ATKINS

Duck Creek, Sunset to Sandhill

Request for Conditional Letter of Map Revision

October 15, 2013

Prepared for City of Henderson

Prepared By

ATKINS
2270 Corporate Circle, Suite 200
Henderson NV 89074-7755
702.263.7275

Plan Design Enable

ATKINS

October 15, 2013

Attn: LOMC Manager
LOMC Clearinghouse
847 South Pickett Street
Alexandria, VA 22304-4605

RE: CLOMR for Duck Creek, Sunset to Sandhill Project

To whom it may concern:

Transmitted herewith is the Request for Conditional Letter of Map Revision Duck Creek, Sunset to Sandhill Project. The pertinent FEMA Forms are in Appendix A.

Please feel free to contact me at (702) 551- 0309 or vance.skidmore@atkinsglobal.com if you have any questions.

Sincerely,



Vance Skidmore, PE
Project Engineer

Harshal Desai, PE, CFM
Project Manager

Table of Contents

Sections		Page
1.	**General Information**	**1**
1.1.	Project Background and Purpose	1
1.2.	Community Coordination	1
1.3.	Site Description	1
1.4.	Flooding Problems	2
1.5.	FEMA Flood Zone Information	2
1.6.	Existing Topographic information	2
1.7.	Proposed Improvements	3
2.	**Hydrology**	**7**
3.	**Hydraulics**	**8**
3.1.	Effective Hydraulic Model	8
3.2.	Hydraulic Modeling	8
3.3.	Pre-Project Hydraulic Model	9
3.4.	Post-Project Hydraulic Model	10
3.5.	Proposed Change to Flood Zone	11
4.	**Conclusions**	**19**
5.	**References**	**20**

List of Tables

Table 1. Flow Summary Table 7
Table 2. Roughness Coefficient Table 9
Table 3. Expansion and Contraction Coefficient Table 9
Table 4. Water Surface Elevation Comparison (effective – pre-project) 10
Table 5. Water Surface Elevation Comparison at Selected Stations 11

List of Figures

Figure 1. Vicinity Map 4
Figure 2. FEMA FIRM Panel 5
Figure 3. Effective FEMA Flood Zones Overlaid on Aerial Photos....6
Figure 4. Effective FEMA Hydraulic Model Cross-Sections 12
Figure 5. Pre-Project Hydraulic Work Map 13
Figure 6. Post-Project Hydraulic Work Map....14
Figure 7. Comparison Effective and Pre-Project WSE 15
Figure 8. Comparison Pre-Project and Post-Project WSE....16
Figure 9. Post-Project Proposed Flood Zone Work Map 17
Figure 10. Annotated FIRM Panel....18

List of Appendices

Appendix A FEMA Forms

Appendix B Hydraulic Analysis

- Appendix B-1: Pre-Project Hydraulic Model
- Appendix B-2: Post-Project Hydraulic Model

Appendix C Reference Material

Appendix D Improvement Plans

Appendix E Electronic Data CD

1. General Information

1.1. Project Background and Purpose

The City of Henderson (COH) is proposing to make improvements to Duck Creek between Sunset Road and Sandhill Road in Henderson, Nevada. **Figure 1** shows the general location of the project. The proposed improvements include the design of approximately 2,700 linear feet of concrete lined channel. The project also includes other design elements related to the concrete channel including channel transitions and maintenance access ramps.

Duck Creek within the study reach is currently a graded earthen channel. Annual and post storm maintenance activities (that include, but are not limited to vegetation removal, erosion repair and re-shaping of the channel section) and the associated costs are significant for this reach of channel. The primary goal of this project is to improve the channel lining and reduce maintenance activities and the associated costs.

Completion of the project will result in the revision of the Special Flood Hazard Area (SFHA) along this reach of channel. This study is intended to serve as the Request for Conditional Letter of Map Revision (CLOMR) for Duck Creek through the study reach. The purpose of this CLOMR is to address needed revisions to the existing Federal Emergency Management Agency (FEMA) flood zone delineation shown on the current effective Flood Insurance Rate Maps (FIRM) for Clark County Nevada and Incorporated Areas (Community Numbers 320003 and 32005), panel 2580 F. Please refer to **Section 1.5** for FEMA Flood Zone Information.

1.2. Community Coordination

COH and Atkins have been working closely with other agencies on this proposed project. The entities include Clark County Regional Flood Control District (CCRFCD) and the Clark County Department of Public Works (CCPW).

Atkins submitted a Final Technical Report on March 05, 2013 for supporting project documentation and presenting the hydraulic modelling incorporating the 90% design plans. Since the completion of the 90% design, Atkins has made some revisions to the design. This CLOMR is based on the latest design plans. It is anticipated that no design changes impacting the channel hydraulics will be made before construction. The latest design plans are included in **Appendix D**.

1.3. Site Description

The project is located within Section 6, Township 22 South, Range 62 East and Section 31 Township 21 South, Range 62 East of Clark County, Nevada. The improvements are planned in only dedicated public Right-of-Way or dedicated public drainage easements planned for flood control infrastructure. The width of the Right-of-Way or drainage easements is either 100-ft or 140-ft in width. The width of the dedicated Right-of-Way or drainage easements is shown on the improvement plans in **Appendix D**. On each side of the Duck Creek is privately owned residential or commercial developments. The adjacent land is mostly developed.

Three existing bridge structures cross Duck Creek in the study reach. The Sunfish Drive Bridge and the Camden Common Apartment Bridge (Camden Bridge) are privately owned and maintained bridges. Sunset Road Bridge is publicly owned and maintained by COH.

The study reach extends from Sandhill Road to just downstream of Sunset Road. Duck Creek at the beginning of the proposed improvements is concrete lined. There are three consecutive channel drop structures in the Duck Creek channel immediately upstream of the proposed channel improvements. The existing channel through the study reach is a graded and unlined channel. Downstream of Sunset Road, the channel banks are lined with gabions and the bottom is unlined / graded. The unlined channel bottom has experienced both erosion and deposition at various locations throughout this study reach. The bottom of the channel has a well defined low flow section. The study reach has limited vegetation growth because of channel maintenance. The study reach has a small constant flow within the low flow channel conveyance area.

1.4. Flooding Problems

The study reach is highly unstable and susceptible to erosion and deposition. This instability provides higher probability of bank failure and/or reduced conveyance capacity during larger storm events. The effective hydraulic model shows that the 100-year storm flow hits the bridge decks at both Sunfish Drive Bridge and Camden Bridge. This higher water surface elevation (WSE) causes the flood waters to breakout from the existing channel banks as shown on **Figures 2** and **3**.

1.5. FEMA Flood Zone Information

There is a FEMA SFHA, Zone AE associated with Duck Creek within the study reach. The Zone AE flood zone is contained within the channel banks except at a few locations where the floodplain encroaches into the private property adjacent to Duck Creek as explained in **Section 1.4**. The base flood elevations (BFE) for the study reach of the Duck Creek have been determined.

Figure 2 is a reproduction of the FEMA Flood Insurance Rate Map (FIRM) for Clark County Unincorporated Areas Community Number 32003C, Panel 2580 F, dated November 13, 2011. The DFIRM flood zone delineations for the entire study reach are shown on **Figure 3**. As shown on both figures, the entire study reach lies within FEMA Flood Zone AE. The area outside of the Zone AE project site lies within a FEMA Flood Zone X, which is defined as an area outside the 500-year floodplain.

1.6. Existing Topographic information

The existing topographic information and the contours used for the pre-project and post-project hydraulic analysis of the channelization improvements are based on the composite surface generated specifically for this project. The following sources were used for the development of the composite surface.

1. 1-ft Aerial topography completed by AeroTech Mapping Inc. #0412-046 (flight date of 04/20/2012). (project topography)

2. 4-ft Topography Effective Topography, (FIS topography)

The above sources utilize the vertical datum of North American Vertical Datum (NAVD) 88, and English Units. The aerial topographic information developed by AeroTech Mapping Inc. was used as a base for the development of the composite surface. The topographic data from the FIS topography was incorporated into the base surface to supplement missing information based on the project topography extents. Using the above mentioned sources a triangulated irregular network (TIN) was developed (using 3D Analyst extension in ArcGIS) for the study reach. This TIN

was used as a topographic base for the hydraulic modeling cross-sections for the pre-project (existing) hydraulic model. All aerial photography, 3D polylines, and survey shots, and the 1-foot contours are included in the data CD in **Appendix E**. The proposed 1-foot contours are also provided on the same data CD and the proposed grading (contours) is shown on the improvement plans in **Appendix D**.

1.7. Proposed Improvements

The proposed channel improvements include the rebuilding of the unlined/natural channel with a concrete lined channel. The proposed channel is trapezoidal with a 35-ft bottom, 9-ft deep with 2:1 side slopes. Just upstream of Sunset Road Bridge the channel expands to 45-ft bottom, 12-ft deep with 2:1 side slopes. Just downstream of the Sunset Road Bridge the channel height increases to 12.5-ft deep. The proposed channel improvements end with 40 linear feet of gabion baskets prior to transition into the natural channel bottom. Please refer the improvement plans supplied in **Appendix D** to see the extent and scope of the improvements.

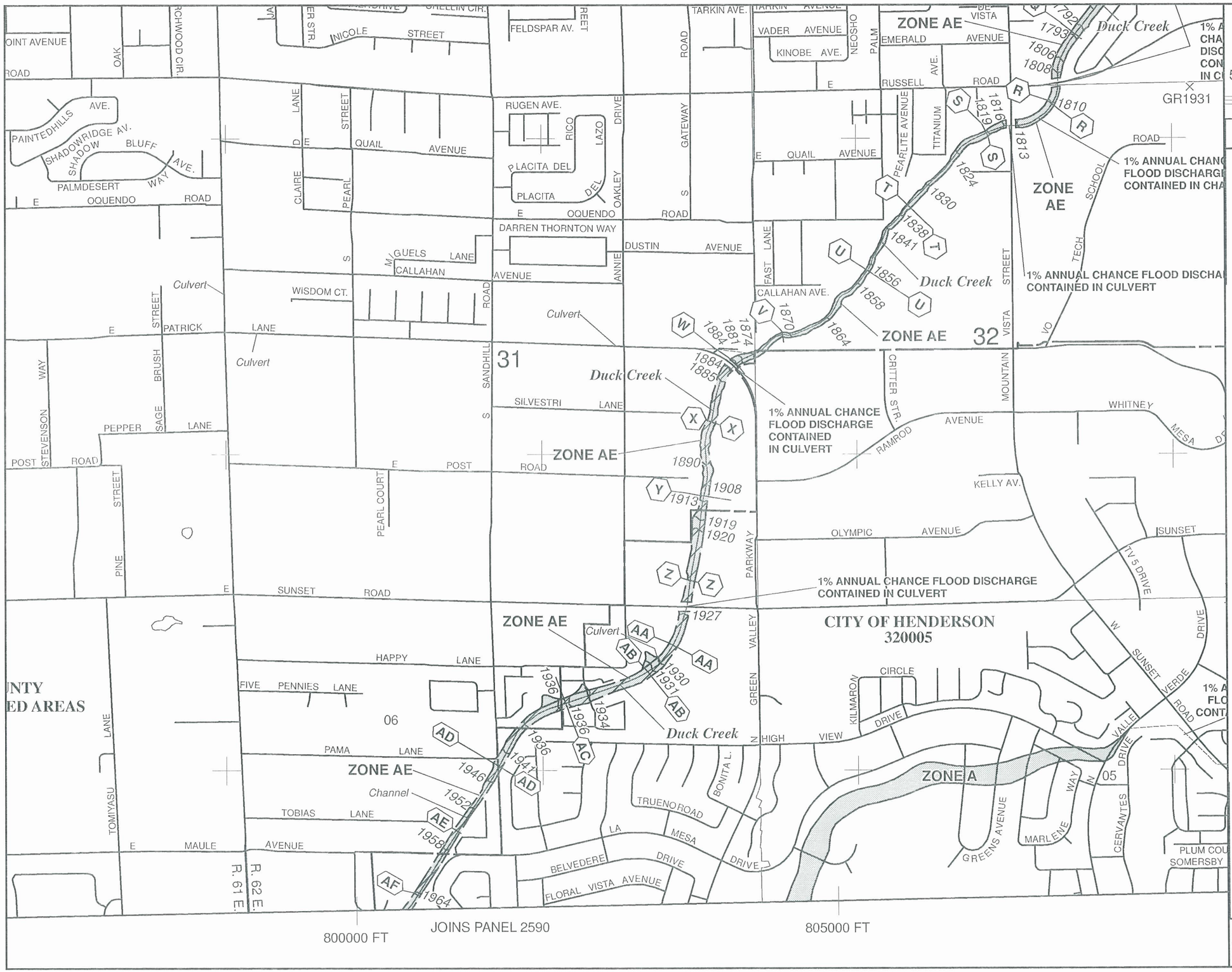
The existing bridges will not have any significant improvements or modifications. The proposed concrete channels will be built under the existing bridges. The proposed channel depths were coordinated with the existing bridges, so that only minor grading alterations would be required at the time of construction. These alterations to the bridges include removal of some existing concrete slope paving, excavation/backfill to accommodate the reduced channel cross-section, and miscellaneous grading within the Right-of-Way/easements to match to existing grades at the corridor boundaries and provided maintenance access adjacent to the channel. There are some stretches of short retaining walls adjacent to the proposed maintenance access to assist in matching the existing grades at the easements/Right-of-Way boundaries.

The channel profile is a constant 0.5% through the proposed study reach. After the end of the improvements, the channel transitions to the existing channel at 1.0% to catch the existing channel flow line.

These improvements are designed such that there are no adverse impacts downstream and upstream of the proposed improvements.



Figure 1. Vicinity Map



NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2580F

FIRM

FLOOD INSURANCE RATE MAP

CLARK COUNTY, NEVADA

AND INCORPORATED AREAS

PANEL 2580 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLARK COUNTY	320003	2580	F
HENDERSON, CITY OF	320005	2580	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
32003C2580F

MAP REVISED
NOVEMBER 16, 2011

Federal Emergency Management Agency

Figure 2

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



FIGURE 3: Effective FEMA Flood Zones Overlaid on Aerial Photo

LEGEND

- Study Limit
- Clark County Parcel Data
- 100-year Floodway
- 100-year Flood Zone AE

Aerial Source: Clark County Fall 2011

0 150 300 600

Feet

1 inch = 300 feet

N

DUCK CREEK, SUNSET to SANDHILL PROJECT
Conditional Letter of Map Revision

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2. Hydrology

The effective 100-year flow rate for Duck Creek through the study reach is 5,825 cfs upstream of Sandhill Road, increases to 5,998 cfs near Sandhill Road and increases to 6,074 cfs near Sunset Road. The flows are summarized in **Table 1**. These flows are referenced from the *Duck Creek Channel Improvements CLOMR: Robindale Road to El Dorado Lane* (Duck Creek CLOMR), FEMA case 08-09-0224R. As a result, the 100-year pre-project (Existing) and 100-year post-project hydraulic models use these flow rates. Please refer to **Section 3** for further discussion on the hydraulic models for the study reach.

Table 1. Flow Summary Table

Effective Cross-Sections	Pre-Project Cross-Sections	Flow (cfs)
10800 to 10500	5101.524 to 3678.752	5,825
10600 to 9300	3495.033 to 1222.326	5,998
9200 to 8500	1117.286 to 0.35639	6,074

3. Hydraulics

The hydraulic models provided within this CLOMR include the following: effective hydraulic model, a pre-project (existing) hydraulic model and a post-project hydraulic model. Each of the above mentioned hydraulic models are discussed below.

3.1. Effective Hydraulic Model

The effective hydraulic model is from the Duck Creek CLOMR (FEMA Case # 08-09-0224R) approved by FEMA March 25, 2008. The hydraulic model was based on the 4' effective topography (NGVD 1929) and the hydraulic model and results were converted to NAVD 1988 for map publication and base flood elevation (BFE) reporting. The hydraulic model for the Duck Creek CLOMR was developed using the USACE HEC-RAS modeling system. This model was used to establish a Zone AE flood zone for a 10-mile reach of the Duck Creek Channel, extending from the outfall from the Lower Duck Creek Detention Basin to the Pittman Wash Confluence. The FEMA FIRM panels affected by the Duck Creek CLOMR include 2567 F, 2568 F, 2569 F, 2580 F, 2583 F, 2585 F, and 2590 F.

For the purpose of this CLOMR, the effective hydraulic model was truncated to include hydraulic cross-sections 10800 through 8800. The segment of the effective hydraulic model pertinent to this project has flows between 5,825 cfs and 6,074 cfs. The truncated effective hydraulic model and associated electronic files (cross-sections, flood zone delineations, 3D polylines, etc.) were obtained from internal company records. This hydraulic model was used as the upstream effective tie-in for both the pre- and post-project hydraulic models. The cross-sections in the vicinity of this project are shown on **Figure 4**. A truncated version of the effective hydraulic model is provided in the HEC-RAS model on the data CD under plan: Effective_Truncated.

3.2. Hydraulic Modeling

Hydraulic models for both pre-project (existing) and post-project (proposed) conditions were developed for this project. The hydraulic modeling was performed using HEC-RAS version 4.1.0 software package. This section provides a brief overview of required inputs and modeling methodology that was used in the development of the HEC-RAS models for the pre and post-project hydraulic analysis.

3.2.1. Boundary Conditions

HEC-RAS normal depth option with a slope of 1% and 3% was used as the upstream and downstream boundary condition, respectively. These slopes are representative of the upstream and downstream channel slopes at the study limits.

3.2.2. Roughness Coefficient

The Manning's roughness coefficients (n value) utilized in the hydraulic models are based on field visits, aerial photos, the proposed improvements and are in accordance with the recommendations provided in the Hydrologic criteria and Drainage Design Manual (HCDDM) published by the CCRFCD. **Table 2**, below, shows the n values used in the hydraulic model.

Table 2. Roughness Coefficient Table

Ground Condition	n value
Existing Unlined Channel (Vegetation, Deposition, etc.)	0.04
Access Roads in Existing Channel	0.03
Concrete	0.015
Proposed Gabions	0.03

3.2.3. Expansion and Contraction Coefficients

The expansion and contraction coefficients used in the hydraulic models are summarized in **Table 3**, below. These values are in accordance with the recommendations provided in the HEC-RAS technical manual.

Table 3. Expansion and Contraction Coefficient Table

Flow conditions/regime	Contraction Coefficient	Expansion Coefficient
Supercritical Regime	0.01	0.03
Subcritical Regime	0.1	0.3
U/S & D/S of Bridges under Subcritical Regime	0.3	0.5

3.2.4. Steady State Analysis

The HEC-RAS models (existing and proposed) are simulated under mixed flow regime using ultimate condition 100-year flows of 5,825 cfs, 5,998 cfs and 6,074 cfs. The mixed flow regime allows the models to change flow regime at any location where the hydraulic characteristics cause a change in the flow regime. The results of the analysis are discussed later in the section.

3.3. Pre-Project Hydraulic Model

The pre-project hydraulic model utilized the project topography discussed in **Section 1.6**. The elevation of the surrounding 4' effective topography was converted to NAVD 1988 (by adding 2.37-ft). The 4' effective topography was used only areas where the project topography was not available. The two source topography sets were merged into a single TIN representing existing ground. The two upstream cross-sections 4711 and 5101 (10800 and 10700 effective) and the downstream cross-section 0.35 (8800 effective) were directly referenced from the effective model. Additional hydraulic cross-sections were added within the study reach to more precisely represent existing condition using the latest topography and survey shots at the three bridge structures.

Figure 5 shows the pre-project (existing) cross-section locations overlaid on an aerial photo with the effective model cross-sections and topography. The GIS files associated with the cross-sections and topography is included in the Data CD in **Appendix C**.

The upstream and downstream water surface elevation ties into the effective model with less than a 0.5 foot difference. **Table 4** shows all of the common cross-section to show a direct comparison between the effective and the pre-project hydraulic models through the study reach. The largest change in water surface elevation occurs at effective cross-sections 10500 and 10400. These

of the bridge structures. The hydraulic model shows a minimum of 1-foot freeboard in the study reach. **Table 5** shows the change in water surface elevation at several locations through the study reach. **Figure 8** shows the profile of pre and post-project WSE throughout the study reach. The post-project hydraulic model is provided in the HEC-RAS model on the data CD under plan: Proposed.

Table 5. Water Surface Elevation Comparison at Selected Stations (pre-project and post-project)

Pre-project Station	Pre-project WSE	Post-project Station	Post-project WSE	Δ WSE
5101.524	1959.76	-419.619	1959.76	0.0
4711.268	1955.85	-29.933	1955.85	0.0
4292.498	1949.12	387.751	1949.12	0.0
3909.086	1940.71	771.57	1940.57	-0.14
3495.033	1938.54	1173.4	1930.57	-7.97
3104.647	1936.55	1577.7	1929.80	-6.75
2912.798	1936.11	1776.2	1929.09	-7.02
2684.211	1935.65	1991.84	1928.27	-7.38
2637.879	1933.89	2037.879	1928.09	-5.80
1867.342	1931.91	2803.2	1924.77	-7.14
1810.339	1929.3	2860.99	1924.5	-4.8
1222.326	1927.93	3438.65	1926.54	-1.39
1117.286	1927.04	3554.44	1926.31	-0.73
841.691	1923.56	3835.75	1923.27	-0.29
468.45	1922.5	4197.64	1922.43	-0.07
301.8796	1921.93	4363.63	1921.83	-0.1
0.35639	1910.39	4664.36	1910.34	-0.05

3.5. Proposed Change to Flood Zone

The results of the post –project hydraulic models shows containment of the effective channel flows. The Base Flood Elevation (BFE) in the study reach is significantly reduced by the proposed channel improvements resulting in the flows being efficiently conveyed. The bridges no longer cause backwater conditions within the study reach and no channel breakouts or inundation areas are present.

The AE flood zone and the floodway are mapped to the channel banks within this reach. The Sunfish Drive and Camden Apartment Bridge have been removed from the flood zone because the bridge will convey the 1% annual channel flood under the bridge. This is similar to how the effective flood zone is mapped at Sunset Road. The proposed flood zone revisions are shown on **Figure 9**. An annotated FIRM Panel showing the proposed revisions to the flood zones is provided as **Figure 10**.

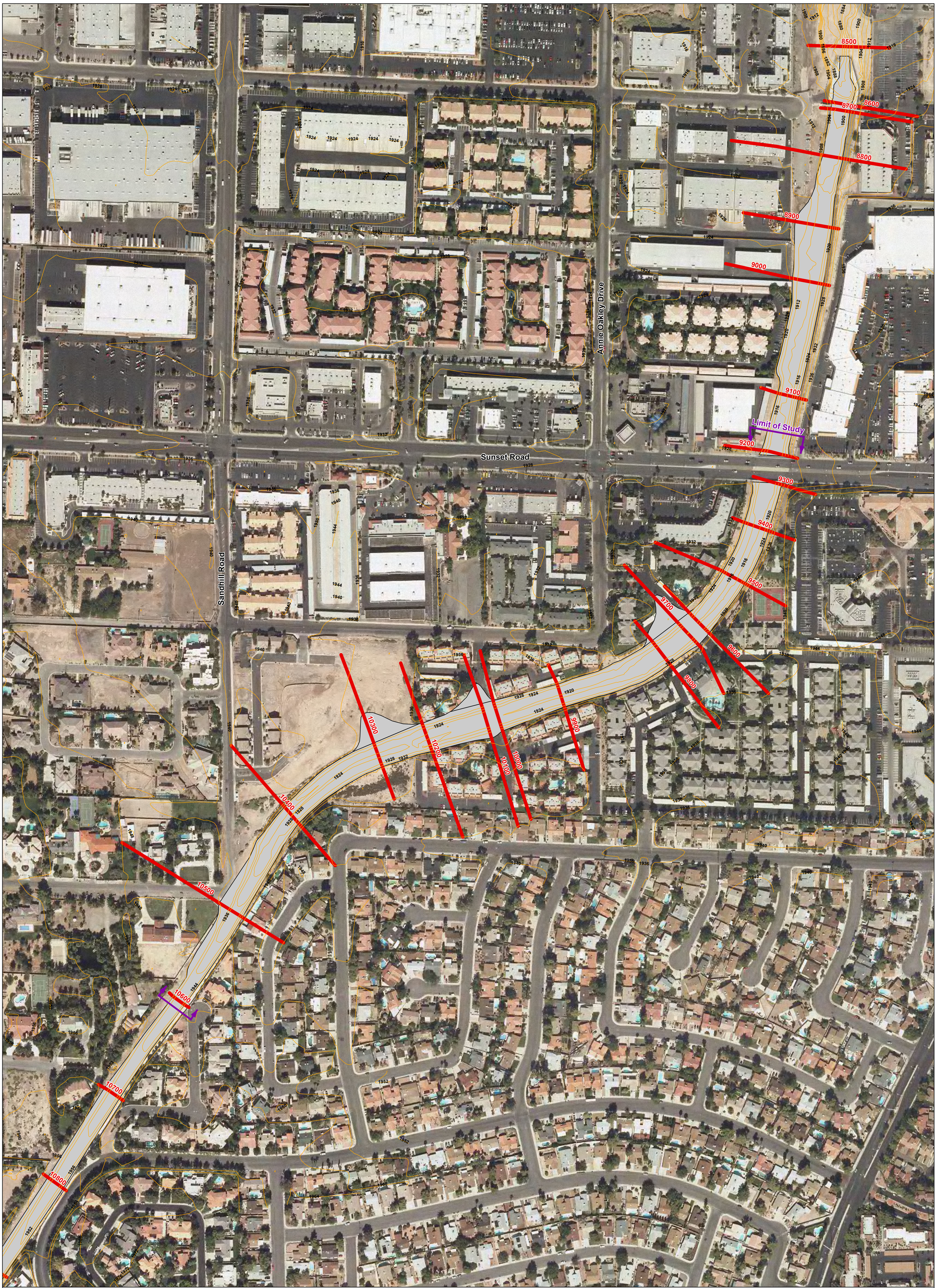


FIGURE 4: Effective FEMA Hydraulic Model Cross-Sections

LEGEND

- Study_limit
- Effective 4ft Contours (NGVD 29)
- Effective Model Cross-Sections
- Flood Zone AE

Note: Effective 4-foot contours based on NGVD 29 vertical datum. Post project hydraulic model based on NAVD 88 vertical datum, add 2.37 feet to effective contour elevation.

N

0 150 300 600

Feet

1 inch = 150 feet

Aerial Source: Clark County Fall 2011

DUCK CREEK, SUNSET to SANDHILL PROJECT
Conditional Letter of Map Revision

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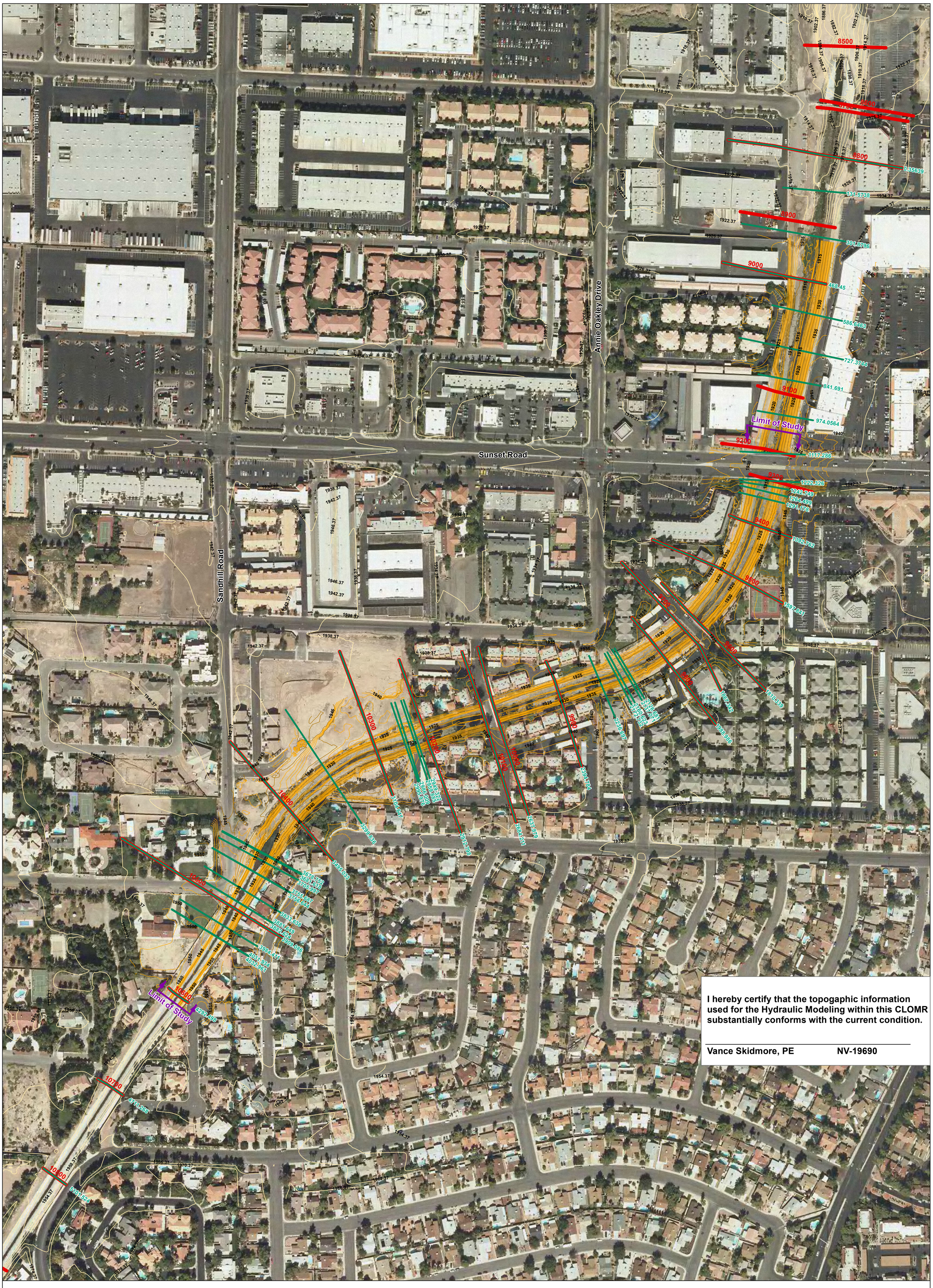


FIGURE 5: Pre-Project (Existing) Hydraulic Model Work Map

LEGEND

- Study Limit
- Pre-Project (exist) Cross-Sections
- Effective Model Cross-Sections
- Effective Topography (NAVD 88)

Project Topography

- 5' Index Contour
- 1' Contour

Note: Effective 4-foot contours based on NGVD 29 vertical datum. Post project hydraulic model based on NAVD 88 vertical datum, 2.37 feet added to effective contour elevation to convert to NAVD 88.

N

0 150 300 600

Feet

1 inch = 150 feet

Aerial Source: Clark County Fall 2011

DUCK CREEK, SUNSET to SANDHILL PROJECT
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FIGURE 6: Post-Project Hydraulic Model Work Map

LEGEND

- Proposed Cross-section
- Study Limit
- Effective Topography (NAVD 88)

Project Topography

- 5' Index Contour
- 1' Contour

Note: Effective 4-foot contours based on NGVD 29 vertical datum. Post project hydraulic model based on NAVD 88 vertical datum, 2.37 feet added to effective contour elevation to convert to NAVD 88.

N

0 150 300 600

Feet

1 inch = 150 feet

Aerial Source: Clark County Fall 2011

DUCK CREEK, SUNSET to SANDHILL PROJECT
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Figure 7: Comparison of Effective and Pre-Project WSE

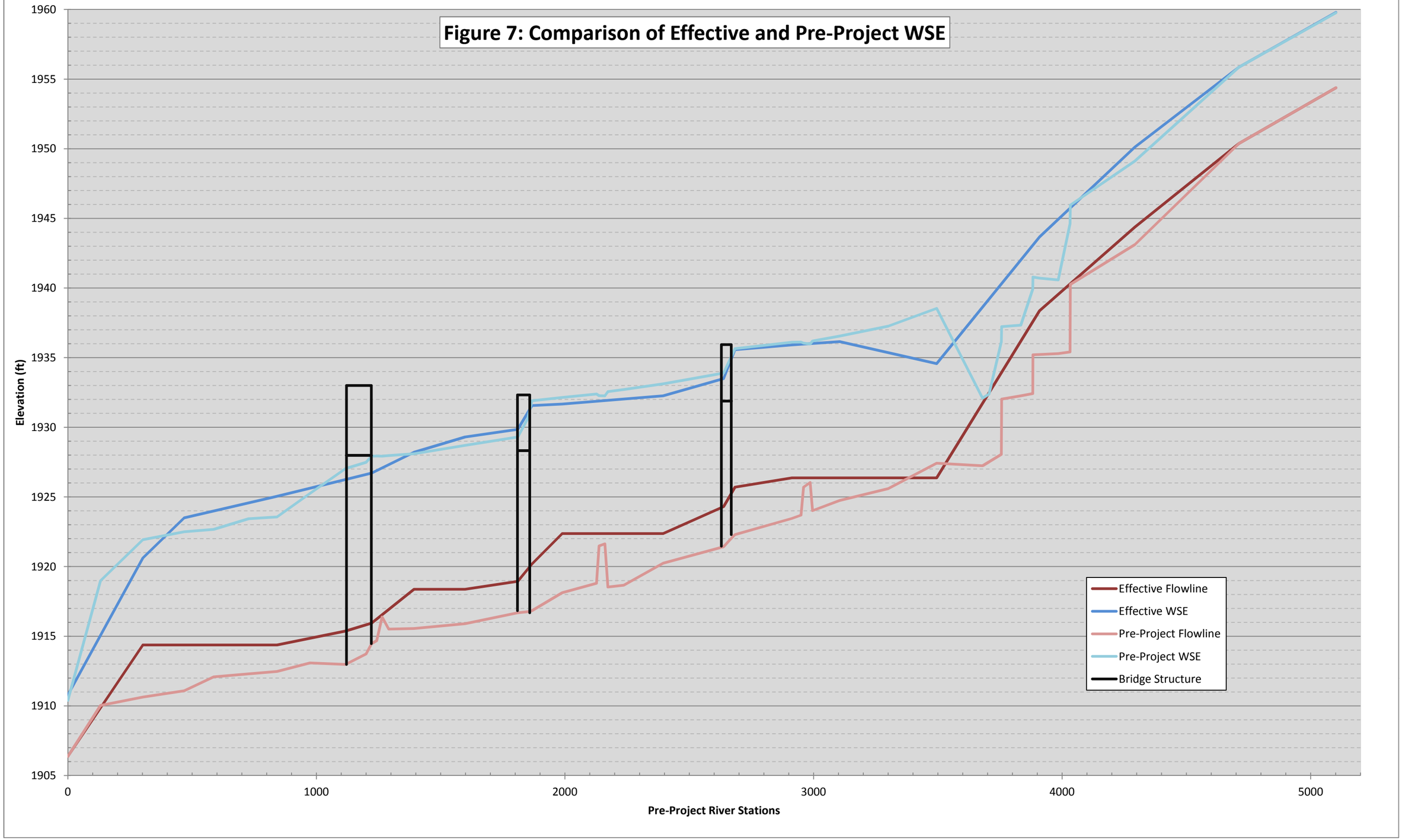


Figure 8: Comparison of Pre and Post Project WSE

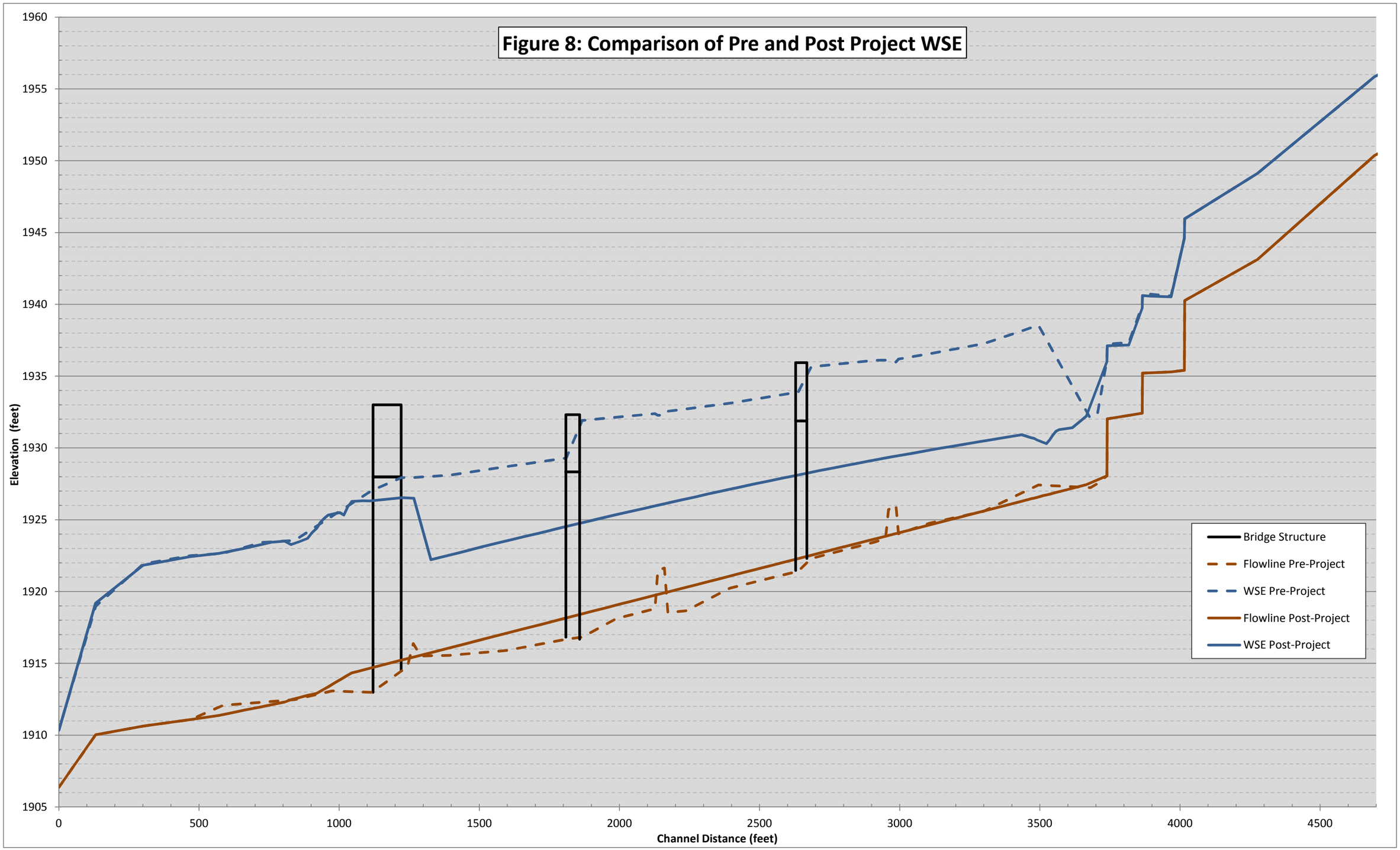




FIGURE 9: Post-Project Flood Zone Work Map

LEGEND

- Proposed BFE
- Removed Flood Zone
- Study Limit
- Proposed Flood Zone AE and Floodway
- Effective Flood Zone AE and floodway

N

0 120 240 480

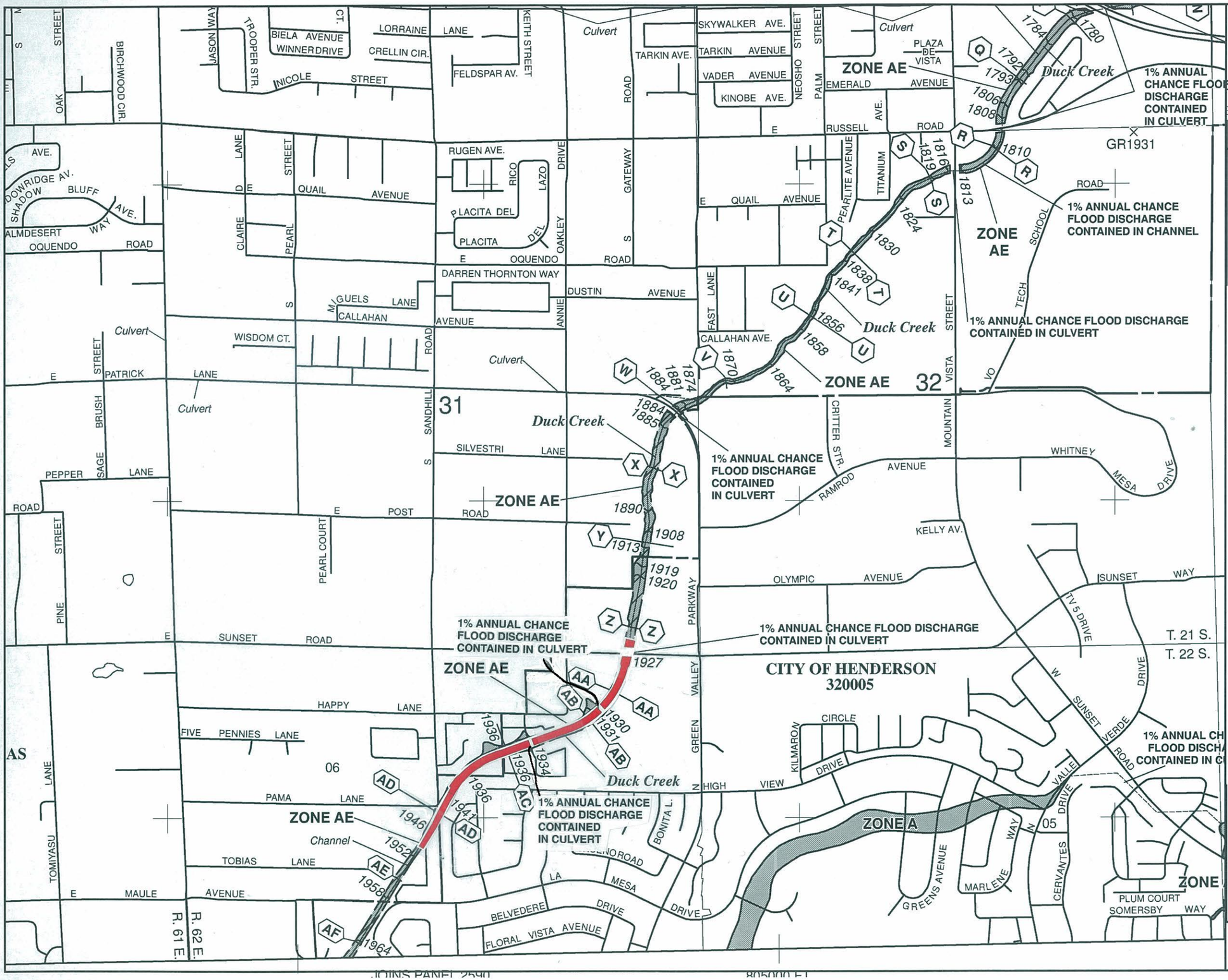
Feet

1 inch = 120 feet

Aerial Source: Clark County Fall 2011

DUCK CREEK, SUNSET to SANDHILL PROJECT
Conditional Letter of Map Revision

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MAP SCALE 1" = 1000'

500 0 1000 2000 FEET METE

PANEL 2580F

FIRM

FLOOD INSURANCE RATE MAP

CLARK COUNTY, NEVADA

AND INCORPORATED AREAS

PANEL 2580 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLARK COUNTY	320003	2580	F
HENDERSON, CITY OF	320005	2580	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
32003C2580F

MAP REVISED
NOVEMBER 16, 2011

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

FIGURE 10

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

4. Conclusions

The analysis and associated results presented in this CLOMR demonstrate that the proposed channel improvements will require a revision to the existing flood zone. No updates to the hydrology or effective channel flows are proposed with this CLOMR. The post-project hydraulic model shows that the 1% annual discharge is contained in the channel and is conveyed under the three bridges within the study reach. The AE flood zone and the floodway are mapped at the channel banks in the study reach. The hydraulic analysis shows that the proposed improvements will not cause any adverse impacts upstream or downstream of the study reach.

5. References

1. Las Vegas Valley Master Plan Update, Clark County Regional Flood Control District, 2008.

2. *Duck Creek/Blue Diamond Washes FIS Restudy.* Prepared for Clark County Regional Flood Control District. Prepared by G.C. Wallace, 2002.

3. Hydrologic Criteria and Drainage Design Manual, Clark County Regional Flood Control District, 1999.

4. I-15 / Silverado Ranch Interchange, Request for Conditional Letter of Map Revision, Prepared by PBS&J. Approved by FEMA Jul 19, 2006 Case Number # 06-0-B230R.

5. HEC-RAS River Analysis System Version 4.1.0, U.S. Army Corps of Engineers - Hydrologic Engineering Center, 2010.

6. *Hydrologic Analysis Letter Report for Duck Creek Channel Improvements CLOMR.* Prepared for Clark County Regional Flood Control District. Prepared by PBS&J, 2007.

7. Duck Creek Channel Improvements Conditional Letter of Map Revision (CLOMR): Robindale Road to El Dorado Lane, Prepared by PBS&J. Approved by FEMA March 25, 2008, Case Number # 08-09-0224R.

Appendix A

FEMA FORMS

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☒ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☐ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Example: 480301 480287	City of Katy Harris County	TX TX	48473C 48201C	0005D 0220G	02/08/83 09/28/90
320003	Clark County	NV	320003	2580F	11/16/11
320005	City of Henderson	NV	320005	2580F	11/16/12

2. a. Flooding Source: Duck Creek Wash

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: Duck Creek, Sunset to Sandhill Project

4. FEMA zone designations affected: AE (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☒ Physical Change ☒ Improved Methodology/Data ☐ Regulatory Floodway Revision ☐ Base Map Changes
   ☐ Coastal Analysis ☒ Hydraulic Analysis ☐ Hydrologic Analysis ☐ Corrections
   ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
   ☒ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☒ Channelization ☐ Levee/Floodwall ☒ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other (Attach Description)

6. ☒ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $4400

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Vance Skidmore, PE	Company: Atkins	
Mailing Address: 2270 Corporate Circle, suite 200 Henderson, NV 89074	Daytime Telephone No.: 702-551-0309	Fax No.: 702-263-7200
	E-Mail Address: vance.skidmore @atkinsglobal.com	
Signature of Requester (required):	Date: October 15, 2013	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Albert Jankowiak, PE Flood Control Engineer	Community Name: City of Henderson	
Mailing Address: 240 Water Street Henderson, NV 89009-5050	Daytime Telephone No.: 702-267-3024	Fax No.:
	E-Mail Address: albert.jankowiak@cityof henderson.com	
Community Official's Signature (required):	Date: 10-17-13	

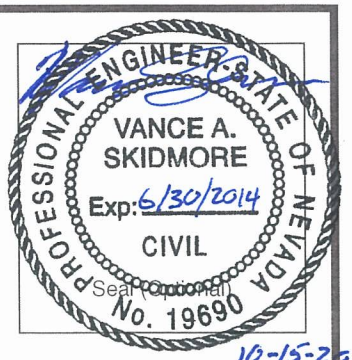
CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Vance Skidmore, PE	License No.: 19690	Expiration Date: 6/30/14	
Company Name: Atkins	Telephone No.: 702-551-0309	Fax No.: 702-263-7200	
Signature:	Date: Oct 15, 2013	E-Mail Address: vance.skidmore@atkinsglobal.com	

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if …
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans



Seal (Optional)

10-15-2013

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Duck Creek

Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☒ Not revised (skip to section B) ☐ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☐ Precipitation/Runoff Model → Specify Model: _____
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters), and documentation to support the new analysis.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Is the hydrology for the revised flooding source(s) affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation..

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.)	
			Effective	Proposed/Revised
Downstream Limit*	Model end	8800	1910.78	1910.34
Upstream Limit*	Model start	10800	1959.76	1959.76

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

2. Hydraulic Method/Model Used: HEC-RAS version 4.1.0

3. Pre-Submittal Review of Hydraulic Models*

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4.

Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name: DuckCreekCLOMR	Plan Name: Effective_truncated	File Name:	Plan Name:	NAVD88
Corrected Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	
Existing or Pre-Project Conditions Model	File Name: DuckCreekCLOMR	Plan Name: Existing	File Name:	Plan Name:	NAVD88
Revised or Post-Project Conditions Model	File Name: DuckCreekCLOMR	Plan Name: Proposed	File Name:	Plan Name:	NAVD88
Other - (attach description)	File Name:	Plan Name:	File Name:	Plan Name:	

* For details, refer to the corresponding section of the instructions.

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic work map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☒ Digital Mapping (GIS/CADD) Data Submitted (preferred)

Topographic Information: Project Topography

Source: Aerotech Mapping, Inc Date: 4/20/12

Accuracy: 1 ft topography

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM**, at the same scale as the original, annotated to show the boundaries of the revised 1%-and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%-and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area on revision.

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☒ No

   a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:

      - The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot compared to pre-project conditions.
      - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot compared to pre-project conditions.

   b. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA? ☐ Yes ☒ No
      If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notifications can be found in the MT-2 Form 2 Instructions.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No

   If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(A)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☐ No

   If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being established. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For CLOMR requests, please submit documentation to FEMA and the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA).

For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA. Please see the MT-2 instructions for more detail.

* Not inclusive of all applicable regulatory requirements. For details, see 44 CFR parts 60 and 65.

DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. NO. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20598-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program; Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Duck Creek

Note**:** Fill out one form for each flooding source studied.

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization.....complete Section B
Bridge/Culvert.....complete Section C
Dam.....complete Section D
Levee/Floodwall.....complete Section E
Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure

1. Name of Structure: Duck Creek Channel Improvements

   Type (check one): ☒ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Sandhill Road to Sunset Road

   Downstream Limit/Cross Section: 9200

   Upstream Limit/Cross Section: 10600

2. Name of Structure: Sunset Road Bridge

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Duck Creek @ Sunset Road

   Downstream Limit/Cross Section: 9200

   Upstream Limit/Cross Section: 9300

3. Name of Structure: Camden Commons Appartments Bridge

   Type (check one) ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Upstream of Sunset Road

   Downstream Limit/Cross Section: 9600

   Upstream Limit/Cross Section: 9700

NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.

DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program; Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Duck Creek

Note**:** Fill out one form for each flooding source studied.

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization.....complete Section B
Bridge/Culvert.....complete Section C
Dam.....complete Section D
Levee/Floodwall.....complete Section E
Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure

1. Name of Structure: Sunfish Road Bridge

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Duck Creek at Sunfish Road

   Downstream Limit/Cross Section: 10000

   Upstream Limit/Cross Section: 10100

2. Name of Structure: _____

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

3. Name of Structure: _____

   Type (check one) ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.

B. CHANNELIZATION

Flooding Source: Duck Creek

Name of Structure: Duck Creek Improvements

1. Hydraulic Considerations

The channel was designed to carry 6074 (cfs) and/or the 100-year flood.

The design elevation in the channel is based on (check one):

☒ Subcritical flow ☐ Critical flow ☒ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☒ At Transitions

☐ Other locations (specify): n

2. Channel Design Plans

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)] ☐ Drop structures ☐ Superelevated sections

☒ Transitions in cross sectional geometry ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)] ☐ Energy dissipator

☐ Weir ☐ Other (Describe):

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport? ☐ Yes ☒ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Duck Creek

Name of Structure: Sunset Road Bridge

1. This revision reflects (check one):

☐ Bridge/culvert not modeled in the FIS

☒ Modified bridge/culvert previously modeled in the FIS

☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): _____
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☐ Shape (culverts only)
☒ Material
☐ Beveling or Rounding
☐ Wing Wall Angle
☐ Skew Angle
☐ Distances Between Cross Sections
☐ Erosion Protection
☒ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

Are the hydraulics of the structure affected by sediment transport? ☐ Yes ☒ No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.

B. CHANNELIZATION

Flooding Source: _____

Name of Structure: _____

1. Hydraulic Considerations

The channel was designed to carry _____ (cfs) and/or the _____-year flood.

The design elevation in the channel is based on (check one):

☒ Subcritical flow ☐ Critical flow ☒ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☒ At Transitions

☐ Other locations (specify): n

2. Channel Design Plans

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)] ☐ Drop structures ☐ Superelevated sections

☒ Transitions in cross sectional geometry ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)] ☐ Energy dissipator

☐ Weir ☐ Other (Describe):

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Duck Creek

Name of Structure: Camden Bridge

1. This revision reflects (check one):

☐ Bridge/culvert not modeled in the FIS

☒ Modified bridge/culvert previously modeled in the FIS

☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): _____
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☐ Shape (culverts only)
☒ Material
☐ Beveling or Rounding
☐ Wing Wall Angle
☐ Skew Angle
☐ Distances Between Cross Sections
☐ Erosion Protection
☒ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

Are the hydraulics of the structure affected by sediment transport? ☐ Yes ☒ No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.

B. CHANNELIZATION

Flooding Source: _____

Name of Structure: _____

1. Hydraulic Considerations

The channel was designed to carry _____ (cfs) and/or the _____-year flood.

The design elevation in the channel is based on (check one):

☒ Subcritical flow ☐ Critical flow ☒ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☒ At Transitions

☐ Other locations (specify): n

2. Channel Design Plans

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)] ☐ Drop structures ☐ Superelevated sections

☒ Transitions in cross sectional geometry ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)] ☐ Energy dissipator

☐ Weir ☐ Other (Describe):

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport? ☐ Yes ☒ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Duck Creek

Name of Structure: Sunfish Drive Bridge

1. This revision reflects (check one):

☐ Bridge/culvert not modeled in the FIS

☒ Modified bridge/culvert previously modeled in the FIS

☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): _____
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☐ Shape (culverts only)
☒ Material
☐ Beveling or Rounding
☐ Wing Wall Angle
☐ Skew Angle
☐ Distances Between Cross Sections
☐ Erosion Protection
☒ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

Are the hydraulics of the structure affected by sediment transport? ☐ Yes ☒ No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.

Explanations on MT-2 Forms

Overview & Concurrence Form

B. Overview

6. See attached ESA documentation

Riverine Hydrology & Hydraulics Form

B. Hydraulics

1. Form Lists Effective cross-sections.

pre-project cross-sections: downstream 0.356939; upstream 5101.524

post-project cross-sections: downstream -4664.36; upstream 419.619

B. Common Regulatory Requirements

4. See attached ESA documentation.

Riverine structures Form

B. Channelization

1. Hydraulic considerations

Hydraulic jump occurs within the concrete lined section of the channel and will not impact the channel Stability

4. Sediment Transport Considerations

No: Sediment transport was not considered because the existing upstream channel and the proposed channel are concrete lined.

C. Bridge/Culvert

4. Sediment Transport Considerations

No: Sediment transport was not considered because the existing channel upstream of project and proposed channel are concrete lined.

Note: Reference bridge improvement plans are included in **Appendix C**. The improvement plans (**Appendix D**) reflect the survey of the existing bridges. The survey points are available on the Data CD (**Appendix E**).

ATKINS

Atkins North America, Inc.
2270 Corporate Circle, Suite 200
Henderson, Nevada 89074-7755

Telephone: +1.702.263.7275
Fax: +1.702.263.7200

www.atkinsglobal.com/northamerica

October 9, 2013

Attn: LOMC Manager
LOMC Clearinghouse
847 South Pickett Street
Alexandria, Virginia 22304-4605

RE: Endangered Species Act Compliance Documentation for a Conditional Letter of Map Revision - Duck Creek, Sunset Road to Sandhill Road Flood Control Project

Dear Sir or Madam:

The City of Henderson is proposing to construct the Duck Creek, Sunset Road to Sandhill Road Flood Control Project. This project is a Clark County Regional Flood Control District (CCRFCD) funded project identified on the CCRFCD 2008 Las Vegas Valley Flood Control Master Plan Update (2008 MPU) as facilities DCWA 0648, DCWA 0656, and DCWA 0670 (CCRFCD, 2008). The proposed flood control improvements would begin at Sandhill Road and end downstream of Sunset Road. A figure showing the proposed project location is included as Enclosure 1.

The project area is currently a graded earthen channel. The proposed improvements include the design of a concrete lined channel and other elements related to the concrete channel, including channel transitions and maintenance access ramps. As part of these improvements the City is submitting a Conditional Letter of Map Revision (CLOMR) to the Federal Emergency Management Agency (FEMA). Atkins has been hired by the City to assist with the preparation of the CLOMR. The purpose of this letter is to document the City's compliance with the Endangered Species Act of 1973 (16 United States Code 1531 et seq.; Public Law 93-205) in support of the CLOMR submittal.

A list of special status species potentially occurring in the project area was compiled by corresponding with the U.S. Fish and Wildlife Service, Nevada Department of Wildlife, and Nevada Natural Heritage Program. A copy of these correspondences is included in Enclosure 2. Currently, there are 10 species that occur in Clark County, Nevada that are listed by the U.S. Fish and Wildlife Service as Threatened or Endangered, and thus protected under the Endangered Species Act (a copy of the Endangered Species Program Report is provided in Enclosure 2). The 10 species are: Moapa dace (*Moapa coriacea*), Pahrump poolfish (*Empetrichthys latos*), woundfin (*Plagopterus argentissimus*), bonytail chub (*Gila elegans*), Virgin River chub (*Gila seminuda* (=*robusta*)), razorback sucker (*Xyrauchen texanus*), Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*), desert tortoise (*Gopherus agassizii*), Yuma clapper rail (*Rallus longirostris yumanensis*), and the southwestern willow flycatcher (*Empidonax traillii extimus*).

Presently, development activities within Clark County, without a federal nexus, are covered by an Incidental Take Permit that was issued pursuant to the provisions of Section 10(a)(1)(B) of the ESA by the USFWS on January 9, 2001 (A copy of the Incidental Take Permit is included as Enclosure 3). The Clark County Multiple Species Habitat Conservation Plan (MSHCP) is the regional habitat conservation plan associated with this Incidental Take Permit. The MSHCP and Incidental Take Permit authorizes the take of the federally threatened desert tortoise (*Gopherus agassizii*) and the endangered southwestern willow flycatcher (*Empidonax traillii extimus*), so long as the take is incidental to otherwise lawful activities. This Incidental Take Permit also provides take authority for 76 other species that are currently not listed under the Endangered Species Act, should they become listed during the 30-year term of the permit. Individuals, corporations, and local governments obtain coverage under this permit through the payment of a 550 dollar per acre mitigation fee for each acre of development, where mitigation fees have not already been paid. Per Section 2.7.2 of the Clark County MSHCP, local government projects are exempted from fee payment.

The following table is a summary of the listed species occurring in Clark County, Nevada and a determination of the potential for the project to impact the species.

Species	Endangered Species Act Status	Range and Habitat Requirements	Potential to be Impacted by Proposed Project	Affect Determination
Fish				
Moapa dace (*Moapa coriacea*)	Endangered	This species is endemic to the warm spring area at the headwaters of the Muddy River, in northern Clark County, Nevada. It is restricted to clear pools and outlet streams of moderate to high temperatures. Spawns in headwater tributaries of the Muddy River, within 150 meters of warm water spring discharge in water temperatures of 30-32 Celcius.	None. Project is outside of the species known range.	No effect.
Pahrump poolfish (*Empetrichthys latos*)	Endangered	This species is extirpated from native range in three springs in Pahrump Valley, Nevada. Individuals have been introduced to a few warm springs elsewhere in Nevada. They are: Corn Creek Springs on the Desert National Wildlife Refuge in Clark County; Shoshone Springs, in White Pine County; and an irrigation reservoir, fed by Sandstone Spring, at Spring Mountain Ranch State Park in Clark County.	None. Project is outside of the species current or historic range. The project will not impact springs.	No effect.
Woundfin (*Plagopterus argentissimus*)	Endangered	Formerly more widespread in the Colorado and Gila river systems in Arizona, Nevada, and Utah. Now essentially restricted to the Virgin	None. Project is outside of the species current known range.	No effect.

Species	Endangered Species Act Status	Range and Habitat Requirements	Potential to be Impacted by Proposed Project	Affect Determination
		River system. Habitat includes seasonally swift, warm, highly turbid, small to medium rivers, with constantly shifting substrates.		
Bonytail chub (*Gila elegans*)	Endangered	Formerly widespread and common in much of the Colorado River basin; now widely extirpated and very rare, with no known self-sustaining populations. Habitat includes main-stem rivers regardless of turbidity, usually in or near deep swift water, in flowing pools and eddies just outside the main current.	None. No known self-sustaining populations exist.	No effect.
Virgin River Chub (*Gila seminuda* (=*robusta*))	Endangered	Species occupies a small range in the Virgin and Muddy rivers in Arizona, Nevada, and Utah. Habitat includes rocky runs, rapids, pools, and undercut banks of headwaters, creeks, and small rivers.	None. Project is outside of the species current known range.	No effect.
Razorback sucker (*Xyrauchen texanus*)	Endangered	Confined to the Colorado River system. Habitats include deep runs, eddies, backwaters, and flooded off-channel environments in spring; runs and pools often in shallow water associated with submerged sandbars in summer; and low-velocity runs, pools, and eddies in winter.	None. Project is outside of the species current known range.	No effect.
Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*)	Threatened	Historically abundant in lakes and streams throughout the physiographic Lahontan basin of northern Nevada, eastern California, Oregon, and Utah. In Nevada, present range includes Pyramid Lake and the Truckee River (Washoe County), both forks of the Walker River and Walker Lake (Mineral County), Summit Lake, and Carson River and its tributaries (Douglas and Lyons counties).	None. Project is outside of the species current or historic range.	No effect.
Reptiles				
Desert tortoise (*Gopherus agassizii*)	Threatened	Range extends from Inyo County, California, southern Nevada (Clark, Nye, and Lincoln counties, north to Yucca Mt. and Coyote Springs), and extreme southwestern Utah (Washington County: Beaver Dam slope and north St. George) south throughout most of the Mohave Desert to the eastern Colorado Desert. Habitat includes creosote scrub, creosote bursage, shadscale	None. The project is located in an area that is completely developed and no impacts to suitable habitat would occur.	No effect. Take of this species is covered under the Clark County MSHCP and Incidental Take Permit.

Species	Endangered Species Act Status	Range and Habitat Requirements	Potential to be Impacted by Proposed Project	Affect Determination
		scrub, Joshua tree communities, and, more rarely (in the northern periphery of their range), in mixed blackbush scrub.		
Birds				
Yuma clapper rail (*Rallus longirostris yumanensis*)	Endangered	Range includes the lower Colorado River from California and Arizona into Mexico; also Salton Sea, Imperial County, California. Occurs in freshwater marshes containing dense stands of cattails and bulrushes.	None. The project is located in an area that is completely developed and no impacts to suitable habitat would occur.	No effect.
Southwestern willow flycatcher (*Empidonax traillii extimus*)	Endangered	Breeding range includes southwestern U.S. (southern California north to Independence, Arizona, southwestern New Mexico, southern Utah, and, at least formerly, southern Nevada) and possibly northern Baja California and Sonora. Species is restricted to riparian habitats and nests primarily in swampy thickets of willow, buttonbush, tamarisk, vines, or other plants, where vegetation is 4-7 meters or more in height.	None. The project is located in an area that is completely developed and no impacts to suitable habitat would occur.	No effect. Take of this species is covered under the Clark County MSHCP and Incidental Take Permit.

No federally threatened or endangered species are known to occur within the project area. Additionally, suitable habitat for these species would not be impacted, either directly or indirectly, by construction of the proposed project. Furthermore, the proposed project is not located within designated critical habitat for any of the above listed species.

This letter documents the City's compliance with the federal Endangered Species Act. Should you have any questions regarding this review, please contact me at (702) 263-7275 or by email at Kimberley.Jenkins@atkinsglobal.com. Thank you for your assistance in processing this CLOMR.

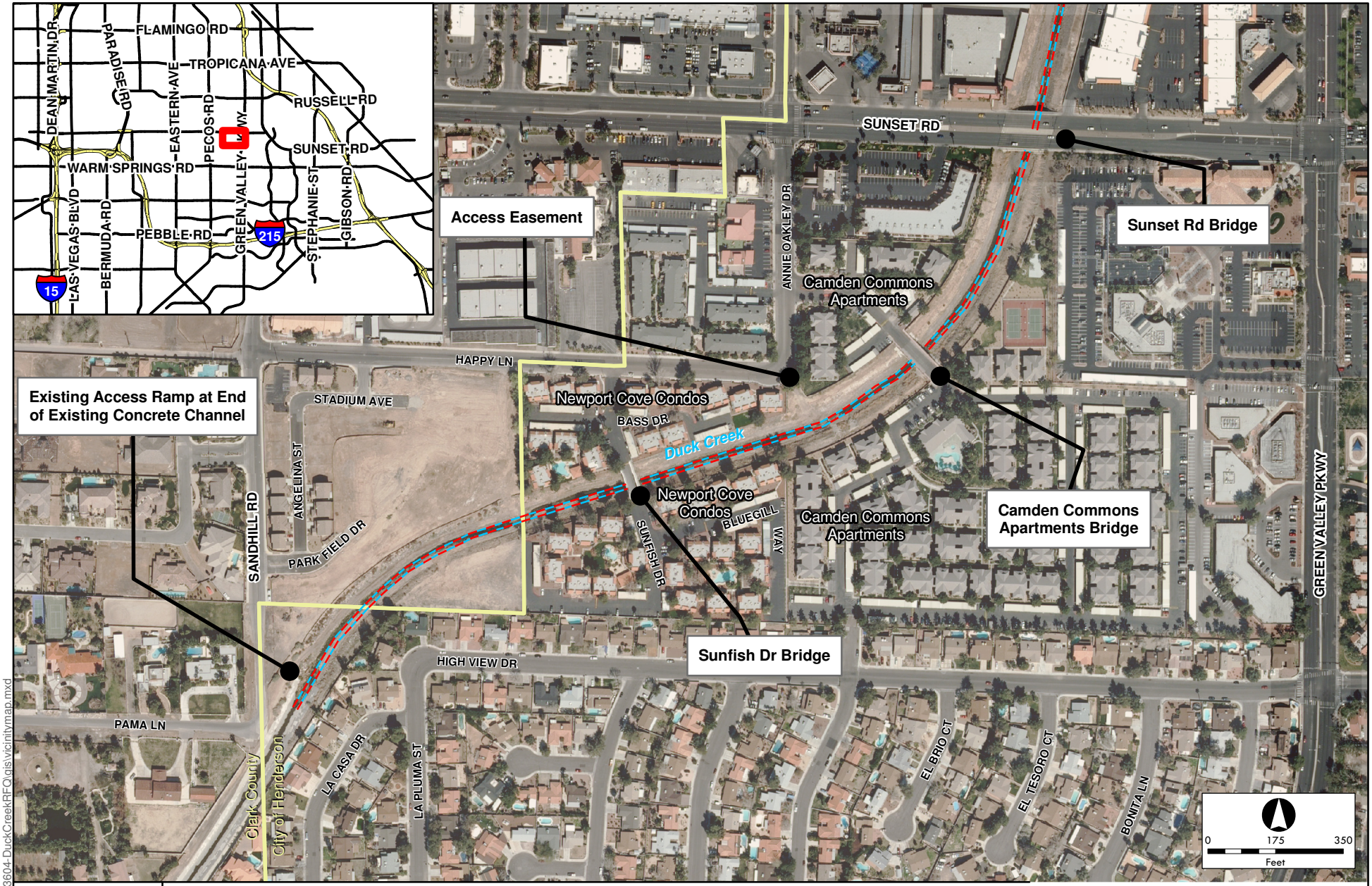
Sincerely,

Kimberley Jenkins

Kimberley Jenkins
Sr. Biologist II
Atkins, Sciences and Planning

Cc: Harshal Desai, Vance Skidmore

Enclosures:
1. Site Figure
2. Agency Correspondences
3. Endangered Species Program Report
3. Clark County Incidental Take Permit



Path: X:\Projects\p100023604-DuckCreekRFQ\gis\vicinitymap.mxd

ATKINS

Figure 1: Vicinity Map

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Nevada Fish and Wildlife Office
1340 Financial Blvd., Suite 234
Reno, Nevada 89502
Ph: (775) 861-6300 ~ Fax: (775) 861-6301

July 24, 2012
84320-2012-SL-0304

Ms. Melinda Jones
Atkins North America, Inc.
2270 Corporate Circle, Suite 100
Henderson, Nevada 89074-7755

Dear Ms. Jones:

Subject: Species List for the City of Henderson Duck Creek, Sunset Road to Sandhill Road Flood Control Project, Clark County, Nevada

This responds to your letter received on July 16, 2012, requesting information on threatened and endangered species and their designated critical habitat that may occur within or adjacent to the subject project area. The project consists of the design of a lined channel to replace the existing unlined channel from the concrete apron ending at Sandhill Road to the bridge at Sunset Road in order to safely convey storm water flow and to prevent additional erosion.

The area is within the historic range of the threatened Mojave desert tortoise (*Gopherus agassizii*). However, the project area and the surrounding areas are completely developed. Thus, this area no longer supports habitat for the desert tortoise. Furthermore, designated critical habitat for the desert tortoise does not occur near the area. To the best of our knowledge, no other listed, proposed, or candidate species or their designated critical habitat occur in the area. This response fulfills the requirement of the Fish and Wildlife Service (Service) to provide information on federally listed species pursuant to section 7(c) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*), for projects that are authorized, funded, or carried out by a Federal agency.

Based on the Service's management authority for migratory birds under the Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. 703 et. seq.), we are concerned about potential impacts the proposed project may have on migratory birds in the area. Under the MBTA, nests (nests with eggs or young) of migratory birds may not be harmed, nor may migratory birds be killed. Given these concerns, we recommend that any land clearing or other surface disturbance associated with proposed actions within the project area be conducted outside the avian breeding season (approximately March through August) to avoid potential destruction of bird nests or young, or birds that breed in the area. If this is not feasible, we recommend a qualified biologist survey the area prior to land clearing. If nests are located, or if other evidence of nesting (i.e., mated pairs, territorial defense, carrying nesting material, transporting food) is observed, a protective buffer (the size depending on the habitat requirements of the species) should be delineated and the entire area avoided to prevent destruction or disturbance to nests until they are no longer active.

In particular, we are concerned about the State-protected western burrowing owl (*Athene cunicularia hypugea*) and potential project impacts to this species from your project. The reduction of habitat in southern Nevada is a major threat to this species. Therefore, we recommend that the project avoid disturbing burrows that are used by burrowing owls. If this is not possible, we ask that the project incorporate recommendations in the enclosed pamphlet, "Protecting Burrowing Owls at Construction Sites in Nevada's Mojave Desert Region."

Most of the species for which we have concern are also on the Animal and Plant At-Risk Tracking List for Nevada maintained by the State of Nevada's Natural Heritage Program (Heritage). Instead of maintaining our own list, we adopted Heritage's At-Risk list and are partnering with them to provide distribution data and information on the conservation needs for sensitive species to agencies or project proponents. As you may know, the mission of Heritage is to continually evaluate the conservation priorities of native plants, animals, and their habitats; particularly those most vulnerable to extinction or are in serious decline. In addition, in order to avoid future conflicts, we ask that you consider these at-risk species early in your project planning and explore management alternatives that provide for their long-term conservation.

For a specific list of at-risk species that may occur in the project area, you can obtain a data request form from http://heritage.nv.gov/forms.htm or by contacting Administrator, Heritage at 901 South Stewart Street, Suite 5002, Carson City, NV 89701, 775-684-2900. Please indicate on the form that your request is being obtained as part of your coordination with the Service under the Act. During your project analysis, if you obtain new information or data for any Nevada sensitive species, we request that you provide the information to Heritage at the above address.

Furthermore, certain species of fish and wildlife are classified as protected by the State of Nevada (see http://www.leg.state.nv.us/NAC/NAC-503.html). You must first obtain the appropriate license, permit, or written authorization from the Nevada Department of Wildlife to take or possess any parts of protected wildlife species. Please visit http://www.ndow.org or contact Supervisory Biologist - Habitat, Nevada Department of Wildlife at 4747 Vegas Drive Las Vegas, NV 89108, 702-486-5127.

Please reference File No. 84320-2012-SL-0304 in future correspondence concerning this species list. If you have questions regarding this correspondence or require additional information, please contact Susan Cooper in the Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230.

Sincerely,



Michael J. Senn
Assistant Field Supervisor

BRIAN SANDOVAL
Governor

STATE OF NEVADA
DEPARTMENT OF WILDLIFE
1100 Valley Road
Reno, Nevada 89512
(775) 688-1500 • Fax (775) 688-1595

KENNETH E. MAYER
Director
RICHARD L. HASKINS, II
Deputy Director
PATRICK O. CATES
Deputy Director

SOUTHERN REGION OFFICE
4747 Vegas Drive
Las Vegas, Nevada 89108
(702) 486-5127 · Fax (702) 486-5133

July 16, 2012

NDOW-SR #: 13-009

Melinda G. Jones, P.G., Group Manager
Atkins North America, Inc.
2270 Corporate Circle, Suite 100
Henderson, NV 89074-7755

Re: Duck Creek, Sunset Road to Sandhill Road Flood Control Project
(Flood Control Project ID Miles DCWA 0648, 0656 & 0670)

Dear Ms. Jones:

Thank you for your letter of July 13th apprising the Nevada Department of Wildlife (Department) of the subject project. Relative to potential impacts this project may have to wildlife under jurisdiction of the State of Nevada, the Department does not foresee significant conditions that may influence where within the project area, as depicted in attached Figure 1, a particular alignment may be proposed or selected.

One consideration for the project's construction phase is for migratory birds protected under the Migratory Bird Treaty Act (MBTA). Relative to the project area, the burrowing owl and lesser nighthawk, both ground nesters, quickly come to mind as example potential. Ground disturbing activities should avoid the breeding and nesting season which roughly occurs between March 1 and July 31. If this seasonal avoidance is not practicable, then the Department recommends a qualified biologist survey the project site prior to any ground disturbing activities to determine if nesting is underway. In the event an active nest (containing eggs or young) is discovered or frequently attended by adult birds, a buffer area around the nest appropriate for the species involved must be identified and avoided until young birds have fledged. This measure would be consistent with preventive actions advocated by the U.S. Fish & Wildlife Service concerning MBTA-protected birds. An educational pamphlet addressing the burrowing owl can be found online at:
http://www.fws.gov/nevada/nv_species/documents/Protecting_Burrowing_Owls_at_Construction_Sites.pdf

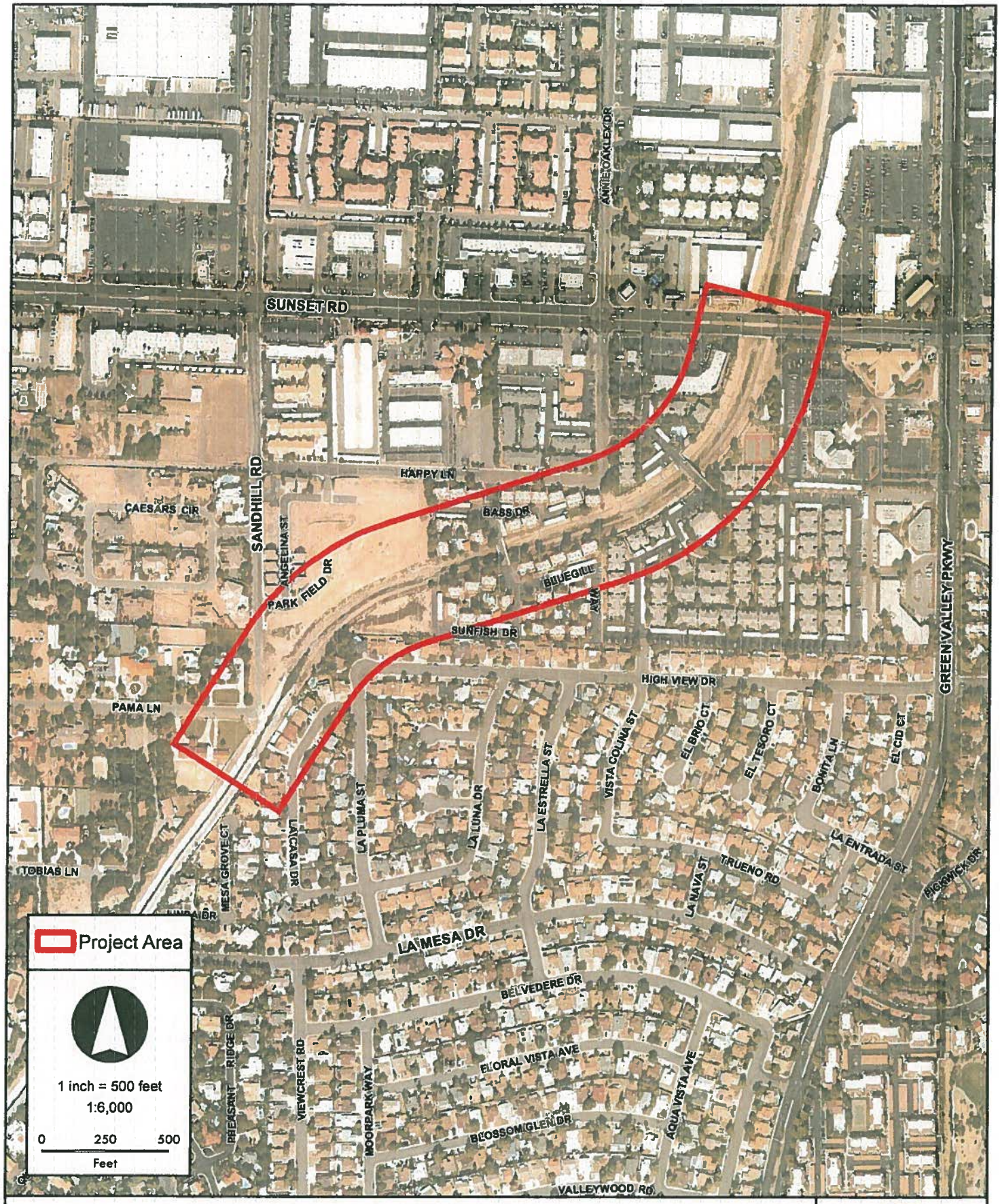
Should you need additional assistance, please do not hesitate contacting me.

Sincerely,

D. Bradford Hardenbrook
Supervisory Habitat Biologist
Southern Region, Nevada Department of Wildlife
4747 Vegas Drive, Las Vegas, Nevada 89108
702.486.5127 x3600; 702.486.5133 FAX
bhrdnbrk@ndow.org

REC'D ATKINS
JUL 18 2012
HENDERSON OFFICE

cc: NDOW, Files



Duck Creek, Sunset Road to Sandhill Road Flood Control Project

Figure 1. Duck Creek Flood Control Channel Study Corridor

Source: Clark County Imagery Fall 2011.

THE CITY OF HENDERSON
A Place To Call Home

LEO DROZDOFF
Director

Department of Conservation
and Natural Resources

JENNIFER E. NEWMARK
Administrator

BRIAN SANDOVAL
Governor

Nevada Natural Heritage Program
Richard H. Bryan Building
901 S. Stewart Street, suite 5002
Carson City, Nevada 89701-5245
U.S.A.

tel: (775) 684-2900
fax: (775) 684-2909

Nevada Natural Heritage Program

STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

Nevada Natural Heritage Program

http://heritage.nv.gov

16 July 2012

Kimberley Jenkins
Atkins
2270 Corporate Circle, Suite 100
Henderson, NV 89074-7755

RE: Data request received 16 July 2012

Dear Ms. Jenkins:

We are pleased to provide the information you requested on endangered, threatened, candidate, and/or At Risk plant and animal taxa recorded within or near the Duck Creek Flood Control Channel Project area. We searched our database and maps for the following, a two kilometer radius around the project area including:

Township 22S Range 62E Section 06
Township 21S Range 62E Section 31

The enclosed printout lists the taxa recorded within the given area. Please be aware that habitat may also be available for: the hoary bat, *Lasiurus cinereus*, a Nevada Bureau of Land Management Sensitive Species. The Nevada Department of Wildlife (NDOW) manages, protects, and restores Nevada's wildlife resources and associated habitat. Please contact Chet Van Dellen, NDOW GIS Coordinator (775.688.1565) to obtain further information regarding wildlife resources within and near your area of interest. Removal or destruction of state protected flora species (NAC 527.010) requires a special permit from Nevada Division of Forestry (NRS 527.270).

Please note that our data are dependent on the research and observations of many individuals and organizations, and in most cases are not the result of comprehensive or site-specific field surveys. Natural Heritage reports should never be regarded as final statements on the taxa or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments.

Thank you for checking with our program. Please contact us for additional information or further assistance.

Sincerely,

Eric S. Miskow
Biologist /Data Manager

Data Sensitive and At Risk Taxa Recorded Near the Duck Creek Flood Control Channel Project Area

Compiled by the Nevada Natural Heritage Program for Atkins

16 July 2012

Scientific name	Common name	Usfws	Blm	Usfs	State	Srank	Grank	UTM E	UTM N	Prec	Last observed
Plants											
Arctomecon californica	Las Vegas bearpoppy		S		CE	S3	G3	668739.00	3991898.00	M	1963-05-06
Eriogonum corymbosum var. *nilesii*	Las Vegas buckwheat	C	S		CE#	S1S2	G5T2	671858.52	3994106.66	S	1998-10-14
Reptiles											
Heloderma suspectum cinctum	banded Gila monster		N;C		YES	S2	G4T4	T22S R62E Sec. 06		S	1998-05-25
Mammals											
Euderma maculatum	spotted bat		N	S	YES	S2	G4	672318.33	3997645.38	G	1983-08-29
Tadarida brasiliensis	Mexican free-tailed bat		N		YES	S3S4B	G5	670881.23	4004614.87	G	1965-04-22

U. S. Fish and Wildlife Service (Usfws) Categories for Listing under the Endangered Species Act:

- C — Candidate

Bureau of Land Management (Blm) Species Classification:

- S — Nevada Special Status Species - USFWS listed, proposed or candidate for listing, or protected by Nevada state law
- N — Nevada Special Status Species - designated Sensitive by State Office
- C — California Special Status Species (see definition S and N)

United States Forest Service (Usfs) Species Classification:

- S — Region 4 (Humboldt-Toiyabe NF) sensitive species

Nevada State Protected (State) Species Classification:

Fauna:
- YES — Species protected under NRS 501.

Flora:
- CE — Critically endangered - species whose survival requires assistance because of overexploitation, disease or other factors, or because their habitat is threatened with destruction, drastic modification or severe curtailment (NRS 527.260-.300)
- CE# — Recommended for listing as critically endangered

Precision (Prec) of Mapped Occurrence:

Precision, or radius of uncertainty around latitude/longitude coordinates:

- S — Seconds: within a three-second radius
- M — Minutes: within a one-minute radius, approximately 2 km or 1.5 miles
- G — General: within about 8 km or 5 miles, or to map quadrangle or place name

Nevada Natural Heritage Program Global (**Grank**) and State (**Srank**) Ranks for Threats and/or Vulnerability:

- G — Global rank indicator, based on worldwide distribution at the species level
- T — Global trinomial rank indicator, based on worldwide distribution at the infraspecific level
- S — State rank indicator, based on distribution within Nevada at the lowest taxonomic level
  - 1 — Critically imperiled and especially vulnerable to extinction or extirpation due to extreme rarity, imminent threats, or other factors
  - 2 — Imperiled due to rarity or other demonstrable factors
  - 3 — Vulnerable to decline because rare and local throughout its range, or with very restricted range
  - 4 — Long-term concern, though now apparently secure; usually rare in parts of its range, especially at its periphery
  - 5 — Demonstrably secure, widespread, and abundant
    - A — Accidental within Nevada
    - B — Breeding status within Nevada (excludes resident taxa)
    - H — Historical; could be rediscovered
    - N — Non-breeding status within Nevada (excludes resident taxa)
    - Q — Taxonomic status uncertain

Group	Name	Population	Status	Lead Office	Recovery Plan Name	Recovery Plan Stage
Amphibians	Relict leopard Frog (Lithobates		Candidate	Nevada Fish And Wildlife Office		
Birds	Yuma clapper rail (Rallus	U.S.A. only	Endangered	Arizona Ecological Services	Draft Revised Recovery Plan for	Draft Revision 1
Birds	Yellow-billed Cuckoo (Coccyzus	Western U.S. DPS	Candidate	Sacramento Fish And Wildlife		
Birds	Southwestern willow flycatcher	Entire	Endangered	Arizona Ecological Services	Final Recovery Plan for the	Final
Fishes	Moapa dace (Moapa coriacea)	Entire	Endangered	Nevada Fish And Wildlife Office	Recovery Plan for the Rare	Final Revision 1
Fishes	Pahrump poolfish	Entire	Endangered	Nevada Fish And Wildlife Office	Pahrump Killifish Recovery Plan	Final
Fishes	Lahontan cutthroat trout	Entire	Threatened	Nevada Fish And Wildlife Office	Lahontan Cutthroat Trout	Final
Fishes	Woundfin (Plagopterus	except Gila R. drainage, AZ, NM	Endangered	Utah Ecological Services Field	Virgin River Fishes Recovery	Final Revision 2
Fishes	Bonytail chub (Gila elegans)	Entire	Endangered	Upper Colorado River	Bonytail Chub Revised	Final Revision 2
Fishes	Virgin River Chub (Gila	Entire	Endangered	Utah Ecological Services Field	Virgin River Fishes Recovery	Final Revision 2
Fishes	Razorback sucker (Xyrauchen	Entire	Endangered	Upper Colorado River	Razorback Sucker - Recovery	Final Revision 1
Flowering Plants	Las Vegas buckwheat		Candidate	Nevada Fish And Wildlife Office		
Reptiles	Desert tortoise (Gopherus	U.S.A., except in Sonoran	Threatened	Nevada Fish And Wildlife Office	Revised Recovery Plan for the	Final Revision 1

United States Department of the Interior

FISH AND WILDLIFE SERVICE

California/Nevada Operations Office
2800 Cottage Way, Suite W-2606
Sacramento, California 95825-1846

CLARK COUNTY
COMPREHENSIVE
PLANNING

2001 MAR 30 A 10:05

RECEIVED
MAR 28 2001

IN REPLY REFER TO:

Dr. Cynthia Truelove
Multiple Species Habitat Conservation Plan Administrator
Clark County Department of Comprehensive Planning
500 Grand Central Parkway, Third Floor
Las Vegas, Nevada 89155

Dear Dr. Truelove:

Subject: Clark County Desert Conservation Plan Permit PRT 801045

On November 22, 2000, you were issued Permit TE 034927-0 for the Clark County Multiple Species Habitat Conservation Plan (MSHCP), under Section 10(a)1(B) of the Endangered Species Act of 1973, as amended. While this permit became valid upon execution of the Implementing Agreement for the MSHCP, effective with the final signature on January 9, 2001, you have requested, that for accounting purposes, that we modify the effective date of the MSHCP permit to February 1, 2001. We concur with this modification. Please note that this effective date supercedes the effective date of January 9, 2001, as discussed in correspondence from our Regional Office in Portland, dated February 8, 2001.

In accordance with the Implementing Agreement for the Clark County MSHCP, this permit supercedes Permit PRT 801045 for the Clark County Desert Conservation Plan, issued to Clark County on August 1, 1995. I therefore request that you relinquish PRT 801045, as this permit is no longer valid. Pursuant to 50 CFR § 13.26, you should return the permit within 30 days of the discontinuance, to the issuing office, together with a written statement surrendering the permit for cancellation. Please return the permit to the following address:

Assistant Regional Director, Ecological Services
U.S. Fish and Wildlife Service
911 NE 11th Avenue
Portland, Oregon 97232-4181
(Attn: Laura Hill)

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

3-201
(1/97)

FEDERAL FISH AND WILDLIFE PERMIT

1. PERMITTEE

CLARK COUNTY MSHCP PERMITTEES
(SEE BOX C.1. BELOW)

2. AUTHORITY-STATUTES
16 USC 1539(A)
16 USC 703-712

REGULATIONS *(Attached)*
50 CFR 17.22
50 CFR 17.32
50 CFR 13
50 CFR 21.27

3. NUMBER
TE034927-0

4. RENEWABLE
[X] YES
[ ] NO

5. MAY COPY
[X] YES
[ ] NO

6. EFFECTIVE
1/9/01

7. EXPIRES
1/8/31

8. NAME AND TITLE OF PRINCIPAL OFFICER *(If #1 is a business)*
CYNTHIA J TRUELOVE
PLAN ADMINISTRATOR

9. TYPE OF PERMIT
THREATENED AND ENDANGERED SPECIES

10. LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED
Non-Federal lands in Clark County, Nevada, for cities and Clark County; Nevada Department of Transportation activities in Clark, Nye, Lincoln, Mineral and Esmeralda counties, Nevada, south of the 38th parallel and below 5000 feet elevation.

11. CONDITIONS AND AUTHORIZATIONS:

A. GENERAL CONDITIONS SET OUT IN SUBPART D OF 50 CFR 13, AND SPECIFIC CONDITIONS CONTAINED IN FEDERAL REGULATIONS CITED IN BLOCK #2 ABOVE, ARE HEREBY MADE A PART OF THIS PERMIT. ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED OUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED. CONTINUED VALIDITY, OR RENEWAL, OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE FILING OF ALL REQUIRED INFORMATION AND REPORTS.

B. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT OBSERVANCE OF ALL APPLICABLE FOREIGN, STATE, LOCAL OR OTHER FEDERAL LAW.

C. VALID FOR USE BY PERMITTEE NAMED ABOVE.

C.1.

a. Clark County
500 S. Grand Central Parkway
Las Vegas, NV 89155
(702) 455-4181

b. City of Las Vegas
400 East Stewart
Las Vegas, NV 89101
(702) 229-6501

c. City of North Las Vegas
2200 Civic Center Drive
North Las Vegas, NV 89030
(702) 649-5811

d. City of Henderson
240 Water Street
Henderson, NV 89015
(702) 565-2488

e. City of Boulder City
900 Arizona Street
Boulder City, NV 89024
(702) 293-9282

f. City of Mesquite
11 E. Mesquite Blvd & Yucca
Mesquite, NV 89024
(702) 346-5295

g. Nevada Department of Transportation
1263 South Stewart Street
Carson City, NV 89712
(702) 689-5440

D. FURTHER CONDITIONS OF AUTHORIZATION ARE CONTAINED IN THE ATTACHED SPECIAL TERMS AND CONDITIONS.

[X] ADDITIONAL CONDITIONS AND AUTHORIZATIONS ALSO APPLY

12. REPORTING REQUIREMENTS

ISSUED BY	TITLE	DATE
Michael J. Spear	MANAGER, CALIF/NEVADA OPERATIONS OFFICE	11/22/00

U.S. FISH AND WILDLIFE SERVICE, SACRAMENTO, CALIFORNIA
SPECIAL TERMS AND CONDITIONS FOR TE034927-0

D. All sections of Title 50 Code of Federal Regulations, parts 13, 17.22, and 17.32 are conditions of this permit (Attachments 1).

E. This permit is not effective until all of the parties have signed the Implementing Agreement.

F. The authorization granted by this permit is subject to compliance with, and implementation of the Clark County Multiple Species Habitat Conservation Plan (MSHCP), and executed Implementing Agreement, both of which are hereby incorporated into the permit.

G. The Permittees (Clark County, the cities of Las Vegas, North Las Vegas, Henderson, Boulder city, and Mesquite, and the Nevada Department of Transportation), and agents designated by the Permittees are authorized to take 78 species on the attached list of "Covered Species Subject to Incidental Take" to the extent that take of these species would otherwise be prohibited under section 9 of the Endangered Species Act of 1973, as amended (Act), and its implementing regulations, or pursuant to a rule promulgated under section 4(d) of the Act. For each Covered Species Subject to Incidental Take which is not listed as threatened or endangered under the Act, the section 10(a) permit will become effective with respect to such species concurrent with the listing of the species to the extent that their take is prohibited by the Act. Take must be incidental to otherwise lawful activities as described in the MSHCP, and as conditioned herein. The amount and nature of the take (e.g., harassment, or harm due to habitat loss) is described in the MSHCP for each species and clarified in permit conditions J and K for certain species.

H. The Permittees shall carry out the minimization, mitigation, and monitoring measures specified in section 2.8 of the MSHCP, and as otherwise stated under the IA. Unless specifically modified by the MSHCP, the minimization, mitigation, and monitoring stated in sections 3C and 3D of the Clark County Desert Conservation Plan (DCP) (Permit PRT 801045) are incorporated by reference and shall remain in effect as written unless later modified through the MSHCP, its adaptive management program, or the Implementation Plan and Budget process.

I. The Permittees shall ensure that a science-based Adaptive Management Process (AMP) is developed and implemented as specified in the MSHCP and IA. A Memorandum of Agreement will be developed within 9 months of the issuance of the permit among the signatories to the IA conducting conservation actions funded under the MSHCP, and Clark County, to ensure that any management or conservation action that may potentially affect the Covered Species are reviewed by AMP for their effectiveness in the conservation of the species and their habitats.

J. The Permittees, in cooperation with the AMP contractor and the Service, shall participate with the land management agencies in development and/or revision of conservation management plans that identify the management and monitoring actions needed for the following areas or Covered Species:

1. Low Elevation Uplands: a) Piute Eldorado Desert Wildlife Management Area (DWMA), b) Coyote Springs Valley DWMA, c) Mormon Mesa DWMA, d) Gold Butte DWMA, and e) catclaw habitats;

2. Desert Riparian Habitats: a) Muddy River riparian habitat, b) Virgin River riparian habitat, and c) Meadow Valley Wash riparian habitat;

3. Low Elevation Springs: a) amphibian and aquatic snail species and b) bats;

4. Low Elevation Plant Species.

The prioritization and schedule for completion of the management plans will be developed within 6 months of permit issuance.

K. The following conditions apply to covered avian species listed in section 2.1.6 of the MSHCP:

1. Take, with the exception of Peregrine falcon (*Falco peregrinus anatum*) and phainopela (*Phainopepla nitens*), under this permit is conditioned upon the acquisition of private lands in desert riparian habitats along the Muddy and Virgin rivers, and Meadow Valley Wash. The total number and location of acres to be acquired within each watershed will be identified in the conservation management plan (I.2 above) through the AMP and agreed to by the Permittees, the land management agencies, and the Service.

2. No lethal take is authorized. Take of active nests is not permitted at any time.

3. This section 10(a) permit also constitutes a Special Purpose Permit under 50 CFR 21.27 for the take of those Covered Species Subject to Incidental Take which are listed as threatened or endangered under the Act, and which are also protected under the MBTA. Such Special Purpose Permit shall be valid for a period of 3 years from the effective date, provided the section 10(a) permit remains in effect for such period. Such Special Purpose Permit shall be renewed, provided that the Permittees and MSHCP Participants continue to fulfill their obligations under the MSHCP and IA. Each such renewal shall be valid for the maximum period of time allowed by 50 CFR 21.27 or its successor at the time of renewal.

L. Special restrictions apply to wetland species:

Incidental take of Covered Species due to mortality or habitat loss within U.S. Army Corps of Engineer's (Corps) jurisdictional wetlands is not authorized by this incidental take permit. Incidental take authorization for projects that affect such jurisdictional wetlands shall be authorized through future Section 7 consultations between the Service and the Corps under the Act, pursuant to section 404 of the Clean Water Act. Incidental take of wetland associated or dependent species outside of jurisdictional wetlands will be in accordance with the MSHCP and the IA.

M. Tortoise Translocation Program and other Handling Programs. The Permittees shall continue the desert tortoise translocation developed and implemented under the DCP, and described in section 2.8.3.8 of the MSHCP, for so long as desert tortoise translocation is in effect. On an annual basis, the Permittees must request, in writing, authorization for handling and moving tortoises under this program. Individuals who handle desert tortoises in association with the translocation program or other programs permitted under the MSHCP (as described in section 2.8 of the MSHCP) must be authorized in writing by the Service or be under the direct on-site supervision of authorized personnel. The Permittees will be responsible for quarterly inspection of the fence around the translocation site. In addition, during the tortoise active season (March 1 to October 31), fence inspection will be conducted within 72 hours of a major precipitation event (any rain event that would cause water to flow across the landscape causing soil erosion) and within 10 days during the desert tortoise inactive season (November 1 to February 28). All breaches shall be corrected within 72 hours during the active season and within 10 days during the inactive season.

N. Highway and Road Fencing. The Permittees will continue to retrofit, repair, and construct desert tortoise proof fencing along highways and roads within Clark County in accordance with section 2.8.3.7 of the MSHCP. Each biennial budget shall include the location, number of miles, and dollars allocated to fencing during the next biennium. The Permittees shall be responsible for quarterly inspection and repairs of the highway and road fences in accordance with the provisions identified in item L above when breaches are found.

O. Coyote Springs Valley. Pursuant to this permit only those conditions carried forward from the DCP for the take of desert tortoise will apply to the properties identified in the DCP and MSHCP as Aerojet, which is located in the Coyote Springs Valley.

P. Boulder City Conservation Easement. The Permittees shall ensure that any future development or use of the 85,000-acre conservation easement be consistent with the goals outlined in the DCP which are to protect and manage the desert tortoise and its habitat. Furthermore, the Permittees shall take measures necessary to ensure maintenance in

perpetuity, of connectivity for desert tortoise and other Covered Species, within the Boulder City Conservation Easement, including an adequate North-South corridor for the desert tortoise, as determined through the AMP.

Q. Monitoring and enforcement:

The Permittees must ensure that Service personnel are given appropriate access (as defined under 50 CFR 13.21(e)(2)) to monitor the Covered Species Subject to Incidental Take within the MSHCP planning area in perpetuity.

1. The Permittees must ensure that the Service's Southern Nevada Field Office (1510 North Decatur Boulevard, Las Vegas, Nevada, 89108, telephone 702-647-5230) or the Nevada Fish and Wildlife Office (1340 Financial Boulevard, Suite 234, Reno, Nevada 89502, telephone 775-861-6300) is contacted immediately regarding any violations of the MSHCP or this permit.

2. Upon finding dead, injured, or sick Covered Species associated with activities authorized under the Incidental Take Permit, the Permittees or designated agents must notify the Fish and Wildlife Service's Division of Law Enforcement at (702) 388-6380 within 5 working days.

R. All reporting for this permit shall be in compliance with sections 2.12.1 and 2.12.2 of the MSHCP. In addition, copies of all reports shall be submitted to the Field Supervisor, Nevada Fish and Wildlife Office, 1340 Financial Boulevard, Suite 234, Reno, Nevada 89502, and to the Assistant Regional Director, Ecological Services, U.S. Fish and Wildlife Service, 911 Northeast 11th Avenue, Portland, Oregon 97232.

S. A copy of this permit must be on file with each of the Permittees. Please refer to the permit number in all correspondence and reports concerning permit activities. Any questions you may have about this permit should be directed to the Field Supervisor, Nevada Fish and Wildlife Office, at 775-861-6300.

Fish and Wildlife Service Permit TE034927-0
Covered Species Subject to Incidental Take

Reptiles and Amphibians

1. Desert tortoise, *Gopherus agassizii*
2. Glossy snake, *Arizona elegans*
3. Banded gecko, *Coleonyx variegatus*
4. Sidewinder, *Crotalus cerastes*
5. Speckled rattlesnake, *Crotalus mitchelli*
6. Mojave green rattlesnake, *Crotalus scutulatus scutulatus*
7. Great Basin collared lizard, *Crotaphytus insularis bicintores*
8. Desert iguana, *Dipsosaurus dorsalis*
9. Western red-tailed skink, *Eumeces gilberti rubricaudatus*
10. Large-spotted leopard lizard, *Gambelia wislizenii wislizenii*
11. California (common) king snake, *Lampropeltis getula californiae*
12. Western leaf-nosed snake, *Phyllorhynchus decurtatus*
13. Western long-nosed snake, *Rhinocheilus lecontei lecontei*
14. Sonoran lyre snake, *Trimorphodon biscutatus lambda*
15. Relict leopard frog, *Rana onca*

Birds

16. Southwestern willow flycatcher, *Empidonax traillii extimus*
17. American peregrine falcon, *Falco peregrinus anatum*
18. Yellow-billed cuckoo, *Coccyzus americanus*
19. Blue grosbeak, *Guiraca caerulea*
20. Phainopepla, *Phainopepla nitens*
21. Summer tanager, *Piranga rubra*
22. Vermillion flycatcher, *Pyrocephalus rubinus*
23. Arizona Bell's vireo, *Vireo bellii arizoniae*

Mammals

24. Silver-haired bat, *Lasionycteris noctivagans*
25. Long-eared myotis, *Myotis evotis*
26. Long-legged myotis, *Myotis volans*
27. Palmer's chipmunk, *Tamias palmeri*

PERMIT CONDITIONS FOR TE034927-0, cont'd.

Insects

28. Spring Mountains acastus checkerspot, *Chlosyne acastus robusta*
29. Dark blue butterfly, *Euphilotes enoptes purpurea*
30. Morland's checkerspot buttefly, *Euphydryas anicia morandi*
31. Spring Mountains comma skipper, *Hesperia comma mojavensis*
32. Spring Mountains icarioides blue, *Icaricia icarioides austinorum*
33. Mt. Charleston blue butterfly, *Icaricia shasta charlestonensis*
34. Nevada admiral, *Limenitus weidemeyerii nevadae*
35. Carole's silverspot butterfly, *Speyeria zerene carolae*

Crustaceans

36. Spring Mountains springsnail, *Pyrgulopsis deaconi*
37. Southeast Nevada springsnail, *Pyrgulopsis turbatrix*

Plants

38. Blue Diamond cholla, *Opuntia whipplei* var. *multigeniculata*
39. Rough angelica, *Angelica scabrida*
40. Sticky ringstem, *Anulocaulis leisolenus*
41. Charleston pussytoes, *Antennaria soliceps*
42. Las Vegas bearpoppy, *Arctomecon californica*
43. White bearpoppy, *Arctomecon merriamii*
44. Rosy King sandwort, *Arenaria kingii* ssp. *rosea*
45. Clokey milkvetch, *Astragalus aequalis*
46. Threecorner milkvetch, *Astragalus geyeri* var. *triquetrus*
47. Clokey eggvetch, *Astragalus oophorus* var. *clokeyanus*
48. Spring Mountain milkvetch, *Astragalus remotus*
49. Alkali mariposa lily, *Calochortus striatus*
50. Clokey paintbrush, *Castelleja martinii* var. *clokeyi*
51. Clokey thistle, *Cirsium clokeyi*
52. Jaeger whitlowgrass, *Draba jaegeri*
53. Charleston draba, *Draba paucifructa*
54. Inch high flebane, *Erigeron uncialis* ssp. *conjugans*
55. Forked buckwheat, *Eriogonum bifurcatum*
56. Sticky buckwheat, *Eriogonum viscidulum*
57. Clokey greasebush, *Glossopetalon clokeyi*
58. Smooth pungent greasebush, *Glossopetalon pungens* var. *glabra*
59. Pungent dwarf greasebush, *Glossopetalon pungens* var. *pungens*
60. Red Rock Canyon aster, *Ionactis caelestis*
61. Hidden ivesia, *Ivesia cryptocaulis*

62. Jaegar ivesia, *Ivesia jaegeri*
63. Hitchcock bladderpod, *Lesquerella hitchcockii*
64. Charleston pinewood lousewort, *Pedicularis semibarbata* var. *charlestonensis*
65. White-margined beardtongue, *Penstemon albomarginatus*
66. Charleston beardtongue, *Penstemon leiophyllus* var. *keckii*
67. Jaegar beartongue, *Penstemon thompsoneae* var. *jaegeri*
68. Parish's phacclia, *Phacelia parishii*
69. Clokey mountain sage, *Salvia dorrii* var. *clokeyi*
70. Clokey catchfly, *Silene clokeyi*
71. Charleston tansy, *Sphaeromeria compacta*
72. Charleston kittentails, *Synthyris ranunculina*
73. Charleston grounddaisy, *Townsendia jonesii* var. *tumulosa*
74. Limestone violet, *Viola purpurea* var. *charlestonensis*
75. *Anacolia menziesii*
76. *Claopodium whippleanum*
77. *Dicranoweisia crispula*
78. *Syntrichia princeps*

Appendix B

Hydraulic Analysis

- Appendix B-1: Pre-Project Hydraulic Model
- Appendix B-2: Post-Project Hydraulic Model

Appendix B-1

Pre-Project Hydraulic Model

HEC-RAS Plan: Existing River: duckcreek Reach: 1 Profile: CLOMR

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)	
1	5101.524	CLOMR	5825.00	1954.37	1959.76	1962.39	1968.03	0.010006	23.08	252.39	68.95	2.13
1	4711.268	CLOMR	5825.00	1950.37	1955.85	1958.44	1964.16	0.009851	23.13	251.84	67.47	2.11
1	4292.498	CLOMR	5825.00	1943.12	1949.12	1952.76	1959.83	0.009713	26.26	221.81	46.75	2.12
1	4032.961	CLOMR	5825.00	1940.26	1945.95	1949.34	1957.13	0.010749	26.83	217.12	48.75	2.24
1	4031.934	CLOMR	5825.00	1935.41	1944.62	1948.34	1956.99	0.014210	28.23	206.35	44.29	2.30
1	3984.411	CLOMR	5825.00	1935.29	1940.58	1944.65	1955.96	0.016379	31.48	185.03	44.82	2.73
1	3909.086	CLOMR	5825.00	1935.23	1940.71	1944.53	1954.28	0.013765	29.57	197.00	45.85	2.51
1	3882.624	CLOMR	5825.00	1935.21	1940.78	1944.53	1953.73	0.013005	28.88	201.68	46.74	2.45
1	3881.649	CLOMR	5825.00	1932.42	1939.92	1943.81	1953.64	0.015227	29.73	195.94	44.09	2.49
1	3833.638	CLOMR	5825.00	1932.26	1937.33	1941.45	1952.72	0.016363	31.48	185.01	44.09	2.71
1	3756.644	CLOMR	5825.00	1932.02	1937.23	1941.09	1951.06	0.014440	29.84	195.19	46.35	2.56
1	3755.687	CLOMR	5825.00	1928.06	1936.14	1940.22	1950.94	0.017683	30.88	188.65	42.87	2.59
1	3705.997	CLOMR	5825.00	1927.52	1932.39	1936.73	1949.76	0.019508	33.45	174.13	43.31	2.94
1	3681.618	CLOMR	5825.00	1927.25	1932.11	1936.37	1949.20	0.019813	33.17	175.61	44.89	2.96
1	3678.752	CLOMR	5825.00	1927.24	1932.12	1936.33	1949.02	0.138900	32.99	176.59	45.63	2.95
1	3495.033	CLOMR	5998.00	1927.42	1938.54	1936.57	1940.08	0.005622	9.98	600.96	84.47	0.66
1	3299.836	CLOMR	5998.00	1925.59	1937.26	1935.55	1938.91	0.006274	10.31	581.67	84.43	0.69
1	3104.647	CLOMR	5998.00	1924.75	1936.55	1933.77	1937.81	0.004130	9.00	666.10	86.42	0.57
1	2995.976	CLOMR	5998.00	1924.02	1936.19	1933.06	1937.36	0.003753	8.65	695.43	105.52	0.54
1	2986.009	CLOMR	5998.00	1926.04	1935.98	1933.60	1937.31	0.002651	9.25	653.29	104.86	0.61
1	2959.885	CLOMR	5998.00	1925.70	1936.04	1933.00	1937.20	0.002045	8.61	696.32	94.51	0.54
1	2949.322	CLOMR	5998.00	1923.69	1936.12	1932.52	1937.12	0.003245	8.05	747.14	102.15	0.51
1	2912.798	CLOMR	5998.00	1923.46	1936.11	1932.13	1936.98	0.002599	7.45	804.83	98.19	0.46
1	2684.211	CLOMR	5998.00	1922.30	1935.65	1931.12	1936.41	0.002142	6.95	862.59	101.33	0.42
1	2675		Bridge									
1	2637.879	CLOMR	5998.00	1921.42	1933.89	1930.60	1935.05	0.003786	8.67	691.75	88.88	0.55
1	2394.784	CLOMR	5998.00	1920.24	1933.12	1929.46	1934.14	0.003169	8.10	740.79	91.38	0.50
1	2236.697	CLOMR	5998.00	1918.66	1932.71	1928.71	1933.64	0.002789	7.74	774.50	91.97	0.47
1	2172.732	CLOMR	5998.00	1918.53	1932.56	1928.90	1933.46	0.002770	7.62	789.47	112.91	0.47
1	2160.623	CLOMR	5998.00	1921.63	1932.26	1929.78	1933.40	0.002257	8.57	701.59	108.04	0.56
1	2137.071	CLOMR	5998.00	1921.48	1932.27	1929.37	1933.32	0.002050	8.23	728.74	100.37	0.54
1	2126.681	CLOMR	5998.00	1918.80	1932.39	1928.40	1933.24	0.002685	7.37	813.83	104.39	0.47
1	1988.986	CLOMR	5998.00	1918.12	1932.14	1927.19	1932.89	0.002041	6.92	869.19	106.68	0.41
1	1867.342	CLOMR	5998.00	1916.83	1931.91	1926.67	1932.63	0.002113	6.78	884.57	106.34	0.41
1	1850		Bridge									
1	1810.339	CLOMR	5998.00	1916.68	1929.30	1926.39	1930.58	0.004210	9.08	660.43	85.92	0.58
1	1597.841	CLOMR	5998.00	1915.90	1928.70	1924.72	1929.70	0.002909	7.99	750.57	88.27	0.48
1	1392.762	CLOMR	5998.00	1915.55	1928.10	1924.33	1929.09	0.002971	7.98	751.65	90.59	0.49

HEC-RAS Plan: Existing River: duckcreek Reach: 1 Profile: CLOMR (Continued)

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)	
1	1291.178	CLOMR	5998.00	1915.51	1927.97	1923.58	1928.77	0.002301	7.20	833.05	97.69	0.43
1	1264.499	CLOMR	5998.00	1916.38	1927.93	1923.55	1928.72	0.001290	7.13	840.94	99.70	0.43
1	1242.749	CLOMR	5998.00	1914.68	1927.94	1923.16	1928.67	0.002067	6.87	873.14	101.08	0.41
1	1222.326	CLOMR	5998.00	1914.47	1927.93	1923.06	1928.61	0.001988	6.63	904.09	108.20	0.40
1	1200		Bridge									
1	1117.286	CLOMR	6074.00	1912.98	1927.04	1922.44	1927.79	0.002198	6.98	870.74	103.08	0.42
1	974.0564	CLOMR	6074.00	1913.08	1925.25	1923.50	1926.99	0.006541	10.58	573.93	80.97	0.70
1	841.691	CLOMR	6074.00	1912.47	1923.56	1922.75	1925.89	0.009640	12.25	495.92	75.61	0.84
1	727.3744	CLOMR	6074.00	1912.30	1923.43	1921.48	1924.79	0.005362	9.35	649.83	97.06	0.64
1	586.6463	CLOMR	6074.00	1912.08	1922.67	1920.73	1924.04	0.005331	9.38	647.76	96.57	0.64
1	468.45	CLOMR	6074.00	1911.08	1922.50	1919.80	1923.40	0.003435	7.63	796.50	117.25	0.52
1	301.8796	CLOMR	6074.00	1910.63	1921.93	1919.64	1922.76	0.004033	7.31	833.10	170.26	0.54
1	131.5738	CLOMR	6074.00	1910.03	1918.98	1918.98	1921.50	0.011833	12.80	483.66	125.41	0.93
1	0.35639	CLOMR	6074.00	1906.37	1910.39	1912.68	1917.94	0.065322	22.04	275.59	75.13	2.03

Duck Creek CLOMR Plan: Existing 10/15/2013

duckcreek 1

Legend

EG CLOMR

Crit CLOMR

WS CLOMR

Ground

Elevation (ft)

1970
1960
1950
1940
1930
1920
1910
1900

0
1000
2000
3000
4000
5000
6000

Main Channel Distance (ft)

Appendix B-2

Post-Project Hydraulic Model

HEC-RAS Plan: proposed River: Duck Creek Reach: 1 Profile: CLOMR

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)	
1	419.619	CLOMR	5825.00	1954.37	1959.76	1962.39	1968.03	0.010006	23.08	252.39	68.95	2.13
1	29.933	CLOMR	5825.00	1950.37	1955.85	1958.44	1964.16	0.009851	23.13	251.84	67.47	2.11
1	-387.751	CLOMR	5825.00	1943.12	1949.12	1952.76	1959.83	0.009713	26.26	221.81	46.75	2.12
1	-647.693	CLOMR	5825.00	1940.26	1945.95	1949.33	1957.13	0.010750	26.83	217.11	48.76	2.24
1	-648.721	CLOMR	5825.00	1935.41	1944.60	1948.35	1957.10	0.014427	28.38	205.28	44.21	2.32
1	-696.264	CLOMR	5825.00	1935.29	1940.52	1944.65	1956.33	0.017019	31.90	182.58	44.63	2.78
1	-771.57	CLOMR	5825.00	1935.23	1940.57	1944.54	1955.07	0.015148	30.56	190.61	45.43	2.63
1	-798.015	CLOMR	5825.00	1935.21	1940.61	1944.52	1954.66	0.014633	30.08	193.63	46.19	2.59
1	-798.989	CLOMR	5825.00	1932.42	1939.74	1943.80	1954.64	0.017150	30.97	188.07	43.51	2.63
1	-846.984	CLOMR	5825.00	1932.26	1937.17	1941.44	1953.77	0.018261	32.70	178.16	43.62	2.85
1	-923.965	CLOMR	5825.00	1932.02	1937.01	1941.09	1952.38	0.016827	31.46	185.16	45.64	2.75
1	-924.923	CLOMR	5825.00	1928.06	1935.91	1940.22	1952.36	0.020601	32.54	179.01	42.13	2.78
1	-998.46	CLOMR	5998.00	1927.44	1932.24	1936.82	1951.28	0.021698	35.01	171.30	43.12	3.10
1	-1048.46	CLOMR	5998.00	1927.19	1931.44	1935.68	1950.11	0.024948	34.67	172.99	50.60	3.30
1	-1050.64	CLOMR	5998.00	1927.17	1931.42	1935.66	1950.05	0.024876	34.64	173.16	50.61	3.30
1	-1095.72	CLOMR	5998.00	1926.95	1931.30	1935.38	1948.95	0.022976	33.72	177.90	50.98	3.18
1	-1106.9*	CLOMR	5998.00	1926.90	1931.18	1935.14	1948.68	0.024450	33.57	178.69	62.55	3.26
1	-1118.2*	CLOMR	5998.00	1926.84	1930.91	1934.82	1948.39	0.025845	33.55	178.79	61.69	3.34
1	-1129.5*	CLOMR	5998.00	1926.78	1930.58	1934.40	1948.10	0.027721	33.59	178.56	60.55	3.43
1	-1140.80	CLOMR	5998.00	1926.73	1930.32	1934.12	1947.78	0.027485	33.54	178.86	59.76	3.42
1	-1151.6*	CLOMR	5998.00	1926.68	1930.40	1934.25	1947.49	0.025848	33.18	180.77	58.52	3.33
1	-1162.5*	CLOMR	5998.00	1926.62	1930.48	1934.35	1947.22	0.024295	32.83	182.72	57.28	3.24
1	-1173.4*	CLOMR	5998.00	1926.56	1930.57	1934.44	1946.96	0.022869	32.49	184.63	56.08	3.16
1	-1184.31	CLOMR	5998.00	1926.51	1930.68	1934.55	1946.72	0.021508	32.14	186.64	54.92	3.07
1	-1195.3*	CLOMR	5998.00	1926.46	1930.73	1934.59	1946.48	0.020548	31.84	188.36	54.23	3.01
1	-1206.3*	CLOMR	5998.00	1926.40	1930.80	1934.66	1946.26	0.019616	31.55	190.12	53.52	2.95
1	-1217.4*	CLOMR	5998.00	1926.35	1930.87	1934.73	1946.04	0.018731	31.25	191.92	52.85	2.89
1	-1228.44	CLOMR	5998.00	1926.29	1930.94	1934.78	1945.84	0.017916	30.97	193.65	52.20	2.83
1	-1278.3*	CLOMR	5998.00	1926.04	1930.79	1934.53	1944.95	0.016653	30.21	198.56	52.58	2.74
1	-1328.2*	CLOMR	5998.00	1925.79	1930.63	1934.28	1944.14	0.015533	29.50	203.35	52.94	2.65
1	-1378.1*	CLOMR	5998.00	1925.54	1930.46	1934.03	1943.37	0.014529	28.83	208.06	53.30	2.57
1	-1428.0*	CLOMR	5998.00	1925.29	1930.30	1933.78	1942.65	0.013629	28.20	212.68	53.64	2.50
1	-1477.9*	CLOMR	5998.00	1925.04	1930.14	1933.53	1941.98	0.012820	27.61	217.20	53.98	2.43
1	-1527.8*	CLOMR	5998.00	1924.79	1929.97	1933.28	1941.34	0.012093	27.07	221.61	54.30	2.36
1	-1577.7*	CLOMR	5998.00	1924.54	1929.80	1933.03	1940.74	0.011438	26.55	225.91	54.62	2.30
1	-1627.62	CLOMR	5998.00	1924.29	1929.62	1932.78	1940.17	0.010833	26.06	230.18	54.93	2.24
1	-1640	CLOMR	5998.00	1924.23	1929.58	1932.72	1940.04	0.010703	25.95	231.14	55.00	2.23
1	-1690	CLOMR	5998.00	1923.98	1929.41	1932.46	1939.50	0.010172	25.50	235.24	55.30	2.18

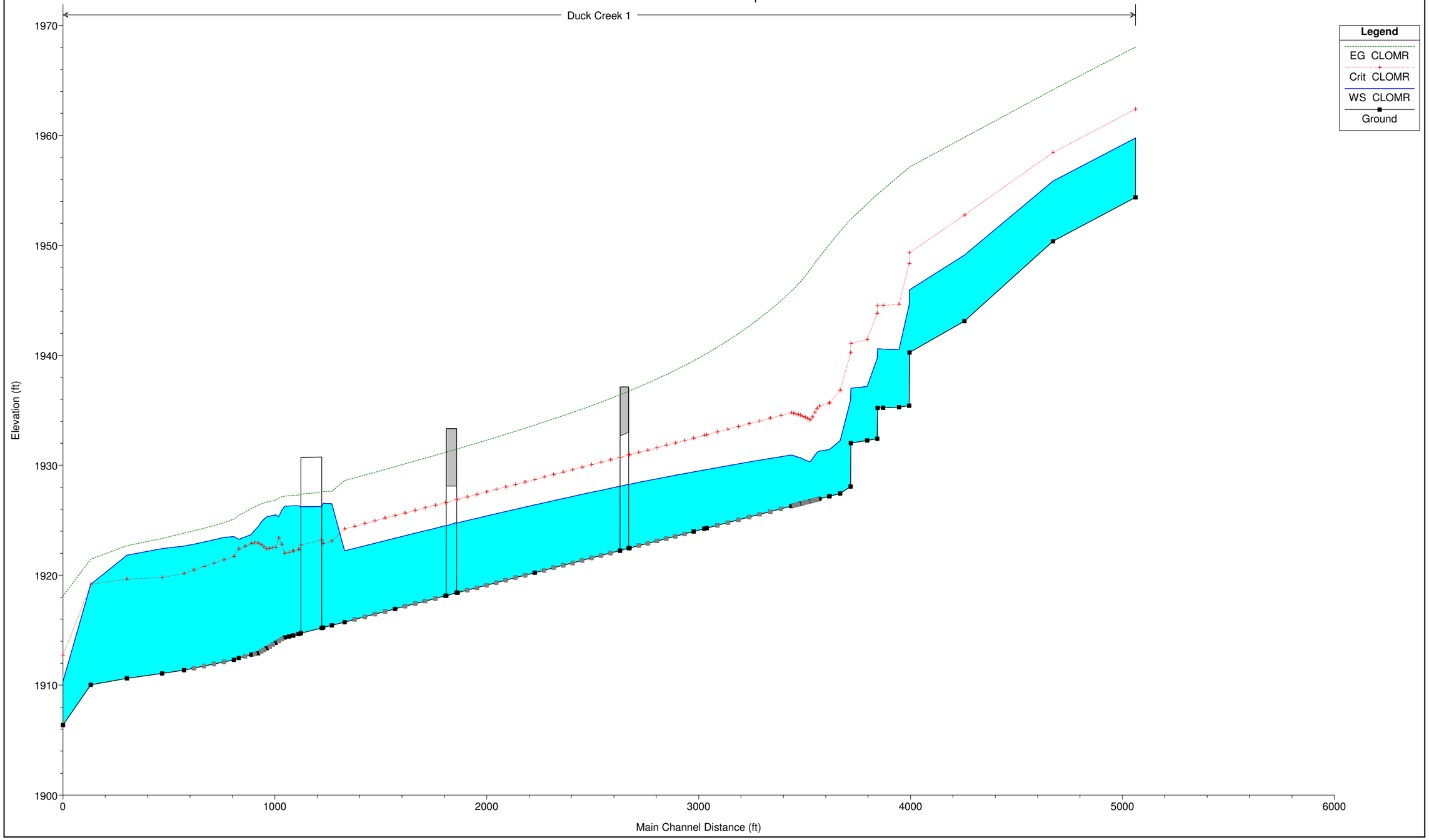
HEC-RAS Plan: proposed River: Duck Creek Reach: 1 Profile: CLOMR (Continued)

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)	
1	-1733.1*	CLOMR	5998.00	1923.76	1929.24	1932.24	1939.06	0.009775	25.15	238.51	55.53	2.14
1	-1776.2*	CLOMR	5998.00	1923.55	1929.09	1932.03	1938.65	0.009392	24.80	241.83	55.77	2.10
1	-1819.3*	CLOMR	5998.00	1923.33	1928.93	1931.82	1938.24	0.009057	24.49	244.89	55.99	2.06
1	-1862.4*	CLOMR	5998.00	1923.12	1928.77	1931.60	1937.86	0.008730	24.18	248.02	56.22	2.03
1	-1905.6*	CLOMR	5998.00	1922.90	1928.60	1931.38	1937.48	0.008447	23.91	250.87	56.42	2.00
1	-1948.7*	CLOMR	5998.00	1922.69	1928.45	1931.18	1937.12	0.008168	23.63	253.81	56.63	1.97
1	-1991.84	CLOMR	5998.00	1922.47	1928.27	1930.95	1936.77	0.007928	23.39	256.46	56.81	1.94
1	-2000		Bridge									
1	-2037.55	CLOMR	5998.00	1922.24	1928.09	1930.72	1936.42	0.007706	23.16	259.00	56.99	1.91
1	-2082.2*	CLOMR	5998.00	1922.02	1927.92	1930.50	1936.07	0.007479	22.92	261.70	57.18	1.89
1	-2126.9*	CLOMR	5998.00	1921.79	1927.72	1930.27	1935.75	0.007306	22.73	263.84	57.33	1.87
1	-2171.6*	CLOMR	5998.00	1921.57	1927.55	1930.06	1935.42	0.007111	22.52	266.33	57.50	1.84
1	-2216.3*	CLOMR	5998.00	1921.35	1927.36	1929.83	1935.11	0.006948	22.34	268.49	57.65	1.82
1	-2261.0*	CLOMR	5998.00	1921.12	1927.17	1929.60	1934.81	0.006812	22.19	270.35	57.78	1.81
1	-2305.7*	CLOMR	5998.00	1920.90	1926.98	1929.38	1934.51	0.006670	22.02	272.34	57.92	1.79
1	-2350.4*	CLOMR	5998.00	1920.68	1926.79	1929.16	1934.22	0.006538	21.87	274.24	58.05	1.77
1	-2395.1*	CLOMR	5998.00	1920.45	1926.59	1928.94	1933.93	0.006431	21.75	275.81	58.16	1.76
1	-2439.85	CLOMR	5998.00	1920.23	1926.40	1928.71	1933.65	0.006317	21.61	277.55	58.28	1.75
1	-2485.2*	CLOMR	5998.00	1920.00	1926.20	1928.48	1933.37	0.006219	21.49	279.06	58.38	1.73
1	-2530.6*	CLOMR	5998.00	1919.78	1926.01	1928.26	1933.09	0.006112	21.36	280.76	58.50	1.72
1	-2576.1*	CLOMR	5998.00	1919.55	1925.80	1928.03	1932.82	0.006030	21.26	282.09	58.59	1.71
1	-2621.5*	CLOMR	5998.00	1919.32	1925.60	1927.82	1932.55	0.005941	21.16	283.52	58.67	1.70
1	-2666.9*	CLOMR	5998.00	1919.10	1925.39	1927.58	1932.28	0.005866	21.06	284.82	58.78	1.69
1	-2712.3*	CLOMR	5998.00	1918.87	1925.18	1927.35	1932.02	0.005802	20.98	285.90	58.85	1.68
1	-2757.7*	CLOMR	5998.00	1918.65	1924.99	1927.13	1931.76	0.005726	20.88	287.22	58.94	1.67
1	-2803.20	CLOMR	5998.00	1918.42	1924.77	1926.90	1931.50	0.005673	20.81	288.16	59.00	1.66
1	-2830		Bridge									
1	-2860.99	CLOMR	5998.00	1918.13	1924.50	1926.61	1931.18	0.005611	20.74	289.26	59.08	1.65
1	-2908.5*	CLOMR	5998.00	1917.89	1924.27	1926.37	1930.91	0.005563	20.67	290.13	59.14	1.64
1	-2956.1*	CLOMR	5998.00	1917.65	1924.05	1926.13	1930.65	0.005520	20.62	290.93	59.19	1.64
1	-3003.7*	CLOMR	5998.00	1917.42	1923.84	1925.90	1930.39	0.005462	20.54	292.00	59.26	1.63
1	-3051.3*	CLOMR	5998.00	1917.18	1923.61	1925.66	1930.13	0.005427	20.49	292.67	59.31	1.63
1	-3098.9	CLOMR	5998.00	1916.94	1923.38	1925.43	1929.87	0.005394	20.45	293.28	59.35	1.62
1	-3146.5*	CLOMR	5998.00	1916.70	1923.15	1925.19	1929.62	0.005364	20.41	293.86	59.39	1.62
1	-3194.1*	CLOMR	5998.00	1916.46	1922.92	1924.95	1929.36	0.005336	20.37	294.39	59.42	1.61
1	-3241.8*	CLOMR	5998.00	1916.22	1922.68	1924.70	1929.11	0.005311	20.34	294.88	59.46	1.61
1	-3289.4*	CLOMR	5998.00	1915.98	1922.45	1924.46	1928.86	0.005288	20.31	295.33	59.49	1.61
1	-3337.09	CLOMR	5998.00	1915.74	1922.22	1924.22	1928.61	0.005266	20.28	295.76	59.52	1.60

HEC-RAS Plan: proposed River: Duck Creek Reach: 1 Profile: CLOMR (Continued)

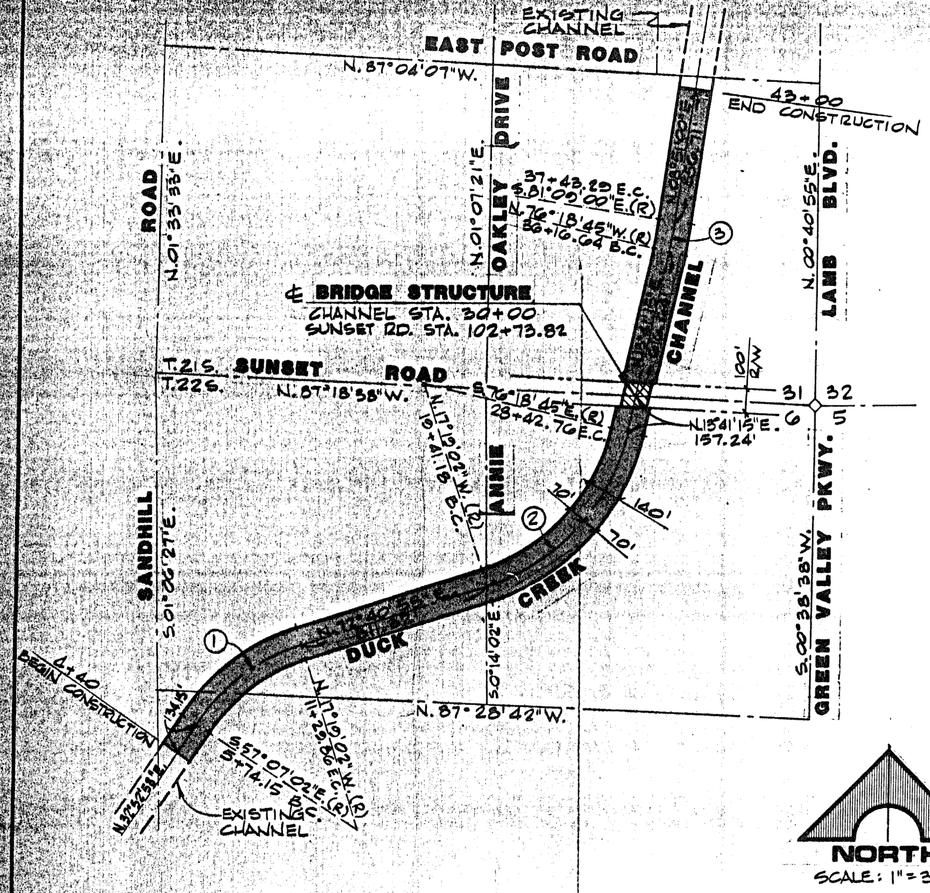
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	-3397.09	CLOMR	6074.00	1915.45	1926.50	1923.11	1927.63	0.000488	8.53	711.89	87.40	0.53
1	-3438.65	CLOMR	6074.00	1915.24	1926.54	1922.89	1927.61	0.000448	8.28	733.91	88.40	0.51
1	-3500		Bridge									
1	-3554.44	CLOMR	6074.00	1914.66	1926.31	1922.34	1927.29	0.000399	7.94	764.97	89.80	0.48
1	-3579.44	CLOMR	6074.00	1914.53	1926.32	1922.21	1927.26	0.000381	7.82	777.17	90.34	0.47
1	-3581.44	CLOMR	6074.00	1914.52	1926.32	1922.20	1927.26	0.001520	7.81	778.08	90.38	0.47
1	-3599.44	CLOMR	6074.00	1914.43	1926.30	1922.08	1927.23	0.001484	7.74	784.79	90.68	0.46
1	-3619.44	CLOMR	6074.00	1914.34	1926.28	1922.00	1927.20	0.001451	7.68	791.26	90.96	0.46
1	-3633.2*	CLOMR	6074.00	1914.18	1925.92	1922.81	1927.13	0.003848	8.83	687.67	87.01	0.55
1	-3647.4*	CLOMR	6074.00	1914.01	1925.33	1923.38	1927.02	0.006030	10.43	582.20	80.60	0.68
1	-3661.61	CLOMR	6074.00	1913.85	1925.50	1922.53	1926.84	0.004290	9.29	653.48	82.07	0.58
1	-3675.7*	CLOMR	6074.00	1913.69	1925.44	1922.49	1926.78	0.004281	9.29	654.02	81.96	0.58
1	-3689.9*	CLOMR	6074.00	1913.52	1925.38	1922.45	1926.72	0.004286	9.28	654.40	81.86	0.58
1	-3704.12	CLOMR	6074.00	1913.36	1925.32	1922.40	1926.66	0.004318	9.29	653.79	81.74	0.58
1	-3717.5*	CLOMR	6074.00	1913.21	1925.10	1922.58	1926.58	0.004944	9.76	622.13	80.35	0.62
1	-3731.0*	CLOMR	6074.00	1913.06	1924.82	1922.78	1926.49	0.005849	10.37	585.81	78.71	0.67
1	-3744.5	CLOMR	6074.00	1912.91	1924.40	1922.92	1926.37	0.007384	11.26	539.50	76.49	0.75
1	-3760.5*	CLOMR	6074.00	1912.84	1924.11	1922.94	1926.23	0.008174	11.67	520.44	75.48	0.78
1	-3776.62	CLOMR	6074.00	1912.77	1923.71	1922.89	1926.06	0.009527	12.31	493.60	74.06	0.84
1	-3806.1*	CLOMR	6074.00	1912.62	1923.48	1922.64	1925.75	0.009432	12.09	502.47	77.02	0.83
1	-3835.75	CLOMR	6074.00	1912.47	1923.27	1922.40	1925.45	0.009304	11.85	512.47	79.99	0.83
1	-3858.58	CLOMR	6074.00	1912.31	1923.51	1921.71	1925.11	0.005673	10.14	599.18	96.30	0.67
1	-3905.6*	CLOMR	6074.00	1912.12	1923.44	1921.40	1924.77	0.005162	9.26	655.85	97.25	0.63
1	-3952.8*	CLOMR	6074.00	1911.93	1923.23	1921.11	1924.52	0.004971	9.15	664.07	97.58	0.62
1	-3999.9*	CLOMR	6074.00	1911.75	1923.02	1920.80	1924.28	0.004762	9.01	673.84	97.96	0.61
1	-4047.0*	CLOMR	6074.00	1911.56	1922.83	1920.47	1924.05	0.004535	8.86	685.37	98.45	0.59
1	-4094.14	CLOMR	6074.00	1911.37	1922.65	1920.15	1923.83	0.004294	8.69	698.65	99.00	0.58
1	-4197.64	CLOMR	6074.00	1911.08	1922.43	1919.80	1923.35	0.003545	7.71	788.21	116.97	0.52
1	-4363.63	CLOMR	6074.00	1910.63	1921.83	1919.64	1922.69	0.004237	7.45	815.89	153.80	0.56
1	-4533.56	CLOMR	6074.00	1910.03	1919.19	1919.19	1921.47	0.010397	12.24	520.27	134.89	0.88
1	-4664.36	CLOMR	6074.00	1906.37	1910.34	1912.68	1918.10	0.068174	22.35	271.79	74.96	2.07

Duck Creek CLOMR Plan: Proposed 10/15/2013



Appendix C

Reference Material



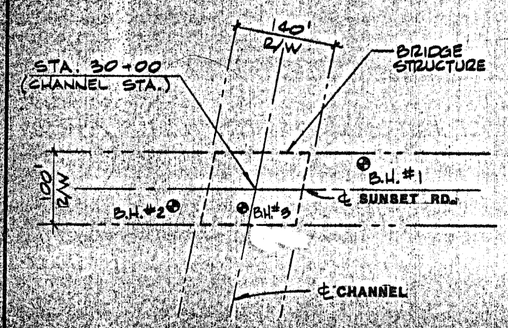
NORTH
SCALE: 1"=300'

CONTROL PLAN

SCALE: 1"= 300'

CURVE DATA

№	Δ	R	L	T
1	39°48'00"	800.00	555.71'	289.60
2	58°50'43"	875.61'	901.58'	495.35'
3	04°50'15"	1500.00'	126.65'	63.36'

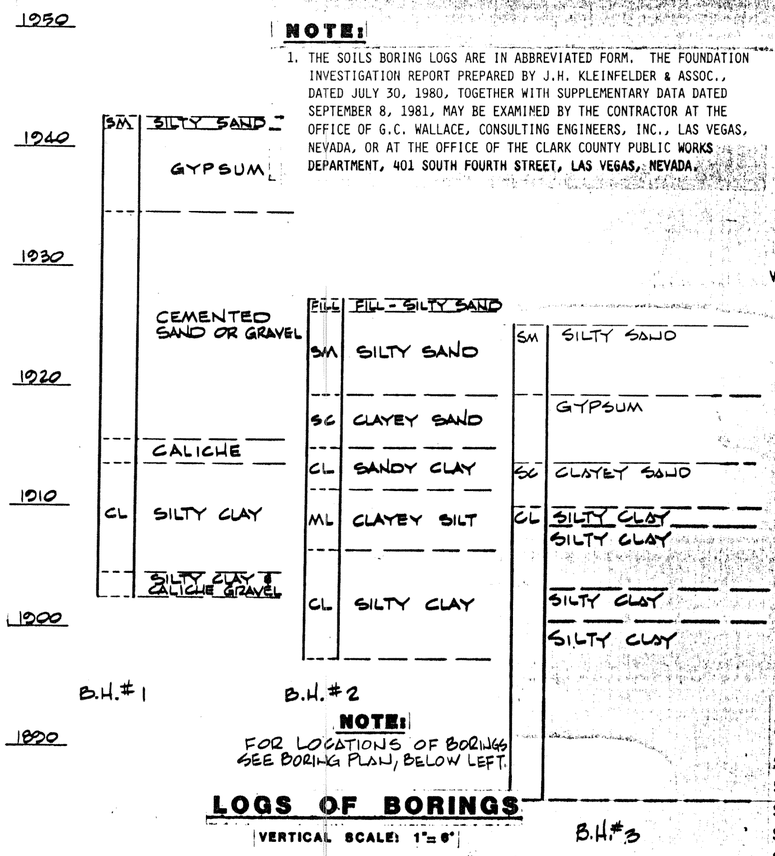


BORING PLAN

SCALE: 1"=100'

BENCH MARK

BENCHMARK NO. 11 (STA. 100+00)
5/8"℄ REBAR 100' SOUTH OF ℄ OF SUNSET RD. - C.C.S.D. DATUM.
EL. 1927.32



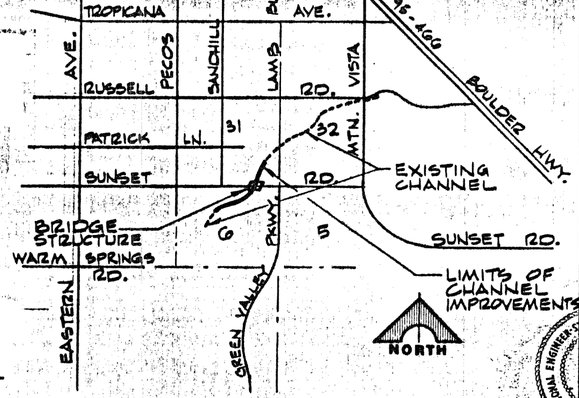
NOTE:

1. THE SOILS BORING LOGS ARE IN ABBREVIATED FORM. THE FOUNDATION INVESTIGATION REPORT PREPARED BY J.H. KLEINFELDER & ASSOC., DATED JULY 30, 1980, TOGETHER WITH SUPPLEMENTARY DATA DATED SEPTEMBER 8, 1981, MAY BE EXAMINED BY THE CONTRACTOR AT THE OFFICE OF G.C. WALLACE, CONSULTING ENGINEERS, INC., LAS VEGAS, NEVADA, OR AT THE OFFICE OF THE CLARK COUNTY PUBLIC WORKS DEPARTMENT, 401 SOUTH FOURTH STREET, LAS VEGAS, NEVADA.

NOTE:
FOR LOCATIONS OF BORINGS SEE BORING PLAN, BELOW LEFT.

LOGS OF BORINGS

VERTICAL SCALE: 1"= 6'



VICINITY MAP

NO SCALE

INDEX OF DRAWINGS

BRIDGE STRUCTURE:

S - 1	CONTROL PLAN, VICINITY MAP, INDEX OF DWGS. & MISC.
S - 2	SITE PLAN & SECTIONS
S - 3	FOUNDATION PLAN & SECTIONS
S - 4	SLAB & COLUMN PLAN, SECTIONS & DETAILS
S - 5	SLAB REINFORCEMENT PLAN & SECTIONS
S - 6	MISC. SECTIONS & DETAILS
S - 7	MISC. SECTIONS & DETAILS
S - 8	MISC. SECTIONS & DETAILS

DUCK CREEK CHANNEL:

S - 9	PLAN & PROFILE STA.	4	• 00	TO	STA.	17	• 00
S -10	PLAN & PROFILE STA.	17	• 00	TO	STA.	32	• 00
S -11	PLAN & PROFILE STA.	32	• 00	TO	STA.	43	• 00
S -12	TYPICAL DETAILS						
S -13	CROSS SECTIONS STA.	4	• 00	TO	STA.	22	• 00
S -14	CROSS SECTIONS STA.	23	• 00	TO	STA.	43	• 00

GENERAL NOTES

1. ALL STRUCTURAL CONCRETE, EXCEPT FOR THE BRIDGE DECK, SHALL DEVELOP A COMPRESSIVE STRENGTH OF 3000 PSI MINIMUM IN 28 DAYS. CONCRETE FOR THE BRIDGE DECK SHALL BE 4000 PSI MINIMUM IN 28 DAYS. (SEE SPECIFICATIONS).
2. "REINFORCING STEEL SHALL BE HOT ROLLED DEFORMED BARS, ASTM DESIGNATION A615, GRADE 60, EXCEPT COLUMN TIES WHICH MAY BE GRADE 40."
3. FOR PROVISIONS REGARDING TEMPORARY DETOUR AROUND BRIDGE STRUCTURE CONSTRUCTION, SEE SPECIFICATIONS.
4. DESIGN SPECIFICATIONS - AASHO "STANDARD SPECIFICATION FOR HIGHWAY BRIDGES", 1977 EDITION, HS 20-44 LOADING UTILIZING LOAD FACTOR DESIGN METHOD.
5. THE CONTRACTOR SHALL CONDUCT HIS PILE DRILLING AND OTHER CONSTRUCTION OPERATIONS SO AS NOT TO DAMAGE EXISTING OVERHEAD AND UNDERGROUND UTILITIES LOCATED WITHIN OR ADJACENT TO THE AREA REQUIRED FOR CONSTRUCTION. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, MAKE ALL ARRANGEMENTS FOR THE TEMPORARY RELOCATION OF SAID OVERHEAD OR UNDERGROUND UTILITIES, IF RELOCATION IS REQUIRED BY HIS OPERATIONS.

   THE CONTRACTOR SHALL BEAR FULL RESPONSIBILITY FOR THE PROTECTION OF EXISTING UTILITIES.
6. CLEARANCE TO REBAR (UNLESS NOTED OTHERWISE)
   TOP OF ROADWAY SLAB.....2"
   BOTTOM OF ROADWAY SLAB.....1½"
   CAST AGAINST EARTH.....3"
   ALL OTHERS.....2"

LEGEND

BTM.	BOTTOM
R.C.P.	REINFORCED CONCRETE PIPE
A.C.	ASPHALT CONCRETE
F.L.	FLOW LINE
F.S.	FINISHED SLAB
R/W	RIGHT OF WAY
ELEV.	ELEVATION
—→—	DITCH OR SWALE
—T—	TOP OF SLOPE
T.S.W.	TOP OF SIDEWALK
PP	POWER POLE
T.W.W.	TOP OF WINGWALL

AS BUILT DRAWING

REV	DATE	DESCRIPTION
1	4/26/82	HYDRO PAVING & PERL ADDED DUM
2	8/16/82	AS-BUILT "NO REVISIONS"

RECOMMENDED FOR APPROVAL: G.C. WALLACE, CONSULTING ENGINEER, STATE OF NEVADA, PROFESSIONAL ENGINEER, No. 2163, DATE 8/16/82

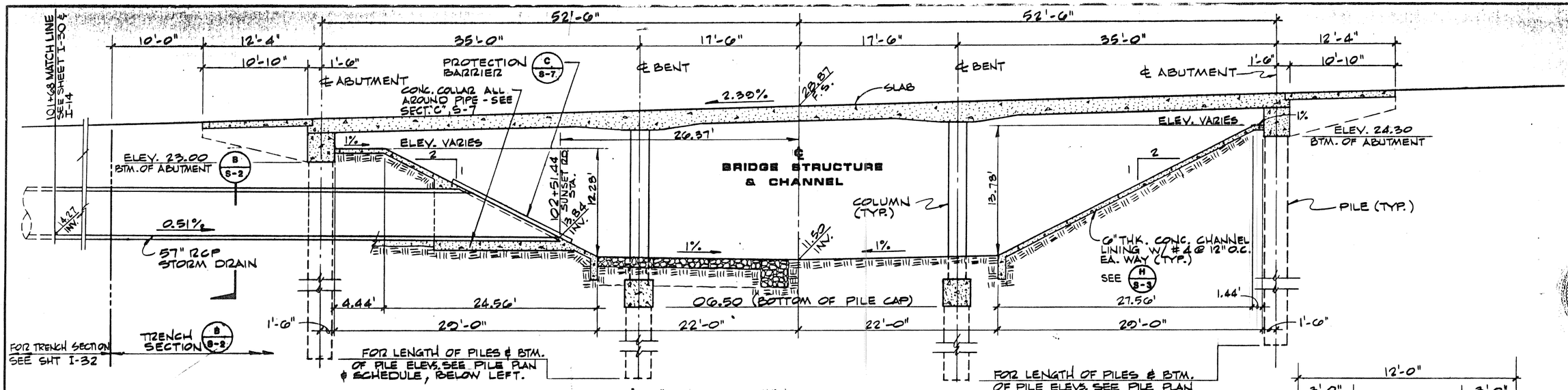
G.C. WALLACE
Consulting Engineers, Inc.
1100 East Sahara Ave. • Las Vegas, Nevada 89104 • 732-3330

CLARK COUNTY PUBLIC WORKS DEPT.
SUNSET ROAD BRIDGE & CHANNEL
BRIDGE STRUCTURE
CONTROL PLAN, VICINITY MAP, INDEX OF DWGS. & MISC.

SHEET S-1 OF 26 SHEETS

JOB NO. 590.020

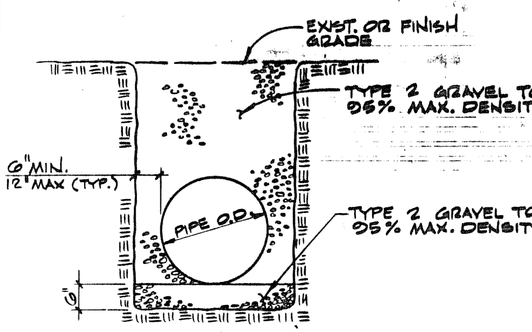
B-1755



SECTION

SCALE: 3/16" = 1'-0"

(A S-2)



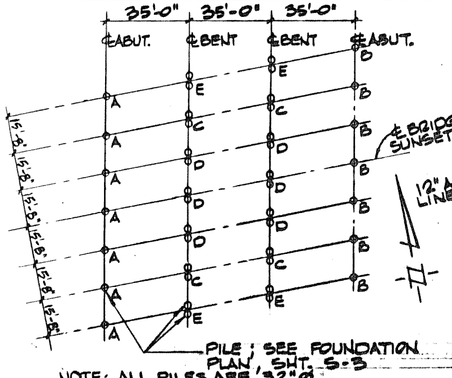
TYP. TRENCH SECTION

(B S-2)

NO SCALE

PILE SCHEDULE

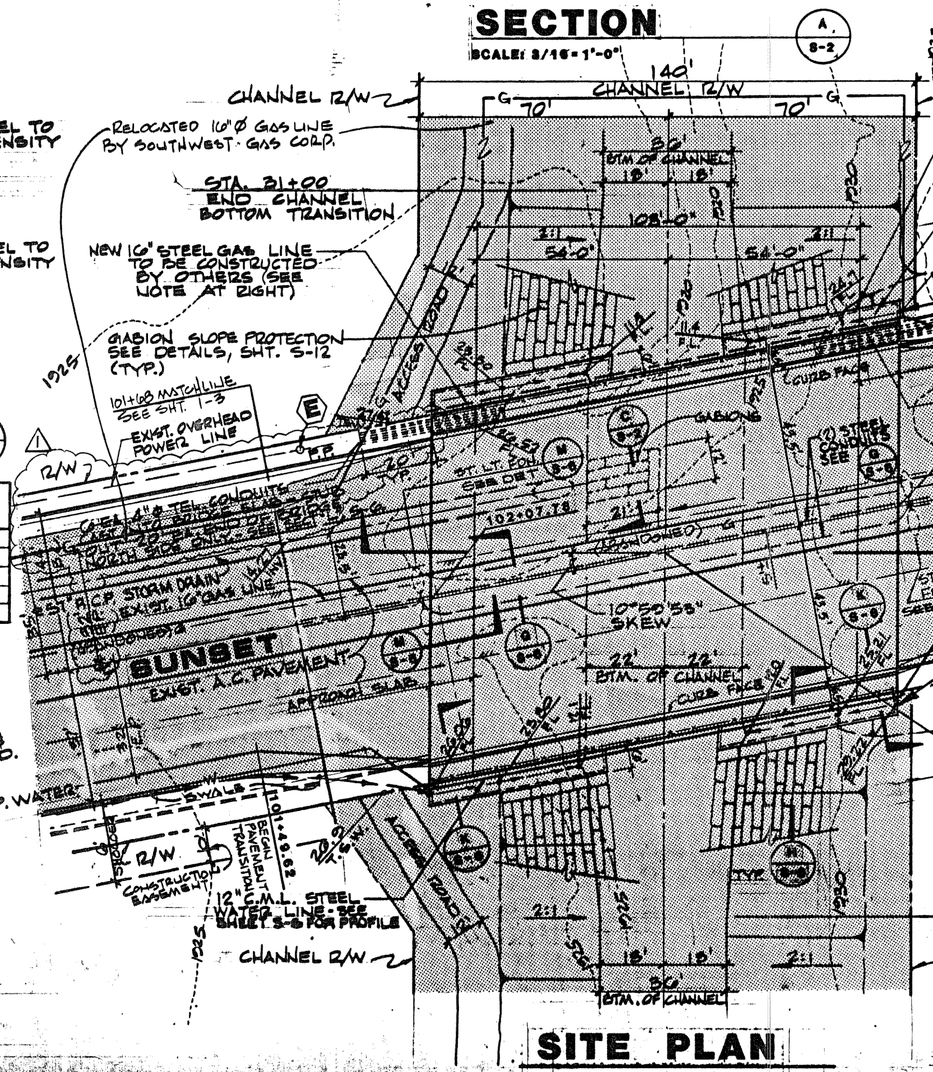
PILE TYPE	LENGTH OF PILE	BOTTOM OF PILE ELEV.	REMARKS
A	30'	1803.00	SINGLE PILE
B	30'	1804.30	SINGLE PILE
C	28	1878.50	BOTH PILES
D	27'	1879.50	BOTH PILES
E	21'	1885.50	BOTH PILES



NOTE: ALL PILES ARE 32" ø

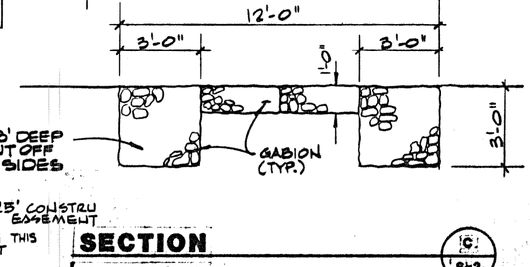
PILE PLAN & SCHEDULE

SCALE: 1" = 30'



SITE PLAN

SCALE: 1" = 20'



SECTION

SCALE: 3/8" = 1'-0"

(C S-2)

NOTE

THE EXISTING 16" STEEL GAS LINE SHALL BE RELOCATED TO THE NORTH SIDE OF THE BRIDGE BY SOUTHWEST GAS CORP. THE CONTRACTOR SHALL COORDINATE THE BRIDGE & CHANNEL CONSTRUCTION WITH THE SOUTHWEST GAS CORP. (SEE SPECS).

RELOCATED 16" ø GASLINE BY SOUTHWEST GAS CORP.

NOTE:

FOR REQUIREMENTS PERTAINING TO PROTECTION OF EXISTING OVERHEAD & UNDERGROUND UTILITIES, SEE NOTES, SHT. S-1.

AS BUILT DRAWING

REV	DATE	DESCRIPTION
A	2/78	AS-BUILTS REVISED CONSTRUCTION LIMITS

RECOMMENDED FOR APPROVAL: Richard Dimond 2/28/78 CLARK COUNTY PUBLIC WORKS ENGINEER

G.C. WALLACE Consulting Engineers, Inc. 1100 East Bonanza Ave., Las Vegas, Nevada 89104 (702) 735-8391

CLARK COUNTY PUBLIC WORKS DEPT.

SUNSET ROAD BRIDGE & CHANNEL

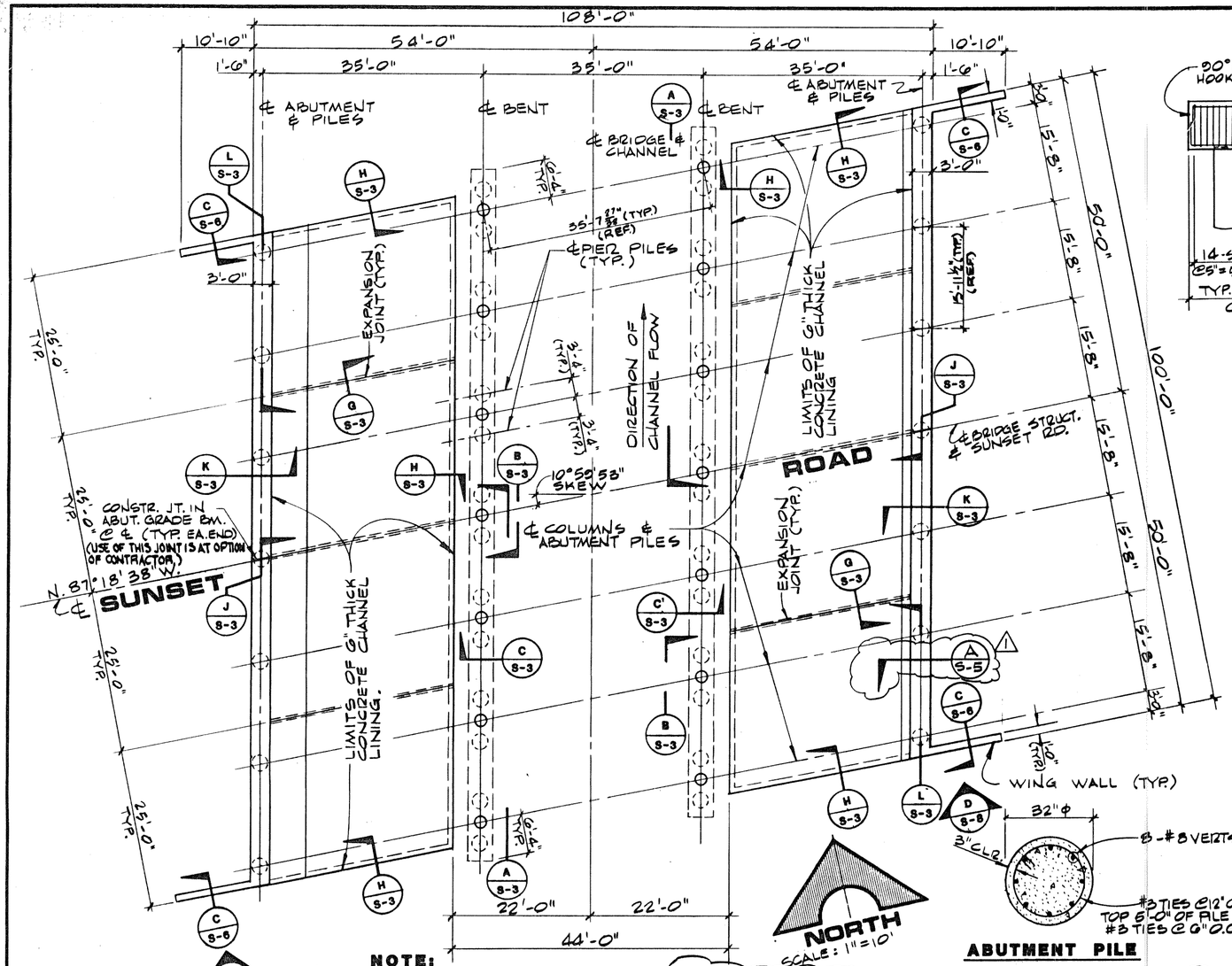
BRIDGE STRUCTURE SITE PLAN & SECTIONS

SHEET S-2 OF 26 SHEETS

JOB NO. 500.020

9/75 DIETERICH-POST

L-1087



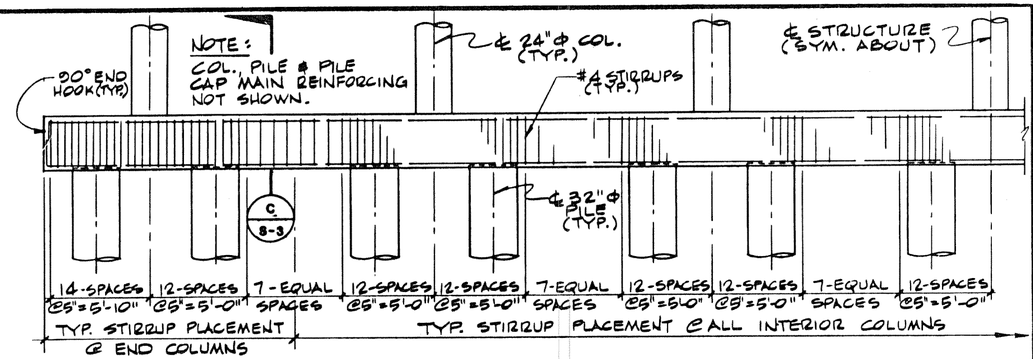
NOTE:
FOR REQUIREMENTS PERTAINING TO PROTECTION OF EXISTING OVERHEAD & UNDERGROUND UTILITIES, SEE NOTES, SHT. S-1.

NOTE:
SEE SHEET S-2 FOR EXIST. POWER & GAS LINES.

FOUNDATION PLAN

SCALE: 1"= 10'

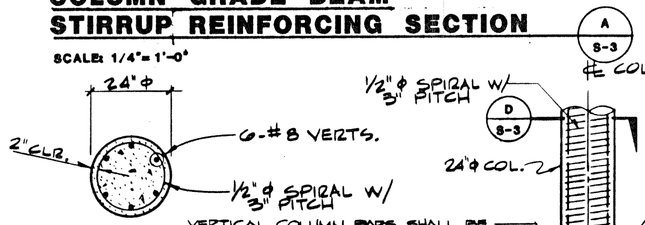
FOR CONSTRUCTION OF ABUT. AT S.E. COR. OF EAST ABUTMENT SEE SECTION A S-5



COLUMN GRADE BEAM STIRRUP REINFORCING SECTION

SCALE: 1/4"= 1'-0"

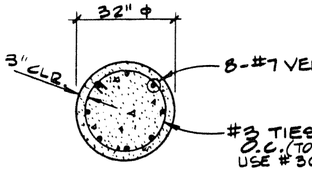
A S-3 ℄ COL.



COLUMN SECTION

D S-3

NO SCALE



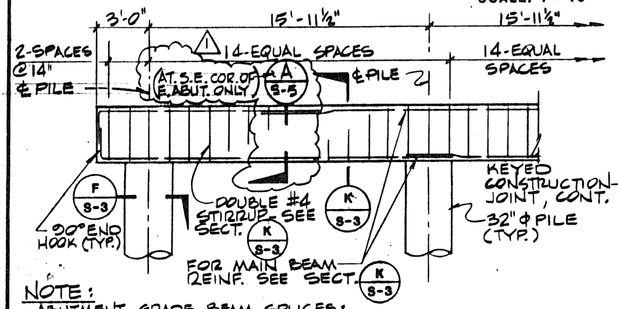
PIER PILE

ABUTMENT PILE

SECTION

L S-3

SCALE: 1/4"=1'-0"



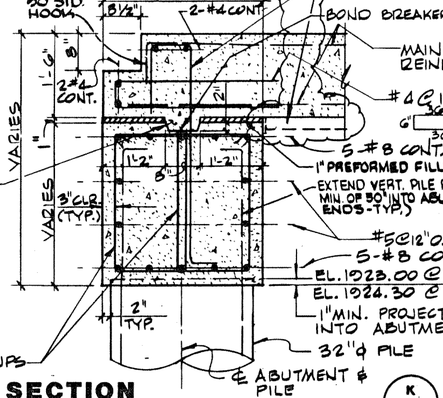
NOTE:
ABUTMENT GRADE BEAM SPLICES:
TOP BARS - 40" LAP, SPLICE @ MIDSPAN BETWEEN 32" ϕ PILES.
BTM. BARS - 30" LAP, SPLICE @ 32" ϕ PILES.
SIDE BARS - 18" LAP, STAGGER SPLICES.

SECTION

K S-3

SCALE: 3/4"=1'-0"

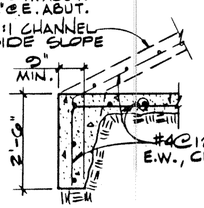
SECTION PERPENDICULAR TO ABUTMENT



SECTION

F S-3

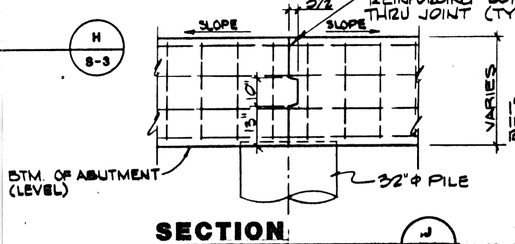
NO SCALE



SECTION

H S-3

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



SECTION

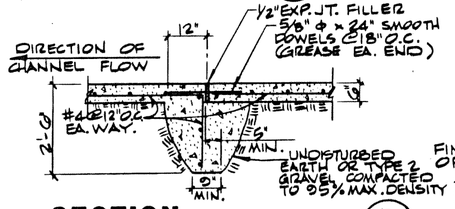
J S-3

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

SECTION

E' S-3

NO SCALE



SECTION

G S-3

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

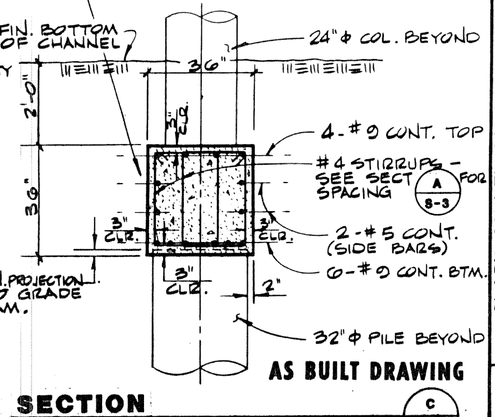
℄ BRIDGE STRUCTURE

SECTION

B S-3

SCALE: 3/8"=1'-0"

NOTE: (GRADE BM. SPLICES)
TOP BARS:
50" LAP, SPLICE @ 24" ϕ COL.
BOTTOM BARS:
44" LAP, SPLICE 7'-10" FROM 24" ϕ COL.
SIDE BARS:
18" LAP, STAGGER SPLICES



AS BUILT DRAWING

SECTION

C S-3

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

SECTION PERPENDICULAR TO GRADE BEAM

REV	DATE	DESCRIPTION
1	5/25/82	AS-BUILT - REV. ABUT. SECTION

DATE 8/12/82

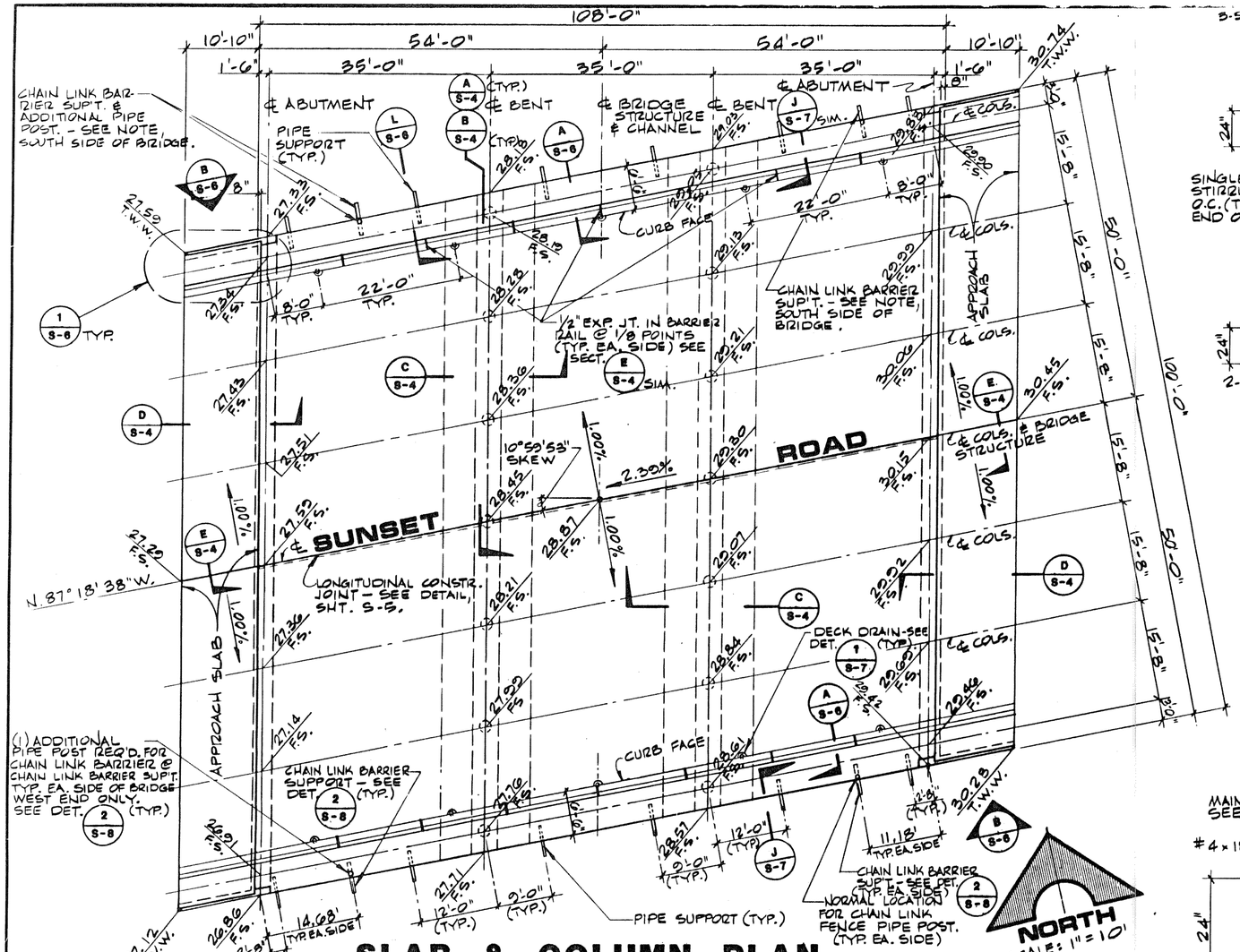
RECOMMENDED FOR APPROVAL: PROFESSIONAL ENGINEER — JAMES E. THOMAS — STRUCTURAL — No. 2857 — REGISTERED

G.C. WALLACE
Consulting Engineers, Inc.
1100 East Sahara Ave. · Las Vegas, Nevada 89104 · 732-3330

CLARK COUNTY PUBLIC WORKS DEPT.
SUNSET ROAD BRIDGE & CHANNEL
BRIDGE STRUCTURE
FOUNDATION PLAN & SECTIONS

SHEET S-3 OF 26 SHEETS

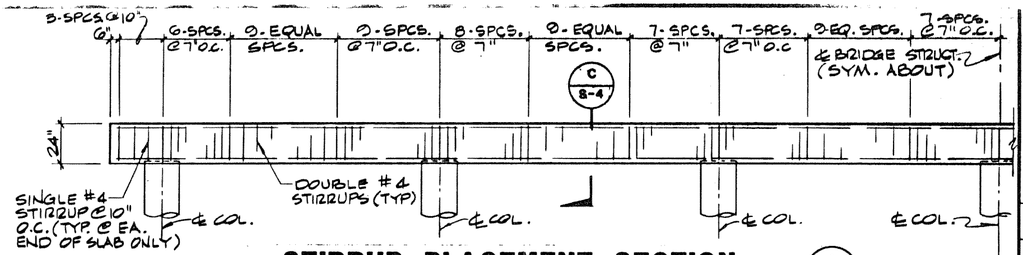
JOB NO. 500.020



SLAB & COLUMN PLAN

SCALE: 1"=10'

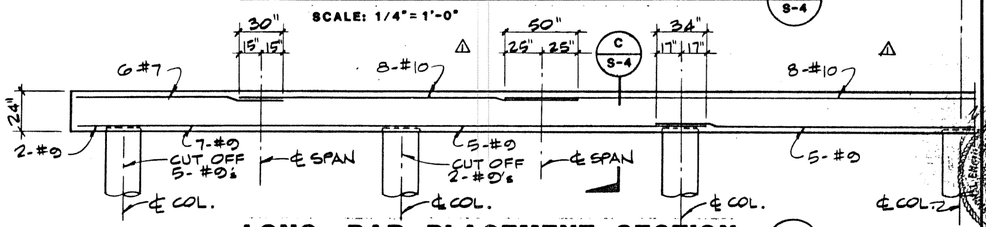
NOTE: FOR SLAB D.L. CAMBER DIAGRAM SEE DETAIL 4 S-4



STIRRUP PLACEMENT SECTION

A S-4

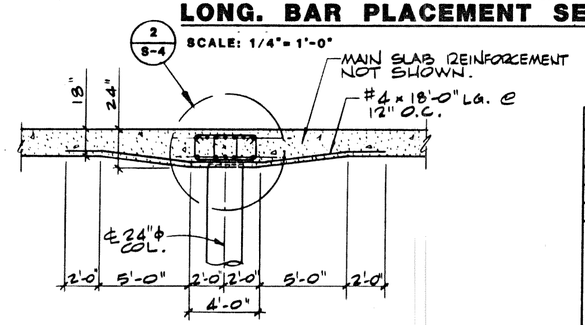
SCALE: 1/4"=1'-0"



LONG. BAR PLACEMENT SECTION

B S-4

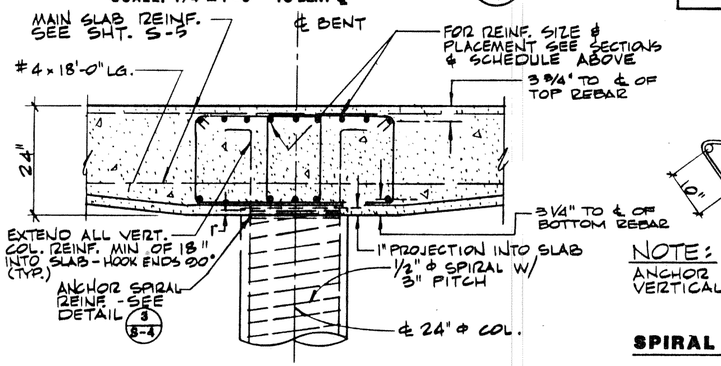
SCALE: 1/4"=1'-0"



SECTION

C S-4

SCALE: 1/4"=1'-0" SECTION PERPENDICULAR TO BENT ℄



DETAIL

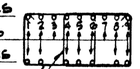
2 S-4

SCALE: 3/4"=1'-0"

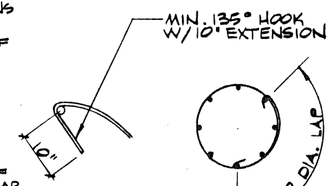
BAR & STIRRUP PLACEMENT SCHEDULE

Nº OF BARS USED	LOCATIONS REQUIRED
2	1 & 9
5	1, 4, 5, 6 & 9
7	ALL EXCEPT 3 & 7
8	ALL EXCEPT 5
9	ALL

TOP BARS
BAR LOCATIONS
BTM. BARS



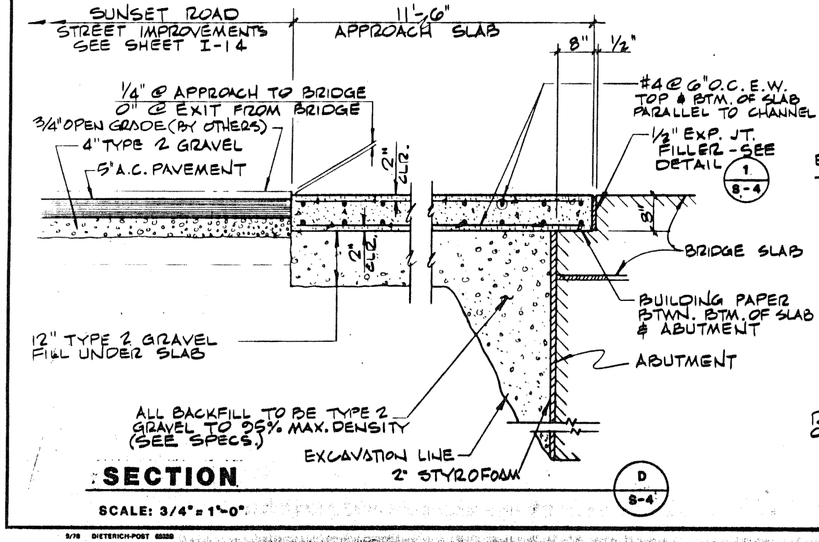
TYP. STIRRUP ARRANGEMENT WHEN MORE THAN 2-BARS ARE USED. - WHEN ONLY 2-BARS ARE USED, A SINGLE STIRRUP IS REQUIRED.



NOTE:
ANCHOR SPLICES IN SPIRAL AROUND VERTICAL BAR

SPIRAL TIE ANCHOR HOOK

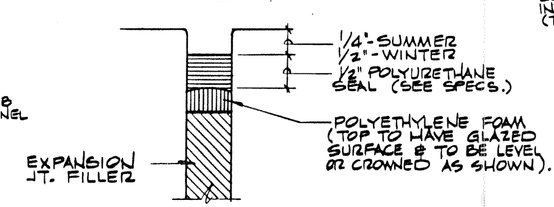
DETAIL
NO SCALE
3 S-4



SECTION

D S-4

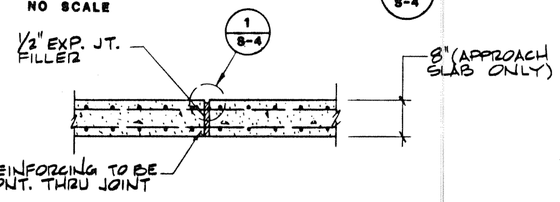
SCALE: 3/4"=1'-0"



DETAIL

NO SCALE

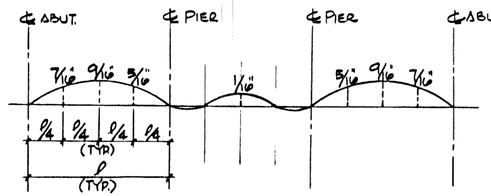
1 S-4



SECTION

E S-4

NO SCALE



SLAB D.L. CAMBER DIAGRAM

DETAIL

NO SCALE

4 S-4

AS BUILT DRAWING

JOB NO. 500.020

9/70 DIETERICH-POST 65320

L-1087

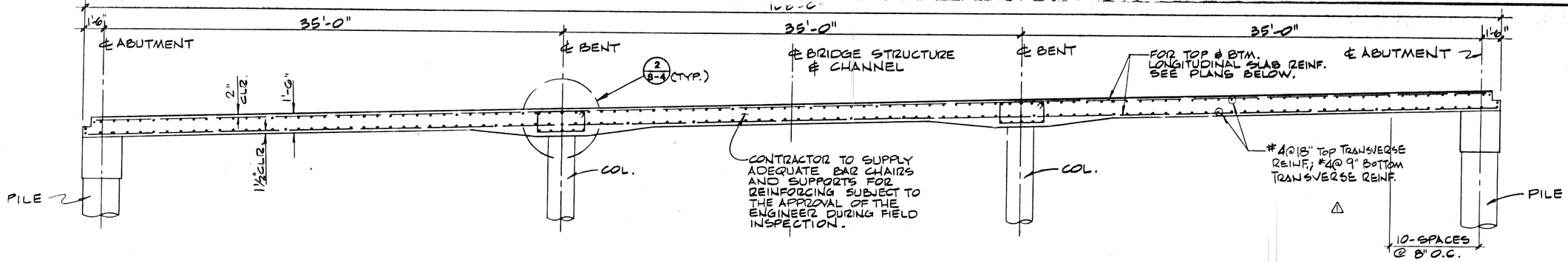
G.C. WALLACE Consulting Engineers, Inc. 3100 East Sahara Ave. - Las Vegas, Nevada 89104 - 732-3330

CLARK COUNTY PUBLIC WORKS DEPT.
SUNSET ROAD BRIDGE & CHANNEL
BRIDGE STRUCTURE
SLAB & COLUMN PLAN, SECTIONS & DETAILS

SHEET S-4 of 24 SHEETS

REV	DATE	DESCRIPTION
1	4/26/68	REVISED AS PER ADDENDUM No. 1 #3
2	5/6/68	AS-BUILT - NO REVISIONS

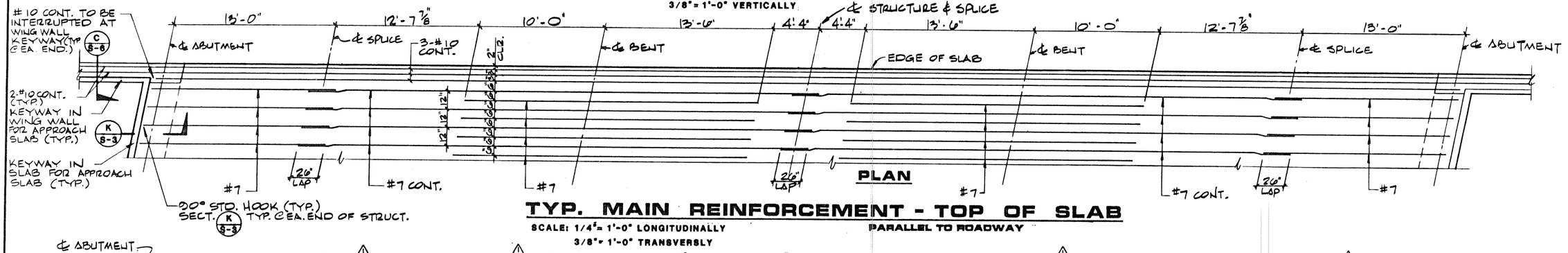
RECOMMENDED FOR APPROVAL 2/6/68 DATE
APPROVED 2/16/68 DATE
CHIEF ENGINEER



LONGITUDINAL SECTION

SCALE: 1/4"= 1'-0" LONGITUDINALLY
3/8"= 1'-0" VERTICALLY

PERPENDICULAR TO DRAINAGE CHANNEL

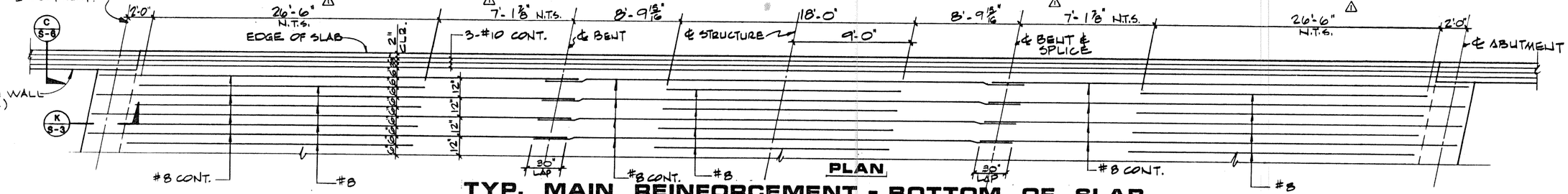


PLAN

TYP. MAIN REINFORCEMENT - TOP OF SLAB

SCALE: 1/4"= 1'-0" LONGITUDINALLY
3/8"= 1'-0" TRANSVERSLY

PARALLEL TO ROADWAY

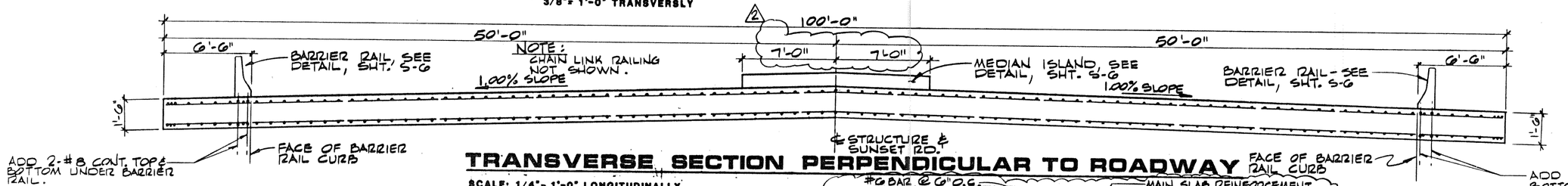


PLAN

TYP. MAIN REINFORCEMENT - BOTTOM OF SLAB

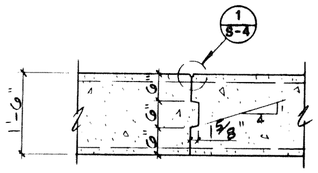
SCALE: 1/4"= 1'-0" LONGITUDINALLY
3/8"= 1'-0" TRANSVERSLY

PARALLEL TO ROADWAY



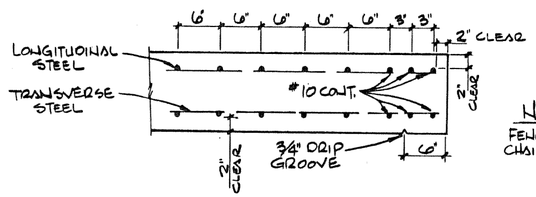
TRANSVERSE SECTION PERPENDICULAR TO ROADWAY

SCALE: 1/4"= 1'-0" LONGITUDINALLY
3/8"= 1'-0" VERTICALLY



LONGITUDINAL SLAB CONSTRUCTION JOINT

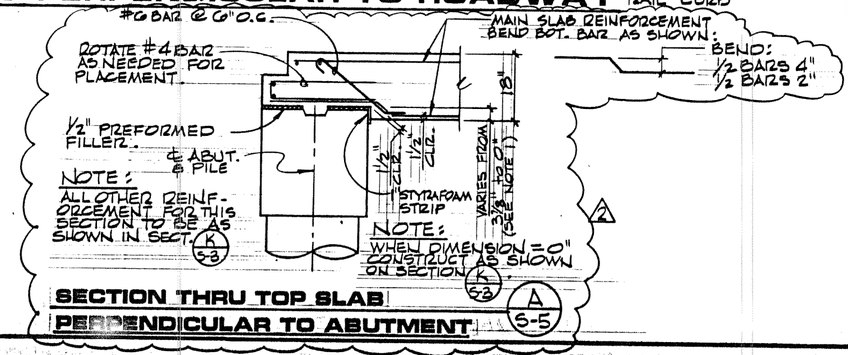
SCALE: 3/4"= 1'-0"



EDGE OF SLAB DETAIL

NO SCALE

NOTE: FENCE & BAR CHAIRS NOT SHOWN



SECTION THRU TOP SLAB PERPENDICULAR TO ABUTMENT

AS BUILT DRAWING

REV	DATE	DESCRIPTION
1	4/28/82	REVISED AS PER ADDENDUM NO. 1 - # 4 & # 5 BARS
2	5/4/82	AS BUILT - MOVED ABUT. SEC'T.

RECOMMENDED BY: [signature] CLARK COUNTY PUBLIC WORKS ENGINEER
DATE: 2/18, 5/4/82
APPROVED: [signature] CLARK COUNTY BOARD OF COMMISSIONERS
DATE: 5/4/82
STATE OF NEVADA — REGISTERED ENGINEER — CIVIL — STRUCTURAL — 5969

G.C. WALLACE, Inc.
Consulting Engineers
1100 East Sahara Ave. • Las Vegas, Nevada 89104 • 732-3330

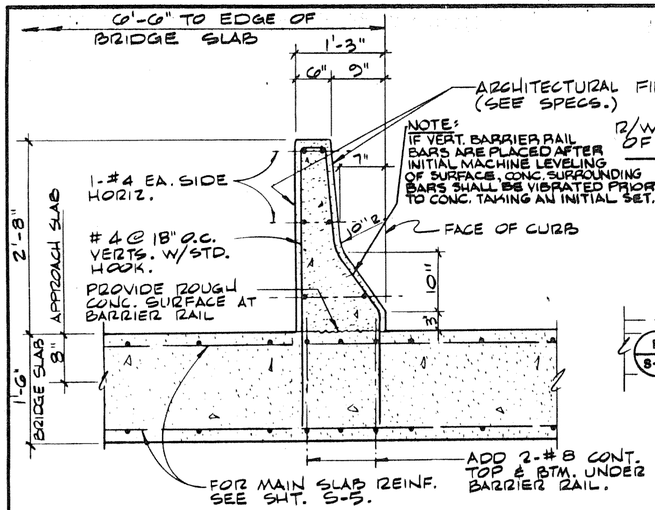
CLARK COUNTY PUBLIC WORKS DEPT.
SUNSET ROAD BRIDGE & CHANNEL
BRIDGE STRUCTURE SLAB REINFORCEMENT PLAN & SECTIONS

SHEET S-5 OF 26 SHEETS

JOB NO. 500.020

L-1087

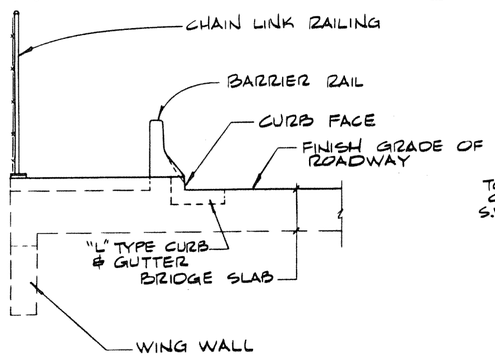
9/76 DIETERICH-POST 68329

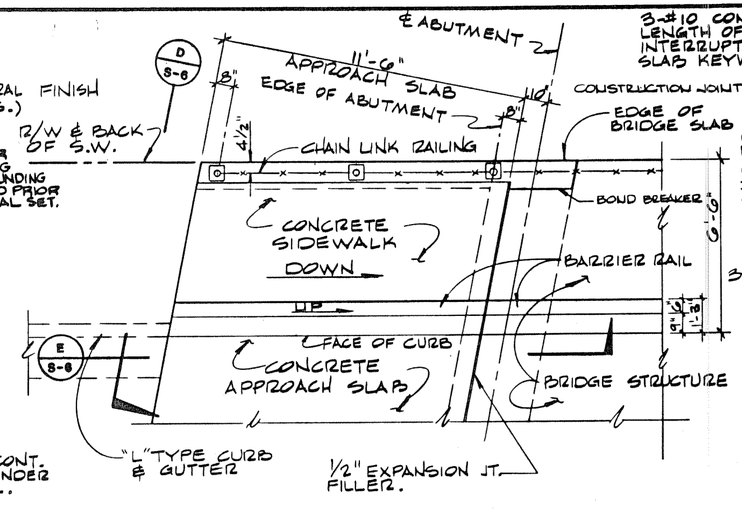


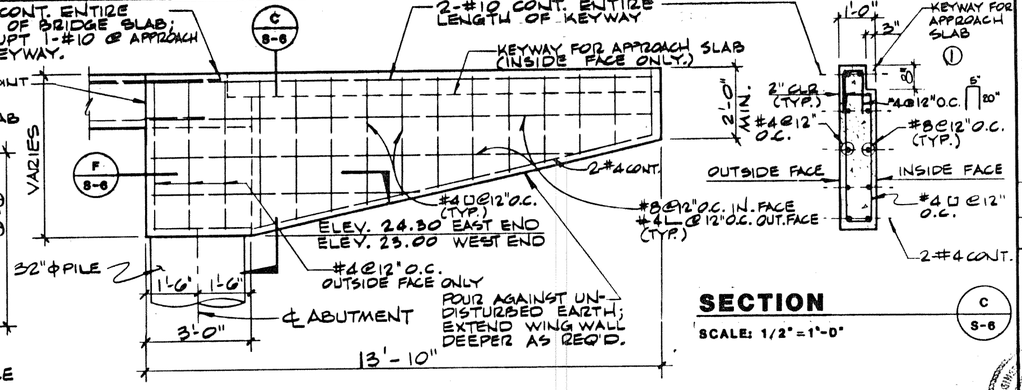
TYP. BARRIER RAIL SECTION

A S-4

SCALE: 1" = 1'-0"







SECTION

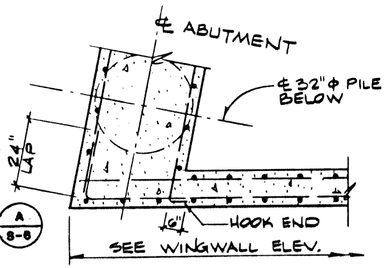
C S-6

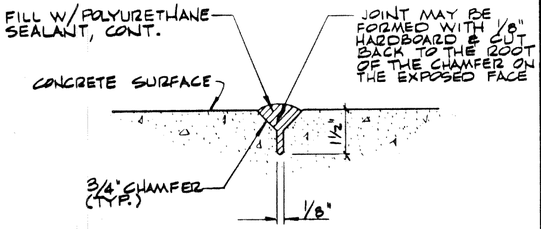
SCALE: 1/2" = 1'-0"

TYP. WINGWALL ELEVATION

B S-4

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

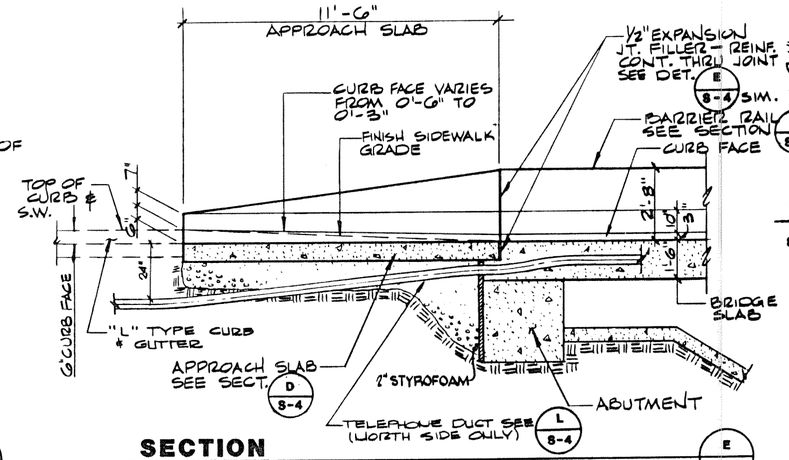




DETAIL

1 S-4

SCALE: 3/8" = 1'-0"



SECTION

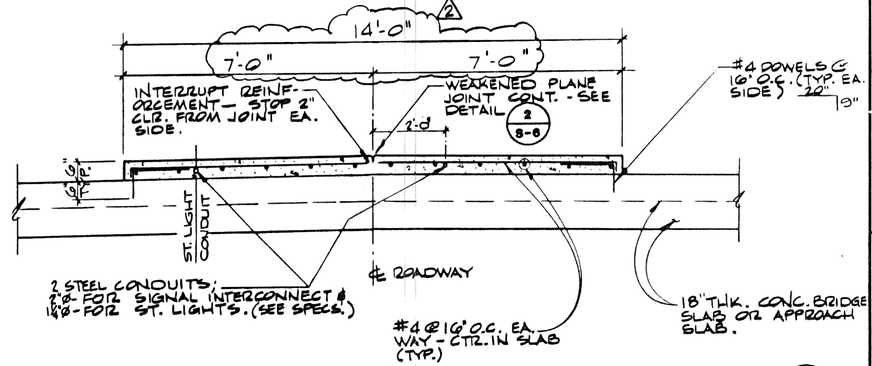
F S-6

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

DETAIL

2 S-6

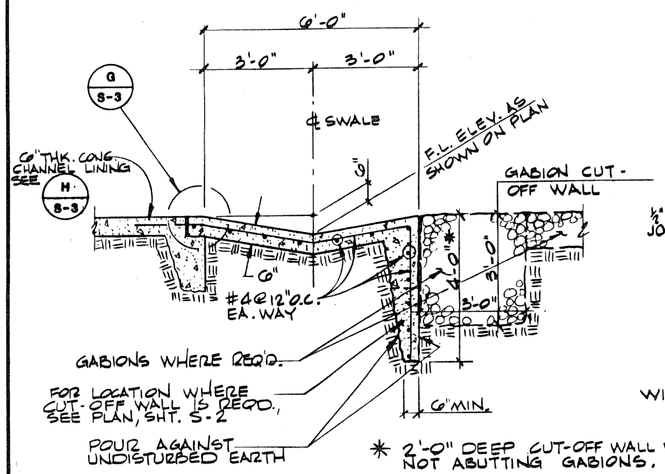
NO SCALE



SECTION

D S-6

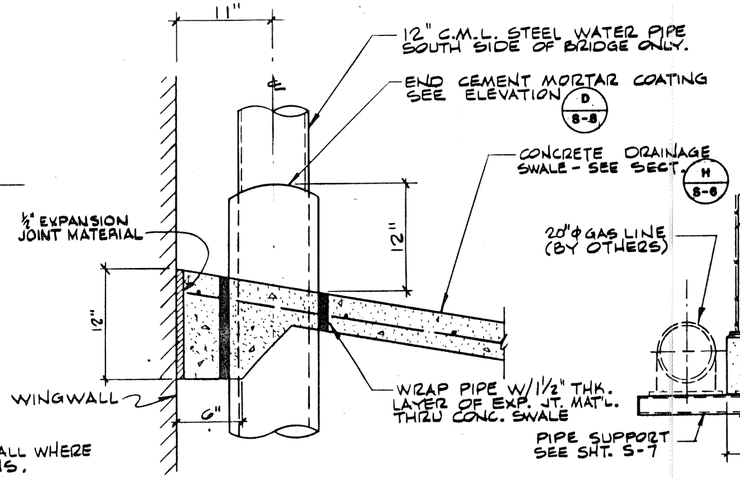
SCALE: 3/8" = 1'-0"



SECTION

H S-2

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



SECTION

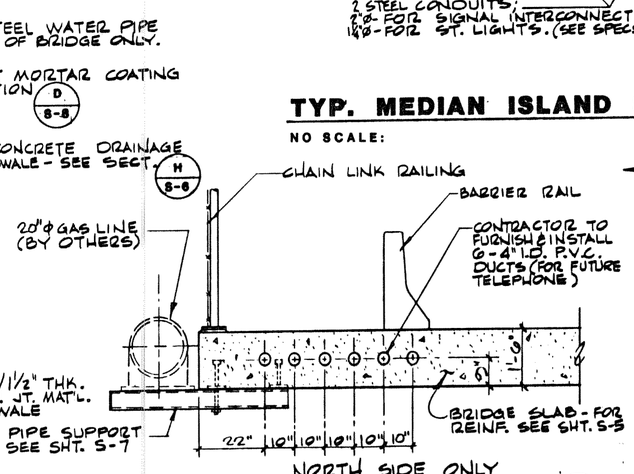
K S-2

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

TYP. MEDIAN ISLAND SECTION

G S-2

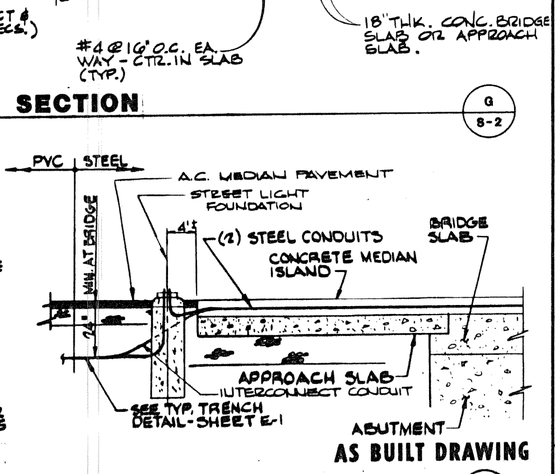
NO SCALE:



SECTION

L S-4

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



SECTION

TYPICAL BOTH ENDS OF BRIDGE

M S-2

REV	DATE	DESCRIPTION
1	11/4/82	CHG'D APPROACH SLAB KEYWAY BY WING WALL FROM 9" TO 8"
2	7/31/85	AS-BUILT - REV. MEDIAN.

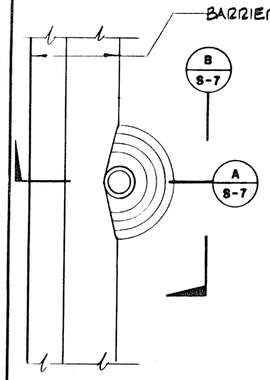
RECOMMENDED 2/12/82 DATE
APPROVED DATE
STATE OF NEVADA — PROFESSIONAL ENGINEER — GEORGE C. WALLACE — REGISTERED STRUCTURAL ENGINEER

G.C. WALLACE
Consulting Engineers, Inc.
1100 East Sahara Ave. - Las Vegas, Nevada 89104 - 732-3330

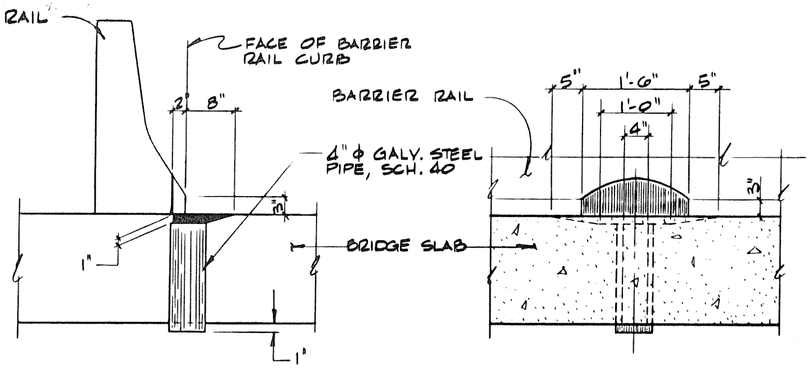
CLARK COUNTY PUBLIC WORKS DEPT.
SUNSET ROAD BRIDGE & CHANNEL
BRIDGE STRUCTURE
MISC. SECTIONS & DETAILS

SHEET

JOB NO. 500.020



PLAN



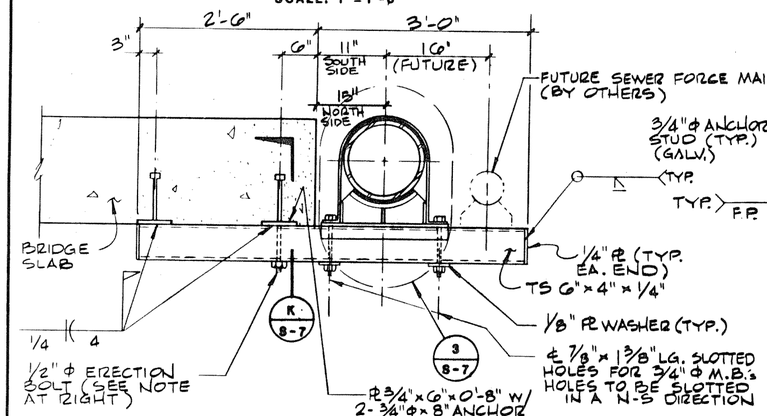
SECTION A S-7

SECTION B S-7

DECK DRAINAGE DETAIL

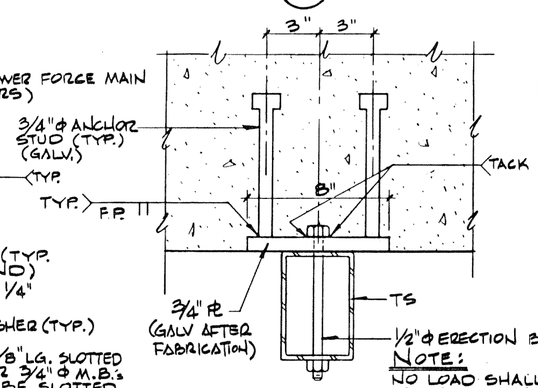
1 S-4

SCALE: 1" = 1'-0"



SECTION J S-4

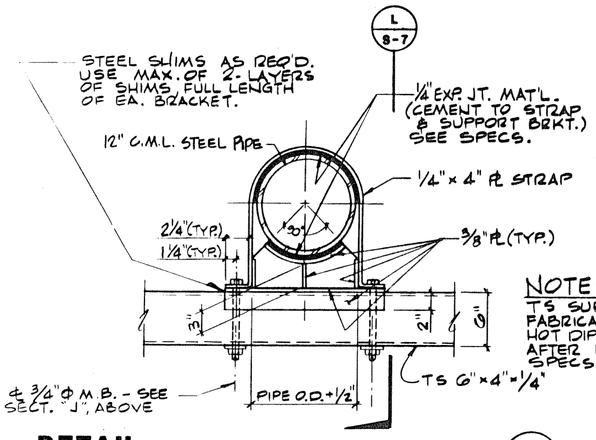
SCALE: 1" = 1'-0"



NOTE:
NO LOAD SHALL BE APPLIED TO THE SUPPORT BRACKET (TS 6x4) UNTIL AFTER IT IS WELDED TO THE EMBEDDED PL's.

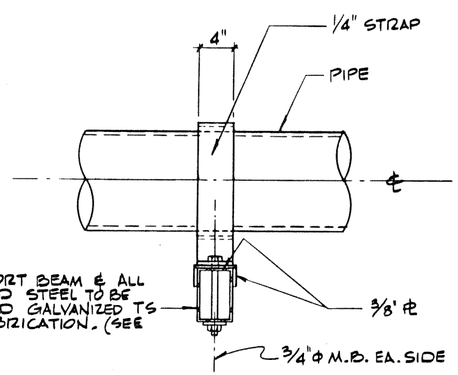
SECTION K S-7

SCALE: 3" = 1'-0"



DETAIL 3 S-7

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

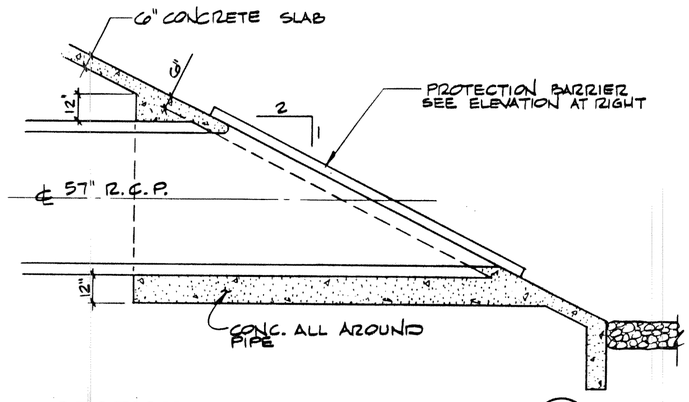


NOTE:
TS SUPPORT BEAM & ALL FABRICATED STEEL TO BE HOT DIPPED GALVANIZED TS AFTER FABRICATION. (SEE SPECS.)

SECTION L S-7

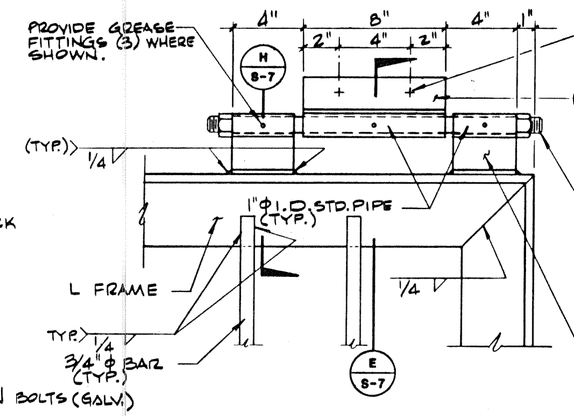
SCALE: 1 1/2" = 1'-0"

PIPE SUPPORT DETAILS



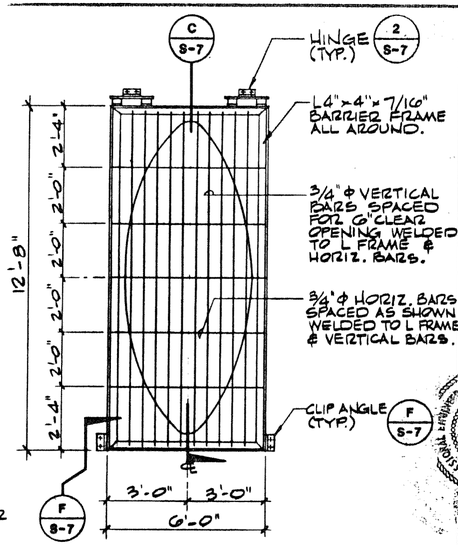
SECTION C S-2

SCALE: 3/8" = 1'-0"



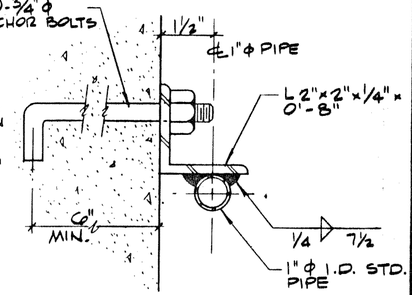
DETAIL 2 S-7

SCALE: 3" = 1'-0"



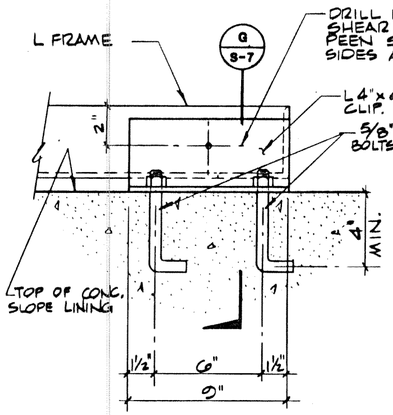
ELEVATION D S-7

SCALE: 3/8" = 1'-0"



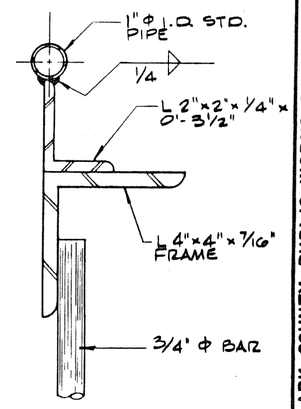
SECTION E S-7

SCALE: 1/2" = 1"



SECTION G S-7

SCALE: 3" = 1'-0"



SECTION H S-7

SCALE: 1/2" = 1"

NOTES:
1) COVER ALL MOVABLE CONTACT SURFACES WITH A COAT OF WATERPROOF GREASE PRIOR TO INSTALLATION.
2) GALV. ALL FERROUS PARTS AFTER FABRICATION (SEE SPECS.)

SECTION F S-7

SCALE: 3" = 1'-0"

PROTECTION BARRIER DETAILS

AS BUILT DRAWING

REV	DATE	DESCRIPTION
		"AS-BUILT" NO REVISIONS
△	8/83	

RECOMMENDED FOR APPROVAL — Thomas Wallace — 2/24/82 — DATE

STATE OF NEVADA — DEPARTMENT OF HIGHWAYS — PROJECT NO. BRF-068(3) — APPROVED — 2/24/82 — DATE

G.C. WALLACE, Inc.
Consulting Engineers
3100 East Sahara Ave. • Las Vegas, Nevada 89104 • 733-8300

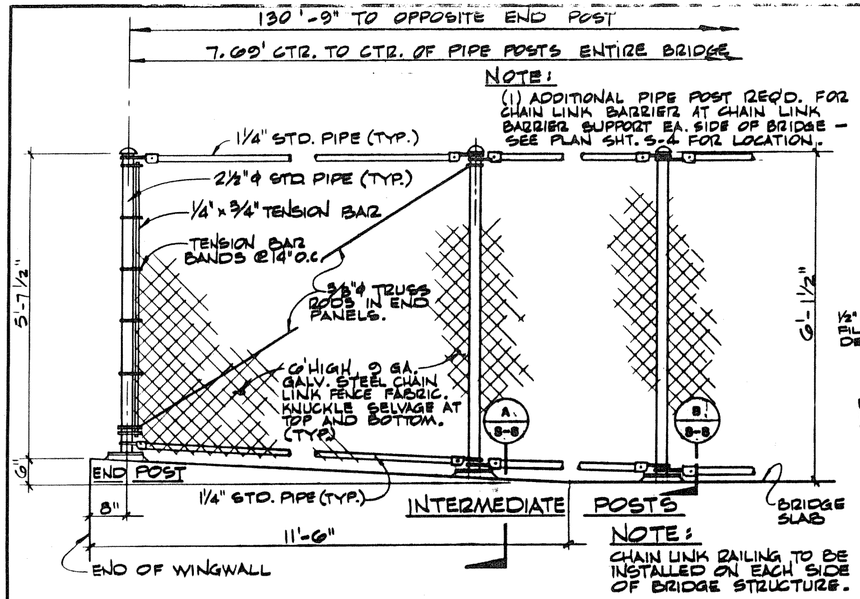
CLARK COUNTY PUBLIC WORKS DEPT.
SUNSET ROAD BRIDGE & CHANNEL
BRIDGE STRUCTURE
MISC. SECTIONS & DETAILS

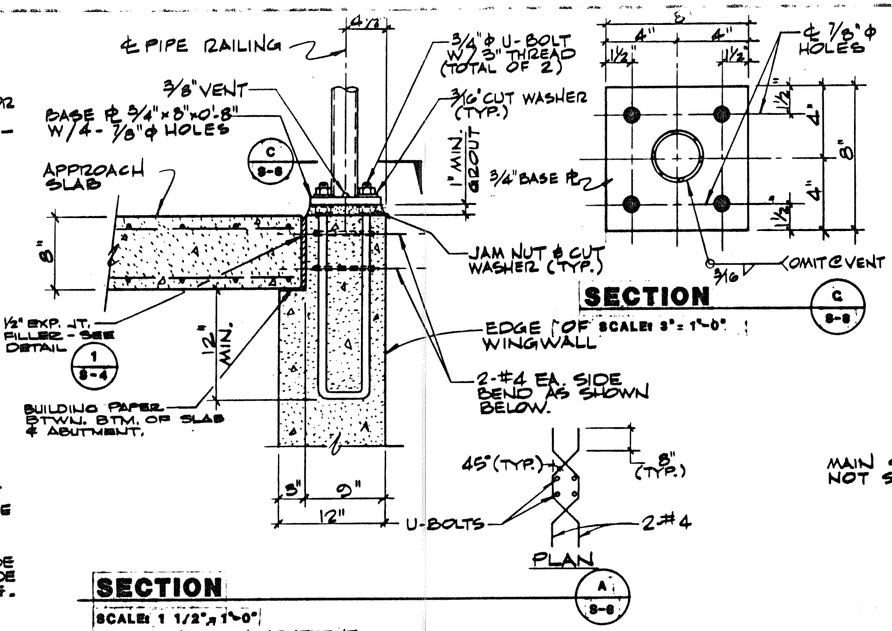
SHEET S-7 OF 26 SHEETS

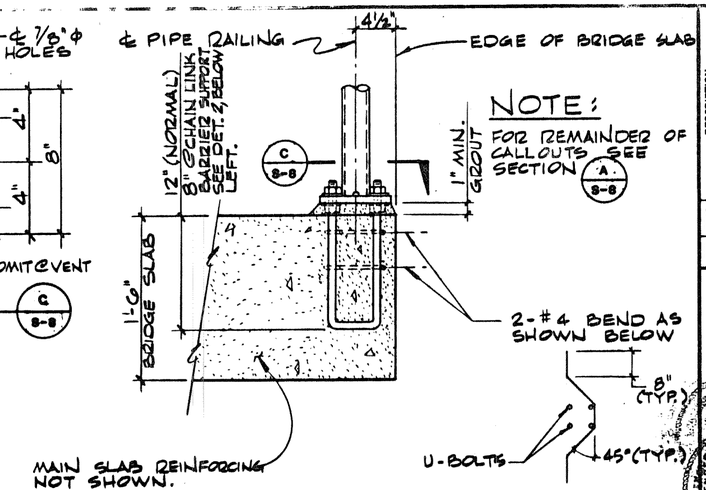
JOB NO. 500.020

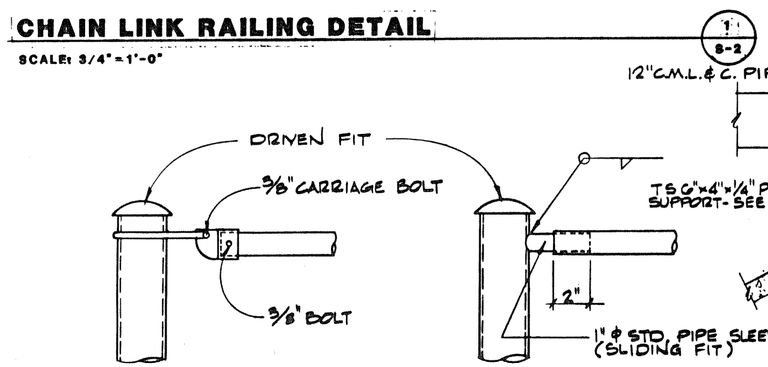
9/78 DIETERICH-POST 65309

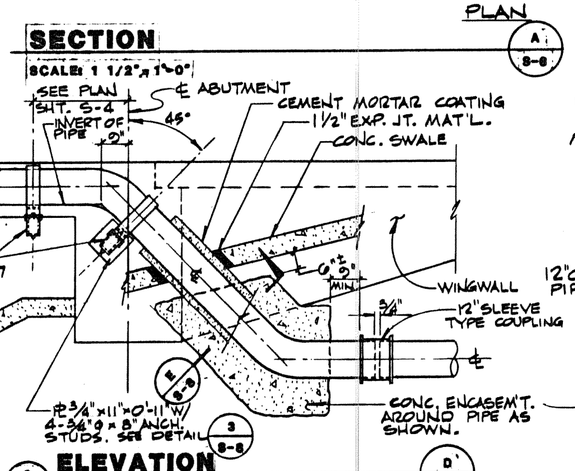
L-1087

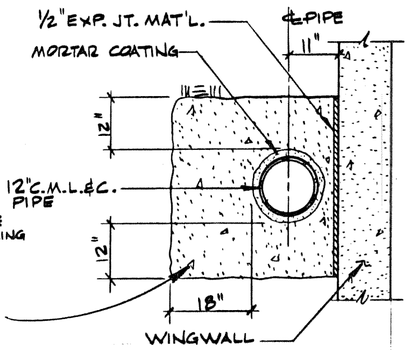


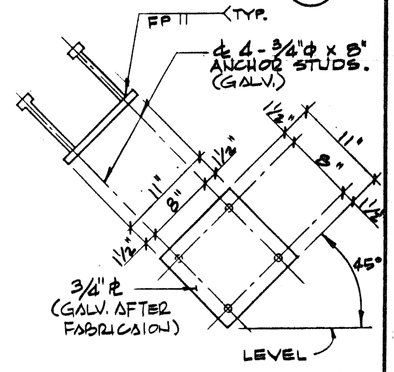


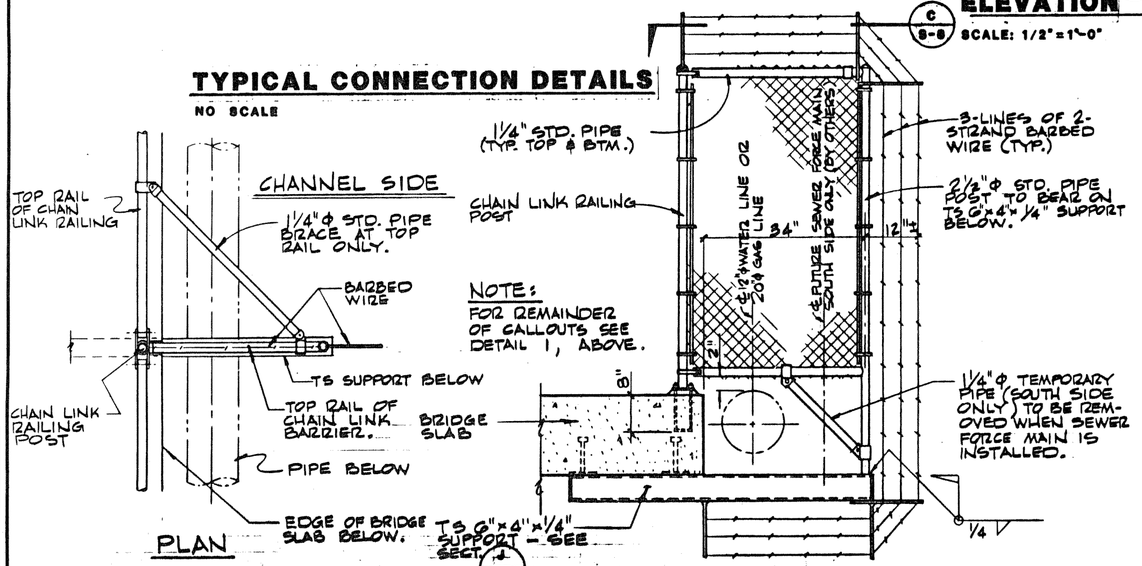


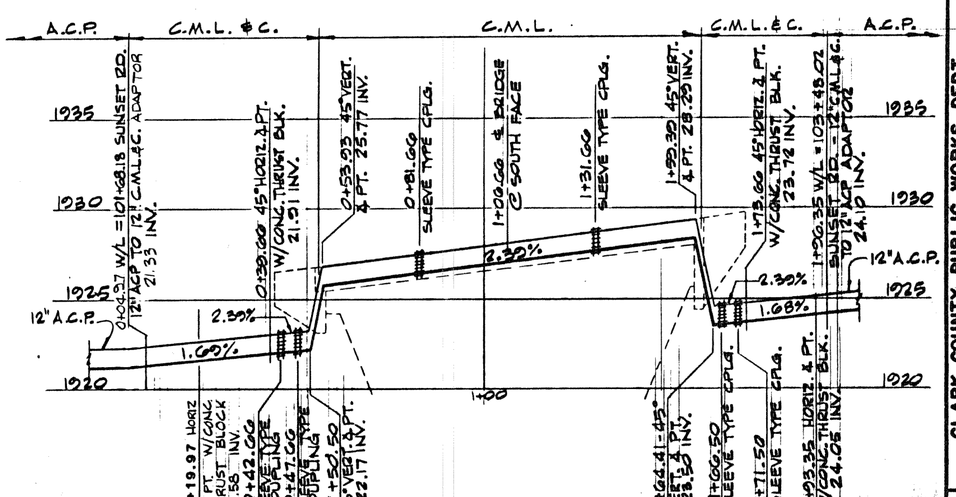




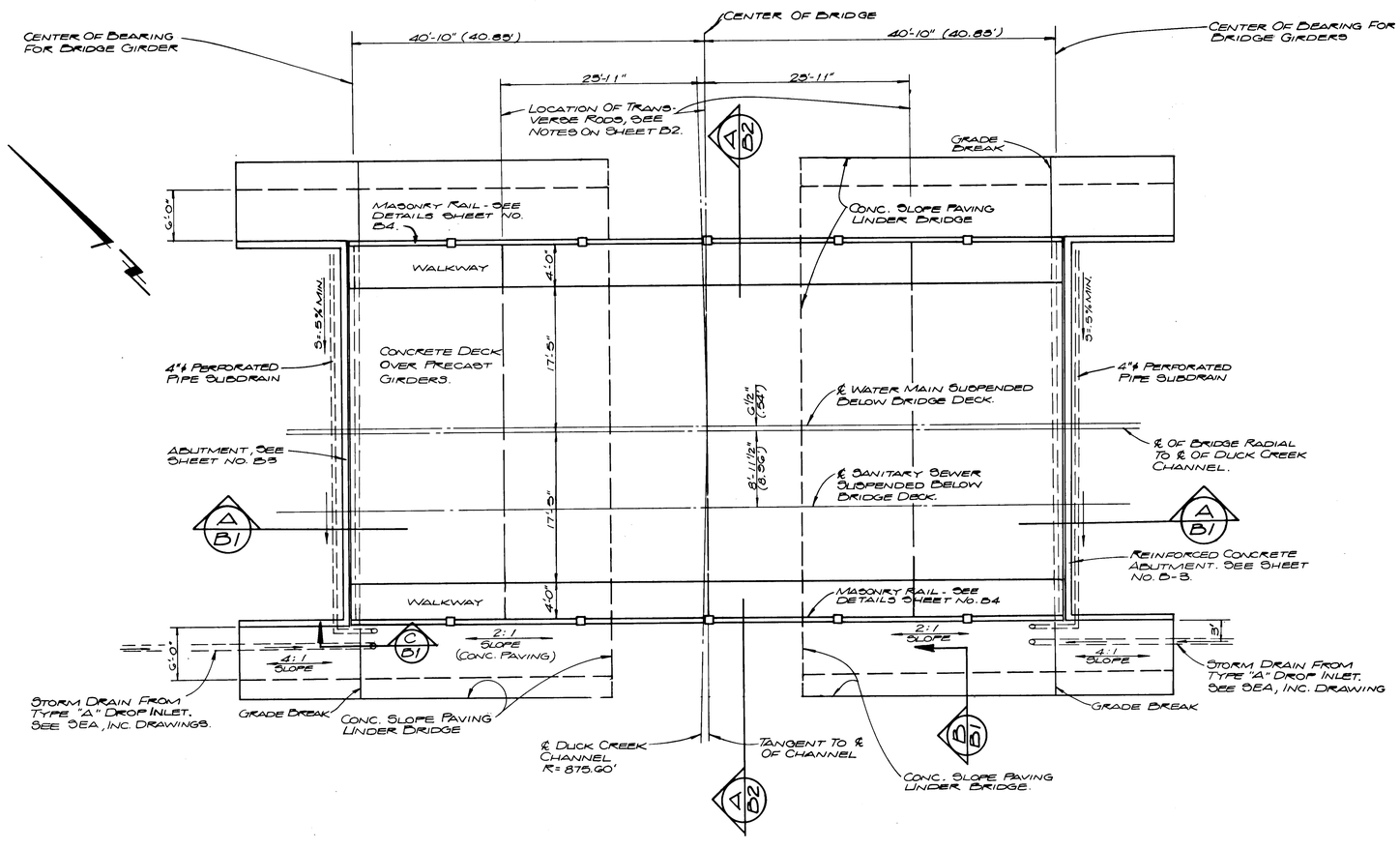








REV | DATE | DESCRIPTION
1 | 10/88 | AS-BUILT - NO REVISIONS
2168 2/1988
G.C. WALLACE Consulting Engineers, Inc. 1100 East Sahara Ave., Las Vegas, Nevada 89104 • 732-3550
CLARK COUNTY PUBLIC WORKS DEPT.
SUNSET ROAD BRIDGE & CHANNEL
BRIDGE STRUCTURE
MISC. SECTIONS & DETAILS
SHEET S-8 OF 26 SHEETS
JOB NO. 500.020
L-1087



BRIDGE PLAN
SCALE: 1/8"=1'-0"

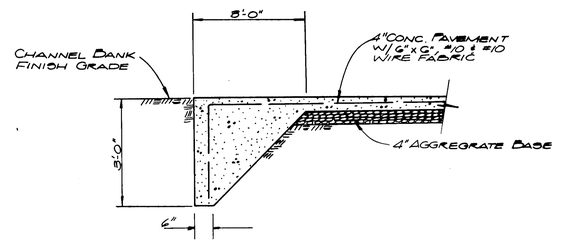
NOTES:
1. BRIDGE DESIGN AS INDICATED ON SHEETS NO. B-1 THROUGH B-4 IS BASED ON USE OF PRECAST, PRESTRESSED CONCRETE BOX GIRDERS TO BE PROVIDED BY HOLCOMB CONSTRUCTION CO., INC. RENO, NEVADA.
2. SEE PLANS PREPARED BY SEA, INCORPORATED FOR LOCATION AND ALIGNMENT OF BRIDGE STRUCTURE AND LOCATION AND ALIGNMENT OF WATER MAIN AND SANITARY SEWER TO BE SUSPENDED BELOW BRIDGE DECK.
3. THE CONTRACTOR SHALL VERIFY DIMENSIONS OF PRECAST GIRDERS PRIOR TO ESTABLISHING LOCATION OF ABUTMENTS.
4. SEE SHEET NO. B-4 FOR SPECIFICATION NOTES AND SHEET NO. B-2 FOR PLACEMENT OF PRECAST GIRDERS.
5. SEE SHEET NO. B-2 FOR DETAILS OF HANGERS FOR SEWER AND WATER LINE SUSPENDED BELOW BRIDGE DECK.

APPROVALS:

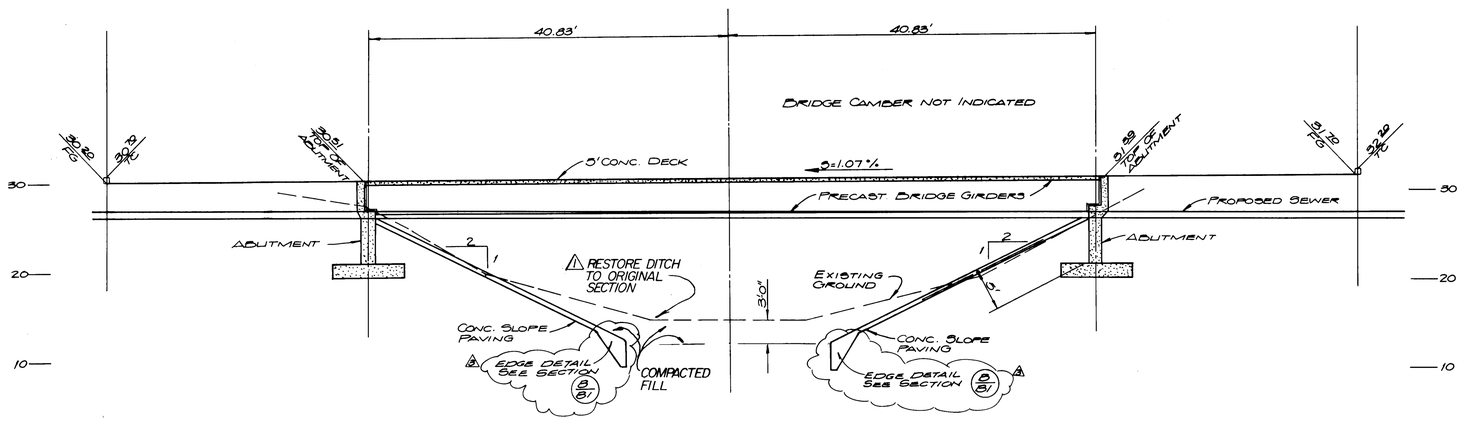
P. Vinson Carter NEVADA POWER COMPANY	3/17/88 DATE
Wade Smith CENTRAL TELEPHONE COMPANY	3/17/88 DATE
Thomas J. Hosea SOUTHWEST GAS COMPANY	3/18/88 DATE
Joe Tritten BUILDING SUPERINTENDENT CITY OF HENDERSON	3-18-88 DATE
Hall Harr FIRE CHIEF CITY OF HENDERSON	3-21-88 DATE

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW & APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON IF WORK IS NOT COMPLETED BY 3.21. 1989

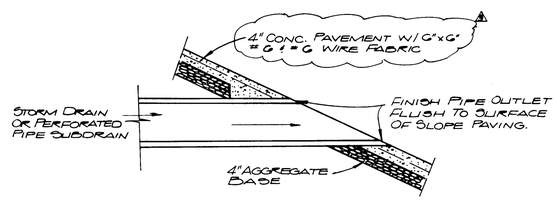
REGISTERED PROFESSIONAL ENGINEER MILTON SHARP CIVIL No. 1255



SECTION B/B1
SCALE: 1/2"= 1'-0"



BRIDGE PROFILE A/B1
SCALE: 1/8"= 1'-0"



SECTION C/B1
TYPICAL DRAIN PIPE OUTLET
SCALE: 1/2"=1'-0"

MARK	DATE	REVISIONS	BY
			CVA
1	3-16-88	REV PER CON AUTH BY MILTON SHARP	MLS
2	3-14-88	ADD APPROVALS	MLS
3	3-14-88	ADD DITCH CHANNEL RESTORATION NOTE	MLS

BENCH MARK
DESIGNED BY MLS
DRAWN BY MAE
CHECKED BY MLS
DATE SURVEYED
APPROVED BY
DATE FEB 1, 1988
R.E. NO. 1255

MILTON L. SHARP, P.E.
Consulting Engineer
2295 SKYLINE BLVD., SUITE 205, RENO, NEVADA 89509 · (702) 827-1077

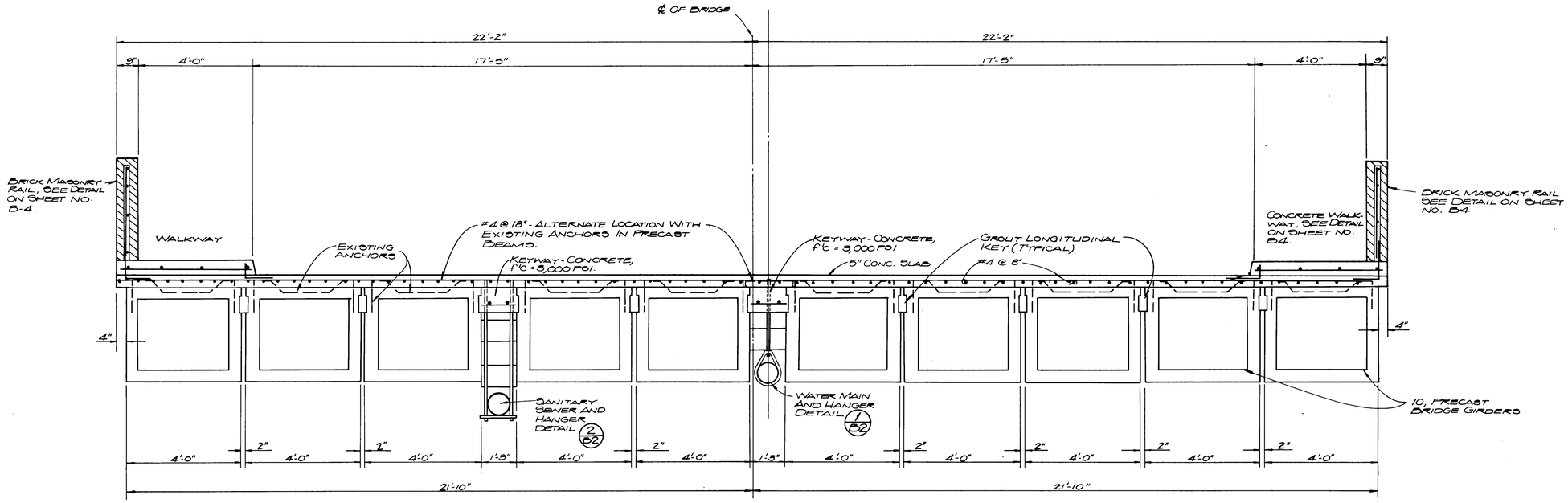
SUNSET CLIFFS APARTMENTS
BRIDGE AT DUCK CREEK CHANNEL

BRIDGE PLAN & PROFILE

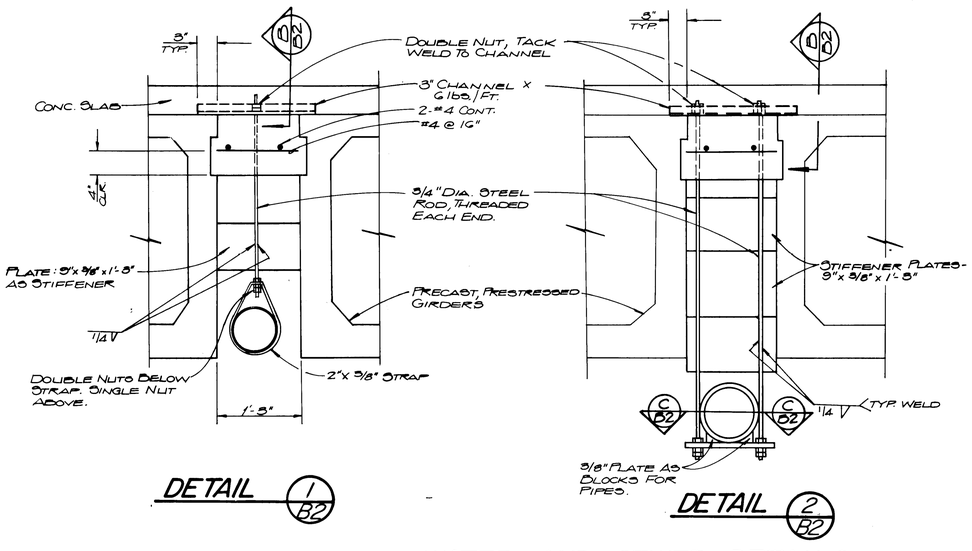
JOB NO. 2387
DATE JAN. 1988
SHEET B1 OF

Ø3037

BRUNING 44-132-45261

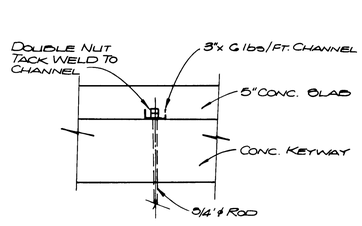


SECTION A/B2
SCALE: 1/2"=1'-0"

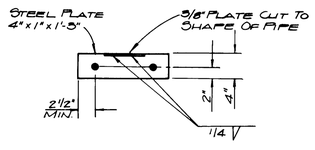


DETAIL 1/B2

DETAIL 2/B2



SECTION B/B2



SECTION C/B2

WATER AND SEWER DETAILS
SCALE: 1" = 1'-0"

PRECAST GIRDERS ERECTION NOTES:

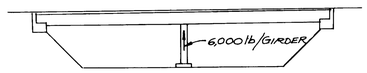
1. PRECAST GIRDERS SHALL BE PLACED ON PRECONSTRUCTED ABUTMENTS AND SHALL BE SPACED AS INDICATED IN SECTION A/B2.

2. TRANSVERSE RODS WILL BE FURNISHED AND INSTALLED AT LOCATIONS INDICATED ON THE BRIDGE PLAN, SHEET NO. B-1. CONTRACTOR SHALL VERIFY LOCATIONS OF TRANSVERSE RODS FROM EXISTING GIRDERS.

3. TRANSVERSE RODS SHALL CONSIST OF 1¼" DIA. STEEL, THREADED EACH END, WITH NUTS AND 6"x6"x1" STEEL ANCHOR PLATES FOR EACH END. ANCHOR PLATES WILL HAVE A 1¼" DIA. HOLE AT THE CENTER TO FIT OVER ENDS OF RODS. ALL RODS, NUTS AND ANCHOR PLATES WILL BE GALVANIZED.

PRIOR TO GROUTING THE LONGITUDINAL KEYS, THE PRECAST MEMBERS WILL BE BLOCKED IN POSITION WITH SPACER BLOCKS. THE TRANSVERSE RODS WILL BE GIVEN A PRELIMINARY TIGHTENING TO HOLD THE MEMBERS IN POSITION DURING GROUTING OPERATIONS. AFTER THE GROUT HAS CURED, EACH TRANSVERSE ROD WILL BE TENSIONED TO 30,000 POUNDS (TORQUE TO 500 POUNDS). MEMBERS ARE TO BE GROUTED AND THE RODS TENSIONED BEFORE THE DECK SLAB IS PLACED.

4. BEFORE CONCRETE FOR THE DECK SLAB IS PLACED, AN UPWARD JACKING FORCE OF 6,000 LB. PER GIRDER SHALL BE PROVIDED AT THE MIDSPAN AND MAINTAINED UNTIL THE DECK CONCRETE HAS ATTAINED DESIGN STRENGTH (f'c=5,000 psi).



JACKING METHODS AND SUPPORTS SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.

NO VEHICULAR LOADS EXCEPT CONCRETE FINISHING EQUIPMENT BE ALLOWED ON THE PRECAST MEMBERS UNTIL THE TOP SLAB CONCRETE HAS REACHED THE REQUIRED COMPRESSIVE STRENGTH (f'c=5,000 psi).

6. ALTERNATE HANGER DETAILS FOR WATER MAIN AND SEWER MAY BE PROVIDED SUBJECT TO ENGINEER'S APPROVAL.

7. ALL MATERIAL FOR HANGERS SHALL BE GALVANIZED. HANGERS SHALL BE SPACED @ 10'0". PIPE FOR WATER MAIN AND SEWERS SHALL BE WEATHER RESISTANT AND CAPABLE OF SPANNING BETWEEN HANGERS. PIPE MATERIAL SHALL BE SUBJECT TO ENGINEER'S APPROVAL.

REGISTERED PROFESSIONAL ENGINEER — MILTON L. SHARP — CIVIL — No. 1255 — STATE OF NEVADA

BENCH MARK		DESIGNED BY	MLS	DRAWN BY	MAE
		CHECKED BY	MLS	DATE SURVEYED	
		APPROVED BY		DATE	FEB. 1, 1988

DATE	MARK	REVISIONS	BY

MILTON L. SHARP, P.E.
Consulting Engineer
2295 SKYLINE BLVD., SUITE 205, RENO, NEVADA 89509 • (702) 827-1077

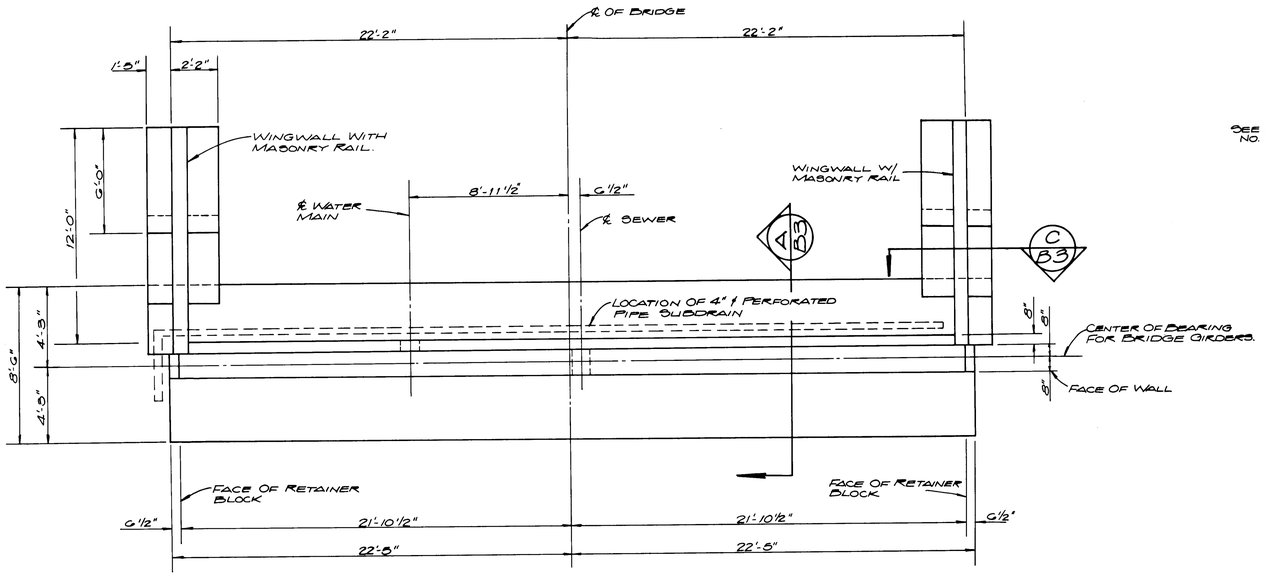
SUNSET CLIFFS APARTMENTS
BRIDGE AT DUCK CREEK CHANNEL

SECTIONS & DETAILS

JOB NO. 2387
DATE JAN. 1988
SHEET B2 OF

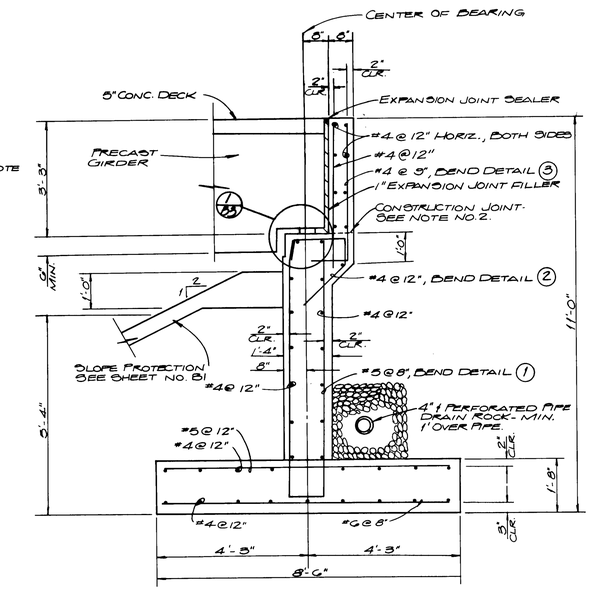
Ø3037

BRUNING 44-132 49261



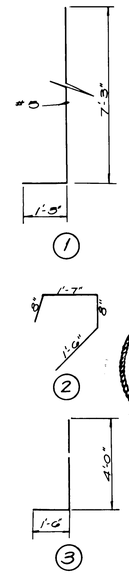
PLAN - NORTH ABUTMENT

SOUTH ABUTMENT IS SYMMETRICAL AND ALL DETAILS AND DIMENSIONS ARE THE SAME.
SCALE: 1/4" = 1'-0"



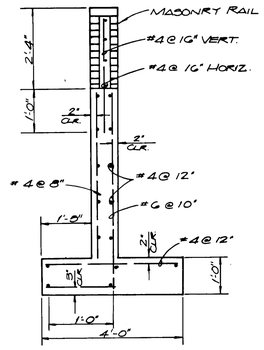
SECTION (A / B3)

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

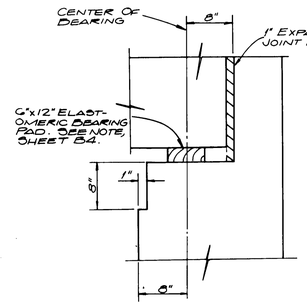


SECTION A / B3 BAR BEND DETAILS

N.T.S.

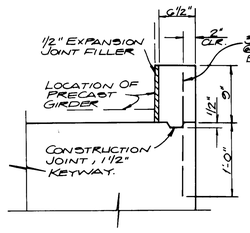


SECTION (C / B3)



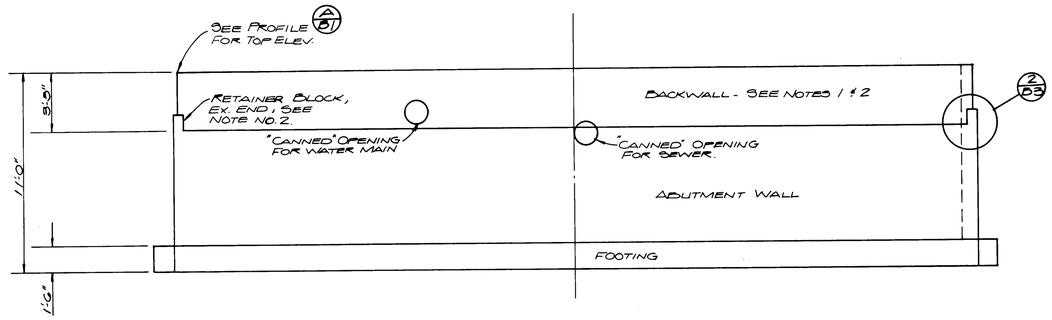
DETAIL (1 / B3)

SCALE: 1" = 1'-0"



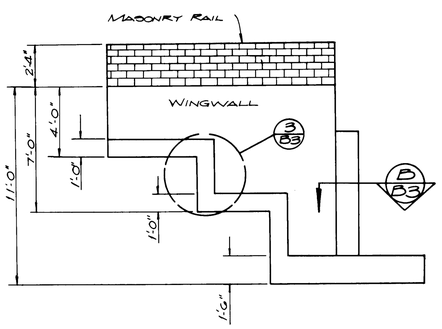
DETAIL (2 / B3)

SCALE: 1" - 1'-0"



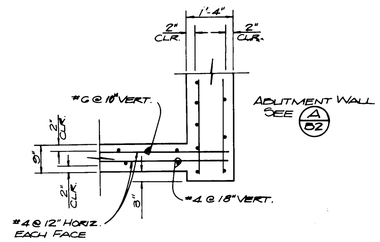
ELEVATION - NORTH ABUTMENT

SOUTH ABUTMENT IS SYMMETRICAL AND ALL DETAILS AND DIMENSIONS ARE THE SAME.
SCALE: 1/4" = 1'-0"



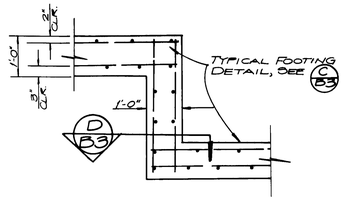
ELEVATION - WINGWALL

SCALE: 1/4" = 1'-0"



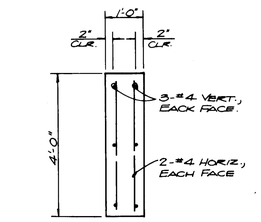
SECTION (B / B3)

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



STEP FOOTING DETAIL (4 / B3)

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



SECTION (D / B3)

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

NOTES, ABUTMENT CONSTRUCTION:
1. CONTRACTOR SHALL VERIFY DIMENSION OF GIRDER END BEFORE CONSTRUCTION OF ABUTMENTS.
2. BACKWALL AND RETAINER BLOCKS WILL NOT BE CONSTRUCTED UNTIL AFTER PRECAST GIRDERS ARE SET IN PLACE.

BY	REVISIONS	MARK	DATE
	-		

BENCH MARK

DESIGNED BY MLS | DRAWN BY MAE | CHECKED BY MLS | DATE SURVEYED | APPROVED BY | DATE FEB. 1, 1988 | R.E. NO. 12551

REGISTERED PROFESSIONAL ENGINEER — MILTON L. SHARP — CIVIL — No. 1255 — STATE OF NEVADA

MILTON L. SHARP, P.E.
Consulting Engineer
295 RIDGE LAKE BLVD., SUITE 205, RENO, NEVADA 89509 - (702) 827-1077

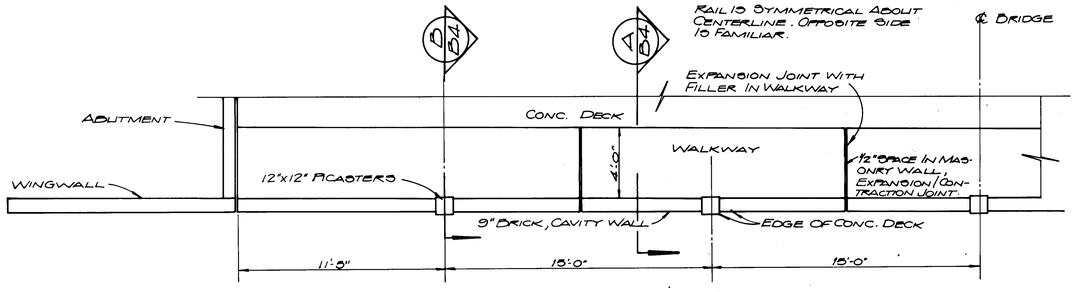
SUNSET CLIFFS APARTMENTS
BRIDGE AT DUCK CREEK CHANNEL

ABUTMENT PLANS AND DETAILS

JOB NO. 2387
DATE JAN. 1988
SHEET B3 OF

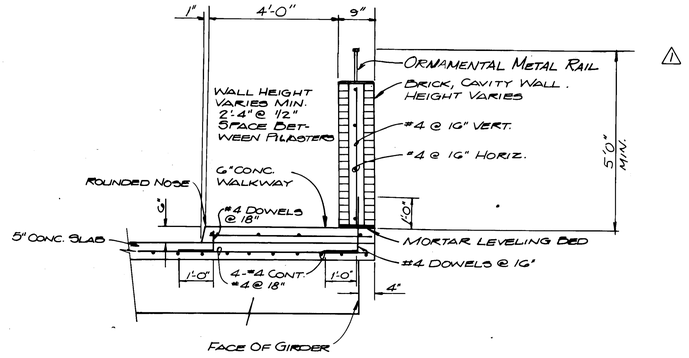
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BRUNING 44-132 45261



PLAN - MASONRY RAIL

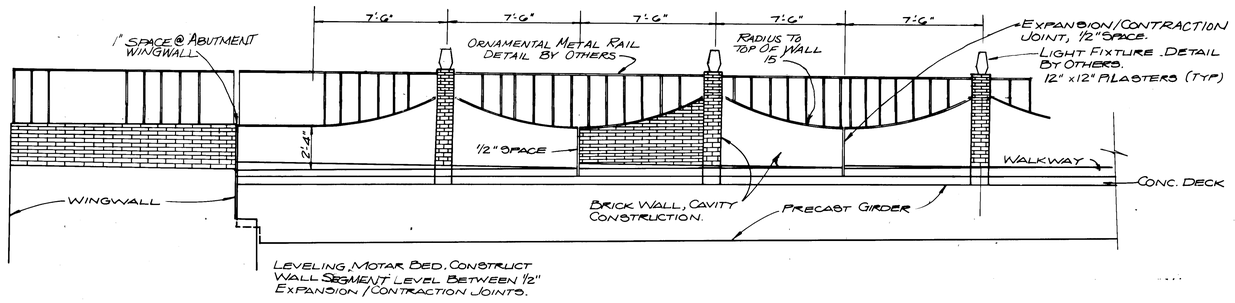
SCALE: 1/4"=1'-0"



SECTION (A B4)

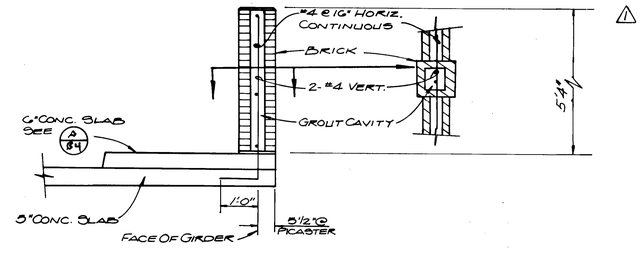
TYPICAL WALKWAY AND RAIL

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



ELEVATION - MASONRY RAIL

SCALE: 1/4" = 1'-0"



SECTION (B B4)

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

SPECIFICATION NOTES

DESIGN SPECIFICATIONS: AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 1973," AND INTERIM SPECIFICATIONS THROUGH 1981.

CONSTRUCTION SPECIFICATIONS: STATE OF NEVADA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 1976" EXCEPT AS NOTED BELOW.

CONCRETE: ALL CONCRETE SHALL BE CLASS A, ULTIMATE COMPRESSIVE STRENGTH f'_c = 3000 PSI AT 28 DAYS; EXCEPT THE DECK SLAB, WHICH SHALL BE CLASS A MODIFIED (MAJOR), ULTIMATE COMPRESSIVE STRENGTH f'_c = 5,000 PSI AT 28 DAYS.

CEMENT SHALL BE TYPE II CONFORMING TO ASTM C150 EXCEPT THAT CONCRETE IN CONTACT WITH EARTH (FOOTING, ETC.) SHALL HAVE TYPE V CEMENT OR EQUAL.

THE CONCRETE MIXES SHALL BE DESIGNED BY A CERTIFIED INDEPENDENT TESTING LABORATORY. COPIES OF THE DESIGN IN ADDITION TO 7 AND 28 DAY CYLINDER TEST RESULTS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER AND THE CITY BUILDING DEPARTMENT. APPROVAL SHALL BE OBTAINED PRIOR TO USING THE CONCRETE IN THE STRUCTURE.

GROUT FOR SHEAR KEYS BETWEEN PRECAST MEMBERS SHALL BE COMPOSED OF ONE (1) PART BY VOLUME OF CEMENT TO TWO (2) PARTS VOLUME OF SAND. THE GROUT SHALL CONTAIN ONLY ENOUGH WATER TO PERMIT PLACING & TAMPING.

CONCRETE AREAS TO BE IN CONTACT WITH THE GROUT SHALL BE CLEANED OF ALL LOOSE OR FOREIGN MATERIAL THAT WOULD IN ANY WAY PREVENT BOND BETWEEN THE GROUT AND THE CONCRETE SURFACES. THESE AREAS SHALL BE FLUSHED WITH WATER AND ALLOWED TO DRY TO A SURFACE DRY CONDITION IMMEDIATELY PRIOR TO PLACING THE GROUT.

LONGITUDINAL KEYWAYS AND OTHER LOCATIONS WHERE GROUT COULD ESCAPE SHALL BE MORTAR-TIGHT BEFORE PLACING GROUT. THE GROUT SHALL BE THOROUGHLY TAMPED INTO THE OPENINGS. AFTER PLACING, THE GROUT SHALL BE CURED BY THE WATER METHOD FOR A PERIOD OF NOT LESS THAN THREE DAYS.

ALL IMPROPERLY CURED OR OTHERWISE DEFECTIVE GROUT SHALL BE REMOVED AND REPLACED BY THE CONTRACTOR AT HIS EXPENSE.

FINISHING CONCRETE SURFACES: ALL EXPOSED CONCRETE SURFACES, EXCEPT SURFACE OF DECK SLAB AND UNDER SIDE OF BRIDGE SHALL BE FINE SURFACE FINISH (NEV. D.O.T. SPECIFICATIONS).

REINFORCING STEEL: ALL REINFORCING STEEL SHALL BE ASTM A615 GRADE 60. DIMENSIONS RELATING TO BAR SPACING ARE CENTER TO CENTER. BENDING DIMENSIONS ARE OUT TO OUT OF BARS.

STRUCTURAL STEEL: ALL STRUCTURAL STEEL SHALL BE ASTM A-36. PIPE SHALL BE WELDED SEAMLESS CONFORMING TO ASTM A-53, GRADE "B". TUBE STEEL SHALL BE COLD FORMED CONFORMING TO ASTM A500 GRADE "C".

PRECAST, PRESTRESSED CONCRETE: THE PRECAST PRESTRESSED CONCRETE MEMBERS WERE DESIGNED IN ACCORDANCE WITH AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES."

THE MEMBERS WERE CONSTRUCTED IN ACCORDANCE WITH THE STATE OF NEVADA DEPT. OF HIGHWAYS "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 1976".

SEE EVALUATION OF CONCRETE BOX GIRDERS REPORT PREPARED BY JOHN WEBSTER BROWN, CIVIL & STRUCTURAL ENGINEERS, INC., 642 NO. SIERRA ST. RENO, NEVADA 89503, DATED APRIL 2, 1980.

ELASTOMERIC BEARING PADS: THE BEARINGS SHALL BE 50 DUROMETER ELASTOMERIC BEARING PADS WITH LAMINATIONS AT 1/2" INCREMENTS. THE PADS SHALL BE 2" THICK X 6" WIDE AND SHALL BE CONTINUOUS FOR THE FULL LENGTH OF ABUTMENT BEARING SEAT.

MARK	DATE	REVISIONS	BY
1	3-14-88	INCREASE RAILING HEIGHT TO 5'	MLS

DESIGNED BY MLS — DATE SURVEYED —
DRAWN BY MAE — DATE 1-29-88
CHECKED BY MLS — DATE —
APPROVED BY — DATE FEB. 1, 1988 — R.E. NO. 12557

REGISTERED PROFESSIONAL ENGINEER — MILTON L. SHARP — CIVIL — No. 1255

MILTON L. SHARP, P.E.
Consulting Engineer
295 SKYLINE BLVD., SUITE 205, RENO, NEV/ADA 89509 - (702) 827-1977

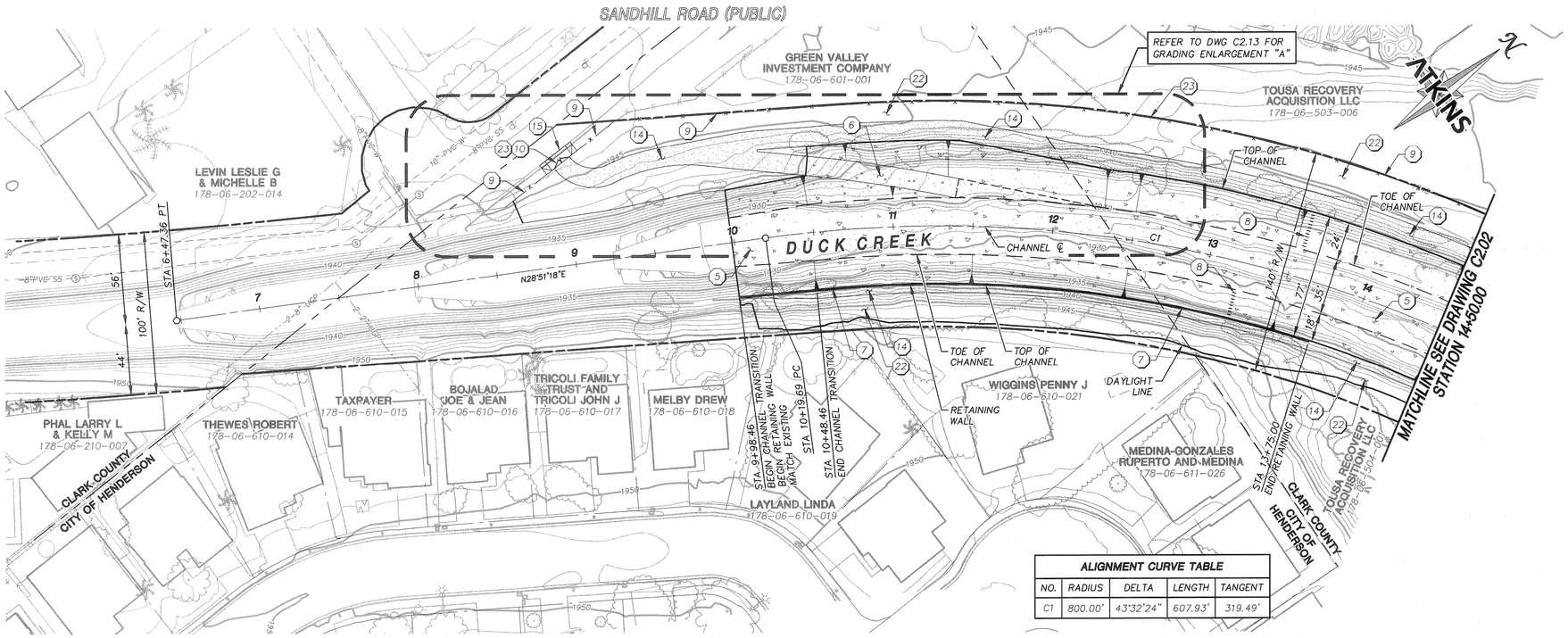
SUNSET CLIFFS APARTMENTS
BRIDGE AT DUCK CREEK CHANNEL
DETAILS & SPECIFICATIONS

JOB NO. 2387
DATE JAN. 1988
SHEET B4 OF

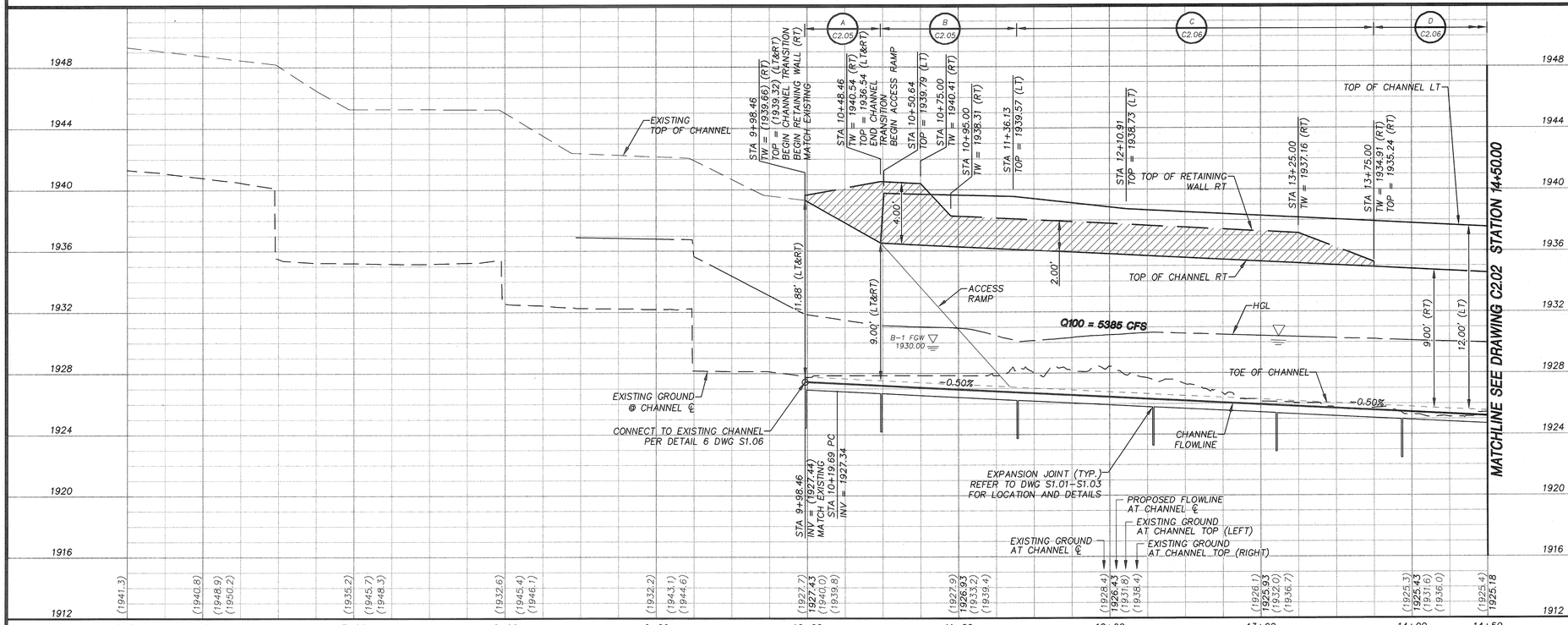
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Appendix D

Improvement Plans



ALIGNMENT CURVE TABLE				
NO.	RADIUS	DELTA	LENGTH	TANGENT
C1	800.00'	43°32'24"	607.93'	319.49'



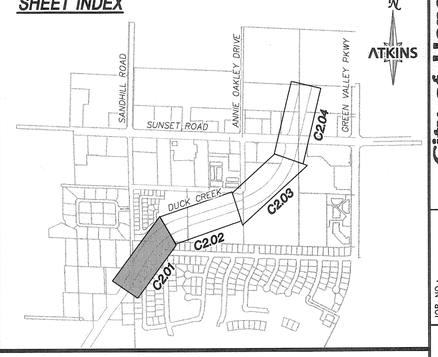
KEY NOTES

1. INSTALL 24" RCP SD PER TRENCH DETAIL 2 DRAWING C2.21
2. INSTALL 36" RCP SD PER TRENCH DETAIL 2 DRAWING C2.21
3. INSTALL 57" RCP SD PER TRENCH DETAIL 2 DRAWING C2.21
4. CONSTRUCT TYPE III MANHOLE PER USD #406
5. CONSTRUCT CONCRETE CHANNEL PER DRAWINGS C2.05-C2.12
6. CONSTRUCT CONCRETE ACCESS RAMP PER DRAWING C2.05
7. INSTALL POST AND CABLE FENCE PER DETAIL 1 DRAWING C2.22
8. INSTALL ACCESS LADDER PER DETAIL 5 DRAWING C2.22
9. INSTALL 72" CHAIN LINK FENCE PER USD #252
10. INSTALL 12' DOUBLE SWING GATE PER USD #253
11. CONNECT RCP SD TO CONCRETE CHANNEL PER DETAIL 4 DRAWING S1.06
12. CONSTRUCT CONCRETE COLLAR PER DETAIL 3 DRAWING C2.21
13. CONSTRUCT CONCRETE SLOPE PAVING PER DETAIL 2 DRAWING C2.24
14. CONSTRUCT 8" TYPE II AGGREGATE BASE MAINTENANCE ACCESS ROAD/MANWAY PER DRAWINGS C2.05-C2.12
15. CONSTRUCT 16' COMMERCIAL AND INDUSTRIAL DRIVEWAY (OPTION A) PER USD #224
16. CONSTRUCT CHANNEL MONITORING STATION PER DETAIL 1 DRAWING C2.17
17. CONSTRUCT GABIONS PER DETAIL 1 DRAWING C2.25
18. INSTALL COLLAPSIBLE BOLLARDS PER DETAIL 4 DRAWING C2.21
19. CONSTRUCT CONCRETE VALLEY GUTTER PER DETAIL 2 DRAWING C2.25
20. CONSTRUCT U-SHAPE GUTTER PER DETAIL 3 DRAWING C2.25
21. PROTECT-IN-PLACE EXISTING BRIDGE COLUMNS. REFER TO DETAIL C DRAWING S1.05 FOR CONCRETE CHANNEL AT EXISTING COLUMNS
22. APPLY DUST PALLIATIVE IN AREAS OUTSIDE OF CHANNEL
23. INSTALL NO TRESPASSING SIGN PER DETAIL 1 DRAWING C2.27
24. REMOVE, SALVAGE AND INSTALL EXISTING TRASH RACK

EXISTING UTILITIES ARE LOCATED ON THE PLANS FROM A SEARCH OF AVAILABLE RECORDS. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION

GRAPHIC SCALE
40 0 20 40 80 160
(IN FEET)
HORZ: 1 inch = 40 ft. VERT: 1 inch = 4 ft.

SHEET INDEX



Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES IT'S COSTLY. Call 811 OR 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

PROFESSIONAL ENGINEER STATE OF NEVADA STEVEN M. BELLINO EXP. 12-31-14 CIVIL No. 19040 10/21/13

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2379 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1(702)263-7275
Fax: +1(702)263-7090

THE CITY OF HENDERSON

City of Henderson, Nevada

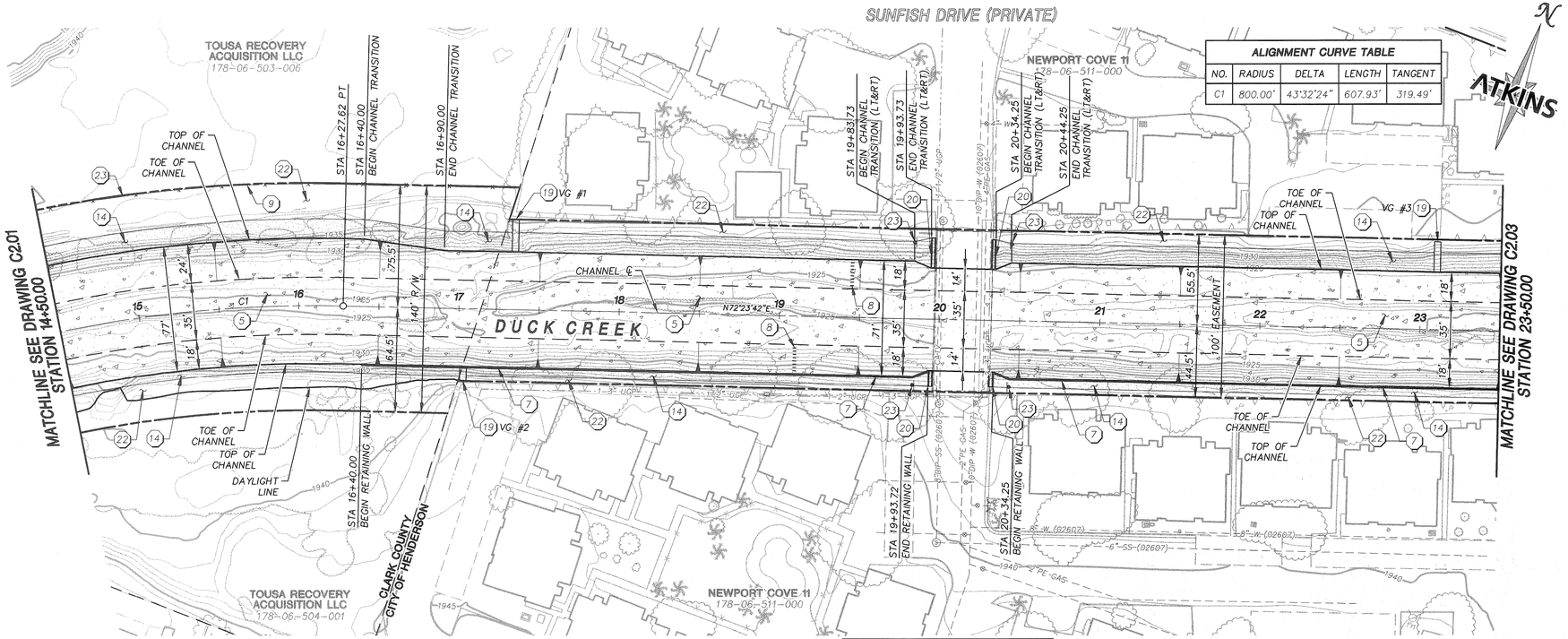
DUCK CREEK SUNSET TO SANDHILL
CHANNEL PLAN AND PROFILE
STA. 5+50.00 TO STA. 14+50.00

JOB NO.: 100028146
FILE NO.: 28146-C2.01
SCALE: HORZ.:1"=40' VERT.: 1"=4'
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.01
SHEET 9 OF 41

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COH KIVA # PCOH 2012780014

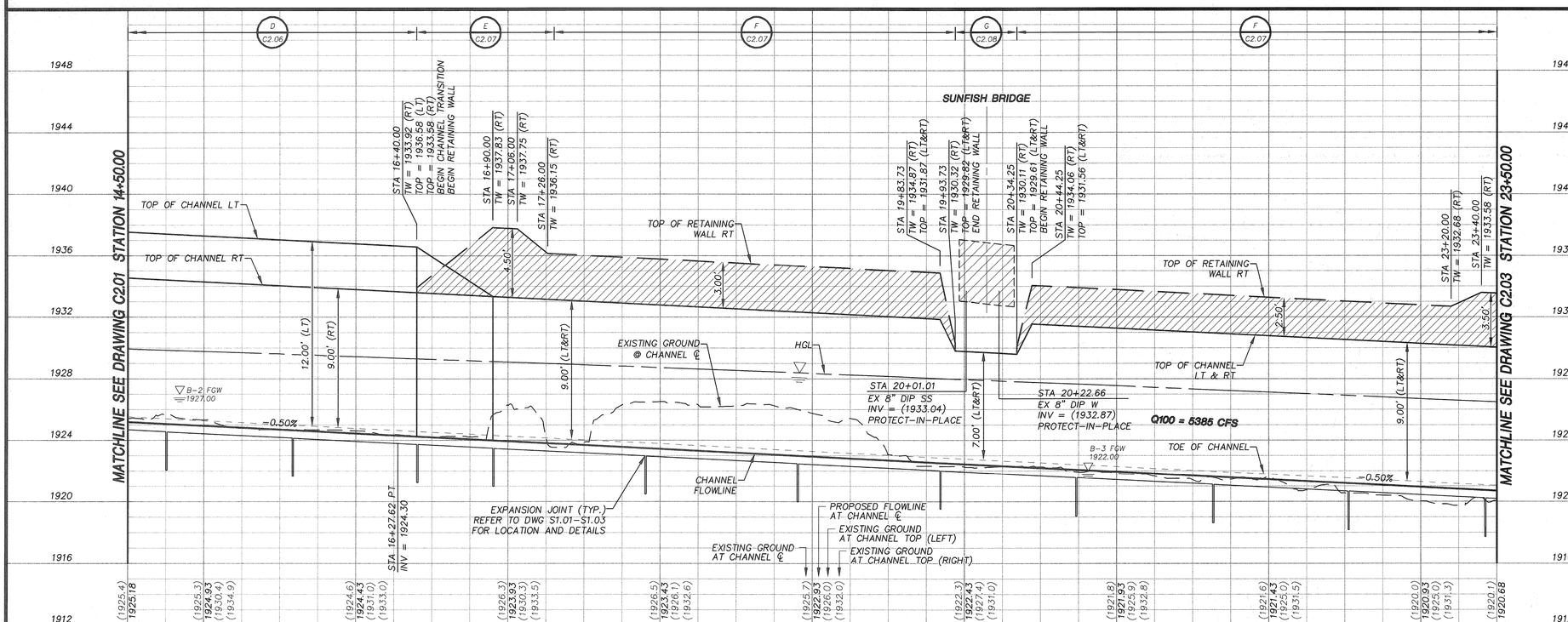


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REFER TO DRAWING C2.24 FOR SUNFISH BRIDGE GRADING ENLARGEMENT

KEY NOTES

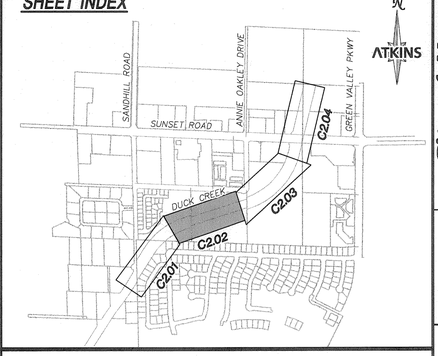
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PROFESSIONAL ENGINEER-STATE OF NEVADA STEVEN M. BELLINO EXP. 12-31-14 CIVIL No. 19040 10/21/13

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle, Suite 200
Henderson, Nevada 89074
Telephone: +1 702.387.2275
Fax: +1 702.263.7300

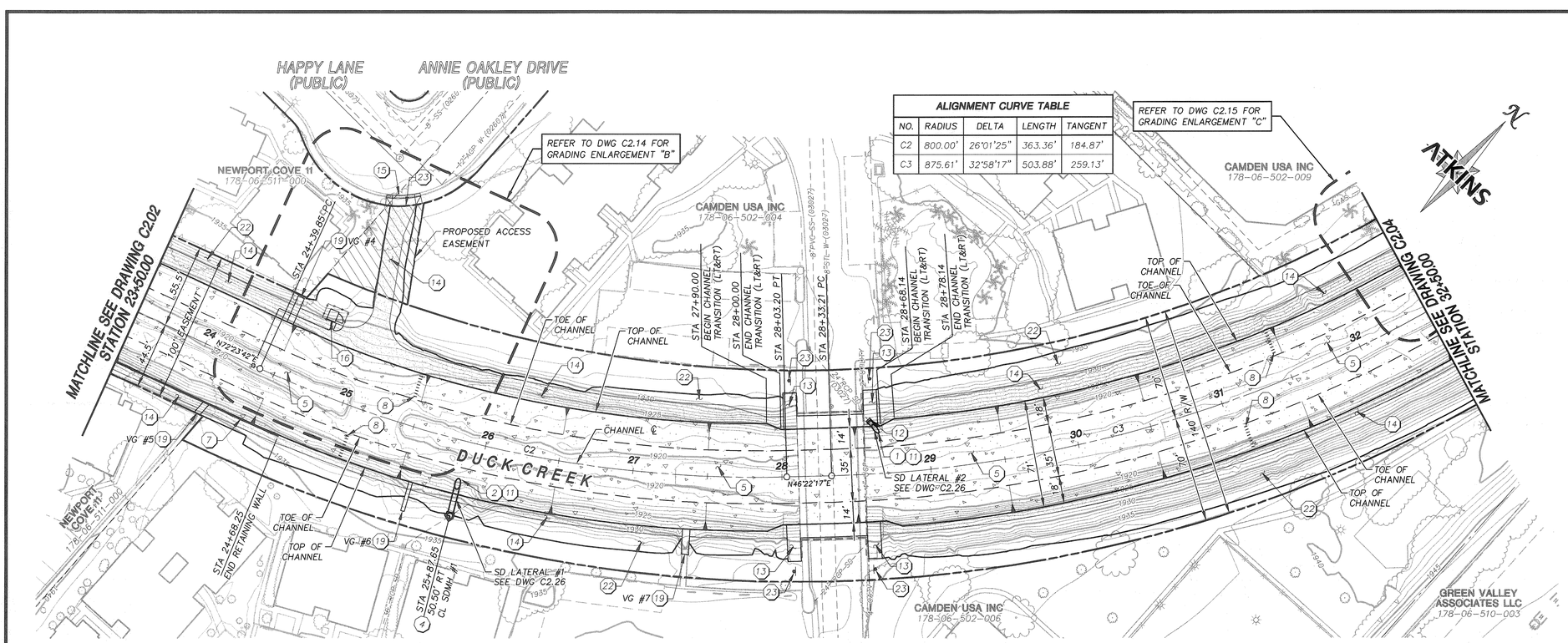
City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
CHANNEL PLAN AND PROFILE
STA. 14+50.00 TO STA. 23+50.00

JOB NO:	100028146
FILE NAME:	28146-C2.02
SCALE:	HORIZ.:1"=40' VERT.: 1"=4'
DESIGNED BY:	S. BELLINO
DRAWN BY:	R. WATSON
CHECKED BY:	A. SPATA
DATE:	OCTOBER 31, 2013
JOB NO.	100028146
DRAWING NO.	C2.02
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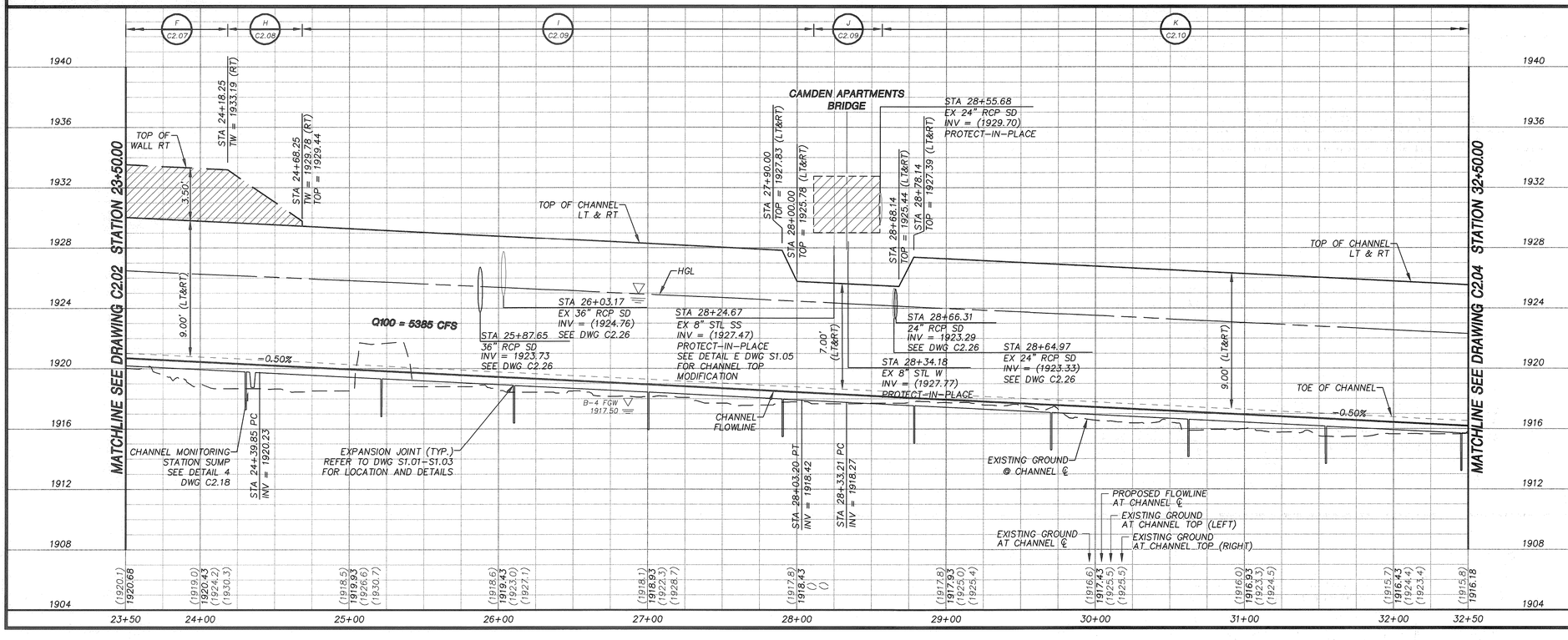
COH KIVA # PCOH 2012780014



ALIGNMENT CURVE TABLE

NO.	RADIUS	DELTA	LENGTH	TANGENT
C2	800.00'	26°01'25"	363.36'	184.87'
C3	875.61'	32°58'17"	503.88'	259.13'

REFER TO DRAWING C2.24 FOR CAMDEN APARTMENT BRIDGE GRADING ENLARGEMENT



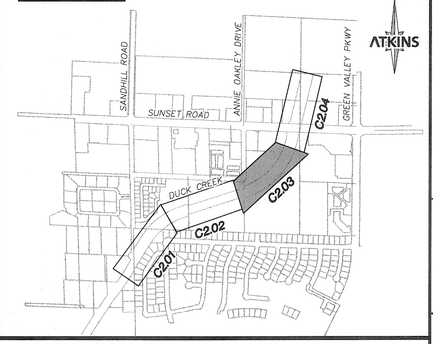
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19. CONSTRUCT CONCRETE VALLEY GUTTER PER DETAIL 2 DRAWING C2.25
20. CONSTRUCT U-SHAPE GUTTER PER DETAIL 3 DRAWING C2.25
21. PROTECT-IN-PLACE EXISTING BRIDGE COLUMNS. REFER TO DETAIL C DRAWING S1.05 FOR CONCRETE CHANNEL AT EXISTING COLUMNS
22. APPLY DUST PALLIATIVE IN AREAS OUTSIDE OF CHANNEL
23. INSTALL NO TRESPASSING SIGN PER DETAIL 1 DRAWING C2.27
24. REMOVE, SALVAGE AND INSTALL EXISTING TRASH RACK

EXISTING UTILITIES ARE LOCATED ON THE PLANS FROM A SEARCH OF AVAILABLE RECORDS. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION

GRAPHIC SCALE
40 0 20 40 80 160
(IN FEET)
HORZ: 1 inch = 40 ft. VERT: 1 inch = 4 ft.

SHEET INDEX



Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 OR 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

PROFESSIONAL ENGINEER-STATE OF NEVADA STEVEN M. BELLINO EXP. 12-31-14 CIVIL No. 19040 10/21/13

REV.	DESCRIPTION	BY	DATE	APPROVAL
	REVISIONS			

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone 702.233.1227
Fax 1.702.243.7220

City of Henderson, Nevada

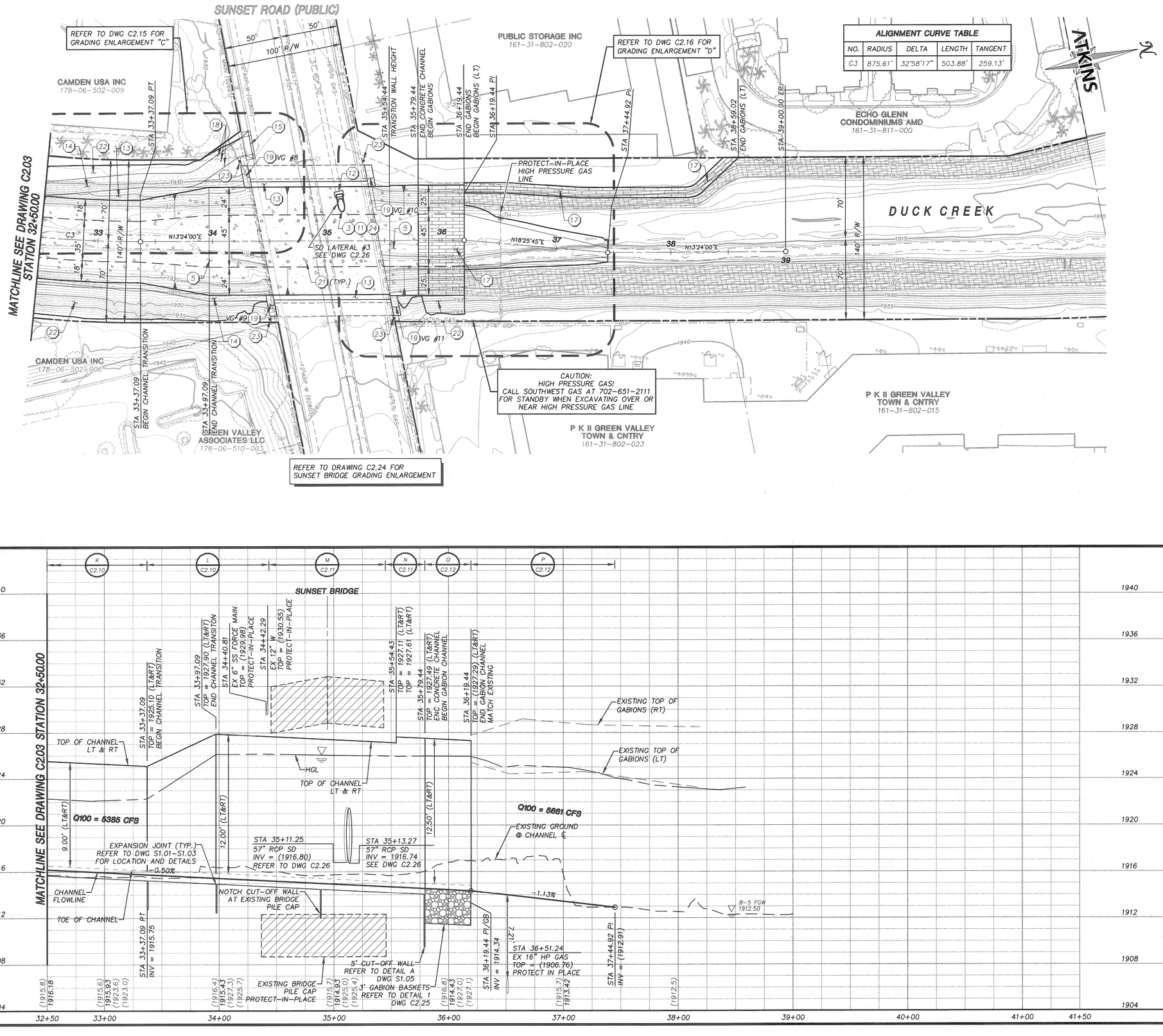
DUCK CREEK SUNSET TO SANDHILL
CHANNEL PLAN AND PROFILE
STA. 23+50.00 TO STA. 32+50.00

JOB NO.: 100028146
FILE NAME: 28146-C2.03
SCALE: HORIZ.:1"=40' VERT.: 1"=4'
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.03
SHEET 11 OF 41

X:\Projects\100028146_DC\Sheets\28146-C2.03.dwg Layout: C2.03 Oct 21, 2013 - 11:05am

COH KIVA # PCOH 2012780014



ALIGNMENT CURVE TABLE				
NO.	RADIUS	DELTA	LENGTH	TANGENT
C3	875.61'	32°58'17"	503.88'	259.13'

KEY NOTES

1. INSTALL 24" RCP SD PER TRENCH DETAIL 2 DRAWING C2.21
2. INSTALL 36" RCP SD PER TRENCH DETAIL 2 DRAWING C2.21
3. INSTALL 57" RCP SD PER TRENCH DETAIL 2 DRAWING C2.21
4. CONSTRUCT TYPE III MANHOLE PER USD #406
5. CONSTRUCT CONCRETE CHANNEL PER DRAWINGS C2.05-C2.12
6. CONSTRUCT CONCRETE ACCESS RAMP PER DRAWING C2.05
7. INSTALL POST AND CABLE FENCE PER DETAIL 1 DRAWING C2.22
8. INSTALL ACCESS LADDER PER DETAIL 5 DRAWING C2.22
9. INSTALL 72" CHAIN LINK FENCE PER USD #252
10. INSTALL 12' DOUBLE SWING GATE PER USD #253
11. CONNECT RCP SD TO CONCRETE CHANNEL PER DETAIL 4 DRAWING S1.06
12. CONSTRUCT CONCRETE COLLAR PER DETAIL 3 DRAWING C2.21
13. CONSTRUCT CONCRETE SLOPE PAVING PER DETAIL 2 DRAWING C2.24
14. CONSTRUCT 6" TYPE II AGGREGATE BASE MAINTENANCE ACCESS ROAD/MANWAY PER DRAWINGS C2.05-C2.12
15. CONSTRUCT 16' COMMERCIAL AND INDUSTRIAL DRIVEWAY (OPTION A) PER USD #224
16. CONSTRUCT CHANNEL MONITORING STATION PER DETAIL 1 DRAWING C2.17
17. CONSTRUCT GABIONS PER DETAIL 1 DRAWING C2.25
18. INSTALL COLLAPSIBLE BOLLARDS PER DETAIL 4 DRAWING C2.21
19. CONSTRUCT CONCRETE VALLEY GUTTER PER DETAIL 2 DRAWING C2.25
20. CONSTRUCT U-SHAPE GUTTER PER DETAIL 3 DRAWING C2.25
21. PROTECT-IN-PLACE EXISTING BRIDGE COLUMNS. REFER TO DETAIL C DRAWING S1.05 FOR CONCRETE CHANNEL AT EXISTING COLUMNS
22. APPLY DUST PALLIATIVE IN AREAS OUTSIDE OF CHANNEL
23. INSTALL NO TRESPASSING SIGN PER DETAIL 1 DRAWING C2.27
24. REMOVE, SALVAGE AND INSTALL EXISTING TRASH RACK

EXISTING UTILITIES ARE LOCATED ON THE PLANS FROM A SEARCH OF AVAILABLE RECORDS. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION

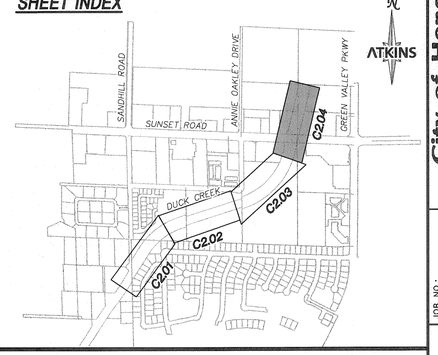
GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)

HORZ: 1 inch = 40 ft. VERT: 1 inch = 4 ft.

SHEET INDEX



Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 OR 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

PROFESSIONAL ENGINEER STATE OF NEVADA STEVEN M. BELLINO EXP. 12-31-14 CIVIL NO. 19040 10/21/13

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle, Suite 200
Henderson, Nevada 89074
Telephone: +1702.263.7225
Fax: +1702.453.7206

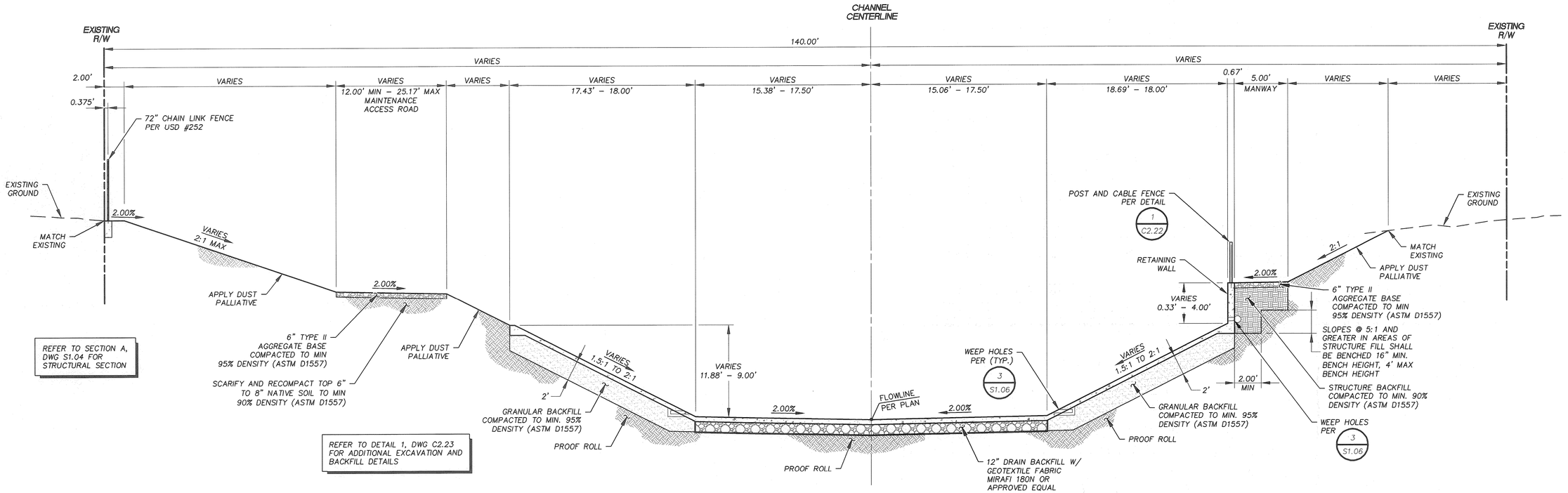
City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
CHANNEL PLAN AND PROFILE
STA. 32+50.00 TO STA. 39+00.00

JOB NO. 100028146
FILE NAME: 28146-C2.04
SCALE: HORZ.:1"=40' VERT.: 1"=4'
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013
JOB NO. 100028146
DRAWING NO. C2.04
12
41

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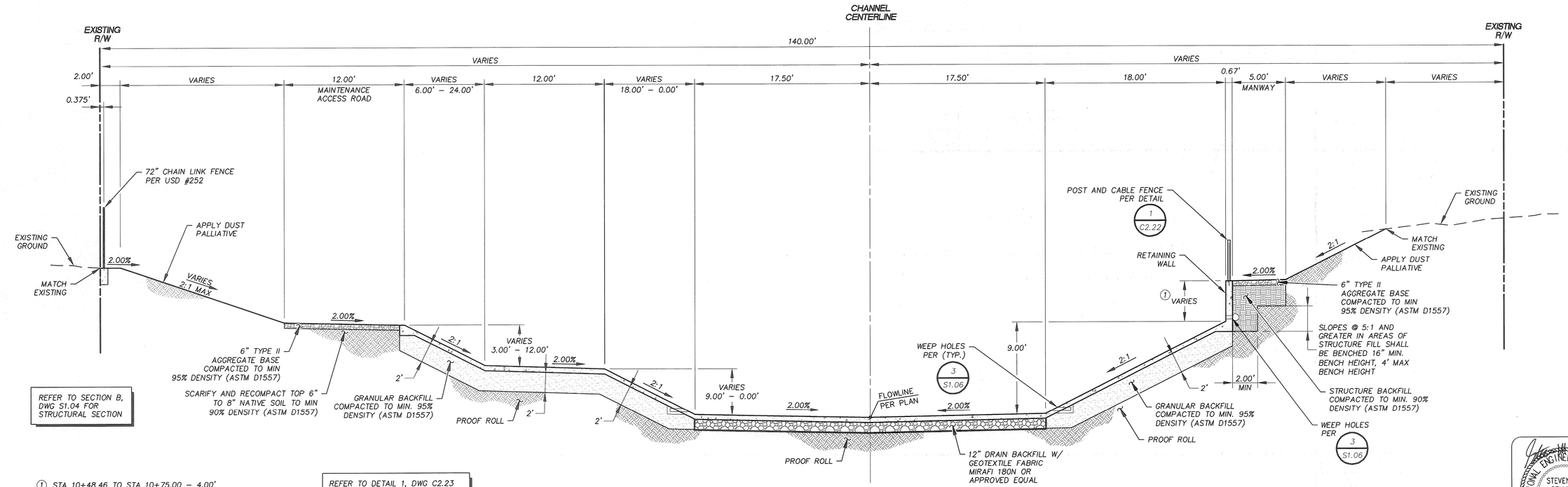
COH KIVA # PCOH 2012780014



CHANNEL SECTION

SCALE: N.T.S.
STA 9+98.46 TO STA 10+48.46

A
C2.05



REFER TO SECTION B, DWG S1.04 FOR STRUCTURAL SECTION

REFER TO DETAIL 1, DWG C2.23 FOR ADDITIONAL EXCAVATION AND BACKFILL DETAILS

1 STA 10+48.46 TO STA 10+75.00 – 4.00'
STA 10+75.00 TO STA 10+95.00 – 4.00' TO 2.00'
STA 10+95.00 TO STA 11+38.64 – 2.00'

CHANNEL SECTION

SCALE: N.T.S.
STA 10+48.46 TO STA 11+38.64

B
C2.05

PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN M. BELLINO
No. 19040
EXP. 12-31-14
CIVIL
10/22/13

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.836.7275
Fax: +1.702.263.7300

City of Henderson, Nevada

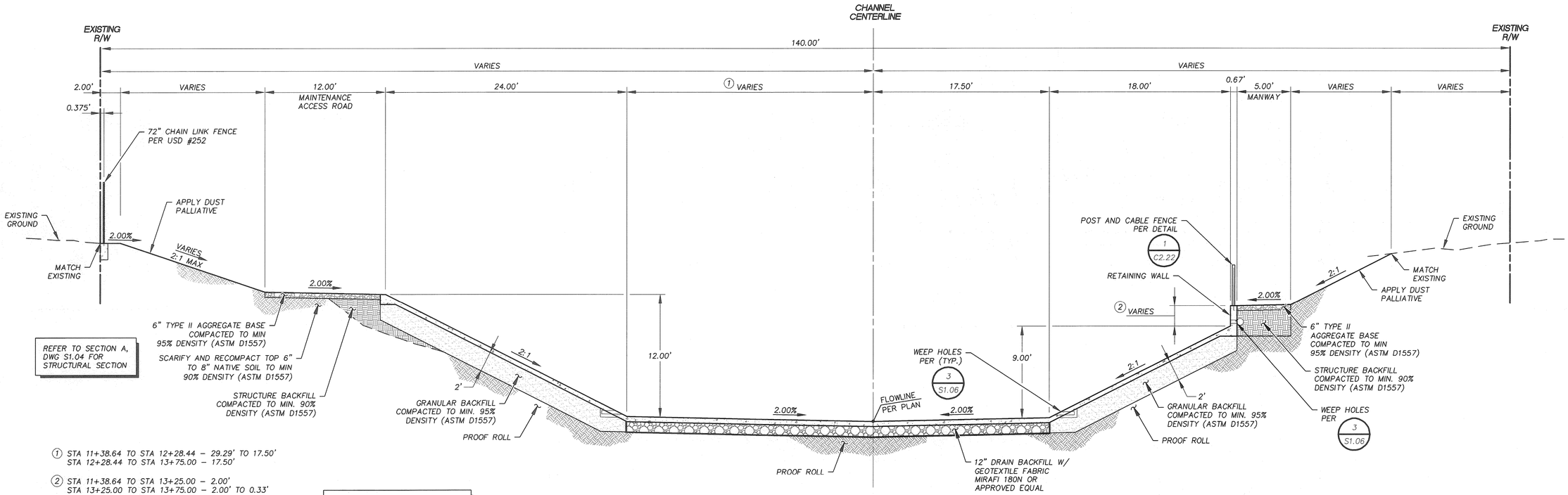
DUCK CREEK SUNSET TO SANDHILL
CHANNEL
TYPICAL SECTIONS

JOB NO: 100028146
FILE NAME: 28146-C2.05
SCALE: HORIZ:NONE VERT.: NONE
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

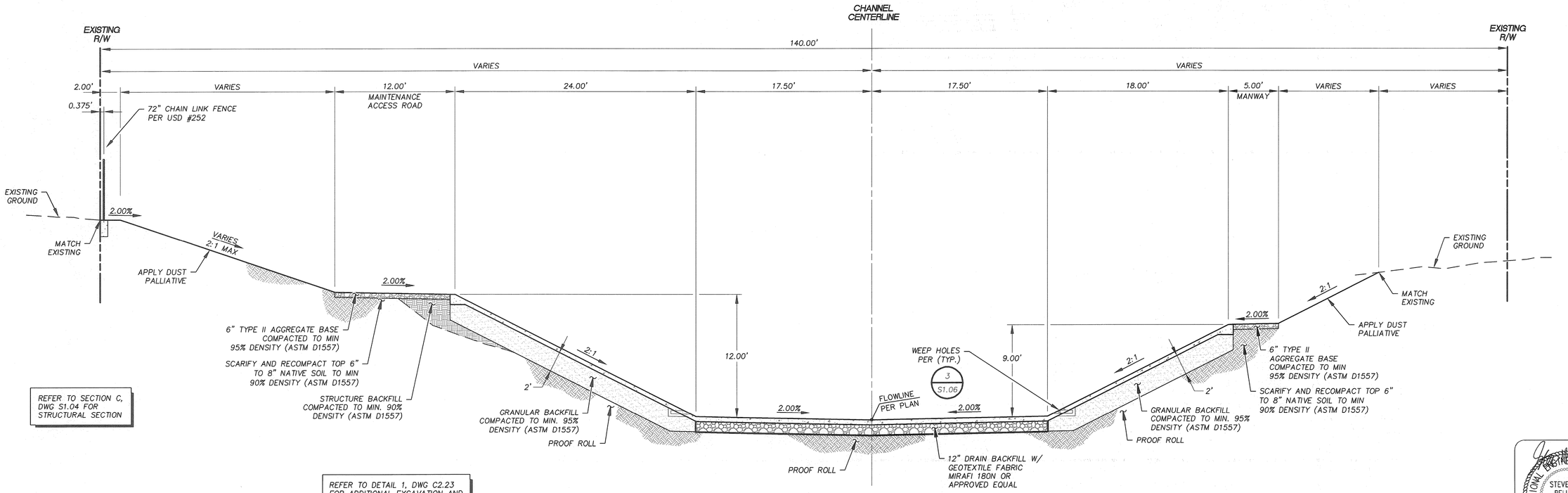
JOB NO. 100028146
DRAWING NO. C2.05
13
41

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COH KIVA # PCOH 2012780014



CHANNEL SECTION — C / C2.06
SCALE: N.T.S.
STA 11+38.64 TO STA 13+75.00



CHANNEL SECTION — D / C2.06
SCALE: N.T.S.
STA 13+75.00 TO STA 16+40.00

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2720 Capurro Circle, Suite 200
Henderson, Nevada 89074
Telephone: +1702.263.7275
Fax: +1702.263.7290

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
CHANNEL
TYPICAL SECTIONS

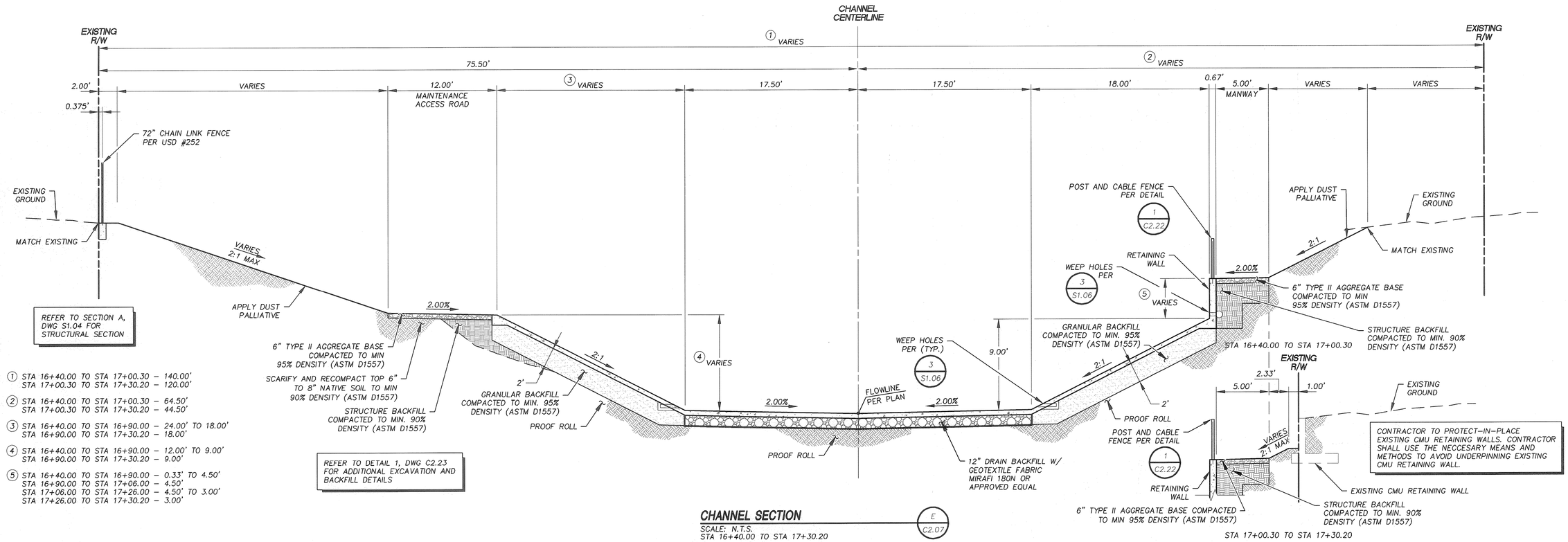
JOB NO.: 100028146
FILE NAME: 28146-C2.06
SCALE: HORIZ:NONE VERT.: NONE
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.06
14
41

PROFESSIONAL ENGINEER — STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19040
10/21/13

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COH KIVA # PCOH 2012780014



① STA 16+40.00 TO STA 17+00.30 – 140.00'
STA 17+00.30 TO STA 17+30.20 – 120.00'

② STA 16+40.00 TO STA 17+00.30 – 64.50'
STA 17+00.30 TO STA 17+30.20 – 44.50'

③ STA 16+40.00 TO STA 16+90.00 – 24.00' TO 18.00'
STA 16+90.00 TO STA 17+30.20 – 18.00'

④ STA 16+40.00 TO STA 16+90.00 – 12.00' TO 9.00'
STA 16+90.00 TO STA 17+30.20 – 9.00'

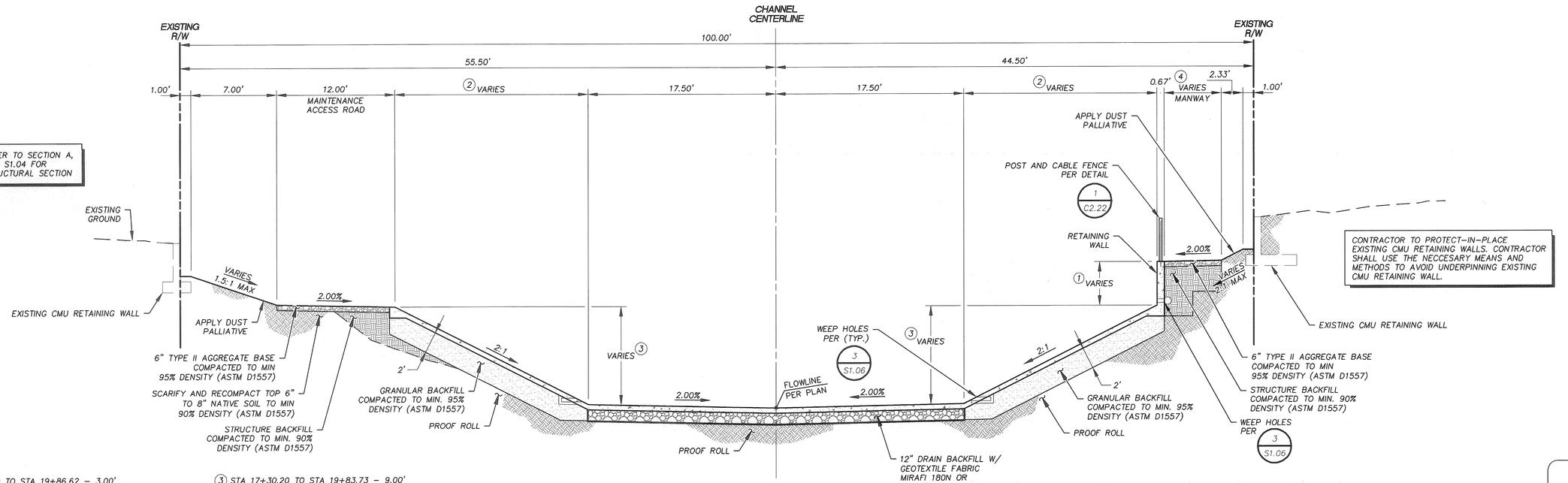
⑤ STA 16+40.00 TO STA 16+90.00 – 0.33' TO 4.50'
STA 16+90.00 TO STA 17+06.00 – 4.50'
STA 17+06.00 TO STA 17+26.00 – 4.50' TO 3.00'
STA 17+26.00 TO STA 17+30.20 – 3.00'

REFER TO DETAIL 1, DWG C2.23 FOR ADDITIONAL EXCAVATION AND BACKFILL DETAILS

CHANNEL SECTION

SCALE: N.T.S.
STA 16+40.00 TO STA 17+30.20

E C2.07



① STA 17+30.20 TO STA 19+86.62 – 3.00'
STA 19+83.73 TO STA 19+93.73 – 3.00' TO 0.50'
STA 20+34.25 TO STA 20+44.25 – 0.50' TO 2.50'
STA 20+44.25 TO STA 23+20.00 – 2.50'
STA 23+20.00 TO STA 23+40.00 – 2.50' TO 3.50'
STA 23+40.00 TO STA 24+18.25 – 3.50'

② STA 17+30.20 TO STA 19+83.73 – 18.00'
STA 19+83.73 TO STA 19+93.73 – 18.00' TO 14.00'
STA 20+34.25 TO STA 20+44.25 – 14.00' TO 18.00'
STA 20+44.25 TO STA 20+18.25 – 18.00'

③ STA 17+30.20 TO STA 19+83.73 – 9.00'
STA 19+83.73 TO STA 19+93.73 – 9.00' TO 7.00'
STA 20+34.25 TO STA 20+44.25 – 7.00' TO 9.00'
STA 20+44.25 TO STA 24+18.25 – 9.00'

④ STA 17+30.20 TO STA 19+83.73 – 5.00'
STA 19+83.73 TO STA 19+93.73 – 5.00' TO 9.13'
STA 20+34.25 TO STA 20+44.25 – 9.13' TO 5.00'
STA 20+74.25 TO STA 24+18.25 – 5.00'

REFER TO DETAIL 1, DWG C2.23 FOR ADDITIONAL EXCAVATION AND BACKFILL DETAILS

CHANNEL SECTION

SCALE: N.T.S.
STA 17+30.20 TO STA 19+93.73
STA 20+34.25 TO STA 24+18.25

F C2.07

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2370 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1(702)263.7275
Fax: +1(702)263.7282

THE SITE OF OPPORTUNITY

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
CHANNEL
TYPICAL SECTIONS

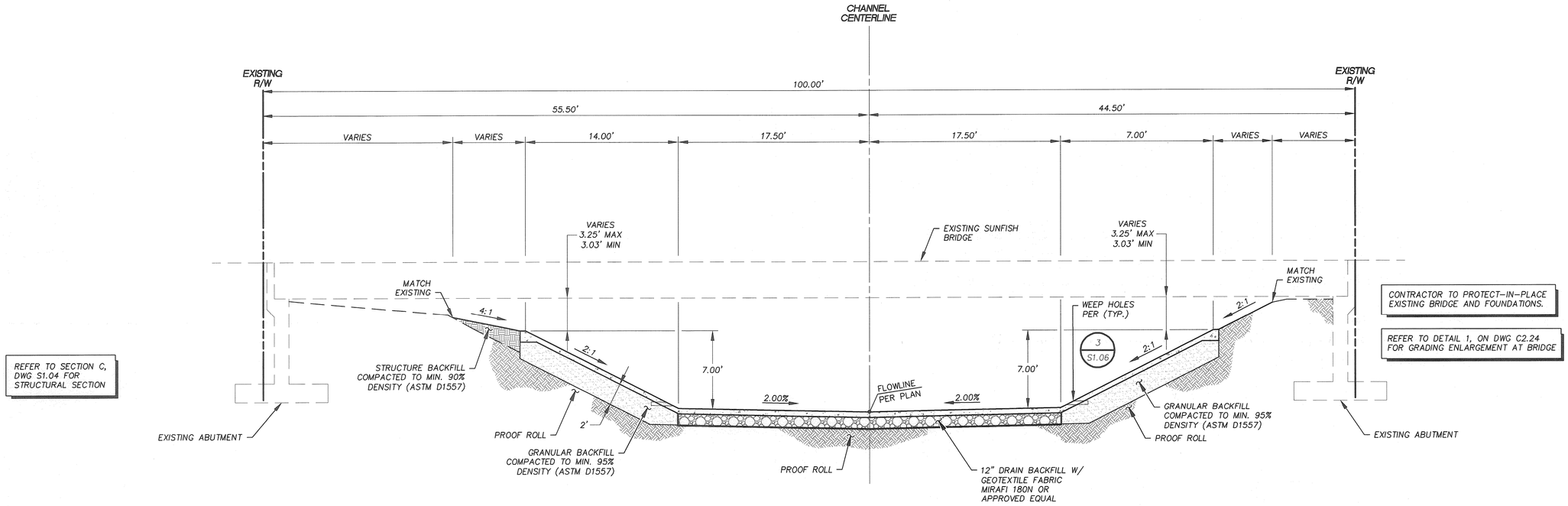
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FILE NAME: 28146-C2.07
SCALE: HORIZ.:NONE VERT.: NONE
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.07
15
41

PROFESSIONAL ENGINEER - STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19040
10/21/13

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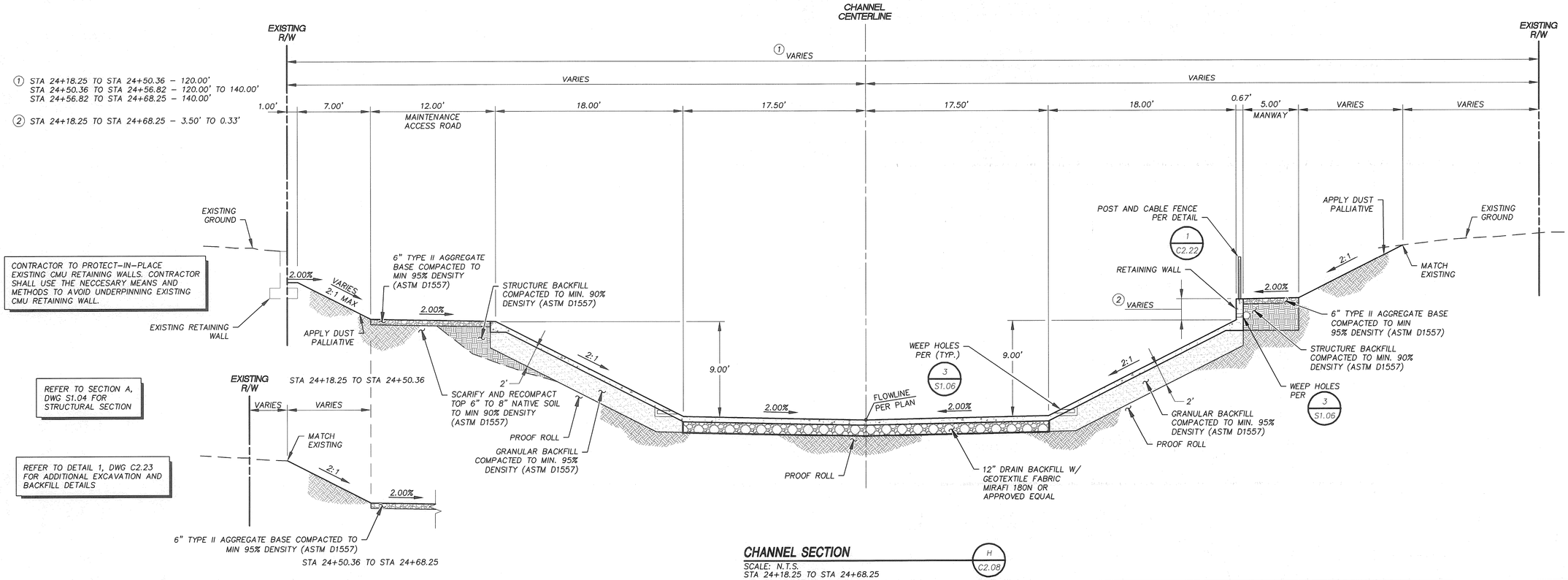
COH KIVA # PCOH 2012780014



CHANNEL SECTION

SCALE: N.T.S.
STA 19+96.23 TO STA 20+31.90

G C2.08



CHANNEL SECTION

SCALE: N.T.S.
STA 24+18.25 TO STA 24+68.25

H C2.08

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2370 Corporate Circle, Suite 200
Henderson, Nevada, 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7300

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
CHANNEL
TYPICAL SECTIONS

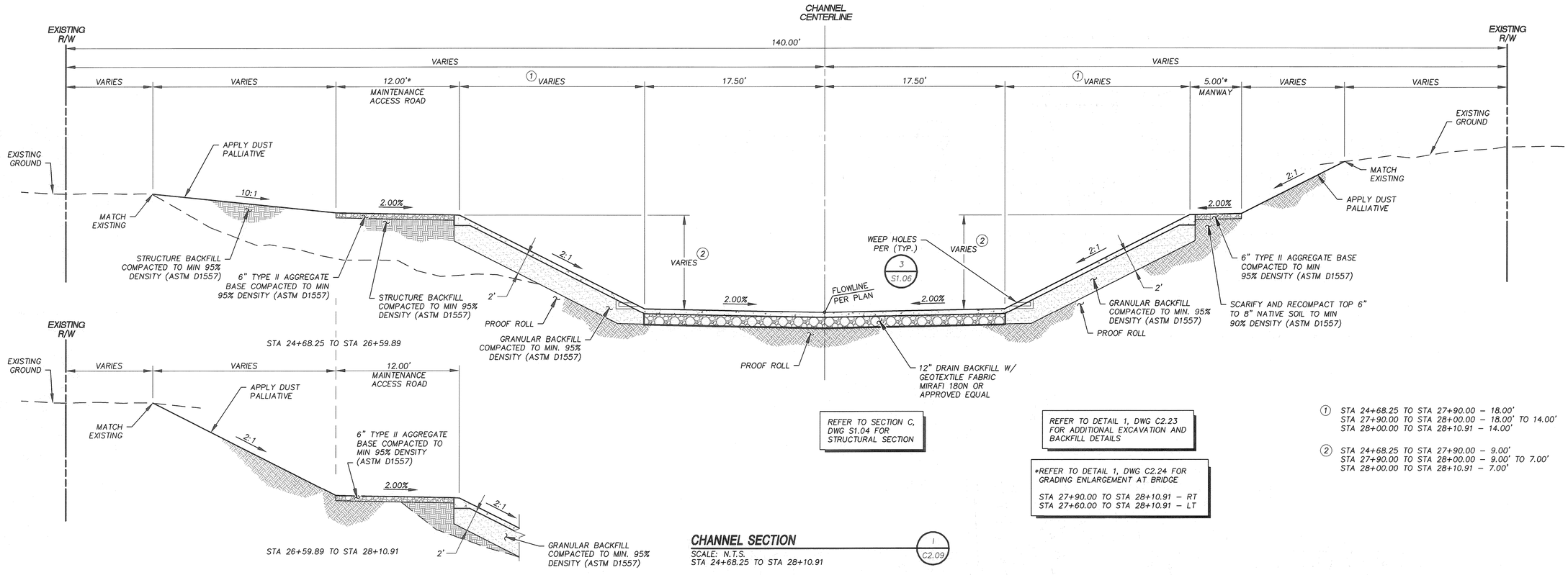
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FILE NAME: 28146-C2.08
SCALE: HORIZ.:NONE VERT.: NONE
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.08
16 / 41

PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19040
10/21/13

X:\Projects\100028146_DC\Sheets\28146-C2.08.dwg Layout: C2.08 Oct 21, 2013 - 11:08am

COH KIVA # PCOH 2012780014



REFER TO SECTION C, DWG S1.04 FOR STRUCTURAL SECTION

REFER TO DETAIL 1, DWG C2.23 FOR ADDITIONAL EXCAVATION AND BACKFILL DETAILS

*REFER TO DETAIL 1, DWG C2.24 FOR GRADING ENLARGEMENT AT BRIDGE

STA 27+90.00 TO STA 28+10.91 – RT
STA 27+60.00 TO STA 28+10.91 – LT

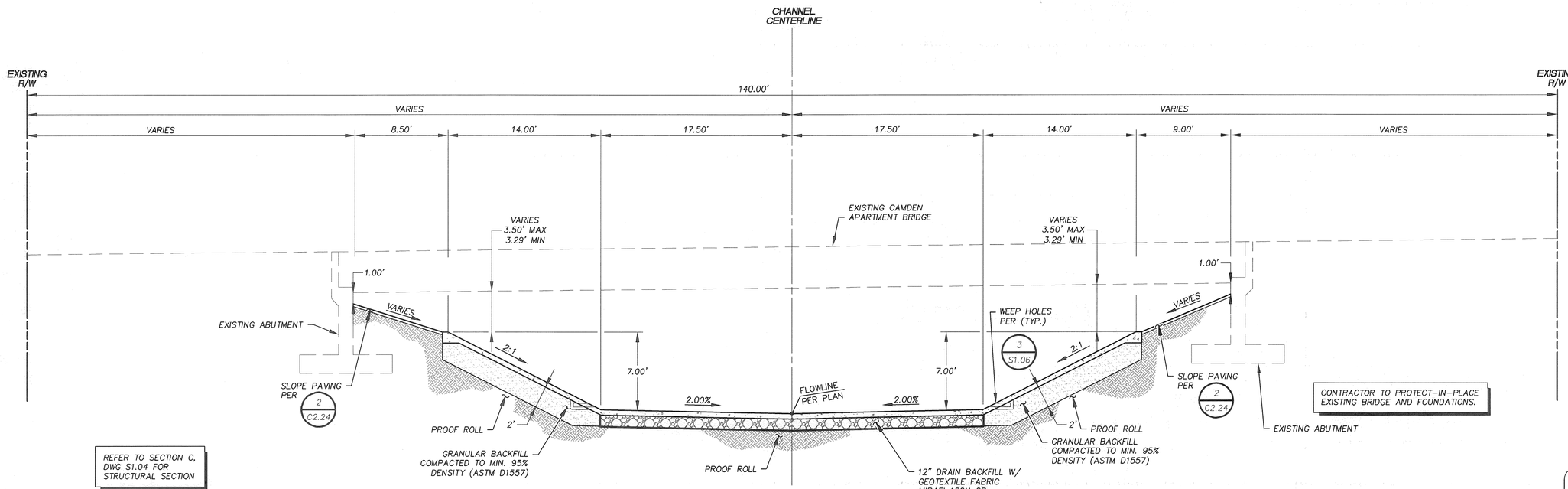
(1) STA 24+68.25 TO STA 27+90.00 – 18.00'
STA 27+90.00 TO STA 28+00.00 – 18.00' TO 14.00'
STA 28+00.00 TO STA 28+10.91 – 14.00'

(2) STA 24+68.25 TO STA 27+90.00 – 9.00'
STA 27+90.00 TO STA 28+00.00 – 9.00' TO 7.00'
STA 28+00.00 TO STA 28+10.91 – 7.00'

CHANNEL SECTION

SCALE: N.T.S.
STA 24+68.25 TO STA 28+10.91

1 / C2.09



REFER TO SECTION C, DWG S1.04 FOR STRUCTURAL SECTION

CONTRACTOR TO PROTECT-IN-PLACE EXISTING BRIDGE AND FOUNDATIONS.

CHANNEL SECTION

SCALE: N.T.S.
STA 28+10.91 TO STA 28+56.84

J / C2.09

PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19010
10/21/13

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle, Suite 200
Henderson, Nevada 89074
Tel: +1 (702) 263-7225
Fax: +1 (702) 263-7300

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
CHANNEL
TYPICAL SECTIONS

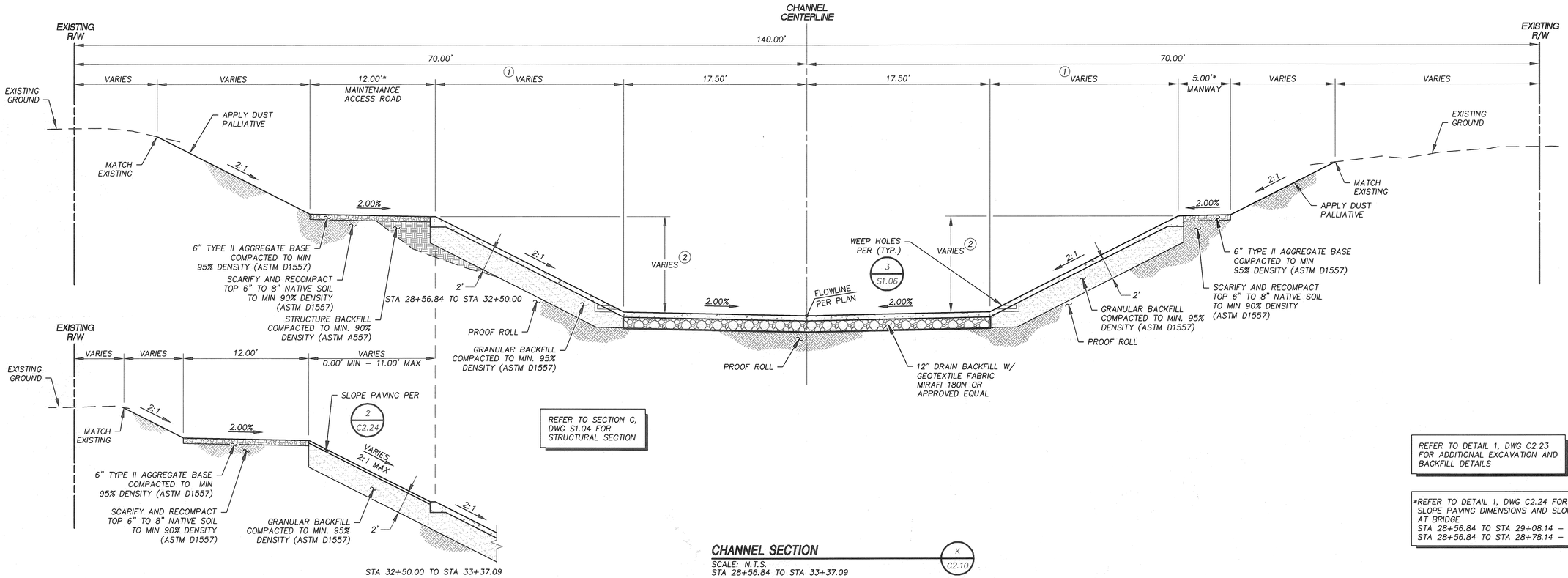
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FILE NAME: 28146-C2.09
SCALE: HORIZ:NONE VERT.: NONE

DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.09
17 / 41

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COH KIVA # PCOH 2012780014



REFER TO SECTION C, DWG S1.04 FOR STRUCTURAL SECTION

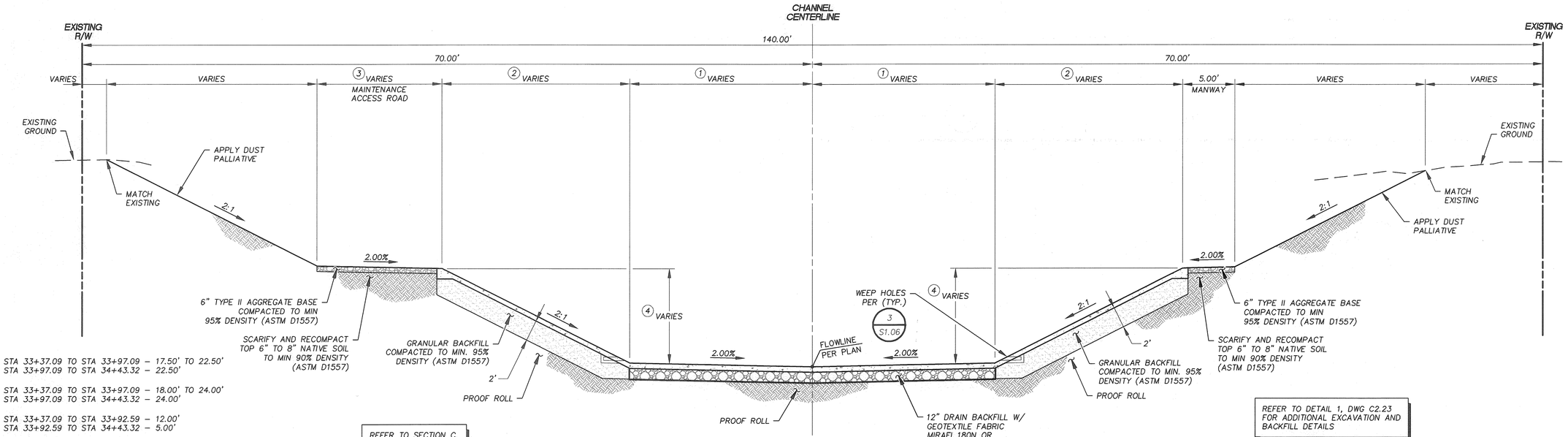
REFER TO DETAIL 1, DWG C2.23 FOR ADDITIONAL EXCAVATION AND BACKFILL DETAILS

*REFER TO DETAIL 1, DWG C2.24 FOR SLOPE PAVING DIMENSIONS AND SLOPE AT BRIDGE
STA 28+56.84 TO STA 29+08.14 – LT
STA 28+56.84 TO STA 28+78.14 – RT

CHANNEL SECTION

SCALE: N.T.S.
STA 28+56.84 TO STA 33+37.09

K C2.10



① STA 33+37.09 TO STA 33+97.09 – 17.50' TO 22.50'
STA 33+97.09 TO STA 34+43.32 – 22.50'

② STA 33+37.09 TO STA 33+97.09 – 18.00' TO 24.00'
STA 33+97.09 TO STA 34+43.32 – 24.00'

③ STA 33+37.09 TO STA 33+92.59 – 12.00'
STA 33+92.59 TO STA 34+43.32 – 5.00'

④ STA 33+37.09 TO STA 33+97.09 – 9.00' TO 12.00'
STA 33+97.09 TO STA 34+43.32 – 12.00'

REFER TO SECTION C, DWG S1.04 FOR STRUCTURAL SECTION

REFER TO DETAIL 1, DWG C2.23 FOR ADDITIONAL EXCAVATION AND BACKFILL DETAILS

CHANNEL SECTION

SCALE: N.T.S.
STA 33+37.09 TO STA 34+43.32

L C2.10

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle, Suite 200
Henderson, Nevada 89074
Telephone: +1702.263.7275
Fax: +1702.263.7200

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
CHANNEL
TYPICAL SECTIONS

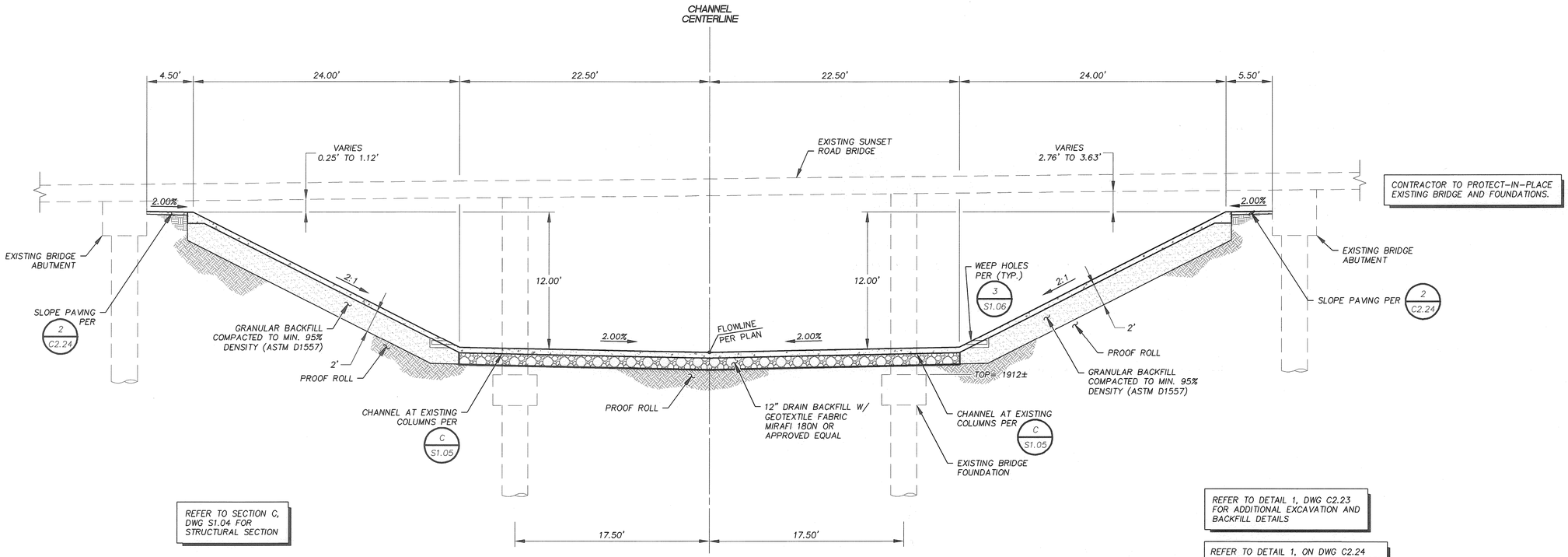
JOB NO.: 100028146
FILE NAME: 28146-C2.10
SCALE: HORIZ.:NONE VERT.: NONE
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.10
18
41

PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19040
10/21/13

X:\Projects\100028146_DC\Sheets\28146-C2.10.dwg Layout: C2.10 Oct 21, 2013 - 11:07am

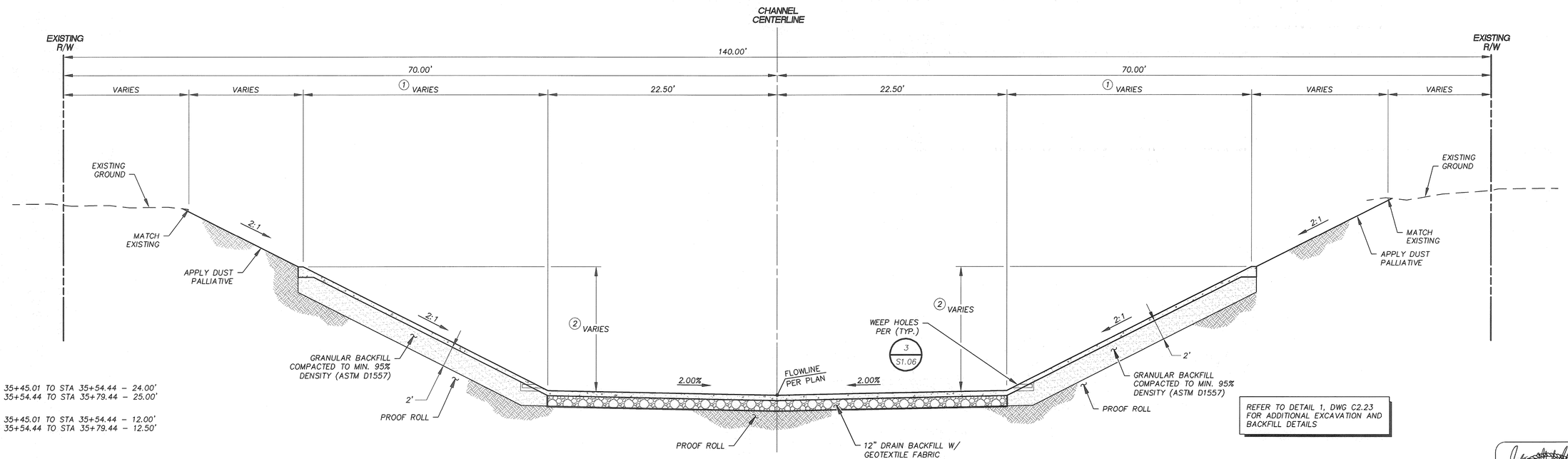
COH KIVA # PCOH 2012780014



CHANNEL SECTION

SCALE: N.T.S.
STA 34+43.32 TO STA 35+45.01

(M / C2.11)



① STA 35+45.01 TO STA 35+54.44 – 24.00'
STA 35+54.44 TO STA 35+79.44 – 25.00'

② STA 35+45.01 TO STA 35+54.44 – 12.00'
STA 35+54.44 TO STA 35+79.44 – 12.50'

CHANNEL SECTION

SCALE: N.T.S.
STA 35+45.01 TO STA 35+79.44

(N / C2.11)

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.453.7373
Fax: +1.702.263.7200

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
CHANNEL
TYPICAL SECTIONS

JOB NO: 100028146
FILE NAME: 28146-C2.11
SCALE: HORIZ:NONE VERT.: NONE

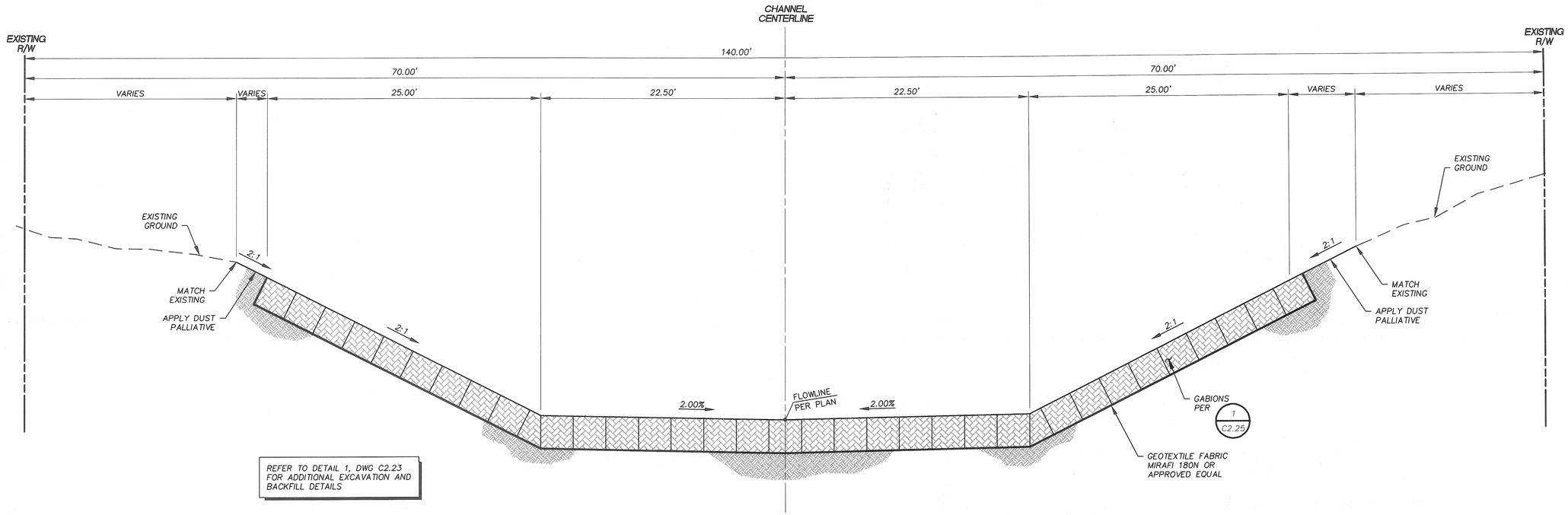
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. 19 / 41
C2.11

PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19040
10/21/13

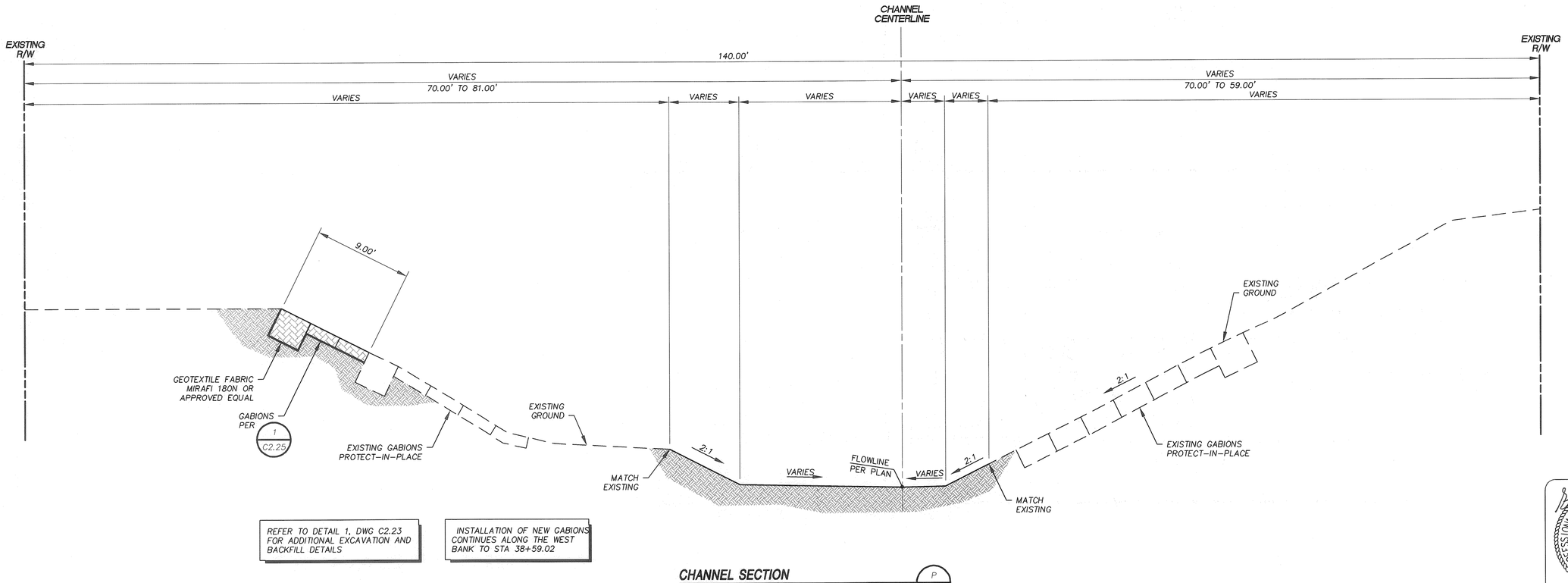
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COH KIVA # PCOH 2012780014



CHANNEL SECTION (0 / C2.12)

SCALE: N.T.S.
STA 35+79.44 TO STA 36+19.44



CHANNEL SECTION (P / C2.12)

SCALE: N.T.S.
STA 36+19.44 TO STA 37+44.92

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle, Suite 200
Henderson, Nevada 89074
Telephone: +1.702.836.7225
Fax: +1.702.263.7300

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
CHANNEL
TYPICAL SECTIONS

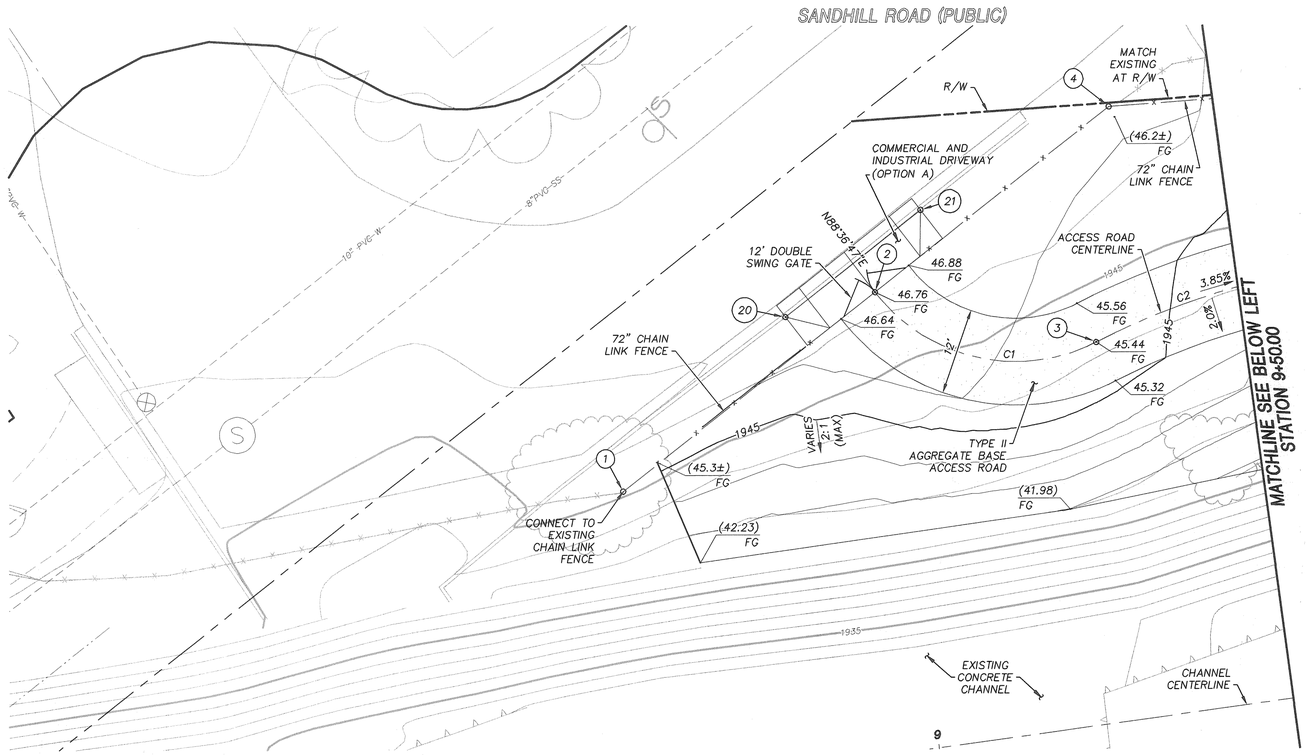
JOB NO: 100028146
FILE NAME: 28146-C2.12
SCALE: HORIZ: NONE VERT.: NONE
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.12
20 / 41

PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 15040
10/21/13

X:\Projects\100028146_DC\Sheets\28146-C2.12.dwg Layout: C2.12 Oct 21, 2013 - 11:07am

COH KIVA # PCOH 2012780014



POINT TABLE					
POINT NO.	NORTHING	EASTING	STATION	OFFSET	DESCRIPTION
1	730681.5477	301616.8026	8+60.96	41.13' LT	FENCE BP
2	730726.2824	301615.7196	8+99.62	63.66' LT	BP
3	730746.9837	301639.7435	9+29.35	52.61' LT	PRC
4	730767.7837	301614.7149	9+35.48	84.57' LT	FENCE AP
5	730775.0159	301648.7815	9+58.26	58.22' LT	BP
6	730799.7561	301665.4329	9+87.96	55.58' LT	PT
7	730797.9607	301690.4349	9+98.46	32.82' LT	TOP
8	730822.1179	301671.6083	10+10.53	60.96' LT	PC
9	730832.2397	301677.3114	10+21.97	60.86' LT	PT
10	730843.9031	301713.3014	10+48.46	35.50' LT	TOP
11	730847.9202	301708.8446	10+49.56	41.39' LT	PC
12	730855.0417	301699.2358	10+50.64	53.29' LT	TOP
13	730851.9372	301704.3877	10+50.64	47.28' LT	TOE
14	730886.7032	301690.7663	10+71.39	77.18' LT	FENCE PC
15	730910.8823	301780.4414	11+38.64	17.50' LT	GB
16	730934.4351	301753.3956	11+40.80	53.29' LT	TOP
17	730919.8152	301772.4287	11+40.80	29.29' LT	GB/TOE
18	730997.1447	301822.7970	12+28.44	41.50' LT	TOP
19	730980.5314	301840.1175	12+28.44	17.50' LT	TOE
20	730714.1649	301611.0115	8+86.74	61.94' LT	TBC
21	730738.1579	301610.4306	9+07.47	74.03' LT	TBC
22	730915.3488	301776.4350	11+39.73	23.40' LT	EP

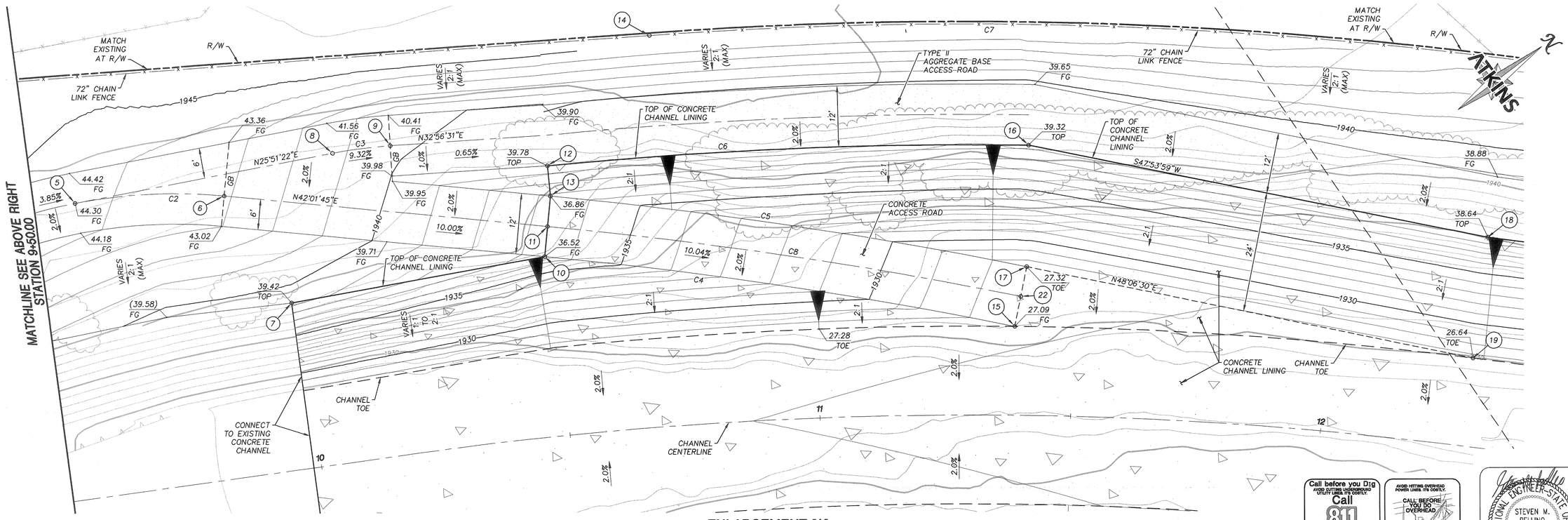
*STATIONING IS CHANNEL CENTERLINE

CENTERLINE CURVE TABLE				
NO.	RADIUS	DELTA	LENGTH	TANGENT
C1	25.00'	78°43'44"	34.35'	20.51'
C2	106.00'	32°08'42"	59.47'	30.54'
C3	94.00'	7°05'09"	11.63'	5.82'
C8	900.28'	6°04'44"	95.52'	47.80'

CURVE TABLE				
NO.	RADIUS	DELTA	LENGTH	TANGENT
C4	894.28'	6°04'44"	94.88'	47.49'
C5	906.28'	6°04'44"	96.15'	48.12'
C6	853.29'	6°27'24"	96.16'	48.13'
C7	869.50'	39°47'43"	603.92'	314.71'

EXISTING UTILITIES ARE LOCATED ON THE PLANS FROM A SEARCH OF AVAILABLE RECORDS. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
HORZ: 1 inch = 10 ft.



ENLARGEMENT "A"

Call before you Dig
AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY.
Call 811 OR 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

PROFESSIONAL ENGINEER-STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 9040
10/21/13

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2720 Carpenter Circle, Suite 200
Henderson, Nevada 89074
Telephone: +1702.263.7275
Fax: +1702.263.7290

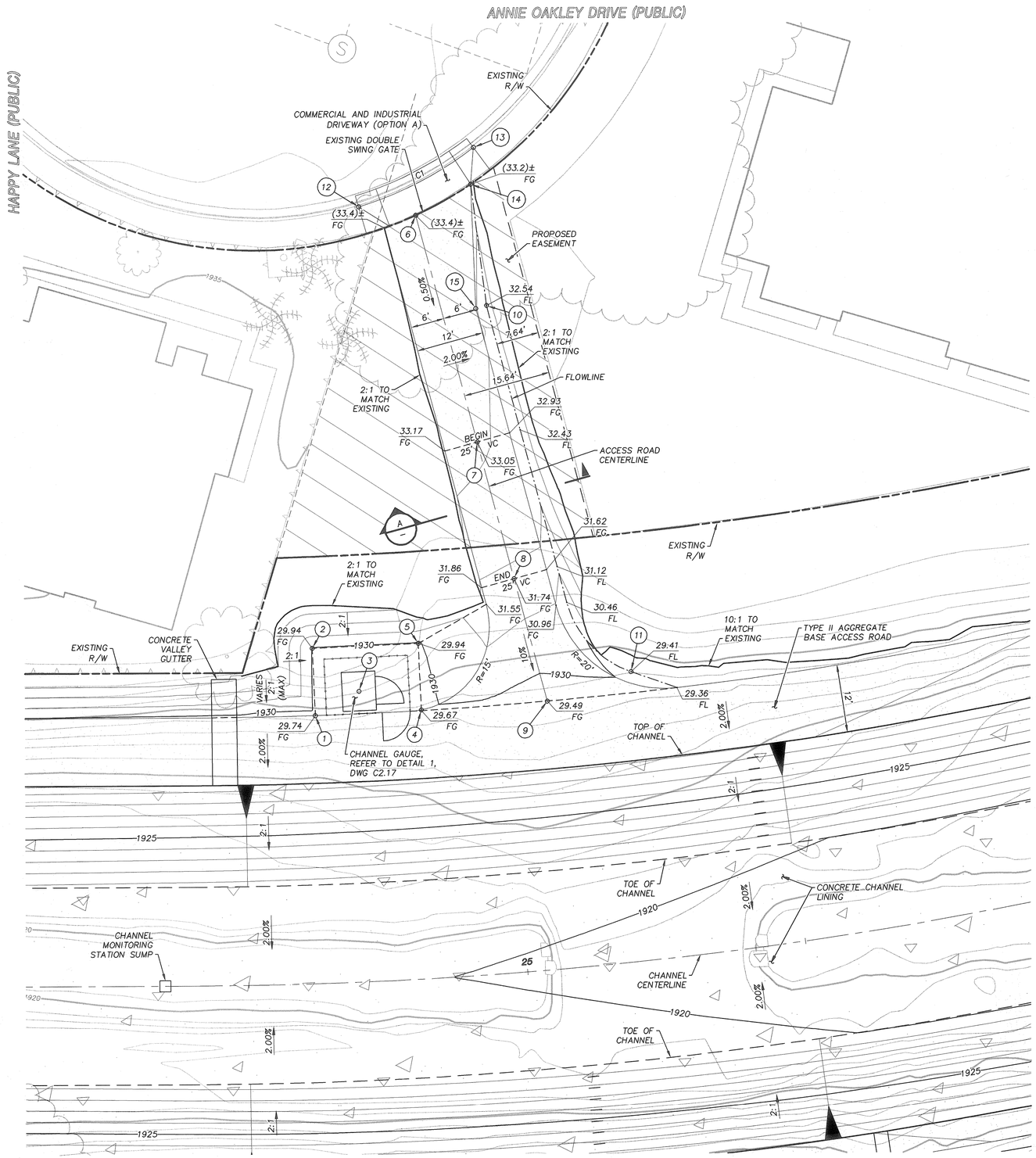
City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
GRADING ENLARGEMENT

JOB NO.	100028146	DESIGNED BY:	S. BELLINO
FILE NAME:	28146-C2.13	DRAWN BY:	W. JOHNSON
SCALE:	HORZ.:1"=10'	CHECKED BY:	A. SPATA
	VERT.: NA	DATE:	OCTOBER 31, 2013
JOB NO. 100028146	DRAWING NO. C2.13	21	41

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COH KIVA # PCOH 2012780014

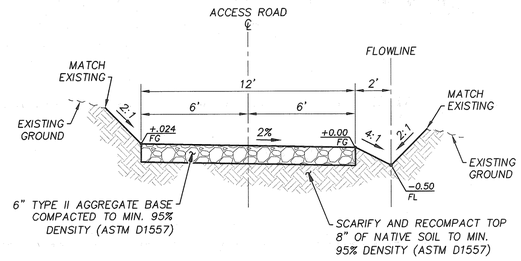


ENLARGEMENT "B"

POINT TABLE					
POINT NO.	NORTHING	EASTING	STATION	OFFSET	DESCRIPTION
1	731475.1270	302968.9904	24+63.42	47.50' LT	GB
2	731486.3820	302964.8937	24+63.26	59.48' LT	GB
3	731481.6034	302975.1483	24+71.92	51.54' LT	CENTER OF STRUCTURE
4	731481.7544	302986.7988	24+83.63	47.63' LT	GB
5	731492.8856	302982.7457	24+83.79	59.48' LT	GB
6	731564.9457	302959.6944	24+88.57	135.02' LT	BP
7	731529.9381	302982.1897	24+98.08	94.21' LT	BEGIN V.C.
8	731508.9060	302995.7045	25+03.28	69.65' LT	END V.C.
9	731489.9601	303007.8788	25+07.68	47.50' LT	EP
10	731553.4854	302976.5679	25+00.32	126.60' LT	FL
11	731499.4638	303020.6125	25+24.13	51.26' LT	FL
12	731563.2974	302949.4865	24+76.37	137.08' LT	TBC
13	731579.4088	302965.9512	25+02.09	146.17' LT	TBC
14	731573.0791	302967.4230	25+00.86	139.75' LT	BSW
15	731552.4042	302974.8853	24+99.90	117.78' LT	AP

*STATIONING IS CHANNEL CENTERLINE

CURVE TABLE				
NO.	RADIUS	DELTA	LENGTH	TANGENT
C1	65.00'	20°24'49"	23.16'	11.70'



SECTION A

EXISTING UTILITIES ARE LOCATED ON THE PLANS FROM A SEARCH OF AVAILABLE RECORDS. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
HORZ: 1 inch = 10 ft.

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 OR 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

PROFESSIONAL ENGINEER-STATE OF NEVADA STEVEN M. BELLINO EXP. 12-31-14 CIVIL No. 15040 10/21/13

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2770 Corporate Circle, Suite 200
Henderson, Nevada 89074
Telephone: +1702.263.7275
Fax: +1702.263.7290

THE CITY OF HENDERSON NEVADA

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
GRADING ENLARGEMENT

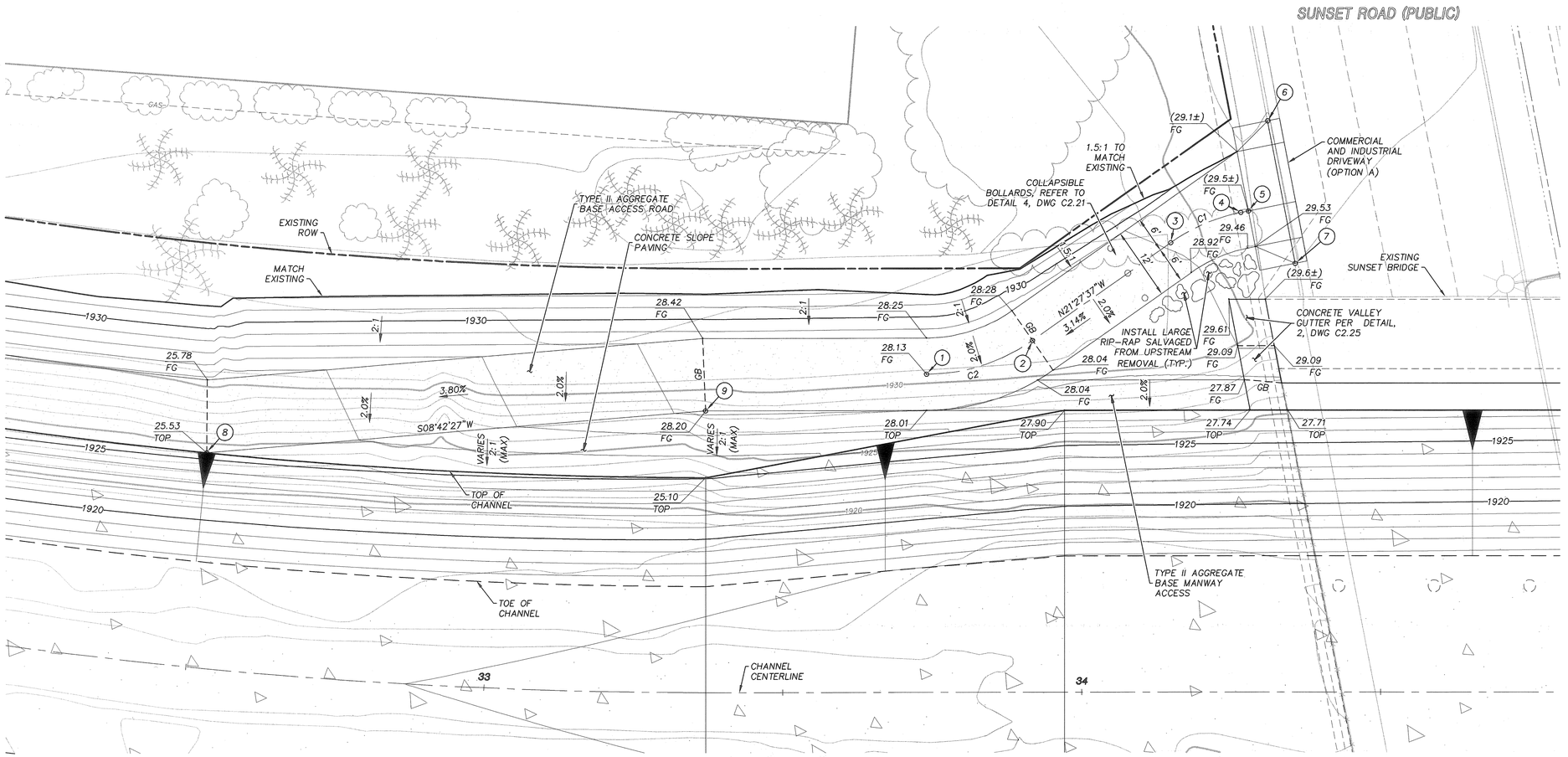
JOB NO.: 100028146
FILENAME: 28146-C2.14
SCALE: HORIZ.:1"=10' VERT.: NA

DESIGNED BY: S. BELLINO
DRAWN BY: M. JOHNSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.14
22
41

X:\Projects\100028146_DC\Sheets\28146-C2.14.dwg Layout: C2.14 Oct 21, 2013 - 11:08am

COH KIVA # PCOH 2012780014



ENLARGEMENT "C"

POINT TABLE					
POINT NO.	NORTHING	EASTING	STATION	OFFSET	DESCRIPTION
1	732105.9661	303499.1693	33+74.02	52.50' LT	PC
2	732124.4918	303497.8640	33+91.74	58.06' LT	PT
3	732150.7202	303487.5534	34+14.86	74.17' LT	PC
4	732163.2908	303485.4286	34+26.60	79.15' LT	PT
5	732164.5926	303485.4802	34+27.88	79.40' LT	PT
6	732171.1718	303471.7429	34+31.09	94.29' LT	TBC
7	732170.1705	303495.7094	34+35.67	70.75' LT	TBC
8	731985.9156	303483.7765	32+50.00	35.50' LT	TOP
9	732068.6546	303496.4483	33+37.09	46.50' LT	AP

*STATIONING IS CHANNEL CENTERLINE

CURVE TABLE				
NO.	RADIUS	DELTA	LENGTH	TANGENT
C1	31.00'	23°43'57"	12.84'	6.51'
C2	31.00'	34°51'37"	18.86'	9.73'

EXISTING UTILITIES ARE LOCATED ON THE PLANS FROM A SEARCH OF AVAILABLE RECORDS. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
HORZ: 1 inch = 10 ft.

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES ITS COSTLY. Call 811 OR 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES ITS COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

PROFESSIONAL ENGINEER STATE OF NEVADA STEVEN M. BELLINO EXP. 12-31-14 CIVIL No. 19040 10/21/13

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Tel: +1 702.453.3775
Fax: +1 702.263.7290

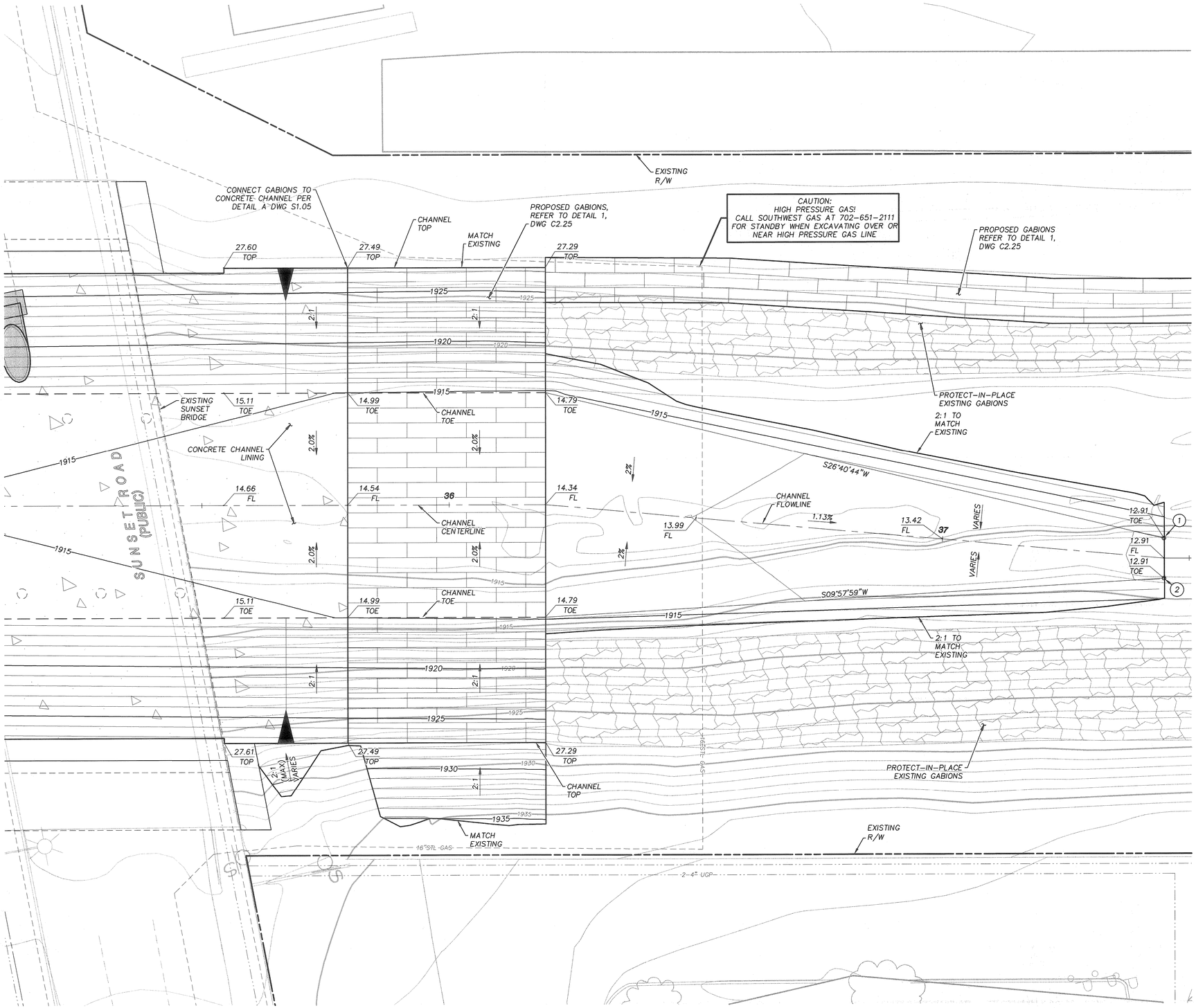
City of Henderson, Nevada
DUCK CREEK SUNSET TO SANDHILL
GRADING ENLARGEMENT

JOB NO: 100028146
FILE NAME: 28146-C2.15
SCALE: HORIZ.:1"=10' VERT.: NA
DESIGNED BY: S. BELLINO
DRAWN BY: W. JOHNSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.15
SHEET NO. 23
OF 41

X:\Projects\100028146_DC\Sheets\28146-C2.15.dwg Layout: C2.15 Oct 21, 2013 - 11:09am

COH KIVA # PCOH 2012780014



ENLARGEMENT "D"

POINT TABLE					
POINT NO.	NORTHING	EASTING	STATION	OFFSET	DESCRIPTION
1	732452.5098	303642.8928	37+44.57	4.00' LT	TOE
2	732450.6558	303650.6750	37+44.92	4.00' RT	TOE

*STATIONING IS CHANNEL CENTERLINE

EXISTING UTILITIES ARE LOCATED ON THE PLANS FROM A SEARCH OF AVAILABLE RECORDS. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
HORZ: 1 inch = 10 ft.

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES IT'S COSTLY. Call 811 or 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

PROFESSIONAL ENGINEER STATE OF NEVADA STEVEN M. BELLINO EXP. 12-31-14 CIVIL No. 19040 10/21/13

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1702.263.7275
Fax: +1702.263.7200

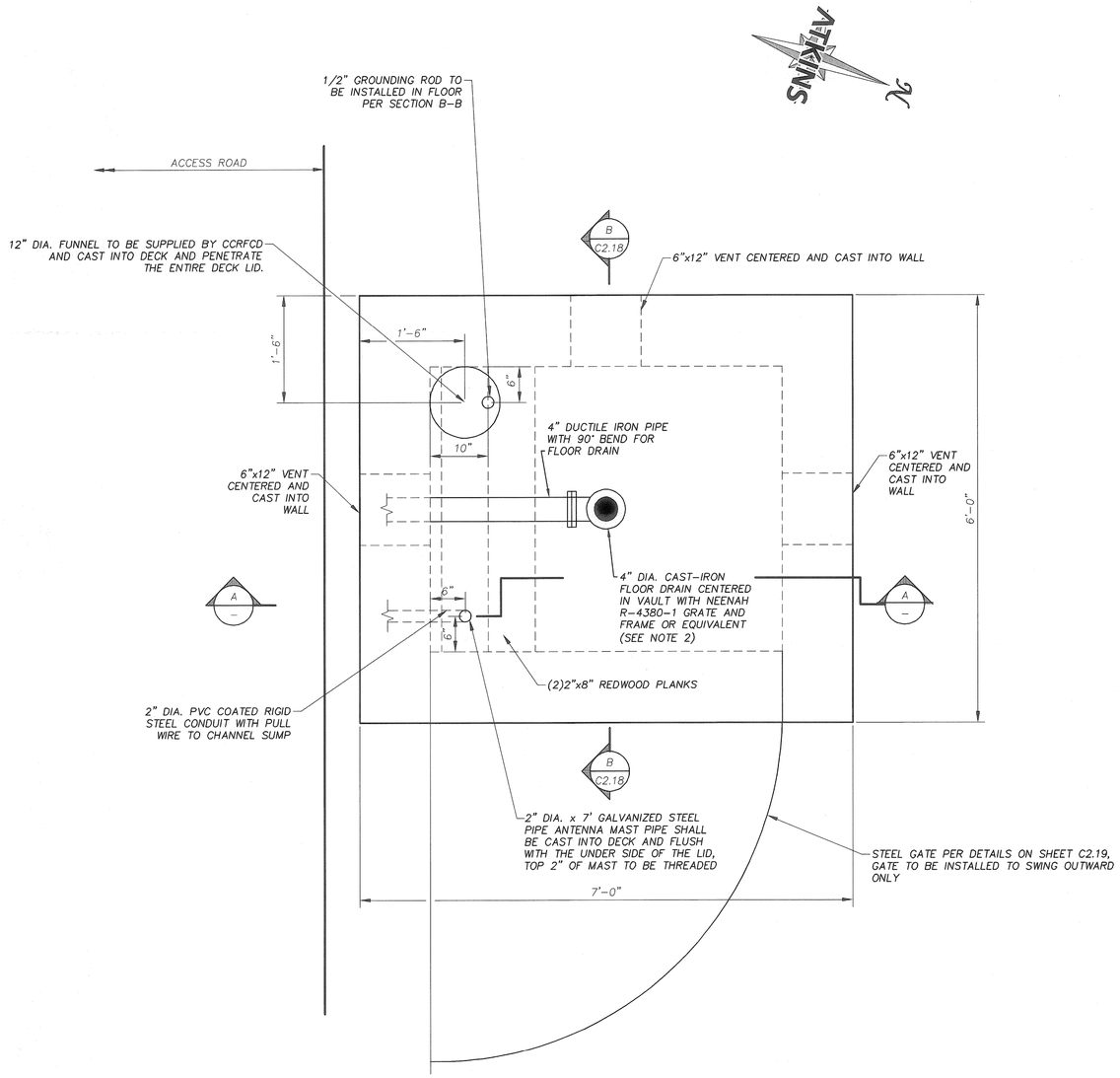
City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
GRADING ENLARGEMENT

JOB NO: 100028146
FILE NAME: 28146-C2.16
SCALE: HORIZ.:1"=10' VERT.: NA
DESIGNED BY: S. BELLINO
DRAWN BY: W. JOHNSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013
JOB NO: 100028146
DRAWING NO.: C2.16
24 / 41

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COH KIVA # PCOH 2012780014



PLAN VIEW

SCALE: N.T.S.

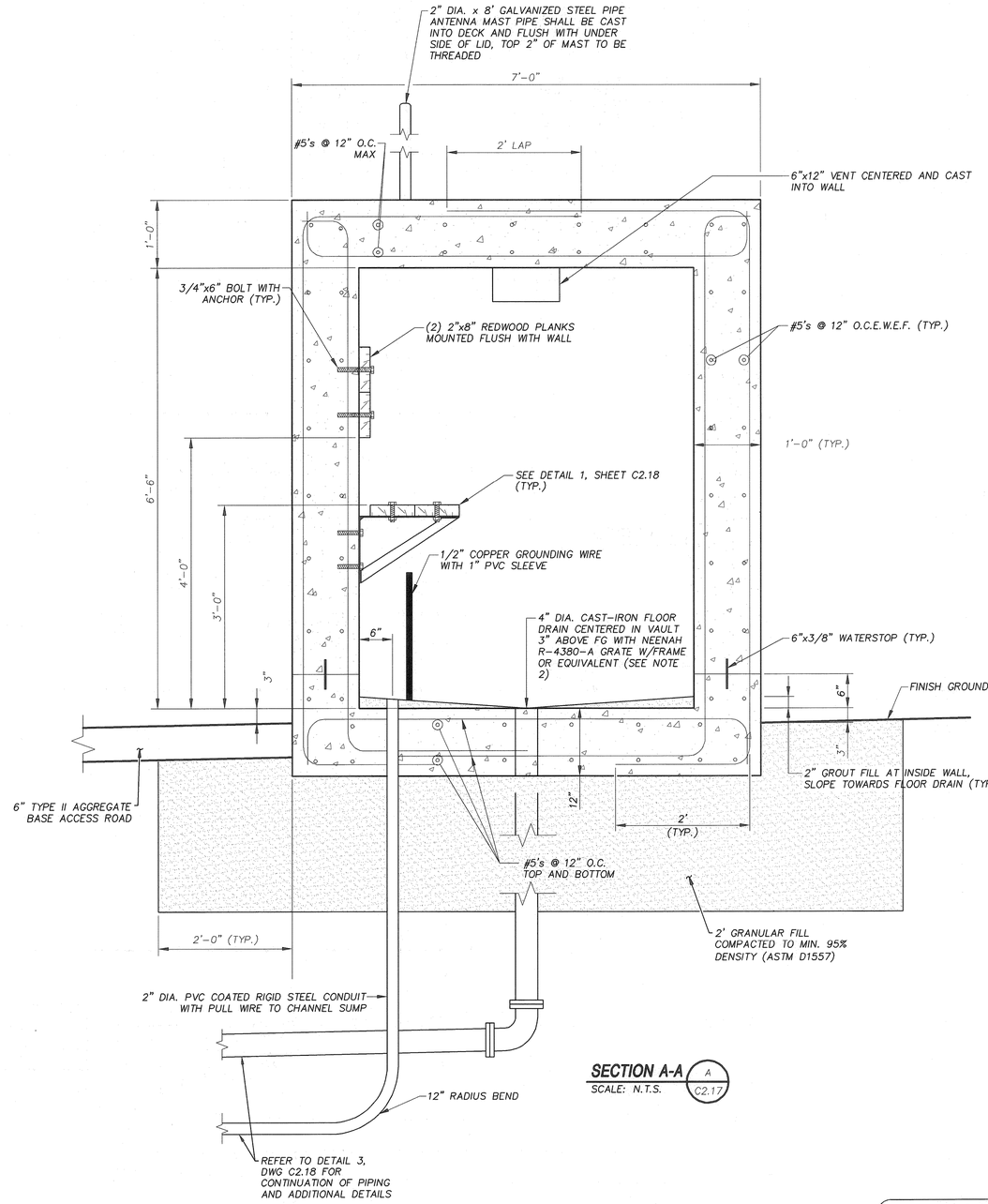
NOTES:

1. MONITORING STATION BEDDING SHALL BE 2' OF GRANULAR BACKFILL COMPACTED TO MIN 95% DENSITY (ASTM D1577)
2. FLOOR DRAIN TO BE INSTALLED AND CONNECTED TO DRAIN PIPE PER MANUFACTURER'S RECOMMENDATIONS.
3. REFER TO DWG C2.14 FOR CHANNEL GAUGE GRADING AND LOCATION.
4. REFER TO DETAIL 3, DWG C2.18 CONTINUATION OF PIPING AND ADDITIONAL DETAILS.

CHANNEL MONITORING STATION DETAIL

1 / C2.17

SCALE: N.T.S.



SECTION A-A

A / C2.17

SCALE: N.T.S.

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

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Fax: +1.702.263.7200

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
DETAILS

JOB NO.: 100028146
FILE NAME: 28146-C2.17
SCALE: HORIZ.:NONE VERT.: NONE

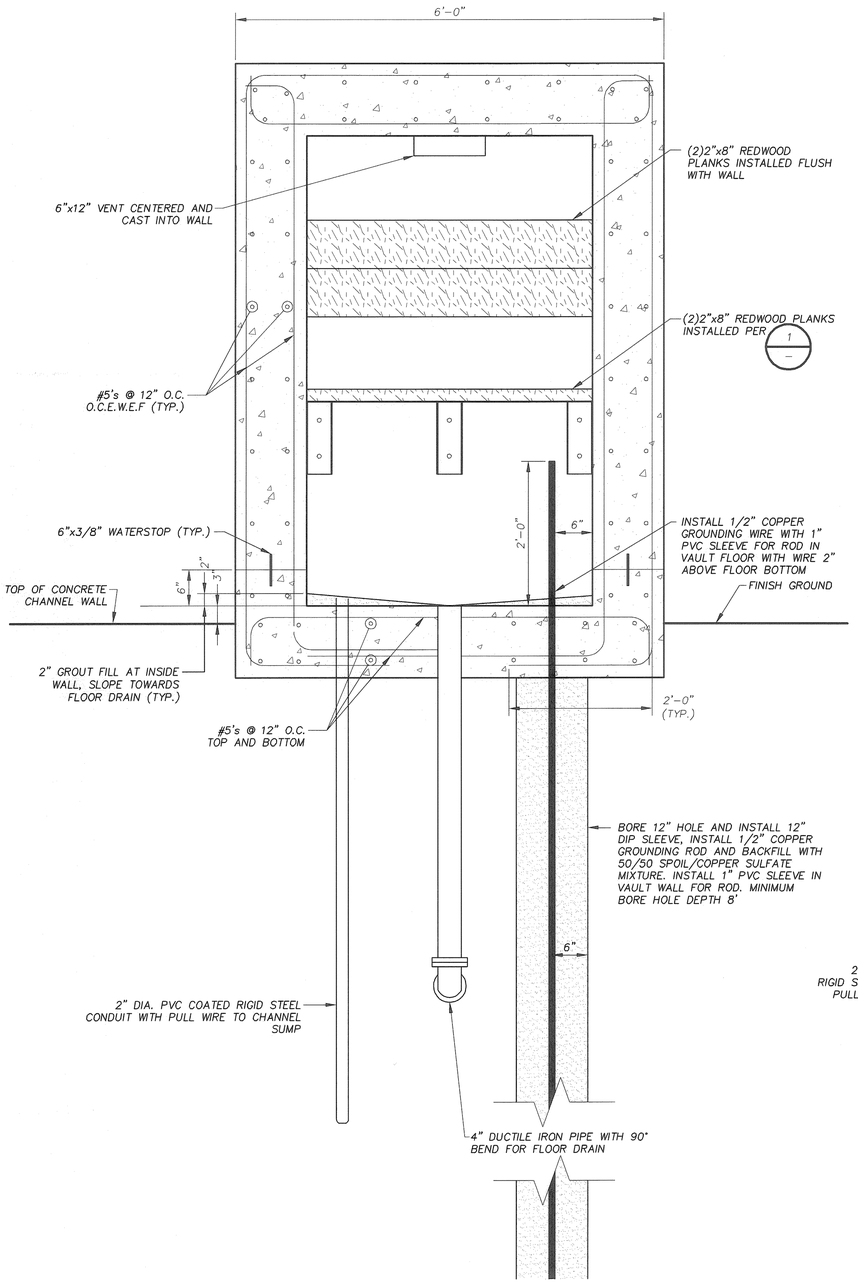
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.17
25 / 41

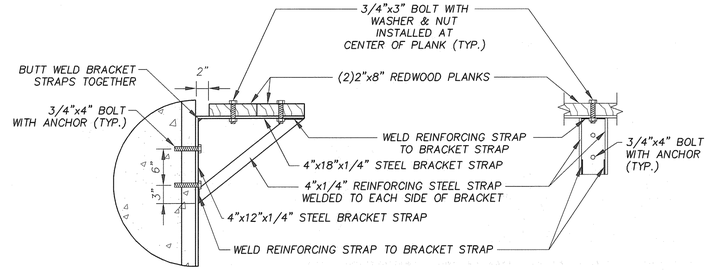
PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN W. BELLINO
EXP. 12-31-14
CIVIL
No. 15040
10/31/13

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COH KIVA # PCOH 2012780014

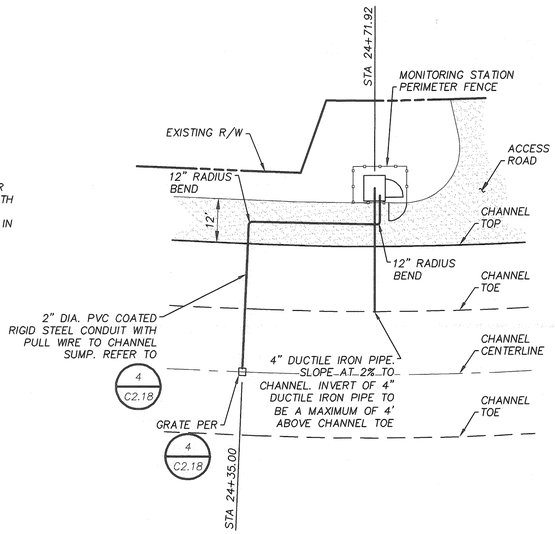


SECTION B-B
SCALE: N.T.S.
B / C2.18

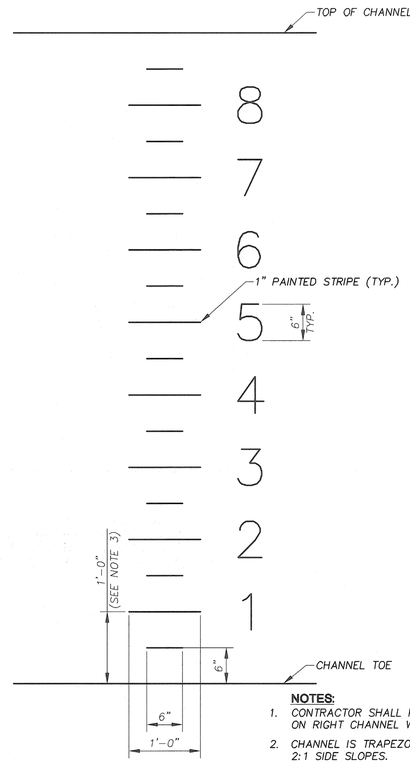


NOTES:
1. INSTALL BRACKETS AT EACH END AND IN THE MIDDLE

BRACKET DETAIL
SCALE: N.T.S.
1 / C2.18



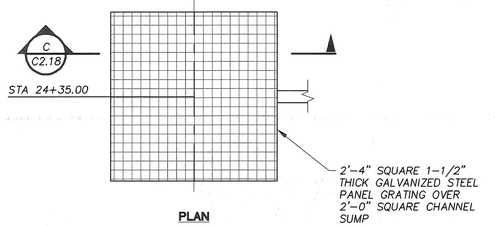
CHANNEL MONITORING STATION OVERALL PIPE ROUTING PLAN
SCALE: N.T.S.
3 / C2.18



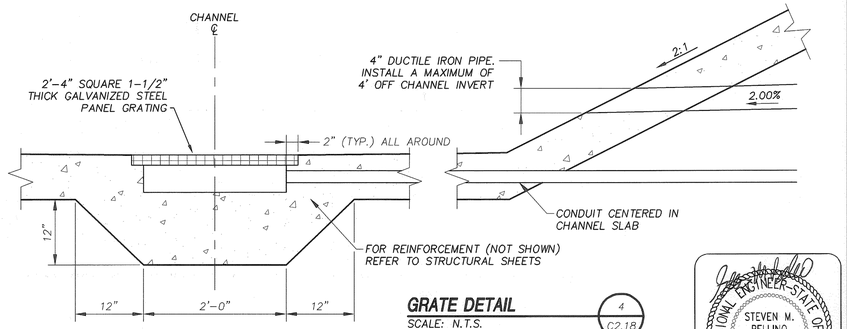
NOTES:
1. CONTRACTOR SHALL PAINT STAFF GAGE ON RIGHT CHANNEL WALL AT STA 24+35.00
2. CHANNEL IS TRAPEZOIDAL WITH 2:1 SIDE SLOPES.
3. DIMENSION REPRESENTS VERTICAL DISTANCE MEASURED FROM CHANNEL CENTERLINE.
4. UNITS FOR STAFF GAGE ARE FEET.

ELEVATION

PAINTED STAFF GAGE DETAIL
SCALE: N.T.S.
2 / C2.18



PLAN



SECTION C-C

GRATE DETAIL
SCALE: N.T.S.
4 / C2.18

PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19040
10/21/13

REV.	DESCRIPTION	BY	DATE	APPROVAL
	REVISIONS			

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1702.453.6275
Fax: +1702.263.7300

City of Henderson, Nevada

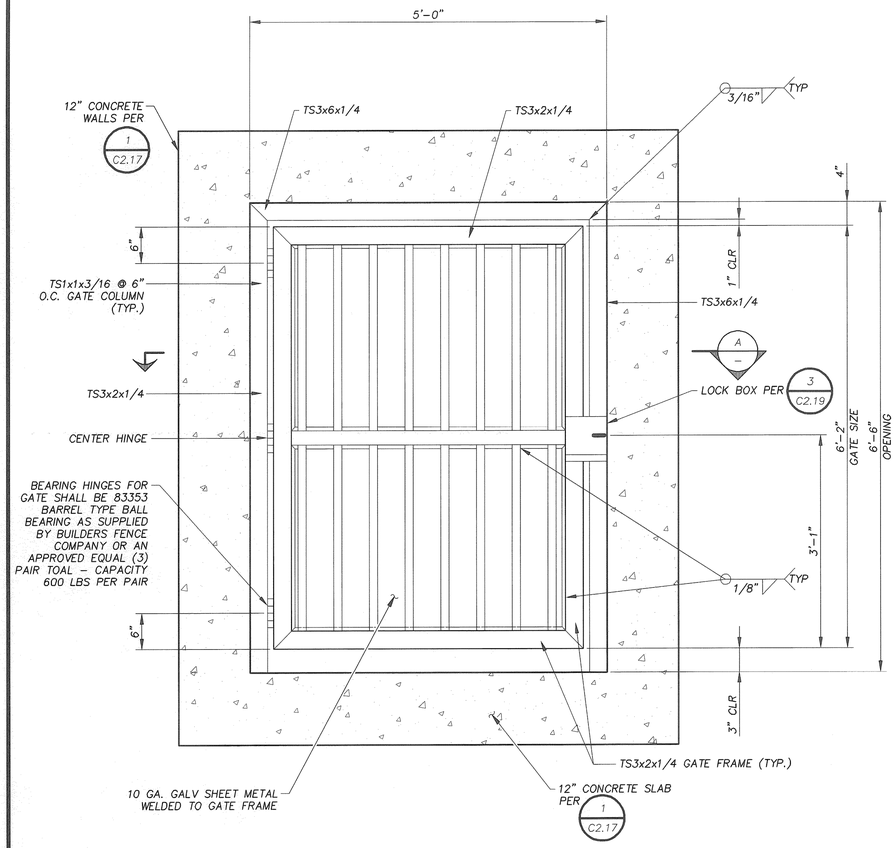
DUCK CREEK SUNSET TO SANDHILL
DETAILS

JOB NO: 100028146
FILE NAME: 28146-C2.18
SCALE: HORIZ.:NONE VERT.: NONE
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

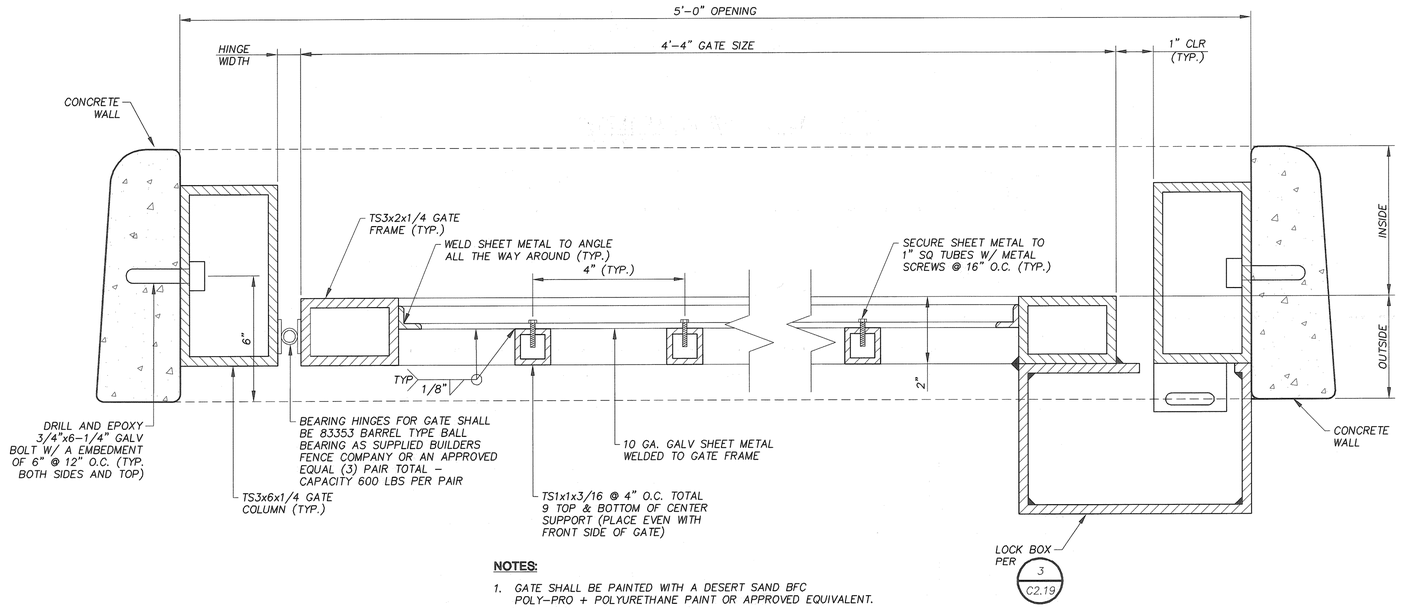
JOB NO. 100028146
DRAWING NO. C2.18
SHEET 26 / 41

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COH KIVA # PCOH 2012780014



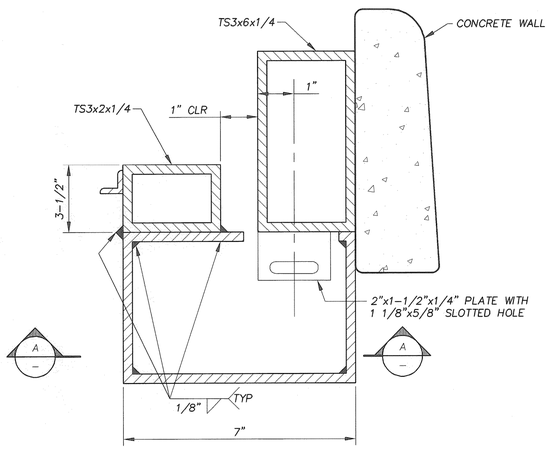
GATE ELEVATION DETAIL
SCALE: N.T.S.
1 / C2.18



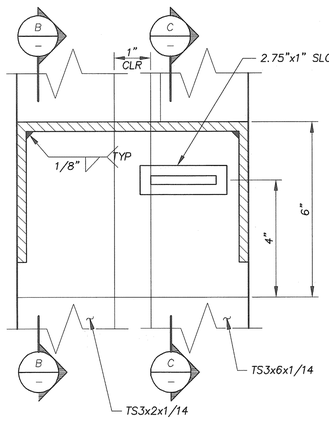
NOTES:

1. GATE SHALL BE PAINTED WITH A DESERT SAND BFC POLY-PRO + POLYURETHANE PAINT OR APPROVED EQUIVALENT.
2. GATE SHALL SWING IN THE OUTWARD DIRECTION

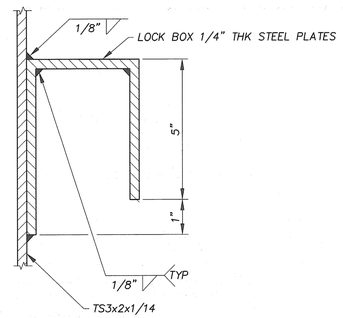
GATE AND LOCK BOX SECTION
SCALE: N.T.S.
2 / C2.19



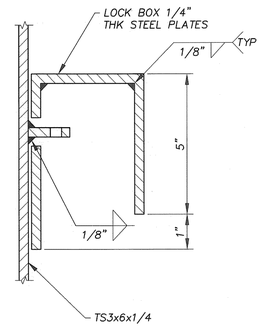
PLAN VIEW
SCALE: N.T.S.



SECTION A-A
SCALE: N.T.S.



SECTION B-B
SCALE: N.T.S.



SECTION C-C
SCALE: N.T.S.

LOCK BOX DETAILS
SCALE: N.T.S.
3 / C2.19

REV.	DESCRIPTION	BY	DATE	APPROVAL

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City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
DETAILS

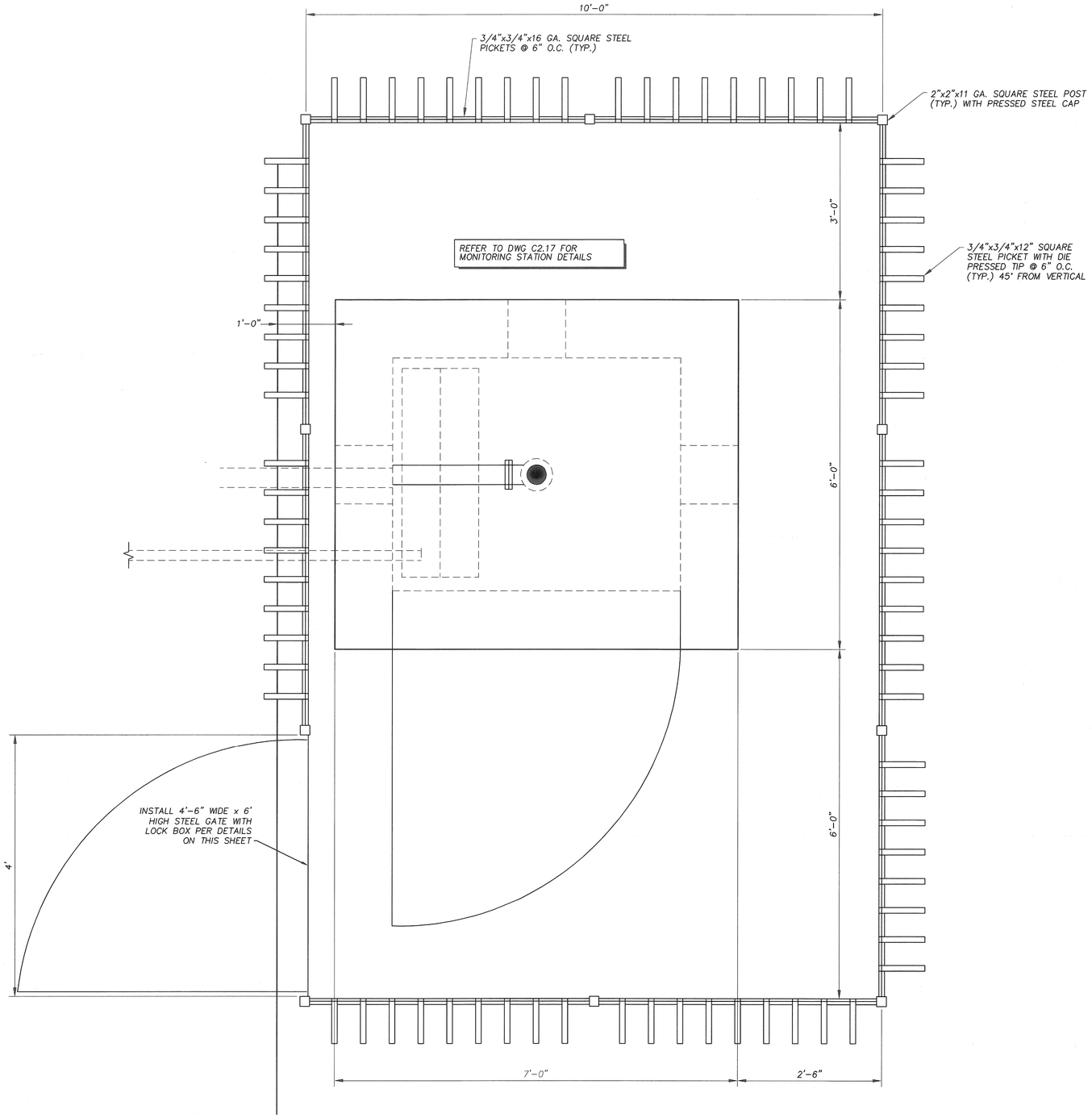
JOB NO.: 100028146
FILE NAME: 28146-C2.19
SCALE: HORIZ.-NONE VERT.- NONE
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.19
27
41

PROFESSIONAL ENGINEER-STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19040
10/21/13

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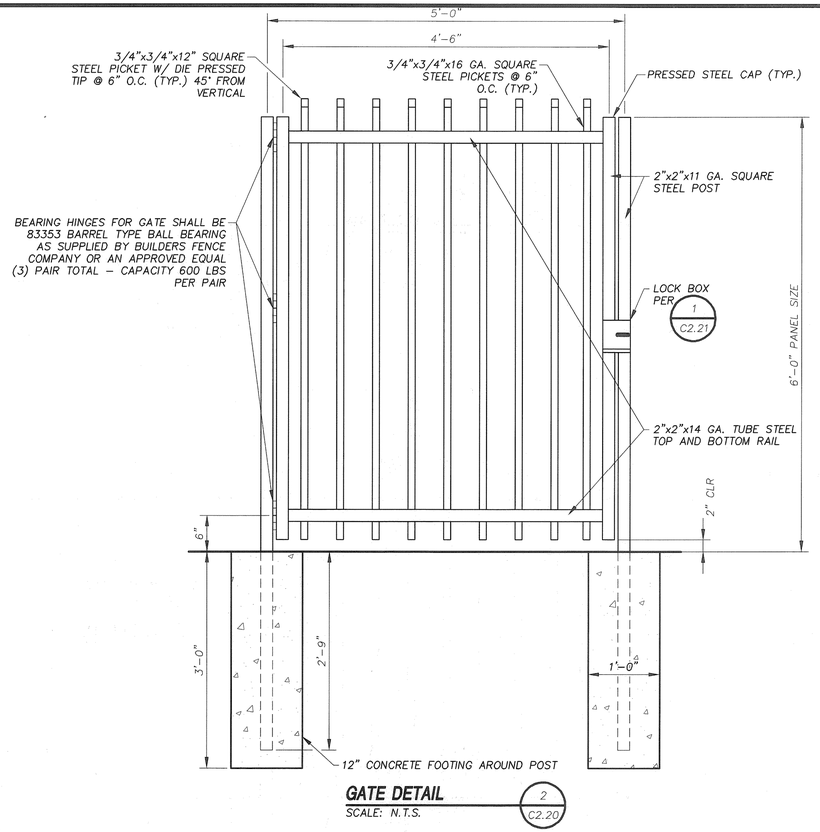
COH KIVA # PCOH 2012780014



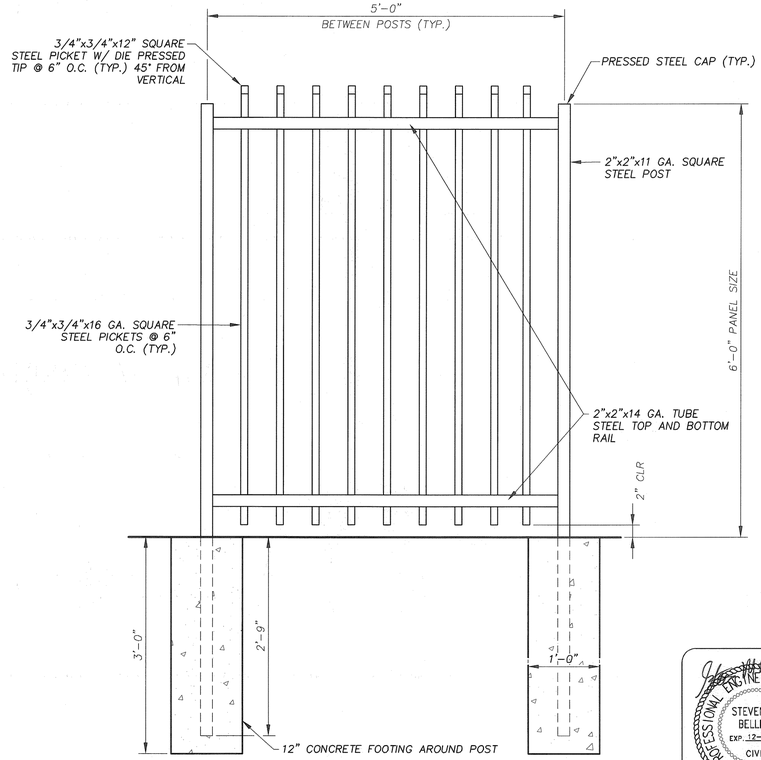
NOTES:

1. FENCE AND GATE SHALL BE A HEAVY GUARDIAN IRON FENCE TYPE FROM BUILDERS FENCE COMPANY OR SIMILAR APPROVED EQUIVALENT
2. FENCE SHALL BE PAINTED WITH A DESERT SAND BFC POLY-PRO+ POLYURETHANE PAINT OR APPROVED EQUIVALENT

MONITORING STATION FENCING PLAN (1 / C2.20)
SCALE: N.T.S.



GATE DETAIL (2 / C2.20)
SCALE: N.T.S.



TYPICAL FENCE DETAIL (3 / C2.20)
SCALE: N.T.S.

PROFESSIONAL ENGINEER STATE OF NEVADA — STEVEN M. BELLINO — EXP. 12-31-14 — CIVIL — No. 19040
10/21/13

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

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Telephone: +1 (702) 263-3727
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City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
DETAILS

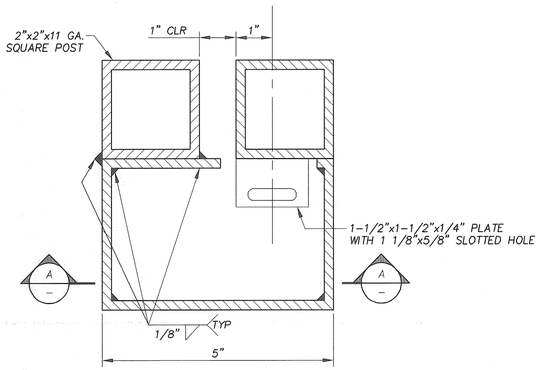
JOB NO.: 100028146
FILE NAME: 28146-C2.20
SCALE: HORIZ.:NONE VERT.: NONE

DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

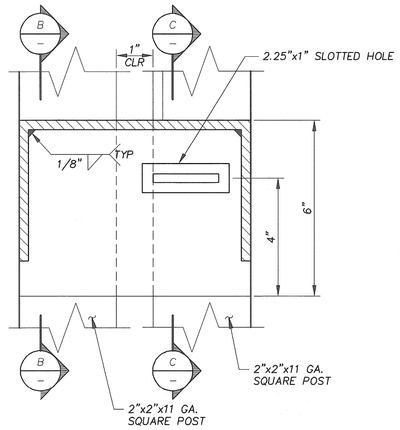
JOB NO. 100028146
DRAWING NO. C220
28 / 41

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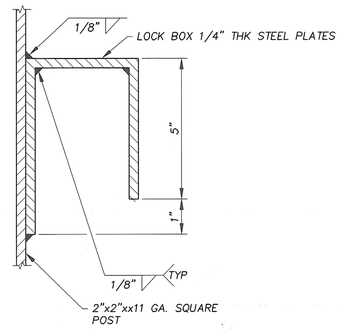
COH KIVA # PCOH 2012780014



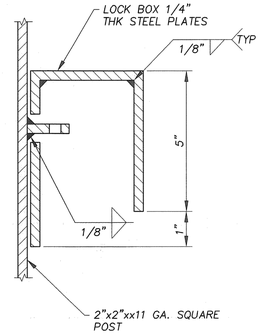
PLAN VIEW
SCALE: N.T.S.



SECTION A-A
SCALE: N.T.S.



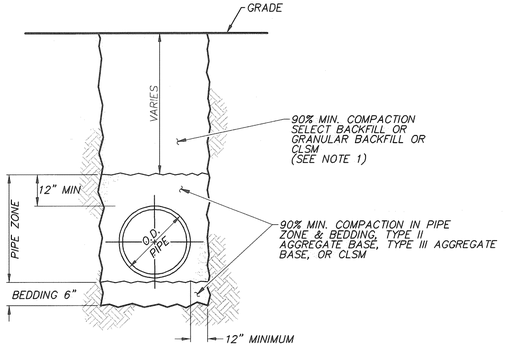
SECTION B-B
SCALE: N.T.S.



SECTION C-C
SCALE: N.T.S.

LOCK BOX DETAILS
SCALE: N.T.S.

1 / C2.21



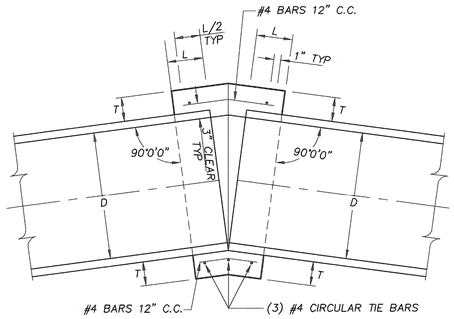
NOTES:

1. NO STONES OR LUMPS GREATER THAN 3" PERMITTED IN TRENCH 2' OR LESS IN WIDTH.
2. NATIVE SOILS AT THE BOTTOM OF THE TRENCH SHOULD BE MOISTURE CONDITIONED, AND. COMPACTED TO 90% RELATIVE COMPACTION, AS EVALUATED BY ASTM D1557, UNLESS EXPOSED SOILS AT THE BASE OF THE TRENCH ARE LOOSE, SOFT, OR DISTURBED BY EXCAVATION OPERATIONS IN WHICH CASE THESE SOILS SHALL BE SCARIFIED TO A DEPTH OF 6-INCHES, MOISTURE CONDITIONED, AND COMPACTED TO 95 PERCENT RELATIVE COMPACTION, AS EVALUATED BY ASTM D1557.

UNPAVED AREAS

TYPICAL RCP TRENCH SECTION
N.T.S.

2 / C2.21

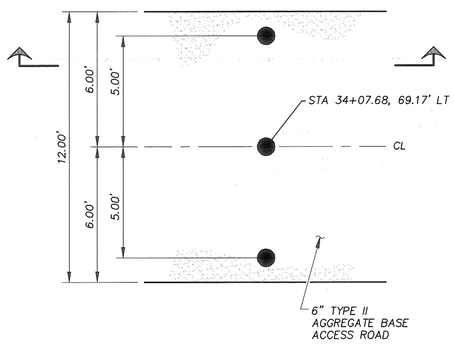


PLAN VIEW

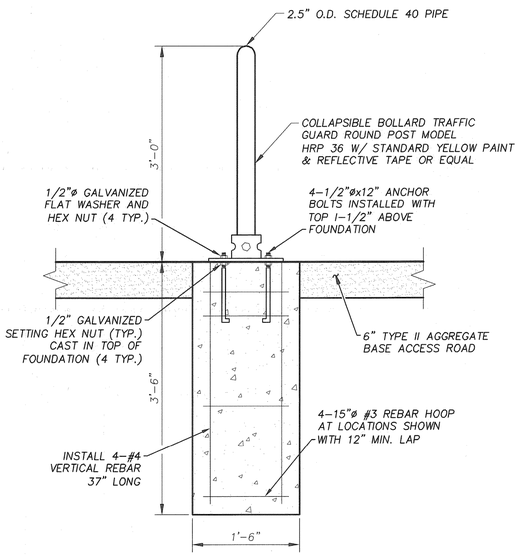
D	18"	24"	30"	36"	42"	48"	60"	72"
T	5"	6"	7"	8"	9"	10"	12"	14"
L	12"	12"	18"	18"	24"	24"	30"	36"

CONCRETE COLLAR DETAIL
N.T.S.

3 / C2.21



PLAN



NOTES:

1. INSTALL PER MANUFACTURERS RECOMMENDATIONS AND INSTRUCTIONS.

SECTION

COLLAPSIBLE BOLLARD
SCALE: N.T.S.

4 / C2.21

STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19040
PROFESSIONAL ENGINEER-STATE OF NEVADA
10/21/13

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ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
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City of Henderson, Nevada

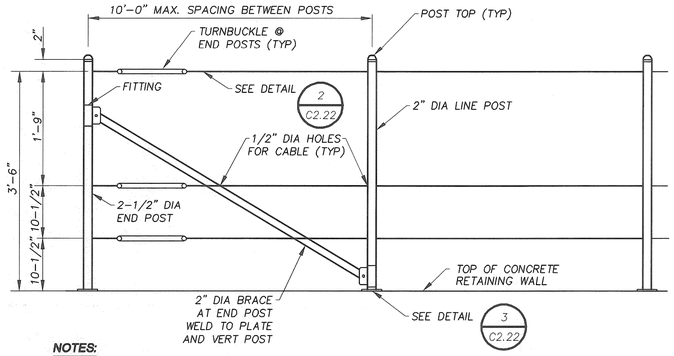
DUCK CREEK SUNSET TO SANDHILL
DETAILS

JOB NO.: 100028146
FILE NAME: 28146-C2.21
SCALE: HORIZ.:NONE VERT.: NONE
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C221
29 / 41

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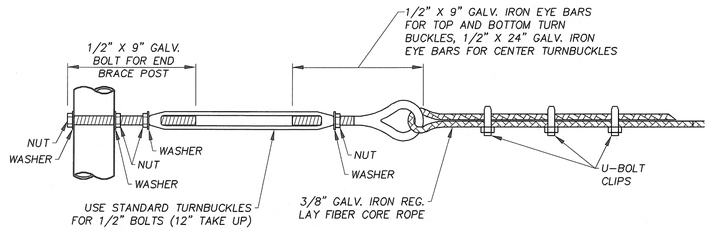
COH KIVA # PCOH 2012780014



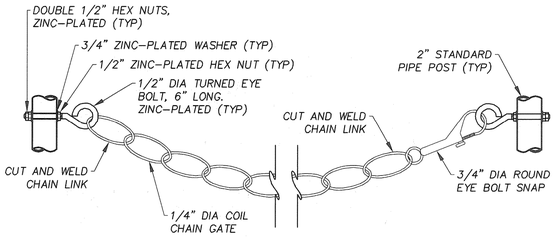
NOTES:

1. ALL POSTS SHALL BE SET PLUMB.
2. RAILING POSTS AND FITTINGS SHALL BE HOT DIPPED GALVANIZED MALLEABLE, CAST IRON, OR PRESSED STEEL.
3. CHAIN SAFETY GATES SHALL BE PROVIDED AT LADDER LOCATIONS. SEE DETAIL 4 THIS SHEET FOR DETAILS.
4. ATTACH TO TOP OF CONCRETE WALL PER DETAIL 3 AS SHOWN ON THIS SHEET.
5. BRACE POST SHALL NOT BE INSTALLED ACROSS EXPANSION JOINTS.
6. WHEN AN EXPANSION JOINT OCCURS AT A HORIZONTAL ANGLE POINT. THE CONCTRACTOR SHALL INSTALL TWO END POSTS, ONE ON EACH SIDE OF EXPANSION JOINT, WITH A MAX. 6" GAP BETWEEN THE POSTS.
7. BRACE POSTS SHALL BE PLACED AT A MAXIMUM OF 250' INTERVALS AND AT END POSTS.

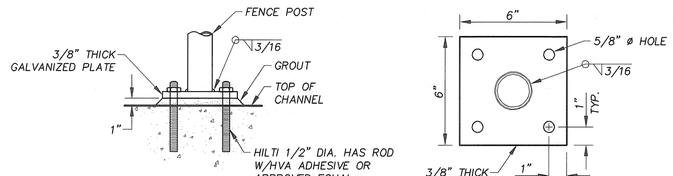
POST AND CABLE FENCE ELEVATION VIEW (1 C2.22)
N.T.S.



TURNBUCKLE @ END POST DETAIL (2 C2.22)
N.T.S.



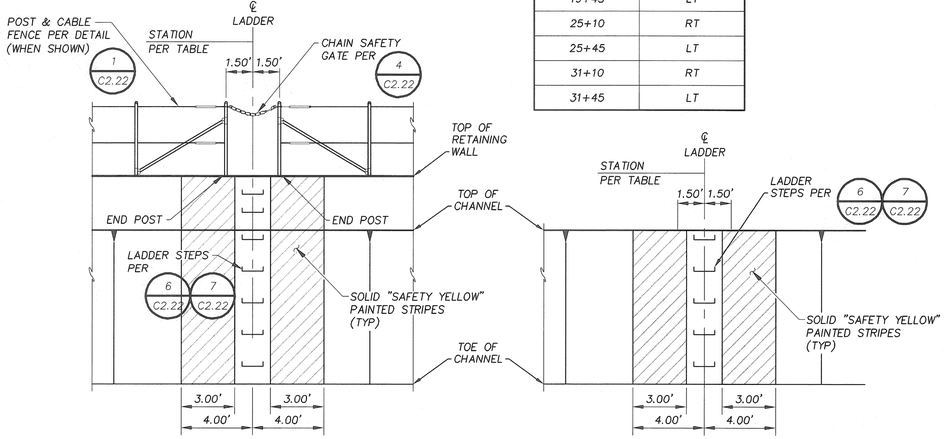
CHAIN SAFETY GATE DETAIL (4 C2.22)
N.T.S.



MOUNTING DETAIL (3 C2.22)
N.T.S.

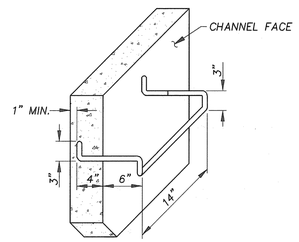
LADDER LOCATION TABLE

STA	OFFSET
13+20	RT
13+55	LT
19+10	RT
19+45	LT
25+10	RT
25+45	LT
31+10	RT
31+45	LT

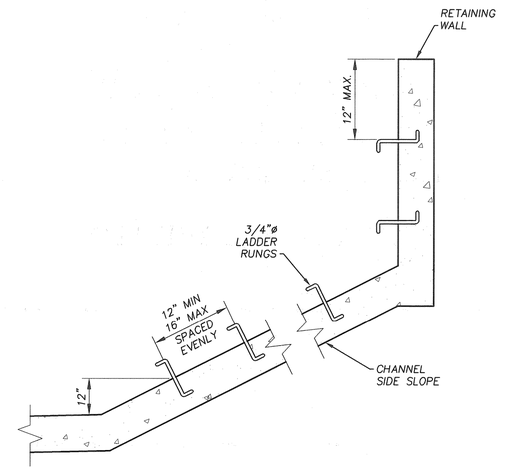


ACCESS LADDER WITH POST & CABLE FENCE — **ACCESS LADDER**

CHANNEL ACCESS LADDER (5 C2.22)
N.T.S.



STEP DETAIL (6 C2.22)
SCALE: N.T.S.



NOTES:

1. LADDER RUNGS TO BE CAST-IN-PLACE PER DETAIL 6 OR NEENAH FOUNDRY R-1982-F MANHOLE STEP OR EQUAL DRILLED AND EPOXIED IN PLACE WITH 4" EMBEDMENT.
2. THE LADDER SHALL BE MADE OF EITHER GALVANIZED STEEL OR SOME OTHER UV-RESISTANT MATERIAL.
3. LADDERS SHALL BE PLACED IN PAIRS AND ARE SHOWN PER PLAN SHEETS.
4. THE PAIRS SHALL BE LOCATED ON OPPOSITE SIDES OF THE CHANNEL AND WILL BE OFFSET BY APPROXIMATELY THE WIDTH OF THE CHANNEL BOTTOM
5. YELLOW STRIPES 36" WIDE SHALL BE PAINTED ON BOTH SIDES OF THE LADDER FROM BOTTOM OF CHANNEL TO TW
6. SEE STRUCTURAL SECTIONS FOR CHANNEL WALL AND SLAB REINFORCEMENT REQUIREMENTS

LADDER DETAILS (7 C2.22)
N.T.S.

REVISIONS

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THE CITY OF HENDERSON

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL

DETAILS

JOB NO.: 100028146
FILE NAME: 28146-C2.22
SCALE: HORIZ.:NONE VERT.: NONE

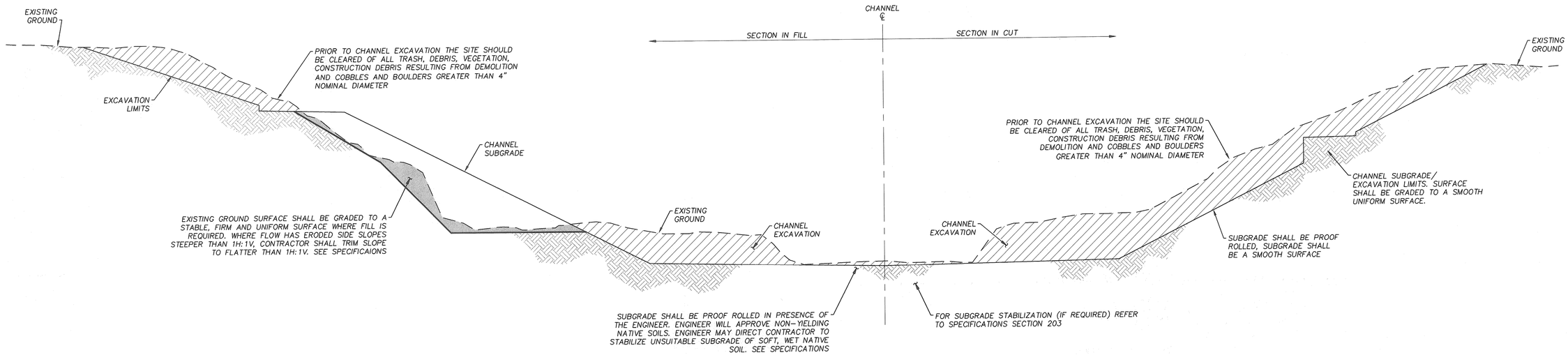
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146 | DRAWING NO. C2.22 | 30 | 41

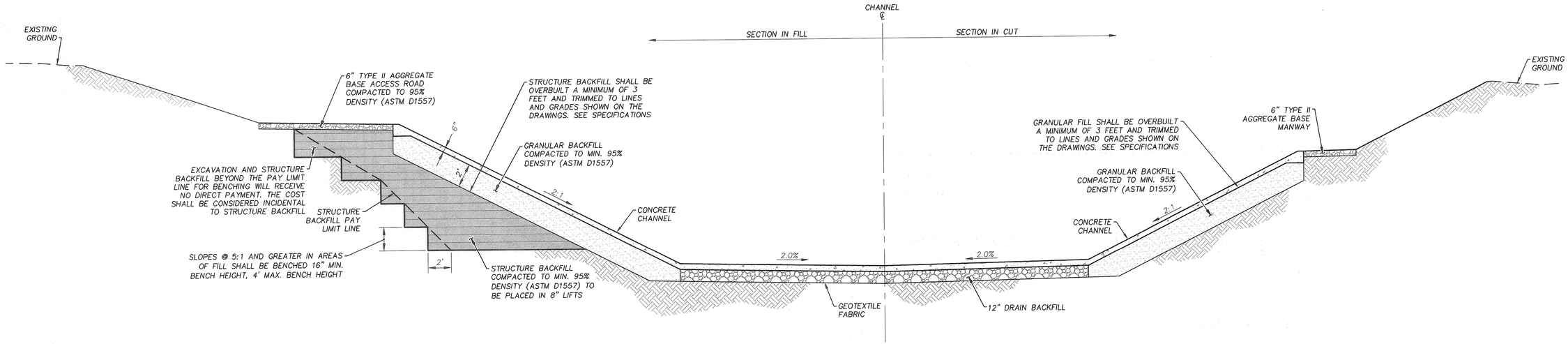
PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19040
10/21/13

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COH KIVA # PCOH 2012780014



CHANNEL EXCAVATION/SITE PREPARATION



CHANNEL BACKFILL

CHANNEL EXCAVATION/BACKFILL
N.T.S.

1
C2.23

REVISIONS

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DUCK CREEK SUNSET TO SANDHILL
DETAILS

JOB NO.: 100028146
FILE NAME: 28146-C2.23
SCALE: HORZ.:NONE VERT.: NONE

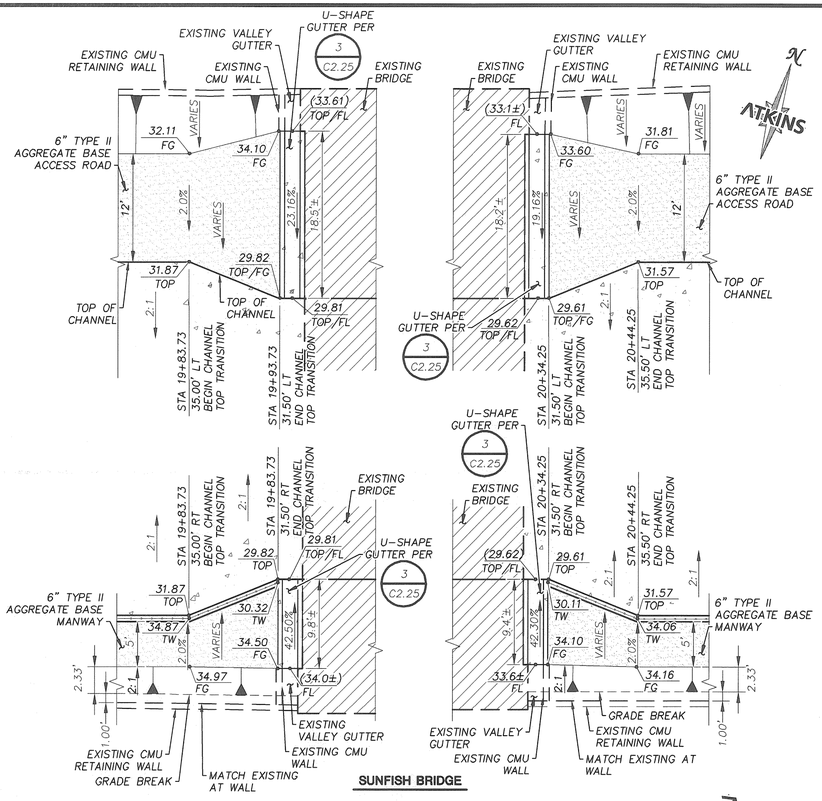
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

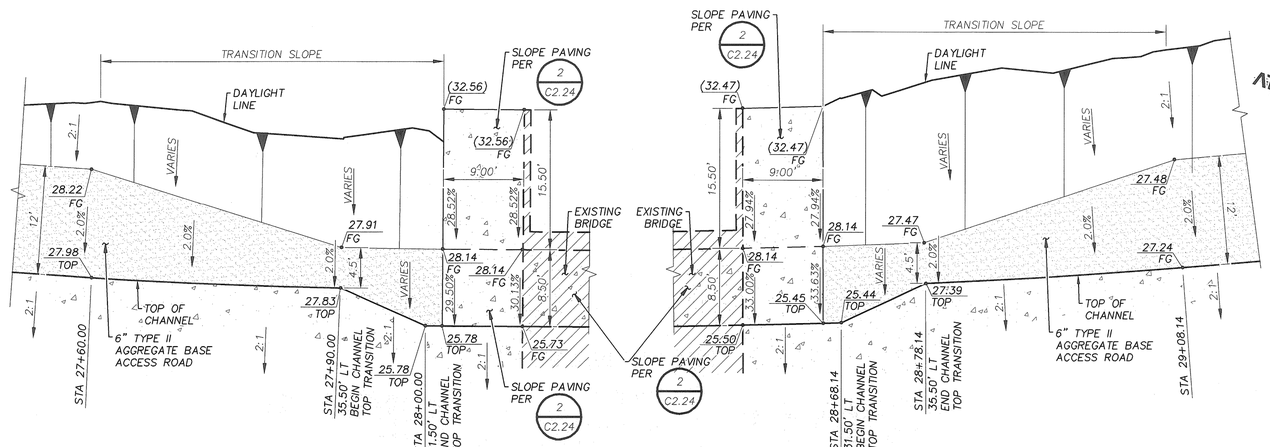
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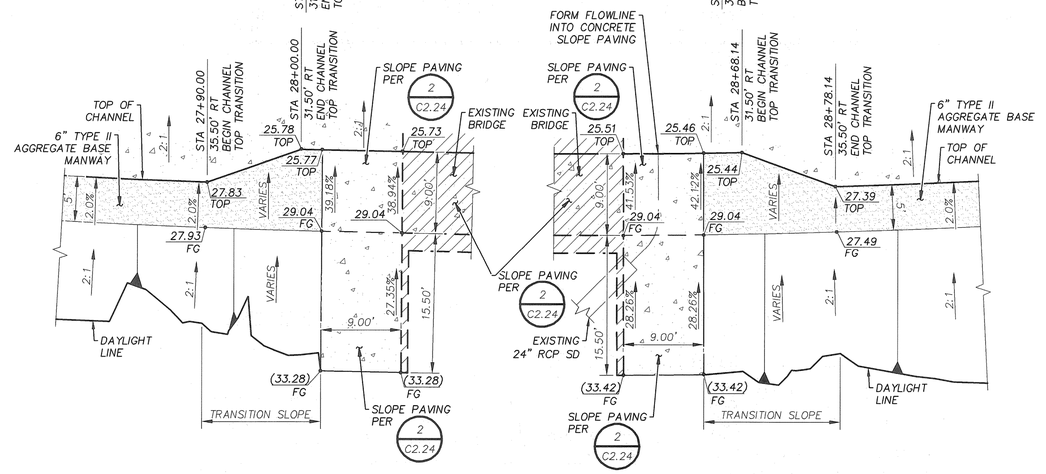
PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19040
10/21/13

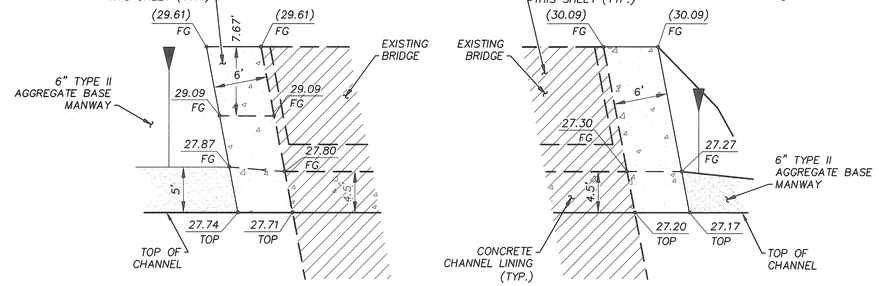
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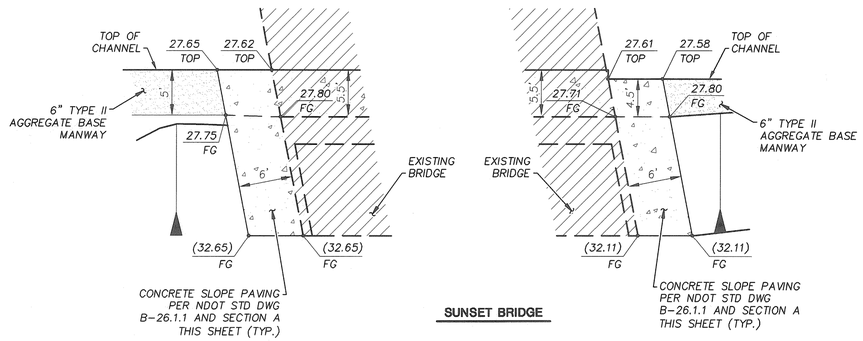
COH KIVA # PCOH 2012780014

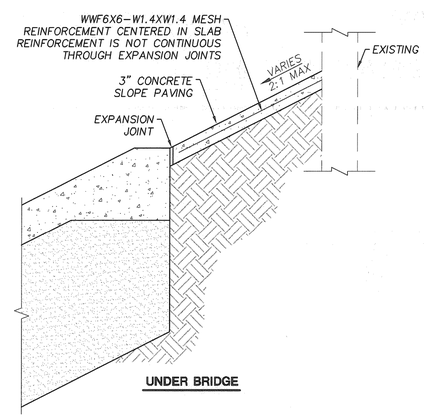


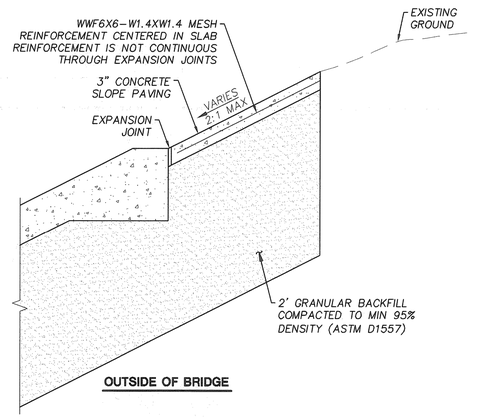


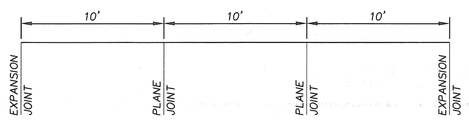


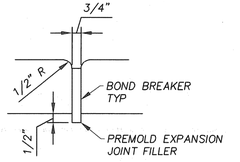












NOTES

1. 3/4" EXPANSION JOINT AT 30' INTERVALS AND AT BEGINNING AND END OF SLOPE PAVING AND AT TOP AND BOTTOM.
2. EXPANSION JOINT MATERIAL SHALL BE PREMOLDED JOINT FILLER WITH BOND BREAKER.
3. WEAKENED PLANE JOINTS SHALL BE 3/4" DEEP.
4. WEAKENED PLANE JOINTS ARE NOT SEALED.

BRIDGE GRADING ENLARGEMENTS (1 / C2.24) N.T.S.

CONCRETE SLOPE PAVING (2 / C2.24) SCALE: N.T.S.

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone +1702.263.7200
Fax: +1702.263.7300

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
DETAILS

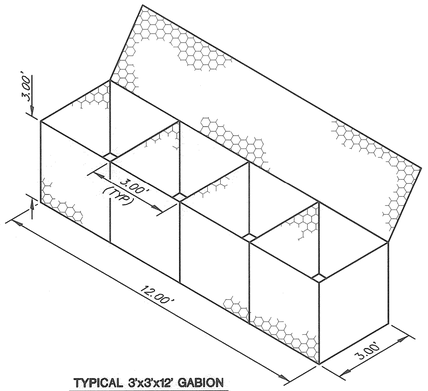
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FILE NAME: 28146-C2.24
SCALE: HORIZ.:NONE VERT.: NONE
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.24
32 / 41

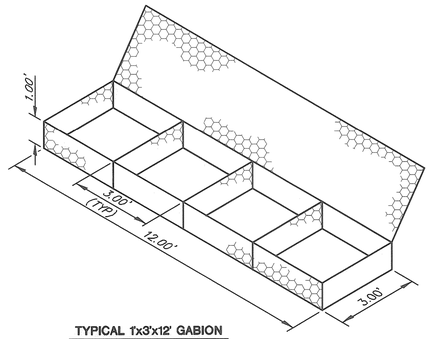
PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19040
10/21/13

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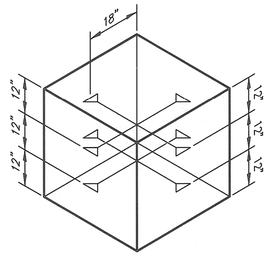
COH KIVA # PCOH 2012780014



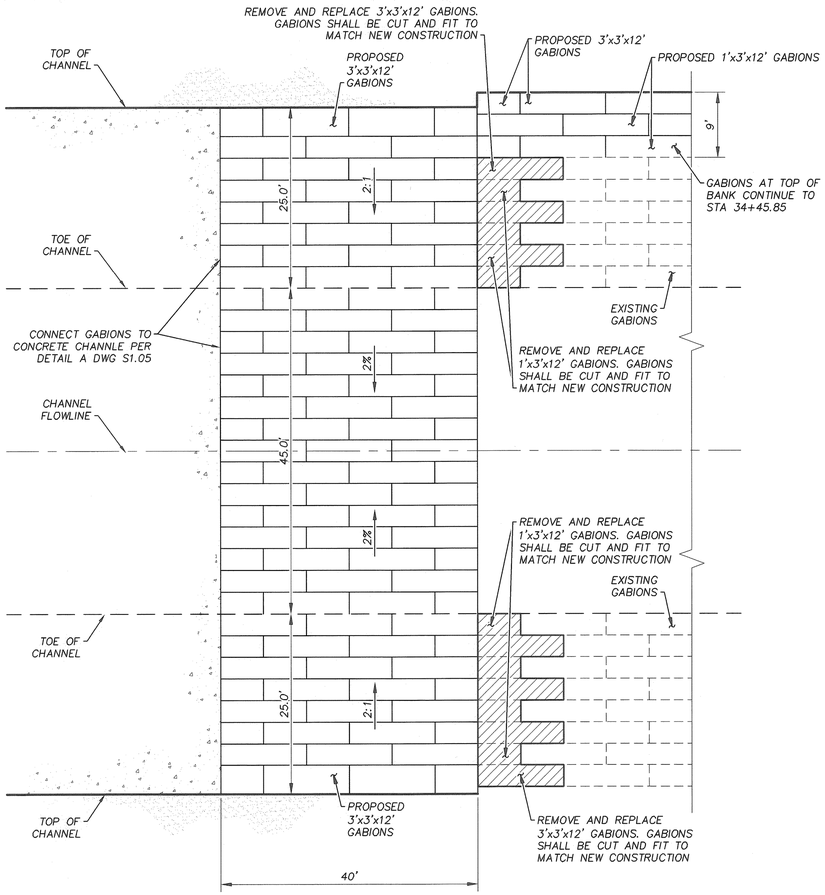
TYPICAL 3'x3'x12' GABION



TYPICAL 1'x3'x12' GABION



INTERNAL WIRING

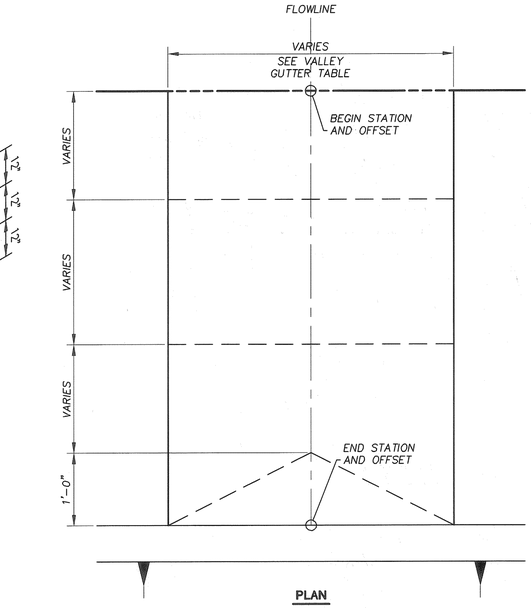


PLAN

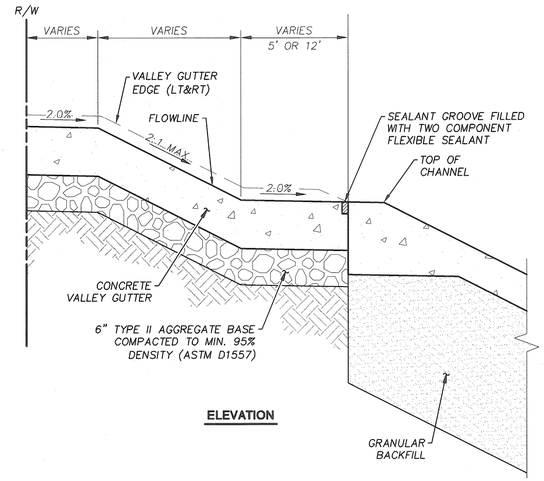
NOTES:

1. LOCATIONS OF INDIVIDUAL GABION BASKETS SHOWN ARE NOT EXACT LOCATIONS. LOCATION TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR. REMOVE GABIONS TO THE NEAREST JOINT BETWEEN BASKETS.
2. WIRE BASKETS TO BE JOINED BY LACING ALL EDGES OF INDIVIDUAL UNITS PER MANUFACTURER'S SPECIFICATIONS AND PER THE PROJECT SPECIFICATIONS.
3. GABIONS TO BE INSTALLED OVER FILTER FABRIC, MIRAFI 180N OR EQUAL.

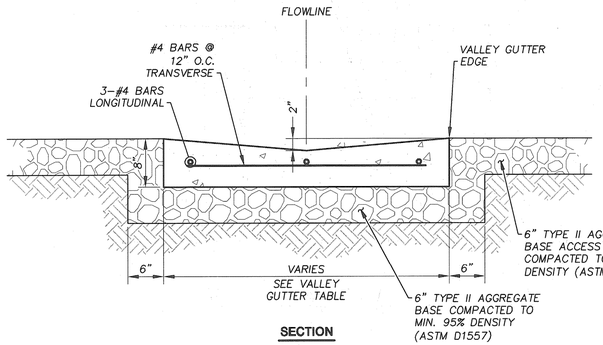
GABIONS
N.T.S. — 1 / C2.25



PLAN



ELEVATION



SECTION

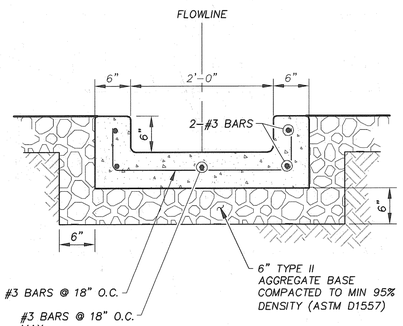
VALLEY GUTTER TABLE

VALLEY GUTTER NO.	BEGIN STATION	BEGIN OFFSET	END STATION	END OFFSET	WIDTH
1	17+34.36	55.50' LT	17+34.36	35.50' LT	4.00'
2	17+03.36	44.50' RT	17+03.36	36.17' RT	4.00'
3	23+10.03	52.24' LT	23+10.03	35.50' LT	4.00'
4	24+46.06	54.36' LT	24+46.09	35.50' LT	4.00'
5	24+13.87	44.50' RT	24+16.43	36.17' RT	4.00'
6	25+58.20	55.54' RT	25+58.20	35.50' RT	2.50'
7	27+37.83	52.42' RT	25+37.83	35.50' RT	4.00'
8	34+27.64	64.83' LT	34+31.22	46.50' LT	6.00'
9	34+52.88	64.83' RT	34+49.31	46.50' RT	6.00'
10	35+35.64	64.83' LT	35+39.21	46.50' LT	6.00'
11	35+60.86	64.83' RT	35+57.49	47.50' RT	6.00'

NOTES:

1. VALLEY GUTTERS FOLLOW PROPOSED GRADING

CONCRETE VALLEY GUTTER
N.T.S. — 2 / C2.25



CONCRETE U-SHAPE GUTTER
N.T.S. — 3 / C2.25

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

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Fax: +1.702.263.7200

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL

DETAILS

JOB NO.: 100028146
FILE NAME: 28146-C2.25
SCALE: HORIZ.:NONE VERT.: NONE

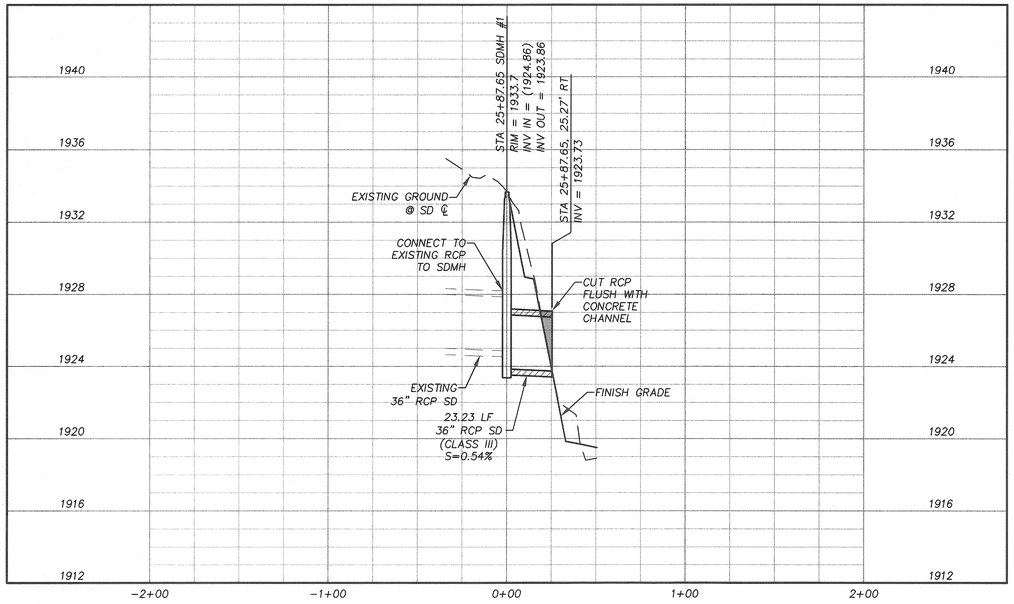
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C2.25
33 / 41

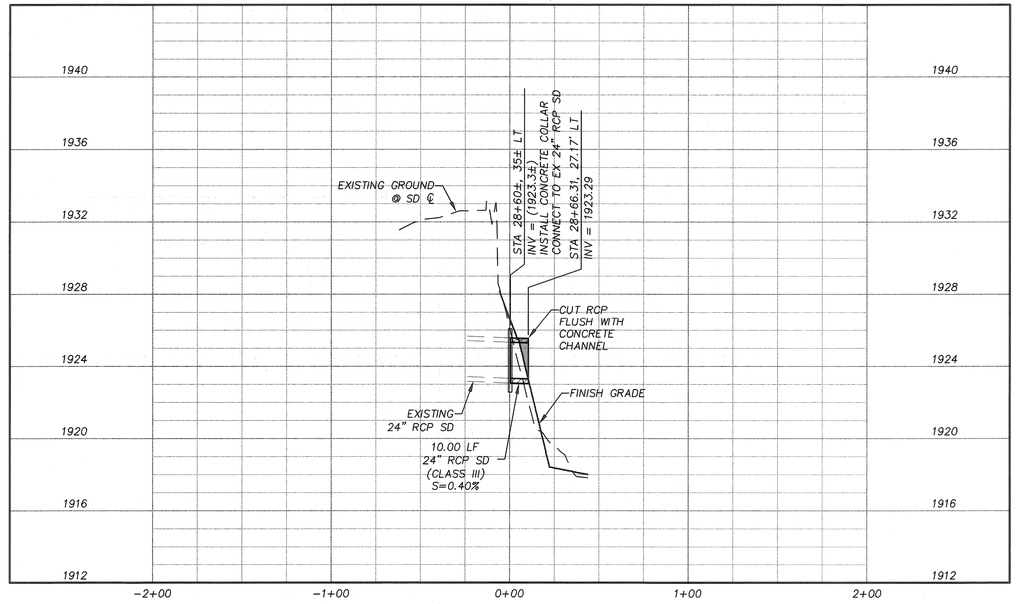
PROFESSIONAL ENGINEER-STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 19040
10/21/13

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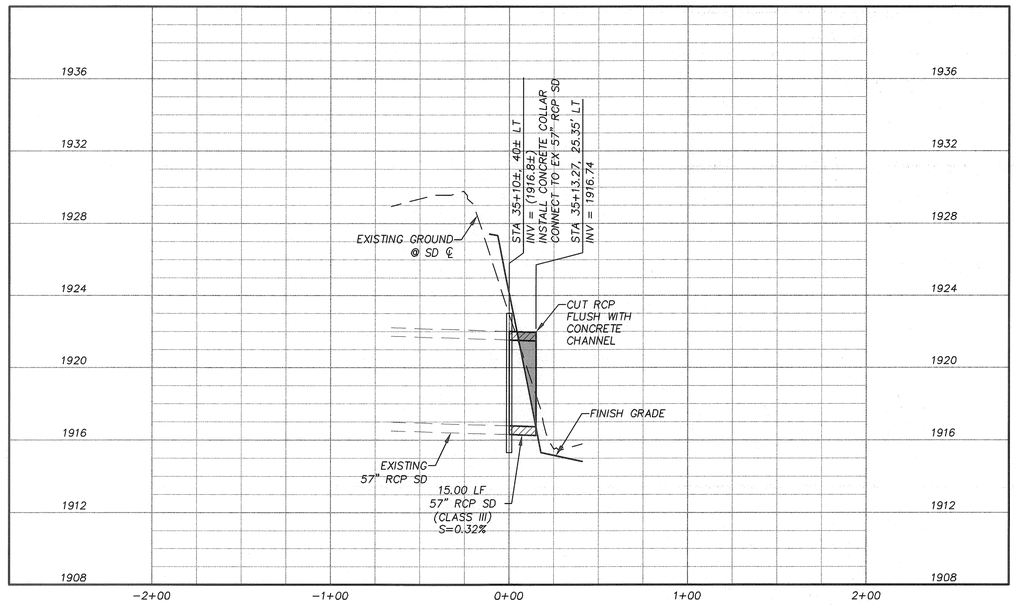
COH KIVA # PCOH 2012780014



SD LATERAL #1



SD LATERAL #2



SD LATERAL #3

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

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Henderson, Nevada 89074
Telephone: +1702.263.7275
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City of Henderson, Nevada

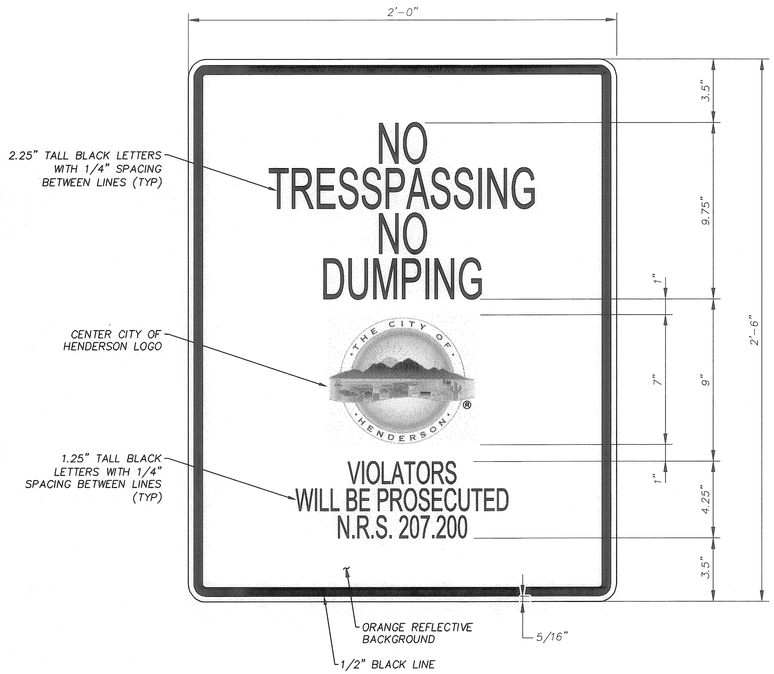
DUCK CREEK SUNSET TO SANDHILL
LATERAL PROFILES

JOB NO: 100028146
FILE NAME: 28146-C2.26
SCALE: HORIZ.:1"=40' VERT.: 1"=4'
DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. C226
34
41

PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 15040
10/21/13

X:\Projects\100028146_DC\Sheets\28146-C2.26.dwg Layout: C2.26 Oct 21, 2013 - 11:12am



NO TRESSPASSING SIGN
N.T.S.

1
C2.27

SIGN LOCATION TABLE

STATION	OFFSET	SIGN MOUNTING
8+97.24	62.28' LT	FENCE
12+50.00	76.85' LT	FENCE
15+00.00	75.77' LT	FENCE
19+83.73	47.00' LT	POST
19+83.73	40.67' RT	POST
20+44.25	47.00' LT	POST
20+44.25	40.67' RT	POST
24+92.00	136.16' LT	FENCE
28+06.30	63.00' LT	POST
28+06.30	63.00' RT	POST
28+62.51	63.00' LT	POST
28+59.08	63.00' RT	POST
34+23.86	68.62' LT	POST
34+49.82	67.42' RT	POST
35+31.85	68.61' LT	POST
35+58.23	67.00' RT	POST

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

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PROFESSIONAL ENGINEER STATE OF NEVADA
STEVEN M. BELLINO
EXP. 12-31-14
CIVIL
No. 15040
10/21/13

JOB NO. 100028146
DRAWING NO. 35 / 41
C2.27

DESIGNED BY: S. BELLINO
DRAWN BY: R. WATSON
CHECKED BY: A. SPATA
DATE: OCTOBER 31, 2013

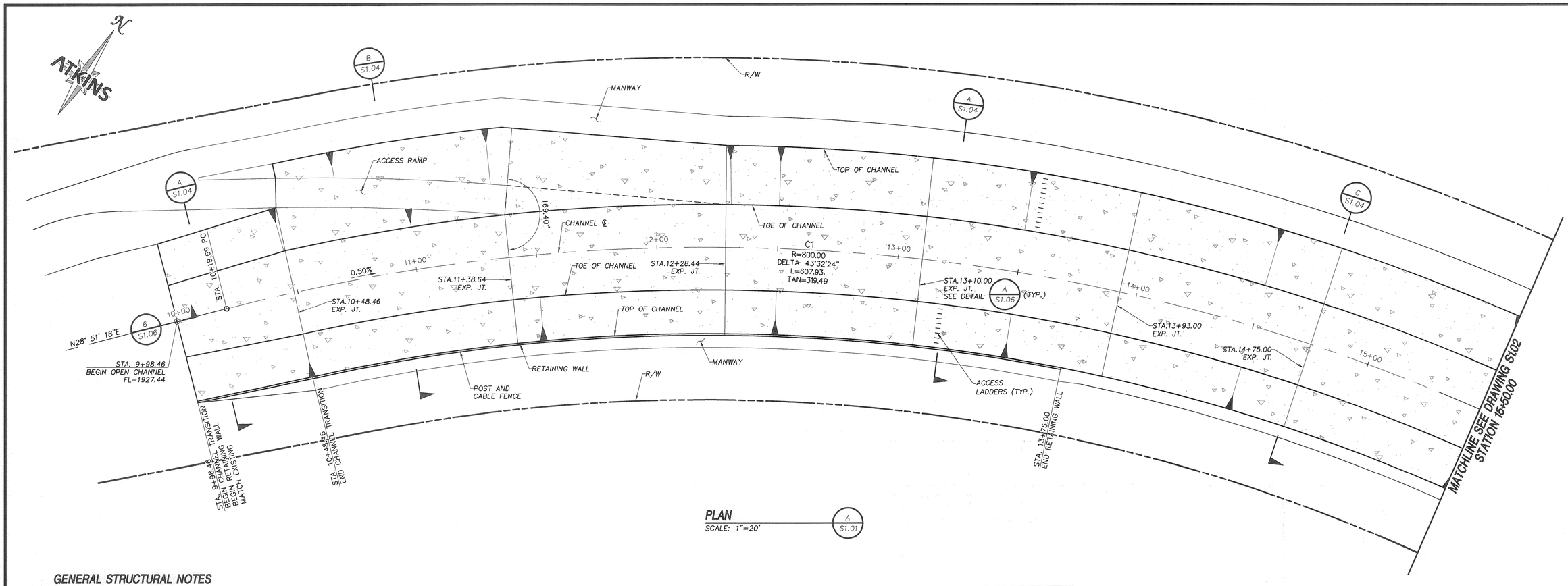
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SCALE: HORIZ.:NONE VERT.: NONE

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
DETAILS

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COH KIVA # PCOH 2012780014



PLAN
SCALE: 1"=20'
A S1.01

GENERAL STRUCTURAL NOTES

GENERAL

STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL LOADS ON THE COMPLETED STRUCTURES. DURING CONSTRUCTION, THE STRUCTURES SHALL BE PROTECTED BY BRACING AND BALANCING WHEREVER EXCESSIVE CONSTRUCTION LOADS MAY OCCUR.

UNLESS OTHERWISE SHOWN ON ALL STRUCTURAL DRAWINGS THE FINISH GRADE AROUND STRUCTURES IS SHOWN THUS ~~~~~ INDICATING EITHER GROUND SURFACE, TOP OF CONCRETE SLAB OR AC PAVEMENT. FOR DETAILS OF FINISH SURFACES SEE CIVIL AND ARCHITECTURAL DRAWINGS.

FOR PROJECT CONTROL POINTS REFER TO PLAN SHEET C1.06

STRUCTURAL

DESIGN IN ACCORDANCE WITH IBC 2009 AND CCRFCD "HYDROLOGIC CRITERIA AND DESIGN MANUAL".

LOCATION OF ALL CONSTRUCTION JOINTS SHALL BE AS SHOWN ON THE DRAWINGS OR APPROVED BY THE ENGINEER.

LOADING:
LIVE LOAD: 100 PSF

CONCRETE

UNLESS OTHERWISE NOTED OR SPECIFIED, ALL STRUCTURAL CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4500 PSI IN 28 DAYS. CEMENT SHALL BE TYPE V FOR ALL CONCRETE.

FILLET FORMS AT ALL EXPOSED CORNERS USING TRIANGULAR MOLDING WITH 2 EQUAL SIDES OF 3/4" IN SIZE.

REINFORCEMENT STEEL SHALL BE DEFORMED BARS CONFORMING IN QUALITY TO THE REQUIREMENTS OF ASTM A-615 "SPECIFICATIONS FOR DEFORMED BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT". GRADE 60.

ALL DETAILING, FABRICATION AND PLACING OF REINFORCING BARS, UNLESS OTHERWISE INDICATED, SHALL BE IN ACCORDANCE WITH ACI-315, "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES" LATEST EDITION.

TOLERANCES IN PLACING REINFORCEMENT SHALL BE:

± 3/8 INCH FOR MEMBERS WITH D ≤ 8 INCHES

± 1/2 INCH FOR MEMBERS WITH D > 8 INCHES

CONCRETE CONT.

ALL KEYWAYS IN CONSTRUCTION JOINTS, WHERE SHOWN, SHALL BE ROUGH AND THOROUGHLY CLEANED FOR BOND.

DOWELS, WATERSTOPS AND OTHER INSTALLED MATERIALS AND ACCESSORIES SHALL BE HELD SECURELY IN POSITION WHILE CONCRETE IS BEING PLACED.

UNLESS OTHERWISE INDICATED, ASIDE FROM NORMAL ACCESSORIES USED TO HOLD REINFORCING BARS FIRMLY IN POSITION, THE FOLLOWING SHALL BE ADDED:

A) IN SLABS #5 RISER BARS AT 36 INCHES O.C. MAXIMUM TO SUPPORT TOP REINFORCING BARS.

B) IN WALLS WITH 2 CURTAINS #3 U OR Z SHAPE SPACERS AT 6 FEET O.C. EACH WAY.

METAL CLIPS OR SUPPORTS SHALL NOT BE PLACED IN CONTACT WITH THE FORMS OR THE SUBGRADE. CONCRETE BLOCKS (OR DOBIES) SUPPORTING BARS ON SUBGRADE SHALL BE IN SUFFICIENT NUMBERS TO SUPPORT THE BARS WITHOUT SETTLEMENT, BUT IN NO CASE SHALL SUCH SUPPORT BE CONTINUOUS.

DOWELS SHALL BE WIRED OR OTHERWISE HELD IN POSITION. THEY SHALL NOT BE PLACED AFTER CONCRETE HAS BEEN POURED.

UNLESS OTHERWISE INDICATED ON THE DRAWINGS. LAPS OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH THE LATEST VERSION OF ACI-318.

REINFORCING BARS AND ACCESSORIES SHALL NOT BE IN CONTACT WITH METAL PARTS EMBEDDED IN CONCRETE. A MINIMUM OF 2 INCHES CLEARANCE SHALL BE PROVIDED AT ALL TIMES.

UNLESS OTHERWISE SHOWN ON THE DRAWINGS CONCRETE COVER FOR REINFORCING BARS SHALL BE AS FOLLOWS:

FOR CONCRETE PLACED AGAINST EARTH _____ 3"

FOR SURFACES IN CONTACT WITH WATER OR WEATHER AND FORMED SURFACES IN CONTACT WITH EARTH _____ 2"

FOR CONCRETE NOT EXPOSED TO WEATHER. OR IN CONTACT WITH WATER OR EARTH _____ 1-1/2"

UNLESS OTHERWISE NOTED, WALLS AND SLABS SHOWN WITH A SINGLE LAYER OF REINFORCEMENT SHALL HAVE THAT REINFORCEMENT CENTERED.

EXCAVATION AND BACKFILL

PREPARATION OF FOUNDATION MATERIAL LOCATED BELOW THE BOTTOM OF WALL FOOTINGS AND BACKFILL SHALL BE PERFORMED PER SPECIFICATIONS.

SOIL PARAMETERS USED FOR DESIGN:
(A) ALLOWABLE NET SOIL BEARING PRESSURE: 140 PSF.
(B) ACTIVE PRESSURE: 40 PCF (LEVEL BACKFILL)
(C) DYNAMIC PRESSURE: 8.9 PCF (LEVEL BACKFILL)
(D) ALLOWABLE COEFFICIENT OF FRICTION: 0.40
(E) SOIL WEIGHT: 125 PCF

THE FOOTINGS SHALL BE CAST AGAINST NATIVE MATERIAL FOR THE FULL DEPTH OF THE FOOTING OR FOOTING SHALL BE COMPLETELY BACKFILLED AND COMPACTED PER SPECIFICATIONS PRIOR TO PLACING ANY BACKFILL BEHIND THE WALL.

CONTRACTOR SHALL EXERCISE CARE DURING BACKFILL OPERATIONS TO ASSURE THAT WALLS ARE NOT DAMAGED. REFER TO EARTH WORK SPECIFICATIONS FOR BACKFILL PLACEMENT PROCEDURES AND LIMITATIONS ON EQUIPMENT WEIGHT.

TRENCH EXCAVATION AND SHORING SHALL CONFORM TO OSHA REGULATIONS 29 CFR PART 1926, SUBPART C.

MISCELLANEOUS

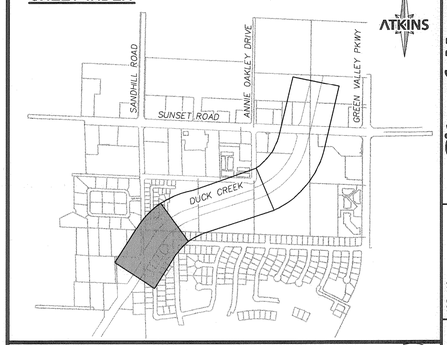
JOINT MATERIALS SHALL BE FURNISHED AND INSTALLED IN ACCORDANCE WITH CONCRETE SPECIFICATIONS.

SPECIAL INSPECTION IS REQUIRED FOR THE WORK. REFER TO IBC 2009 SECTION 1704.

DOWELS SHALL BE EPOXY TYPE, THE FOLLOWING PRODUCTS SATISFY THE REQUIREMENTS FOR THIS PROJECT: HIT RE 500 BY HILTI INCORPORATED.

THE INSTALLATION OF EPOXY DOWELS SHALL FOLLOW THE RECOMMENDATIONS OF THE SELECTED MANUFACTURER.

SHEET INDEX



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Call 811
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PROFESSIONAL ENGINEER STATE OF NEVADA
JAIME A CHANG
EXP. 12-31-14
CIVIL
No. 14012
10/21/13

REVISIONS

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2370 Corporate Circle Suite 200
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City of Henderson, Nevada

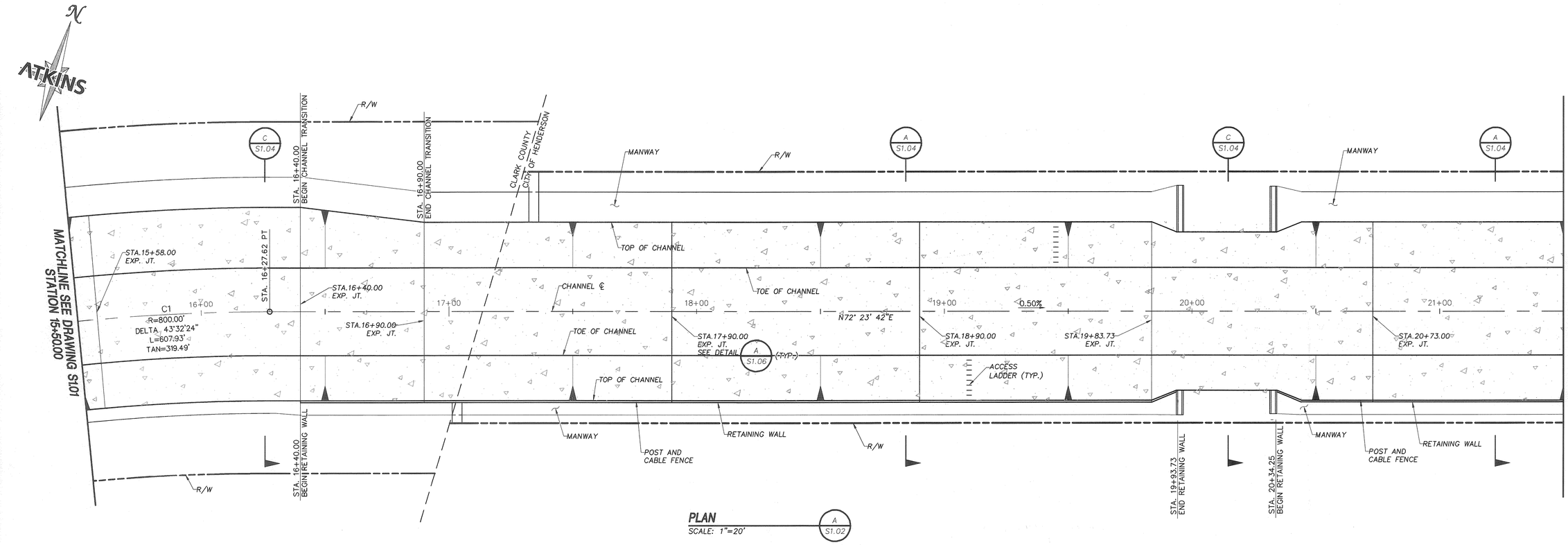
DUCK CREEK SUNSET TO SANDHILL
STRUCTURAL PLAN 1 OF 3
STA. 9+98.46 TO STA. 15+50.00

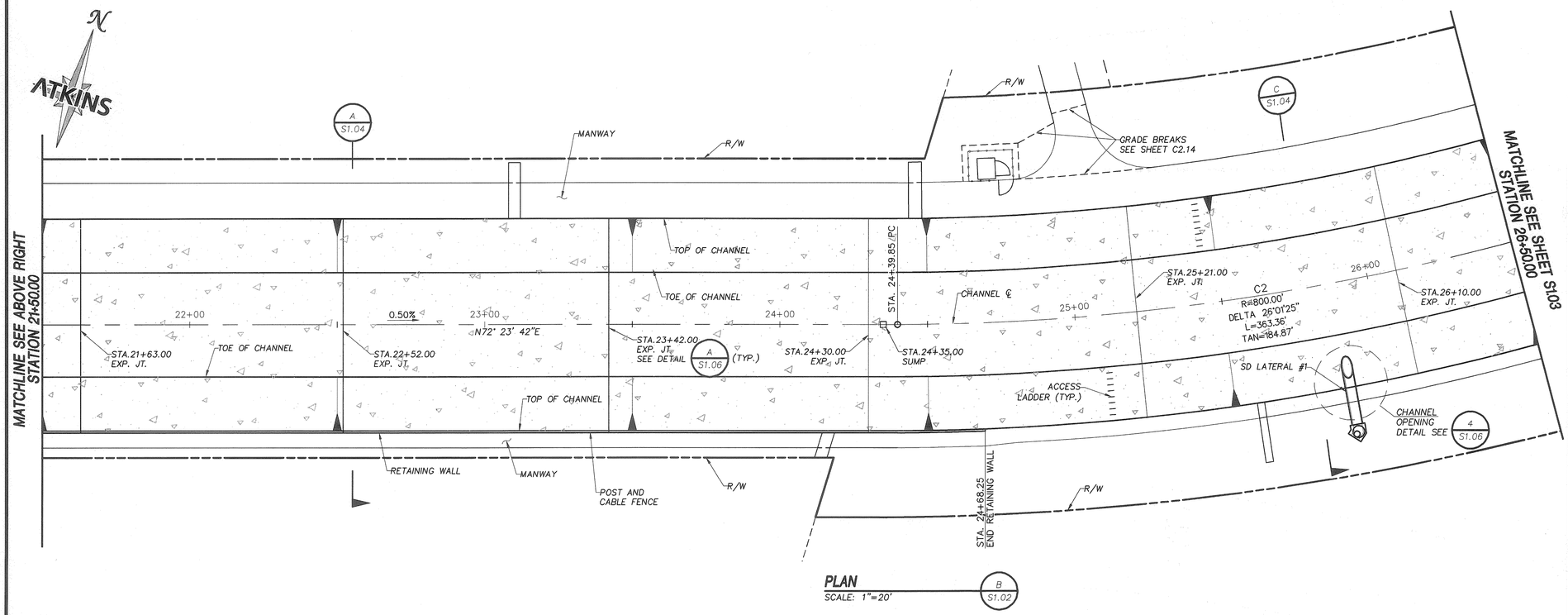
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FILE NAME: 28146-S1.01
SCALE: HORIZ.:AS SHOWN VERT.: AS SHOWN
DESIGNED BY: P. PEMAFIEL
DRAWN BY: D. EVANS
CHECKED BY: J. CHANG
DATE: OCTOBER 31, 2013

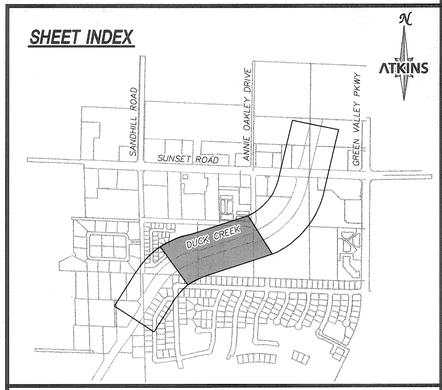
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DRAWING NO. S101
36
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COH KIVA # PCOH 2012780014







REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

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Henderson, Nevada 89074
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City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
STRUCTURAL PLAN 2 OF 3
STA. 16+50.00 TO STA. 26+50.00

JOB NO.: 100028146
FILE NAME: 28146-S1.02
SCALE: HORIZ.: AS SHOWN
VERT.: AS SHOWN

DESIGNED BY: P. PENAFIEL
DRAWN BY: D. EVANS
CHECKED BY: J. CHANG
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. S102
37
41

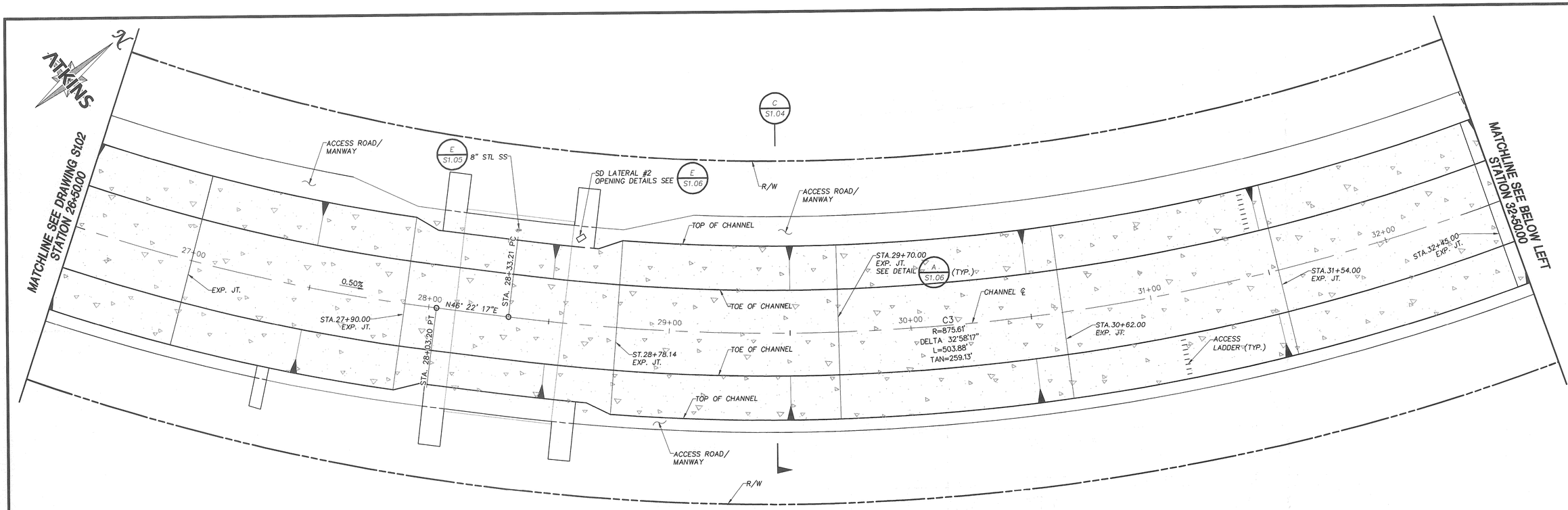
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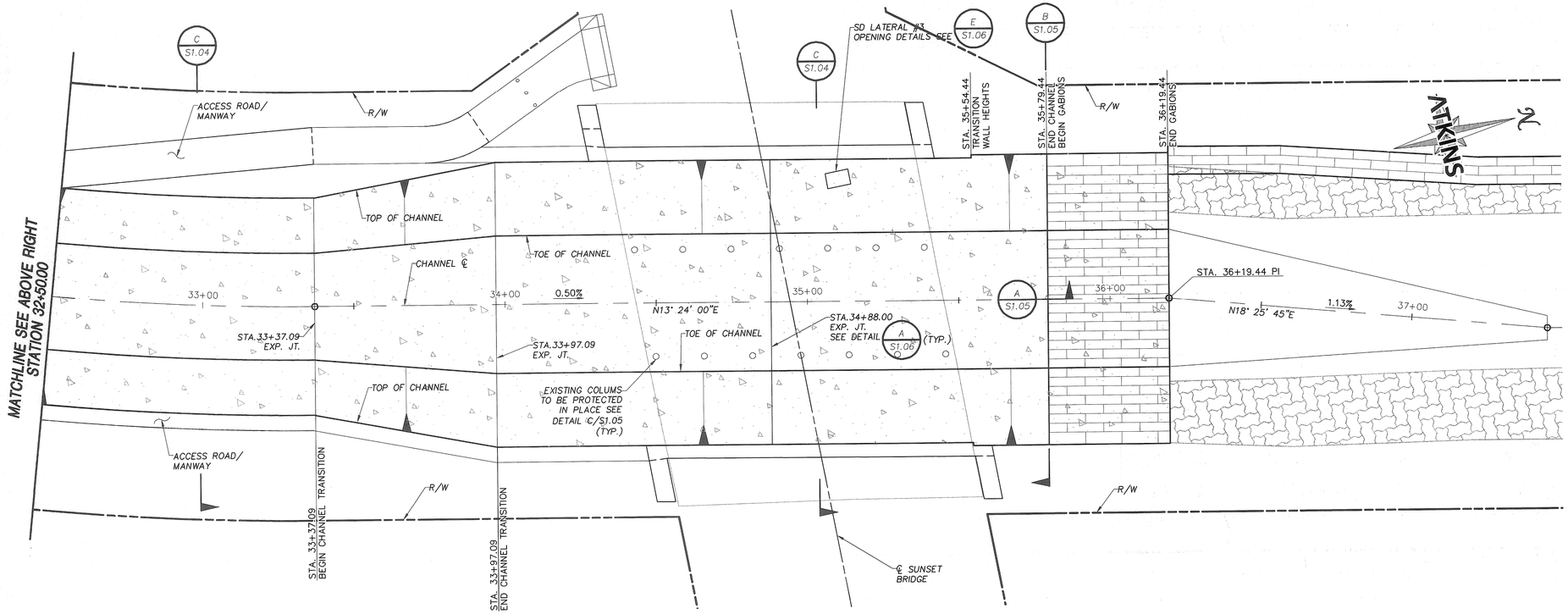
PROFESSIONAL ENGINEER
JAIME A. CHANG
EXP. 12-31-14
CIVIL
No. 14035
STATE OF NEVADA
10/21/13

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COH KIVA # PCOH 2012780014



PLAN
SCALE: 1"=20'
A S1.03



PLAN
SCALE: 1"=20'
B S1.03

SHEET INDEX



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JAIME A. CHANG
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CIVIL
No. 14023
10/21/13

REVISIONS				
REV.	DESCRIPTION	BY	DATE	APPROVAL

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Fax: +1702.387.7581

THE CITY OF HENDERSON NEVADA

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
STRUCTURAL PLAN 3 OF 3
STA. 28+50.00 TO STA. 37+50.00

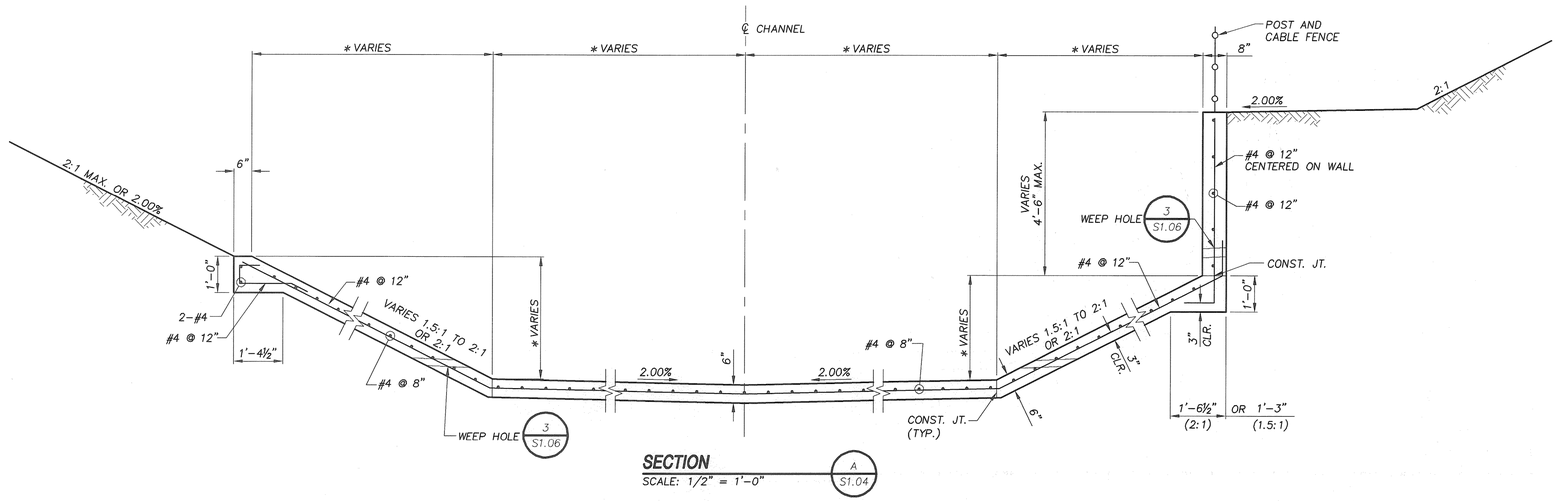
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DESIGNED BY: P. PENAFIEL
DRAWN BY: D. EVANS
CHECKED BY: J. CHANG
DATE: OCTOBER 31, 2013

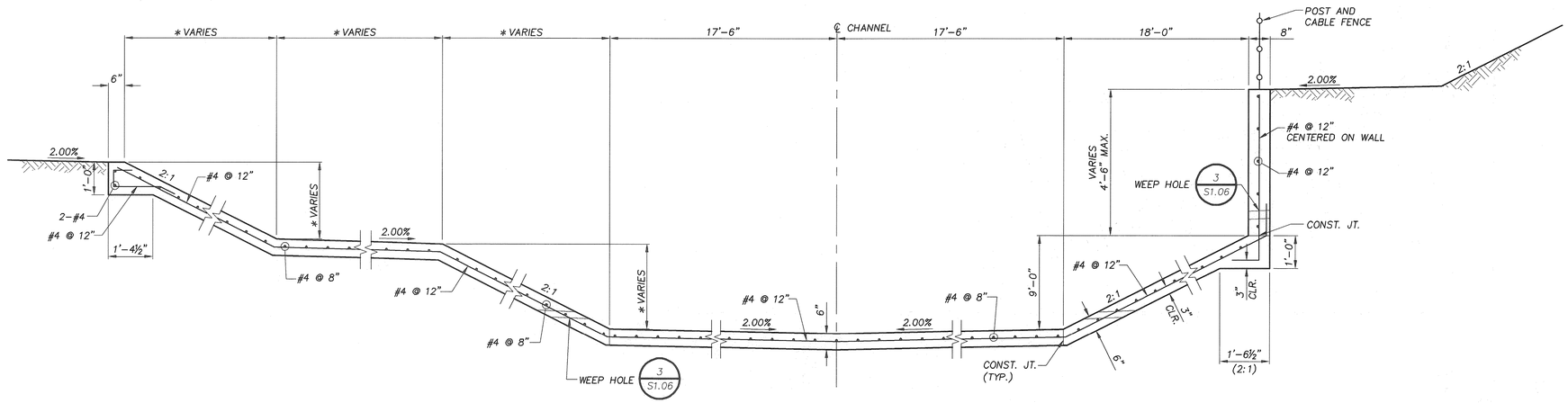
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DRAWING NO. S103
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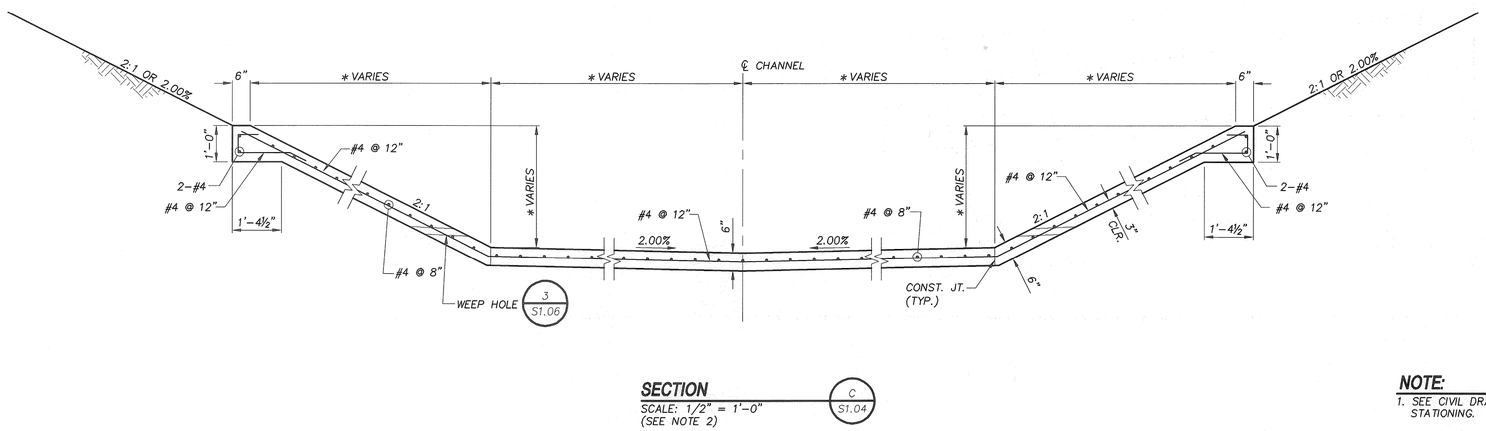
COH KIVA # PCOH 2012780014



SECTION A S1.04
SCALE: 1/2" = 1'-0"



SECTION B S1.04
SCALE: 1/2" = 1'-0"



SECTION C S1.04
SCALE: 1/2" = 1'-0"
(SEE NOTE 2)

NOTE:

1. SEE CIVIL DRAWINGS FOR DIMENSIONS, SLOPES AND STATIONING.
2. EXISTING BRIDGE STRUCTURE NOT DEPICTED FOR CLARITY ON SECTION C.

PROFESSIONAL ENGINEER-STATE OF NEVADA
JAIME A. CHANG
EXP. 12-31-14
CIVIL
No. 14023
10/21/13

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Tel: +1.702.263.7225
Fax: +1.702.263.7200

City of Henderson, Nevada

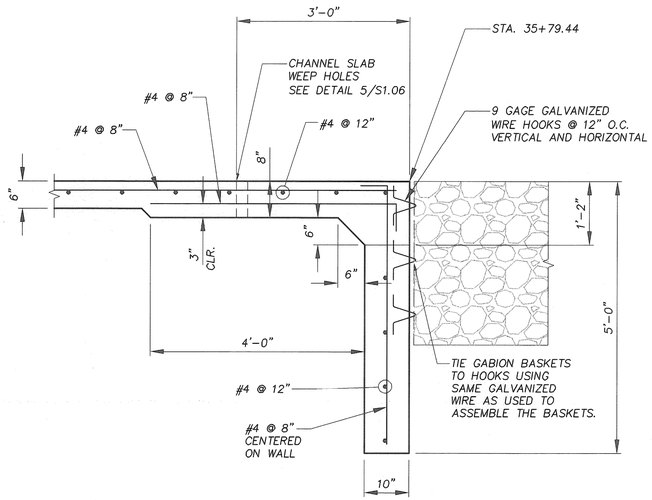
DUCK CREEK SUNSET TO SANDHILL
STRUCTURAL SECTIONS

JOB NO: 100028146
FILE NAME: 28146-S1.04
SCALE: HORIZ: AS SHOWN VERT: AS SHOWN
DESIGNED BY: P. PENAFIEL
DRAWN BY: D. EVANS
CHECKED BY: J. CHANG
DATE: OCTOBER 31, 2013

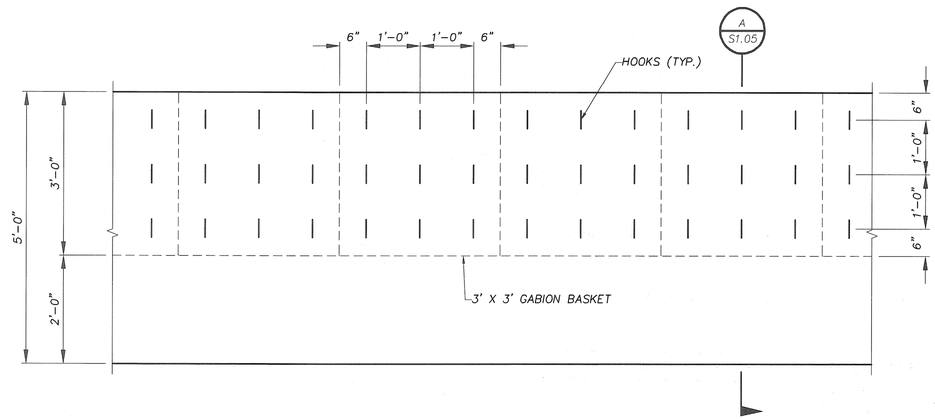
JOB NO. 100028146
DRAWING NO. 39 41
S104

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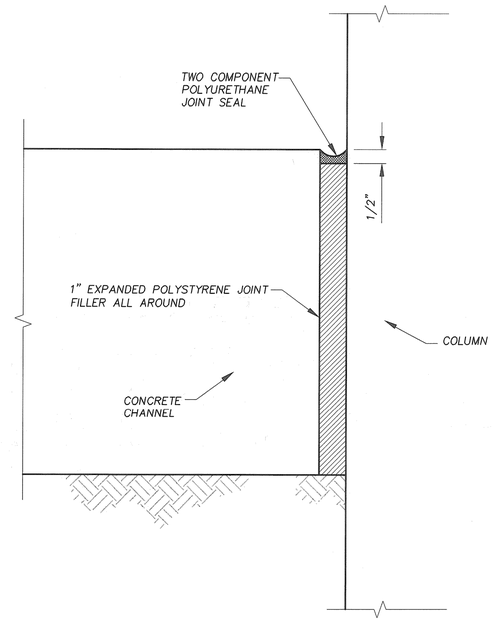
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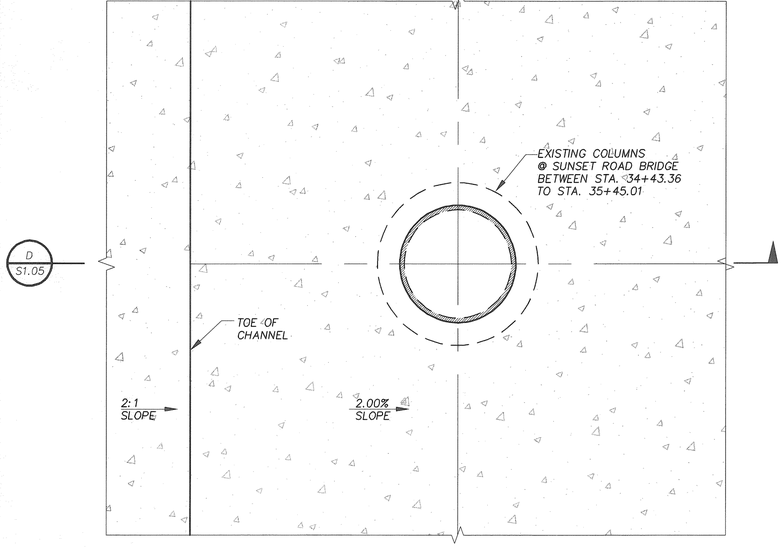
CUT-OFF WALL DETAIL (A / S1.05)
SCALE: 3/4" = 1'-0"



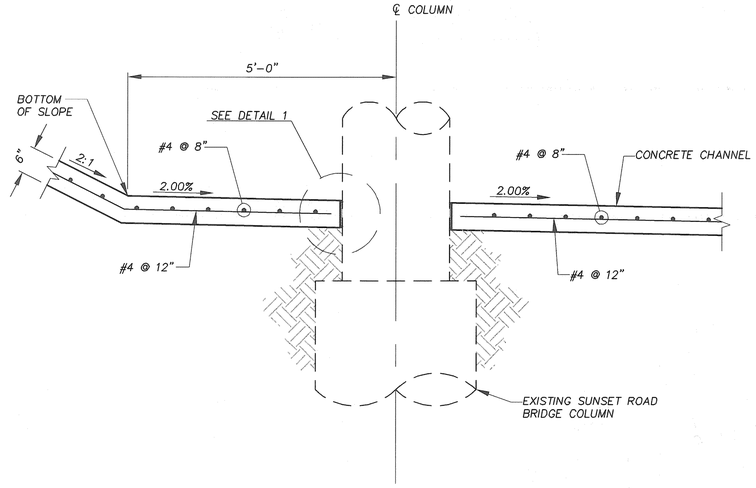
CUT-OFF WALL ELEVATION (B / S1.05)
SCALE: 3/4" = 1'-0"



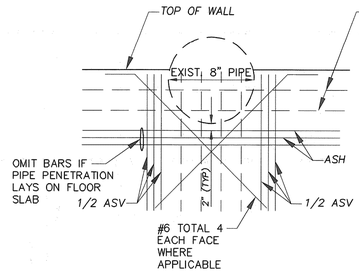
DETAIL (1 / S1.05)
SCALE: N.T.S.



PLAN (C / S1.05)
SCALE: 3/4" = 1'-0"



SECTION (D / S1.05)
SCALE: 3/4" = 1'-0"



NOTES:

1. ALL BAR LENGTHS TO BE D"+3'-10"
2. ASH = TOTAL AREA OF HORIZONTAL REINFORCEMENT MADE DISCONTINUOUS BY PIPE PENETRATION.
3. ASV = TOTAL AREA OF VERTICAL REINFORCEMENT MADE DISCONTINUOUS BY PIPE PENETRATION.

   ASV BARS SHALL BE EVENLY DISTRIBUTED ON EACH SIDE OF PIPE PENETRATION, AND PLACED IN ADDITION TO TYPICAL VERTICAL WALL REINFORCEMENT SHOWN.

   ASH BARS SHALL BE CONCENTRATED AT BOTTOM OF PIPE AND PLACED IN ADDITION TO THE TYPICAL HORIZONTAL WALL REINFORCEMENT AS SHOWN.
4. ASH AND ASV BARS SHALL BE UNIFORMLY SPACED OVER A DISTANCE NOT TO EXCEED D/4 ON EACH SIDE OF THE PIPE PENETRATION. BEND BARS AS REQUIRED TO FIT WALL DIMENSIONS.

EXISTING PIPE PENETRATION DETAIL (E / S1.05)
STA. 28+24.67
NOT TO SCALE

Call before you Dig
AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY.
Call 811 OR 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

PROFESSIONAL ENGINEER STATE OF NEVADA
JAIME A. CHANG
EXP. 12-31-14
CIVIL
No. 14033
10/21/13

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2720 Corporate Circle, Suite 200
Henderson, Nevada 89074
Telephone: +1(702)263-7275
Fax: +1(702)263-7280

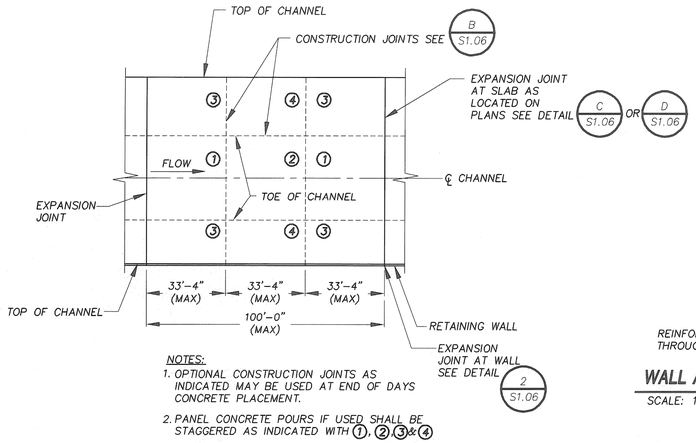
City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
STRUCTURAL DETAILS 1 OF 2

JOB NO:	100028146
FILE NAME:	28146-S1.05
SCALE:	HORIZ.:AS SHOWN VERT.: AS SHOWN
DESIGNED BY:	A. KNAFEL
DRAWN BY:	D. EVANS
CHECKED BY:	J. CHANG
DATE:	OCTOBER 31, 2013
JOB NO.	100028146
DRAWING NO.	S105
	40 / 41

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COH KIVA # PCOH 2012780014



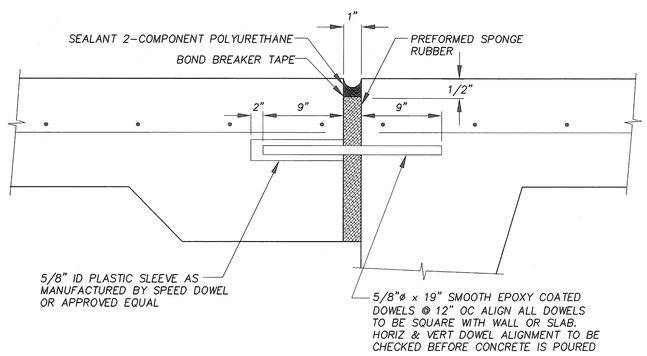
NOTES:

1. OPTIONAL CONSTRUCTION JOINTS AS INDICATED MAY BE USED AT END OF DAYS CONCRETE PLACEMENT.
2. PANEL CONCRETE POURS IF USED SHALL BE STAGGERED AS INDICATED WITH ①, ②, ③ & ④

TYPICAL PLAN VIEW FOR JOINTS IN DRAINAGE CHANNEL

A S1.06

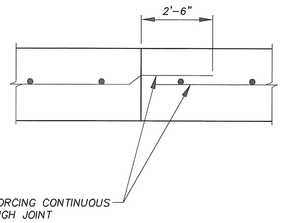
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EXPANSION JOINT DETAIL AT SLAB

1 S1.06

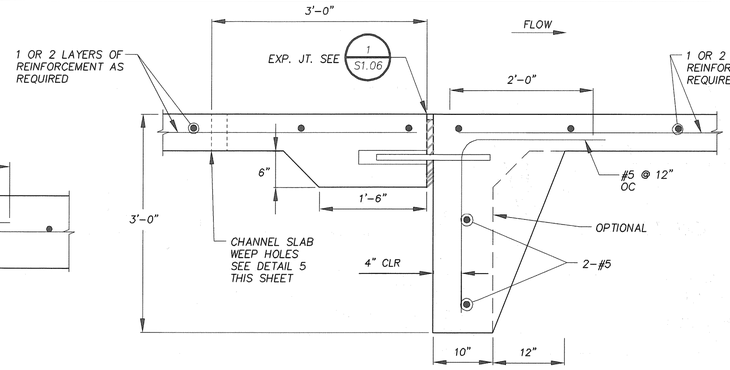
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WALL AND SLAB CONSTRUCTION JOINT DETAIL

B S1.06

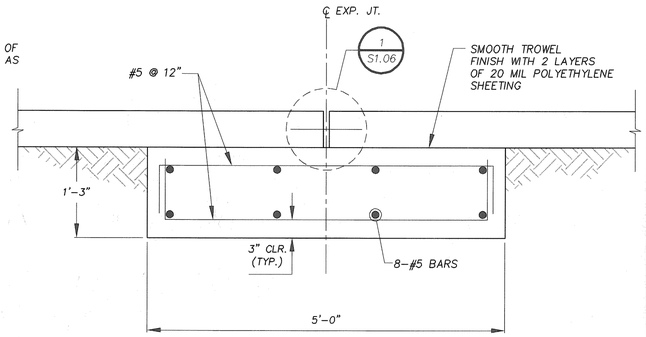
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EXPANSION JOINT SECTION

C S1.06

SCALE: 1"=1'-0"

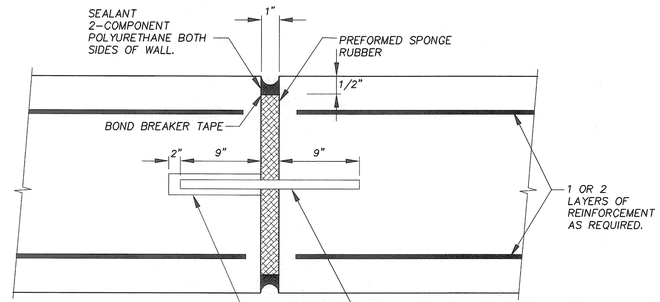


EXPANSION JOINT SECTION

D S1.06

ONLY AT STA.34+88.00

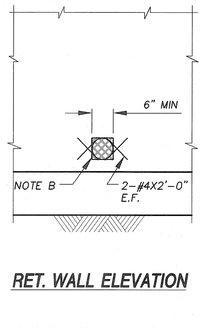
SCALE: 1"=1'-0"



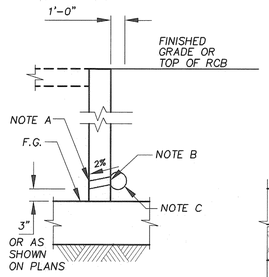
EXPANSION JOINT DETAIL AT WALL

2 S1.06

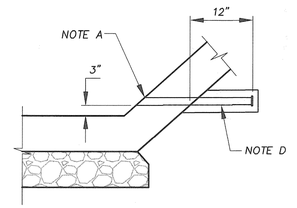
SCALE: NTS



RET. WALL ELEVATION



RET. WALL SECTION



CHANNEL SLOPE SECTION

A. 4" DIA. WEEP HOLES SPACED AT 25'-0" MAX. FOR CANTILEVER WALLS AND TRAPEZOIDAL CHANNEL SIDE SLOPES. BOTTOM OF EXPOSED WALL DRAINS SHALL BE LOCATED 3" ABOVE FINISHED GRADE OR AS SHOWN ON PLANS

B. 6" SQUARE ALUMINUM OR GALVANIZED STEEL WIRE ¼" MESH HARDWARE CLOTH (MIN. WIRE DIA. 0.030") ANCHOR FIRMLY TO BACK FACE.

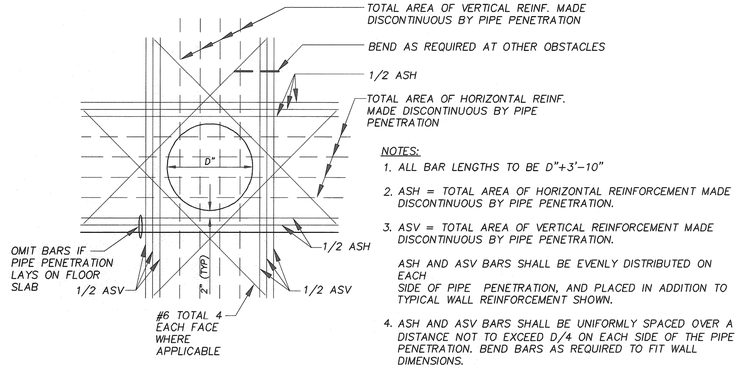
C. TWO CU. FT OF DRAIN BACKFILL, ENCAPSULATED IN NONWOVEN FILTER FABRIC, MIRAFI 180N OR EQUAL.

D. WEEP HOLES IN THE CHANNEL SIDE WALLS SHOULD BE CONSTRUCTED WITH A CAPPED 3" PERFORATED PIPE EXTENDING 12" INTO THE BACKFILL. THE PIPE SECTION INSIDE THE BACKFILL SHALL BE PERFORATED AND SHOULD BE PACKED IN A MINIMUM OF 2 CUBIC FOOT OF DRAIN BACKFILL WRAPPED IN FILTER FABRIC.

WEEP HOLE DETAIL

3 S1.06

NOT TO SCALE



NOTES:

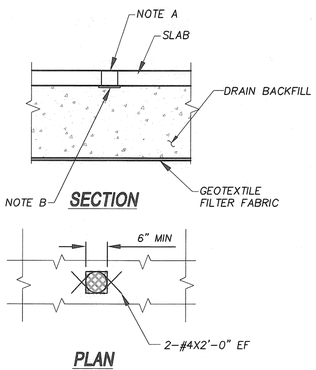
1. ALL BAR LENGTHS TO BE D"+3'-10"
2. ASH = TOTAL AREA OF HORIZONTAL REINFORCEMENT MADE DISCONTINUOUS BY PIPE PENETRATION.
3. ASV = TOTAL AREA OF VERTICAL REINFORCEMENT MADE DISCONTINUOUS BY PIPE PENETRATION.

   ASH AND ASV BARS SHALL BE EVENLY DISTRIBUTED ON EACH SIDE OF PIPE PENETRATION, AND PLACED IN ADDITION TO TYPICAL WALL REINFORCEMENT SHOWN.
4. ASH AND ASV BARS SHALL BE UNIFORMLY SPACED OVER A DISTANCE NOT TO EXCEED D/4 ON EACH SIDE OF THE PIPE PENETRATION. BEND BARS AS REQUIRED TO FIT WALL DIMENSIONS.

PIPE PENETRATION DETAIL

4 S1.06

NOT TO SCALE



SECTION

PLAN

NOTES:

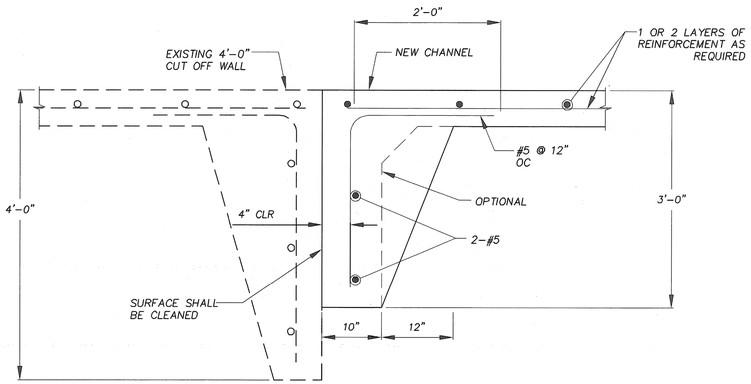
A. 4" DIA. WEEPHOLES SPACED AT 10'-0" MAX IN THE TRANSVERSE DIRECTION.

B. 6" SQUARE ALUMINUM OR GALVANIZED STEEL WIRE 1/4" MESH.

CHANNEL SLAB WEEP HOLE DETAIL

5 S1.06

NOT TO SCALE



UPSTREAM CUT-OFF WALL

6 S1.06

SCALE: 1"=1'-0"

PROFESSIONAL ENGINEER — Stamped — JAIME A. CHANG — EXP. 12-31-14 — CIVIL — No. 14073 — STATE OF NEVADA — 10/21/13

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
1270 Corporate Circle, Suite 200
Henderson, Nevada 89074
Telephone: +1702.263.7275
Fax: +1702.263.7280

City of Henderson, Nevada

DUCK CREEK SUNSET TO SANDHILL
STRUCTURAL DETAILS 2 OF 2

JOB NO.: 100028146
FILE NAME: 28146-S1.06
SCALE: HORIZ.-AS SHOWN VERT.- AS SHOWN
DESIGNED BY: A. BENAFTEL
DRAWN BY: D. EVANS
CHECKED BY: J. CHANG
DATE: OCTOBER 31, 2013

JOB NO. 100028146
DRAWING NO. S108
41 41

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COH KIVA # PCOH 2012780014

Appendix E

Electronic Data

Atkins
2270 Corporate Circle, Suite 200
Henderson NV 89074-7755

ATKINS

Plan Design Enable

ATKINS

Duck Creek, Sunset to Sandhill

Request for Conditional Letter of Map Revision

Response to Comments Case No.: 14-09-0274R

January 09, 2014

Prepared for City of Henderson

Prepared By

ATKINS
2270 Corporate Circle, Suite 200
Henderson NV 89074-7755
702.263.7275

Plan Design Enable

ATKINS

January 09, 2014

Attn: Syed Qayum, CFM
LOMC Clearinghouse
847 South Pickett Street
Alexandria, VA 22304-4605

RE: Duck Creek, Sunset to Sandhill Project
Response to comments
FEMA Case No.: 14-09-0274R

Dear Mr. Qayum:

Transmitted herewith is the response to comments for the Request for Conditional Letter of Map Revision Duck Creek, Sunset to Sandhill Project. This submittal responds to the comments issued by FEMA on January 6, 2014. A copy of the correspondence is included in **Appendix A**.

Comment 1: Our detail review revealed that Clark County is affected by this revision. Please provide community acknowledgment in the form of a letter stating that Clark County has reviewed the revision request and understands the effects of the revision on flooding conditions in the community, or Application/Certification Form 1, entitled "Overview & Concurrence Form," signed by a community official from Clark County.

Response 1: Please find a signed the community acknowledgement by Clark County on the *Overview & Concurrence Form* included in **Appendix B.**

Comment 2: There is a hydraulic jump just upstream of Sunset Road in the submitted proposed conditions HEC-RAS hydraulic analysis. Please revise the submitted hydraulic analysis to remove the hydraulic jump or revise the mapping to reflect the higher Base Flood Elevation (BFE) directly downstream of the hydraulic jump to eliminate the drawdown.

Response 2: The hydraulic jump cannot be removed from the model. The hydraulic jump forms because of the unlined downstream channel segment. The proposed flood zone is updated to reflect the HGL after propagating the hydraulic jump upstream until it crosses the channel HGL (no drawdown). Please find revised **Figures 9** and **10** in **Appendix B** depicting this mapping change.

Comment 3: The downstream reach length shown in the submitted hydraulic analysis at Cross Section -924 does not match the approximate downstream reach length shown on the submitted topographic work map entitled "Post-Project Hydraulic Model Work Map," prepared by Atkins,

dated October 15, 2013. Please make the appropriate changes, or explain why this is not necessary.

Response 3:
The reach length has been corrected in the hydraulic model. The correction caused a very minor change in the water surface elevation. The output from the corrected hydraulic model is included **Appendix C**. A revised **Table 5 Water Surface Elevation Comparison at Selected Stations** is also included in **Appendix B** to show changes in water surface elevations compared to the Pre-project model. The revised hydraulic model is included digitally in **Appendix D**.

Comment 4: The base (1-percent-annual-chance) floodplain top widths shown in the proposed conditions HEC-RAS hydraulic analysis at Cross Sections -1640 and -1050 do not match the approximate base floodplain top widths shown on the above-referenced topographic work map. Please provide an explanation for these discrepancies, or make the appropriate changes.

Response 4: The flood plain delineation was revised accordingly. Please find revised **Figures 9** and **10** depicting the revised floodplain width in **Appendix B**. The revised GIS data is included in **Appendix D**.

Comment 5: Please extend the limit of study and the proposed mapping upstream until the proposed BFEs tie into the effective BFE within 0.5 foot, or within 0.0 feet if practical.

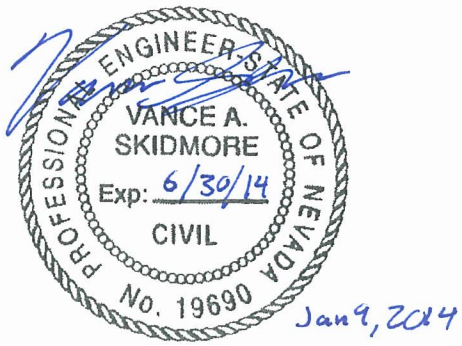
Response 5: The limit of study is moved to Effective cross-section 10700 (Pre-project cross-section 4711.268 and Post-project cross-section 29.933). At this cross-section the effective, pre-project, and post-project model BFE's match within a few hundredth of a foot. Please find revised **Figure 9** in **Appendix B** reflecting the new limit of study location. An update MT2 form is included in **Appendix B.**

Table 1. Comparison of BFE at Effective 10700

Model Cross-section	BFE	Change from Effective
Effective 10700	1955.86	N/A
Effective 10700 (truncated model)	1955.84	-0.02
Pre-project 4711.268	1955.85	- 0.01
Post-project 29.933	1955.85	- 0.01

Please feel free to contact me at (702) 551- 0309 or vance.skidmore@atkinsglobal.com if you have any questions on this project.

Sincerely,



Vance Skidmore, PE

Project Engineer

List of Appendices

Appendix A FEMA Comment Letter

Appendix B Revised Figures and Forms

Appendix C Revised Hydraulic Analysis

- Post-Project Hydraulic Model

Appendix D Electronic Data CD

Appendix A

FEMA Comment Letter

NATIONAL FLOOD INSURANCE PROGRAM
FEMA PRODUCTION AND TECHNICAL SERVICES CONTRACTOR

January 6, 2013

Mr. Vance Skidmore, P.E.
Engineer, Integrated Water Resources
Atkins
2270 Corporate Circle, Suite 200
Henderson, NV 89074

IN REPLY REFER TO:
Case No.: 14-09-0274R
Community: City of Henderson, NV
Community No.: 320005

316-AD

Dear Mr. Skidmore:

This responds to your request dated October 15, 2013, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a conditional revision to the Flood Insurance Rate Map (FIRM) for Clark County, Nevada and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Duck Creek, Sunset to Sandhill Project
Flooding Source:	Duck Creek
FIRM Panel(s) Affected:	32003C2580 F

The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed on the enclosed summary.

If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures, including the flat review and processing fee for requests of this type established by the current fee schedule. A copy of the notice summarizing the current fee schedule, which was published in the *Federal Register*, is available on the FEMA website at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm for your information.

FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, we are unable to grant extensions for the submission of required data/fees for revision requests. If a requester is informed by letter that additional data are required to complete our review of a request, the data/fee **must** be submitted within 90 days of the date of the letter. Any fees already paid will be forfeited for any request for which the requested data are not received within 90 days.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Map Information eXchange (FMIX), toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please contact your case reviewer, Mr. James Lindsay, by e-mail at JGLindsay@mbakercorp.com or by telephone at 720-514-1122, or the Revisions Coordinator for your request, Mr. Joseph Kuechenmeister, P.E., CFM, at jkuechenmeister@mbakercorp.com or at (720) 479-3181.

Sincerely,

Syed Qayum

Syed Qayum, CFM
LOMR Technical Manager
BakerAECOM

Enclosure

cc: Mr. Albert Jankowiak, P.E.
Flood Control Engineer
City of Henderson

Summary of Additional Data Required to Support a
Conditional Letter of Map Revision (CLOMR)

Case No.: 14-09-0274R

Requester: Mr. Vance Skidmore, P.E.

Community: City of Henderson, NV

Community No.: 320005

The issues listed below must be addressed before we can continue the review of your request.

1. Our detail review revealed that Clark County is affected by this revision. Please provide community acknowledgment in the form of a letter stating that Clark County has reviewed the revision request and understands the effects of the revision on flooding conditions in the community, or Application/Certification Form 1, entitled "Overview & Concurrence Form," signed by a community official from Clark County.

2. There is a hydraulic jump just upstream of Sunset Road in the submitted proposed conditions HEC-RAS hydraulic analysis. Please revise the submitted hydraulic analysis to remove the hydraulic jump or revise the mapping to reflect the higher Base Flood Elevation (BFE) directly downstream of the hydraulic jump to eliminate the drawdown.

3. The downstream reach length shown in the submitted hydraulic analysis at Cross Section -924 does not match the approximate downstream reach length shown on the submitted topographic work map entitled "Post-Project Hydraulic Model Work Map," prepared by Atkins, dated October 15, 2013. Please make the appropriate changes, or explain why this is not necessary.

4. The base (1-percent-annual-chance) floodplain top widths shown in the proposed conditions HEC-RAS hydraulic analysis at Cross Sections -1640 and -1050 do not match the approximate base floodplain top widths shown on the above-referenced topographic work map. Please provide an explanation for these discrepancies, or make the appropriate changes.

5. Please extend the limit of study and the proposed mapping upstream until the proposed BFEs tie into the effective BFE within 0.5 foot, or within 0.0 feet if practical.

Please send the required data and/or fee directly to us at the address shown at the bottom of this page. For identification purposes, please include the case number referenced above on all correspondence.

Appendix B

Revised Figures and Forms

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☒ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☐ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Example: 480301 480287	City of Katy Harris County	TX TX	48473C 48201C	0005D 0220G	02/08/83 09/28/90
320003	Clark County	NV	320003	2580F	11/16/11
320005	City of Henderson	NV	320005	2580F	11/16/12

2. a. Flooding Source: Duck Creek Wash

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: Duck Creek, Sunset to Sandhill Project

4. FEMA zone designations affected: AE (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☒ Physical Change ☒ Improved Methodology/Data ☐ Regulatory Floodway Revision ☐ Base Map Changes
   ☐ Coastal Analysis ☒ Hydraulic Analysis ☐ Hydrologic Analysis ☐ Corrections
   ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
   ☒ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☒ Channelization ☐ Levee/Floodwall ☒ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other (Attach Description)

6. ☒ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $4400

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Vance Skidmore, PE	Company: Atkins	
Mailing Address: 2270 Corporate Circle, suite 200 Henderson, NV 89074	Daytime Telephone No.: 702-551-0309	Fax No.: 702-263-7200
	E-Mail Address: vance.skidmore@atkinsglobal.com	
Signature of Requester (required):	Date: January 09, 2014	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: W. Layne Weber, PE Principal Engineer	Community Name: Clark County	
Mailing Address: 500 South Grand Central Parkwayt Las Vegas, Nevada 89155	Daytime Telephone No.: 702-455-4856	Fax No.: 702-455-6040
	E-Mail Address: wlweber@co.clark.nv.us	
Community Official's Signature (required): Wayne Weber	Date: 1-29-14	

Duck Creek Sunset to Starr Hill

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Vance Skidmore, PE	License No.: 19690	Expiration Date: 6/30/14
Company Name: Atkins	Telephone No.: 702-551-0309	Fax No.: 702-263-7200
Signature:	Date: Jan 09, 2014	E-Mail Address: vance.skidmorei@atkinsglobal.com

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if …
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Seal (Optional)

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit*		8800	1910.78	1910.34
Upstream Limit*		10700	1955.86	1955.85

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

2. Hydraulic Method/Model Used: HEC-RAS version 4.1.0

3. Pre-Submittal Review of Hydraulic Models*

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4.

Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name: DuckCreekCLOMR	Plan Name: Effective_truncated	File Name:	Plan Name:	NAVD88
Corrected Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	
Existing or Pre-Project Conditions Model	File Name: DuckCreekCLOMR	Plan Name: Existing	File Name:	Plan Name:	NAVD88
Revised or Post-Project Conditions Model	File Name: DuckCreekCLOMR	Plan Name: Proposed	File Name:	Plan Name:	NAVD88
Other - (attach description)	File Name:	Plan Name:	File Name:	Plan Name:	

* For details, refer to the corresponding section of the instructions.

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic work map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☒ Digital Mapping (GIS/CADD) Data Submitted (preferred)

Topographic Information: Project Topography

Source: Aerotech Mapping, Inc Date: 4/20/12

Accuracy: 1 ft topography

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM**, at the same scale as the original, annotated to show the boundaries of the revised 1%-and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%-and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area on revision.

☒ Annotated FIRM and/or FBFM (Required)

Table 5 - Water Surface Elevation at Selected Stations (Pre-project and Post-project)

Revised

Pre-project Station	Pre-project WSE	Post-project Station	Post-project WSE	Δ WSE
5101.524	1959.76	-419.619	1959.76	0.0
4711.268	1955.85	-29.933	1955.85	0.0
4292.498	1949.12	387.751	1949.12	0.0
3909.086	1940.71	771.57	1940.57	-0.14
3495.033	1938.54	1173.4	1930.61	-7.93
3104.647	1936.55	1577.7	1929.83	-6.72
2912.798	1936.11	1776.2	1929.09	-7.02
2684.211	1935.65	1991.84	1928.30	-7.35
2637.879	1933.89	2037.879	1928.11	-5.78
1867.342	1931.91	2803.2	1924.78	-7.13
1810.339	1929.3	2860.99	1924.51	-4.79
1222.326	1927.93	3438.65	1926.54	-1.39
1117.286	1927.04	3554.44	1926.31	-0.73
841.691	1923.56	3835.75	1923.27	-0.29
468.45	1922.5	4197.64	1922.43	-0.07
301.8796	1921.93	4363.63	1921.83	-0.1
0.35639	1910.39	4664.36	1910.34	-0.05



FIGURE 9: Post-Project Flood Zone Work Map

LEGEND

- Right-of-Way
- Proposed BFE
- Removed Flood Zone
- Study Limit
- Proposed Flood Zone AE and Floodway
- Effective Flood Zone AE and floodway

N

0 150 300 600

Feet

1 inch = 150 feet

Aerial Source: Clark County Fall 2011

DUCK CREEK, SUNSET to SANDHILL PROJECT
Conditional Letter of Map Revision

ATKINS

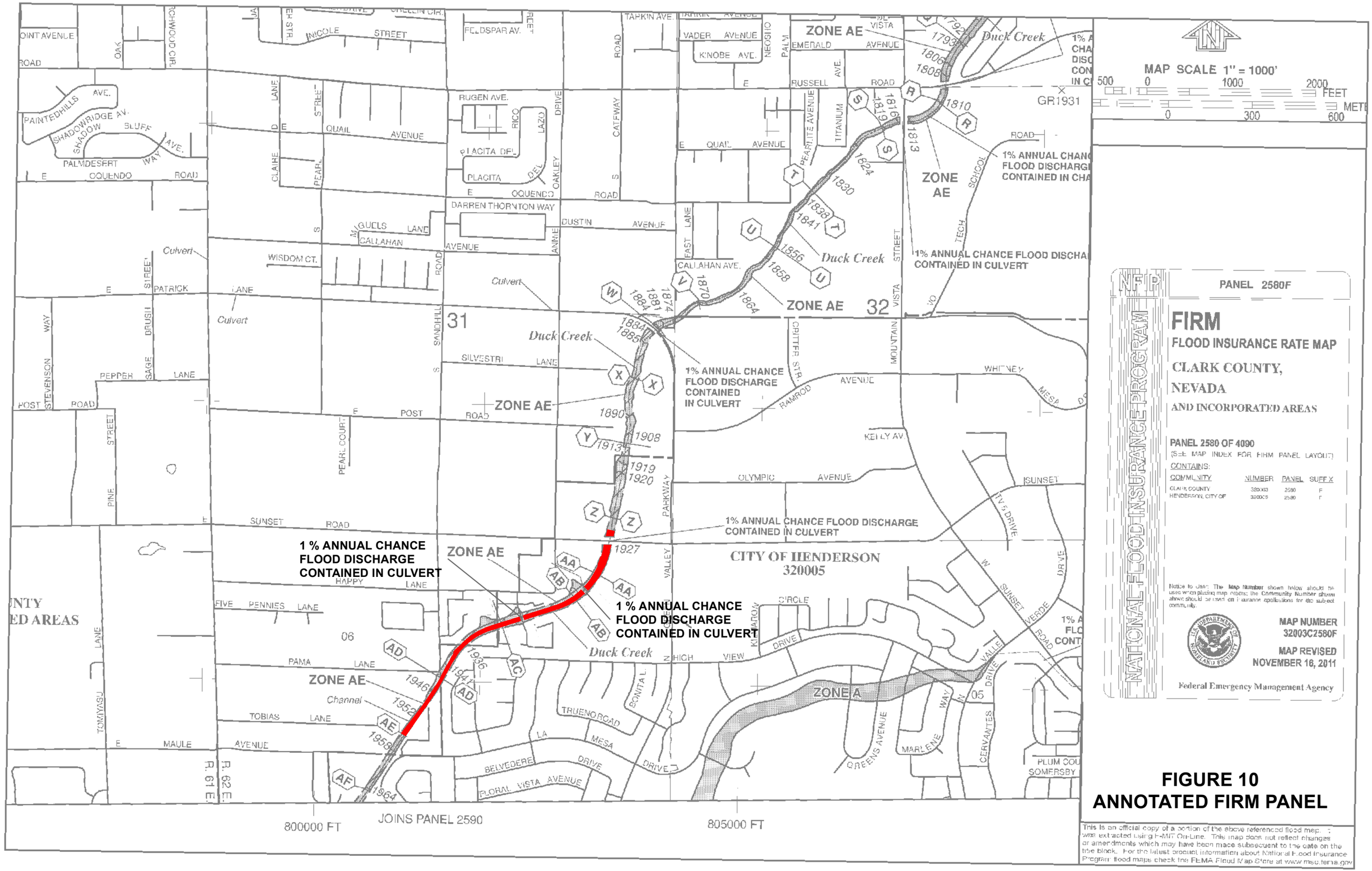


FIGURE 10
ANNOTATED FIRM PANEL

Appendix C

Hydraulic Analysis

- Post-Project Hydraulic Model

HEC-RAS Plan: proposed River: Duck Creek Reach: 1 Profile: CLOMR

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)	
1	419.619	CLOMR	5825.00	1954.37	1959.76	1962.39	1968.03	0.010006	23.08	252.39	68.95	2.13
1	29.933	CLOMR	5825.00	1950.37	1955.85	1958.44	1964.16	0.009851	23.13	251.84	67.47	2.11
1	-387.751	CLOMR	5825.00	1943.12	1949.12	1952.76	1959.83	0.009713	26.26	221.81	46.75	2.12
1	-647.693	CLOMR	5825.00	1940.26	1945.95	1949.33	1957.13	0.010750	26.83	217.11	48.76	2.24
1	-648.721	CLOMR	5825.00	1935.41	1944.60	1948.35	1957.10	0.014427	28.38	205.28	44.21	2.32
1	-696.264	CLOMR	5825.00	1935.29	1940.52	1944.65	1956.33	0.017019	31.90	182.58	44.63	2.78
1	-771.57	CLOMR	5825.00	1935.23	1940.57	1944.54	1955.07	0.015148	30.56	190.61	45.43	2.63
1	-798.015	CLOMR	5825.00	1935.21	1940.61	1944.52	1954.66	0.014633	30.08	193.63	46.19	2.59
1	-798.989	CLOMR	5825.00	1932.42	1939.74	1943.80	1954.64	0.017150	30.97	188.07	43.51	2.63
1	-846.984	CLOMR	5825.00	1932.26	1937.17	1941.44	1953.77	0.018261	32.70	178.16	43.62	2.85
1	-923.965	CLOMR	5825.00	1932.02	1937.01	1941.09	1952.38	0.016827	31.46	185.16	45.64	2.75
1	-924.923	CLOMR	5825.00	1928.06	1935.91	1940.22	1952.36	0.020601	32.54	179.01	42.13	2.78
1	-998.46	CLOMR	5998.00	1927.44	1932.30	1936.82	1950.81	0.020836	34.53	173.71	43.29	3.04
1	-1048.46	CLOMR	5998.00	1927.19	1931.48	1935.68	1949.68	0.024039	34.24	175.19	50.77	3.25
1	-1050.64	CLOMR	5998.00	1927.17	1931.47	1935.66	1949.63	0.023970	34.20	175.36	50.78	3.24
1	-1095.72	CLOMR	5998.00	1926.95	1931.34	1935.38	1948.57	0.022172	33.31	180.07	51.15	3.13
1	-1106.9*	CLOMR	5998.00	1926.90	1931.22	1935.14	1948.30	0.023552	33.17	180.82	62.71	3.21
1	-1118.2*	CLOMR	5998.00	1926.84	1930.95	1934.82	1948.03	0.024924	33.17	180.84	61.83	3.29
1	-1129.5*	CLOMR	5998.00	1926.78	1930.61	1934.40	1947.75	0.026766	33.22	180.54	60.69	3.37
1	-1140.80	CLOMR	5998.00	1926.73	1930.35	1934.12	1947.45	0.026603	33.18	180.78	59.89	3.37
1	-1151.6*	CLOMR	5998.00	1926.68	1930.43	1934.25	1947.16	0.025024	32.83	182.72	58.65	3.28
1	-1162.5*	CLOMR	5998.00	1926.62	1930.52	1934.35	1946.90	0.023524	32.48	184.68	57.41	3.19
1	-1173.4*	CLOMR	5998.00	1926.56	1930.61	1934.44	1946.65	0.022148	32.14	186.62	56.22	3.11
1	-1184.31	CLOMR	5998.00	1926.51	1930.71	1934.55	1946.41	0.020832	31.79	188.65	55.06	3.03
1	-1195.3*	CLOMR	5998.00	1926.46	1930.77	1934.59	1946.18	0.019906	31.50	190.39	54.38	2.97
1	-1206.3*	CLOMR	5998.00	1926.40	1930.84	1934.66	1945.97	0.019005	31.21	192.17	53.68	2.91
1	-1217.4*	CLOMR	5998.00	1926.35	1930.91	1934.73	1945.76	0.018150	30.92	193.98	53.01	2.85
1	-1228.44	CLOMR	5998.00	1926.29	1930.98	1934.78	1945.56	0.017363	30.64	195.74	52.36	2.79
1	-1278.3*	CLOMR	5998.00	1926.04	1930.82	1934.53	1944.71	0.016160	29.90	200.61	52.73	2.70
1	-1328.2*	CLOMR	5998.00	1925.79	1930.66	1934.28	1943.91	0.015091	29.21	205.37	53.09	2.62
1	-1378.1*	CLOMR	5998.00	1925.54	1930.50	1934.03	1943.16	0.014133	28.56	210.04	53.44	2.54
1	-1428.0*	CLOMR	5998.00	1925.29	1930.34	1933.78	1942.47	0.013274	27.95	214.62	53.79	2.47
1	-1477.9*	CLOMR	5998.00	1925.04	1930.17	1933.53	1941.81	0.012502	27.38	219.09	54.12	2.40
1	-1527.8*	CLOMR	5998.00	1924.79	1930.00	1933.28	1941.19	0.011807	26.84	223.45	54.44	2.33
1	-1577.7*	CLOMR	5998.00	1924.54	1929.83	1933.03	1940.59	0.011162	26.33	227.82	54.76	2.27
1	-1627.62	CLOMR	5998.00	1924.29	1929.66	1932.78	1940.03	0.010586	25.85	232.02	55.07	2.22
1	-1640	CLOMR	5998.00	1924.23	1929.61	1932.72	1939.91	0.010461	25.74	232.98	55.13	2.21
1	-1690	CLOMR	5998.00	1923.98	1929.44	1932.46	1939.38	0.009953	25.31	237.02	55.43	2.16

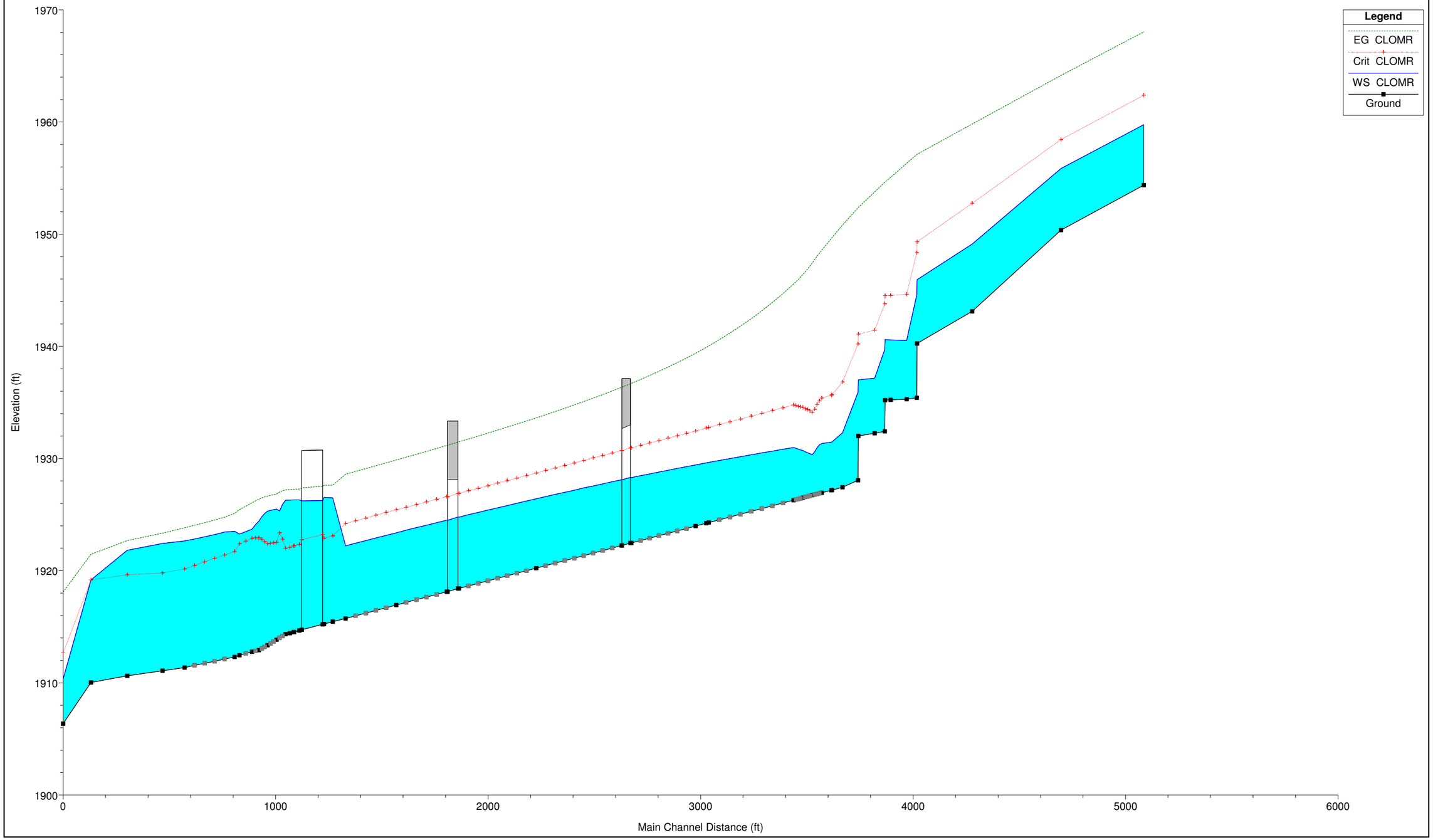
HEC-RAS Plan: proposed River: Duck Creek Reach: 1 Profile: CLOMR (Continued)

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)	
1	-1733.1*	CLOMR	5998.00	1923.76	1929.27	1932.24	1938.96	0.009574	24.97	240.22	55.66	2.12
1	-1776.2*	CLOMR	5998.00	1923.55	1929.12	1932.03	1938.55	0.009207	24.63	243.50	55.89	2.08
1	-1819.3*	CLOMR	5998.00	1923.33	1928.96	1931.82	1938.15	0.008886	24.33	246.51	56.11	2.05
1	-1862.4*	CLOMR	5998.00	1923.12	1928.80	1931.60	1937.77	0.008572	24.03	249.59	56.33	2.01
1	-1905.6*	CLOMR	5998.00	1922.90	1928.63	1931.38	1937.40	0.008301	23.76	252.40	56.53	1.98
1	-1948.7*	CLOMR	5998.00	1922.69	1928.47	1931.18	1937.04	0.008032	23.49	255.30	56.73	1.95
1	-1991.84	CLOMR	5998.00	1922.47	1928.30	1930.95	1936.70	0.007802	23.26	257.88	56.91	1.93
1	-2000		Bridge									
1	-2037.55	CLOMR	5998.00	1922.24	1928.11	1930.72	1936.36	0.007599	23.05	260.25	57.08	1.90
1	-2082.2*	CLOMR	5998.00	1922.02	1927.94	1930.50	1936.02	0.007382	22.82	262.89	57.26	1.88
1	-2126.9*	CLOMR	5998.00	1921.79	1927.74	1930.27	1935.70	0.007216	22.64	264.98	57.41	1.86
1	-2171.6*	CLOMR	5998.00	1921.57	1927.56	1930.06	1935.39	0.007045	22.45	267.20	57.56	1.84
1	-2216.3*	CLOMR	5998.00	1921.35	1927.38	1929.83	1935.08	0.006886	22.27	269.33	57.71	1.82
1	-2261.0*	CLOMR	5998.00	1921.12	1927.18	1929.60	1934.78	0.006755	22.12	271.14	57.84	1.80
1	-2305.7*	CLOMR	5998.00	1920.90	1926.99	1929.38	1934.48	0.006616	21.96	273.10	57.97	1.78
1	-2350.4*	CLOMR	5998.00	1920.68	1926.81	1929.16	1934.19	0.006488	21.81	274.97	58.10	1.77
1	-2395.1*	CLOMR	5998.00	1920.45	1926.60	1928.94	1933.91	0.006386	21.69	276.50	58.21	1.75
1	-2439.85	CLOMR	5998.00	1920.23	1926.41	1928.71	1933.63	0.006274	21.56	278.21	58.32	1.74
1	-2485.2*	CLOMR	5998.00	1920.00	1926.21	1928.48	1933.35	0.006180	21.45	279.68	58.42	1.73
1	-2530.6*	CLOMR	5998.00	1919.78	1926.02	1928.26	1933.07	0.006075	21.32	281.35	58.54	1.71
1	-2576.1*	CLOMR	5998.00	1919.55	1925.81	1928.03	1932.80	0.005996	21.22	282.65	58.63	1.70
1	-2621.5*	CLOMR	5998.00	1919.32	1925.61	1927.82	1932.53	0.005910	21.12	284.04	58.71	1.69
1	-2666.9*	CLOMR	5998.00	1919.10	1925.40	1927.58	1932.27	0.005836	21.02	285.32	58.81	1.68
1	-2712.3*	CLOMR	5998.00	1918.87	1925.19	1927.35	1932.00	0.005774	20.94	286.38	58.88	1.67
1	-2757.7*	CLOMR	5998.00	1918.65	1924.99	1927.13	1931.74	0.005701	20.85	287.67	58.97	1.66
1	-2803.20	CLOMR	5998.00	1918.42	1924.78	1926.90	1931.49	0.005649	20.78	288.58	59.03	1.66
1	-2830		Bridge									
1	-2860.99	CLOMR	5998.00	1918.13	1924.51	1926.61	1931.17	0.005590	20.71	289.65	59.10	1.65
1	-2908.5*	CLOMR	5998.00	1917.89	1924.28	1926.37	1930.90	0.005544	20.65	290.48	59.16	1.64
1	-2956.1*	CLOMR	5998.00	1917.65	1924.05	1926.13	1930.64	0.005502	20.59	291.26	59.21	1.64
1	-3003.7*	CLOMR	5998.00	1917.42	1923.84	1925.90	1930.38	0.005446	20.52	292.30	59.28	1.63
1	-3051.3*	CLOMR	5998.00	1917.18	1923.61	1925.66	1930.12	0.005412	20.47	292.95	59.33	1.62
1	-3098.9	CLOMR	5998.00	1916.94	1923.38	1925.43	1929.87	0.005381	20.43	293.54	59.37	1.62
1	-3146.5*	CLOMR	5998.00	1916.70	1923.15	1925.19	1929.61	0.005351	20.39	294.10	59.40	1.62
1	-3194.1*	CLOMR	5998.00	1916.46	1922.92	1924.95	1929.36	0.005324	20.36	294.62	59.44	1.61
1	-3241.8*	CLOMR	5998.00	1916.22	1922.69	1924.70	1929.10	0.005300	20.33	295.10	59.47	1.61
1	-3289.4*	CLOMR	5998.00	1915.98	1922.46	1924.46	1928.85	0.005278	20.30	295.53	59.50	1.60
1	-3337.09	CLOMR	5998.00	1915.74	1922.22	1924.22	1928.60	0.005257	20.27	295.94	59.53	1.60

HEC-RAS Plan: proposed River: Duck Creek Reach: 1 Profile: CLOMR (Continued)

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)	
1	-3397.09	CLOMR	6074.00	1915.45	1926.50	1923.11	1927.63	0.000488	8.53	711.89	87.40	0.53
1	-3438.65	CLOMR	6074.00	1915.24	1926.54	1922.89	1927.61	0.000448	8.28	733.91	88.40	0.51
1	-3500		Bridge									
1	-3554.44	CLOMR	6074.00	1914.66	1926.31	1922.34	1927.29	0.000399	7.94	764.97	89.80	0.48
1	-3579.44	CLOMR	6074.00	1914.53	1926.32	1922.21	1927.26	0.000381	7.82	777.17	90.34	0.47
1	-3581.44	CLOMR	6074.00	1914.52	1926.32	1922.20	1927.26	0.001520	7.81	778.08	90.38	0.47
1	-3599.44	CLOMR	6074.00	1914.43	1926.30	1922.08	1927.23	0.001484	7.74	784.79	90.68	0.46
1	-3619.44	CLOMR	6074.00	1914.34	1926.28	1922.00	1927.20	0.001451	7.68	791.26	90.96	0.46
1	-3633.2*	CLOMR	6074.00	1914.18	1925.92	1922.81	1927.13	0.003848	8.83	687.67	87.01	0.55
1	-3647.4*	CLOMR	6074.00	1914.01	1925.33	1923.38	1927.02	0.006030	10.43	582.20	80.60	0.68
1	-3661.61	CLOMR	6074.00	1913.85	1925.50	1922.53	1926.84	0.004290	9.29	653.48	82.07	0.58
1	-3675.7*	CLOMR	6074.00	1913.69	1925.44	1922.49	1926.78	0.004281	9.29	654.02	81.96	0.58
1	-3689.9*	CLOMR	6074.00	1913.52	1925.38	1922.45	1926.72	0.004286	9.28	654.40	81.86	0.58
1	-3704.12	CLOMR	6074.00	1913.36	1925.32	1922.40	1926.66	0.004318	9.29	653.79	81.74	0.58
1	-3717.5*	CLOMR	6074.00	1913.21	1925.10	1922.58	1926.58	0.004944	9.76	622.13	80.35	0.62
1	-3731.0*	CLOMR	6074.00	1913.06	1924.82	1922.78	1926.49	0.005849	10.37	585.81	78.71	0.67
1	-3744.5	CLOMR	6074.00	1912.91	1924.40	1922.92	1926.37	0.007384	11.26	539.50	76.49	0.75
1	-3760.5*	CLOMR	6074.00	1912.84	1924.11	1922.94	1926.23	0.008174	11.67	520.44	75.48	0.78
1	-3776.62	CLOMR	6074.00	1912.77	1923.71	1922.89	1926.06	0.009527	12.31	493.60	74.06	0.84
1	-3806.1*	CLOMR	6074.00	1912.62	1923.48	1922.64	1925.75	0.009432	12.09	502.47	77.02	0.83
1	-3835.75	CLOMR	6074.00	1912.47	1923.27	1922.40	1925.45	0.009304	11.85	512.47	79.99	0.83
1	-3858.58	CLOMR	6074.00	1912.31	1923.51	1921.71	1925.11	0.005673	10.14	599.18	96.30	0.67
1	-3905.6*	CLOMR	6074.00	1912.12	1923.44	1921.40	1924.77	0.005162	9.26	655.85	97.25	0.63
1	-3952.8*	CLOMR	6074.00	1911.93	1923.23	1921.11	1924.52	0.004971	9.15	664.07	97.58	0.62
1	-3999.9*	CLOMR	6074.00	1911.75	1923.02	1920.80	1924.28	0.004762	9.01	673.84	97.96	0.61
1	-4047.0*	CLOMR	6074.00	1911.56	1922.83	1920.47	1924.05	0.004535	8.86	685.37	98.45	0.59
1	-4094.14	CLOMR	6074.00	1911.37	1922.65	1920.15	1923.83	0.004294	8.69	698.65	99.00	0.58
1	-4197.64	CLOMR	6074.00	1911.08	1922.43	1919.80	1923.35	0.003545	7.71	788.21	116.97	0.52
1	-4363.63	CLOMR	6074.00	1910.63	1921.83	1919.64	1922.69	0.004237	7.45	815.89	153.80	0.56
1	-4533.56	CLOMR	6074.00	1910.03	1919.19	1919.19	1921.47	0.010397	12.24	520.27	134.89	0.88
1	-4664.36	CLOMR	6074.00	1906.37	1910.34	1912.68	1918.10	0.068174	22.35	271.79	74.96	2.07

Duck Creek CLOMR



Appendix D

Electronic Data