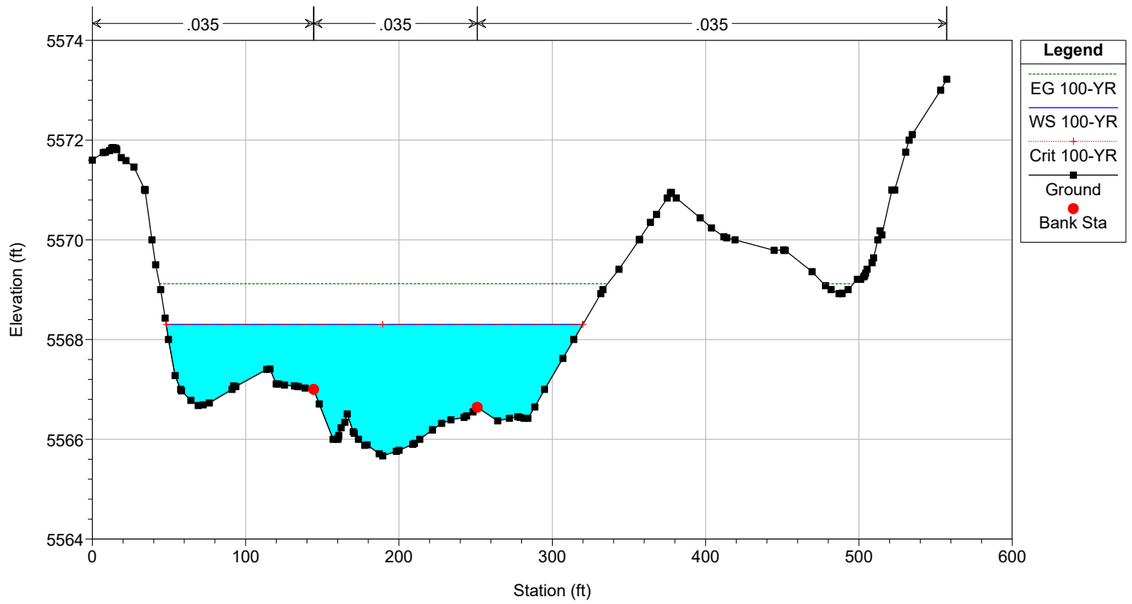
River = La Cueva Reach = La Cueva RS = 1527 Lot 16



La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM

Geom: Existing Conditions Flow: Historic Flow

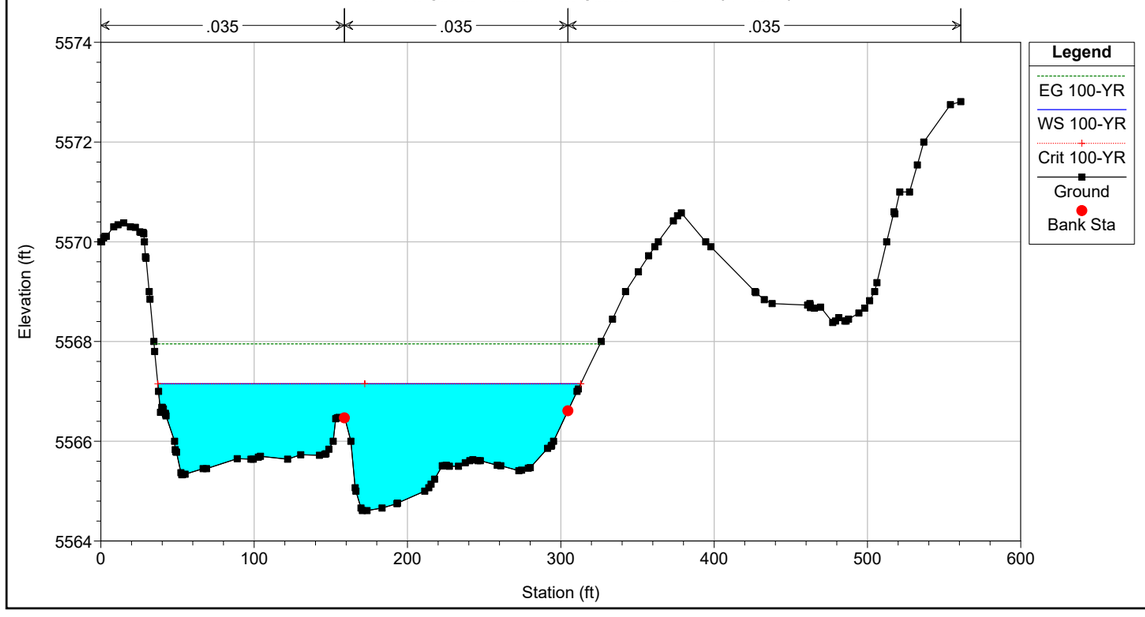
River = La Cueva Reach = La Cueva RS = 1520 Lot 16



La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM

Geom: Existing Conditions Flow: Historic Flow

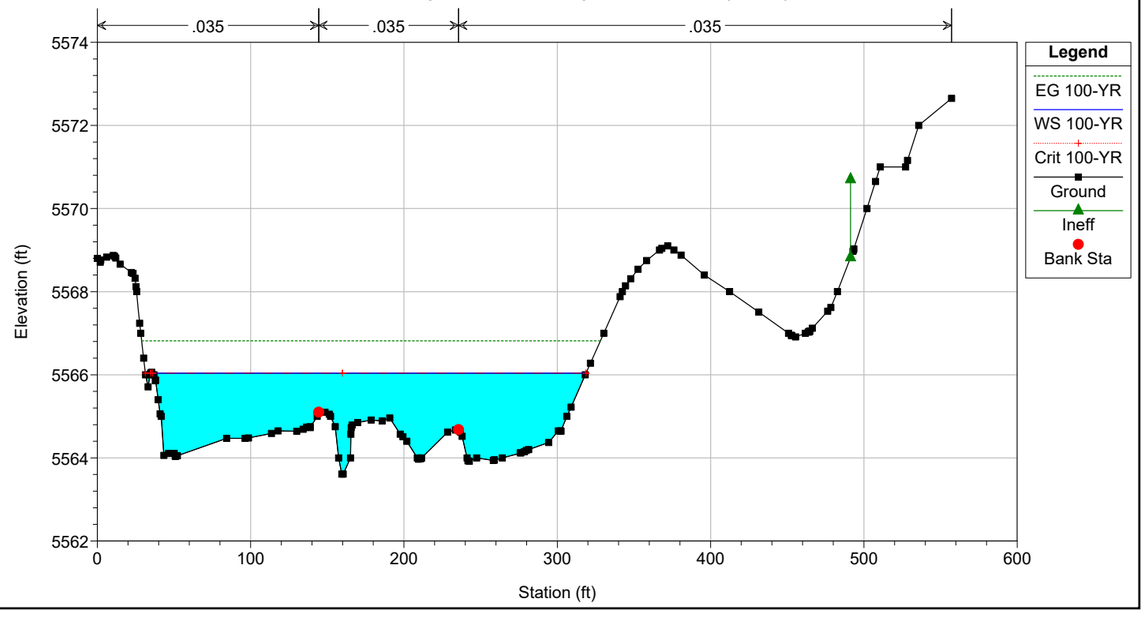
River = La Cueva Reach = La Cueva RS = 1491 Lot 16



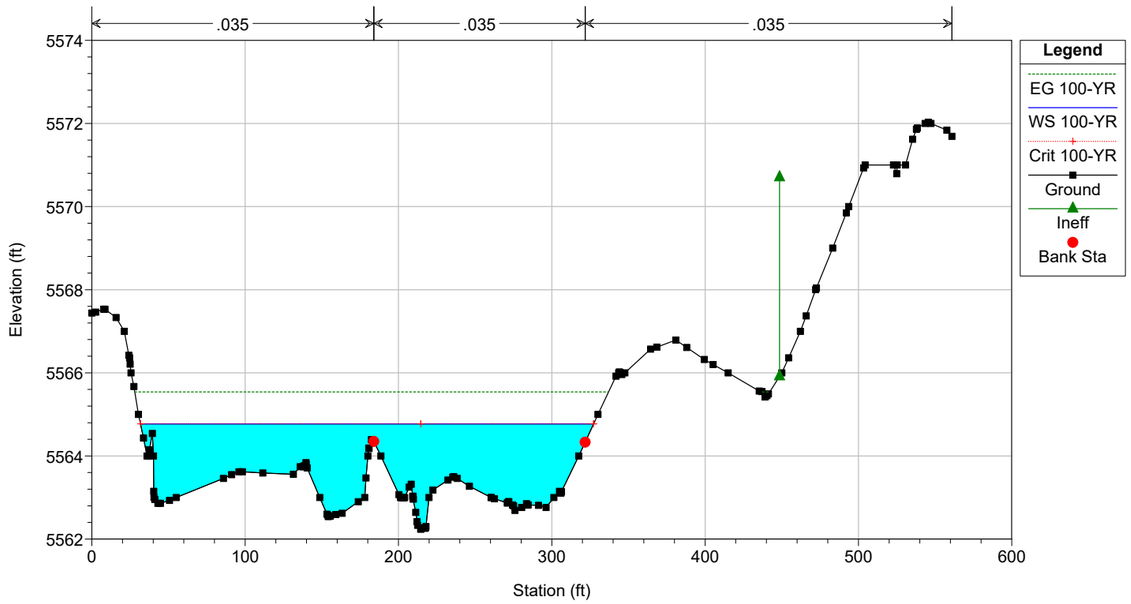
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM

Geom: Existing Conditions Flow: Historic Flow

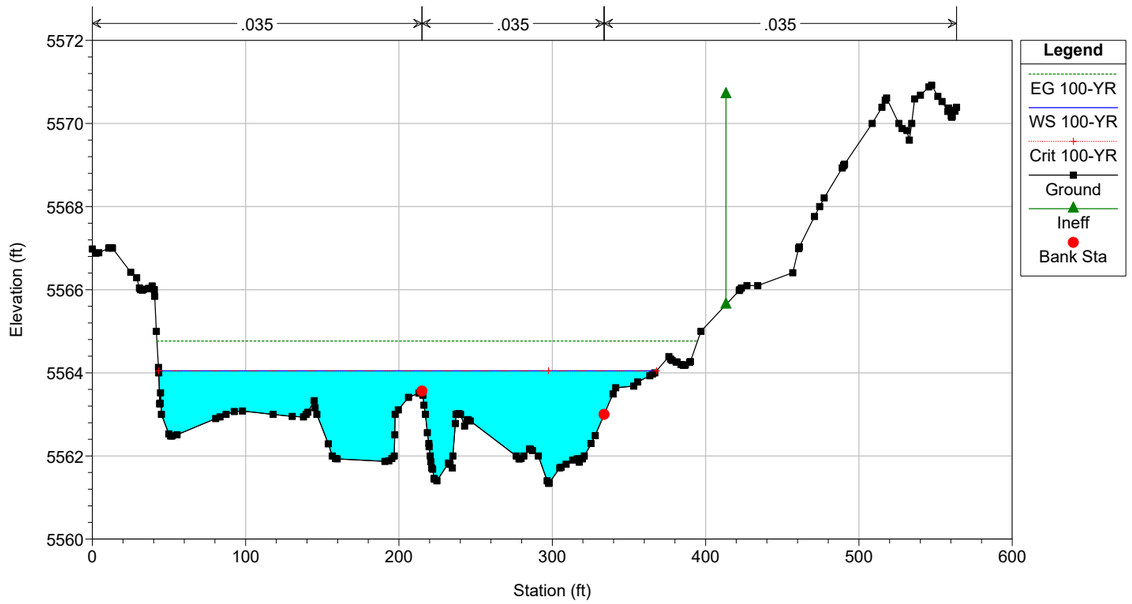
River = La Cueva Reach = La Cueva RS = 1449 Lot 16



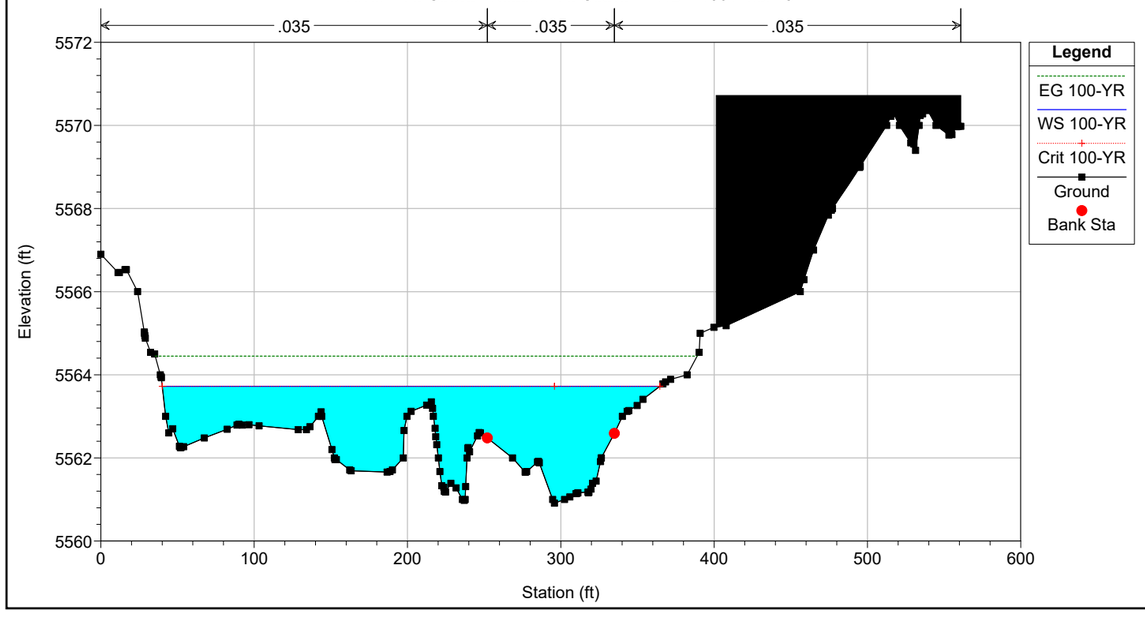
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1406 Lot 16



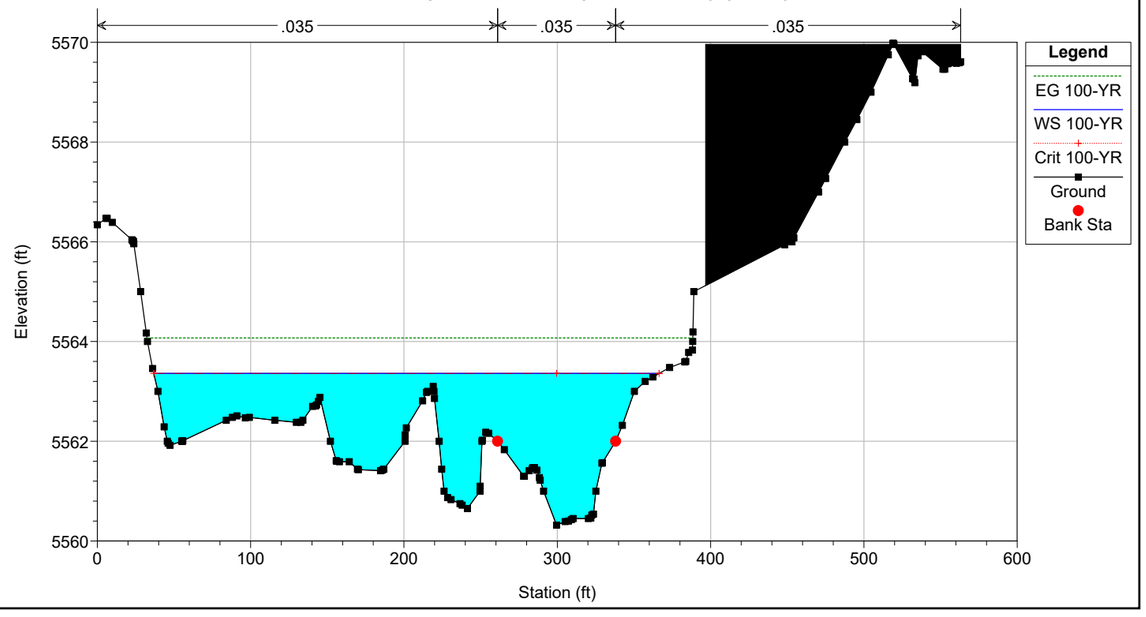
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1372 Lot 16



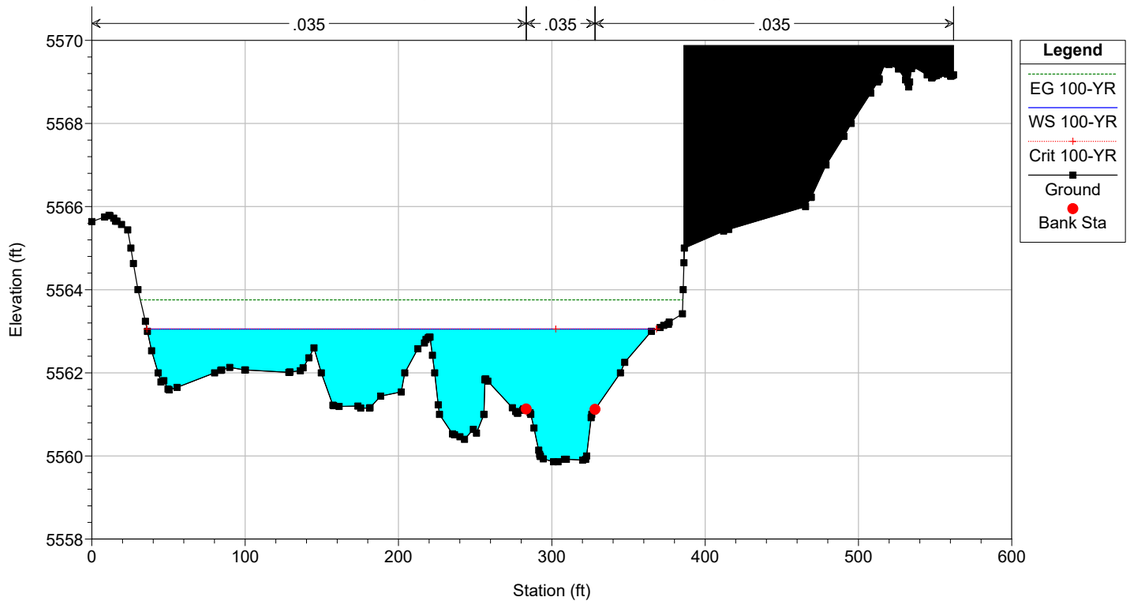
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1361 Lot 15



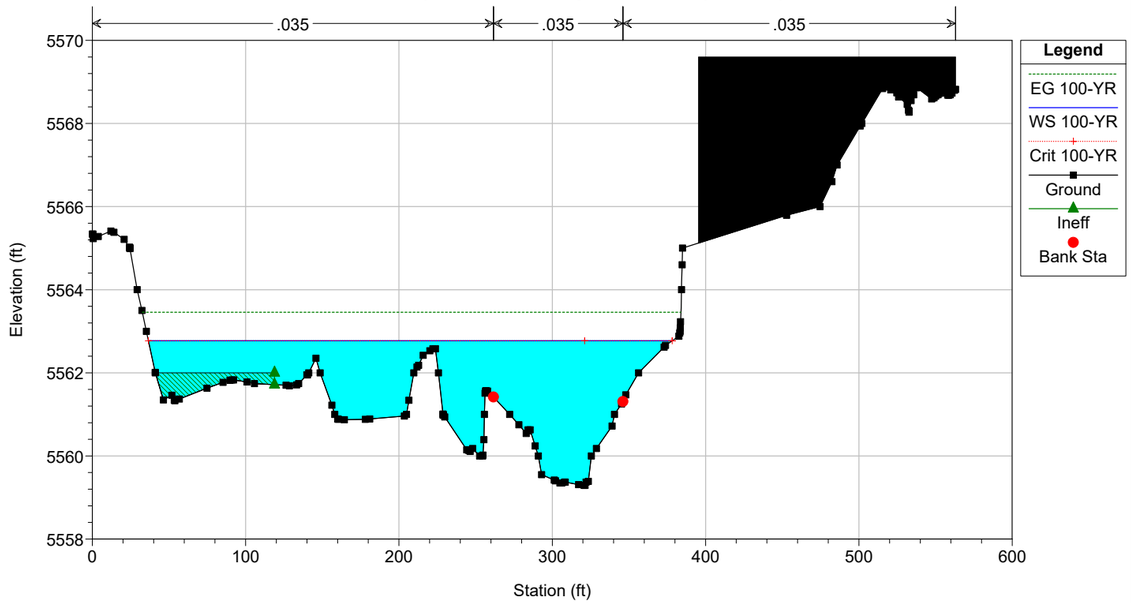
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1348 Lot 15



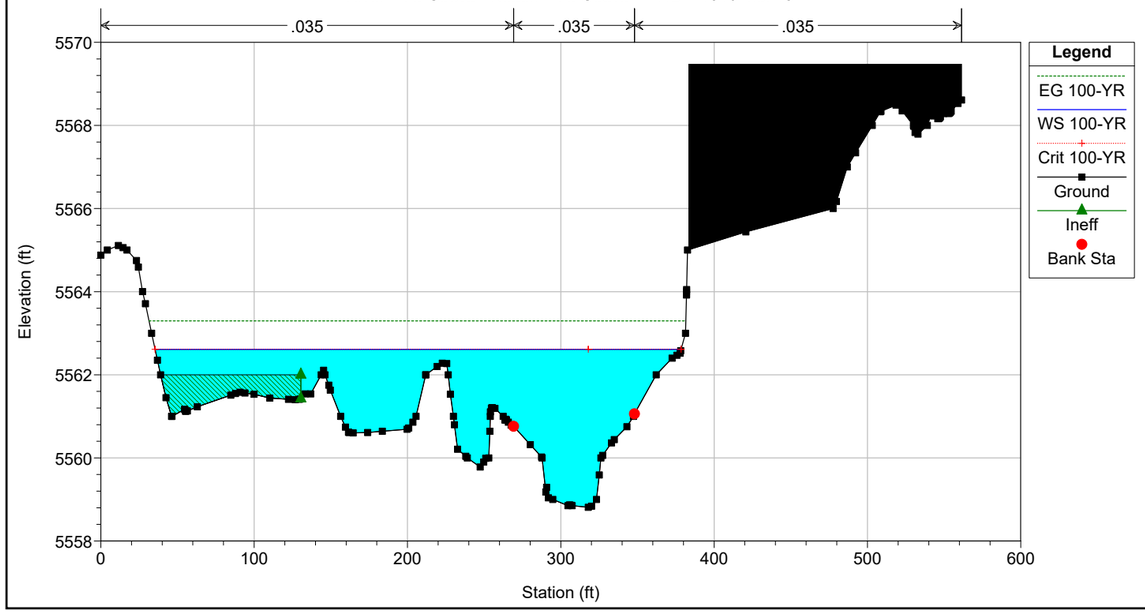
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1338 Lot 15



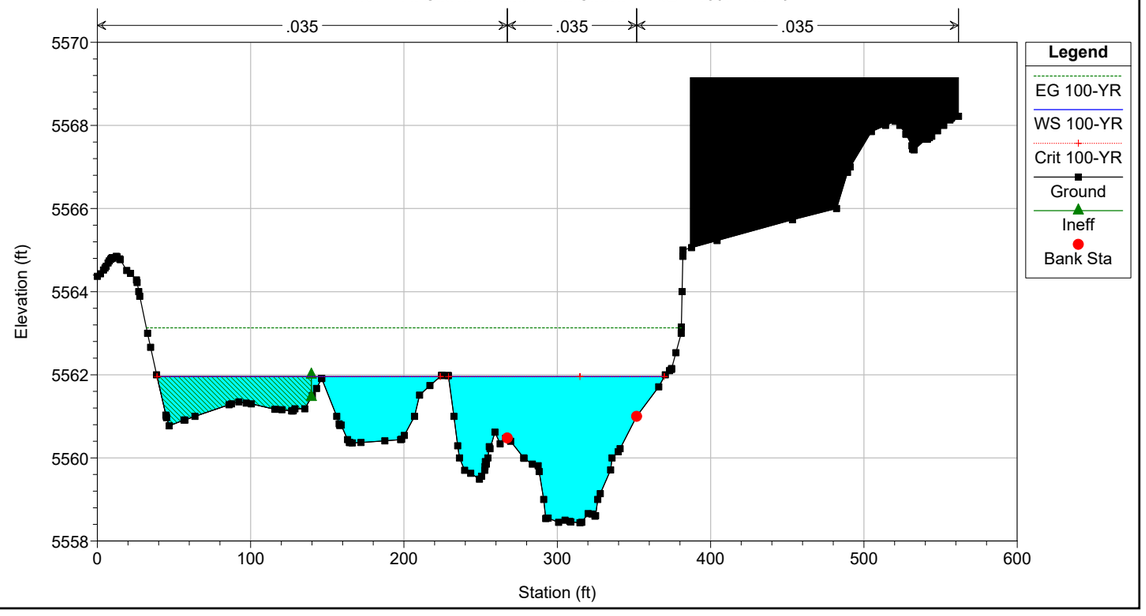
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1327 Lot 15



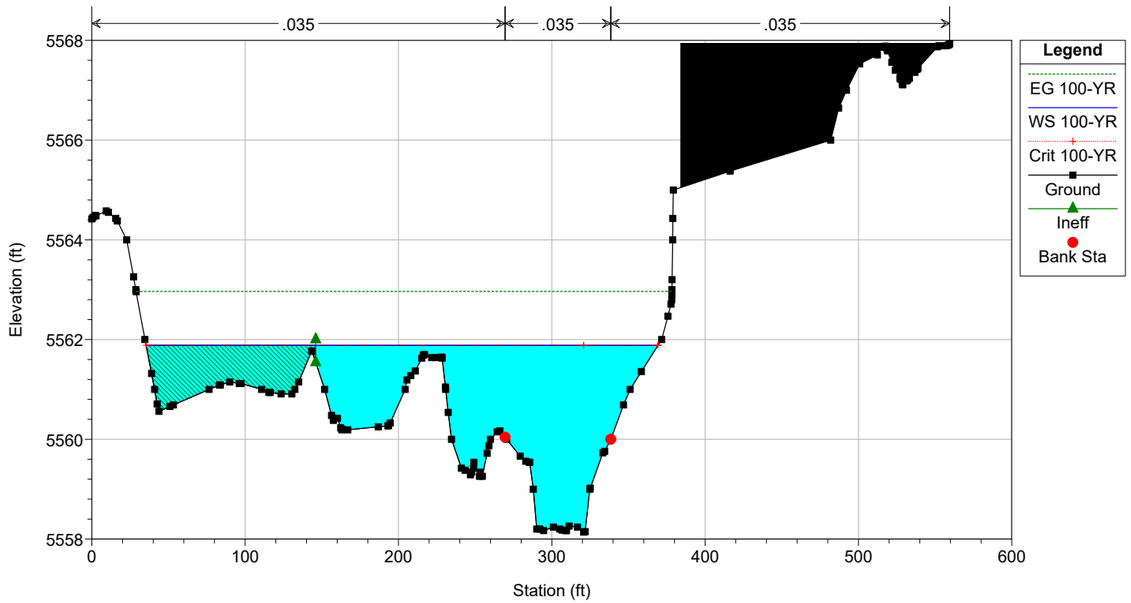
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1316 Lot 15



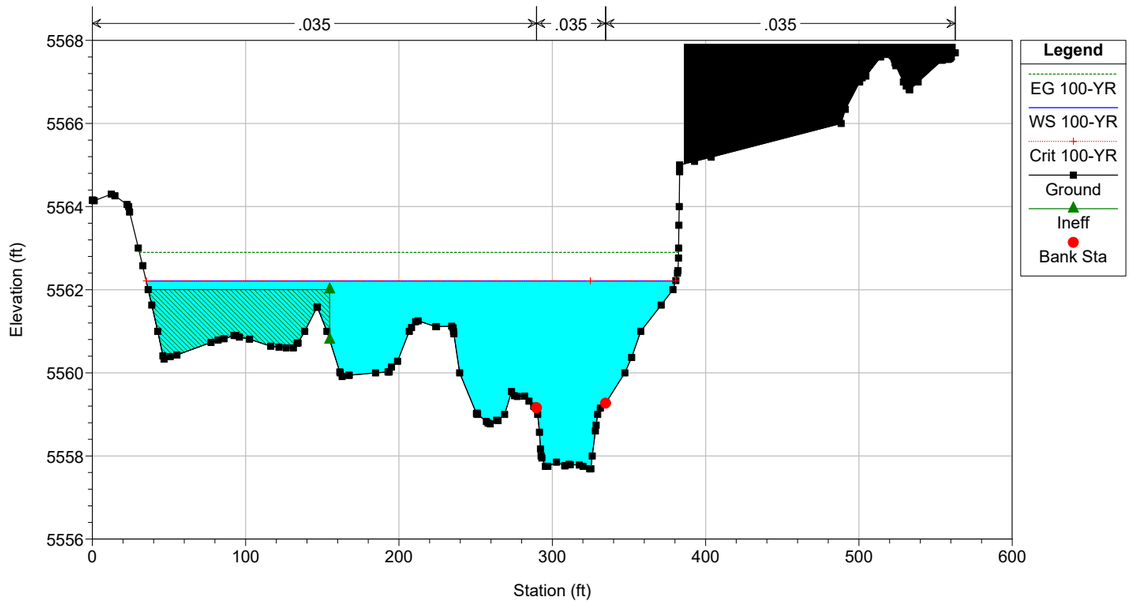
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1307 Lot 15



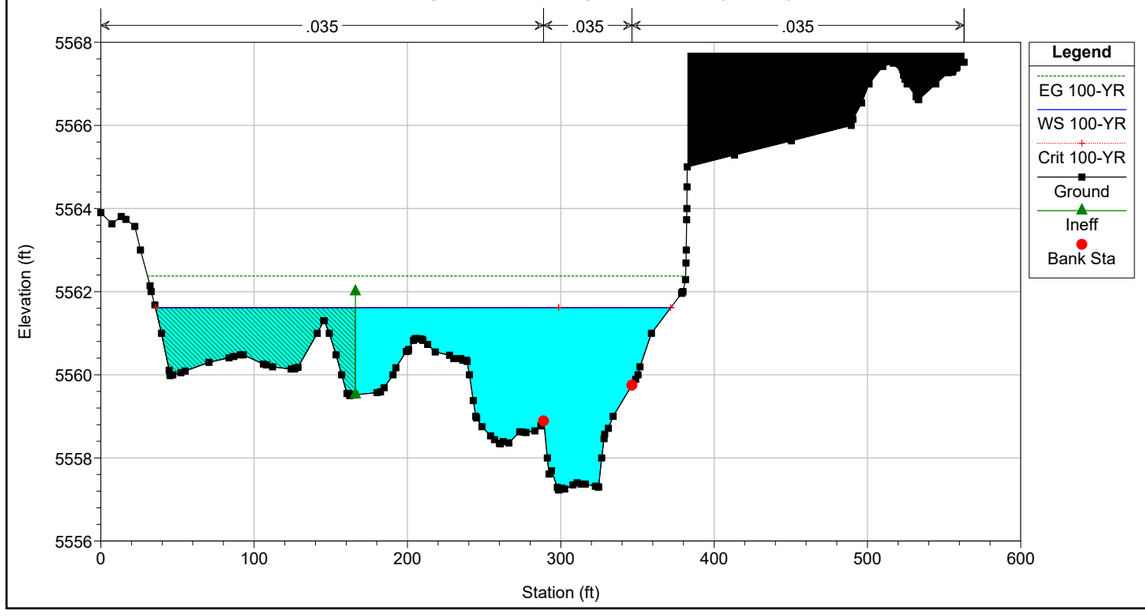
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1301 Lot 15



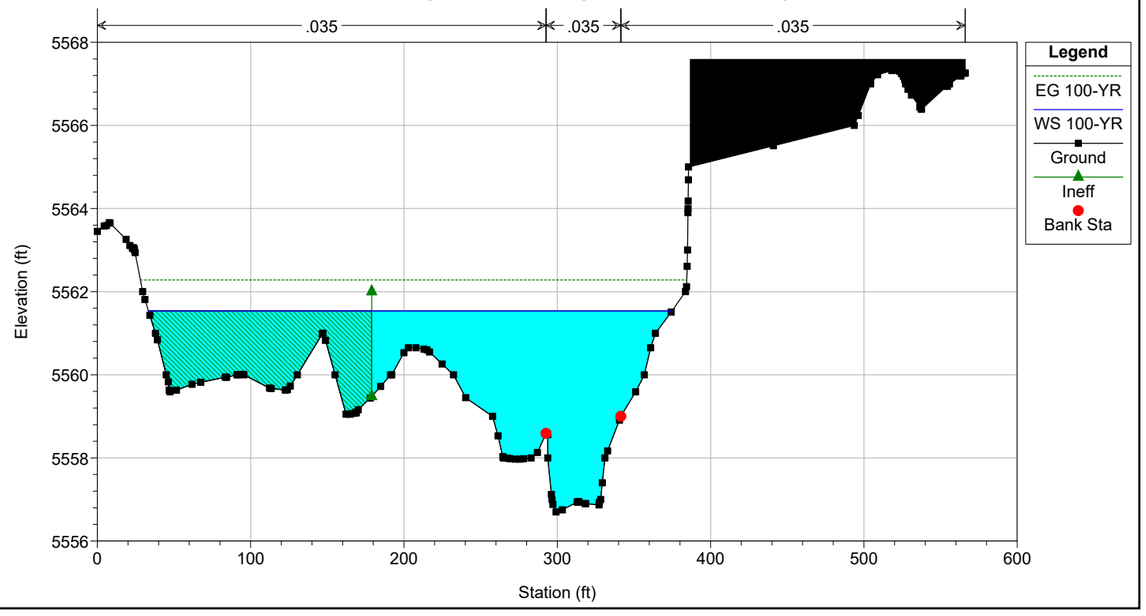
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1292 Lot 15



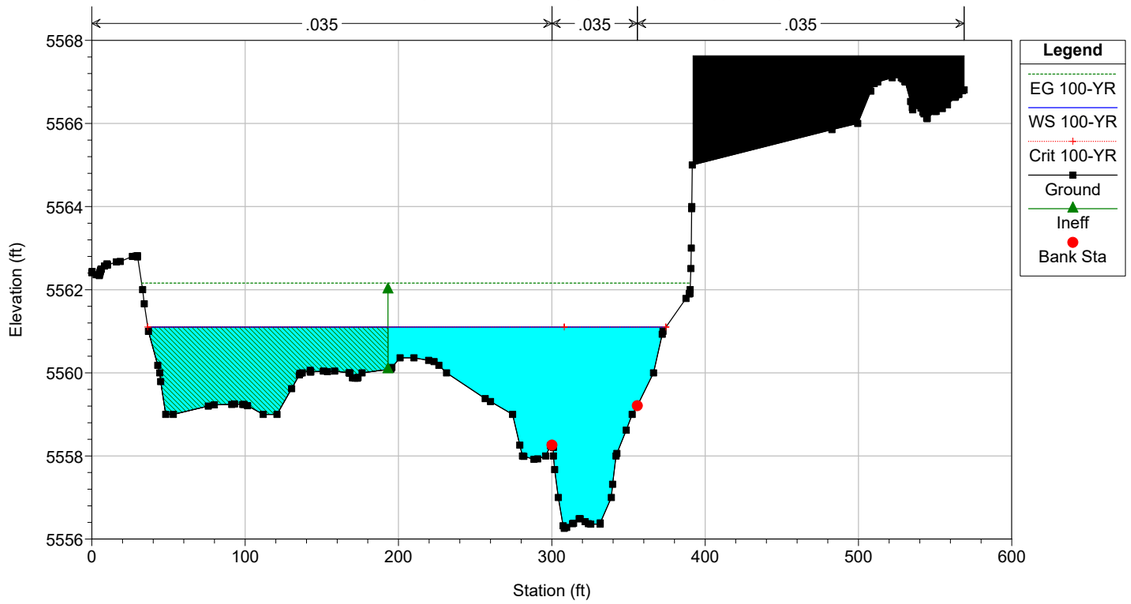
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1282 Lot 15



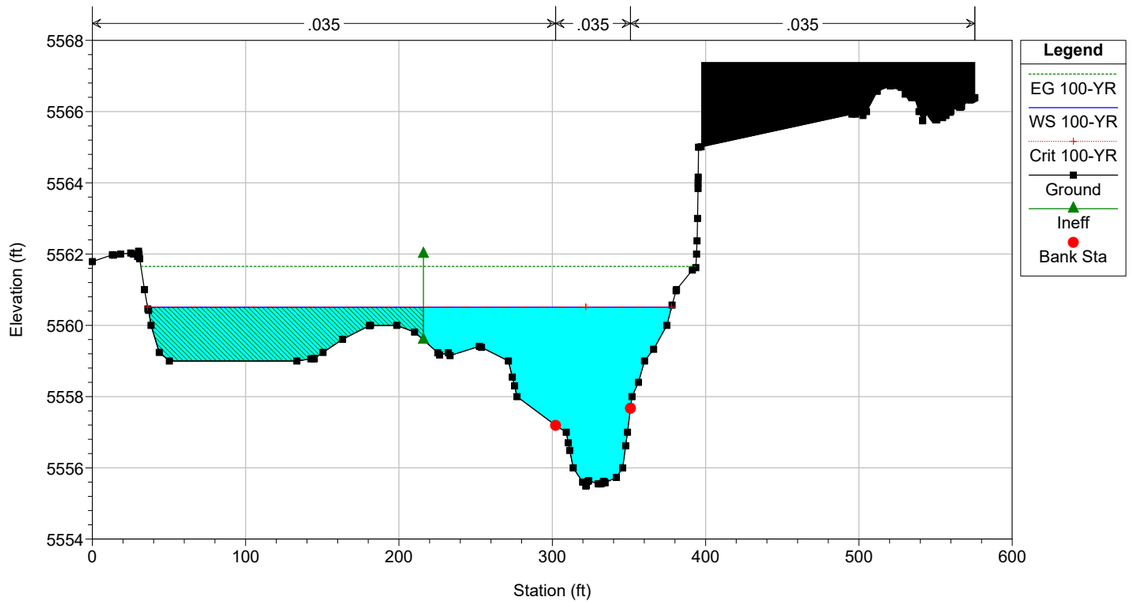
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1271 Lot 15



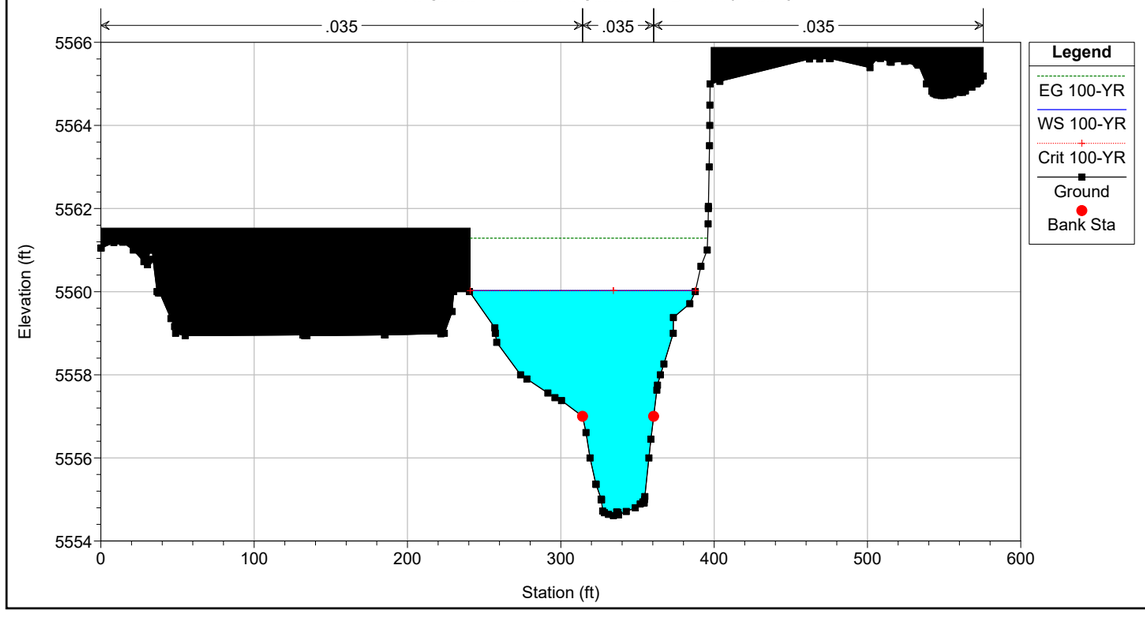
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1258 Lot 15



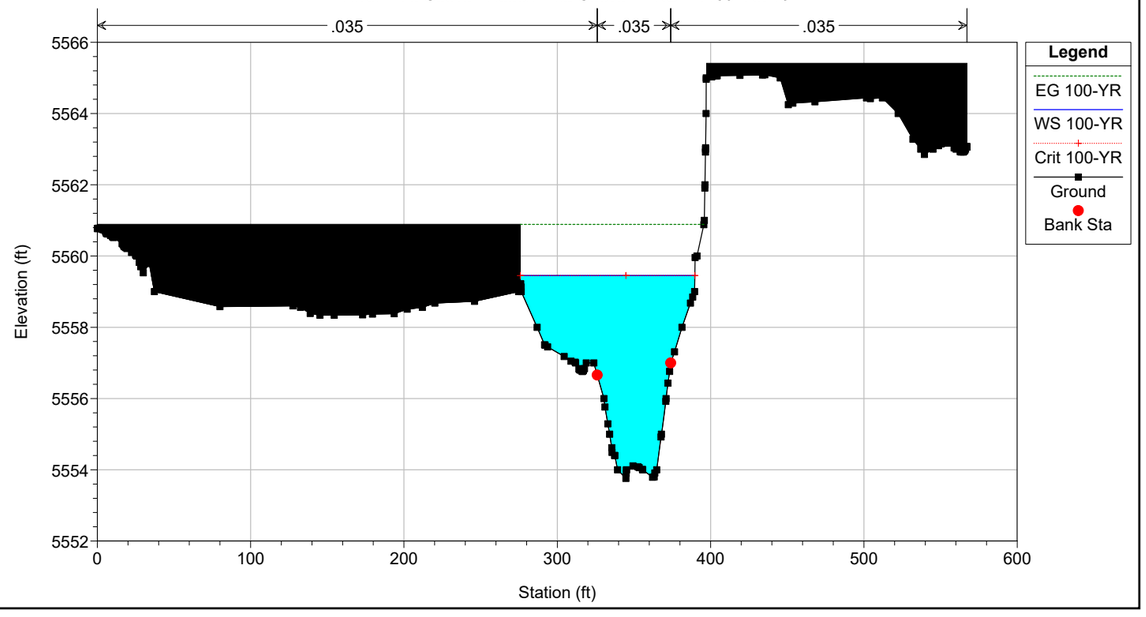
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1239 Lot 15



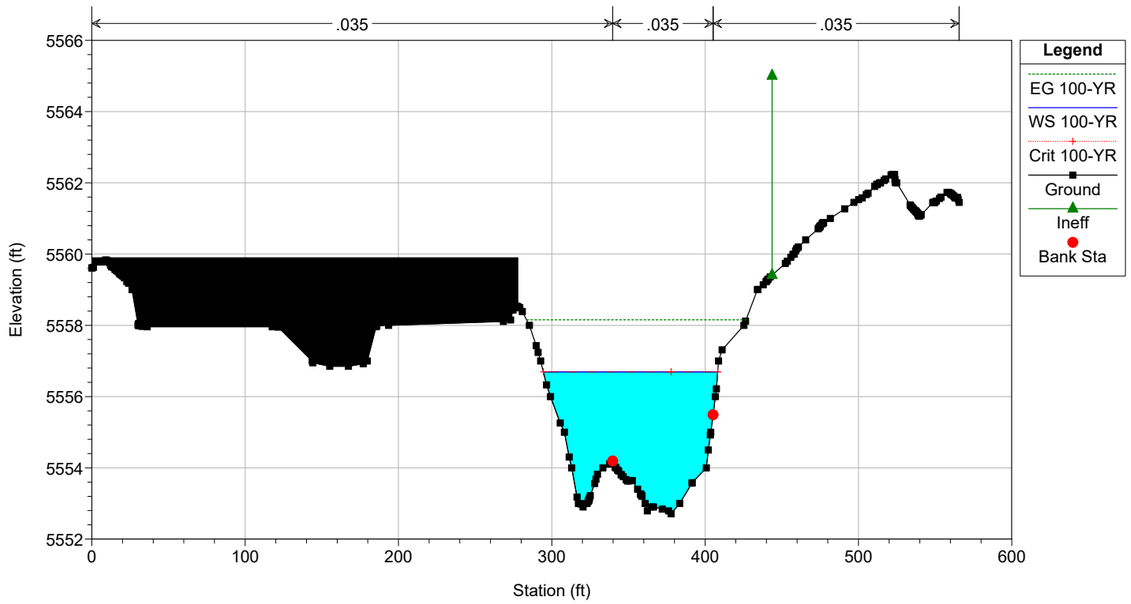
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1216 Lot 15



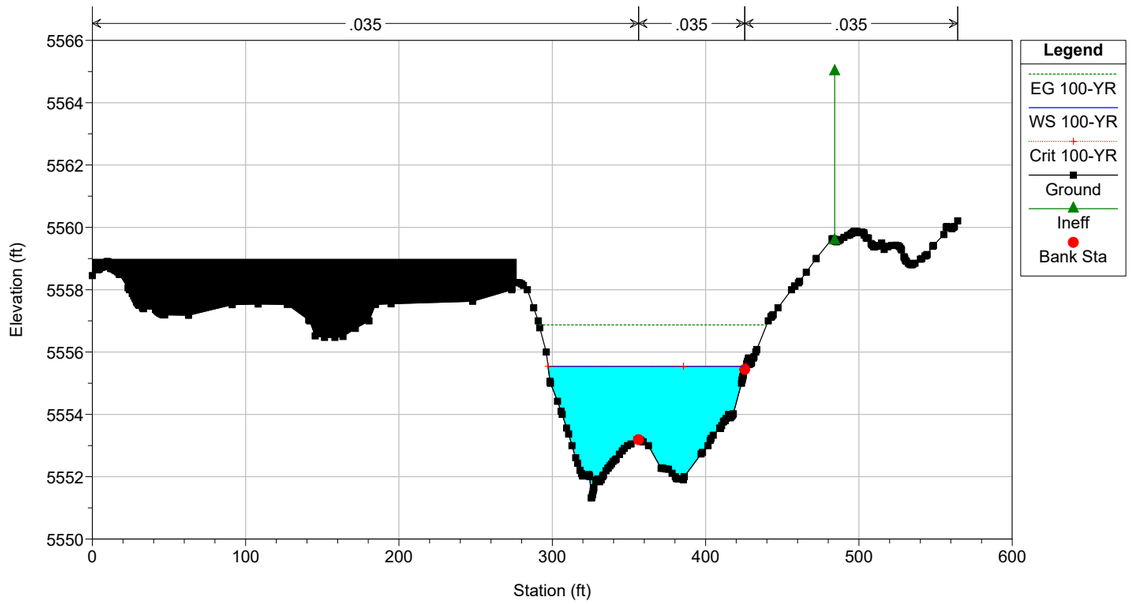
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1189 Lot 15



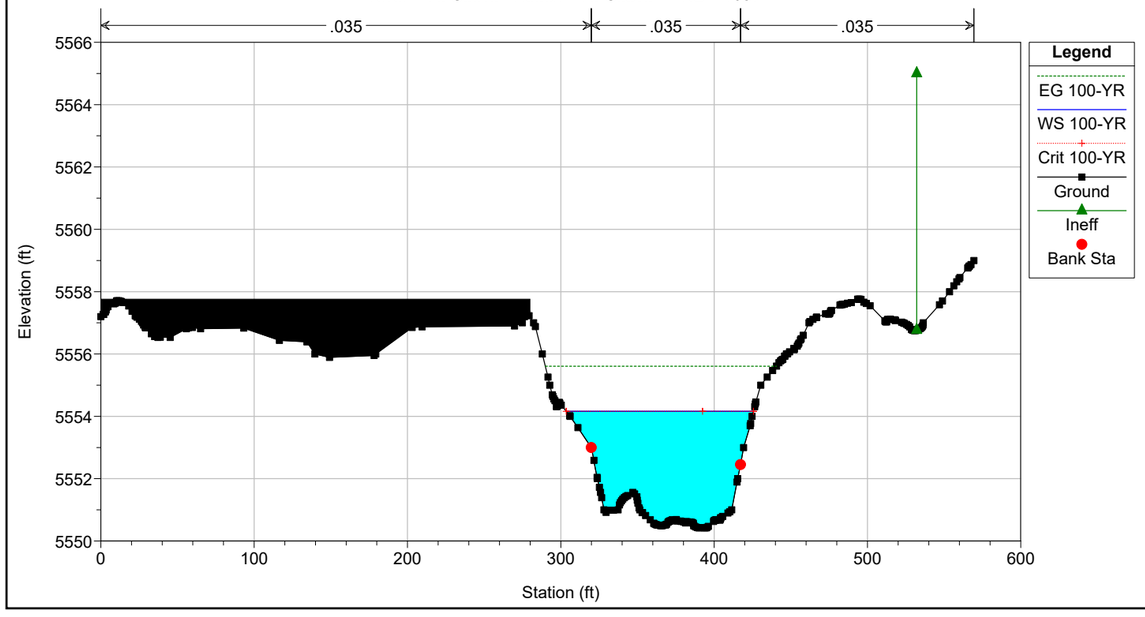
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1143



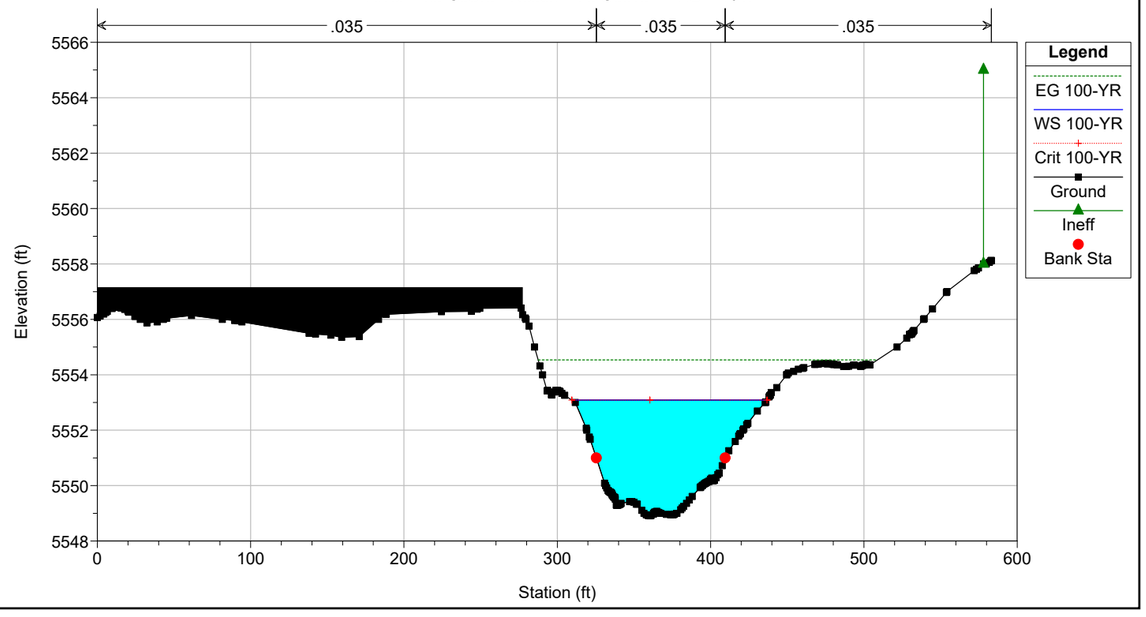
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1104



La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1057



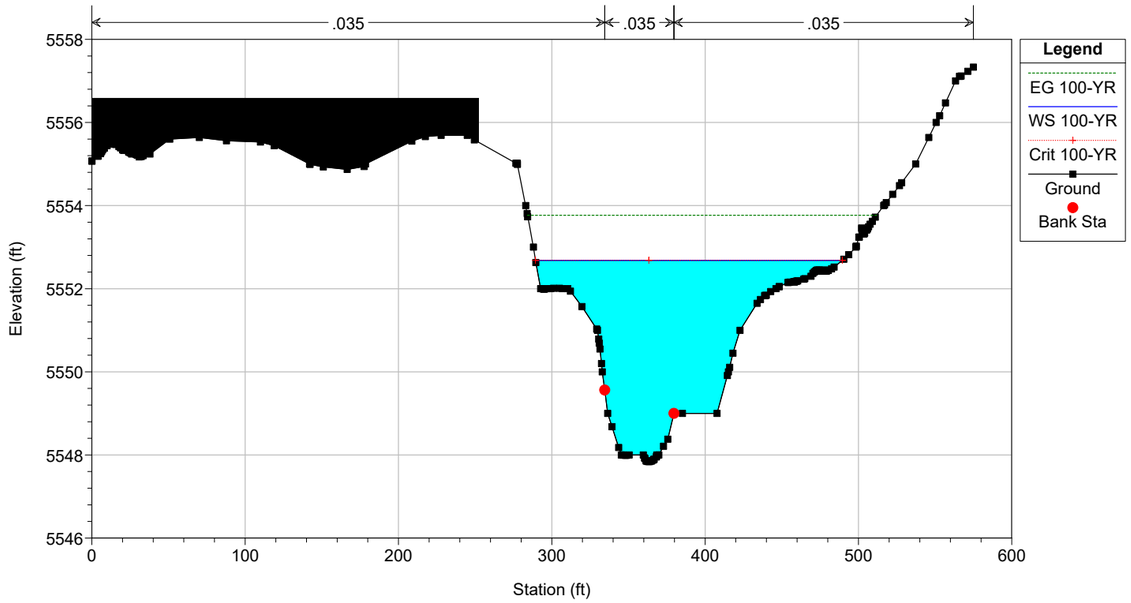
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1012



La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM

Geom: Existing Conditions Flow: Historic Flow

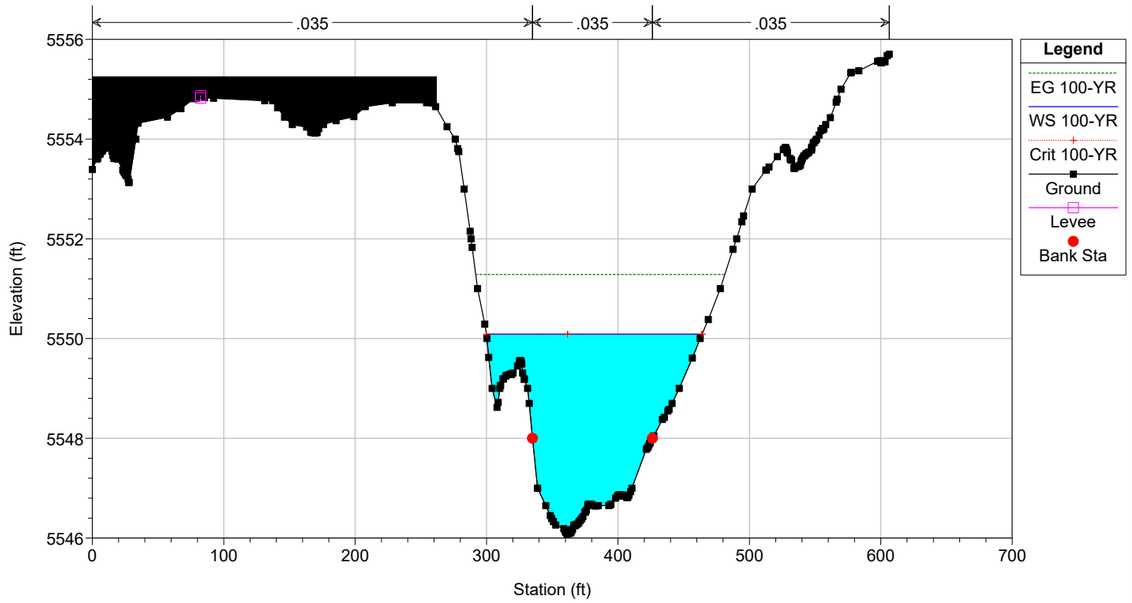
River = La Cueva Reach = La Cueva RS = 975



La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM

Geom: Existing Conditions Flow: Historic Flow

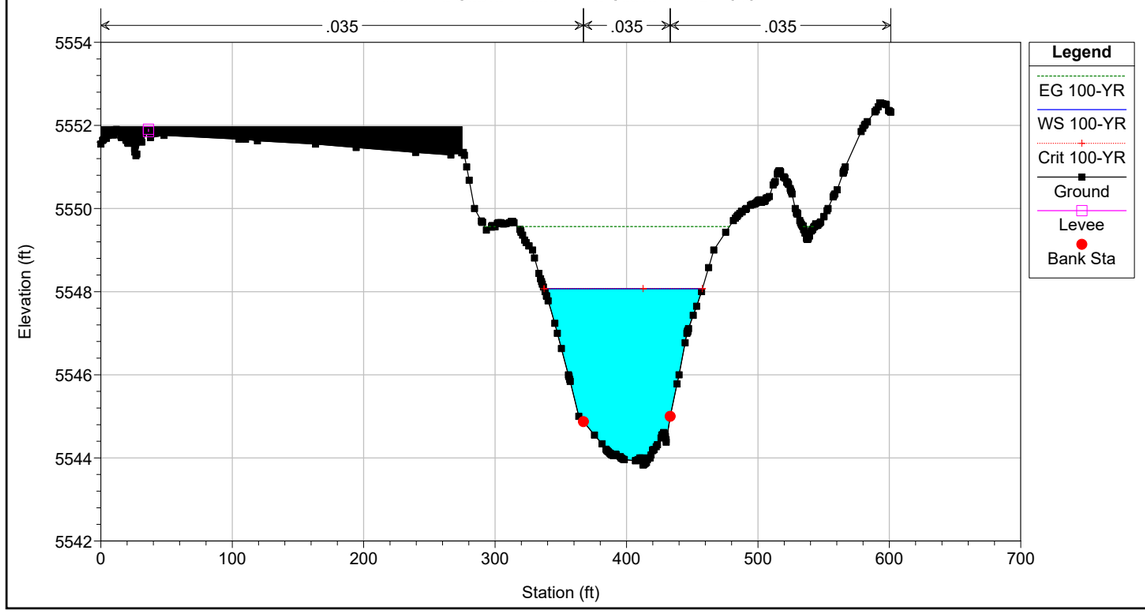
River = La Cueva Reach = La Cueva RS = 916



La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM

Geom: Existing Conditions Flow: Historic Flow

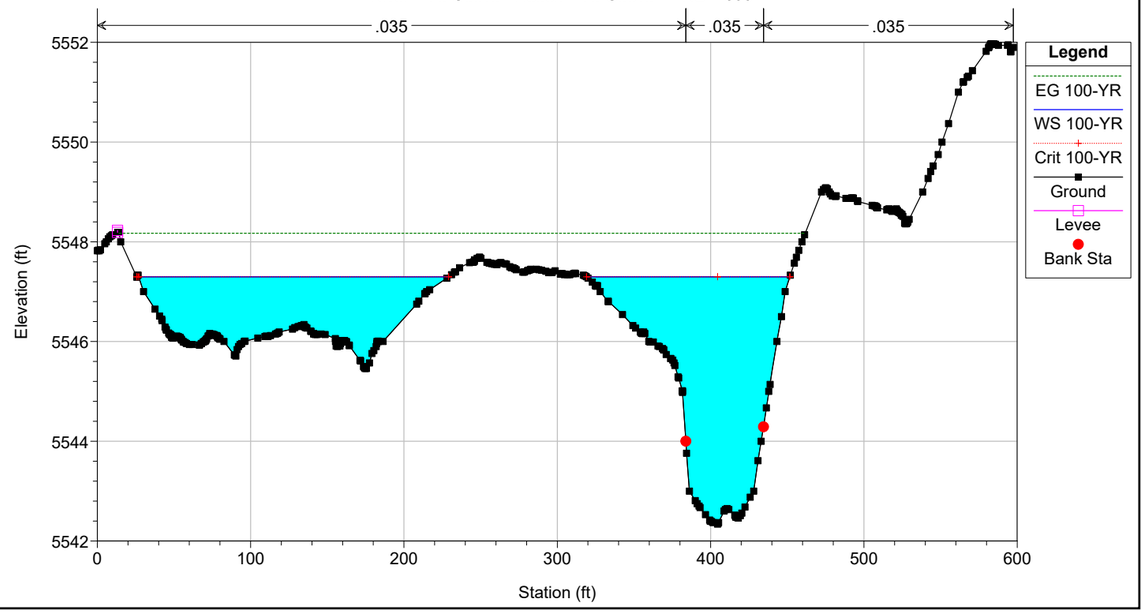
River = La Cueva Reach = La Cueva RS = 848



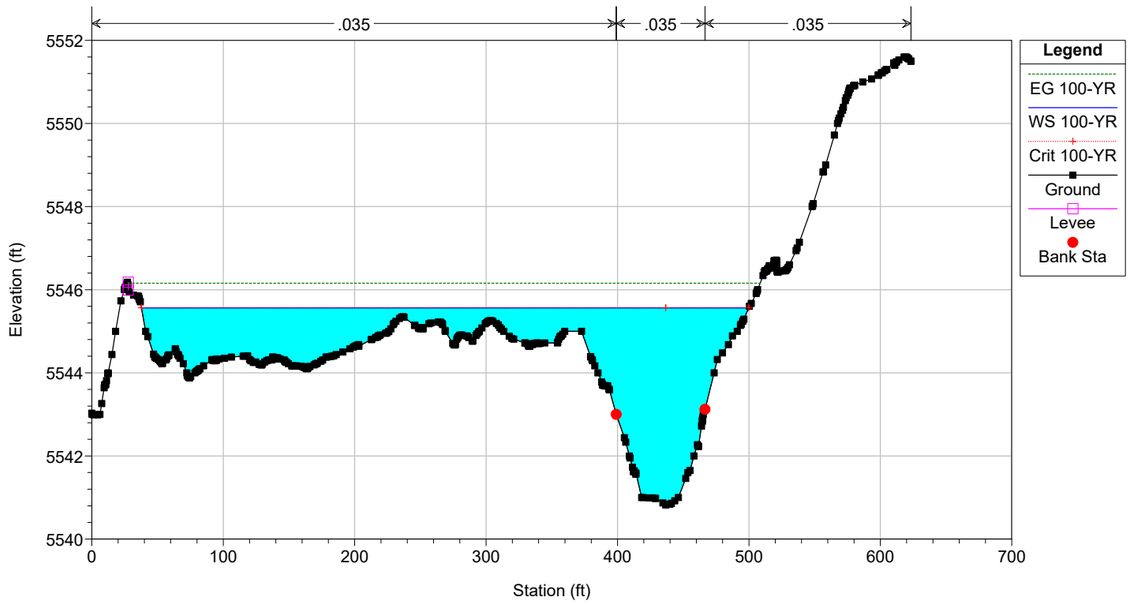
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM

Geom: Existing Conditions Flow: Historic Flow

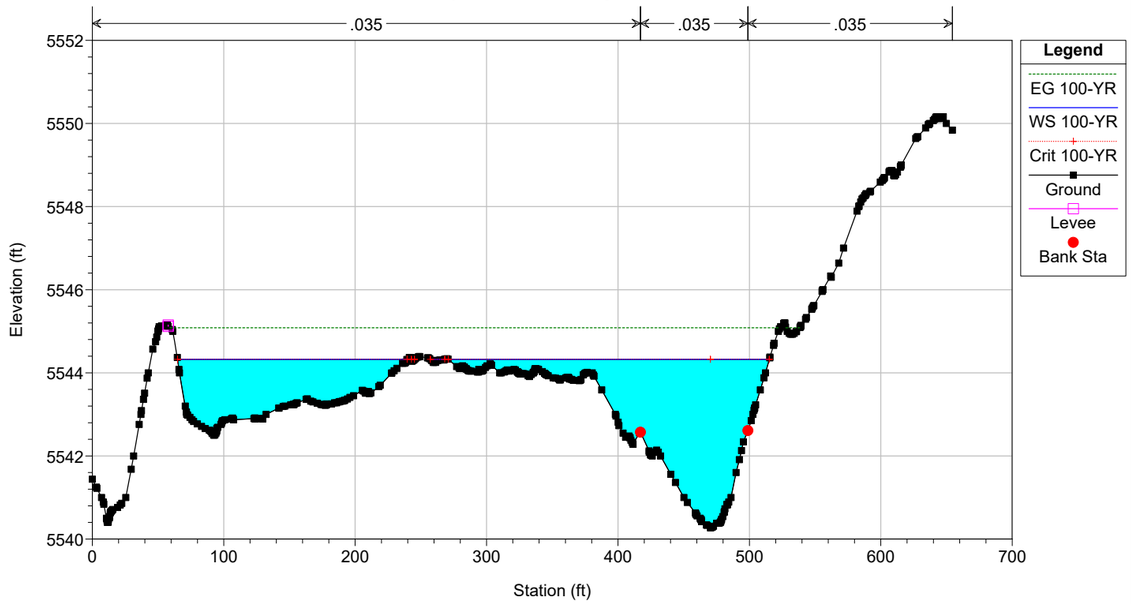
River = La Cueva Reach = La Cueva RS = 805



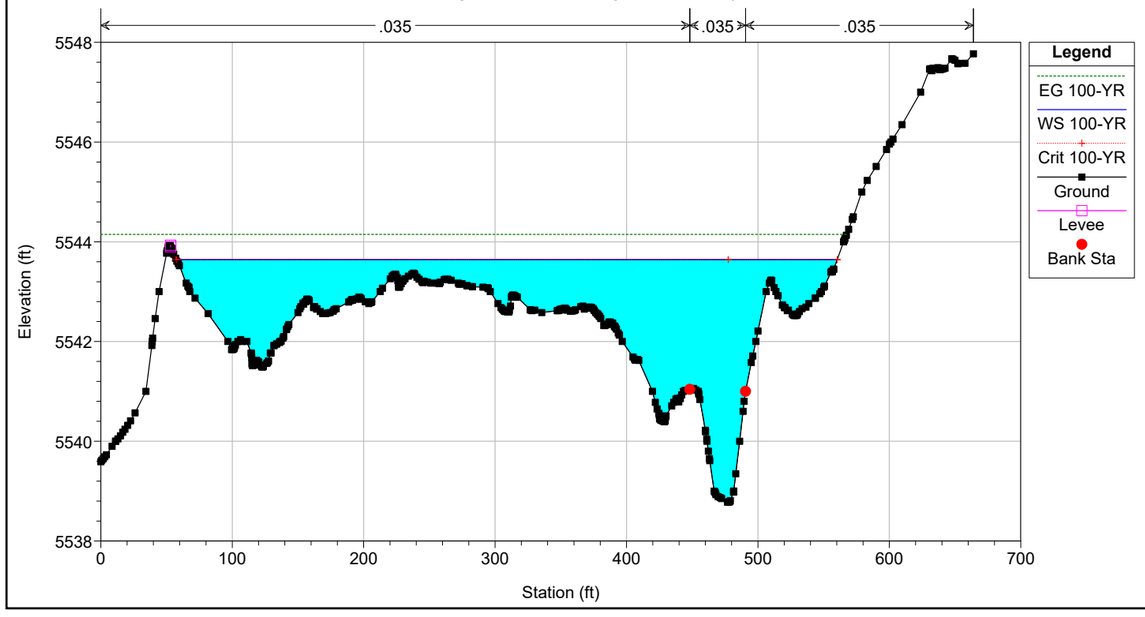
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 743



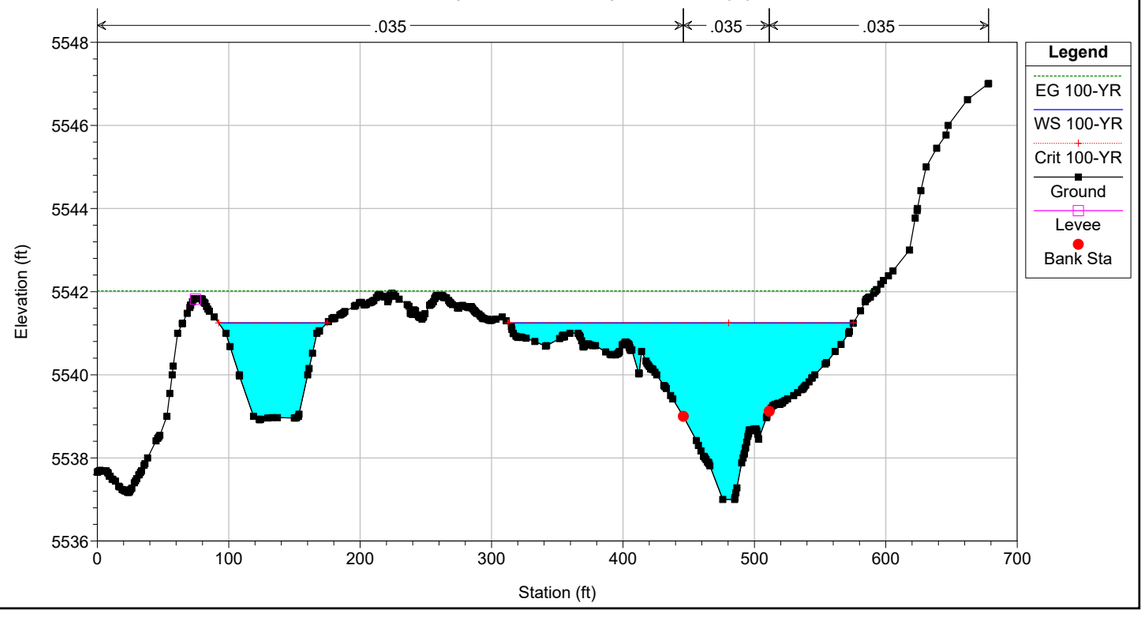
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 712

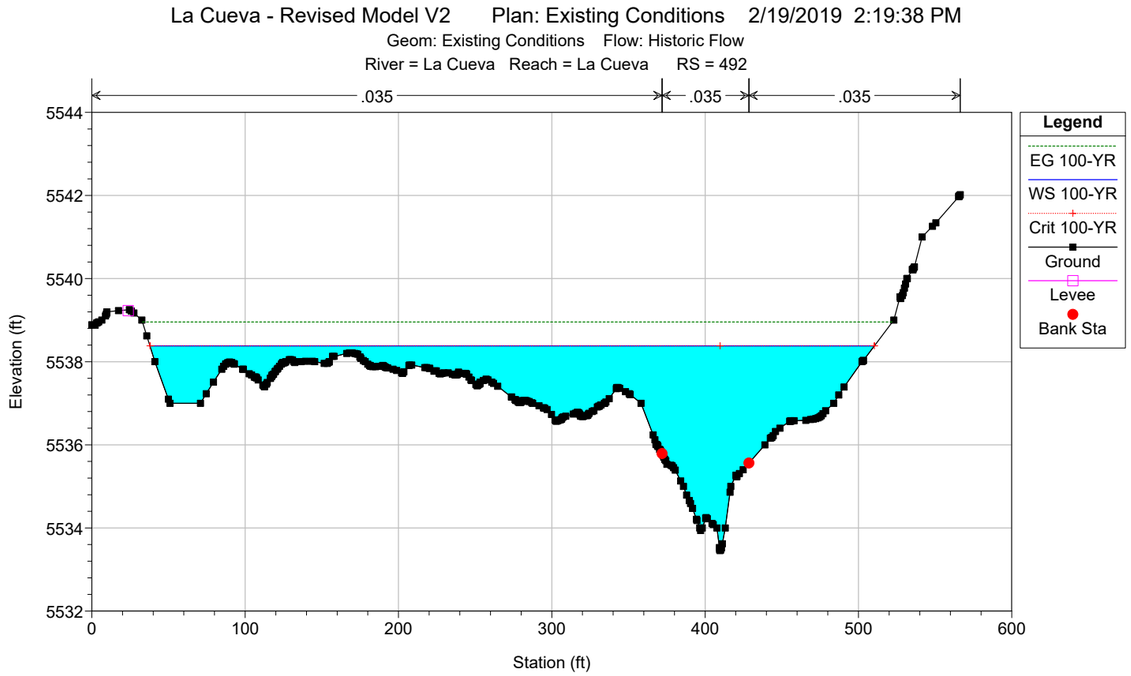


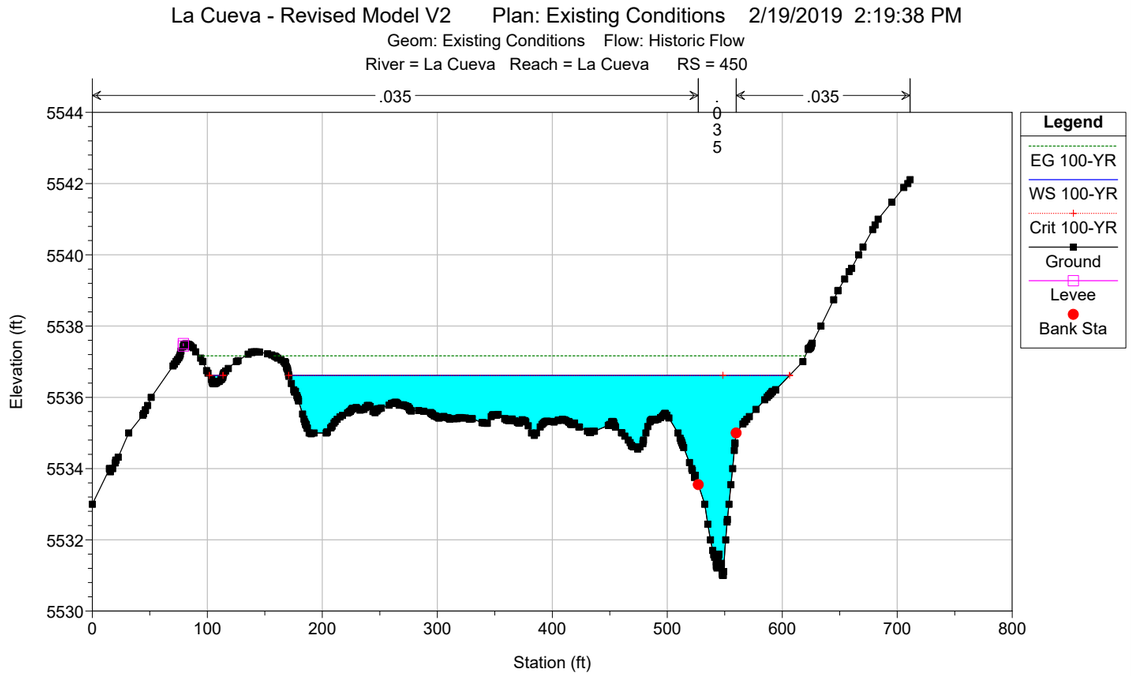
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 674

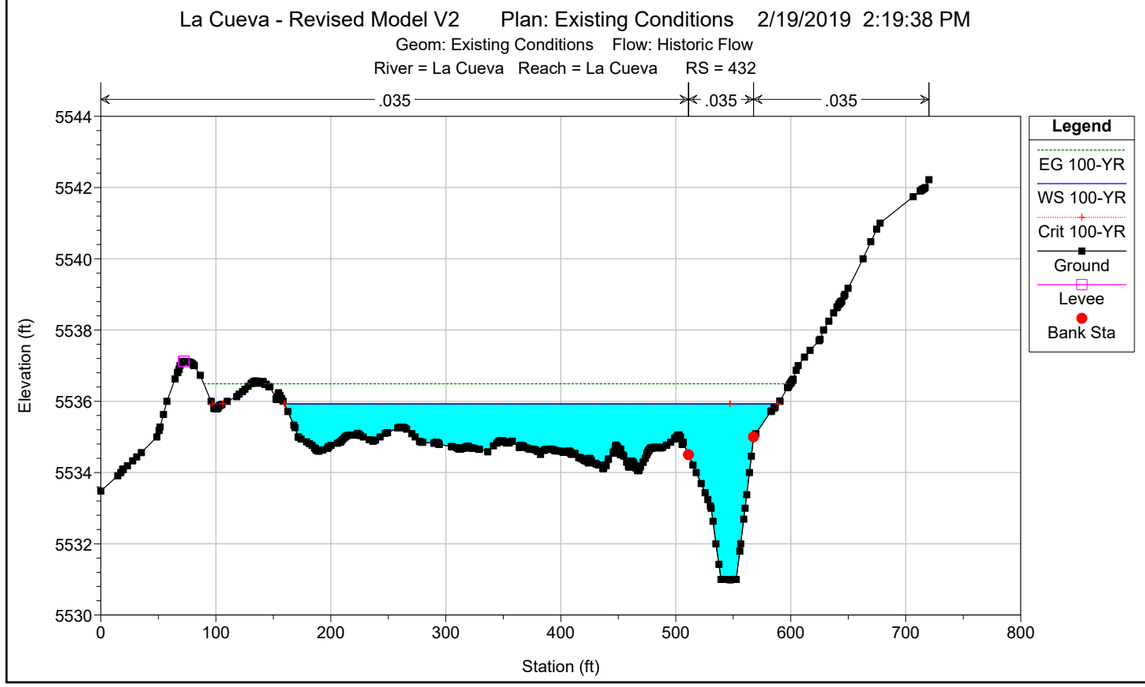


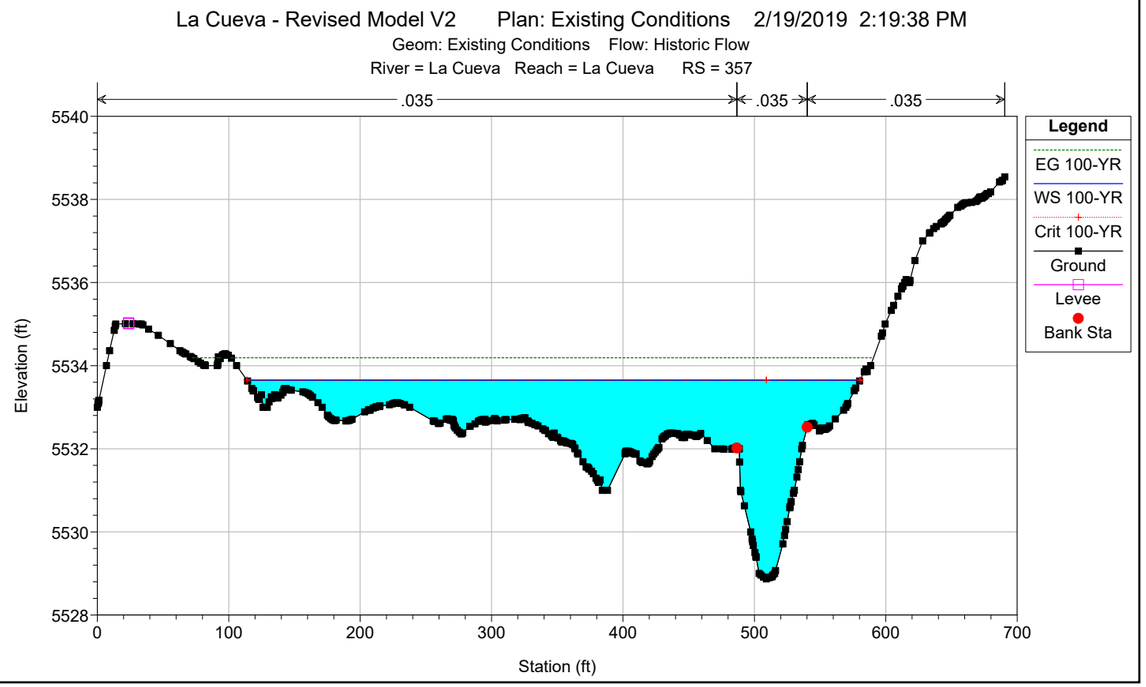
La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 619

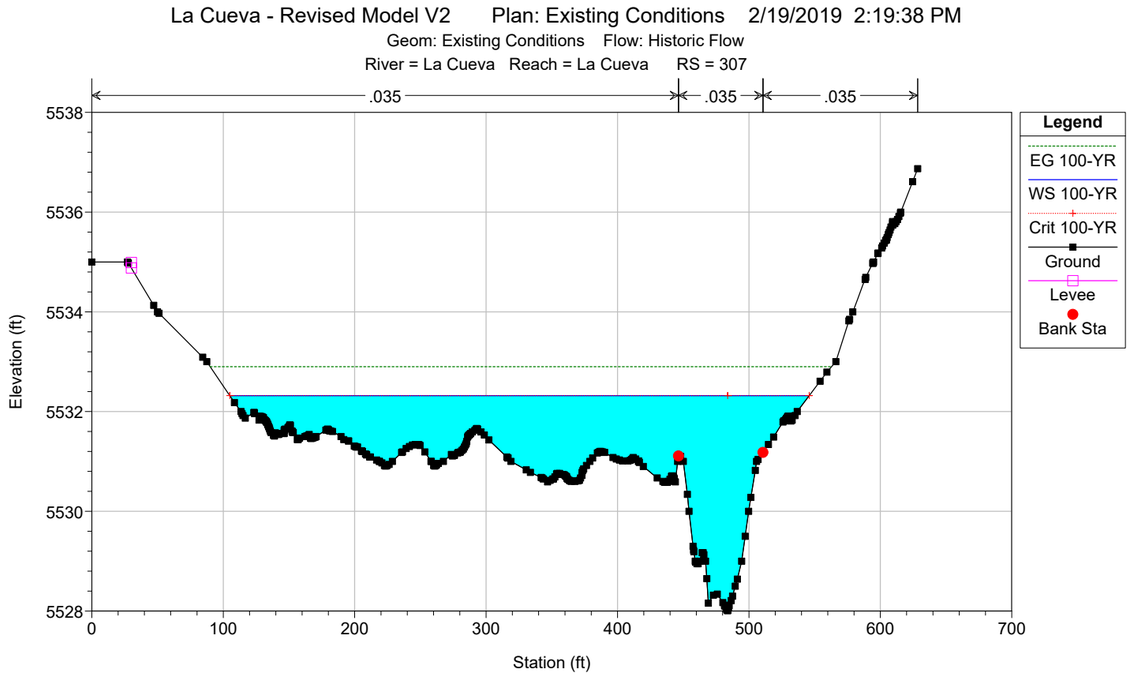


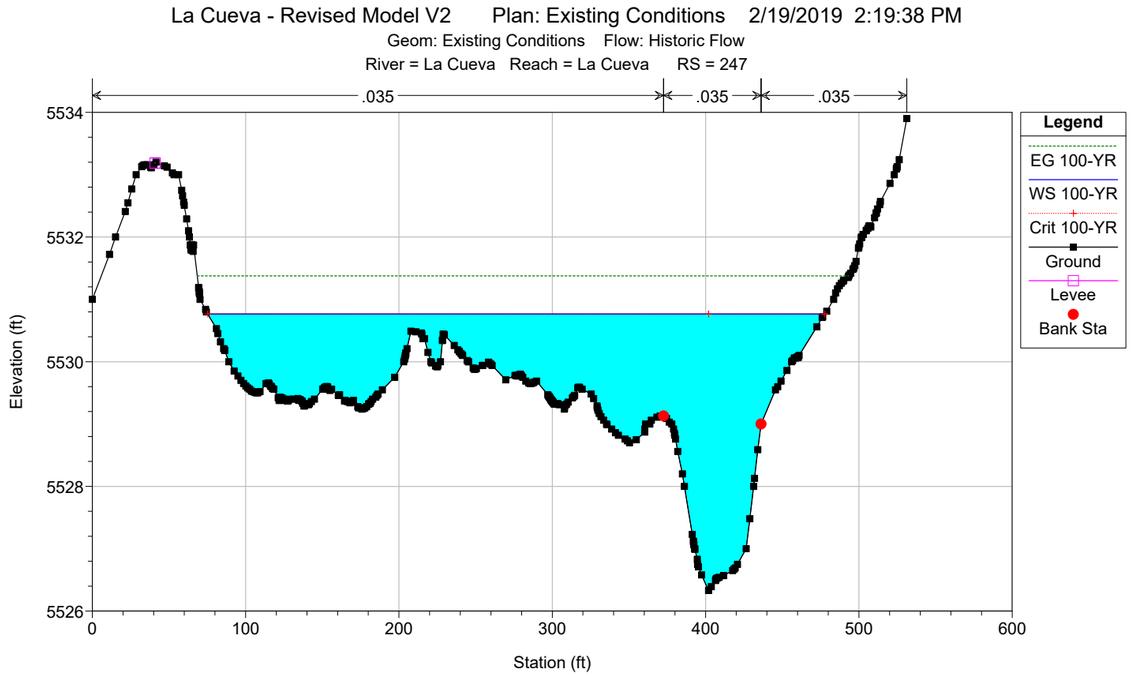

La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 492
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

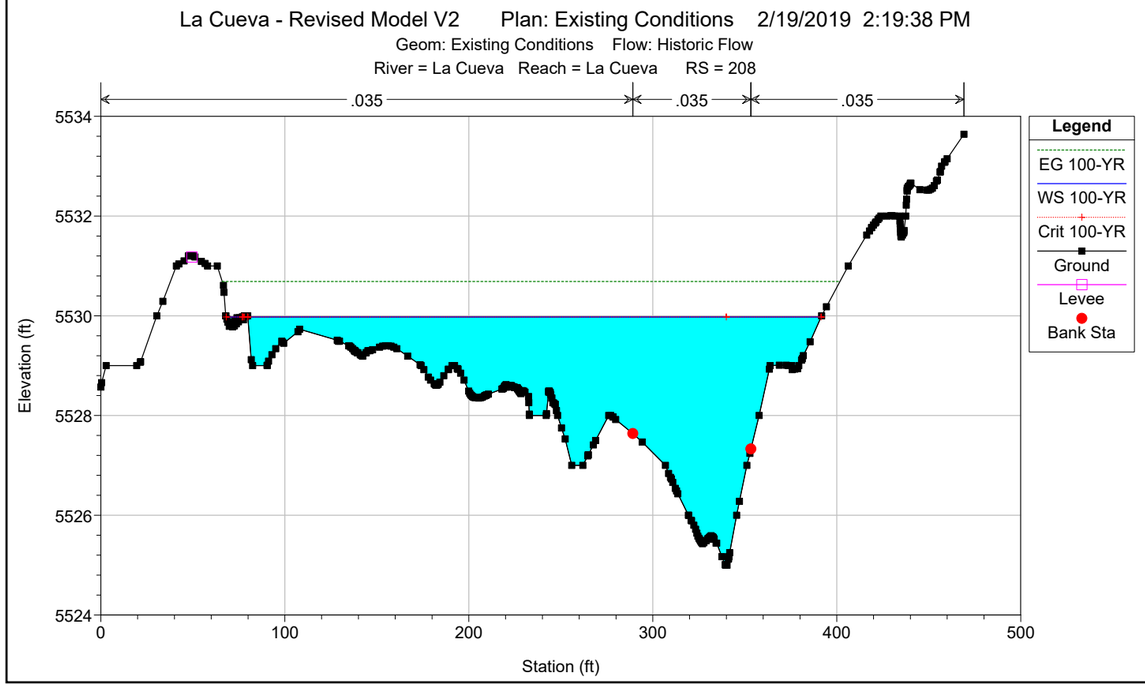

La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 450
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

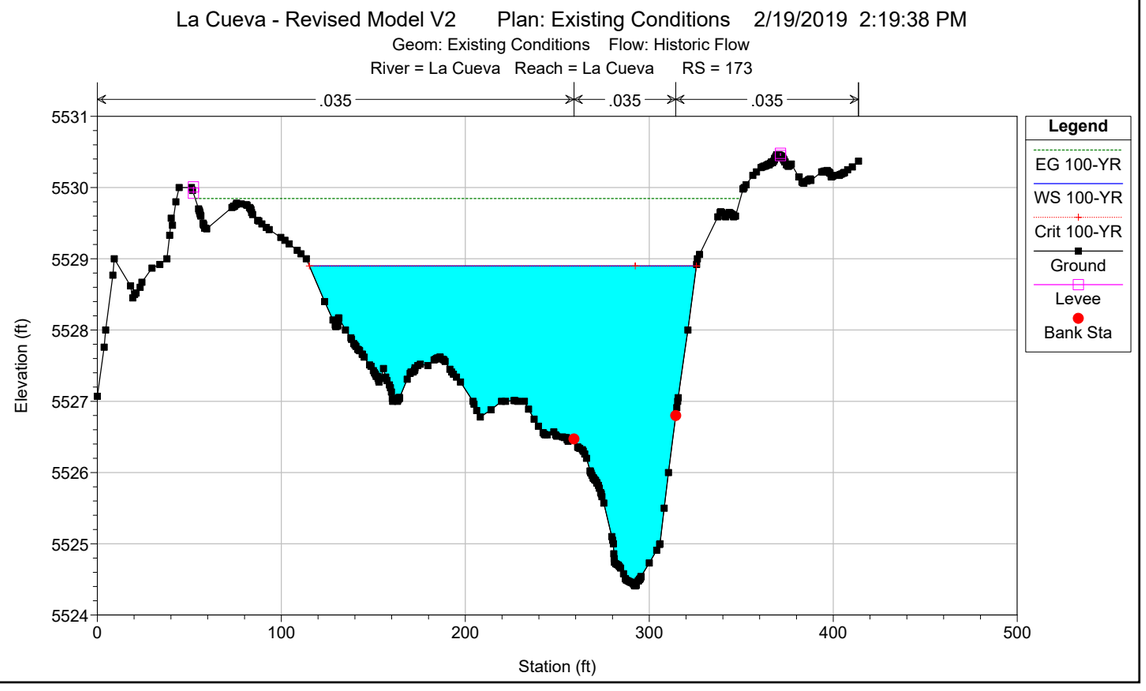

La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 432
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

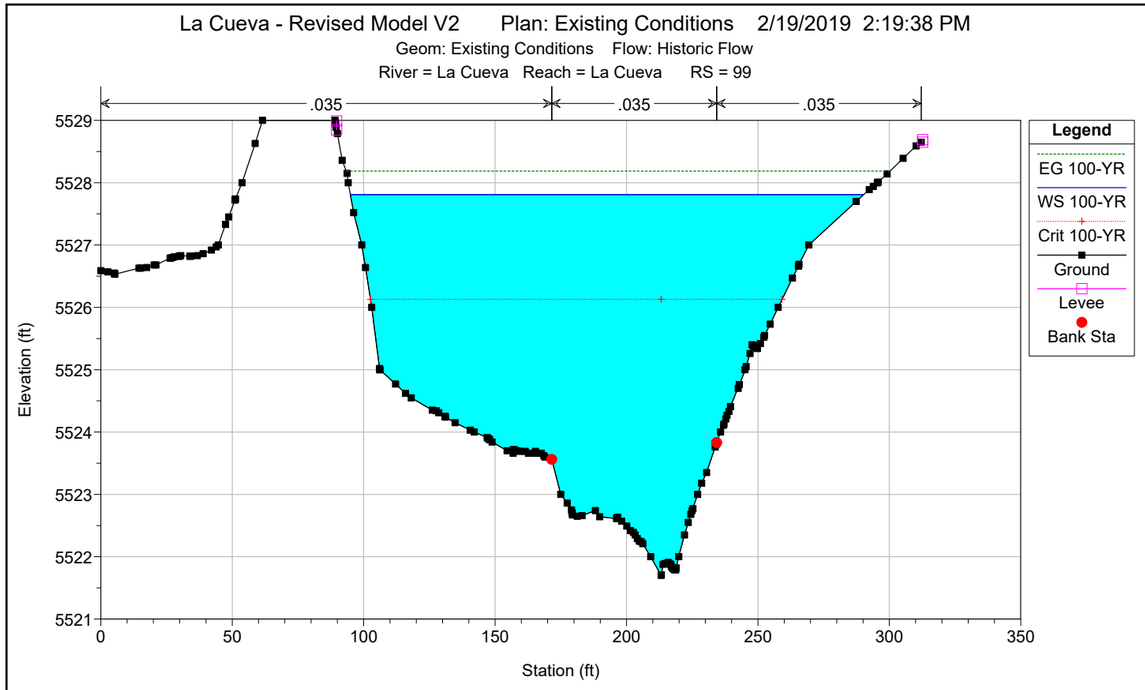

La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 357
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

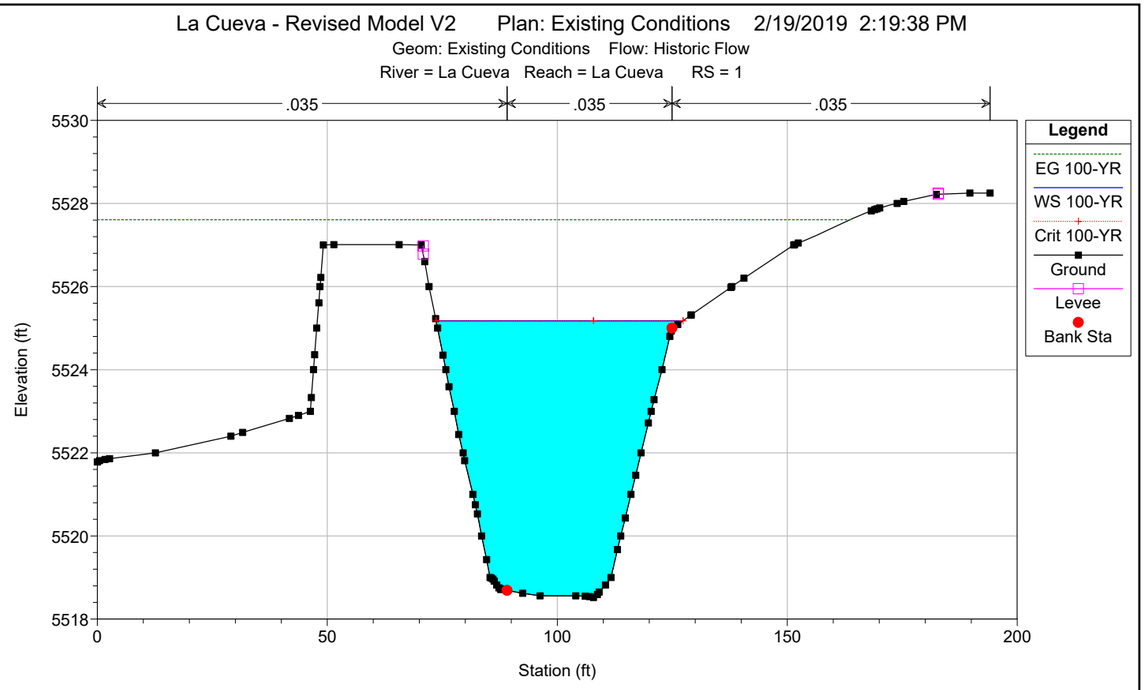

La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 307
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 247
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 208
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

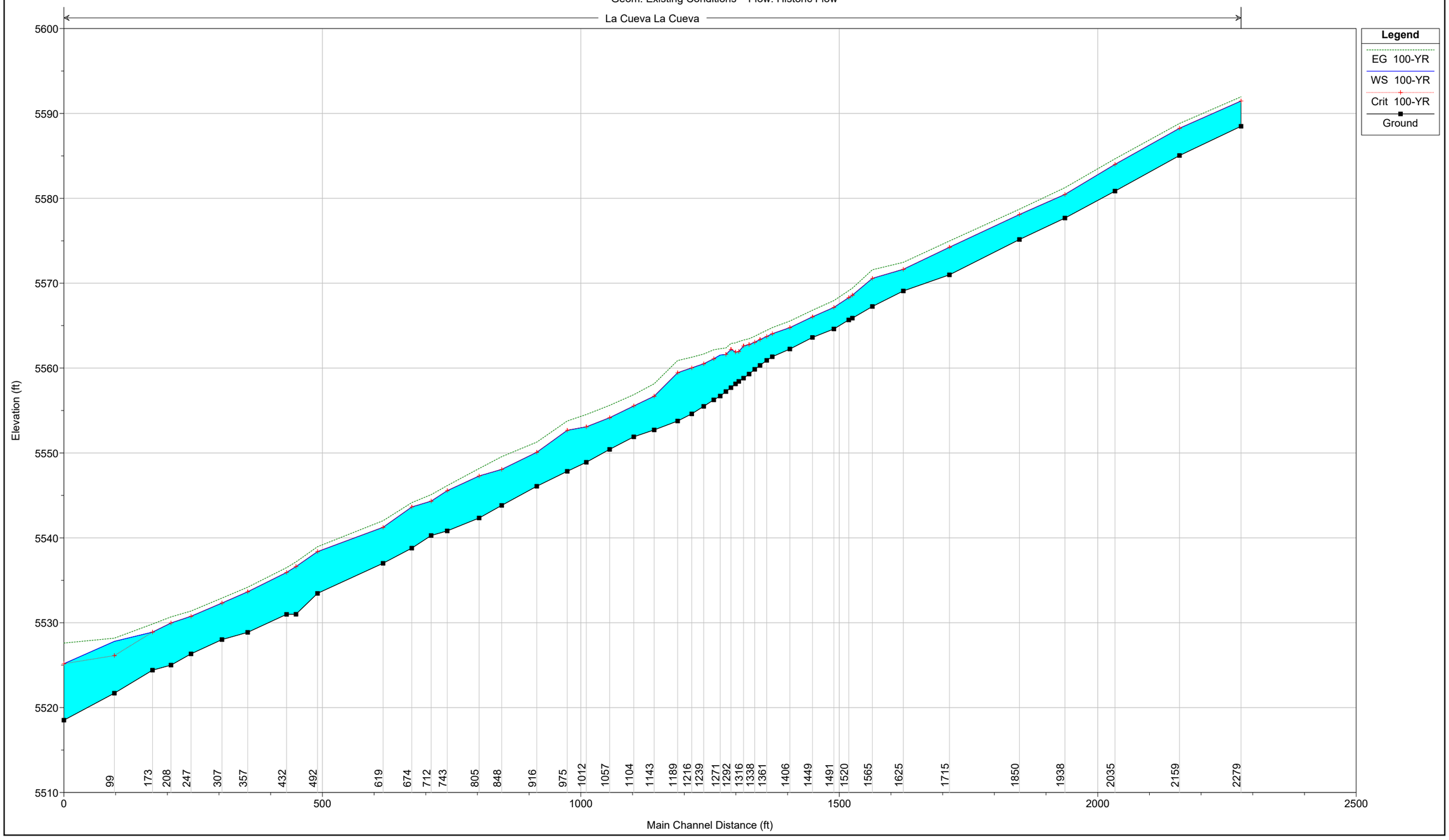

La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 173
.035
.035
.035
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 99
.035
.035
.035
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta


La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:38 PM
Geom: Existing Conditions Flow: Historic Flow
River = La Cueva Reach = La Cueva RS = 1
.035
.035
.035
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Levee
Bank Sta

La Cueva - Revised Model V2 Plan: Existing Conditions 2/19/2019 2:19:23 PM

Geom: Existing Conditions Flow: Historic Flow



HEC-RAS Plan: Existing River: La Cueva Reach: La Cueva Profile: 100-YR

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
La Cueva	2279	100-YR	3090.00	5588.49	5591.47	5591.47	5591.96	0.010567	6.69	601.96	530.19	0.86
La Cueva	2159	100-YR	3090.00	5585.04	5588.26	5588.26	5588.83	0.010815	6.71	562.55	564.37	0.86
La Cueva	2035	100-YR	3090.00	5580.85	5584.01	5584.01	5584.66	0.011100	7.00	517.57	392.77	0.88
La Cueva	1938	100-YR	3090.00	5577.67	5580.46	5580.46	5581.25	0.015831	8.04	464.35	411.80	1.04
La Cueva	1850	100-YR	3090.00	5575.15	5578.10	5578.10	5578.72	0.010308	7.06	529.34	377.97	0.86
La Cueva	1715	100-YR	3090.00	5570.99	5574.24	5574.24	5574.98	0.011016	8.74	476.99	292.83	0.93
La Cueva	1625	100-YR	3090.00	5569.09	5571.64	5571.64	5572.46	0.013924	7.66	435.41	269.35	0.98
La Cueva	1565	100-YR	3090.00	5567.26	5570.58	5570.58	5571.59	0.012690	8.09	391.38	209.16	0.96
La Cueva	1527 Lot 16	100-YR	3090.00	5565.88	5568.60	5568.60	5569.42	0.012179	8.05	446.83	267.11	0.95
La Cueva	1520 Lot 16	100-YR	3090.00	5565.67	5568.31	5568.31	5569.12	0.012879	8.06	445.02	271.76	0.97
La Cueva	1491 Lot 16	100-YR	3090.00	5564.61	5567.15	5567.15	5567.95	0.014566	7.57	435.77	275.90	0.99
La Cueva	1449 Lot 16	100-YR	3090.00	5563.61	5566.04	5566.04	5566.82	0.015578	6.85	437.44	286.17	0.99
La Cueva	1406 Lot 16	100-YR	3090.00	5562.24	5564.77	5564.77	5565.54	0.015805	7.30	440.71	295.50	1.02
La Cueva	1372 Lot 16	100-YR	3090.00	5561.34	5564.05	5564.05	5564.77	0.013369	7.46	469.03	324.72	0.96
La Cueva	1361 Lot 15	100-YR	3090.00	5560.91	5563.72	5563.72	5564.45	0.013240	7.90	470.69	324.52	0.97
La Cueva	1348 Lot 15	100-YR	3090.00	5560.32	5563.36	5563.36	5564.07	0.011905	8.00	485.18	329.63	0.94
La Cueva	1338 Lot 15	100-YR	3090.00	5559.86	5563.05	5563.05	5563.76	0.010309	8.71	506.42	332.35	0.90
La Cueva	1327 Lot 15	100-YR	3090.00	5559.29	5562.77	5562.77	5563.46	0.009793	7.86	512.57	341.63	0.87
La Cueva	1316 Lot 15	100-YR	3090.00	5558.81	5562.61	5562.61	5563.30	0.008497	7.88	528.66	343.06	0.82
La Cueva	1307 Lot 15	100-YR	3090.00	5558.44	5561.96	5561.96	5563.13	0.014920	9.67	379.64	325.55	1.07
La Cueva	1301 Lot 15	100-YR	3090.00	5558.14	5561.89	5561.89	5562.97	0.011777	9.53	407.41	334.00	0.97
La Cueva	1292 Lot 15	100-YR	3090.00	5557.69	5562.21	5562.21	5562.90	0.006068	8.48	572.23	345.38	0.73
La Cueva	1282 Lot 15	100-YR	3090.00	5557.23	5561.61	5561.61	5562.38	0.006672	8.09	473.39	336.00	0.75
La Cueva	1271 Lot 15	100-YR	3090.00	5556.70	5561.54		5562.28	0.005554	8.15	488.82	341.51	0.70
La Cueva	1258 Lot 15	100-YR	3090.00	5556.26	5561.10	5561.10	5562.16	0.007993	9.40	417.33	337.99	0.83
La Cueva	1239 Lot 15	100-YR	3090.00	5555.49	5560.51	5560.51	5561.66	0.007304	9.75	406.40	341.73	0.82
La Cueva	1216 Lot 15	100-YR	3090.00	5554.61	5560.03	5560.03	5561.29	0.007004	10.06	389.28	146.91	0.81
La Cueva	1189 Lot 15	100-YR	3090.00	5553.76	5559.45	5559.45	5560.89	0.007668	10.46	351.92	113.83	0.84
La Cueva	1143	100-YR	3090.00	5552.71	5556.69	5556.69	5558.16	0.012055	10.24	323.89	113.69	1.00
La Cueva	1104	100-YR	3090.00	5551.90	5555.54	5555.54	5556.87	0.013344	9.15	334.39	129.07	1.01
La Cueva	1057	100-YR	3090.00	5550.42	5554.16	5554.16	5555.61	0.011186	9.72	328.16	122.11	0.96
La Cueva	1012	100-YR	3090.00	5548.91	5553.09	5553.09	5554.54	0.010165	9.89	336.27	127.27	0.93
La Cueva	975	100-YR	3090.00	5547.84	5552.68	5552.68	5553.77	0.007265	9.78	433.21	200.15	0.82
La Cueva	916	100-YR	3090.00	5546.08	5550.09	5550.09	5551.28	0.009383	9.15	378.45	164.18	0.88
La Cueva	848	100-YR	3090.00	5543.83	5548.07	5548.07	5549.57	0.009984	10.37	335.88	120.44	0.93
La Cueva	805	100-YR	3090.00	5542.34	5547.30	5547.30	5548.17	0.005949	8.90	535.04	334.90	0.74
La Cueva	743	100-YR	3090.00	5540.82	5545.57	5545.57	5546.16	0.004729	7.37	653.17	462.18	0.65
La Cueva	712	100-YR	3090.00	5540.27	5544.33	5544.33	5545.09	0.008485	8.20	535.24	432.29	0.83
La Cueva	674	100-YR	3090.00	5538.78	5543.64	5543.64	5544.15	0.005678	7.83	683.63	502.95	0.70
La Cueva	619	100-YR	3090.00	5537.00	5541.25	5541.25	5542.02	0.008483	8.48	511.81	345.29	0.84
La Cueva	492	100-YR	3090.00	5533.46	5538.38	5538.38	5538.96	0.005945	7.71	639.07	472.56	0.71
La Cueva	450	100-YR	3090.00	5531.00	5536.61	5536.61	5537.17	0.006206	8.38	637.38	447.46	0.73
La Cueva	432	100-YR	3090.00	5530.99	5535.93	5535.93	5536.49	0.006967	7.76	608.66	438.34	0.75
La Cueva	357	100-YR	3090.00	5528.87	5533.65	5533.65	5534.19	0.006423	7.70	641.33	466.51	0.73
La Cueva	307	100-YR	3090.00	5528.01	5532.32	5532.32	5532.90	0.007796	7.74	595.10	440.97	0.79
La Cueva	247	100-YR	3090.00	5526.33	5530.77	5530.77	5531.38	0.006672	7.79	592.68	402.44	0.75
La Cueva	208	100-YR	3090.00	5525.00	5529.98	5529.98	5530.69	0.006513	8.08	539.71	321.11	0.75
La Cueva	173	100-YR	3090.00	5524.41	5528.90	5528.90	5529.85	0.008580	9.16	438.88	210.34	0.85
La Cueva	99	100-YR	3090.00	5521.70	5527.81	5526.13	5528.19	0.001891	5.55	672.35	195.27	0.43
La Cueva	1	100-YR	3090.00	5518.52	5525.18	5525.18	5527.61	0.010654	13.01	250.75	53.71	1.00

100-YEAR HYDROLOGIC CALCULATIONS

BASIN #	AREA (acre)	LAND TREATMENT A (%)	B (%)	C (%)	D (%)	WEIGHTED E (in)	100-YEAR PRECIPITATION V (6-hr) (acre-ft)	V (6-hr) (cu-ft)	V(24-hr) (acre-ft)	V(24-hr) (cu-ft)	Q (cfs)
EXISTING CONDITIONS											
SITE	0.5890	100.00	0.00	0.00	0.00	0.66	0.03	1,411	0.03	1,411	1.10
OFF-SITE	1.2300	46.00	0.00	32.00	22.00	1.24	0.13	5,517	0.14	6,008	3.77
TOTAL RUNOFF	1.819						0.16	6,928	0.17	7,419	4.88
PROPOSED CONDITIONS											
SITE	0.5890	0.00	23.10	23.20	53.70	1.78	0.09	3,804	0.10	4,378	2.41
TOTAL RUNOFF	0.589						0.09	3,804	0.10	4,378	2.41
EXCESS PRECIP.		0.66	0.92	1.29	2.36	E_i (in)					
PEAK DISCHARGE		1.87	2.6	3.45	5.02	Q_{Pi} (cfs)					

ZONE = 3

$P_{6\text{-HR}}$ (in.) = 2.60

$P_{24\text{-HR}}$ (in.) = 3.10

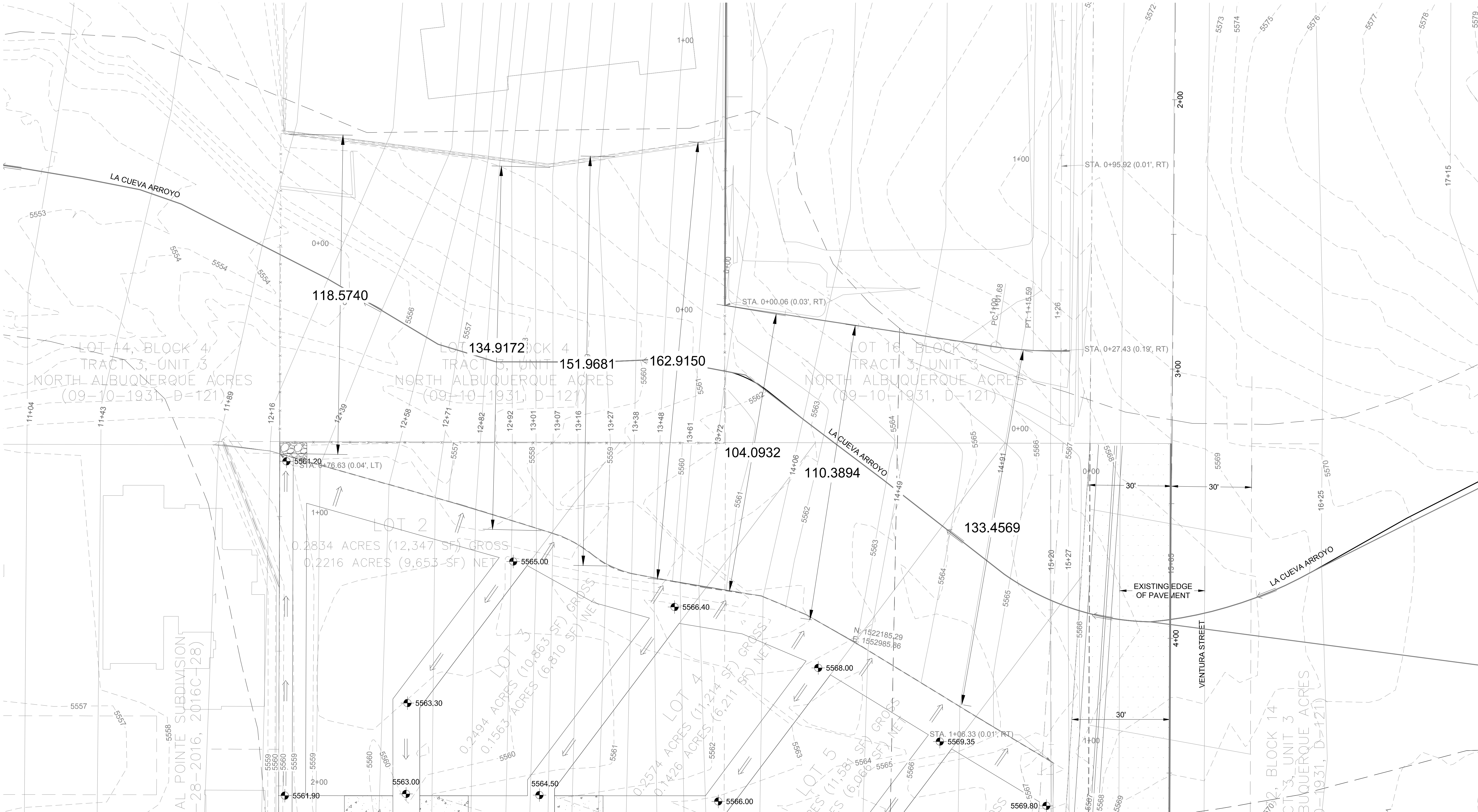
P_{10DAY} (in.) = 4.90

WEIGHTED E (in) = $(E_A)(\%A) + (E_B)(\%B) + (E_C)(\%C) + (E_D)(\%D)$

$V_{6\text{-HR}}$ (acre-ft) = (WEIGHTED E)(AREA)/12

V_{10DAY} (acre-ft) = $V_{6\text{-HR}} + (A_D)(P_{10DAY} - P_{6\text{-HR}})/12$

Q (cfs) = $(Q_{PA})(A_A) + (Q_{PB})(A_B) + (Q_{PC})(A_C) + (Q_{PD})(A_D)$


LA CUEVA ARROYO
118.5740
134.9172
151.9681
162.9150
104.0932
110.3894
133.4569
LOT 14, BLOCK 4
TRACT 3, UNIT 3
NORTH ALBUQUERQUE ACRES
(09-10-1931, D-121)
LOT 16, BLOCK 4
TRACT 3, UNIT 3
NORTH ALBUQUERQUE ACRES
(09-10-1931, D-121)
LOT 2
0.2834 ACRES (12,347 SF) GROSS
0.2216 ACRES (9,653 SF) NET
LOT 3
0.2494 ACRES (10,863 SF) GROSS
0.1563 ACRES (6,810 SF) NET
LOT 4
0.2574 ACRES (11,214 SF) GROSS
0.1426 ACRES (6,211 SF) NET
LOT 5
STA. 0+76.63 (0.04', LT)
STA. 0+00.06 (0.03', RT)
STA. 0+95.92 (0.01', RT)
STA. 0+27.43 (0.19', RT)
STA. 1+06.33 (0.01', RT)
PC 1+01.68
PT 1+15.59
N: 1522185.29
E: 1552985.86
5561.20
5565.00
5566.40
5568.00
5563.30
5569.35
5563.00
5564.50
5561.90
5566.00
5569.80
EXISTING EDGE
OF PAVEMENT
VENTURA STREET
30'
30'
30'
2+00
3+00
4+00
17+15
16+25
15+20
15+27
14+91
14+49
14+06
13+72
13+61
13+48
13+38
13+27
13+16
13+07
13+01
12+92
12+82
12+71
12+58
12+39
12+16
11+89
11+43
11+04
1+26
0+00
1+00
2+00
5553
5554
5556
5557
5558
5559
5560
5561
5562
5563
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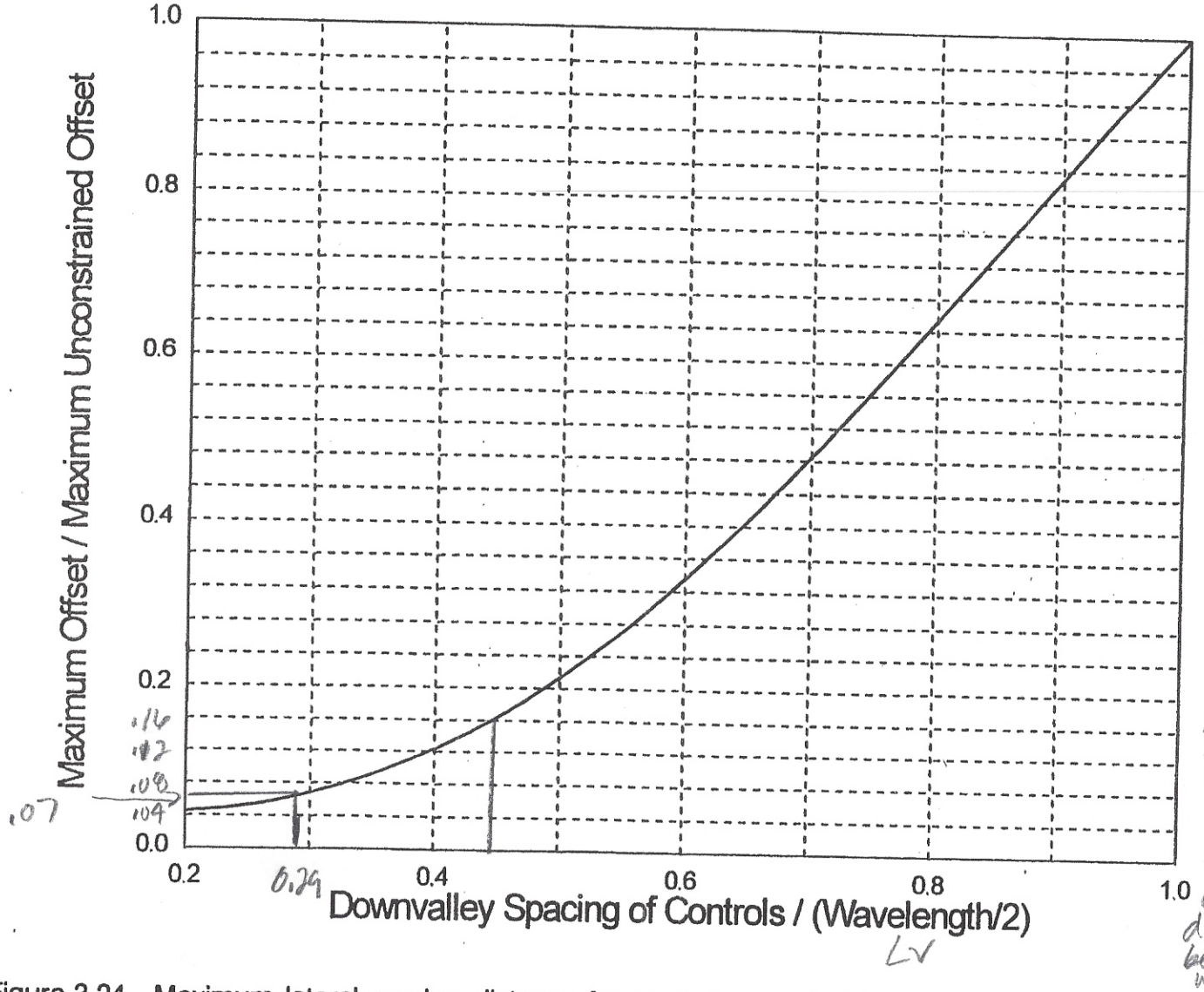


Figure 3.24. Maximum lateral erosion distance for control spaced at less than half the assumed unconstrained meander length.

LV = 360 FT

TABLE 1

LA CUEVA ARROYO SCOUR ANALYSIS INCLUDING CHANNEL EXCAVATION WITH VERTICAL CONCRETE SCOUR WALL WITHOUT VENTURA CULVERT

COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20	COL 21	COL 22	COL 23	COL 24	COL 25	COL 26	COL 27	COL 28	COL 29	COL 30	COL 31	COL 32
SEC. NO.	HEC-RAS STA.	Q100 (CFS)	QD (CFS)	SC (FT/FT)	SAVG (FT/FT)	WD (FT)	LAMDA	LV (FT)	DELTA MAX (FT)	EROS. SET. (FT)	SPACING OF CNTRLS. (FT)	SPACING./ LV	MO/ MUO	MO (FT)	2(MO)/WD	VEL (FPS)	FROUDE	AREA (SF)	TOP WID (FT)	HYD DEP (FT)	YS/Y	YS (FT)	HECRAS DEPTH (FT)	HECRAS FROUDE	SEQ DEP (FT)	FRBRD (FT)	WALL HT (FT)	MIN CH. ELEV	BOTTOM WALL EL.	MIN. TOP WALL EL.	HEC-RAS STA.
1	1527	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	133.5	0.37	0.11	21.9	0.73	12.89	2.27	262.09	262.25	1.00	3.00	3.00	2.46	1.61	3.29	1.70	9.99	5565.88	5561.88	5571.88	1527
2	1520	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	133.5	0.37	0.11	21.9	0.73	14.10	2.06	219.22	150.33	1.46	2.59	3.78	1.50	2.06	3.62	1.68	11.09	5565.65	5560.87	5571.96	1520
3	1491	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	133.5	0.37	0.11	21.9	0.73	10.49	1.25	296.91	136.34	2.18	1.42	3.09	2.56	1.20	3.15	1.65	9.89	5564.61	5560.52	5570.41	1491
4	1449	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	120.0	0.33	0.08	15.9	0.53	11.95	1.41	259.65	115.71	2.24	1.60	3.59	2.52	1.38	3.67	1.68	10.95	5563.16	5558.57	5569.52	1449
5	1406	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	110.4	0.31	0.07	13.9	0.46	12.03	1.37	257.08	106.61	2.41	1.55	3.74	2.84	1.36	4.01	1.70	11.45	5561.68	5556.94	5568.39	1406
6	1372	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	104.0	0.29	0.06	11.9	0.40	12.71	1.44	243.18	100.85	2.41	1.65	3.97	2.81	1.44	4.25	1.71	11.93	5560.50	5555.53	5567.46	1372
7	1361	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	162.9	0.45	0.16	31.8	1.06	11.44	1.35	272.87	121.93	2.24	1.53	3.42	3.25	1.25	4.00	1.70	11.12	5560.13	5555.71	5566.83	1361
8	1348	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	162.9	0.45	0.16	31.8	1.06	12.01	1.39	261.13	113.24	2.31	1.58	3.65	3.15	1.35	4.24	1.71	11.60	5559.68	5555.03	5566.63	1348
9	1338	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	162.9	0.45	0.16	31.8	1.06	12.37	1.46	259.39	115.83	2.24	1.66	3.72	3.13	1.34	4.16	1.72	11.60	5559.33	5554.61	5566.21	1338
10	1327	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	152.0	0.42	0.13	25.8	0.86	13.24	1.61	234.21	111.73	2.10	1.87	3.92	2.71	1.57	4.34	1.72	11.98	5559.00	5554.08	5566.06	1327
11	1316	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	152.0	0.42	0.13	25.8	0.86	12.17	1.44	256.11	115.41	2.22	1.64	3.64	2.88	1.39	4.05	1.70	11.40	5558.81	5554.17	5565.57	1316
12	1307	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	134.9	0.37	0.11	21.9	0.73	12.56	1.49	246.63	111.34	2.22	1.70	3.77	2.81	1.45	4.16	1.71	11.64	5558.44	5553.67	5565.31	1307
13	1301	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	134.9	0.37	0.11	21.9	0.73	12.83	1.49	244.67	106.42	2.30	1.71	3.93	2.88	1.42	4.19	1.72	11.84	5558.09	5553.16	5565.00	1301
14	1292	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	134.9	0.37	0.11	21.9	0.73	13.35	1.55	238.87	103.51	2.31	1.78	4.12	2.97	1.44	4.35	1.74	12.20	5557.56	5552.44	5564.64	1292
15	1282	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	130.0	0.36	0.10	19.9	0.66	13.51	1.56	229.43	98.98	2.32	1.81	4.19	2.96	1.31	3.93	1.74	11.86	5557.14	5551.95	5563.81	1282
16	1271	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	130.0	0.36	0.10	19.9	0.66	12.58	1.40	251.55	99.81	2.52	1.59	4.00	3.39	1.31	4.45	1.73	12.18	5556.70	5551.70	5563.88	1271
17	1258	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	125.0	0.35	0.09	17.9	0.60	10.04	1.02	315.21	105.16	3.00	1.19	3.56	4.42	0.97	4.42	1.69	11.67	5556.26	5551.70	5563.37	1258
18	1239	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	125.0	0.35	0.09	17.9	0.60	11.36	1.17	314.52	107.12	2.94	1.33	3.91	4.78	0.98	4.78	1.73	12.42	5555.49	5550.58	5563.00	1239
19	1216	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	118.6	0.33	0.08	15.9	0.53	13.28	1.41	271.01	98.80	2.74	1.61	4.41	4.64	1.16	5.23	1.79	13.43	5554.61	5549.20	5562.63	1216
20	1189	3090	618.0	0.0157	0.0359	60.1	719.5	359.7	168.8	198.8	118.6	0.33	0.08	15.9	0.53	13.39	1.49	270.63	108.00	2.51	1.71	4.28	4.97	1.17	5.54	1.80	13.62	5553.76	5548.48	5562.10	1189

COL 1	CHANNEL CROSS-SECTION NUMBER
COL 2	HEC-RAS CHANNEL STATION
COL 3	100-YEAR PEAK DISCHARGE, Q (CFS)
COL 4	DOMINANT DISCHARGE, QD = 0.2 Q100 (CFS)
COL 5	CRITICAL SLOPE, SC = 0.037 QD (^-0.133) (FT/FT)
COL 6	AVERAGE SLOPE OF THE CHANNEL (FT/FT)
COL 7	DOMINANT CHANNEL WIDTH, WD = 4.6QD(^0.4) (FT), SINCE SAVG>SC
COL 8	MEANDER WAVELENGTH, LAMDA = ((4)LOG(QD)+0.8)WD (FT) FOR 200 < QD < 2000 CFS
COL 9	DOWN-VALLEY LENGTH, LV = LAMDA/2 (FT)
COL 10	MAXIMUM LATERAL EROSION, DELTA MAX = (0.92+(4.6)LOG(QD))QD(^0.4) (FT) FOR 200 < QD < 2000 CFS
COL 11	EROSION SETBACK = WD/2 + DELTA MAX (FT)
COL 12	SPACING OF CONTROLS (DISTANCE BETWEEN PARALLEL SCOUR WALLS IN FT.)
COL 13	SPACING OF CONTROLS/DOWN-VALLEY LENGTH (LV)
COL 14	MAXIMUM OFFSET/MAXIMUM UNCONSTRAINED OFFSET (OR EROSION SETBACK), FROM FIGURE 3.24 AMAFCA SEDIMENT AND EROSION DESIGN GUIDE
COL 15	MAXIMUM OFFSET = (MO/MUO)MUO OR EROSION SETBACK, FT.
COL 16	2(MAXIMUM OFFSET)/DOMINANT CHANNEL WIDTH, IF LESS THAN 1.0 THEN HAVE PARALLEL SCOUR ACTING ON WALL, IF GREATER THAN 1.0 THEN HAVE PARALLEL AND IMPINGEMENT SCOUR ON WALL
COL 17	CHANNEL VELOCITY FROM HECRAS (FT/SEC)
COL 18	FROUDE NUMBER CALCULATED USING HYDRAULIC DEPTH
COL 19	CROSS-SECTIONAL AREA FROM HECRAS (SQ. FT)
COL 20	TOP WIDTH FROM HECRAS (FT)
COL 21	HYDRAULIC DEPTH, HD = A/TW (FT)
COL 22	RATIO OF SCOUR DEPTH TO FLOW DEPTH, YS/Y (SINCE COL 16 IS LESS THAN OR EQUAL TO 1.0, SCOUR ACTING ON THE WALLS IS PARALLEL SCOUR, YS/Y = 0.73 + (0.14)PI(FR^2)
COL 23	ESTIMATED SCOUR (FT)
COL 24	DEPTH OF FLOW FROM HECRAS (FT)
COL 25	FROUDE NUMBER FROM HECRAS
COL 26	SEQUENT DEPTH (FT)
COL 27	FREEBOARD (FT)
COL 28	SCOUR WALL HEIGHT = SCOUR DEPTH + SEQUENT DEPTH +FREEBOARD+ TWO FOOT FACTOR OF SAFTEY (FT)
COL 29	MINIMUM CHANNEL ELEVATION
COL 30	BOTTOM OF SCOUR WALL ELEVATION
COL 31	MINIMUM TOP OF WALL ELEVATION
COL 32	HEC-RAS CHANNEL STATION

TABLE 1

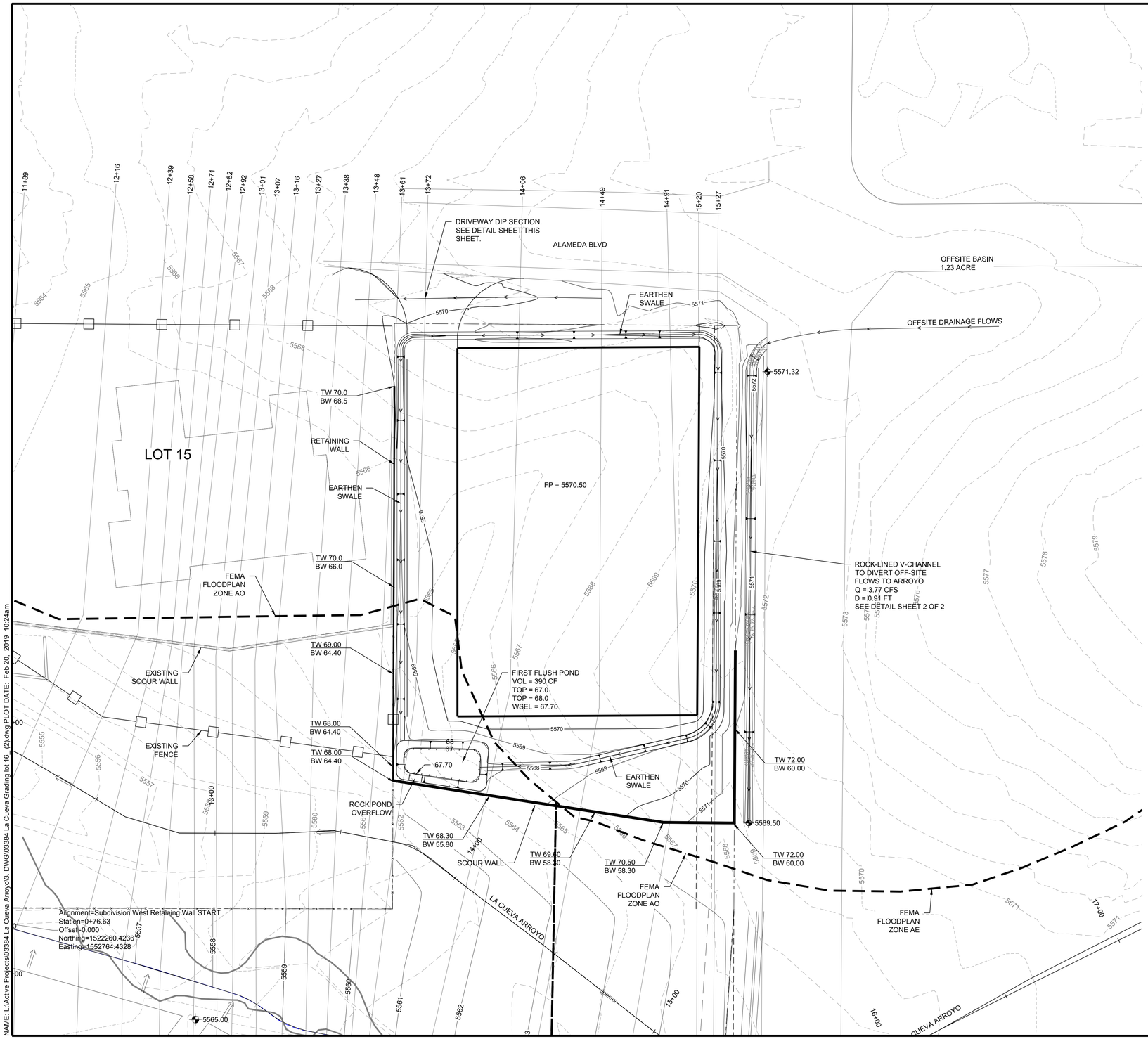
LA CUEVA ARROYO SCOUR ANALYSIS INCLUDING CHANNEL EXCAVATION WITH VERTICAL CONCRETE SCOUR WALL WITH VENTURA CULVERT

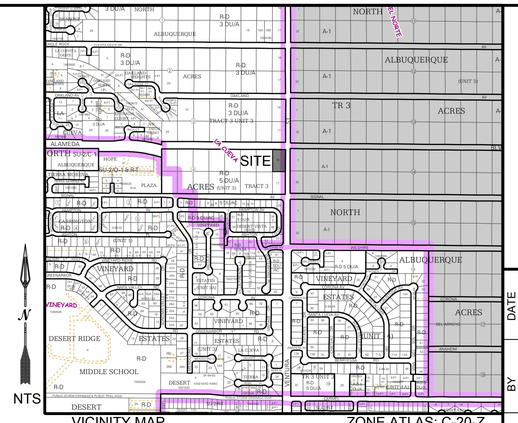
COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8	COL 9	COL 10	COL 11	COL 12	COL 13	COL 14	COL 15	COL 16	COL 17	COL 18	COL 19	COL 20	COL 21	COL 22	COL 23	COL 24	COL 25	COL 26	COL 27	COL 28	COL 29	COL 30	COL 31	COL 32
SEC. NO.	HEC-RAS STA.	Q100 (CFS)	QD (CFS)	SC (FT/FT)	SAVG (FT/FT)	WD (FT)	LAMDA	LV (FT)	DELTA MAX (FT)	EROS. SET. (FT)	SPACING OF CNTRLS. (FT)	SPACING./ LV	MO/ MUO	MO (FT)	2(MO)/WD	VEL (FPS)	FROUDE	AREA (SF)	TOP WID (FT)	HYD DEP (FT)	YS/Y	YS (FT)	HECRAS DEPTH (FT)	HECRAS FROUDE	SEQ DEP (FT)	FRBRD (FT)	WALL HT (FT)	MIN CH. ELEV	BOTTOM WALL EL.	MIN. TOP WALL EL.	HEC-RAS STA.
1	1527	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	133.5	0.37	0.11	21.9	0.73	9.24	1.19	334.49	178.72	1.87	1.35	2.53	3.02	1.00	3.02	1.63	9.19	5563.54	5560.01	5569.19	1527
2	1520	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	133.5	0.37	0.11	21.9	0.73	12.63	1.72	244.62	145.31	1.68	2.02	3.41	1.72	1.72	3.38	1.66	10.45	5563.40	5558.99	5569.44	1520
3	1491	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	133.5	0.37	0.11	21.9	0.73	9.65	1.00	320.31	111.60	2.87	1.17	3.37	2.94	1.00	2.94	1.64	9.95	5562.66	5558.29	5568.24	1491
4	1449	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	120.0	0.33	0.08	15.9	0.53	11.25	1.20	274.65	100.93	2.72	1.37	3.72	2.79	1.20	3.52	1.68	10.91	5561.58	5556.86	5567.78	1449
5	1406	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	110.4	0.31	0.07	13.9	0.46	10.17	1.03	303.77	100.28	3.03	1.20	3.62	3.53	1.03	3.65	1.67	10.95	5560.45	5555.83	5566.77	1406
6	1372	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	104.0	0.29	0.06	11.9	0.40	13.91	1.69	222.19	106.07	2.09	1.99	4.17	2.10	1.69	4.07	1.71	11.96	5559.58	5554.41	5566.36	1372
7	1361	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	162.9	0.45	0.16	31.8	1.06	9.69	1.01	318.94	110.52	2.89	1.17	3.39	3.34	1.00	3.34	1.65	10.38	5559.30	5554.91	5565.29	1361
8	1348	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	162.9	0.45	0.16	31.8	1.06	6.56	0.59	471.12	122.26	3.85	0.88	3.40	3.98	0.59	3.98	1.58	10.96	5558.97	5554.57	5565.53	1348
9	1338	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	162.9	0.45	0.16	31.8	1.06	9.20	0.95	343.08	117.75	2.91	1.13	3.28	3.49	0.89	3.49	1.64	10.42	5558.70	5554.42	5564.83	1338
10	1327	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	152.0	0.42	0.13	25.8	0.86	7.66	0.76	410.38	130.56	3.14	0.98	3.10	3.96	0.71	3.96	1.61	10.67	5558.42	5554.32	5564.99	1327
11	1316	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	152.0	0.42	0.13	25.8	0.86	9.73	1.03	319.83	115.23	2.78	1.20	3.32	3.53	0.99	3.53	1.66	10.51	5558.14	5553.82	5564.33	1316
12	1307	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	134.9	0.37	0.11	21.9	0.73	7.82	0.76	400.86	123.14	3.26	0.99	3.21	4.21	0.72	4.21	1.62	11.04	5557.67	5553.46	5564.50	1307
13	1301	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	134.9	0.37	0.11	21.9	0.73	9.98	1.04	315.77	110.59	2.86	1.21	3.44	3.67	0.97	3.67	1.67	10.78	5557.51	5553.07	5563.85	1301
14	1292	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	134.9	0.37	0.11	21.9	0.73	11.33	1.21	281.36	104.17	2.70	1.38	3.73	3.32	1.13	3.79	1.70	11.21	5557.28	5552.55	5563.77	1292
15	1282	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	130.0	0.36	0.10	19.9	0.66	11.01	1.17	283.35	102.64	2.76	1.33	3.67	3.49	1.13	3.97	1.69	11.33	5557.03	5552.36	5563.69	1282
16	1271	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	130.0	0.36	0.10	19.9	0.66	11.62	1.24	272.30	99.97	2.72	1.41	3.83	3.41	1.16	4.00	1.71	11.53	5556.70	5551.87	5563.40	1271
17	1258	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	125.0	0.35	0.09	17.9	0.60	12.34	1.34	250.95	94.92	2.64	1.52	4.01	3.28	1.31	4.39	1.72	12.12	5556.27	5551.26	5563.38	1258
18	1239	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	125.0	0.35	0.09	17.9	0.60	7.83	0.70	412.86	107.46	3.84	0.95	3.64	4.84	0.64	4.84	1.63	12.11	5555.49	5550.85	5562.96	1239
19	1216	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	118.6	0.33	0.08	15.9	0.53	6.10	0.50	532.53	116.22	4.58	0.84	3.85	5.91	0.45	5.91	1.59	13.36	5554.61	5549.76	5563.11	1216
20	1189	3090	618.0	0.0157	0.0291	60.1	719.5	359.7	168.8	198.8	118.6	0.33	0.08	15.9	0.53	10.46	1.05	351.92	113.83	3.09	1.21	3.75	5.69	0.84	5.69	1.73	13.17	5553.76	5549.01	5562.18	1189

COL 1	CHANNEL CROSS-SECTION NUMBER
COL 2	HEC-RAS CHANNEL STATION
COL 3	100-YEAR PEAK DISCHARGE, Q (CFS)
COL 4	DOMINANT DISCHARGE, QD = 0.2 Q100 (CFS)
COL 5	CRITICAL SLOPE, SC = 0.037 QD (^-0.133) (FT/FT)
COL 6	AVERAGE SLOPE OF THE CHANNEL (FT/FT)
COL 7	DOMINANT CHANNEL WIDTH, WD = 4.6QD(^0.4) (FT), SINCE SAVG>SC
COL 8	MEANDER WAVELENGTH, LAMDA = ((4)LOG(QD)+0.8)WD (FT) FOR 200 < QD < 2000 CFS
COL 9	DOWN-VALLEY LENGTH, LV = LAMDA/2 (FT)
COL 10	MAXIMUM LATERAL EROSION, DELTA MAX = (0.92+(4.6)LOG(QD))QD(^0.4) (FT) FOR 200 < QD < 2000 CFS
COL 11	EROSION SETBACK = WD/2 + DELTA MAX (FT)
COL 12	SPACING OF CONTROLS (DISTANCE BETWEEN PARALLEL SCOUR WALLS IN FT.)
COL 13	SPACING OF CONTROLS/DOWN-VALLEY LENGTH (LV)
COL 14	MAXIMUM OFFSET/MAXIMUM UNCONSTRAINED OFFSET (OR EROSION SETBACK), FROM FIGURE 3.24 AMAFCA SEDIMENT AND EROSION DESIGN GUIDE
COL 15	MAXIMUM OFFSET = (MO/MUO)MUO OR EROSION SETBACK, FT.
COL 16	2(MAXIMUM OFFSET)/DOMINANT CHANNEL WIDTH, IF LESS THAN 1.0 THEN HAVE PARALLEL SCOUR ACTING ON WALL, IF GREATER THAN 1.0 THEN HAVE PARALLEL AND IMPINGEMENT SCOUR ON WALL
COL 17	CHANNEL VELOCITY FROM HECRAS (FT/SEC)
COL 18	FROUDE NUMBER CALCULATED USING HYDRAULIC DEPTH
COL 19	CROSS-SECTIONAL AREA FROM HECRAS (SQ. FT)
COL 20	TOP WIDTH FROM HECRAS (FT)
COL 21	HYDRAULIC DEPTH, HD = A/TW (FT)
COL 22	RATIO OF SCOUR DEPTH TO FLOW DEPTH, YS/Y (SINCE COL 16 IS LESS THAN OR EQUAL TO 1.0, SCOUR ACTING ON THE WALLS IS PARALLEL SCOUR, YS/Y = 0.73 + (0.14)PI(FR^2)
COL 23	ESTIMATED SCOUR (FT)
COL 24	DEPTH OF FLOW FROM HECRAS (FT)
COL 25	FROUDE NUMBER FROM HECRAS
COL 26	SEQUENT DEPTH (FT)
COL 27	FREEBOARD (FT)
COL 28	SCOUR WALL HEIGHT = SCOUR DEPTH + SEQUENT DEPTH +FREEBOARD+ TWO FOOT FACTOR OF SAFTEY (FT)
COL 29	MINIMUM CHANNEL ELEVATION
COL 30	BOTTOM OF SCOUR WALL ELEVATION
COL 31	MINIMUM TOP OF WALL ELEVATION
COL 32	HEC-RAS CHANNEL STATION

TABLE 1
WORST CASE SCOUR WALL HEIGHT

SEC. NO.	HEC-RAS STA.	MIN. CHANNEL ELEV.	BOTTOM WALL ELEV.	TOP WALL ELEV.	WALL HEIGHT (FT)	ADJUSTED BOTTOM WALL ELEV.	ADJUSTED TOP WALL ELEV.	ADJUSTED WALL HEIGHT (FT)	WALL DEPTH BELOW GRADE (FT)	HEC-RAS STA.
1	1527	5565.88	5560.01	5571.88	11.87	5560.00	5572.00	12.00	5.88	1527
2	1520	5565.65	5558.99	5571.96	12.97	5559.00	5572.00	13.00	6.65	1520
3	1491	5564.61	5558.29	5570.41	12.12	5558.30	5570.50	12.20	6.31	1491
4	1449	5563.16	5556.86	5569.52	12.66	5556.80	5569.60	12.80	6.36	1449
5	1406	5561.68	5555.83	5568.39	12.56	5555.80	5568.30	12.50	5.88	1406
6	1372	5560.50	5554.41	5567.46	13.05	5554.40	5567.50	13.10	6.10	1372
7	1361	5560.13	5554.91	5566.83	11.92	5554.40	5566.90	12.50	5.73	1361
8	1348	5559.68	5554.57	5566.63	12.06	5554.40	5566.70	12.30	5.28	1348
9	1338	5559.33	5554.42	5566.21	11.79	5554.40	5566.30	11.90	4.93	1338
10	1327	5559.00	5554.08	5566.06	11.98	5554.00	5566.10	12.10	5.00	1327
11	1316	5558.81	5553.82	5565.57	11.75	5553.80	5565.60	11.80	5.01	1316
12	1307	5558.44	5553.46	5565.31	11.85	5553.40	5565.40	12.00	5.04	1307
13	1301	5558.09	5553.07	5565.00	11.93	5553.00	5565.00	12.00	5.09	1301
14	1292	5557.56	5552.44	5564.64	12.20	5552.40	5564.70	12.30	5.16	1292
15	1282	5557.14	5551.95	5563.81	11.86	5551.90	5563.90	12.00	5.24	1282
16	1271	5556.70	5551.70	5563.88	12.18	5551.70	5563.90	12.20	5.00	1271
17	1258	5556.26	5551.26	5563.37	12.11	5551.20	5563.40	12.20	5.06	1258
18	1239	5555.49	5550.58	5563.00	12.42	5550.50	5563.20	12.70	4.99	1239
19	1216	5554.61	5549.20	5563.11	13.91	5549.20	5563.20	14.00	5.41	1216
20	1189	5553.76	5548.48	5562.18	13.70	5548.40	5562.20	13.80	5.36	1189

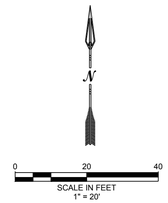


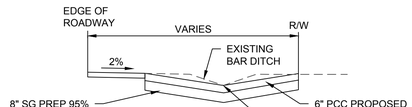


VICINITY MAP ZONE ATLAS: C-20-Z

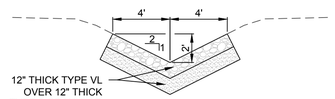
LEGEND

- ROCK V-DITCH
- RETAINING WALL
- SCOUR WALL
- EARTHEN BERM
- FIRST FLUSH POND
- SWALE FLOWLINE
- BUILDING
- EDGE OF ROAD
- PROPERTY LINE
- PROPOSED DRAINAGE EASEMENT
- EXISTING MAJOR CONTOUR 5567
- EXISTING MINOR CONTOUR
- EXISTING CONTOUR LABEL
- EXISITNG SCOUR WALL TRACT 15





DRIVEWAY SECTION
NOSCALE



ROCK-LINED CHANNEL DETAIL
NOSCALE

Thompson Engineering Consultants, Inc.
P.O. BOX 69760
ALBUQUERQUE, NM 87197
PHONE: (505) 271-2199
FAX: (505) 880-9245
tecnm@yahoo.com

NO.	REVISION	BY	DATE

PROJECT:
DATE:
HORIZ. SCALE:
VERT. SCALE:
DRAWN BY: DEM
CHECKED BY:
APPROVED BY:
FILE:

CITY/COUNTY REVIEW

DEPARTMENT	SIGN-OFF	DATE
WASTEWATER MGMT. DIV.		
WATER SERVICES		
SUBDIVISION ENG.		
STREETS		
TRAFFIC		

FOR CITY/COUNTY USE ONLY

LOT 16, BLOCK 4, TRACT 3, UNIT 3
NORTH ALBUQUERQUE ACRES

GRADING AND DRAINAGE PLAN

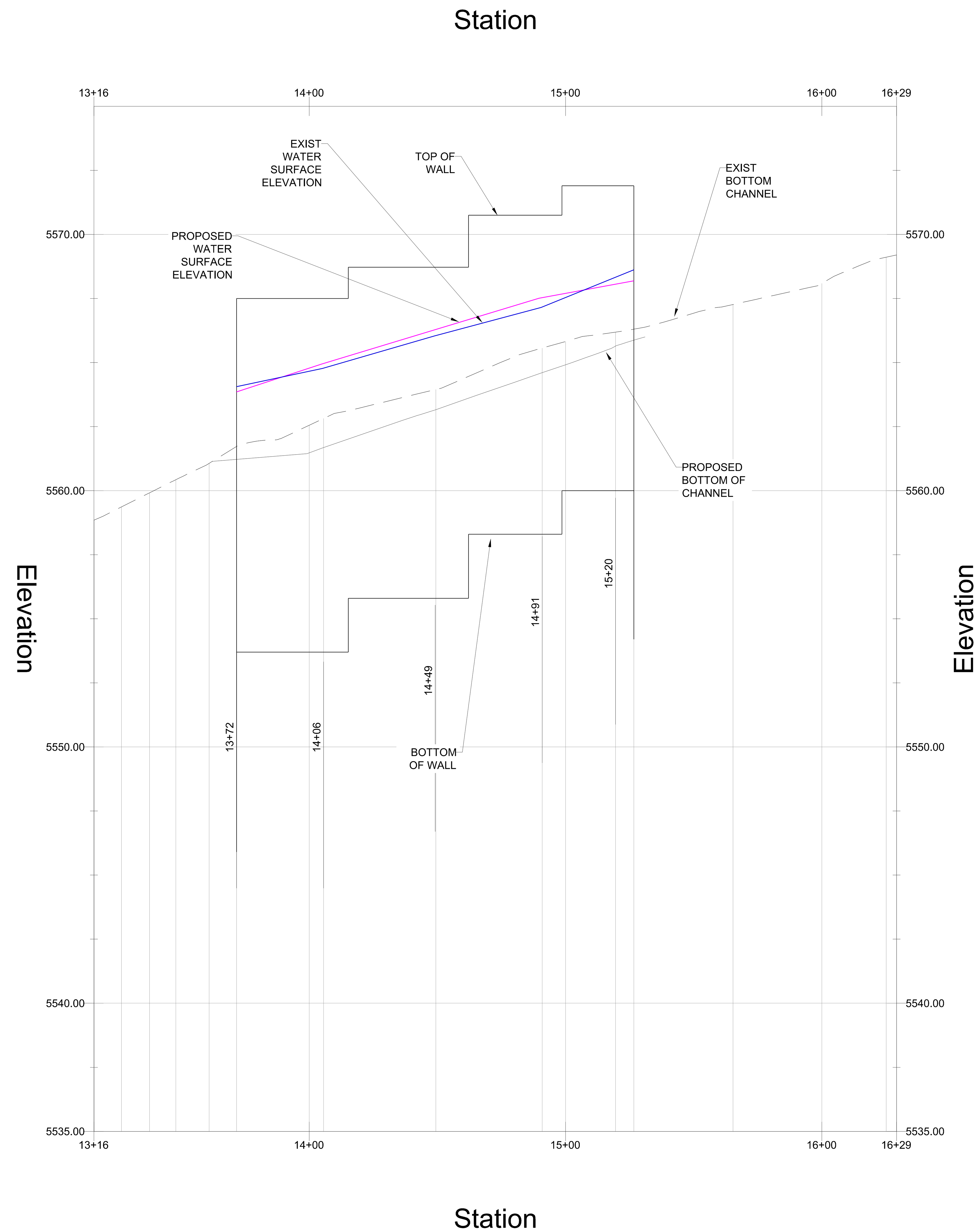
PAGE NO.

C-101

LOT 16 SOUTH SCOUR WALL

CROSS SECTION COORDINATES AT LOT 16 SCOUR WALL

Arroyo Station	N	E
15+20	1522298.44	1553050.75
14+91	1522298.82	1553039.83
14+49	1522303.86	1553004.24
14+06	1522309.62	1552966.99
13+72	1522314.78	1552933.74



HORZ 0 30
VERT 0 10
SCALE IN FEET

Thompson Engineering Consultants, Inc.
tecnm@yahoo.com
P.O. BOX 65760
ALBUQUERQUE, NM 87193
PHONE: (505) 271-2199
FAX: (505) 830-9248

NO.	REVISION	BY	DATE

PROJECT:
DATE:
HORIZ. SCALE:
VERT. SCALE:
DRAWN BY: DEM
CHECKED BY:
APPROVED BY:
FILE:

9677
PROFESSIONAL

LOT 16

WEST AND EAST WALL PROFILES

CITY/COUNTY REVIEW

DEPARTMENT	SIGN-OFF	DATE
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WATER SERVICES		
SUBDIVISION ENG.		
STREETS		
TRAFFIC		

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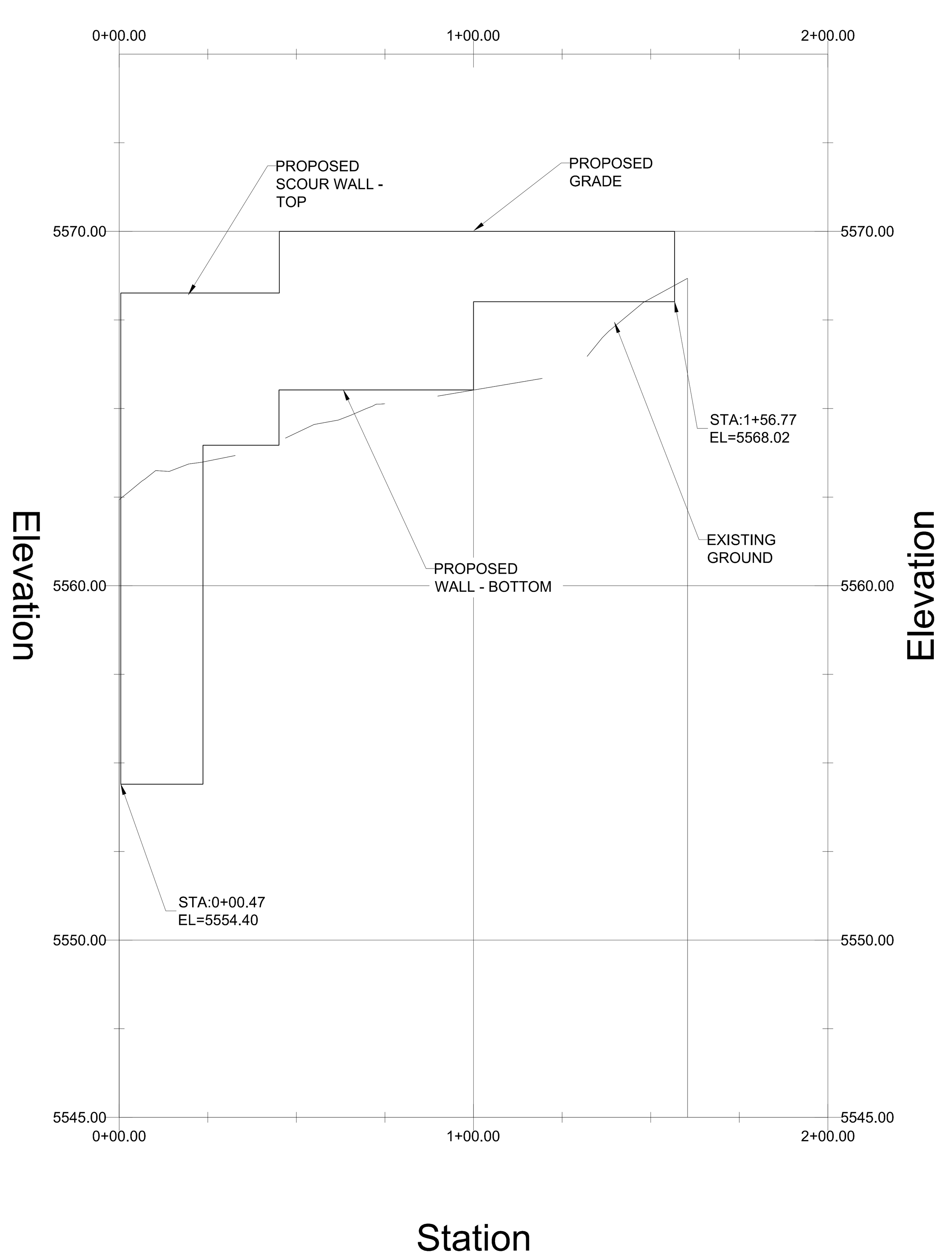
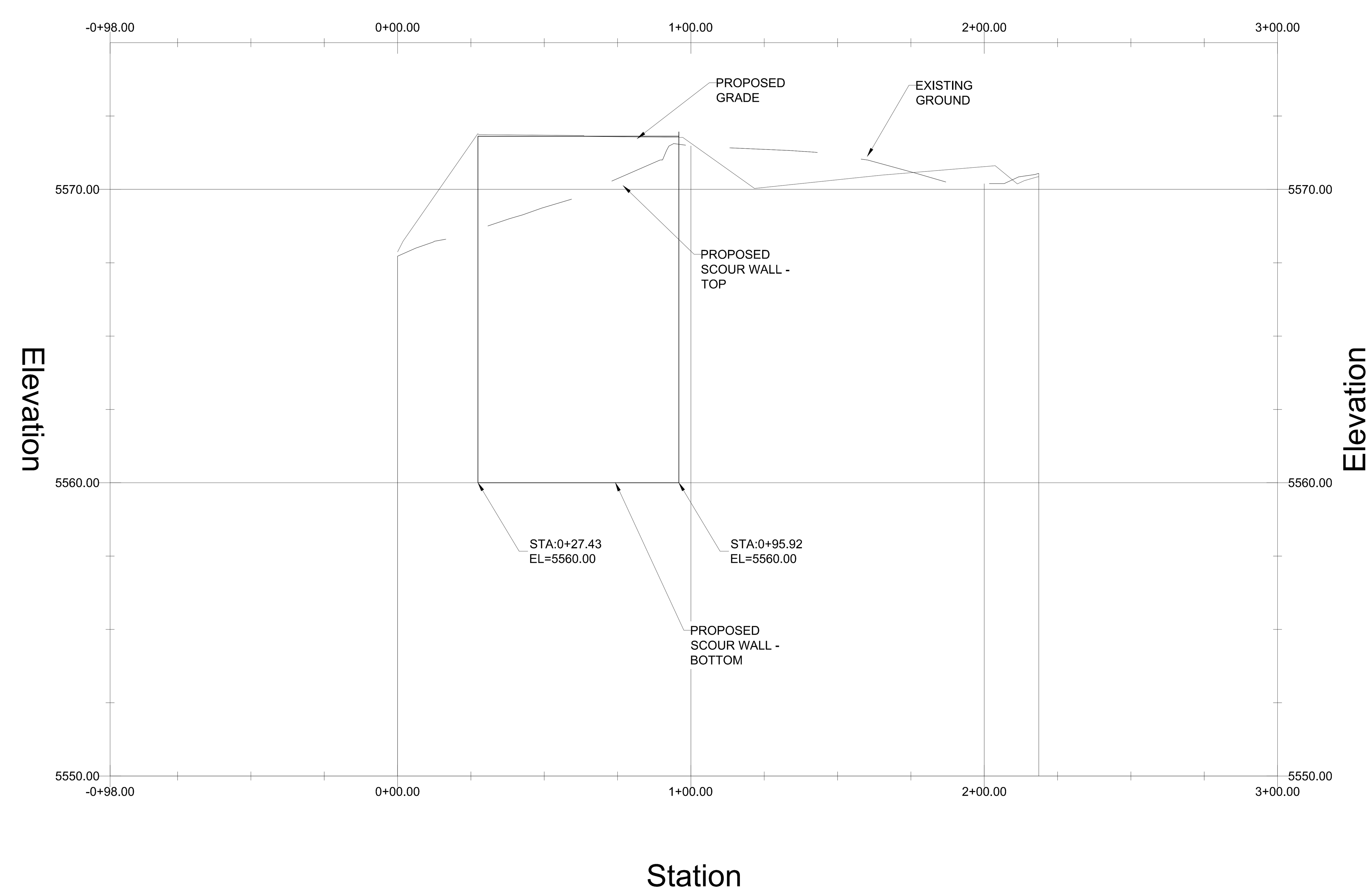
SHEET No.

C-102

Profile View of Lot 16 West Retaining Wall



Profile View of Lot 16 East Scour Wall



Thompson Engineering Consultants, Inc.
P.O. BOX 65760
ALBUQUERQUE, NM 87193
tecnm@yahoo.com
PHONE: (505) 271-2199
FAX: (505) 830-9248

NO.	REVISION	BY	DATE

PROJECT:
DATE:
HORIZ. SCALE:
VERT. SCALE:
DRAWN BY: DEM
CHECKED BY:
APPROVED BY:
FILE:

DAVID THOMPSON 9677 PROFESSIONAL

LOT 16

WEST AND EAST WALL PROFILES

CITY/COUNTY REVIEW

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SUBDIVISION ENG.		
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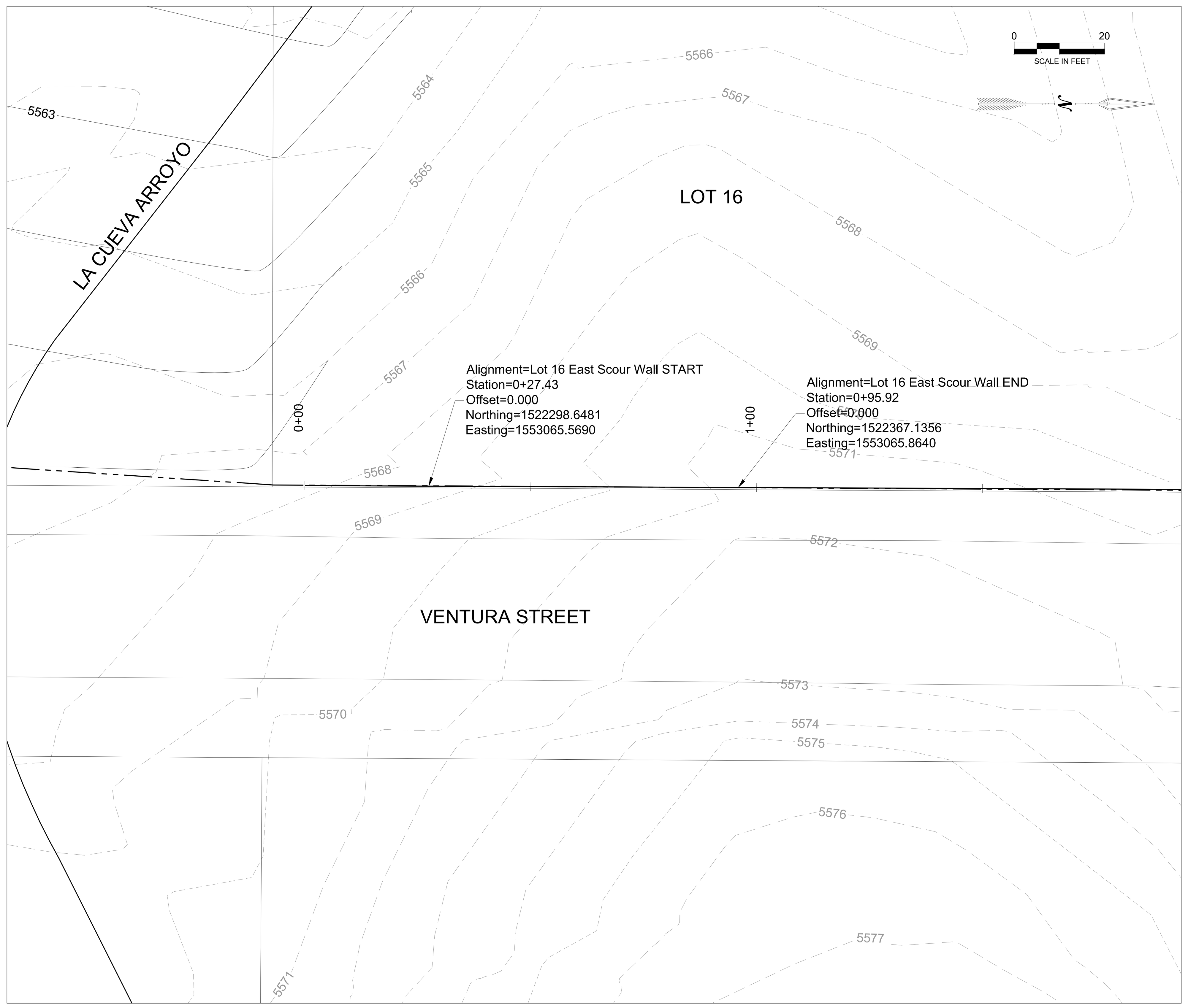
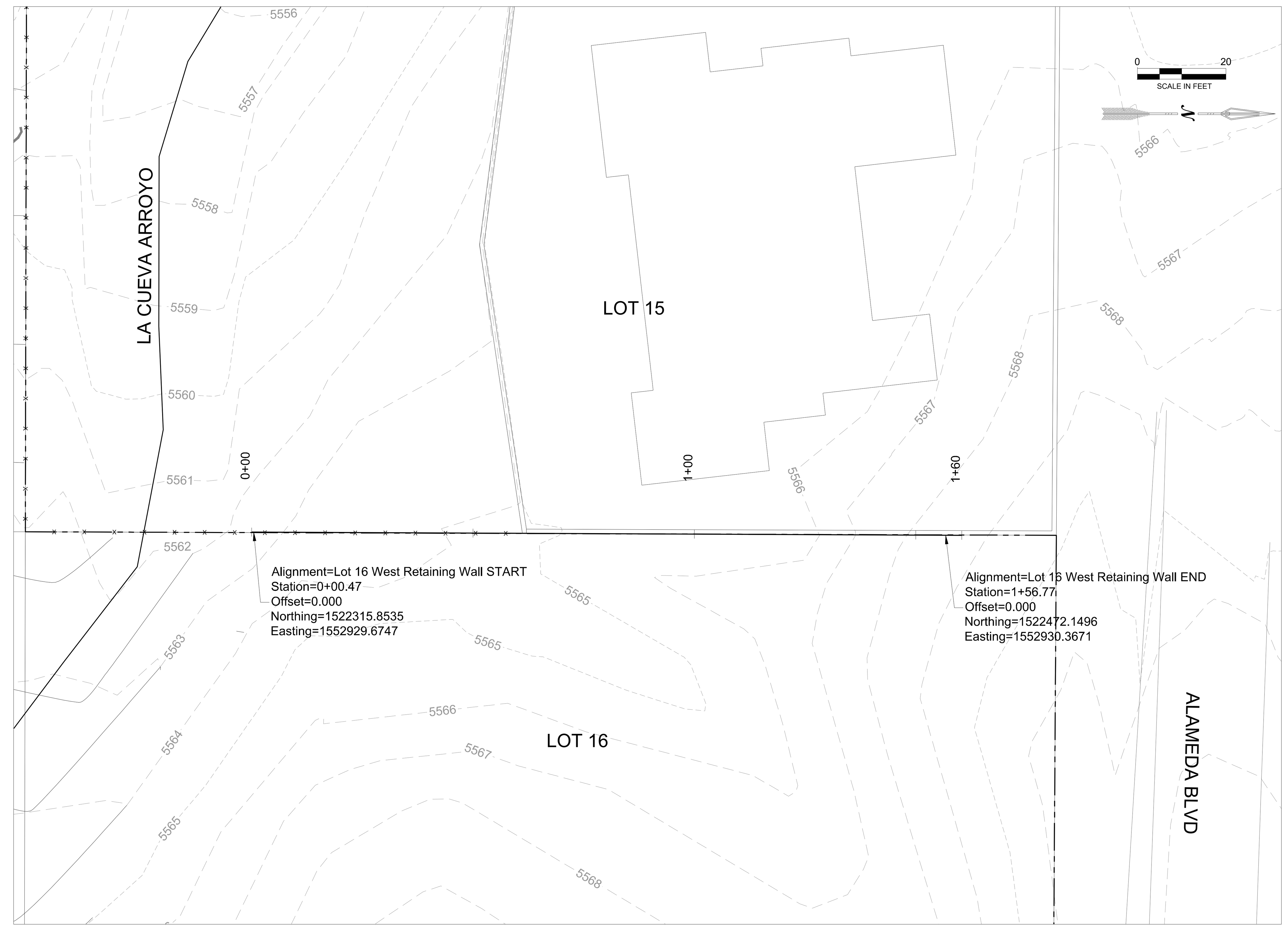
C-103

LOT 16 EAST WALL



LOT 16 WEST WALL



Thompson Engineering Consultants, Inc.
tecnm@yahoo.com
P.O. BOX 65760
ALBUQUERQUE, NM 87193
PHONE: (505) 271-2199
FAX: (505) 830-8246

NO.	REVISION	BY	DATE

PROJECT:
DATE:
HORIZ. SCALE:
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DRAWN BY: DEM
CHECKED BY:
APPROVED BY:
FILE:

DAVID THOMPSON
9677
LICENSED PROFESSIONAL ENGINEER
2-20-19

LOT 16

WEST AND EAST WALL PLAN VIEW

CITY/COUNTY REVIEW

DEPARTMENT	SIGN-OFF	DATE
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WATER SERVICES		
SUBDIVISION ENG.		
STREETS		
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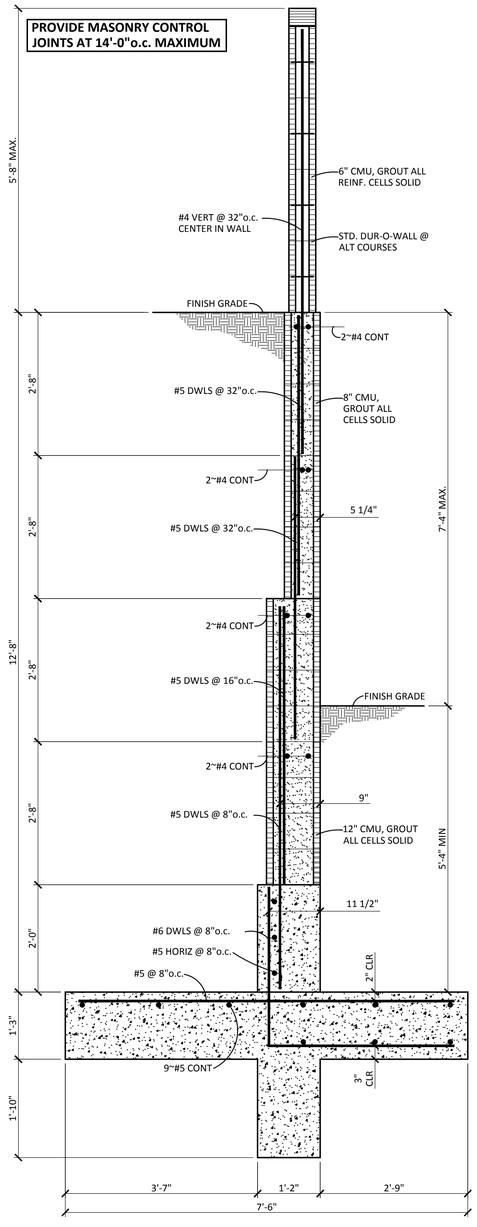
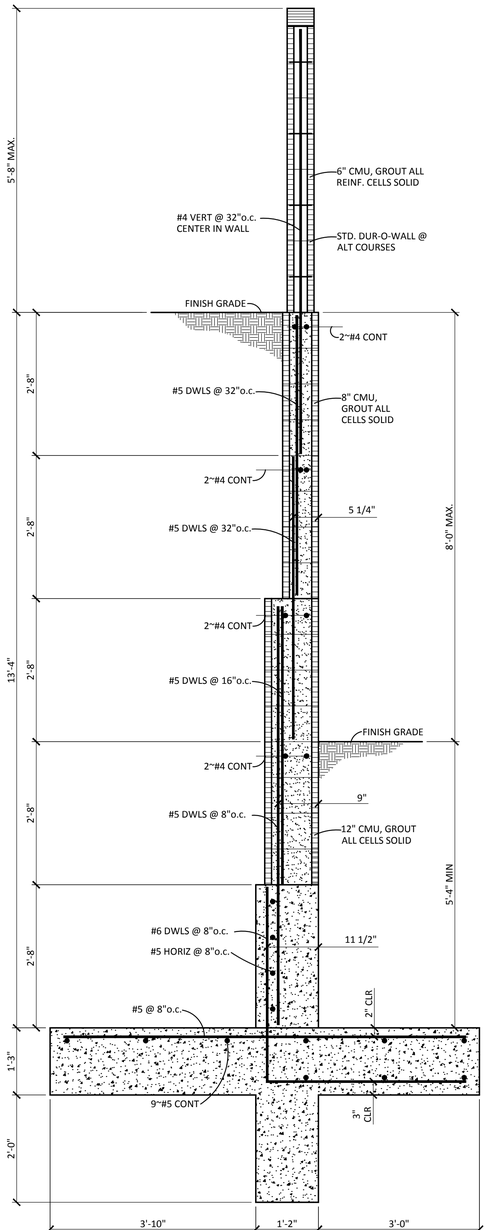
C-104



1 S1 3/4"=1'-0"



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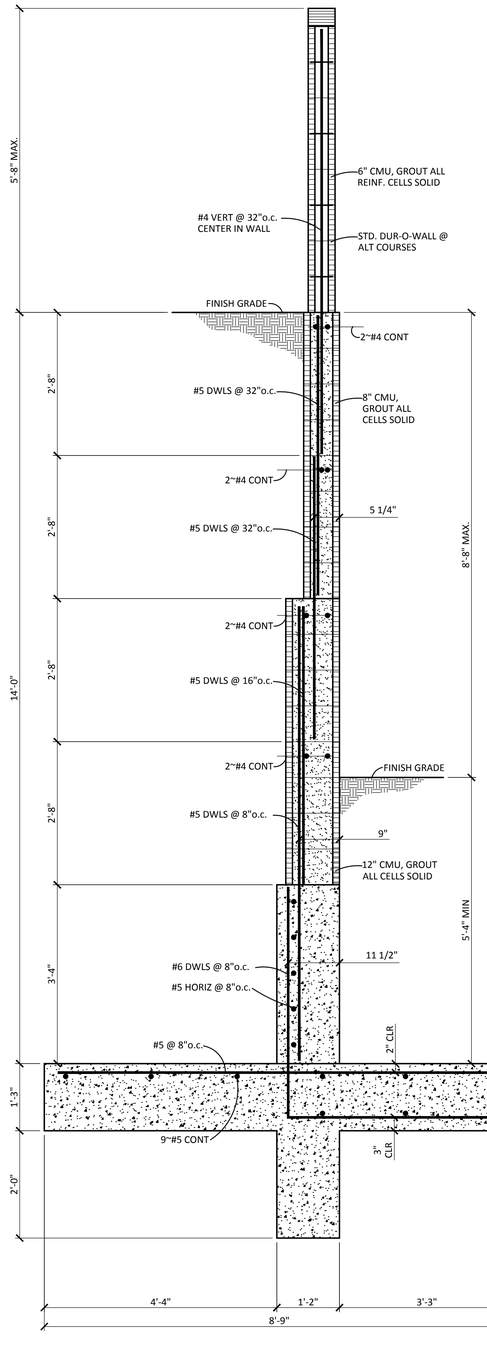

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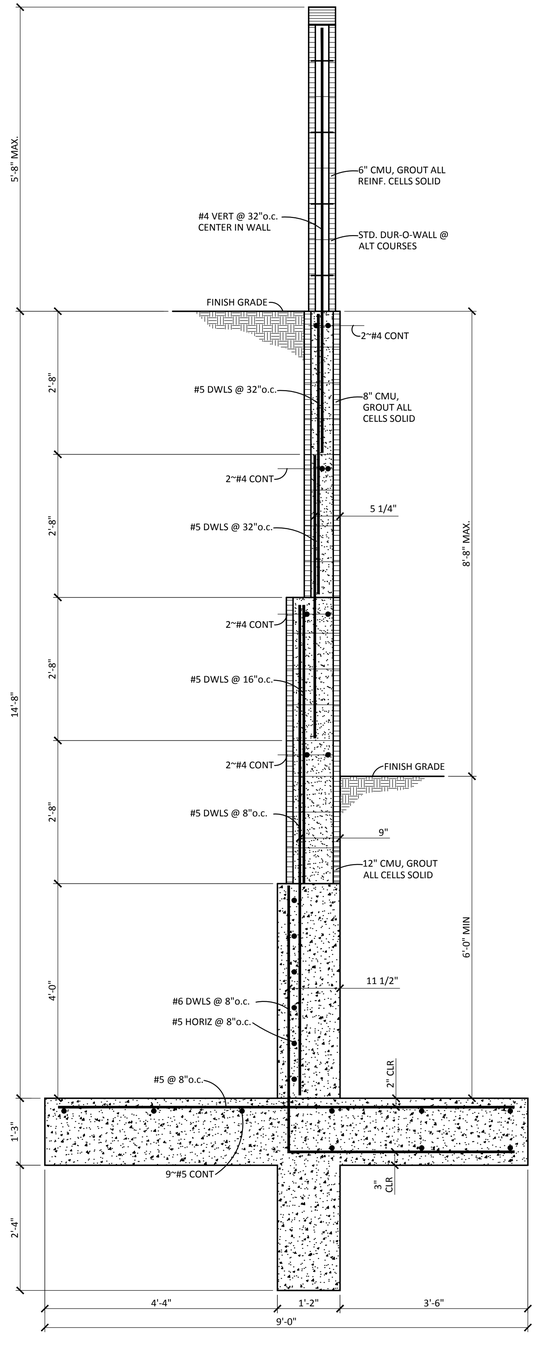

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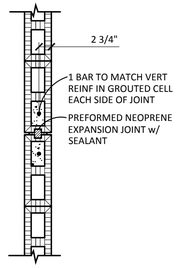
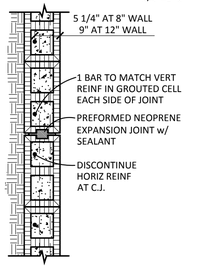
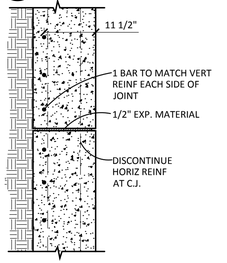


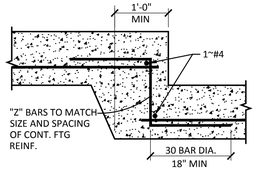
5 S1 TYP. MASONRY WALL CONTROL JOINT (MCJ) AT 6" CMU WALL 3/4"=1'-0"



6 S1 TYP. MASONRY WALL CONTROL JOINT (MCJ) AT 8" AND 12" CMU WALL 3/4"=1'-0"



7 S1 TYP. MASONRY WALL CONTROL JOINT (MCJ) AT 14" CONCRETE WALL 3/4"=1'-0"



8 S1 TYP. FOOTING STEP 3/4"=1'-0"

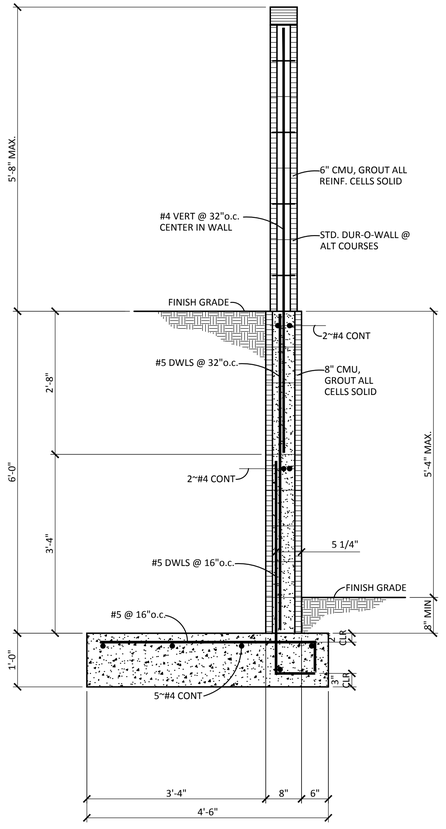
GENERAL STRUCTURAL NOTES

1. CODES AND MANUALS:
   International Building Code, 2015 Edition
   ACI 318-05
2. DESIGN LOADS:
   A. Equivalent Fluid Pressure = 35 pcf/ft
   B. Maximum allowable soil bearing pressure: 2,00psf
3. GENERAL:
   A. The Contractor shall verify all dimensions in the field.
   B. The Contractor shall be responsible for providing safe and adequate shoring for all parts of the structure during construction.
4. MATERIALS:
   A. Cast-in-place Concrete:
      1. All concrete shall conform to the Specifications for Structural Concrete, ACI 301
      2. Normal Weight Concrete:
         a. 3,000 psi @ 28 days
      3. The sides of all footings shall be FORMED. The use of earth forms is NOT allowed.
   B. Reinforcing Steel:
      1. All reinforcing steel shall conform to ASTM A615 Grade 60.
      2. Reinforcing steel shall be fabricated and placed in accordance with the Building Code Requirements for Reinforced Concrete ACI 318 and the Standard Manual ACI 315.
      3. Bar supports and spacers for rebar shall be provided in accordance with ACI 315.
      4. Where lapped splices in reinforcing occur, the minimun lap shall be made as follows:
         a. Vertical reinforcing: 40 bar dia. or 24" minimum.
         b. Horizontal reinforcing: 30 bar dia. or 18" minimum.
         c. Horizontal corner bars: 30 bar dia. or 18" minimum.
      5. Concrete cover for reinforcing shall be as follows:
         a. Concrete cast against and permanently exposed to earth.....3"
         b. Concrete exposed to earth or weather
            1. Bars larger than No. 5 .....2"
            2. Bars No. 5 or smaller ....1 1/2"
      6. The Contractor shall be responsible to see that all rebar is properly aligned and tied in place before placing concrete. All wall dowels and vertical steel shall be accurately located and secured in place so that it remains in the position during the concrete placing operation. Any rebar found to be improperly installed shall be removed and replaced at no additional cost to the Owner.
   C. Masonry:
      1. All masonry units shall have an average compressive strength of 1850 psi @ 28 days.
      2. All mortar shall be Type S with a strength of 2500 psi at 28 days.
      3. Grout shall have a minimum compressive strength of 3000 psi at 28 days.
      4. All hollow masonry to be reinforced shall be marked with keel at the bottom of the wall at the cells where dowels occur or rebar is to be placed and grouted.
      5. Cells containing rebar shall be grouted solid from the bottom to the top of the wall in accordance with IBC regulations. Cleanouts shall be provided at the bottom of walls at all cells to be grouted where the grout pour exceeds 4' in height.
      6. Lap all bars 40 diameters or 2'-0" minimum unless otherwise noted.
5. SITE GRADING AND EARTHWORK
   A. Foundation Preparation:
      Building areas shall be completely stripped of vegetation, existing construction and debris, and soft or muddy areas.
   B. Foundations:
      Over excavate beneath bottom elevation of all footings a minimum of three feet. The excavation shall extend a minimum of three feet laterally beyond the edge of all footings.
      The bottoms of excavations shall be scarified to a depth of 8", moistened within optimum moisture, +/-3%, and compacted to a minimum of 95% of standard proctor as determined by ASTM D698. The structural fill shall be thoroughly mixed within optimum moisture, +/-3%, placed in thin horizontal lifts, 8" max. loose depth, and compacted to a minimum of 95% of standard proctor as determined by ASTM D698.
   C. Backfills:
      All backfills should be thoroughly mixed within optimum moisture, +/-3%, placed in thin horizontal lifts, 8" max. loose depth, and compacted to a minimum of 95% of standard proctor, ASTM D698.
   D. Site Drainage:
      Provide positive surface drainage away from foundation excavations during construction.

MacCORNACK ENGINEERING
1776 Montano Blvd. NW, SUITE 24
LOS RANCHOS de ALBUQUERQUE, NEW MEXICO 87107

DONALD A. MACCORNACK NEW MEXICO 9838 REGISTERED PROFESSIONAL ENGINEER 2-13-19

CLIENT:	**RBK REALTY INC** 8830 Keeran Lane NE Albuquerque, New Mexico
PROJECT:	SIGNAL VILLAGE SUBDIVISION North Albuquerque Acres Albuquerque, New Mexico
DRAWING:	RETAINING WALL SECTIONS AND GENERAL STRUCTURAL NOTES
JOB NO: R37-002	DATE: 2/13/19
SHEET NO:	S1



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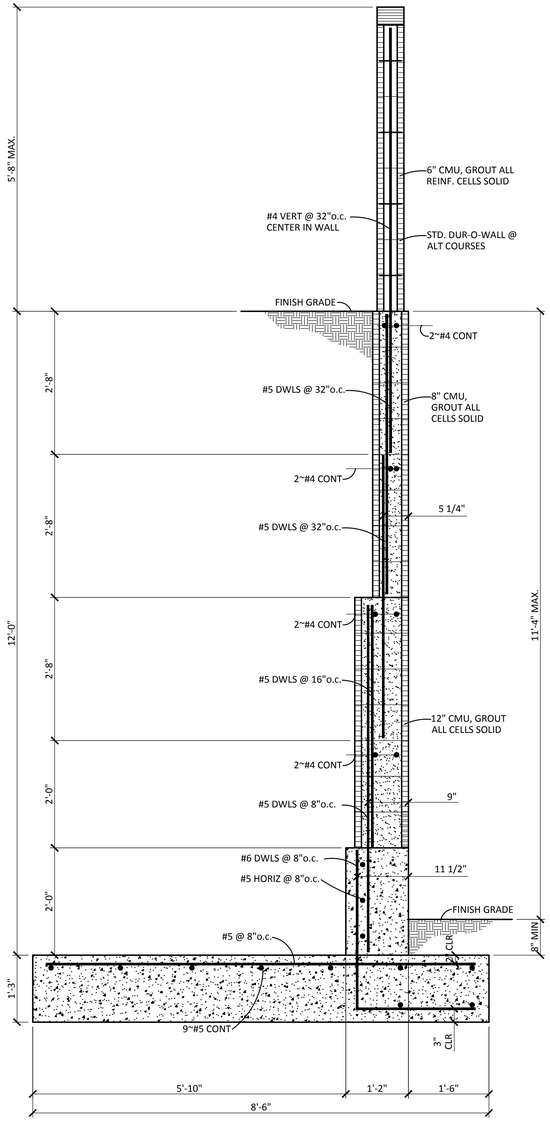

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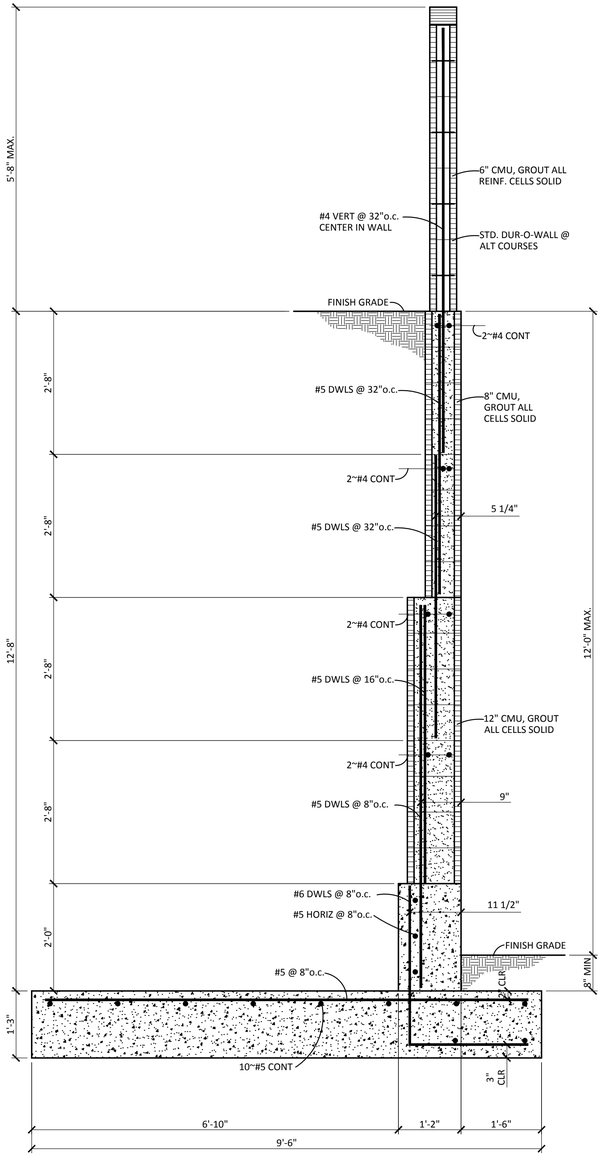

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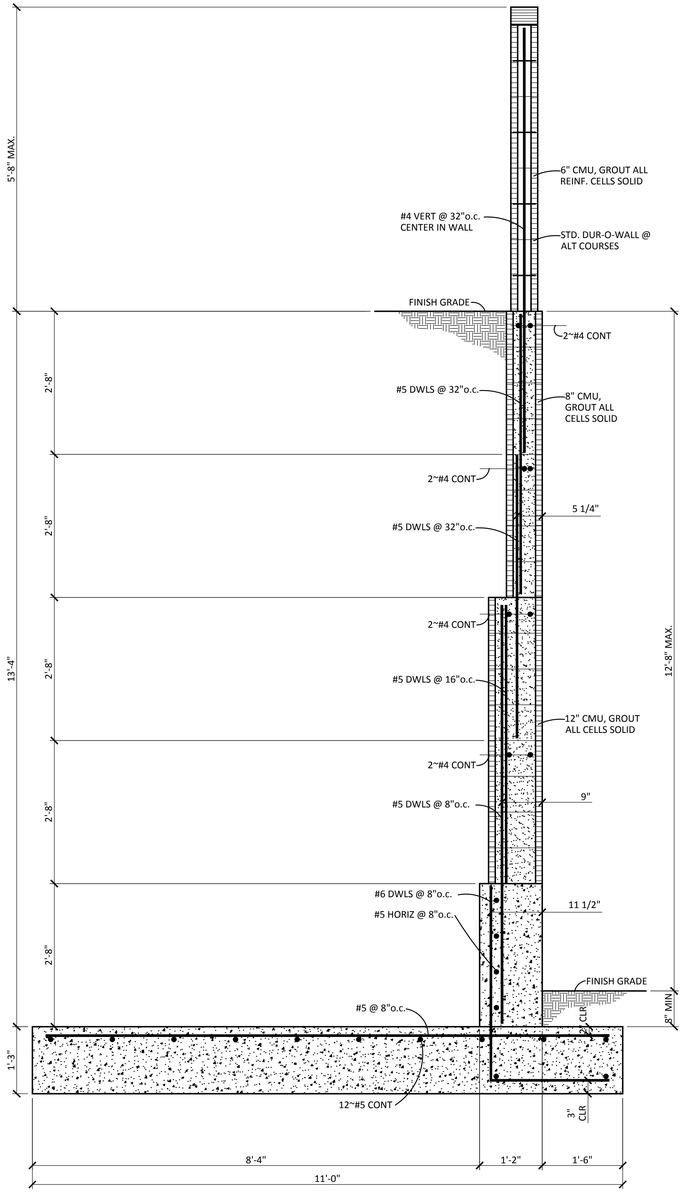

4 S2 3/4"=1'-0"

MacCORNACK ENGINEERING
1776 Montano Blvd. NW, SUITE 24
LOS RANCHOS de ALBUQUERQUE, NEW MEXICO 87107

CLIENT: **RBK REALTY INC**
8830 Keeran Lane NE
Albuquerque, New Mexico

PROJECT: SIGNAL VILLAGE SUBDIVISION
North Albuquerque Acres
Albuquerque, New Mexico

DRAWING: RETAINING WALL SECTIONS AND GENERAL STRUCTURAL NOTES

JOB NO:	DATE:	SHEET NO:
R37-002	2/13/19	S2