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DEVIATION REQUEST AND DECISION FORM

Updated: 6/26/2019

PROJECT INFORMATION

Project Name :	Waterbury Filing No. 1
Schedule No.(s) :	4200000417
Legal Description :	Waterbury Filing No. 1

APPLICANT INFORMATION

Company :	ACM ALF VIII JV SUB II LLC
Name :	Jason Pock
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ENGINEER INFORMATION

Company :	Terra Nova Engineering, Inc.		
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OWNER, APPLICANT, AND ENGINEER DECLARATION

To the best of my knowledge, the information on this application and all additional or supplemental documentation is true, factual and complete. I am fully aware that any misrepresentation of any information on this application may be grounds for denial. I have familiarized myself with the rules, regulations and procedures with respect to preparing and filing this application. I also understand that an incorrect submittal will be cause to have the project removed from the agenda of the Planning Commission, Board of County Commissioners and/or Board of Adjustment or delay review until corrections are made, and that any approval of this application is based on the representations made in the application and may be revoked on any breach of representation or condition(s) of approval.

Signature of owner (or authorized representative) — Date: 2/27/2025

Engineer's Seal, Signature And Date of Signature

COLORADO REGISTERED QUENTIN N. ARMIJO 37170 PROFESSIONAL ENGINEER 2/27/25

DEVIATION REQUEST (Attach diagrams, figures, and other documentation to clarify request)

A deviation from the standards of or in Section **DCM 10.5.4, 10.7, and DCM Update 9.0-9.1 per ECM 3.3.3.B.** is requested.

Identify the specific ECM standard which a deviation is requested:

DCM 10.5.4, 10.7, and DCM Update 9.0-9.1 per ECM 3.3.3.B and for comparison/ justification MHFD USDCM: Criteria Manual Volume 1 – Management, Hydrology and Hydraulics Chapter 8 Table 8.3 Design parameters for naturalized channels

ECM 3.3.3.B Open Channels Conformance with Standards refers to the following sections
-DCM 6.5.2, Channel Velocity
The channel velocity is exceeded in one RS x-section for the East Channel and 3 for the West channel all located at the proposed armored drop structures.

-DCM 10.5.4, Low Flow Channels
There is no proposed low flow channel for both the East and West Channels.

-DCM 10.7 Supercritical Flow
There are several Supercritical RS x-sections in both the East and West Channels

-DCM Update 9.0-Design Flows for Low-Flow Channels, 9.1-Stabilized Natural Channels
There is no proposed low flow channel for both the East and West Channels

-USDCM Table 8.3 Design parameters for naturalized channels
The "*Froude No"* is higher than the given Design Value for the West channel, the *"Maximum longitudinal slope of low flow channel (assuming lined, vegetated low flow channel*)" is higher than the given Design Value for both the East and West channels, the "*Minimum radius of curvature"* is lower than the given Design Value given in ECM 3.3.3.E for both the East and West channels having a centerline radius a minimum 2 times the top width.

State the reason for the requested deviation:

ECM 3.3.3.B Open Channels Conformance with Standards refers to the following sections
The reason for the requested deviations below is to do minimal work on the channel in order to avoid disturbing the well-established vegetation and wetlands (east channel only), as the channels currently show no sign of erosion or disturbance and are functioning properly. The thought is the more improvements to the channel the more disturbance that is required to the existing vegetation and this would cause more harm than good in the future.

-DCM 10.5.4, Low Flow Channels
The project is not installing a low flow channel due to the well-established vegetation and no current erosion or stabilization issues in the bottom of either the East or West channel.

-DCM 10.7 Supercritical Flow
The HEC RAS analysis shows the following RS x-sections as supercritical.
The East channel has no supercritical RS x-sections in the 100-y event and 3 in the 5-y event (RS sections 2010.45, 1300, & 600)

The West channel has 4 supercritical RS x-sections in the 100-y event (RS x-section **1820, 1800, 1420, & 350**) and 7 in the 5-y event (RS sections **1850, 1800, 1420, 1340, 1200, 350, & 200**)

-DCM Update 9.0-Design Flows for Low-Flow Channels, 9.1-Stabilized Natural Channels
The project is not installing a low flow channel due to the well-established vegetation and no current erosion or stabilization issues in either the East or West channel, except in the upper West Channel.

-USDCM Table 8.3 Design parameters for naturalized channels
The Froude No value is above the limits on the West channel in the 100-Y event located at a drop structures at RS-X-sections 1800, 1420, & 350 that we are putting in to lower the channel slope. This area is proposed to be armored with riprap upstream & downstream of the drop and also along the banks. The Froude No is above the values listed in Table 8.3 but the RS Section will be well protected to prevent any future concerns.

We are not doing a total re-design of the channels but adding some improvements where needed, such as channel bank armoring some grading for the dual 48" culvert crossing. The 2 channels are well established stable channels with thick vegetation including wetlands and show no signs of erosion or deficiencies. Any re-design of the existing channel to meet the recommended Table 8.3 values for *Maximum longitudinal slope of low flow channel* & *Minimum radius of curvature* would cause major re-grading of the entire channel.

State the reason for the requested deviation:

Note: For the East channel RS x-section 400 and for the West Channel RS-x-section 0 are the last stations which are always supercritical, have a higher velocity and Froude No due to no downstream RS x-section to properly run calculations in the HECRAS analysis. For this Deviation these 2 sections are not being analyzed or requested in this deviation.

Explain the proposed alternative and compare to the ECM standards (May provide applicable regional or national standards used as basis):

The alternative to the proposed design is to redesign both channels from the north end of the site to the south end of the site by doing major grading to the channel, adding a new flow channel, and widening the curves. This would require destroying all the established vegetation and in the case of the East channel destroying wetlands. The west Channel does have some proposed improvements in areas where needed but re-aligning for minimum radius and low flow channel longitudinal slope is more detrimental.

-DCM 10.5.4, Low Flow Channels
The project is not installing a low flow channel due to the well-established vegetation and no current erosion or stabilization issues in wither the East or West channel, except in the upper West Channel.

-DCM 10.7 Supercritical Flow
The HEC Ras analysis shows the following RS x-sections as supercritical, but the same output shows that their Velocities and Shear Stress meet the EPC DCM criteria of being non-erosive.

An alternate for the East Channel is to armor it or provide drop structures and we are arguing that we do not need to disturb the East Chanel due to the established wetlands and vegetation that currently show no signs of degradation from past storm events. In Walking the site with an El Paso County Engineer, the East Channel showed it is performing fine as it currently is.

The East channel has no supercritical RS x-sections in the 100-y event and 3 in the 5-y event (RS sections **2010.45, 1300, & 600**)

In the 5-y event RS x-section **2010.45** is shown as supercritical, the Froude number is 0.98 which is above the allowable 0.7 but the velocity is 3.34 fps and the shear stress is 2.63 lbs/sq ft, shows it is not erosive and with no shown degradation or erosion the proposed alternative is to leave it as.

In the 5-y event RS x-section **1300** is shown as supercritical, the Froude number is 0.98 which is above the allowable 0.7 but the velocity is 3.34 fps and the shear stress is 2.57 lbs/sq ft, shows it is not erosive and with no shown degradation or erosion the proposed alternative is to leave it as.

In the 5-y event RS x-section **600** is shown as supercritical, the Froude number is 0.92 which is above the allowable 0.7 but the velocity is 3.79 fps and the shear stress is 2.57 lbs/sq ft, shows it is not erosive and with no shown degradation or erosion the proposed alternative is to leave it as.
An alternate for the West Channel in the 100-Year event is to armor the channel sides, provide drop structures and plant cattails and palustrine emergent wetland vegetation. We are proposing to do just that with the construction drawings at these locations listed below in the 100-Year event.

The West channel has 4 supercritical RS x-sections in the 100-y event (RS x-section **1820, 1800, 1420, & 350)** and 7 in the 5-y event **(**RS sections **1850, 1800, 1420, 1340, 1200, 350, & 200**)

In the 100-y event RS x-section **1820** is shown as supercritical the velocity is 5.06 fps, the Froude number is 0.91 and the shear stress is 2.63 lbs/sq ft, this cross section is at the top of a proposed grouted riprap drop structure with armoring on the sides and being re-vegetated. This is the proposed alternative to resolving the issue.

Explain the proposed alternative and compare to the ECM standards (May provide applicable regional or national standards used as basis):

In the 100-y event RS x-section **1800** is shown as supercritical the velocity is 5.25 fps, the Froude number is 1.01 and the shear stress is 2.98 lbs/sq ft, this cross section is a proposed grouted riprap drop structure with armoring on the sides and being re-vegetated. This is the proposed alternative to resolving the issue.

In the 100-y event RS x-section **1420** is shown as supercritical the velocity is 4.00 fps, the Froude number is 1.01 and the shear stress is 2.07 lbs/sq ft, all below the erosive limits shown in Table 8.3 this cross section is a proposed grouted riprap drop structure with armoring on the sides and being re-vegetated. This is the proposed alternative to resolving the issue.

In the 100-y event RS x-section **350** is shown as supercritical the velocity is 5.25 fps, the Froude number is 1.01 and the shear stress is 8.09 lbs/sq ft, this cross section is a proposed grouted riprap drop structure with armoring on the sides and being re-vegetated. This is the proposed alternative to resolving the issue.

An alternate for the West Channel in the 5-Year event is to armor the channel sides, provide drop structures and plant cattails and palustrine emergent wetland vegetation. We are proposing to do just with the that construction drawings at these locations listed below.

In the 5-y event RS x-section **1850** is shown as supercritical, the Froude number is 0.91 which is above the allowable 0.7 but the velocity is 3.06 fps and the shear stress is 1.47 lbs/sq ft, shows it is not erosive. this cross section is at the top of a proposed grouted riprap drop structure with armoring on the sides and being re-vegetated. This is the proposed alternative to resolving the issue.

In the 5-y event RS x-section **1800** is shown as supercritical the velocity is 2.91 fps, the Froude number is 0.98 and the shear stress is 2.98 lbs/sq ft, all below the erosive limits shown in Table 8.3 this cross section is a proposed grouted riprap drop structure with armoring on the sides and being re-vegetated. This is the proposed alternative to resolving the issue.

In the 5-y event RS x-section **1420** is shown as supercritical, the Froude number is 1.00 which is above the allowable 0.7 but the velocity is 2.21 fps and the shear stress is 2.07 lbs/sq ft, shows it is not erosive. This cross section is a proposed grouted riprap drop structure with armoring on the sides and being re-vegetated. This is the proposed alternative to resolving the issue.

In the 5-y event RS x-section **1340** is shown as supercritical the velocity is 2.21 fps, the Froude number is 1.00 and the shear stress is 0.13 lbs/sq ft, showing that flow at this x-section is not erosive. Armoring is the proposed alternative to resolving the issue.

In the 5-y event RS x-section **1200** is shown as supercritical, the Froude number is 1.02 which is above the allowable 0.7 but the velocity is 2.42fps and the shear stress is 1.52 lbs/sq ft, shows it is not erosive. Armoring is the proposed alternative to resolving the issue.

In the 5-y event RS x-section **350** is shown as supercritical the velocity is 2.92 fps, the Froude number is 0.99 and the shear stress is 8.09 lbs/sq ft, this cross section is a proposed grouted riprap drop structure with armoring on the sides and being re-vegetated. This is the proposed alternative to resolving the issue.

In the 5-y event RS x-section **200** is shown as supercritical, the Froude number is 1.00 which is above the allowable 0.7 but the velocity is 2.78 fps and the shear stress is 0.91 lbs/sq ft, shows it is not erosive. Armoring is the proposed alternative to resolving the issue.

-DCM Update 9.0-Design Flows for Low-Flow Channels, 9.1-Stabilized Natural Channels
The project is not installing a low flow channel due to the well-established vegetation and no current erosion or stabilization issues in either the East or West channel, except in the upper West Channel.

-USDCM Table 8.3 Design parameters for naturalized channels
For the Froude No values above the limits on the West channel in the 100-year event that are located upstream and downstream of the proposed drop structure at RS-X-section 1420 The drop structure is being installed to lower the channel slope upstream of the proposed dual 48” culverts at Gilbert Road. This whole area is proposed to be armored with riprap upstream & downstream of the drop and also along the banks. Also, the velocity (3.36 fps) and

Explain the proposed alternative and compare to the ECM standards (May provide applicable regional or national standards used as basis):

shear stress (2.07 lb/sq ft) show that they are below allowable values and not erosive. This deficiency is being addressed with channel protection

We are not doing a total redesign of the channels but adding some improvements where needed, such as along the West channel bank by armoring and doing some grading for the dual 48" culvert crossing. The 2 channels are well established stabilized channels with thick vegetation including wetlands and show no signs of erosion or deficiencies. Any re-design of the existing channel to meet the recommended Table 8.3 values such as minimum radius or low flow channel longitudinal slope would cause major re-grading of the entire channel.

Note: For the East channel RS x-section 400 and for the West Channel RS-x-section 0 are the last stations which are always supercritical, have a higher velocity and Froude # due to no downstream RS x-section to properly run calculations in the HECRAS analysis. For this Deviation these 2 sections are not being analyzed or requested in this deviation.

LIMITS OF CONSIDERATION

(At least one of the conditions listed below must be met for this deviation request to be considered.)

☐ The ECM standard is inapplicable to the particular situation.

☐ Topography, right-of-way, or other geographical conditions or impediments impose an undue hardship and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility.

☒ A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.

Provide justification:

The existing channels are currently well established with vegetation and show minimal signs of erosion or deficiencies and is performing well in its current condition. To meet the minimum channel slope and radii the channel would need to be completely gutted and re-graded which would mean it would be a year or two before vegetation would be re-established to previous conditions.

The East channel is fully inundated with wetlands that would require a Nation-wide permit from the Army Corp for any disturbance to these areas.

The west channel has very thick vegetation that is well established.

Also, per a joint walk through with an El Paso County Engineer we both noted there were currently no areas of concern on the East channel and we are preparing construction drawings for the West channel showing improvements on the few areas of concern we noted.

Per USDCM Table 8.3 Design parameters for naturalized channels, the channels require a minimum slope of 0.2% for a low flow channel. The East channel currently has a maximum slope of 3.84% and the West channel has a maximum slope of 4.84%. With the steeper slopes the velocity of the runoff is increased and depth lowered. However, the velocities show even in these areas of steeper slopes that they are under the erosive limits of 4 ft/s, and under the shear stress limits, therefore the channel still functions safely and stable.

The suggested minimum radius for per USDCM Table 8.3 Design parameters for naturalized channels is 360' for the East channel and 648' for the West channel. We have a minimum radius of 200' for both channels. These channels are not big wide channels that have constant flow that cause hydro morphology with winding channel bends.

CRITERIA FOR APPROVAL

Per ECM section 5.8.7 the request for a deviation may be considered if the request is **not based exclusively on financial considerations**. The deviation must not be detrimental to public safety or surrounding property. The applicant must include supporting information demonstrating compliance with **all of the following criteria**:

The deviation will achieve the intended result with a comparable or superior design and quality of improvement.

The deviation would be the best design as the channels currently perform properly with minimal erosion or deficiencies shown. There is no need to alter the East channel to meet the maximum longitudinal slope or minimum radii, as there is no major increase in developed runoff. The east channel has an increase from 151 fs to 188 cfs only due to the release of the Pond #3 detention runoff downstream of RS x-section 1000. In the 100-y event we have no supercritical flows downstream of this increase in flow. In the West Channel the increase in flow in the 100-y event from the developed flow is from 216 cfs to 222 cfs due to backyard drainage. In the 100-y event we have no supercritical flows downstream of this increase in flow. The West channel is also adding drop structures, armor and plantings to further increase erosion protection on the RS sections of concern mentioned above, but a majority of the channels are currently preforming with minimal erosion or deterioration. The effects of base flows and extended durations of peak flows from detention releases (onsite and upstream) will always cause typical channel degradation and erosion. The channels will need to be actively monitored by the Waterbury Metro District No. 1 and be maintained with an **Adaptive Management Plan** (coordinated between the Waterbury Metro District No. 1 and El Paso County) that corrects any degradation or erosion and keeps the channel stabilized. This is in conformance with all streamside development as all channel require monitoring and maintenance This current solution is as effectively equivalent or superior in meeting all criteria up-front.

On the west channel in the 100-y the one area where the Froude No. (1.01) RS-x-section 1420 is above the max 0.8 where we have protective armoring. In the 5 year all RS x-sections described above with a higher Froude # have velocities and shear stress that are under the maximum requirements and meet all the other suggested criteria of Table 8.3.

The 2 channels are well established stabilized channels with thick vegetation including wetlands, show minimal signs of erosion or deficiencies due to the existing channel slope or radii and are working efficiently. The current areas of deficiency are being addressed with drop structures, channel armoring and planting of vegetation. All other areas are currently working fine due to the well-established vegetation and will continue to operate with the intended results If the deviation is not accepted the destruction of the well-established existing vegetations would increase erosion.

There are proposed access roads in dedicated easements for maintenance of any channel areas that may need attention for repairs.

The deviation will not adversely affect safety or operations.

The HEC-RAS analyses of both channels show that they currently meet all the other standards besides the 3 criteria stated here "*Froude No"* Chapter 8 Table 8.3 Design parameters for naturalized channels. As mentioned above it our opinion that this standard of *"Maximum longitudinal slope of low flow channel (assuming lined, vegetated low flow channel*)" and "*Minimum radius of curvature"* and the supercritical RS-X-sections which we have worked with the county to show bank armoring in these areas on our construction drawings. On the listed RS x-sections above where the "*Froude No"* is higher than the given Design Value for the West channel we have a drop structure and armoring upstream and downstream in the channel and along the banks. El Paso County requires all Finished Floor Elevations on lots adjacent to the channels to be a minimum 1' above the High-Water Line (HWL) calculated in the HEC-RAS analyses. The minimum in Waterbury Filing No. 1 is 2.64' on Lot 131. The rest of the lots are being set from 3.00' to 8.73 above the above the HWL.

The deviation will not adversely affect maintenance and its associated cost.

The natural East channel currently does not require any maintenance and therefore induce that it would not adversely affect future maintenance. The natural West channel currently has a few areas that require maintenance. These areas are being addressed and upgraded with the proposed Channel Construction drawings. The other areas of the channel currently do not show a need for maintenance, therefore induce that they would not adversely affect future maintenance as they are being left as in most instances. Providing some riprap armoring along the RS-X-section listed above will ensure maintenance will still be minimal. By not providing a *Maximum longitudinal slope of low flow channel (assuming lined, vegetated low flow channel*)" and "*Minimum radius of curvature"* no increase in maintenance will be required as mentioned above the channels do not require maintenance now in the current inadequate values of Table 8.3 outside of the areas we are improving.

An **Adaptive Management Plan** (coordinated between the Waterbury Metro District No. 1 and El Paso County) will allow for the Waterbury Metro District No. 1 to monitor the channel and maintain it. There is no current entity doing this right now, so this is an improvement over the current situation.

Access maintenance roads are being provided at several points for both channels which will help decrease the maintenance cost by providing shorter routes and less disturbance of existing vegetation for any maintenance that may be needed thus helping to decrease costs. This maintenance would consist of periodic site visits to check for scouring, erosion, if occurring remove sedimentation and repair affected areas.

The deviation will not adversely affect aesthetic appearance.

The deviation will actually benefit the aesthetics of the channels as the well-established vegetation and covered ground will not need to be cleared and grubbed for grading to re-configure the channels to meet the *"Maximum longitudinal slope of low flow channel (assuming lined, vegetated low flow channel*)" and "*Minimum radius of curvature"*, thus leaving it bare ground that will need several years to be re-established. The current slopes and minimum radius are performing with minimal concerns such as erosion or deterioration. As mentioned above, there are proposed access easements with roads for any future maintenance needed.

The deviation meets the design intent and purpose of the ECM standards.

This deviation does meet the design intent and purpose of the ECM standards that are set for the design of a channel in sections 3.3.3. These 2 channels do not need to be designed to proposed ECM standards as they meet the MHFD Chapter 8.2 Natural Stream Corridors listed below. In the long term these channels as any other channel are going to need continuous monitoring and maintenance associated with the nature of channel morphing and long-term release of base flows and extended durations of peak flows from detention releases upstream of our site & from our site. An **Adaptive Management Plan** will be placed to make sure the channels are always restored and maintained.

2.1 Functions and benefits of Natural Streams

Healthy streams and floodplains provide a number of important functions and benefits. These are summarized below and illustrated in Figure 8-4.

1. Stable conveyance of baseflows and storm runoff.

2. Support of riparian vegetation.

3. Creation of habitat for wildlife and aquatic species.

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8-4 Urban Drainage and Flood Control District January 2016

Urban Storm Drainage Criteria Manual Volume 1

4. Appropriate management of energy during a wide range of flows.

5. Promotion of infiltration, groundwater recharge, and exchange of surface and subsurface water in the hyporheic zone located under and adjacent to the low-flow channel (this exchange has been shown to be an important beneficial biological process).

6. Enhancement of water quality through reduced erosion and through vegetative filtering and soil-water interactions.

7. Provision of corridors for trails and open space.

8. Enhancement of property values and quality of life.

The deviation meets the control measure requirements of Part I.E.3 and Part I.E.4 of the County's MS4 permit, as applicable.

This deviation still meets the requirements of Part I.E.3 by providing a site plan for review that meets all control measures for construction activity. The channel does not affect the permanent control measures that are being provided for the site.

This deviation still meets the requirements of Part I.E.4 by providing Control Measure requirements and Post Construction Stormwater Quality Control Plans along with Long-Term Operations and Maintenance and Post Acceptance Oversight

REVIEW AND RECOMMENDATION:

Approved by the ECM Administrator
This request has been determined to have met the criteria for approval. A deviation from Section **DCM 10.5.4, 10.7, and DCM Update 9.0-9.1 per ECM 3.3.3.B.** of the ECM is hereby granted based on the justification provided.

Denied by the ECM Administrator
This request has been determined not to have met criteria for approval. A deviation from Section **DCM 10.5.4, 10.7, and DCM Update 9.0-9.1 per ECM 3.3.3.B.** of the ECM is hereby denied.

ECM ADMINISTRATOR COMMENTS/CONDITIONS:

The draft adaptive management plan shall be submitted prior to plan approvals and completed prior to project preliminary acceptance.

1.1. PURPOSE

The purpose of this resource is to provide a form for documenting the findings and decision by the ECM Administrator concerning a deviation request. The form is used to document the review and decision concerning a requested deviation. The request and decision concerning each deviation from a specific section of the ECM shall be recorded on a separate form.

1.2. BACKGROUND

A deviation is a critical aspect of the review process and needs to be documented to ensure that the deviations granted are applied to a specific development application in conformance with the criteria for approval and that the action is documented as such requests can point to potential needed revisions to the ECM.

1.3. APPLICABLE STATUTES AND REGULATIONS

Section 5.8 of the ECM establishes a mechanism whereby an engineering design standard can be modified when if strictly adhered to, would cause unnecessary hardship or unsafe design because of topographical or other conditions particular to the site, and that a departure may be made without destroying the intent of such provision.

1.4. APPLICABILITY

All provisions of the ECM are subject to deviation by the ECM Administrator provided that one of the following conditions is met:

- The ECM standard is inapplicable to a particular situation.
- Topography, right-of-way, or other geographical conditions or impediments impose an undue hardship on the applicant, and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility.
- A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.

1.5. TECHNICAL GUIDANCE

The review shall ensure all criteria for approval are adequately considered and that justification for the deviation is properly documented.

1.6. LIMITS OF APPROVAL

Whether a request for deviation is approved as proposed or with conditions, the approval is for project-specific use and shall not constitute a precedent or general deviation from these Standards.

1.7. REVIEW FEES

A Deviation Review Fee shall be paid in full at the time of submission of a request for deviation. The fee for Deviation Review shall be as determined by resolution of the BoCC.

Table 8-3. Design parameters for naturalized channels

Design Parameter	Design Value	Results East Channel	Results West Channel
Maximum 100-year depth outside of bankfull channel per MHFD Criteria Manual Volume 1 Table 8.3	5 ft	< than 5 ft	< than 5 ft
Roughness values per EPC Table 10-2 section e. (Channels not maintained, weeds and brush uncut for Dense weeds, high as flow depth)	0.05 to 0.12	0.06 to 0.10	0.06 to 0.10
Maximum 5-year velocity, main channel (within bankfull channel width) (ft/s) per EPC Table 10-4.	3-4 ft/s	3.79 ft/s	3.32 ft/s
Maximum 100-year velocity, main channel (within bankfull channel width) (ft/s) per EPC Table 10-4.	3-4 ft/s	4.00 ft/s	5.25 ft/s****
Froude No., 5-year, main channel (within bankfull channel width low Manning's n) per MHFD Criteria Manual Volume 1 Table 8.3	0.7	1.00*	1.02*
Froude No., 100-year, main channel (within bankfull channel width) per MHFD Criteria Manual Volume 1 Table 8.3	0.8	0.74	1.01**
Maximum Vegetal shear stress, 100-year, main channel (within bankfull channel width) *using shear retardance* per Open Channels- Engineering Policy Guide Table 8.9	Class A:3.7lb/sq ft Class B: 2.1 lb/sq ft Class C: 1.0 lb/sq ft	2.63 lb/sq ft	2.98 lb/sq ft
Minimum bankfull capacity of bankfull channel (based on future development conditions) per MHFD Criteria Manual Volume 1 Table 8.3	70% of 2-year discharge or 10% of 100-yr discharge, whichever is greater	100% of 100-year	100% of 100-year
Maximum longitudinal slope of low flow channel (assuming lined, vegetated low flow channel) per MHFD Criteria Manual Volume 1 Table 8.3	0.20%	3.84%**	3.43%**
Maximum Overbank Side Slopes per MHFD Criteria Manual Volume 1 Table 8.3	4:1	4:1	4:1
Maximum Bankful Side Slopes per MHFD Criteria Manual Volume 1 Table 8.3	2.5:1	2.5:1	2.5:1
Minimum radius of curvature (2 times the top width of a trapezoidal channel) per ECM 3.3.3.E	East Max Top W=144', Min R=360' West Max Top W=279', Min R=648'	R=200'***	Min R=200'***

Note: For the East channel RS x-section 400 and for the West Channel RS-x-section 0 are the last stations which are always critical, have a higher velocity and Froude # due to no downstream RS x-section to properly run calculations in the HECRAS analysis. For this table these 2 sections are not addressed in this table

* Froude No. not in compliance in the 100 -Y occur at areas with proposed stabilzation measures. A deviation is being requested for the Froude No's. East Channel RS-section 5-Y: 2010.45, 1300, & 600 West Channel 5-Y: 1850, 1800, 1420, 1340, 1200, 350, 300, & 200. 100-Y: 1820, 1800, 1420, & 350.

**Slope are the Existing Condition of the channels. We are not adding a low flow channel. A deviation is being requested for the longitudal slopes.

***Radii are the Existing Condition of the channels. No channel re-aligning is proposed for the centerline. A deviation is being requested for the minimum radius. Bank Stabaliation is being provided along sections that have concerns where radii do not meet minimum values.

****Velocites occur at a proposed grouted riprap drop structure with a cutoff wall

PROPOSED WEST CHANNEL 100-Y

HEC-RAS Plan: Plan p02 River: WEST PR Reach: chan-west-pr Profile: PF 1

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)	
chan-west-pr	2600	PF 1	216.00	6966.83	6967.85		6967.93	0.018480	2.32	93.12	162.80	0.54
chan-west-pr	2500	PF 1	216.00	6964.90	6965.79		6965.90	0.022300	2.63	82.02	136.48	0.60
chan-west-pr	2400	PF 1	216.00	6963.25	6964.31		6964.37	0.010916	2.03	106.60	153.80	0.43
chan-west-pr	2300	PF 1	216.00	6961.27	6962.36		6962.51	0.038187	3.10	69.57	135.31	0.76
chan-west-pr	2200	PF 1	216.00	6958.46	6959.85		6959.95	0.018192	2.56	84.60	129.59	0.55
chan-west-pr	2100	PF 1	216.00	6955.98	6957.55		6957.75	0.026921	3.58	60.39	73.05	0.69
chan-west-pr	2000	PF 1	216.00	6954.57	6956.33		6956.40	0.007738	2.18	98.95	98.57	0.38
chan-west-pr	1950	PF 1	216.00	6953.44	6955.36		6955.46	0.011771	2.46	87.72	99.89	0.46
chan-west-pr	1900	PF 1	216.00	6952.76	6954.86		6954.94	0.009029	2.16	99.81	113.00	0.41
chan-west-pr	1850	PF 1	216.00	6951.60	6953.22		6953.42	0.029464	3.66	59.03	73.85	0.72
chan-west-pr	1820	PF 1	216.00	6950.65	6951.94	6951.86	6952.34	0.043656	5.06	42.71	44.04	0.9
chan-west-pr	1800	PF 1	216.00	6950.00	6950.92	6950.92	6951.35	0.057149	5.25	41.18	49.12	1.0
chan-west-pr	1780	PF 1	216.00	6948.00	6950.44		6950.53	0.004383	2.43	89.00	48.83	0.32
chan-west-pr	1700	PF 1	216.00	6947.11	6949.64		6949.88	0.018693	3.93	54.95	43.40	0.62
chan-west-pr	1600	PF 1	216.00	6945.84	6948.23		6948.37	0.012010	2.97	72.67	63.17	0.49
chan-west-pr	1500	PF 1	216.00	6944.87	6947.02	6946.57	6947.13	0.012690	2.66	81.10	86.75	0.49
chan-west-pr	1440	PF 1	216.00	6944.35	6945.90	6945.66	6946.07	0.025967	3.36	64.33	83.31	0.67
chan-west-pr	1420	PF 1	216.00	6944.50	6945.02	6945.02	6945.27	0.068516	4.00	54.01	111.39	1.01
chan-west-pr	1400	PF 1	216.00	6941.00	6942.05		6942.11	0.006974	2.06	104.70	104.87	0.36
chan-west-pr	1380	PF 1	216.00	6940.70	6941.97		6942.01	0.003173	1.61	133.78	106.25	0.25
chan-west-pr	1340	PF 1	216.00	6940.60	6941.23		6941.40	0.034542	3.32	65.03	105.95	0.75
chan-west-pr	1300	PF 1	216.00	6939.80	6940.97		6941.01	0.003931	1.67	129.32	115.65	0.28
chan-west-pr	1200	PF 1	216.00	6938.25	6940.90	6938.86	6940.91	0.000412	0.93	235.54	99.66	0.10
chan-west-pr	1042.5		Culvert									
chan-west-pr	900	PF 1	222.00	6935.37	6936.76		6936.81	0.010333	1.68	132.40	112.98	0.27
chan-west-pr	800	PF 1	222.00	6934.21	6935.71		6935.74	0.010932	1.52	146.24	151.34	0.27
chan-west-pr	700	PF 1	222.00	6932.80	6934.20		6934.26	0.021238	1.81	122.92	161.31	0.36
chan-west-pr	600	PF 1	222.00	6930.86	6932.42		6932.45	0.015472	1.52	154.43	246.36	0.31
chan-west-pr	500	PF 1	222.00	6928.40	6929.91		6930.04	0.043154	2.80	79.17	91.39	0.53
chan-west-pr	400	PF 1	222.00	6924.97	6927.99		6928.05	0.011259	1.88	117.99	90.52	0.29
chan-west-pr	370	PF 1	222.00	6924.50	6926.26	6925.64	6926.40	0.026430	2.94	76.46	64.47	0.45
chan-west-pr	350	PF 1	222.00	6924.00	6924.88	6924.88	6925.30	0.159086	5.17	42.94	52.49	1.01
chan-west-pr	330	PF 1	222.00	6922.00	6924.08		6924.18	0.013338	2.52	88.17	49.72	0.33
chan-west-pr	300	PF 1	222.00	6921.60	6923.73		6923.81	0.011412	2.33	95.12	52.82	0.31
chan-west-pr	250	PF 1	222.00	6920.20	6921.88		6922.03	0.031497	3.04	73.10	58.98	0.48
chan-west-pr	200	PF 1	222.00	6919.30	6921.01		6921.07	0.012198	1.85	119.81	99.73	0.30
chan-west-pr	100	PF 1	222.00	6918.00	6920.46		6920.49	0.003285	1.33	169.27	98.32	0.17
chan-west-pr	0	PF 1	222.00	6918.00	6919.14	6919.14	6919.45	0.172225	4.46	49.81	81.02	1.00

DROP STRUCTURE

DROP STRUCTURE

DROP STRUCTURE

HEC-RAS Plan: Plan p02 River: WEST PR Reach: chan-west-pr Profile: PF 1

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)	
chan-west-pr	2600	PF 1	34.00	6966.83	6967.39	6967.26	6967.42	0.019407	1.25	27.18	124.51	0.47
chan-west-pr	2500	PF 1	34.00	6964.90	6965.27	6965.18	6965.31	0.023072	1.48	22.93	92.66	0.53
chan-west-pr	2400	PF 1	34.00	6963.25	6963.72		6963.74	0.011246	1.15	29.48	101.26	0.38
chan-west-pr	2300	PF 1	34.00	6961.27	6961.88		6961.94	0.032970	1.93	17.64	62.76	0.64
chan-west-pr	2200	PF 1	34.00	6958.46	6959.12		6959.17	0.023467	1.87	18.22	52.79	0.56
chan-west-pr	2100	PF 1	34.00	6955.98	6956.76		6956.83	0.023358	2.11	16.09	38.55	0.58
chan-west-pr	2000	PF 1	34.00	6954.57	6955.41		6955.44	0.009227	1.36	25.06	58.15	0.36
chan-west-pr	1950	PF 1	34.00	6953.44	6954.52		6954.55	0.008387	1.39	24.48	51.04	0.35
chan-west-pr	1900	PF 1	34.00	6952.76	6954.13		6954.15	0.007665	1.18	28.83	71.72	0.33
chan-west-pr	1850	PF 1	34.00	6951.60	6952.31	6952.28	6952.45	0.062217	3.06	11.11	31.80	0.9
chan-west-pr	1820	PF 1	34.00	6950.65	6951.19	6951.05	6951.27	0.026685	2.39	14.20	31.11	0.6
chan-west-pr	1800	PF 1	34.00	6950.00	6950.28	6950.28	6950.41	0.078517	2.91	11.70	43.06	0.9
chan-west-pr	1780	PF 1	34.00	6948.00	6949.00		6949.02	0.002320	1.10	30.87	34.53	0.2
chan-west-pr	1700	PF 1	34.00	6947.11	6948.36		6948.51	0.050128	3.11	10.92	25.61	0.84
chan-west-pr	1600	PF 1	34.00	6945.84	6947.11		6947.14	0.006056	1.53	22.16	31.07	0.32
chan-west-pr	1500	PF 1	34.00	6944.87	6946.12		6946.17	0.018127	1.74	19.50	51.44	0.50
chan-west-pr	1440	PF 1	34.00	6944.35	6945.24		6945.28	0.012228	1.59	21.32	47.96	0.4
chan-west-pr	1420	PF 1	34.00	6944.50	6944.65	6944.65	6944.73	0.099195	2.21	15.36	101.65	1.0
chan-west-pr	1400	PF 1	34.00	6941.00	6941.28		6941.30	0.014911	1.27	26.74	97.99	0.4
chan-west-pr	1380	PF 1	34.00	6940.70	6941.22		6941.22	0.001572	0.63	54.06	104.98	0.1
chan-west-pr	1340	PF 1	34.00	6940.60	6940.75	6940.75	6940.83	0.098507	2.21	15.38	101.36	1.00
chan-west-pr	1300	PF 1	34.00	6939.80	6940.14		6940.15	0.006408	0.95	35.90	108.65	0.29
chan-west-pr	1200	PF 1	34.00	6938.25	6938.43	6938.43	6938.52	0.096858	2.42	14.04	79.74	1.02
chan-west-pr	1042.5		Culvert									
chan-west-pr	900	PF 1	37.00	6935.37	6936.14		6936.15	0.002971	0.59	63.01	102.01	0.13
chan-west-pr	800	PF 1	37.00	6934.42	6935.49		6935.51	0.020998	1.22	30.30	70.91	0.33
chan-west-pr	700	PF 1	37.00	6932.80	6933.46		6933.47	0.019920	1.03	35.82	103.56	0.31
chan-west-pr	600	PF 1	37.00	6930.86	6931.79		6931.81	0.014124	1.15	36.27	110.54	0.28
chan-west-pr	500	PF 1	37.00	6928.40	6929.08		6929.15	0.069105	1.98	18.67	51.62	0.58
chan-west-pr	400	PF 1	37.00	6924.97	6926.75		6926.77	0.011861	1.21	30.47	46.47	0.26
chan-west-pr	370	PF 1	37.00	6924.50	6925.27	6924.89	6925.30	0.018263	1.46	25.38	40.91	0.3
chan-west-pr	350	PF 1	37.00	6924.00	6924.28	6924.28	6924.41	0.223040	2.92	12.69	47.34	0.9
chan-west-pr	330	PF 1	37.00	6922.00	6923.51		6923.52	0.001154	0.61	60.84	45.57	0.0
chan-west-pr	300	PF 1	37.00	6922.38	6923.24		6923.39	0.137106	3.12	11.87	27.76	0.8
chan-west-pr	250	PF 1	37.00	6920.20	6921.11		6921.13	0.008662	1.12	33.03	45.23	0.23
chan-west-pr	200	PF 1	37.00	6919.30	6919.78	6919.78	6919.90	0.234212	2.78	13.33	55.53	1.00
chan-west-pr	100	PF 1	37.00	6918.00	6919.17		6919.17	0.001401	0.55	66.69	66.81	0.10
chan-west-pr	0	PF 1	37.00	6918.00	6918.53	6918.53	6918.68	0.231293	3.07	12.05	42.77	1.02

DROP STRUCTURE

DROP STRUCTURE

DROP STRUCTURE

PROPOSED WEST CHANNEL 2-Y

HEC-RAS Plan: Plan p02 River: WEST PR Reach: chan-west-pr Profile: PF 1

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)	
chan-west-pr	2600	PF 1	22.00	6966.83	6967.33	6967.19	6967.35	0.020117	1.10	19.95	113.38	0.46
chan-west-pr	2500	PF 1	22.00	6964.90	6965.21		6965.24	0.022153	1.26	17.51	87.97	0.50
chan-west-pr	2400	PF 1	22.00	6963.25	6963.63		6963.65	0.011997	1.03	21.38	91.49	0.38
chan-west-pr	2300	PF 1	22.00	6961.27	6961.81		6961.85	0.029694	1.65	13.30	55.03	0.59
chan-west-pr	2200	PF 1	22.00	6958.46	6959.01		6959.05	0.026173	1.73	12.73	44.90	0.57
chan-west-pr	2100	PF 1	22.00	6955.98	6956.65		6956.70	0.021236	1.83	12.01	33.18	0.54
chan-west-pr	2000	PF 1	22.00	6954.57	6955.28		6955.30	0.009888	1.23	17.92	50.86	0.36
chan-west-pr	1950	PF 1	22.00	6953.44	6954.38		6954.40	0.008119	1.24	17.71	42.62	0.34
chan-west-pr	1900	PF 1	22.00	6952.76	6954.00		6954.02	0.007271	1.07	20.48	56.29	0.31
chan-west-pr	1850	PF 1	22.00	6951.60	6952.18	6952.18	6952.32	0.073639	2.93	7.51	26.03	0.96
chan-west-pr	1820	PF 1	22.00	6950.65	6951.08	6950.95	6951.14	0.023784	1.99	11.05	29.34	0.57
chan-west-pr	1800	PF 1	22.00	6950.00	6950.21	6950.21	6950.31	0.087239	2.54	8.67	42.39	0.99
chan-west-pr	1780	PF 1	22.00	6948.00	6948.81		6948.83	0.001995	0.90	24.45	33.10	0.13
chan-west-pr	1700	PF 1	22.00	6947.11	6948.24	6948.19	6948.36	0.055947	2.77	7.94	24.06	0.85
chan-west-pr	1600	PF 1	22.00	6945.84	6946.89		6946.92	0.006288	1.39	15.85	26.57	0.32
chan-west-pr	1500	PF 1	22.00	6944.87	6945.89		6945.96	0.016715	2.03	10.82	21.28	0.50
chan-west-pr	1440	PF 1	22.00	6944.35	6945.13		6945.15	0.010590	1.35	16.24	41.85	0.38
chan-west-pr	1420	PF 1	22.00	6944.50	6944.62	6944.62	6944.67	0.098664	1.86	11.81	100.70	0.96
chan-west-pr	1400	PF 1	22.00	6941.00	6941.17		6941.20	0.029371	1.31	16.74	97.06	0.56
chan-west-pr	1380	PF 1	22.00	6940.70	6941.12		6941.12	0.001353	0.51	43.50	104.80	0.14
chan-west-pr	1340	PF 1	22.00	6940.60	6940.72	6940.72	6940.77	0.093407	1.83	12.02	101.05	0.94
chan-west-pr	1300	PF 1	22.00	6939.80	6940.06		6940.07	0.006238	0.79	27.80	108.02	0.27
chan-west-pr	1200	PF 1	22.00	6938.25	6938.38	6938.38	6938.45	0.104661	2.09	10.55	79.38	1.01
chan-west-pr	1042.5		Culvert									
chan-west-pr	900	PF 1	24.00	6935.37	6935.98		6935.99	0.003232	0.51	46.94	99.66	0.13
chan-west-pr	800	PF 1	24.00	6934.42	6935.32		6935.34	0.018529	1.18	20.31	45.43	0.31
chan-west-pr	700	PF 1	24.00	6932.80	6933.35		6933.36	0.020851	0.94	25.54	88.08	0.31
chan-west-pr	600	PF 1	24.00	6930.86	6931.67		6931.69	0.013873	1.01	24.99	78.37	0.27
chan-west-pr	500	PF 1	24.00	6928.40	6928.98		6929.03	0.071038	1.78	13.49	44.80	0.57
chan-west-pr	400	PF 1	24.00	6924.97	6926.54		6926.56	0.012280	1.11	21.66	38.81	0.26
chan-west-pr	370	PF 1	24.00	6924.50	6925.12	6924.79	6925.15	0.016339	1.22	19.62	37.90	0.30
chan-west-pr	350	PF 1	24.00	6924.00	6924.21	6924.21	6924.31	0.250286	2.55	9.41	46.74	1.00
chan-west-pr	330	PF 1	24.00	6922.00	6923.32		6923.32	0.000782	0.46	52.07	44.20	0.07
chan-west-pr	300	PF 1	24.00	6922.38	6923.05	6923.05	6923.22	0.215184	3.31	7.24	21.69	1.01
chan-west-pr	250	PF 1	24.00	6920.20	6920.94		6920.95	0.007874	0.94	25.48	42.14	0.21
chan-west-pr	200	PF 1	24.00	6919.30	6919.70	6919.70	6919.80	0.246084	2.54	9.45	46.77	1.00
chan-west-pr	100	PF 1	24.00	6918.00	6918.97		6918.98	0.001118	0.44	53.93	63.53	0.09
chan-west-pr	0	PF 1	24.00	6918.00	6918.45	6918.45	6918.57	0.237386	2.76	8.70	36.96	1.00

DROP STRUCTURE

DROP STRUCTURE

DROP STRUCTURE

PROPOSED EAST CHANNEL 100-Y

HEC-RAS Plan: Plan 01 River: CHAN EAST PR Reach: chan-east-pr Profile: PF 1

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)	
chan-east-pr	2600	PF 1	151.00	6942.53	6944.49		6944.60	0.020083	3.02	66.20	108.74	0.48
chan-east-pr	2500	PF 1	151.00	6941.18	6943.07		6943.13	0.010904	1.96	84.33	124.93	0.34
chan-east-pr	2400	PF 1	151.00	6939.95	6941.64		6941.73	0.018619	2.32	65.19	74.51	0.44
chan-east-pr	2300	PF 1	151.00	6938.19	6939.43		6939.53	0.026082	2.57	58.82	74.24	0.51
chan-east-pr	2200	PF 1	151.00	6936.58	6938.37		6938.40	0.006135	1.52	100.52	103.51	0.26
chan-east-pr	2100	PF 1	151.00	6935.13	6937.50		6937.58	0.011365	2.31	65.48	51.30	0.36
chan-east-pr	2010.45	PF 1	151.00	6933.88	6935.43		6935.63	0.056212	3.63	42.30	65.96	0.74
chan-east-pr	1900	PF 1	151.00	6931.88	6933.84		6933.88	0.007048	1.62	93.32	88.19	0.28
chan-east-pr	1801.17	PF 1	151.00	6931.01	6932.59		6932.66	0.027173	2.09	72.33	92.03	0.41
chan-east-pr	1694.83	PF 1	151.00	6929.94	6931.11		6931.13	0.008773	1.24	121.34	143.39	0.24
chan-east-pr	1600	PF 1	151.00	6928.36	6929.63		6929.71	0.030740	2.19	69.00	89.57	0.44
chan-east-pr	1500	PF 1	151.00	6924.52	6926.65		6926.76	0.028222	2.70	55.97	49.57	0.45
chan-east-pr	1400	PF 1	151.00	6922.11	6924.73		6924.81	0.014150	2.23	67.68	66.38	0.39
chan-east-pr	1300	PF 1	151.00	6921.11	6924.05		6924.08	0.004293	1.49	101.14	73.88	0.22
chan-east-pr	1200	PF 1	151.00	6919.19	6924.04	6920.52	6924.04	0.000109	0.47	355.73	125.84	0.04
chan-east-pr	1111.15		Culvert									
chan-east-pr	1000	PF 1	188.00	6916.11	6919.03		6919.16	0.011207	3.06	73.33	65.85	0.38
chan-east-pr	900	PF 1	188.00	6915.02	6917.87		6917.99	0.012344	2.79	67.32	42.09	0.39
chan-east-pr	800	PF 1	188.00	6913.85	6916.89		6916.97	0.008358	2.34	80.17	48.98	0.32
chan-east-pr	700	PF 1	188.00	6913.13	6916.11		6916.19	0.007279	2.18	86.53	55.48	0.30
chan-east-pr	600	PF 1	188.00	6912.13	6914.59		6914.84	0.031340	4.00	46.99	34.58	0.61
chan-east-pr	500	PF 1	188.00	6909.89	6913.37		6913.46	0.007372	2.36	79.71	43.67	0.31
chan-east-pr	400	PF 1	188.00	6908.81	6911.02	6911.02	6911.60	0.094950	6.11	30.76	27.24	1.01

PROPOSED EAST CHANNEL 5-Y

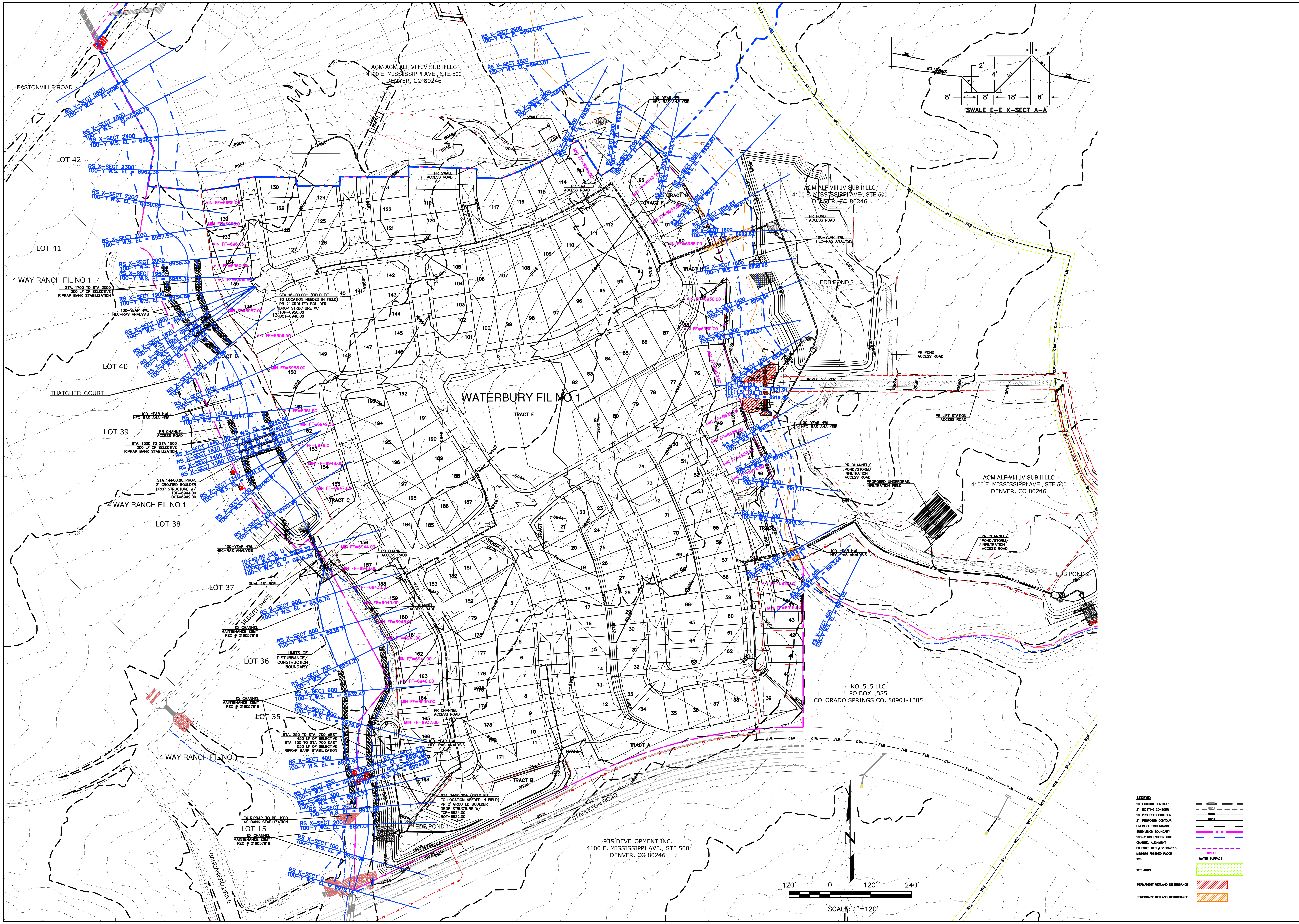
HEC-RAS Plan: Plan 01 River: CHAN EAST PR Reach: chan-east-pr Profile: PF 1

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)	
chan-east-pr	2600	PF 1	31.00	6942.53	6943.83		6943.89	0.019615	1.94	15.94	24.40	0.42
chan-east-pr	2500	PF 1	31.00	6941.18	6942.43		6942.45	0.010793	1.12	27.62	62.13	0.30
chan-east-pr	2400	PF 1	31.00	6939.95	6940.80		6940.85	0.025978	1.77	17.49	38.34	0.46
chan-east-pr	2300	PF 1	31.00	6938.19	6938.88		6938.90	0.014891	1.32	23.46	52.68	0.35
chan-east-pr	2200	PF 1	31.00	6936.58	6937.54		6937.56	0.012323	1.14	27.31	66.80	0.31
chan-east-pr	2100	PF 1	31.00	6935.13	6936.57	6936.11	6936.60	0.007728	1.24	24.90	36.77	0.27
chan-east-pr	2010.45	PF 1	31.00	6933.88	6934.63	6934.62	6934.80	0.125209	3.34	9.29	25.65	0.98
chan-east-pr	1900	PF 1	31.00	6931.88	6932.93		6932.95	0.006112	1.03	30.23	50.91	0.23
chan-east-pr	1801.17	PF 1	31.00	6931.01	6931.95		6931.99	0.018414	1.54	20.08	41.86	0.39
chan-east-pr	1694.83	PF 1	31.00	6929.94	6930.55		6930.55	0.010212	0.71	43.53	133.24	0.22
chan-east-pr	1600	PF 1	31.00	6928.36	6929.02		6929.05	0.028146	1.33	23.29	59.69	0.38
chan-east-pr	1500	PF 1	31.00	6924.52	6925.46		6925.54	0.044684	2.20	14.08	23.87	0.51
chan-east-pr	1400	PF 1	31.00	6922.11	6924.18		6924.19	0.006255	0.89	34.87	52.71	0.19
chan-east-pr	1300	PF 1	31.00	6921.11	6922.19	6922.19	6922.36	0.200434	3.34	9.28	25.68	0.98
chan-east-pr	1200	PF 1	31.00	6919.19	6921.57	6920.03	6921.58	0.000290	0.31	99.20	71.76	0.05
chan-east-pr	1111.15		Culvert									
chan-east-pr	1000	PF 1	32.00	6916.11	6917.92		6917.95	0.010581	1.38	23.12	26.69	0.26
chan-east-pr	900	PF 1	32.00	6915.02	6916.54		6916.58	0.018490	1.58	20.27	28.93	0.33
chan-east-pr	800	PF 1	32.00	6913.85	6915.51		6915.53	0.006648	1.17	27.31	28.48	0.21
chan-east-pr	700	PF 1	32.00	6913.13	6914.93		6914.94	0.005243	0.99	32.44	36.42	0.18
chan-east-pr	600	PF 1	32.00	6912.13	6913.12	6913.12	6913.38	0.189670	4.04	7.92	15.92	1.01
chan-east-pr	500	PF 1	32.00	6909.89	6911.81		6911.83	0.004944	1.15	27.75	23.54	0.19
chan-east-pr	400	PF 1	32.00	6908.81	6910.10	6910.10	6910.32	0.207973	3.71	8.63	20.97	1.02

PROPOSED EAST CHANNEL 2-Y

HEC-RAS Plan: Plan 01 River: CHAN EAST PR Reach: chan-east-pr Profile: PF 1

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)	
chan-east-pr	2600	PF 1	21.00	6942.53	6943.67		6943.72	0.018097	1.71	12.27	21.41	0.40
chan-east-pr	2500	PF 1	21.00	6941.18	6942.31		6942.33	0.010976	1.03	20.48	53.39	0.29
chan-east-pr	2400	PF 1	21.00	6939.95	6940.68		6940.72	0.025717	1.60	13.12	33.26	0.45
chan-east-pr	2300	PF 1	21.00	6938.19	6938.77		6938.79	0.014820	1.17	17.90	47.90	0.34
chan-east-pr	2200	PF 1	21.00	6936.58	6937.39		6937.41	0.012863	1.11	18.89	49.25	0.32
chan-east-pr	2100	PF 1	21.00	6935.13	6936.42	6936.03	6936.43	0.007648	1.09	19.31	34.63	0.26
chan-east-pr	2010.45	PF 1	21.00	6933.88	6934.53	6934.51	6934.67	0.121395	3.00	7.01	22.18	0.94
chan-east-pr	1900	PF 1	21.00	6931.88	6932.77		6932.78	0.006323	0.94	22.37	44.10	0.23
chan-east-pr	1801.17	PF 1	21.00	6931.01	6931.87	6931.56	6931.89	0.013535	1.24	16.88	38.60	0.33
chan-east-pr	1694.83	PF 1	21.00	6929.94	6930.45		6930.46	0.013196	0.67	31.11	125.07	0.24
chan-east-pr	1600	PF 1	21.00	6928.36	6928.97		6928.99	0.018681	1.02	20.55	57.53	0.30
chan-east-pr	1500	PF 1	21.00	6924.52	6925.16		6925.28	0.105830	2.70	7.77	18.48	0.74
chan-east-pr	1400	PF 1	21.00	6922.11	6923.84		6923.85	0.005242	0.97	21.73	25.27	0.18
chan-east-pr	1300	PF 1	21.00	6921.11	6922.08	6922.08	6922.23	0.249263	3.19	6.58	22.91	1.05
chan-east-pr	1200	PF 1	21.00	6919.19	6921.28	6919.87	6921.28	0.000248	0.27	79.17	65.08	0.04
chan-east-pr	1111.15		Culvert									
chan-east-pr	1000	PF 1	22.00	6916.11	6917.74		6917.77	0.009297	1.19	18.51	24.19	0.24
chan-east-pr	900	PF 1	22.00	6915.02	6916.35		6916.38	0.022502	1.48	14.84	27.01	0.35
chan-east-pr	800	PF 1	22.00	6913.85	6915.28		6915.30	0.006315	1.04	21.10	25.25	0.20
chan-east-pr	700	PF 1	22.00	6913.13	6914.72		6914.74	0.005064	0.87	25.26	33.29	0.18
chan-east-pr	600	PF 1	22.00	6912.13	6912.98	6912.98	6913.20	0.198497	3.74	5.88	13.72	1.01
chan-east-pr	500	PF 1	22.00	6909.89	6911.55		6911.56	0.004425	1.00	21.96	21.17	0.17
chan-east-pr	400	PF 1	22.00	6908.81	6910.00	6910.00	6910.18	0.238618	3.40	6.47	19.84	1.05



REVISIONS

NO.	DESCRIPTION	DATE

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OFFICE: 719-635-6422
FAX: 719-635-6426
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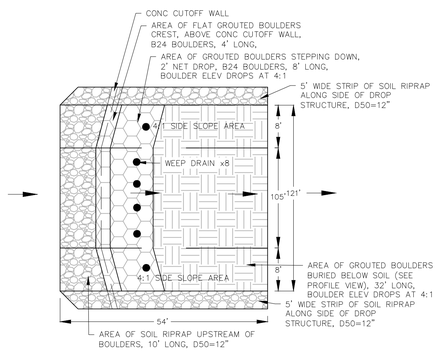
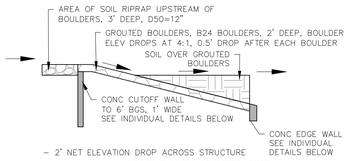
WATERBURY FILING NO. 1

PROPOSED 100-Y FLOODPLAIN EXHIBIT

DESIGNED BY DLF
DRAWN BY QNA
CHECKED BY QNA
H-SCALE 1" = 100'
V-SCALE N/A
JOB NO. 2356.00
DATE ISSUED 4/17/26
SHEET NO. 1 OF 2



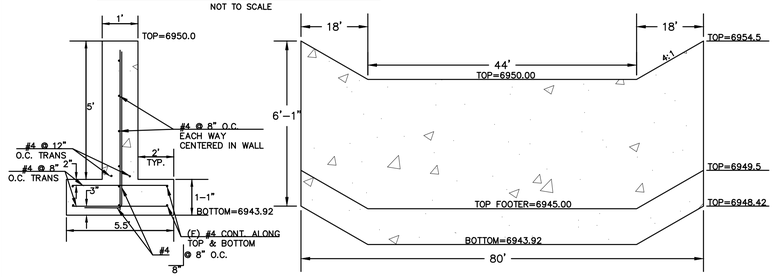
PLAN VIEW



PROFILE VIEW (CENTER LINE)

GROUTED BOULDER DROP STRUCTURE DETAIL

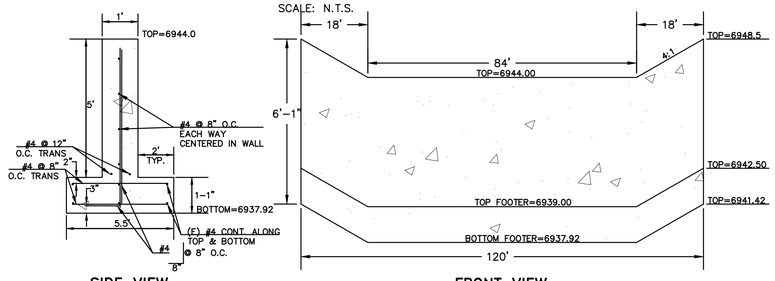
NOT TO SCALE



SIDE VIEW — FRONT VIEW

STA 18+00.00 DROP STRUCTURE CONCRETE CUT OFF WALL

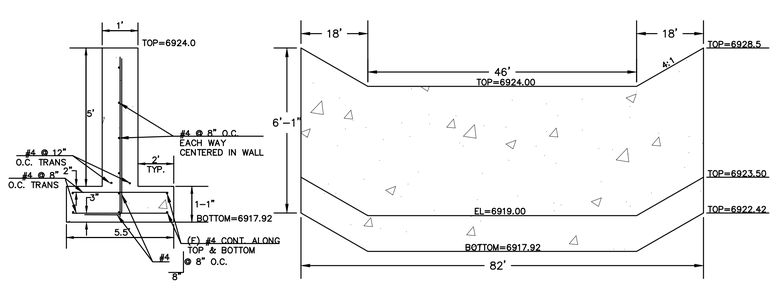
SCALE: N.T.S.



SIDE VIEW — FRONT VIEW

STA 14+00.00 DROP STRUCTURE CONCRETE CUT OFF WALL

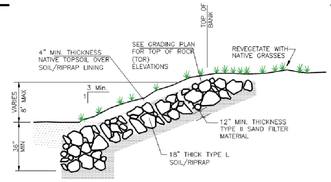
SCALE: N.T.S.



SIDE VIEW — FRONT VIEW

STA 3+50.00 DROP STRUCTURE CONCRETE CUT OFF WALL

SCALE: N.T.S.



TYPICAL SOIL/RIPRAP BANK LINING

SCALE : N.T.S.

GENERAL NOTES

1. B24 BOULDERS ARE 24"ø MIN.

CONSTRUCTION REQUIREMENT NOTES

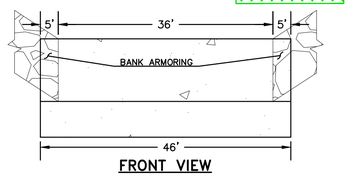
1. GROUT DEPTH RANGES FROM HALF TO FULL BOULDER HEIGHT. ALL GROUT SHALL BE A MINIMUM HALF BOULDER HEIGHT.
2. AN EDGE WALL IS REQUIRED AROUND THE ENTIRE DROP STRUCTURE.
3. THE MAX ALLOWABLE INDIVIDUAL DROP HEIGHT OFF A BOULDER IS 1.5' (0.5' USED IN DESIGN).

CHANNEL REVEGETATION SPECS (OUTSIDE WETLANDS)

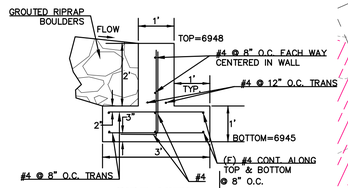
SEED DISTURBED CHANNEL AREA PER COLORADO SPRINGS SCM 'TABLE 5-1 EL PASO COUNTY CONSERVATION DISTRICT ALL-PURPOSE MIX FOR UPLAND, TRANSITION AND PERMANENT CONTROL MEASURE AREAS' AND COLORADO SPRINGS DCM VOL 1 TABLE 14-10 'WILDFLOWER MIX'. SEED ALL DISTURBED.

LEGEND

- EXISTING MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 6810
- PROPOSED CONTOUR — 6810
- SUBDIVISION BOUNDARY
- CHANNEL FLOW LINE
- 100-Y FEMA FLOODPLAIN
- EXISTING 100-Y HWL PER HECRAS ANLYSIS
- PROPOSED ACCESS ROAD
- PROPOSED RIPRAP
- PROPOSED PLANTING AREA

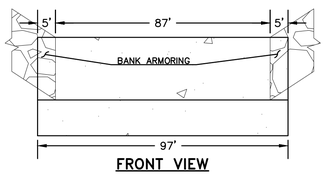


FRONT VIEW

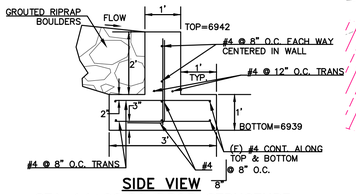


SIDE VIEW

STA 18+00.00 DROP STRUCTURE CONCRETE EDGE WALL

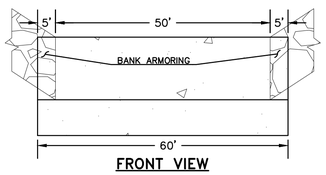


FRONT VIEW

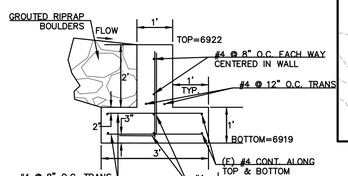


SIDE VIEW

STA 14+00.00 DROP STRUCTURE CONCRETE EDGE WALL

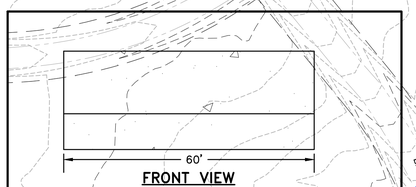


FRONT VIEW



SIDE VIEW

STA 3+50.00 DROP STRUCTURE CONCRETE EDGE WALL



FRONT VIEW — SIDE VIEW

STA 9+50.00 CULVERT RIPRAP CONCRETE EDGE WALL

12' OR 20' CHANNEL MAINTENANCE ACCESS ROAD SECTION

SCALE: N.T.S.

THIS DESIGN WAS PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF TERRA NOVA ENGINEERING, INC.

COLORADO LICENSED QUENTIN N ARMIJO 37170 4/17/26 PROFESSIONAL ENGINEER

QUENTIN ARMIJO
COLORADO P.E. NO. 37170

REVISIONS

NO.	DESCRIPTION	DATE

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PREPARED FOR:
ACM ALF VIII JV SUB II LLC
ATTN: JASON POCK
8100 E. MISSISSIPPI AVE., STE 500
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COLORADO SPRINGS, CO 80904
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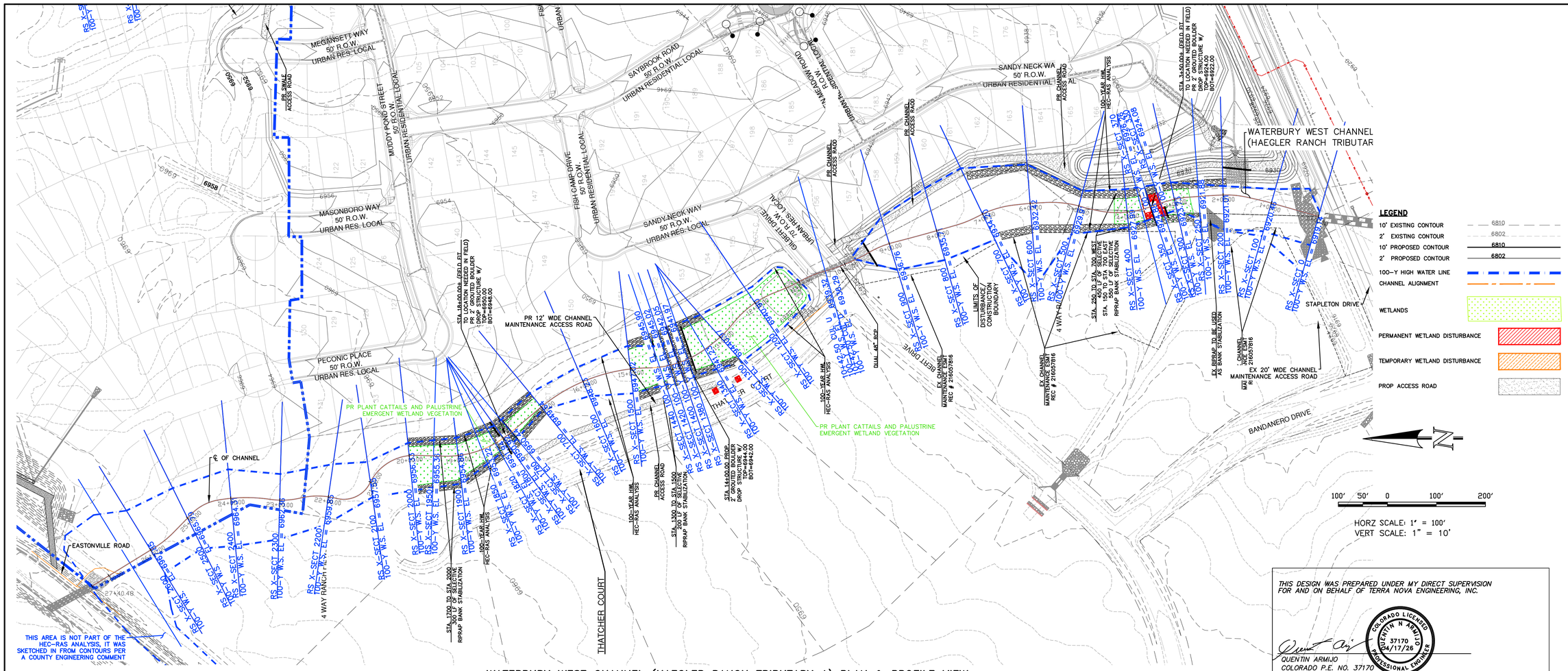
FAX: 719-635-6426
www.tnesinc.com

WATERBURY FILING NO. 1

CONSTRUCTION SET
WEST CHANNEL - CHANNEL IMPROVEMENTS PLAN

DESIGNED BY	DLF
DRAWN BY	QNA
CHECKED BY	QNA
H-SCALE	AS SHOWN
V-SCALE	N/A
JOB NO.	2356.00
DATE ISSUED	4/17/26
SHEET NO.	51 OF 57



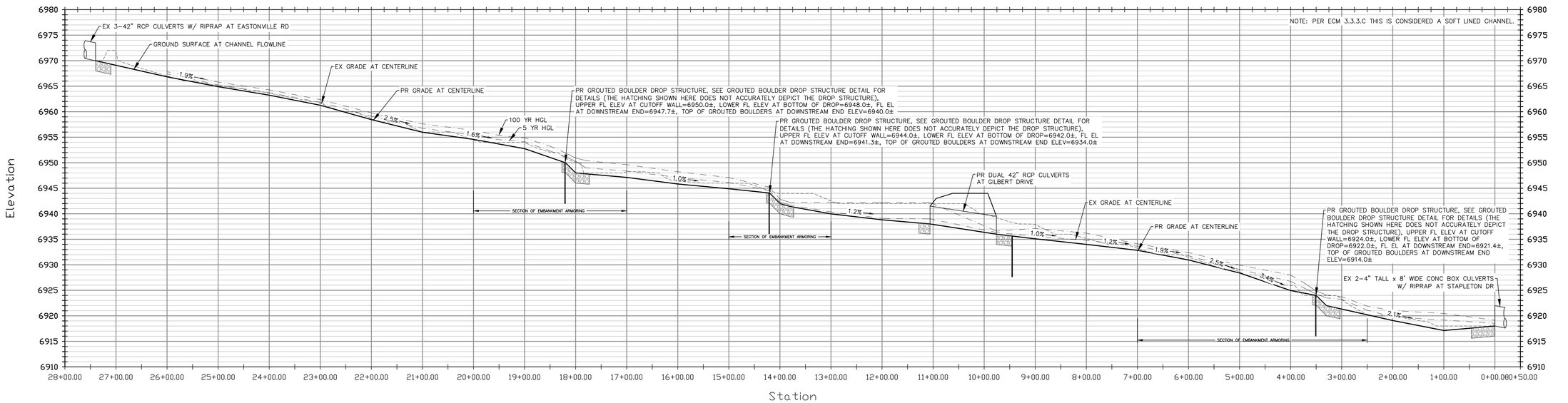
THIS DESIGN WAS PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF TERRA NOVA ENGINEERING, INC.

QUENTIN ARMIJO
COLORADO P.E. NO. 37170

COLORADO LICENSED QUENTIN N ARMIJO 37170 4/17/26 PROFESSIONAL ENGINEER

WATERBURY WEST CHANNEL (HAEGLER RANCH TRIBUTARY 1) PLAN & PROFILE VIEW

HORZ SCALE: 1"=100' – VERT SCALE: 1"=10'



REVISIONS		
NO.	DESCRIPTION	DATE

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PREPARED FOR:
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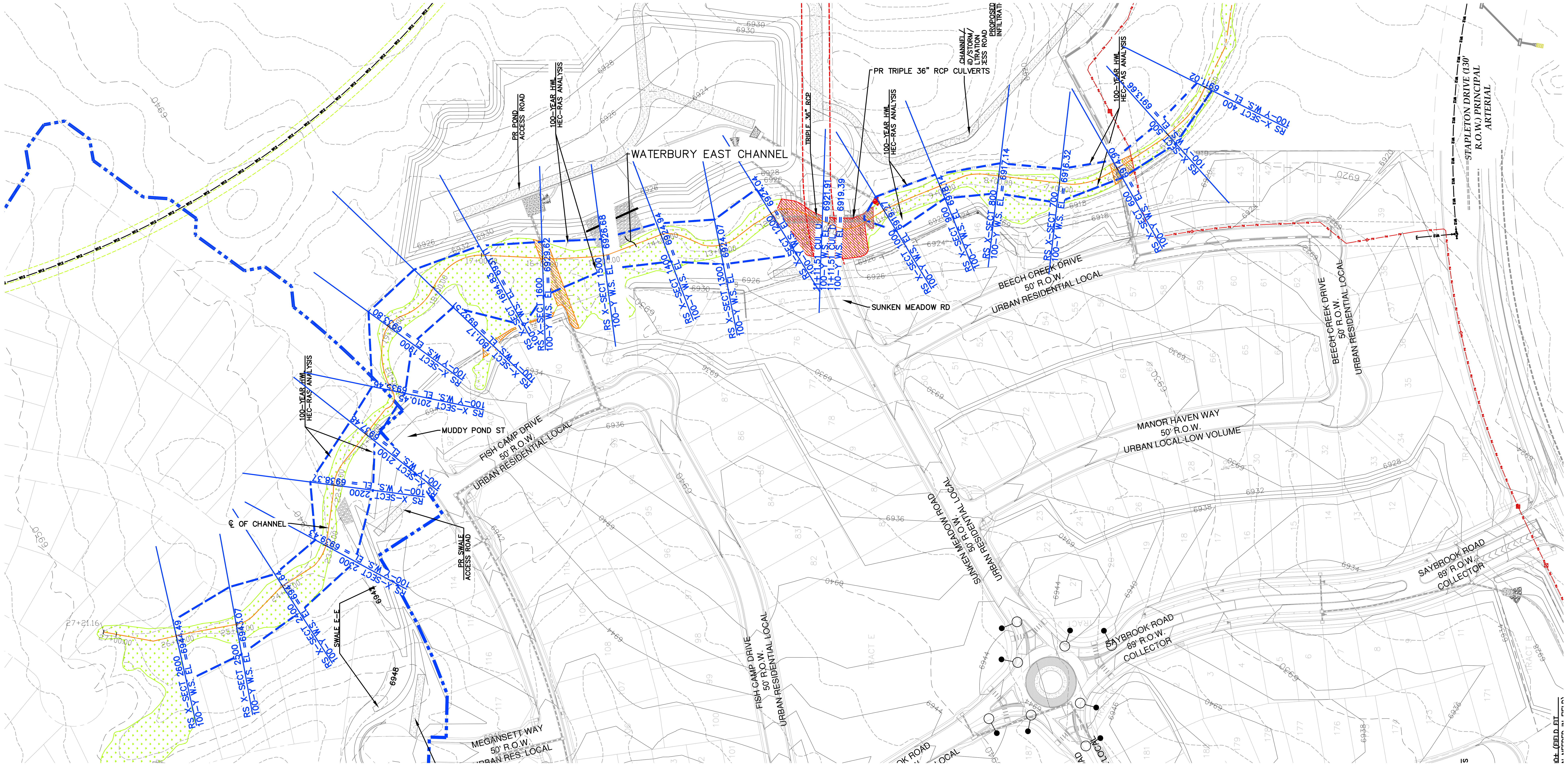
www.tneinc.com

WATERBURY FILING NO. 1

CONSTRUCTION SET
WEST CHANNEL – PLAN AND PROFILE

DESIGNED BY	DLF
DRAWN BY	QNA
CHECKED BY	QNA
H-SCALE	AS SHOWN
V-SCALE	AS SHOWN
JOB NO.	2356.00
DATE ISSUED	4/17/26
SHEET NO.	52 OF 57



LEGEND

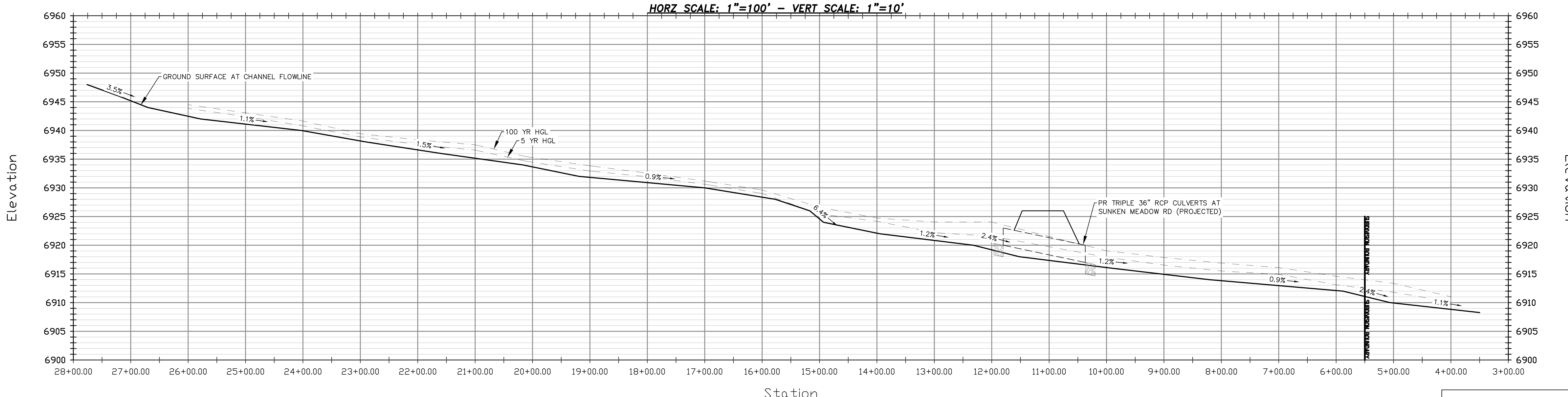
10' EXISTING CONTOUR	6810
2' EXISTING CONTOUR	6802
10' PROPOSED CONTOUR	6810
2' PROPOSED CONTOUR	6802
100-Y HIGH WATER LINE	
CHANNEL ALIGNMENT	
WETLANDS	
PERMANENT WETLAND DISTURBANCE	
TEMPORARY WETLAND DISTURBANCE	
PROP ACCESS ROAD	

100' 50' 0 100' 200'

HORZ SCALE: 1" = 100'
VERT SCALE: 1" = 10'

WATERBURY EAST CHANNEL PLAN & PROFILE VIEW

HORZ SCALE: 1"=100' – VERT SCALE: 1"=10'



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QUENTIN ARMIJO
COLORADO P.E. NO. 37170

COLORADO LICENSED QUENTIN N ARMIJO 37170 4/17/26 PROFESSIONAL ENGINEER

REVISIONS

NO.	DESCRIPTION	DATE

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FAX: 719-635-6426
www.tnesinc.com

WATERBURY FILING NO. 1

EAST CHANNEL – PLAN AND PROFILE

DESIGNED BY	DLF
DRAWN BY	QNA
CHECKED BY	QNA
H-SCALE	AS SHOWN
V-SCALE	AS SHOWN
JOB NO.	2356.00
DATE ISSUED	4/17/26
SHEET NO.	A OF A

EROSION CONTROL LEGEND

KEY	TITLE	SYMBOL
SF	SILT FENCE	SF
CF	CONSTRUCTION FENCE	CF
CIP	CULVERT INLET PROTECTION	
IP	INLET PROTECTION	
SBB	STRAW BALE BARRIER	
SP	STOCKPILE PROTECTION	
VTC	VEHICLE TRACKING CONTROL	
CWA	CONCRETE WASHOUT AREA	
SSA	STABILIZED STAGING AREA	
TSM	TEMPORARY SEEDING AND MULCHING	
PSM	PERMANENT SEEDING AND MULCHING	
DW	DE-WATERING	

GRADING LEGEND

10' EXISTING CONTOUR	6810
2' EXISTING CONTOUR	6802
10' PROPED CONTOUR	6810
2' PROPED CONTOUR	6802
LIMITS OF DISTURBANCE/ CONSTRUCTION BOUNDARY	
SUBDIVISION BOUNDARY	
CUT/FILL LINE	FILL / CUT
TRIBUTARY AREA TO TSB	
DIRECTION OF SURFACE FLOW	4.0%
HIGH POINT	HP
LOW POINT	LP
A LOT	"A"
B LOT	"B"
WALK OUT LOT MODIFIED	"WO*"
GARDEN LEVEL LOT MODIFIED	"G*"
100-Y FEMA FLOODPLAIN	
100-Y HWL PER HECRAS ANLYSIS	
AREAS OF DE-WATERING	

WETLANDS LEGEND

EXISTING WETLANDS	
PERMANENT WETLAND DISTURBANCE	

RUNOFF REDUCTION LEGEND

UNCONNECTED IMPERVIOUS AREA	
RECEIVING PERVIOUS AREA	
EXCLUDED UNDEVELOPED PERVIOUS AREA PER THE EXCLUSION IN ECM APPENDIX I.7.1.B.7 — SITES WITH LAND DISTURBANCE TO UNDEVELOPED LAND THAT WILL REMAIN UNDEVELOPED	

100' 0 100' 200'

SCALE: 1"=100'

VEGETATION NOTE:

EXISTING VEGETATION CONSISTS OF NATIVE PRAIRIE GRASSES AND SHRUBS WITH FAIR TO GOOD COVERAGE OF 50% TO 70%

GENERAL NOTE:

ALL AREAS TO BE VEGETATED WITH PERMANENT SEEDING SHOULD ALSO BE TEMPORARY STABILIZED VIA TRACK ROLLING OR SOME OTHER MEANS.

GENERAL NOTE:

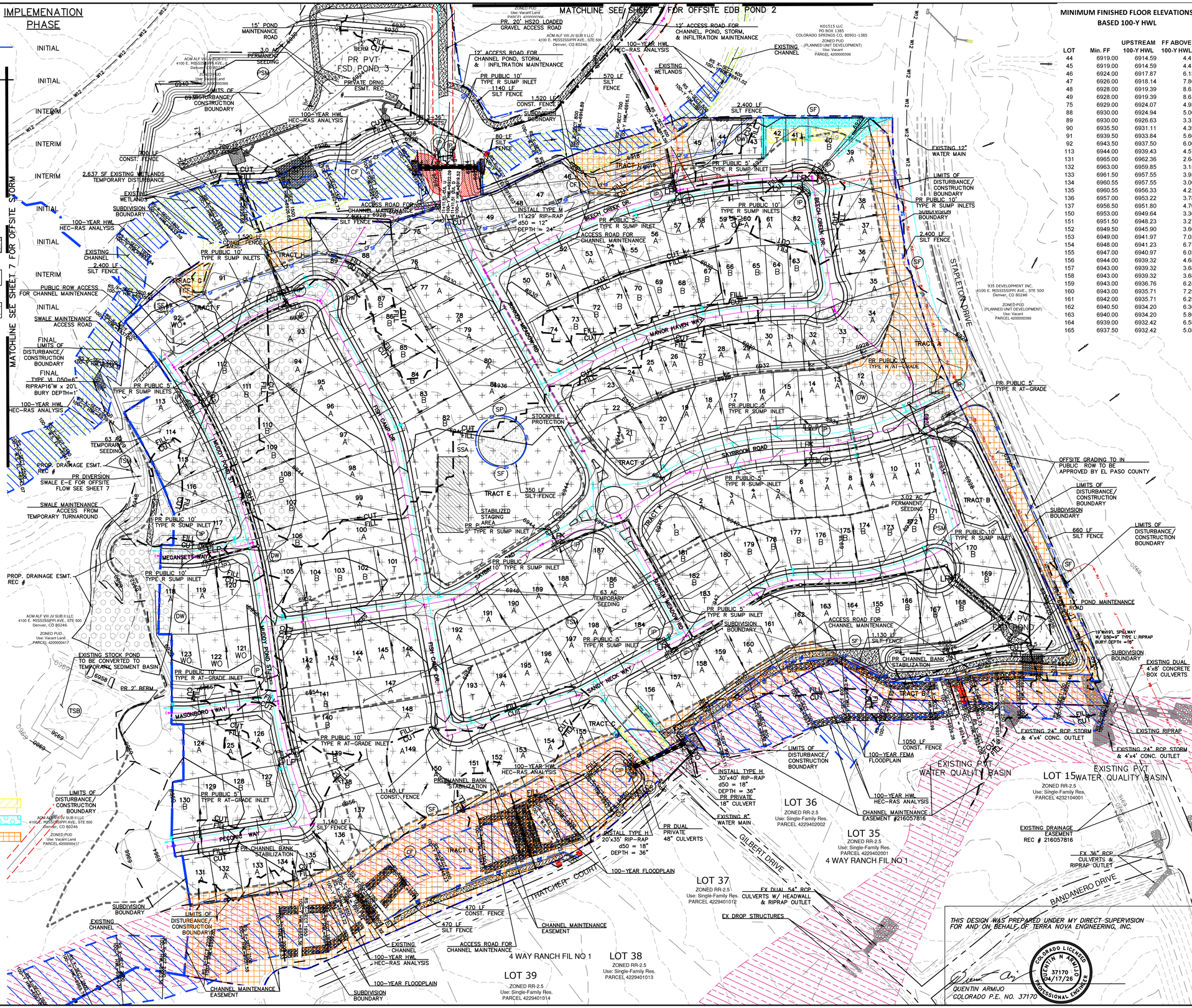
1. NO BATCH PLANTS ARE PR
2. ALL CONTROL MEASURES ARE BEING IMPLEMENTED BY THE OWNER/DEVELOPER/CONTRACTOR
3. FOR INFORMATION ONLY? FOR PRES-SUBDIVISION SITE GRADING THERE WILL BE NO CURB AND GUTTER AND STORM DRAIN, ONLY SEEDING AND MULCHING.

IMPLEMENATION PHASE

INITIAL
INTERIM
INTERIM
INTERIM
INITIAL
INTERIM
INITIAL
INITIAL
FINAL
FINAL
INITIAL

MATCHLINE SEE SHEET 7 FOR OFFSITE STORM

MATCHLINE SEE SHEET 7 FOR OFFSITE EDB POND 2



MINIMUM FINISHED FLOOR ELEVATIONS BASED 100-Y HWL

LOT	Min. FF	UPSTREAM 100-Y HWL	FF ABOVE 100-Y HWL
44	6919.00	6914.59	4.41
45	6919.00	6914.59	4.41
46	6924.00	6917.87	6.13
47	6926.00	6918.14	7.86
48	6928.00	6919.39	8.61
49	6928.00	6919.39	8.61
75	6929.00	6924.07	4.93
88	6930.00	6924.94	5.06
89	6930.00	6926.63	3.37
90	6935.50	6931.11	4.39
91	6939.50	6933.84	5.66
92	6943.50	6937.50	6.00
113	6944.00	6939.43	4.57
131	6965.00	6962.36	2.64
132	6963.00	6959.85	3.15
133	6961.50	6957.55	3.95
134	6960.55	6957.55	3.00
135	6960.55	6956.33	4.22
136	6957.00	6953.22	3.78
137	6956.50	6951.80	4.70
150	6953.00	6949.64	3.36
151	6951.50	6948.23	3.27
152	6949.50	6945.90	3.60
153	6949.00	6941.97	7.03
154	6948.00	6941.23	6.77
155	6947.00	6940.97	6.03
156	6944.00	6939.32	4.68
157	6943.00	6939.32	3.68
158	6943.00	6939.32	3.68
159	6943.00	6936.76	6.24
160	6943.00	6935.71	7.29
161	6942.00	6935.71	6.29
162	6940.50	6934.20	6.30
163	6940.00	6934.20	5.80
164	6939.00	6932.42	6.58
165	6937.50	6932.42	5.08

REVISIONS		
NO.	DESCRIPTION	DATE

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

PREPARED FOR:
ACM ALF VIII JV SUB II LLC
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303-984-9800

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Creative Civil Engineering Solutions
721 S. 23RD STREET
COLORADO SPRINGS, CO 80904
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FAX: 719-635-6428
www.tnesinc.com

WATERBURY FILING NO. 1

GRADING AND EROSION CONTROL PLAN
FINAL EROSION CONTROL PLAN 1

THIS DESIGN WAS PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF TERRA NOVA ENGINEERING, INC.

QUENTIN ARMIJO
COLORADO P.E. NO. 37170

COLORADO LICENSED
QUENTIN N ARMIJO
37170
04/17/26
PROFESSIONAL ENGINEER

DESIGNED BY	DLF
DRAWN BY	QNA
CHECKED BY	QNA
H-SCALE	1" = 100'
V-SCALE	N/A
JOB NO.	2356.00
DATE ISSUED	4/17/26
SHEET NO.	6 OF 52