Memorandum

City of Las Vegas
Department of Public Works
Engineering Planning

To: Randy McConnell, P.E.
Engineering Project Manager

From: Peter Jackson, CFM
Flood Control Section

Date: January 2, 2014

Re: Rancho Road System, Elkhorn – Fort Apache to Grand Canyon
Design Report and 90% Plans
Hansen # 41990, WU8202

We have reviewed the Rancho Road System, Elkhorn – Fort Apache to Grand Canyon Design Report and 90% Plans for the proposed CCRFCD drainage facility within the Elkhorn Road alignment and offer the following comments:

1. Flood Control concurs with the overall hydrology for this MPU facility.
2. The proposed roadway improvements to Elkhorn Road and Grand Canyon Drive from the Savona Unit #3 appear to modify the detailed local analysis of the hydrology for the drop inlet collection system based upon the provided referenced Grading Plan (Sheet G-1). The street slopes route flow south on Grand Canyon. Review the need to provide an additional inlet on Grand Canyon, south of Elkhorn. Review and coordinate the impacts of this development on the drainage patterns to meet the MPU.
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5. Adjust the pavement replacement and trenching quantities to reflect the added pavement from the Savona developments.
6. Flood Control noted CCRFCD's acceptance of the Environmental Screening on November 6, 2012.

7. The provided WSPG analysis shows the velocities consistently above 25 fps. With the design process, the engineer must recommend the preferred alternative for mitigating the higher velocity flows on these proposed facilities. The Engineer must provide a detail showing additional sacrificial concrete (1-inch minimum) on the plans. Previous regional facilities have proposed an alternative to use high strength concrete (6,000 psi) in lieu of the additional sacrificial concrete. A Special Construction Note must be added to the Plan and Profile Sheets that calls out the special construction requirement for the additional sacrificial concrete or the use of 6,000 psi high strength concrete for the RCBs.
8. Continue to coordinate this project with the Rancho Road System Fort Apache – Echelon Point Drive to Elkhorn Road project for Fort Apache Road prepared by LBG.
9. Provide rip-rap limits on the detailed grading plans for the area drop inlets shown on Sheet SD-10. Review the concrete collar grades on Special Drop Inlets # 1 and # 2 to create more of a sump condition, similar to Special Drop Inlet # 3. See Sheet SD-07 and SD-10.
10. The construction of the curved RCB section near Station 44+00 crosses the existing 12-inch Sanitary Sewer at a shallow angle. This will require the sewer crossing to be removed and replaced per Crossing Detail SD-20 of the DCSWCS. The associated costs are incidental to the RCB construction and need to be covered within the Specifications.
11. Provide pothole information on the existing 6-inch Hp Gas line shown on the storm drain laterals. The HP Gas is located near the concrete collars and this information is needed for proper construction separation. See Sheets SD-04 and SD-05.
12. Show the RCB angle points and/or curved segments by station location and angle/degree change. Include the radius information and discuss how the curved sections are to be completed using curved forms or multiple angled segments. This needs to be explained within the Specifications.
13. Provide detail sheets showing typical details needed for the construction, connection and any special transition structure details. Structural details, if required, must be submitted by the 90% submittal.
14. Provide an updated cost estimate with the next submittal. The cost estimate must be refined based upon the 90% review to assure that the requested and allocated storm drain funds are sufficient for construction.
15. The Final Design report needs to include an electronic copy of the entire report with the input and output files for the hydraulics and hydrology.
16. Expand the Storm Drain Final Location Map Note (Note 20) to include "the storm drain lateral angle points."
17. Continue to coordinate the required County Approval signature blocks for the plans and the inspection process within the County jurisdiction.
18. See the plans for additional comments.

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5. Adjust the pavement replacement and trenching quantities to reflect the added pavement from the Savona developments.
6. Flood Control noted CCRFCD's acceptance of the Environmental Screening on November 6, 2012.

Peter Jackson

From: Todd L. Myers [TMyers@regionalflood.org]
Sent: Tuesday, December 24, 2013 10:00 AM
To: Randy McConnell
Cc: Mark Failla (mfailla@shg-inc.com); Peter Jackson
Subject: Rancho Road System, Elkhorn - Ft Apache to Grand Canyon 90% submittal

Randy/Mark,

I've completed my review of the 90% plans for the above referenced project. I'm still going over SP's, but wanted to go ahead and get these out. After today I'll be out of the office until Jan 6. Have great Christmas and New Year...Stay safe.

Plans

1. Sheet G-01: Coordinate with Clark County Public Works regarding signature block. I'm not sure if they will want to sign cover sheet, or just individual sheets applicable to Clark County.

2. Sheet R-01: Plans call out 2" Cold Mill and SP's call-out Rotomill (2 inch). Revise for consistency.

3. Sheet R-01: Verify that all necessary removals for Tee-Pee lateral are accounted for...Pavement, cross gutter, spandrel etc.

4. Sheet SD-02: Plan note calls out "Rubber Gaskets and Elastomeric joint sealant..." 10 ft each side of RCB waterline crossing. Typically rubber gaskets aren't used on RCB's. The RCB joints should be constructed with a product such as Ram-Nec or Butyl-Nec and then sealed with a two part sealant such as Seca Flex. Remove reference to rubber gaskets and revise to read "Elastomeric joint sealant shall be used...".

5. Sheet SD-03: Provide detail (collar) for RCB connection at "RCB" 64+00.00. It may not end up being necessary for construction, but we should have a bid item in case we need it.

6. Sheet SD-03: Coordinate with Louis Berger regarding re-alignment of Sanitary Sewer, and resulting temporary storm drain near "RCB" 63+00.

7. Sheet SD-04 & 05: Lateral Profiles 4, 5, 7 & 8 – Locate 6" PE Gas line. It's obvious the 6" gas is below the lateral, but we are excavating and pouring collars directly above it. We should get a better idea of how deep it is.

8. Sheet SD-07: The concrete aprons are designed with 3:1 ± H:V side slopes. Consider reducing slope to 4:1 H:V or less for safety considerations.

9. Sheet SD-08: The Modified Type DM2 drop inlet specifies a Neenah R-4999-L9 grate with openings perpendicular to flow. Verify that this grate is available with the perpendicular openings – I didn't see it in their online catalogue.

Special Provisions

10. SP 202: All full depth pavement replacement is considered incidental to the storm drain and/or sanitary sewer work. As a result, when this project goes to bid we won't have a unit price for full depth replacement, meaning any over runs will need to be negotiated in the field. We should discuss this at next progress meeting.

11. SP 501.03.10.4: Revise the last sentence of paragraph to read "Spraying shall be at twice the manufacturers recommendation, with second coat sprayed perpendicular to first coat, and shall occur...".

7. The provided WSPG analysis shows the velocities consistently above 25 fps. With the design process, the engineer must recommend the preferred alternative for mitigating the higher velocity flows on these proposed facilities. The Engineer must provide a detail showing additional sacrificial concrete (1-inch minimum) on the plans. Previous regional facilities have proposed an alternative to use high strength concrete (6,000 psi) in lieu of the additional sacrificial concrete. A Special Construction Note must be added to the Plan and Profile Sheets that calls out the special construction requirement for the additional sacrificial concrete or the use of 6,000 psi high strength concrete for the RCBs.
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MEETING AGENDA
RANCHO RD SYSTEM – ELKHORN
(FORT APACHE TO GRAND CANYON)
Progress Meeting #7 – January 15, 2014

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1. PROJECT STATUS
   - ❑ Submitted 90% DFDR to CLV/CCRFCD- 10/7/13
   - ❑ Received 90% DFDR Comments from CLV Survey – 10/14/13 References ROS
   - ❑ Received 90% DFDR Comments from CLV Sewer – 10/28/13
   - ❑ Received 90% DFDR Approval from CCPW- 11/5/13
   - ❑ Received 90% DFDR Comments from CLV Traffic – 12/19/13
   - ❑ Received 90% DFDR Comments from CLV Engineering – 12/19/13
   - ❑ Received 90% DFDR Comments from CCRFCD – 12/24/13
   - ❑ Recieved 90% DFDR Comments from CLV Flood – 1/6/14

2. COORDINATION
   - ❑ CLV/CCRFCD – Review 90% Comments
   - ❑ CCPW – What sheets to sign
   - ❑ FASD Project – Sewer Relocate, SD Lateral
   - ❑ Savona Project – Waterline, Drainage

3. SCHEDULE

❑ 30% Submittal	August 30, 2012
❑ 70% Submittal	March 11, 2013
❑ 90% Submittal	October 7, 2013
❑ CCRFCD Project Presentations	Complete: 11/21/13 TAC 12/2/13 CAC 12/12/13 Board
❑ 100% (Pre-final) Submittal	30 days*
❑ 100% (Final) Submittal	15 days*

*Calendar days following receipt of City comments.

Action Items	Assigned	Due
Verify if UTACS is needed		
Add 6" Gas potholing		

Rancho Rd. System
Elkhorn Branch-Ft. Apache to Grand Canyon
Response to 90% Comments

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
			DRAWINGS (90%)	
1	G-01	ED (HS)	Have plans been submitted to FAST, why are we requiring their signature?	
2	G-03	ED (HS)	Update CLV General Notes and CLV Street Light Notes to the Capital Project (CPM) version. Most current notes are attached to sheet G-03.	
3	G-03	ED (HS)	Add "CLARK COUNTY" to Stormwater Management Notes title	
4	R-01	ED (HS)	Verify STA 24+40 is the correct call out for the 18-inch SD plug, SD-01 shows a plug near STA 23+40	
5	R-01	ED (HS)	Limits of removal of median island curb and sidewalk ramp/sidewalk/cross gutter are not clear. Please clarify.	
6	SD-01 to SD-03	ED (HS)	Revise Note 7 to read "SEE G-05".	
7	SD-01 to SD-03	ED (HS)	Provide both proposed and existing elevations over RCB every 100' in profile view	
8	SD-01 to SD-04	ED (HS)	What is existing wearing surface, should it be UTACS (1-inch mill/overlay)?	
9	SD-01	ED (HS)	Is there enough room for MH @ STA 40+64 to be built?	
10	SD-02	ED (HS)	Limits of new/replaced sidewalk/sidewalk ramp/cross gutter/landscape are not clear. Please clarify	
11	SD-02	ED (HS)	Adjust note 7 from "G-04" to "G-05"	
12	SD-02	ED (HS)	Please fix note leader	
13	SD-03	ED (HS)	Need to add lateral from Ft. Apache and protect	From LBG Plan Sht C-1
14	SD-04 & SD-05	ED (HS)	Please verify slopes of storm drain laterals where called out	
15	SD-06	ED (HS)	Any notes (see attached)	
16	SD-06	ED (HS)	CLV uses 1-inch UTACS on roadways ≥ 80-ft	
17	SD-10	ED (HS)	Any rebar or dowels for concrete pad replacement on detail 4/SD-10?	
18	SD-10	ED (HS)	Clarify limits of sidewalk/ramp/landscape/under-drain removal and replacement	
19	SD-10	ED (HS)	Note on detail 4/SD-10 states to replace sidewalk ramp under-drain, is this still required with DI?	
20	SS-01	ED (HS)	Can you make the proposed improvements standout better?	
21	SS-01	ED (HS)	Clarify limits of A-curb removal and replacement	
22	General	Traffic (RM)	Town Center 44/50 #1 permit have been extended to 2-27-14. H16761. Almost released.	

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
23	General	Traffic (RM)	E.S.School boundary Thompson and Danell (CC), and Escobedo for M.S.	
24	General	Traffic (RM)	Construction shall be daytime only and must maintain a minimum of one travel lane in each direction, for left turn maintain 100' storage typical at major interseciton.	
25	ST-01	Traffic (RM)	Bike lane marking to be film	
26	ST-01	Traffic (RM)	Move right turn only striping from 26+15.00 to approx. 24+00.00	
27	ST-01	Traffic (RM)	Deleter RTMTR sign and move to west of Vail River	
28	ST-01	Traffic (RM)	Per Luis' workorder 521886 (7/27/09); completed 1/6/10), all bike lane striping show is tape	
29	SD-05	Sewer (none)	Per 70% comment, detail 6 - protect ex 8" ss per sd-21 of DCSWCS	
30	SS-01	Sewer (none)	Per 70% comment, match crowns of 8" and 12" sewer using 60" MH with corrosion protection	
31	G-03	Survey (JT)	Please insert the latest CLV survey monument general note (note 14)	
32	G-05	Survey (JT)	Please make a note stating "Please see the recorded record of Survey File 187 Page 17 of surveys regards this Horizontal Control"	
33	G-01	RFCD (TM)	Coordinate with Clark County Public Works regarding signature block. I'm not sure if they will want to sign cover sheet, or just individual sheets applicable to Clark County	
34	R-01	RFCD (TM)	Plans call out 2" Cold Mill and SP's call-out Rotomill (2 inch). Revise for consistency	
35	R-01	RFCD (TM)	Verify that all necessary removals for Tee-Pee lateral are accounted for...Pavement, cross gutter, spandrel etc.	
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42	General	Flood Control (PJ)	Flood Control concurs with the overall hydrology for this MPU facility.	
43	G-03	Flood Control (PJ)	Expand the Storm Drain Final Location Map Note (Note 20) to include "the storm drain lateral angle points."	
44	R-01	Flood Control (PJ)	Revise for pvmt.	
45	R-01	Flood Control (PJ)	Show removal limits.	
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Actions:
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B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
48	R-01	Flood Control (PJ)	There are apparent construction conflicts at Grand Canyon and Elkhorn with the proposed water line plans from the Savona Unit 2 & Savona Unit 3 projects. The water line needs to be relocated so that it does not impact this storm drain project. Coordinate the relocation with the Savona development, Nevada Energy and the Las Vegas Valley Water District to eliminate the construction conflict.	
49	SD-04	Flood Control (PJ)	The provided WSPG analysis shows the velocities consistently above 25 fps. With the design process, the engineer must recommend the preferred alternative for mitigating the higher velocity flows on these proposed facilities. The Engineer must provide a detail showing additional sacrificial concrete (1-inch minimum) on the plans. Previous regional facilities have proposed an alternative to use high strength concrete (6,000 psi) in lieu of the additional sacrificial concrete. A Special Construction Note must be added to the Plan and Profile Sheets that calls out the special construction requirement for the additional sacrificial concrete or the use of 6,000 psi high strength concrete for the RCBs.	
50	SD-05	Flood Control (PJ)	Provide pothole information on the existing 6-inch Hp Gas line shown on the storm drain laterals. The HP Gas is located near the concrete collars and this information is needed for proper construction separation. See Sheets SD-04 and SD-05.	
51	SD-07	Flood Control (PJ)	Provide rip-rap limits on the detailed grading plans for the area drop inlets shown on Sheet SD-10. Review the concrete collar grades on Special Drop Inlets # 1 and # 2 to create more of a sump condition, similar to Special Drop Inlet # 3. See Sheet SD-07 and SD-10.	
52	General	Flood Control (PJ)	Flood Control noted that there is existing pavement on Elkhorn Road west of Grand Canyon. Additionally, the proposed Savona development will construct roadway improvements within Elkhorn and Grand Canyon. Coordinate the improvements and revise the inlet improvements shown to match into the existing and proposed improvements. Provide an interim submittal to Flood Control for review on these drainage related issues prior to the pre'final submittal.	
53	General	Flood Control (PJ)	Flood Control noted CCRFCD's acceptance of the Environmental Screening on November 6, 2012.	
54	General	Flood Control (PJ)	Continue to coordinate this project with the Rancho Road System Fort Apache - Echelon Point Drive to Elkhorn Road project for Fort Apache Road prepared by LBG.	
55	General	Flood Control (PJ)	The construction of the curved RCB section near Station 44+00 crosses the existing 12-inch Sanitary Sewer at a shallow angle. This will require the sewer crossing to be removed and replaced per Crossing Detail SD-20 of the DCSWCS. The associated costs are incidental to the RCB construction and need to be covered within the Specifications.	
56	General	Flood Control (PJ)	Show the RCB angle points and/or curved segments by station location and angle/degree change. Include the radius information and discuss how the curved sections are to be completed using curved forms or multiple angled segments. This needs to be explained within the Specifications.	
57	General	Flood Control (PJ)	Provide detail sheets showing typical details needed for the construction, connection and any special transition structure details. Structural details, if required, must be submitted by the 90% submittal.	
58	General	Flood Control (PJ)	Provide an updated cost estimate with the next submittal. The cost estimate must be refined based upon the 90% review to assure that the requested and allocated storm drain funds are sufficient for construction.	
59	General	Flood Control (PJ)	The Final Design report needs to include an electronic copy of the entire report with the input and output files for the hydraulics and hydrology.	
60	General	Flood Control (PJ)	Continue to coordinate the required County Approval signature blocks for the plans and the inspection process within the County jurisdiction.	
61	General	Flood Control (PJ)	See the plans for additional comments.	
SPECIFICATIONS (90%)				

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No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
1	SP 202	RFCD (TM)	All full depth pavement replacement is considered incidental to the storm drain and/or sanitary sewer work. As a result, when this project goes to bid we won't have a unit price for full depth replacement, meaning any over runs will need to be negotiated in the field. We should discuss this at next progress meeting	
2	SP 501.03.10.4	RFCD (TM)	Revise the last sentence of paragraph to read "Spraying shall be at twice the manufacturers recommendation, with second coat sprayed perpendicular to first coat, and shall occur..."	

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CALL BEFORE YOU DIG
Call before you UnderGround
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CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-432-5300
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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CONSTRUCTION NOTES

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2. INSTALL 30" ROLL C&G PER USDCCA #217A
3. INSTALL SIDEWALK PER USDCCA #234
4. INSTALL 6' CROSS GUTTER PER USDCCA #228
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SEWER CONSTRUCTION NOTES

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22. INSTALL 4" SEWER LATERAL (PER DCSWCS STD No. SD-17, SD-22 & SD-25) AND 1 CU-FT THRUST BLOCK @ CAP
23. TYPICAL LOCATION FOR SEWER LATERAL AT WATER MAIN CROSSING. ALL SEWER LATERALS MUST MAINTAIN 18" VERTICAL CLEARANCE BELOW WATER MAIN AT CROSSINGS.

BENCHMARK

CLARK COUNTY BENCHMARK NUMBER 44 BLV90 18SW8 - CLARK COUNTY GIS CONTROL POINT #806, ±7.4' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD.

ELEV=868.435 METERS (2849.19 FEET) NAVD 88

BASIS OF BEARINGS

N 00°00'21" W, BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., AS SHOWN THAT CERTAIN MAP IN FILE 82, PAGE 20, OF PARCEL MAPS ON FILE IN THE COUNTY RECORDERS OFFICE, CLARK COUNTY, NEVADA.

CASE 1
SIDEWALK RAMP
PER CC STD DWG
235

CURVE TABLE						
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WATER MAIN JOINT DEFLECTION (PVC 4"-24")

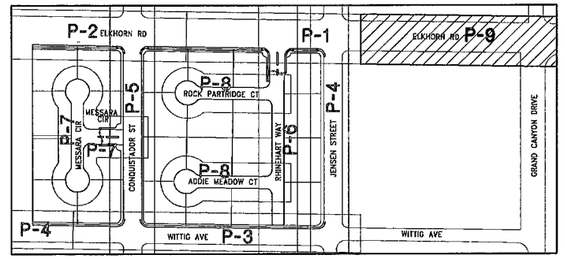
PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UDACS 2.07.01 AND 2.07.02

FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.

NOTE:
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING PER UDACS PLATE NO. 15

NOTES:

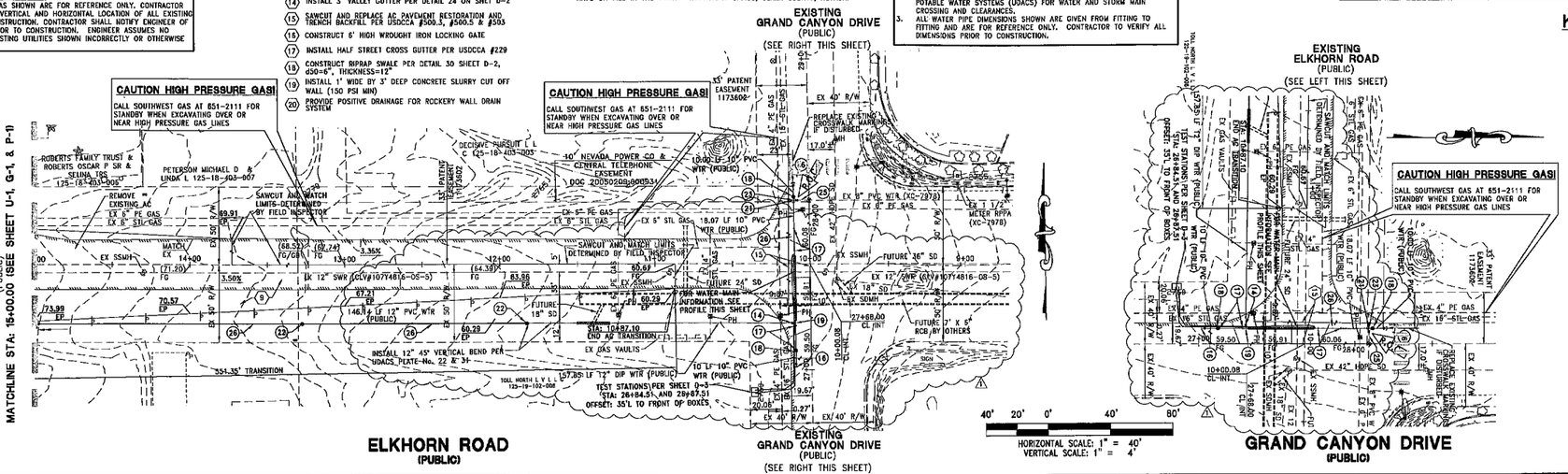
1. ADJUST WATER VALVE BOXES TO FINISH GRADE PER UDACS PLATE NO. 39. VALVES SHALL BE ACCESSIBLE AT ALL TIMES.
2. ALL SEWER/STORM DRAINS CROSSING WATERLINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSING AND CLEARANCES.
3. ALL WATER PIPE DIMENSIONS SHOWN ARE GIVEN FROM FITTING TO FITTING AND ARE FOR REFERENCE ONLY. CONTRACTOR TO VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION.



KEYMAP

WATER CONSTRUCTION NOTES

1. INSTALL FIRE HYDRANT ASSEMBLY PER UDACS PLATE No. 40 (INCLUDES 6" GATE VALVE)
2. INSTALL 8" GATE VALVE PER UDACS PLATE No. 30 & No. 39
3. INSTALL 8" X 6" TEE PER UDACS PLATE No. 31
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9. INSTALL 1" COPPER SERVICE LATERAL WITH 3/4" METER PER
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11. INSTALL (2) 4" SCHEDULE 40 PVC IRRIGATION SLEEVES
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CAUTION HIGH PRESSURE GAS!
CALL SOUTHWEST GAS AT 851-2111 FOR STANDBY WHEN EXCAVATING OVER OR NEAR HIGH PRESSURE GAS LINES
ELKHORN ROAD (PUBLIC)
MATCHLINE STA: 15+00.00 (SEE SHEET U-1, G-1, & P-1)
EXISTING GRAND CANYON DRIVE (PUBLIC)
(SEE RIGHT THIS SHEET)
EXISTING ELKHORN ROAD (PUBLIC)
(SEE LEFT THIS SHEET)
GRAND CANYON DRIVE (PUBLIC)
ROBERTS FAMILY TRUST & ROBERTS OSCAR P SR & SEUNA TRS 125-18-403-008
PETERSOM MICHAEL D & LINDA L 125-18-403-007
DECISIVE PURSUIT L L C 125-18-403-005
NEVADA POWER CO & CENTRAL TELEPHONE EASEMENT DOC 20050208:00093
35' PATENT EASEMENT 1173602
REMOVE EXISTING AC
SAWCUT AND MATCH BY FIELD INSPECTOR
SAWCUT AND MATCH LIMITS DETERMINED BY FIELD INSPECTOR
EX 6" PE GAS
EX 6" STL GAS
EX 8" STL GAS
EX 8" PVC WTR (XC-7978)
EX 12" SWR (GV#107T4816-08-S)
EX SSMH
FUTURE 36" SD
FUTURE 24" SD
FUTURE 18" SD
FUTURE 2' X 5' RCB BY OTHERS
EX 18" SD
EX 12" SWR (GV#107T4816-08-S)
EX 42" HDPE SD
EX 4" PE GAS
EX 18" STL GAS
EX 10" STL GAS
EX 6" PE GAS
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EX 8

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CURVE TABLE					CASE 1 SIDEWALK RAMP PER CC STD DWG 235	
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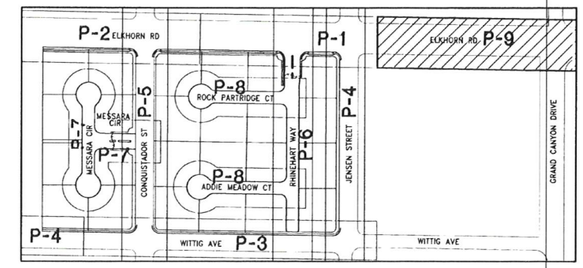
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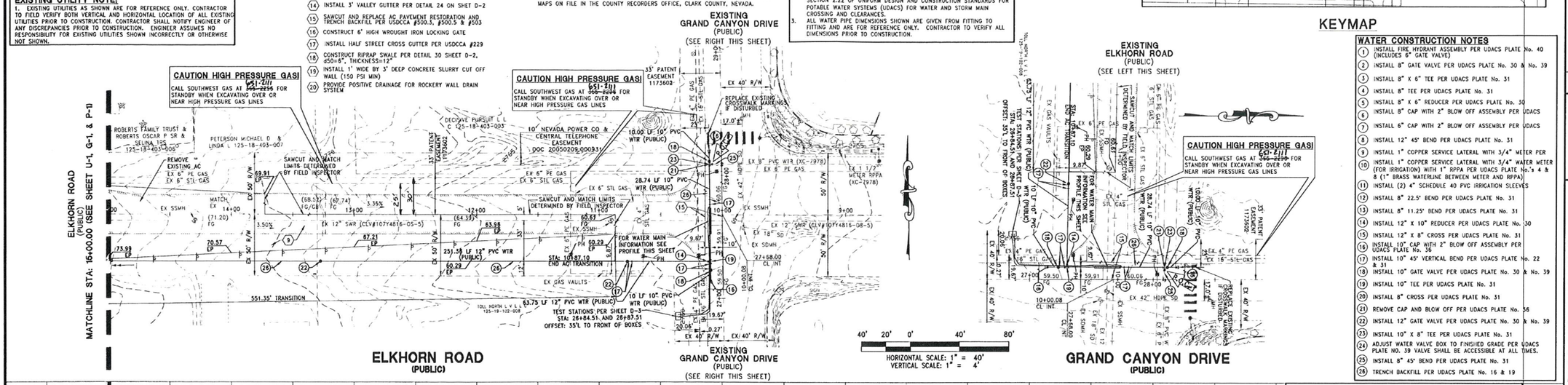
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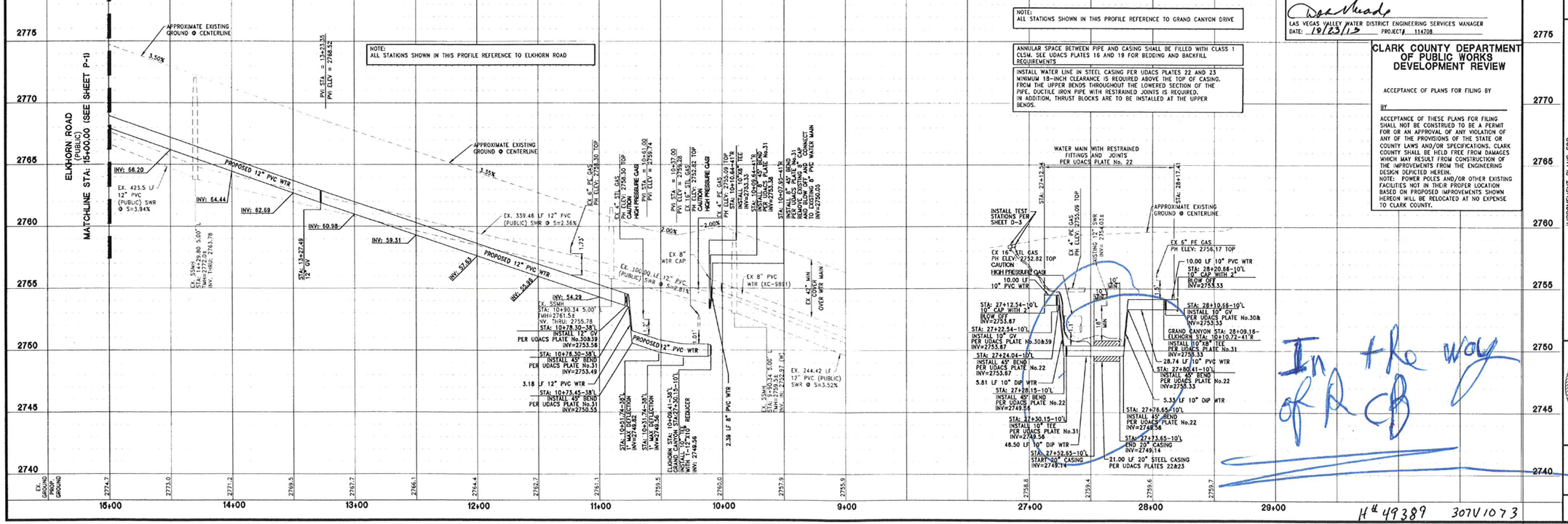


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APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: 10/23/13 PROJECT# 114708

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS DEVELOPMENT REVIEW

ACCEPTANCE OF PLANS FOR FILING BY

BY

ACCEPTANCE OF THESE PLANS FOR FILING SHALL NOT BE CONSTRUED TO BE A PERMIT FOR OR AN APPROVAL OF ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS AND/OR SPECIFICATIONS. CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREIN.
NOTE: POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN THEIR PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.

H# 49389 307V1073

NO.	DESCRIPTION	BY	APP'D	DATE
	KEY			

DATE: October 20, 2013
HORIZ. SCALE: 1"=40'
VERT. SCALE: 1"=4'
DRAWN BY: AM
DESIGNED BY: CR/SC
CHECKED BY: JEL
APPROVED BY: JEL
PROJECT #: 3110.0007

TOLL NORTH LV, LLC
1140 TOWN CENTER DRIVE SUITE 250
LAS VEGAS, NV 89144
PHONE: 702-243-3500 FAX: 702-243-9610

RCI Engineering
3281 S. HIGHLAND DRIVE SUITE 810, Las Vegas, NV 89109
PH#702.453.0800 FAX#702.453.0801

IMPROVEMENT PLANS FOR
SAVONA UNIT 2
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
PLAN AND PROFILE - GRAND CANYON DRIVE & ELKHORN ROAD STA: 9+00.00 - 15+00.00
CLARK COUNTY NEVADA

PROFESSIONAL ENGINEER STATE OF NEVADA JOHN I. LAND Exp. 12/31/2013 CIVIL No. 16441
10/21/2013

DRAWING
P-9
SHT 19 OF 21

HTE#
13-18613

O:\3110_Toll\0007_Savona_CIVIL\PS\Unit 2\0007_P-1.dwg jland 10/20/13 11:02pm

DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND OR OVERHEAD UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION. CONTRACTOR TO NOTIFY ENGINEER OF ANY CHANGES OR DISCREPANCIES.

Avoid overhead power line contact. It's costly.
Call before you Overhead
1-702-227-2929
NV Energy
Environment and Safety Services Department

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Avoid cutting underground utility lines. It's costly.
Call 811
1-800-227-2600
CLARK COUNTY TRAFFIC OPERATIONS
1-702-455-7544

Avoid Hitting Underground Traffic Signal Systems and Street Light System
Conduits It's Costly
CALL BEFORE YOU DIG UNDERGROUND
Call before you UnderGround
1-702-455-7611
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-432-5300
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

CONSTRUCTION NOTES

1. CONSTRUCT AC PAVEMENT PER DETAILS 1 THRU DETAIL 8 ON SHEET D-1
2. CONSTRUCT 24" "L" TYPE CURB AND GUTTER PER CCAUSD # 216
3. CONSTRUCT 30" ROLL CURB PER CCAUSD # 217.51
4. CONSTRUCT "A" CURB PER CCAUSD # 219
5. CONSTRUCT 8' CROSS GUTTER PER CCAUSD # 228
6. CONSTRUCT 5' SIDEWALK PER CCAUSD # 234
7. CONSTRUCT SIDEWALK RAMPS USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT PER CCAUSD # 235 (CASE 1)
8. CONSTRUCT 5' CURB TRANSITION FROM "L" CURB TO ROLL CURB
9. CONSTRUCT 5' CURB TRANSITION FROM ROLL CURB TO DEPRESSED CURB
10. CONSTRUCT RIPRAP SWALE, d50=6", THICKNESS=12"
11. CONSTRUCT 2' SIDEWALK DRAIN PER CCAUSD # 236
12. CONSTRUCT 6' HIGH WROUGHT IRON FENCE SEE DETAIL 36/D-2
13. CONSTRUCT 5' WIDE PEDESTRIAN ACCESS GATE
14. CONSTRUCT 12.5' TYPE 'CM2' DROP INLET (4 GRATES W/ 2.5' SWEEPER) PER CCAUSD #412.1 & 421
15. CONSTRUCT MIN 20" OF SIDEWALK PER CCAUSD #236 ON EITHER SIDE OF SW UNDERDRAIN
16. CONSTRUCT 7.5' TYPE 'CM2' DROP INLET (2 GRATES W/ 2.5' SWEEPER) PER CCAUSD #412.1 & 421
17. CONSTRUCT WROUGHT IRON FENCE SEE DETAIL 35/D-2
18. CONSTRUCT 1' WIDE BY 3' DEEP 150 PSI CONCRETE SLURRY CUT OF WALL
19. CONSTRUCT 27.5' TYPE 'CM2' DROP INLET (10 GRATES W/ 2.5' SWEEPER) PER CCAUSD #412.1 & 421

SEWER CONSTRUCTION NOTES

21. INSTALL 48" STANDARD MANHOLE (PER DCSWCS STD. No. SD-1A, SD-4, SD-5 & SD-6)
22. INSTALL 4" SEWER LATERAL (PER DCSWCS STD No. SD-17, SD-22 & SD-25) AND 1 CU-FT THRUST BLOCK @ CAP
23. TYPICAL LOCATION FOR SEWER LATERAL AT WATER MAIN CROSSING. ALL SEWER LATERALS MUST MAINTAIN 18" VERTICAL CLEARANCE BELOW WATER MAIN AT CROSSINGS.

BENCHMARK

CLARK COUNTY BENCHMARK NUMBER 44 BLV90 18SWS – CLARK COUNTY GIS CONTROL POINT #806, ±74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD. ELEV=868.435 METERS (2849.19 FEET) NAVD 88

BASIS OF BEARINGS

N 00°00'21" W, BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., AS SHOWN THAT CERTAIN MAP IN FILE 82, PAGE 20, OF PARCEL MAPS ON FILE IN THE COUNTY RECORDERS OFFICE, CLARK COUNTY, NEVADA.

CURVE TABLE

CURVE	DELTA	RADIUS	LENGTH	TANGENT
C8	89°11'4"	25.00'	38.91'	24.65'
C12	92°0'0"	25.00'	39.27'	25.00'
C13	92°0'0"	25.00'	39.27'	25.00'
C14	89°9'18"	30.00'	46.68'	29.54'

CASE 1 SIDEWALK RAMP PER CC STD DWG 235

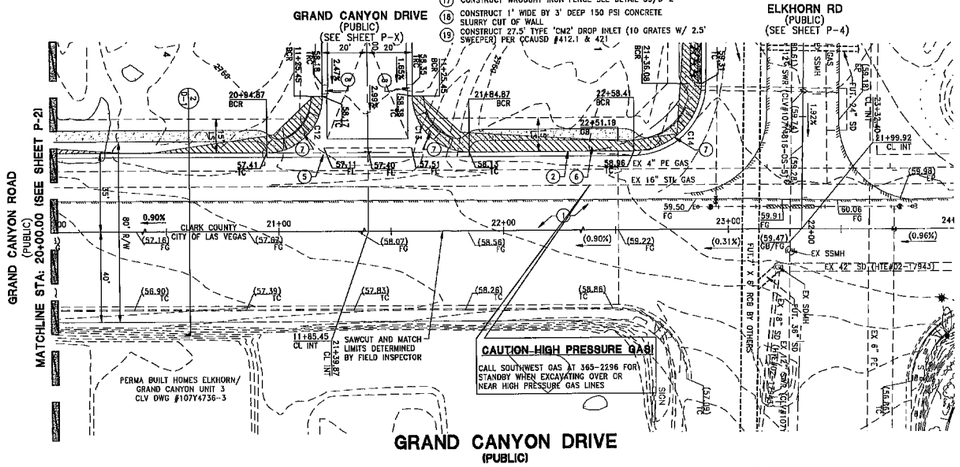
	"A"	"B"
	4.5'	9.5'
	8.0'	8.0'
	8.0'	8.0'
	8.0'	8.0'

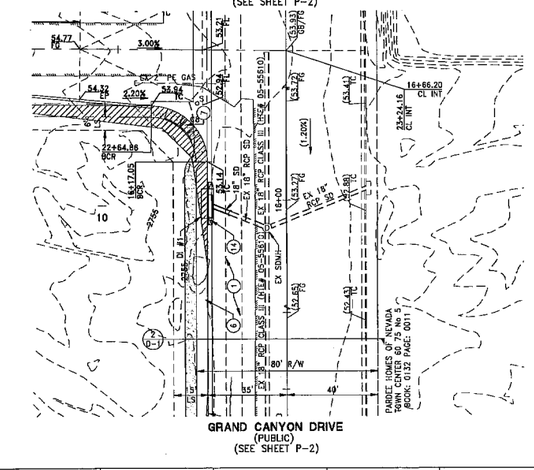
WATER MAIN JOINT DEFLECTION (PVC 4"-24")

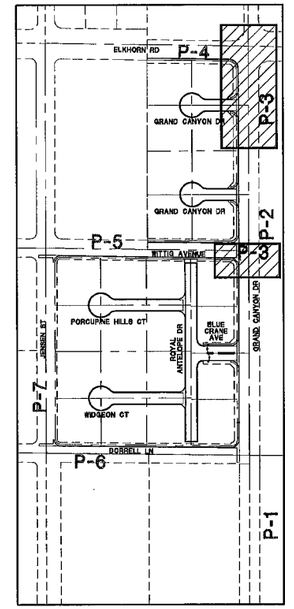
PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UDACS 2.07.01 AND 2.07.02

FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUN ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.

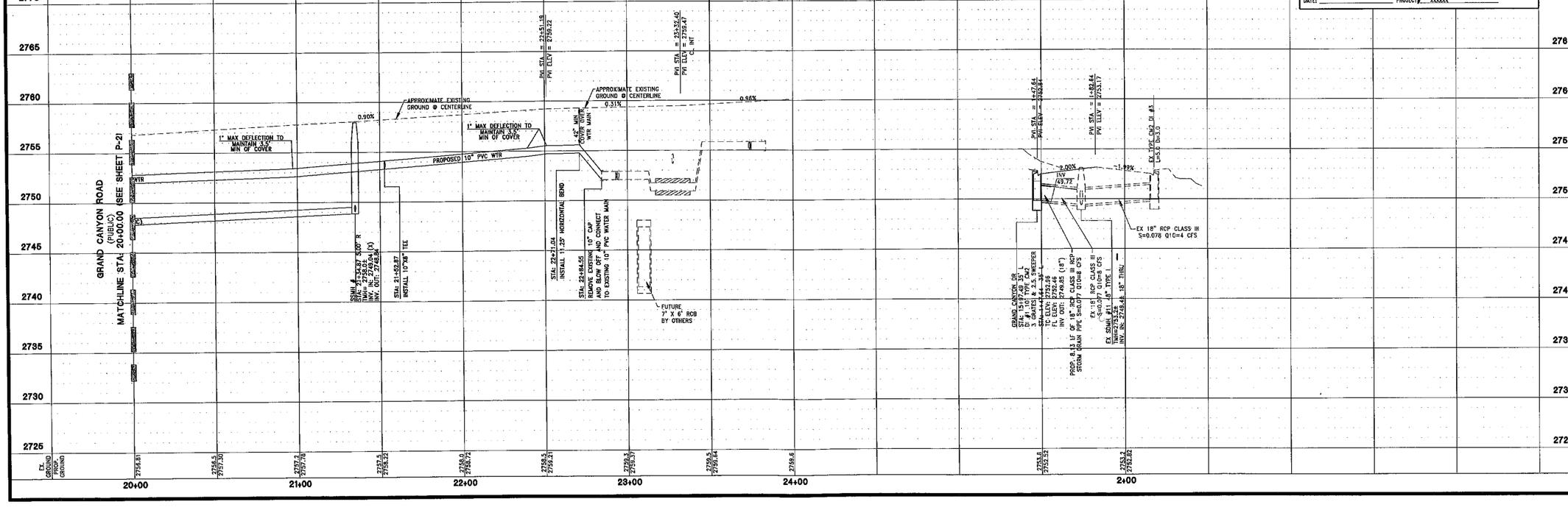
NOTE:
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING PER UDACS PLATE NO. 15







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



APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT# XXXXX

REV	DESCRIPTION	BY	APPD	DATE

DATE: September 04, 2013
HORIZ. SCALE: 1"=30'
VERT. SCALE: 1"=5'
DRAWN BY: CB
DESIGNED BY: SC
CHECKED BY: JIL
APPROVED BY: JIL
PROJECT #: 3110.0007

TOLL NORTH LV, LLC
(PUBLIC)
1140 TOWN CENTER DRIVE SUITE 250
LAS VEGAS, NV 89144
PHONE: 702-243-8810 FAX: 702-243-8818

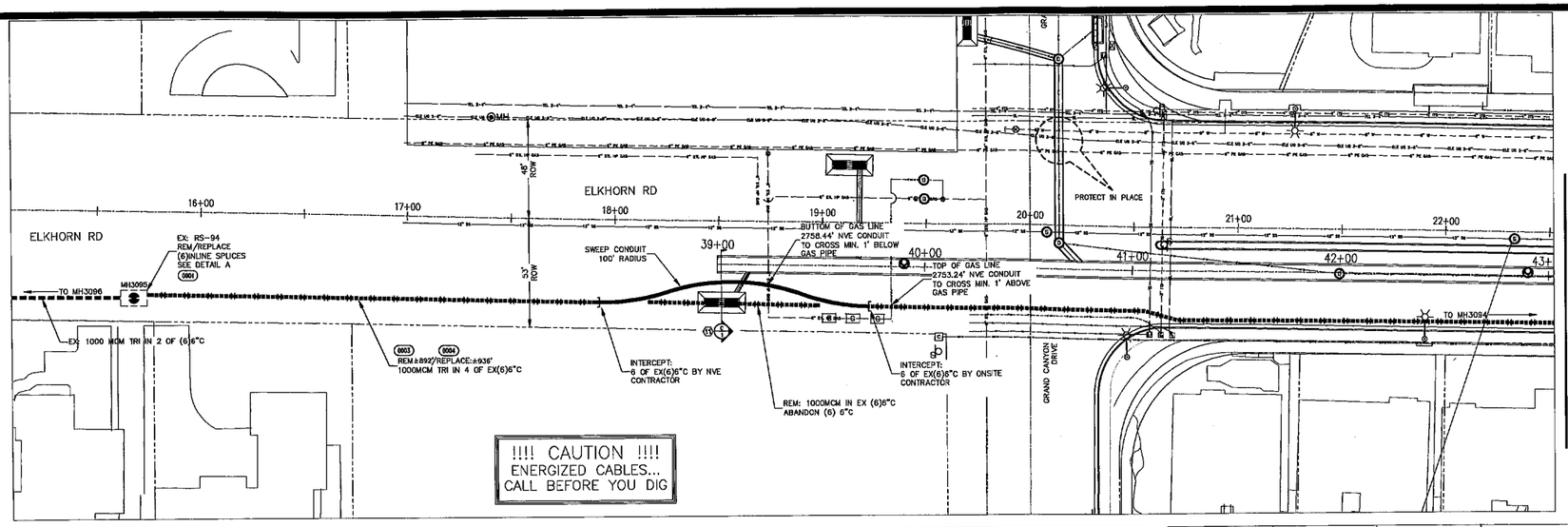
RCI Engineering
3321 S. HIGHLAND DRIVE SUITE 850, Las Vegas, NV 89109
PHONE: (702) 243-8800 FAX: (702) 243-8818

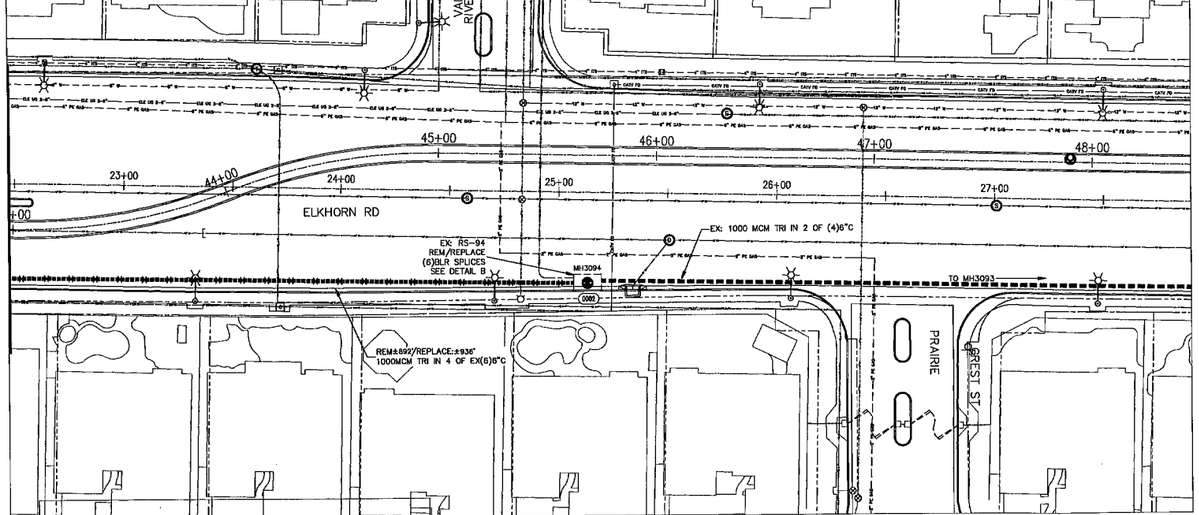
IMPROVEMENT PLANS FOR
SAVONA UNIT 3
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
PLAN AND PROFILE - GRAND CANYON DRIVE
STA: 20+00.00 - 23+32.40 AND DI #1
CLARK COUNTY NEVADA

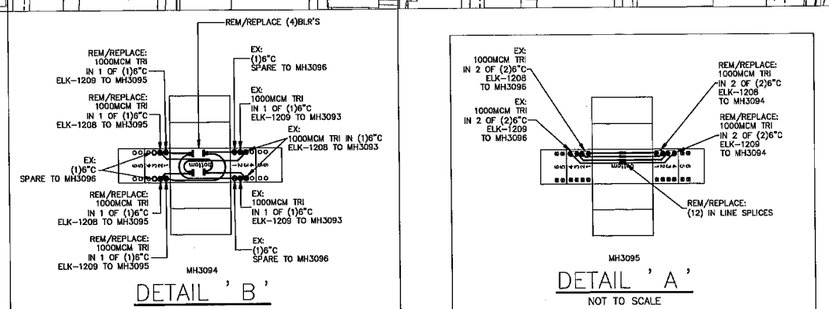
PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN I. LAND
Exp. 12/31/2013
CIVIL
No. 16441

DRAWING
P-3
SHT 14 OF 18
HITE#

O:\3110_Toll\0007_Savona_CIVIL\PS\unit 3\0007_P-1.dwg scarobey 9/04/13 8:56am

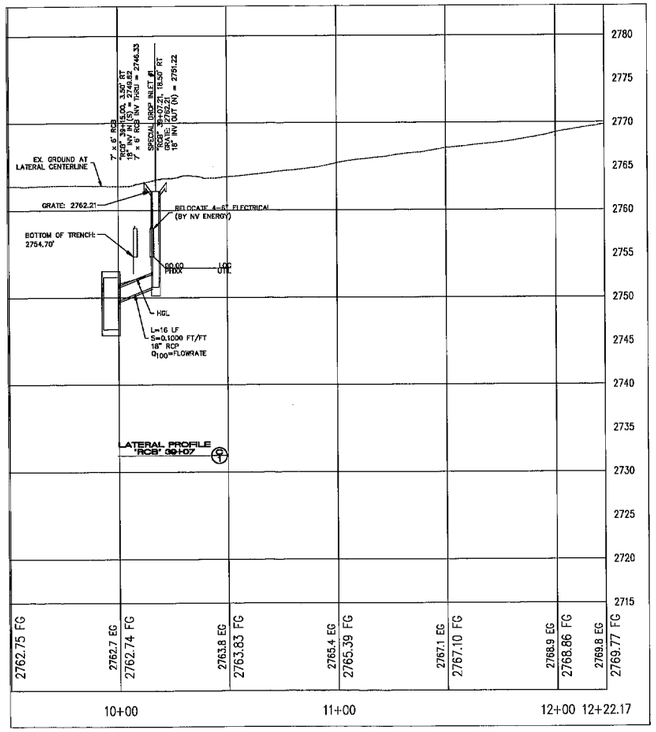




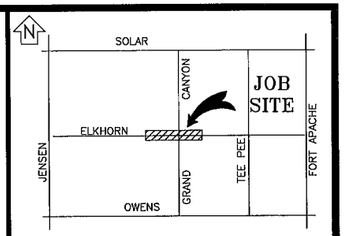


DETAIL 'B'
NOT TO SCALE

DETAIL 'A'
NOT TO SCALE



T,R,S: 1860-17
APN: 12517401014



VICINITY MAP
(NOT TO SCALE)

EVERY EFFORT HAS BEEN MADE TO IDENTIFY ALL NVE FACILITIES. THE CUSTOMER SHALL CONFIRM THE EXISTENCE AND LOCATION OF THESE FACILITIES.

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DIG OVERHEAD
CALL 1-702-402-2929

Call before you Dig
Avoid hitting underground utility lines. It's costly.
Call 811
OR
1-800-227-2600
FOR CLARK COUNTY MARKING OPERATIONS
1-702-455-7544

REVISIONS

NO.	DESCRIPTION	DATE	G.A.

TYPE OF EASEMENT:		JPA NOTES:
AERIAL	☐	EMBARQ CONTACT: N/A
STANDARD	☐	PHONE NUMBER:
R/W-31	☐	DATE OF CONTACT:
UNDERGROUND	☐	TO SET NEW POLES
AS BUILT UNDERGROUND	☐	TO STAKE NEW POLES
R.O.E./R/W-5-CCM	☐	TO PROVIDE POLES
3rd PARTY	☐	FT. CLASS
UNDERGROUND BY EXHIBIT	☐	FT. CLASS
(N-DOT) PERMIT	☐	FT. CLASS
(BLM) PERMIT	☐	TO DIG POLE HOLES
RAILROAD-UPRR-PERMIT	☐	TO REMOVE EX. POLES
SO. NEVADA WATER PERMIT	☐	
NOT REQUIRED	☐	
Misc. Info.	☐	JPA#: N/A

EXHIBIT 'A'

NVE INFORMATION:
COORDINATOR: PAT BROWN
PHONE: 702-402-6812
DESIGNER: LARRY ODDIEO
DCA:
INSPECTOR: 402-3008
STAND BY: 402-6788,402-6795,402-6840
DISTRICT: LAS VEGAS SOUTH

CUSTOMER INFORMATION:
APPLICANT CLV
ENGINEER: SLATER HANIFAN GROUP
CONTACT: MATTHEW MEYER
APPROVAL DATE:

GOVERNMENT INFORMATION:
AGENCY: CITY OF LAS VEGAS
APPROVAL DATE:

FOR EACH SERVICE POINT (POINT OF DELIVERY), ENERGY FOR EACH TENANT SPACE WILL BE MEASURED THROUGH ONE WATTHOUR METER. ENERGY FOR ALL NON-TENANT SPACE WILL BE MEASURED THROUGH ONE WATTHOUR METER. CONTACT NPC METER OPERATIONS FOR MULTIPLE RATE CLASS INSTALLATIONS

PURPOSE OF PROJECT:
NVE TO RELOCATE EXISTING FACILITIES FOR NEW DRAINAGE TO BE INSTALLED.

APPROVED FOR CONSTRUCTION
THIS APPROVAL IS FOR WORK IN CLV R/W & EASEMENT ONLY. OBTAINING PERMISSIONS OR EASEMENTS FOR WORK SHOWN ON PRIVATE PROPERTY IS THE RESPONSIBILITY OF THE UTILITY.

APPROVAL DATE

CITY OF LAS VEGAS PERMIT REQUIRED*
CONTACT CLV LAND DEVELOPMENT (229-6371)
CLV CONSTRUCTION SERVICES MUST BE NOTIFIED 24 HOURS PRIOR TO COMMENCING CONSTRUCTION (229-6320)
HANSEN DATE
*NVE INSPECTOR MUST BE NOTIFIED BY FAX 48 HOURS PRIOR TO COMMENCING CONSTRUCTION & WILL VERIFY CITY PERMIT FOR WORK DONE IN STREETS OR SIDEWALK.
FAX PERMIT TO:
LAS VEGAS NORTH (ROW CENTER): 402-4364
LAS VEGAS SOUTH (BELTWAY CENTER): 402-6804

CIVIL LINETYPE LEGEND

	PROPOSED	EXISTING
CENTERLINE		
PROPERTY LINE/ROW		
CURB		
EDGE OF PAVEMENT	W W	W W
EDGE OF SIDEWALK		
SEWER LINE *	S"S	S"S
WATER LINE *	W"W	W"W
GAS LINE *	G"G	G"G
TELEPHONE LINE *	TEL	TEL
CABLE TV LINE *	CATV	CATV
STORM DRAIN LINE *	12"SD	12"SD
FIRE HYDRANT		
STREET LIGHT	RCD	RCD
STREET LIGHT SERVICE	SS	SS

* LINETYPES UTILIZED WHERE CONFLICT OCCURS WITH NVE FACILITIES.

NVEnergy.

CLV-ELKHORN ROAD STORM DRAIN
FORT APACHE/DURANGO

PROJ. ID: 3000156503	SCALE: 1" = 30'
SHEET #: 2 OF 3	DATE: 06/01/2012

Sharing of this drawing and the information contained herein shall be only to individuals/parties who have entered into an agreement with Applicant for the completion of work associated with this specific project. Use for purposes other than this specific project requires the written consent of NV Energy.

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811
1-800-227-2600
CLARK COUNTY TRAFFIC OPERATIONS
1-702-455-7544

EXISTING UTILITY NOTE:

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CONSTRUCTION NOTES

1. INSTALL 24" "L" TYPE C&G PER USDCCA DWG. NO. 216
2. INSTALL 30" ROLL C&G PER USDCCA #217A
3. INSTALL SIDEWALK PER USDCCA #234
4. INSTALL 8' CROSS GUTTER PER USDCCA #228
5. INSTALL WROUGHT IRON FENCE (PER DETAIL 30 SHEET D-2)
6. INSTALL HANDICAP RAMP PER USDCCA #235 CASE 1 USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT
7. INSTALL AC PAVEMENT PER DETAIL 5 & 6 ON SHEET D-1
8. INSTALL AC PAVEMENT PER DETAIL 2-4 ON SHEET D-1
9. INSTALL AC PAVEMENT PER DETAIL 1 ON SHEET D-1
10. 5' ROLL CURB TO L CURB TRANSITION PER DETAIL 32, SHEET D-2
11. INSTALL BLOCK WALL OPENING PER DETAIL 25 ON SHEET D-2
12. INSTALL "A" TYPE ISLAND CURB PER USDCCA DWG. NO. 219
13. INSTALL DEPRESSED CURB DETAIL PER DETAIL 28 SHEET D-2
14. INSTALL 3' VALLEY GUTTER PER DETAIL 24 ON SHEET D-2
15. SAWCUT AND REPLACE AC PAVEMENT RESTORATION AND TRENCH BACKFILL PER USDCCA #500.3, #500.5 & #503
16. CONSTRUCT 6' HIGH WROUGHT IRON LOCKING GATE
17. INSTALL HALF STREET CROSS GUTTER PER USDCCA #229
18. CONSTRUCT RIPRAP SWALE PER DETAIL 30 SHEET D-2, d50=6", THICKNESS=12"
19. INSTALL 1' WIDE BY 3' DEEP CONCRETE SLURRY CUT OFF WALL (150 PSI MIN)
20. PROVIDE POSITIVE DRAINAGE FOR ROCKERY WALL DRAIN SYSTEM

SEWER CONSTRUCTION NOTES

21. INSTALL 48" STANDARD MANHOLE (PER DCSWCS STD. No. SD-1A, SD-4, SD-5 & SD-6)
22. INSTALL 4" SEWER LATERAL (PER DCSWCS STD No. SD-17, SD-22 & SD-25) AND 1 CU-FT THRUST BLOCK @ CAP
23. TYPICAL LOCATION FOR SEWER LATERAL AT WATER MAIN CROSSING. ALL SEWER LATERALS MUST MAINTAIN 18" VERTICAL CLEARANCE BELOW WATER MAIN AT CROSSINGS.

BENCHMARK

CLARK COUNTY BENCHMARK NUMBER 44 BLV30 18SWS - CLARK COUNTY GIS CONTROL POINT 8806, ±74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD.

ELEV=868.435 METERS (2849.19 FEET) NAVD 88

BASIS OF BEARINGS

N 00°00'21" W, BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., AS SHOWN THAT CERTAIN MAP IN FILE 82, PAGE 20, OF PARCEL MAPS ON FILE IN THE COUNTY RECORDERS OFFICE, CLARK COUNTY, NEVADA.

CASE 1 SIDEWALK RAMP PER CC STD DWG 235

CURVE TABLE						
CURVE	DELTA	RADIUS	LENGTH	TANGENT	"A"	"B"
C3	89°8'11"	25.00'	38.89'	24.63'	8.0'	8.0'
C4	90°51'49"	25.00'	39.65'	25.38'	9.5'	4.5'
C5	89°8'11"	25.00'	38.89'	24.63'	4.5'	9.5'

WATER MAIN JOINT DEFLECTION (PVC 4"-24")

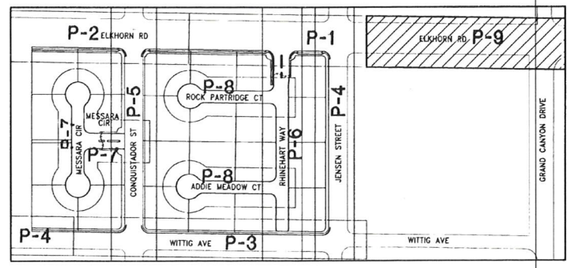
PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UDACS 2.07.01 AND 2.07.02

FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.

NOTE:
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING PER UDACS PLATE NO. 15

NOTES:

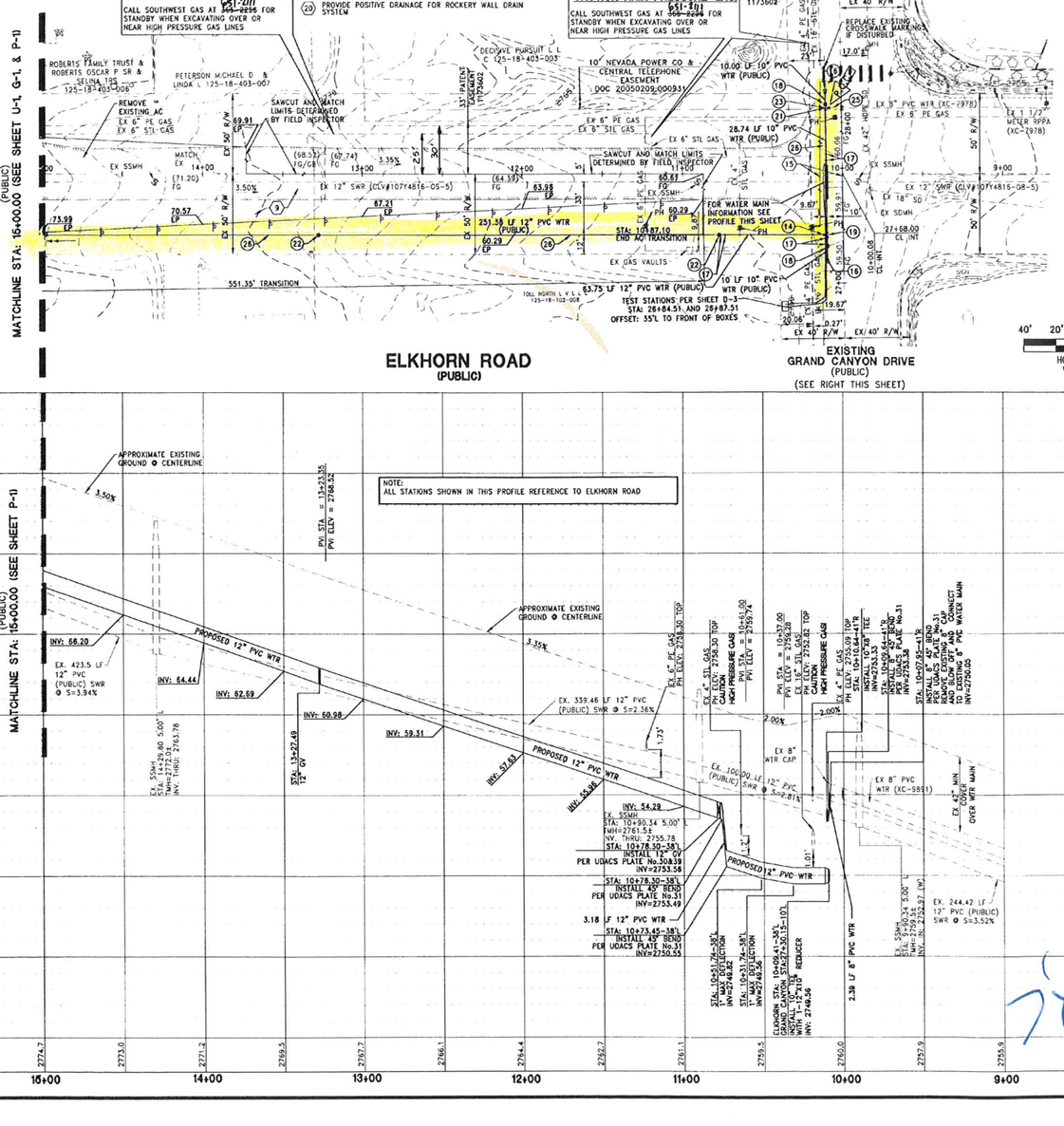
1. ADJUST WATER VALVE BOXES TO FINISH GRADE PER UDACS PLATE NO. 39. VALVES SHALL BE ACCESSIBLE AT ALL TIMES.
2. ALL SEWER/STORM DRAINS CROSSING WATERLINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSING AND CLEARANCES.
3. ALL WATER PIPE DIMENSIONS SHOWN ARE GIVEN FROM FITTING TO FITTING AND ARE FOR REFERENCE ONLY. CONTRACTOR TO VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION.



KEYMAP

CAUTION HIGH PRESSURE GAS!

CALL SOUTHWEST GAS AT 251-2111 OR 365-2496 FOR STANDBY WHEN EXCAVATING OVER OR NEAR HIGH PRESSURE GAS LINES



CAUTION HIGH PRESSURE GAS!

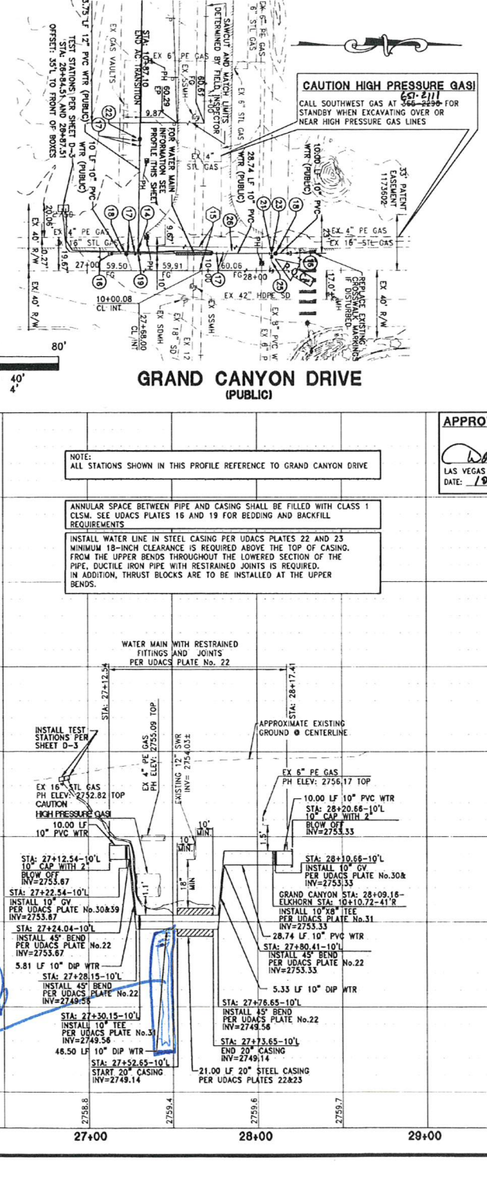
CALL SOUTHWEST GAS AT 251-2111 OR 365-2496 FOR STANDBY WHEN EXCAVATING OVER OR NEAR HIGH PRESSURE GAS LINES

ELKHORN ROAD (PUBLIC)

EXISTING GRAND CANYON DRIVE (PUBLIC) (SEE RIGHT THIS SHEET)

HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 4'

EXISTING ELKHORN ROAD (PUBLIC) (SEE LEFT THIS SHEET)



CAUTION HIGH PRESSURE GAS!

CALL SOUTHWEST GAS AT 251-2111 OR 365-2496 FOR STANDBY WHEN EXCAVATING OVER OR NEAR HIGH PRESSURE GAS LINES

GRAND CANYON DRIVE (PUBLIC)

WATER CONSTRUCTION NOTES

1. INSTALL FIRE HYDRANT ASSEMBLY PER UDACS PLATE No. 40 (INCLUDES 6" GATE VALVE)
2. INSTALL 8" GATE VALVE PER UDACS PLATE No. 30 & No. 39
3. INSTALL 8" X 6" TEE PER UDACS PLATE No. 31
4. INSTALL 8" TEE PER UDACS PLATE No. 31
5. INSTALL 8" X 6" REDUCER PER UDACS PLATE No. 30
6. INSTALL 8" CAP WITH 2" BLOW OFF ASSEMBLY PER UDACS
7. INSTALL 6" CAP WITH 2" BLOW OFF ASSEMBLY PER UDACS
8. INSTALL 12" 45° BEND PER UDACS PLATE No. 31
9. INSTALL 1" COPPER SERVICE LATERAL WITH 3/4" METER PER
10. INSTALL 1" COPPER SERVICE LATERAL WITH 3/4" WATER METER (FOR IRRIGATION) WITH 1" RPPA PER UDACS PLATE No.'s 4 & 8 (1" BRASS WATERLINE BETWEEN METER AND RPPA)
11. INSTALL (2) 4" SCHEDULE 40 PVC IRRIGATION SLEEVES
12. INSTALL 8" 22.5° BEND PER UDACS PLATE No. 31
13. INSTALL 8" 11.25° BEND PER UDACS PLATE No. 31
14. INSTALL 12" X 10" REDUCER PER UDACS PLATE No. 30
15. INSTALL 12" X 8" CROSS PER UDACS PLATE No. 31
16. INSTALL 10" CAP WITH 2" BLOW OFF ASSEMBLY PER UDACS PLATE No. 36
17. INSTALL 10" 45° VERTICAL BEND PER UDACS PLATE No. 22 & 31
18. INSTALL 10" GATE VALVE PER UDACS PLATE No. 30 & No. 39
19. INSTALL 10" TEE PER UDACS PLATE No. 31
20. INSTALL 8" CROSS PER UDACS PLATE No. 31
21. REMOVE CAP AND BLOW OFF PER UDACS PLATE No. 36
22. INSTALL 12" GATE VALVE PER UDACS PLATE No. 30 & No. 39
23. INSTALL 10" X 8" TEE PER UDACS PLATE No. 31
24. ADJUST WATER VALVE BOX TO FINISHED GRADE PER UDACS PLATE NO. 39 VALVE SHALL BE ACCESSIBLE AT ALL TIMES.
25. INSTALL 8" 45° BEND PER UDACS PLATE No. 31
26. TRENCH BACKFILL PER UDACS PLATE No. 16 & 19

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: 10/23/13 PROJECT# 114708

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS DEVELOPMENT REVIEW

ACCEPTANCE OF PLANS FOR FILING BY

BY

ACCEPTANCE OF THESE PLANS FOR FILING SHALL NOT BE CONSTRUED TO BE A PERMIT FOR OR AN APPROVAL OF ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS AND/OR SPECIFICATIONS. CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREIN.
NOTE: POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN THEIR PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.

H# 49389 307U1073

REV	DESCRIPTION	BY	APP'D	DATE

DATE: October 20, 2013
HORIZ. SCALE: 1"=40'
VERT. SCALE: 1"=4'
DRAWN BY: CR/SC
DESIGNED BY: AW
CHECKED BY: JH
APPROVED BY: JH
PROJECT #: 3110.0007

TOLL NORTH LV, LLC
1140 TOWN CENTER DRIVE SUITE 250
LAS VEGAS, NEVADA 89144
PHONE: 702-243-6800 FAX: 702-243-6810

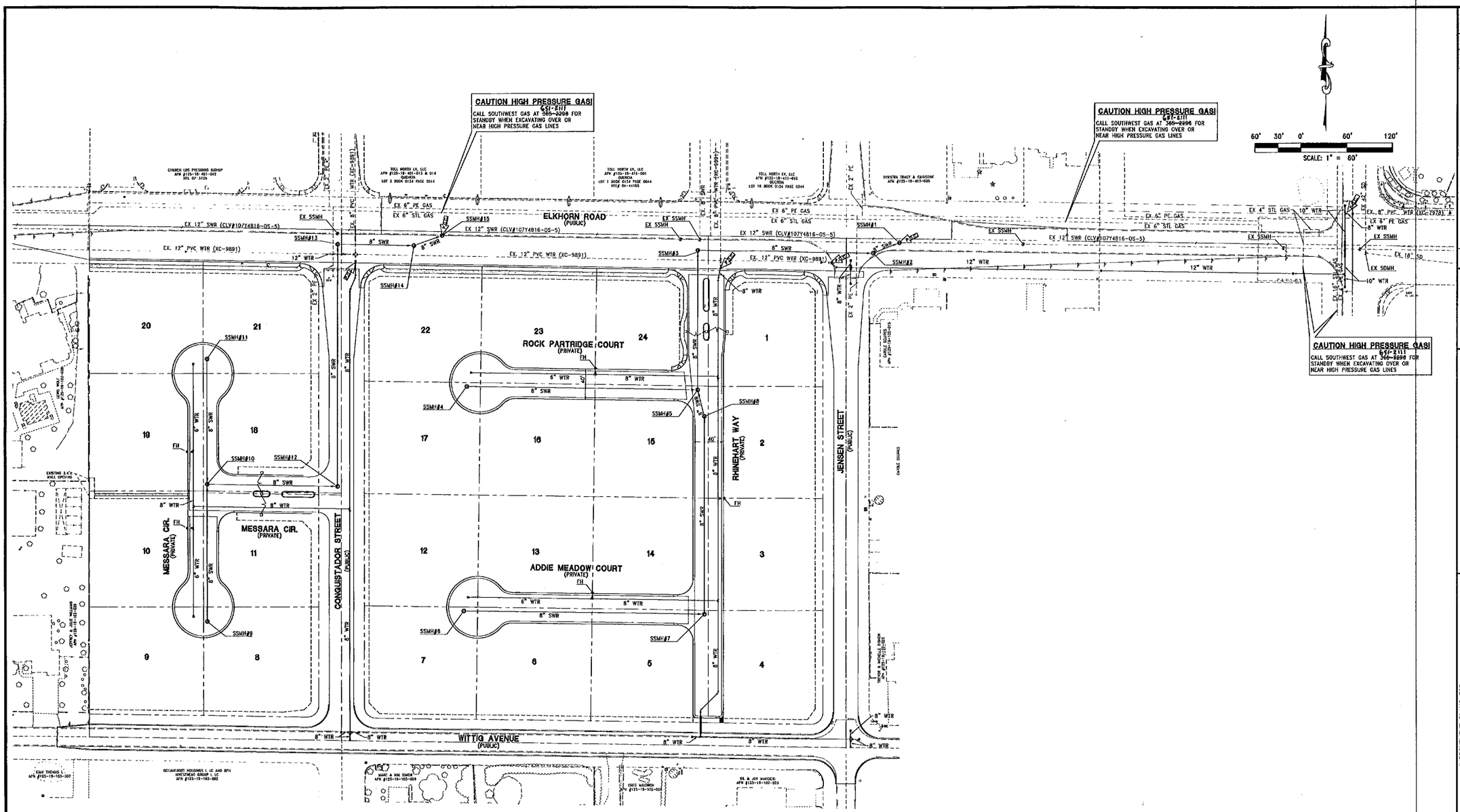
RCI Engineering
3281 S. HIGHLAND DRIVE SUITE 810, Las Vegas, NV 89109
PH#702.453.0800 FAX#702.453.0801

IMPROVEMENT PLANS FOR
SAVONA UNIT 2
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
PLAN AND PROFILE - GRAND CANYON DRIVE & ELKHORN ROAD STA: 9+00.00 - 15+00.00
NEVADA

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN I. LAND
Exp. 12/31/2013
CIVIL
No. 16441
10/2/2013

DRAWING
P-9
SHT 18 OF 21
HTE#
13-18613

O:\3110_Toll\0007_Savona_CIVIL\PS\Unit 2\3007_P-1.dwg jland 10/26/13 11:02pm



DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND OR OVERHEAD UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION. CONTRACTOR TO NOTIFY ENGINEER OF ANY CHANGES OR DISCREPANCIES.

Avoid overhead power line contact. It's costly.
Call before you Overhead
1-702-227-2929
Nevada Power Environment and Safety Services Department

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
1-800-227-2600
CLARK COUNTY SIGNAL OPERATIONS
1-702-455-7544

Avoid Hitting Underground Traffic Signal Systems and Street Light System Conduits It's Costly
CALL BEFORE YOU DIG UNDERGROUND
Call before you UnderGround
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-432-5300
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

BENCHMARK

CLARK COUNTY BENCHMARK NUMBER 44 8LY90 18SWS – CLARK COUNTY GIS CONTROL POINT #806, ±74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD.

ELEV=858.435 METERS (2849.19 FEET) NAVD 88

BASIS OF BEARINGS

N 00°00'21" W, BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., AS SHOWN THAT CERTAIN MAP IN FILE 82, PAGE 20, OF PARCEL MAPS ON FILE IN THE COUNTY RECORDERS OFFICE, CLARK COUNTY, NEVADA.

CLARK COUNTY FIRE DEPARTMENT APPROVAL

BY: _____ DATE: 22oct13

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR ANY APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS.

APPROVAL BY THE FIRE DEPARTMENT HAVING JURISDICTION IS REQUIRED PRIOR TO OBTAINING FINAL APPROVAL FROM THE LVVWD.

FIRE FLOW 2,000 GPM AT 20 PSI RESIDUAL 13-18874 SFH

APPROVED FOR CONSTRUCTION CLV HM 49389 307V1073

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: 10/23/13 PROJECT# 114708

LVVWD APPROVED FIRE FLOW 2,000 GPM AT 20 PSI RESIDUAL

REV	DESCRIPTION	BY	APP'D	DATE

DATE: October 20, 2013
HORIZ. SCALE: 1"=60'
VERT. SCALE: N/A
DRAWN BY: CR/SC
DESIGNED BY: ___AM___
CHECKED BY: ___JIL___
APPROVED BY: ___JIL___
PROJECT #: 3110.0007

TOLL NORTH LV, LLC
1140 TOWN CENTER DRIVE SUITE 250
LAS VEGAS, NV 89144
PHONE: 702-240-8888 FAX: 702-240-8810

RCI Engineering
3281 S. HIGHLAND DRIVE SUITE 850, Las Vegas, NV 89109
PH#702.451.0800 FAX#702.451.0821

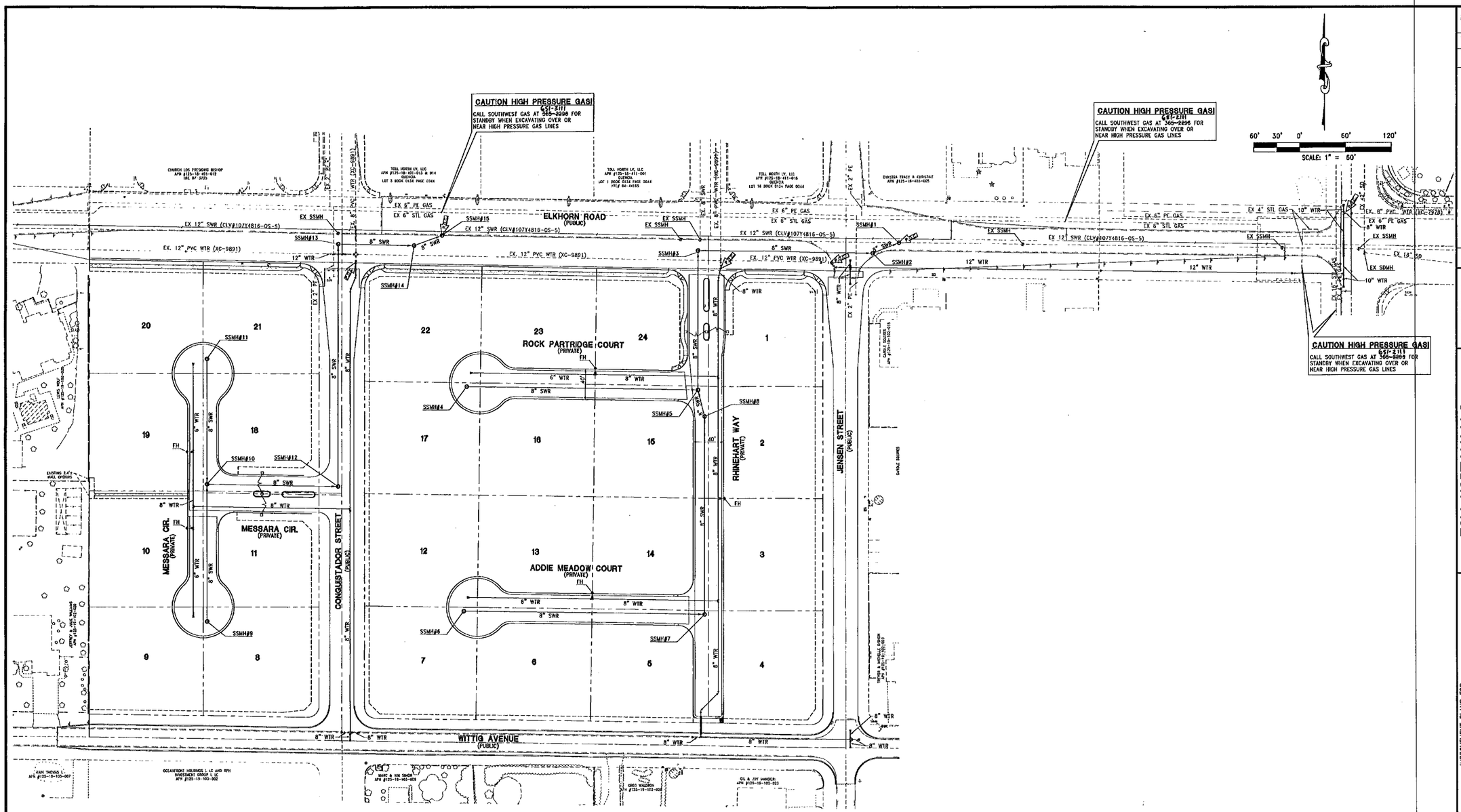
IMPROVEMENT PLANS FOR
SAVONA UNIT 2
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
NEVADA

MASTER UTILITY PLAN

JOHN I. LAND
Exp. 12/31/2013
CIVIL
No. 16441
STATE OF NEVADA
10/21/2013

DRAWING
MU-1
SHT 8 OF 21
HTE#
13-18613

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Nevada Power Environment and Safety Services Department

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811
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1-702-455-7544

Avoid Hitting Underground Traffic Signal Systems and Street Light System
Conduits It's Costly
CALL BEFORE YOU DIG UNDERGROUND
Call before you UnderGround
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CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-432-5300
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

BENCHMARK

CLARK COUNTY BENCHMARK NUMBER 44 BLV90 18SWS – CLARK COUNTY GIS CONTROL POINT #806, ±74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD.

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CLARK COUNTY FIRE DEPARTMENT APPROVAL

BY: _____ 22oct13
DATE

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APPROVAL BY THE FIRE DEPARTMENT HAVING JURISDICTION IS REQUIRED PRIOR TO OBTAINING FINAL APPROVAL FROM THE LVVWD.

FIRE FLOW 2,000 GPM AT 20 PSI RESIDUAL 13-48874 SFH

APPROVED FOR CONSTRUCTION CLV H# 49389 3074073

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: 10/23/13 PROJECT# 114708

LVVWD APPROVED FIRE FLOW 2,000 GPM AT 20 PSI RESIDUAL

REV	DESCRIPTION	BY	APP'D	DATE

DATE: October 20, 2013
HORIZ. SCALE: 1"=60'
VERT. SCALE: N/A
DRAWN BY: CR/SC
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APPROVED BY: JIL
PROJECT #: 3110.0007

TOLL NORTH LV, LLC
1140 TOWN CENTER DRIVE SUITE 250
LAS VEGAS, NEVADA 89144
PHONE: 702-243-4900 FAX: 702-243-9610

RCI Engineering
2281 S. HIGHLAND DRIVE SUITE 210, Las Vegas, NV 89109
PH#702.455.0800 FAX#702.455.0801

IMPROVEMENT PLANS FOR
SAVONA UNIT 2
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
NEVADA

MASTER UTILITY PLAN

PROFESSIONAL ENGINEER — JOHN I. LAND — Exp. 12/31/2013 CIVIL — No. 16441 — STATE OF NEVADA
10/21/2013

DRAWING
MU-1
SHT 8 OF 21
HTE#
13-18613

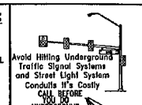
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Call before you UnderGround
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-432-5300
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

CONSTRUCTION NOTES

1. INSTALL 24" "L" TYPE C&G PER USDCCA DWG. NO. 216
2. INSTALL 30" ROLL C&G PER USDCCA #217A
3. INSTALL SIDEWALK PER USDCCA #234
4. INSTALL 8' CROSS GUTTER PER USDCCA #228
5. INSTALL WROUGHT IRON FENCE (PER DETAIL 30 SHEET D-2)
6. INSTALL HANDICAP RAMP PER USDCCA #235 CASE I USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT
7. INSTALL AC PAVEMENT PER DETAIL 5 & 6 ON SHEET D-1
8. INSTALL AC PAVEMENT PER DETAIL 2-4 ON SHEET D-1
9. INSTALL AC PAVEMENT PER DETAIL 1 ON SHEET D-1
10. 5' ROLL CURB TO L CURB TRANSITION PER DETAIL 32, SHEET D-2
11. INSTALL BLOCK WALL OPENING PER DETAIL 25 ON SHEET D-2
12. INSTALL "A" TYPE ISLAND CURB PER USDCCA DWG. NO. 219
13. INSTALL DEPRESSED CURB DETAIL PER DETAIL 28 SHEET D-2
14. INSTALL 3' VALLEY GUTTER PER DETAIL 24 ON SHET D-2
15. SAWCUT AND REPLACE AC PAVEMENT RESTORATION AND TRENCH BACKFILL PER USDCCA #500.3, #500.5 & #503
16. CONSTRUCT 6' HIGH WROUGHT IRON LOCKING GATE
17. INSTALL HALF STREET CROSS GUTTER PER USDCCA #229
18. CONSTRUCT RIPRAP SWALE PER DETAIL 30 SHEET D-2, D50=6", THICKNESS=12"
19. INSTALL 1' WIDE BY 3' DEEP CONCRETE SLURRY CUT OFF WALL (150 PSI MIN)
20. PROVIDE POSITIVE DRAINAGE FOR ROCKERY WALL DRAIN SYSTEM

SEWER CONSTRUCTION NOTES

21. INSTALL 48" STANDARD MANHOLE (PER DCSWCS STD. No. SD-1A, SD-4, SD-5 & SD-6)
22. INSTALL 4" SEWER LATERAL (PER DCSWCS STD No. SD-17, SD-22 & SD-25) AND 1 CU-FT THRUST BLOCK @ CAP
23. TYPICAL LOCATION FOR SEWER LATERAL AT WATER MAIN CROSSING. ALL SEWER LATERALS MUST MAINTAIN 18" VERTICAL CLEARANCE BELOW WATER MAIN AT CROSSINGS.

CURVE TABLE					CASE I SIDEWALK RAMP PER CC STD DWG 235	
CURVE	DELTA	RADIUS	LENGTH	TANGENT	"A"	"B"
C1	89°10'4"	30.00'	46.69'	29.57'	8.0'	8.0'
C2	90°49'56"	30.00'	47.67'	30.44'	4.5'	9.5'

BENCHMARK

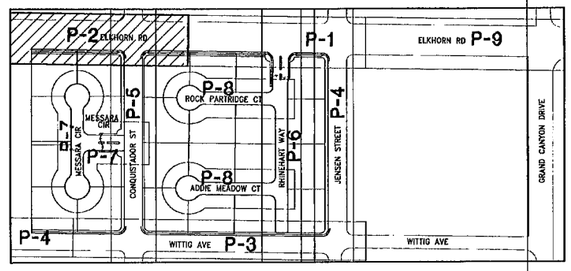
CLARK COUNTY BENCHMARK NUMBER 44 ALVOO 18SWS – CLARK COUNTY GIS CONTROL POINT #808, ± 74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD.

ELEV=868.435 METERS (2849.19 FEET) NAVD 88

BASIS OF BEARINGS

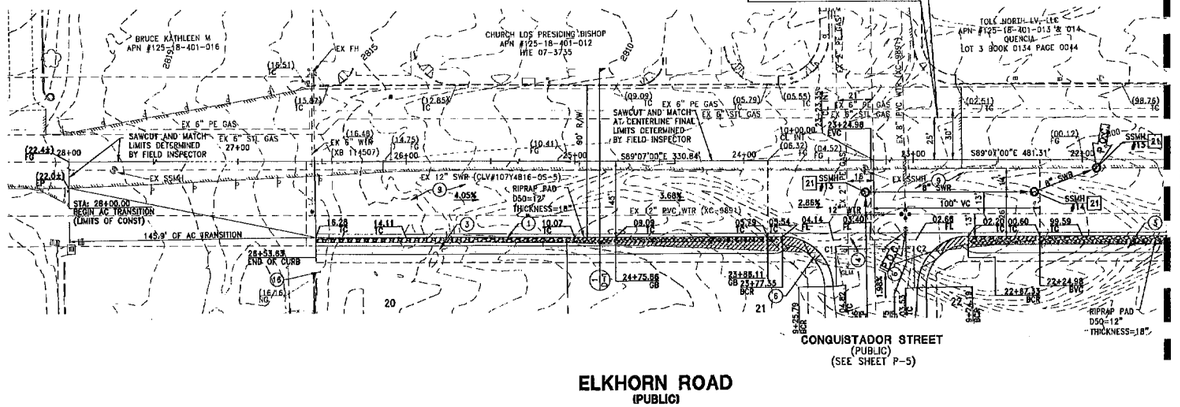
N 00°00'21" W, BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., AS SHOWN THAT CERTAIN MAP IN FILE 82, PAGE 20, OF PARCEL MAPS ON FILE IN THE COUNTY RECORDERS OFFICE, CLARK COUNTY, NEVADA.

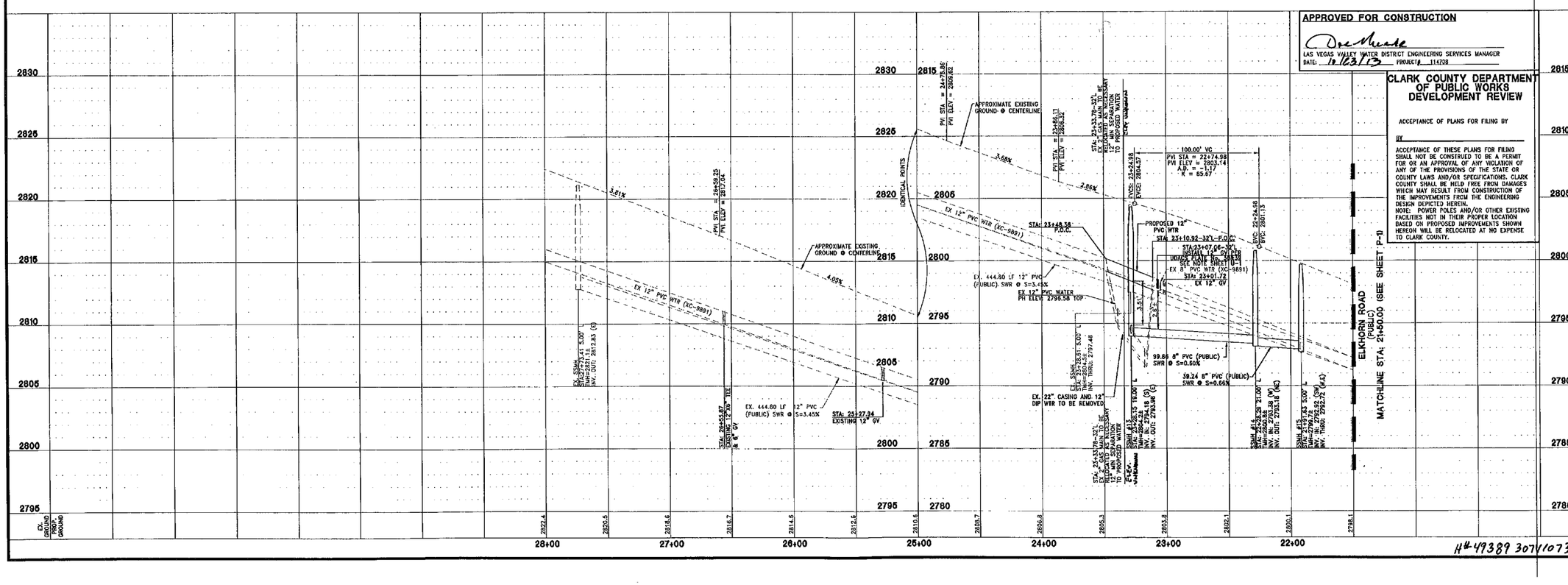
40' 20' 0' 40' 80'
HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 4'



KEYMAP

CAUTION HIGH PRESSURE GAS!
CALL SOUTHWEST GAS AT 365-2356 FOR STANDBY WHEN EXCAVATING OVER OR NEAR HIGH PRESSURE GAS LINES





TOLL NORTH LV, LLC
1140 TOWN CENTER DRIVE SUITE 250
LAS VEGAS, NV 89144
PHONE: 702-243-8800 FAX: 702-243-8810

RCI Engineering
3283 S. HIGHLAND DRIVE SUITE E-5-5, Las Vegas, NV 89109
PH#702.458.5800 FAX#702.458.5801

REV	DESCRIPTION	BY	APP'D	DATE

DATE: October 21, 2013
HORIZ. SCALE: 1"=40'
VERT. SCALE: 1"=4'
DRAWN BY: CR/SC
DESIGNED BY: AM
CHECKED BY: JL
APPROVED BY: —
PROJECT #: 3110.0007

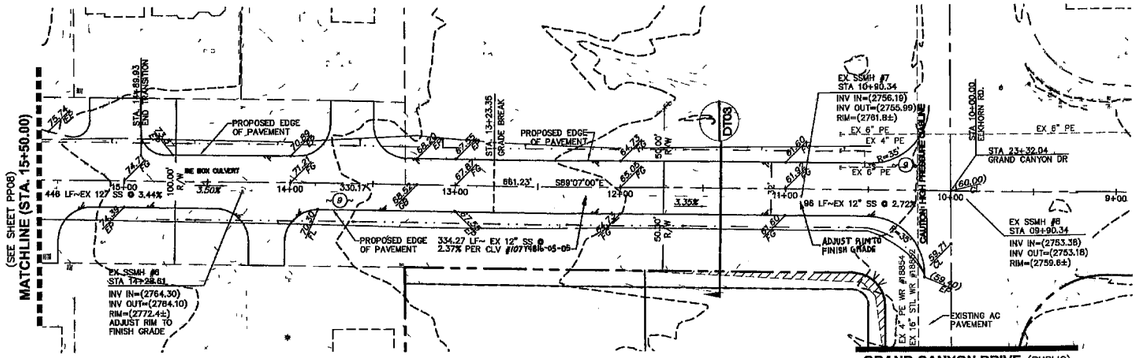
IMPROVEMENT PLANS FOR
SAVONA UNIT 2
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
PLAN AND PROFILE - ELKHORN ROAD
STA: 21+50.00 - 28+00.00
NEVADA

JOHN I. LAND, Exp. 12/31/2013, CIVIL, STATE OF NEVADA
10/21/2013

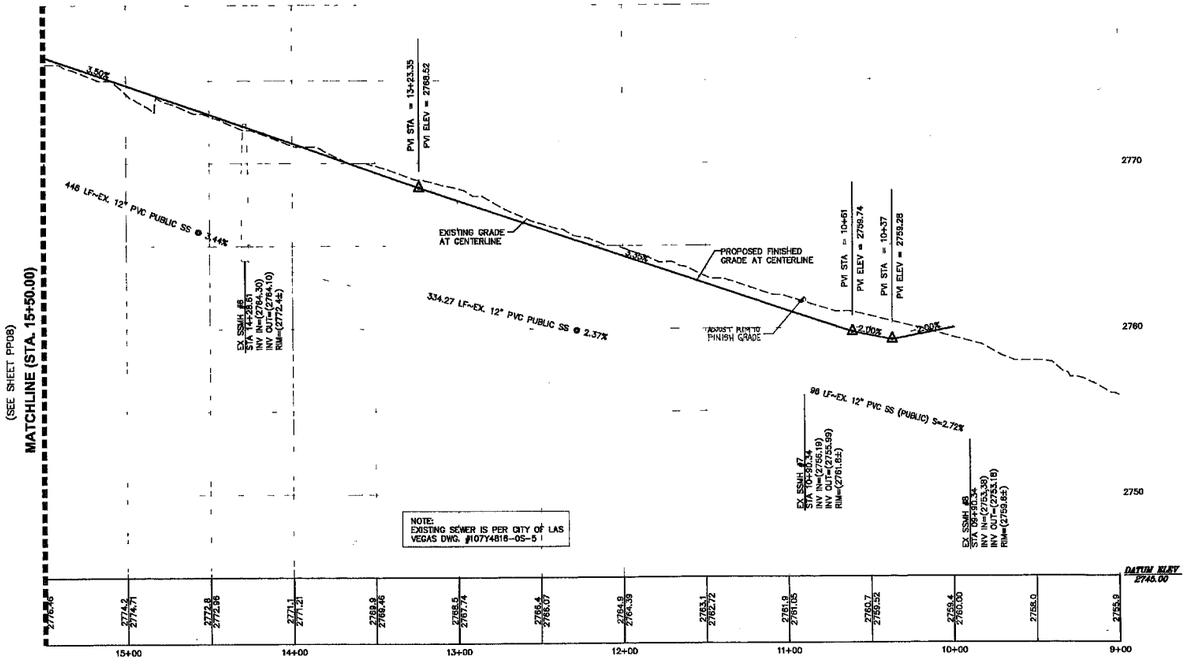
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P-2
SHT 12 OF 21
HITE#
13-18613

H#49389 30741073

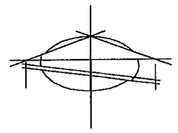
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ELKHORN STREET PLAN (PUBLIC)
HORIZONTAL SCALE: 1"=40'

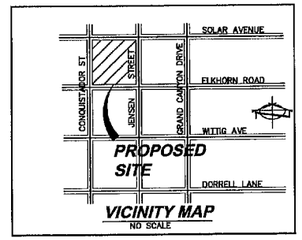


ELKHORN ROAD PROFILE
HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'

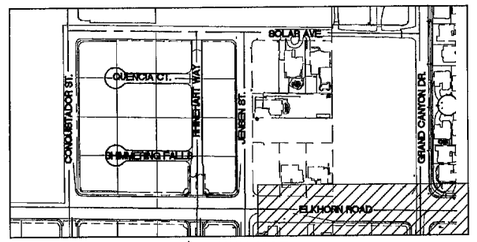


GRAPHIC SCALE

(IN FEET)
1 inch = 40 ft.



VICINITY MAP
NO SCALE



KEY MAP
NO SCALE

LEGEND

- PROPERTY LINE
- STREET CENTERLINE
- LOT LINE
- BUILDING SETBACK LINE
- PROPOSED ROLL CURB
- EXISTING "L" CURB & GUTTER
- EXISTING CONTOUR LINES
- PROPOSED RETAINING WALL
- EXISTING SCREEN/RETAINING WALL
- PROPOSED FLOW LINE
- PROPOSED EDGE OF PAVEMENT
- EXIST. EDGE OF PAVEMENT
- 00.00 LOC — PROPOSED ELEVATION & LOCATION
- (00.00) LOC — EXISTING ELEVATION & LOCATION
- 0.00% — PROPOSED GRADE
- CONSTRUCTION NOTE
- PROPOSED 250 W HPS LUMINAIRE
- PROPOSED HYDRANT

CL	CENTERLINE
TC	TOP OF CURB
EP	EDGE OF PAVEMENT
CR	CROWN LINE
FG	FINISHED GRADE
TF	TOP OF FOOTING
TRW	TOP OF RETAINING WALL
BSW	BACK OF SIDEWALK
GB	GRADE BREAK
BVC	BEGIN VERTICAL CURVE
EVC	END VERTICAL CURVE
FF	FINISHED FLOOR
HP	HIGHPOINT
AC	ASPHALTIC CONCRETE

CONSTRUCTION NOTES

#	ITEM	UNIT	QUANTITY PUBLIC	QUANTITY PRIVATE
1	INSTALL 24" "L" TYPE C & G PER USDCCA DWG. NO. 216	LF	557	–
2	INSTALL 30" ROLL CURB & GUTTER PER USDCCA #217A	LF	–	2102
3	INSTALL SIDEWALK PER USDCCA #234	SF	3459	–
4	INSTALL 8' CROSS GUTTER PER USDCCA #228	SF	708	1328
5	INSTALL CRASH GATE	EA	–	1
6	INSTALL HANDICAP RAMP PER USDCCA #235 CASE 1 USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT	EA	2	–
7	INSTALL 2" MIN. AC OVER 4" TYPE II A.B. OVER 6" TYPE I A.B.	SY	–	5350
8	INSTALL 3" MIN. AC OVER 4" TYPE II A.B. OVER 6" TYPE I A.B.	SY	7368	–
9	INSTALL 5" MIN AC OVER 9" MIN. TYPE II AGG. BASE	SY	3954	–
10	5' TRANSITION FR. 30" "ROLL" TYPE C&G TO 24" "L" TYPE C&G	EA	–	2
11	INSTALL SIDEWALK DRAIN PER USDCCA DWG. NO. 238	EA	–	2
12	INSTALL "A" TYPE ISLAND CURB PER USDCCA DWG. NO. 218	LF	–	103
13	INSTALL 9" MEDIUM DUTY DRAIN (ZURN Z-507 OR EQUIVALENT) WITH 4" PVC DRAINPIPE (SEE DETAIL SHEET)	EA	–	4

CLARK COUNTY DEPARTMENT OF DEVELOPMENT SERVICES CIVIL ENGINEERING

Acceptance of plans for filing

By _____ 7/11/06

Acceptance of these plans for filing shall not be construed to be a permit for or an approval of any violation of any of the provisions of the state or county laws and / or specifications. Clark County shall be held free from damages which may result from the construction of the improvements from the engineering design depicted herein.

NOTE: power poles and / or other existing facilities not in proper location based on proposed improvements shown hereon will be relocated at no expense to Clark County.

Call before you UNDERGROUND
1-702-455-7511

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Avoid cutting underground utility lines. It's costly. Call before you Dig 1-800-227-2600 UNDERGROUND SERVICE (DIG)

Avoid overhead power line contact Call before you OVERHEAD 1-702-227-2929 NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

HTE#04-44165

CLV DWG # 307V977

95375

LEGAL DESCRIPTION

A PORTION OF THE SOUTHWEST QUATER (SW ¼) OF THE SOUTHEAST QUARTER (SE ¼) OF THE SOUTHWEST QUARTER (SW ¼) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B. & M.

BENCHMARK

CLARK COUNTY BENCHMARK NUMBER 44 BLV90 18SWS – CLARK COUNTY GIS CONTROL POINT #806, ±74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD. ELEV=868.435 METERS (2849.19 FEET)

BASIS OF BEARING

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DATE	BY	REVISIONS	APP'D

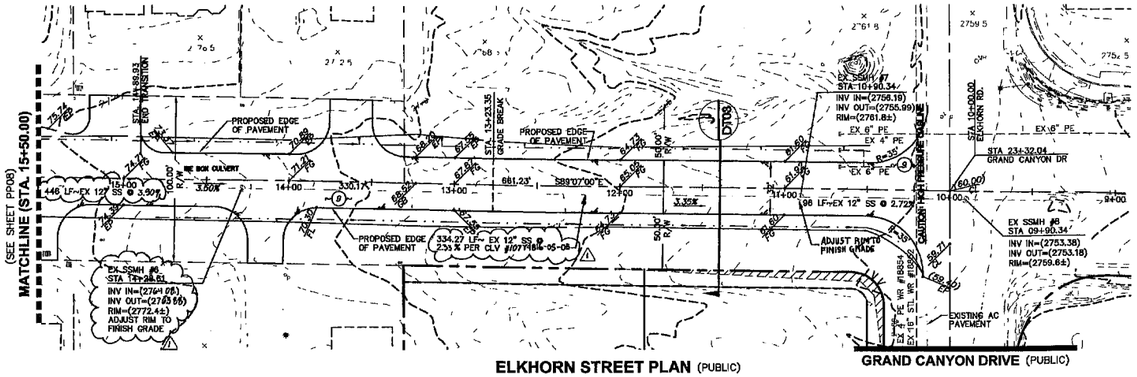
PREPARED FOR :
COLEMAN–TOLL

DATE JUNE 2006
DESIGN UPH
DRAWN UPH
CHECK LHP
SCALE 1" = 40'

BAUGHMAN & TURNER, INC.
CIVIL ENGINEERS LAND PLANNERS LAND SURVEYORS
1210 HINSON STREET LAS VEGAS, NEVADA 89102
(702) 870-6771

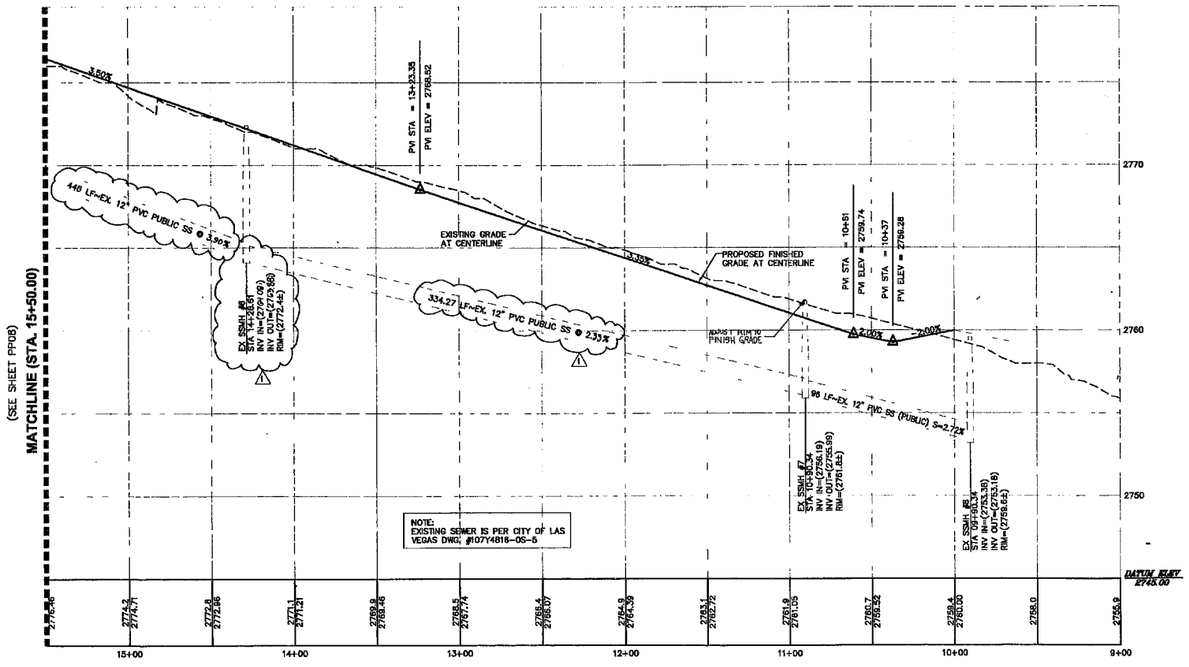
QUENCIA
PLAN & PROFILE–ELKHORN ROAD
SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B.& M.
CLARK COUNTY NEVADA
ELKHORN ROAD & JENSEN STREET

SHEET PP09 OF 16
PROJ. NO. QUENCIA–UNIT 1



ELKHORN STREET PLAN (PUBLIC)
HORIZONTAL SCALE: 1"=40'

GRAND CANYON DRIVE (PUBLIC)



ELKHORN ROAD PROFILE
HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'

98556
95375

LEGAL DESCRIPTION

A PORTION OF THE SOUTHWEST QUATER (SW ¼) OF THE SOUTHEAST QUARTER (SE ¼) OF THE SOUTHWEST QUARTER (SW ¼) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B. & M.

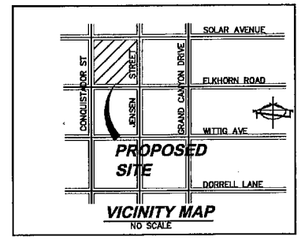
BENCHMARK

CLARK COUNTY BENCHMARK NUMBER 44 BLV90 18SWS – CLARK COUNTY GIS CONTROL POINT #806, 3.74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD. ELEV=868.435 METERS (2849.19 FEET)

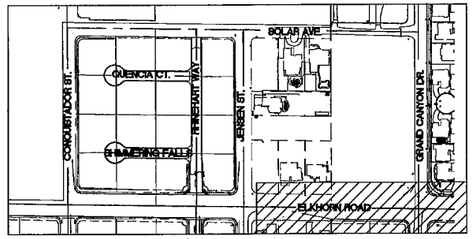
BASIS OF BEARING

N 00°00'21" W, BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M. AS SHOWN THAT CERTAIN MAP IN FILE 82, PAGE 20, OF PARCEL MAPS ON FILE IN THE COUNTY RECORDERS OFFICE, CLARK COUNTY, NEVADA.

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



VICINITY MAP
NO SCALE



KEY MAP
NO SCALE

LEGEND

- PROPERTY LINE
- STREET CENTERLINE
- LOT LINE
- BUILDING SETBACK LINE
- PROPOSED ROLL CURB
- EXISTING "L" CURB & GUTTER
- EXISTING CONTOUR LINES
- PROPOSED RETAINING WALL
- EXISTING SCREEN/RETAINING WALL
- PROPOSED FLOW LINE
- PROPOSED EDGE OF PAVEMENT
- EXIST. EDGE OF PAVEMENT
- 00.00 LOC — PROPOSED ELEVATION & LOCATION
- (00.00) LOC — EXISTING ELEVATION & LOCATION
- 0.00% — PROPOSED GRADE
- Ⓒ — CONSTRUCTION NOTE
- PROPOSED 250 W HPS LUMINAIRE
- PROPOSED HYDRANT

CL	CENTERLINE
TC	TOP OF CURB
EP	EDGE OF PAVEMENT
CR	CROWN LINE
FG	FINISHED GRADE
TF	TOP OF FOOTING
TRW	TOP OF RETAINING WALL
BSW	BACK OF SIDEWALK
GB	GRADE BREAK
BVC	BEGIN VERTICAL CURVE
EVC	END VERTICAL CURVE
FF	FINISHED FLOOR
HP	HIGHPOINT
AC	ASPHALTIC CONCRETE

CONSTRUCTION NOTES

#	ITEM	UNIT	QUANTITY PUBLIC	QUANTITY PRIVATE
1	INSTALL 24" "L" TYPE C & G PER USDCCA DWG. NO. 216	LF	557	–
2	INSTALL 30" ROLL CURB & GUTTER PER USDCCA #217A	LF	–	2102
3	INSTALL SIDEWALK PER USDCCA #234	SF	3459	–
4	INSTALL 8' CROSS GUTTER PER USDCCA #228	SF	708	1328
5	INSTALL CRASH GATE	EA	–	1
6	INSTALL HANDICAP RAMP PER USDCCA #235 CASE 1 USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT	EA	2	–
7	INSTALL 2" MIN. AC OVER 4" TYPE II A.B. OVER 6" TYPE I A.B.	SY	–	5350
8	INSTALL 3" MIN. AC OVER 4" TYPE II A.B. OVER 8" TYPE I A.B.	SY	7368	–
9	INSTALL 5" MIN AC OVER 9" MIN. TYPE II AGG. BASE	SY	3954	–
10	5' TRANSITION FR. 30" "ROLL" TYPE C&G TO 24" "L" TYPE C&G	EA	–	2
11	INSTALL SIDEWALK DRAIN PER USDCCA DWG. NO. 236	EA	–	2
12	INSTALL "A" TYPE ISLAND CURB PER USDCCA DWG. NO. 219	LF	–	103
13	INSTALL 9" MEDIUM DUTY DRAIN (CURN 2-507 OR EQUIVALENT) WITH 4" PVC DRAINPIPE (SEE DETAIL SHEET)	EA	–	4

CLARK COUNTY DEPARTMENT OF DEVELOPMENT SERVICES CIVIL ENGINEERING

Acceptance of plans for filing

By _____ 7/18/06

Acceptance of these plans for filing shall not be construed to be a permit for or an approval of any violation of any of the provisions of the state or county laws and / or specifications. Clark County shall be held free from damages which may result from the construction of the improvements from the engineering design depicted herein.

NOTE: power poles and / or other existing facilities not in proper location based on proposed improvements shown hereon will be relocated at no expense to Clark County.

ABOVE NOTICE UNDERGROUND TRAFFIC SIGNAL SYSTEM AND STREET LIGHT SYSTEM CONDUITS IT'S ONLY CALL BEFORE YOU DO UNDERGROUND
Call before you UNDERGROUND
1-702-455-7511
CLARK COUNTY DEPT. OF TRAFFIC ENGINEERING
1-702-229-6811
LAS VEGAS VALLEY WATER DISTRICT

DISCLAIMER NOTE

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

Avoid cutting underground utility lines. It's costly. Call before you Dig 1-800-227-2600 UNDERGROUND SERVICE (USA)

Avoid overhead power line contact Call before you OVERHEAD 1-702-227-2929 NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

HTE#04-44165

CLV DWG # 307V977

PROFESSIONAL ENGINEER STATE OF NEVADA No. 12362

REVISIONS	APP'D
PER CCDCS COMMENTS DATED 6/21/06	
ADDED INTERSECTION PROFILE AND EXISTING CONDITIONS	

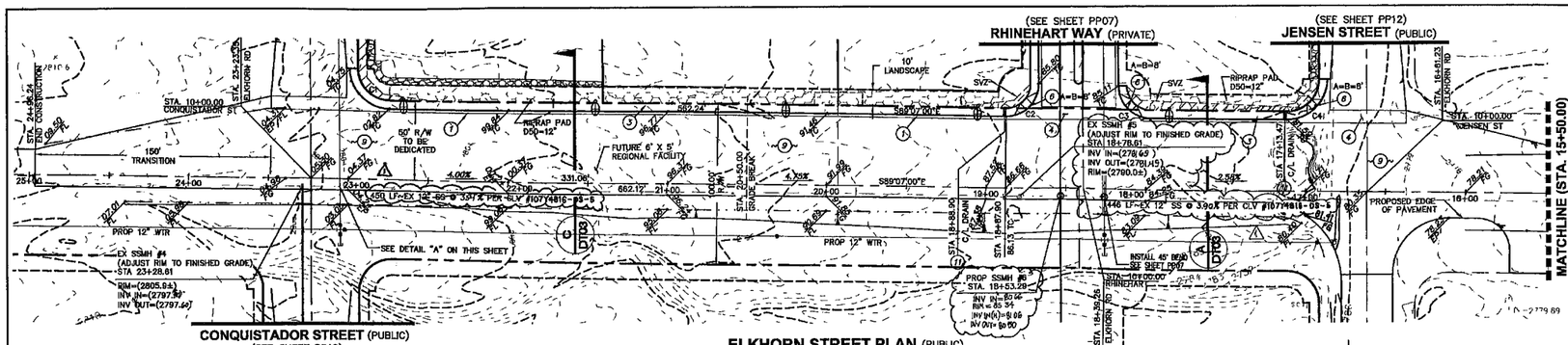
BAUGHMAN & TURNER, INC.
CIVIL ENGINEERS LAND PLANNERS LAND SURVEYORS
1210 HINSON STREET LAS VEGAS, NEVADA 89102
(702) 870-8771

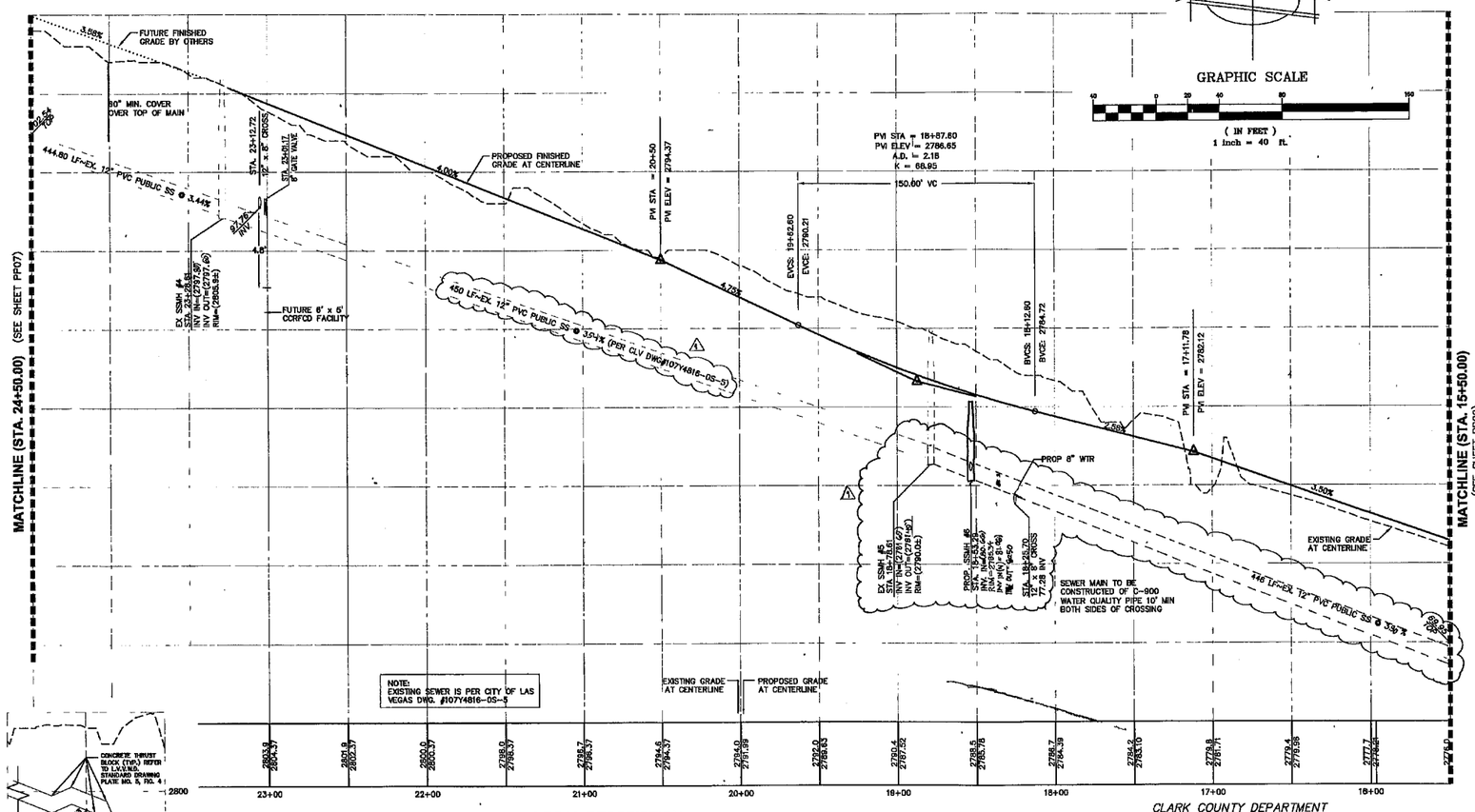
PREPARED FOR: COLEMAN–TOLL

DATE	JUNE 2006
DESIGN	UPI
DRAWN	UPI
CHECK	UP
SCALE	1" = 40'

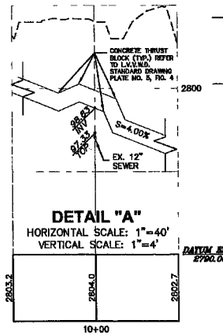
QUENCIA
PLAN & PROFILE–ELKHORN ROAD
SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B.& M.
CLARK COUNTY NEVADA
ELKHORN ROAD & JENSEN STREET

SHEET: PP09 OF 16
PROJ. NO. QUENCIA–UNIT 1





GRAPHIC SCALE
(IN FEET)
1 inch = 40 ft.



DETAIL "A"
HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'
DATUM ELEV 2790.00

98555
95374

LEGAL DESCRIPTION
A PORTION OF THE SOUTHWEST QUARTER (SW ¼) OF THE SOUTHEAST QUARTER (SE ¼) OF THE SOUTHWEST QUARTER (SW ¼) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B. & M.

BASIS OF BEARING
N 00°00'21" W, BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M. AS SHOWN THAT CERTAIN MAP IN FILE 82, PAGE 20, OF PARCEL MAPS ON FILE IN THE COUNTY RECORDERS OFFICE, CLARK COUNTY, NEVADA.

BENCHMARK
CLARK COUNTY BENCHMARK NUMBER 44 BLV90
1BSWS – CLARK COUNTY GIS CONTROL POINT #6085, ±74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD.
ELEV=808.430 METERS (2849.19 FEET)

ELKHORN ROAD PROFILE
HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'

BACK OF CURB CURVE TABLE				
CURVE	LENGTH	RADIUS	DELTA	TANGENT
C1	38.78	25.00	88°52'52"	24.59
C2	31.77	20.00	91°00'14"	20.35
C3	31.07	20.00	88°59'46"	19.65
C4	39.71	25.00	91°00'14"	25.44

CLARK COUNTY DEPARTMENT OF DEVELOPMENT SERVICES CIVIL ENGINEERING

Acceptance of plans for filing
By _____ 7/18/06

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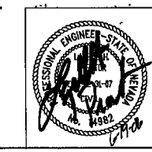
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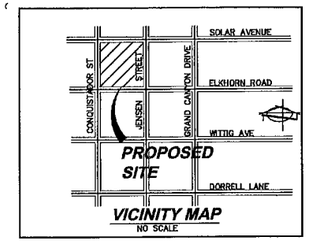
Avoid cutting underground utility lines. It's costly.
Call before you Dig
1-800-227-2600
NEVADA ONE CALL SERVICE

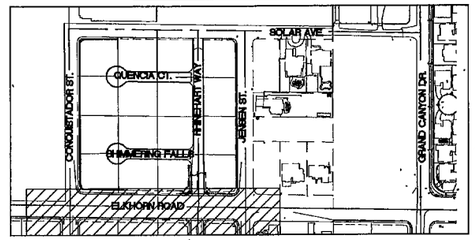
Avoid overhead power line contact
Call before you OVERHEAD
1-702-227-2929
NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

HTE#04-44165

CLV DWG # 30TV977







LEGEND

PROPERTY LINE	00.00 LOC — PROPOSED ELEVATION & LOCATION
STREET CENTERLINE	(00.00) LOC — EXISTING ELEVATION & LOCATION
LOT LINE	0.00% — PROPOSED GRADE
BUILDING SETBACK LINE	(#) — CONSTRUCTION NOTE
PROPOSED ROLL CURB	PROPOSED HYDRANT
EXISTING "L" CURB & GUTTER	CL CENTERLINE
EXISTING CONTOUR LINES	TC TOP OF CURB
PROPOSED RETAINING WALL	EP EDGE OF PAVEMENT
EXISTING SCREEN/RETAINING WALL	CR CROWN LINE
PROPOSED FLOW LINE	FG FINISHED GRADE
PROPOSED EDGE OF PAVEMENT	BSW BACK OF SIDEWALK
EXIST. EDGE OF PAVEMENT	GB GRADE BREAK
PARSON'S RETAINING WALL	BVC BEGIN VERTICAL CURVE
RIPRAP PAD	EVC END VERTICAL CURVE
	FF FINISHED FLOOR
	HP HIGHPOINT
	AC ASPHALTIC CONCRETE

CONSTRUCTION NOTES

#	ITEM	UNIT	QUANTITY PUBLIC	QUANTITY PRIVATE
(1)	INSTALL 24" "L" TYPE C & G PER USDCCA DWG. NO. 216	LF	557	–
(2)	INSTALL 30" ROLL CURB & GUTTER PER USDCCA #217A	LF	–	2102
(3)	INSTALL SIDEWALK PER USDCCA #234	SF	3459	–
(4)	INSTALL 8' CROSS GUTTER PER USDCCA #228	SF	708	1328
(5)	INSTALL CRASH GATE	EA	–	1
(6)	INSTALL HANDICAP RAMP PER USDCCA #235 CASE 1 USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT	EA	2	–
(7)	INSTALL 2" MIN. AC OVER 4" TYPE II A.B. OVER 6" TYPE I A.B.	SY	–	5350
(8)	INSTALL 3" MIN. AC OVER 4" TYPE II A.B. OVER 6" TYPE I A.B.	SY	7368	–
(9)	INSTALL 5" MIN AC OVER 9" MIN. TYPE II AGG. BASE	SY	3954	–
(10)	5' TRANSITION FR. 30" "ROLL" TYPE C&G TO 24" "L" TYPE C&G	EA	–	2
(11)	INSTALL SIDEWALK DRAIN PER USDCCA DWG. NO. 236	EA	–	2
(12)	INSTALL "A" TYPE ISLAND CURB PER USDCCA DWG. NO. 219	LF	–	103
(13)	INSTALL 9" MEDIUM DUTY DRAIN (ZURN Z-507 OR EQUIVALENT) WITH 4" PVC DRAINPIPE (SEE DETAIL SHEET)	EA	–	4

NO.	DATE	REVISIONS	APP'D
1	10/25/06	REVISED INVERT & GRADE PER 24" ELEVATION CONDITIONS	

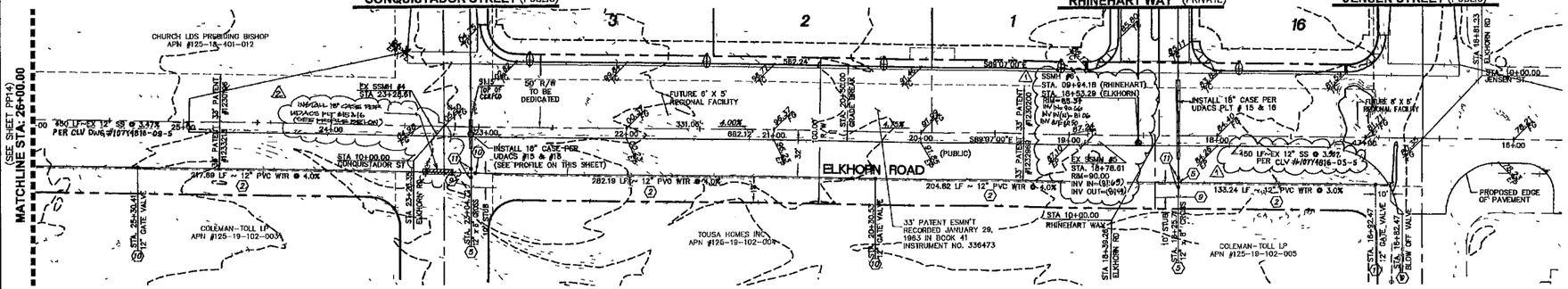
PREPARED FOR : COLEMAN-TOLL

DATE	JUNE 2006
DESIGN	UPI
DRAWN	UPI
CHECK	UPI
SCALE	1" = 40'

BAUGHMAN & TURNER, INC.
CIVIL ENGINEERS LAND PLANNERS LAND SURVEYORS
1210 HINSON STREET LAS VEGAS, NEVADA 89102
(702) 870-5771

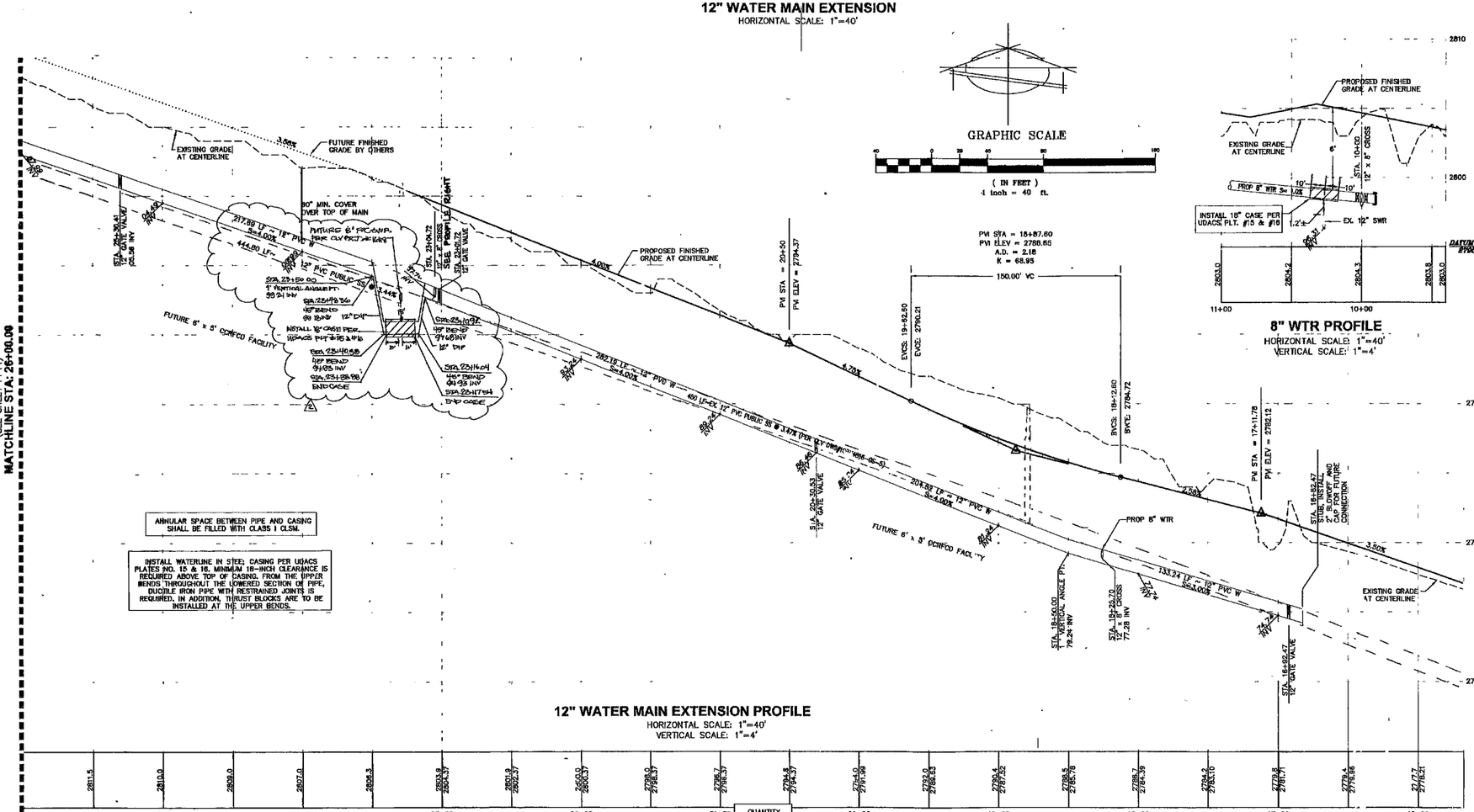
QUENCIA
PLAN & PROFILE-ELKHORN ROAD
SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B.& M. NEVADA
CLARK COUNTY
ELKHORN ROAD & JENSEN STREET

SHEET PP08 OF 16
PROJ. NO. QUENCIA-UNIT 1



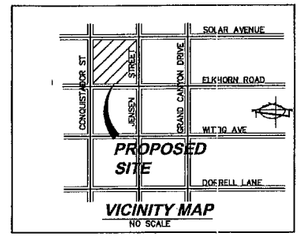
12" WATER MAIN EXTENSION
HORIZONTAL SCALE: 1"=40'

GRAPHIC SCALE
(IN FEET)
1 inch = 40 ft.

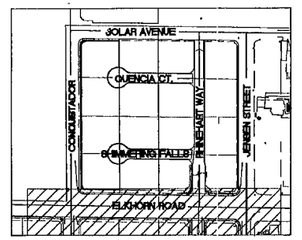


12" WATER MAIN EXTENSION PROFILE
HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'

8" WTR PROFILE
HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



VICINITY MAP
NO SCALE



KEY MAP
NO SCALE

LEGEND

- PROPERTY LINE
- STREET CENTERLINE
- BUILDING SETBACK LINE
- PROPOSED ROLL CURB
- EXISTING "L" CURB & GUTTER
- PROPOSED EDGE OF PAVEMENT
- EXIST. EDGE OF PAVEMENT
- 00.00 LOC — PROPOSED ELEVATION & LOCATION
- (00.00) LOC — EXISTING ELEVATION & LOCATION
- (#) — WATER CONSTRUCTION NOTES
- 0.00% — PROPOSED GRADE
- PROPOSED HYDRANT
- PROP WTR — PROPOSED WATER LINE
- EX. WTR — EXISTING WATER LINE
- PROP SS — PROPOSED SEWER LINE
- EX SS — EXISTING SEWER LINE
- PROPOSED GATE VALVE
- (#) — WATER CONSTRUCTION NOTE

WATER CONSTRUCTION NOTES

	UNIT		QUANTITY PUBLIC	QUANTITY PRIVATE
(1)	INSTALL FIRE HYDRANT ASSEMBLY WITH GATE VALVE PER UDS PLATE NO. 7	EA	3	--
(2)	INSTALL 12" PVC (CLASS 150) WATER LINE	LF	2047	--
(3)	INSTALL 8" PVC (CLASS 150) WATER LINE	LF	--	--
(4)	INSTALL 6" PVC (CLASS 150) WATER LINE	LF	69	--
(5)	INSTALL 12" X 8" CROSS WITH THRUST BLOCK PER UDS PLT. #5	EA	2	--
(6)	INSTALL 8" X 8" TEE WITH THRUST BLOCK PER UDS PLT. #5	EA	2	--
(7)	INSTALL 8" X 6" TEE WITH THRUST BLOCK PER UDS PLT. #5	EA	2	--
(8)	INSTALL 12" 45° BEND WITH THRUST BLOCK	EA	1	--
(9)	INSTALL 2" BLOWOFF VALVE & CAP W/ THRUST BLK. PER UDACS PLT. NO. 4A	EA	7	--
(10)	INSTALL 12" GATE VALVE W/THRUST BLOCKS	EA	5	--
(11)	INSTALL 8" GATE VALVE W/THRUST BLOCKS	EA	7	--
(12)	INSTALL 1" WATER METER ASSB. WITH 1" WATER LATERAL PER UDS PLT. NO. 10	EA	16	--
(13)	INSTALL 1" WATER METER ASSB. WITH 1" RPPA PER UDS PLT. NO. 10 & 11A	EA	1	--
(14)	INSTALL 8" X 6" REDUCER	EA	2	--
(15)	INSTALL 12" x 12" TEE WITH THRUST BLOCK PER UDS PLT. #5	EA	2	--
(16)	INSTALL 8" 45° BEND WITH THRUST BLOCK	EA	--	--

LEGAL DESCRIPTION

A PORTION OF THE SOUTHWEST QUARTER (SW ¼) OF THE SOUTHEAST QUARTER (SE ¼) OF THE SOUTHWEST QUARTER (SW ¼) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B. & M.

BENCHMARK

CLARK COUNTY BENCHMARK NUMBER 44 ELVSD 18SWS — CLARK COUNTY GIS CONTROL POINT #606, ±74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD. ELEV=888.435 METERS (2849.19 FEET)

BASIS OF BEARING

N 00°00'21" W, BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M. AS SHOWN THAT CERTAIN MAP IN FILE 82, PAGE 20, OF PARCEL MAPS ON FILE IN THE COUNTY RECORDERS OFFICE, CLARK COUNTY, NEVADA.

Call before you UNDERGROUND
1-702-455-7511
1-702-229-5511

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Avoid overhead power lines contact — Call before you OVERHEAD — 1-702-257-2529 NEVADA POWER ENVIRONMENTAL AND SAFETY SERVICES DEPARTMENT

Avoid digging underground utility lines at risk. — Call before you Dig — 1-800-227-2600 UNDERGROUND SERVICE (USA)

HTE-04-44165

CLARK COUNTY DEPARTMENT OF DEVELOPMENT SERVICES CIVIL ENGINEERING

Acceptance of plans for filing

By _____ 7/13/06

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LAS VEGAS VALLEY WATER DISTRICT PROJECT #(11099 — DATE CW DWG # 307V974

PROFESSIONAL ENGINEER No. 14982 — 7-12-06

NO.	DATE	APP'D
1	11/9/06	ADDED DEPTH OF 12" WTR LINE TO PLAN & PROFILE & INVERTS & STORM DRAIN.	JD
2	12/5/06	ADDED 8" WTR LINE.	JD

REVISIONS

PREPARED FOR: COLEMAN-TOLL

DATE	JUNE 2006
DESIGN	UPH
DRAWN	UPH
CHECK	UPH
SCALE	1" = 40'

BAUGHMAN & TURNER, INC.
CIVIL ENGINEERS — LAND SURVEYORS — LAND PLANNERS
1510 HINSON STREET — LAS VEGAS, NEVADA 89102
(TEL.) 870-0777

QUENCIA
PLAN & PROFILE - 12" WATER MAIN EXTENSION
SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B. & M.
CLARK COUNTY, NEVADA
ELKHORN ROAD & JENSEN STREET

SHEET PP13 OF 16
PROJ. NO QUENCA UN. 1

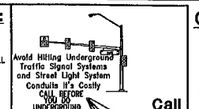
98557
95379

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NV Energy
Environment and Safety Services Department

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
1-800-227-2600
OR
CLARK COUNTY TRAFFIC OPERATIONS
1-702-455-7644



CONSTRUCTION NOTES

1. INSTALL 24" "L" TYPE C&G PER USDCCA DWG. NO. 216
2. INSTALL 30" ROLL C&G PER USDCCA #217A
3. INSTALL SIDEWALK PER USDCCA #234
4. INSTALL 8' CROSS GUTTER PER USDCCA #228
5. INSTALL WROUGHT IRON FENCE (PER DETAIL 30 SHEET D-2)
6. INSTALL HANDICAP RAMP PER USDCCA #235 CASE 1 USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT
7. INSTALL AC PAVEMENT PER DETAIL 5 & 6 ON SHEET D-1
8. INSTALL AC PAVEMENT PER DETAIL 2-4 ON SHEET D-1
9. INSTALL AC PAVEMENT PER DETAIL 1 ON SHEET D-1
10. 5' ROLL CURB TO L CURB TRANSITION PER DETAIL 32, SHEET D-2
11. INSTALL BLOCK WALL OPENING PER DETAIL 25 ON SHEET D-2
12. INSTALL "A" TYPE ISLAND CURB PER USDCCA DWG. NO. 219
13. INSTALL DEPRESSED CURB DETAIL PER DETAIL 28 SHEET D-2
14. INSTALL 3' VALLEY GUTTER PER DETAIL 24 ON SHEET D-2
15. SAWCUT AND REPLACE AC PAVEMENT RESTORATION AND TRENCH BACKFILL PER USDCCA #500.3, #500.5 & #503
16. CONSTRUCT 6' HIGH WROUGHT IRON LOCKING GATE
17. INSTALL HALF STREET CROSS GUTTER PER USDCCA #229
18. CONSTRUCT RIPRAP SWALE PER DETAIL 30 SHEET D-2, d50=6", THICKNESS=12"
19. INSTALL 1' WIDE BY 3' DEEP CONCRETE SLURRY CUT OFF WALL (150 PSI MIN)
20. PROVIDE POSITIVE DRAINAGE FOR ROCKERY WALL DRAIN SYSTEM

SEWER CONSTRUCTION NOTES

21. INSTALL 48" STANDARD MANHOLE (PER DCSWCS STD. No. SD-1A, SD-4, SD-5 & SD-6)
22. INSTALL 4" SEWER LATERAL (PER DCSWCS STD No. SD-17, SD-22 & SD-25) AND 1 CU-FJ THRUST BLOCK @ CAP
23. TYPICAL LOCATION FOR SEWER LATERAL AT WATER MAIN CROSSING. ALL SEWER LATERALS MUST MAINTAIN 18" VERTICAL CLEARANCE BELOW WATER MAIN AT CROSSINGS.

CASE 1 SIDEWALK RAMP PER CC STD DWG 235

CURVE TABLE						
CURVE	DELTA	RADIUS	LENGTH	TANGENT	"A"	"B"
C3	89°8'11"	25.00'	38.89'	24.63'	8.0'	8.0'
C4	90°51'49"	25.00'	39.65'	25.39'	4.5'	9.5'
C5	89°8'11"	30.00'	46.67'	29.55'	8.0'	8.0'

BENCHMARK

CLARK COUNTY BENCHMARK NUMBER 44 BLV90 18SWS - CLARK COUNTY GIS CONTROL POINT #806, ±74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD.

ELEV=868.435 METERS (2849.19 FEET) NAVD 88

BASIS OF BEARINGS

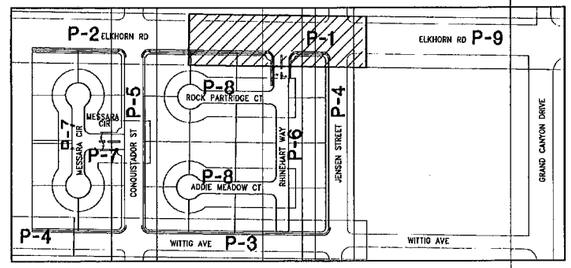
N 00°00'21" W, BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., AS SHOWN THAT CERTAIN MAP IN FILE 82, PAGE 20, OF PARCEL MAPS ON FILE IN THE COUNTY RECORDERS OFFICE, CLARK COUNTY, NEVADA.

WATER MAIN JOINT DEFLECTION (PVC 4"-24")

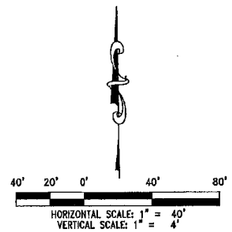
PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UDACS 2.07.01 AND 2.07.02

FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.

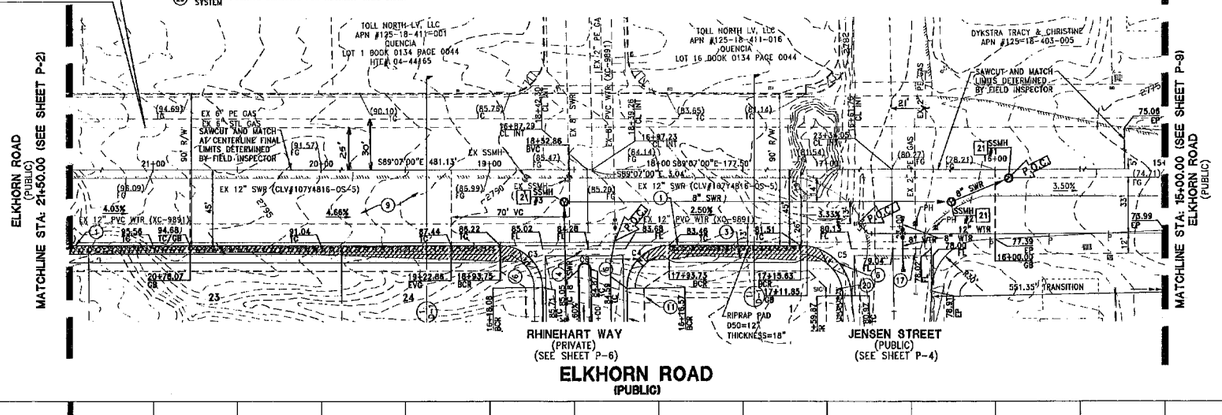
NOTE:
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING PER UDACS PLATE NO. 15

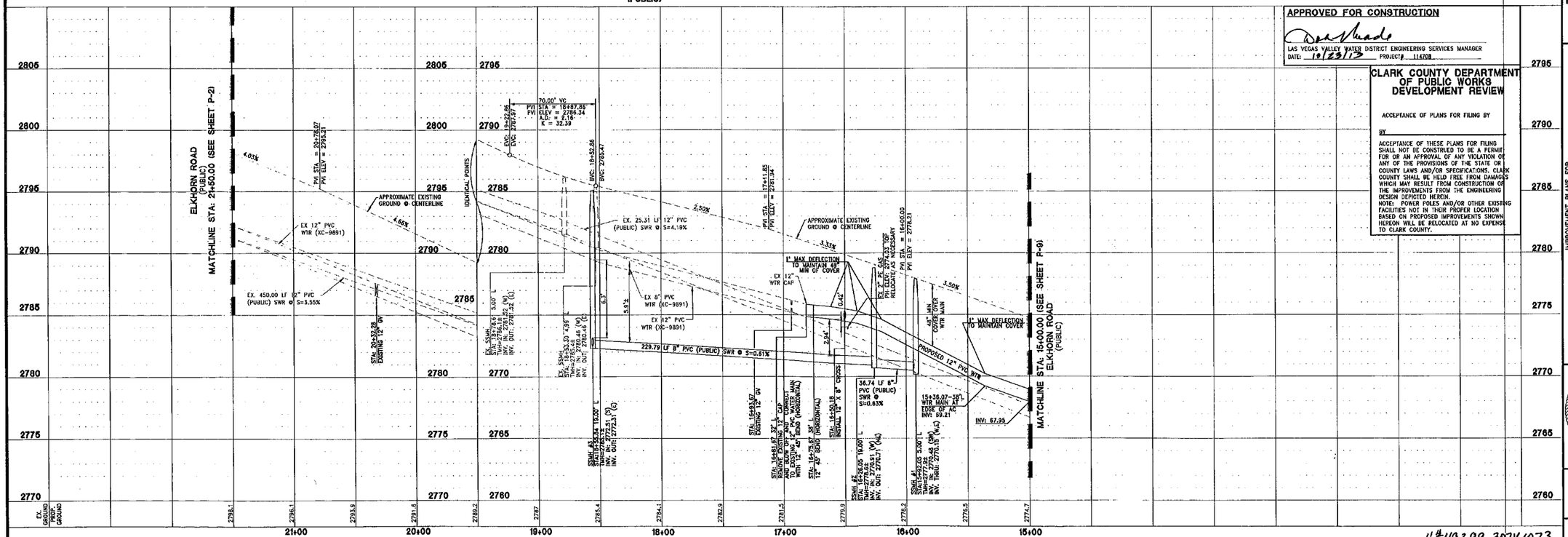


KEYMAP



CAUTION HIGH PRESSURE GAS!
CALL SOUTHWEST GAS AT 362-2200 FOR STANDBY WHEN EXCAVATING OVER OR NEAR HIGH PRESSURE GAS LINES





APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: 10/23/13 PROJECT # 114708

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS DEVELOPMENT REVIEW

ACCEPTANCE OF PLANS FOR FILING BY

BY

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REV	DESCRIPTION	BY	APP'D	DATE

DATE: October 26, 2013
HORIZ. SCALE: 1"=40'
VERT. SCALE: 1"=4'
DRAWN BY: GR/SC
DESIGNED BY: AW
CHECKED BY: JHL
APPROVED BY: JHL
PROJECT #: 3110.0007

TOLL NORTH L.V, LLC
1140 TOWN CENTER DRIVE SUITE 250
LAS VEGAS, NV 89144
PHONE: 702-243-8900 FAX: 702-243-8910

RCI Engineering
3283 S. HIGHLAND DRIVE SUITE 810, Las Vegas, NV 89109
PHONE: 853.0800 FAX: 853.0801

IMPROVEMENT PLANS FOR
SAVONA UNIT 2
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
PLAN AND PROFILE - ELKHORN ROAD STA: 15+00.00 - 21+50.00
NEVADA

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN L. LAND
Exp. 12/31/2013
CIVIL
No. 16441
10/21/2013

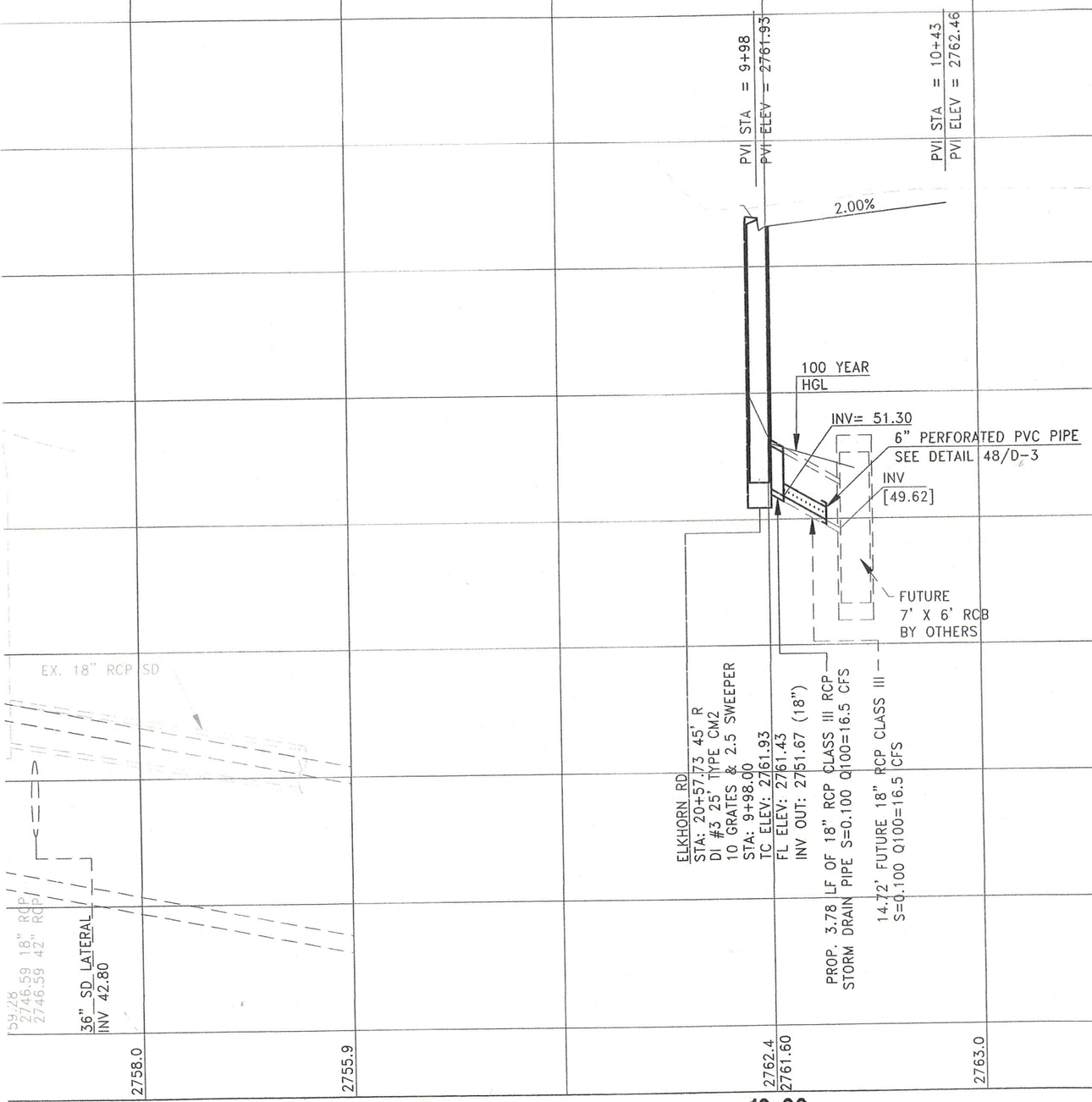
DRAWING
P-1
SHT 11 OF 21
HTE#
13-18613

H#49389 307V1073

O:\3110_Toll\0007_Savona_CIVIL\PS\Unit 2\S007_P-1.dwg Jland 10/26/13 10:02pm

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT# XXXXXX

Savona Unit 3
4.8%
Inv 42.04

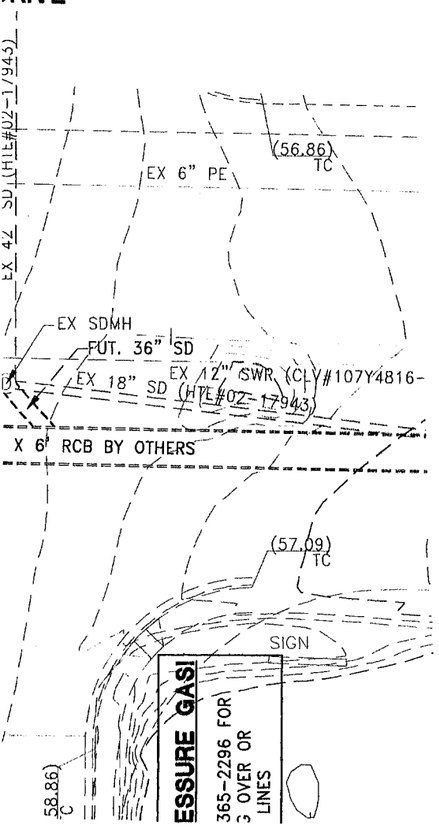


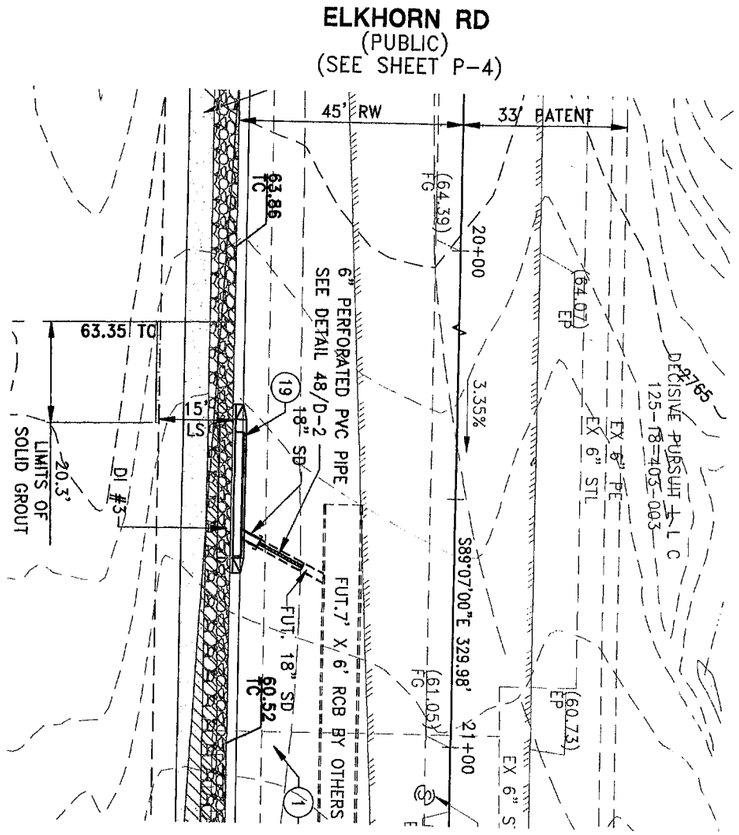
This grading plan is a part of drainage study #4626 which was received on 10/2/13 and App'd on 10/16/13. Page 12 of 15.

IMPROVEMENT PLANS FOR
SAVONA UNIT 3
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
PLAN AND PROFILE
ELKHORN ROAD AND DI #3
NEVADA
CLARK COUNTY

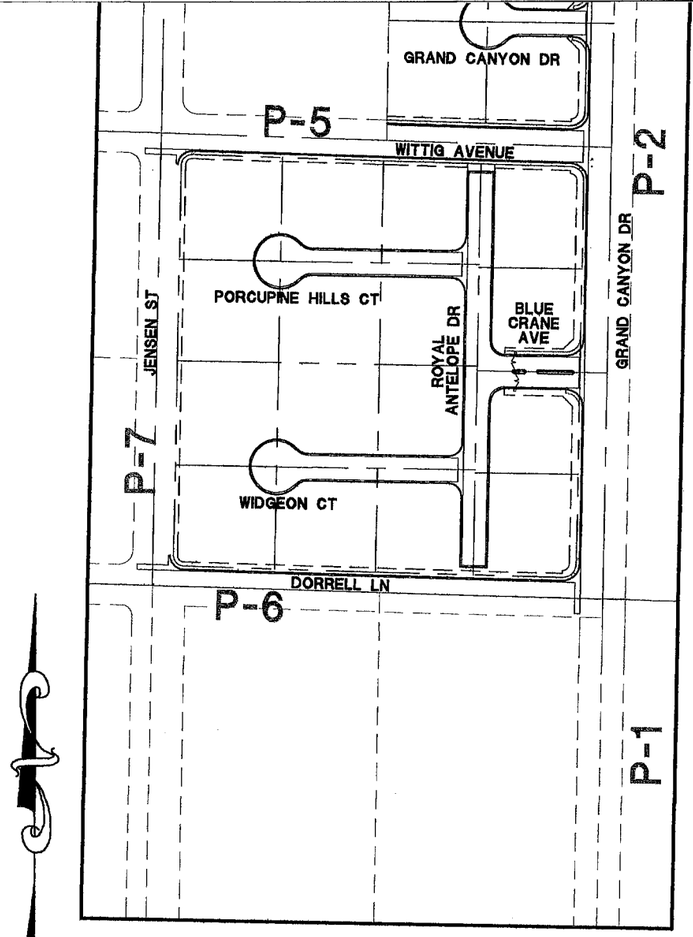
PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN I. LAND
Exp. 12/31/2013
CIVIL
No. 16441
10/2/2013

DRAWING
P-4
SHT 15 OF 18
HTE#





DROP INLET #3
(PUBLIC)



REV	DESCRIPTION

DATE: September 04, 2013
HORIZ. SCALE: 1"=30'
VERT. SCALE: 1"=5'
DRAWN BY: CR
DESIGNED BY: SC
CHECKED BY: JIL
APPROVED BY: JIL
PROJECT #: 3110.0007

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT# XXXXXX

2775

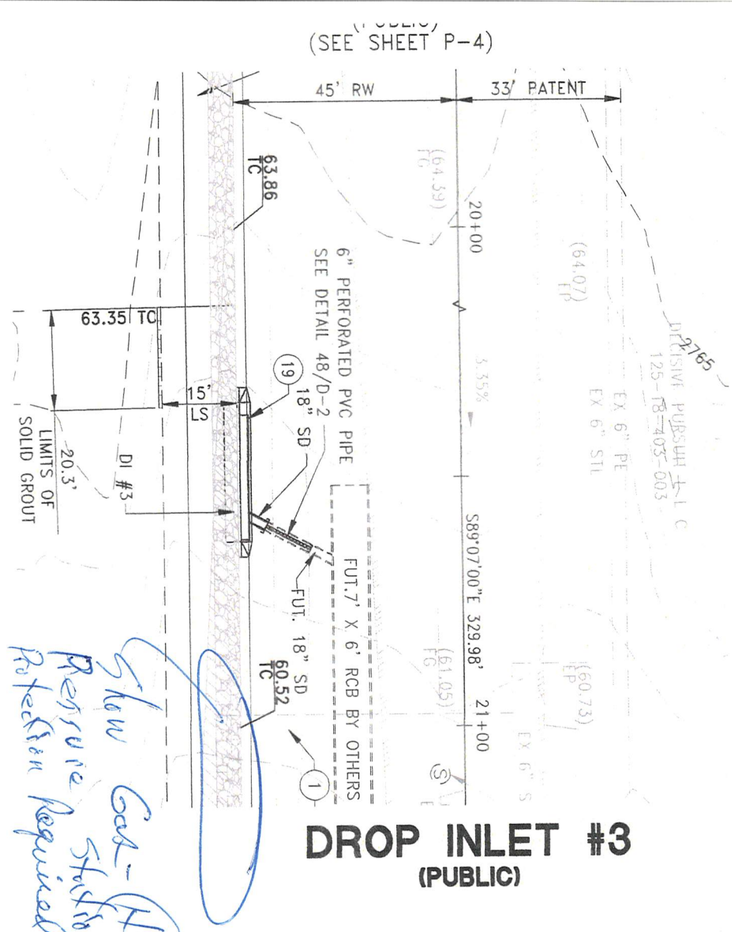
2770

TOLL NORTH LV, LLC
1140 TOWN CENTER DRIVE SUITE 250
LAS VEGAS, NV 89144
PHONE: 702-243-9800 FAX: 702-243-9610

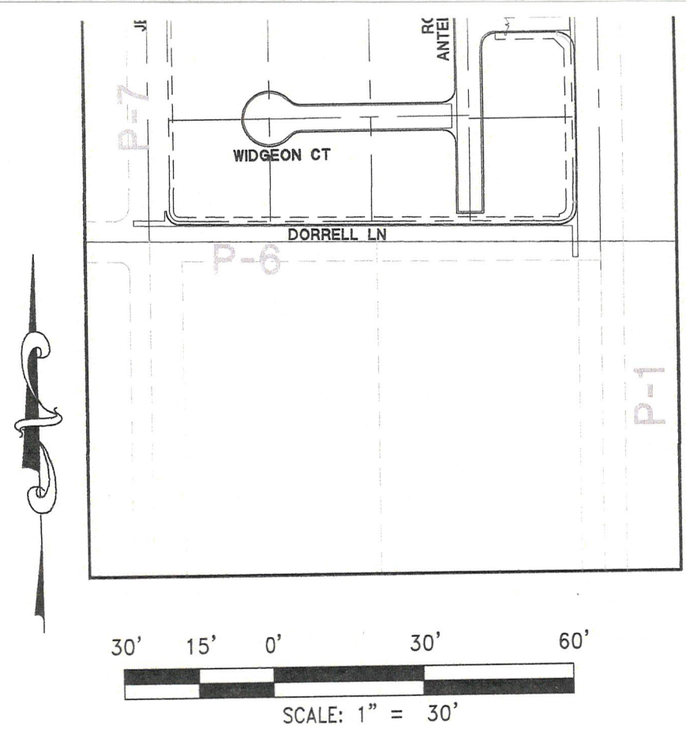
RCI Engineering
3281 S. HIGHLAND DRIVE SUITE 810, Las Vegas, NV 89109
PH#702.453.0800 FAX#702.453.0801

VISION

NEVADA

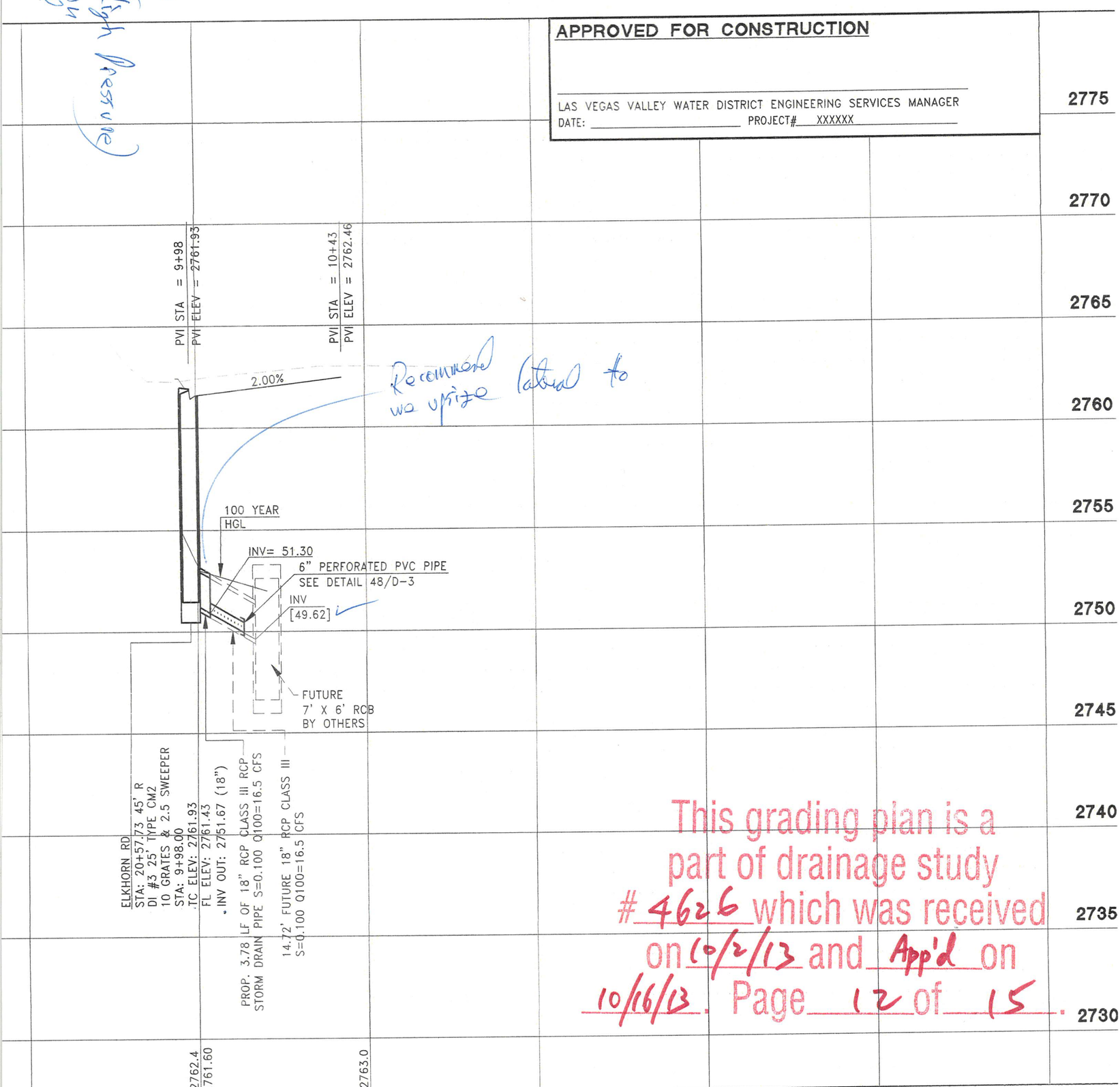


DROP INLET #3
(PUBLIC)

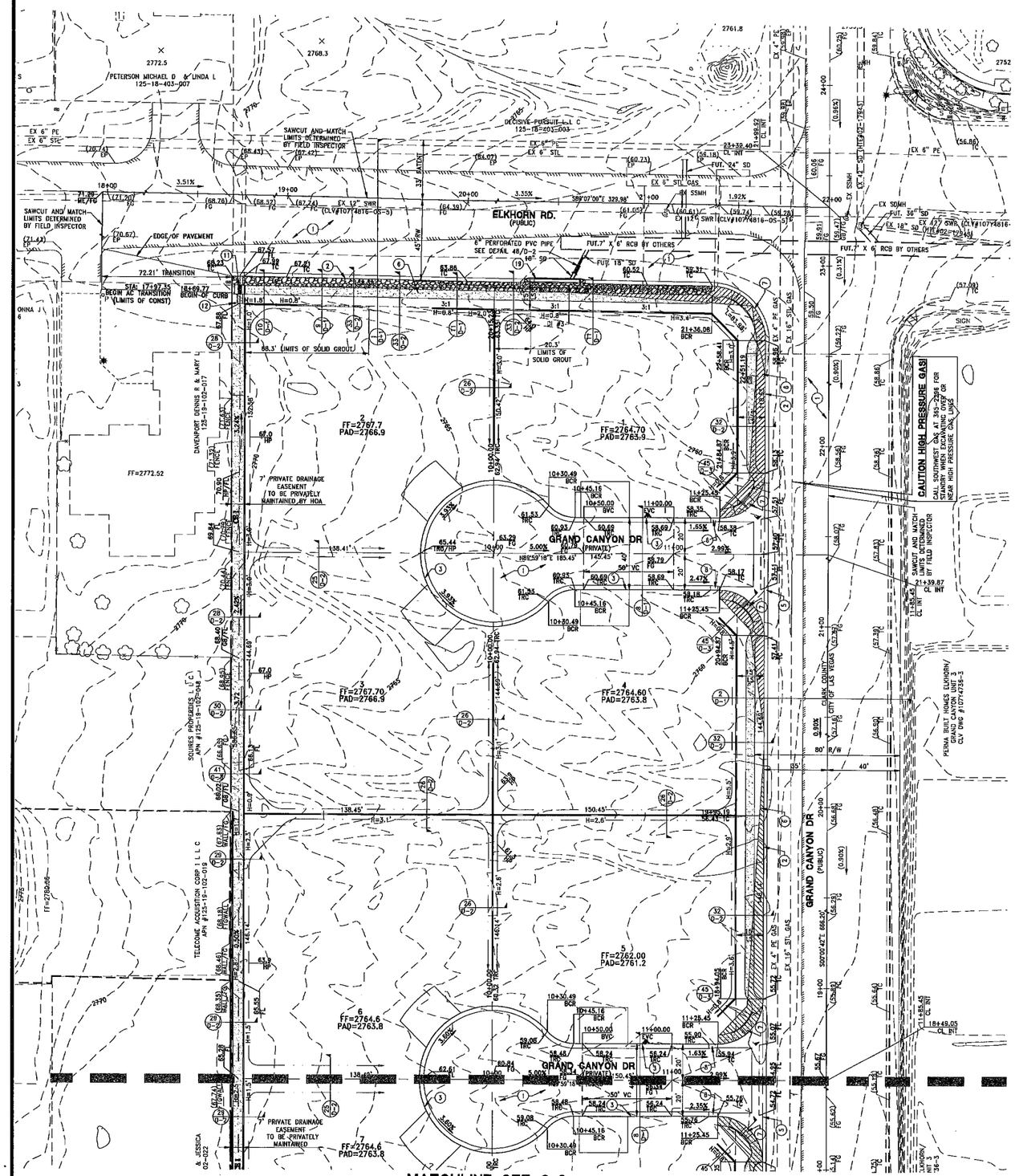


APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT# XXXXXX



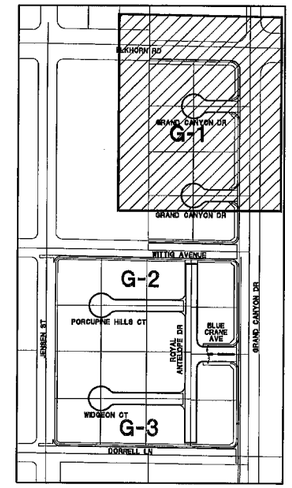
This grading plan is a part of drainage study #4626 which was received on 10/2/13 and App'd on 10/16/13. Page 12 of 15.



ENGINEERS NOTES

1. CONTRACTOR IS RESPONSIBLE FOR DUST AND EROSION CONTROL DURING CONSTRUCTION.
2. SEE DETAIL SHEET FOR ON-SITE PAVEMENT SECTIONS. CONTRACTOR TO VERIFY WITH SOILS REPORT.
3. IF THERE IS A LOT DIMENSION DISCREPANCY BETWEEN THIS PLAN SET AND THE FINAL MAP, THE FINAL MAP DIMENSION SHOULD BE REFERENCED
4. ENGINEER TO BE NOTIFIED OF ANY DISCREPANCIES IMMEDIATELY.
5. THESE PLANS SHALL NOT, IN PART OR IN WHOLE, BE USED FOR CONSTRUCTION UNTIL APPROVED AND SIGNED BY THE GOVERNING AGENCIES.
6. ALL GRADING SHALL CONFORM TO SOILS REPORT RECOMMENDATIONS.
7. DURING CONSTRUCTION, SURVEYORS AND CONTRACTORS MUST VERIFY THAT ALL STREETS AND LOTS HAVE POSITIVE DRAINAGE. SAME MUST UTILIZE AT LEAST THREE GRADES ON VERTICAL TANGENTS TO VERIFY SLOPES.
8. SOIL REPORT NOTE:
   GRADING SHALL BE IN ACCORDANCE WITH SOILS REPORT PREPARED BY:
   ENGINEER: GEOTEK RESIDENTIAL, LLC
   FILE NO. 7696-LVRE
   DATED: MAY 15, 2007
   UPDATED: NOVEMBER 12, 2012
9. CUT/FILL ESTIMATES
   EXISTING TO FINISH GRADE ELEVATIONS
   NET CUT: 32,870 CY
   NET FILL: 22,452 CY
10. SEE DETAIL 43/D-3 FOR TYPICAL LOT DRAINAGE
11. ALL DRIVEWAY SLOPES NOT TO EXCEED 12.5% MAXIMUM.
12. THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHER STRUCTURES, SEPERATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE. (APPENDIX SECTION J103.1 AS AMENDED)
13. FOR STORMWATER RUNOFF MANAGEMENT NOTES REFER TO SHEET N-1

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



CONSTRUCTION NOTES

1. CONSTRUCT AC PAVEMENT PER DETAILS 1 THRU DETAIL 8 ON SHEET D-1
2. CONSTRUCT 24" "L" TYPE CURB AND GUTTER PER CCAUSD # 216
3. CONSTRUCT 30" ROLL CURB PER CCAUSD # 217.51
4. CONSTRUCT "A" CURB PER CCAUSD # 215
5. CONSTRUCT 8' CROSS GUTTER PER CCAUSD # 228
6. CONSTRUCT 5' SIDEWALK PER CCAUSD # 234
7. CONSTRUCT SIDEWALK RAMPS USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT PER CCAUSD # 235 (CASE 1)
8. CONSTRUCT 5' CURB TRANSITION FROM "L" CURB TO ROLL CURB
9. CONSTRUCT 5' CURB TRANSITION FROM ROLL CURB TO DEPRESSED CURB
10. CONSTRUCT RIPRAP SWALE, d50=6", THICKNESS=12"
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13. CONSTRUCT 5' WIDE PEDESTRIAN ACCESS GATE
14. CONSTRUCT 12.5' TYPE 'CM2' DROP INLET (4 GRATES W/ 2.5' SWEEPER) PER CCAUSD #412.1 & 421
15. CONSTRUCT MIN 20' OF SIDEWALK PER CCAUSD #236 ON EITHER SIDE OF SW UNDERDRAIN
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BENCHMARK

CLARK COUNTY BENCHMARK NUMBER 44 BLV90 185WS – CLARK COUNTY GIS CONTROL POINT #806, ±74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD. ELEV=868.435 METERS (2849.19 FEET) NAVD 88

BASIS OF BEARINGS

N 00°00'21" W, BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., AS SHOWN THAT CERTAIN MAP IN FILE 82, PAGE 20, OF PARCEL MAPS ON FILE IN THE COUNTY RECORDERS OFFICE, CLARK COUNTY, NEVADA.

FLOOD ZONE DATA

THIS SITE IS LOCATED IN A ZONE "X". ZONE "X" HAS BEEN DETERMINED TO BE AN AREA OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD EVENT.
COMMUNITY PANEL NO. 3200631745E
EFFECTIVE DATE SEPTEMBER 27, 2002

SURVEY MONUMENT NOTE

OWNER RESPONSIBLE TO PROVIDE SURVEY MONUMENTATION AS REQUIRED BY CLARK COUNTY PUBLIC WORKS AND CLARK COUNTY UNIFORM STANDARD DRAWING NUMBER 243. OWNER IS ALSO RESPONSIBLE TO REPLACE ALL SURVEY MONUMENTATION DAMAGED, DESTROYED, OR OBSCURED DURING CONSTRUCTION.

BUILDING PERMIT NOTE

ALL STRUCTURES SHOWN OR INDICATED ON THIS SUBMITTAL WITHIN THE PROPERTY REQUIRE A BUILDING PERMIT APPLICATION AND SUBMITTAL THIS INCLUDES BUILDINGS, ABOVE GROUND TANKS, SIGNS, RETAINING WALLS, FENCES, TRASH ENCLOSURES, SHADE STRUCTURES, STAIRWAYS, RAMPS, LIGHT POLES, LIGHT BOLLARDS, ETC. THIS DOES NOT INCLUDE ANY FLOOD CONTROL STRUCTURE SUCH AS PIPES, CULVERTS, ARCH CULVERTS, HEADWALLS, ETC. THIS DOES NOT INCLUDE ANY WORK WITHIN A PUBLIC STREET RIGHT-OF-WAY. THIS DOES NOT INCLUDE PRIVATE STREETS. THE REVIEW OF CIVIL IMPROVEMENT AND/OR GRADING PLANS DOES NOT INCLUDE ANY REVIEW OF ANY STRUCTURE THAT REQUIRES A BUILDING PERMIT APPLICATION."

SIGHT VISIBILITY ZONE

NO STRUCTURE, VEGETATION, OR OBJECTS OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF THE ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS DEVELOPMENT REVIEW

ACCEPTANCE OF PLANS FOR FILING BY

BY _____

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Avoid overhead power line contact. It's costly.
Call before you Overhead
1-702-227-2929
Nevada Power
Environment and Safety Services Department

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
1-800-227-2600
CLARK COUNTY TRAFFIC OPERATIONS
1-702-455-7544

Avoid Hitting Underground Traffic Signal Systems and Street Light System Conduits. It's Costly
CALL BEFORE YOU DIG 811 UNDERGROUND
Call before you UnderGround
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-432-5300
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

I HEREBY CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY HITE # 13-22286UP ON FILE WITH CLARK COUNTY FOR THIS PROJECT.

JOHN LAND, PE NO. 16441 DATE

REV	DESCRIPTION	BY	APPD	DATE

DATE: September 04, 2013
HORIZ. SCALE: 1"=30'
VERT. SCALE: N/A
DRAWN BY: CR
DESIGNED BY: SC
CHECKED BY: JHL
APPROVED BY: JHL
PROJECT #: 3110.0007

TOLL NORTH LV, LLC
1140 TOWN CENTER DRIVE SUITE 250
LAS VEGAS, NV 89144
PHONE: 702-243-8800 FAX: 702-243-8810

RCI Engineering
8325 S. HIGHLAND DRIVE SUITE 103, Las Vegas, NV 89139
PH#702.453.0900 FAX#702.453.0905

IMPROVEMENT PLANS FOR
SAVONA UNIT 3
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
GRADING PLAN (SHEET 1 OF 3)
CLARK COUNTY NEVADA

PROFESSIONAL ENGINEER – STATE OF NEVADA
JOHN I. LAND
Exp. 12/31/2013
CIVIL
No. 16441

DRAWING
G-1
SHT 3 OF 18
HITE#

O:\3110_Toll\0007_Savona_CIVIL\PS\unit 3\0003_G-1.dwg scarobay 9/04/13 8:45am

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CALL BEFORE YOU DIG UNDERGROUND
Call before you UnderGround
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CLARK COUNTY TRAFFIC OPERATIONS
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LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

CONSTRUCTION NOTES

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13. CONSTRUCT 5' WIDE PEDESTRIAN ACCESS GATE
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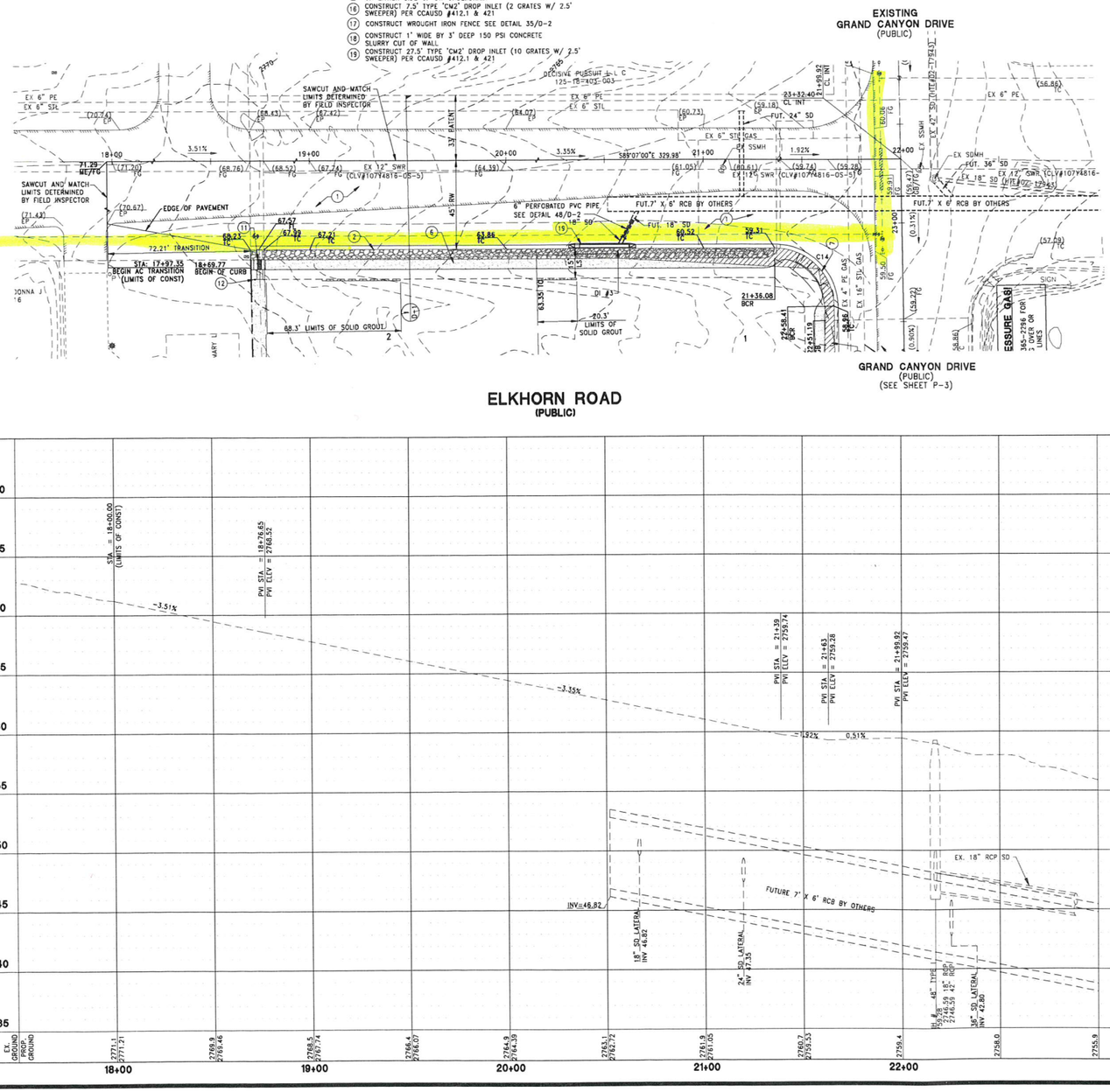
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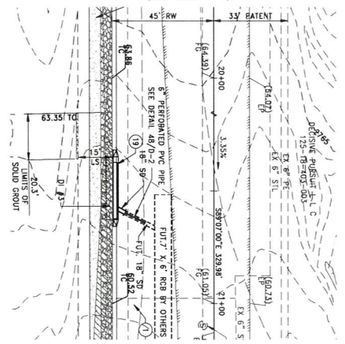
WATER MAIN JOINT DEFLECTION (PVC 4"-24")

PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UDACS 2.07.01 AND 2.07.02

FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.

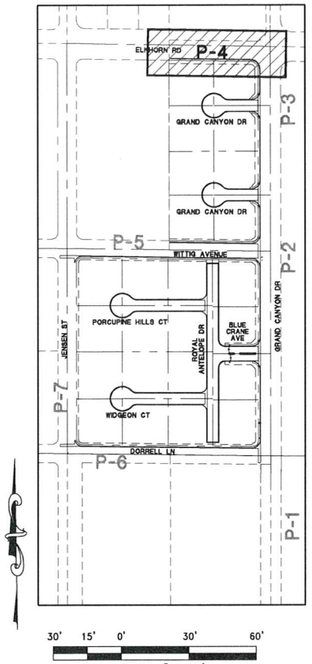
NOTE:
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING PER UDACS PLATE NO. 15





ELKHORN ROAD
(PUBLIC)

DROP INLET #3
(PUBLIC)



APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT# XXXXX

REV	DESCRIPTION	BY	APP'D	DATE

DATE: September 04, 2013
HORIZ. SCALE: 1"=30'
VERT. SCALE: 1"=5'
DRAWN BY: CR
DESIGNED BY: SC
CHECKED BY: JIL
APPROVED BY: JIL
PROJECT #: 3110.0007

TOLL NORTH LV, LLC
1140 TOWN CENTER DRIVE SUITE 250
LAS VEGAS, NV 89144
PHONE: 702-243-9800 FAX: 702-243-9810

RCI Engineering
3221 S. HIGHLAND DRIVE #210, Las Vegas, NV 89109
PHONE:702.243.9800 FAX:702.243.9808

IMPROVEMENT PLANS FOR
SAVONA UNIT 3
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
PLAN AND PROFILE
ELKHORN ROAD AND DI #3

CLARK COUNTY NEVADA

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN I. LAND
Exp. 12/31/2013
CIVIL
No. 16441

DRAWING
P-4
SHT 15 OF 18
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FINAL DESIGN REPORT FOR

RANCHO ROAD SYSTEM
ELKHORN (FORT APACHE TO GRAND CANYON)

OCTOBER 2013

PREPARED FOR:

CITY OF LAS VEGAS PUBLIC WORKS
333 NORTH RANCHO DRIVE
LAS VEGAS, NEVADA 89106

PREPARED BY:

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

5740 SOUTH ARVILLE STREET #216
LAS VEGAS, NEVADA 89118

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1.0 EXECUTIVE SUMMARY

The Rancho Road System – Elkhorn Storm Drain (ESD) is a proposed flood control conveyance facility located in the City of Las Vegas (CLV) along Elkhorn Road between Fort Apache Road and Grand Canyon Drive as depicted in **Figure 1**. The facility is identified as a portion of Clark County Regional Flood Control District (CCRFCD) regional facility RCHB 0295 and is proposed as 2,500 LF of 7-foot wide x 6-foot high RCB for conveyance of the 100-year storm event flow ranging between 631 CFS and 808 CFS. The ESD facility is designed to connect to a 7-foot wide x 6-foot high RCB lateral junction stubbed in Elkhorn Road at Fort Apache Road that is currently under design by others as part of the Rancho-Fort Apache Storm Drain project (regional facility RCHB 0250).

The project also includes design of appurtenant drop inlet and lateral storm drain facilities necessary to intercept the 100-year frequency design storm, pavement and striping replacement, and incidental utility relocations.

The ESD alignment is primarily proposed within the north half of the roadway because it is less encumbered by existing utilities than the south half. A shift in the alignment from north side to south side is proposed for the upstream most 600 feet to avoid conflicts with existing gas lines and appurtenances west of the Grand Canyon/Elkhorn intersection. Additionally, the ESD alignment is within the north half of the roadway because the storm flows are well divided between the north and south halves of Elkhorn Road, with the majority of flow contributing to and maintained on the north half of the street. Note that there is an existing 18-inch RCP storm drain system located within the south half of Elkhorn Road which is capable of intercepting and conveying storm flows contributing to the south half of the street.

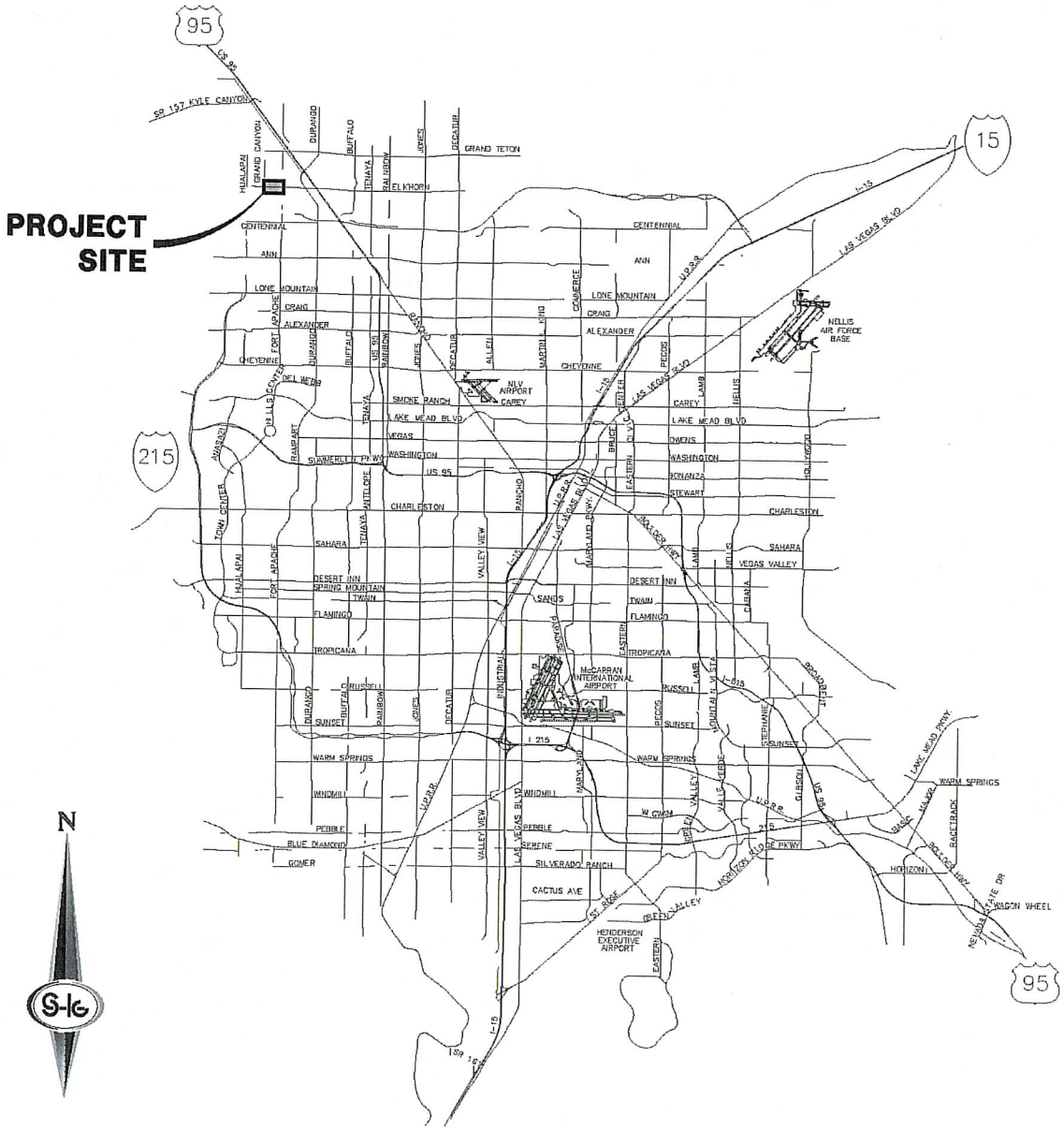
As a CCRFCD funded project, CCRFCD approval is required. Additionally, since proposed improvements extend approximately 150 feet west of the intersection of Grand Canyon Drive and Elkhorn Road centerline and into Clark County jurisdiction, Clark County approval will also be required for this project.

As the prime engineering consultant for the design of the ESD project, Slater Hanifan Group (SHG) is responsible for project management, preparation of design reports, and preparation of construction documents. Assisting SHG are sub-consultants in the fields of geotechnical engineering, surveying, subsurface utility engineering, and environmental assessment. GES is

conducting the geotechnical field exploration and interpretive report. Stanley Consultants is conducting the survey mapping, control and right-of-way mapping. Cardno TBE is conducting the subsurface utility designation and potholing. MBP is conducting the Environmental Screening Analysis.

Availability of construction funding has tentatively been identified for November/December 2013. Final design will be completed in coordination with the anticipated funding availability.

Figure 1. Vicinity Map



2.0 EXISTING CONDITIONS

2.1 Right-of-Way

The project corridor consists of a minimum of 100 feet of right-of-way centered on the project control line. Additional right-of-way is provided at the Fort Apache Road intersection for roadway flaring to provide dual left-turn and exclusive right-turn lanes as well as bus turn-outs along the corridor. A right-of-way exhibit depicting existing right-of-way and easements has been included in Section Five of the Appendix. Segments that do not have existing right-of-way are listed below. Right-of-way take is not anticipated to construct the proposed storm drain improvements, however, an Authorization to Enter Property (AEP) is required on the northwest corner of Elkhorn/Grand Canyon for grading improvements to tie into existing ground.

1) Elkhorn/Grand Canyon Intersection: There is an existing 33-foot patent easement on the northwest corner of the intersection (APN No. 125-18-403-003).
2) Elkhorn/Tee Pee Intersection: There is an existing 20-foot drainage easement on the northwest corner of the intersection (APN No. 125-18-897-012).

Centerline control for the project was established as part of the preliminary design efforts. A Record of Survey was prepared and submitted by Stanley Consultants, Inc. (File 187, Page 17 of Surveys). A copy of the Record of Survey is included in Section Four of the Appendix.

2.2 Utilities

Existing and planned utility information has been requested from utility companies. Information received has been incorporated into the plans and is shown on the 90% Design Plans. Existing major utilities include the following:

Las Vegas Valley Water District (LVVWD):

- 8-inch water main on the north side of Elkhorn Road from Grand Canyon Drive to Vail River Street.
- 12-inch water main on the north side of Elkhorn Road from Vail River Street connecting to a 12-inch main in Tee Pee Lane.
- 36-inch water main on the west side of Tee Pee Lane crossing Elkhorn Road.
- 10-inch/12-inch water main on the east side of Tee Pee Lane crossing Elkhorn Road.
- 12-inch water main on the south side of Elkhorn Road from Tee Pee Lane connecting to a 12-inch main in Fort Apache Road.
- 12-inch water main on the east side of Fort Apache Road.

- 8-inch fire hydrant lateral extending south from the 12-inch water main at Vail River Street.
- 8-inch water lateral extending south from the 12-inch water main at Prairie Crest Street to serve the Valley Crest Development on the south side of Elkhorn Road.
- 8-inch fire hydrant lateral extending south from the 12-inch water main on the south side of Elkhorn Road approximately 230 feet east of Tee Pee Lane.
- 8-inch water lateral extending south from the 12-inch water main at Blue Granite Street to serve the DR Horton Project currently under construction.
- 6-inch fire hydrant lateral extending north from the 12-inch water main on the south side of Elkhorn Road approximately 730 feet east of Tee Pee Lane.
- 8-inch water lateral extending north from the 12-inch water main at Fresh Rain Street to serve the Town Center Estates on the north side of Elkhorn Road from Tee Pee Lane to Fort Apache Road.

City of Las Vegas Sewer:

- 12-inch sanitary sewer main line 5 feet south of the Elkhorn Road centerline from west of Grand Canyon Drive continuing east beyond Fort Apache Road.
- 8-inch sanitary sewer laterals 5 feet east of the Tee Pee Lane centerline from the north and south connecting to the 12-inch sanitary sewer main line in Elkhorn Road.
- 8-inch sanitary sewer lateral along the west side of Fort Apache Road from the north connecting to the 12-inch sanitary sewer main line in Elkhorn Road.

Southwest Gas:

- Miscellaneous vaults, valves and manholes on the west side of the Grand Canyon Drive intersection.
- 6-inch PE gas line on the north side of Elkhorn Road from east of Grand Canyon Drive to Fort Apache Road.
- 4-inch PE gas line and 16-inch Steel High Pressure gas line on the west side of Grand Canyon Drive crossing Elkhorn Road.
- 2-inch PE gas line crossing Elkhorn Road at the Vail River Street/Prairie Crest Street intersection serving the Valley Crest Development.
- 6-inch PE gas line on the west side of Tee Pee Lane crossing Elkhorn Road.
- 2-inch PE gas line crossing Elkhorn Road approximately 680 feet east of Tee Pee Lane serving the DR Horton Project currently under construction.
- 2-inch PE gas line on the west side of Fresh Rain Street to serve the Town Center Estates on the north side of Elkhorn Road from Tee Pee Lane to Fort Apache Road.
- 6-inch PE gas line on the west side of Fort Apache Road continuing south.

Southern Nevada Water Authority (SNWA):

- No SNWA facilities exist within the limits of the project.

NV Energy (Transmission):

- No NV Energy Transmission facilities exist within the limits of the project.

NV Energy (Distribution):

- (2) 6-inch conduits with (6) 1000 MCM conductor on the north side of Elkhorn Road from west of Grand Canyon Drive to Tee Pee Lane. The facilities change to (3) 6-inch conduits and cross the east leg of the Tee Pee Lane intersection and continue to Fort Apache Road along the south side of Elkhorn Road and cross back to the north side of Elkhorn Road on the west leg of the Fort Apache intersection.
- (4) 6-inch conduits with (12) 1000 MCM conductor on the south side of Elkhorn Road from Grand Canyon Drive to Tee Pee Lane where they change to (6) 6-inch conduits and continue to Fort Apache Road. The facilities cross the west leg of the Fort Apache Road intersection and continue along the north side of Elkhorn Road to the east.
- 4-inch conduit with (3) 1/0 conductor crossing Elkhorn Road at Prairie Crest Street.
- 4-inch conduit with (3) 1/0 conductor on the north side of Elkhorn Road from Vail River Street to Tee Pee Lane continuing north on the east side of Tee Pee Lane.
- (2) 6-inch conduits with (6) 1000 MCM conductor crossing the north leg of the Tee Pee Lane/Elkhorn Road intersection then across the east leg to continue along the south side of Elkhorn Road to Fort Apache Road. The facilities cross the west leg of the Fort Apache intersection and continue along the north side of Elkhorn Road to the east.
- Underground conduit crossing the north leg of the Tee Pee Lane/Elkhorn Road intersection then continuing north and south along the east side of Tee Pee Lane.
- Underground conduit crossing Fresh Rain Street along the north side of Elkhorn Road continuing north on the west side of Fort Apache Road.

CenturyLink:

- Multiple 4-inch underground telephone conduits on the north side of Elkhorn Road from Grand Canyon Drive to Fort Apache Road.
- (2) 4-inch underground telephone conduits crossing Elkhorn Road at the Vail River Street intersection.
- Multiple 4-inch underground telephone conduits on the east side of Tee Pee Lane crossing Elkhorn Road.
- (4) 4-inch underground telephone conduits on the west side of Fort Apache Road crossing Elkhorn Road.

Cox Communications:

- Underground fiber optic cable on the south side of Elkhorn Road from Grand Canyon Drive to Vail River Street. Facilities then cross Elkhorn Road to the north side and continue to Tee Pee Lane where they cross the east leg of the intersection and continue east to Fort Apache Road on the south side of Elkhorn Road.

Storm Drain:

- 30-inch storm drain main line in the center of Grand Canyon Drive increases in size to 42-inch at the manhole immediately north of the intersection. Connects to the 18-inch storm drain main line in Elkhorn Road.
- 18-inch storm drain main line on the south side of Elkhorn Road from Grand Canyon Drive connecting to a 60-inch storm drain main line on the west side of Fort Apache Road.
- 60-inch storm drain main line on the west side of Fort Apache Road.
- 12-foot drop inlet with an 18-inch storm drain lateral on the northeast corner of Grand Canyon Drive and Elkhorn Road connected to the 30-inch storm drain main line in Grand Canyon Drive.
- 4-foot drop inlet with an 18-inch storm drain lateral approximately 125 feet west of Prairie Crest Street on the south side of Elkhorn Road connected to the 18-inch storm drain main line in Elkhorn Road.
- 4-foot drop inlet with an 18-inch storm drain lateral approximately 335 feet east of Vail River Street on the north side of Elkhorn Road connected to the 18-inch storm drain main line in Elkhorn Road.
- 4-foot drop inlet with an 18-inch storm drain lateral approximately 100 feet west of Tee Pee Lane on the north side of Elkhorn Road connected to the 18-inch storm drain main line in Elkhorn Road.
- 4-foot drop inlet with an 18-inch storm drain lateral approximately 75 feet west of Tee Pee Lane on the south side of Elkhorn Road connected to the 18-inch storm drain main line in Elkhorn Road.
- 2.5-foot drop inlet with an 18-inch storm drain lateral approximately 135 feet east of Tee Pee Lane on the south side of Elkhorn Road connected to the 18-inch storm drain main line in Elkhorn Road.
- 4-foot drop inlet with an 18-inch storm drain lateral approximately 250 feet east of Tee Pee Lane on the north side of Elkhorn Road connected to the 18-inch storm drain main line in Elkhorn Road.
- 4-foot drop inlet with an 18-inch storm drain lateral approximately 90 feet west of Fresh Rain Street on the north side of Elkhorn Road connected to the 18-inch storm drain main line in Elkhorn Road.

- 2.5-foot drop inlet with an 18-inch storm drain lateral approximately 80 feet west of Fresh Rain Street on the south side of Elkhorn Road connected to the 18-inch storm drain main line in Elkhorn Road.
- 4-foot drop inlet with an 18-inch storm drain lateral on the northwest corner of Fort Apache Road and Elkhorn Road connected to the 60-inch storm drain main line on the west side of Fort Apache Road.

Intelligent Transportation System:

- Developer installed interconnect conduit and pull boxes along the north side of Elkhorn Road from Grand Canyon Drive to Fort Apache Road.

2.3 Adjacent Development

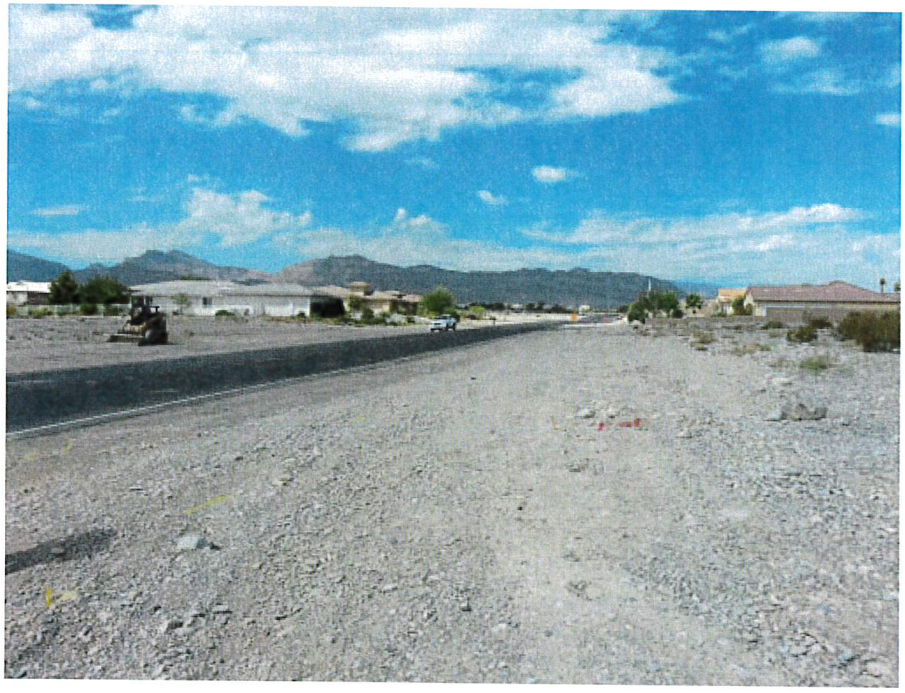
The majority of the abutting parcels are developed or are currently under construction between Grand Canyon Drive and Fort Apache Road with undeveloped parcels on the west side of Grand Canyon Drive. The developed parcels are all residential. A DR Horton residential development on the south side of Elkhorn Road from Tee Pee Lane to Fort Apache Road is currently under construction and is installing off-site improvements consisting of curb & gutter, pavement, and water and sewer laterals to serve the development. It is anticipated that the DR Horton off-site improvements will be complete prior to construction of this project.

A single family residential development know as Savona Unit 3 located at the southwest corner of Elkhorn Road and Grand Canyon Drive is currently under design. The Savona Unit 3 project is currently scheduled for rough grading prior to the end of 2013. Coordination between this ESD project and the Savona Unit 3 project has taken place in preparation of this Final Design Report. Most notably, the lateral storm drain facility located at the southwest corner of Elkhorn Road and Grand Canyon Drive proposed as part of this ESD project, has been coordinated with the horizontal and vertical alignment of the ultimate condition drop inlet proposed by the Savona Unit 3 project at the same location.

2.4 Photo Library

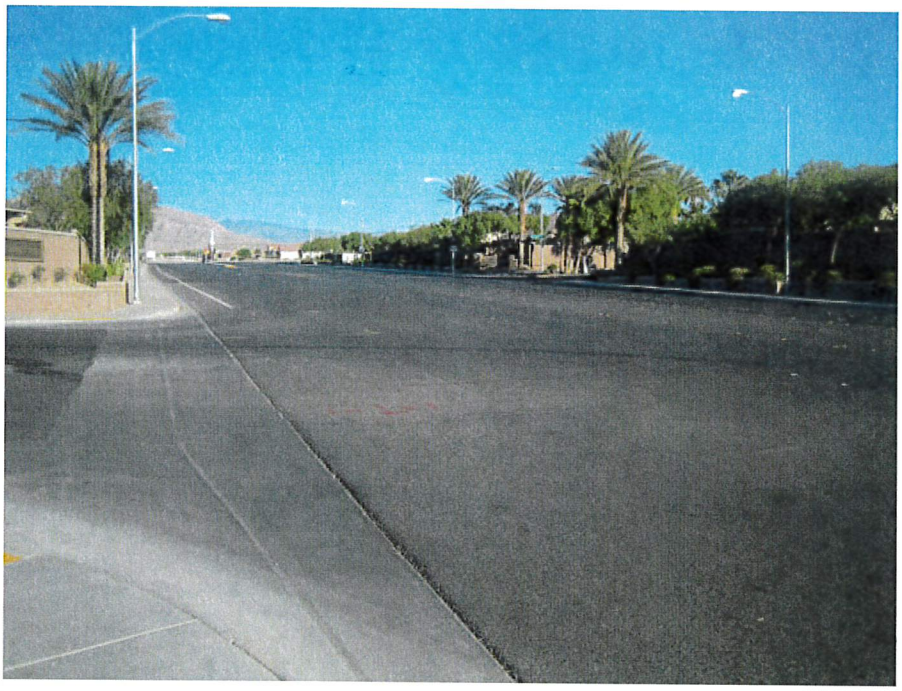


Grand Canyon Drive Intersection (looking east)



Grand Canyon Drive Intersection (looking west)

New Pavement



Prairie Crest Street Intersection (looking west)



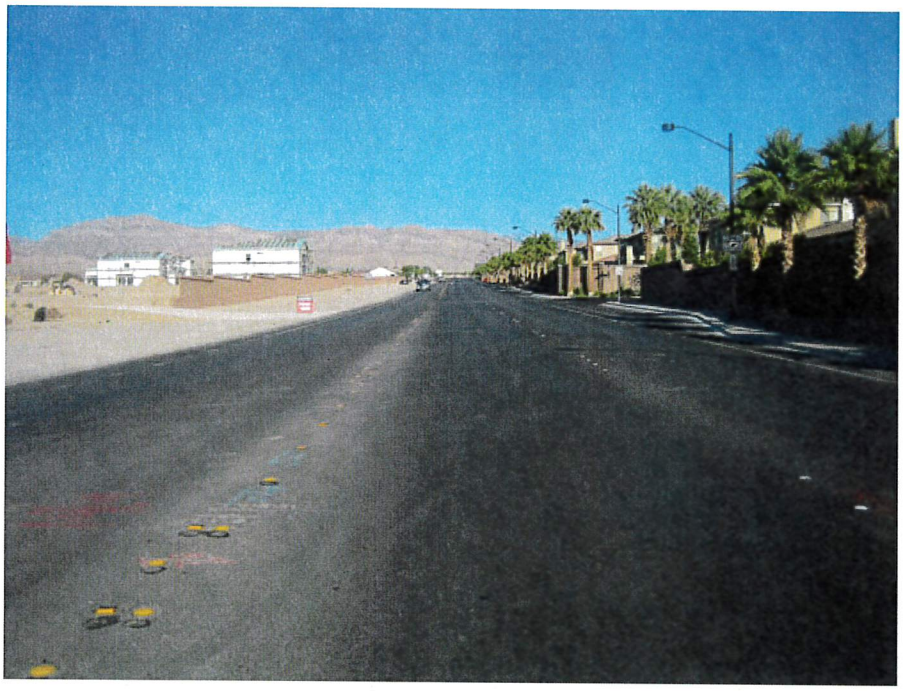
Tee Pee Lane Intersection (looking east)



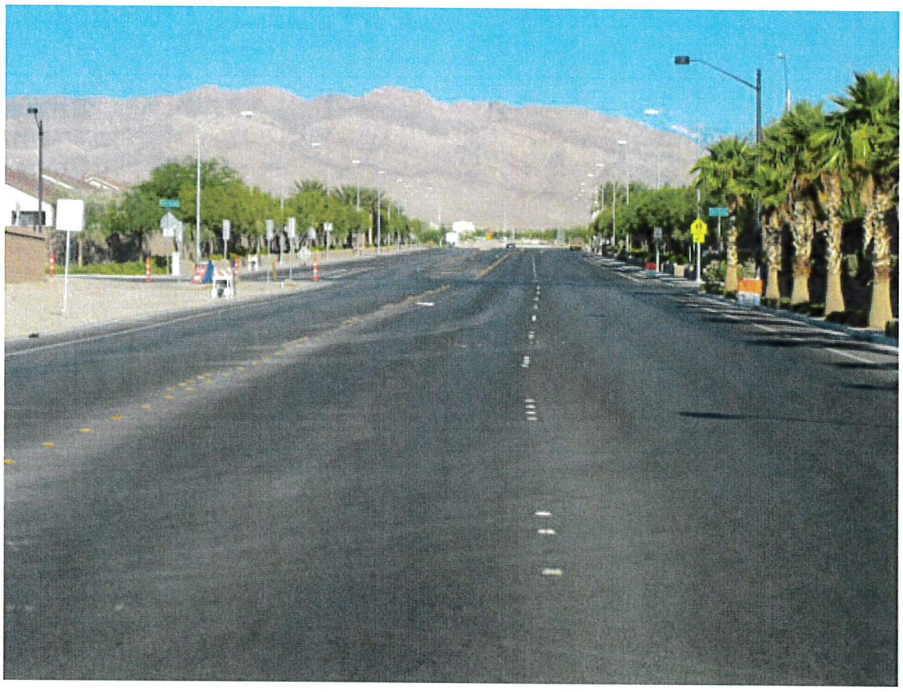
Tee Pee Lane Intersection (looking west)



Drainage Easement at Tee Pee Lane Northwest Corner



Fort Apache Road Intersection (looking west)



Fresh Rain Street Intersection (looking west)



DR Horton development south side of Elkhorn (looking east)



Tee Pee Lane Intersection (looking southeast)

3.0 STORM DRAIN DESIGN

Recommended drainage improvements for the ESD have been addressed in detail by the Final Design Drainage Report, Rancho Road System – Elkhorn (Fort Apache to Grand Canyon), dated October 2013 and prepared by Slater Hanifan Group (SHG Drainage Study). A copy of the SHG Drainage Study is enclosed in Section One of the Appendix. The drainage study was designed in accordance with criteria outlined in the Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual (Manual). Noted exceptions to these criteria contained in the Manual are discussed in the SHG Drainage Study. The following subsections describe design criteria and considerations used in the final design, identify potential utility impacts, CLV/CCRFCD coordinated recommendations for drainage improvements and estimated construction cost. 90% plans are enclosed in Section Ten of the Appendix.

3.1 Design Criteria

The following design standards, manuals and procedures have been utilized for design:

1) Uniform Standard Drawings for Public Works' Construction – Off-site Improvements, Clark County Area, Nevada, Volumes I and II.
2) Uniform Standard Specifications for Public Works' Construction – Off-site Improvements, Clark County Area, Nevada.
3) Clark County Regional Flood Control District, Hydrologic Criteria and Drainage Design Manual.
4) Clark County Regional Flood Control District, Policies and Procedures.
5) Design and Construction Standards for Wastewater Collection Systems – Southern Nevada.
6) Local utility standards as required.

Drainage design criteria used to prepare the recommended drainage improvements are provided in **Table 1**.

Table 1: Drainage Design Criteria

Design Criteria	Proposed Value for Design
Design Storm	Storm drain was designed to intercept and convey the major (100-year frequency) storm event.
Manning's "n" Value	A Manning's "n" value of 0.013 was utilized for RCP storm drain and a value of 0.015 was utilized for RCB storm drain.
100-Yr Street Hydraulics	• Longitudinal Flow: Flow depth <2', vxd <8 • Thru Intersections: Flow depth <1', vxd <8
10-Yr Street Hydraulics	• >80' ROW: Longitudinal Flow depth <1', vxd <6, 12-ft dry lane (not including center turn lane); Thru Intersections Flow Depth <6" • <80' ROW, Longitudinal Flow depth <1', vxd <6
Storm Drain Velocity	Per CCRFCD Manual maximum velocity is to be limited to 25 fps; however due to facility slopes ranging between 2.00% and 3.41% the proposed velocities range between 15.1 and 30.8 fps. Velocities are mitigated by use of 6000 psi concrete in pre-cast RCB.
Hydraulic Grade Line	HGL limited to 1' below drop inlet grate and manhole rim elevations.

3.2 Utility Crossings

Existing utilities were reviewed for possible conflicts with the proposed storm drain improvements. The following summarizes the existing utility crossings with the proposed storm drain improvements:

RCB Mainline Storm Drain Crossings

- **"ER" 18+77** – Existing 6-inch Steel High Pressure gas lateral running north and south crossing the proposed RCB.
- **"ER" 19+36** – Existing 4-inch Steel High Pressure gas lateral running north and south crossing the proposed RCB.
- **"ER" 19+81** – Existing 4-inch PE gas main running north and south crossing the proposed RCB.
- **"ER" 19+81** – Existing 16-inch Steel High Pressure gas main running north and south crossing the proposed RCB.
- **"ER" 20+66** – Existing traffic signal and ITS conduits running north and south crossing the proposed RCB.
- **"ER" 20+70** – Existing street light conduit running north and south crossing the proposed RCB.

- **"ER" 23+72** – Existing (2) 2-inch cable television conduits running north and south crossing the proposed RCB.
- **"ER" 24+21** – Existing (2) 4-inch telephone conduits running north and south crossing the proposed RCB.
- **"ER" 24+76** – Existing 2-inch PE gas lateral running north and south crossing the proposed RCB.
- **"ER" 24+86** – Existing 8-inch fire hydrant water lateral running north and south crossing the proposed RCB.
- **"ER" 24+94** – Existing 4" electrical conduit running north and south crossing the proposed RCB.
- **"ER" 26+41** – Existing 8-inch water lateral running north and south crossing the proposed RCB.
- **"ER" 28+22** – Existing 18-inch storm drain lateral running north and south crossing the proposed RCB.
- **"ER" 32+39** – Existing 18-inch storm drain lateral running north and south crossing the proposed RCB.
- **"ER" 32+65** – Existing traffic signal conduits running north and south crossing the proposed RCB.
- **"ER" 32+68** – Existing street light conduit running north and south crossing the proposed RCB.
- **"ER" 32+90** – Existing 6-inch PE gas lateral running north and south crossing the proposed RCB.
- **"ER" 33+04** – Existing 36-inch water main running north and south in Tee Pee Lane crossing the proposed RCB.
- **"ER" 33+23** – Existing 8-inch sanitary sewer lateral running north and south in Tee Pee Lane crossing the proposed RCB.
- **"ER" 33+38** – Existing 10-inch water main running north and south in Tee Pee Lane crossing the proposed RCB.
- **"ER" 33+53** – Existing (2) 6-inch electrical conduit running north and south in Tee Pee Lane crossing the proposed RCB.
- **"ER" 33+55** – Existing cable television conduit running north and south in Tee Pee Lane crossing the proposed RCB.
- **"ER" 33+63** – Existing (2) encased electrical conduit running north and south in Tee Pee Lane crossing the proposed RCB.
- **"ER" 33+79** – Existing traffic signal conduits running north and south crossing the proposed RCB.
- **"ER" 33+82** – Existing street light conduit running north and south crossing the proposed RCB.
- **"ER" 35+88** – Existing 18-inch storm drain lateral running north and south crossing the proposed RCB.

- **"ER" 39+92** – Existing 2-inch PE gas lateral running north and south crossing the proposed RCB.
- **"ER" 40+50** – Existing 6-inch fire hydrant water lateral running north and south crossing the proposed RCB.
- **"ER" 41+88** – Existing 18-inch storm drain lateral running north and south crossing the proposed RCB.
- **"ER" 42+26** – Existing 4" electrical conduit running north and south crossing the proposed RCB.
- **"ER" 42+77** – Existing 8-inch water lateral running north and south crossing the proposed RCB.

Storm Drain Lateral Crossings

- **"ER" 19+17** – Existing 6-inch Steel High Pressure gas lateral running east and west crossing the proposed RCP lateral.
- **"ER" 19+17** – Existing 12-inch sanitary sewer main running east and west crossing the proposed RCP lateral.
- **"ER" 19+81** – Existing 4-inch PE gas main running north and south along the west side of Grand Canyon Drive crossing the proposed RCP lateral.
- **"ER" 19+81** – Existing 16-inch Steel High Pressure gas main running north and south along the west side of Grand Canyon Drive crossing the proposed RCP lateral.
- **"ER" 20+16** – Existing 8-inch water main running east and west along the north side of Elkhorn Road crossing the proposed RCP lateral.
- **"ER" 20+16** – Existing (2) 6-inch electrical conduit running east and west along the north side of Elkhorn Road crossing the proposed RCP lateral.
- **"ER" 20+16** – Existing 6-inch PE gas main running east and west along the north side of Elkhorn Road crossing the proposed RCP lateral.
- **"ER" 20+16** – Existing 12-inch water main running east and west along the north side of Elkhorn Road crossing the proposed RCP lateral.
- **"ER" 32+79** – Existing multiple electrical conduit running east and west along the north side of Elkhorn Road crossing the proposed RCP lateral.
- **"ER" 32+79** – Existing cable television conduit running east and west along the north side of Elkhorn Road crossing the proposed RCP lateral.
- **"ER" 32+79** – Existing telephone conduit running east and west along the north side of Elkhorn Road crossing the proposed RCP lateral.
- **"ER" 32+79** – Existing 12-inch water main running east and west along the north side of Elkhorn Road crossing the proposed RCP lateral.
- **"ER" 32+79** – Existing 6-inch PE gas main running east and west along the north side of Elkhorn Road crossing the proposed RCP lateral.

Drop Inlet Crossings

- **"ER" 18+59** – Existing (4) 6-inch encased electrical conduit running east and west along the south side of Elkhorn Road crossing the proposed drop inlet.
- **"ER" 19+18** – Existing 6-inch PE gas main running east and west along the north side of Elkhorn Road crossing the proposed drop inlet.
- **"ER" 32+70** – Existing 8-inch sanitary sewer lateral running along the drainage easement on the northwest corner of the Tee Pee intersection crossing the proposed drop inlet.

Above mentioned crossings have been coordinated with the respective utility company. Potholes have been obtained at locations deemed necessary based on as-built information and are included in Section Eleven of the Appendix. At this time, it is anticipated that the (4) 6-inch encased electrical conduits at "ER" 18+59 will require relocation due to conflict with the proposed drop inlet. A Utility Conflict Schedule has been developed and will be updated throughout the course of the Project. This schedule lists potential conflicts based on the current design, and is enclosed in Section Two of the Appendix.

3.3 Recommended Drainage Improvements

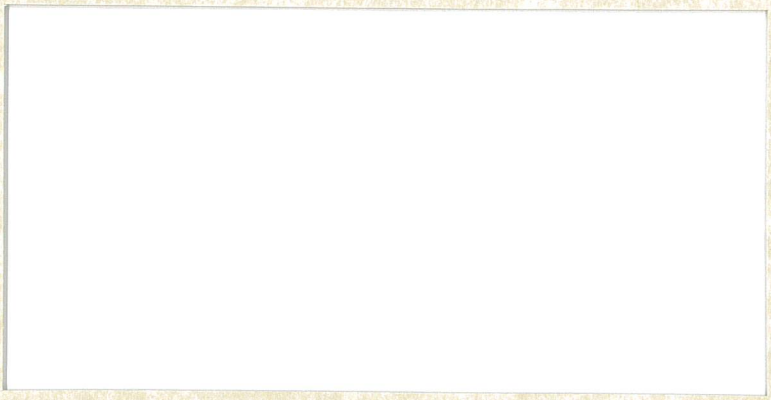
Recommended drainage improvements are depicted on the 90% plans that are enclosed in Section Ten of the Appendix. A summary of recommended drainage improvements is provided in **Table 2**.

Table 2: Summary of Recommended Drainage Improvements

Location	Description
"RCB" 39+00 to "RCB" 64+00	Construct 7' X 6' RCB main line connecting to a 7' x 6' RCB being installed by the RCHB0250 facility at the Elkhorn Road/Fort Apache Road intersection
"RCB" 39+07, 18.5' RT	Construct 18-inch storm drain lateral with Special 3' x 3' drop inlet with concrete apron
"RCB" 39+63, 48.5' LT	Construct 24-inch storm drain lateral with Special 3' x 14' drop inlet with concrete apron
"RCB" 40+19, 122' LT	Construct 29-inch by 45-inch storm drain lateral with Special 3' x 24' drop inlet with concrete apron. Lateral will connect to a new manhole in Grand Canyon Drive and continue to the new 7' X 6' RCB through a new 36-inch lateral
"RCB" 53+24, 83.5' LT	Construct 36-inch storm drain lateral with 17.5' Modified Type DM2 drop inlet. Reconstruct existing concrete drainage flume to match the new drop inlet. Lateral will continue along the west side of Tee Pee Lane to the new 7' X 6' RCB

3.4 Project Cost Estimate

A Project construction cost estimate is detailed in Section Three of the Appendix. Proposed improvements are estimated to cost $2,358,358 which includes a 10% contingency and 7% construction management cost.



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FINAL DESIGN DRAINAGE REPORT

Rancho Rd System - Elkhorn (Fort Apache to Grand Canyon)

City of Las Vegas, Nevada

Job No.: CLV1201.000
Date: October 2013

Prepared By:
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10/7/13

Mark Failla, P.E.
NV Professional Engineer No. 14566

Assisted By: Amy Poechmann, P.E.
Kellin Collins, P.E.

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Rancho Rd System-Elkhorn(Fort Apache to Grand Canyon) 90% Final Design Report Date: October 2013

Location of Development:
a) Descriptive (Cross Streets): North/South: Grand Canyon Drive
East/West: Elkhorn Road
b) Section: 18 and 19 Township: 19 South Range: 60 East
c) APN: 125-18-889-006, 125-19-599-013, -001, 125-18-899-008, 125-19-599-014, 125-18-899-010, 125-19-599-002, 125-18-899-001, 125-19-599-020, 125-18-899-009 125-19-599-004, and 125-19-599-005

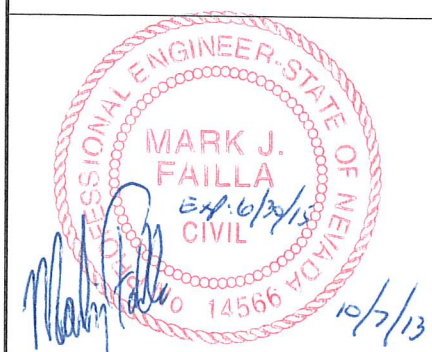
Name of Owner/Developer: City of Las Vegas
Telephone No.: (702) 229-6276 Fax No.: (702) 382-0848 E-mail Address: RMcConnell@lasvegasnevada.gov
Address: 333 N. Ranch Drive, Las Vegas, NV 89106

Contact Person – Name: Mark Failla, P.E. Telephone No.: (702) 284-5300
*E-mail Address: mfailla@shg-inc.com Fax No.: (702) 284-5399
Firm: Slater Hanifan Group
Address: 5740 S. Arville St. #216, Las Vegas, NV 89118

Type of Land Development/Land Disturbance Process:

☐	Rezoning	☐	Subdivison Map	☐	Clearing and grading Only
☐	Parcel Map	☐	Planned Unit Development	☒	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit		Regional Storm Drain Improvements

1. Total Owned Land Area: At Site: 0 acres (Public ROW) Being Developed/Disturbed: 0.50 linear mile of storm drain
2. Is a portion or all of the subject property located in a FEMA Flood Hazard Area? ☐ Yes** ☒ No
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ Yes** ☐ No
4. Proposed type of development (Residential, Commercial, Etc.): Regional Storm Drain Improvements
   Approximate upstream land area which drains to the subject site: Approx. 1.75 square mile
6. Has the site drainage been evaluated in the past? ☒ Yes** ☐ No If yes, please identify documentation: (See Section 1.5 of report)
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: CCRFCD Facility RCHC 0250
8. Briefly describe your proposed schedule for the subject project: 30% Pre-Design, 70% Design, 90% Design, and 100% Design



Engineer's Seal

Submit this form as part of the required drainage study to the local entity which has jurisdiction over The subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

*Newly Required Field
**Review and concurrence of the Clark County Regional Flood Control District is required

Local Entity File No.

Revision	Date

FERENCE: ***CLV1201***

STANDARD FORM 1

Updated 05/01/2008

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1 INTRODUCTION

1.1 Project Overview & Study Purpose

The Rancho-Elkhorn Storm Drain (ESD) is a proposed flood control conveyance facility located along Elkhorn Road between Fort Apache Road and Grand Canyon Drive within the City of Las Vegas (CLV), Nevada. The proposed facility is identified as a portion of the Clark County Regional Flood Control District (CCRFCD) regional facility RCHB 0295 and is proposed as 2,500 LF of 7'w x 6'h RCB for conveyance of the 100-year storm event flow ranging between 631 cfs and 808 cfs. The ESD facility is designed to connect to a 7'w x 6'h RCB lateral junction stubbed in Elkhorn Road at Fort Apache Road as currently under design by others as part of the Rancho-Fort Apache Storm Drain project (FASD, regional facility RCHB 0250).

The ESD alignment is primarily proposed within the north half of the roadway because it is less encumbered by existing utilities than the south half. A shift in the alignment from north side to south side is proposed for the upstream most 600 feet to avoid conflicts with existing gas lines and appurtenances west of the Grand Canyon/Elkhorn intersection. Additionally, the ESD alignment is within the north half of the roadway because the storm flows are well divided between the north and south halves of Elkhorn Road, with the majority of flow contributing to and maintained on the north half of the street. Note that there is an existing 18-inch RCP storm drain system located within the south half of Elkhorn Road which is capable of intercepting and conveying storm flows contributing to the south half of the street.

The project also includes design of appurtenant drop inlet and lateral storm drain facilities necessary to intercept the 100-year frequency design storm, pavement and striping replacement, and incidental utility relocations.

As the prime engineering consultant for the design of the ESD project, Slater Hanifan Group (SHG) is responsible for project management, preparation of design reports, and preparation of construction documents. Assisting SHG are sub-consultants in the fields of geotechnical engineering, surveying, subsurface utility engineering, and environmental assessment. GES is conducting the geotechnical field exploration and interpretive report. Stanley Consultants is conducting the survey mapping, control, and right-of-way mapping. Cardno TBE is conducting the subsurface utility designation and potholing. MBP is conducting the Environmental Screening Analysis.

This Final Design Drainage Report is a comprehensive document incorporating alternative design recommendations, agency review comments, and general coordination items identified in, and subsequent to, the Preliminary Design Report. This report also provides detailed hydrologic and hydraulic analyses in support of the final design. The following items have been performed and included in this report:

- Identified the relevant FEMA Special Flood Hazard Area (SFHA) mapping.
- Identified the project in relation to CCRFCD regional drainage facilities.
- Identified and reviewed previously approved drainage studies and improvement plans in the vicinity of the project.
- Provided an inventory of existing drainage facilities impacting the ESD.

- Determined 10- and 100-year storm event facility design flows. A local hydrologic analysis was performed for determining design flows for drop inlet and lateral storm drain facilities and a regional hydrologic analysis as referenced from the FASD project was utilized for establishing design flows in the mainline ESD facility.
- Analyzed street flow, such that hydraulic characteristics within the street sections are in accordance with local stormwater criteria.
- Identified potential constraints to proposed drainage facilities based on assessment of field pothole data and prepared the recommended design to minimize conflicts and accommodate necessary relocations.
- Designed proposed drainage facilities as recommended by this report and performed supporting hydrologic and hydraulic analyses.
- Incorporated Preliminary Design Report agency review comments.
- Incorporated 70% improvement plan and Draft Final Design Report agency review comments.
- Prepared 90% drainage facility improvement plans.

1.2 Site Description

The ESD spans approximately 2,500 LF of Elkhorn Road, from Grand Canyon Drive to Fort Apache Road. The improvements are located within Sections 18 and 19, Township 19 South, Range 60 East within the City of Las Vegas, Nevada. Note that the centerline of Grand Canyon Drive at Elkhorn Road is the boundary limit of City of Las Vegas and unincorporated Clark County jurisdiction. Proposed improvements extend approximately 150 feet west of the intersection centerline and into Clark County jurisdiction. It is noted that Clark County approval will be required for this project.

Currently, Elkhorn Road is fully improved from Grand Canyon Drive to Fort Apache Road. At Grand Canyon, Elkhorn Road pavement extends west as a two lane access road with no curb and gutter. There is undeveloped land on the northwest and southwest corner of the Elkhorn Road and Grand Canyon Drive intersection. Existing improvements and topography shows that Elkhorn Road drains from west to east towards Fort Apache Road. A location map, identified as Exhibit A, has been included in Appendix A for reference.

1.3 FEMA Flood Zone Designation

The limits of the ESD are located on FEMA Flood Insurance Rate Map (FIRM) Panel 32003C1745E dated September 27, 2002. The project is located within an un-shaded Zone 'X'. An un-shaded Zone 'X' is defined as an area determined to be outside the 0.2% annual chance flood.

Exhibit B, identifying the project site on the FIRM Panel identified above, has been included in Appendix A for reference. Note that the parcels identified as 'Clark County Unincorporated Areas' adjacent to the project site are no longer valid. Those parcels have been incorporated into the City of Las Vegas.

1.4 CCRFCD MPU & CLV Neighborhood Study Information

Figure F-13, from the 2008 CCRFCD Las Vegas Valley Flood Control Master Plan Update (CCRFCD 2008 MPU, Reference 1), shows that the project site consists of the east half of the planned CCRFCD regional facility RCHB 0295 for conveyance of 973 cfs. The

drainage facility recommended by this report will discharge to the CCRFCD regional facility RCHB 0250 which is currently under design by others. It is noted that CCRFCD concurrence will be required for this project. Exhibits C and D identifying the project on the CCRFCD 2008 MPU Figures F-13 and H-13, respectively, have been included in Appendix A for reference.

The ESD is included in both the CLV Northwest Neighborhood Study (Reference 2) and the Northwest Neighborhood Study Phase 2 (Reference 3) documents. Both studies identify the ESD as a regional facility for conveyance of a 100-year flow of 1,166 cfs. Exhibits E and F identifying the project on Figure F-1 and Sheet 11, respectively from each document have been included in Appendix A for reference.

1.5 Reference Studies

Various approved drainage studies and improvement plans for projects in the vicinity of the ESD have been reviewed in preparation of this study. The following documents have been identified as relevant and are considered acceptable for reference. Relevant reference material utilized in preparation of this report has been excerpted and included in Appendix E.

- *Rancho-Fort Apache Storm Drain Study,* LBG (FASD Study, Reference 4): This study, inclusive of 70% design supplemental analysis, was utilized to reference the regional hydrologic analysis and the 7'w x 6'h RCB lateral junction stub design at Fort Apache to which the ESD mainline is proposed to connect. Reference material provided in Appendix E was provided to SHG by LBG as part of the 70% supplemental analysis prepared for the FASD project and is current to date of this report.
- *Elkhorn/Grand Canyon Unit 1 & Unit 2*, VTN (Grand Canyon Plans, Reference 5): These plans were utilized to verify existing and future storm drain design flow along Grand Canyon Drive between Elkhorn Road and Severance Lane.
- *Elkhorn/Grand Canyon Unit 1 & Unit 3,* VTN (Grand Canyon Plans 1&3, Reference 6): These plans were utilized to verify design slopes for the existing 18-inch storm drain in Elkhorn Road.
- *Elkhorn/Grand Canyon Unit 4,* VTN (Grand Canyon Plans 4, Reference 7): These plans were utilized to verify design grades and section for the existing drainage easement at the southeast corner of the Elkhorn/Grand Canyon residential development.
- *Town Center L-TC 60/70 No.4,* SHG (Town Center Plans, Reference 8): These plans were utilized to verify design slopes for the existing 18-inch storm drain in Elkhorn Road.
- *Savona Unit 3*, RCI (Savona Unit 3, Reference 9): This drainage study was utilized to coordinate local drainage patterns upstream of Grand Canyon and south of Elkhorn. These plans were utilized to coordinate the future extension of the interim drop inlet proposed with the ESD project on the south side of Elkhorn with the future ultimate condition drop inlet proposed as part of the Savona Unit 3 project.

1.6 Project Coordination

The following coordination has taken place in preparation of this study.

- *CLV & CCRFCD*: Two meetings have taken place subsequent to the Preliminary Design Report submittal: November 6, 2012 and February 5 2013. The meetings were progress meetings which took place to present progress and discuss intermediate design recommendations and issues. Refer to meeting minutes included in Appendix G for additional details.

  In addition to progress meetings, various email coordination took place, notably November 20, 2012, February 25, 2013 and February 26, 2013. Refer to email correspondence included in Appendix G for additional details.

- *LBG*: Various meetings, phone calls, and email correspondence took place with LBG to coordinate with the concurrent FASD project. The FASD project established the regional hydrology inclusive of this ESD project and also provides the stub to which the ESD will connect. As part of a 70% supplemental analysis performed by LBG, various revisions were made to the regional hydrologic analysis in coordination with recommendations made as part of the ESD Preliminary Design Report. Additionally, revisions were made to the FASD stub at Elkhorn; specifically invert and HGL revisions. The revisions made for the FASD project have been incorporated in the ESD design presented herein. Refer to reference material included in Appendix F and email correspondence included in Appendix G.

- *RCI Engineers*: Subsequent to the 70% design submittal, SHG was contacted by RCI Engineers to coordinate their concurrent residential subdivision project known as Savona Unit 3 located on the southwest corner of Elkhorn/Grand Canyon. Based on coordination with RCI and review of related technical drainage studies, the local hydrologic analysis prepared for this ESD project was adjusted west of Grand Canyon and south of Elkhorn to replicate drainage patterns established by the proposed Savona improvements. The Savona Unit 3 project is currently scheduled for rough grading prior to the end of 2013. This ESD project is anticipated for construction Spring of 2013. Based on coordination with RCI, CLV, CCPW and CCRFCD, it was decided that the ESD plans will depict an interim drop inlet located on the southwest corner of Elkhorn/Grand Canyon assuming the Savona Unit 3 project is not yet constructed. The Savona Unit 3 plans have been revised to provide an ultimate drop inlet sized for an ultimate condition 100-year flow rate of 17 cfs extending to the storm drain lateral from the interim drop inlet provided by the ESD project. The location and inverts for the drop inlets and storm drain lateral have been coordinated. Refer to reference material included in Appendix F and email correspondence included in Appendix G.

2 METHODOLOGY

2.1 Compliance

The methodologies utilized in the preparation of this study are in compliance with the Clark County Regional Flood Control District's Hydrologic and Drainage Design Manual (CCRFCD Manual, Reference 10).

2.2 Hydrologic Modeling

Modeling: The FASD Study provided regional hydrologic modeling inclusive of this ESD project. In an effort to coordinate design flows for the ESD mainline facility established by the FASD Study, the regional analysis was referenced (refer to Appendix F).

A separate HEC-1 local hydrologic analysis was performed by this study for drainage areas directly impacting Elkhorn Road. The SCS Unit Hydrograph Method (SCS Method) was utilized to determine peak flow rates. The SCS Method utilizes precipitation, drainage area, curve number and lag time parameters to determine peak flow rates. The SCS Method routine within the U.S. Army Corp of Engineers HEC-1 Flood Hydrograph Package program was utilized to model the local drainage basins analyzed by this study. Design flows resulting from the local hydrologic analysis were utilized for design of drop inlets and lateral storm drain facilities. The 100-year, 6-hour storm was used as the basis of design for all ESD facilities. The 10-year, 6-hour storm was evaluated for adherence to 12-foot dry lane street flow criteria.

Precipitation: The local drainage basins are located outside of the McCarran Rainfall Area. The precipitation values utilized in the HEC-1 model are 2.85 and 1.61 inches for the 100-year and 10-year storm event, respectively. The precipitation values have been selected from CCRFCD Manual Figure 503 and 506 and applying the adjustment ratio from CCRFCD Manual Table 501. Additionally, since the drainage area is less than 8 square miles, an SDN 3 design storm distribution referenced from Table 503 of the CCRFCD Manual is used. Relevant tables and figures from the CCRFCD Manual have been included in Appendix B.

Curve Number: The SCS curve number loss rate methodology was utilized to approximate infiltration for the drainage basins. Per the SCS Soil Survey of the Las Vegas Valley Area, the local drainage basins lie within Soil Type 191 as depicted on Exhibit G, included in Appendix A. The Hydrologic Soil Group (HSG) breakdown for Soil Type 191 is 5%-HSG A, 85%-HSG B, 0%-HSG C, and 10% HSG D. The local hydrologic analysis was performed based on ultimate conditions. As such, land uses were selected based on existing development and/or current zoning for undeveloped areas. Curve numbers were taken from 602 from the CCRFCD Manual for the appropriate land use. Composite curve numbers were computed for subbasins consisting of multiple land uses and HSG soil breakdown. A copy of Table 602 from the CCRFCD Manual, and composite curve number computations are included in Appendix B.

Lag Time: The lag time is defined as the time measured from the center of mass of effective rainfall to the time to peak of the outflow hydrograph. The lag time is related to the time of concentration as 0.6 times the time of concentration. The time of concentration is defined as the time required for runoff to flow from the hydraulically most distant point of a basin to the outlet point of the basin. Standard Form 4, as outlined in the CCRFCD Manual, was utilized to determine the lag times for basins modeled. The lag time computations have been included in Appendix B.

2.3 Hydraulic Modeling

Street Flow: Street flow was analyzed utilizing the Flowmaster Version 7.0 software by Haestad Methods. In accordance with the CCRFCD Manual, the depth times velocity

factor (DxV) for street flow for the 10-year storm event must be less than or equal to 6 with a maximum depth of 1 foot. The depth times velocity factor (DxV) for street flow for the 100-year storm event must be less than or equal to 8 with a maximum depth of 2 feet. Additionally, transverse street flow on through traffic streets shall be at a depth less than or equal to 1-ft for the 100-year storm event. Since the ESD improvements are within a right-of-way greater than 80-ft in width, the following additional criteria for street flow must be satisfied:

- During the 10-year storm event, a 12-ft wide dry lane shall be maintained in each direction (without the use of a center turning lane),
- During the 10-year storm event, the flow depth at intersections with other streets of 80-ft or greater right-of-way width shall be at curb height or less.

Storm Drain and Drop Inlets: The hydraulic gradient line (HGL) for storm drain flows was determined utilizing the Water Surface and Pressure Gradient (WSPG) Hydraulic Analysis System software by the Los Angeles County Department of Public Works. The storm drain has been designed to convey both 100-year and 10-year flows. Hydraulic analysis for the mainline storm drain was performed for both a Manning's "n" value of 0.013 and 0.015. Based on coordination with CLV and CCRFCD, HGL results based on the Manning "n" value of 0.015 evaluation is reported on plan profiles.

Continuous grade drop inlets were designed using a spreadsheet which utilizes equations taken from Section 805 of the CCRFCD Manual. Sump drop inlets were designed using a spreadsheet incorporating orifice and weir equations.

3 HYDROLOGY

3.1 Summary of Various Source Reported Flows

Various planning documents have reported design flow for the ESD. Additionally, and most recently, the regional analysis included as part of the FASD Study established design flows for the ESD. The following table summarizes the reported flows from the various documents.

Table 1: Summary of Various Source Reported Flows (100-Year)

Location	Source			
	CCRFCD MPU[1] (cfs)	CNLV NWNS[2] (cfs)	CNLV NWNS PH2[3] (cfs)	LBG FASD[4] (cfs)
Elkhorn: Grand Canyon to Tee Pee	973	1166	1166	744
Elkhorn: Tee Pee to Ft. Apache	973	1166	1166	808

1: CCRFCD 2008 MPU
2: CNLV Northwest Neighborhood Study
3: CNLV Northwest Neighborhood Study Phase 2
4: Rancho-Fort Apache Storm Drain Study (70%) by LBG

3.2 Regional Analysis

The FASD Study provided regional hydrologic modeling inclusive of this ESD project. In an effort to coordinate design flows for the ESD mainline facility established by the FASD Study, the regional analysis was referenced. Excerpts from the regional analysis HEC-1 model included with the FASD Study are provided in Appendix F. A copy of the supporting Future Conditions Hydrology exhibit from the FASD Study is also included in Appendix F. Exhibit H, included in Appendix A, was created to summarize relevant regional flows utilized in design of the ESD mainline facility and referenced from the FASD Study. The following table provides a summary of regional HEC-1 nodes referenced from the FASD Study and corresponding computed 100-year peak flows impacting the ESD.

Table 2: Summary of Regional Analysis Flows

Ultimate Condition

HEC-1 Node[1]	Q_{100} (cfs)
RN26-C	419
CNW26-C	219
NW53-CC	121
DNW2C-C	102
DOUTFLOW	631
CNW53-C	744
C66-CA	808
C66-CB	815

1: HEC-1 Node and Q_{100} referenced from FASD Study. See Exhibit H.

3.3 Local Analysis

In order to determine local flows directly impacting Elkhorn Road at various key locations, a separate local HEC-1 hydrologic analysis was performed. Peak 100-year storm flows determined by the local hydrologic analysis were utilized for design of drop inlet and lateral storm drain facilities, as well as street flow computations. The local HEC-1 hydrologic analysis is included in Appendix B. Exhibit I included in Appendix A provides a depiction of the drainage basins analyzed by the local hydrologic analysis. The following table provides a summary of the local hydrologic analysis.

Table 3: Summary of Local Analysis Flows

Ultimate Condition

Subbasin	Q_{100} (cfs)	Q_{10} (cfs)	Area (acres)
[1]NW53-CA	55	16	41.15
[1]DSGC	10	3	N/A
[1]SEV	45	13	N/A

Table 3: Summary of Local Analysis Flows Ultimate Condition			
Subbasin	**Q_{100} (cfs)**	**Q_{10} (cfs)**	**Area (acres)**
MDI3	64	18	48.93
CPMDI3 (DSGC + MDI3)	72	21	N/A
MDI1	17	6	10.00
MDI2	45	13	31.76
MDI4	4	2	1.37
MDI5	4	2	1.12
MDI6	2	1	0.56
MDI7	72	29	34.60
MDI8	8	4	2.60
MDI9	3	1	0.72
MDI10	8	3	3.33
18DI1	4	2	1.00
18DI2	4	2	1.05
18DI3	9	3	4.05
18DI4	7	4	2.03
18DI5	2	1	0.57
1: Referenced from FASD Study. See Exhibit I.			

3.4 Summary of Design Flows

Design flows established for the ESD mainline were determined by starting with the referenced regional flow HEC-1 Node "DOUTFLOW" (631 cfs) from the FASD Study at the Hualapai Way and Elkhorn Road intersection. Referenced flows from the FASD Study at the Grand Canyon and Elkhorn intersection (HEC-1 Node CNW53-C = 744 cfs) and the Tee Pee and Elkhorn intersection (C66-CA = 808 cfs) were utilized for design of the ESD moving in a downstream direction. The following table provides a summary of design flows established by the FASD Study and utilized for the ESD mainline facility.

Table 4: Summary of Elkhorn Mainline Storm Drain Flow - North Side Regional Analysis - Ultimate Condition	
Segment	**Referenced HEC-1 Flow Q_{100} (cfs)**
Hualapai to Grand Canyon	631 DOUTFLOW
Grand Canyon to Tee Pee	744 CNW53-C
Tee Pee to Fort Apache	808/815 C66-CA/C66-CB
1: See Exhibit H.	

An 18-inch RCP storm drain system exists in the south side of Elkhorn Road between Grand Canyon Drive and Fort Apache Road. Storm flows impacting Elkhorn Road are well separated between the north and south halves of the street and the existing storm drain has sufficient capacity to accommodate the south side flows. Flow rates utilized in analysis for the existing 18-inch RCP system were established by the local hydrologic analysis. Analysis for the existing 18-inch RCP system was performed for the 100-year storm and evaluated based on street flow, drop inlet interception and full flow capacity. Detailed discussion of design for the 18-inch RCP system is included in Section 4.2.

4 FACILITY DESIGN

4.1 Alternative Considerations

Alternative mainline facility designs and flow interception schemes at the Grand Canyon/Elkhorn intersection and Tee Pee/Elkhorn intersection were presented in the Preliminary Design Report. This study incorporates selected alternatives based on CLV and CCRFCD coordination.

4.2 Discussion of Facility Design

Mainline Storm Drain (North Side): The ESD is proposed as 2,500 LF of 7'w x 6'h RCB for conveyance of the 100-year storm event flow ranging between 631 cfs and 808 cfs. The ESD facility is designed to connect to a 7'w x 6'h RCB lateral junction stubbed in Elkhorn Road at Fort Apache Road as currently under design by others as part of the Rancho-Fort Apache Storm Drain project. The project also includes design of appurtenant drop inlet and lateral storm drain facilities necessary to intercept the 100-year frequency design storm. As previously discussed, the mainline storm drain was designed based on regional flows established by the FASD Study and drop inlet and lateral facilities were designed based on flows established by the local hydrologic analysis.

The ESD mainline was hydraulically evaluated for both Manning's "n" values of 0.013 and 0.015. Per coordination with CLV and CCRFCD, it was agreed that a Manning's "n" value is most appropriate for design of the proposed facility; therefore HGL results from the 0.015 Manning's "n" analysis are reported. Copies of both WSPG hydraulic models are included in Appendix E.

The ESD alignment is primarily proposed within the north half of the roadway because it is less encumbered by existing utilities than the south half. A shift in the alignment from north side to south side is proposed for the upstream most 600 feet to avoid conflicts with existing gas lines and appurtenances west of the Grand Canyon/Elkhorn intersection. Additionally, the ESD alignment is within the north half of the roadway because the storm flows are well divided between the north and south halves of Elkhorn Road, with the majority of flow contributing to and maintained on the north half of the street. Note that an existing 18-inch RCP storm drain system located within the south half of Elkhorn Road is capable of intercepting and conveying storm flows contributing to the south half of the street. Exhibit J included in Appendix A depicts the proposed facility designs.

Existing 18-Inch Storm Drain System (South Side): The proposed design limits flows contributing to the existing 18-inch RCP storm drain system from areas between Grand Canyon and Fort Apache on the south side of Elkhorn. As such, the existing system is capable of intercepting and conveying storm flows contributing to it. An evaluation of the existing storm drain system was performed. The evaluation consisted of performing south side street flow computations, existing drop inlet interception computations and full flow capacity computations. Supporting computations are included in Appendices C, D and E respectively.

4.3 Summary of Street Flow

The storm drain design was initiated by first evaluating street flow hydraulics and assessing the need/location for drop inlets necessary to intercept flow in order to meet CCRFCD street flow criteria. Drop inlets where then provided based on locations where street flow criteria would be exceeded and/or to meet the intent of the 100-year design flow conveyance of the regional facility. The following table provides a summary of 100-year storm event street flow hydraulics based on the proposed design (after drop inlet interception). Street flow computations are included in Appendix C.

Table 5: Summary of Street Flow Hydraulics: 100-Year

Street Section[1]	Slope (%)	Cross Slope (%)	Q_{100} (cfs)	D_{100} (ft)	V_{100} (ft/s)	$D_{100}*V_{100}$
Elkhorn North Half Section A	2.1	2.0	45	0.66	6.07	4.01
Elkhorn South Half Section A	2.1	2.0	15	0.48	5.04	2.42
Elkhorn North Half Section B	3.4	2.0	0	0.00	0.00	0.00
Elkhorn South Half Section B	3.4	2.0	4	0.32	4.33	1.39
Elkhorn North Half Section C	3.4	3.2	4	0.34	4.78	1.63
Elkhorn South Half Section C	3.4	2.2	0	0.00	0.00	0.00
Elkhorn North Half Section D	3.4	3.6	3.3	0.32	4.68	1.50
Elkhorn South Half Section D	3.4	2.6	5.8	0.36	5.08	1.83
Elkhorn North Half Section E	3.4	4.0	8.7	0.43	6.19	2.66
Elkhorn South Half Section E	3.4	3.0	11.7	0.45	6.25	2.81
Elkhorn North Half Section F	3.4	3.0	7.4	0.39	5.64	2.20
Elkhorn South Half Section F	3.4	2.5	14.3	0.46	6.30	2.90
Elkhorn North Half Section G	2.2	3.5	11.6	0.49	5.45	2.67
Elkhorn South Half Section G	2.2	1.0	11.9	0.39	4.08	1.59

Table 5: Summary of Street Flow Hydraulics: 100-Year						
Street Section[1]	**Slope (%)**	**Cross Slope (%)**	**Q_{100} (cfs)**	**D_{100} (ft)**	**V_{100} (ft/s)**	**$D_{100}*V_{100}$**
Grand Canyon West Half Section H	0.5	2.0	72	0.94	3.44	3.23
Grand Canyon East Half Section H	0.5	2.0	4	0.41	2.06	0.84
1 - See Exhibit J						

Review of the table above indicates the proposed design will be in compliance with CCRFCD street flow criteria for the 100-year storm event. Review of the Grand Canyon West Half (Section H) computation indicates the potential for the 100-year storm peak flow (72 cfs) to overtop the street crown. A supplemental computation (included in Appendix C) was performed to determine the west half street capacity at crown height. Based on the supplemental computation, the street has a capacity of 50 cfs at crown height. Although the proposed drop inlet located on the west side of Grand Canyon is designed to collect the entire 72 cfs, the supplemental analysis was performed to evaluate the interception capacity of the existing 12-foot drop inlet located on the east side of Grand Canyon should 22 cfs overtop the street crown. Additional discussion regarding drop inlet capacity at this location is included in Section 4.4.

Since Elkhorn Road is a greater than 80-foot right-of-way street, the 10-year CCRFCD criteria must also be met. The following table provides a summary of maximum flow rates in the street that will be compliant with 10-year CCRFCD criteria for dry lane, flow depth, and DxV.

Table 6: Summary of Street Flow Hydraulics: 10-Year Maximum Capacity							
Roadway Reach	**Slope (%)**	**Cross Slope (%)**	**Q_{10}[1] (cfs)**	**D_{10} (ft)**	**V_{10} (ft/s)**	**$D_{10}*V_{10}$**	**10-Year Dry Lane Width (ft)**
Elkhorn-North Half Grand Canyon to Tee Pee	3.4	2.0	56	0.65	7.67	4.99	19.0
	3.4	3.2	55	0.72	8.31	5.98	25.8
	3.4	3.6	51	0.72	8.26	5.95	27.7
Elkhorn-South Half Grand Canyon to Tee Pee	3.4	2.0	55	0.65	7.64	4.97	19.0
	3.4	2.2	67	0.70	8.21	5.75	19.0
	3.4	2.6	62	0.71	8.27	5.87	22.2
Elkhorn-North Half Tee Pee to Ft. Apache	3.4	3.0	58	0.72	8.34	6.00	24.7
	3.4	3.5	52	0.72	8.27	5.95	27.3
	3.4	4.0	47	0.72	8.21	5.91	29.3
Elkhorn-South Half Tee Pee to Ft. Apache	3.4	2.5	64	0.71	8.29	5.89	21.4
	3.4	3.0	58	0.72	8.34	6.00	24.7
	3.4	3.5	52	0.72	8.27	5.95	27.3
1 -- All flows presented in table are maximum half street flows meeting CCRFCD criteria.							

Review of the table above indicates maximum street flows meeting 10-year criteria range from 47 cfs to 67 cfs. Note that in some cases dry lane dictates maximum flow rate and in other cases the DxV dictates maximum flow rate. In all cases, the maximum flow rate meeting 10-year criteria far exceeds design surface flows at any location even for the 100-year storm event.

4.4 Summary of Recommended Drop Inlets

The following table provides a summary of proposed drop inlets located based on where street flow criteria would be exceeded and/or to meet the intent of the 100-year design flow conveyance of the regional facility. Note that existing drop inlets were utilized to offset the need and size of proposed drop inlets. Drop inlet computations are included in Appendix D.

Table 7: Summary of Drop Inlets

Description[1]	Station	Size & Type	Total Inflow Q_{100} (cfs)	Collected Q_{100} (cfs)	Bypass Q_{100} (cfs)
Elkhorn North Side					
MDI1	39+07	Special Drop Inlet	17	17	0
MDI2	39+63	Special Drop Inlet	45	45	0
MDI3	40+19	Special Drop Inlet	72	72	0
MDI4	40+82 (existing)	12-ft Neenah R-3295	4	4	0
MDI5	48+52 (existing)	4.0-ft CM2	4	2.7	1.3
MDI6	52+76 (existing)	4.0-ft CM2	3.3	2.6	0.7
MDI7	53+24	17.5-ft Modified DM2	72	72	0
MDI8	56+25 (existing)	4.0-ft CM2	8.7	4.3	4.4
MDI9	62+23 (existing)	4.0-ft CM2	7.4	3.8	3.6
MDI10	65+36 (proposed by others)	22.5-ft CM2	11.6	11.5	0.1
Elkhorn South Side					
18DI1	45+90 (existing)	4.0-ft CM2	4.0	2.2	1.8
18DI2	53+00 (existing)	4.0-ft CM2	5.8	3.1	2.7
18DI3	55+14 (existing)	2.5-ft CM2	11.7	4.4	7.3
18DI4	62+44 (existing)	2.5-ft CM2	14.3	4.4	9.9
18DI5	66+33 (proposed by others)	22.5-ft CM2	11.9	9.9	2.0

1 - See Exhibit J.

As previously discussed in Section 4.3, the potential for 22 cfs of the total 72 cfs 100-year storm peak flow to overtop the street crown from the west at Grand Canyon exists. Although the proposed drop inlet on the west side of Grand Canyon has been designed to intercept the entire 72 cfs; a supplemental computation for the existing 12-foot drop inlet on the east side of Grand Canyon was performed assuming that 22 cfs overtops the street crown from the west. The supplemental computation (included in Appendix D) was evaluated based on an east side street flow computation with 26 cfs (22 cfs overtopping+4cfs generated from east side of Grand Canyon). The supplement analysis shows that should the additional 22 cfs reach the existing 12-foot drop inlet, it has sufficient capacity to intercept 20 cfs, with the potential of 6 cfs bypass. The 6 cfs bypass flow would not exceed street flow criteria and could be accommodated by existing downstream drop inlets. Based on this evaluation, it is concluded that upsizing the existing drop inlet on the east side of Grand Canyon is not justified for the cost.

4.5 Summary of Recommended Storm Drain

The following table provides a summary of the proposed mainline and lateral storm drain, as well as the design flows, for the ESD located on the north side of Elkhorn Road. Storm drain computations are included in Appendix E.

Table 8: Summary of Storm Drain Facilities - Elkhorn North Side

Station	Facility Description	Design Flow (cfs)
Mainline		
39+00.00 to 39+68.00	7'w x 6'h RCB	631
39+68.00 to 40+73.59	7'w x 6'h RCB	668
40+73.59 to 53+37.72	7'w x 6'h RCB	744
53+37.72 to 64+00.00	7'w x 6'h RCB	808
64+00.00	7'w x 6'h RCB connect to 7'w x 6'h RCB proposed by others	808
Laterals		
Lateral 1 – 39+07	18" RCP	17
Lateral 2 – 39+63	24" RCP	45
Lateral 3 - 40+19	36" RCP	76
Lateral 4 - 48+73	18" RCP (collar to existing)	2.7
Lateral 5 - 52+90	18" RCP (collar to existing)	2.6
Lateral 6 – 53+24	30" RCP	72
Lateral 7 - 56+40	18" RCP (collar to existing)	4.3
Lateral 8 – 62+40	18" RCP (collar to existing)	3.8
65+60.00	30" RCP (proposed by others)	11.5

The following table provides a summary of the existing mainline and lateral storm drain, as well as the design flows, for the existing 18-inch RCP storm drain system located on the south side of Elkhorn Road. Storm drain computations are included in Appendix E.

Table 9: Summary of Storm Drain Facilities - Elkhorn South Side

Station	Facility Description	Design Flow (cfs)
Mainline		
46+07 to 53+17	18" RCP (existing)	2.2
53+17 to 55+31	18" RCP (existing)	5.3
55+31 to 62+61	18" RCP (existing)	9.7
62+61 to 66+40	18" RCP (existing)	14.1
66+40 to 66+60	30" RCP (proposed by others)	24
Laterals		
46+07	18" RCP (existing)	2.2
53+17	18" RCP (existing)	3.1
55+31	18" RCP (existing)	4.4
62+61	18" RCP (existing)	4.4
66+40	30" RCP (proposed by others)	9.9

5 CONCLUSIONS & RECOMMENDATIONS

1. The project site is not located within a FEMA designated SFHA. FEMA acceptance is not required.

2. The project is a planned and funded CCRFCD regional drainage facility, per the CCRFCD 2008 MPU. CCRFCD approval is required.

3. A portion of the project improvements are located within and adjacent to unincorporated Clark County. Clark County approval is required.

4. It has been determined that the existing storm drain system within Elkhorn Road does **not** provide enough capacity for the surface flow in Elkhorn Road to meet CCRFCD Manual criteria during the 100-year and 10-year storm events.

5. The proposed ESD project will effectively provide 100-year storm flow interception and conveyance for the remaining street flow in Elkhorn Road to meet CCRFCD Manual criteria during the 100-year and 10-year storm events.

6. Proposed flow velocities in the ESD mainline range from 15.11 to 30.78 fps. This exceeds the CCRFCD Manual criterion of a maximum velocity of 25 fps at some locations due to facility slopes ranging from 2.00% to 3.41%. The project allows for pre-cast RCB only which has a minimum specification for concrete strength of 6000 psi. Per coordination with CCRFCD, 6000 psi strength concrete is sufficient for mitigating high velocities in lieu of providing a sacrificial concrete layer. Email correspondence and pre-cast RCB specifications are included in Appendix G for reference.

7. The accompanying 90% Design Plans support the concepts, drainage patterns, conclusions and/or recommendations discussed in this report.

6 REFERENCES

1. *CCRFCD 2008 Las Vegas Valley Flood Control Master Plan Update.* PBS&J, 2010.

2. *CLV Northwest Neighborhood Study.* September 1999.

3. *CLV Northwest Neighborhood Study Phase 2.* September 1999.

4. *Rancho-Fort Apache Storm Drain Study.* LBG, July 2012.

5. *Elkhorn/Grand Canyon Unit 1 & Unit 2.* VTN, 2002.

6. *Elkhorn/Grand Canyon Unit 1 & Unit 3.* VTN, 2003.

7. *Elkhorn/Grand Canyon Unit 4.* VTN, 2004.

8. *Town Center L-TC 60/70 No.4.* SHG, 2005.

9. *Savona Unit 3.* RCI, 2013

10. *Hydrologic Criteria and Drainage Design Manual.* Clark County Regional Flood Control District, 1990.

LIST OF APPENDICES

Appendix A Drainage Exhibits
- Exhibit A – Location Map
- Exhibit B – FEMA FIRM Map
- Exhibit C – CCRFCD 2008 MPU Facilities Map
- Exhibit D – CCRFCD 2008 MPU Hydrologic Map
- Exhibit E – NW Neighborhood Study Exhibit
- Exhibit F – NW Neighborhood Study Phase 2 Exhibit
- Exhibit G – Soils Map
- Exhibit H – Regional Hydrologic Analysis, Ultimate Conditions Exhibit
- Exhibit I – Local Hydrologic Analysis, Ultimate Conditions Exhibit
- Exhibit J – Storm Drain Facilities Exhibit

Appendix B Local Hydrologic Analysis
- Precipitation Data & Computations
- Curve Number Computations
- Lag Time Computations, Standard Form 4
- 10- & 100-Year HEC-1 Analysis, Ultimate Conditions

Appendix C Street Flow Computations
- Street Flows Impacting Drop Inlets
- 10-Year Maximum Street Flow Capacities

Appendix D Drop Inlet Computations
- Mainline Drop Inlet Computations, MDI1 thru MDI10
- Existing 18" RCP Drop Inlet Computations, 18DI1 thru 18DI5

Appendix E Storm Drain Hydraulic Analyses
- Mainline WSPG Analysis, Manning's N=0.013
- Mainline WSPG Analysis, Manning's N=0.015
- Mainline Lateral WSPG Analyses
- Mainline Lateral Inlet Control Computations for HGL thru Inlet
- Existing 18" RCP Storm Drain Full Flow Capacity Computations

Appendix F Reference Material
- Rancho-Fort Apache Storm Drain Study, LBG
- Elkhorn/Grand Canyon Unit 1 & Unit 2, VTN
- Elkhorn/Grand Canyon Unit 1 & Unit 3, VTN
- Elkhorn/Grand Canyon Unit 4, VTN
- Town Center L-TC 60/70 No.4, SHG
- Savona Unit 3, RCI

Appendix G Coordination Documents
-
- CLV/CCRFCD Kickoff Meeting Minutes – May 2, 2012
- CLV/CCRFCD Progress Meeting#1 Minutes – June 5, 2012
- CLV/CCRFCD Progress Meeting#2 Minutes – July 31, 2012
- LBG Email Correspondence – August 2, 2012
- CLV/CCRFCD Progress Meeting#3 Minutes – November 6, 2012
- CLV/CCRFCD Progress Meeting#4 Minutes – February 5, 2013
- LBG Email Correspondence – November 20, 2012; February 19, 2013

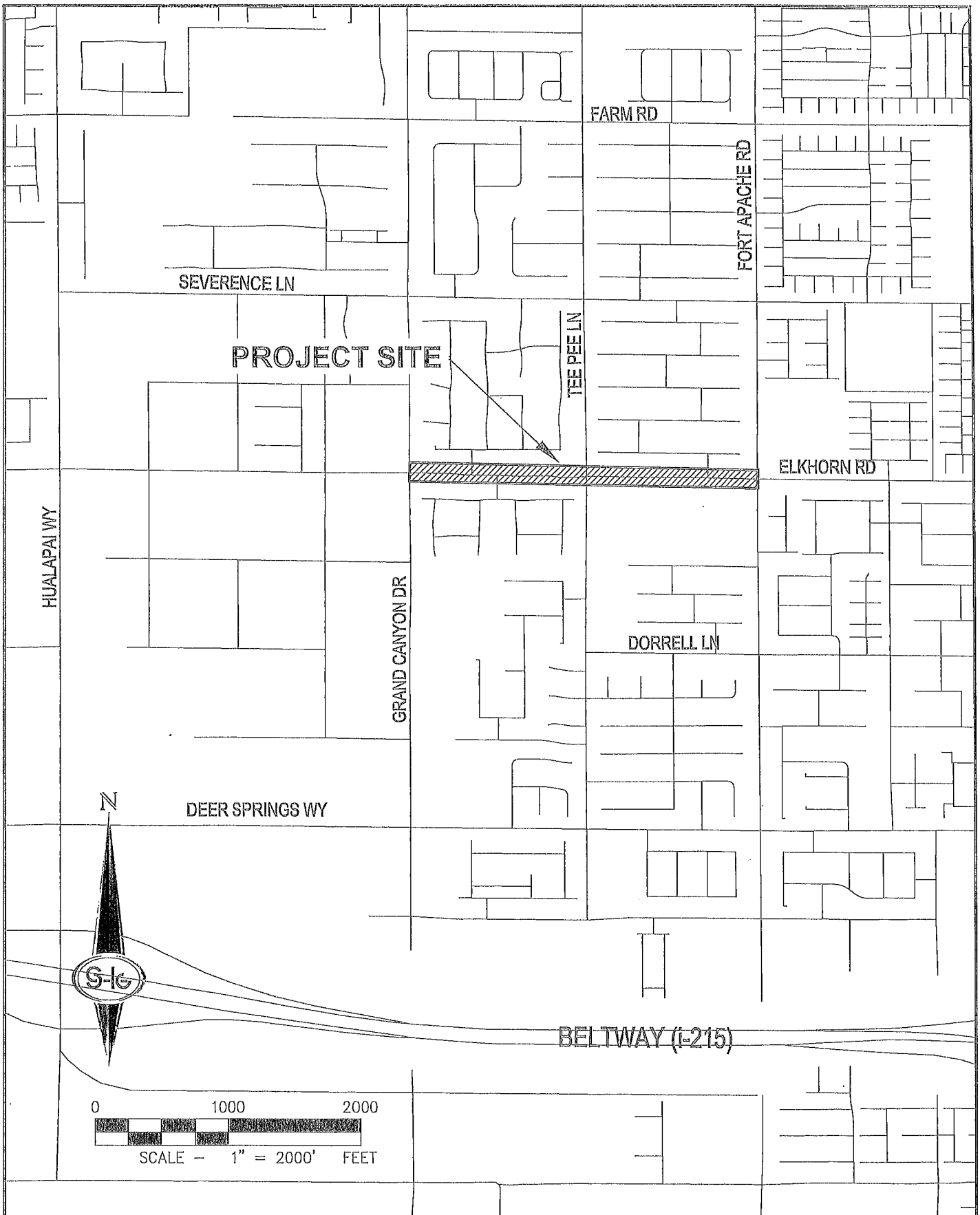
- CLV/RFCD Email Correspondence – November 20, 2012; February 25, 2013; February 26, 2013
- CLV/CCRFCD Progress Meeting#5 Minutes – April 3, 2013
- CLV/CCRFCD Progress Meeting#6 Minutes – August 7, 2013
- Rinker Materials Email Correspondence – August 21, 2013
- CCRFCD/CCPW Email Correspondence – August 28, 2013
- RCI Email Correspondence – August 16, 2013 thru September 11, 2013

Appendix H Response to CLV/CCRFCD/CCPW 70% Review Comments

Appendix I 90% Storm Drain Plan & Profile

APPENDIX A

Drainage Exhibits



f:\clv1201\drainage\0% design\exhibits\clv1201 exhibit a location map.dwg 2/7/2013 1:19 . . Amy Poechmann

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CITY OF LAS VEGAS

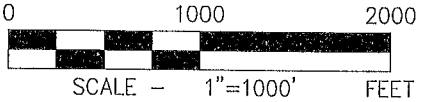
RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

LOCATION MAP

DATE: FEB 2013	PROJECT NO. CLV1201-000
DRAFTER: KC	
DESIGNER: KC	EXH A
CHECKED: MJF	SHEET 1 OF 1







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CITY OF LAS VEGAS

RANCHO RD SYSTEM- ELKHORN
SOILS MAP

DATE: AUG 2013	PROJECT NO. CLV1201.00
DRAFTER: AP	
DESIGNER: AP	EXHIBIT G
CHECKED: MF	SHEET 1 OF 1

File: F:\CLv1201\Drainage\90% Design\Figures\CLV 1201 90% EXHIBIT X Soils Exhibit.dwg Sep 30, 2013 - 09:15

APPENDIX B

Local Hydrologic Analysis

Precipitation Data & Computations

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

Rainfall and Precipitation Computation

Project Name: Rancho Road System - Elkhorn
Date: Jan-13
File Name: CLV1201 Std Form 4.xls
By: AP

Data:

Reference:

Project is located in: Township: 19 S. Range: 60 E. Section: 18 & 19 — APN Map

Site is NOT located in the McCarren Airport Rainfall Area — Figure 513*

Rainfall Depth-Duration-Frequency 10-Year, 6-Hour: 1.3 inches — Figure 503*

Rainfall Depth-Duration-Frequency 100-Year, 6-Hour: 2.0 inches — Figure 506*

Precipitation Adjustment Ratios:

10-Year: 1.24 — Table 501*
100-Year: 1.43 — Table 501*

Six Hour Depth Area Reduction Factors (DARF):

Area (gross acres): 183 = 0.2859 square miles — Table 502*
DARF = 1.00

Calculations:

P_{10} = 1.61 10-Year Precipitation (in)
P_{100} = 2.85 100-Year Precipitation (in)

P10/P100= 0.57 HEC-1 Multiple Ratio Value

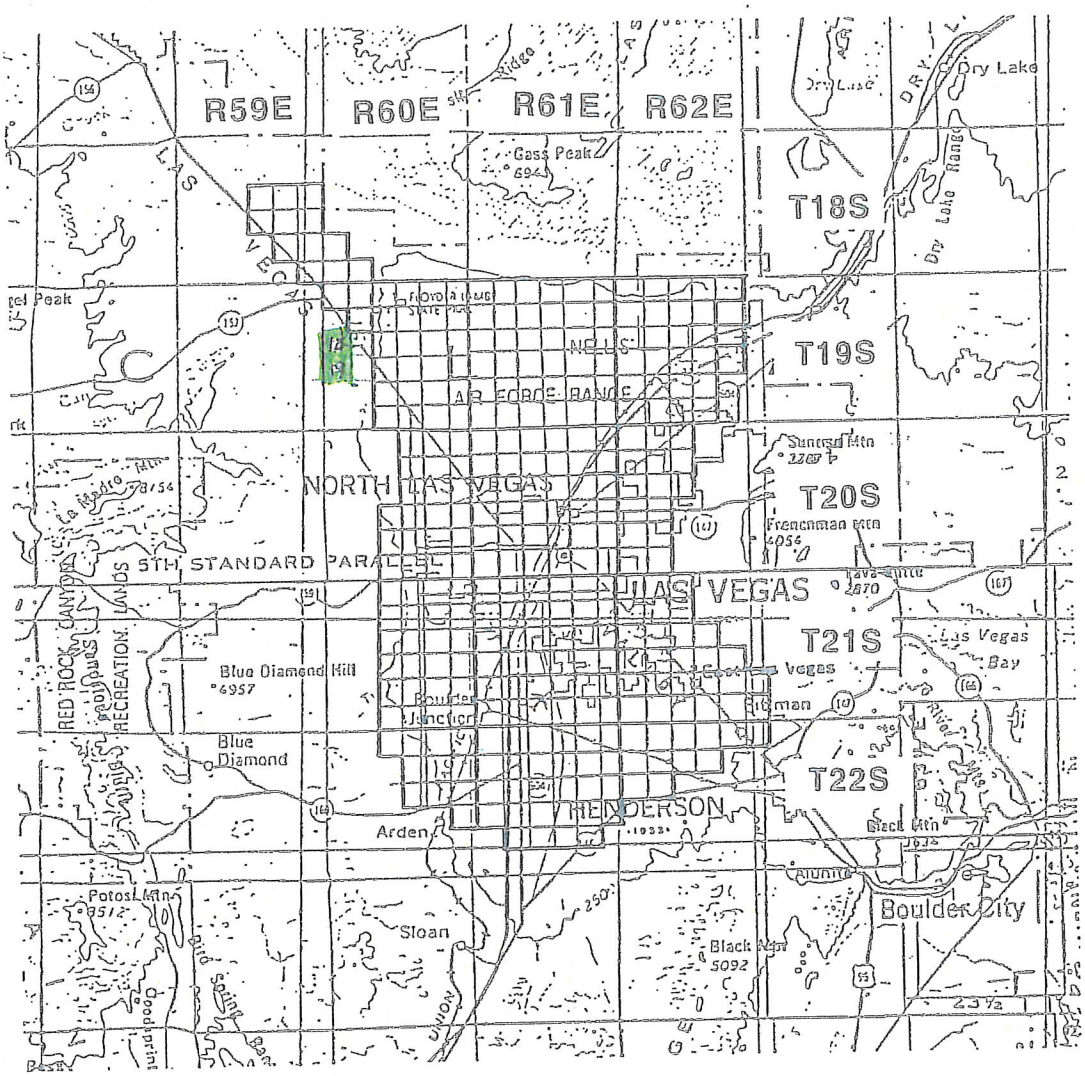
Equations:

P=(Rainfall)*(Precipitation Adjustment Ratio)*(Depth Area Reduction Factor)

* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage Design Manual

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McCARRAN AIRPORT RAINFALL AREA



TOWNSHIP	RANGE	SECTIONS
18 South	59 East	13-15,22-26,36
18 South	60 East	30-32
19 South	60 East	1-6,8-16,21-28,33-36
19 South	61 East	ALL SECTIONS
19 South	62 East	2-11,14-23,27-34
20 South	60 East	1-3,10-15,21-28,33-36
20 South	61 East	ALL SECTIONS

TOWNSHIP	RANGE	SECTIONS
20 South	62 East	4-9,16-20,29-32
21 South	60 East	1-4,9-16,21-28,33-36
21 South	61 East	ALL SECTIONS
21 South	62 East	4-9,15-23, 25-36
22 South	60 East	1-4,10-15,24
22 South	61 East	1-24,26-29
22 South	62 East	1-10,17-18

Notes:
1. Refer to Table 505 and Figure 516 Depth-Duration- Frequency values in the McCarran Airport Rainfall Area.
2. Refer to Table 506 and Figure 517 for Time-Intensity-Frequency values on the McCarran Airport Rainfall Area.

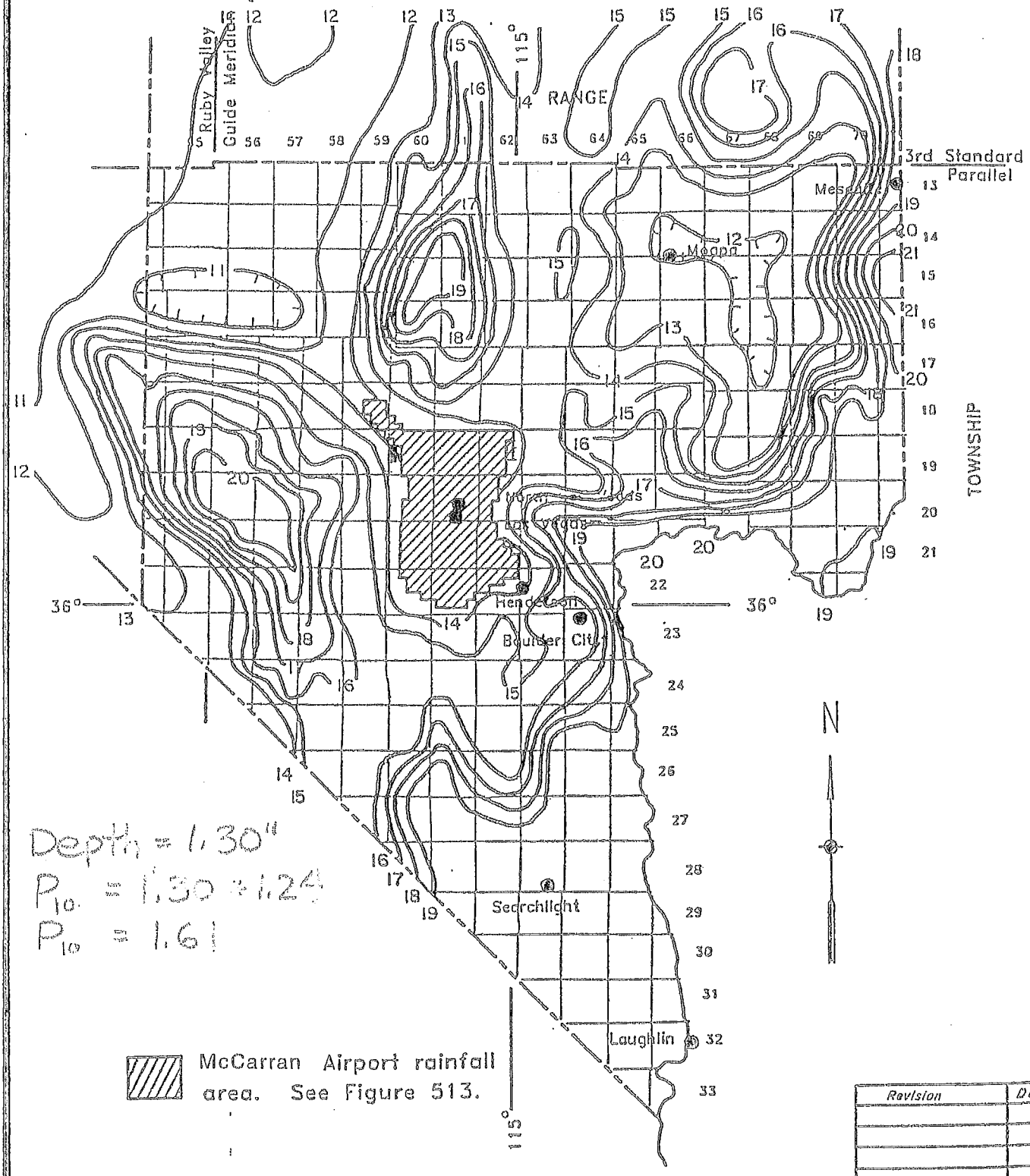
Revision	Date

WRC

REFERENCE:

FIGURE 513

RAINFALL DEPTH-DURATION-FREQUENCY
10-YEAR, 6-HOUR
(DEPTHS IN TENTHS OF INCHES)



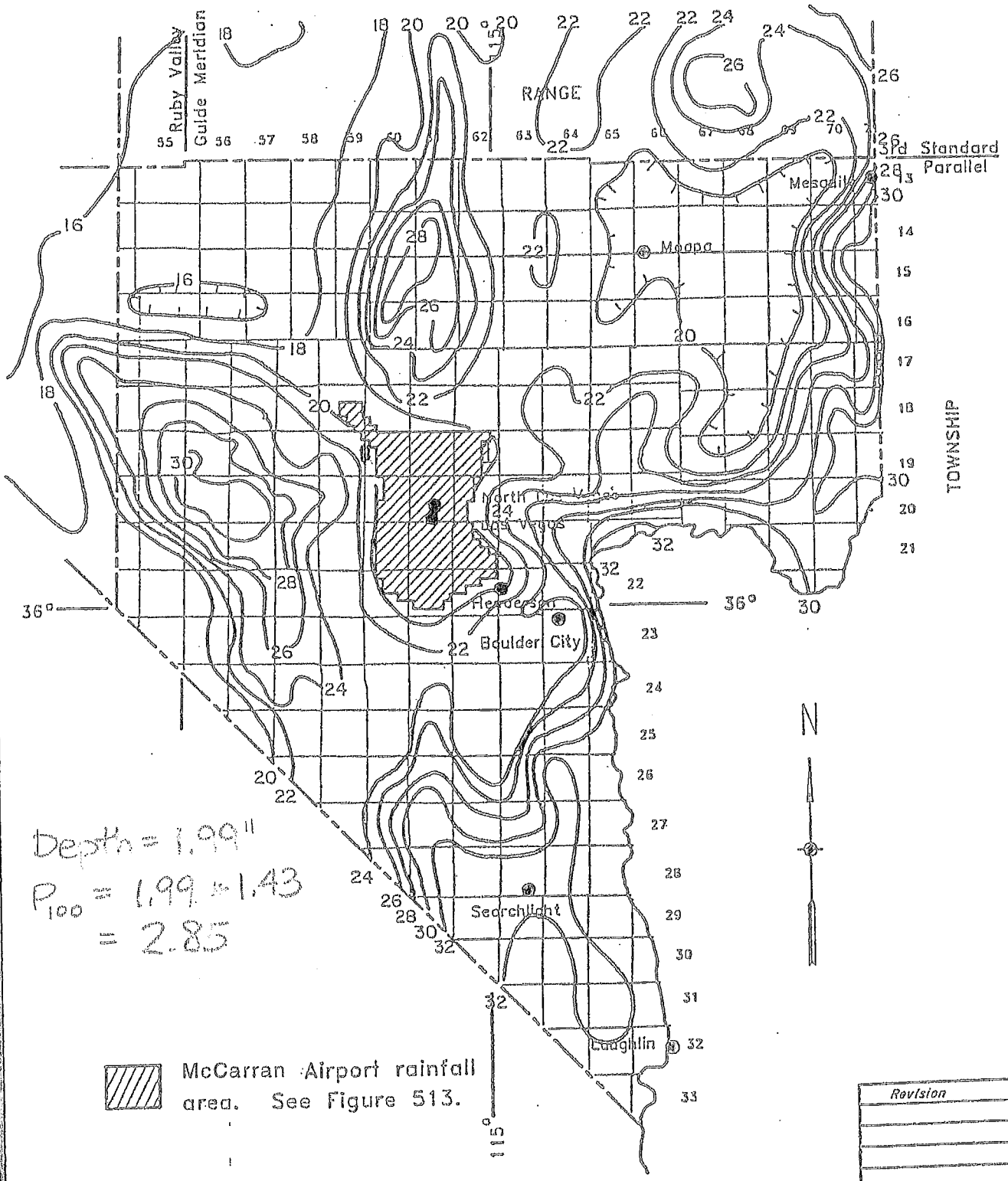
Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 503

RAINFALL DEPTH-DURATION-FREQUENCY
100-YEAR, 6-HOUR
(DEPTHS IN TENTHS OF INCHES)



Depth = 1.99"

P_{100} = 1.99 × 1.43

= 2.85

McCarran Airport rainfall area. See Figure 513.

Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 506

PRECIPITATION ADJUSTMENT RATIOS

Recurrence Interval	Ratio to NOAA Atlas 2
2-year	1.00
5-year	1.16
10-year	1.24
25-year	1.33
50-year	1.39
100-year	1.43

NOTE: 1. Multiply the values obtained from the NOAA Atlas 2 by the above ratios to obtain the adjusted precipitation values.

2. NOAA Atlas 2 values for use with TR-55 shall not be adjusted by the above ratios.

3. Tables 505 and 506 require no adjustments.

Revision	Date

SIX HOUR DEPTH-AREA REDUCTION FACTORS

Drainage Area (Square Miles)	Six-Hour Depth-Area Reduction Factor
0.0	1.00
0.5	0.98
1.0	0.97
2.0	0.93
4.0	0.91
6.0	0.90
8.0	0.88
10.0	0.86
20.0	0.79
30.0	0.74
50.0	0.68
100.0	0.60
150.0	0.55
200.0	0.51
300.0	0.46
400.0	0.42
500.0	0.39

NOTES: 1. A graphical representation of these factors is presented in Figure 514.

2. Consult with the local entity and/or the CCRFCD for guidance in using the Depth-Area Reduction Factors for drainage areas greater than 200 square miles.

Revision	Date

Curve Number Computations

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

Soil & Curve Number Computation

Project Name: Rancho Road System - Elkhorn
Date: Fort Apache to Grand Canyon
File Name: CLV1201 90% Composite_CN_Calculation.xlsx
By: ARP/KC

Data: **Reference:**

Soil Type & Description		A	B	C	D
191	Dalian very cobbly fine sandy loam, 2 to 8 percent slopes	5%	85%	0%	10%

Exhibit G
SCS Soil Data

Land Use	A	B	C	D
Residential (40,000 sf)	51	68	79	84
Residential (20,000 sf)	54	70	80	85
Residential (14,000 sf)	57	72	81	86
Residential (10,000 sf)	61	75	83	87
Residential (6,000 sf)	80	87	90	92
Residential (<6,000 sf)	89	92	94	95
Roadway	98	98	98	98
Commercial	89	92	94	95

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP A	B	C	D	LAND USE CN A	B	C	D	SUBAREA ACRES	CALCULATED CN
MDI1	191	54.7%	Residential (20,000 sf)	5%	85%	0%	10%	54	70	80	85	5.47	38.67
	191	45.3%	Roadway	5%	85%	0%	10%	98	98	98	98	4.53	44.39
TOTAL PERCENT		100.0%									TOTAL AREA	10.00	**83.07**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP A	B	C	D	LAND USE CN A	B	C	D	SUBAREA ACRES	CALCULATED CN
MDI2	191	13.0%	Residential (40,000 sf)	5%	85%	0%	10%	51	68	79	84	4.12	8.92
	191	33.8%	Residential (20,000 sf)	5%	85%	0%	10%	54	70	80	85	10.72	23.87
	191	30.3%	Residential (8,000 sf)	5%	85%	0%	10%	73	82	88	90	9.61	24.93
	191	12.8%	Commercial	5%	85%	0%	10%	89	92	94	95	4.06	11.78
	191	10.2%	Roadway	5%	85%	0%	10%	98	98	98	98	3.24	10.00
TOTAL PERCENT		100.0%									TOTAL AREA	31.75	**79.50**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP A	B	C	D	LAND USE CN A	B	C	D	SUBAREA ACRES	CALCULATED CN
MDI3	191	8.4%	Residential (40,000 sf)	5%	85%	0%	10%	51	68	79	84	4.13	5.80
	191	29.5%	Residential (20,000 sf)	5%	85%	0%	10%	54	70	80	85	14.43	20.85
	191	8.4%	Residential (14,000 sf)	5%	85%	0%	10%	57	72	81	86	4.12	6.11
	191	39.4%	Residential (8,000 sf)	5%	85%	0%	10%	73	82	88	90	19.26	32.41
	191	14.3%	Roadway	5%	85%	0%	10%	98	98	98	98	7.00	14.02
TOTAL PERCENT		100.0%									TOTAL AREA	48.94	**79.19**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP A	B	C	D	LAND USE CN A	B	C	D	SUBAREA ACRES	CALCULATED CN
MDI4	191	100.0%	Roadway	5%	85%	0%	10%	98	98	98	98	1.37	98.00
TOTAL PERCENT		100.0%									TOTAL AREA	1.37	**98.00**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP A	B	C	D	LAND USE CN A	B	C	D	SUBAREA ACRES	CALCULATED CN
MDI5	191	100.0%	Roadway	5%	85%	0%	10%	98	98	98	98	1.12	98.00
TOTAL PERCENT		100.0%									TOTAL AREA	1.12	**98.00**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP A	B	C	D	LAND USE CN A	B	C	D	SUBAREA ACRES	CALCULATED CN
MDI6	191	100.0%	Roadway	5%	85%	0%	10%	98	98	98	98	0.56	98.00
TOTAL PERCENT		100.0%									TOTAL AREA	0.56	**98.00**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP A	B	C	D	LAND USE CN A	B	C	D	SUBAREA ACRES	CALCULATED CN
MDI7	191	100.0%	Residential (6,000 sf)	5%	85%	0%	10%	80	87	90	92	34.60	87.15
TOTAL PERCENT		100.0%									TOTAL AREA	34.60	**87.15**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP A	B	C	D	LAND USE CN A	B	C	D	SUBAREA ACRES	CALCULATED CN
MDI8	191	100.0%	Roadway	5%	85%	0%	10%	98	98	98	98	2.60	98.00
TOTAL PERCENT		100.0%									TOTAL AREA	2.60	**98.00**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
MDI9	191	100.0%	Roadway	5%	85%	0%	10%	98	98	98	98	0.72	98.00
TOTAL PERCENT		100.0%									TOTAL AREA	0.72	**98.00**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
MDI10	191	67.6%	Residential (7,000 sf)	5%	85%	0%	10%	76	84	89	91	2.25	56.96
	191	32.4%	Roadway	5%	85%	0%	10%	98	98	98	98	1.08	31.78
TOTAL PERCENT		100.0%									TOTAL AREA	3.33	**88.74**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
18DI1	191	100.0%	Roadway	5%	85%	0%	10%	98	98	98	98	1.00	98.00
TOTAL PERCENT		100.0%									TOTAL AREA	1.00	**98.00**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
18DI2	191	100.0%	Roadway	5%	85%	0%	10%	98	98	98	98	1.05	98.00
TOTAL PERCENT		100.0%									TOTAL AREA	1.05	**98.00**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
18DI3	191	85.9%	Residential (7,000 sf)	5%	85%	0%	10%	76	84	89	91	3.48	72.44
	191	14.1%	Roadway	5%	85%	0%	10%	98	98	98	98	0.57	13.79
TOTAL PERCENT		100.0%									TOTAL AREA	4.05	**86.23**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
18DI4	191	45.3%	Residential (<6,000 sf)	5%	85%	0%	10%	89	92	94	95	0.92	41.76
	191	54.7%	Roadway	5%	85%	0%	10%	98	98	98	98	1.11	53.59
TOTAL PERCENT		100.0%									TOTAL AREA	2.03	**95.35**

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
18DI5	191	100.0%	Roadway	5%	85%	0%	10%	98	98	98	98	0.57	98.00
TOTAL PERCENT		100.0%									TOTAL AREA	0.57	**98.00**

RUNOFF CURVE NUMBERS
(URBAN AREAS[1])

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
See Table 602A					
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94

1 Average runoff condition, and $I_a = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system. Impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using Figure 603.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using Figure 603 based on the impervious area percentage (CN #98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using Figure 603 based on the degree of development impervious area percentage) and the CN's for the newly graded pervious areas.

Revision	Date

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

Average Lot Size or Usage[1]	Percent Impervious[2]	Curve Number for Hydrologic Soil Groups			
		A	B	C	D
Apartments/Condos	72	81	88	91	93
Townhouses/6,000 sq ft lots or less[3]	69	80	87	90	92
7,000 sq ft lots	63	76	84	89	91
8,000 sq ft lots	58	73	82	88	90
10,000 sq ft lots	38	61	75	83	87
14,000 sq ft lots	30	57	72	81	86
20,000 sq ft lots	25	54	70	80	85
40,000 sq ft lots	20	51	68	79	84
80,000 sq ft lots	12	46	65	77	82

1 Lot size should represent the size of the average lot and not the gross acreage divided by the number of lots.
2 Actual percent impervious value should be compared to selected land use type.
3 In cases where average residential lots are smaller than 6,000 sq ft, commercial/business/industrial land use should be used.

Revision	Date

REFERENCE:

TABLE 602A

Lag Time Computations, Standard Form 4

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL
TIME OF CONCENTRATION

Project Name: RANCHO ROAD SYSTEM - ELKHORN
Description: FORT APACHE TO GRAND CANYON
File Name: CLV1201 90 % Std Form 4.xls
By: AP/KC
Date: Aug-13

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check Urbanized Basins		Tlag
DESIG:	DEV./EX (D or E)	CN	K [1]	AREA Ac	AREA Mi^2 [2]	INITIAL LENGTH Feet	SLOPE %	Ti Min [3]	TRAVEL LENGTH Feet	SLOPE %	V1 VELOCITY FPS [4]	V2 VELOCITY FPS [5]	Tt Min [6]	Tc Calc. [7]	Total Length Feet [8]	Tc Check [9]	Tlag Hours [10]
NW53-CA	Referenced from the Rancho-Fort Apache Storm Drain Project by Louis Berger Group																
MDI1	D	83.1	0.707	10.00	0.0156	270	1.00	11.64	1770	3.50	3.78	5.72	5.90	17.54	2040	21.333	0.175
MDI2	D	79.5	0.659	31.76	0.0496	100	1.00	7.93	2873	3.50	3.78	5.72	9.11	17.04	2973	26.517	0.170
MDI3	D	79.2	0.655	48.93	0.0765	140	1.00	9.47	2837	2.70	3.32	5.03	10.26	19.73	2977	26.539	0.197
MDI4	D	98.0	0.904	1.37	0.0021	15	2.00	1.09	1300	0.40	1.28	1.94	13.41	14.50	1315	17.306	0.145
MDI5	D	98.0	0.904	1.12	0.0018	40	2.00	1.77	837	3.50	3.78	5.72	3.19	4.96	877	14.872	0.050
MDI6	D	98.0	0.904	0.56	0.0009	40	2.00	1.77	425	3.50	3.78	5.72	1.87	3.65	465	12.583	0.050
MDI7	D	87.2	0.760	34.60	0.0541	110	1.00	6.41	2110	1.60	2.56	3.87	10.19	16.61	2220	22.333	0.166
MDI8	D	98.0	0.904	2.60	0.0041	20	2.00	1.25	1410	0.80	1.81	2.74	10.15	11.41	1430	17.944	0.114
MDI9	D	98.0	0.904	0.72	0.0011	40	2.00	1.77	586	3.50	3.78	5.72	2.46	4.23	626	13.478	0.050
MDI10	D	88.7	0.781	3.33	0.0052	100	1.00	5.74	1250	3.50	3.78	5.72	4.39	10.12	1350	17.500	0.101
18DI1	D	98.0	0.904	1.00	0.0016	40	2.00	1.77	475	3.50	3.78	5.72	2.09	3.87	515	12.861	0.050
18DI2	D	98.0	0.904	1.05	0.0016	40	2.00	1.77	690	3.50	3.78	5.72	2.76	4.53	730	14.056	0.050
18DI3	D	86.2	0.748	4.05	0.0063	110	1.00	6.64	1547	3.50	3.78	5.72	5.25	11.89	1657	19.206	0.119
18DI4	D	95.4	0.869	2.03	0.0032	100	1.00	4.16	920	3.50	3.78	5.72	3.43	7.59	1020	15.667	0.076
18DI5	D	98.0	0.904	0.57	0.0009	40	2.00	1.77	380	3.50	3.78	5.72	1.68	3.45	420	12.333	0.050

[1] K = 0.0132 (CN) - 0.39
[2] A = Area/640
[3] Ti = (1.8 (1.1-K) L^0.5)/S^0.33
[4] For Existing Conditions: V1 = 14.8 * (S/100)^0.5
For Developed Conditions: V1 = 20.2 * (S/100)^0.5
[5] For Existing Conditions: V2 = 29.4 * (S/100)^0.5
For Developed Conditions: V2 = 30.6 * (S/100)^0.5
[6] Tt = L/(60*V)
[7] Tc = Ti + Tt
[8] Total L = Initial L + Travel L
[9] Tc = (L/180) + 10
[10] Tlag = (0.6*Tc)/60
[11] Min Tlag =0.05

Note: For Travel Time Calcs: V1 applies to first 500 feet and V2 applies to remaining distance.

REFERENCE :

STANDARD FORM 4

Local Analysis - Ultimate Condition HEC-1 Analysis

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   14AUG13  TIME  09:35:02   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X              X       X X
XXXXXXX  XXXX     XXXXX  X      X  X
X     X  X        X      X      X   X
X     X  X        X     X       X    X
X     X  XXXXXXX  XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

              *DIAGRAM
    1         ID     SLATER HANIFAN GROUP
    2         ID     RANCHO ROAD SYSTEM - ELKHORN
    3         ID     LOCAL DRAINAGE ANALYSIS ULTIMATE CONDITIONS
    4         ID     LOCAL DRAINAGE ANALYSIS UTILIZED FOR DESIGN OF DROP INLET, DESIGN OF
    5         ID     LATERAL STORM DRAINS AND ESTABLISHMENT OF DESIGN FLOWS IN EXISTING
    6         ID     18-INCH PARALLEL STORM DRAIN SYSTEM (SOUTH SIDE OF ELKHORN)
    7         ID
    8         ID     RETURN PERIOD -------- 100 AND 10-YEAR
    9         ID     DISTRIBUTION --------- 6-HOUR SDN3
   10         ID     PROJECT NO. ---------- CLV1201.000
   11         ID     FILENAME ------------- ELKHORN.H1
   12         ID     DATE ----------------- AUGUST 2013
   13         ID     MODELED BY ----------- ARP/KC
   14         ID     CHECKED BY ----------- MJF
   15         ID
   16         ID        SIX HOUR DEPTH-AREA REDUCTION FACTORS
   17         ID        DRAINAGE AREA (MI^2)          DARF
   18         ID                  SHG (0-0.5 MI^2)         1.00
   19         ID                  LBG (0-0.5 MI^2)         0.99
   20         ID
   21         ID        PRECIPITATION
   22         ID        STORM EVENT          RATIO
   23         ID        100-YEAR                1.00
   24         ID         10-YEAR                0.57
   25         ID
   26         IT      5       0       0     300
   27         IO      5       0       0
   28         IN      5       0       0
   29         JR    PREC    1.00    0.99    0.57
              *

   30         KK  NW53CA
   31         KM   NW53-CA REFERENCED FROM RANCHO-FORT APACHE STORM DRAIN PROJECT
   32         KM   PREPAPRED BY LOUIS BERGER GROUP AS SUPPLEMENTAL ANALYSIS AND
   33         KM   INCLUDED AS HEC-1 MODEL FASD_SDN3.OUT RUN DATE 07NOV12
   34         BA   0.064
   35         PB    2.85
   36         PC      0   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
   37         PC  0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
   38         PC  0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
   39         PC  0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
   40         PC  0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
   41         PC  0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
   42         PC  0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
   43         PC  0.998   0.999       1
   44         LS      0    79.1
   45         UD  0.176
              *
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1 HEC-1 INPUT PAGE 2

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LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   46         KK     SEV
   47         KM   FLOW SPLIT AT SEVERENCE AND GRAND CANYON
   48         KM   REMAINING FLOW GOES EAST ON SEVERENCE
   49         KM   PIMA COUNTY METHOD
   50         KM   FLOW SPLIT REFERENCED FROM RANCHO-FORT APACHE STORM DRAIN PROJECT
   51         KM   PREPAPRED BY LOUIS BERGER GROUP AS SUPPLEMENTAL ANALYSIS AND
   52         KM   INCLUDED AS HEC-1 MODEL FASD_SDN3.OUT RUN DATE 07NOV12
   53         DT    DSGC
   54         DI       0      50     100     150     200     250     350     500     750
   55         DQ       0       9      16      23      29      38      60      80     129
              *

   56         KK    DSGC
   57         KM   RETRIEVE FLOWS SOUTH ON GRAND CANYON
   58         DR    DSGC
              *

   59         KK    MDI3
   60         KM   BASIN DRAINING TO DROP INLET ON MAIN ELKHORN SYSTEM
   61         BA   .0765
   62         LS      0    79.2
   63         UD  0.197
              *

   64         KK  CPMDI3
   65         KM   COMBINE DSGC FRON FLOW SPLIT AND MDI3 AT ELKHORN AND GRAND CANYON
   66         HC       2
              *

   67         KK    MDI1
   68         KM   BASIN DRAINING TO DROP INLET ON MAIN ELKHORN SYSTEM
   69         BA   .0156
   70         LS      0    83.1
   71         UD  0.175
              *

   72         KK    MDI2
   73         KM   BASIN DRAINING TO DROP INLET ON MAIN ELKHORN SYSTEM
   74         BA   .0496
   75         LS      0    79.5
   76         UD  0.170
              *

   77         KK    MDI4
   78         KM   BASIN DRAINING TO DROP INLET ON MAIN ELKHORN SYSTEM
```

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 79          BA   .0021
 80          LS      0    98.0
 81          UD   0.145
             *
1                                        HEC-1 INPUT                                        PAGE  3

LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 82          KK    MDI5
 83          KM   BASIN DRAINING TO DROP INLET ON MAIN ELKHORN SYSTEM
 84          BA   .0018
 85          LS      0    98.0
 86          UD   0.050
             *

 87          KK  DUMCP1
 88          KM   DUMMY CONTROL POINT
 89          HC      4
             *

 90          KK    MDI6
 91          KM   BASIN DRAINING TO DROP INLET ON MAIN ELKHORN SYSTEM
 92          BA   .0009
 93          LS      0    98.0
 94          UD   0.050
             *

 95          KK    MDI7
 96          KM   BASIN DRAINING TO DROP INLET ON MAIN ELKHORN SYSTEM
 97          BA   .0541
 98          LS      0    87.2
 99          UD   0.166
             *

100          KK    MDI8
101          KM   BASIN DRAINING TO DROP INLET ON MAIN ELKHORN SYSTEM
102          BA   .0041
103          LS      0    98.0
104          UD   0.114
             *

105          KK    MDI9
106          KM   BASIN DRAINING TO DROP INLET ON MAIN ELKHORN SYSTEM
107          BA   .0011
108          LS      0    98.0
109          UD   0.050
             *

110          KK   MDI10
111          KM   BASIN DRAINING TO DROP INLET ON MAIN ELKHORN SYSTEM
112          BA   .0052
113          LS      0    88.7
114          UD   0.101
             *

115          KK  DUMCP2
116          KM   DUMMY CONTROL POINT
117          HC      5
             *
1                                        HEC-1 INPUT                                        PAGE  4

LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

118          KK   18DI1
119          KM   BASIN DRAINING TO DROP INLET ON EXISTING 18" ELKHORN SYSTEM
120          BA   .0016
121          LS      0    98.0
122          UD   0.050
             *

123          KK   18DI2
124          KM   BASIN DRAINING TO DROP INLET ON EXISTING 18" ELKHORN SYSTEM
125          BA   .0016
126          LS      0    98.0
127          UD   0.050
             *

128          KK   18DI3
129          KM   BASIN DRAINING TO DROP INLET ON EXISTING 18" ELKHORN SYSTEM
130          BA   .0063
131          LS      0    86.2
132          UD   0.119
             *

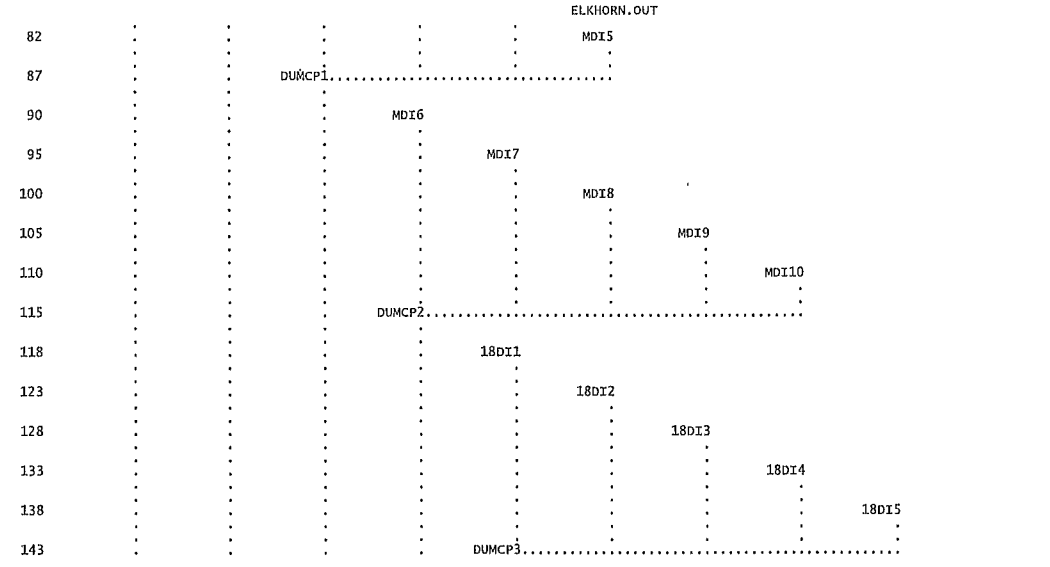
133          KK   18DI4
134          KM   BASIN DRAINING TO DROP INLET ON EXISTING 18" ELKHORN SYSTEM
135          BA   .0032
136          LS      0    95.4
137          UD   0.076
             *

138          KK   18DI5
139          KM   BASIN DRAINING TO DROP INLET ON EXISTING 18" ELKHORN SYSTEM
140          BA   .0009
141          LS      0    98.0
142          UD   0.050
             *

143          KK  DUMCP3
144          KM   DUMMY CONTROL POINT
145          HC      5
             *
146          ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
 LINE     (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR        (<----) RETURN OF DIVERTED OR PUMPED FLOW

  30      NW53CA
            .
            .
  53        .-------->    DSGC
  46      SEV
            .
            .
  58        .           .<-------    DSGC
  56        .       DSGC
            .         .
            .         .
  59        .         .       MDI3
            .         .         .
            .         .         .
  64        .      CPMDI3.............
            .         .
            .         .
  67        .         .       MDI1
            .         .         .
            .         .         .
  72        .         .         .       MDI2
            .         .         .         .
            .         .         .         .
  77        .         .         .         .       MDI4
            .         .         .         .         .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1**********
* *
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* *
* RUN DATE 14AUG13 TIME 09:35:02 *
* *
****

****
* *
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
* *
****

SLATER HANIFAN GROUP
RANCHO ROAD SYSTEM - ELKHORN
LOCAL DRAINAGE ANALYSIS ULTIMATE CONDITIONS
LOCAL DRAINAGE ANALYSIS UTILIZED FOR DESIGN OF DROP INLET, DESIGN OF
LATERAL STORM DRAINS AND ESTABLISHMENT OF DESIGN FLOWS IN EXISTING
18-INCH PARALLEL STORM DRAIN SYSTEM (SOUTH SIDE OF ELKHORN)

RETURN PERIOD ------- 100 AND 10-YEAR
DISTRIBUTION -------- 6-HOUR SDN3
PROJECT NO. ---------- CLV1201.000
FILENAME ------------- ELKHORN.H1
DATE ----------------- AUGUST 2013
MODELED BY ----------- ARP/KC
CHECKED BY ----------- MJF

SIX HOUR DEPTH-AREA REDUCTION FACTORS

DRAINAGE AREA (MI^2)	DARF
SHG (0-0.5 MI^2)	1.00
LBG (0-0.5 MI^2)	0.99

PRECIPITATION

STORM EVENT	RATIO
100-YEAR	1.00
10-YEAR	0.57

27 IO OUTPUT CONTROL VARIABLES
IPRNT 5 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
NMIN 5 MINUTES IN COMPUTATION INTERVAL
IDATE 1 0 STARTING DATE
ITIME 0000 STARTING TIME
NQ 300 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 2 0 ENDING DATE
NDTIME 0055 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
1.00 .99 .57

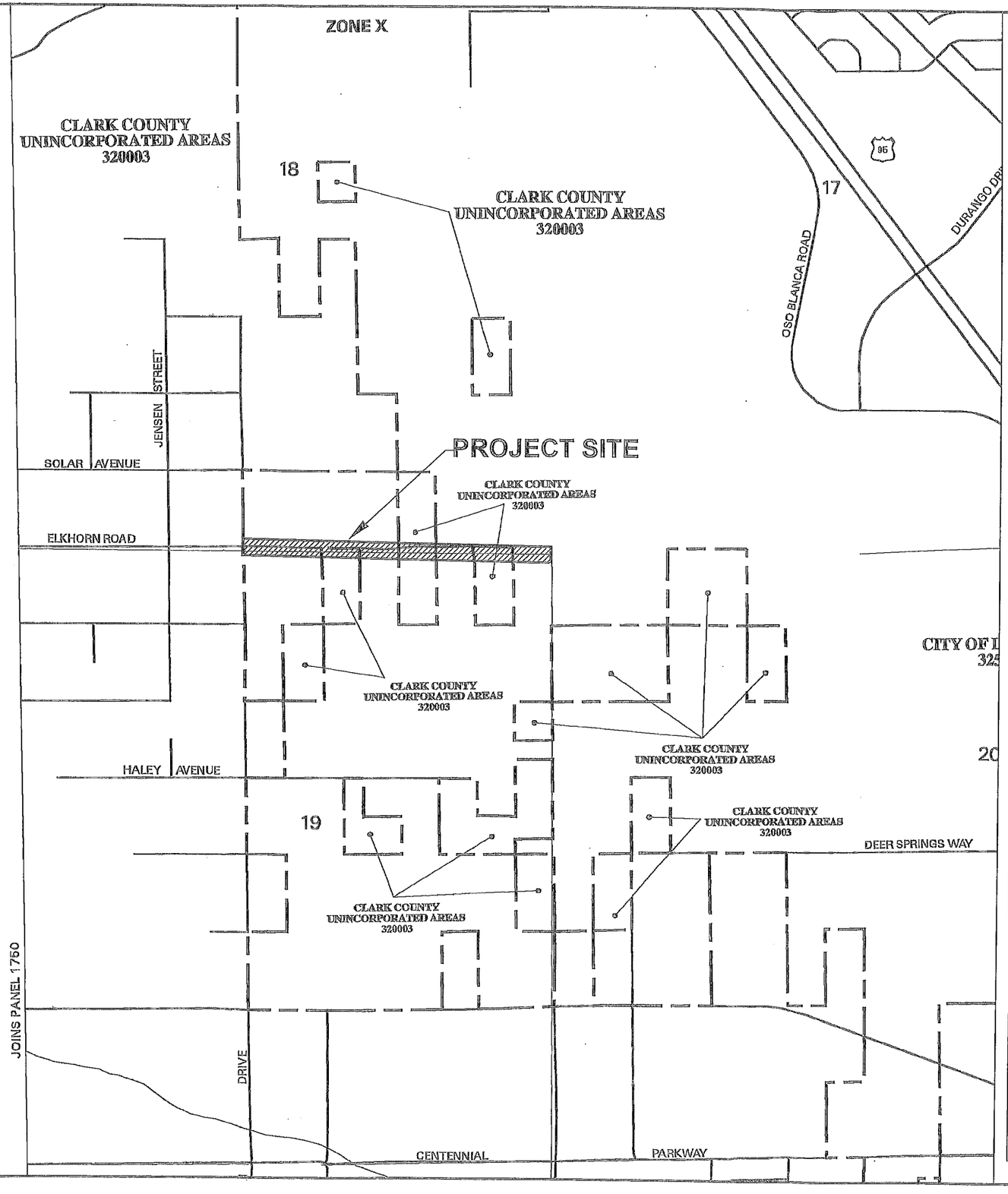
1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 1.00	RATIO 2 .99	RATIO 3 .57
HYDROGRAPH AT							
+	NW53CA	.06	1	FLOW	56.	55.	16.
				TIME	3.58	3.58	3.67
DIVERSION TO							
+	DSGC	.06	1	FLOW	10.	10.	3.
				TIME	3.58	3.58	3.67
HYDROGRAPH AT							
+	SEV	.06	1	FLOW	46.	45.	13.
				TIME	3.58	3.58	3.67

HYDROGRAPH AT							
+	DSGC	.00	1	FLOW	10.	10.	3.
				TIME	3.58	3.58	3.67
HYDROGRAPH AT							
+	MDI3	.08	1	FLOW	64.	63.	18.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CPMDI3	.08	1	FLOW	73.	72.	21.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	MDI1	.02	1	FLOW	17.	17.	6.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	MDI2	.05	1	FLOW	45.	44.	13.
				TIME	3.58	3.58	3.67
HYDROGRAPH AT							
+	MDI4	.00	1	FLOW	4.	4.	2.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	MDI5	.00	1	FLOW	4.	4.	2.
				TIME	3.50	3.50	3.50
4 COMBINED AT							
+	DUMCP1	.07	1	FLOW	68.	67.	22.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	MDI6	.00	1	FLOW	2.	2.	1.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	MDI7	.05	1	FLOW	72.	71.	29.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	MDI8	.00	1	FLOW	8.	8.	4.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	MDI9	.00	1	FLOW	3.	3.	1.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	MDI10	.01	1	FLOW	8.	8.	3.
				TIME	3.50	3.50	3.50
5 COMBINED AT							
+	DUMCP2	.07	1	FLOW	90.	89.	38.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	18DI1	.00	1	FLOW	4.	4.	2.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	18DI2	.00	1	FLOW	4.	4.	2.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	18DI3	.01	1	FLOW	9.	8.	3.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	18DI4	.00	1	FLOW	7.	7.	4.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	18DI5	.00	1	FLOW	2.	2.	1.
				TIME	3.50	3.50	3.50
5 COMBINED AT							
+	DUMCP3	.01	1	FLOW	24.	24.	8.
				TIME	3.50	3.50	3.50

*** NORMAL END OF HEC-1 ***



0 1000 2000
SCALE – 1"=1000' FEET

N

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.
ZONE A99	Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); base flood elevations determined.
	FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

	OTHER FLOOD AREAS
ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
	OTHER AREAS
ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.
	COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
	OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain Boundary
	Floodway Boundary
	Zone D Boundary
	Coastal Barrier Boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross Section Line
23 — 23	Transect Line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276000M	1000-meter Universal Transverse Mercator grid values, zone 11
600000 FT	5000-foot grid ticks
DX5519	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1745 E

FIRM
FLOOD INSURANCE RATE MAP
CLARK COUNTY, NEVADA AND INCORPORATED AREAS

PANEL 1745 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAS VEGAS, CITY OF	325276	1745	E
CLARK COUNTY, UNINCORPORATED AREAS	320003	1745	E

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
32003C1745 E

MAP REVISED:
SEPTEMBER 27, 2002

Federal Emergency Management Agency

CITY OF LAS VEGAS
RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
FEMA FIRM MAP

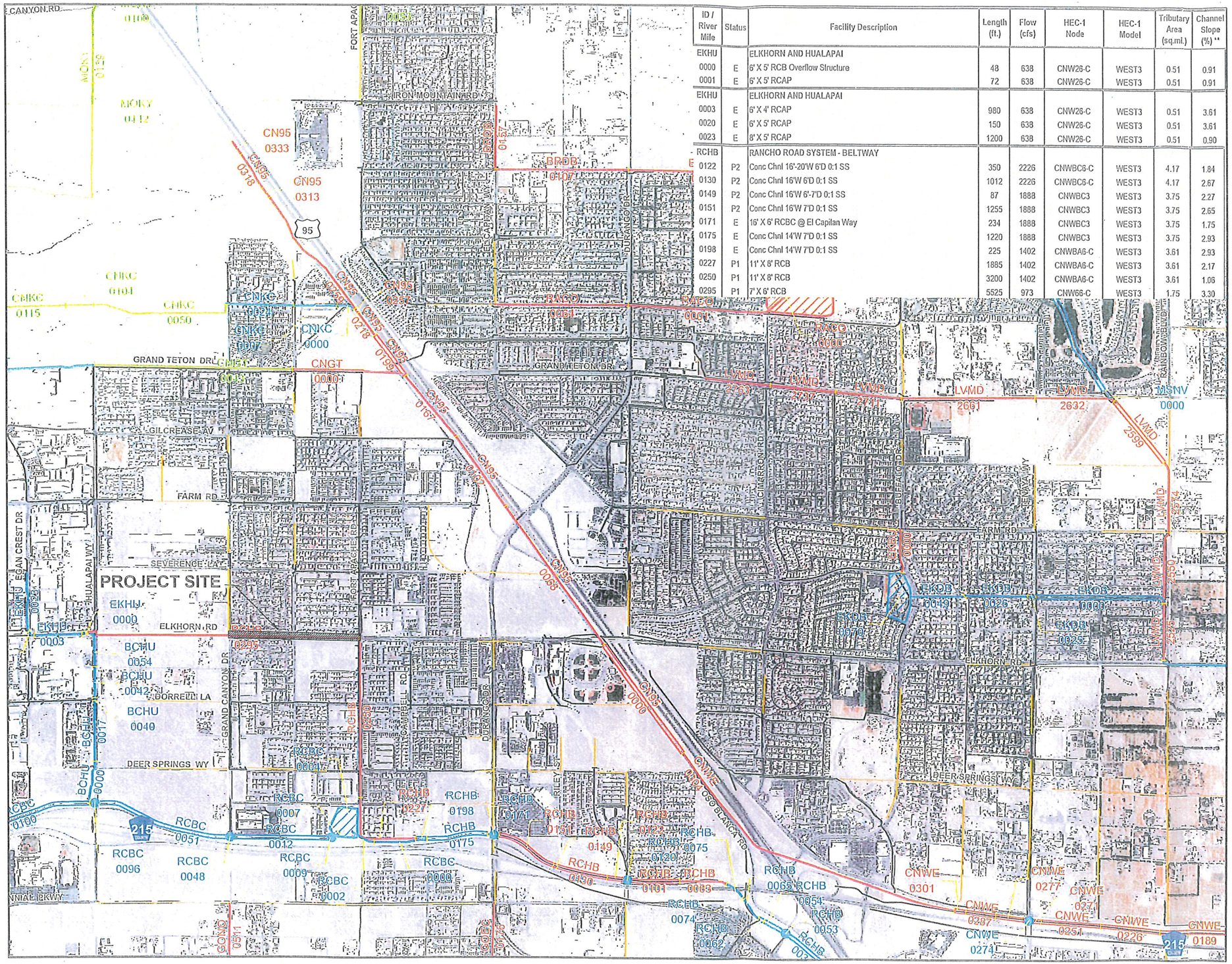
NO.	DESCRIPTION	DATE	BY	APP. DATE	APP.

SLATER HANIFAN GROUP
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PHONE (702) 284-6300 FAX (702) 284-6399

DATE: FEB 2013
DRAFTER: KC
DESIGNER: KC
CHECKED: MJF
PROJECT NO.
CLV1201-000

EXHIBIT B
SHEET 1 OF 1

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ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
EKHU		ELKHORN AND HUALAPAI						
0000	E	6' X 5' RCB Overflow Structure	48	638	CNW26-C	WEST3	0.51	0.91
0001	E	6' X 5' RCAP	72	638	CNW26-C	WEST3	0.51	0.91
EKHU		ELKHORN AND HUALAPAI						
0003	E	6' X 4' RCAP	980	638	CNW26-C	WEST3	0.51	3.61
0020	E	6' X 5' RCAP	150	638	CNW26-C	WEST3	0.51	3.61
0023	E	8' X 5' RCAP	1200	638	CNW26-C	WEST3	0.51	0.90
RCHB		RANCHO ROAD SYSTEM - BELTWAY						
0122	P2	Conc Chnl 16'-20'W 6'D 0:1 SS	350	2226	CNWBC6-C	WEST3	4.17	1.84
0130	P2	Conc Chnl 16'W 6'D 0:1 SS	1012	2226	CNWBC6-C	WEST3	4.17	2.67
0149	P2	Conc Chnl 16'W 6'-7'D 0:1 SS	87	1888	CNWBC3	WEST3	3.75	2.27
0151	P2	Conc Chnl 16'W 7'D 0:1 SS	1255	1888	CNWBC3	WEST3	3.75	2.65
0171	E	16' X 6' RCBC @ El Capilan Way	234	1888	CNWBC3	WEST3	3.75	1.75
0175	E	Conc Chnl 14'W 7'D 0:1 SS	1220	1888	CNWBC3	WEST3	3.75	2.93
0198	E	Conc Chnl 14'W 7'D 0:1 SS	225	1402	CNWBA6-C	WEST3	3.61	2.93
0227	P1	11' X 8' RCB	1885	1402	CNWBA6-C	WEST3	3.61	2.17
0250	P1	11' X 8' RCB	3200	1402	CNWBA6-C	WEST3	3.61	1.06
0295	P1	7' X 6' RCB	5525	973	CNW66-C	WEST3	1.75	3.30

REGIONAL FLOOD CONTROL DISTRICT

2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F-13
FLOOD CONTROL FACILITIES

LEGEND

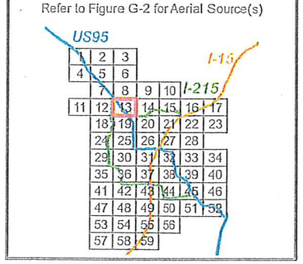
- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin
- Culvert or Bridge Crossing
- Stormdrain
- Lined Channel
- Unlined Channel
- Levee/Dike
- Natural Wash/Floodway
- ID-Mile Separator

Remove & Replace/Parallel Facilities

Category A	Category B
Channel	Channel
Stormdrain	Stormdrain
Crossing	Crossing

N

0 500 1,000 2,000 3,000
Feet
Scale: 1 inch = 2,000 feet
Refer to Figure G-2 for Aerial Source(s)



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CITY OF LAS VEGAS

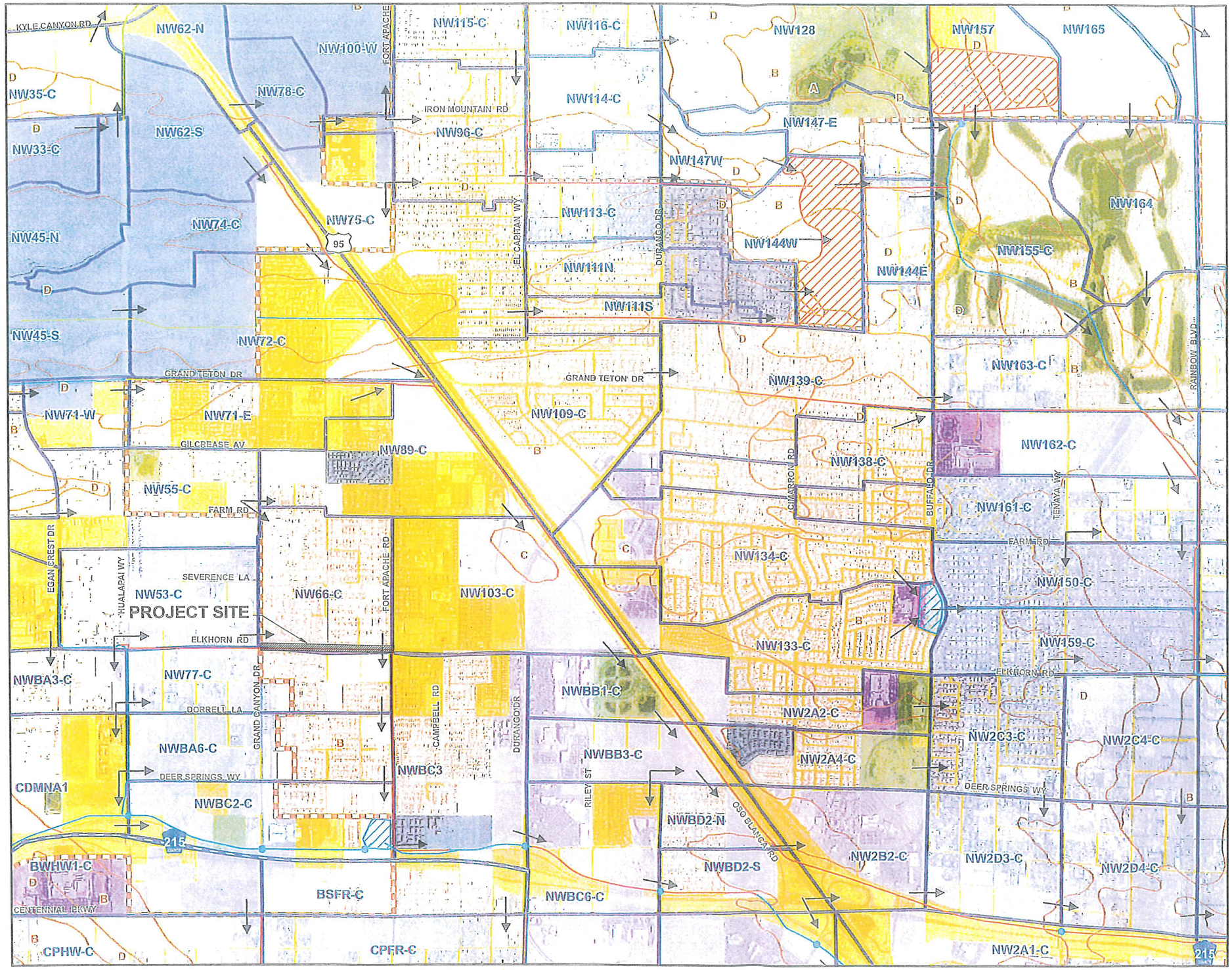
RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

CCRFCD 2008 MPU FACILITIES MAP

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PROJECT NO.	CLV1201-000

EXHIBIT C
SHEET 1 OF 1

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REGIONAL FLOOD CONTROL DISTRICT

2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE H-13
HYDROLOGIC SUMMARY

LEGEND

- Ultimate Development Boundary
- Watershed Boundary
- Subbasin Boundary
- Drought Ordinance Boundary
- Flow Arrows

Flood Control Facilities

- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Category A Remove & Replace/ Parallel Facilities
- Category B Remove & Replace/ Parallel Facilities

Type Hydrologic Soil Groups

- A Low Runoff Potential
- B Moderately Low Runoff Potential
- C Moderately High Runoff Potential
- D High Runoff Potential/Rock Outcrops

Typical Land Use

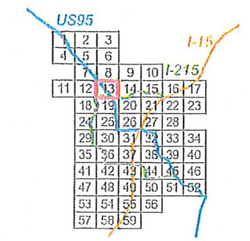
1	Undeveloped Land, Open Desert
2	Parks, Golf Courses
3	Rural
4 / 14*	Low Density Residential
5 / 15*	Medium Density Residential
6 / 16*	High Density Residential
7 / 17*	Public Facility, Residential
8 / 18*	Very High Density Residential
9 / 19*	Commerical, Retail, Casino, High Rise Condominiums
10 / 20*	Light Industrial
11 / 21*	Heavy Industrial
12 / 22*	Schools
13	Lakes

* Drought Ordinance Applied

N

0 500 1,000 2,000 3,000
Feet
Scale: 1 inch = 2,000 feet

Refer to Figure G-2 for Aerial Source(s)



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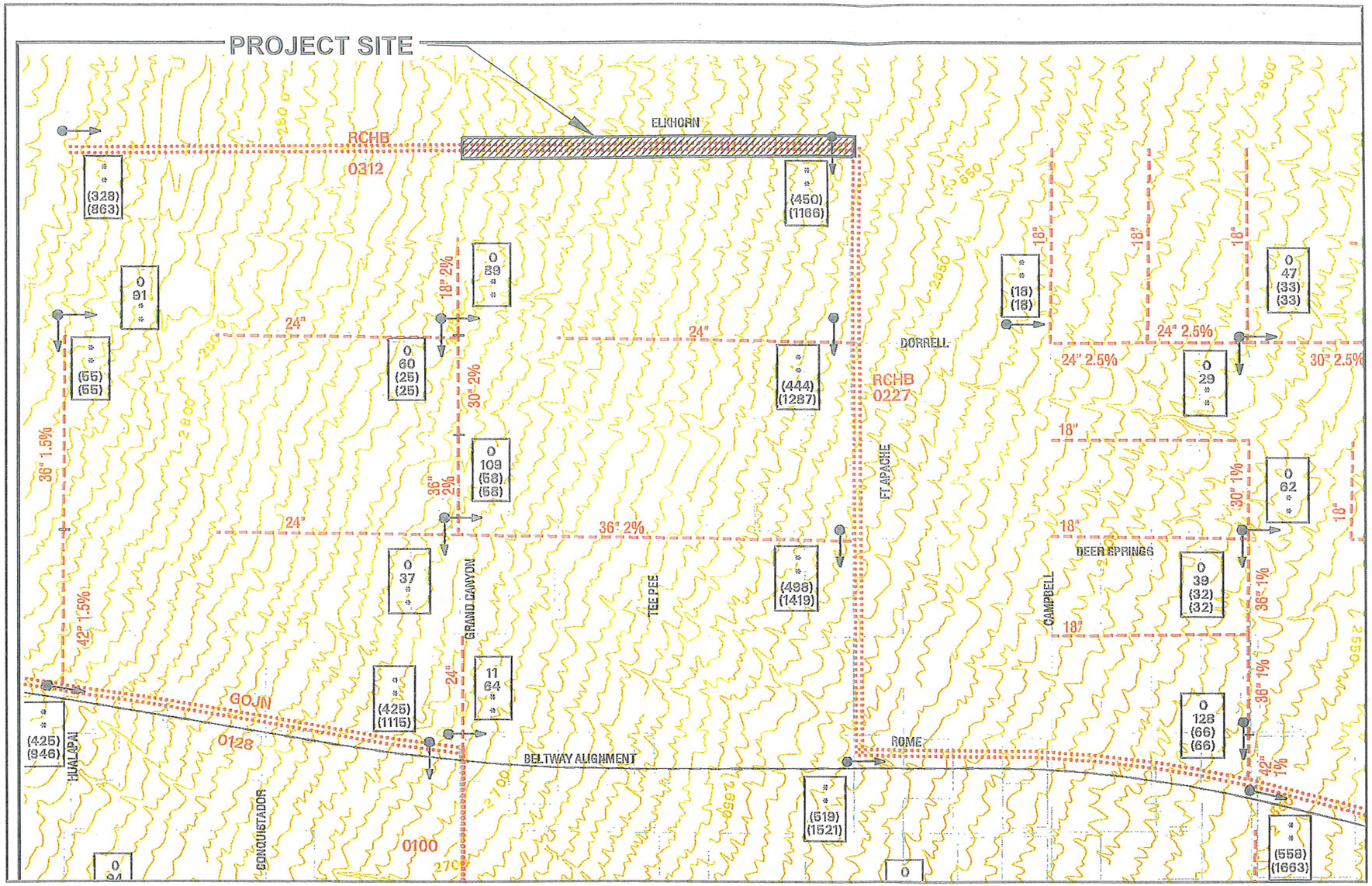
NO.	DESCRIPTION	DATE	BY	APP'D DATE	APP'D

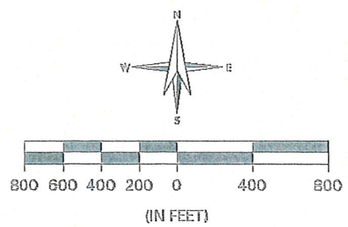
CITY OF LAS VEGAS
RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CCRFCD 2008 MPU HYDROLOGIC MAP

DATE:	FEB 2013
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EXHIBIT D
SHEET 1 OF 1

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FLOW ARROW

250	10-YEAR STREET FLOW
500	100-YEAR STREET FLOW
(300)	10-YEAR FACILITY FLOW
(800)	100-YEAR FACILITY FLOW

(FLOWS IN CFS)

NOTE:

Ultimate drainage conditions are based on future CN values with all flood control facilities in place

See the "September 1999 City of Las Vegas Northwest Neighborhood Study Phase 2" for proposed facilities in and north of Elkhorn.

REVISED SEPTEMBER 1999

CITY OF LAS VEGAS NEVADA

NORTHWEST NEIGHBORHOOD STUDY

LEGEND

- EXISTING REGIONAL DETENTION BASINS
- PROPOSED REGIONAL DETENTION BASINS
- EXISTING LOCAL DETENTION BASINS
- EXISTING REGIONAL BRIDGES
- PROPOSED REGIONAL BRIDGES
- EXISTING LOCAL BRIDGES
- EXISTING REGIONAL CULVERT
- PROPOSED REGIONAL CULVERT
- EXISTING LOCAL CULVERT
- EXISTING REGIONAL PIPELINE
- PROPOSED REGIONAL PIPELINE
- EXISTING LOCAL PIPELINE
- PROPOSED LOCAL PIPLINE
- EXISTING REGIONAL CHANNEL
- PROPOSED REGIONAL CHANNEL
- EXISTING LOCAL CHANNEL
- PROPOSED REGIONAL PIPELINE (Not included in 1999 MFU)
- PROPOSED REGIONAL CHANNEL (Not included in 1999 MFU)
- EXISTING REGIONAL DIKE/LEVEE
- PROPOSED REGIONAL DIKE/LEVEE
- EXISTING LOCAL DIKE/LEVEE
- EXISTING STORM WATER PUMPING STATION
- PROPOSED BELTWAY ALIGNMENT

FIGURE F-1

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CITY OF LAS VEGAS

RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

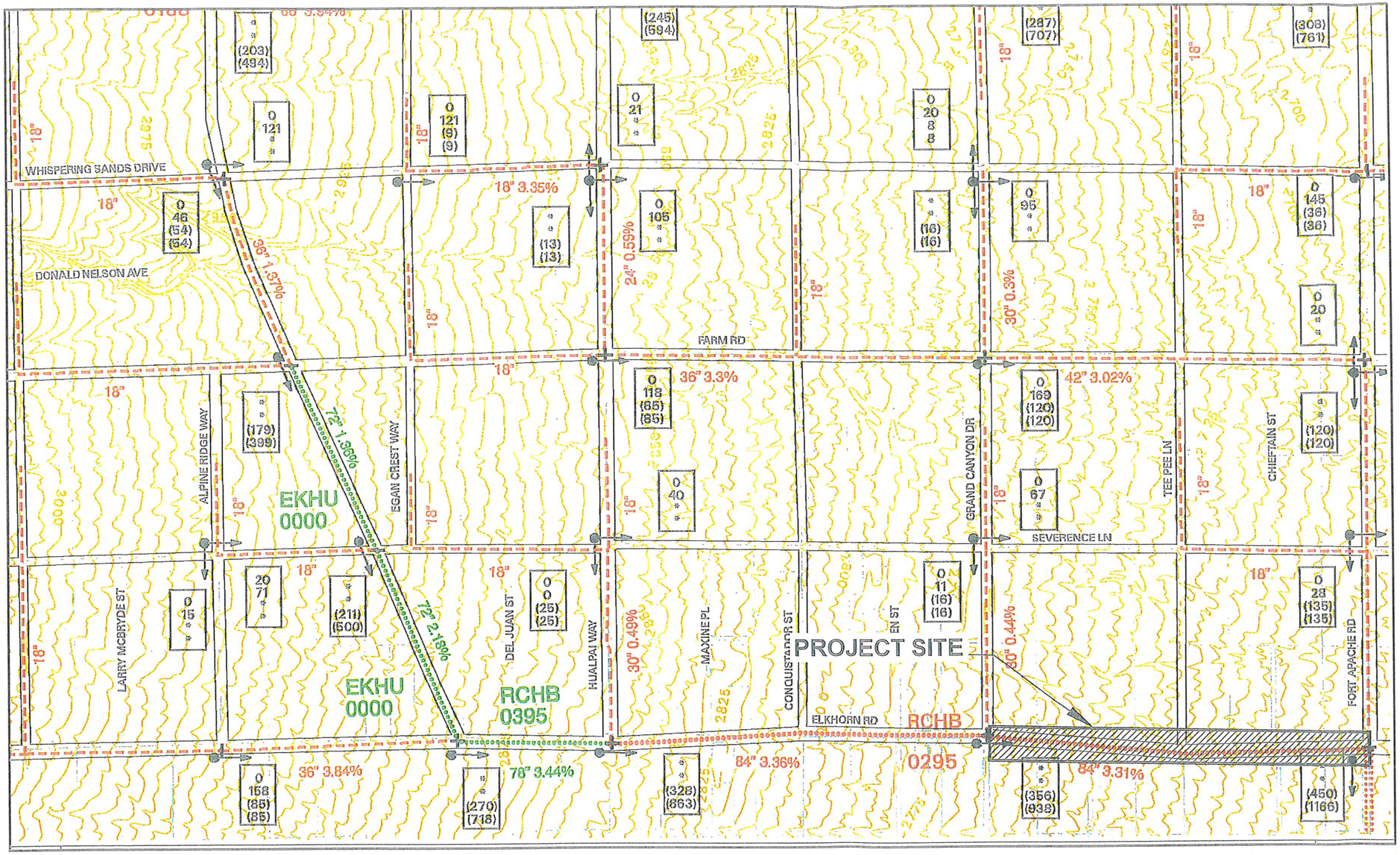
NORTHWEST NEIGHBORHOOD STUDY PHASE 1 MAPS

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EXHIBIT E

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CITY OF LAS VEGAS NEVADA

NORTHWEST NEIGHBORHOOD STUDY PHASE 2

LEGEND

- EXISTING REGIONAL DETENTION BASINS
- PROPOSED REGIONAL DETENTION BASINS (Not Included in 1996 MPU)
- EXISTING REGIONAL BRIDGES
- PROPOSED REGIONAL BRIDGES
- PROPOSED REGIONAL BRIDGES (Not Included in 1996 MPU)
- EXISTING LOCAL BRIDGES
- PROPOSED REGIONAL CULVERT
- EXISTING REGIONAL CULVERT
- EXISTING LOCAL CULVERT
- EXISTING REGIONAL PIPELINE
- PROPOSED REGIONAL PIPELINE
- PROPOSED REGIONAL PIPELINE (Not Included in 1996 MPU)
- EXISTING LOCAL PIPELINE
- PROPOSED LOCAL PIPELINE
- EXISTING REGIONAL CHANNEL
- PROPOSED REGIONAL CHANNEL
- EXISTING LOCAL CHANNEL
- PROPOSED LOCAL CHANNEL
- PROPOSED REGIONAL CHANNEL (Not Included in 1996 MPU)
- EXISTING REGIONAL DIKE/LEVEE
- PROPOSED REGIONAL DIKE/LEVEE
- PROPOSED REGIONAL DIKE/LEVEE (Not Included in 1996 MPU)
- PROPOSED LOCAL DIKE/LEVEE

N W E S

800 600 400 200 0 400 800
(IN FEET)
SCALE: 1 INCH = 800 FEET

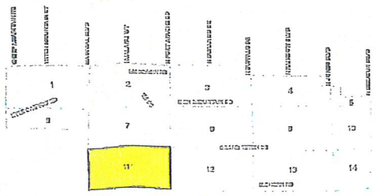
FLOW ARROW

250	10-YEAR STREET FLOW
500	100-YEAR STREET FLOW
(300)	10-YEAR FACILITY FLOW
(800)	100-YEAR FACILITY FLOW

(FLOWS IN CFS)

NOTE:
Ultimate drainage conditions are based on future CN values with all flood control facilities in place.
Regional facility identifiers were established based on the methodology used in the "1996 Clark County Regional Flood Control Master Plan Update for the Las Vegas Valley."

NOTE:
All regional facilities proposed in the "1996 Clark County Regional Flood Control Master Plan Update for the Las Vegas Valley" have been resized based on the flows developed in this study. In addition, many of these facilities have been changed from channels to reinforced concrete box culverts.



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CITY OF LAS VEGAS

RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
NORTHWEST NEIGHBORHOOD STUDY PHASE 2 MAPS

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APPENDIX C

Street Flow Computations

Street Flows Impacting Drop Inlets

Elkhorn North Half Section A
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	2.1000 %
Discharge	45.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.66 ft
Elevation Range	0.00 to 1.03
Flow Area	7.4 ft²
Wetted Perimeter	31.93 ft
Top Width	31.33 ft
Actual Depth	0.66 ft
Critical Elevation	0.83 ft
Critical Slope	0.3844 %
Velocity	6.07 ft/s
Velocity Head	0.57 ft
Specific Energy	1.23 ft
Froude Number	2.20
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.56519341e-1 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

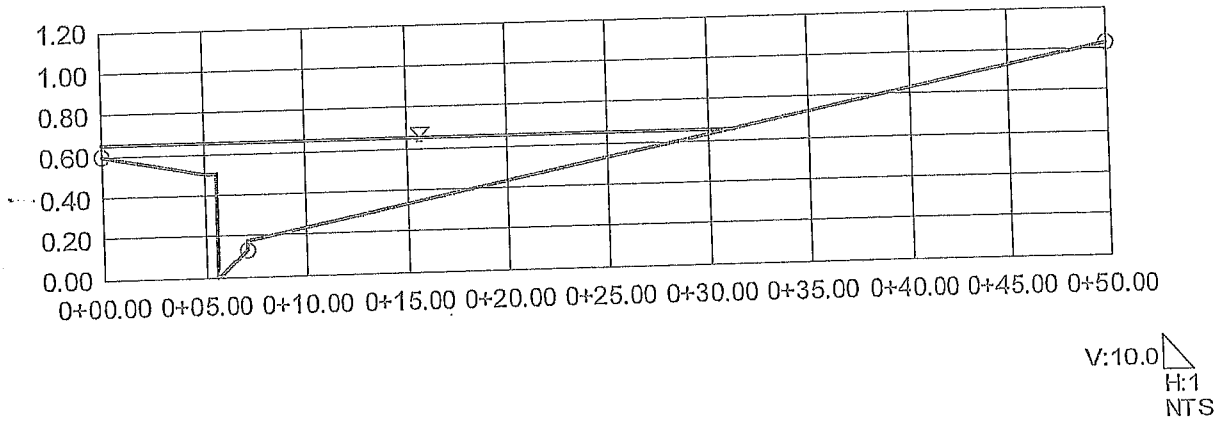
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.03

Elkhorn North Half Section A
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	2.1000 %
Water Surface Elevation	0.66 ft
Elevation Range	0.00 to 1.03
Discharge	45.00 cfs



Elkhorn South Half Section A
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Slope	2.1000	%
Discharge	15.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Water Surface Elevation	0.48	ft
Elevation Range	0.00 to 1.03	
Flow Area	3.0	ft²
Wetted Perimeter	17.38	ft
Top Width	16.85	ft
Actual Depth	0.48	ft
Critical Elevation	0.60	ft
Critical Slope	0.4405	%
Velocity	5.04	ft/s
Velocity Head	0.39	ft
Specific Energy	0.87	ft
Froude Number	2.12	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

Natural Channel Points

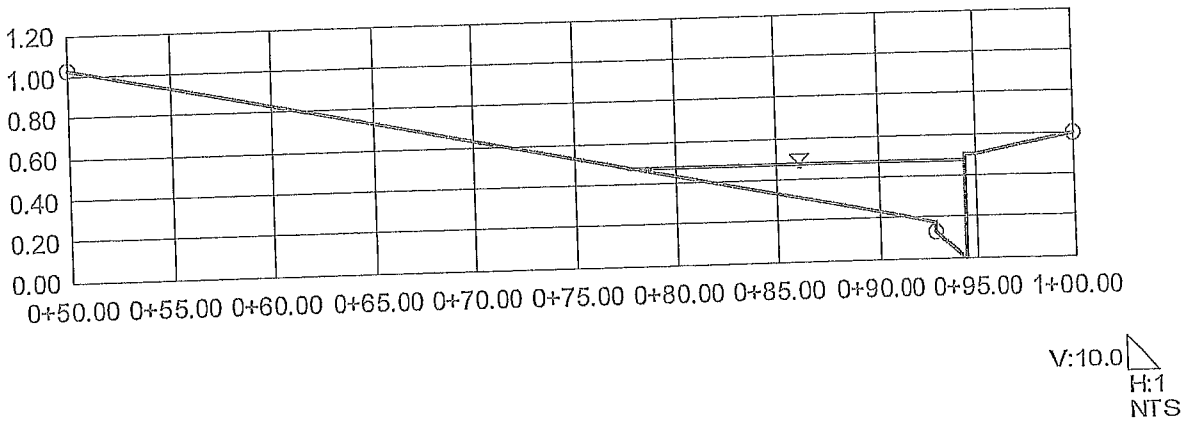
Station (ft)	Elevation (ft)
0+50.00	1.03
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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Elkhorn South Half Section A
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	2.1000 %
Water Surface Elevation	0.48 ft
Elevation Range	0.00 to 1.03
Discharge	15.00 cfs



Elkhorn South Half Section B
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	4.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.32 ft
Elevation Range	0.00 to 1.03
Flow Area	0.9 ft²
Wetted Perimeter	9.24 ft
Top Width	8.88 ft
Actual Depth	0.32 ft
Critical Elevation	0.40 ft
Critical Slope	0.5400 %
Velocity	4.33 ft/s
Velocity Head	0.29 ft
Specific Energy	0.61 ft
Froude Number	2.37
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

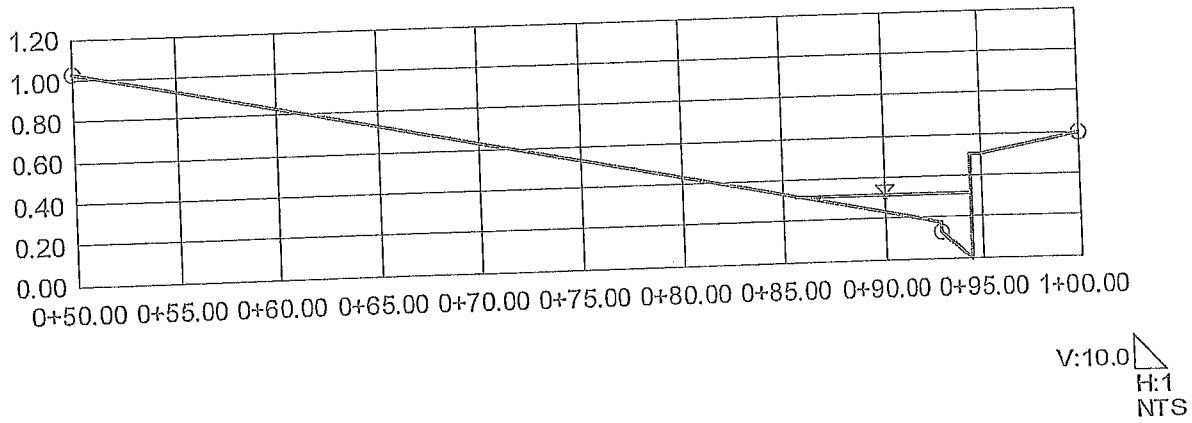
Natural Channel Points

Station (ft)	Elevation (ft)
0+50.00	1.03
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

Elkhorn South Half Section B
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.32 ft
Elevation Range	0.00 to 1.03
Discharge	4.00 cfs



Elkhorn North Half Section C
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section C
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	4.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.34 ft
Elevation Range	0.00 to 1.55
Flow Area	0.8 ft²
Wetted Perimeter	7.06 ft
Top Width	6.67 ft
Actual Depth	0.34 ft
Critical Elevation	0.44 ft
Critical Slope	0.5334 %
Velocity	4.78 ft/s
Velocity Head	0.36 ft
Specific Energy	0.69 ft
Froude Number	2.38
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

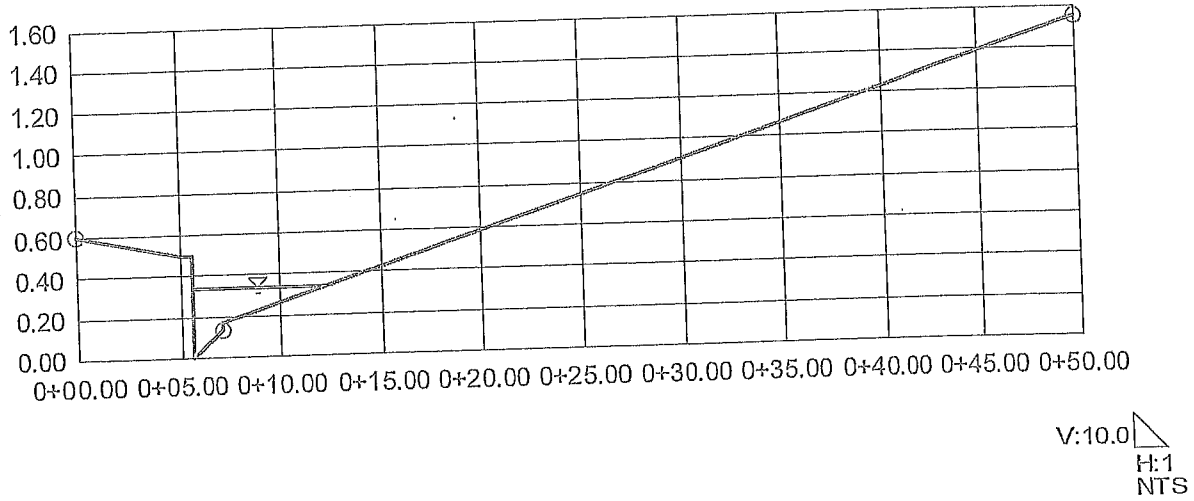
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.55

Elkhorn North Half Section C
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section C
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.34 ft
Elevation Range	0.00 to 1.55
Discharge	4.00 cfs



Elkhorn North Half Section D
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	3.30 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.32 ft
Elevation Range	0.00 to 1.72
Flow Area	0.7 ft²
Wetted Perimeter	6.09 ft
Top Width	5.72 ft
Actual Depth	0.32 ft
Critical Elevation	0.42 ft
Critical Slope	0.5518 %
Velocity	4.68 ft/s
Velocity Head	0.34 ft
Specific Energy	0.66 ft
Froude Number	2.35
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

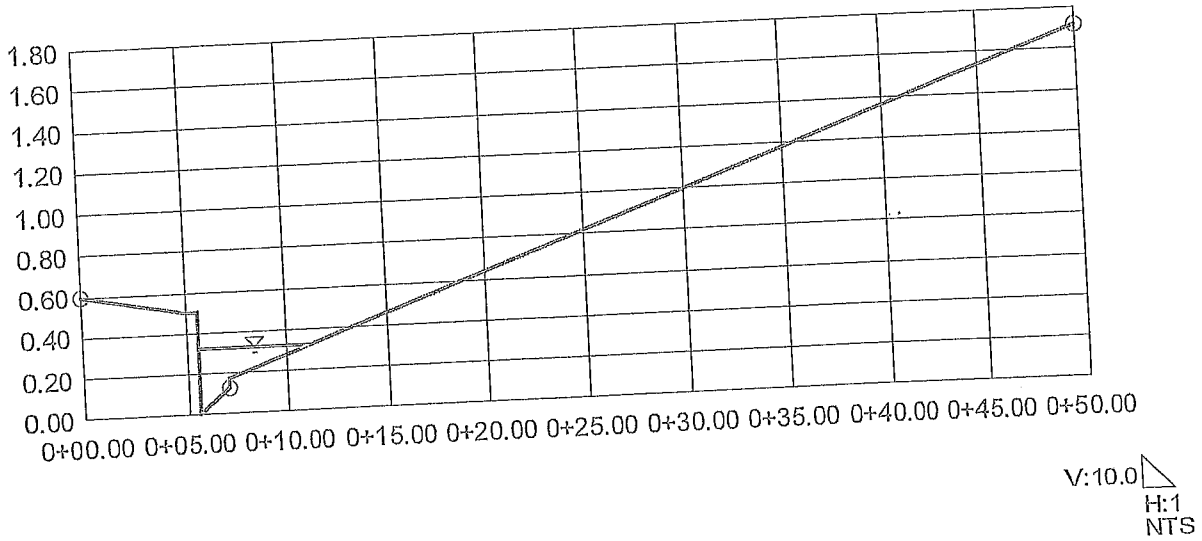
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.72

Elkhorn North Half Section D
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.32 ft
Elevation Range	0.00 to 1.72
Discharge	3.30 cfs



Elkhorn South Half Section D
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	5.80 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.36 ft
Elevation Range	0.00 to 1.29
Flow Area	1.1 ft²
Wetted Perimeter	9.23 ft
Top Width	8.82 ft
Actual Depth	0.36 ft
Critical Elevation	0.47 ft
Critical Slope	0.5030 %
Velocity	5.08 ft/s
Velocity Head	0.40 ft
Specific Energy	0.76 ft
Froude Number	2.49
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

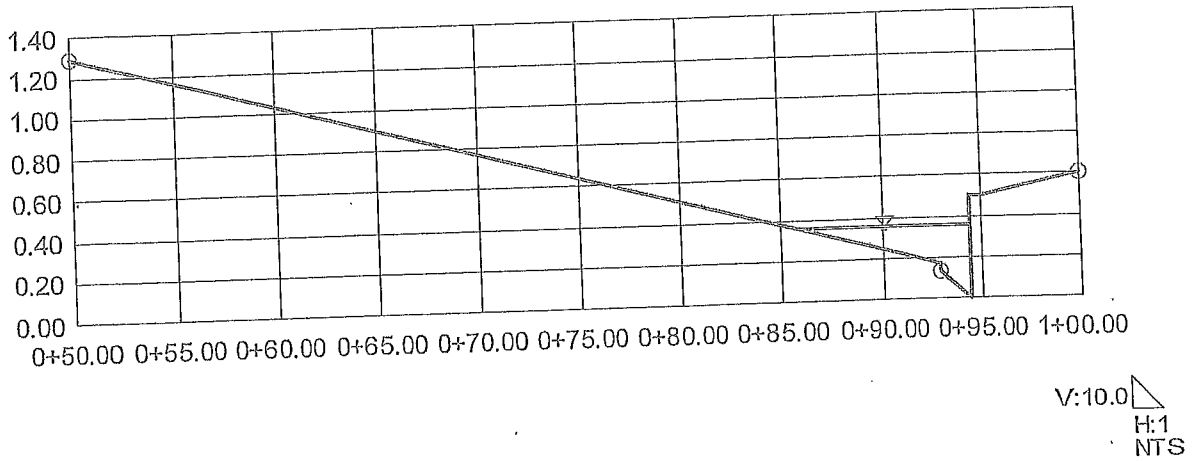
Natural Channel Points

Station (ft)	Elevation (ft)
0+50.00	1.29
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

Elkhorn South Half Section D
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.36 ft
Elevation Range	0.00 to 1.29
Discharge	5.80 cfs



Elkhorn North Half Section E
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section E
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	8.70 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.43 ft
Elevation Range	0.00 to 1.89
Flow Area	1.4 ft²
Wetted Perimeter	8.53 ft
Top Width	8.04 ft
Actual Depth	0.43 ft
Critical Elevation	0.60 ft
Critical Slope	0.4634 %
Velocity	6.19 ft/s
Velocity Head	0.59 ft
Specific Energy	1.03 ft
Froude Number	2.61
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

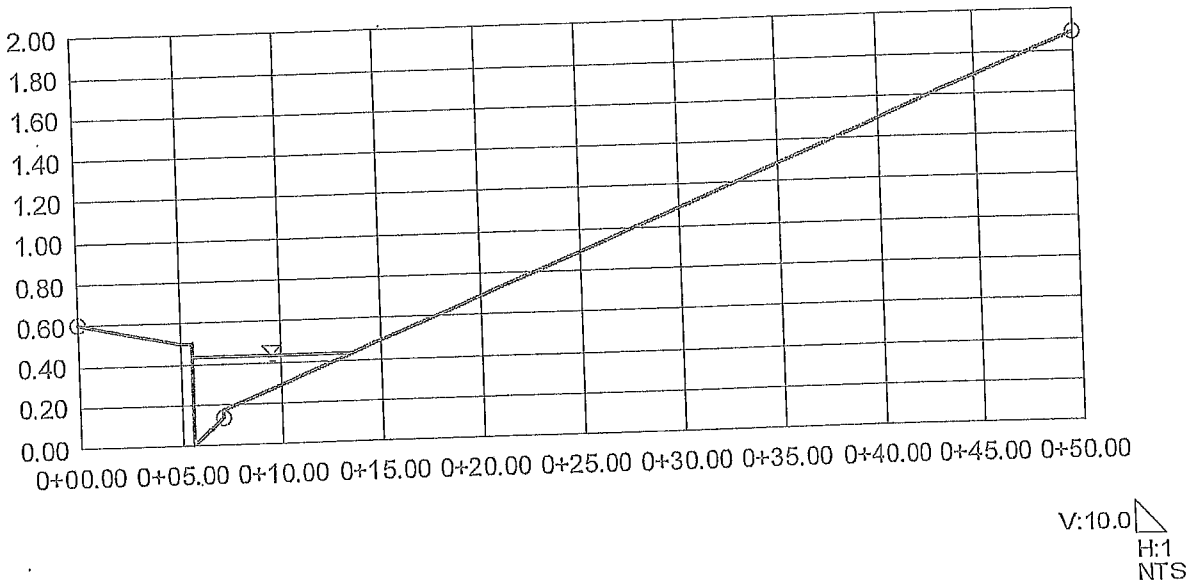
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.89

Elkhorn North Half Section E
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section E
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.4000 %
Water Surface Elevation	0.43 ft
Elevation Range	0.00 to 1.89
Discharge	8.70 cfs



Elkhorn South Half Section E
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section E
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Slope	3.4000	%
Discharge	11.70	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Water Surface Elevation	0.45	ft
Elevation Range	0.00 to 1.46	
Flow Area	1.9	ft²
Wetted Perimeter	11.30	ft
Top Width	10.80	ft
Actual Depth	0.45	ft
Critical Elevation	0.62	ft
Critical Slope	0.4465	%
Velocity	6.25	ft/s
Velocity Head	0.61	ft
Specific Energy	1.06	ft
Froude Number	2.64	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

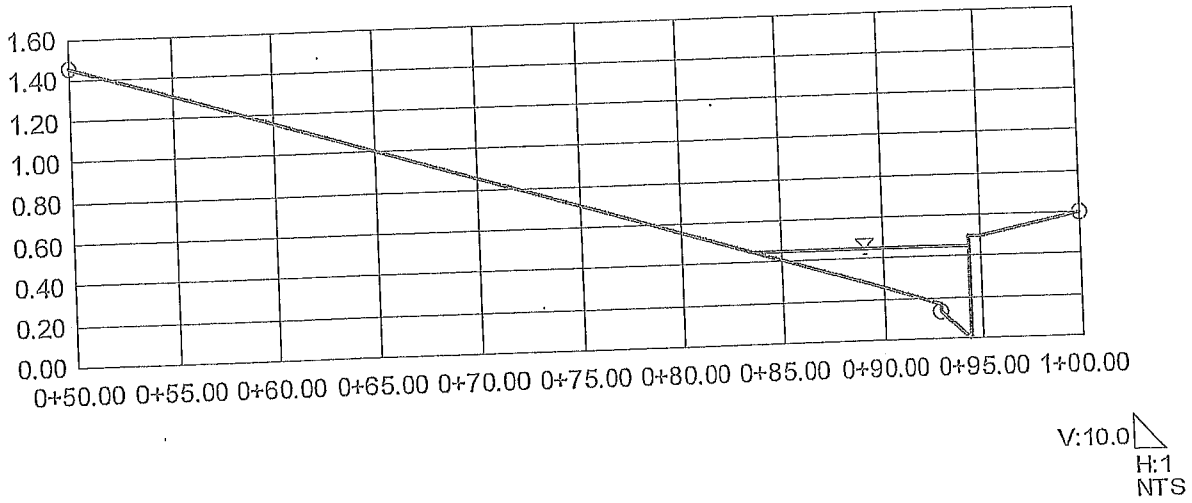
Natural Channel Points

Station (ft)	Elevation (ft)
0+50.00	1.46
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

Elkhorn South Half Section E
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section E
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.4000 %
Water Surface Elevation	0.45 ft
Elevation Range	0.00 to 1.46
Discharge	11.70 cfs



Elkhorn North Half Section F
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section F
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	7.40 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.39 ft
Elevation Range	0.00 to 1.46
Flow Area	1.3 ft²
Wetted Perimeter	9.35 ft
Top Width	8.90 ft
Actual Depth	0.39 ft
Critical Elevation	0.54 ft
Critical Slope	0.4607 %
Velocity	5.64 ft/s
Velocity Head	0.49 ft
Specific Energy	0.89 ft
Froude Number	2.59
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

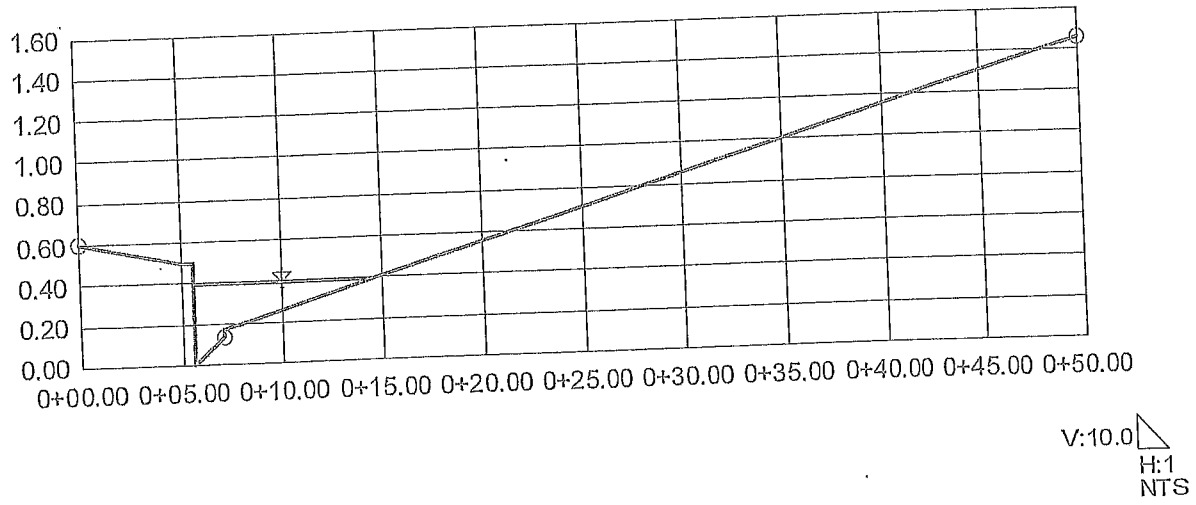
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.46

Elkhorn North Half Section F
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section F
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.4000 %
Water Surface Elevation	0.39 ft
Elevation Range	0.00 to 1.46
Discharge	7.40 cfs



Elkhorn South Half Section F
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section F
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	14.30 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.46 ft
Elevation Range	0.00 to 1.25
Flow Area	2.3 ft²
Wetted Perimeter	13.56 ft
Top Width	13.06 ft
Actual Depth	0.46 ft
Critical Elevation	0.63 ft
Critical Slope	0.4364 %
Velocity	6.30 ft/s
Velocity Head	0.62 ft
Specific Energy	1.08 ft
Froude Number	2.66
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

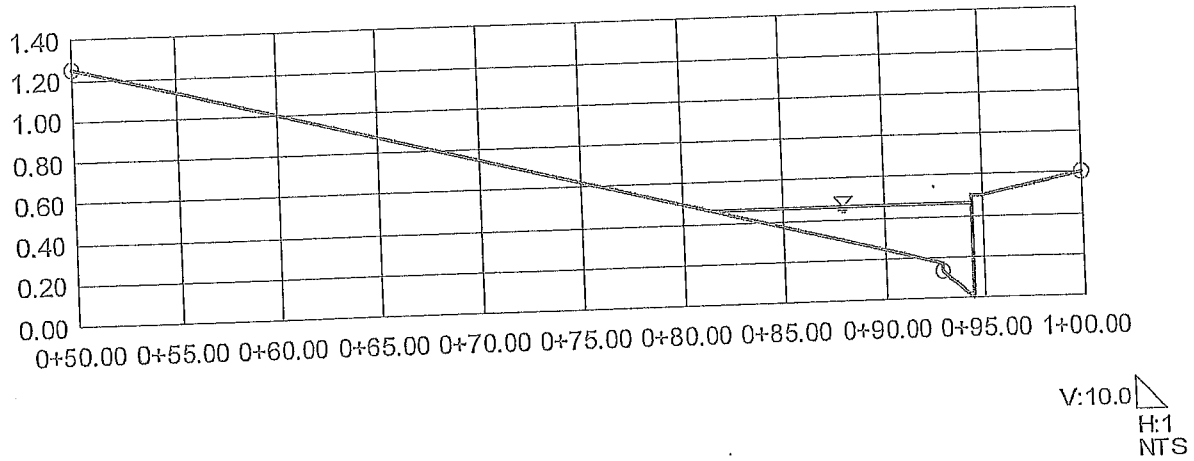
Natural Channel Points

Station (ft)	Elevation (ft)
0+50.00	1.25
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

Elkhorn South Half Section F
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section F
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.4000 %
Water Surface Elevation	0.46 ft
Elevation Range	0.00 to 1.25
Discharge	14.30 cfs



Elkhorn North Half Section G
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section G
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Slope	2.2000	%
Discharge	11.60	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Water Surface Elevation	0.49	ft
Elevation Range	0.00 to 1.68	
Flow Area	2.1	ft²
Wetted Perimeter	11.25	ft
Top Width	10.70	ft
Actual Depth	0.49	ft
Critical Elevation	0.63	ft
Critical Slope	0.4471	%
Velocity	5.45	ft/s
Velocity Head	0.46	ft
Specific Energy	0.95	ft
Froude Number	2.15	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

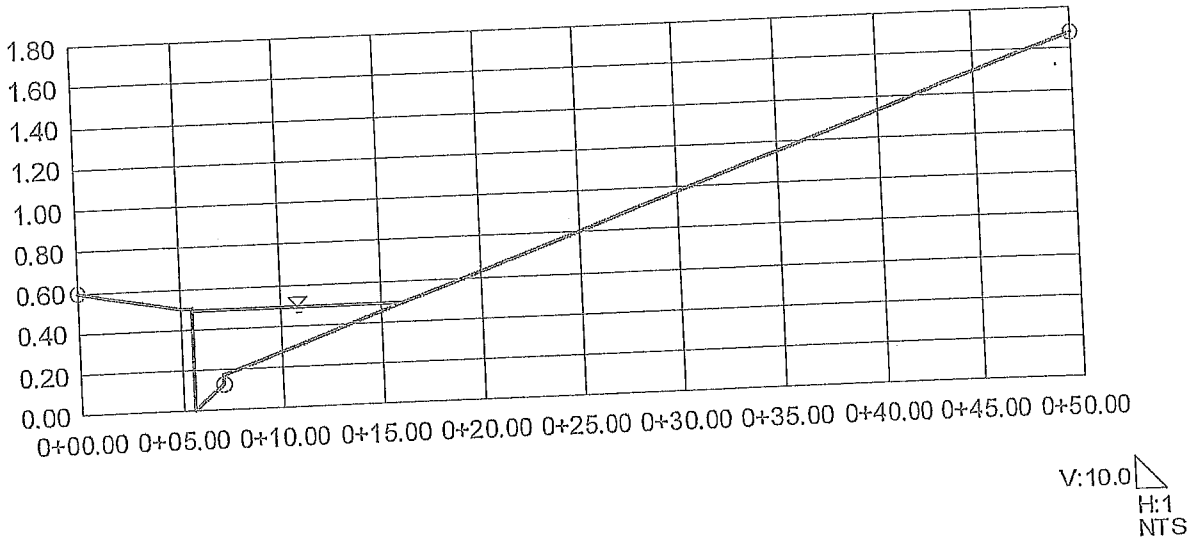
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.68

Elkhorn North Half Section G
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section G
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	2.2000 %
Water Surface Elevation	0.49 ft
Elevation Range	0.00 to 1.68
Discharge	11.60 cfs



Elkhorn South Half Section G
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section G
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	2.2000 %
Discharge	11.90 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.39 ft
Elevation Range	0.00 to 0.60
Flow Area	2.9 ft²
Wetted Perimeter	23.97 ft
Top Width	23.53 ft
Actual Depth	0.39 ft
Critical Elevation	0.47 ft
Critical Slope	0.4808 %
Velocity	4.08 ft/s
Velocity Head	0.26 ft
Specific Energy	0.65 ft
Froude Number	2.05
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

Natural Channel Points

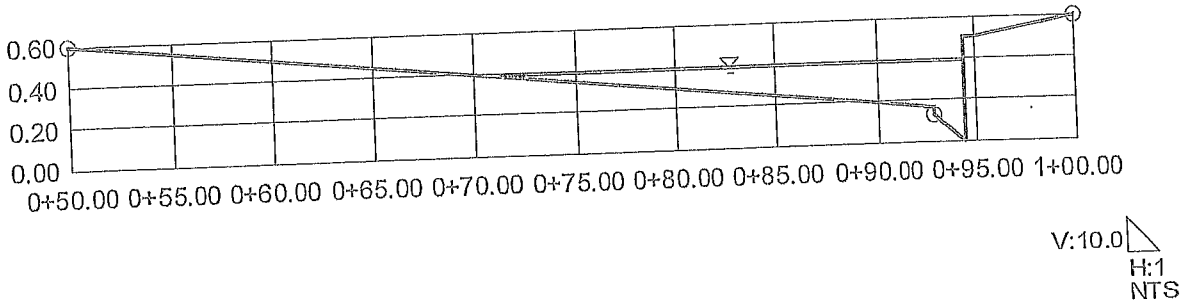
Station (ft)	Elevation (ft)
0+50.00	0.60
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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Elkhorn South Half Section G
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section G
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	2.2000 %
Water Surface Elevation	0.39 ft
Elevation Range	0.00 to 0.60
Discharge	11.90 cfs



Grand Canyon East Half Section H
Worksheet for Irregular Channel

Project Description	
Worksheet	Grand Canyon East Half Section H
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.5000 %
Discharge	4.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.41 ft
Elevation Range	0.00 to 0.83
Flow Area	1.9 ft²
Wetted Perimeter	13.89 ft
Top Width	13.44 ft
Actual Depth	0.41 ft
Critical Elevation	0.40 ft
Critical Slope	0.5497 %
Velocity	2.06 ft/s
Velocity Head	0.07 ft
Specific Energy	0.47 ft
Froude Number	0.96
Flow Type	Subcritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+40.00	0.016

Natural Channel Points

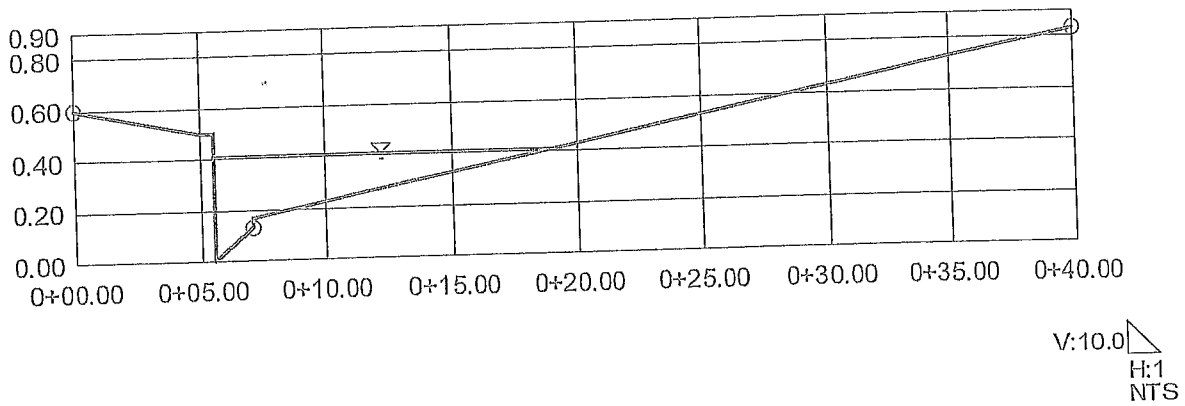
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83

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Grand Canyon East Half Section H
Cross Section for Irregular Channel

Project Description	
Worksheet	Grand Canyon East Half Section H
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	0.5000 %
Water Surface Elevation	0.41 ft
Elevation Range	0.00 to 0.83
Discharge	4.00 cfs



Grand Canyon East Half Section H - with overflow from west half
Worksheet for Irregular Channel

Project Description	
Worksheet	Grand Canyon East Half Section H - With overflow from West Half
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.5000 %
Discharge	26.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.71 ft
Elevation Range	0.00 to 0.83
Flow Area	9.2 ft²
Wetted Perimeter	34.69 ft
Top Width	34.03 ft
Actual Depth	0.71 ft
Critical Elevation	0.70 ft
Critical Slope	0.5451 %
Velocity	2.83 ft/s
Velocity Head	0.12 ft
Specific Energy	0.84 ft
Froude Number	0.96
Flow Type	Subcritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.11062803 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+40.00	0.016

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83

Grand Canyon West Half Section H
Worksheet for Irregular Channel

Project Description	
Worksheet	Grand Canyon West Half Section H
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.5000 %
Discharge	72.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.020
Water Surface Elevation	0.94 ft
Elevation Range	0.00 to 0.83
Flow Area	20.9 ft²
Wetted Perimeter	40.53 ft
Top Width	40.00 ft
Actual Depth	0.94 ft
Critical Elevation	0.89 ft
Critical Slope	0.7353 %
Velocity	3.44 ft/s
Velocity Head	0.18 ft
Specific Energy	1.13 ft
Froude Number	0.84
Flow Type	Subcritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.39313199 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+40.00	0+54.00	0.016
0+54.00	0+80.00	0.022

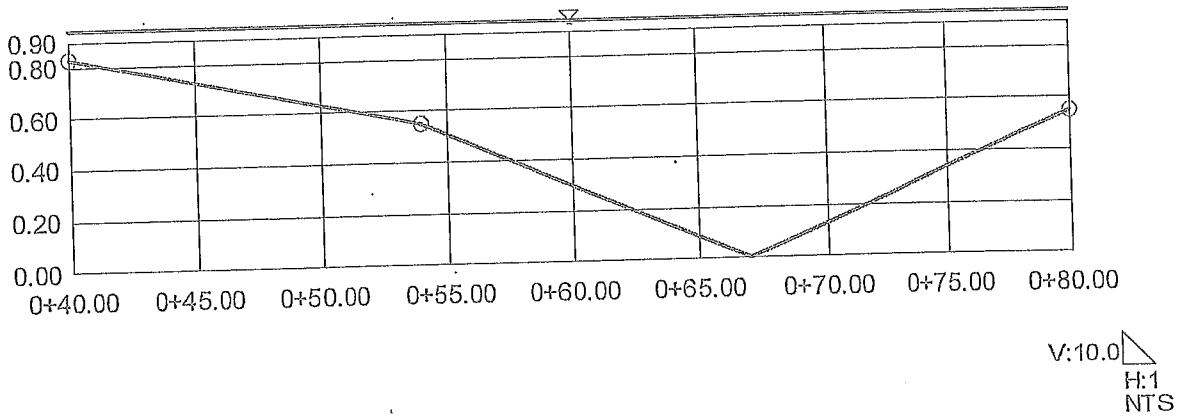
Natural Channel Points	
Station (ft)	Elevation (ft)
0+40.00	0.83
0+54.00	0.55
0+67.00	0.00
0+80.00	0.55

Notes: Note that the improvement plans of Grand Canyon show the future roadway improvement and not any interim roadway swale. A 33-ft patent easment is assumed.

Grand Canyon West Half Section H
Cross Section for Irregular Channel

Project Description	
Worksheet	Grand Canyon West Half Section H
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.020
Channel Slope	0.5000 %
Water Surface Elevation	0.94 ft
Elevation Range	0.00 to 0.83
Discharge	72.00 cfs



Grand Canyon West Half Section H - Capacity to Crown
Worksheet for Irregular Channel

Project Description	
Worksheet	Grand Canyon West Half Section H - Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	0.5000 %
Water Surface Elevation	0.83 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.019
Elevation Range	0.00 to 0.83
Discharge	49.65 cfs
Flow Area	16.4 ft²
Wetted Perimeter	40.31 ft
Top Width	40.00 ft
Actual Depth	0.83 ft
Critical Elevation	0.77 ft
Critical Slope	0.7345 %
Velocity	3.03 ft/s
Velocity Head	0.14 ft
Specific Energy	0.97 ft
Froude Number	0.83
Flow Type	Subcritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.28 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+40.00	0+54.00	0.016
0+54.00	0+80.00	0.022

Natural Channel Points	
Station (ft)	Elevation (ft)
0+40.00	0.83
0+54.00	0.55
0+67.00	0.00
0+80.00	0.55

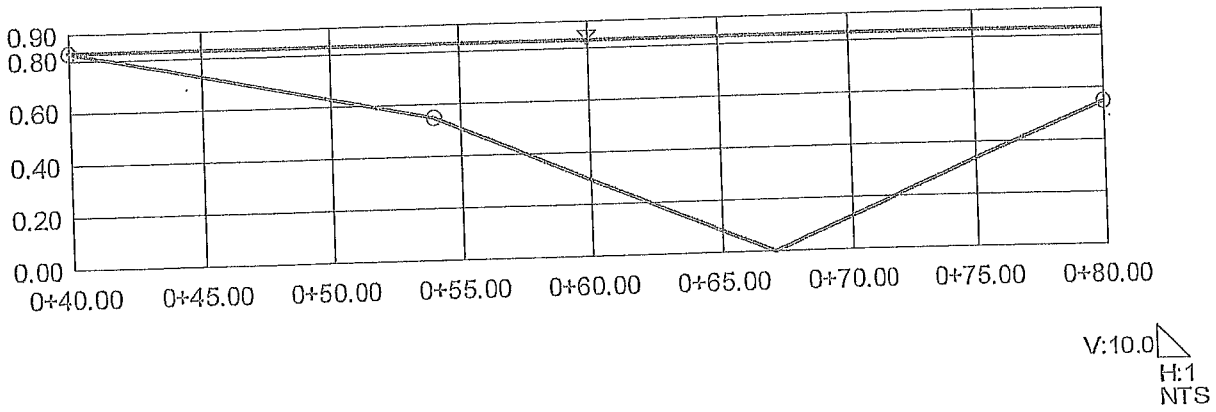
Notes: Note that the improvement plans of Grand Canyon show the future roadway improvement and not any interim roadway swale. A 33-ft patent easment is assumed.

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Grand Canyon West Half Section H
Cross Section for Irregular Channel

Project Description	
Worksheet	Grand Canyon West Half Section H - Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.019	
Channel Slope	0.5000	%
Water Surface Elevation	0.83	ft
Elevation Range	0.00 to 0.83	
Discharge	49.65	cfs



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10-Year Maximum Street Flow Capacities

10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.65 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Elevation Range	0.00 to 1.03
Discharge	56.00 cfs
Flow Area	7.3 ft²
Wetted Perimeter	31.74 ft
Top Width	31.14 ft
Actual Depth	0.65 ft
Critical Elevation	0.89 ft
Critical Slope	0.3724 %
Velocity	7.67 ft/s
Velocity Head	0.92 ft
Specific Energy	1.57 ft
Froude Number	2.79
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.5271829e-1 ft.

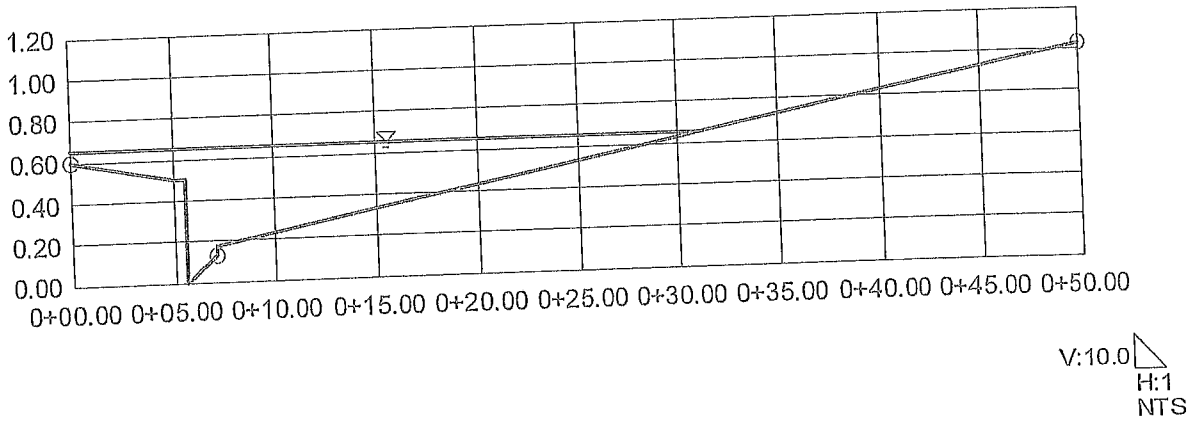
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.03

10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.4000 %
Water Surface Elevation	0.65 ft
Elevation Range	0.00 to 1.03
Discharge	56.00 cfs



10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.2% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.2% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.55
Discharge	55.29 cfs
Flow Area	6.7 ft²
Wetted Perimeter	24.81 ft
Top Width	24.14 ft
Actual Depth	0.72 ft
Critical Elevation	1.00 ft
Critical Slope	0.3732 %
Velocity	8.31 ft/s
Velocity Head	1.07 ft
Specific Energy	1.79 ft
Froude Number	2.79
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

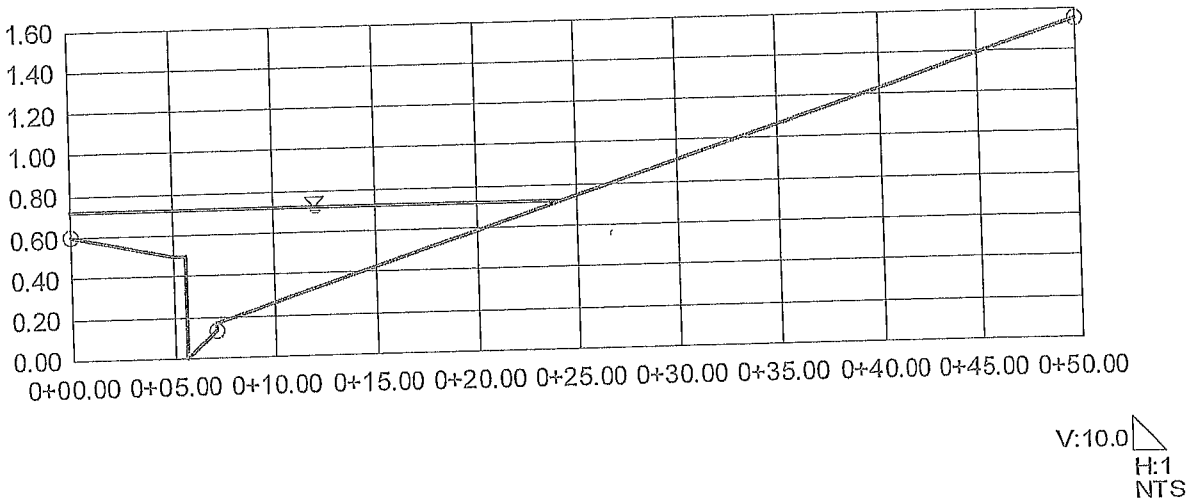
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.55

10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.2% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.2% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.55
Discharge	55.29 cfs



10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.6% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.6% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.72
Discharge	50.68 cfs
Flow Area	6.1 ft²
Wetted Perimeter	22.93 ft
Top Width	22.26 ft
Actual Depth	0.72 ft
Critical Elevation	1.00 ft
Critical Slope	0.3777 %
Velocity	8.26 ft/s
Velocity Head	1.06 ft
Specific Energy	1.78 ft
Froude Number	2.77
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

Natural Channel Points

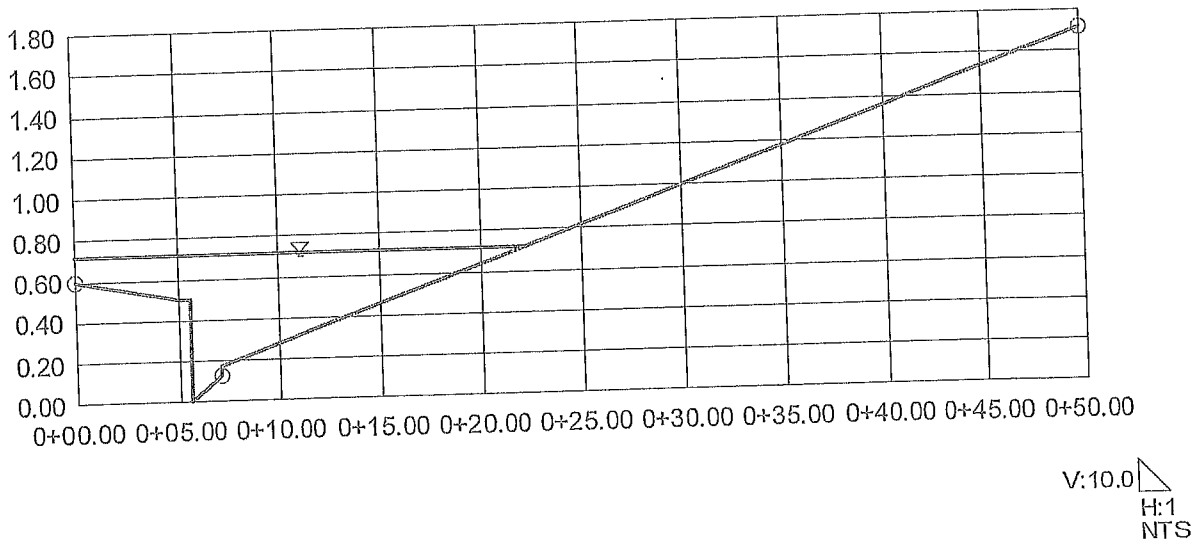
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.72

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10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.6% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.6% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.72
Discharge	50.68 cfs



10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.65 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Elevation Range	0.00 to 1.03
Discharge	55.11 cfs
Flow Area	7.2 ft²
Wetted Perimeter	31.60 ft
Top Width	31.00 ft
Actual Depth	0.65 ft
Critical Elevation	0.89 ft
Critical Slope	0.3730 %
Velocity	7.64 ft/s
Velocity Head	0.91 ft
Specific Energy	1.56 ft
Froude Number	2.79
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.05 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

Natural Channel Points

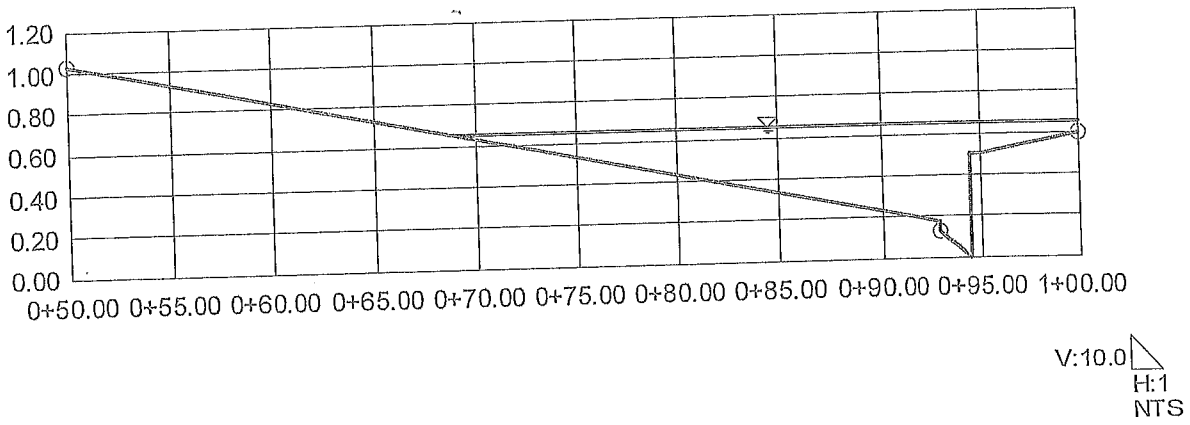
Station (ft)	Elevation (ft)
0+50.00	1.03
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.4000 %
Water Surface Elevation	0.65 ft
Elevation Range	0.00 to 1.03
Discharge	55.11 cfs



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10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.2% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.2% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.70 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.12
Discharge	67.03 cfs
Flow Area	8.2 ft²
Wetted Perimeter	31.64 ft
Top Width	30.99 ft
Actual Depth	0.70 ft
Critical Elevation	0.97 ft
Critical Slope	0.3652 %
Velocity	8.21 ft/s
Velocity Head	1.05 ft
Specific Energy	1.75 ft
Froude Number	2.82
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.1 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

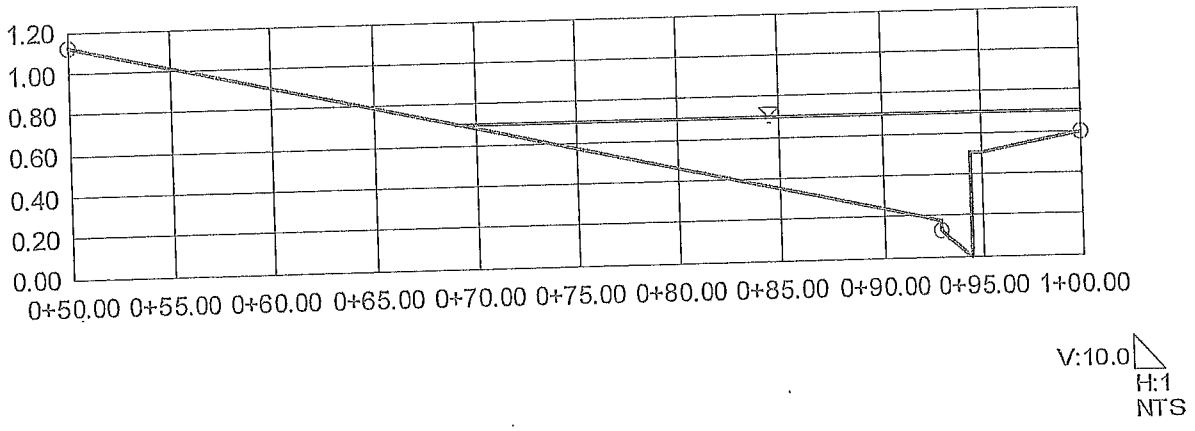
Natural Channel Points	
Station (ft)	Elevation (ft)
0+50.00	1.12
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.2% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.2% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.70 ft
Elevation Range	0.00 to 1.12
Discharge	67.03 cfs



10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.6% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.6% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.71 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.29
Discharge	61.79 cfs
Flow Area	7.5 ft²
Wetted Perimeter	28.40 ft
Top Width	27.73 ft
Actual Depth	0.71 ft
Critical Elevation	0.99 ft
Critical Slope	0.3682 %
Velocity	8.27 ft/s
Velocity Head	1.06 ft
Specific Energy	1.77 ft
Froude Number	2.81
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.11 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

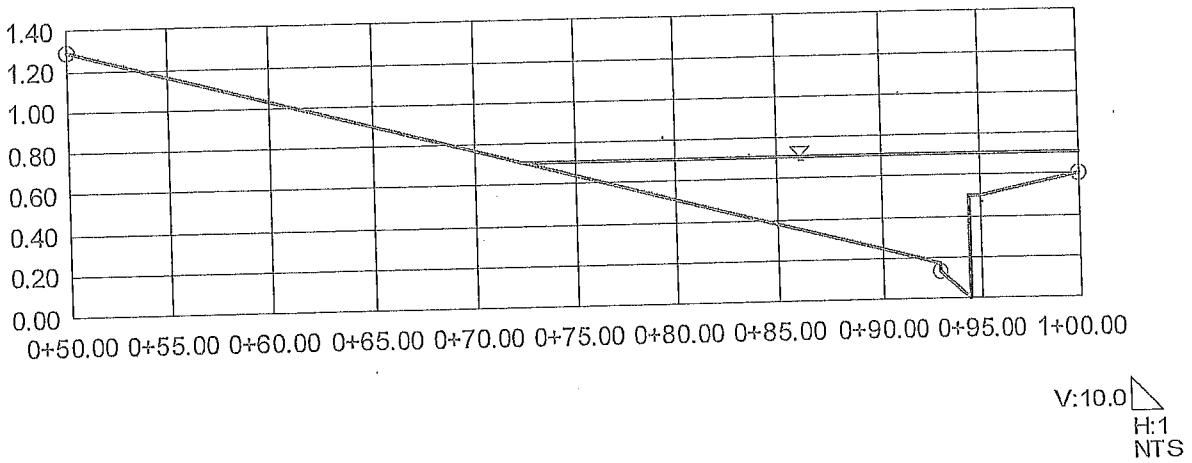
Natural Channel Points	
Station (ft)	Elevation (ft)
0+50.00	1.29
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.6% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.6% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.71 ft
Elevation Range	0.00 to 1.29
Discharge	61.79 cfs



10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.0% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.46
Discharge	58.22 cfs
Flow Area	7.0 ft²
Wetted Perimeter	26.01 ft
Top Width	25.33 ft
Actual Depth	0.72 ft
Critical Elevation	1.00 ft
Critical Slope	0.3708 %
Velocity	8.34 ft/s
Velocity Head	1.08 ft
Specific Energy	1.80 ft
Froude Number	2.80
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

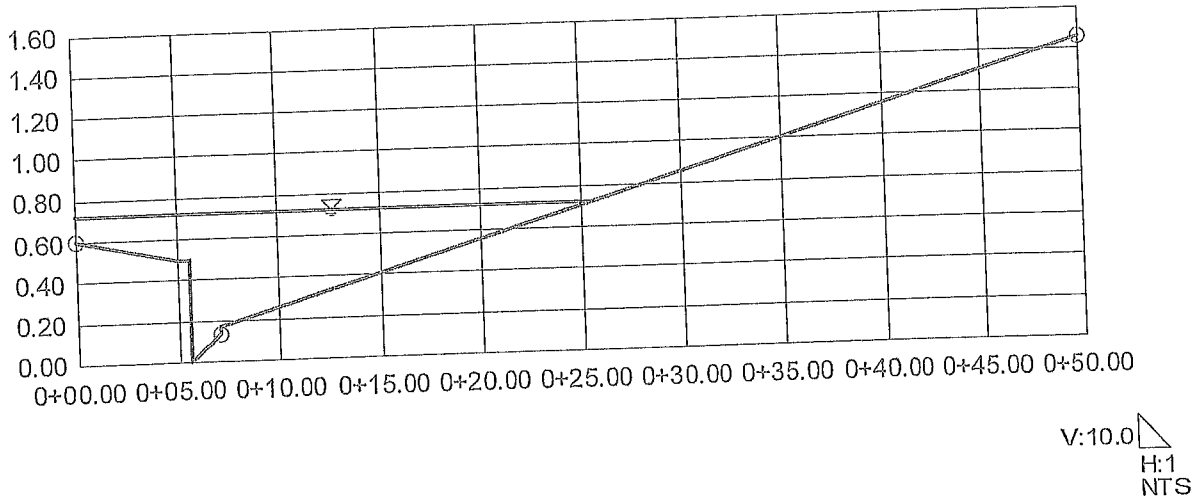
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.46

10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.0% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.46
Discharge	58.22 cfs



10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.5% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.5% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.68
Discharge	51.67 cfs
Flow Area	6.2 ft²
Wetted Perimeter	23.34 ft
Top Width	22.66 ft
Actual Depth	0.72 ft
Critical Elevation	1.00 ft
Critical Slope	0.3767 %
Velocity	8.27 ft/s
Velocity Head	1.06 ft
Specific Energy	1.78 ft
Froude Number	2.78
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

Natural Channel Points

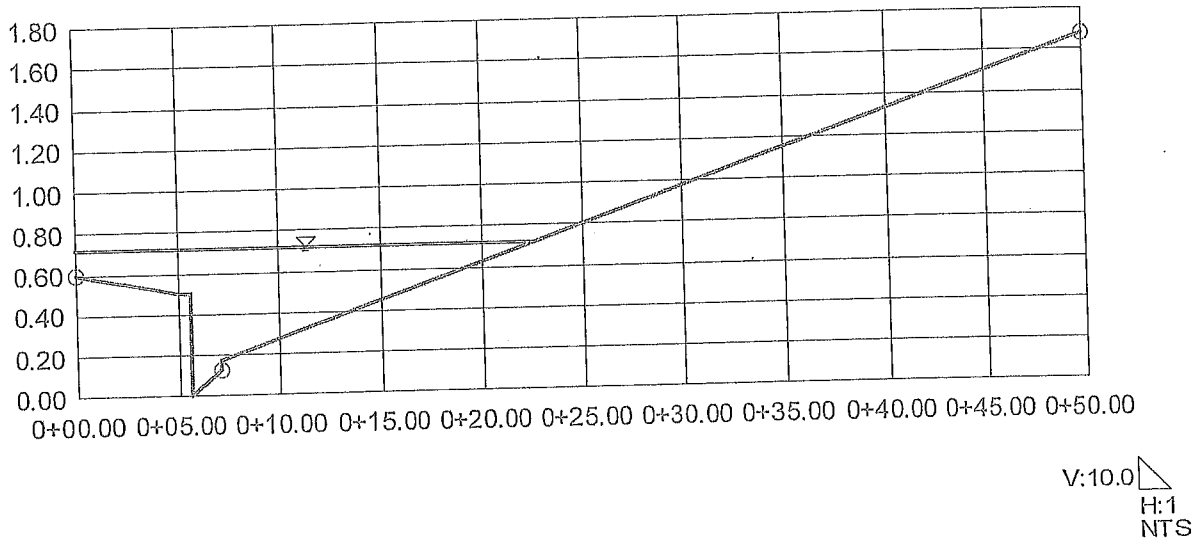
Station (ft)	Elevation (ft)
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0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.68

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10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.5% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.5% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.68
Discharge	51.67 cfs



10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 4.0% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 4.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.89
Discharge	46.98 cfs
Flow Area	5.7 ft²
Wetted Perimeter	21.43 ft
Top Width	20.75 ft
Actual Depth	0.72 ft
Critical Elevation	0.99 ft
Critical Slope	0.3820 %
Velocity	8.21 ft/s
Velocity Head	1.05 ft
Specific Energy	1.77 ft
Froude Number	2.76
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

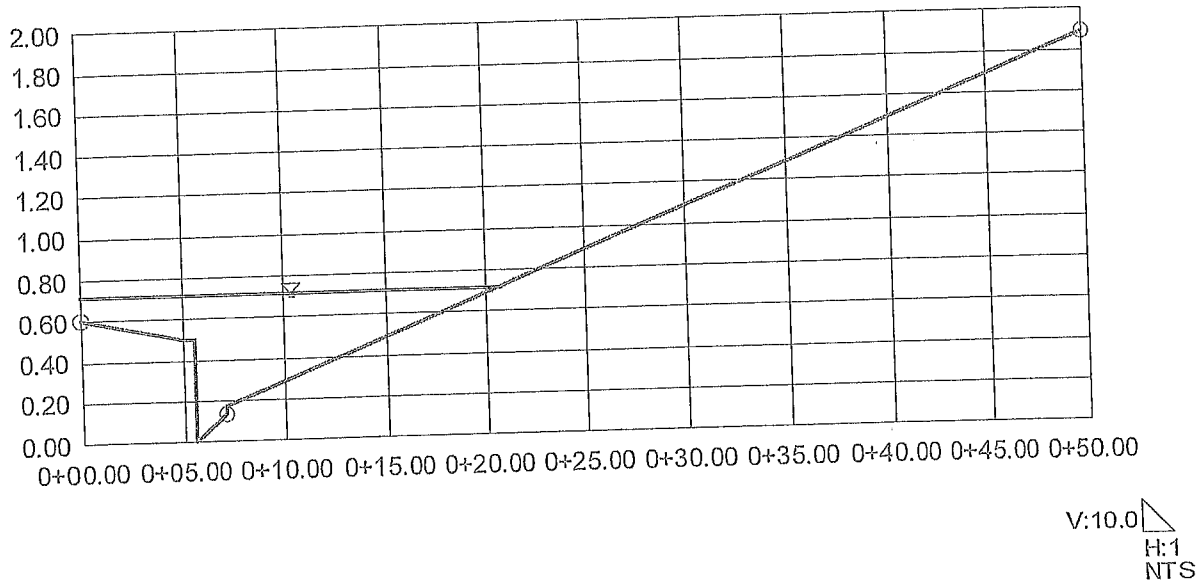
Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.89

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10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 4.0% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 4.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.89
Discharge	46.98 cfs



10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 2.5% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 2.5% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.71 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.25
Discharge	63.62 cfs
Flow Area	7.7 ft²
Wetted Perimeter	29.16 ft
Top Width	28.50 ft
Actual Depth	0.71 ft
Critical Elevation	0.99 ft
Critical Slope	0.3670 %
Velocity	8.29 ft/s
Velocity Head	1.07 ft
Specific Energy	1.78 ft
Froude Number	2.81
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.11 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

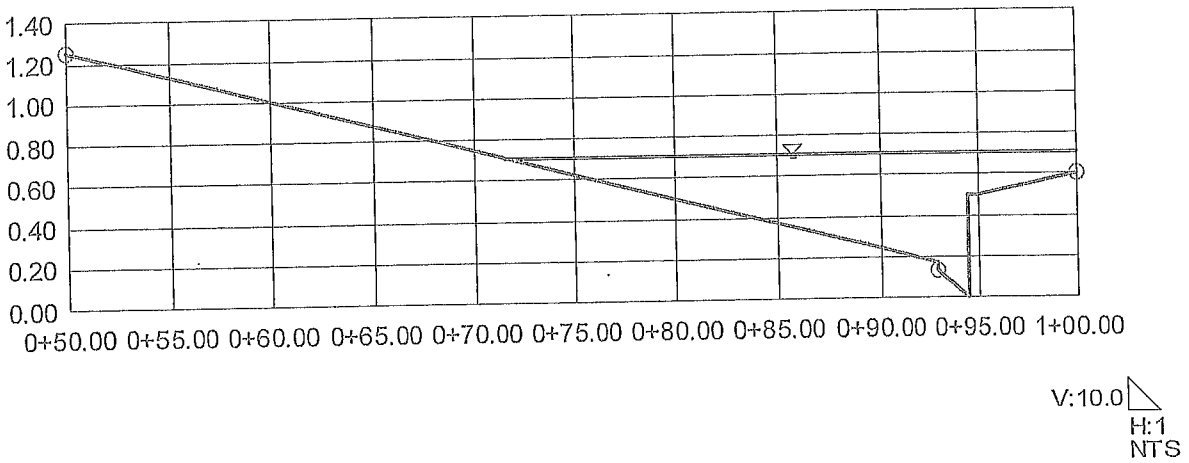
Natural Channel Points	
Station (ft)	Elevation (ft)
0+50.00	1.25
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 2.5% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 2.5% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.71 ft
Elevation Range	0.00 to 1.25
Discharge	63.62 cfs



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10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.0% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.46
Discharge	58.22 cfs
Flow Area	7.0 ft²
Wetted Perimeter	26.01 ft
Top Width	25.33 ft
Actual Depth	0.72 ft
Critical Elevation	1.00 ft
Critical Slope	0.3708 %
Velocity	8.34 ft/s
Velocity Head	1.08 ft
Specific Energy	1.80 ft
Froude Number	2.80
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

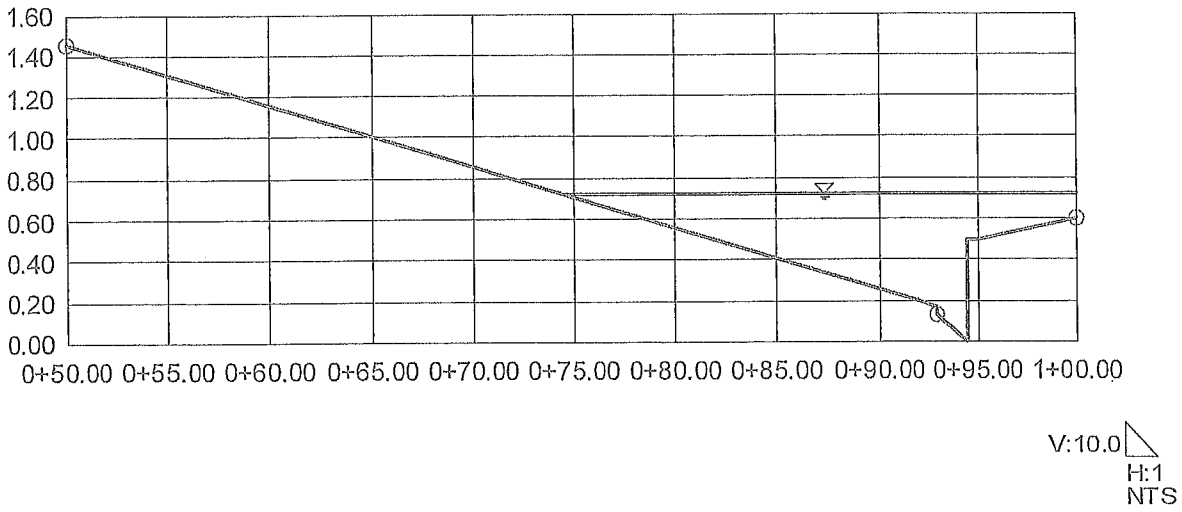
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+50.00	1.46
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.0% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.014	
Channel Slope	3.4000	%
Water Surface Elevation	0.72	ft
Elevation Range	0.00 to 1.46	
Discharge	58.22	cfs



10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.5% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.5% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.68
Discharge	51.67 cfs
Flow Area	6.2 ft²
Wetted Perimeter	23.34 ft
Top Width	22.66 ft
Actual Depth	0.72 ft
Critical Elevation	1.00 ft
Critical Slope	0.3767 %
Velocity	8.27 ft/s
Velocity Head	1.06 ft
Specific Energy	1.78 ft
Froude Number	2.78
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

Natural Channel Points

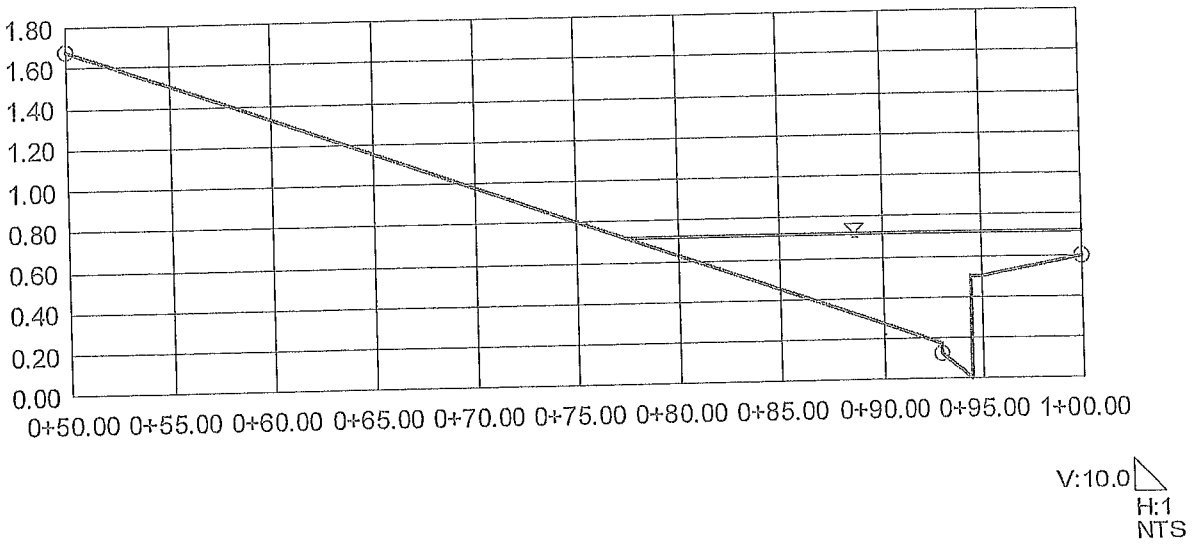
Station (ft)	Elevation (ft)
0+50.00	1.68
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.5% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.5% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.68
Discharge	51.67 cfs



APPENDIX C

Street Flow Computations

Street Flows Impacting Drop Inlets

Elkhorn North Half Section A
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	2.1000 %
Discharge	45.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.66 ft
Elevation Range	0.00 to 1.03
Flow Area	7.4 ft²
Wetted Perimeter	31.93 ft
Top Width	31.33 ft
Actual Depth	0.66 ft
Critical Elevation	0.83 ft
Critical Slope	0.3844 %
Velocity	6.07 ft/s
Velocity Head	0.57 ft
Specific Energy	1.23 ft
Froude Number	2.20
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.56519341e-1 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

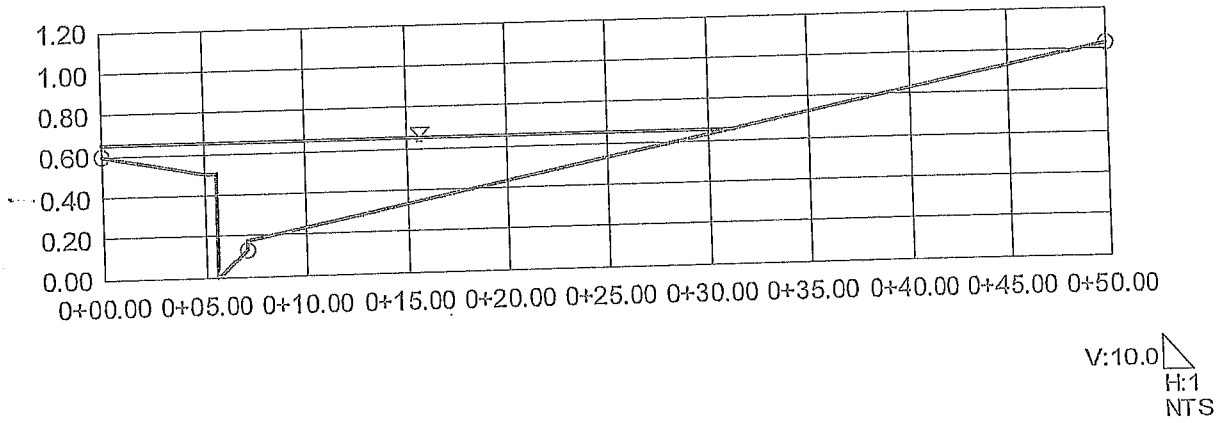
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.03

Elkhorn North Half Section A
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	2.1000 %
Water Surface Elevation	0.66 ft
Elevation Range	0.00 to 1.03
Discharge	45.00 cfs



Elkhorn South Half Section A
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Slope	2.1000	%
Discharge	15.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Water Surface Elevation	0.48	ft
Elevation Range	0.00 to 1.03	
Flow Area	3.0	ft²
Wetted Perimeter	17.38	ft
Top Width	16.85	ft
Actual Depth	0.48	ft
Critical Elevation	0.60	ft
Critical Slope	0.4405	%
Velocity	5.04	ft/s
Velocity Head	0.39	ft
Specific Energy	0.87	ft
Froude Number	2.12	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

Natural Channel Points

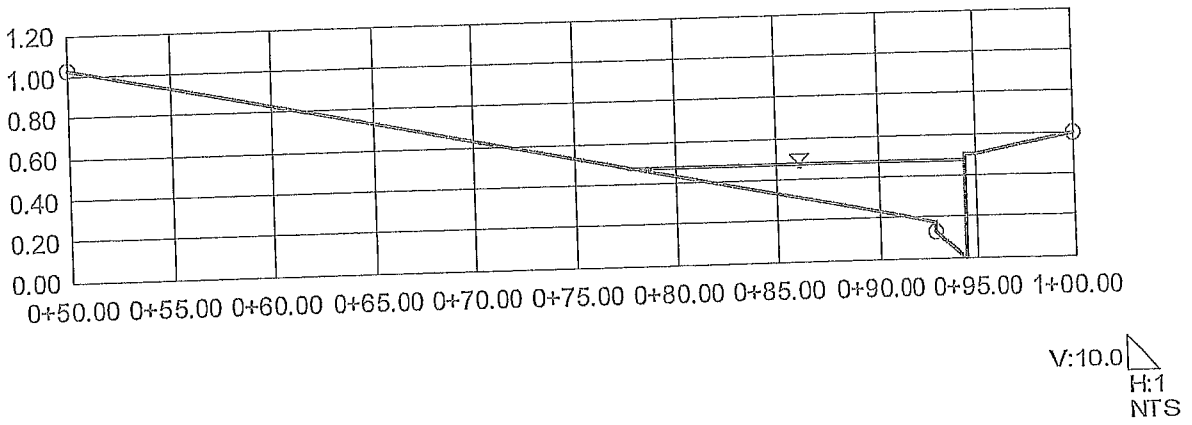
Station (ft)	Elevation (ft)
0+50.00	1.03
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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Elkhorn South Half Section A
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	2.1000 %
Water Surface Elevation	0.48 ft
Elevation Range	0.00 to 1.03
Discharge	15.00 cfs



Elkhorn South Half Section B
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	4.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.32 ft
Elevation Range	0.00 to 1.03
Flow Area	0.9 ft²
Wetted Perimeter	9.24 ft
Top Width	8.88 ft
Actual Depth	0.32 ft
Critical Elevation	0.40 ft
Critical Slope	0.5400 %
Velocity	4.33 ft/s
Velocity Head	0.29 ft
Specific Energy	0.61 ft
Froude Number	2.37
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

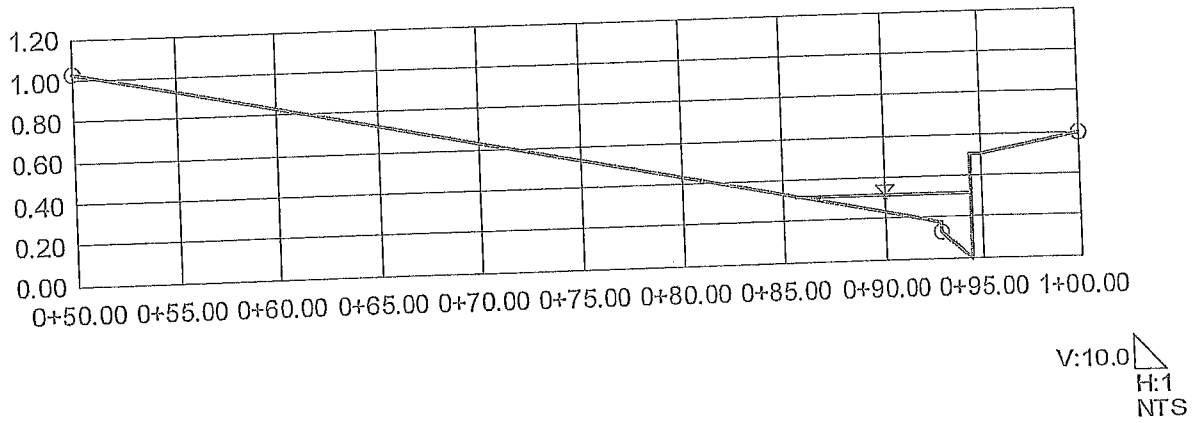
Natural Channel Points

Station (ft)	Elevation (ft)
0+50.00	1.03
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

Elkhorn South Half Section B
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.32 ft
Elevation Range	0.00 to 1.03
Discharge	4.00 cfs



Elkhorn North Half Section C
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section C
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	4.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.34 ft
Elevation Range	0.00 to 1.55
Flow Area	0.8 ft²
Wetted Perimeter	7.06 ft
Top Width	6.67 ft
Actual Depth	0.34 ft
Critical Elevation	0.44 ft
Critical Slope	0.5334 %
Velocity	4.78 ft/s
Velocity Head	0.36 ft
Specific Energy	0.69 ft
Froude Number	2.38
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

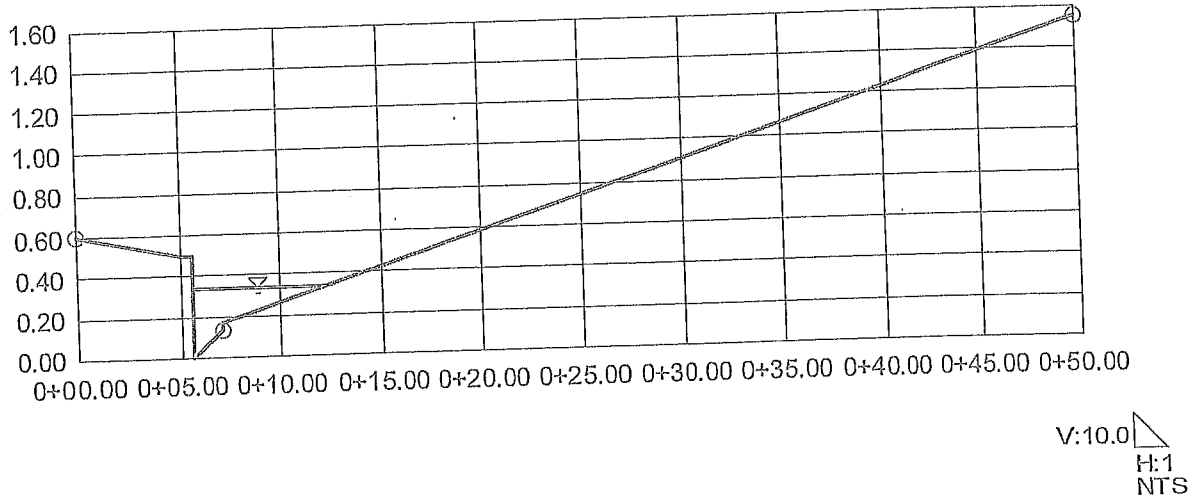
Natural Channel Points

Station (ft)	Elevation (ft)
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0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.55

Elkhorn North Half Section C
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section C
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.34 ft
Elevation Range	0.00 to 1.55
Discharge	4.00 cfs



Elkhorn North Half Section D
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	3.30 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.32 ft
Elevation Range	0.00 to 1.72
Flow Area	0.7 ft²
Wetted Perimeter	6.09 ft
Top Width	5.72 ft
Actual Depth	0.32 ft
Critical Elevation	0.42 ft
Critical Slope	0.5518 %
Velocity	4.68 ft/s
Velocity Head	0.34 ft
Specific Energy	0.66 ft
Froude Number	2.35
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

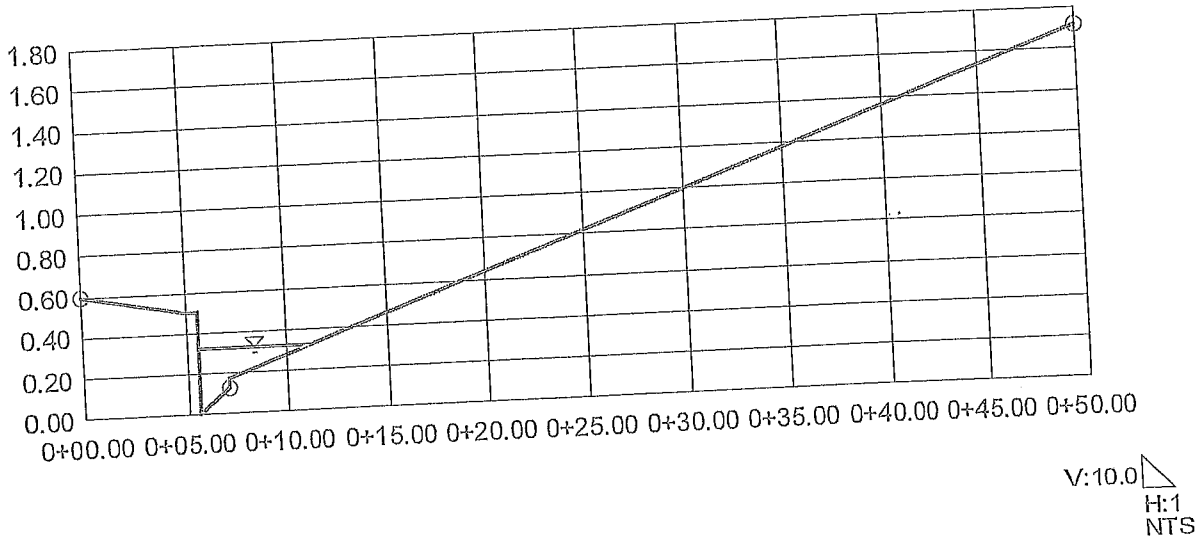
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.72

Elkhorn North Half Section D
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.32 ft
Elevation Range	0.00 to 1.72
Discharge	3.30 cfs



Elkhorn South Half Section D
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	5.80 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.36 ft
Elevation Range	0.00 to 1.29
Flow Area	1.1 ft²
Wetted Perimeter	9.23 ft
Top Width	8.82 ft
Actual Depth	0.36 ft
Critical Elevation	0.47 ft
Critical Slope	0.5030 %
Velocity	5.08 ft/s
Velocity Head	0.40 ft
Specific Energy	0.76 ft
Froude Number	2.49
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

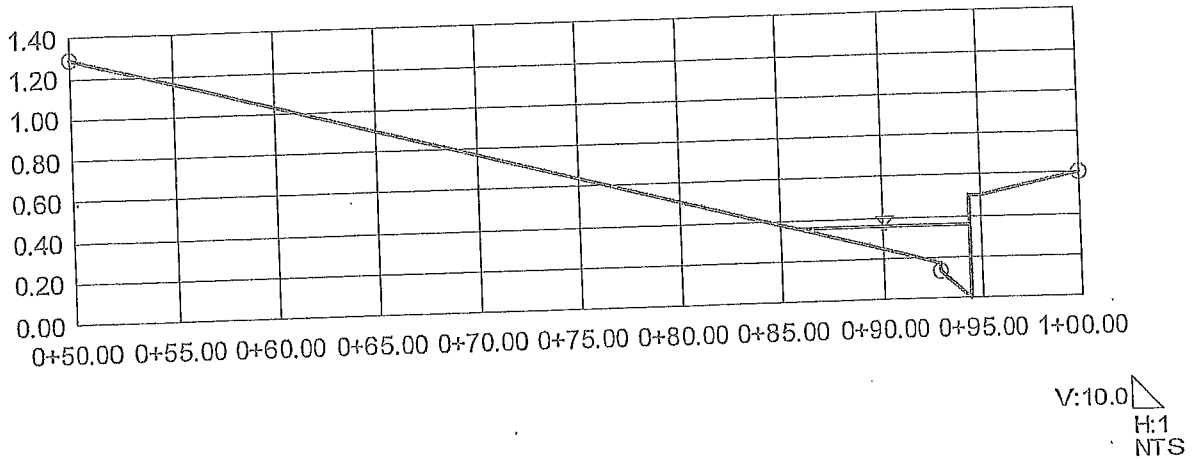
Natural Channel Points

Station (ft)	Elevation (ft)
0+50.00	1.29
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

Elkhorn South Half Section D
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.36 ft
Elevation Range	0.00 to 1.29
Discharge	5.80 cfs



Elkhorn North Half Section E
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section E
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	8.70 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.43 ft
Elevation Range	0.00 to 1.89
Flow Area	1.4 ft²
Wetted Perimeter	8.53 ft
Top Width	8.04 ft
Actual Depth	0.43 ft
Critical Elevation	0.60 ft
Critical Slope	0.4634 %
Velocity	6.19 ft/s
Velocity Head	0.59 ft
Specific Energy	1.03 ft
Froude Number	2.61
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

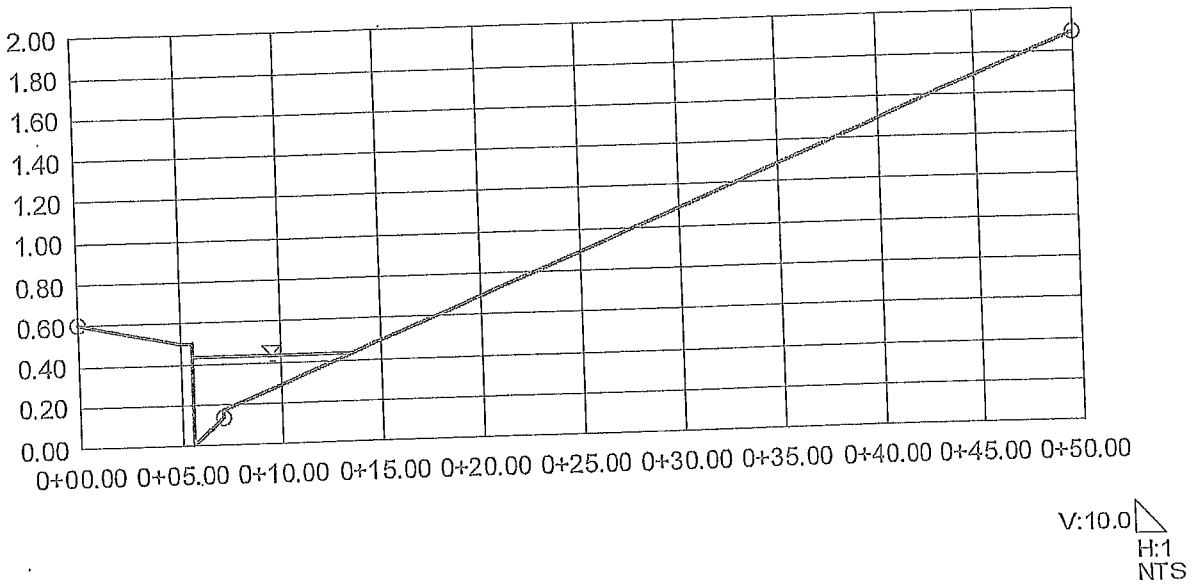
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.89

Elkhorn North Half Section E
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section E
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.4000 %
Water Surface Elevation	0.43 ft
Elevation Range	0.00 to 1.89
Discharge	8.70 cfs



Elkhorn South Half Section E
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section E
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Slope	3.4000	%
Discharge	11.70	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Water Surface Elevation	0.45	ft
Elevation Range	0.00 to 1.46	
Flow Area	1.9	ft²
Wetted Perimeter	11.30	ft
Top Width	10.80	ft
Actual Depth	0.45	ft
Critical Elevation	0.62	ft
Critical Slope	0.4465	%
Velocity	6.25	ft/s
Velocity Head	0.61	ft
Specific Energy	1.06	ft
Froude Number	2.64	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

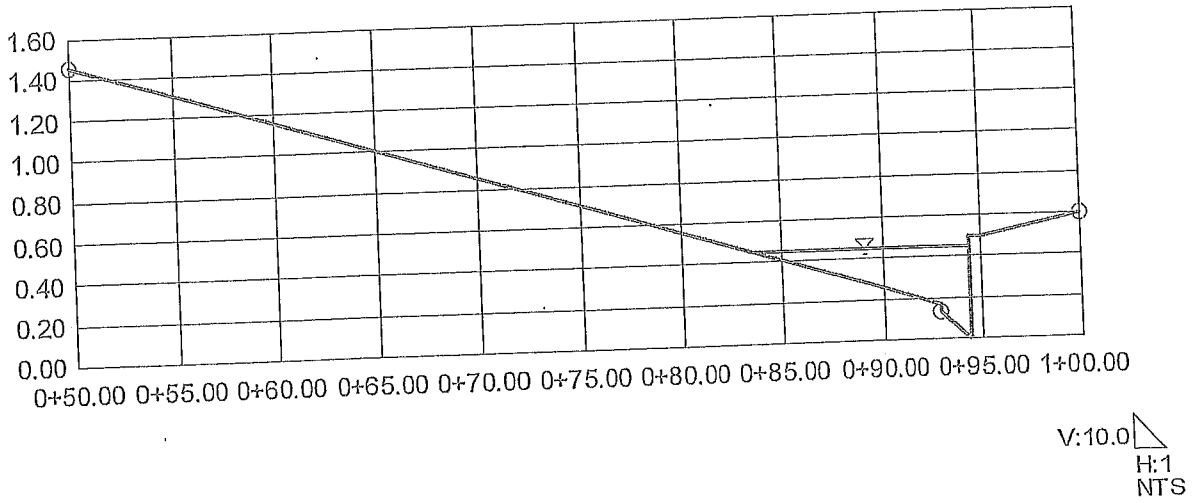
Natural Channel Points

Station (ft)	Elevation (ft)
0+50.00	1.46
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

Elkhorn South Half Section E
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section E
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.4000 %
Water Surface Elevation	0.45 ft
Elevation Range	0.00 to 1.46
Discharge	11.70 cfs



Elkhorn North Half Section F
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section F
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	7.40 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.39 ft
Elevation Range	0.00 to 1.46
Flow Area	1.3 ft²
Wetted Perimeter	9.35 ft
Top Width	8.90 ft
Actual Depth	0.39 ft
Critical Elevation	0.54 ft
Critical Slope	0.4607 %
Velocity	5.64 ft/s
Velocity Head	0.49 ft
Specific Energy	0.89 ft
Froude Number	2.59
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

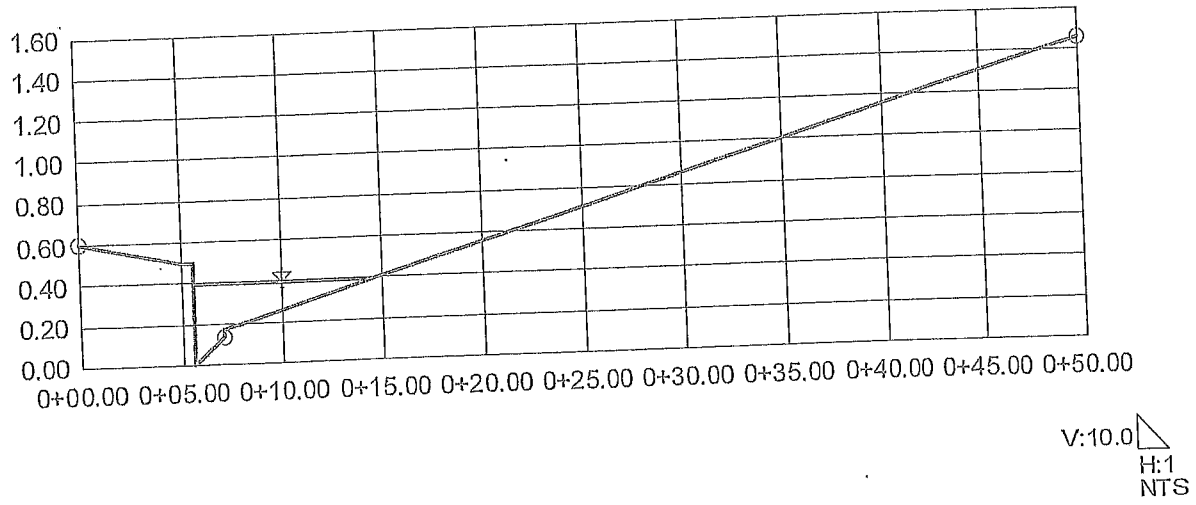
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.46

Elkhorn North Half Section F
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section F
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.4000 %
Water Surface Elevation	0.39 ft
Elevation Range	0.00 to 1.46
Discharge	7.40 cfs



Elkhorn South Half Section F
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section F
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.4000 %
Discharge	14.30 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.46 ft
Elevation Range	0.00 to 1.25
Flow Area	2.3 ft²
Wetted Perimeter	13.56 ft
Top Width	13.06 ft
Actual Depth	0.46 ft
Critical Elevation	0.63 ft
Critical Slope	0.4364 %
Velocity	6.30 ft/s
Velocity Head	0.62 ft
Specific Energy	1.08 ft
Froude Number	2.66
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

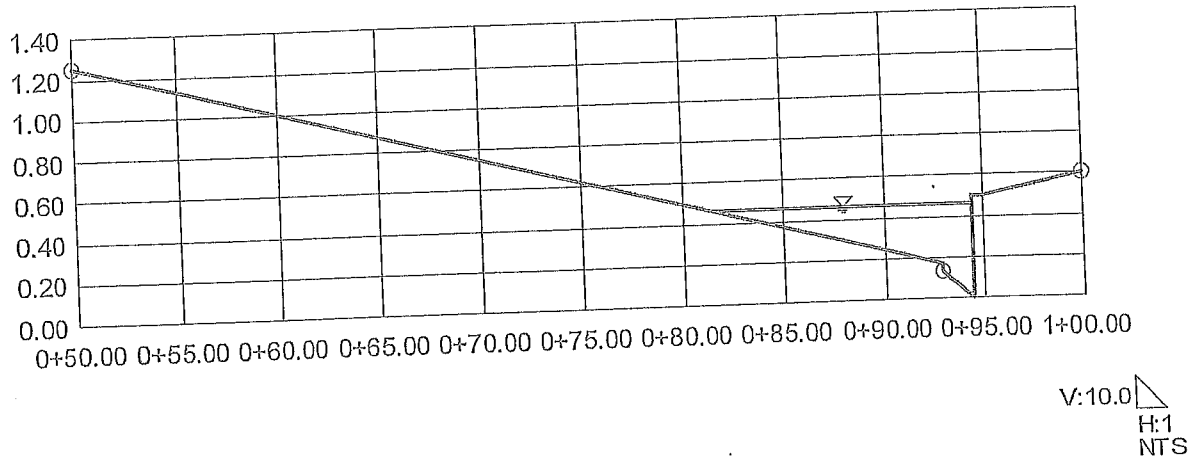
Natural Channel Points

Station (ft)	Elevation (ft)
0+50.00	1.25
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

Elkhorn South Half Section F
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section F
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.4000 %
Water Surface Elevation	0.46 ft
Elevation Range	0.00 to 1.25
Discharge	14.30 cfs



Elkhorn North Half Section G
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section G
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Slope	2.2000	%
Discharge	11.60	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Water Surface Elevation	0.49	ft
Elevation Range	0.00 to 1.68	
Flow Area	2.1	ft²
Wetted Perimeter	11.25	ft
Top Width	10.70	ft
Actual Depth	0.49	ft
Critical Elevation	0.63	ft
Critical Slope	0.4471	%
Velocity	5.45	ft/s
Velocity Head	0.46	ft
Specific Energy	0.95	ft
Froude Number	2.15	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

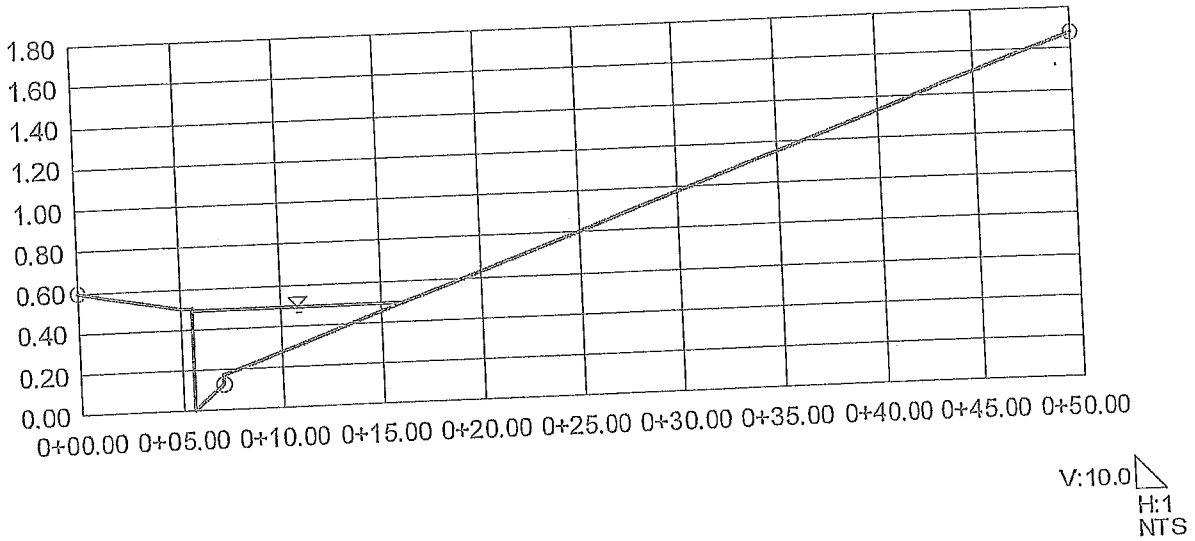
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.68

Elkhorn North Half Section G
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn North Half Section G
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	2.2000 %
Water Surface Elevation	0.49 ft
Elevation Range	0.00 to 1.68
Discharge	11.60 cfs



Elkhorn South Half Section G
Worksheet for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section G
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	2.2000 %
Discharge	11.90 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elevation	0.39 ft
Elevation Range	0.00 to 0.60
Flow Area	2.9 ft²
Wetted Perimeter	23.97 ft
Top Width	23.53 ft
Actual Depth	0.39 ft
Critical Elevation	0.47 ft
Critical Slope	0.4808 %
Velocity	4.08 ft/s
Velocity Head	0.26 ft
Specific Energy	0.65 ft
Froude Number	2.05
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

Natural Channel Points

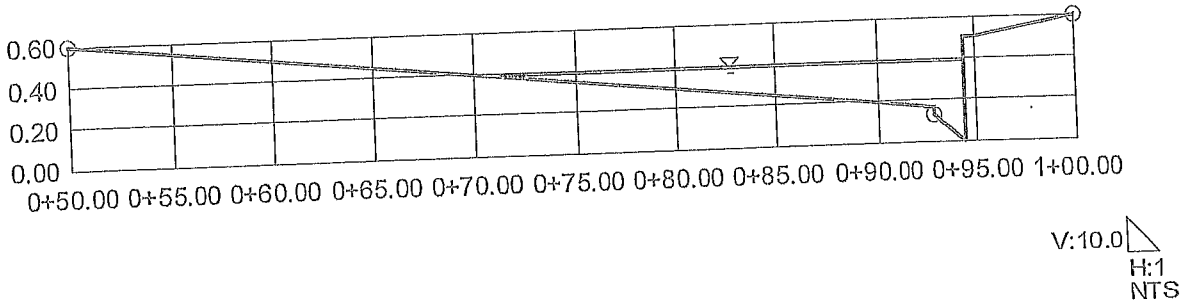
Station (ft)	Elevation (ft)
0+50.00	0.60
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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Elkhorn South Half Section G
Cross Section for Irregular Channel

Project Description	
Worksheet	Elkhorn South Half Section G
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	2.2000 %
Water Surface Elevation	0.39 ft
Elevation Range	0.00 to 0.60
Discharge	11.90 cfs



Grand Canyon East Half Section H
Worksheet for Irregular Channel

Project Description	
Worksheet	Grand Canyon East Half Section H
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.5000 %
Discharge	4.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Water Surface Elevation	0.41 ft
Elevation Range	0.00 to 0.83
Flow Area	1.9 ft²
Wetted Perimeter	13.89 ft
Top Width	13.44 ft
Actual Depth	0.41 ft
Critical Elevation	0.40 ft
Critical Slope	0.5497 %
Velocity	2.06 ft/s
Velocity Head	0.07 ft
Specific Energy	0.47 ft
Froude Number	0.96
Flow Type	Subcritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+40.00	0.016

Natural Channel Points

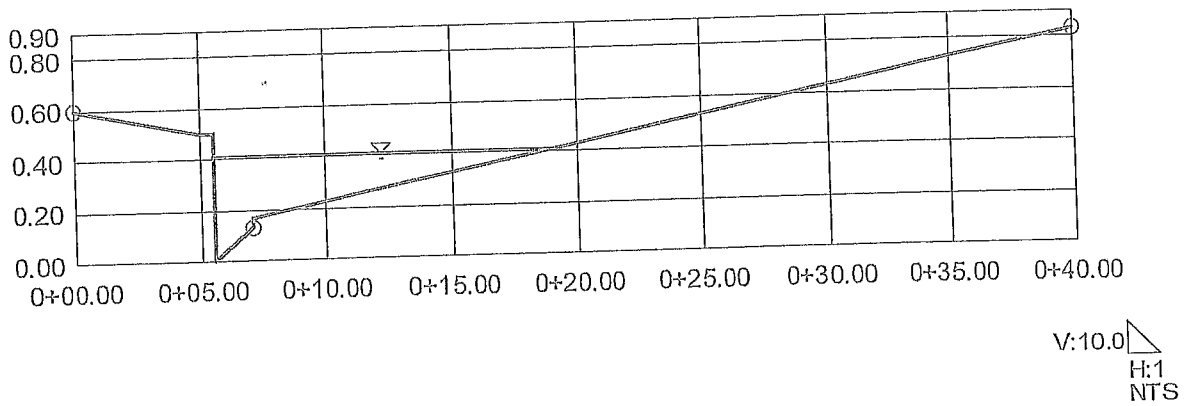
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83

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Grand Canyon East Half Section H
Cross Section for Irregular Channel

Project Description	
Worksheet	Grand Canyon East Half Section H
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Channel Slope	0.5000 %
Water Surface Elevation	0.41 ft
Elevation Range	0.00 to 0.83
Discharge	4.00 cfs



Grand Canyon East Half Section H - with overflow from west half
Worksheet for Irregular Channel

Project Description	
Worksheet	Grand Canyon East Half Section H - With overflow from West Half
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.5000 %
Discharge	26.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.71 ft
Elevation Range	0.00 to 0.83
Flow Area	9.2 ft²
Wetted Perimeter	34.69 ft
Top Width	34.03 ft
Actual Depth	0.71 ft
Critical Elevation	0.70 ft
Critical Slope	0.5451 %
Velocity	2.83 ft/s
Velocity Head	0.12 ft
Specific Energy	0.84 ft
Froude Number	0.96
Flow Type	Subcritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.11062803 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+40.00	0.016

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83

Grand Canyon West Half Section H
Worksheet for Irregular Channel

Project Description	
Worksheet	Grand Canyon West Half Section H
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.5000 %
Discharge	72.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.020
Water Surface Elevation	0.94 ft
Elevation Range	0.00 to 0.83
Flow Area	20.9 ft²
Wetted Perimeter	40.53 ft
Top Width	40.00 ft
Actual Depth	0.94 ft
Critical Elevation	0.89 ft
Critical Slope	0.7353 %
Velocity	3.44 ft/s
Velocity Head	0.18 ft
Specific Energy	1.13 ft
Froude Number	0.84
Flow Type	Subcritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.39313199 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+40.00	0+54.00	0.016
0+54.00	0+80.00	0.022

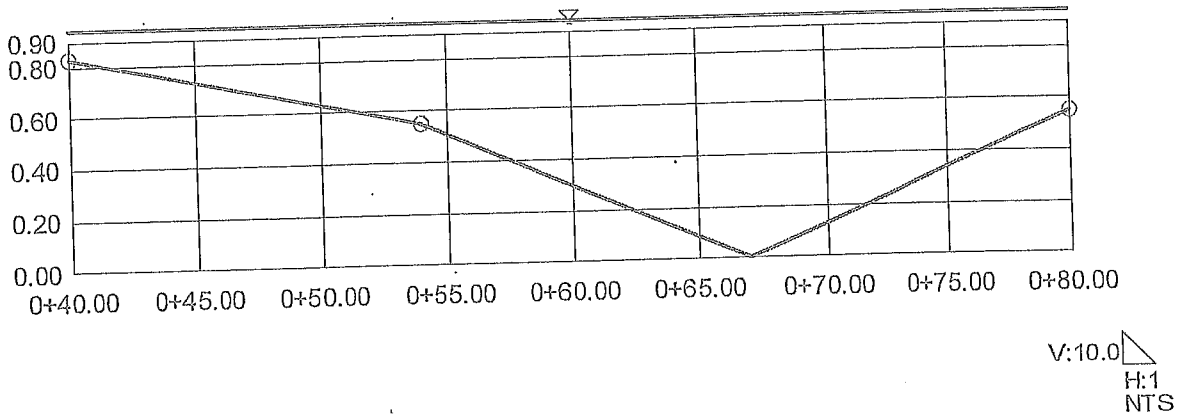
Natural Channel Points	
Station (ft)	Elevation (ft)
0+40.00	0.83
0+54.00	0.55
0+67.00	0.00
0+80.00	0.55

Notes: Note that the improvement plans of Grand Canyon show the future roadway improvement and not any interim roadway swale. A 33-ft patent easment is assumed.

Grand Canyon West Half Section H
Cross Section for Irregular Channel

Project Description	
Worksheet	Grand Canyon West Half Section H
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.020
Channel Slope	0.5000 %
Water Surface Elevation	0.94 ft
Elevation Range	0.00 to 0.83
Discharge	72.00 cfs



Grand Canyon West Half Section H - Capacity to Crown
Worksheet for Irregular Channel

Project Description	
Worksheet	Grand Canyon West Half Section H - Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	0.5000 %
Water Surface Elevation	0.83 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.019
Elevation Range	0.00 to 0.83
Discharge	49.65 cfs
Flow Area	16.4 ft²
Wetted Perimeter	40.31 ft
Top Width	40.00 ft
Actual Depth	0.83 ft
Critical Elevation	0.77 ft
Critical Slope	0.7345 %
Velocity	3.03 ft/s
Velocity Head	0.14 ft
Specific Energy	0.97 ft
Froude Number	0.83
Flow Type	Subcritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.28 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+40.00	0+54.00	0.016
0+54.00	0+80.00	0.022

Natural Channel Points	
Station (ft)	Elevation (ft)
0+40.00	0.83
0+54.00	0.55
0+67.00	0.00
0+80.00	0.55

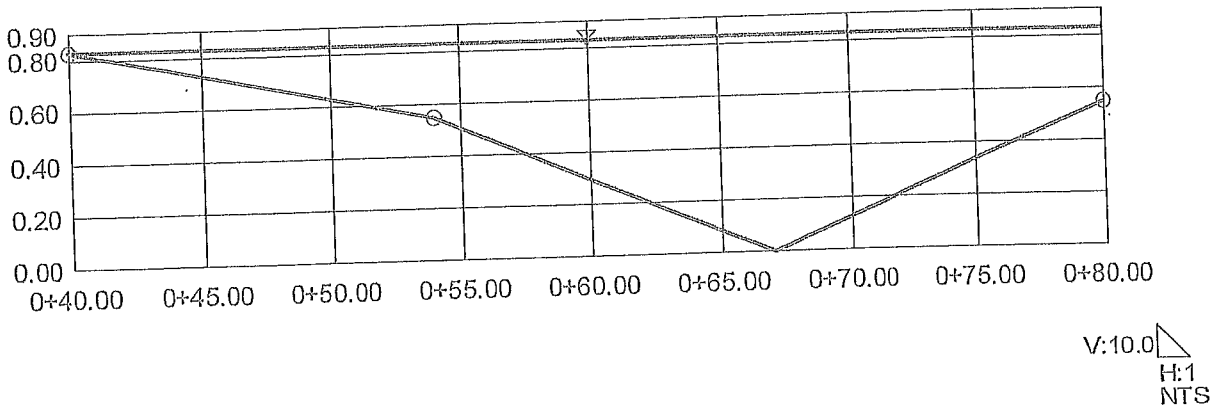
Notes: Note that the improvement plans of Grand Canyon show the future roadway improvement and not any interim roadway swale. A 33-ft patent easment is assumed.

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Grand Canyon West Half Section H
Cross Section for Irregular Channel

Project Description	
Worksheet	Grand Canyon West Half Section H - Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.019	
Channel Slope	0.5000	%
Water Surface Elevation	0.83	ft
Elevation Range	0.00 to 0.83	
Discharge	49.65	cfs



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10-Year Maximum Street Flow Capacities

10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.65 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Elevation Range	0.00 to 1.03
Discharge	56.00 cfs
Flow Area	7.3 ft²
Wetted Perimeter	31.74 ft
Top Width	31.14 ft
Actual Depth	0.65 ft
Critical Elevation	0.89 ft
Critical Slope	0.3724 %
Velocity	7.67 ft/s
Velocity Head	0.92 ft
Specific Energy	1.57 ft
Froude Number	2.79
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.5271829e-1 ft.

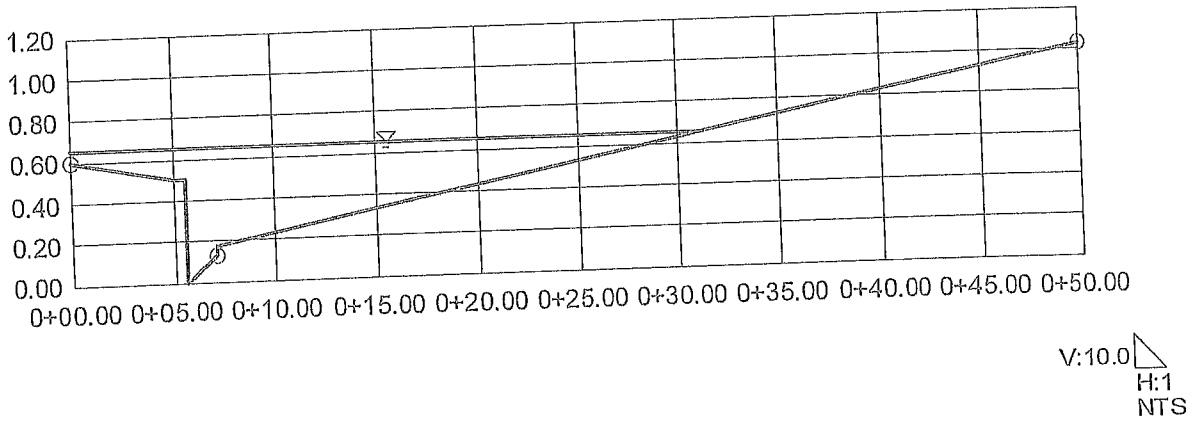
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.03

10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.4000 %
Water Surface Elevation	0.65 ft
Elevation Range	0.00 to 1.03
Discharge	56.00 cfs



10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.2% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.2% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.55
Discharge	55.29 cfs
Flow Area	6.7 ft²
Wetted Perimeter	24.81 ft
Top Width	24.14 ft
Actual Depth	0.72 ft
Critical Elevation	1.00 ft
Critical Slope	0.3732 %
Velocity	8.31 ft/s
Velocity Head	1.07 ft
Specific Energy	1.79 ft
Froude Number	2.79
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

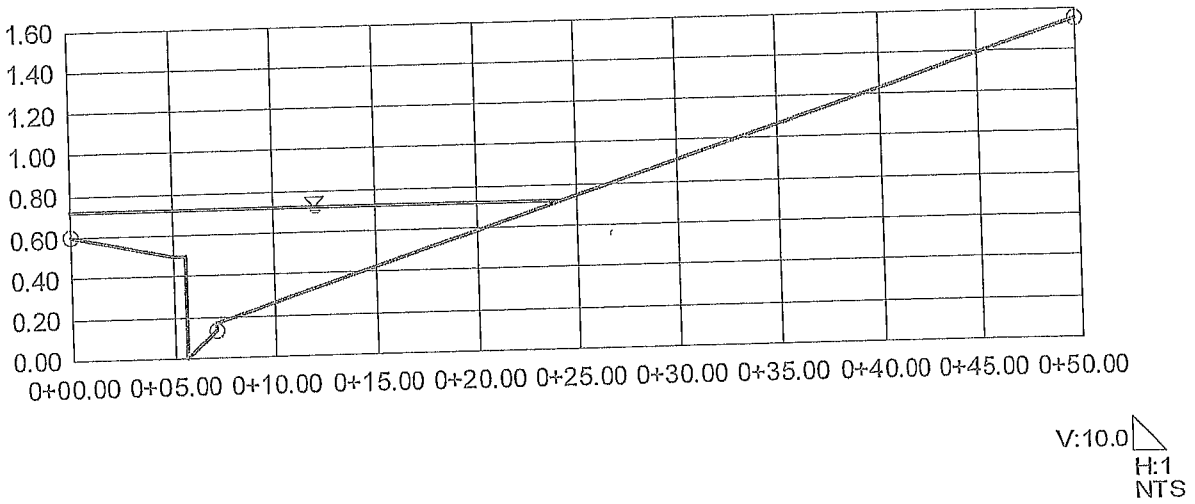
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.55

10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.2% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.2% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.55
Discharge	55.29 cfs



10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.6% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.6% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.72
Discharge	50.68 cfs
Flow Area	6.1 ft²
Wetted Perimeter	22.93 ft
Top Width	22.26 ft
Actual Depth	0.72 ft
Critical Elevation	1.00 ft
Critical Slope	0.3777 %
Velocity	8.26 ft/s
Velocity Head	1.06 ft
Specific Energy	1.78 ft
Froude Number	2.77
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

Natural Channel Points

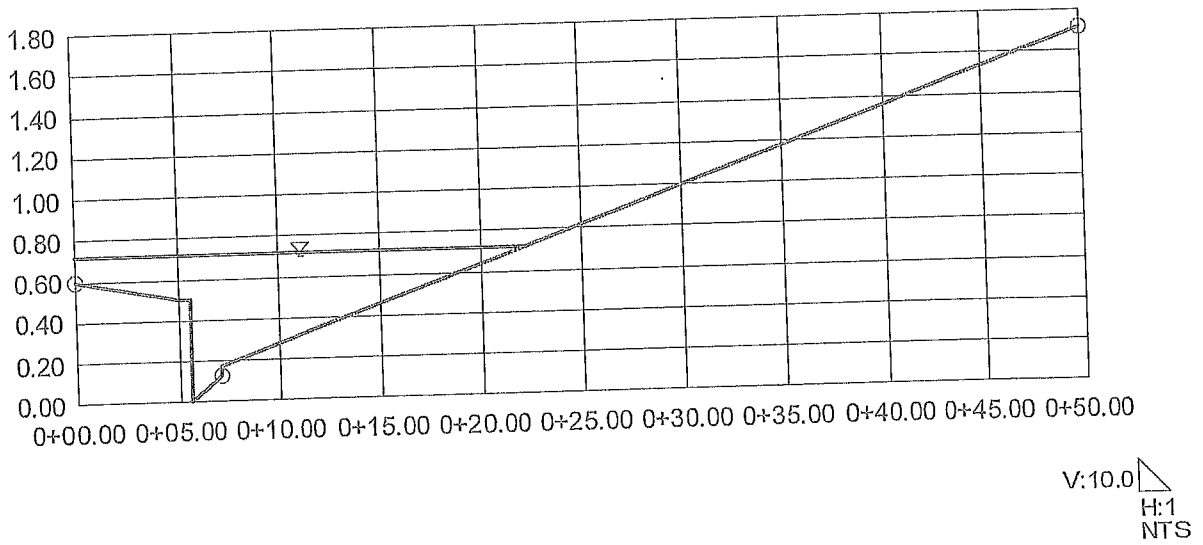
Station (ft)	Elevation (ft)
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0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.72

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10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.6% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn North Half Grand Canyon to Tee Pee - 3.6% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.72
Discharge	50.68 cfs



10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.65 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Elevation Range	0.00 to 1.03
Discharge	55.11 cfs
Flow Area	7.2 ft²
Wetted Perimeter	31.60 ft
Top Width	31.00 ft
Actual Depth	0.65 ft
Critical Elevation	0.89 ft
Critical Slope	0.3730 %
Velocity	7.64 ft/s
Velocity Head	0.91 ft
Specific Energy	1.56 ft
Froude Number	2.79
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.05 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

Natural Channel Points

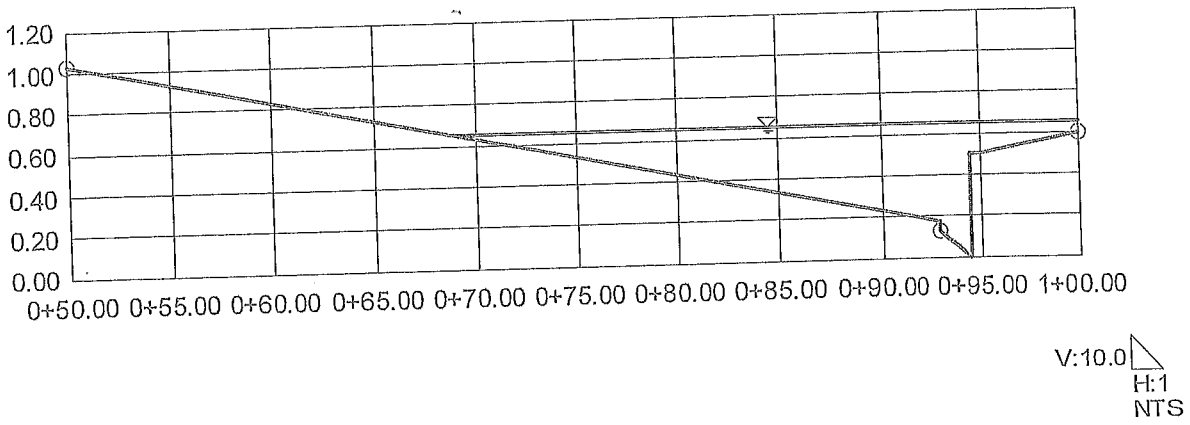
Station (ft)	Elevation (ft)
0+50.00	1.03
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.013
Channel Slope	3.4000 %
Water Surface Elevation	0.65 ft
Elevation Range	0.00 to 1.03
Discharge	55.11 cfs



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10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.2% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.2% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.70 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.12
Discharge	67.03 cfs
Flow Area	8.2 ft²
Wetted Perimeter	31.64 ft
Top Width	30.99 ft
Actual Depth	0.70 ft
Critical Elevation	0.97 ft
Critical Slope	0.3652 %
Velocity	8.21 ft/s
Velocity Head	1.05 ft
Specific Energy	1.75 ft
Froude Number	2.82
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.1 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

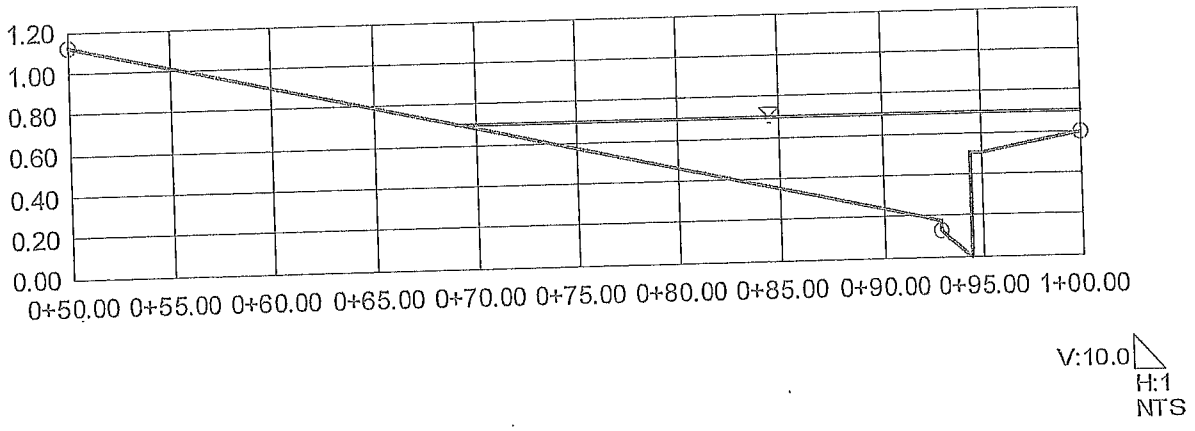
Natural Channel Points	
Station (ft)	Elevation (ft)
0+50.00	1.12
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.2% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.2% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.70 ft
Elevation Range	0.00 to 1.12
Discharge	67.03 cfs



10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.6% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.6% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.71 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.29
Discharge	61.79 cfs
Flow Area	7.5 ft²
Wetted Perimeter	28.40 ft
Top Width	27.73 ft
Actual Depth	0.71 ft
Critical Elevation	0.99 ft
Critical Slope	0.3682 %
Velocity	8.27 ft/s
Velocity Head	1.06 ft
Specific Energy	1.77 ft
Froude Number	2.81
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.11 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

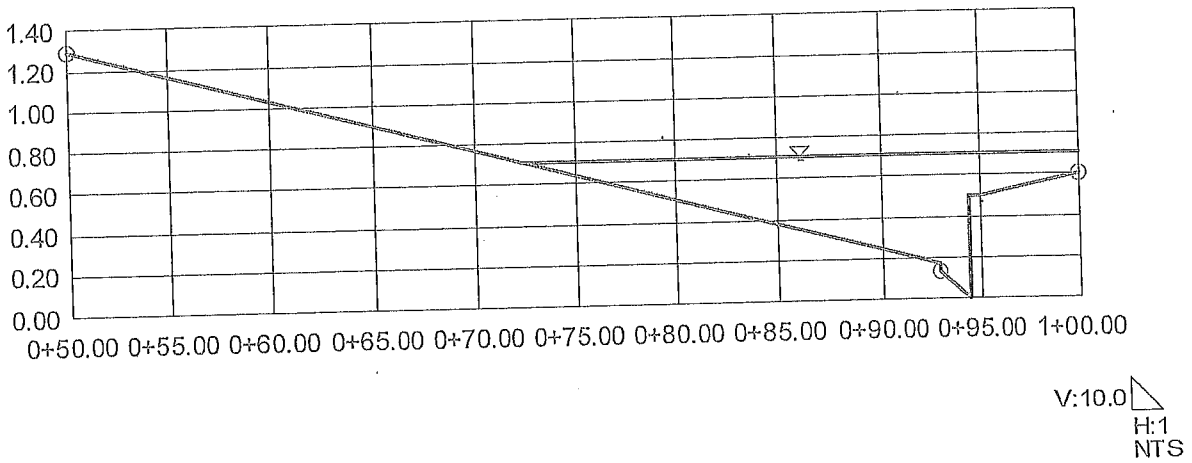
Natural Channel Points	
Station (ft)	Elevation (ft)
0+50.00	1.29
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.6% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Grand Canyon to Tee Pee - 2.6% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.71 ft
Elevation Range	0.00 to 1.29
Discharge	61.79 cfs



10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.0% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.46
Discharge	58.22 cfs
Flow Area	7.0 ft²
Wetted Perimeter	26.01 ft
Top Width	25.33 ft
Actual Depth	0.72 ft
Critical Elevation	1.00 ft
Critical Slope	0.3708 %
Velocity	8.34 ft/s
Velocity Head	1.08 ft
Specific Energy	1.80 ft
Froude Number	2.80
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

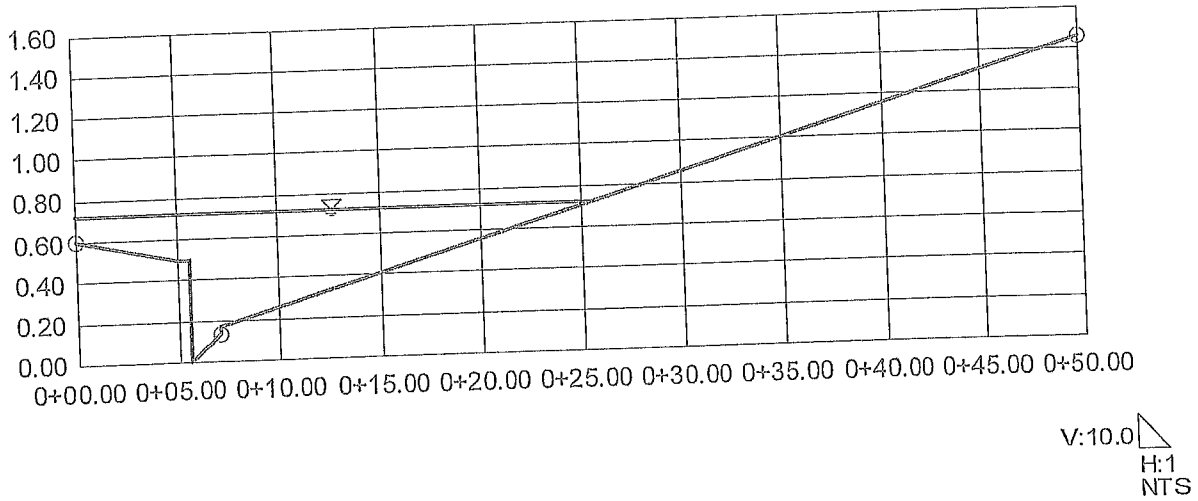
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.46

10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.0% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.46
Discharge	58.22 cfs



10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.5% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.5% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.68
Discharge	51.67 cfs
Flow Area	6.2 ft²
Wetted Perimeter	23.34 ft
Top Width	22.66 ft
Actual Depth	0.72 ft
Critical Elevation	1.00 ft
Critical Slope	0.3767 %
Velocity	8.27 ft/s
Velocity Head	1.06 ft
Specific Energy	1.78 ft
Froude Number	2.78
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

Natural Channel Points

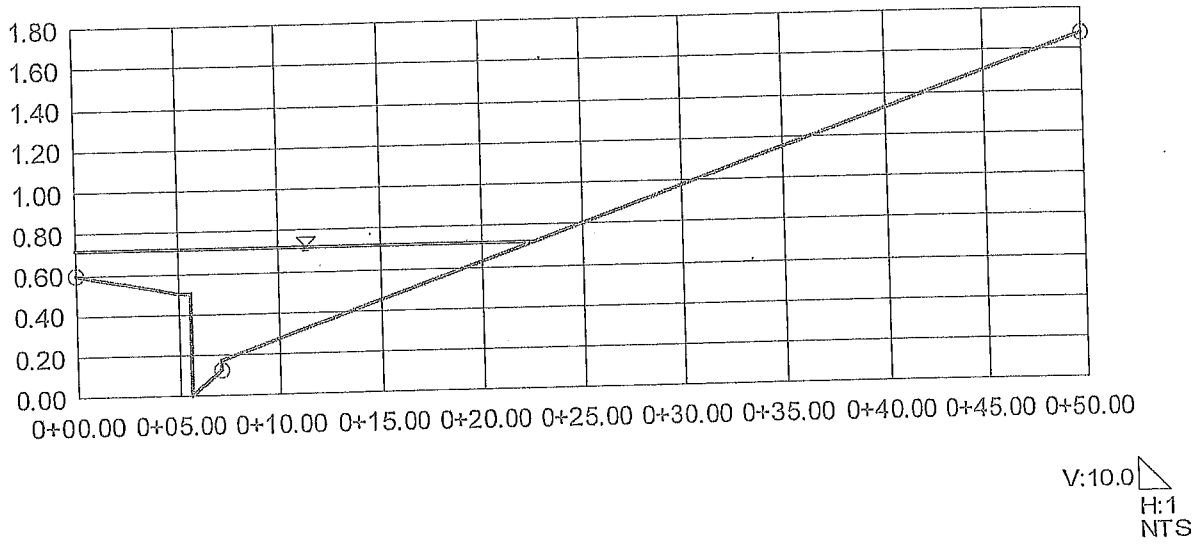
Station (ft)	Elevation (ft)
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0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.68

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10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.5% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 3.5% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.68
Discharge	51.67 cfs



10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 4.0% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 4.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.89
Discharge	46.98 cfs
Flow Area	5.7 ft²
Wetted Perimeter	21.43 ft
Top Width	20.75 ft
Actual Depth	0.72 ft
Critical Elevation	0.99 ft
Critical Slope	0.3820 %
Velocity	8.21 ft/s
Velocity Head	1.05 ft
Specific Energy	1.77 ft
Froude Number	2.76
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.016
0+07.00	0+50.00	0.013

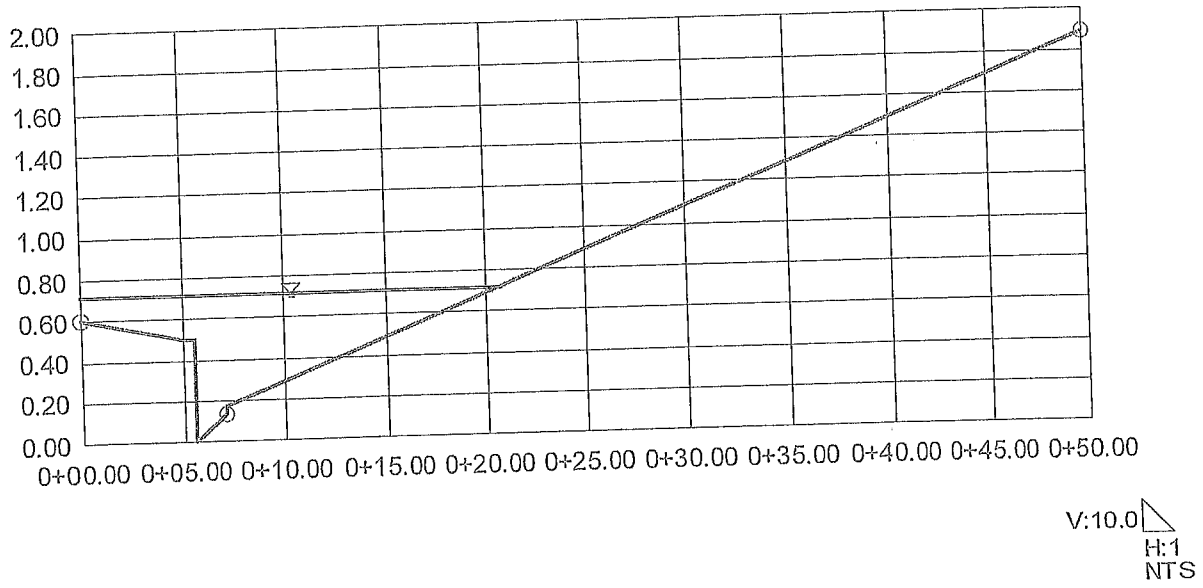
Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.89

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10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 4.0% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn Nortth Half Tee Pee to Fort Apache - 4.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.89
Discharge	46.98 cfs



10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 2.5% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 2.5% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.71 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.25
Discharge	63.62 cfs
Flow Area	7.7 ft²
Wetted Perimeter	29.16 ft
Top Width	28.50 ft
Actual Depth	0.71 ft
Critical Elevation	0.99 ft
Critical Slope	0.3670 %
Velocity	8.29 ft/s
Velocity Head	1.07 ft
Specific Energy	1.78 ft
Froude Number	2.81
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.11 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

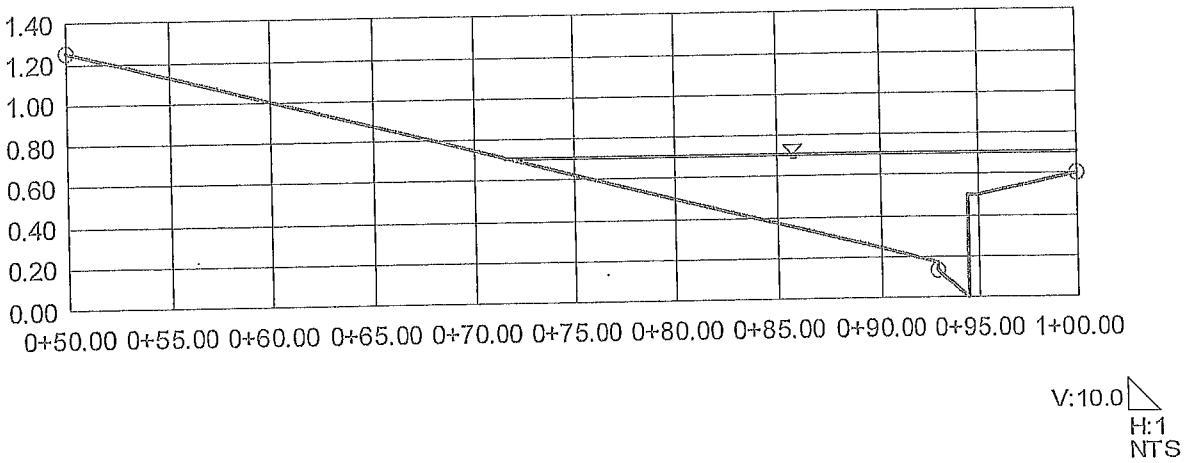
Natural Channel Points	
Station (ft)	Elevation (ft)
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0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 2.5% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 2.5% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.71 ft
Elevation Range	0.00 to 1.25
Discharge	63.62 cfs



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10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.0% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.46
Discharge	58.22 cfs
Flow Area	7.0 ft²
Wetted Perimeter	26.01 ft
Top Width	25.33 ft
Actual Depth	0.72 ft
Critical Elevation	1.00 ft
Critical Slope	0.3708 %
Velocity	8.34 ft/s
Velocity Head	1.08 ft
Specific Energy	1.80 ft
Froude Number	2.80
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

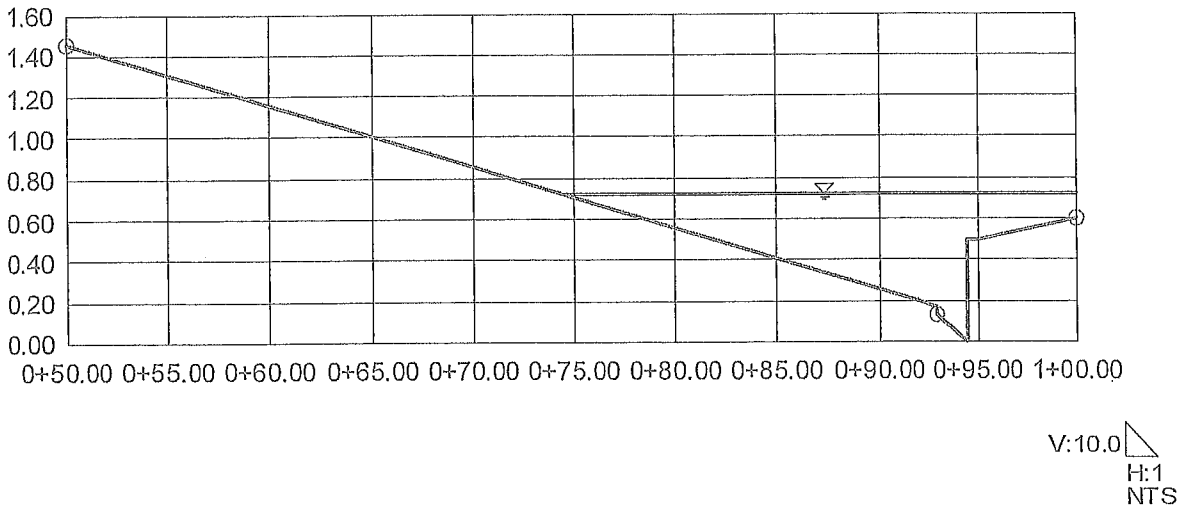
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+50.00	1.46
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.0% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.0% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.014	
Channel Slope	3.4000	%
Water Surface Elevation	0.72	ft
Elevation Range	0.00 to 1.46	
Discharge	58.22	cfs



10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.5% Cross Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.5% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.014
Elevation Range	0.00 to 1.68
Discharge	51.67 cfs
Flow Area	6.2 ft²
Wetted Perimeter	23.34 ft
Top Width	22.66 ft
Actual Depth	0.72 ft
Critical Elevation	1.00 ft
Critical Slope	0.3767 %
Velocity	8.27 ft/s
Velocity Head	1.06 ft
Specific Energy	1.78 ft
Froude Number	2.78
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.12 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+50.00	0+93.00	0.013
0+93.00	1+00.00	0.016

Natural Channel Points

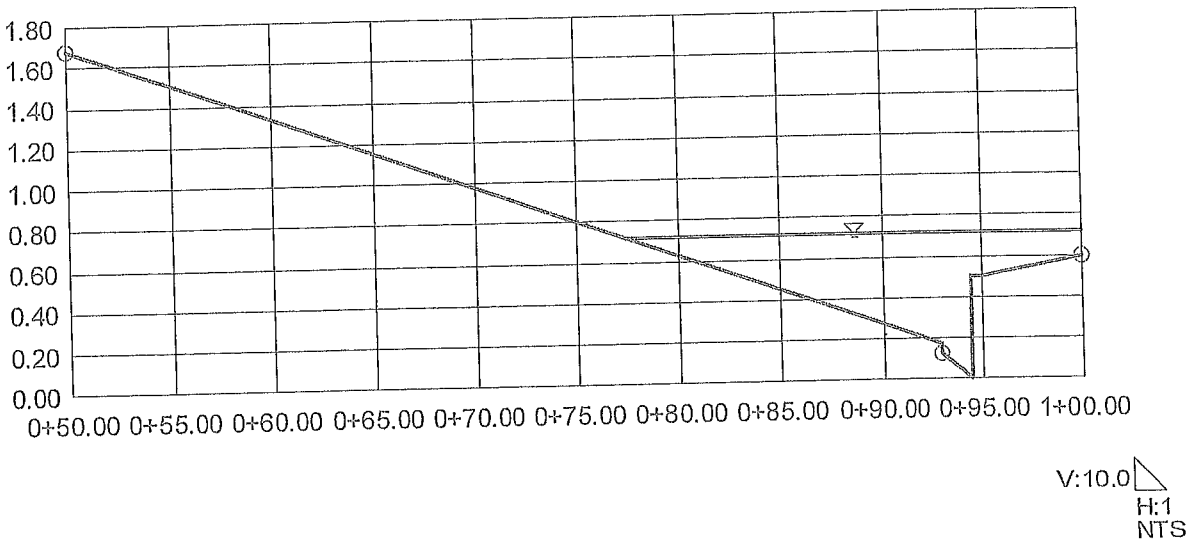
Station (ft)	Elevation (ft)
0+50.00	1.68
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

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10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.5% Cross Slope
Cross Section for Irregular Channel

Project Description	
Worksheet	10-yr Capacity - Elkhorn South Half Tee Pee to Fort Apache - 3.5% Cross Slope
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	3.4000 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.68
Discharge	51.67 cfs



APPENDIX E

Storm Drain Hydraulic Analyses

Mainline WSPG Analysis, Manning's "N"=0.013

DATE: 9/30/2013
TIME: 15:53

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	7	3	0	0.00	6.00	7.00	0.00	0.00	0.00										
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SLATER HANIFAN GROUP, 09-30-2013

HEADING LINE NO 2 IS -

CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

HEADING LINE NO 3 IS -

CLV1201.000, 90% DESIGN, MAINLINE (N=0.013)
F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

		STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO 1 IS A SYSTEM OUTLET	U/S DATA	-6400.00	2669.50	7										2673.73				
ELEMENT NO 2 IS A REACH	U/S DATA	-6300.00	2670.00	7			0.013								0.00	0.00	0.00	0
ELEMENT NO 3 IS A REACH	U/S DATA	-5900.00	2682.29	7			0.013								0.00	0.00	0.00	0
ELEMENT NO 4 IS A REACH	U/S DATA	-5575.00	2688.79	7			0.013								0.00	0.00	0.00	0
ELEMENT NO 5 IS A REACH	U/S DATA	-5350.00	2700.28	7			0.013								0.00	0.00	0.00	0
ELEMENT NO 6 IS A JUNCTION	U/S DATA	-5337.72	2700.70	7	36	0	0.013	64.0	0.0	2702.45	0.00	45.00	0.00					
ELEMENT NO 7 IS A REACH	U/S DATA	-4550.00	2727.55	7			0.013								0.00	0.00	0.00	0
ELEMENT NO 8 IS A REACH	U/S DATA	-4499.23	2728.82	7			0.013								0.00	22.48	0.00	0
ELEMENT NO 9 IS A REACH	U/S DATA	-4401.13	2731.27	7			0.013								0.00	22.48	0.00	0
ELEMENT NO 10 IS A REACH	U/S DATA	-4303.04	2733.73	7			0.013								0.00	0.00	0.00	0
ELEMENT NO 11 IS A REACH	U/S DATA	-4300.00	2733.80	7			0.013								0.00	0.00	0.00	0
ELEMENT NO 12 IS A JUNCTION	U/S DATA	-4073.59	2741.17	7	36	0	0.013	76.0	0.0	2742.84	0.00	45.00	0.00					

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

		STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO 13 IS A JUNCTION	U/S DATA	-3968.00	2744.60	7	24	0	0.013	37.0	0.0	2747.35	0.00	90.00	0.00					
ELEMENT NO 14 IS A REACH	U/S DATA	-3900.00	2746.82	7			0.013								0.00	0.00	0.00	0
ELEMENT NO 15 IS A SYSTEM HEADWORKS	U/S DATA	-3900.00	2746.82	7										0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: SLATER HANIFAN GROUP F0515P PAGE 1

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 09-30-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, MAINLINE (N=0.013)

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		

-6400.00	2669.50	4.309	2673.809	808.0	26.79	11.142	2684.951	0.00	6.000		6.00	7.00	0.00	0	0.00
7.37	0.00500					.023052	0.17			6.000			0.00		
-6392.63	2669.54	4.278	2673.815	808.0	26.98	11.306	2685.121	0.00	6.000		6.00	7.00	0.00	0	0.00
47.02	0.00500					.024811	1.17			6.000			0.00		
-6345.61	2669.77	4.079	2673.851	808.0	28.30	12.437	2686.288	0.00	6.000		6.00	7.00	0.00	0	0.00
45.61	0.00500					.028105	1.28			6.000			0.00		
-6300.00	2670.00	3.889	2673.889	808.0	29.68	13.680	2687.569	0.00	6.000		6.00	7.00	0.00	0	0.00
400.00	0.03072					.028143	11.26			3.847			0.00		
-5900.00	2682.29	4.074	2686.364	808.0	28.33	12.464	2698.828	0.00	6.000		6.00	7.00	0.00	0	0.00
27.39	0.02000					.026734	0.73			4.535			0.00		
-5872.61	2682.84	4.038	2686.876	808.0	28.58	12.686	2699.562	0.00	6.000		6.00	7.00	0.00	0	0.00
122.16	0.02000					.028845	3.52			4.535			0.00		
-5750.45	2685.28	3.851	2689.132	808.0	29.98	13.954	2703.086	0.00	6.000		6.00	7.00	0.00	0	0.00
95.73	0.02000					.032706	3.13			4.535			0.00		
-5654.72	2687.20	3.671	2690.867	808.0	31.44	15.350	2706.217	0.00	6.000		6.00	7.00	0.00	0	0.00
79.72	0.02000					.037111	2.96			4.535			0.00		
-5575.00	2688.79	3.500	2692.290	808.0	32.98	16.885	2709.175	0.00	6.000		6.00	7.00	0.00	0	0.00
33.70	0.05107					.038742	1.31			3.179			0.00		
-5541.30	2690.51	3.549	2694.060	808.0	32.52	16.423	2710.483	0.00	6.000		6.00	7.00	0.00	0	0.00
86.26	0.05107					.035768	3.09			3.179			0.00		
-5455.04	2694.92	3.723	2698.639	808.0	31.01	14.930	2713.569	0.00	6.000		6.00	7.00	0.00	0	0.00
60.17	0.05107					.031530	1.90			3.179			0.00		

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 09-30-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, MAINLINE (N=0.013)

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
-5394.87	2697.99	3.904	2701.893	808.0	29.56	13.572	2715.465	0.00	6.000		6.00	7.00	0.00	0	0.00
44.87	0.05107					.027814	1.25			3.179			0.00		
-5350.00	2700.28	4.095	2704.375	808.0	28.19	12.339	2716.714	0.00	6.000		6.00	7.00	0.00	0	0.00
JUNCT STR	0.03420					.029785	0.37						0.00		
-5337.72	2700.70	3.499	2704.199	744.0	30.38	14.328	2718.527	0.00	6.000		6.00	7.00	0.00	0	0.00
225.59	0.03409					.033109	7.47			3.476			0.00		
-5112.13	2708.39	3.529	2711.918	744.0	30.11	14.082	2726.000	0.00	6.000		6.00	7.00	0.00	0	0.00
335.24	0.03409					.030781	10.32			3.476			0.00		
-4776.89	2719.82	3.702	2723.518	744.0	28.71	12.801	2736.319	0.00	6.000		6.00	7.00	0.00	0	0.00
141.36	0.03409					.027132	3.84			3.476			0.00		
-4635.53	2724.64	3.882	2728.517	744.0	27.38	11.637	2740.154	0.00	6.000		6.00	7.00	0.00	0	0.00
85.53	0.03409					.023933	2.05			3.476			0.00		
-4550.00	2727.55	4.072	2731.622	744.0	26.10	10.580	2742.202	0.00	6.000		6.00	7.00	0.00	0	0.00
50.77	0.02501					.022193	1.13			3.906			0.00		
-4499.23	2728.82	4.106	2732.926	744.0	25.88	10.402	2743.328	0.00	6.000		6.00	7.00	0.00	0	0.00
98.10	0.02498					.021338	2.09			3.909			0.00		
-4401.13	2731.27	4.198	2735.468	744.0	25.32	9.956	2745.424	0.00	6.000		6.00	7.00	0.00	0	0.00
98.09	0.02508					.019842	1.95			3.903			0.00		
-4303.04	2733.73	4.344	2738.074	744.0	24.47	9.296	2747.370	0.00	6.000		6.00	7.00	0.00	0	0.00
3.04	0.02303					.018937	0.06			4.032			0.00		
-4300.00	2733.80	4.348	2738.148	744.0	24.45	9.279	2747.427	0.00	6.000		6.00	7.00	0.00	0	0.00
JUNCT STR	0.03255					.017504	3.96						0.00		

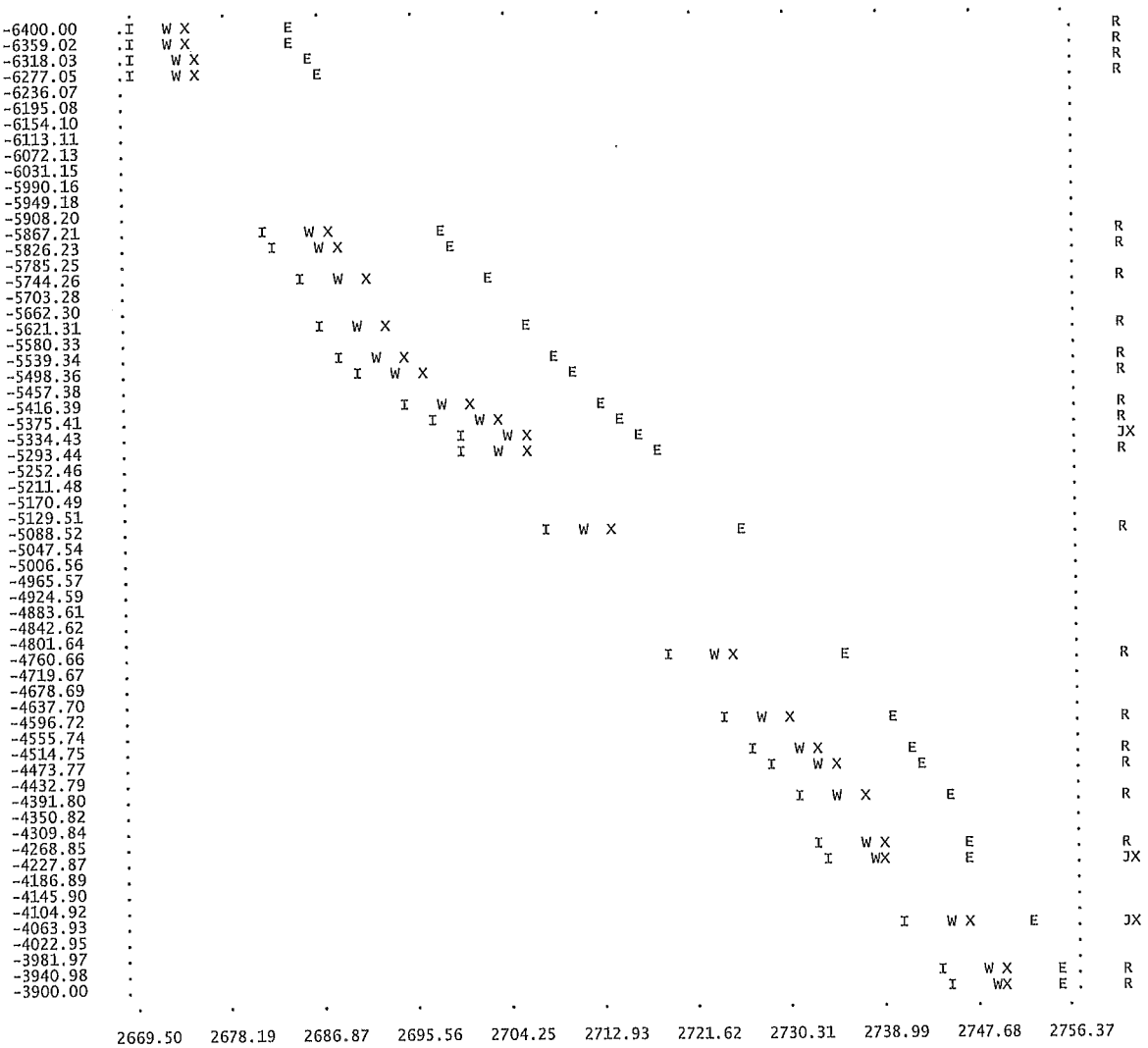
WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 09-30-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, MAINLINE (N=0.013)

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
-4073.59	2741.17	4.259	2745.429	668.0	22.41	7.797	2753.226	0.00	6.000		6.00	7.00	0.00	0	0.00

JUNCT STR	0.03248					.014829	1.57						0.00		
-3968.00	2744.60	4.353	2748.953	631.0	20.71	6.660	2755.613	0.00	6.000		6.00	7.00	0.00	0	0.00
14.98	0.03265					.012980	0.19			3.124			0.00		
-3953.02	2745.09	4.507	2749.596	631.0	20.00	6.211	2755.807	0.00	6.000		6.00	7.00	0.00	0	0.00
16.43	0.03265					.011679	0.19			3.124			0.00		
-3936.59	2745.63	4.727	2750.353	631.0	19.07	5.646	2755.999	0.00	6.000		6.00	7.00	0.00	0	0.00
12.67	0.03265					.010334	0.13			3.124			0.00		
-3923.92	2746.04	4.958	2750.997	631.0	18.18	5.133	2756.130	0.00	6.000		6.00	7.00	0.00	0	0.00
9.56	0.03265					.009151	0.09			3.124			0.00		
-3914.36	2746.35	5.200	2751.551	631.0	17.34	4.667	2756.218	0.00	6.000		6.00	7.00	0.00	0	0.00
6.95	0.03265					.008109	0.06			3.124			0.00		
-3907.41	2746.58	5.454	2752.032	631.0	16.53	4.242	2756.274	0.00	6.000		6.00	7.00	0.00	0	0.00
4.69	0.03265					.007191	0.03			3.124			0.00		
-3902.72	2746.73	5.720	2752.451	631.0	15.76	3.857	2756.308	0.00	6.000		6.00	7.00	0.00	0	0.00
2.72	0.03265					.008029	0.02			3.124			0.00		
-3900.00	2746.82	6.000	2752.820	631.0	15.11	3.547	2756.367	0.00	6.000		6.00	7.00	0.00	0	0.00

SLATER HANIFAN GROUP, 09-30-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, MAINLINE (N=0.013)



N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL

E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY†

Mainline WSPG Analysis, Manning's "N"=0.015

DATE: 9/30/2013
TIME: 15:53

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WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	7	3	0	0.00	6.00	7.00	0.00	0.00	0.00										
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SLATER HANIFAN GROUP, 09-30-2013

HEADING LINE NO 2 IS -

CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

HEADING LINE NO 3 IS -

CLV1201.000, 90% DESIGN, MAINLINE (N=0.015)
F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	-6400.00	2669.50	7	2679.21

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	-6300.00	2670.00	7	0.015	0.00	0.00	0.00	0

ELEMENT NO 3 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	-5900.00	2682.29	7	0.015	0.00	0.00	0.00	0

ELEMENT NO 4 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	-5575.00	2688.79	7	0.015	0.00	0.00	0.00	0

ELEMENT NO 5 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	-5350.00	2700.28	7	0.015	0.00	0.00	0.00	0

ELEMENT NO 6 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	-5337.72	2700.70	7	36	0	0.015	64.0	0.0	2702.45	0.00	45.00	0.00

ELEMENT NO 7 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	-4550.00	2727.55	7	0.015	0.00	0.00	0.00	0

ELEMENT NO 8 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	-4499.23	2728.82	7	0.015	0.00	22.48	0.00	0

ELEMENT NO 9 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	-4401.13	2731.27	7	0.015	0.00	22.48	0.00	0

ELEMENT NO 10 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	-4303.04	2733.73	7	0.015	0.00	0.00	0.00	0

ELEMENT NO 11 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	-4300.00	2733.80	7	0.015	0.00	0.00	0.00	0

ELEMENT NO 12 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	-4073.59	2741.17	7	36	0	0.015	76.0	0.0	2742.84	0.00	45.00	0.00

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 13 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	-3968.00	2744.60	7	24	0	0.015	37.0	0.0	2747.35	0.00	90.00	0.00

ELEMENT NO 14 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	-3900.00	2746.82	7	0.015	0.00	0.00	0.00	0

ELEMENT NO 15 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	-3900.00	2746.82	7	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: SLATER HANIFAN GROUP F0515P PAGE 1

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 09-30-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, MAINLINE (N=0.015)

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO				SF AVE	HF			NORM DEPTH			ZR		

-6400.00	2669.50	9.710	2679.210	808.0	19.35	5.816	2685.026	0.00	6.000		6.00	7.00	0.00	0	0.00
100.00	0.00500					.020296	2.03			6.000			0.00		
-6300.00	2670.00	11.240	2681.240	808.0	19.35	5.816	2687.056	0.00	6.000		6.00	7.00	0.00	0	0.00
261.90	0.03072					.020296	5.32			4.291			0.00		
-6038.10	2678.05	8.508	2686.555	808.0	19.35	5.816	2692.371	0.00	6.000		6.00	7.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
-6038.10	2678.05	4.477	2682.524	808.0	25.78	10.323	2692.847	0.00	6.000		6.00	7.00	0.00	0	0.00
138.10	0.03072					.026318	3.63			4.291			0.00		
-5900.00	2682.29	4.640	2686.930	808.0	24.87	9.608	2696.538	0.00	6.000		6.00	7.00	0.00	0	0.00
13.36	0.02000					.025256	0.34			5.071			0.00		
-5886.64	2682.56	4.618	2687.175	808.0	24.99	9.700	2696.875	0.00	6.000		6.00	7.00	0.00	0	0.00
106.71	0.02000					.027076	2.89			5.071			0.00		
-5779.93	2684.69	4.403	2689.094	808.0	26.21	10.670	2699.764	0.00	6.000		6.00	7.00	0.00	0	0.00
81.08	0.02000					.030634	2.48			5.071			0.00		
-5698.85	2686.31	4.198	2690.511	808.0	27.49	11.737	2702.248	0.00	6.000		6.00	7.00	0.00	0	0.00
66.62	0.02000					.034686	2.31			5.071			0.00		
-5632.23	2687.64	4.003	2691.648	808.0	28.84	12.911	2704.559	0.00	6.000		6.00	7.00	0.00	0	0.00
57.23	0.02000					.039303	2.25			5.071			0.00		
-5575.00	2688.79	3.817	2692.607	808.0	30.24	14.202	2706.809	0.00	6.000		6.00	7.00	0.00	0	0.00
87.34	0.05107					.039516	3.45			3.538			0.00		
-5487.66	2693.25	3.985	2697.235	808.0	28.96	13.025	2710.260	0.00	6.000		6.00	7.00	0.00	0	0.00
61.93	0.05107					.035088	2.17			3.538			0.00		

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 09-30-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, MAINLINE (N=0.015)

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
-5425.73	2696.41	4.180	2700.592	808.0	27.61	11.841	2712.433	0.00	6.000		6.00	7.00	0.00	0	0.00
43.44	0.05107					.030987	1.35			3.538			0.00		
-5382.29	2698.63	4.384	2703.015	808.0	26.33	10.765	2713.780	0.00	6.000		6.00	7.00	0.00	0	0.00
32.29	0.05107					.027386	0.88			3.538			0.00		
-5350.00	2700.28	4.598	2704.878	808.0	25.10	9.786	2714.664	0.00	6.000		6.00	7.00	0.00	0	0.00
JUNCT STR	0.03420					.029897	0.37						0.00		
-5337.72	2700.70	3.872	2704.572	744.0	27.45	11.700	2716.272	0.00	6.000		6.00	7.00	0.00	0	0.00
125.37	0.03409					.034093	4.27			3.872			0.00		
-5212.35	2704.97	3.872	2708.845	744.0	27.45	11.700	2720.545	0.00	6.000		6.00	7.00	0.00	0	0.00
437.99	0.03409					.032308	14.15			3.872			0.00		
-4774.36	2719.90	4.039	2723.941	744.0	26.32	10.755	2734.696	0.00	6.000		6.00	7.00	0.00	0	0.00
145.97	0.03409					.028738	4.19			3.872			0.00		
-4628.39	2724.88	4.236	2729.114	744.0	25.09	9.777	2738.891	0.00	6.000		6.00	7.00	0.00	0	0.00
78.39	0.03409					.025385	1.99			3.872			0.00		
-4550.00	2727.55	4.442	2731.992	744.0	23.93	8.888	2740.880	0.00	6.000		6.00	7.00	0.00	0	0.00
50.77	0.02501					.023658	1.20			4.359			0.00		
-4499.23	2728.82	4.466	2733.286	744.0	23.80	8.796	2742.082	0.00	6.000		6.00	7.00	0.00	0	0.00
98.10	0.02498					.023065	2.26			4.362			0.00		
-4401.13	2731.27	4.531	2735.801	744.0	23.46	8.544	2744.345	0.00	6.000		6.00	7.00	0.00	0	0.00
98.09	0.02508					.021902	2.15			4.355			0.00		
-4303.04	2733.73	4.650	2738.380	744.0	22.86	8.114	2746.494	0.00	6.000		6.00	7.00	0.00	0	0.00
3.04	0.02303					.021161	0.06			4.501			0.00		

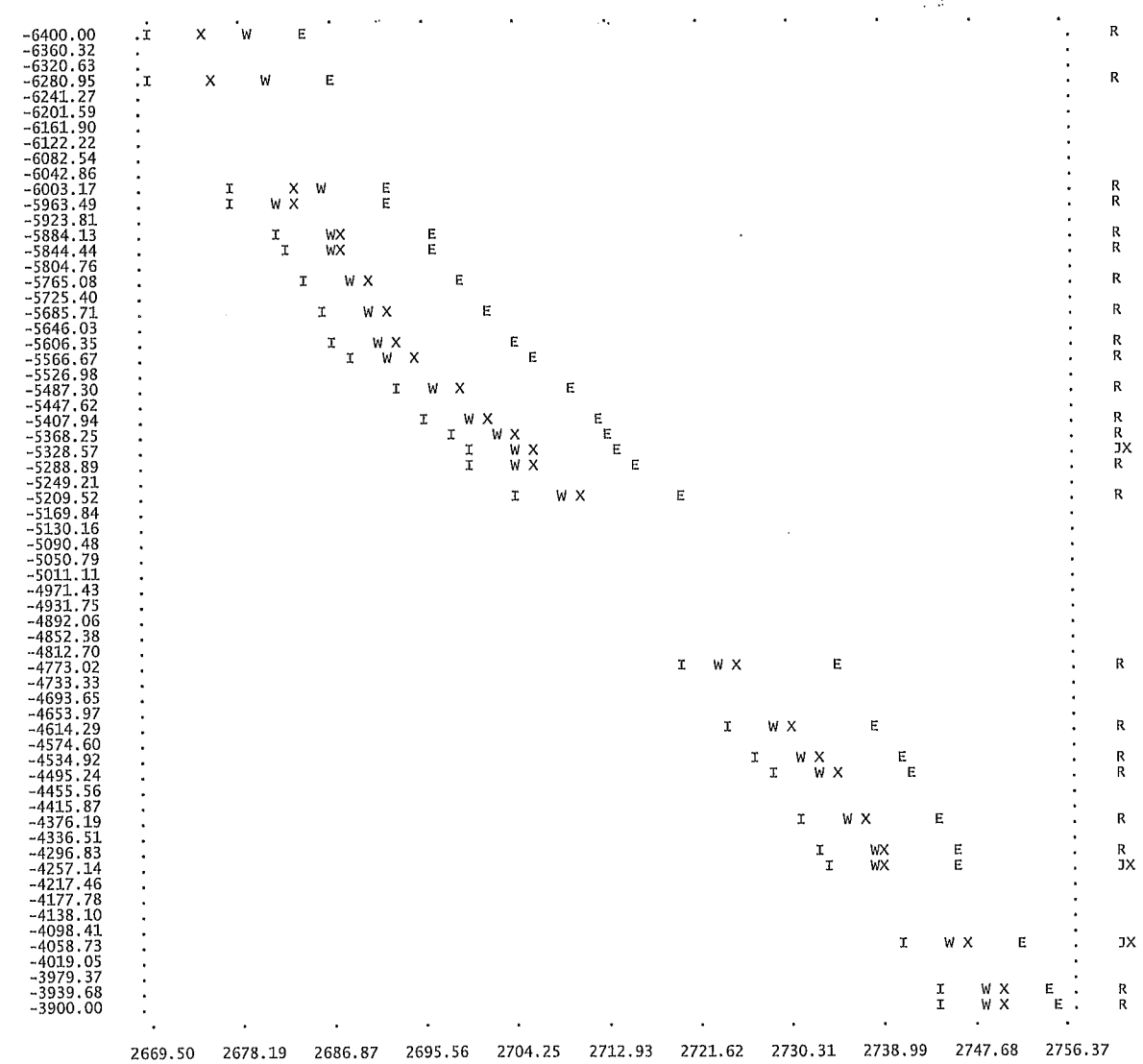
WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 09-30-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, MAINLINE (N=0.015)

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
-4300.00	2733.80	4.652	2738.452	744.0	22.85	8.106	2746.558	0.00	6.000		6.00	7.00	0.00	0	0.00

JUNCT STR	0.03255					.020088	4.55						0.00		
-4073.59	2741.17	4.458	2745.628	668.0	21.41	7.116	2752.744	0.00	6.000		6.00	7.00	0.00	0	0.00
JUNCT STR	0.03248					.018019	1.90						0.00		
-3968.00	2744.60	4.455	2749.055	631.0	20.24	6.358	2755.413	0.00	6.000		6.00	7.00	0.00	0	0.00
5.97	0.03265					.016757	0.10			3.476			0.00		
-3962.03	2744.80	4.507	2749.302	631.0	20.00	6.211	2755.513	0.00	6.000		6.00	7.00	0.00	0	0.00
20.15	0.03265					.015550	0.31			3.476			0.00		
-3941.88	2745.45	4.727	2750.180	631.0	19.07	5.646	2755.826	0.00	6.000		6.00	7.00	0.00	0	0.00
14.97	0.03265					.013759	0.21			3.476			0.00		
-3926.91	2745.94	4.958	2750.899	631.0	18.18	5.133	2756.032	0.00	6.000		6.00	7.00	0.00	0	0.00
10.97	0.03265					.012183	0.13			3.476			0.00		
-3915.94	2746.30	5.200	2751.500	631.0	17.34	4.667	2756.167	0.00	6.000		6.00	7.00	0.00	0	0.00
7.80	0.03265					.010795	0.08			3.476			0.00		
-3908.14	2746.55	5.454	2752.008	631.0	16.53	4.242	2756.250	0.00	6.000		6.00	7.00	0.00	0	0.00
5.18	0.03265					.009574	0.05			3.476			0.00		
-3902.96	2746.72	5.720	2752.443	631.0	15.76	3.857	2756.300	0.00	6.000		6.00	7.00	0.00	0	0.00
2.96	0.03265					.010690	0.03			3.476			0.00		
-3900.00	2746.82	6.000	2752.820	631.0	15.11	3.547	2756.367	0.00	6.000		6.00	7.00	0.00	0	0.00

SLATER HANIFAN GROUP, 09-30-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, MAINLINE (N=0.015)



N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY‡

Mainline Lateral WSPG Analysis

DATE: 9/18/2013
TIME: 8:39

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	7	3	0	0.00	6.00	7.00	0.00	0.00	0.00										
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SLATER HANIFAN GROUP, 09-17-2013

HEADING LINE NO 2 IS -

CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

HEADING LINE NO 3 IS -

CLV1201.000, 90% DESIGN, SD LATERAL 1

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.00	2749.62	18	2751.56

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1016.00	2751.22	18	0.013	0.00	0.00	0.00	0

ELEMENT NO 3 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1016.00	2751.22	18	0.00

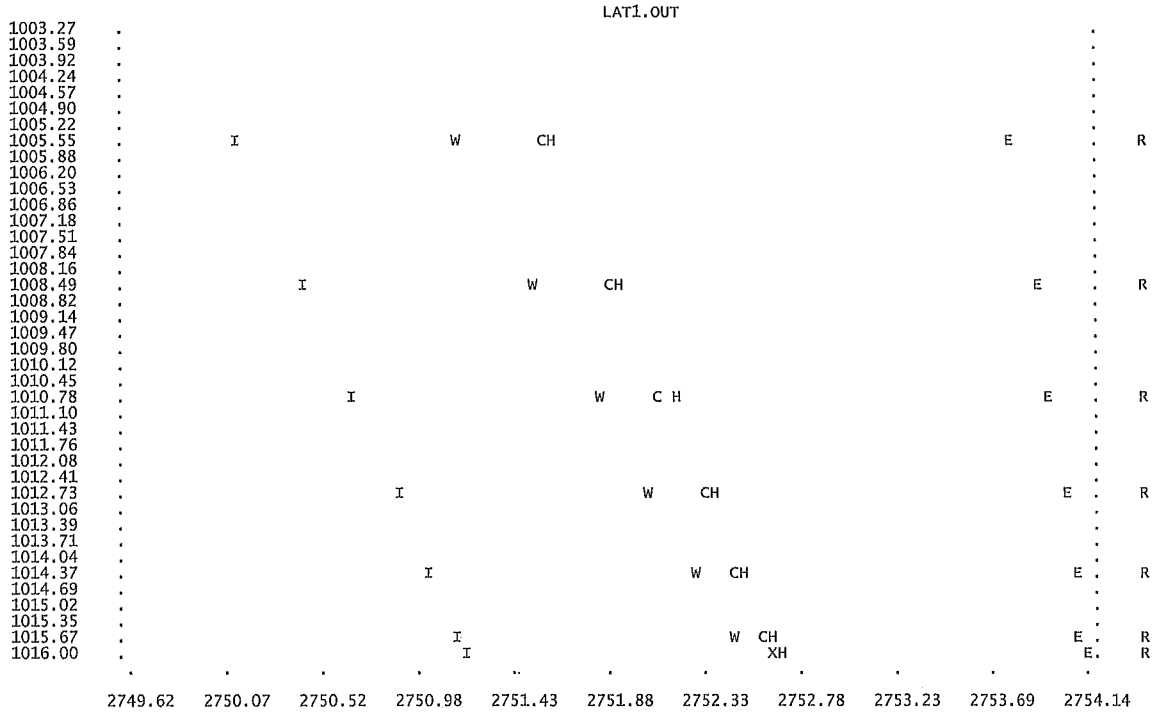
NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: SLATER HANIFAN GROUP F0515P PAGE 1

WATER SURFACE PROFILE LISTING
SLATER HANIFAN GROUP, 09-17-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, SD LATERAL 1

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1000.00	2749.62	0.981	2750.601	17.0	13.88	2.990	2753.591	0.00	1.440	1.50	0.00	0.00	0	0.00
1.66	0.10000					.043901	0.07		0.760			0.00		
1001.66	2749.79	0.997	2750.783	17.0	13.62	2.881	2753.664	0.00	1.440	1.50	0.00	0.00	0	0.00
3.66	0.10000					.040508	0.15		0.760			0.00		
1005.32	2750.15	1.041	2751.193	17.0	12.99	2.619	2753.812	0.00	1.440	1.50	0.00	0.00	0	0.00
2.99	0.10000					.036131	0.11		0.760			0.00		
1008.31	2750.45	1.088	2751.539	17.0	12.38	2.381	2753.920	0.00	1.440	1.50	0.00	0.00	0	0.00
2.44	0.10000					.032335	0.08		0.760			0.00		
1010.75	2750.70	1.139	2751.834	17.0	11.81	2.164	2753.998	0.00	1.440	1.50	0.00	0.00	0	0.00
1.98	0.10000					.029074	0.06		0.760			0.00		
1012.73	2750.89	1.195	2752.088	17.0	11.25	1.966	2754.054	0.00	1.440	1.50	0.00	0.00	0	0.00
1.56	0.10000					.026342	0.04		0.760			0.00		
1014.29	2751.05	1.259	2752.308	17.0	10.73	1.789	2754.097	0.00	1.440	1.50	0.00	0.00	0	0.00
1.14	0.10000					.024193	0.03		0.760			0.00		
1015.43	2751.16	1.335	2752.498	17.0	10.23	1.625	2754.123	0.00	1.440	1.50	0.00	0.00	0	0.00
0.57	0.10000					.023047	0.01		0.760			0.00		
1016.00	2751.22	1.440	2752.660	17.0	9.75	1.477	2754.137	0.00	1.440	1.50	0.00	0.00	0	0.00

SLATER HANIFAN GROUP, 09-17-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, SD LATERAL 1

```
1000.00   .I                W        C H                                  E          .   R
1000.33   .                                                                           .
1000.65   .                                                                           .
1000.98   .                                                                           .
1001.31   .                                                                           .
1001.63   .                                                                           .
1001.96   .   I                  W        CH                                 E       .   R
1002.29   .                                                                           .
1002.61   .                                                                           .
1002.94   .                                                                           .
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N O T E S
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   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY†

DATE: 9/12/2013
TIME: 14:56

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	7	3	0	0.00	7.50	14.00	0.00	0.00	0.00										
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SLATER HANIFAN GROUP, 09-12-2013

HEADING LINE NO 2 IS -

CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

HEADING LINE NO 3 IS -

CLV1201.000, 90% DESIGN, SD LATERAL 2

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT			W S ELEV
	1000.00	2747.35	24			2749.05

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1044.00	2751.75	24	0.013	0.00	0.00	0.00	0

ELEMENT NO 3 IS A WALL ENTRANCE *

U/S DATA	STATION	INVERT	SECT	FP
	1044.00	2751.75	7	0.013

ELEMENT NO 4 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1044.00	2751.75	7	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: SLATER HANIFAN GROUP F0515P PAGE 1

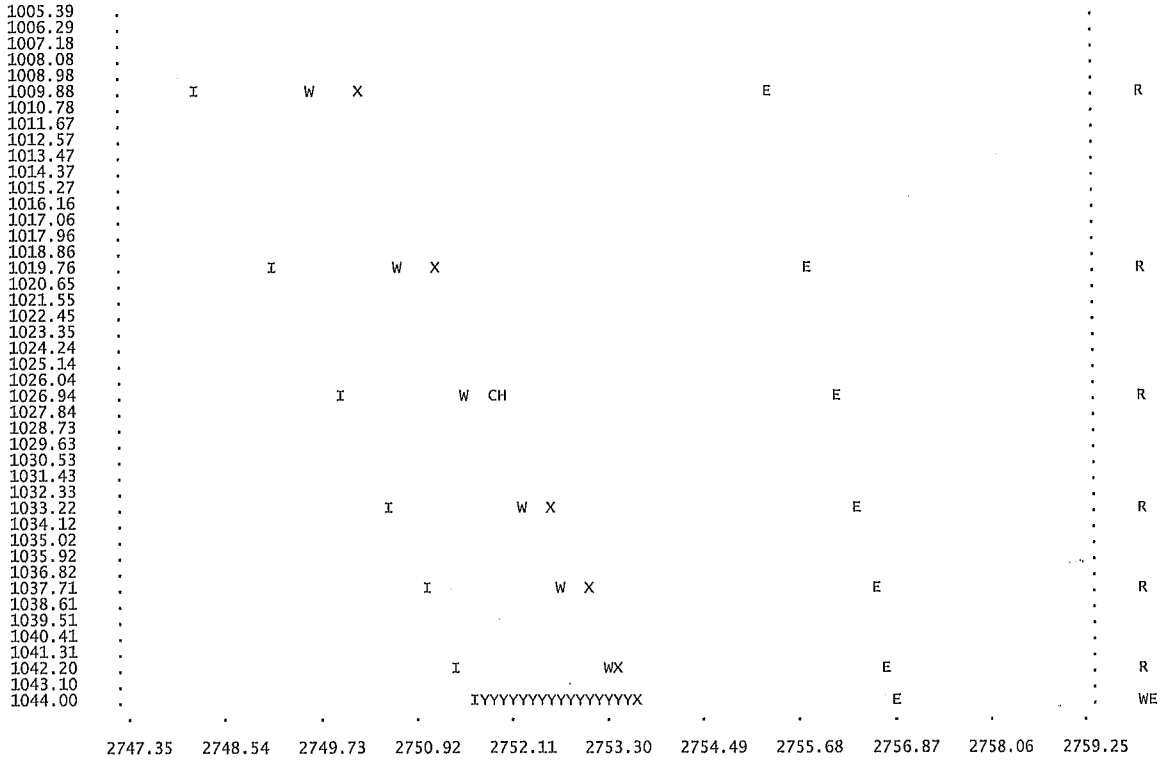
WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 09-12-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, SD LATERAL 2

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH				ZR		
1000.00	2747.35	1.357	2748.707	45.0	19.83	6.108	2754.815	0.00	1.970		2.00	0.00	0.00	0	0.00
9.32	0.10000					.058812	0.55			1.150			0.00		
1009.32	2748.28	1.402	2749.684	45.0	19.12	5.679	2755.363	0.00	1.970		2.00	0.00	0.00	0	0.00
9.70	0.10000					.053242	0.52			1.150			0.00		
1019.02	2749.25	1.465	2750.717	45.0	18.24	5.167	2755.884	0.00	1.970		2.00	0.00	0.00	0	0.00
7.64	0.10000					.047688	0.36			1.150			0.00		
1026.66	2750.02	1.535	2751.551	45.0	17.39	4.695	2756.246	0.00	1.970		2.00	0.00	0.00	0	0.00
6.13	0.10000					.042956	0.26			1.150			0.00		
1032.79	2750.63	1.612	2752.241	45.0	16.58	4.269	2756.510	0.00	1.970		2.00	0.00	0.00	0	0.00
4.92	0.10000					.039011	0.19			1.150			0.00		
1037.71	2751.12	1.700	2752.821	45.0	15.81	3.879	2756.700	0.00	1.970		2.00	0.00	0.00	0	0.00
3.85	0.10000					.035986	0.14			1.150			0.00		
1041.56	2751.51	1.806	2753.312	45.0	15.07	3.527	2756.839	0.00	1.970		2.00	0.00	0.00	0	0.00
2.44	0.10000					.035299	0.09			1.150			0.00		
1044.00	2751.75	1.970	2753.720	45.0	14.37	3.205	2756.925	0.00	1.970		2.00	0.00	0.00	0	0.00
WALL ENTRANCE													0.00		
1044.00	2751.75	5.215	2756.965	45.0	0.62	0.006	2756.971	0.00	0.685		7.50	14.00	0.00	0	0.00

SLATER HANIFAN GROUP, 09-12-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, SD LATERAL 2

```
1000.00   .I        W   X                          E                    .   R
1000.90   .                                                            .
1001.80   .                                                            .
1002.69   .                                                            .
1003.59   .                                                            .
1004.49   .                                                            .
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N O T E S
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   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY.

DATE: 9/23/2013
TIME: 13:22

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	7	3	0	0.00	6.00	24.00	0.00	0.00	0.00										
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SLATER HANIFAN GROUP, 09-18-2013

HEADING LINE NO 2 IS -

CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

HEADING LINE NO 3 IS -

CLV1201.000, 90% DESIGN, SD LATERAL 3

F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.00	2742.80	36	2745.62

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1013.00	2744.10	36	0.013	0.00	0.00	44.00	0

ELEMENT NO 3 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1102.00	2747.42	36	0.013	0.00	0.00	75.00	0

ELEMENT NO 4 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1102.00	2747.92	36	18	0	0.013	4.0	0.0	2748.10	0.00	51.00	0.00

ELEMENT NO 5 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1146.00	2751.81	36	0.013	0.00	0.00	0.00	0

ELEMENT NO 6 IS A WALL ENTRANCE

U/S DATA	STATION	INVERT	SECT	FP
	1146.00	2751.81	7	0.013

ELEMENT NO 7 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1146.00	2751.81	7	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: SLATER HANIFAN GROUP

F0515P

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 09-18-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, SD LATERAL 3

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1000.00	2742.80	1.568	2744.368	76.0	20.34	6.422	2750.790	0.00	2.730	3.00	0.00	0.00	0	0.00
4.86	0.10000					.043366	0.21		1.244			0.00		
1004.86	2743.29	1.598	2744.884	76.0	19.84	6.114	2750.998	0.00	2.730	3.00	0.00	0.00	0	0.00
8.14	0.10000					.039491	0.32		1.244			0.00		
1013.00	2744.10	1.661	2745.761	76.0	18.92	5.558	2751.319	0.00	2.730	3.00	0.00	0.00	0	0.00
89.00	0.03730					.036820	3.28		1.656			0.00		
1102.00	2747.42	1.667	2749.087	76.0	18.84	5.511	2754.598	0.00	2.730	3.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.037855	0.00					0.00		
1102.00	2747.92	1.581	2749.501	72.0	19.07	5.646	2755.147	0.00	2.684	3.00	0.00	0.00	0	0.00
8.23	0.08841					.036928	0.30		1.250			0.00		
1110.23	2748.65	1.638	2750.286	72.0	18.23	5.162	2755.448	0.00	2.684	3.00	0.00	0.00	0	0.00
7.28	0.08841					.032717	0.24		1.250			0.00		
1117.51	2749.29	1.702	2750.993	72.0	17.39	4.694	2755.687	0.00	2.684	3.00	0.00	0.00	0	0.00
6.01	0.08841					.028903	0.17		1.250			0.00		
1123.52	2749.82	1.771	2751.594	72.0	16.57	4.266	2755.860	0.00	2.684	3.00	0.00	0.00	0	0.00
5.03	0.08841					.025570	0.13		1.250			0.00		
1128.55	2750.27	1.843	2752.110	72.0	15.80	3.878	2755.988	0.00	2.684	3.00	0.00	0.00	0	0.00
4.19	0.08841					.022653	0.09		1.250			0.00		
1132.74	2750.64	1.920	2752.558	72.0	15.07	3.526	2756.084	0.00	2.684	3.00	0.00	0.00	0	0.00
3.51	0.08841					.020103	0.07		1.250			0.00		
1136.25	2750.95	2.001	2752.949	72.0	14.37	3.206	2756.155	0.00	2.684	3.00	0.00	0.00	0	0.00
2.88	0.08841					.017878	0.05		1.250			0.00		

LICENSEE: SLATER HANIFAN GROUP

F0515P

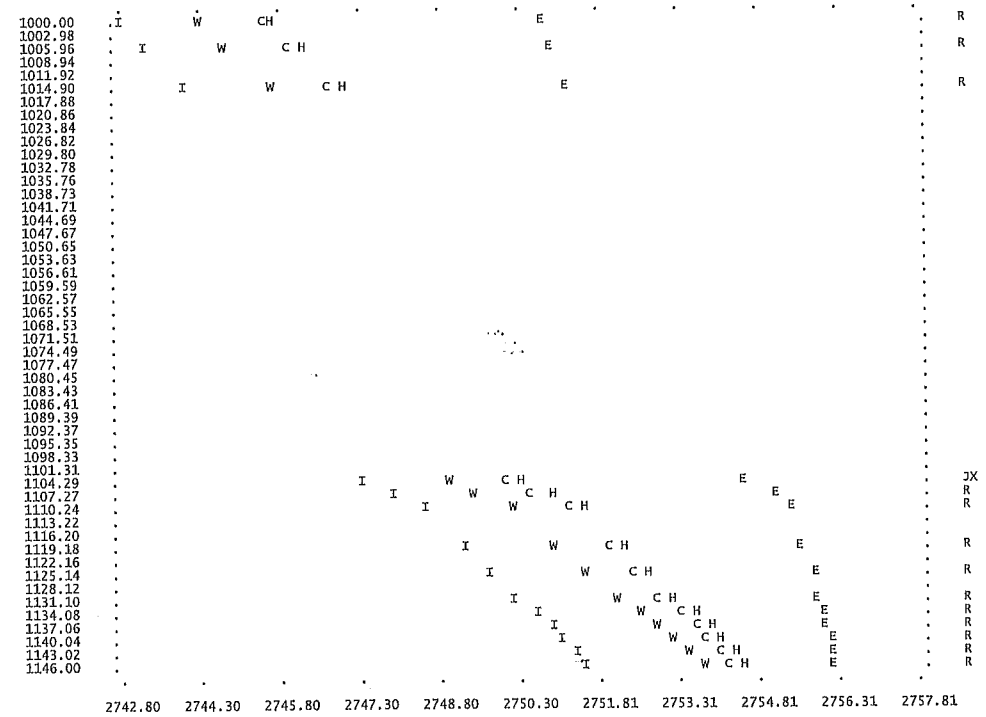
WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 09-18-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, SD LATERAL 3

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1139.13	2751.20	2.089	2753.292	72.0	13.70	2.914	2756.206	0.00	2.684	3.00	0.00	0.00	0	0.00
2.36	0.08841					.015947	0.04		1.250			0.00		

1141.49	2751.41	2.183	2753.594	72.0	13.06	2.649	2756.243	0.00	2.684		3.00	0.00	0.00	0	0.00
1.86	0.08841					.014275	0.03			1.250			0.00		
1143.35	2751.58	2.286	2753.862	72.0	12.45	2.409	2756.271	0.00	2.684		3.00	0.00	0.00	0	0.00
1.39	0.08841					.012845	0.02			1.250			0.00		
1144.74	2751.70	2.400	2754.099	72.0	11.88	2.190	2756.289	0.00	2.684		3.00	0.00	0.00	0	0.00
0.91	0.08841					.011649	0.01			1.250			0.00		
1145.65	2751.78	2.529	2754.308	72.0	11.32	1.991	2756.299	0.00	2.684		3.00	0.00	0.00	0	0.00
0.35	0.08841					.010710	0.00			1.250			0.00		
1146.00	2751.81	2.684	2754.494	72.0	10.79	1.808	2756.302	0.00	2.684		3.00	0.00	0.00	0	0.00
WALL ENTRANCE													0.00		
1146.00	2751.81	4.512	2756.322	72.0	0.66	0.007	2756.329	0.00	0.654		6.00	24.00	0.00	0	0.00?

SLATER HANIFAN GROUP, 09-18-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, SD LATERAL 3



N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY?

DATE: 3/ 1/2013
TIME: 10:50

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WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	7	3	0	0.00	6.00	7.00	0.00	0.00	0.00										
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SLATER HANIFAN GROUP, 02-28-2013

HEADING LINE NO 2 IS -

CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

HEADING LINE NO 3 IS -

CLV1201.000, 70% DESIGN, SD LATERAL 4

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET
U/S DATA STATION 1000.00 INVERT 2719.72 SECT 18 W S ELEV 2720.56

ELEMENT NO 2 IS A REACH
U/S DATA STATION 1013.00 INVERT 2724.80 SECT 18 N 0.013 RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 0

ELEMENT NO 3 IS A REACH
U/S DATA STATION 1032.00 INVERT 2726.00 SECT 18 N 0.013 RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 0

ELEMENT NO 4 IS A SYSTEM HEADWORKS
U/S DATA STATION 1032.00 INVERT 2726.00 SECT 18 W S ELEV 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC PAGE 1
LICENSEE: SLATER HANIFAN GROUP

F0515P

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 4

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR ZR
L/ELEM	SO					SF AVE	HF								
1000.00	2719.72	0.226	2719.946	2.7	16.17	4.059	2724.005	0.00	0.623		1.50	0.00	0.00	0	0.00
1.12	0.39077					.270721	0.30			0.200			0.00		
1001.12	2720.16	0.228	2720.384	2.7	15.98	3.963	2724.347	0.00	0.623		1.50	0.00	0.00	0	0.00
2.45	0.39077					.247731	0.61			0.200			0.00		
1003.57	2721.12	0.235	2721.351	2.7	15.17	3.573	2724.924	0.00	0.623		1.50	0.00	0.00	0	0.00
1.82	0.39077					.216135	0.39			0.200			0.00		
1005.39	2721.83	0.243	2722.070	2.7	14.52	3.272	2725.342	0.00	0.623		1.50	0.00	0.00	0	0.00
1.43	0.39077					.188741	0.27			0.200			0.00		
1006.82	2722.38	0.251	2722.635	2.7	13.85	2.977	2725.612	0.00	0.623		1.50	0.00	0.00	0	0.00
1.15	0.39077					.164914	0.19			0.200			0.00		
1007.97	2722.83	0.260	2723.094	2.7	13.17	2.694	2725.788	0.00	0.623		1.50	0.00	0.00	0	0.00
0.96	0.39077					.144023	0.14			0.200			0.00		
1008.93	2723.21	0.268	2723.477	2.7	12.56	2.449	2725.926	0.00	0.623		1.50	0.00	0.00	0	0.00
0.81	0.39077					.125664	0.10			0.200			0.00		
1009.74	2723.52	0.277	2723.801	2.7	11.95	2.216	2726.017	0.00	0.623		1.50	0.00	0.00	0	0.00
0.68	0.39077					.109854	0.07			0.200			0.00		
1010.42	2723.79	0.287	2724.079	2.7	11.39	2.015	2726.094	0.00	0.623		1.50	0.00	0.00	0	0.00
0.59	0.39077					.096090	0.06			0.200			0.00		
1011.01	2724.02	0.297	2724.319	2.7	10.89	1.841	2726.160	0.00	0.623		1.50	0.00	0.00	0	0.00
0.51	0.39077					.083986	0.04			0.200			0.00		

1011.52	2724.22	0.307	2724.530	2.7	10.38	1.675	2726.205	0.00	0.623		1.50	0.00	0.00	0	0.00
0.45	0.39077					.073354	0.03			0.200			0.00		

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 4

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1011.97	2724.40	0.317	2724.714	2.7	9.89	1.519	2726.233	0.00	0.623		1.50	0.00	0.00	0	0.00
0.39	0.39077					.064090	0.02			0.200			0.00		
1012.36	2724.55	0.328	2724.877	2.7	9.44	1.384	2726.261	0.00	0.623		1.50	0.00	0.00	0	0.00
0.34	0.39077					.056024	0.02			0.200			0.00		
1012.70	2724.68	0.339	2725.022	2.7	9.00	1.258	2726.280	0.00	0.623		1.50	0.00	0.00	0	0.00
0.30	0.39077					.048988	0.01			0.200			0.00		
1013.00	2724.80	0.351	2725.151	2.7	8.57	1.141	2726.292	0.00	0.623		1.50	0.00	0.00	0	0.00
2.57	0.06316					.044105	0.11			0.320			0.00		
1015.57	2724.96	0.357	2725.319	2.7	8.36	1.085	2726.404	0.00	0.623		1.50	0.00	0.00	0	0.00
3.71	0.06316					.039807	0.15			0.320			0.00		
1019.28	2725.20	0.369	2725.565	2.7	7.96	0.985	2726.550	0.00	0.623		1.50	0.00	0.00	0	0.00
2.70	0.06316					.034813	0.09			0.320			0.00		
1021.98	2725.37	0.382	2725.749	2.7	7.61	0.898	2726.647	0.00	0.623		1.50	0.00	0.00	0	0.00
2.09	0.06316					.030455	0.06			0.320			0.00		
1024.07	2725.50	0.395	2725.894	2.7	7.24	0.814	2726.708	0.00	0.623		1.50	0.00	0.00	0	0.00
1.65	0.06316					.026645	0.04			0.320			0.00		
1025.72	2725.60	0.409	2726.012	2.7	6.91	0.740	2726.752	0.00	0.623		1.50	0.00	0.00	0	0.00
1.34	0.06316					.023318	0.03			0.320			0.00		
1027.06	2725.69	0.423	2726.111	2.7	6.59	0.673	2726.784	0.00	0.623		1.50	0.00	0.00	0	0.00
1.08	0.06316					.020408	0.02			0.320			0.00		
1028.14	2725.76	0.438	2726.194	2.7	6.28	0.612	2726.806	0.00	0.623		1.50	0.00	0.00	0	0.00
0.90	0.06316					.017864	0.02			0.320			0.00		

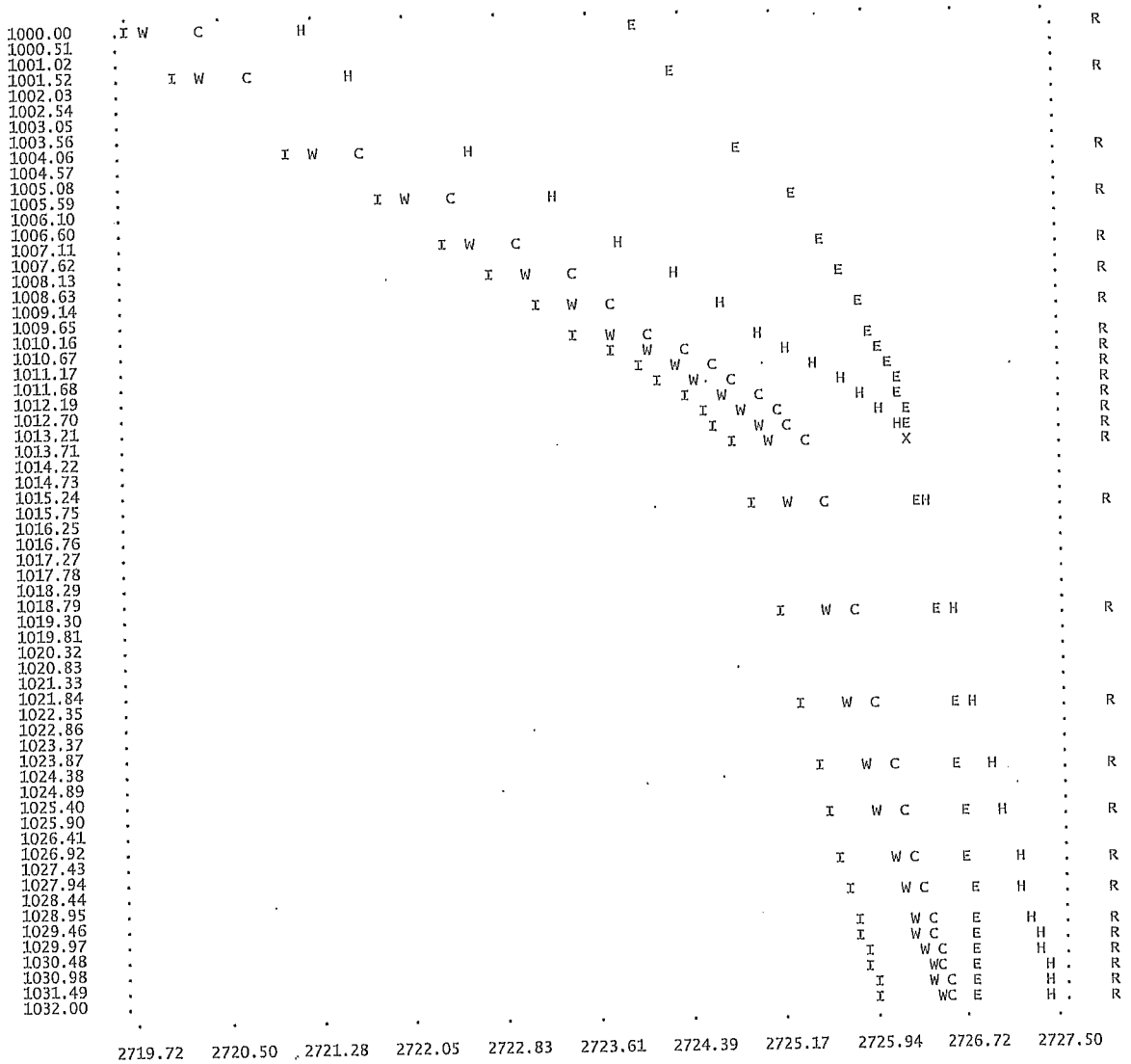
WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 4

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1029.04	2725.81	0.453	2726.266	2.7	5.99	0.557	2726.823	0.00	0.623		1.50	0.00	0.00	0	0.00
0.72	0.06316					.015637	0.01			0.320			0.00		
1029.76	2725.86	0.469	2726.328	2.7	5.71	0.506	2726.834	0.00	0.623		1.50	0.00	0.00	0	0.00
0.59	0.06316					.013701	0.01			0.320			0.00		
1030.35	2725.90	0.486	2726.382	2.7	5.44	0.460	2726.842	0.00	0.623		1.50	0.00	0.00	0	0.00
0.49	0.06316					.012004	0.01			0.320			0.00		
1030.84	2725.93	0.503	2726.429	2.7	5.19	0.419	2726.848	0.00	0.623		1.50	0.00	0.00	0	0.00
0.38	0.06316					.010517	0.00			0.320			0.00		
1031.22	2725.95	0.521	2726.472	2.7	4.95	0.380	2726.852	0.00	0.623		1.50	0.00	0.00	0	0.00
0.30	0.06316					.009215	0.00			0.320			0.00		
1031.52	2725.97	0.539	2726.509	2.7	4.72	0.346	2726.855	0.00	0.623		1.50	0.00	0.00	0	0.00
0.21	0.06316					.008079	0.00			0.320			0.00		
1031.73	2725.98	0.559	2726.542	2.7	4.50	0.314	2726.856	0.00	0.623		1.50	0.00	0.00	0	0.00
0.15	0.06316					.007088	0.00			0.320			0.00		
1031.88	2725.99	0.579	2726.572	2.7	4.29	0.285	2726.857	0.00	0.623		1.50	0.00	0.00	0	0.00
0.09	0.06316					.006219	0.00			0.320			0.00		
1031.97	2726.00	0.600	2726.598	2.7	4.09	0.260	2726.858	0.00	0.623		1.50	0.00	0.00	0	0.00
0.03	0.06316					.005443	0.00			0.320			0.00		

1032.00	2726.00	0.623	2726.623	2.7	3.89	0.235	2726.858	0.00	0.623	1.50	0.00	0.00	0	0.00	

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 4



NOTES
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY.

DATE: 3/ 1/2013
TIME: 10:50

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	7	3	0	0.00	6.00	7.00	0.00	0.00	0.00										
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SLATER HANIFAN GROUP, 02-28-2013

HEADING LINE NO 2 IS -

CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

HEADING LINE NO 3 IS -

CLV1201.000, 70% DESIGN, SD LATERAL 5
F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET
U/S DATA STATION 1000.00 INVERT 2705.50 SECT 18 W S ELEV 2706.20

ELEMENT NO 2 IS A REACH
U/S DATA STATION 1011.00 INVERT 2711.90 SECT 18 N 0.013 RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 0

ELEMENT NO 3 IS A REACH
U/S DATA STATION 1028.00 INVERT 2712.40 SECT 18 N 0.013 RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 0

ELEMENT NO 4 IS A SYSTEM HEADWORKS
U/S DATA STATION 1028.00 INVERT 2712.40 SECT 18 W S ELEV 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: SLATER HANIFAN GROUP

F0515P
WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 5

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF						ZR		
1000.00	2705.50	0.206	2705.706	2.6	17.81	4.924	2710.630	0.00	0.611		1.50	0.00	0.00	0	0.00
0.23	0.58182					.373567	0.09			0.170			0.00		
1000.23	2705.64	0.206	2705.841	2.6	17.81	4.924	2710.765	0.00	0.611		1.50	0.00	0.00	0	0.00
1.88	0.58182					.348070	0.65			0.170			0.00		
1002.11	2706.72	0.213	2706.938	2.6	16.88	4.426	2711.364	0.00	0.611		1.50	0.00	0.00	0	0.00
1.42	0.58182					.303883	0.43			0.170			0.00		
1003.53	2707.56	0.220	2707.777	2.6	16.15	4.050	2711.827	0.00	0.611		1.50	0.00	0.00	0	0.00
1.14	0.58182					.265122	0.30			0.170			0.00		
1004.67	2708.22	0.227	2708.446	2.6	15.38	3.675	2712.121	0.00	0.611		1.50	0.00	0.00	0	0.00
0.93	0.58182					.231479	0.22			0.170			0.00		
1005.60	2708.76	0.235	2708.996	2.6	14.69	3.351	2712.347	0.00	0.611		1.50	0.00	0.00	0	0.00
0.78	0.58182					.202290	0.16			0.170			0.00		
1006.38	2709.21	0.243	2709.457	2.6	13.98	3.034	2712.491	0.00	0.611		1.50	0.00	0.00	0	0.00
0.67	0.58182					.176650	0.12			0.170			0.00		
1007.05	2709.60	0.251	2709.850	2.6	13.33	2.761	2712.611	0.00	0.611		1.50	0.00	0.00	0	0.00
0.56	0.58182					.154152	0.09			0.170			0.00		
1007.61	2709.93	0.259	2710.189	2.6	12.75	2.522	2712.711	0.00	0.611		1.50	0.00	0.00	0	0.00
0.49	0.58182					.134599	0.07			0.170			0.00		
1008.10	2710.22	0.268	2710.483	2.6	12.15	2.292	2712.775	0.00	0.611		1.50	0.00	0.00	0	0.00
0.43	0.58182					.117614	0.05			0.170			0.00		

1008.53	2710.46	0.277	2710.741	2.6	11.56	2.073	2712.814	0.00	0.611		1.50	0.00	0.00	0	0.00
0.38	0.58182					.102697	0.04			0.170			0.00		

LICENSEE: SLATER HANIFAN GROUP

F0515P

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 5

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1008.91	2710.68	0.286	2710.968	2.6	11.02	1.885	2712.853	0.00	0.611		1.50	0.00	0.00	0	0.00
0.32	0.58182					.089714	0.03			0.170			0.00		
1009.23	2710.87	0.296	2711.169	2.6	10.53	1.721	2712.890	0.00	0.611		1.50	0.00	0.00	0	0.00
0.29	0.58182					.078419	0.02			0.170			0.00		
1009.52	2711.04	0.306	2711.348	2.6	10.04	1.565	2712.913	0.00	0.611		1.50	0.00	0.00	0	0.00
0.26	0.58182					.068496	0.02			0.170			0.00		
1009.78	2711.19	0.316	2711.507	2.6	9.56	1.419	2712.926	0.00	0.611		1.50	0.00	0.00	0	0.00
0.23	0.58182					.059850	0.01			0.170			0.00		
1010.01	2711.32	0.327	2711.649	2.6	9.12	1.292	2712.941	0.00	0.611		1.50	0.00	0.00	0	0.00
0.20	0.58182					.052320	0.01			0.170			0.00		
1010.21	2711.44	0.338	2711.777	2.6	8.70	1.174	2712.951	0.00	0.611		1.50	0.00	0.00	0	0.00
0.17	0.58182					.045750	0.01			0.170			0.00		
1010.38	2711.54	0.350	2711.891	2.6	8.28	1.065	2712.956	0.00	0.611		1.50	0.00	0.00	0	0.00
0.16	0.58182					.040020	0.01			0.170			0.00		
1010.54	2711.63	0.362	2711.995	2.6	7.90	0.970	2712.965	0.00	0.611		1.50	0.00	0.00	0	0.00
0.14	0.58182					.034981	0.00			0.170			0.00		
1010.68	2711.71	0.374	2712.087	2.6	7.54	0.882	2712.969	0.00	0.611		1.50	0.00	0.00	0	0.00
0.12	0.58182					.030583	0.00			0.170			0.00		
1010.80	2711.78	0.387	2712.171	2.6	7.18	0.801	2712.972	0.00	0.611		1.50	0.00	0.00	0	0.00
0.11	0.58182					.026770	0.00			0.170			0.00		
1010.91	2711.85	0.401	2712.247	2.6	6.84	0.727	2712.974	0.00	0.611		1.50	0.00	0.00	0	0.00
0.09	0.58182					.023437	0.00			0.170			0.00		

LICENSEE: SLATER HANIFAN GROUP

F0515P

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 5

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1011.00	2711.90	0.415	2712.315	2.6	6.53	0.663	2712.978	0.00	0.611		1.50	0.00	0.00	0	0.00
0.02	0.02941					.021782	0.00			0.380			0.00		
1011.02	2711.90	0.415	2712.315	2.6	6.52	0.659	2712.974	0.00	0.611		1.50	0.00	0.00	0	0.00
4.94	0.02941					.020343	0.10			0.380			0.00		
1015.96	2712.05	0.430	2712.476	2.6	6.21	0.598	2713.074	0.00	0.611		1.50	0.00	0.00	0	0.00
3.39	0.02941					.017814	0.06			0.380			0.00		
1019.35	2712.15	0.445	2712.591	2.6	5.92	0.545	2713.136	0.00	0.611		1.50	0.00	0.00	0	0.00
2.49	0.02941					.015588	0.04			0.380			0.00		
1021.84	2712.22	0.460	2712.679	2.6	5.64	0.494	2713.173	0.00	0.611		1.50	0.00	0.00	0	0.00
1.77	0.02941					.013652	0.02			0.380			0.00		
1023.61	2712.27	0.477	2712.748	2.6	5.38	0.450	2713.198	0.00	0.611		1.50	0.00	0.00	0	0.00
1.42	0.02941					.011957	0.02			0.380			0.00		
1025.03	2712.31	0.493	2712.806	2.6	5.13	0.408	2713.214	0.00	0.611		1.50	0.00	0.00	0	0.00
1.01	0.02941					.010472	0.01			0.380			0.00		
1026.04	2712.34	0.511	2712.853	2.6	4.89	0.371	2713.224	0.00	0.611		1.50	0.00	0.00	0	0.00
0.78	0.02941					.009180	0.01			0.380			0.00		
1026.82	2712.36	0.529	2712.894	2.6	4.66	0.337	2713.231	0.00	0.611		1.50	0.00	0.00	0	0.00
0.55	0.02941					.008046	0.00			0.380			0.00		

1027.37	2712.38	0.548	2712.929	2.6	4.44	0.307	2713.236	0.00	0.611		1.50	0.00	0.00	0	0.00
0.35	0.02941					.007057	0.00			0.380			0.00		
1027.72	2712.39	0.568	2712.960	2.6	4.24	0.279	2713.239	0.00	0.611		1.50	0.00	0.00	0	0.00
0.23	0.02941					.006190	0.00			0.380			0.00		

LICENSEE: SLATER HANIFAN GROUP

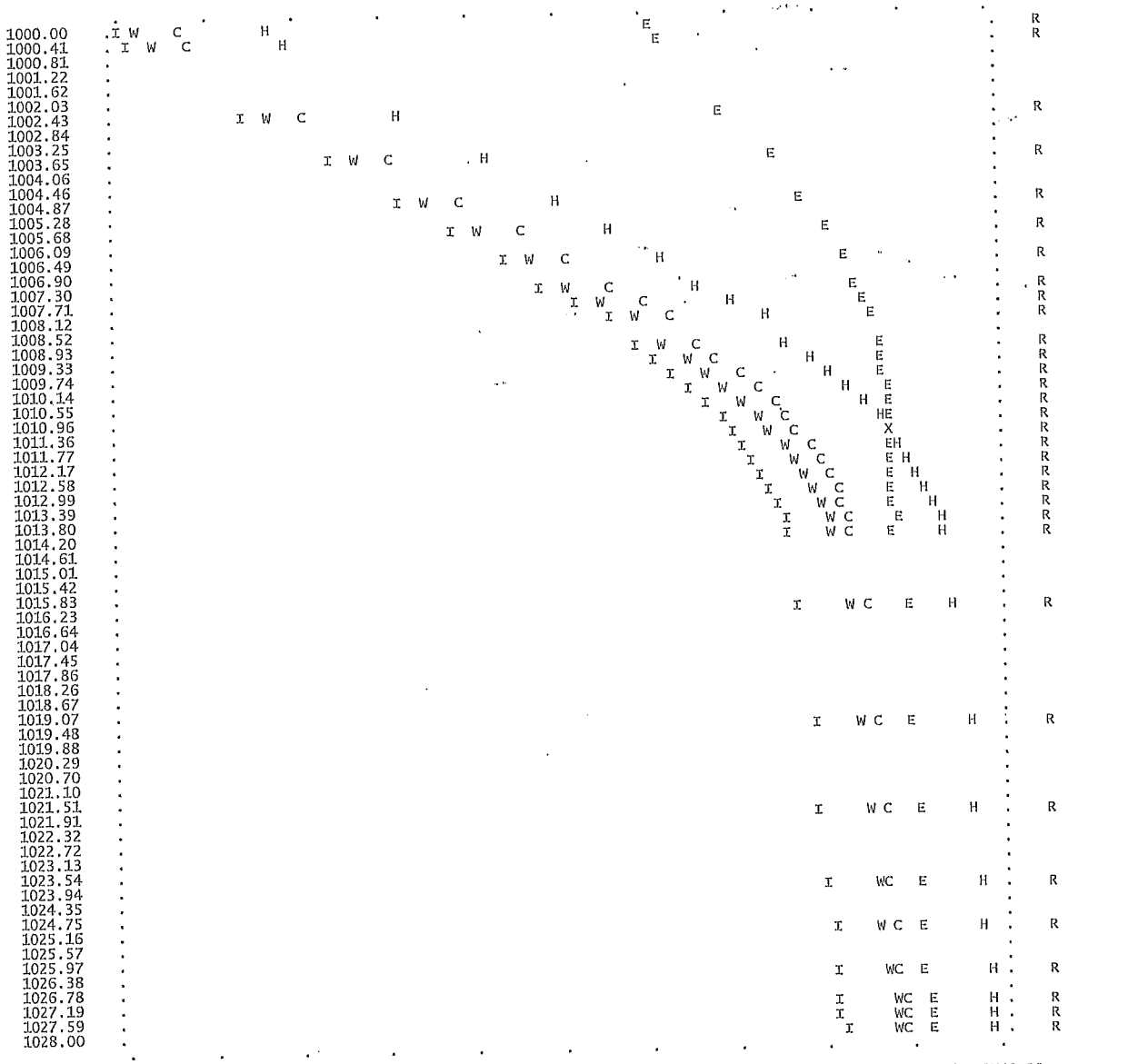
F0515P

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 5

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1027.95	2712.40	0.588	2712.987	2.6	4.04	0.254	2713.241	0.00	0.611		1.50	0.00	0.00	0	0.00
0.05	0.02941					.005416	0.00			0.380			0.00		
1028.00	2712.40	0.611	2713.011	2.6	3.85	0.230	2713.241	0.00	0.611		1.50	0.00	0.00	0	0.00

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 5



N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY$

DATE: 9/18/2013
TIME: 9:32

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	7	3	0	0.00	5.50	17.50	0.00	0.00	0.00										
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SLATER HANIFAN GROUP, 09-18-2013

HEADING LINE NO 2 IS -

CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

HEADING LINE NO 3 IS -

CLV1201.000, 90% DESIGN, SD LATERAL 6

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *
U/S DATA STATION INVERT SECT W S ELEV
1000.00 2702.45 36 2704.57

ELEMENT NO 2 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1008.00 2702.85 36 0.013 0.00 0.00 45.00 0

ELEMENT NO 3 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1068.00 2706.35 36 0.013 0.00 0.00 54.00 0

ELEMENT NO 4 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1082.00 2710.22 36 0.013 0.00 0.00 0.00 0

ELEMENT NO 5 IS A WALL ENTRANCE *
U/S DATA STATION INVERT SECT FP
1082.00 2710.22 7 0.013

ELEMENT NO 6 IS A SYSTEM HEADWORKS * *
U/S DATA STATION INVERT SECT W S ELEV
1082.00 2710.22 7 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: SLATER HANIFAN GROUP F0515P PAGE 1

WATER SURFACE PROFILE LISTING
SLATER HANIFAN GROUP, 09-18-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, SD LATERAL 6

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1000.00	2702.45	1.452	2703.902	72.0	21.23	7.000	2710.902	0.00	2.684	3.00	0.00	0.00	0	0.00
8.00	0.05000					.052177	0.42		1.470			0.00		
1008.00	2702.85	1.451	2704.301	72.0	21.26	7.021	2711.322	0.00	2.684	3.00	0.00	0.00	0	0.00
60.00	0.05833					.049495	2.97		1.404			0.00		
1068.00	2706.35	1.499	2707.849	72.0	20.39	6.456	2714.305	0.00	2.684	3.00	0.00	0.00	0	0.00
0.80	0.27643					.045715	0.04		0.921			0.00		
1068.80	2706.57	1.518	2708.091	72.0	20.06	6.246	2714.337	0.00	2.684	3.00	0.00	0.00	0	0.00
2.18	0.27643					.042052	0.09		0.921			0.00		
1070.98	2707.17	1.576	2708.750	72.0	19.12	5.679	2714.429	0.00	2.684	3.00	0.00	0.00	0	0.00
1.90	0.27643					.037075	0.07		0.921			0.00		
1072.88	2707.70	1.638	2709.337	72.0	18.23	5.162	2714.499	0.00	2.684	3.00	0.00	0.00	0	0.00
1.66	0.27643					.032717	0.05		0.921			0.00		
1074.54	2708.16	1.702	2709.860	72.0	17.39	4.694	2714.554	0.00	2.684	3.00	0.00	0.00	0	0.00
1.45	0.27643					.028903	0.04		0.921			0.00		
1075.99	2708.56	1.771	2710.329	72.0	16.57	4.266	2714.595	0.00	2.684	3.00	0.00	0.00	0	0.00
1.26	0.27643					.025570	0.03		0.921			0.00		
1077.25	2708.91	1.843	2710.749	72.0	15.80	3.878	2714.627	0.00	2.684	3.00	0.00	0.00	0	0.00
1.08	0.27643					.022653	0.02		0.921			0.00		
1078.33	2709.21	1.920	2711.126	72.0	15.07	3.526	2714.652	0.00	2.684	3.00	0.00	0.00	0	0.00

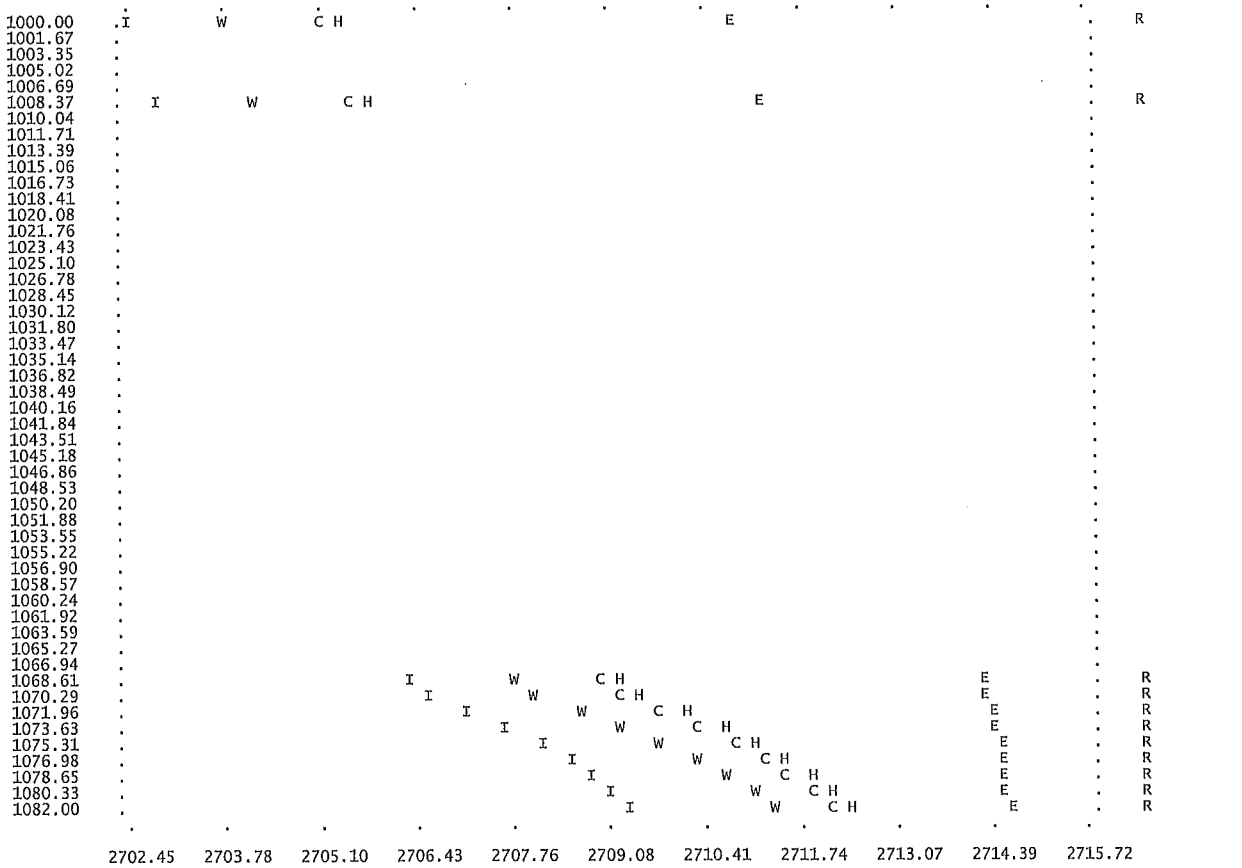
0.94	0.27643					.020103	0.02		0.921			0.00			
1079.27	2709.46	2.001	2711.465	72.0	14.37	3.206	2714.671	0.00	2.684		3.00	0.00	0.00	0	0.00
0.78	0.27643					.017878	0.01		0.921			0.00			

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 09-18-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, SD LATERAL 6

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1080.05	2709.68	2.089	2711.771	72.0	13.70	2.914	2714.685	0.00	2.684		3.00	0.00	0.00	0	0.00
0.66	0.27643					.015947	0.01			0.921			0.00		
1080.71	2709.86	2.183	2712.046	72.0	13.06	2.649	2714.695	0.00	2.684		3.00	0.00	0.00	0	0.00
0.53	0.27643					.014275	0.01			0.921			0.00		
1081.24	2710.01	2.286	2712.295	72.0	12.45	2.409	2714.704	0.00	2.684		3.00	0.00	0.00	0	0.00
0.39	0.27643					.012845	0.01			0.921			0.00		
1081.63	2710.12	2.400	2712.519	72.0	11.88	2.190	2714.709	0.00	2.684		3.00	0.00	0.00	0	0.00
0.27	0.27643					.011649	0.00			0.921			0.00		
1081.90	2710.19	2.529	2712.721	72.0	11.32	1.991	2714.712	0.00	2.684		3.00	0.00	0.00	0	0.00
0.10	0.27643					.010710	0.00			0.921			0.00		
1082.00	2710.22	2.684	2712.904	72.0	10.79	1.808	2714.712	0.00	2.684		3.00	0.00	0.00	0	0.00
WALL ENTRANCE													0.00		
1082.00	2710.22	4.507	2714.727	72.0	0.91	0.013	2714.740	0.00	0.807		5.50	17.50	0.00	0	0.00

SLATER HANIFAN GROUP, 09-18-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 90% DESIGN, SD LATERAL 6



N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER

DATE: 3/ 1/2013
TIME: 10:51

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	7	3	0	0.00	6.00	7.00	0.00	0.00	0.00										
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SLATER HANIFAN GROUP, 02-28-2013

HEADING LINE NO 2 IS -

CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

HEADING LINE NO 3 IS -

CLV1201.000, 70% DESIGN, SD LATERAL 7
F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET — W S ELEV 2691.47

	STATION	INVERT	SECT
U/S DATA	1000.00	2690.77	18

ELEMENT NO 2 IS A REACH — N 0.013 — RADIUS 0.00 — ANGLE 0.00 — ANG PT 0.00 — MAN H 0

	STATION	INVERT	SECT
U/S DATA	1012.00	2701.40	18

ELEMENT NO 3 IS A REACH — N 0.013 — RADIUS 0.00 — ANGLE 0.00 — ANG PT 0.00 — MAN H 0

	STATION	INVERT	SECT
U/S DATA	1025.00	2701.50	18

ELEMENT NO 4 IS A SYSTEM HEADWORKS — W S ELEV 0.00

	STATION	INVERT	SECT
U/S DATA	1025.00	2701.50	18

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: SLATER HANIFAN GROUP

F0515P
WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 7

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF						ZR		
1000.00	2690.77	0.243	2691.013	4.3	23.12	8.299	2699.312	0.00	0.795		1.50	0.00	0.00	0	0.00
1.79	0.88583					.481622	0.86			0.200			0.00		
1001.79	2692.36	0.251	2692.607	4.3	22.05	7.551	2700.158	0.00	0.795		1.50	0.00	0.00	0	0.00
1.46	0.88583					.421791	0.62			0.200			0.00		
1003.25	2693.65	0.259	2693.911	4.3	21.08	6.899	2700.810	0.00	0.795		1.50	0.00	0.00	0	0.00
1.19	0.88583					.368291	0.44			0.200			0.00		
1004.44	2694.70	0.268	2694.973	4.3	20.09	6.269	2701.242	0.00	0.795		1.50	0.00	0.00	0	0.00
0.99	0.88583					.321815	0.32			0.200			0.00		
1005.43	2695.58	0.277	2695.860	4.3	19.11	5.671	2701.531	0.00	0.795		1.50	0.00	0.00	0	0.00
0.84	0.88583					.281000	0.24			0.200			0.00		
1006.27	2696.32	0.286	2696.611	4.3	18.22	5.155	2701.766	0.00	0.795		1.50	0.00	0.00	0	0.00
0.72	0.88583					.245475	0.18			0.200			0.00		
1006.99	2696.96	0.296	2697.256	4.3	17.41	4.706	2701.962	0.00	0.795		1.50	0.00	0.00	0	0.00
0.62	0.88583					.214568	0.13			0.200			0.00		
1007.61	2697.51	0.306	2697.816	4.3	16.60	4.280	2702.096	0.00	0.795		1.50	0.00	0.00	0	0.00
0.54	0.88583					.187418	0.10			0.200			0.00		
1008.15	2697.99	0.316	2698.305	4.3	15.81	3.881	2702.186	0.00	0.795		1.50	0.00	0.00	0	0.00
0.47	0.88583					.163760	0.08			0.200			0.00		
1008.62	2698.41	0.327	2698.735	4.3	15.09	3.535	2702.270	0.00	0.795		1.50	0.00	0.00	0	0.00
0.42	0.88583					.143158	0.06			0.200			0.00		

1009.04	2698.78	0.338	2699.115	4.3	14.38	3.212	2702.327	0.00	0.795		1.50	0.00	0.00	0	0.00
0.37	0.88583					.125180	0.05			0.200			0.00		

LICENSEE: SLATER HANIFAN GROUP

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WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 7

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1009.41	2699.10	0.350	2699.452	4.3	13.69	2.912	2702.364	0.00	0.795		1.50	0.00	0.00	0	0.00
0.32	0.88583					.109503	0.04			0.200			0.00		
1009.73	2699.39	0.362	2699.753	4.3	13.07	2.653	2702.406	0.00	0.795		1.50	0.00	0.00	0	0.00
0.29	0.88583					.095717	0.03			0.200			0.00		
1010.02	2699.65	0.374	2700.021	4.3	12.46	2.412	2702.433	0.00	0.795		1.50	0.00	0.00	0	0.00
0.26	0.88583					.083683	0.02			0.200			0.00		
1010.28	2699.87	0.387	2700.262	4.3	11.88	2.191	2702.453	0.00	0.795		1.50	0.00	0.00	0	0.00
0.23	0.88583					.073249	0.02			0.200			0.00		
1010.51	2700.08	0.401	2700.477	4.3	11.32	1.988	2702.465	0.00	0.795		1.50	0.00	0.00	0	0.00
0.20	0.88583					.064131	0.01			0.200			0.00		
1010.71	2700.26	0.415	2700.671	4.3	10.80	1.813	2702.484	0.00	0.795		1.50	0.00	0.00	0	0.00
0.18	0.88583					.056104	0.01			0.200			0.00		
1010.89	2700.42	0.429	2700.846	4.3	10.29	1.643	2702.489	0.00	0.795		1.50	0.00	0.00	0	0.00
0.16	0.88583					.049086	0.01			0.200			0.00		
1011.05	2700.56	0.444	2701.003	4.3	9.82	1.497	2702.500	0.00	0.795		1.50	0.00	0.00	0	0.00
0.14	0.88583					.042954	0.01			0.200			0.00		
1011.19	2700.69	0.459	2701.145	4.3	9.35	1.357	2702.502	0.00	0.795		1.50	0.00	0.00	0	0.00
0.13	0.88583					.037618	0.00			0.200			0.00		
1011.32	2700.80	0.476	2701.274	4.3	8.92	1.236	2702.510	0.00	0.795		1.50	0.00	0.00	0	0.00
0.11	0.88583					.032953	0.00			0.200			0.00		
1011.43	2700.90	0.492	2701.390	4.3	8.50	1.121	2702.511	0.00	0.795		1.50	0.00	0.00	0	0.00
0.10	0.88583					.028861	0.00			0.200			0.00		

LICENSEE: SLATER HANIFAN GROUP

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WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 7

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1011.53	2700.99	0.510	2701.495	4.3	8.11	1.022	2702.517	0.00	0.795		1.50	0.00	0.00	0	0.00
0.09	0.88583					.025300	0.00			0.200			0.00		
1011.62	2701.06	0.528	2701.590	4.3	7.73	0.929	2702.519	0.00	0.795		1.50	0.00	0.00	0	0.00
0.07	0.88583					.022176	0.00			0.200			0.00		
1011.69	2701.13	0.547	2701.676	4.3	7.38	0.845	2702.521	0.00	0.795		1.50	0.00	0.00	0	0.00
0.07	0.88583					.019438	0.00			0.200			0.00		
1011.76	2701.19	0.566	2701.754	4.3	7.03	0.767	2702.521	0.00	0.795		1.50	0.00	0.00	0	0.00
0.06	0.88583					.017048	0.00			0.200			0.00		
1011.82	2701.24	0.587	2701.824	4.3	6.70	0.697	2702.521	0.00	0.795		1.50	0.00	0.00	0	0.00
0.04	0.88583					.014962	0.00			0.200			0.00		
1011.86	2701.28	0.608	2701.888	4.3	6.39	0.634	2702.522	0.00	0.795		1.50	0.00	0.00	0	0.00
0.05	0.88583					.013129	0.00			0.200			0.00		
1011.91	2701.32	0.630	2701.947	4.3	6.09	0.576	2702.523	0.00	0.795		1.50	0.00	0.00	0	0.00
0.03	0.88583					.011534	0.00			0.200			0.00		
1011.94	2701.34	0.654	2701.999	4.3	5.81	0.524	2702.523	0.00	0.795		1.50	0.00	0.00	0	0.00
0.03	0.88583					.010138	0.00			0.200			0.00		
1011.97	2701.37	0.678	2702.047	4.3	5.54	0.477	2702.524	0.00	0.795		1.50	0.00	0.00	0	0.00
0.02	0.88583					.008910	0.00			0.200			0.00		

1011.99	2701.39	0.703	2702.091	4.3	5.28	0.433	2702.524	0.00	0.795		1.50	0.00	0.00	0	0.00
0.01	0.88583					.007838	0.00			0.200			0.00		
1012.00	2701.40	0.730	2702.130	4.3	5.04	0.394	2702.524	0.00	0.795		1.50	0.00	0.00	0	0.00
4.79	0.00769					.007236	0.03			0.720			0.00		

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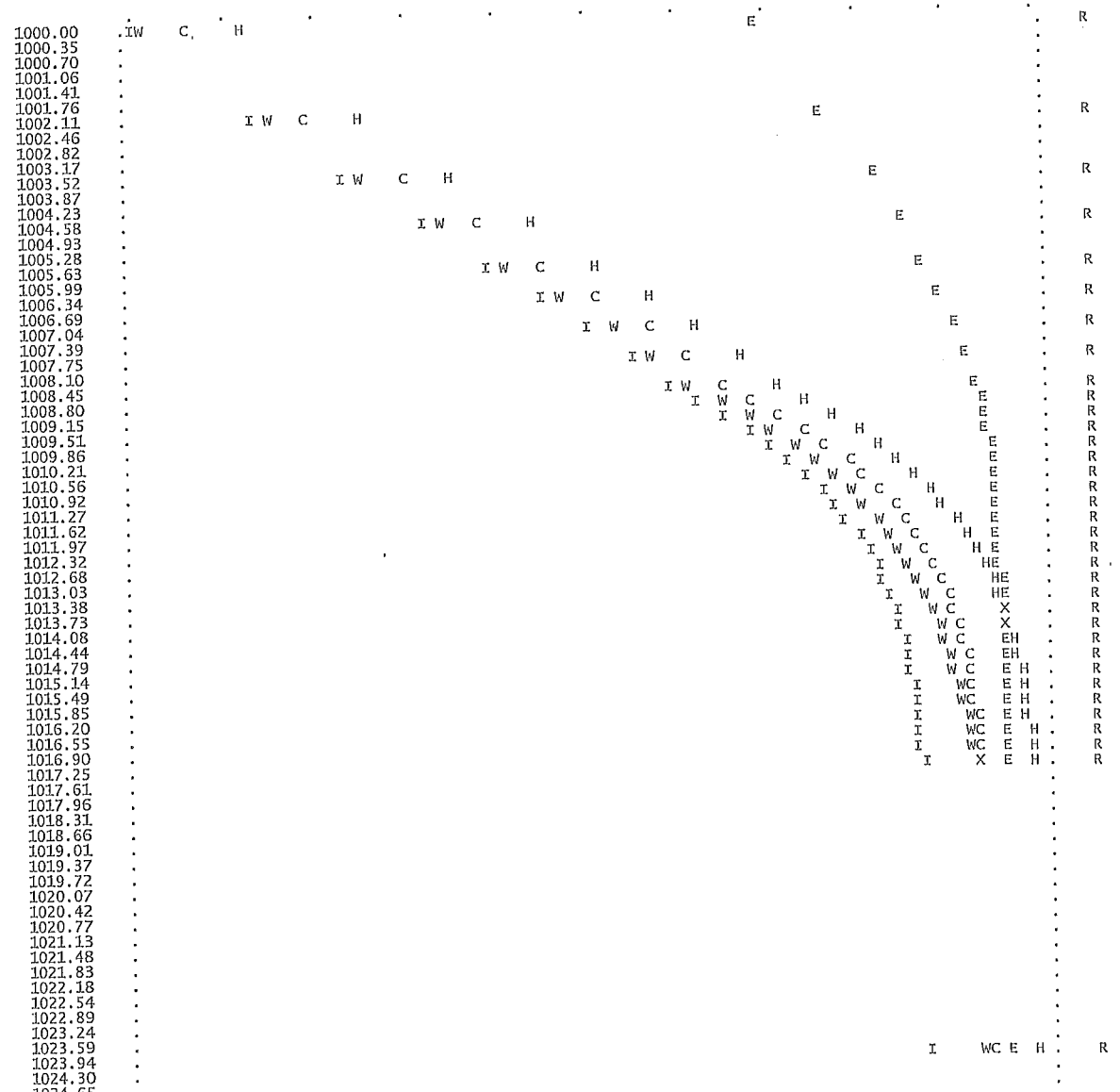
F0515P

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 7

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1016.79	2701.44	0.736	2702.173	4.3	4.98	0.386	2702.559	0.00	0.795		1.50	0.00	0.00	0	0.00
7.12	0.00769					.006705	0.05			0.720			0.00		
1023.91	2701.49	0.764	2702.256	4.3	4.75	0.351	2702.607	0.00	0.795		1.50	0.00	0.00	0	0.00
1.09	0.00769					.005896	0.01			0.720			0.00		
1025.00	2701.50	0.795	2702.295	4.3	4.52	0.317	2702.612	0.00	0.795		1.50	0.00	0.00	0	0.00

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 7



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                                                                                                                    I     X E H .    R
1025.00  .       .       .       .       .       .       .       .       .       .       .
         2690.77 2691.99 2693.22 2694.44 2695.66 2696.88 2698.11 2699.33 2700.55 2701.78 2703.00
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N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY†

DATE: 3/ 1/2013
TIME: 10:51

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	7	3	0	0.00	6.00	7.00	0.00	0.00	0.00										
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SLATER HANIFAN GROUP, 02-28-2013

HEADING LINE NO 2 IS -

CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)

HEADING LINE NO 3 IS -

CLV1201.000, 70% DESIGN, SD LATERAL 8

F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET
U/S DATA STATION 1000.00 INVERT 2673.90 SECT 18 W S ELEV 2682.47

ELEMENT NO 2 IS A REACH
U/S DATA STATION 1011.00 INVERT 2682.30 SECT 18 N 0.013 RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 0

ELEMENT NO 3 IS A REACH
U/S DATA STATION 1029.00 INVERT 2682.90 SECT 18 N 0.013 RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 0

ELEMENT NO 4 IS A SYSTEM HEADWORKS
U/S DATA STATION 1029.00 INVERT 2682.90 SECT 18 W S ELEV 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

F0515P
LICENSEE: SLATER HANIFAN GROUP

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 8

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1000.00	2673.90	8.570	2682.470	3.8	2.15	0.072	2682.542	0.00	0.745		1.50	0.00	0.00	0	0.00
9.27	0.76364					.001295	0.01			0.200			0.00		
1009.27	2680.98	1.500	2682.482	3.8	2.15	0.072	2682.554	0.00	0.745		1.50	0.00	0.00	0	0.00
0.12	0.76364					.001206	0.00			0.200			0.00		
1009.39	2681.07	1.416	2682.487	3.8	2.20	0.075	2682.562	0.00	0.745		1.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1009.39	2681.07	0.355	2681.426	3.8	11.87	2.190	2683.616	0.00	0.745		1.50	0.00	0.00	0	0.00
0.19	0.76364					.081258	0.02			0.200			0.00		
1009.58	2681.22	0.367	2681.582	3.8	11.34	1.998	2683.580	0.00	0.745		1.50	0.00	0.00	0	0.00
0.24	0.76364					.070992	0.02			0.200			0.00		
1009.82	2681.40	0.379	2681.781	3.8	10.80	1.810	2683.591	0.00	0.745		1.50	0.00	0.00	0	0.00
0.22	0.76364					.062049	0.01			0.200			0.00		
1010.04	2681.57	0.392	2681.959	3.8	10.30	1.647	2683.606	0.00	0.745		1.50	0.00	0.00	0	0.00
0.19	0.76364					.054297	0.01			0.200			0.00		
1010.23	2681.71	0.406	2682.119	3.8	9.82	1.497	2683.616	0.00	0.745		1.50	0.00	0.00	0	0.00
0.17	0.76364					.047524	0.01			0.200			0.00		
1010.40	2681.84	0.420	2682.263	3.8	9.36	1.360	2683.623	0.00	0.745		1.50	0.00	0.00	0	0.00
0.15	0.76364					.041599	0.01			0.200			0.00		
1010.55	2681.96	0.435	2682.393	3.8	8.92	1.236	2683.629	0.00	0.745		1.50	0.00	0.00	0	0.00
0.14	0.76364					.036419	0.01			0.200			0.00		

1010.69	2682.06	0.450	2682.511	3.8	8.52	1.127	2683.638	0.00	0.745		1.50	0.00	0.00	0	0.00
0.11	0.76364					.031885	0.00			0.200			0.00		

WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 8

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1010.80	2682.15	0.466	2682.617	3.8	8.12	1.024	2683.641	0.00	0.745		1.50	0.00	0.00	0	0.00
0.11	0.76364					.027919	0.00			0.200			0.00		
1010.91	2682.23	0.482	2682.713	3.8	7.74	0.930	2683.643	0.00	0.745		1.50	0.00	0.00	0	0.00
0.09	0.76364					.024454	0.00			0.200			0.00		
1011.00	2682.30	0.500	2682.800	3.8	7.38	0.845	2683.645	0.00	0.745		1.50	0.00	0.00	0	0.00
0.53	0.03333					.022672	0.01			0.450			0.00		
1011.53	2682.32	0.501	2682.819	3.8	7.34	0.836	2683.655	0.00	0.745		1.50	0.00	0.00	0	0.00
4.75	0.03333					.021109	0.10			0.450			0.00		
1016.28	2682.48	0.519	2682.995	3.8	7.00	0.760	2683.755	0.00	0.745		1.50	0.00	0.00	0	0.00
3.45	0.03333					.018498	0.06			0.450			0.00		
1019.73	2682.59	0.537	2683.128	3.8	6.67	0.690	2683.818	0.00	0.745		1.50	0.00	0.00	0	0.00
2.50	0.03333					.016219	0.04			0.450			0.00		
1022.23	2682.67	0.557	2683.231	3.8	6.37	0.629	2683.860	0.00	0.745		1.50	0.00	0.00	0	0.00
1.94	0.03333					.014231	0.03			0.450			0.00		
1024.17	2682.74	0.577	2683.316	3.8	6.06	0.570	2683.886	0.00	0.745		1.50	0.00	0.00	0	0.00
1.53	0.03333					.012477	0.02			0.450			0.00		
1025.70	2682.79	0.597	2683.387	3.8	5.78	0.519	2683.906	0.00	0.745		1.50	0.00	0.00	0	0.00
1.13	0.03333					.010945	0.01			0.450			0.00		
1026.83	2682.83	0.619	2683.447	3.8	5.52	0.472	2683.919	0.00	0.745		1.50	0.00	0.00	0	0.00
0.84	0.03333					.009614	0.01			0.450			0.00		
1027.67	2682.86	0.642	2683.498	3.8	5.26	0.429	2683.927	0.00	0.745		1.50	0.00	0.00	0	0.00
0.60	0.03333					.008448	0.01			0.450			0.00		

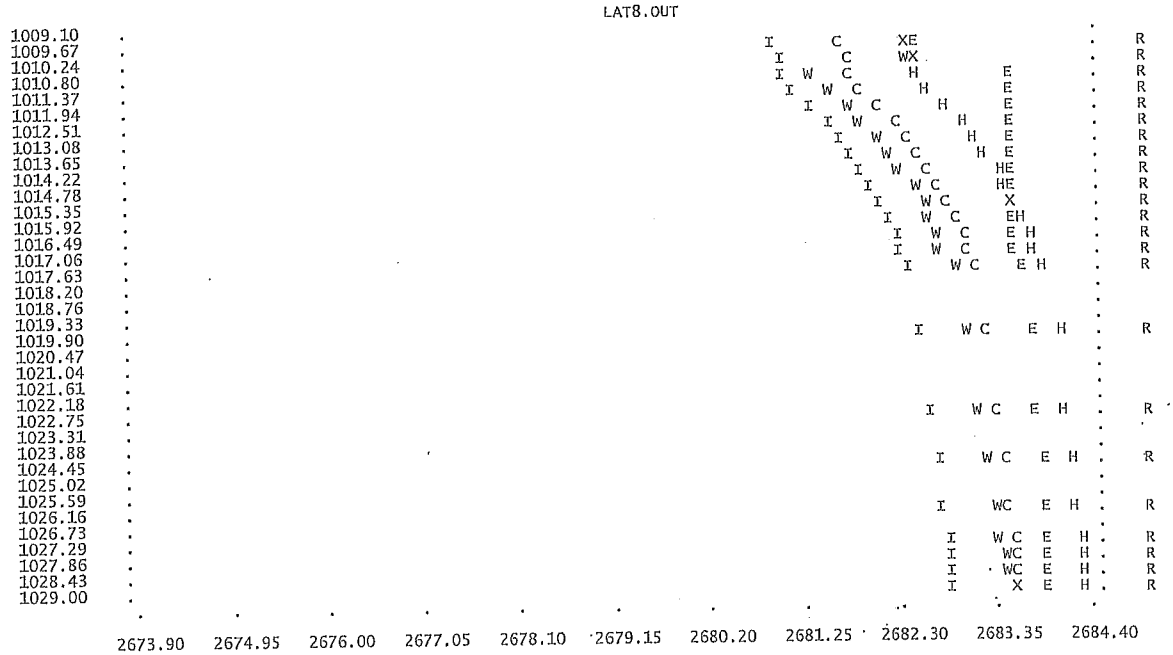
WATER SURFACE PROFILE LISTING

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 8

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1028.27	2682.88	0.666	2683.542	3.8	5.01	0.390	2683.932	0.00	0.745		1.50	0.00	0.00	0	0.00
0.45	0.03333					.007422	0.00			0.450			0.00		
1028.72	2682.89	0.690	2683.581	3.8	4.78	0.355	2683.936	0.00	0.745		1.50	0.00	0.00	0	0.00
0.23	0.03333					.006523	0.00			0.450			0.00		
1028.95	2682.90	0.716	2683.614	3.8	4.56	0.322	2683.936	0.00	0.745		1.50	0.00	0.00	0	0.00
0.05	0.03333					.005731	0.00			0.450			0.00		
1029.00	2682.90	0.745	2683.645	3.8	4.34	0.292	2683.937	0.00	0.745		1.50	0.00	0.00	0	0.00

SLATER HANIFAN GROUP, 02-28-2013
CITY OF LAS VEGAS, RANCHO RD SYSTEM - ELKHORN (FT APACHE TO GRAND CANYON)
CLV1201.000, 70% DESIGN, SD LATERAL 8

| | | | | | | | | | | | | | | |



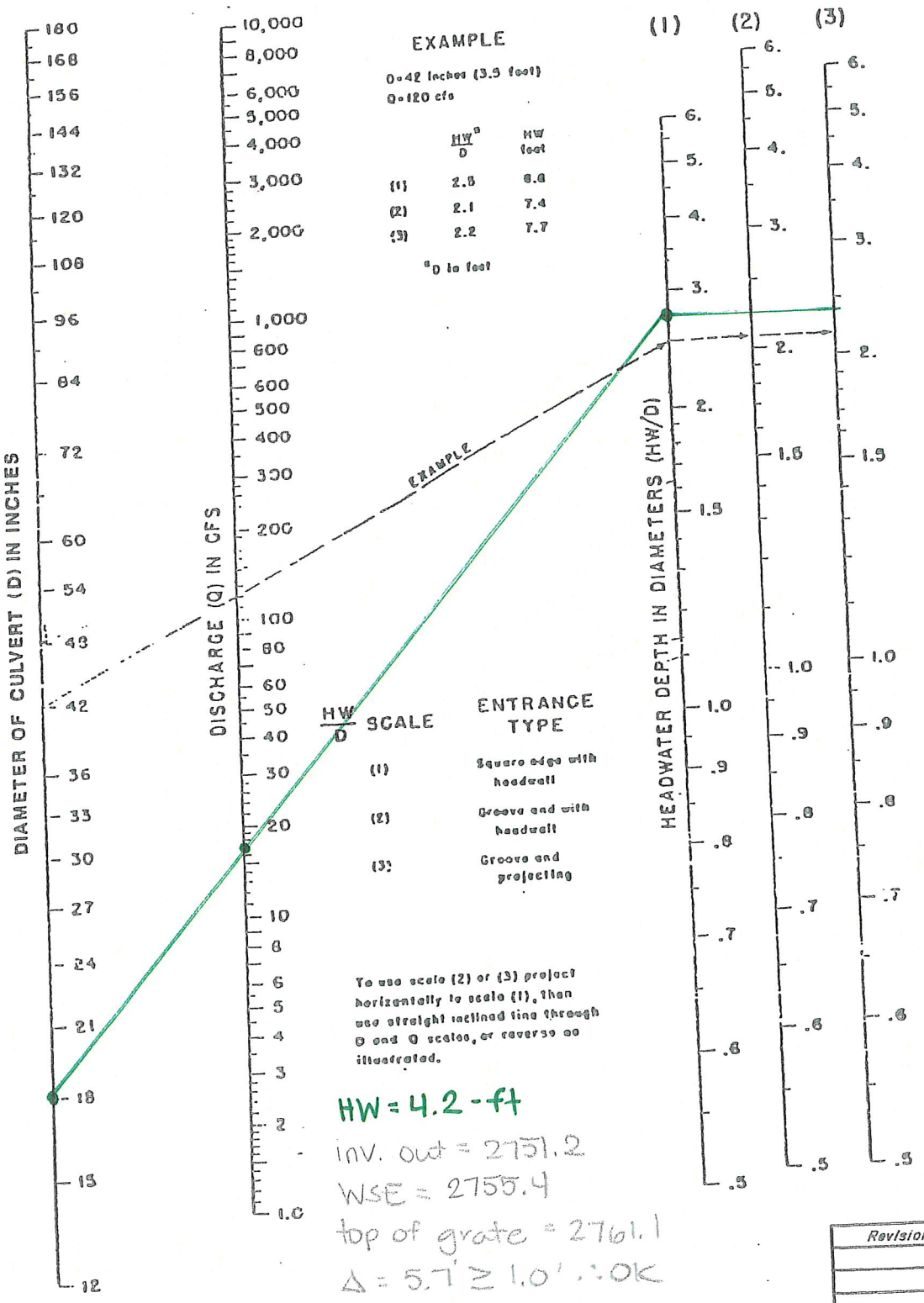
N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY.

Mainline Lateral Inlet Control Computations for HGL thru Inlet

Lateral 1

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH – INLET CONTROL RCP



HW = 4.2 - ft
inv. out = 2751.2
WSE = 2755.4
top of grate = 2761.1
Δ = 5.7' ≥ 1.0' ∴ OK

Revision	Date

WRC ENGINEERING

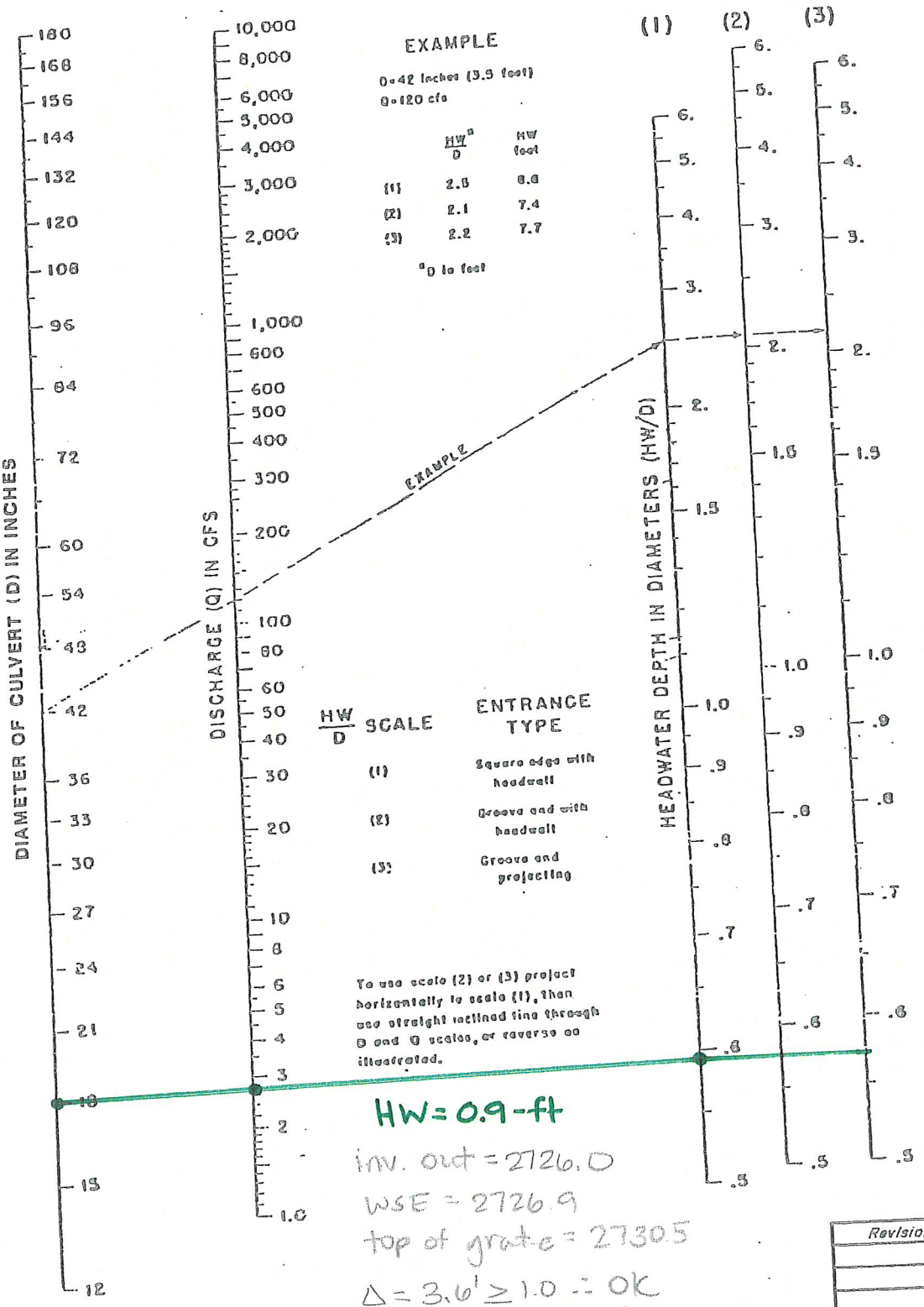
REFERENCE: USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

Lateral 4

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH – INLET CONTROL RCP



HW = 0.9-ft

inv. out = 2726.0

WSE = 2726.9

top of grate = 2730.5

Δ = 3.6' ≥ 1.0 ∴ OK

Revision	Date

WRC ENGINEERING

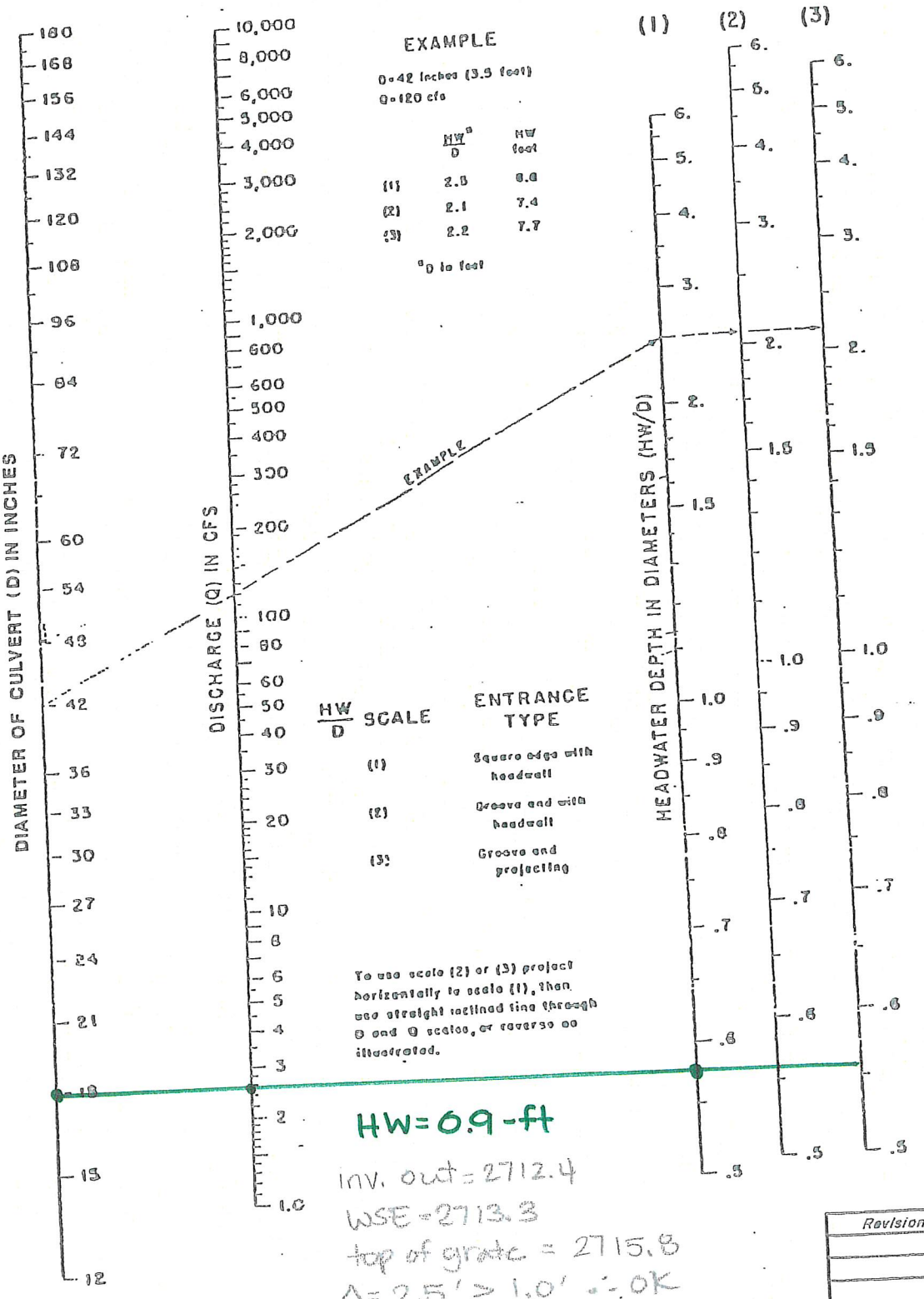
REFERENCE: USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

Lateral 5

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH – INLET CONTROL RCP



Revision	Date

WRC ENGINEERING

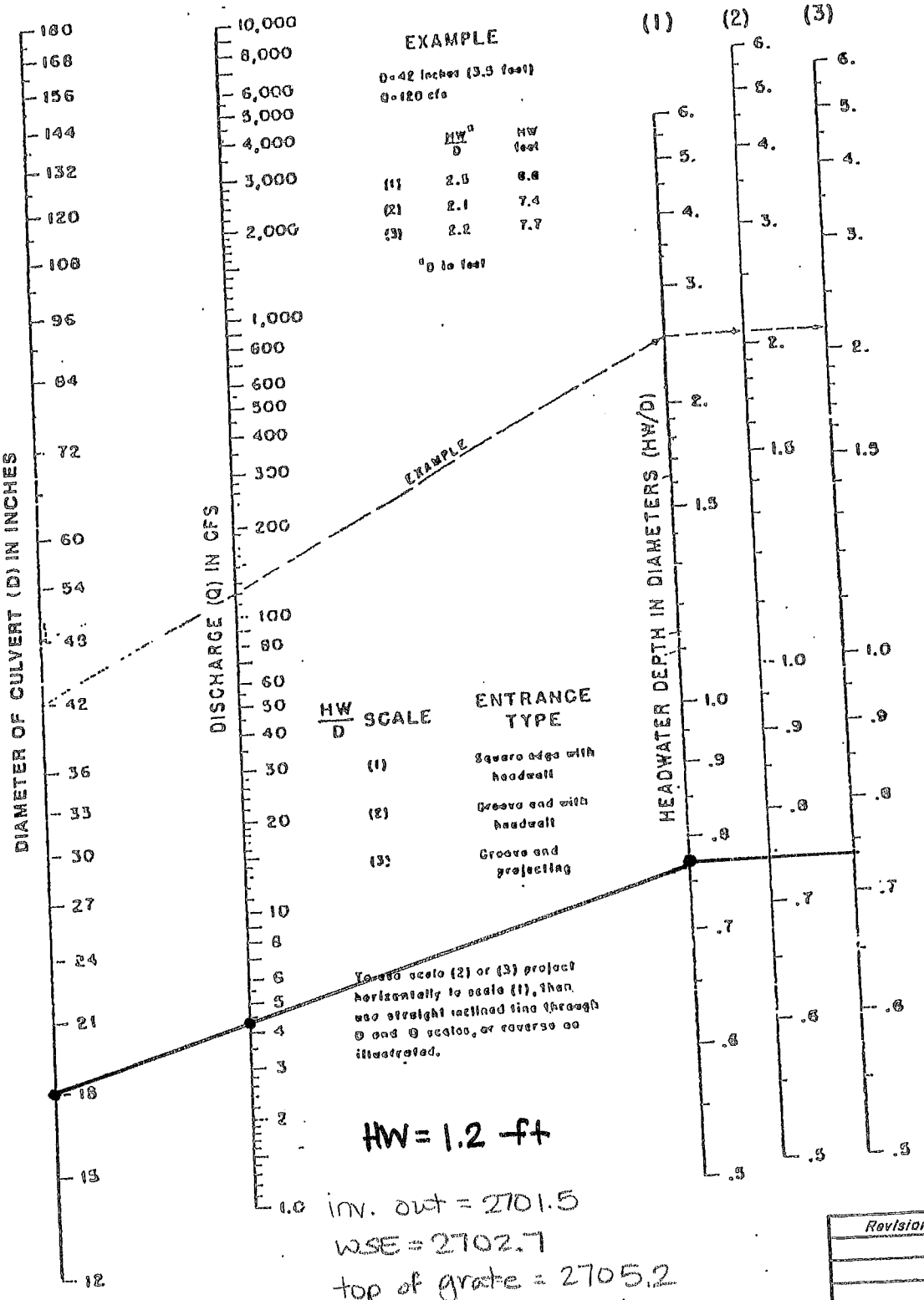
REFERENCE: USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

Lateral 7

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH – INLET CONTROL RCP



HW = 1.2 ft

inv. out = 2701.5
WSE = 2702.7
top of grate = 2705.2
Δ = 2.5' ≥ 1.0' ∴ OK

Revision	Date

WRC ENGINEERING

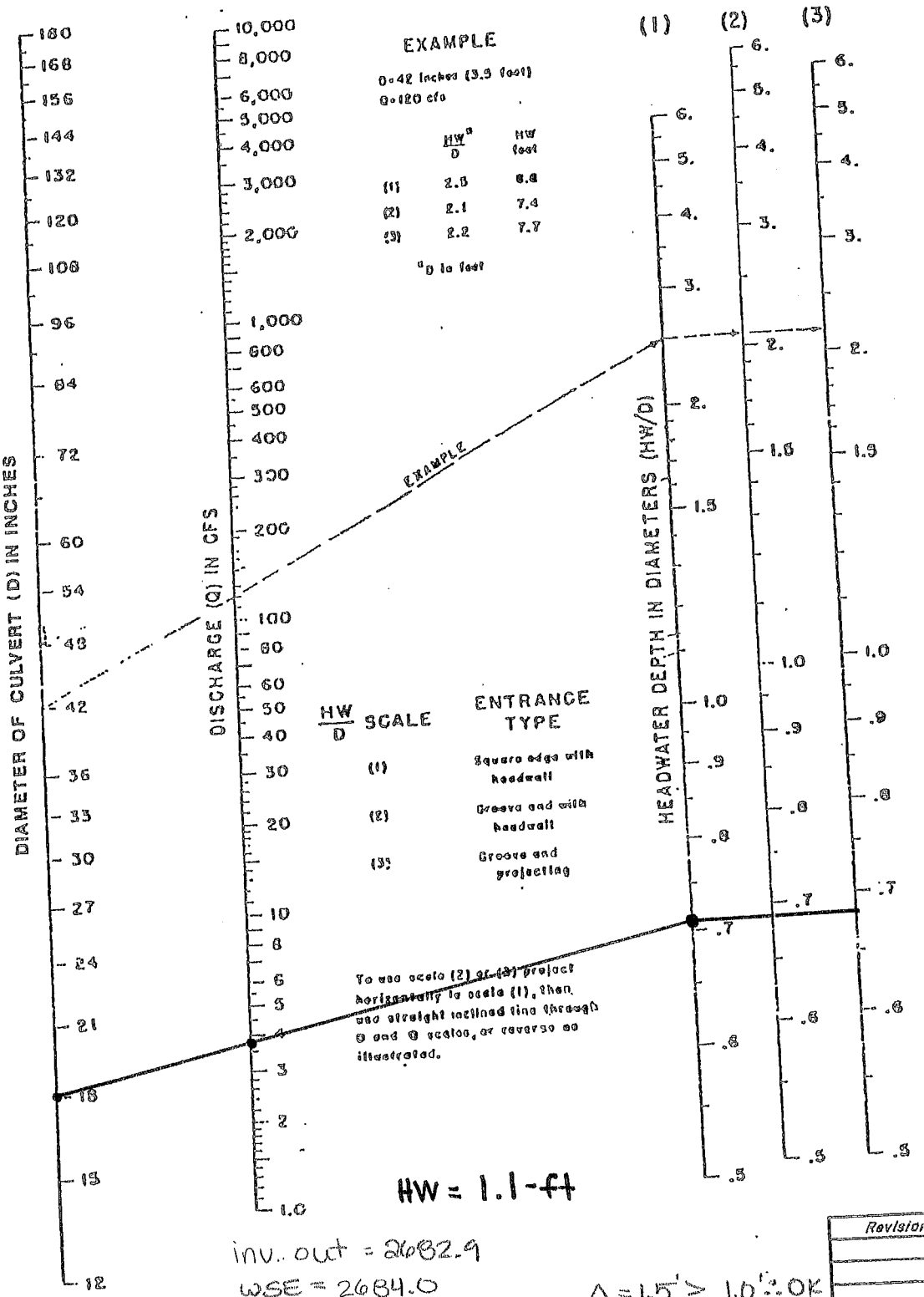
REFERENCE: USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

Lateral B

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH - INLET CONTROL RCP



inv. out = 2682.9
WSE = 2684.0
top of grate = 2685.5

$\Delta = 1.5' \geq 1.0'$ ∴ OK

Revision	Date

WRC ENGINEERING

REFERENCE: USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

NOTE: HGL'S THRU DROP INLETS FOR LATERALS 2, 3 & 6 WERE ESTABLISHED BY INCORPORATION OF A WALL ENTRANCE IN WSPG ANALYSIS.

Existing 18"RCP Storm Drain Full Flow Capacity Computations

Existing 18" SD Capacity				
Pipe Reach		Q_{100}	Min. Slope	Pipe Capacity
From	To	(cfs)	(%)	(cfs)
18DI1	18DI2	2.2	0.50	7.43
18DI2	18DI3	5.3	0.50	7.43
18DI3	18DI4	9.7	2.69	17.23
18DI4	18DI5	14.1	1.93	14.59

Full Flow Capacity of Existing 18" Storm Drain @ 0.50%
Worksheet for Circular Channel

Project Description	
Worksheet	Capacity 18" Existing Storm Drain @ 0.50%
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.5000	%
Diameter	18.0	in

Results		
Depth	1.50	ft
Discharge	7.43	cfs
Flow Area	1.8	ft²
Wetted Perimeter	4.71	ft
Top Width	0.00	ft
Critical Depth	1.06	ft
Percent Full	100.0	%
Critical Slope	0.7032	%
Velocity	4.20	ft/s
Velocity Head	0.27	ft
Specific Energy	1.77	ft
Froude Number	0.00	
Maximum Discharge	7.99	cfs
Discharge Full	7.43	cfs
Slope Full	0.5000	%
Flow Type	N/A	

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Slater Hanifan Group
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Full Flow Capacity of Existing 18" Storm Drain @ 1.93%
Worksheet for Circular Channel

Project Description	
Worksheet	Capacity 18" Existing Storm Drain @ 1.93%
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data		
Mannings Coefficient	0.013	
Channel Slope	1.9300	%
Diameter	18.0	in

Results		
Depth	1.50	ft
Discharge	14.59	cfs
Flow Area	1.8	ft²
Wetted Perimeter	4.71	ft
Top Width	0.00	ft
Critical Depth	1.40	ft
Percent Full	100.0	%
Critical Slope	1.6692	%
Velocity	8.26	ft/s
Velocity Head	1.06	ft
Specific Energy	2.56	ft
Froude Number	0.00	
Maximum Discharge	15.70	cfs
Discharge Full	14.59	cfs
Slope Full	1.9300	%
Flow Type	N/A	

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Slater Hanifan Group
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Full Flow Capacity of Existing 18" Storm Drain @ 2.69%
Worksheet for Circular Channel

Project Description	
Worksheet	Capacity 18" Existing Storm Drain @ 2.69%
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data		
Mannings Coefficient	0.013	
Channel Slope	2.6900	%
Diameter	18.0	in

Results		
Depth	1.50	ft
Discharge	17.23	cfs
Flow Area	1.8	ft²
Wetted Perimeter	4.71	ft
Top Width	0.00	ft
Critical Depth	1.44	ft
Percent Full	100.0	%
Critical Slope	2.3468	%
Velocity	9.75	ft/s
Velocity Head	1.48	ft
Specific Energy	2.98	ft
Froude Number	0.00	
Maximum Discharge	18.53	cfs
Discharge Full	17.23	cfs
Slope Full	2.6900	%
Flow Type	N/A	

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Slater Hanifan Group
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

APPENDIX F

Reference Material

Rancho-Fort Apache Storm Drain, LBG

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN  1998                 *
 *          VERSION 4.1                  *
 *                                       *
 *  RUN DATE   07NOV12  TIME  16:01:57   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104               *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
          LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
                    *DIAGRAM
*** FREE ***
               1    ID    CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
               2    ID    UPPER AND LOWER NORTHERN LAS VEGAS WASH WATERSHEDS
               3    ID    RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
               4    ID    INPUT FILE = WEST8.DAT
               5    ID    INPUT FILE DATE = MAY 2008
               6    ID    DESIGN STORM = 100-YEAR 6-HOUR STORM
               7    ID    STORM DISTRIBUTION = SDN3
               8    ID    MODELED BY PBS&J (KRYSTLE PEMBERTON, E.I., CFM)
               9    ID    CHECKED BY PBS&J (HARSHAL B. DESAI, P.E., CFM)
              10    ID    STORM CENTERING = WEST TRIBUTARY
              11    ID    DOWNSTREAM OF THE UPPER LAS VEGAS WASH DETENTION BASIN TO THE MOST
              12    ID    DOWNSTREAM POINT IN THE LOWER NORTHERN LAS VEGAS WASH WATERSHED
              13    ID
              14    ID    REFERENCED HYDROLOGIC MODELS:
              15    ID    REVISED FINAL DESIGN REPORT FOR THE RANCHO DETENTION BASIN
              16    ID    PHASE II (VTN 2006)
              17    ID    RESPONSE TO COMMENTS ON THE CONCEPTUAL DRAINAGE STUDY FOR
              18    ID    NORTH LAS VEGAS 600-ACRE SITE (GC WALLACE 2006)
```

```
19          ID    SECOND RESPONSE TO COMMENTS OF THE CONCEPTUAL DRAINAGE STUDY
20          ID    FOR NORTH LAS VEGAS 2074-ACRE SITE (GC WALLACE 2006)
21          ID    BASIN MAPS FOR SUPPLEMENT #2 TO ADDENDUM #2 TO THE MASTER
22          ID    DRAINAGE STUDY FOR CLIFF'S EDGE/ PROVIDENCE (VTN 2004)
23          ID    MASTER DRAINAGE STUDY FOR KYLE CANYON (GC WALLACE 2006)
24          ID    TECHNICAL DRAINAGE STUDY FOR GRAND TETON DRIVE STROM DRAIN
25          ID    AND AREA 1 ROADWAY IMPROVEMENTS  (GC WALLACE 2006)
26          ID    90% FINAL DESIGN REPORT FOR RANCHO ROAD SYSTEM - EL CAMPO
27          ID    GRANDE STORM DRAIN PROJECT (PBS&J 2007)
28          ID    MPA FOR RACEL STREET COLLECTOR (LOUIS BERGER JANUARY 2007)
29          ID    HYDROLOGIC MODEL FOR FLOYD LAMB NORTH AND SOUTH ENVIRONMENTAL
30          ID    ENHANCEMENT AREAS (LOUIS BERGER  DECEMBER 7, 2007)
31          ID
32          ID    UPDATED BY THE LOUIS BERGER GROUP INC FOR THE RANCHO-FORT
33          ID    APACHE STORM DRAIN PROJECT.  MODEL WAS NOT TRUNCATED IN ORDER TO
34          ID    VERFITY THAT THE RANCHO DETENTION BASIN (RCHODB) WAS NOT AFFECTED.
35          ID    INPUT FILE = FASD.DAT
36          ID    INPUT FILE DATE = JUNE 2012
37          ID    MODELED BY LBG (RUFIN INOS, E.I. AND FRED RETZLAFF, P.E.)
38          ID    CHECKED BY LBG (JEFFREY, S DOUGLAS, P.E., CFM)
39          ID
40          ID
41          ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
42          ID
43          ID    AREA (SQUARE MILES)          DARF
44          ID          0 - 0.5                0.99
45          ID          0.5 - 1                0.975
46          ID          1 - 2                  0.95
47          ID          2 - 3                  0.925
48          ID          3 - 4                  0.915
49          ID          4 - 5                  0.908
50          ID          5 - 6                  0.903
51          ID          6 - 7                  0.895
52          ID          7 - 8                  0.885
53          ID
```



```
LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

54          IT      5       0       0     200
55          IO      5       0       0
56          IN      5       0       0
57          JR   PREC    0.99   0.975    0.95   0.925   0.915   0.908   0.903   0.895   0.885
            *

58          KK  NW62-S
59          BA   0.208
60          PB    2.77
61          PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
62          PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
63          PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
64          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
65          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
66          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
67          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
68          PC   0.998   0.999   1.000
69          LS       0    95.6
70          UD   0.190
```

```
1191          KKCNN011-C
1192          KM  COMBINE NN011-C AND RC3D4-C
1193          KM  LAS VEGAS WASH MIDDLE @ TROPICAL
1194          HC       2
              *
1195          KK RC011-C
1196          KM  ROUTE CNN011-C TO CNN030-C
1197          KM  FACILITY = LAS VEGAS WASH MIDDLE
1198          KM  FACILITY ID-MILE = LVMD 2192,2197,2223,2228
1199          KM  LINING = CONCRETE
1200          RD    3370   0.018   0.015       0    TRAP      50       0
              *
1201          KK NN030-C
1202          BA   0.288
1203          PB    2.77
1204          LS       0    90.0
1205          UD   0.287
              *
1206          KKCNN030-C
1207          KM  COMBINE NN030-C AND RC011-C
1208          HC       2
              *
1209          KK RC030-C
1210          KM  ROUTE CNN030-C TO 2C043-C
1211          KM  FACILITY = LAS VEGAS WASH MIDDLE
1212          KM  FACILITY ID-MILE = LVMD 2170,2172
1213          KM  LINING = CONCRETE
1214          RD    1789   0.012   0.015       0    TRAP      50       0
              *
              * ************************************************************
              * AREA CONTRIBUTING TO RANCHO DETENTION BASIN
              * ************************************************************
              *
1215          KK  NW27-C
1216          BA   0.148
1217          PB    3.06
1218          LS       0    90.0
1219          UD   0.234
              *
1220          KK  RN27-C
1221          KM  ROUTE NW27-C TO CNW26-C
1222          KM  FACILITY = ELKHORN AND HUALAPAI
1223          KM  FACILITY ID-MILE = EKHU 0023
1224          KM  LINING = RCAP
1225          RD    2300   0.009   0.015       0    TRAP       8       0
              *
```

```
1226          KK  NW26-C
1227          BA   0.367
1228          PB    3.09
1229          LS       0    90.3
1230          UD   0.325
              *
1231          KK CNW26-C
1232          KM  COMBINE NW26-C AND RN27-C
1233          HC       2
              *
1234          KK  RN26-C
1235          KM  ROUTE CN26-C TO DNW26-C
1236          KM  FACILITY = ELKHORN AND HUALAPAI
1237          KM  FACILITY ID-MILE = EKHU 0000,0001,0003,0020
1238          KM  LINING = RCAP
1239          KM   419 CFS IN EXISTING 6'X4' RCA AND 219 AS SURFACE FLOW
1240          RD    1250   0.036   0.015       0    TRAP       6       0
              *
1241          KK NW53-CC
1242          KM   NEW BASIN FOR FLOW IN HUALAPAI LOCAL STORM DRAIN
1243          BA   0.099
1244          PB    2.85
1245          LS       0    87.2
1246          UD   0.191
              *
1247          KKCNW53-CC
1248          KM   COMBINE FLOWS AT ELKHORN & HUALAPAI
1249          KM   ADDED BY LBG FOR RANCHO-FT APACHE STORM DRAIN
1250          HC       2
              *
1251          KK DNW26-C
1252          KM   INTERSECTION OF HUALAPAI AND ELKHORN
1253          KM   FIRST 631 GOES EAST IN RCBH 0295
1254          KM   REMAINING FLOW GOES SOUTH IN BCHU 0054
1255          DTDOUTFLOW
1256          DI       0     631     733     7102
1257          DQ       0     631     631     7000
              *
              *
              * KKDNW26-C
              * KM190 CFS IN FACILITY AND 132 CFS SURFACE FLOW
              * KMGO SOUTH ON HUALAPAI AND REMAINING FLOW GOES EAST
              * KMPER "SUPPLEMENT #2 TO ADDENDUM #2 TO THE TDS FOR
              * KMCLIFFS EDGE" PREPARED BY VTN (FIGURE 5-N AND 5-S)
              * KMTHE FLOW GOING SOUTH WAS REDUCED BY 100 CFS TO
              * KMKEEP THE FORT APACHE DB FROM OVERTOPPING
              * DTDOUTFLOW
              * DI0       222     500     1000    5000
              * DQ0       0       278     778     4778
              *
```

```
1317          HC       2
              *
1318          KKDFADBIN1
1319          KM   DIVERT OUT FLOW INTO DETENTION BASIN.  RETRIEVE AFTER
1320          KM   FLOW SPLIT AT GRAND CANYON AND DEER SPRINGS IS CALCULATED.
1321          DT   DFADB
1322          DI        0  9000.1
1323          DQ        0  9000.0
              *
1324          KK NW53-CA
1325          BA   0.064
1326          PB    2.85
1327          LS       0    79.1
1328          UD   0.176
              *
1329          KK     SEV
1330          KM   FLOW SPLIT AT SEVERENCE & GRAND CANYON
1331          KM   REMAINING FLOW GOES EAST ON SEVERENCE
1332          KM   PIMA COUNTY METHOD
1333          DT    DSGC
1334          DI       0       50      100      150      200      250      350      500      750
1335          DQ       0        9       16       23       29       38       60       80      129
              *
              *
              *
              * ***************
              * NEW BASIN
              * ***************
              *
1336          KKNW66-CI2
1337          BA   0.024
1338          PB    2.85
1339          LS       0    84.0
1340          UD   0.162
              *
1341          KK    CCI2
1342          HC       2
              *
              *
              * ***************
              * NEW BASIN
              * ***************
              *
```



```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

1343          KKNW66-CI3
1344          BA   0.024
1345          PB    2.85
1346          LS       0    84.1
1347          UD   0.163
```

```
                  *
1348              KK    CCI3
1349              HC       2
                  *
1350              KK     SGC
1351              KM   FLOW AT INTERSECTION OF TEE PEE AND SEVERANCE
1352              KM   NO FLOW SPLIT, ALL FLOW CONTINUES EAST ALONG
1353              KM   SEVERANCE.
1354              DT    DSEV
1355              DI       0  3000.1
1356              DQ       0  3000.0
                  *
1357              KKDOUTFLOW
1358              KM   RETIREVE DOUTFLOW FLOWING EAST ON ELKHORN
1359              DRDOUTFLOW
                  *
1360              KKRDOUTFLW
1361              KM   ROUTE DOUTFLOW TO CNW53-C
1362              KM   FACILITY = RANCHO ROAD SYSTEM - BELTWAY
1363              KM   FACILITY # = RCHB 0295
1364              KM   LINING = RCB
1365              RD    2925   0.033   0.015       0    TRAP       7       0
                  *
                  * ***************
                  * REVISE BASIN
                  * ***************
                  *
1366              KK NW53-CB
1367              BA   0.128
1368              PB    2.85
1369              LS       0    79.8
1370              UD   0.210
                  *
1371              KK    DSGC
1372              KM   RETRIEVE DSGC FLOWING SOUTH ON GRAND CANYON
1373              DR    DSGC
                  *
1                                          HEC-1 INPUT                                                    PAGE 38

LINE              ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

1374              KK CNW53-C
1375              KM   COMBINE FLOWS AT ELKHORN AND GRAND CANYON
1376              HC       4
                  *
1377              KKRCNW53-C
1378              KM   ROUTE CNW53-C TO CNW66-C
1379              KM   ROUTE ELK AND GC TO ELK AND FT APACHE
1380              KM   FACILITY = RANCHO ROAD SYSTEM - BELTWAY
1381              KM   FACILITY # = RCHB 0295
```

```
1382          KM   LINING = RCB
1383          RD    2600   0.033   0.015       0    TRAP       7       0
              *

1384          KK NW66-CA
1385          BA   0.067
1386          PB    2.91
1387          LS       0     84.0
1388          UD   0.166
              *

1389          KK  C66-CA
1390          HC       2
              *

1391          KK NW66-CB
1392          BA   0.010
1393          PB    2.91
1394          LS       0     77.5
1395          UD   0.129
              *

1396          KK  C66-CB
1397          KM   FLOW IN RCHB 0295 JUST WEST OF INTERSECTION
1398          KM   OF ELKHORN AND FORT APACHE
1399          HC       2
              *

1400          KKNW66-CJ6
1401          BA   0.006
1402          PB    2.85
1403          LS       0     84.0
1404          UD   0.101
              *

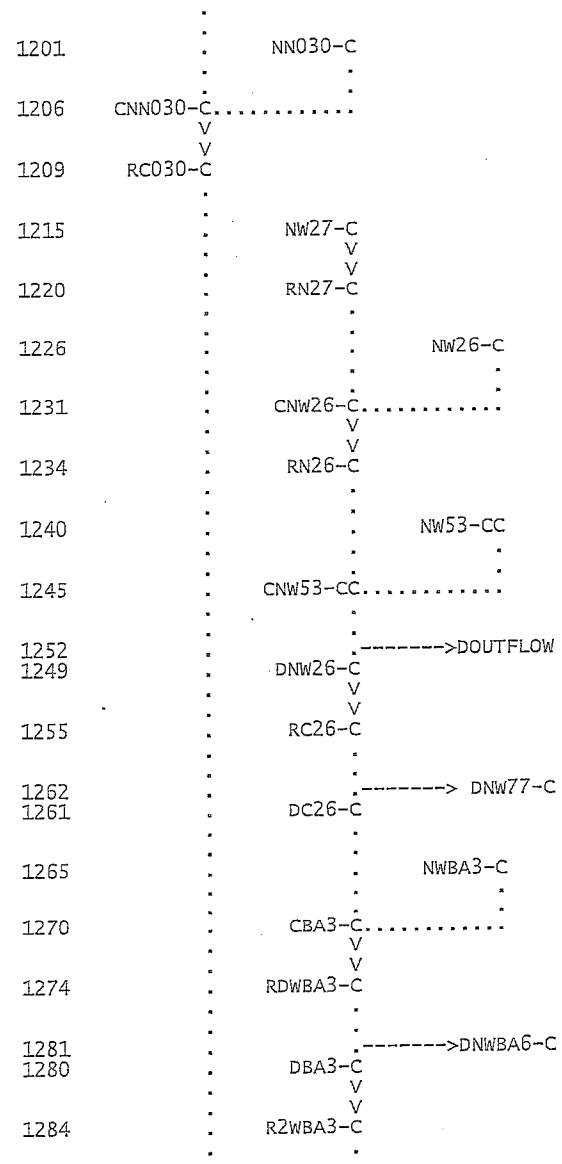
1405          KK  D66CJ6
1406          KM   PART OF FLOW GOES INTO 60" STORM DRAIN
1407          KM   THE REMAINDER TRAVELS IN THE STREET SOUTH ON FT APACHE
1408          DT  S66CJ6
1409          DI       0       4    1004
1410          DQ       0       0    1000
              *
```

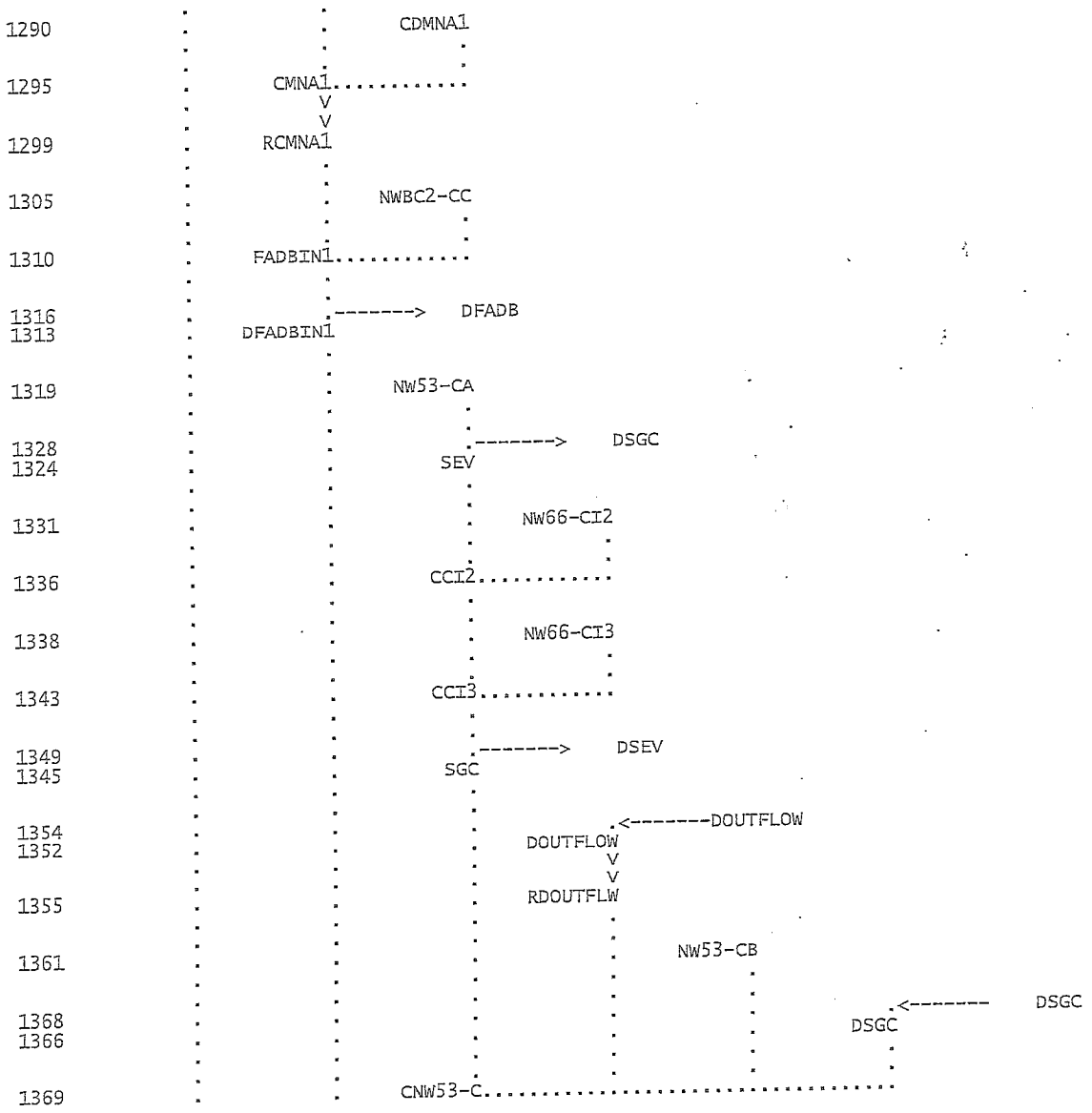


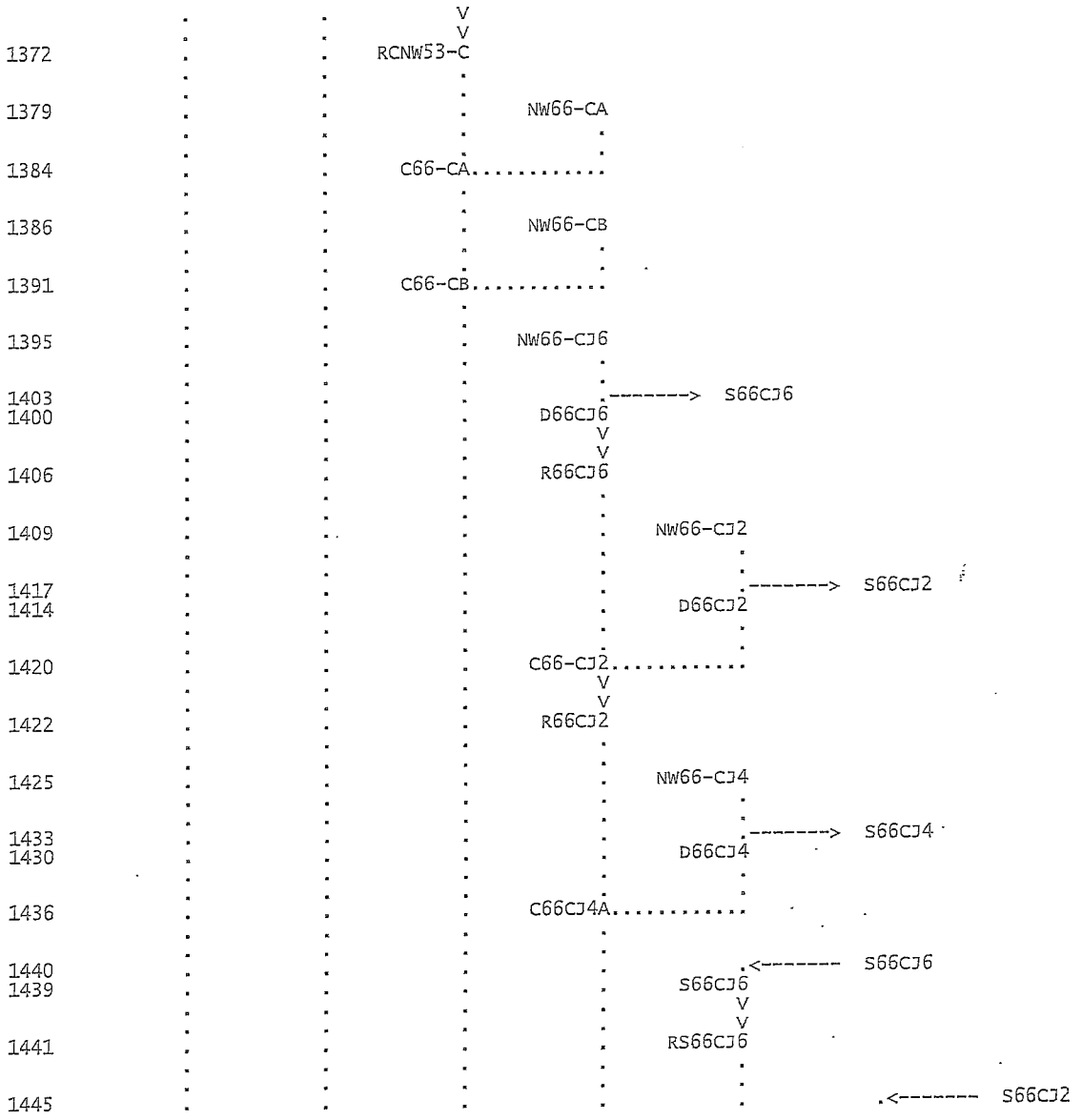
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1
                                   HEC-1 INPUT
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

1411          KK  R66CJ6
1412          KM   ROUTE STORM DRAIN FLOWS TO GOLD LAKE AVE
1413          RD     243  0.0050   0.013       0    CIRC       5       0
              *

1414          KKNW66-CJ2
1415          BA   0.018
1416          PB    2.85
1417          LS       0     84.0
1418          UD   0.128
              *
```


1201
NN030-C
1206
CNN030-C
1209
RC030-C
1215
NW27-C
1220
RN27-C
1226
NW26-C
1231
CNW26-C
1234
RN26-C
1240
NW53-CC
1245
CNW53-CC
1252
DOUTFLOW
1249
DNW26-C
1255
RC26-C
1262
DNW77-C
1261
DC26-C
1265
NWBA3-C
1270
CBA3-C
1274
RDWBA3-C
1281
DNWBA6-C
1280
DBA3-C
1284
R2WBA3-C


1290
CDMNA1
1295
CMNA1
1299
RCMNA1
1305
NWBC2-CC
1310
FADBIN1
1316
1313
DFADBIN1
DFADB
1319
NW53-CA
1328
1324
SEV
DSGC
1331
NW66-CI2
1336
CCI2
1338
NW66-CI3
1343
CCI3
1349
1345
SGC
DSEV
1354
1352
DOUTFLOW
RDOUTFLW
1355
1361
NW53-CB
1368
1366
DSGC
1369
CNW53-C


1372
RCNW53-C
1379
NW66-CA
1384
C66-CA
1386
NW66-CB
1391
C66-CB
1395
NW66-CJ6
1403
1400
D66CJ6
S66CJ6
1406
R66CJ6
1409
NW66-CJ2
1417
1414
D66CJ2
S66CJ2
1420
C66-CJ2
1422
R66CJ2
1425
NW66-CJ4
1433
1430
D66CJ4
S66CJ4
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S66CJ2

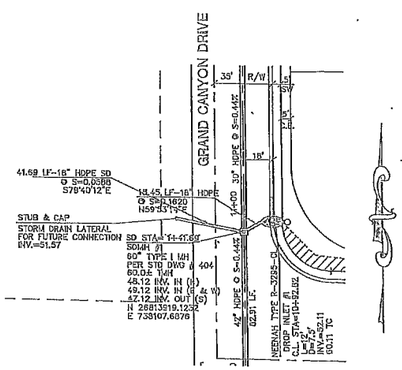
HYDROGRAPH AT	NW27-C	.15	1	FLOW	207.	203.	196.	189.	186.	185.	183.	181.	178.
+				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO	RN27-C	.15	1	FLOW	203.	199.	193.	185.	183.	181.	179.	178.	175.
+				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT	NW26-C	.37	1	FLOW	456.	447.	432.	417.	411.	407.	404.	399.	393.
+				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT	CNW26-C	.51	1	FLOW	650.	638.	617.	596.	587.	582.	577.	571.	562.
+				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO	RN26-C	.51	1	FLOW	649.	636.	616.	595.	586.	581.	576.	570.	560.
+				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT	NW53-CC	.10	1	FLOW	121.	118.	114.	109.	107.	106.	105.	104.	102.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT	CNW53-CC	.61	1	FLOW	748.	733.	709.	685.	675.	668.	662.	655.	645.
+				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
DIVERSION TO	DOUTFLOW	.61	1	FLOW	646.	631.	631.	631.	631.	631.	631.	631.	631.
+				TIME	3.75	3.75	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT	DNW26-C	.61	1	FLOW	102.	102.	78.	54.	44.	37.	31.	24.	14.
+				TIME	3.67	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO	RC26-C	.61	1	FLOW	103.	100.	78.	53.	43.	36.	30.	23.	12.
+				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
DIVERSION TO	DNW77-C	.61	1	FLOW	0.	0.	0.	0.	0.	0.	0.	0.	0.
+				TIME	.00	.00	.00	.00	.00	.00	.00	.00	.00
HYDROGRAPH AT	DC26-C	.61	1	FLOW	103.	100.	78.	53.	43.	36.	30.	23.	12.
+				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT	NWBA3-C	.33	1	FLOW	407.	399.	386.	372.	367.	363.	360.	356.	351.
+				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT	CBA3-C	.94	1	FLOW	510.	500.	464.	425.	410.	399.	390.	379.	363.
+				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO													

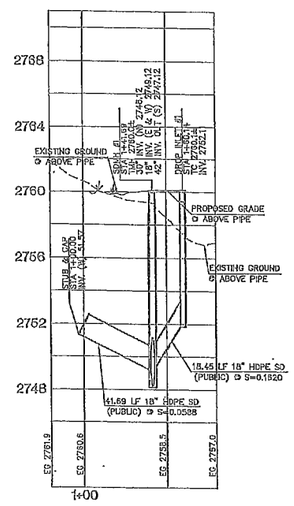
+	RDWBA3-C	.94	1	FLOW TIME	505. 3.75	495. 3.75	459. 3.75	420. 3.75	406. 3.75	395. 3.75	386. 3.75	375. 3.75	359. 3.75
DIVERSION TO +	DNWBA6-C	.94	1	FLOW TIME	0. .00	0. .00	0. .00	0. .00	0. .00	0. .00	0. .00	0. .00	0. .00
HYDROGRAPH AT +	DBA3-C	.94	1	FLOW TIME	505. 3.75	495. 3.75	459. 3.75	420. 3.75	406. 3.75	395. 3.75	386. 3.75	375. 3.75	359. 3.75
ROUTED TO +	R2WBA3-C	.94	1	FLOW TIME	500. 3.75	490. 3.75	453. 3.75	416. 3.75	401. 3.75	391. 3.75	383. 3.75	372. 3.75	356. 3.75
HYDROGRAPH AT +	CDMNA1	.48	1	FLOW TIME	598. 3.75	587. 3.75	567. 3.75	548. 3.75	540. 3.75	535. 3.75	531. 3.75	525. 3.75	517. 3.75
2 COMBINED AT +	CMNA1	1.42	1	FLOW TIME	1099. 3.75	1076. 3.75	1021. 3.75	964. 3.75	942. 3.75	926. 3.75	914. 3.75	897. 3.75	874. 3.75
ROUTED TO +	RCMNA1	1.42	1	FLOW TIME	1068. 3.75	1044. 3.75	990. 3.75	935. 3.75	915. 3.75	899. 3.83	891. 3.75	874. 3.75	854. 3.83
HYDROGRAPH AT +	NWBC2-CC	.20	1	FLOW TIME	191. 3.67	187. 3.67	178. 3.67	170. 3.67	167. 3.67	165. 3.67	163. 3.67	160. 3.67	157. 3.67
2 COMBINED AT +	FADBIN1	1.63	1	FLOW TIME	1257. 3.75	1228. 3.75	1166. 3.75	1104. 3.75	1080. 3.75	1061. 3.75	1052. 3.75	1033. 3.75	1008. 3.75
DIVERSION TO +	DFADB	1.63	1	FLOW TIME	1257. 3.75	1228. 3.75	1166. 3.75	1104. 3.75	1080. 3.75	1061. 3.75	1052. 3.75	1033. 3.75	1008. 3.75
HYDROGRAPH AT +	DFADBIN1	1.63	1	FLOW TIME	0. 3.75	0. 3.75	0. 3.75	0. 3.75	0. 3.75	0. 3.75	0. 3.75	0. 3.75	0. 3.75
HYDROGRAPH AT +	NW53-CA	.06	1	FLOW TIME	55. 3.58	53. 3.58	51. 3.58	48. 3.58	47. 3.58	46. 3.58	46. 3.58	45. 3.58	44. 3.58
DIVERSION TO +	DSGC	.06	1	FLOW TIME	10. 3.58	9. 3.58	9. 3.58	9. 3.58	8. 3.58	8. 3.58	8. 3.58	8. 3.58	8. 3.58
HYDROGRAPH AT +	SEV	.06	1	FLOW TIME	45. 3.58	44. 3.58	42. 3.58	39. 3.58	39. 3.58	38. 3.58	38. 3.58	37. 3.58	36. 3.58
HYDROGRAPH AT +	NW66-CI2	.02	1	FLOW TIME	28. 3.58	27. 3.58	26. 3.58	25. 3.58	24. 3.58	24. 3.58	24. 3.58	23. 3.58	23. 3.58

+ 2 COMBINED AT	CCI2	.09	1	FLOW	73.	71.	67.	64.	63.	62.	61.	60.	59.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
+ HYDROGRAPH AT	NW66-CI3	.02	1	FLOW	28.	27.	26.	25.	24.	24.	24.	23.	23.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
+ 2 COMBINED AT	CCI3	.11	1	FLOW	100.	98.	93.	89.	87.	86.	85.	84.	82.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
+ DIVERSION TO	DSEV	.11	1	FLOW	100.	98.	93.	89.	87.	86.	85.	84.	82.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
+ HYDROGRAPH AT	SGC	.11	1	FLOW	0.	0.	0.	0.	0.	0.	0.	0.	0.
				TIME	3.50	3.50	3.58	3.58	3.58	3.58	3.58	3.58	3.58
+ HYDROGRAPH AT	DOUTFLOW	.00	1	FLOW	646.	631.	631.	631.	631.	631.	631.	631.	631.
				TIME	3.75	3.75	3.67	3.67	3.67	3.67	3.67	3.67	3.67
+ ROUTED TO	RDOUTFLW	.00	1	FLOW	646.	631.	631.	631.	631.	631.	631.	631.	631.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
+ HYDROGRAPH AT	NW53-CB	.13	1	FLOW	107.	104.	99.	94.	92.	91.	90.	88.	86.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
+ HYDROGRAPH AT	DSGC	.00	1	FLOW	10.	9.	9.	9.	8.	8.	8.	8.	8.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
+ 4 COMBINED AT	CNW53-C	.24	1	FLOW	759.	744.	736.	726.	723.	720.	719.	718.	716.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	3.75
+ ROUTED TO	RCNW53-C	.24	1	FLOW	753.	738.	729.	723.	722.	720.	719.	717.	715.
				TIME	3.67	3.67	3.75	3.75	3.75	3.75	3.75	3.75	3.75
+ HYDROGRAPH AT	NW66-CA	.07	1	FLOW	79.	77.	74.	70.	69.	68.	68.	67.	65.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
+ 2 COMBINED AT	C66-CA	.31	1	FLOW	824.	808.	795.	781.	774.	770.	768.	766.	763.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
+ HYDROGRAPH AT	NW66-CB	.01	1	FLOW	9.	9.	9.	8.	8.	8.	8.	8.	7.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													

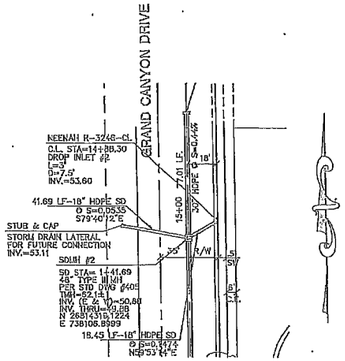
+	C66-CB	.32	1	FLOW TIME	832. 3.67	815. 3.67	802. 3.67	787. 3.67	781. 3.67	776. 3.67	774. 3.67	771. 3.75	768. 3.75
+ HYDROGRAPH AT	NW66-CJ6	.01	1	FLOW TIME	8. 3.50	7. 3.50	7. 3.50	7. 3.50	7. 3.50	7. 3.50	6. 3.50	6. 3.50	6. 3.50
+ DIVERSION TO	S66CJ6	.01	1	FLOW TIME	4. 3.50	3. 3.50	3. 3.50	3. 3.50	3. 3.50	3. 3.50	2. 3.50	2. 3.50	2. 3.50
+ HYDROGRAPH AT	D66CJ6	.01	1	FLOW TIME	4. 3.42	4. 3.42	4. 3.42	4. 3.42	4. 3.42	4. 3.42	4. 3.42	4. 3.42	4. 3.42
+ ROUTED TO	R66CJ6	.01	1	FLOW TIME	4. 3.50	4. 3.50	4. 3.50	4. 3.50	4. 3.50	4. 3.50	4. 3.50	4. 3.50	4. 3.50
+ HYDROGRAPH AT	NW66-CJ2	.02	1	FLOW TIME	22. 3.58	21. 3.58	21. 3.58	20. 3.58	19. 3.58	19. 3.58	19. 3.58	19. 3.58	18. 3.58
+ DIVERSION TO	S66CJ2	.02	1	FLOW TIME	18. 3.58	17. 3.58	17. 3.58	16. 3.58	15. 3.58	15. 3.58	15. 3.58	15. 3.58	14. 3.58
+ HYDROGRAPH AT	D66CJ2	.02	1	FLOW TIME	4. 3.25	4. 3.25	4. 3.25	4. 3.25	4. 3.25	4. 3.33	4. 3.33	4. 3.33	4. 3.33
+ 2 COMBINED AT	C66-CJ2	.02	1	FLOW TIME	8. 3.50	8. 3.50	8. 3.50	8. 3.50	8. 3.50	8. 3.50	8. 3.50	8. 3.50	8. 3.50
+ ROUTED TO	R66CJ2	.02	1	FLOW TIME	8. 3.58	8. 3.58	8. 3.58	8. 3.58	8. 3.58	8. 3.58	8. 3.58	8. 3.58	8. 3.58
+ HYDROGRAPH AT	NW66-CJ4	.01	1	FLOW TIME	7. 3.50	7. 3.50	7. 3.50	7. 3.50	7. 3.50	6. 3.50	6. 3.50	6. 3.50	6. 3.50
+ DIVERSION TO	S66CJ4	.01	1	FLOW TIME	3. 3.50	3. 3.50	3. 3.50	3. 3.50	3. 3.50	2. 3.50	2. 3.50	2. 3.50	2. 3.50
+ HYDROGRAPH AT	D66CJ4	.01	1	FLOW TIME	4. 3.42	4. 3.42	4. 3.42	4. 3.42	4. 3.42	4. 3.42	4. 3.42	4. 3.42	4. 3.42
+ 2 COMBINED AT	C66CJ4A	.03	1	FLOW TIME	12. 3.58	12. 3.58	12. 3.58	12. 3.58	12. 3.58	12. 3.58	12. 3.58	12. 3.58	12. 3.58
+ HYDROGRAPH AT	S66CJ6	.00	1	FLOW TIME	4. 3.50	3. 3.50	3. 3.50	3. 3.50	3. 3.50	3. 3.50	2. 3.50	2. 3.50	2. 3.50

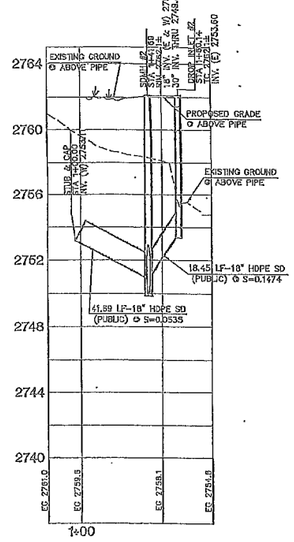
Elkhorn/Grand Canyon Unit 1 & Unit 2, VTN



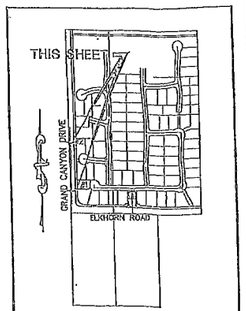


CONNECTOR # 1

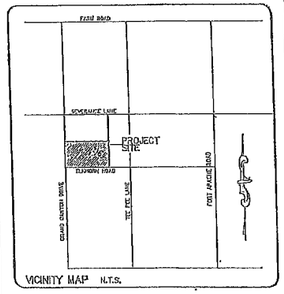




CONNECTOR # 2



SHEET INDEX MAP



VICINITY MAP N.T.S.

GRAPHIC SCALE

40 0 20 40 80

1" = 40'

Avoid cutting underground utility lines. It's costly.
Call before you Dig 1-800-227-2600

Avoid overhead power line contact. It's costly.
Call before you Overhead 1-702-593-6111

BASIS OF BEARING:

SOUTH 00°45'45", BEING THE EAST LINE OF THE GOVERNMENT LOT 1 OF SECTION 25, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M. CLARK COUNTY NEVADA, AS SHOWN ON THAT CERTAIN PARCEL MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDERS, CLARK COUNTY NEVADA, IN FILE 69 OF PARCEL MAPS, AT PAGE 95.

BENCHMARK: PROJECT DATUM NAVD 88

CLARK COUNTY BENCHMARK 1LV10-BSWS
NAVD88 ELEV. 797.904 METERS (2617.790 FEET)
CITY OF LAS VEGAS PIN AND PLATE, NORTHWEST CORNER OF DURANGO DRIVE AND DESERT INN ROAD, NEAR THE PC OF CURB OF DURANGO DRIVE.

This grading plan is part of the # 3010 with on 4/9/02 & is Page

PERMA-BILT HOMES
7160 PULLOCK DRIVE, SUITE 100
LAS VEGAS, NEVADA 89119
(702) 896-8100

CITY OF LAS VEGAS, NEVADA

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5140
PH. (702) 873-7550 FAX (702) 362-2627

MEYER
nevada CONSULTING ENGINEERS ◇ PLANNERS ◇ LAND SURVEYORS

REV	DATE	BY	REVISION
1	03/22/02	M.V.P.	add City of Las Vegas comments.

STORM DRAIN PLAN & PROFILE

ELKHORN / GRAND CANYON UNIT 1

DRAWN BY: M.V.P. 02/05/02
DESIGNED BY: A.Y. 02/06/02
CHECKED BY: A.Y. 02/13/02
PROJECT NO: 5897-01
SCALE: 1"=40' HORIZ. 1"=4' VERT.

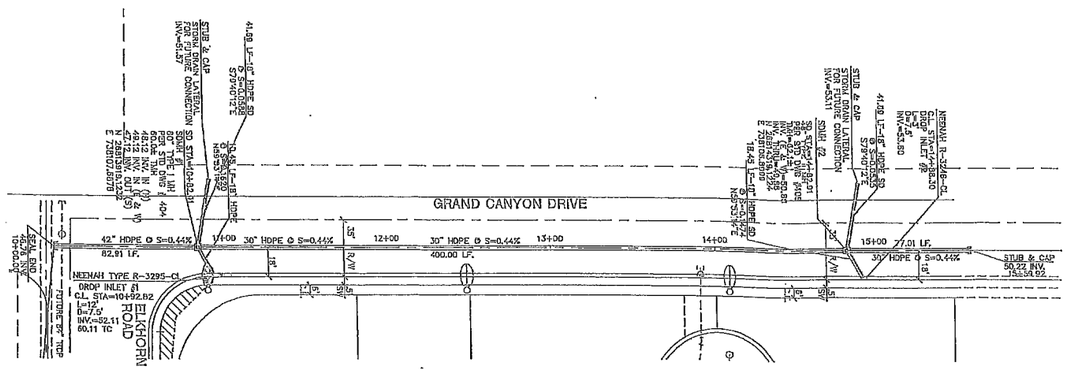
AARON M. YAMACHIKA
No. 10015 CIVIL
PROFESSIONAL ENGINEER STATE OF NEVADA
3-14-02

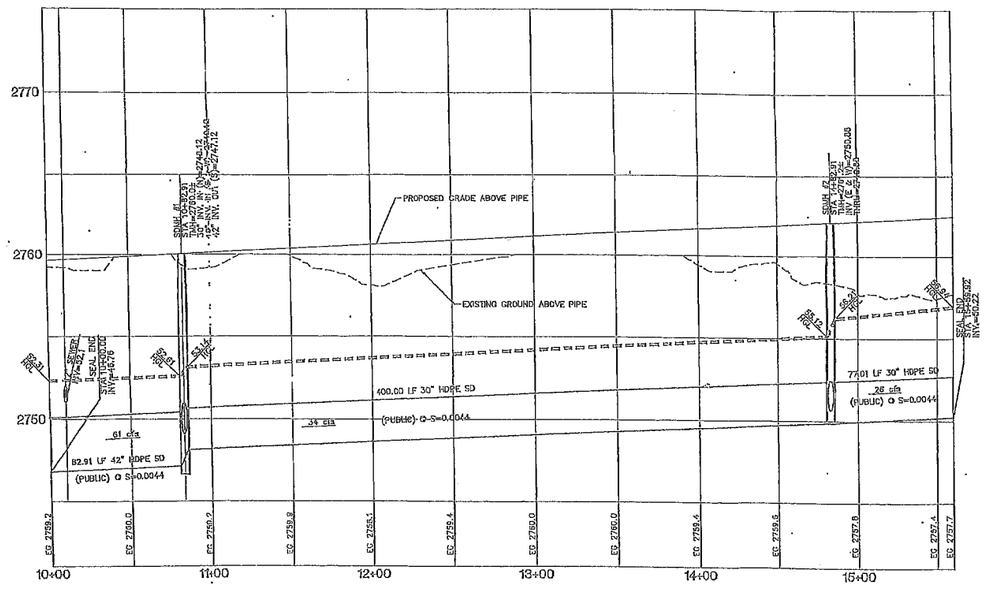
SHEET NO. SD1
OF SHEETS
DRAWING NO.

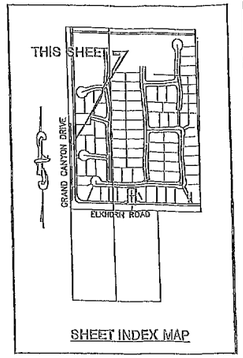
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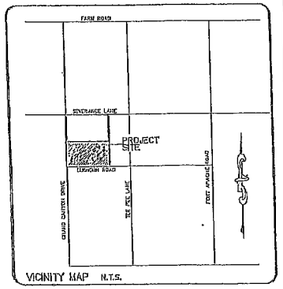
3010 2ND SUBMITTAL PLANS







SHEET INDEX MAP



GRAPHIC SCALE

1" = 40'

NO.	REVISION	DATE	BY
1	Addl City of Las Vegas comments.	10/22/02	M.V.P.

PERMA-BILT HOMES
7150 POLLOCK DRIVE, SUITE 100
LAS VEGAS, NEVADA 89119
(702) 896-4200

CITY OF LAS VEGAS, NEVADA

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5140
PH. (702) 873-7550 FAX (702) 362-2987

AERO
BROWDER CONSULTING ENGINEERS ◎ PLANNERS ◎ LAND SURVEYORS

STORM DRAIN PLAN & PROFILE

ELKHORN / GRAND CANYON
UNIT 1

DRAWN BY: M.V.P.	02/05/02
DESIGNED BY: A.K.	02/05/02
CHECKED BY: A.K.	02/15/02
SCALE:	1"=40' HORIZ. 1"=4' VERT.
PROJECT NO: 5697-01	

AARON M. YAMACHIKA
CIVIL
No. 15079
STATE OF NEVADA
PROFESSIONAL ENGINEER

SHEET
SD2
OF SHEETS
DRAWING NO.

Avoid cutting underground utility lines. It's costly.
Call before you Dig
1-800-227-2600

Avoid accidental power line contact. It's costly.
Call before you Overhead
1-702-593-6111

BASIS OF BEARING:

SOUTH 00°45'45", BEING THE EAST LINE OF THE GOVERNMENT LOT 1 OF SECTION 25, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M. CLARK COUNTY NEVADA, AS SHOWN ON THAT CERTAIN PARCEL MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDERS, CLARK COUNTY NEVADA, IN FILE 89 OF PARCEL MAPS, AT PAGE 95.

BENCHMARK: PROJECT DATUM NAVD 88

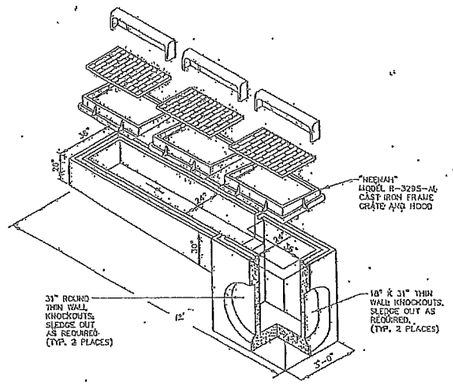
CLARK COUNTY BENCHMARK 1LV10-BSWS
NAVD88 ELEV: 797.904 METERS (2617.790 FEET)
CITY OF LAS VEGAS PIN AND PLATE, NORTHWEST CORNER OF DURANGO DRIVE AND DESERT INN ROAD, NEAR THE PC OF CURB OF DURANGO DRIVE.

This [illegible] plan set is approved [illegible] on 4/08/03 [illegible] Page

H:\5697\UNIT01\5697-SD01.DWG, 04/03/2003 05:14:42 PM, PLOTTED BY: M.V.P.

H:\5697\UNIT01\5697-SD02.DWG(SD2)

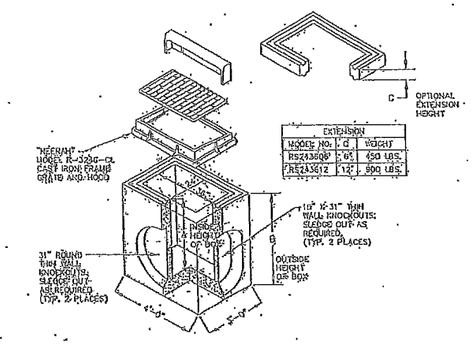
3RD 2ND SUBMITTAL PLANS



DEPTH FROM 3.5' TO 8.0'

24" X 36" CURB INLET W/ CAST IRON FRAME GRATE, AND HOOD W/ 42" TROUGH

SCALE: N.T.S.



EXTENSION		
MODEL NO.	'C'	WEIGHT
RS243606	6"	450 LBS.
RS243612	12"	900 LBS.

DROP INLET, GR. TO 5'-0" BOX DEPTH			
MODEL NO.	'A'	'B'	WEIGHT*
DI243636-4R	36"	42"	3029 LBS.
DI243648-4R	48"	54"	3808 LBS.
DI243660-4R	60"	66"	5511 LBS.
DI243672-4R	72"	78"	5473 LBS.

* BOX ONLY

24" X 36" CURB INLET W/ CAST IRON FRAME GRATE, AND HOOD

SCALE: N.T.S.

Avoid cutting underground utility lines. It's costly.
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1-702-593-6111

This grading plan is part of the # 8090 Wash... on 4/02 and Page ...

PERMA-BILT HOMES
7150 POLLOCK DRIVE, SUITE 100
LAS VEGAS, NEVADA 89119
(702) 895-9100

CITY OF LAS VEGAS, NEVADA

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5948
PH. (702) 873-7550 FAX (702) 362-2557
CONSULTING ENGINEERS & PLANNERS & LAND SURVEYORS

REV	DATE	BY	REVISION

DETAIL SHEET

ELKHORN / GRAND CANYON UNIT 1

DRAWN BY: M.V.P. 01/29/02
DESIGNED BY: M.V.P. 01/29/02
CHECKED BY: A.Y. 02/05/02
PROJECT NO: 8697-1
SCALE: HORZ. NONE VERT. NONE

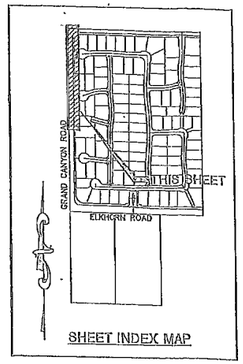
AARON M. YAMACHIKA
Nevada No. 7863
PROFESSIONAL ENGINEER

SHEET DET2 OF SHEETS
DRAWING NO.

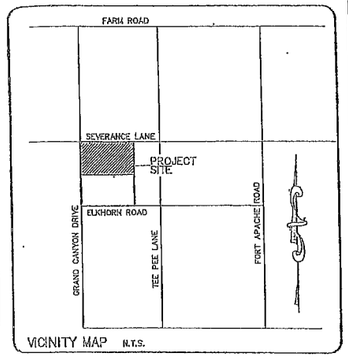
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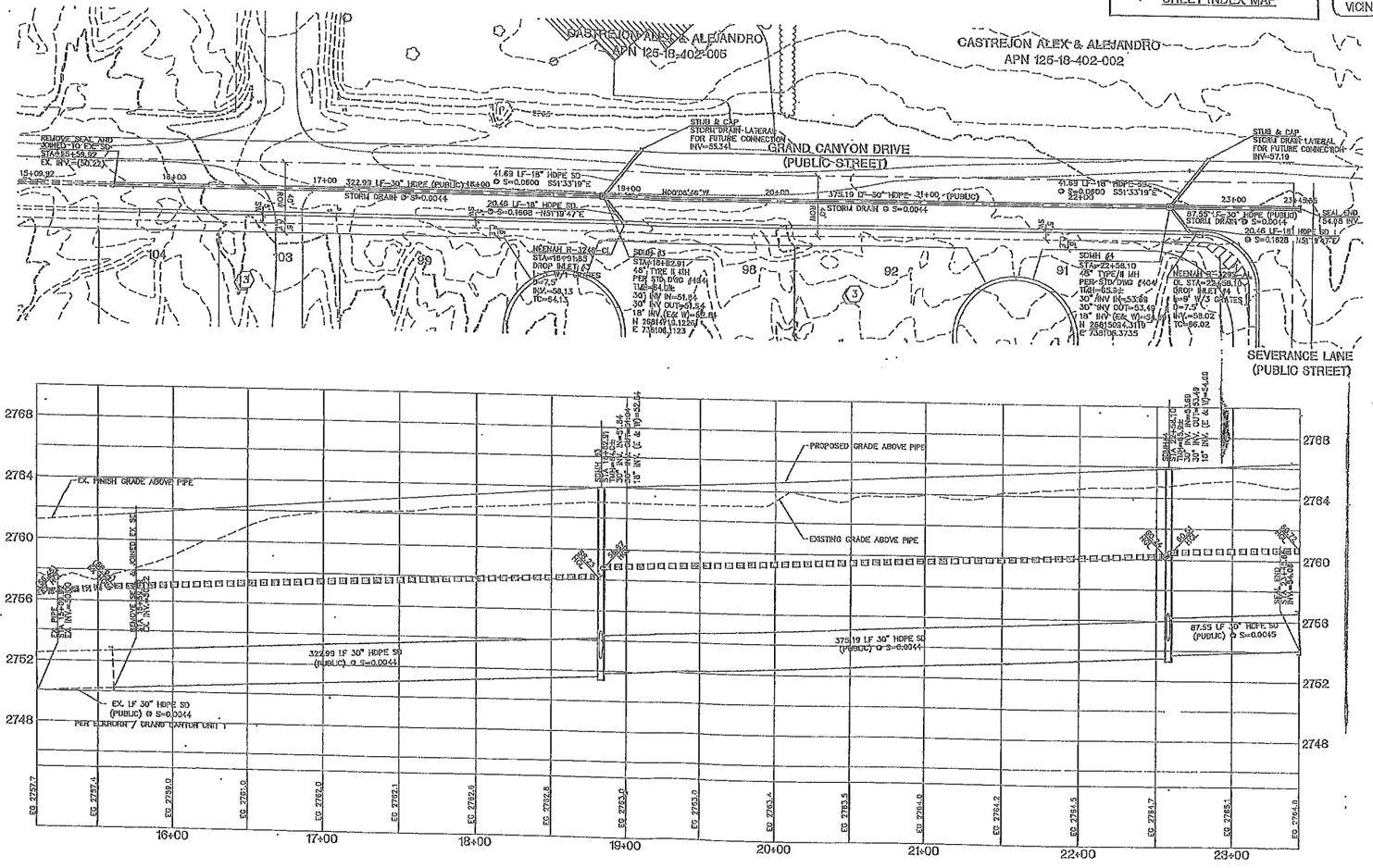
3090 2ND SUBMITTAL PLANS



SHEET INDEX MAP



VICINITY MAP N.T.S.



Avoid cutting underground utility lines. It's costly.
Call before you Dig
1-800-227-2600

Avoid overhead power line contact. It's costly.
Call before you Overhead
1-702-593-6111

BASIS OF BEARING:

SOUTH 00°03'45", BEING THE EAST LINE OF THE GOVERNMENT LOT 1 OF SECTION 25, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M. CLARK COUNTY NEVADA, AS SHOWN ON THAT CERTAIN PARCEL MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDERS, CLARK COUNTY NEVADA, IN FILE 89 OF PARCEL MAPS, AT PAGE 95.

BENCHMARK: PROJECT DATUM NAVD 88

CLARK COUNTY BENCHMARK 1LV10-85W5
NAVD88 ELEV. 797.904 METERS (2617.780 FEET)
CITY OF LAS VEGAS PIN AND PLATE, NORTHWEST CORNER OF DURANGO DRIVE AND DESERT INN ROAD, NEAR THE PC OF CURB OF DURANGO DRIVE.

This grading pl... part of gra... #20940 ... on 9/9/02 ... 6/14/07

PERMA-BILT HOMES
7160 RAINBOW BLVD. #104
LAS VEGAS, NEVADA 89118
(702) 896-8100

CITY OF LAS VEGAS, NEVADA

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5145
PH. (702) 873-7550 FAX (702) 362-2897

MOFFATT & NICHOL ENGINEERS

CONSULTING ENGINEERS ◇ PLANNERS ◇ LAND SURVEYORS

REV	DATE	BY	REVISION

STORM DRAIN PLAN & PROFILE

ELKHORN / GRAND CANYON UNIT 2

DRAWN BY: K.M.P.	05/15/02
DESIGNED BY: T.E.	05/10/02
CHECKED BY: T.C.	05/17/02
PROJECT NO: 5897-2	SCALE: 1"=40' HORIZ. 1"=4' VERT.

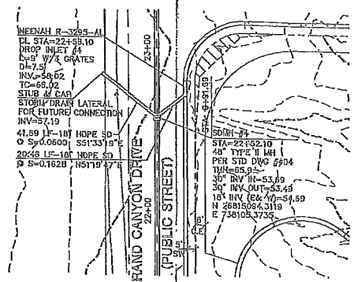
DARIEL HOOD
No. 12187
CIVIL
STATE OF NEVADA
PROFESSIONAL ENGINEER

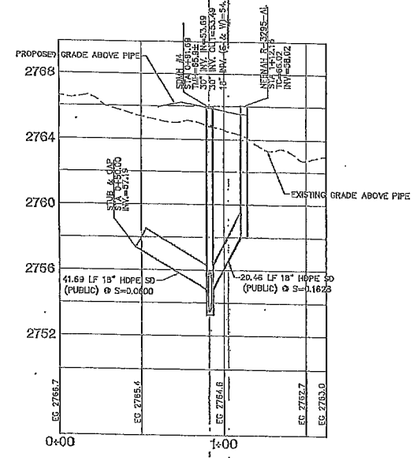
SHEET SD1 OF SHEETS
DRAWING NO. 10

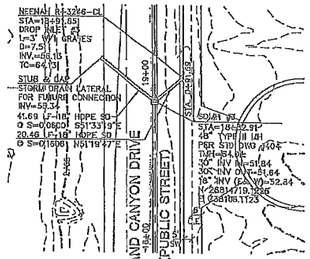
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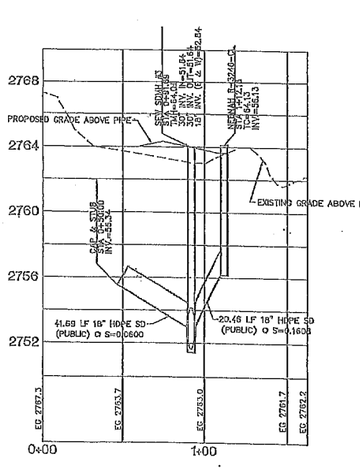
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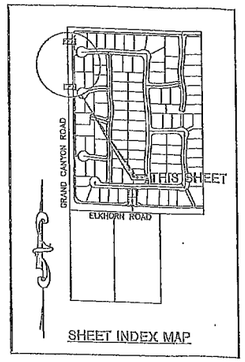
3090 4TH SUBMITTAL PLANS

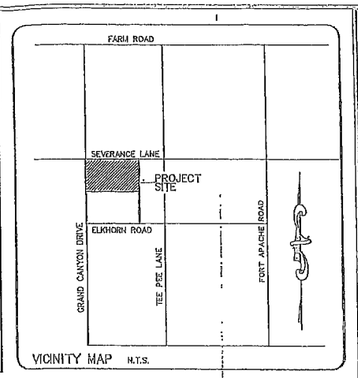


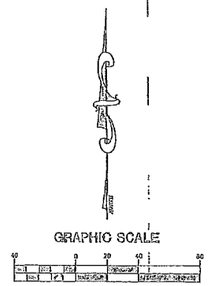












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Avoid overhead power line contact. It's costly.
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1-702-593-6111

BASIS OF BEARING:

SOUTH 00°45'45", BEING THE EAST LINE OF THE GOVERNMENT LOT 1 OF SECTION 25, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M. CLARK COUNTY NEVADA, AS SHOWN ON THAT CERTAIN PARCEL MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDERS, CLARK COUNTY NEVADA, IN FILE 89 OF PARCEL MAPS, AT PAGE 95.

BENCHMARK: PROJECT DATUM NAVD 88

CLARK COUNTY BENCHMARK 1LV10-BSWS
NAVD88 ELEV: 797.904 METERS (2617.790 FEET)
CITY OF LAS VEGAS PIN AND PLATE, NORTHWEST CORNER OF DURANGO DRIVE AND DESERT INN ROAD, NEAR THE PC OF CURB OF DURANGO DRIVE.

This grading plan is part of grading permit # 3000 which was issued on 6/26/02 & is subject to letter dated 6/25/02. Page 7

REV	DATE	BY	REVISION

PERMA-BILT HOMES
7150 POLLOCK DRIVE, SUITE 104
LAS VEGAS, NEVADA 89119
(702) 896-9100

CITY OF LAS VEGAS, NEVADA

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5140
PH. (702) 873-7565 FAX (702) 362-2597

MOYSES CONSULTING ENGINEERS & PLANNERS & LAND SURVEYORS

STORM DRAIN PLAN & PROFILE

ELKHORN / GRAND CANYON UNIT 2

DRAWN BY:	DATE: 05/15/02
DESIGNED BY:	DATE: 05/10/02
CHECKED BY:	DATE: 05/17/02
PROJECT NO: 3887-2	SCALE: 1"=40' HORIZ. 1"=4' VERT.

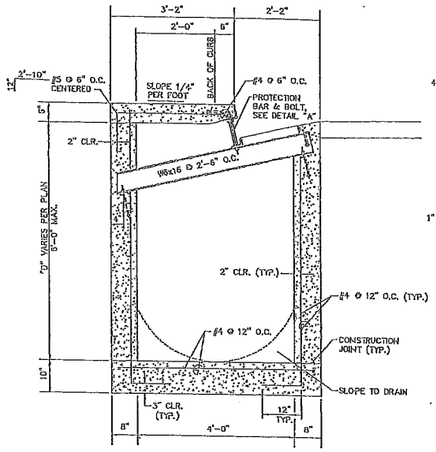
DANIEL HOLD — CIVIL — No. 9811 — PROFESSIONAL ENGINEER — STATE OF NEVADA
5-20-02

SHEET SD2
OF SHEETS
DRAWING NO.

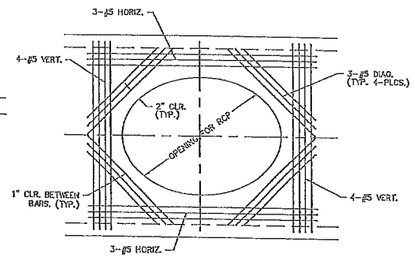
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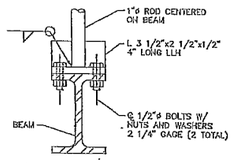
3000 4TH SUBMITTAL PLANS



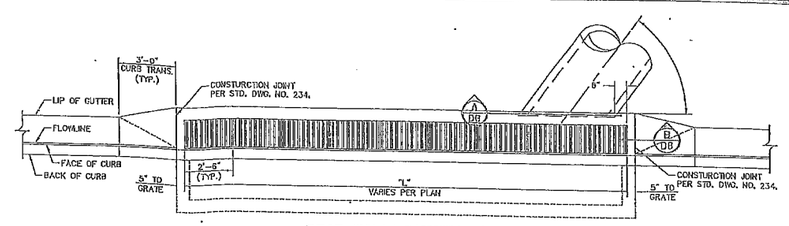
TYPE "CM2" DROP INLET SECTION
SCALE 3/4"=1'



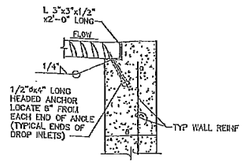
SECTION "A"
SCALE 3/4"=1'



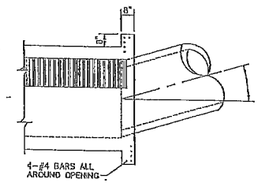
DETAIL "B"
SCALE 3"=1'



DROP INLET LAYOUT PLAN
SCALE 3/8"=1'



SECTION "B"
SCALE 1-1/2"=1'



ALTERNATE CONNECTION DETAIL
SCALE 3/8"=1'

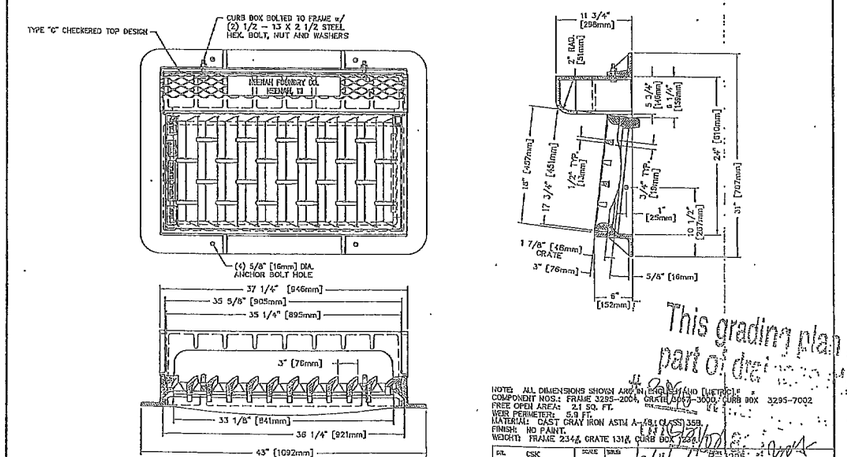
TYPE "DM2" DROP INLET SECTION
SCALE 3/4"=1'

PROTECTIVE FACE & ROD — DETAIL "A"
SCALE 3"=1'

NOTES:

1. ALL EXPOSED METALS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.
2. PROVIDE 1/2" (MIN.) CLEARANCE ALL AROUND THE STEEL BEAM, DRY PACK AFTER INSTALLATION.
3. WHEN REQUIRED BY LENGTH OF OPENING, PLATE ANGLE MAYBE DELIVERED IN SECTIONS AND BUTT WELDED IN PLACE.
4. ALL GALVANIZING DAMAGED BY WELDING SHALL RECEIVE TWO COATS OF GALVALLOY OR EQUAL.
5. CONCRETE SHALL BE MODIFIED CLASS DA, SEE SPECIAL PROVISIONS SECTION 501.
6. SEE GENERAL NOTES FOR STRUCTURES ON DWG D8.
7. ANGLE ANCHORS SHALL BE EMBEDDED MIDPOINT IN EACH ENDWALL AND EVENLY SPACED. (MAXIMUM SPACING OF 2')

NEENAH R-3246



NOTE: ALL DIMENSIONS SHOWN ARE IN ENGLISH AND [METRIC]
COMPONENT NOS.: FRAME 3295-2004, GRATE 3295-3002, CURB BOX 3295-7002
FREE OPEN AREA: 2.1 SQ. FT.
WEIR PERIMETER: 5.9 FT.
MATERIAL: CAST GRAY IRON ASTM A-48 CLASS 35B
FINISH: NO PAINT.
WEIGHT: FRAME 234#, GRATE 131#, CURB BOX 72#

NO.	DESCRIPTION	BY	DATE
1	10-3-2005 REVISED PER NEW STYLE FOR	BSH	10-3-2005
2	5-30-2006 REVISED WEIGHTS THAT DUE TO CHANGE	BSH	5-30-2006

CAD DWG. REF: 3295 100.DWG

DR.	CSK	SCALE	SIZE
DS.		1/8"=1'	D
APP.		DEF SIZE	
DATE	5-05-99		

NEENAH FOUNDRY COMPANY

FRAME AND GRATE AND CURB BOX

NEENAH R-3295 100 B/D

This grading plan is part of the

PERMA-BILT HOMES
7350 PROMONTORY POINT DR. STE. 104
LAS VEGAS, NEVADA 89128
(702) 896-9100

CITY OF LAS VEGAS, NEVADA

LVCE
LEAVELL-VANCE CONSULTING ENGINEERS
2227 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5140
PH. (702) 873-7550 FAX (702) 362-2507
PLANNERS ○ LAND SURVEYORS

REV	DATE	BY	REVISION

DETAIL SHEET

ELKHORN / GRAND CANYON UNIT 2

DRAWN BY: MVP.	05/08/02	SCALE:	HORIZ. NONE
DESIGNED BY: MVP.	05/08/02		VERT. NONE
CHECKED BY:		PROJECT NO:	3287-2

PROFESSIONAL ENGINEER — DANIEL HOD — CIVIL — No. 12811 — STATE OF NEVADA
5-20-02

SHEET
D12
0 OF 0 SHEETS
DRAWING NO.

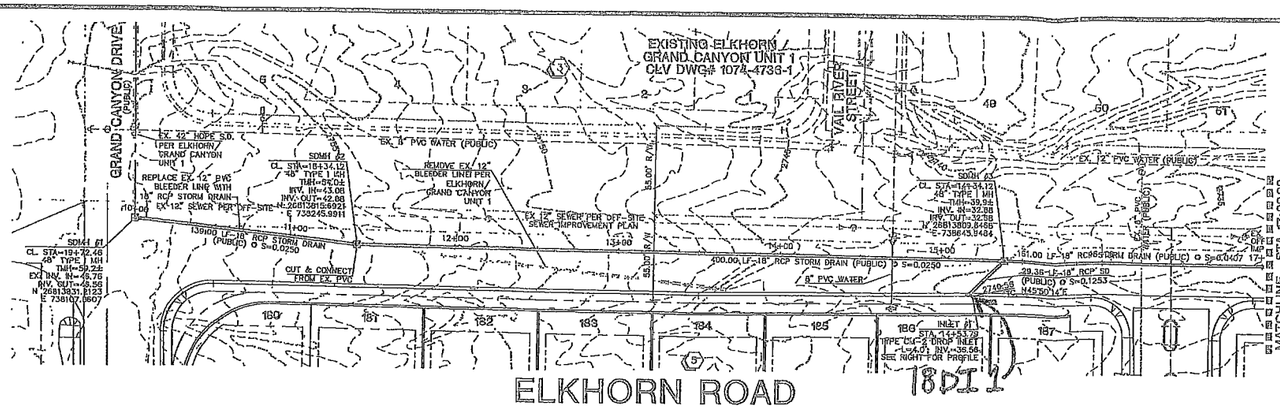
Avoid cutting underground utility lines. It's costly. Call before you Dig 1-800-227-2600

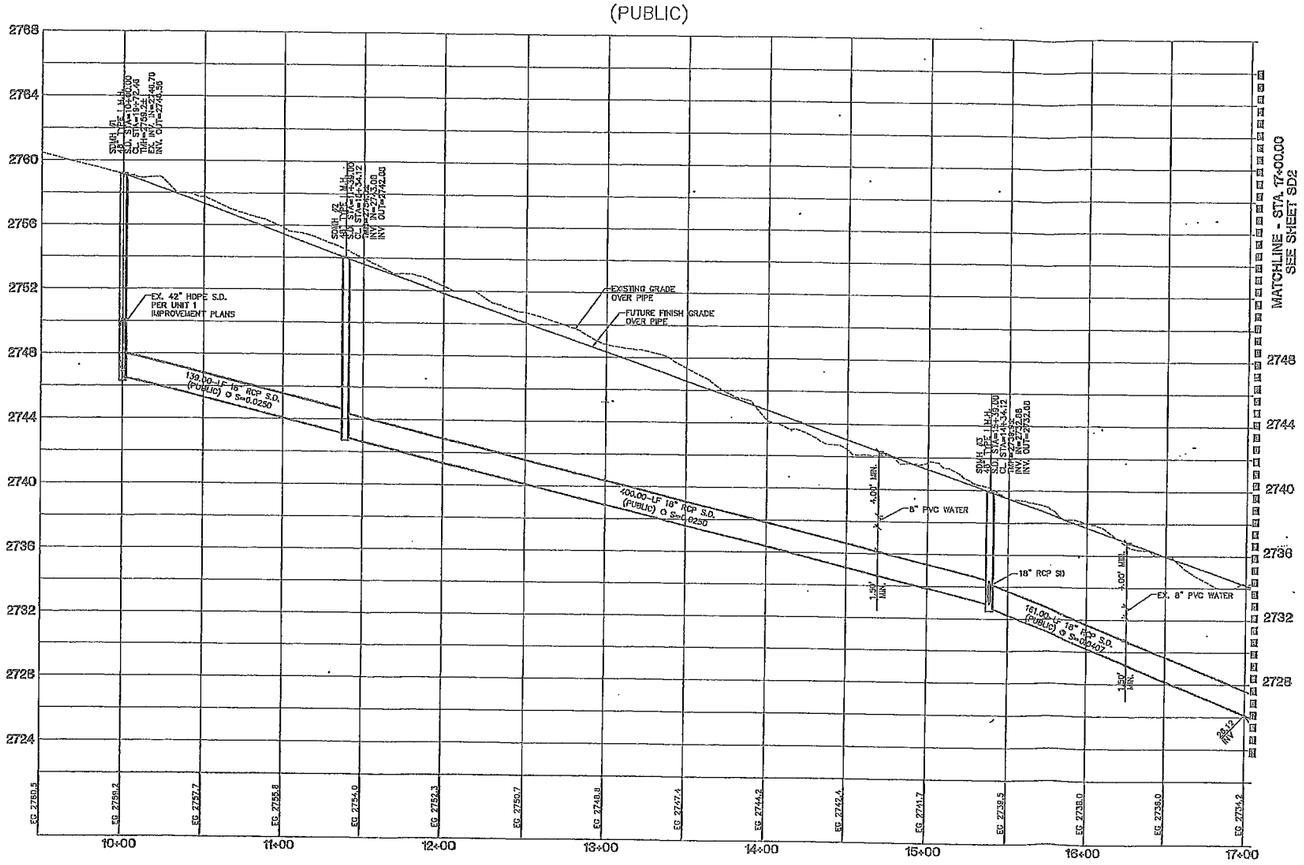
Avoid overhead power line contact. It's costly. Call before you Overhead 1-702-593-6111

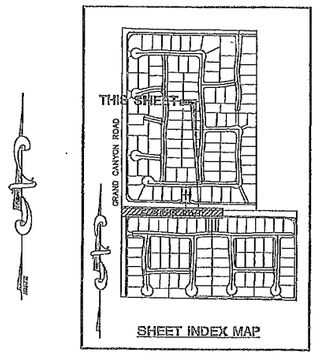
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3090 4TH SUBMITTAL PLANS

Elkhorn/Grand Canyon Unit 1 and Unit 3, VTN

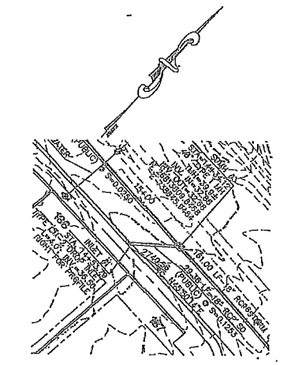


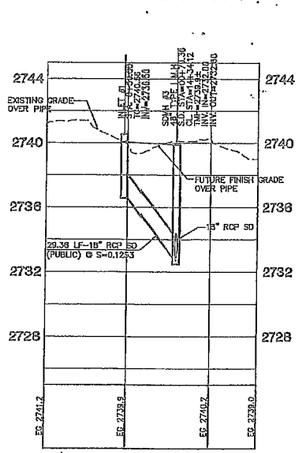




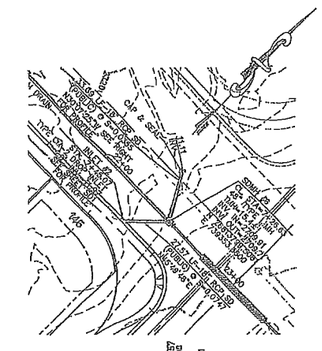
GRAPHIC SCALE

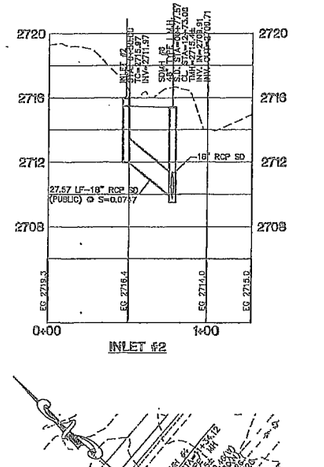
1" = 40'

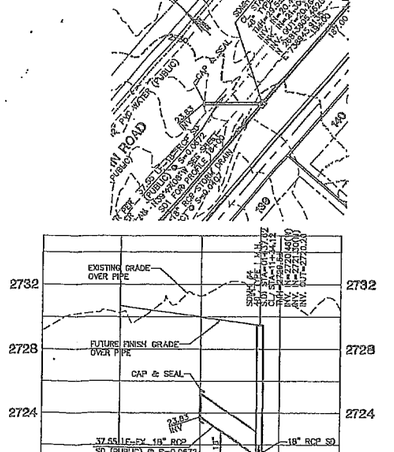




INLET #1







CAP & SEAL #1

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

PROJECT BENCHMARK: CLARK COUNTY BENCHMARK 1C9030N4
NAVD88 ELEVATION: 819.508 METERS (2688.67 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN THE SOUTHEAST CORNER OF A ELECTRICAL CABINET BASE (G00720), 200 FT. SOUTH AND 40 FT. WEST CENTENNIAL PKWY. AND GRAND CANYON DR.

BASIS OF BEARING

THE BASIS OF BEARINGS FOR THIS PROJECT IS NORTH 00°06'46" WEST BEING THE WEST LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON A RECORD OF SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE, IN FILE 114 AT PAGE 57.

Avoid excavation permit time contact. It's easy.
Call before you Overhead
1-702-227-2929

Avoid existing underground utility lines. It's easy.
Call before you Dig
1-800-227-2600

Call Underground

VICINITY MAP N.T.S.

NO.	REVISION	DATE	BY
1			
2			
3			
4			
5			
6			
7			

PERMA-BILT HOMES
710 LAS VEGAS BLVD. SOUTH, STE. 104
LAS VEGAS, NEVADA 89118
(702) 898-9100

CITY OF LAS VEGAS, NEVADA

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5145
PH. (702) 873-7550 FAX (702) 362-2597
NEVADA CONSULTING ENGINEERS ◇ PLANNERS ◇ LAND SURVEYORS

STORM DRAIN PLAN & PROFILE
ELKHORN ROAD
STA. 10+00.00 TO STA. 17+00.00

ELKHORN / GRAND CANYON
UNIT 1 & UNIT 3

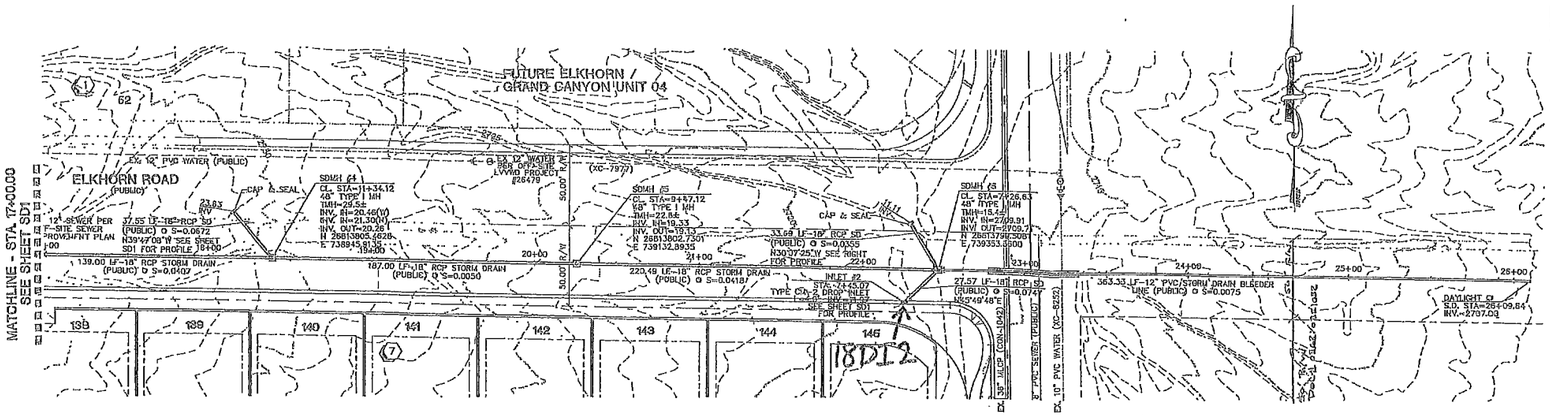
DRAWN BY: JH
DESIGNED BY: DZ
CHECKED BY: KS
PROJECT NO.: 5997
9/29/03
SCALE: 1"=40' HORIZ. NONE VERT.

EXPIRES 06-30-05
PROFESSIONAL ENGINEER - STATE OF NEVADA
DANIEL ZORO
No. 12811
CIVIL
11-10-03

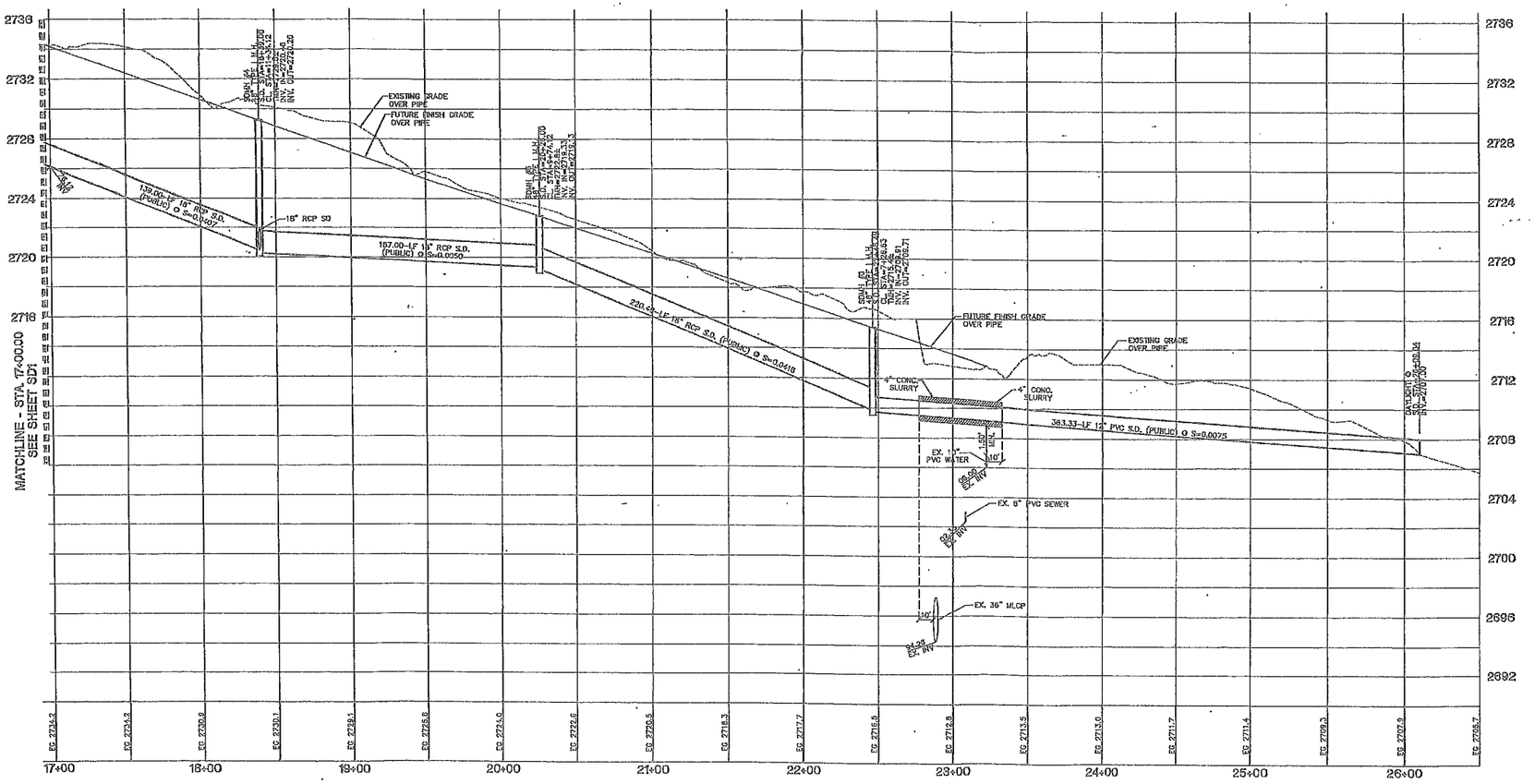
SHEET
SD1
28 OF 31 SHEETS
DRAWING NO.
1074-4736-3

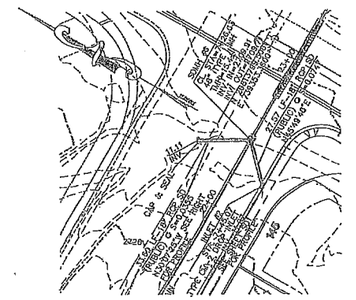
I-TFC# 03-33050

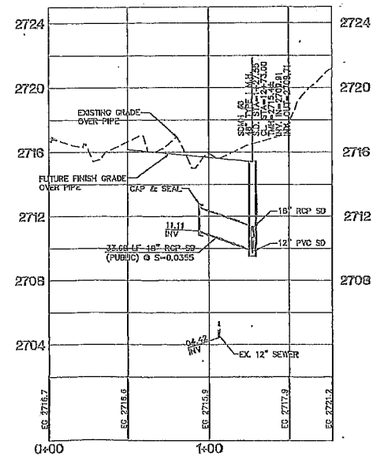
H:\5997\UNIT3\5997SD3.DWG



ELKHORN ROAD
(PUBLIC)







BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

PROJECT BENCHMARK: CLARK COUNTY BENCHMARK 1C9030N4
NAVD88 ELEVATION: 819.508 METERS (2688.67 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN THE SOUTHEAST CORNER OF A ELECTRICAL CABINET BASE (D007291), 200 FT. SOUTH AND 40 FT. WEST CENTENNIAL PKWY. AND GRAND CANYON DR.

605124

BASIS OF BEARING

THE BASIS OF BEARINGS FOR THIS PROJECT IS NORTH 00°05'45" WEST BEING THE WEST LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON A RECORD OF SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE, IN FILE 114 AT PAGE 57.

Avoid overhead power lines contact. It's costly. **Call before you Overhead** 1-702-227-2929

Avoid cutting underground utility lines. It's costly. **Call before you Dig** 1-800-227-2600

Call Underground 1-800-782-5348

REV	DATE	BY	REVISION
1			
2			
3			
4			
5			
6			
7			

PERMA-BILT HOMES
1180 VEGAS, NEVADA 89119
(702) 898-9100

CITY OF LAS VEGAS, NEVADA

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5140
PH. (702) 873-7500 FAX (702) 362-2597
Nevada CONSULTING ENGINEERS ○ PLANNERS ○ LAND SURVEYORS

STORM DRAIN PLAN & PROFILE
ELKHORN ROAD
STA. 174+00.00 TO STA. 214+86.01

ELKHORN / GRAND CANYON
UNIT 1 & UNIT 3

DRAWN BY: JR 9/29/03
DESIGNED BY: D.F.
CHECKED BY: K.C. 9/29/03
PROJECT NO: 2002-0
SCALE: 1"=40' HORIZ. 1"=4' VERT.

EXPIRES 06-30-05
PROFESSIONAL ENGINEER STATE OF NEVADA
DANIEL F. HOWD No. 12811 CIVIL
11-19-03

SHEET
SD2
29 OF 31 SHEETS
DRAWING NO.
1074736-3

H:\2697\UNIT03\2697SD02.DWG

Elkhorn/Grand Canyon Unit 4, VTN

BACK OF CURB CURVE TABLE				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
C23	72.09	919.40	36.06	4°29'33"
C24	64.97	919.31	32.50	4°02'58"
C25	71.37	730.50	35.71	5°35'51"
C26	71.03	730.50	35.54	5°34'16"
C27	48.86	730.50	24.44	3°49'57"
C28	22.43	769.50	11.21	1°40'12"
C29	56.25	769.50	28.14	4°11'19"
C30	15.57	30.00	7.97	29°44'24"
C31	55.60	50.00	31.07	63°42'56"
C32	20.34	50.00	10.31	23°18'23"
C33	55.72	50.00	31.15	63°50'56"
C34	15.92	30.00	8.15	30°24'08"
C35	44.44	50.00	23.61	50°55'33"
C36	15.92	30.00	8.15	30°24'08"
C37	40.48	389.50	20.25	6°16'23"
C38	18.77	480.00	9.38	2°14'24"
C39	75.08	480.00	37.62	8°57'42"
C40	35.01	480.00	17.51	4°10'43"
C41	60.36	319.50	30.21	7°14'18"
C42	16.96	20.00	9.03	48°35'25"
C43	14.45	20.00	7.56	41°24'35"
C44	17.57	30.00	9.05	33°33'26"
C45	29.54	30.00	16.09	56°24'41"
C46	55.07	730.50	27.55	4°19'09"
C47	29.33	730.50	14.67	2°18'02"
C48	40.97	769.50	20.49	3°03'02"
C49	70.03	769.50	35.04	5°12'52"
C50	70.22	769.50	35.13	5°13'43"
C51	26.10	769.50	13.05	1°56'37"
C52	44.52	880.27	22.27	2°53'52"
C53	70.16	880.39	35.10	4°33'59"
C70	4.98	54.00	2.48	5°15'29"
C71	21.44	54.00	10.87	22°45'31"
C72	37.12	54.00	19.33	39°23'03"
C73	85.60	54.00	54.78	90°49'30"
C74	96.70	61.00	61.88	90°49'30"
C78	39.63	25.00	25.36	90°49'30"



GRAPHIC SCALE

40 0 20 40 80

1" = 40'

ENGINEERS ESTIMATE OF PUBLIC FLOOD CONTROL REQUIRED QUANTITIES	
QUANTITY	DESCRIPTION
290 LF	3 COURSE SOLID GROUTED STEM WALL
200 LF	3 COURSE SOLID GROUTED STEM WALL
550 LF	3 COURSE SOLID GROUTED WALL
240 LF	1 COURSE SOLID GROUTED WALL
3100 SF	DRAINAGE EASEMENT
168 SF	GROUTED RIP-RAP D50=0.5'

Avoid existing underground utility lines. Be careful. Call before you Dig 1-800-227-2600

Avoid overhead power line contact. Be careful. Call before you Overhead 1-702-593-6111

Call Underground Locator 811

BENCHMARK:

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

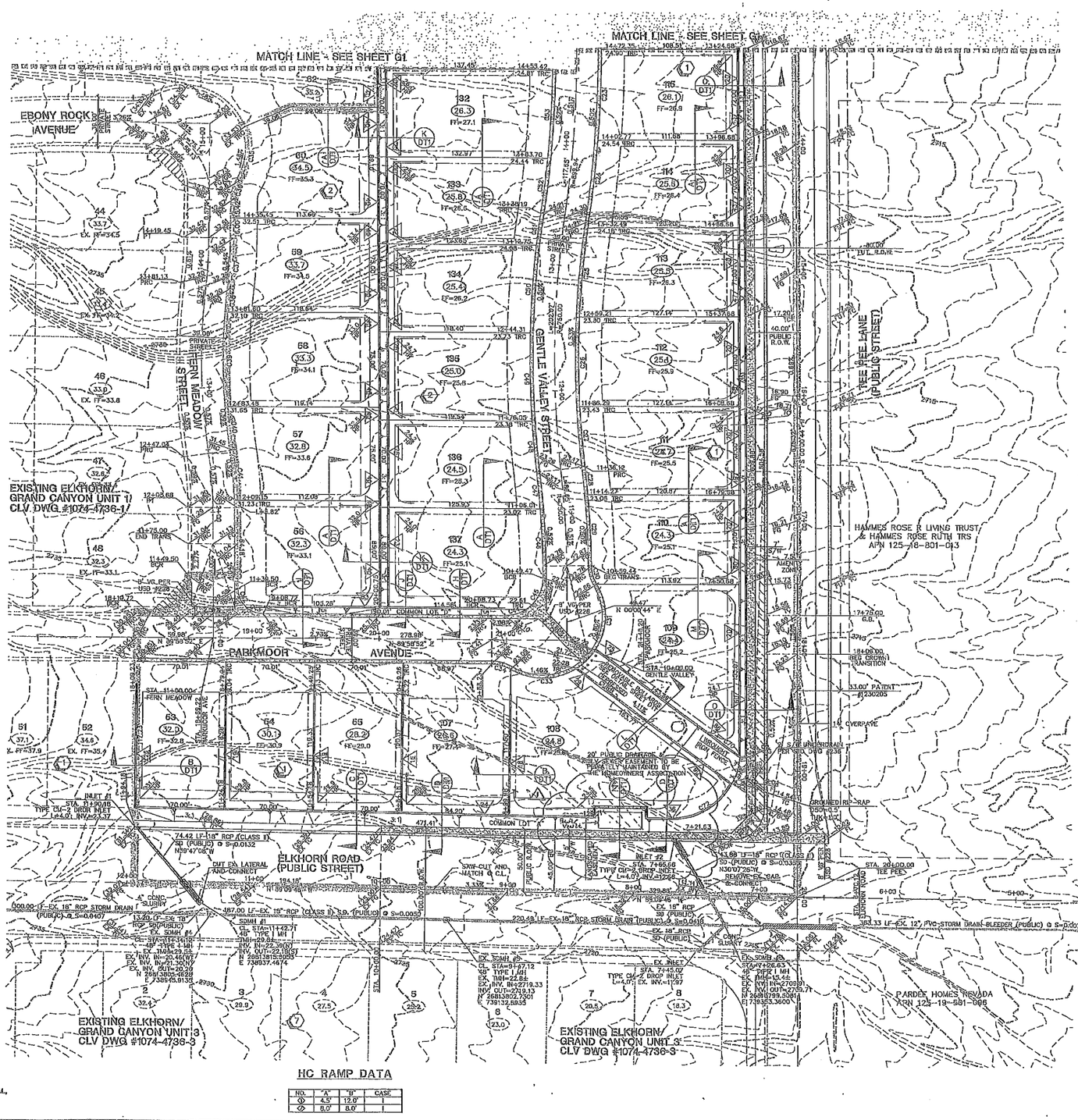
PROJECT BENCHMARK: CITY OF LAS VEGAS BENCHMARK 9LV9018C4
NAVD88 ELEVATION: 845.7883 METERS (2774.89 FEET)

RIVET AND PLATE IN CONCRETE CYLINDER SW CORNER OF FARM AND GRAND CANYON
EQUATION = CLV BM 9LV9018C4 + .20' = PROJECT ELEVATIONS

BASIS OF BEARING

THE BASIS OF BEARINGS FOR THIS PROJECT IS NORTH 00°06'48" WEST BEING THE WEST LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON A RECORD OF SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE, IN FILE 114 AT PAGE 57.

6936 Plan 7040



HC RAMP DATA

NO.	"A"	"B"	CASE
◊	4.5'	12.0'	
◊	8.0'	8.0'	

NOTE:
ALL DRAINAGE EASEMENTS MUST BE COMMON LOTS AND PUBLIC DRAINAGE EASEMENTS TO BE PRIVATELY MAINTAINED BY THE HOMEOWNERS ASSOCIATION.

NOTE:
ALL PRIVATE STREETS ARE P.U.E., PUBLIC SEWER EASEMENTS, AND PUBLIC DRAINAGE EASEMENTS TO BE PRIVATELY MAINTAINED BY HOA.

"I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT."

DANIEL J. HOOD P.E. NO. 12811 — DATE 2-16-24

EXPIRES 06-30-05

DANIEL J. HOOD — STATE OF NEVADA — PROFESSIONAL ENGINEER — CIVIL

2-16-24

NO.	DATE	BY	REVISION
1	1/16/04	mm	Revised wall Bndry + Retaining Wt. Dim. for 6-12
2			
3			
4			
5			
6			
7			

PERMA-BILT HOMES
7150 POLLOCK DRIVE, SUITE 104
LAS VEGAS, NEVADA 89119
(702) 896-4100

CITY OF LAS VEGAS, NEVADA

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5145
PH. (702) 870-7550 FAX (702) 362-2627
Nevada CONSULTING ENGINEERS ◇ PLANNERS ◇ LAND SURVEYORS

GRADING PLAN

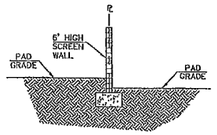
ELKHORN / GRAND CANYON UNIT 4

DRAWN BY: MG
DESIGNED BY: B.F.
CHECKED BY: K.E.
PROJECT NO: 5937-4
07/07/03
06/27/03
SCALE: 1"=40' HORIZ. NONE VERT.

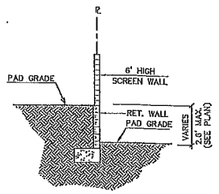
SHEET G2
6 OF 22 SHEETS

DRAWING NO. 1074-4736-4

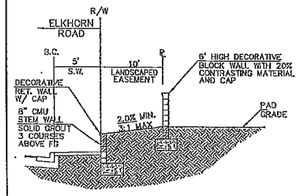
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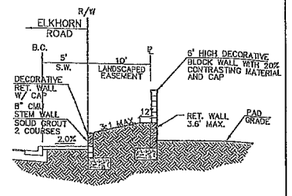
SECTION A
NO SCALE



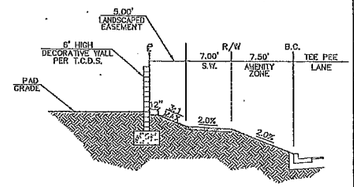
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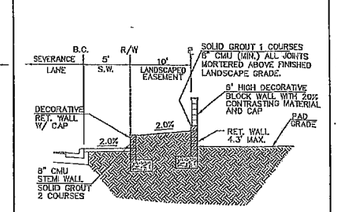
SECTION C
NO SCALE



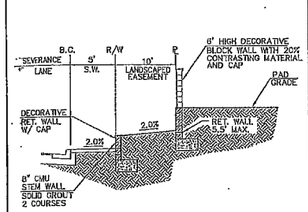
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NO SCALE



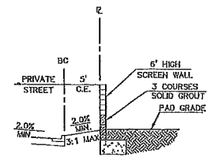
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NO SCALE



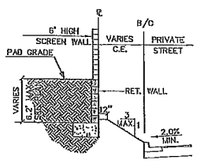
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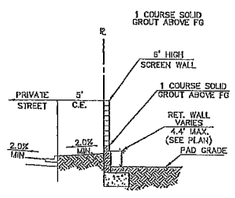
SECTION G
NO SCALE



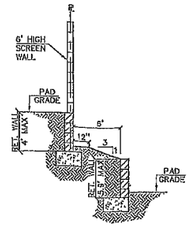
SECTION H
NO SCALE



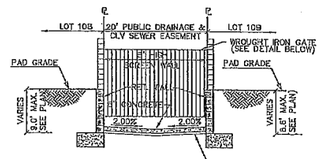
SECTION I
NO SCALE



SECTION J
NO SCALE

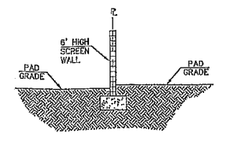


SECTION K
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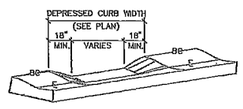


SECTION L
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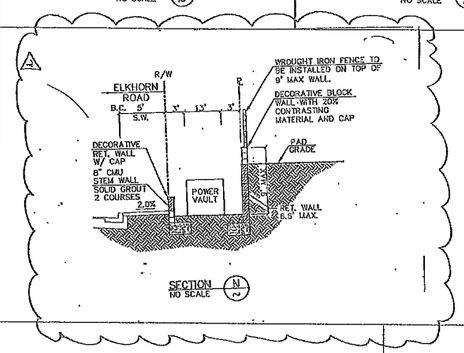
CONTRACTOR TO PROVIDE CLV INSPECTOR SHOP DRAWINGS PRIOR TO CONSTRUCTION
* 1ST 20 L.F. MUST BE DECORATIVE BLOCK WALL PER T.C.D.S.



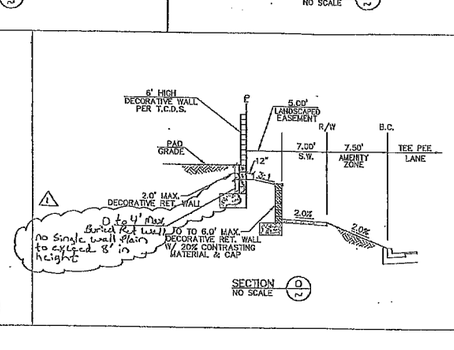
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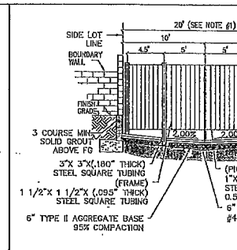
DEPRESSED CURB DETAIL
NO SCALE



SECTION N
NO SCALE



SECTION O
NO SCALE



NOTE 1:
POSTS PLACED IN HARDENED CONCRETE REQUIRE AN 8"ø CORING THROUGH THE SLAB AND BASE FULLY GROUTED WITH HIGH STRENGTH GROUT.

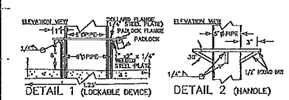
NOTE 2:
INTERIOR POSTS POURED MONOLITHIC WITH THE SLAB SHALL BE EMBEDDED A MINIMUM OF 18" INTO A 24"X24" FOOTER.
END POSTS POURED MONOLITHIC WITH THE SLAB SHALL HAVE FULL EMBEDMENT IN THE SLAB.

NOTE 3:
STEEL WILL BE PRIMERED AND PAINTED WHITE UNLESS OTHERWISE SPECIFIED.

WROUGHT IRON GATE
NO SCALE- PER STD.DWG.# 421B

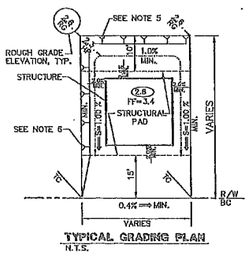
NOTE:
ALL STEEL USED FOR BOLLARDS AND SLEEVE WILL BE SCHEDULE 40.
EXPOSED STEEL WILL BE PRIMERED AND PAINTED YELLOW.

NOTE:
BOLLARDS AND SLEEVE WILL BE EMBEDDED IN FRESH CONCRETE. WHEN PLACED IN HARDENED CONCRETE THE SIZE OF THE CORINGS WILL BE 10"ø FOR BOLLARDS, AND 12"ø FOR SLEEVE.BOLLARDS AND SLEEVE TO BE FULLY GROUTED WITH HIGH STRENGTH GROUT.



DETAIL 1 (LOCKABLE DEVICE) DETAIL 2 (HANDLE)

REMOVABLE BOLLARD POLE DETAIL
N.T.S.



TYPICAL GRADING PLAN
N.T.S.

NOTES:

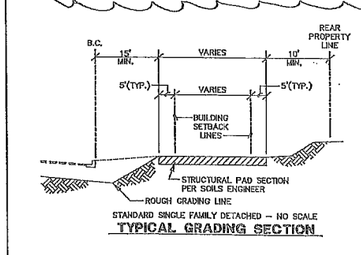
1. GRADING TO BE IN COMPLIANCE WITH CITY OF LAS VEGAS REVISED UNIFORM BUILDING CODE, LATEST EDITION.
2. STRUCTURAL PAD SHALL BE 5' BEYOND BLDG. SETBACK, SEE TYPICAL GRADING SECTION.
3. REAR LOT CORNER GRADES ARE EQUAL TO PAD GRADES UNLESS SHOWN OTHERWISE.
4. MINIMUM SIDEYARD X-SLOPE SHALL BE 2%.
5. MAXIMUM REAR YARD SLOPE IS 2:1 AS SHOWN, EXCEPT THAT WITHIN 15' OF THE HOUSE, THE MAXIMUM SLOPE IS 12:1
6. MAXIMUM SIDEYARD SLOPE IS 5:1 AS SHOWN EXCEPT THAT WITHIN 5' OF THE HOUSE, THE MAXIMUM SLOPE IS 12:1 . .

Avoid cutting underground utility lines. It's costly.
Call before you Dig
1-800-227-2600

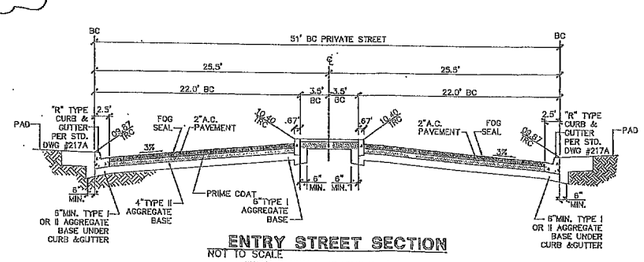
Avoid overhead power line contact. It's costly.
Call before you Overhead
1-702-227-2929

Call Underground
1-800-227-2600

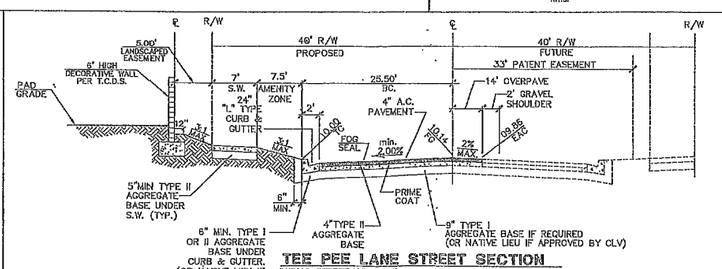
65027 RLm 67754 RLm 70411



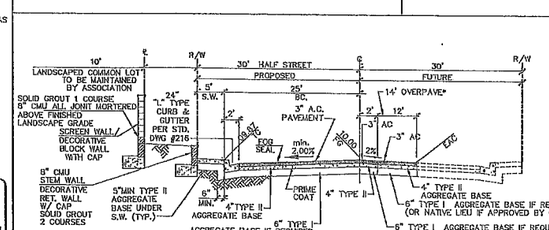
STANDARD SINGLE FAMILY DETACHED – NO SCALE
TYPICAL GRADING SECTION



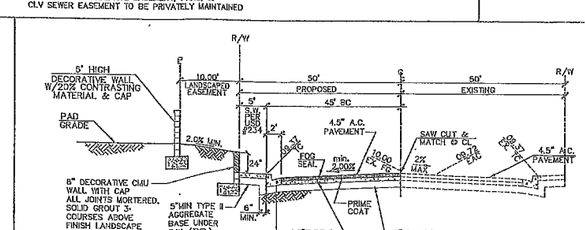
ENTRY STREET SECTION
NOT TO SCALE
PUBLIC DRAINAGE EASEMENT, P.U.E. & CLV SEWER EASEMENT TO BE PRIVATELY MAINTAINED



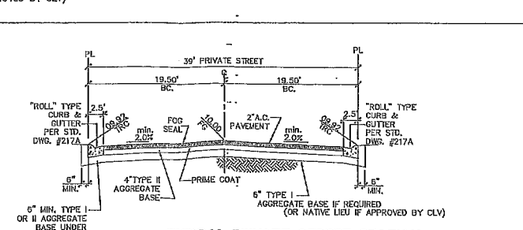
TEE PEE LANE STREET SECTION
PUBLIC STREET NO SCALE



SEVERANCE LANE SECTION
PUBLIC STREET
NO SCALE- PER STD.DWG.# 205
*OVERPAVE IS REQUIRED IF PATENT EASEMENT OR R/W IS EXISTING. IF THERE IS NO R/W OR PATENT EASEMENT THEN CONTRUCT TO CENTER LINE WITH A 2' OVERPAVE.



ELKHORN ROAD STREET SECTION
PUBLIC STREET
NO SCALE- PER USD #203



TYPICAL PRIVATE STREET SECTION
NO SCALE
PUBLIC DRAINAGE EASEMENT, P.U.E. & CLV SEWER EASEMENT TO BE PRIVATELY MAINTAINED

REV	DATE	BY	REVISION
2	6/26/04	mm	Added Detail W per revision #2 on Sheet 6 dated 6/24/04
1	4/26/04	mm	Revised Max. Wall Height for Vinyl fence

PERMA-BILT HOMES
7150 POLLOCK DRIVE, SUITE 104
LAS VEGAS, NEVADA 89119
(702) 896-9100

CITY OF LAS VEGAS, NEVADA

nevada CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5145
PH. (702) 873-7500 FAX (702) 362-2567

DETAIL SHEET

ELKHORN / GRAND CANYON
UNIT 4

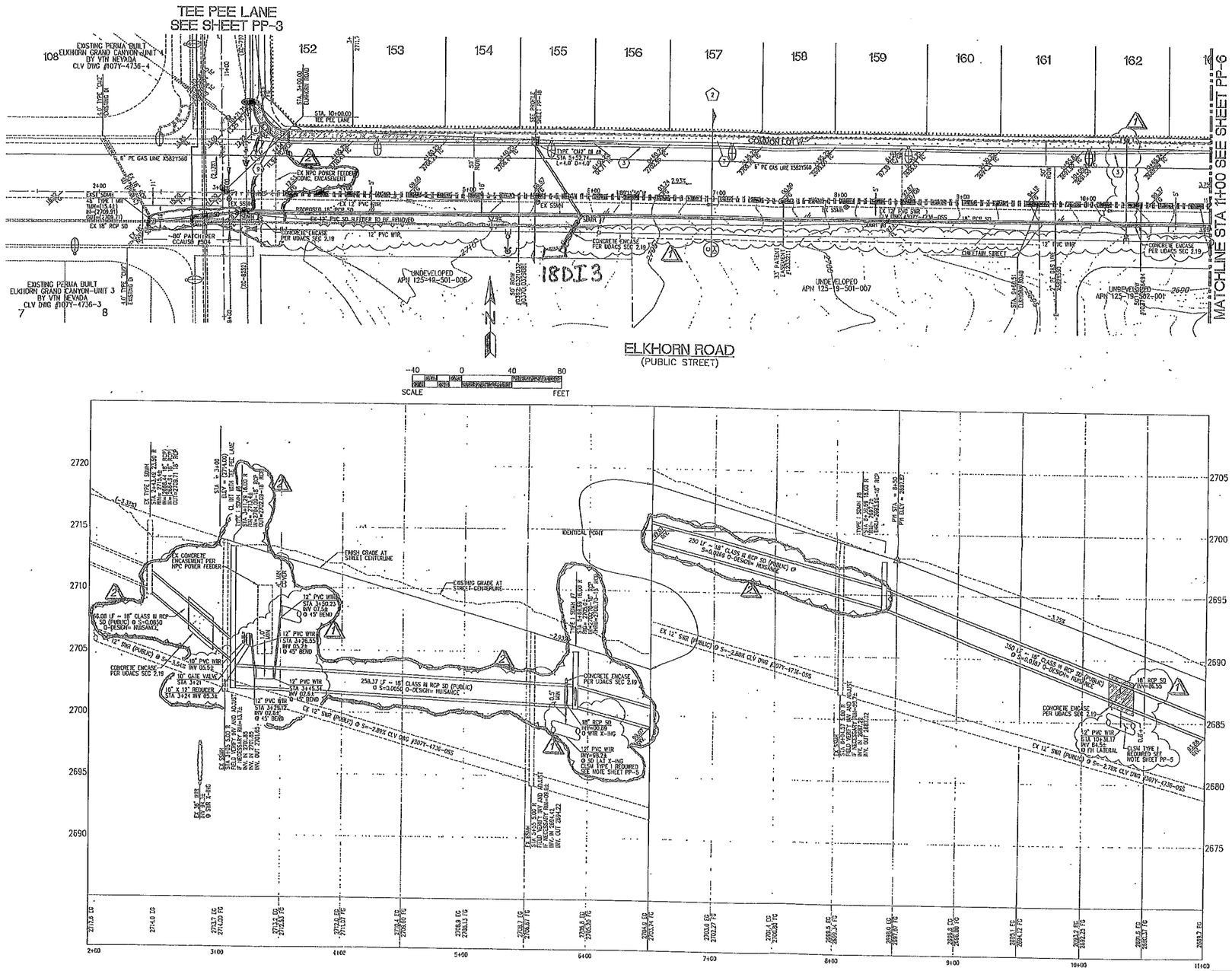
DRAWN BY: MB
DESIGNED BY: MB
CHECKED BY:
PROJECT NO: 2887-4
SCALE: HORIZ. NONE VERT. NONE
07/08/03
07/08/03

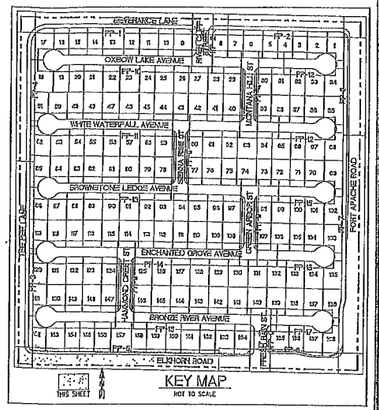
EXPIRES 06-30-05
PROFESSIONAL ENGINEER STATE OF NEVADA
DANIEL HOOD CIVIL
No. 12811
2-16-04

SHEET
DT1
7 OF 22 SHEETS
DRAWING NO.
1674736-4

H:\2887\UNIT4\ASBUILTS\DT1A.DWG

Town Center L-TC 60/70 No.4, SHG





PROFILE NOTES

1. PUBLIC DRAINAGE AND PUBLIC UTILITY EASEMENT TO BE MAINTAINED BY THE HOA SEE DETAILS SHEET D-2 FOR SPECIFIC WITHIN EASEMENTS)
2. CONSTRUCT 6" CROSS GUTTER PER CCAUSD NO. 226 AND DETAIL G SHEET D-3
3. CONSTRUCT "L" TYPE CURB AND GUTTER PER CCAUSD NO. 218
4. SIDEWALK TREATMENT PER TOWN CENTER DEVELOPMENT STANDARDS SEE DETAIL E SHEET D-3
5. SAW CUT AND TIE INTO EXISTING ASPHALT O.C.
6. INSTALL TYPE "CM2" DROP INLET PER SHEET D-4
7. CONSTRUCT SIDEWALK PER CCAUSD DWG NO. 234
8. SIDEWALK RAMP PER CCAUSD DWG NO. 234 CASE 1
9. SIDEWALK RAMP PER TOWN CENTER DEVELOPMENT STANDARDS SEE DETAIL E SHEET D-3
10. CONSTRUCT BUS TURN-OUT PER CCAUSD NO. 234.1
11. CONSTRUCT "A" TYPE CURB AND GUTTER PER CCAUSD NO. 219

RAMP TRANSITION LENGTHS

RAMP NO.	GRADE % "S" TO "A"	"A" (FT) MIN	"B" (FT) MIN
1	-6 TO -5.01	4.5'	21.5'
2	-5 TO -4.01	4.5'	15.0'
3	-4 TO -3.01	4.5'	12.0'
4	-3 TO -2.01	4.5'	9.5'
5	-2 TO 2	8.0'	8.0'
6	2.01 TO 3	9.5'	4.5'
7	3.01 TO 4	12.0'	4.5'
8	4.01 TO 5	15.0'	4.5'
9	5.01 TO 6	21.5'	4.5'

CURVE TABLE				
NO.	LENGTH	RADIUS	DELTA	TANGENT
C55	48.71'	30.00'	89°12'18"	29.59'

NOTES: CURVE DATA ARE AT BACK OF CURB UNLESS OTHERWISE NOTED

BENCHMARK

BRASS AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE 80.15.

ORIGIN/DATUM:- CLARK COUNTY B.M. 0090 17NS
NAVD 88 ELEVATION - 793.117 (U)
2631.770 (F) V 1994 INITIAL PROJECT B.M.

CLARK COUNTY ELEVATION ADDS 0.1' EQUALS
CITY OF LAS VEGAS ELEV 2631.570 (F) - 793.087 (U) V 2003

BASIS OF BEARINGS

NORTH 9°41'42" EAST, BEING THE LINE BETWEEN THE CCOS MONUMENTS 650 TO CCOS MONUMENT 877, USING THE NAD 83 NEVADA EAST ZONE, PUBLISHED VALUES PRESENTS IN THE FILE 88 PG 53 OF SURVEYS, RECORDS IN THE CLARK COUNTY, NEVADA.

WATER NOTES:

- PROTECT WATERLINES IN PLACE. WHEREVER A WATERLINE IS ABOVE A STORM DRAIN OR SEWER WHERE COMPACTION REQUIREMENTS UNDER A WATERLINE CANNOT BE MET, BACKFILL TRENCH WITH CLASS I OR CONTROLLED LOW STRENGTH MATERIAL (CLSM) TO THE SPRINGLINE OF THE WATERLINE. THIS REQUIREMENT IS FOR STRUCTURAL SUPPORT ONLY. ADDITIONAL HEALTH REGULATIONS MAY APPLY PER UDACS 2.19.
- ALL SEWER/STORM DRAIN CROSSING WATER LINES MUST CONFORM TO SECTION 2.19 OF THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS) FOR WATER AND STORM DRAIN CROSSINGS AND CLEARANCES.

NOTE:
- ALL PRIVATE STREETS ARE P.U.E., PUBLIC SEWER EASEMENTS, AND PUBLIC DRAINAGE EASEMENTS TO BE MAINTAINED BY H.O.A.
- UTILITIES SHOWN MAY HAVE TO BE ADJUSTED TO FIT FIELD CONDITIONS.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT — DATE
PROJECT #1-15919

Avoid cutting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

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

Call before you UnderGround
1-702-455-7511
1-702-229-6611

This grading plan is part of drainage #3632 which was approved on 02/02/05 by Todd Steadham for Paul Page, P.E.

NO.	DESCRIPTION	DATE	BY	APP.
1	ADDED 12" WATER IN ELKHORN	2/21/05		

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

LAS VEGAS, NEVADA

PARDEE HOMES OF NEVADA

TOWN CENTER L-TC 60/70 NO. 4
ELKHORN ROAD STA 3+00 TO 11+00
PLAN AND PROFILE

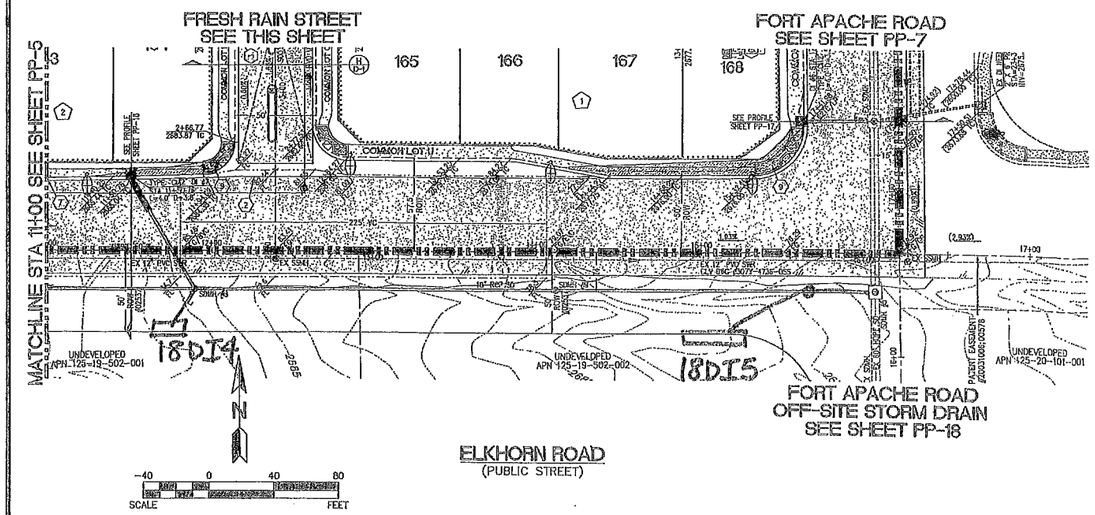
SECTION 18
TOWNSHIP 19 SOUTH
RANGE 60 EAST, M.D.M.

DATE: 1/18/05
DRAFTER: JDP
DESIGNER: JDP
CHECKED: TJS
PROJECT NO.
PAR0302-005

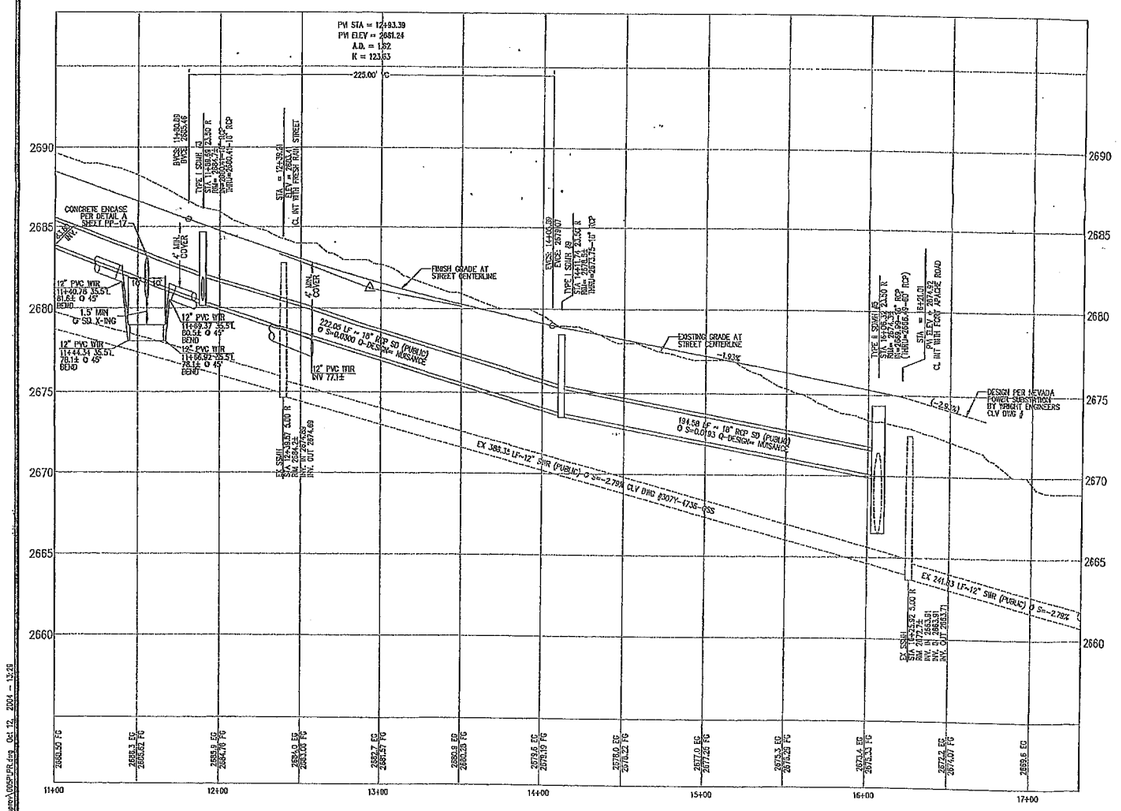
TODD J. STEADHAM
No. 14878
PROFESSIONAL ENGINEER
STATE OF NEVADA
Exp. 06/30/2006
CIVIL

PP-5
SHEET 15 OF 36

3632 PLANS



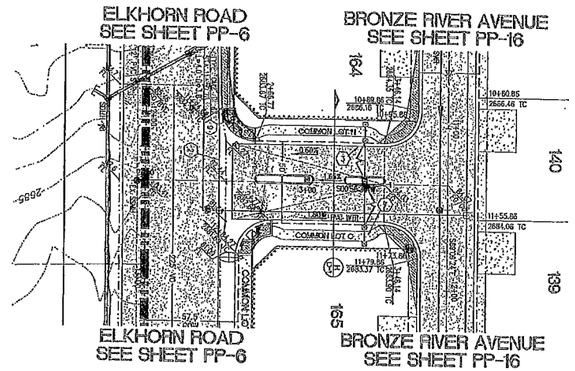
ELKHORN ROAD
(PUBLIC STREET)



PLAN AND PROFILE
HOR. : 1"=40'
VERT. : 1"=4'

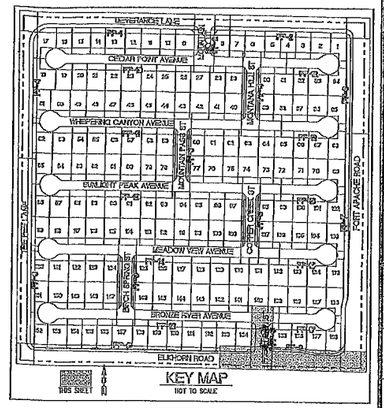
ELKHORN ROAD
SEE SHEET PP-6

BRONZE RIVER AVENUE
SEE SHEET PP-16



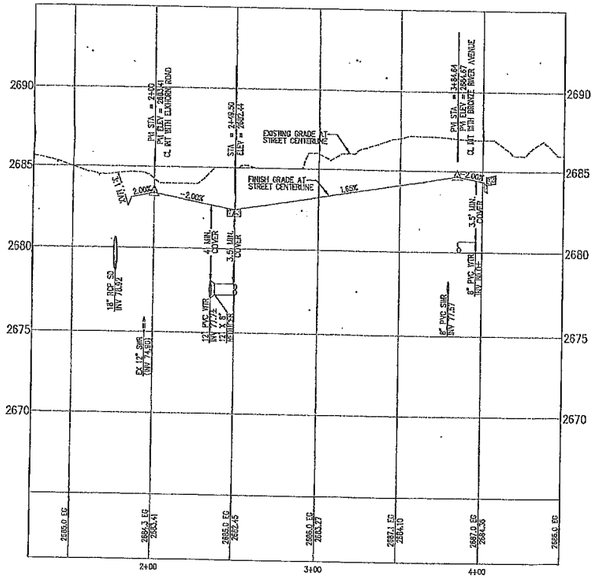
ELKHORN ROAD
SEE SHEET PP-6

BRONZE RIVER AVENUE
SEE SHEET PP-16



FRESH RAIN STREET
(PRIVATE STREET)

-40 0 40 80
SCALE FEET



PLAN AND PROFILE
HOR. : 1"=40'
VERT. : 1"=4'

RAMP TRANSITION LENGTHS

RAMP NO.	GRADE X "B" TO "A"	"A" (FT) LIN.	"B" (FT) LIN.
1	-6 TO -3.01	4.5'	21.5'
2	-5 TO -4.01	4.5'	15.0'
3	-4 TO -3.01	4.5'	12.0'
4	-3 TO -2.01	4.5'	9.5'
5	-2 TO 2	8.0'	8.0'
6	2.01 TO 3	9.5'	4.5'
7	3.01 TO 4	12.0'	4.5'
8	4.01 TO 5	15.0'	4.5'
9	5.01 TO 6	21.5'	4.5'

PROFILE NOTES

1. PUBLIC DRAINAGE AND PUBLIC UTILITY EASEMENT TO BE MAINTAINED BY PPE (NRA SEE DETAILS SHEET D-2 FOR SPACING WITHIN EASEMENTS)
2. CONSTRUCT 4" CROSS GUTTER PER CCAUSO NO. 238 AND DETAIL G SHEET D-3
3. CONSTRUCT "L" TYPE CURB AND GUTTER PER CCAUSO NO. 216
4. SIDEWALK THEATHIGHT PER TOWN CENTER DEVELOPMENT STANDARDS SEE DETAIL E SHEET D-3
5. SAW CUT AND TIE INTO EXISTING ASPHALT
6. INSTALL TYPE "CH2" DROP INLET PER SHEET G-4
7. CONSTRUCT SIDEWALK PER CCAUSO DRG NO. 234
8. SIDEWALK RAMP PER CCAUSO DRG NO. 234 CASE 1
9. SIDEWALK RAMP PER TOWN CENTER DEVELOPMENT STANDARDS SEE DETAIL E SHEET D-3

BENCHMARK

BRASS CAP IN TOP OF CONCRETE MONUMENT, BEING A 3" BRASS CAP STAMPED "2006 LS 7719" SET IN CONCRETE AT THE INTERSECTION OF ELKHORN ROAD AND FORT APACHE ROAD, 0.2' NORTH OF THE CENTERLINE OF ELKHORN ROAD AND 0.2' EAST OF THE CENTERLINE OF FORT APACHE ROAD.

ELEVATION = 2686.41 FEET, NAD 83 (1994 ADJUSTMENT)

BASIS OF BEARINGS

NORTH 0°41'42" EAST, BEING THE LINE BETWEEN THE COORS MONUMENTS 880 TO COORS MONUMENT 877, USING THE NAD 83 NEVADA EAST ZONE, PUBLISHED VALUES PER R.O.S. IN THE FILE 88 PG 53 OF SURVEYS, RECORDS IN THE CLARK COUNTY, NEVADA.

This grading plan is a part of drainage study # 3632 which was received on 10/13/04 and approved on 10/29/04. Page 1 of 1

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT PROJECT # DATE

Avoid cutting underground utility lines. It's costly. Call before you Dig. 1-800-227-2600 UNDERGROUND SERVICE (USA)

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

CALL BEFORE YOU DIG. Call before you UnderGround 1-702-455-7511 1-702-229-6611

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE: (702) 284-4300 FAX (702) 284-4399

NO.	DESCRIPTION	DATE	BY	APP.

LAS VEGAS, NEVADA

PARDEE HOMES OF NEVADA

SECTION 19
TOWNSHIP 19 SOUTH
RANGE 60 EAST, MDM.

TOWN CENTER L-TC 60/70 NO. 4
ELKHORN ROAD STA 18+00 TO 16+21.01 AND
FRESH RAIN STREET PLAN AND PROFILE

DATE: 10/12/04
DRAFTER: JDP
DESIGNER: JDP
CHECKED: TJS
PROJECT NO. PAR0302-005

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. STEADHAM
Exp. 06/30/2006
CIVIL
No. 15202
10/29/04

PP-6
SHEET 16 OF 36

File: s:\AutoCad\2005-Drawings\PAR0302-005\Civil\PAR0302-005-PP-6.dwg, Oct 12, 2004 - 15:26

3632 PLANS

Savona Unit 3, RCI

ADDENDUM #1 TO THE TECHNICAL DRAINAGE STUDY FOR SAVONA UNIT 3

Prepared for:

Toll Brothers, Inc.
1140 Town Center Drive Suite 250
Las Vegas, NV 89144
Phone: (702) 243-9800
Fax: (702) 243-9610

July 2013

PROJECT 3110.0007

RCI Engineering
3281 S. Highland Drive Suite 810 * Las Vegas, NV 89109
Tel: 702.453.0800 * Fax: 702.453.0801
www.rcicnevada.com

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Savona Unit 3 Date: July 31/2013

Location of Development: a) Descriptive (Cross Streets) North/South: Grand Canyon Drive

East/West: Elkhorn Road

b) Section: 19 south Township: 19 south Range: 60 east

c) APN : 125-19-102-008, 011 and 012

Name of Owner: Toll North LV, LLC

Telephone No.: 702-243-9800 Fax No.: 702-243-9610 E-Mail Address:

Address: 1140 Town Center Drive Suite 250 Las Vegas, NV 89144

Contact Person-Name: Rick Read, P.E. **Telephone No.:** 702-453-0800

*** E-Mail Address:** RRead@rcinevada.com **Fax No.:** 702-453-0801

Firm: RCI Engineering

Address: 3281 S. Highland Drive Suite 810 Las Vegas, Nevada 89109

Type of Land Development/Land Disturbance Process:

☐	Rezoning	☐	Subdivision Map	☐	Clearing and Grading Only
☐	Parcel Map	☒	Planned Unit Development	☐	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit		

1. Total Owned Land Area: At Site: 13.95 acres Being Developed/Disturbed: 13.95 Acres
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ Yes** ☐ No
4. Proposed type of development (Residential, Commercial, Etc.): Residential
5. Approximate upstream land area which drains to the subject site: 147 Acres
6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: Technical Drainage Study for Quencia Cove (HTE# 04-47816) and Technical Drainage Study for Quencia Ridge (HTE#04-27587)
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Grand Canyon Drive
8. Briefly describe your proposed schedule for the subject project: ASAP

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

***New Required Field**

****Review and concurrence of the Clark County Regional Flood Control District is required.**

Revision	Date

Engineer's Seal

Local Entity File No.

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

Department of Public Works

500 S Grand Central Pky • Box 554000 • Las Vegas NV 89155-4000
(702) 455-6000 • Fax (702) 455-6040

Denis Cederburg, P.E., Director • E-Mail: dlc@ClarkCountyNV.gov

Drainage Study Comment Letter

Date: June 19, 2013
Firm: RCI Engineering
Engineer: Rick Read, P.E.
Address: 3281 S. Highland Drive, Suite 810, Las Vegas, NV 89109
Phone: (702) 453-0800
Fax: (702) 453-0801
E-mail: rread@rcinevada.com

Subject: Technical Drainage Study Update for Savona Unit 3
Location: SWC of Elkhorn Road and Grand Canyon Drive
APN: 125-19-102-008, -012, -011
Sec, Township, Range: S19, T19S, R60E
Flood Zone & Panel: Zone X, 1745E, Dated September 27, 2002
Application Tracking #: 13-22289UP

HTE13-22289UP

Submittals	Date Received	Date Returned	Reviewer	Miscellaneous
Update	05/30/2013	06/19/2013	WG	

Concurrence Required: (Must be obtained prior to permit issuance)		Reason Concurrence is required
	City of Henderson	Adjacent to or Impacts Henderson
X	City of Las Vegas	Adjacent to or Impacts Las Vegas
	City of North Las Vegas	Adjacent to or Impacts North Las Vegas
	Nevada Department of Transportation	Adjacent to or Impacts NDOT Facility
	Union Pacific Rail Road	Adjacent to or Impacts a UPRR Facility
	US Army Corp of Engineers	Impacts a USACE Facility
X	Clark County Regional Flood Control District	Regional Significance, Adjacent to or Impacts CCRFCD MPU Facility or in a SFHA

BOARD OF COUNTY COMMISSIONERS
STEVE SISOLAK, Chairman • LARRY BROWN, Vice Chairman
SUSAN BRAGER • TOM COLLINS • CHRIS GIUNCHIGLIANI • MARY BETH SCOW • LAWRENCE WEEKLY
DONALD G. BURNETTE, County Manager

The following comments must be fully addressed and response provided with the next submittal. Incomplete responses may result in further review and time delays to the drainage study approval. Any revisions/modifications to the original site design must have supporting hydrologic and/or hydraulic calculations. CCPW Development Review will not be held responsible for project delays due to incomplete responses.

This update is to revise the entire site. The previously approved Technical Drainage Studies are: HTE# 04-47816, 04-27587.

CCPW – Development Review Comments:

1. Coordinate with Slater Hanifan Group for the "Rancho Road System Elkhorn – Ft Apache to Grand Canyon" project as drop inlets, laterals and storm drain are proposed in Elkhorn adjacent to the site. *

2. Consider revising the design of the northern site to provide screen block wall along the western PL. Show wall openings to accept flow. Provide drainage easement on the lots to be called out as "XX-ft Drainage Easement to be Privately Maintained by Subject Owner". As designed a common element is shown with no maintenance access and the interior streets are public, therefore HOA is not needed.

3. Label CLV on east side of Elkhorn.

4. Provide full offsite improvements for Jensen per NOFA.

5. Revise plans to extend drainage easements to ROW limit.

6. Revise Construction Note 16 to provide Standard Drawing 421 on proposed drop inlets.

7. Per Figure H-13 of the 2008 MPU, the upstream basins are B-soil with zoning of high density. It appears a CN of 88 should be used as worst case. Revise all affected analysis accordingly.

8. There is an existing 18-inch storm drain in Grand Canyon Drive adjacent to the site. It appears the design of the storm drain was to be continued north. This must be addressed.

9. Provide a 3-foot deep concrete slurry cutoff wall along the south "edge of pavement" for Dorrell, as the velocity is erosive.

10. Sheet D-4 is referenced on plan Sheet G-4, however Sheet D-4 was not provided.

11. Revise plans as Detail 11 appears to be on Sheet D-1, not D-2.

12. Previously approved study 06-5525 shows 132 cfs crosses Hualapai within Dorrell. This must be addressed.

13. Previously approved study 05-26097 shows 51 cfs crosses Hualapai within Dorrell. This must be addressed.

The drainage/grading plans have been red-lined and require modifications prior to the next submittal. Failure to resubmit the red-lined grading plan will require an additional $400 re-review fee.

The County's review is solely based on the information submitted by the Engineer of Record. The County's review is strictly limited to compliance with minimum County Codes and Standards. The Engineer of Record is responsible for researching and addressing situations that may require designs above and beyond the minimum codes for issues of public safety and impacts to upstream, downstream and adjacent properties. The County assumes no liability for information data, designs or conclusions of the Engineer of Record.

By Wade Gron for:
W. Layne Weber, P.E., CFM
Principal Engineer
Clark County Public Works
Development Review

cc: Toll North

July 31, 2013

Clark County Public Works
Development Review
500 S. Grand Central Pkwy
Las Vegas, NV 89155

Subject: **Technical Drainage Study for Savona Unit 3**
(HTE #13-22289UP)

The purpose of this letter is to address the comments from Clark County Public Works (CCPW) dated June 19, 2013 regarding the above referenced project. The comments are individually addressed as follows:

Comment 1: Coordinate with Slater Hanifan Group for the "Rancho Road System Elkhorn – Ft. Apache to Grand Canyon" project as drop inlets, laterals and storm drain are proposed in Elkhorn adjacent to the site.

Response: RCI Engineering has been in contact with Mr. Mark Failla at Slater Hanifan Group Engineering (SHG). Mr. Failla has informed RCI that the 70-percent report for the Rancho Road System Elkhorn – Ft. Apache to Grand Canyon (Rancho Road System) was submitted to Clark County Regional Flood Control District (CCRFCD) in March of 2013. According to Mr. Failla, the Slater Hanifan Group has received comments from CCRFCD. The construction start date for the Rancho Road System was slated for the end of 2013 but due to delays in the downstream system in Fort Apache Road it is anticipated that start of construction will be pushed back to the first half of 2014. The construction start date for the Savona Unit 3 project is anticipated for November of this year. Therefore, the Savona Unit 3 Project will be constructed prior to the Regional Facility in Rancho Road.

Copies of Sheets SD-01 and SD-04 have been included from the Rancho Road System 70-percent submittal. As is shown on Sheet SD-04, Special Drop Inlet #1 (grated area inlet) is proposed on the south west corner of the of the Grand Canyon Drive/Elkhorn Road intersection. After discussions with Slater Hanifan Group it was decided that the permanent drop inlet on the southwest corner of the Grand Canyon Drive/Elkhorn Road intersection would be constructed with the Savona Unit 3 project. Slater Hanifan Group has determined that the inlet should be designed to intercept the future 100-year storm runoff of 17 cfs that will be conveyed east on the south side of Elkhorn Road. A 25-foot Type CM2 drop inlet w/ sweeper curb (10 grates) has been designed to intercept 16.5 cfs with 0.5 cfs from a 100-year storm event bypassing the inlet. The additional 0.5 cfs of 100-year storm runoff will flow within the curb and gutter and turn south into Grand Canyon Drive. Since Grand Canyon Drive has been designed for the worst case existing conditions storm flows the future storm flow of 0.5 cfs that turns the corner and drains south will not negatively impact any downstream roadways or storm drain facilities. The 18-inch lateral will be capped with a 6-inch perforated bleeder line and pervious backfill until the future storm drain is constructed.

Please see Detail 48 on Sheet D-3. Flowmaster normal depth calculations, drop inlet calculations and a Standard Form 6 model for the 18-inch lateral have been included in the Appendix. As is shown the HGL remains 1-foot below finish grade per Manual Criteria. Copies of the Rancho Road System 70 percent design plans have also been included in the Appendix. The future storm drain in Elkhorn Road has been included in the Savona Unit 3 plans as "Future Storm Drain". A copy of the Savona Unit 3 drainage study with plans has been submitted to the Slater Hanifan Group. RCI Engineering will coordinate with SHG during the improvement plan process to ensure compatibility between designs.

Comment 2: Consider revising the design of the northern site to provide screen block wall along the western PL. Show wall openings to accept flow. Provide drainage easement on the lots to be called out as "XX-ft Drainage Easement to be Privately Maintained by Subject Owner". As designed a common element is shown with no maintenance access and the interior streets are public, therefore HOA is not needed.

Response: The easement has not been changed per discussions from a meeting between Clark County and RCI Engineering on July 10, 2013. In the July 10th meeting pictures were shown to Clark County Staff for the property to the west side of Lot 2 that has an existing wrought iron fence that allows sheet flow from the property to drain east onto the Unit 3 site. Additionally, there are multiple low and high points along the west property line that make grading Savona Unit 3 to incorporate several block wall openings and various elevations difficult. A concrete lined v-ditch allows the sheet flows from the west to be intercepted efficiently without multiple block wall openings and easements across individual lots. In the meeting it was agreed that the drainage ditch could remain and will be within a private drainage easement maintained by the home owners association. The easement has been called out as a "Private Drainage Easement to be Privately Maintained by the HOA" on the Improvement Plans. Additionally, all streets have been labeled as "(Private)" on the plans as the HOA will maintain the streets, perimeter landscaping and drainage easements.

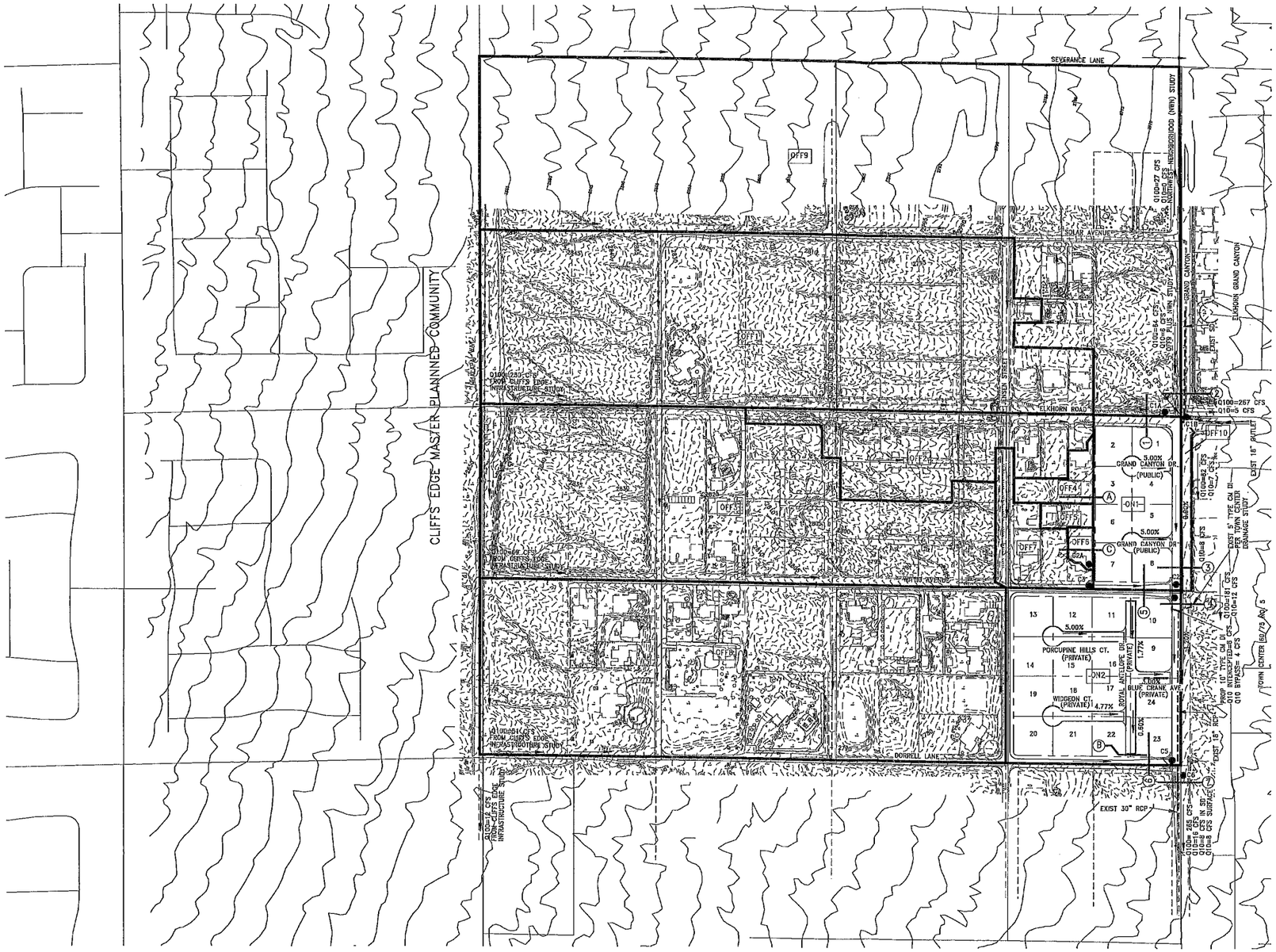
In the meeting Lane Weber expressed concern that erosion protection would be needed at the downstream end of the easement where it drains into Wittig Avenue. Riprap with a D50=6-inches to a depth of 1 foot is proposed at the downstream end of the concrete lined v-ditch. The 1 cfs that will be generated during a 100-year storm will not have erosive velocities and the riprap pad at the outlet of the v-ditch will be sufficient to provide erosion protection.

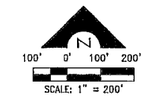
Comment 3: Label CLV on east side of Elkhorn.

Response: City of Las Vegas has been added to the plans.

Comment 4: Provide full offsite improvements for Jensen per NOFA.

Response: Jensen Street will be constructed as a nonurban 60-foot ROW since it is within a Rural Neighborhood Preservation Overlay per the discussion at the meeting





LEGEND

- PROPOSED FLOW DIRECTION
- PROPOSED SUBBASIN BOUNDARY
- EXISTING STORM DRAIN PIPE
- ON1 — PROPOSED DRAINAGE SUBBASIN
- C1 — PROPOSED CONCENTRATION POINT
- (1) — CROSS SECTION LOCATION

PROPOSED CONDITIONS HEC-1 MODEL SUMMARY

SUBBASIN OR CP	BASIN AREA (AC)	100 YR (cfs)	10 YR(CFS)	100-YEAR (TOTAL)	10 YR (TOTAL)
OFF9	46.12	37	6		6
OFF1	32.92	30	5		5
OFF2	6.70	6	1		1
C1A	N/A	35	6	285*	6
C1B	N/A	72	11	349**	11
OFF4	0.92	1	<1		<1
OFF5	0.43	1	<1		<1
OFF6	0.32	<1	<1		<1
C2A	N/A	2	<1		<1
ON1	5.04	6	1		1
C2	N/A	8	1	90*** (8+82)	8*** (7+1)
OFF3	24.90	22	3		3
OFF7	2.35	3	<1		<1
C3	N/A	23	3	92* (23+69)	3
C4	N/A	30	5	181**** (30+82+69)	12*** (7+5)
ON2	10.14	13	2		2
C5	N/A	41	6	243**** (41+82+69+51)	13*** (7+6)
OFF8	30.74	24	3		3
C6	N/A	63	9	265****(63+82+69+51)	16*** (7+9)
OFF10	0.58	2	1	2	1

* 100-YEAR HEC-1 FLOWS PLUS 250 CFS FROM CLIFFS EDGE IN ELKHORN ROAD
* 100-YEAR HEC-1 FLOWS PLUS 69 CFS FROM CLIFFS EDGE IN WITTIG AVENUE
* 100-YEAR HEC-1 FLOWS PLUS 51 CFS FROM CLIFFS EDGE IN DORRELL LANE

** 100-YEAR HEC-1 FLOWS PLUS 250 CFS FROM CLIFFS EDGE AND 27 CFS FROM NWNS
*** STORM FLOWS FROM HEC-1 PLUS FLOW SPLIT AT ELKHORN ROAD/GRAND CANYON DRIVE
*** ADD 10-YEAR=7 CFS, 100-YEAR=82 CFS TO HEC-1 TOTAL
**** STORM FLOWS FROM HEC-1 PLUS FLOWS FROM ELKHORN ROAD/GRAND CANYON DRIVE FLOW SPLIT PLUS FLOWS FROM CLIFFS EDGE MASTER STUDY THAT CROSS HUALAPAI WAY AND DRAIN EAST

Location	Slope (%)	Q_{100} (cfs)	D_{100} (ft)	V_{100} (ft/sec)	D^*V_{100}
Section 1 ELKHORN	3.35	265	0.90	8.9	8.0
Section 2 GRAND CANYON	0.90	84	0.69	N/A	N/A
Section 3 GRAND CANYON	0.90	41	0.74	4.0	2.9
Section 4 GRAND CANYON	1.20	161	0.89	5.7	5.1
Section 5 WITTIG AVENUE	3.57	92	0.99	6.3	6.2
Section 6 DORRELL LANE	3.32	88	0.99	6.0	6.0
Section 7 GRAND CANYON	1.20	265	0.99	6.6	6.5
ONSITE STEEPEST	5.00	13	0.29	0.7	0.2
ONSITE FLATTEST	0.60	13	0.41	2.4	1.0

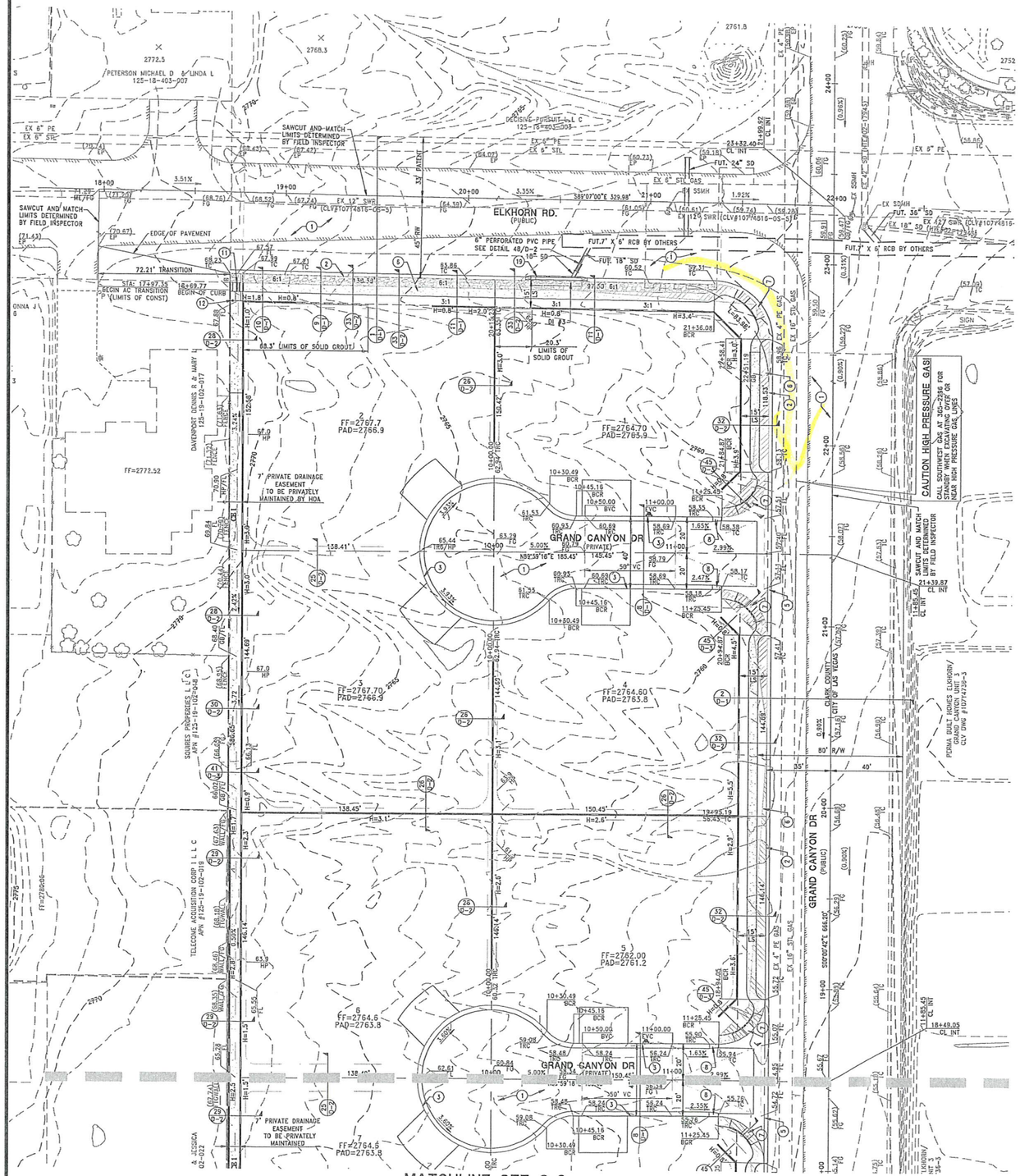
10-YEAR HYDRAULIC SECTIONS

Location	Slope (%)	Q_{10} (cfs)	D_{10} (ft)	LENGTH	DRY LANE
Section 1 ELKHORN	3.35	6	0.30	38.5	OK
Section 3 GRAND CANYON	0.90	6	0.45	19.0	OK
Section 4 GRAND CANYON	1.20	4	0.36	23.5	OK
Section 7 GRAND CANYON	1.20	6	0.44	19.5	OK

SAVONA UNIT 3
TOLL BROTHERS INC.

FIGURE 5 REVISED
PROPOSED CONDITIONS MAP

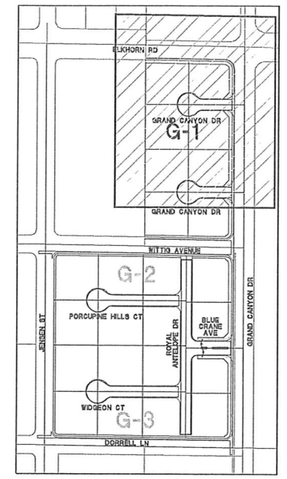
RCI Engineering
3281 S. HIGHLAND DRIVE SUITE 810, LAS VEGAS, NV 89109
PH/702.453.0800 FAX/702.453.0801



ENGINEERS NOTES

1. CONTRACTOR IS RESPONSIBLE FOR DUST AND EROSION CONTROL DURING CONSTRUCTION.
2. SEE DETAIL SHEET FOR ON-SITE PAVEMENT SECTIONS. CONTRACTOR TO VERIFY WITH SOILS REPORT.
3. IF THERE IS A LOT DIMENSION DISCREPANCY BETWEEN THIS PLAN SET AND THE FINAL MAP. THE FINAL MAP DIMENSION SHOULD BE REFERENCED
4. ENGINEER TO BE NOTIFIED OF ANY DISCREPANCIES IMMEDIATELY.
5. THESE PLANS SHALL NOT, IN PART OR IN WHOLE, BE USED FOR CONSTRUCTION UNTIL APPROVED AND SIGNED BY THE GOVERNING AGENCIES.
6. ALL GRADING SHALL CONFORM TO SOILS REPORT RECOMMENDATIONS.
7. DURING CONSTRUCTION, SURVEYORS AND CONTRACTORS MUST VERIFY THAT ALL STREETS AND LOTS HAVE POSITIVE DRAINAGE. SAME MUST UTILIZE AT LEAST THREE GRADES ON VERTICAL TANGENTS TO VERIFY SLOPES.
8. SOIL REPORT NOTE:
   GRADING SHALL BE IN ACCORDANCE WITH SOILS REPORT PREPARED BY:
   ENGINEER: GEOTEK RESIDENTIAL, LLC
   FILE NO. 7696-LV88
   DATED: MAY 15, 2007
   UPDATED: NOVEMBER 12, 2012
9. CUT/FILL ESTIMATES
   EXISTING TO FINISH GRADE ELEVATIONS
   NET CUT: 33,870 CY
   NET FILL: 22,452 CY
10. SEE DETAIL 43/D-3 FOR TYPICAL LOT DRAINAGE
11. ALL DRIVEWAY SLOPES NOT TO EXCEED 12.5% MAXIMUM.
12. THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHER STRUCTURES. SEPERATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE. (APPENDIX SECTION J103.1 AS AMENDED)
13. FOR STORMWATER RUNOFF MANAGEMENT NOTES REFER TO SHEET N-1

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



CONSTRUCTION NOTES

1. CONSTRUCT AC PAVEMENT PER DETAILS 1 THRU DETAIL 8 ON SHEET D-1
2. CONSTRUCT 24" "L" TYPE CURB AND GUTTER PER CCAUSD # 216
3. CONSTRUCT 30" ROLL CURB PER CCAUSD # 217.51
4. CONSTRUCT "A" CURB PER CCAUSD # 219
5. CONSTRUCT 8' CROSS GUTTER PER CCAUSD # 228
6. CONSTRUCT 5' SIDEWALK PER CCAUSD # 234
7. CONSTRUCT SIDEWALK RAMPS USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT PER CCAUSD # 235 (CASE 1)
8. CONSTRUCT 5' CURB TRANSITION FROM "L" CURB TO ROLL CURB
9. CONSTRUCT 5' CURB TRANSITION FROM ROLL CURB TO DEPRESSED CURB
10. CONSTRUCT RIPRAP SWALE, d50=6", THICKNESS=12"
11. CONSTRUCT 2' SIDEWALK DRAIN PER CCAUSD # 235
12. CONSTRUCT 6' HIGH WROUGHT IRON FENCE SEE DETAIL 36/D-2
13. CONSTRUCT 5' WIDE PEDESTRIAN ACCESS GATE
14. CONSTRUCT 12.5' TYPE 'CM2' DROP INLET (4 GRATES W/ 2.5' SWEEPER) PER CCAUSD #412.1 & 421
15. CONSTRUCT MIN 20' OF SIDEWALK PER CCAUSD #236 ON EITHER SIDE OF SW UNDERDRAIN
16. CONSTRUCT 7.5' TYPE 'CM2' DROP INLET (2 GRATES W/ 2.5' SWEEPER) PER CCAUSD #412.1 & 421
17. CONSTRUCT WROUGHT IRON FENCE SEE DETAIL 35/D-2
18. CONSTRUCT 1' WIDE BY 3' DEEP 150 PSI CONCRETE SLURRY CUT OF WALL
19. CONSTRUCT 27.5' TYPE 'CM2' DROP INLET (10 GRATES W/ 2.5' SWEEPER) PER CCAUSD #412.1 & 421

BENCHMARK

CLARK COUNTY BENCHMARK NUMBER 44 BLV90 18SW5 – CLARK COUNTY GIS CONTROL POINT #808, ±74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD. ELEV=868.435 METERS (2849.19 FEET) NAVD 88

BASIS OF BEARINGS

N 00°00'21" W, BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., AS SHOWN THAT CERTAIN MAP IN FILE 82, PAGE 20, OF PARCEL MAPS ON FILE IN THE COUNTY RECORDERS OFFICE, CLARK COUNTY, NEVADA.

FLOOD ZONE DATA

THIS SITE IS LOCATED IN A ZONE "X". ZONE "X" HAS BEEN DETERMINED TO BE AN AREA OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD EVENT.
COMMUNITY PANEL NO. 32003C1745E
EFFECTIVE DATE SEPTEMBER 27, 2002

SURVEY MONUMENT NOTE

OWNER RESPONSIBLE TO PROVIDE SURVEY MONUMENTATION AS REQUIRED BY CLARK COUNTY PUBLIC WORKS AND CLARK COUNTY UNIFORM STANDARD DRAWING NUMBER 243. OWNER IS ALSO RESPONSIBLE TO REPLACE ALL SURVEY MONUMENTATION DAMAGED, DESTROYED, OR OBSCURED DURING CONSTRUCTION.

BUILDING PERMIT NOTE

ALL STRUCTURES SHOWN OR INDICATED ON THIS SUBMITTAL WITHIN THE PROPERTY REQUIRE A BUILDING PERMIT APPLICATION AND SUBMITTAL THIS INCLUDES BUILDINGS, ABOVE GROUND TANKS, SIGNS, RETAINING WALLS, FENCES, TRASH ENCLOSURES, SHADE STRUCTURES, STAIRWAYS, RAMPS, LIGHT POLES, LIGHT BOLLARDS, ETC. THIS DOES NOT INCLUDE ANY FLOOD CONTROL STRUCTURE SUCH AS PIPES, CULVERTS, ARCH CULVERTS, HEADWALLS, ETC. THIS DOES NOT INCLUDE ANY WORK WITHIN A PUBLIC STREET RIGHT-OF-WAY. THIS DOES NOT INCLUDE PRIVATE STREETS. THE REVIEW OF CIVIL IMPROVEMENT AND/OR GRADING PLANS DOES NOT INCLUDE ANY REVIEW OF ANY STRUCTURE THAT REQUIRES A BUILDING PERMIT APPLICATION."

SIGHT VISIBILITY ZONE

NO STRUCTURE, VEGETATION, OR OBJECTS OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF THE ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS DEVELOPMENT REVIEW

ACCEPTANCE OF PLANS FOR FILING BY

BY _____

ACCEPTANCE OF THESE PLANS FOR FILING SHALL NOT BE CONSTRUED TO BE A PERMIT FOR OR AN APPROVAL OF ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS AND/OR SPECIFICATIONS. CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREIN.
NOTE: POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN THEIR PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.

DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND OR OVERHEAD UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION. CONTRACTOR TO NOTIFY ENGINEER OF ANY CHANGES OR DISCREPANCIES.

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Nevada Power Environment and Safety Services Department

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Avoid cutting underground utility lines. It's costly.
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OR
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1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-432-5300
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

I HEREBY CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY HTE # 13-22289UP ON FILE WITH CLARK COUNTY FOR THIS PROJECT.

JOHN LAND, PE NO. 16441 DATE

REV	DESCRIPTION	BY	APP'D	DATE

DATE: September 04, 2013
HORIZ. SCALE: 1"=30'
VERT. SCALE: N/A
DRAWN BY: CB
DESIGNED BY: SC
CHECKED BY: JL
APPROVED BY: JL
PROJECT #: 3110.0007

TOLL NORTH LV, LLC
1140 TOWN CENTER DRIVE, SUITE 250
LAS VEGAS, NV 89144
PHONE: 702-243-8900 FAX: 702-243-8910

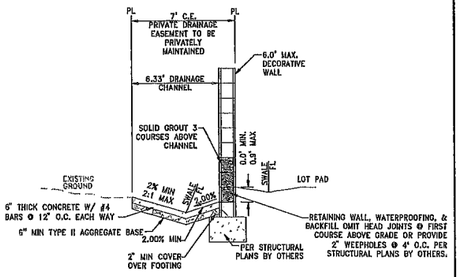
RCI Engineering
3281 S. HIGHLAND DRIVE SUITE 810, Las Vegas, NV 89109
PH(702) 451-0900 FAX(702) 451-0901

IMPROVEMENT PLANS FOR
SAVONA UNIT 3
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
GRADING PLAN (SHEET 1 OF 3)
CLARK COUNTY NEVADA

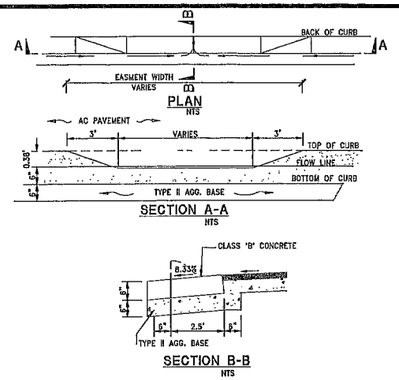
PROFESSIONAL ENGINEER – STATE OF NEVADA
JOHN I. LAND
Exp. 12/31/2013
CIVIL
No. 16441

DRAWING
G-1
SHT 3 OF 18
HTE#

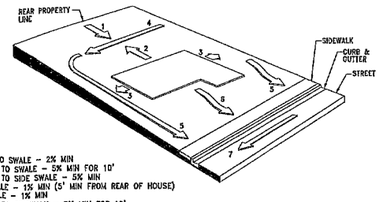
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REAR/SIDE YARD TO EXISTING (41 D-3)
RETAINING SCALE: NTS



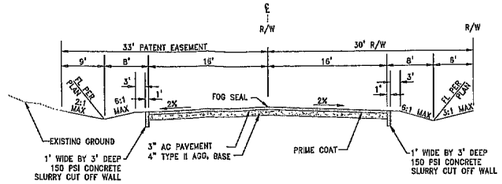
DEPRESSED CURB (42 D-3)
SCALE: NTS



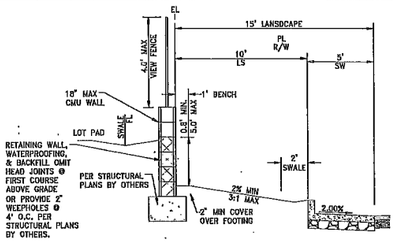
1. SLOPE FROM REAR TO SWALE - 2% MIN
2. SLOPE FROM HOUSE TO SWALE - 5% MIN FOR 10'
3. SLOPE FROM HOUSE TO SIDE SWALE - 5% MIN
4. SLOPE OF REAR SWALE - 1% MIN (5' MIN FROM REAR OF HOUSE)
5. SLOPE OF SIDE SWALE - 1% MIN
6. SLOPE FROM HOUSE TO SIDEWALK - 5% MIN FOR 10'
7. SLOPE OF STREET - PER GRADING PLAN

TYPICAL LOT DRAINAGE DETAIL (43 D-3)
SCALE: NTS

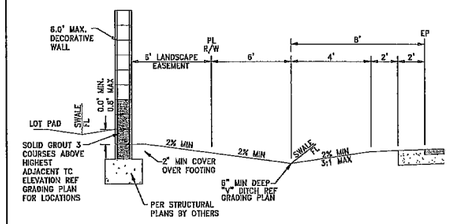
NOTE: ALL AGGREGATE BASES SHALL BE COMPACTED PER THE GEOTECHNICAL REPORT HTE#XX-XXXXX. PRELIMINARY PAVEMENT SECTIONS SHALL BE VERIFIED WITH THE FINAL PAVEMENT SECTION RECOMMENDATION REPORT PRIOR TO CONSTRUCTION. IF FINAL PAVEMENT SECTIONS ARE DIFFERENT A REVISION TO THE IMPROVEMENT PLANS WILL BE REQUIRED.



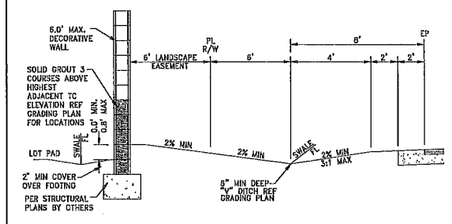
PUBLIC 60' STREET (44 D-3)
DORRELL LANE SCALE: NTS



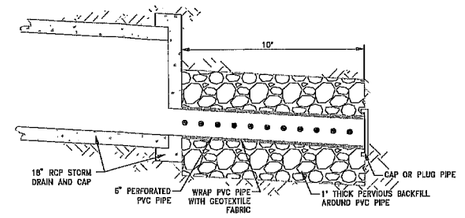
PERIMETER WALL (45 D-3)
RETAINING SCALE: NTS



PERIMETER WALL (46 D-3)
NO RETAINING SCALE: NTS



PERIMETER WALL (47 D-3)
NO RETAINING SCALE: NTS



STORM DRAIN BLEEDER PIPE (48 D-3)
SCALE: NTS

GEOTECHNICAL NOTE:

A GEOLOGIST OR GEOTECHNICAL ENGINEER SHALL BE ON SITE DURING EXCAVATION AND MASS GRADING OPERATIONS TO EXAMINE THE SOIL CHARACTERISTICS AND GEOLOGICAL CONDITIONS ENCOUNTERED, AND TO PROVIDE PROFESSIONAL ADVICE TO THE OWNER IN THE EVENT THAT UNANTICIPATED SOIL PROBLEMS ARISE AND/OR SUBSURFACE SITE CONDITIONS ARE FOUND TO BE SIGNIFICANTLY DIFFERENT THAN DEFINED BY PRE EXPLORATION AND TESTING.

WALL & SCARP NOTE:

1. CONTRACTOR TO CONSTRUCT ALL SCARP AND MAINTAIN PROPER COVER OVER AND FROM ALL WALL FOOTINGS PER THE SOILS REPORT REFERRED TO ON THE GRADING PLANS, REPORT ANY PROBLEMS IN DOING SO TO THE DEVELOPER AND THE ENGINEER IMMEDIATELY.
2. SCARP LESS THAN 1' VERTICAL NOT SHOWN ON PLANS.
3. ALL WALL ALIGNMENTS SHALL FOLLOW SIGHT VISIBILITY ZONE ALIGNMENT AND REMAIN OUTSIDE OF SIGHT VISIBILITY ZONE.

REV	DESCRIPTION	BY	APPD	DATE

DATE: September 04, 2013
HORIZ. SCALE: N/A
VERT. SCALE: N/A
DRAWN BY: CR
DESIGNED BY: SC
CHECKED BY: JL
APPROVED BY: JL
PROJECT #: 3110.0007

TOLL NORTH LV, LLC
1140 TOWN CENTER DRIVE SUITE 250
LAS VEGAS, NV 89144
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IMPROVEMENT PLANS FOR
SAVONA UNIT 3
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
GRADING DETAILS (SHEET 3 OF 3)
CLARK COUNTY NEVADA

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN I. LAND
Exp. 12/31/2013
CIVIL
No. 16441

DRAWING
D-3
SHT 8 OF 18
HTE#

O:\3110_Toll\0007_Savona_CIVIL\PSH\set 3\3110_GR1.dwg saxsbury 9/04/13 8:52am

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Call before you UnderGround
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CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-432-5300
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

CONSTRUCTION NOTES

1. CONSTRUCT AC PAVEMENT PER DETAILS 1 THRU DETAIL 8 ON SHEET D-1
2. CONSTRUCT 24" "L" TYPE CURB AND GUTTER PER CCAUSD # 216
3. CONSTRUCT 30" ROLL CURB PER CCAUSD # 217.51
4. CONSTRUCT "A" CURB PER CCAUSD # 219
5. CONSTRUCT 6' CROSS GUTTER PER CCAUSD # 228
6. CONSTRUCT 5' SIDEWALK PER CCAUSD # 234
7. CONSTRUCT SIDEWALK RAMPS USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT PER CCAUSD # 235 (CASE 1)
8. CONSTRUCT 5' CURB TRANSITION FROM "L" CURB TO ROLL CURB
9. CONSTRUCT 5' CURB TRANSITION FROM ROLL CURB TO DEPRESSED CURB
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14. CONSTRUCT 12.5' TYPE 'CM2' DROP INLET (4 GRATES W/ 2.5' SWEEPER) PER CCAUSD #412.1 & 421
15. CONSTRUCT MIN 20' OF SIDEWALK PER CCAUSD #236 ON EITHER SIDE OF SW UNDERCROSSING
16. CONSTRUCT 7.5' TYPE 'CM2' DROP INLET (2 GRATES W/ 2.5' SWEEPER) PER CCAUSD #412.1 & 421
17. CONSTRUCT WROUGHT IRON FENCE SEE DETAIL 35/D-2
18. CONSTRUCT 1' WIDE BY 3' DEEP 150 PSI CONCRETE SLURRY CUT OF WALL
19. CONSTRUCT 27.5' TYPE 'CM2' DROP INLET (10 GRATES W/ 2.5' SWEEPER) PER CCAUSD #412.1 & 421

SEWER CONSTRUCTION NOTES

21. INSTALL 48" STANDARD MANHOLE (PER DCSWCS STD. No. SD-1A, SD-4, SD-5 & SD-6)
22. INSTALL 4" SEWER LATERAL (PER DCSWCS STD No. SD-17, SD-22 & SD-25) AND 1 CU-FT THRUST BLOCK @ CAP
23. TYPICAL LOCATION FOR SEWER LATERAL AT WATER MAIN CROSSING. ALL SEWER LATERALS MUST MAINTAIN 18" VERTICAL CLEARANCE BELOW WATER MAIN AT CROSSINGS.

BENCHMARK

CLARK COUNTY BENCHMARK NUMBER 44 BLV90 18SWS – CLARK COUNTY GIS CONTROL POINT #3006, ±74' NORTH OF SECTION CORNER AT HUALAPAI WAY AND ELKHORN RD. ELEV=853.435 METERS (2849.19 FEET) NAVD 88

BASIS OF BEARINGS

N 00°00'21" W, BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., AS SHOWN THAT CERTAIN MAP IN FILE 82, PAGE 20, OF PARCEL MAPS ON FILE IN THE COUNTY RECORDERS OFFICE, CLARK COUNTY, NEVADA.

CASE 1 SIDEWALK RAMP PER CC STD DWG 235

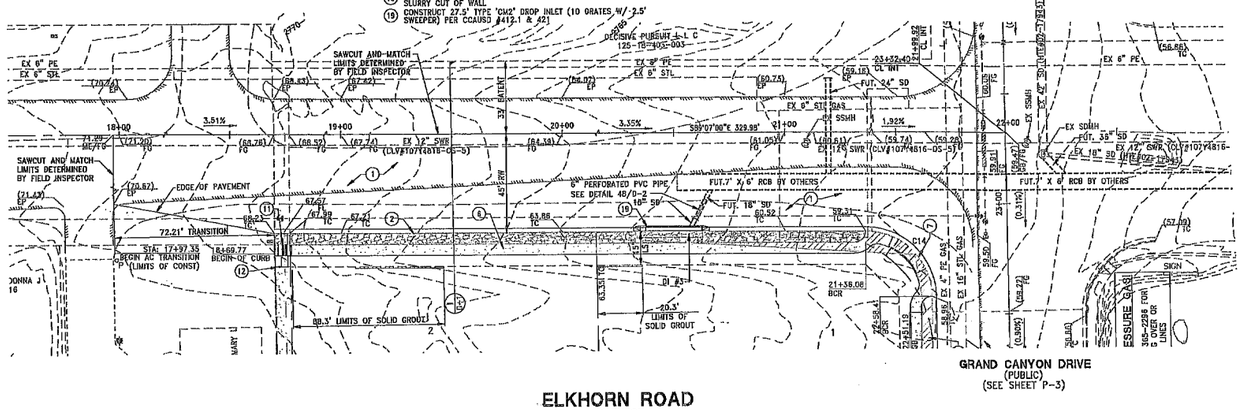
CURVE TABLE						
CURVE	DELTA	RADIUS	LENGTH	TANGENT	"A"	"B"
C14	89°6'18"	30.00'	46.65'	29.54'	8.0'	8.0'

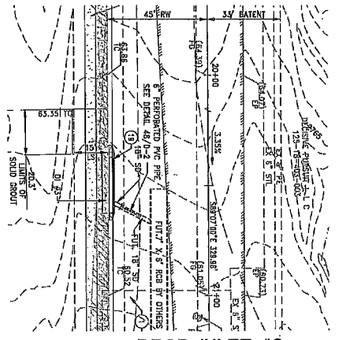
WATER MAIN JOINT DEFLECTION (PVC 4"-24")

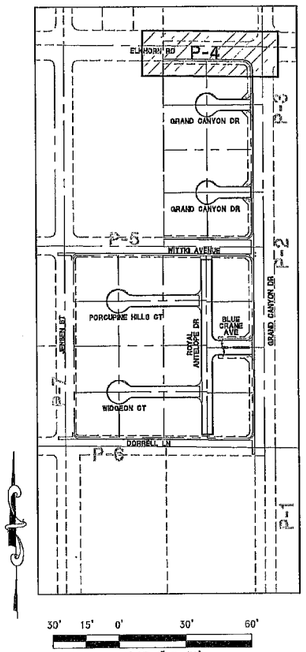
PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UOACS 2.07.01 AND 2.07.02

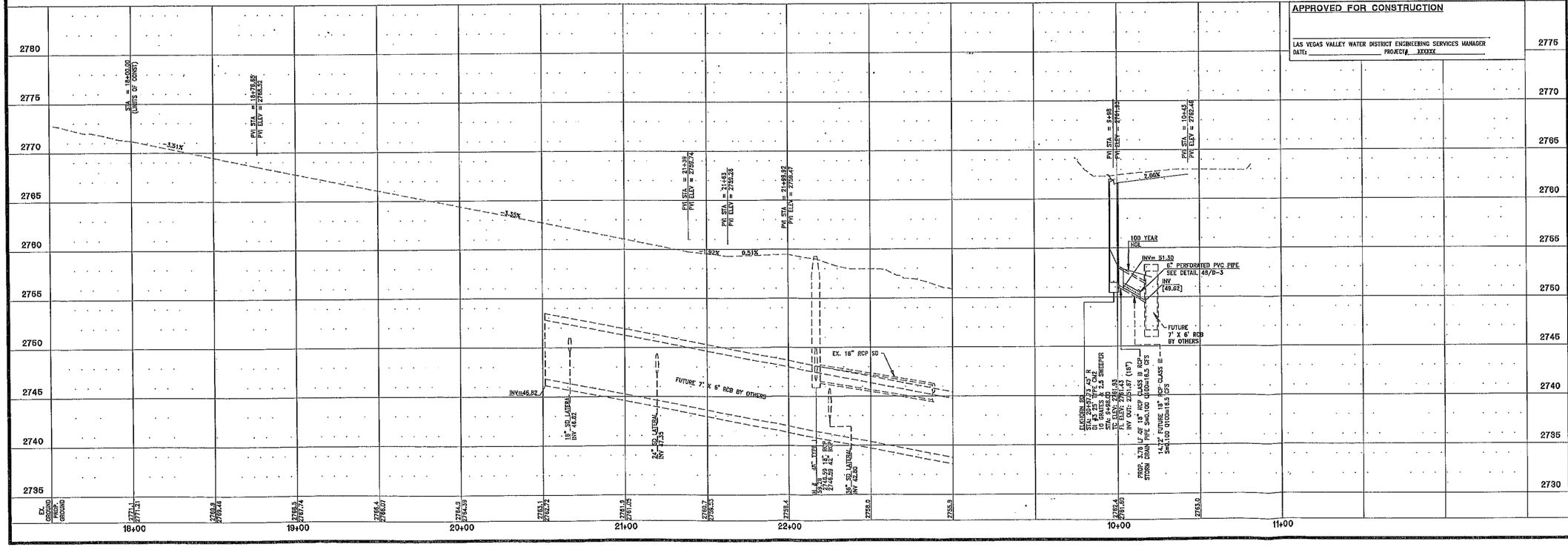
FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.

NOTE:
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING PER UOACS PLATE NO. 15









APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT # XXXXX

NO	DESCRIPTION	REV	BY	APPD	DATE

DATE: September 04, 2013
HORIZ. SCALE: 1"=30'
VERT. SCALE: 1"=5'
DRAWN BY: CR
DESIGNED BY: SC
CHECKED BY: JHL
APPROVED BY: JHL
PROJECT #: 3110.0007

TOLL NORTH LV, LLC
1140 TOWN CENTER DRIVE SUITE 220
LAS VEGAS, NV 89144
PHONE: 702-434-8900 FAX: 702-434-8910

RCI Engineering
3281 S. HIGHLAND DRIVE SUITE 810, Las Vegas, NV 89109
PH/FAX 853.8800 FAX/FAX 853.0801

IMPROVEMENT PLANS FOR
SAVONA UNIT 3
A SINGLE FAMILY RESIDENTIAL SUBDIVISION
PLAN AND PROFILE
ELKHORN ROAD AND DI #3
CLARK COUNTY NEVADA

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN I. LAND
Exp. 12/31/2013
CIVIL
No. 18441

DRAWING
P-4
SHT 16 OF 18
HTE#

G:\3110_Toll\0007_Savona_DWG\PS\unit 3\SGD7_P-1.dwg scarobay 9/04/13 8:56am

Worksheet for ELKHORN DROP INLET CALC

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.4	%
Discharge	17	cfs

Section Definitions

Station (ft)	Elevation (ft)
1+00.0	1.10
1+01.0	1.00
1+04.0	0.50
1+05.0	0.50
1+05.5	0.48
1+05.5	0.00
1+07.0	0.13
1+07.0	0.17
1+50.0	1.03

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(1+00.0, 1.10)	(1+07.0, 0.17)	0.013
(1+07.0, 0.17)	(1+50.0, 1.03)	0.016

Results

Normal Depth		0.47	ft
Elevation Range	0.000 to 1.100 ft		
Flow Area		2.93	ft²
Wetted Perimeter		17.232	ft
Top Width		16.710	ft
Normal Depth		0.47	ft
Critical Depth		0.62	ft
Critical Slope		0.00500	ft/ft

Worksheet for ELKHORN DROP INLET CALC

Results

Velocity	5.81	ft/s
Velocity Head	0.52	ft
Specific Energy	1.00	ft
Froude Number	2.45	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.47	ft
Critical Depth	0.62	ft
Channel Slope	0.03350	ft/ft
Critical Slope	0.00500	ft/ft

Cross Section for ELKHORN DROP INLET CALC

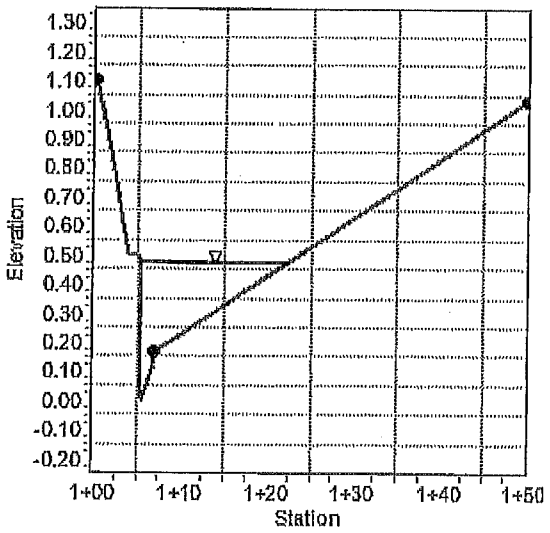
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.4	%
Normal Depth	0.47	ft
Discharge	17	cfs

Cross Section Image



ELKHORN ROAD

Date / time
8/29/2013 / 13:52

MODIFIED TYPE = cm2
Continuous Grade L = 25.00 ft

TRIBUTARY INFORMATION:

17 CFS FUTURE FLOWS IN ELKHORN

INPUT DATA :

Half Street Flow	Q_s =	17.00 cfs
Longitudinal Slope	S_o =	0.0335 ft/ft
Manning's Roughness Coefficient (From Flowmaster)	n =	0.016
Flow Velocity (From Flowmaster)	V_s =	5.81 fps
Flow Depth (From Flowmaster)	D =	0.47 ft
Street Section Transverse (Cross) Slope	S_x =	0.02 ft/ft
Half Street Pavement Width (Edge Pavement to Pavement Centerline)	S_w =	43.00 ft
Gutter Width	W =	1.50 ft
Gutter Cross Slope	S_g =	0.11 ft/ft
Gutter Depression	Ds =	2.00 in
Curb Height	C_h =	0.50 ft
Sidewalk/Landscape Cross Slope	S_s =	0.02 ft/ft
Face of Curb to ROW Length	SW_w =	0.50 ft
Length of Curb Opening	L_c =	25.50 ft
Length of Grate	L_g =	25.00 ft
Clogging Factor for Curb Opening	C_{fc} =	50.0%
Clogging Factor for Grate	C_{fg} =	50.0%
Length of Curb Opening w/ Clogging factored in	L_{cc} =	17.00 ft
Length of Grate w/ Clogging factored in	L_{gc} =	16.67 ft
Grate Style = Vane Grate — Depth in Gutter to Pavement = $W_g * S_g$	D_g =	0.165 ft
p = 0.30 — Street Depth to Street C/L = ($S_w * S_x$) or D - D_g	D_{st} =	0.305 ft
q = 4.85 — Vertical Depth above Street C/L = D - D_g - D_{st} > 0 or 0	D_{as} =	0.000 ft
r = 1.31 — Depth Behind Curb to ROW = $SW_w * S_s$ or D - C_h	D_{sw} =	0.000 ft
s = 0.15 — Vertical Depth above ROW = D - C_h - D_{sw} > 0 or 0	D_{asw} =	0.000 ft

GRATE CAPACITY CALCULATIONS

CALCULATED DATA AND FIXED INPUTS :

[1] Frontal Flow Factor	= 1 - 0.09 * (V_s -V_o) if V_s > V_o; else R_f = 1.0	R_f =	1.00
[2] Splash Over Velocity	= $p + q * L_{gc} - r * L_{gc}^2 + s * L_{gc}^3$	V_o =	11.69 fps
[1] Grate Flow Ratio	= Q_w / Q_s	E_o =	0.20
Frontal Flow	= V * A = V_s (W_g * D - W_g^2 * S_g / 2)	Q_w =	3.40 cfs
Side Flow Street	= V * A = V_s (D_{st}^2 / $S_{x/2}$) + (D_{as} * S_w)	Q_{ss} =	13.60 cfs
Side Flow ROW (Behind Curb)	= V * A = V_s (D_{sw}^2 / $S_{s/2}$) + (D_{asw} * SW_w)	Q_{sw} =	0.00 cfs
Water Spread on Street	= D_{st} / S_x	T_x =	15.25 ft
[1] Side Flow Factor	= 1 / (1+ (0.15 *$Vs^{1.8}$)/(Sx * $Lgc^{2.3}$))	R_s =	0.78
[1] Flow Intercepted by Grate	= [R_f * E_o + R_s * (1 - E_o)] * Q_s	Q_{lg} =	14.06 cfs

CURB OPENING CAPACITY CALCULATIONS

CALCULATED DATA AND FIXED INPUTS :

[1] Equivalent Cross Slope = S_x + S_g * E_o	S_e =	0.0420 ft/ft
Remaining Flow after Flow Intercepted by Grate = Q_s - Q_{lg}	Q_{sx} =	2.94 cfs
[1] Total Interception =0.60 *$Q_{sx}^{0.42}$ * $S_o^{0.30}$ *1 / (n * S_e)$^{0.6}$	L_t =	27.28 ft
[1] Flow Intercepted by Curb Opening = (1 - (1 - L_{cc} /L_t)$^{1.8}$) * Q_{sx} or Q_{sx} if L_t is greater than L_{gc}	Q_{lc} =	2.43 cfs

INLET CALCULATIONS SUMMARY

Total Flow Intercepted = Q_{lg} + Q_{lc}	Q_{li} =	16.5 cfs
Half Street Flow	Q_s =	17.0 cfs
Total Flow Bypassed = Q_s - Q_{li}	Q_{tb} =	0.5 cfs

[1] Formula referenced from CCRFCD manual
[2] Formula referenced from Urban Drainage and Flood Control District Manual

Storm Drain Hydraulics Calculations

DROP INLET NO. 2 AND 18" STORM DRAIN IN ELKHORN ROAD

DATE: 08/30/13

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= D | Headwall:Square Edge (cut concrete and CMP)

CONDUIT DATA									FLOW DATA								ENERGY LOSS DATA																				EGL & HGL				COMMENTS	
																	PIPE		TRANSITION																			CONDUIT		TRANSITION		FULL/	
STATION			PIPE	BOX				#	INVERT ELEV										Manhole			Junction			Contraction/Inlet			Expansion/Outlet			Bend				Misc						PART	CRTL
FROM (ft)	TO (ft)	T/R	D (in)	SPAN (ft)	RISE (ft)	AREA (ft^2)	HYD RAD (ft)		D/S (ft)	U/S (ft)	L (ft)	S (%)	A (in^2)	Φ	Q (cfs)	V (ft/s)	$V^2/2g$ (ft)	Sf (ft/ft)	Ave. S_f (ft/ft)	Fric H_f (ft)	Fric H_f (ft)	Θ (deg)	K_{mh}	H_{mh} (ft)	Θ (deg)	K_j	H_j (ft)	Inlet/ Conf	K_i	H_i (ft)	Θ (deg)	K_e	H_e (ft)	R_{bend} (ft)	Θ (deg)	K_b	H_b (ft)	H_m (ft)	Total (ft)	U/S EGL	U/S HGL	U/S EGL	U/S HGL	FLOW	
	100.00		18							49.62																																
																												Outlet K_e=	1.0														
100.00	118.50		18						49.66	51.61	18.5	10.00%	1.77	0.0049	4.66	9.34	1.35	0.0246	0.0246	0.45																		0.00	54.36	53.01			PART	D/S
118.50	118.50		18						51.49	51.61	0.0		1.77	0.0049	4.66	9.34	1.35	0.0246	0.0246		0.00						Ki=	0.4	0.54									0.54			54.91	54.91	FULL	U/S

Summary of Results

						(Optional)		HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
100.00	49.62	51.12	53.35	52.00	61.20	ELKHORN	FG	OK	NO
118.50	51.51	53.01	54.36	53.01	61.49	DI	FL	OK	NO
118.50	51.51	53.01	54.91	54.91	61.49	DI	FL	OK	NO

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APPENDIX G

Coordination Documents

CLV/CCRFCD Kickoff Meeting Minutes – May 2, 2012

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Jerrod Ratcliffe

Project Number: CLV1201.01
Date: May 2, 2012

SUBJECT:	Rancho Road System – Elkhorn (Fort Apache to Grand Canyon) Kick-off Meeting
PLACE:	City of Las Vegas Public Works Boulder Room 333 N. Rancho Drive Las Vegas, NV 89106
TIME:	10:30 AM
DATE:	May 2, 2012
ATTENDING:	Tim McCoy, SHG Mark Failla, SHG Jerrod Ratcliffe, SHG Alan Riekki, CLV Survey Peter Jackson, CLV Flood Engineering Diane Phomninh, CLV Traffic Todd Myers, CCRFCD Oh Sang Kwon, CLV Flood Bill Snyder, CLV R/W Tim Parks, CLV Sewer Randy McConnell, CLV

The Kick-off meeting was held to introduce the project team and discuss the scope of the project. The following comments and items were discussed:

1. Tim M. introduced the project team:
   - Project Manager – Tim McCoy
   - Assistant Project Manager – Mark Failla
   - Drainage Engineer – Steve Jones/Kylie Rowbury
   - Designer – Jerrod Ratcliffe
   - GES – Geotechnical
   - Stanley Consultants – Surveying
   - AeroTech Mapping – Aerial Mapping
   - MBP Consulting – (Section 8 and 404)
   - TBE - Potholing

2. Tim M. said that monthly progress meetings will be held. Randy will coordinate a day and time with the project team and will setup the monthly progress meetings.

3. Tim M. said that coordination has begun with the Rancho Road System Project that the Louis Berger Group (LBG) is designing. Mark has met with LBG and has obtained draft hydrology maps, plans and profiles of this system. LBG is providing a stub west of the Fort Apache intersection for the Elkhorn RCB connection. The stub is located on the north side of Elkhorn and appears to be the preferred alignment based on minimizing existing utility conflicts. LBG anticipates submitting 70% plans in approximately two weeks. Randy will provide SHG with digital ACAD files and PDF copies of the 70% submittal. Randy will also provide the status of the record of survey. *After the meeting, Randy confirmed that the record of survey has been recorded.*

4. Mark said that DR Horton has revived the Town Center 44/50 No. 1 project along the south side of Elkhorn from Tee Pee to Fort Apache. It is believed that construction has commenced. SHG will investigate status of the project and will provide CLV with an update to include construction time frames and permit status. The possible construction of a proposed drop inlet by LBG on the southwest corner of Elkhorn/Fort Apache will be coordinated with the developer.

5. Tim M. said that plans, specifications and cost estimates will be submitted at 30%, 70%, 90%, and 100% completion levels. The project will include alternative analysis to best convey flows. Alternatives will include utilizing existing storm drain pipes as parallel systems to reduce flows in the proposed RCB. Utilization of the existing storm drain to the extent possible is a preferred alternative. SHG will also look at alternatives at the Grand Canyon intersection to determine the best option for collection of flows from the west. Options will include an area inlet or daylight pipes on the west side of the intersection or utilizing drop inlets in the intersection. SHG will research existing right-of-way and/or easements in the area to help select the best option. The west side of Grand Canyon is within Clark County jurisdiction.

6. Tim M. discussed the RCB trench and pavement patch requirements. SHG will determine if open grade exists on Elkhorn. Randy said that CLV installs only dense grade on <80' right-of-way streets and UTACS on >80' right-of-way streets. Todd said to review the standard drawing trench sections for limits of replacement. Limits may also include a mill/overlay to adjacent lane lines. Replacements limits will be coordinated through the design process.

7. Alan said that CLV has established a new mapping projection that now includes a horizontal tie. This new projection eliminates the need for a grid-to-ground scale factor. Alan will contact Alan Dill at Stanley to give him the translation factors to use for this project. Alan said that this new projection will be used on all future CLV projects.

8. Peter noted that laterals on the cross streets shall be provided to meet RTC criteria.

9. Tim P. will provide sanitary sewer record drawings to SHG.

10. Tim presented the following estimated schedule:

➢ 30% Submittal	60 days
➢ 70% Submittal	90 days*
➢ 90% Submittal	60 days*
➢ CCRFCD Project Presentations	TBD
➢ 100% (Pre-final) Submittal	30 days*
➢ 100% (Final) Submittal	15 days*

*Calendar days following receipt of City comments.

Action Items:

SHG

- *Provide CLV with status of DR Horton Town Center 44/50 No. 1 project.*
- *Review existing right-of-way/easements at the Elkhorn/Grand Canyon intersection.*

CLV

- *Coordinate and schedule monthly progress meeting.*
- *Provide 70% Rancho Road System files and plans to SHG.*
- *Provide Rancho Road System record of survey status to SHG.*
- *Contact Alan Dill at Stanley to coordinate new CLV mapping projection.*
- *Provide SHG with sanitary sewer record drawings.*

cc: Attendees

CLV/CCRFCD Progress Meeting#1 Minutes – June 5, 2012

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Jerrod Ratcliffe

Project Number: CLV1201.01
Date: June 5, 2012

SUBJECT:	Rancho Road System – Elkhorn (Fort Apache to Grand Canyon) Progress Meeting #1
PLACE:	City of Las Vegas Public Works Gravel Room 333 N. Rancho Drive Las Vegas, NV 89106
TIME:	2:30 PM
DATE:	June 5, 2012
ATTENDING:	Todd Myers, CCRFCD Mark Failla, SHG Peter Jackson, CLV Flood Randy McConnell, CLV Engineering Jerrod Ratcliffe, SHG

The progress meeting was held to update the project team on the project progress. The following items were discussed:

1. Peter provided SHG with a CD containing requested drainage studies. Peter said that Louis Berger Group (LBG) is preparing to submit their 70% Rancho Road System plans in two weeks. Randy will provide ACAD and PDF plans to SHG once LBG has submitted. Peter will email a copy of the LBG draft 70% drainage map to SHG.

2. Peter said that the DR Horton development on the south side of Elkhorn from Tee Pee to Fort Apache has continued construction by the new developer due to the bond associated with the plat. Because of the bond, the new developer was able to continue construction without needing plan review/revisions. The team discussed paying for the new drop inlet on the southwest corner of Fort Apache but there is no construction funding in place at this time. Peter will contact LBG to coordinate adding this drop inlet into the Rancho Road System plans.

3. Mark said that all utility companies have responded with the initial request for as-builts with the exception of NV Energy. All utilities received to date have been added to the existing utility base file. Existing utilities will be confirmed with the LBG files once the 70% plans have been received by SHG. Mark noted that significant gas conflicts could occur at the Grand Canyon intersection. These potential conflicts will be considered during the alternative analysis task.

4. Mark said that the record of survey is at the 80% completion level and should be ready for a draft submittal to CLV for review within the next few days. The geotechnical borings were performed last Friday and GES is working on the laboratory testing. Draft boring logs have been provided to SHG for preliminary review. The environmental scope is approximately 90% complete and there are no issues anticipated.

5. Once SHG has received the Rancho Road System 70% submittal, SHG will provide an update for the anticipated 30% submittal date. The 30% submittal is currently scheduled to be July 2nd. It is likely that this date will need to be pushed pending receipt of the Rancho Road System plans.

Action Items:

CLV

- *Provide LBG draft 70% drainage map to SHG.*
- *Provide 70% Rancho Road System files and plans to SHG.*

cc: Attendees

CLV/CCRFCD Progress Meeting#2 Minutes – July 31, 2012

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Mark J. Failla

Project Number: CLV1201.01

SUBJECT:	Rancho Road System – Elkhorn (Fort Apache to Grand Canyon) Progress Meeting #2	
MTG. PLACE:	City of Las Vegas Public Works Gravel Room 333 N. Rancho Drive Las Vegas, NV 89106	
MTG. TIME:	2:30 PM	
MTG. DATE:	July 31, 2012	
ATTENDING:	Todd Myers, CCRFCD Mark Failla, SHG Peter Jackson, CLV Flood Oh Sang Kwon, CLV Flood	Randy McConnell, CLV Engineering Jerrod Ratcliffe, SHG Mark Sorensen, CLV Public Works

The progress meeting was held to update the project team on the project progress. The following items were discussed:

1. Mark F. provided a summary of the project coordination. SHG has received electronic files of relevant area drainage studies from CLV and 70% Rancho/Ft. Apache Project plans, studies and electronic files from LBG. SHG has also received feedback from utility companies including NV Energy.

2. Mark F. provided a summary of Sub-Consultant coordination.
   - Survey – Received topography and Record of Survey (ROS) from Stanley Consultants. Received comments on ROS from CLV. Stanley has responded to CLV comments on ROS. SHG will contact Stanley for the ROS resubmittal date.
   - Geotechnical – Received "draft" Data Report and Interpretive Report from GES. No significant findings. The report indicates no ground water encountered, no hardpan/caliche encountered, potential use of excavated material for structural fill/granular backfill, and a pavement section of 5" Asphalt on 4" Type II. Mark S. noted that the use of excavated material for backfill needs to be clearly defined in the bid docs and may be excluded as backfill. This will be determined at a later date.
   - Environmental – Received "draft" Environmental Screening Report from MBP. No significant findings to report.

3. Mark F. provided an overview of the hydrologic analysis.
   - SHG completed review of hydrologic modeling prepared by LBG for 70% Rancho/Ft. Apache Project and is in agreement with two exceptions. First, record plans and field recon indicate that the portion of Subbasin NW53-CA west of Hualapai will drain south along Hualapai and will be intercepted by existing storm drain and not east along Severence. Mark F. met with Jeff Douglas of LBG regarding this and LBG will incorporate the change in their HEC-1 model with their next submittal. Second, Mark F. noted that the 120 cfs flow split at the Hualapai/Elkhorn

intersection is added at the Grand Canyon/Dorrell Intersection. It was agreed by everyone in attendance that this flow should be assumed to be in the future storm drain in Elkhorn (future design should include drop inlets at the Hualapai/Elkhorn intersection to intercept the 120 cfs surface flow). Mark F. will coordinate this revision with LBG for incorporation in the HEC-1 model at the next submittal for the Rancho/Ft. Apache Project.

- Mark F. noted differences in regional flows between MPU and LBG along Elkhorn. MPU reports storm drain design flow of 973 cfs. LBG reports 578 cfs design flow. This appears to be due to the 120 cfs that was diverted south of Elkhorn and also because the portion of the MPU basin north of Severence was assumed to be in Elkhorn by the MPU whereas the LBG model maintains the flow in Severence.
- Todd confirmed that it was acceptable to utilize regional flow rates determined by the LBG HEC-1 (as revised per above) for the mainline facility design, and utilize prorated flow from the LBG subbasins for determining local facility design (DI's and laterals) and street flow.

4. The Grand Canyon/Elkhorn intersection drainage concept was discussed. The following design elements were agreed to:
   - Extend mainline storm drain west thru intersection. This will require potential relocation of a 16-inch High pressure gas line and some other gas facilities. Randy will coordinate with Nancy of CLV ROW for gas line easement/franchise information.
   - Provide field inlets and laterals from the Elkhorn mainline to the north and south sides of Elkhorn for the segment west of the Grand Canyon Intersection.
   - Provide field inlet at the existing 18-in stub in Grand Canyon at the northwest corner to intercept full design flow of 64 cfs generated from the northwest and draining to Grand Canyon. Replace existing 18-in stub as necessary. The existing 42" mainline storm drain in Grand Canyon is adequate for the design flow. SHG will review the existing grading to determine if additional swale grading is also necessary with the new drop inlet.

5. The Tee Pee/Elkhorn intersection drainage concept was discussed. The following design elements were agreed to:
   - Mark F. noted the drainage easement discharging +/- 65 cfs at the northwest corner of the intersection. If street flow criteria thru 80-ft ROW intersections (max. depth=6 inches) is met, the intent is to allow the flow thru the intersection and provide a drop inlet just downstream due to numerous utilities in the intersection. However, even if street flow criteria are met and SHG can design with minimum utility conflicts, Todd said he would still prefer to intercept the easement discharge with storm drain. If street flow criteria are not met, Peter and Todd agreed that the preference would be to intercept flow at the easement and convey in storm drain. A trench drain in the easement may work for this to avoid utilities in lieu of a drop inlet at the curb. SHG will assess further.
   - Jerrod identified potential utility conflicts at this intersection with power concrete encasement, 8" sewer and 36" water. SHG identified conflict avoidance is probable with a 4-foot high facility. Peter and Todd agreed that the preference would be a minimum 5-foot high facility in accordance with CCRFCD criteria even if this results

in relocation of the 8" sewer. If a 5-foot high facility results in more significant/costly utility relocations, then maybe a 4-foot high facility will be considered. SHG will assess further.

6. Mark noted that surface flows on the north side of Elkhorn are maintained on the north side and flows on the south side are maintained on the south side. Flows on the north side are larger than the south side and will be intercepted and conveyed by the mainline regional facility proposed to be aligned on the north side of Elkhorn. Flows on the south side are small and are accommodated by the existing 18" RCP. This facility will remain and function for south side flows.

7. Mark S. recommends that SHG be in the field to witness potholes and also to consider getting field survey of utility paint lines. This should help avoid utility conflict design/construction issues.

8. Peter and Todd noted that if velocities in storm drain exceed 25 fps, then either sacrificial or high strength concrete (6000 psi) be specified along the facility bottom.

9. Peter will provide comment to LBG on the 70% Rancho/Ft. Apache Project design to include the drop inlet at the southwest corner of Ft. Apache/Elkhorn.

10. Mark S. noted that potholing may be desired earlier than 70% design. This will be decided upon subsequent to CLV/CCRFCD review of the 30% design.

11. Randy will obtain Title Report for patent easement at the northwest corner of Grand Canyon/Elkhorn intersection.

12. The 30% Pre-Design submittal date was set at August 30th.

Action Items:

CLV

- *Coordinate with Nancy at CLV right-of-way to obtain information regarding 16-inch gas main at Grand Canyon/Elkhorn intersection.*
- *Obtain title report for patent easement at the northwest corner of Grand Canyon/Elkhorn.*

SHG

- *Coordinate hydrologic analysis revisions with LBG*
- *Contact Stanley for R.O.S resubmittal date.*

cc: Attendees

LBG Email Correspondence –
August 2, 2012

Mark Failla

From: Mark Failla
Sent: Thursday, August 02, 2012 4:51 PM
To: Douglas, Jeff (jdouglas@louisberger.com)
Cc: Jerrod Ratcliffe; rmcconnell@LasVegasNevada.GOV; Peter Jackson (pjackson@LasVegasNevada.GOV); tmyers@regionalflood.org; Oh-Sang Kwon (okwon@LasVegasNevada.GOV)
Subject: Rancho Rd System - Elkhorn - Coordination with LBG

Jeff,
Per our meeting on July 20th and our telephone conversation today, the following is a summary of hydrology items for you to verify as included with your 70% Submittal for the Rancho Rd System – Fort Apache project.

1. Per reference drawings and drainage maps (copies provided to you at our meeting), it appears that drainage from the portion of the regional Subbasin NW53-CA west of Hualapai should be directed south along Hualapai instead of east along Severence. The reference material identifies no break in street crown with flow contained on west side, as well as storm drain in Hualapai. For our 30% design we are going to assume that this drainage is directed south along Hualapai and will be in the Elkhorn storm drain system, unless you think otherwise. Also as discussed and if substantiated, LBG will incorporate this change into the HEC-1 model prepared for the Rancho Rd System-Fort Apache project.
2. Under ultimate conditions, it appears the 120 cfs surface flow split (FS1) at the Hualapai/Elkhorn intersection should be directed east in Elkhorn instead of southeast toward the Dorrell/Grand Canyon intersection. Under interim conditions, it does appear based on topography that the flow would be directed southeast, however when intersection improvements are complete this would be unlikely. This issue was discussed in our Progress Meeting with CLV/CCRFCD, and generally agreed that this flow should be assumed to be directed east in Elkhorn storm drain. For our 30% design we are going to assume that this drainage is directed east in Elkhorn storm drain, unless you think otherwise. Please take a look and see if I am missing something, as I understand this may result in some changes to your current design. Also as discussed and if substantiated, LBG will incorporate this change into the HEC-1 model prepared for the Rancho Rd System-Fort Apache project.
3. The Future Conditions Hydrology exhibit depicts 542 cfs and 578 cfs in the Elkhorn storm drain at Grand Canyon and Fort Apache respectively. The HEC-1 model appears to indicate flows of 554 cfs and 608 cfs at these locations. No big deal, but thought I would point it out.

Let me know what you find out.

Thanks again,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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CLV/CCRFCD Progress Meeting #3 Minutes – November 6, 2012

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Mark J. Failla

Project Number: CLV1201.01

SUBJECT:	Rancho Road System – Elkhorn (Fort Apache to Grand Canyon) Progress Meeting #3
MTG. PLACE:	City of Las Vegas Public Works Gravel Room 333 N. Rancho Drive Las Vegas, NV 89106
MTG. TIME:	2:30 PM
MTG. DATE:	November 6, 2012
ATTENDING:	Todd Myers, CCRFCD Mark Failla, SHG Peter Jackson, CLV Flood Randy McConnell, CLV Engineering Jerrod Ratcliffe, SHG

The progress meeting was held to update the project team on the project progress. The following items were discussed:

1. Mark F. provided a summary of primary meeting goals: 1.) Obtain status of CLV Flood and CCRFCD comments on PDR, 2.) Obtain status of LBG updated hydrology for Fort Apache Storm Drain project, and 3.) Provide summary of utility coordination feedback.

2. Drainage Discussion:
   - Randy M. will check with LBG on status and schedule for completion of supplemental hydrologic analysis associated with Fort Apache Storm Drain project. SHG will not initiate 70% Drainage Design Report until receipt and review of supplemental report from LBG.
   - Todd M. provided SHG with CCRFCD plan comments for 30% PDR. Todd will follow-up by providing formal written comment letter from CCRFCD.
   - Peter J. will prepare formal written letter and redline plan comments on 30% PDR. Peter anticipates completion of his review by 11/16/12.
   - In general, CCRFCD comments on 30% PDR include: 1.) verify that all lateral and drop inlet designs are designed for local peak flows (as opposed to pro-rated flows from regional subbasins), especially at Elkhorn/Grand Canyon and Elkhorn/Tee Pee, 2.) prefer lateral connections enter mainline 1-foot above or below invert or soffit to avoid conflict with mainline haunch areas, 3.) Provide pre-cast and cast-in-place option in specs and with details (for trench section provide 3-inch leveling course with pre-cast option), 4.) provide 45 degree junction at Elkhorn/Tee Pee lateral if possible.
   - Randy M. will schedule 30% Field Walk Thru, tentatively scheduled for 11/15/12.

3. Utility Coordination Discussion:
   - Jerrod R. reported receipt of feedback from CLV Sewer, CLV Design, CLV Traffic, Centurylink, Cox, FAST, NVE Transmission, SNWA, LVVWD and SWG. Jerrod noted no significant issues identified by each agency with the exception of SWG. Jerrod R. noted we have not received any feedback yet from CCRFCD, CLV Flood, and NVE Distribution. Randy M. will contact Patricia Brown at NVE Distribution to check status of their review.
   - The group discussed SWG comments regarding conflict with gas utilities and valve assembly at Elkhorn/Grand Canyon. All agreed that avoidance of valve assembly is of primary importance. This could be accomplished by shifting storm drain alignment to the south side of Elkhorn prior to the intersection. This will still result in four (4) unavoidable crossings with gas lines; however SHG will investigate vertical alignment alternatives to avoid conflict at the crossings to the furthest extent.
   - Specifications need to address that payment includes SWG inspector.
   - SHG should initiate pothole plan upon completion of SWG conflict resolution alternatives. Pothole plan must be coordinated and reviewed by CLV prior to performance of work. Ensure that potholes include top and bottom of encasements.

Action Items:

CLV
- *Randy M.: Obtain status and anticipated completion date for LBG updated hydrologic analysis for Fort Apache Storm Drain System project.*
- *Randy M.: Contact Patricia Brown at NVE Distribution to check status of their 30% PDR review.*
- *Randy M.: Set and attend 30% Field Walk thru date with project team. Tentatively set for November 15, 2012.*
- *Peter J.: Prepare formal written comment letter and plan redlines from CLV on 30% PDR and provide to SHG and CCRFCD.*

CCRFCD
- *Todd M.: Prepare formal written comment letter from CCRFCD on 30% PDR and provide to SHG and CLV.*

SHG
- *Mark F., Jerrod R.: Attend 30% Field Walk thru with project team.*
- *Mark F., Jerrod R.: Initiate pothole plan and coordinate with CLV prior to performance of potholing.*

cc: Attendees

CLV/CCRFCD Progress Meeting#4 Minutes – February 6, 2013

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Mark J. Failla

Project Number: CLV1201.01

SUBJECT:	Rancho Road System – Elkhorn (Fort Apache to Grand Canyon) Progress Meeting #4	
MTG. PLACE:	City of Las Vegas Public Works Gravel Room 333 N. Rancho Drive Las Vegas, NV 89106	
MTG. TIME:	2:30 PM	
MTG. DATE:	February 5, 2013	
ATTENDING:	Todd Myers, CCRFCD Mark Failla, SHG Peter Jackson, CLV Flood	Randy McConnell, CLV Engineering Jerrod Ratcliffe, SHG Oh-Sang Kwon, CLV Flood

The progress meeting was held to update the project team on the project progress. The following items were discussed:

1. Mark F. provided a summary of primary meeting goals: 1.) Project Status, 2.) Hydrology & Hydraulics Coordination, and 3.) Project Schedule.

2. Project Status:
   - Received 30% comments from all CLV Departments and CCRFCD on or before December 17, 2012.
   - Potholes completed January 21, 2013. SHG performed field observation of potholing to ensure completeness of requested data.
   - Survey pothole and "as-built" field survey completed January 29, 2013.
   - 70% Hydrology & Hydraulic design underway. Hydrology coordination with concurrent LBG Ft. Apache Storm Drain Project on-going.
   - 70% design underway.

3. Hydrology & Hydraulics Coordination:
   - SHG has coordinated the Ft. Apache Storm Drain-Elkhorn stub revised invert elevation with LBG. Jerrod R. reported that the invert elevation has been raised from the previous design. It was noted that the raised tie-in invert may potentially cause a conflict with an existing 8-inch waterline at Station +/- 63+30. The conflict may be able to be avoided if the facility hydraulics work at a slope of 0.005 ft/ft. However, if the hydraulics do not work, a relocation of the waterline may be necessary.
   - Mark F. verified that the hydraulic modeling of the mainline storm drain will be designed (meet CCRFCD & local criteria) based on a Manning's n value of 0.013 and "checked" (CCRFCD & local criteria not necessarily met) based on a Manning's n value of 0.015.
   - Mark F. verified mainline storm drain design will be based on "regional" flows established by LBG hydrologic model and drop inlet/lateral storm drain will be based

on "local" flows established by the SHG local hydrology model. The mainline hydraulic model only needs to include junctions at "significant" lateral locations. The lateral flow will be based those established by the "regional" LBG hydrologic model. The mainline hydraulic model can begin at the tie-in to the Elkhorn stub set by the LBG project design (HGL referenced from LBG design). If considered necessary, the hydraulic model can be extended further downstream.

- Per CLV comment, it was recommended that drop inlets be placed at minimum 600' spacing. Mark F. discussed that current spacing exceeds 600' at a few locations by a couple hundred feet. Since the curb, gutter and drop inlets exist thru this reach of roadway, and hydraulic criteria is met without adding new drop inlets to meet spacing requirements, Mark F. suggested that new drop inlets not be added just to meet the suggested minimum spacing. Peter J. agreed.

4. Project Schedule:
   - Oh-Sang K. and Todd M. confirmed that construction funding is anticipated to be available in 2013 for the project.
   - 70% Submittal scheduled for March 11, 2013.
   - RFCD Board Presentations will be scheduled after the 90% design submittal. Todd M. noted that any right-of-way acquisitions and/or easements that may be necessary for the project would need to be acquired prior to RFCD Board Presentations. Jerrod R. and Mark F. noted that no right-of-way and/or easements are anticipated to be necessary for the project. Randy M. noted that temporary construction easements (TCE's) are only required when federal funding is provided. Authorizations to Enter Property (AEP) may be necessary, however Todd M. noted that any AEP's would not be required in advance of CCRFCD Board presentations nor require signature at the time of CCRFCD funding request.
   - Randy M. reminded SHG to submit 70% plans to Clark County ASAP for their review and approval as they may require a long lead time. Jerrod noted the 30% submittal was forwarded to Clark County.

Action Items:

CLV

- *Randy M.: Provide SHG with current boiler plate special provisions (Randy provided specs at conclusion of meeting).*

SHG

- *SHG: Proceed with 70% design.*

cc: Attendees

LBG Email Correspondence –
November 20, 2012; February 19, 2013

Mark Failla

From: Randy McConnell <rmcconnell@LasVegasNevada.GOV>
Sent: Tuesday, November 20, 2012 4:07 PM
To: Mark Failla
Subject: FW: Rancho-Fort Apache Storm Drain - Updated Hydrology 1 of 3
Attachments: FASD7.OUT; FASD7.DAT

From: Douglas, Jeff [mailto:jdouglas@louisberger.com]
Sent: Thursday, November 08, 2012 5:08 PM
To: Randy McConnell; Todd Myers (TMyers@regionalflood.org); Peter Jackson
Cc: Dudley, Syndi
Subject: Rancho-Fort Apache Storm Drain - Updated Hydrology 1 of 3

Randy, Todd and Peter,

Attached are the updated HEC-1 input and output files for the Rancho-Fort Apache Storm Drain project. We will deliver hardcopies of the output and basin map. I will send PDFs of the annotated output file and hydrology exhibit under separate e-mails.

The updated hydrology includes:

- Subdivided basin NW53-C to account for the local storm drain in Hualapai
- Revised the flow split at Elkhorn and Hualapai to send the base flow east on Elkhorn (bottom 631 cfs) and the storm peak south on Hualapai (top 102 cfs).
- Removed the flow split at Hualapai and Dorrell
- Removed the flow split at Hualapai and Deer Springs
- Updated all the flow values and tables
- Added additional labeling and flow values to clarify flow patterns

In general these changes:

- Decreased flow in the Hualapai system
- Decreased flow in the Severance System
  - We will update the drop inlet analysis after your review of the HEC-1. We anticipate the same number and layout of inlets with minor changes to the lengths
- Increased flow in the Elkhorn system
- Increased flow in the Fort Apache system
  - The current design of the 12'x16' RCB is sufficient to convey the increased flow
  - Portions of the RCB will be pressurized at junctions with the HLG at least 2-feet below grade
- Decreased flow to the Dorrell Trench Drain (flows still warrant a trench drain)
- Decreased flow in the Deer Springs System
  - We will update the drop inlet analysis after your review of the HEC-1. We anticipate the same number and layout of inlets with minor changes to the lengths
- Lowered the Peak Stage in the Fort Apache Detention Basin
  - Previous Peak Stage = 2334.13 ft (1.87 feet of freeboard)
  - Updated Peak Stage = 2632.23 ft (3.77 feet of freeboard)
- Slightly raised the Peak Stage in the Rancho Detention Basin
  - Previous Peak Stage = 2388.62 (2.22 feet of freeboard)
  - Updated Peak Stage = 2288.93 (1.91 feet of freeboard)

Please let me know if you have any comments or would like anything else.

Jeff

effrey S. Douglas, P.E., CFM
Project Engineer
Phone: 702.736.6632
Direct: 702.430.2034
Facsimile: 702.736.0704

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Mark Failla

From: Douglas, Jeff <jdouglas@louisberger.com>
Sent: Tuesday, February 19, 2013 11:26 AM
To: Mark Failla
Cc: Dudley, Syndi
Subject: RE: Rancho Rd. System - Elkhorn Branch
Attachments: CB1121_P-Drainage_mst.dwg

Mark,

Here are the elevations based on the revised confluence structure. Attached is a DWG of the updated layout.

Station 64+00
HGL (n = 0.015) = 2679.21
HGL (n=0.013) = 2673.73
Invert = 2669.50 (same as before)

Station 60+80.96 (begin of 7'x6' RCB / Grade Break)
Invert = 2661.84

Jeff

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Tuesday, February 19, 2013 9:02 AM
To: Douglas, Jeff
Subject: RE: Rancho Rd. System - Elkhorn Branch

Hi Jeff.
I just wanted to follow-up with you on the availability of the revised starting HGL's for the Rancho-Elkhorn lateral.

Thanks,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Douglas, Jeff [mailto:jdouglas@louisberger.com]
Sent: Friday, February 15, 2013 8:23 AM
To: Mark Failla
Subject: RE: Rancho Rd. System - Elkhorn Branch

Morning Mark,

I am making a minor change to confluence at Fort Apache and Elkhorn. It won't affect the profile on Elkhorn, but might have a slight change to water surface elevation. Once I finish with the change I will send you the updated output later today.

Jeff

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Thursday, February 14, 2013 7:49 AM
To: Douglas, Jeff
Subject: RE: Rancho Rd. System - Elkhorn Branch

Hi Jeff.

Could you provide me with the exact corresponding HGL elevations from the .013 model and .015 model at Station 64+00 (or a pdf copy of the hydraulic models). I will be using these as the starting WSEL for the Elkhorn extension.

Thanks,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Douglas, Jeff [mailto:jdouglas@louisberger.com]
Sent: Tuesday, February 05, 2013 10:52 AM
To: Mark Failla
Cc: Jerrod Ratcliffe; Dudley, Syndi
Subject: RE: Rancho Rd. System - Elkhorn Branch

Mark,

As we discussed on the phone, the hydrology and hydraulic revisions were submitted the City and CCRFCD as an informal submittal. The revised hydrology and hydraulics will be incorporated into our 90% design report.

Attached are the plan and profile sheets that show the revised RCB profile and the updated HGL lines (n = 0.013 and n = 0.015).

Please let me know if you need anything else.

Jeff

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Tuesday, February 05, 2013 9:56 AM
To: Douglas, Jeff
Cc: Jerrod Ratcliffe
Subject: FW: Rancho Rd. System - Elkhorn Branch

Hi Jeff.

In addition to the requested info below, will you please provide me with the name/date of the study that you prepared to address the hydrology revisions? (70% Supplemental Hydrology?). A copy of the cover sheet of the report would do it (FYI...CLV forwarded me electronic copies of the drainage exhibit and HEC-1 model included in the study back in November, so I think we are set there unless there have been additional changes).

Thanks again,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Mark Failla
Sent: Monday, February 04, 2013 8:17 AM
To: Douglas, Jeff (jdouglas@louisberger.com)
Cc: Jerrod Ratcliffe
Subject: Rancho Rd. System - Elkhorn Branch

Good Morning Jeff.

Peter and Todd mentioned that the Elkhorn Rd storm drain stub invert that our project is tying into has been revised. Will you please confirm the invert elevation and provide a copy of the supporting plan/profile sheet.

Thanks,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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CLV/CCRFCD Email Correspondence – November 20, 2012; February 25, 2013; February 26, 2013

Mark Failla

From: Randy McConnell <rmcconnell@LasVegasNevada.GOV>
Sent: Tuesday, November 20, 2012 4:16 PM
To: Mark Failla
Cc: Peter Jackson; Todd Myers (TMyers@regionalflood.org)
Subject: RE: Rancho-Fort Apache Storm Drain - Updated Hydrology 3 of 3

Both have initially reviewed and agree with what they have seen so far (may need a tweak here or there, but good starting point).

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Tuesday, November 20, 2012 4:14 PM
To: Randy McConnell
Subject: RE: Rancho-Fort Apache Storm Drain - Updated Hydrology 3 of 3

Excellent, I think. Is this the final stuff that both Todd and Peter have been thru and agree with, OR is it LBG's first submittal of the data? Either way, I will take a look, but may wait to go thru thoroughly if Todd and Peter still need to take a crack at it.

Thanks for forwarding and have a great Thanksgiving!

Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Randy McConnell [mailto:rmcconnell@LasVegasNevada.GOV]
Sent: Tuesday, November 20, 2012 4:06 PM
To: Mark Failla
Subject: FW: Rancho-Fort Apache Storm Drain - Updated Hydrology 3 of 3

Mark,

Attached is the updated HEC-1 info from LBG. I am going to be sending a few emails. Have fun!

Thanks
Randy

From: Douglas, Jeff [mailto:jdouglas@louisberger.com]
Sent: Wednesday, November 14, 2012 10:36 AM
To: Randy McConnell
Cc: Dudley, Syndi; Peter Jackson; Todd Myers (TMyers@regionalflood.org)
Subject: RE: Rancho-Fort Apache Storm Drain - Updated Hydrology 3 of 3

Randy,

Attached is an updated PDF with the input revisions for the Elkhorn and Hualapai systems highlighted (pages 33-35).

Please let me know if you have any questions or need anything else.

Jeff

From: Randy McConnell [mailto:rmcconnell@LasVegasNevada.GOV]
Sent: Wednesday, November 14, 2012 9:09 AM
To: Douglas, Jeff
Cc: Dudley, Syndi; Peter Jackson; Todd Myers (TMyers@regionalflood.org)
Subject: RE: Rancho-Fort Apache Storm Drain - Updated Hydrology 3 of 3

Jeff,

Is there any way to highlight the HEC-1 affected areas (there is 800 pages of stuff to go through).

Thanks
Randy

From: Douglas, Jeff [mailto:jdouglas@louisberger.com]
Sent: Tuesday, November 13, 2012 2:12 PM
To: Randy McConnell; Peter Jackson; Todd Myers (TMyers@regionalflood.org)
Cc: Dudley, Syndi
Subject: RE: Rancho-Fort Apache Storm Drain - Updated Hydrology 3 of 3

This time with the PDF actually attached . . . . . sorry about that.

From: Douglas, Jeff
Sent: Thursday, November 08, 2012 5:08 PM
To: rmcconnell@LasVegasNevada.GOV; pjackson@LasVegasNevada.GOV; Todd Myers (TMyers@regionalflood.org)
Cc: Syndi Dudley (sdudley@louisberger.com)
Subject: Rancho-Fort Apache Storm Drain - Updated Hydrology 3 of 3

Randy, Todd and Peter,

Attached is a PDF of the updated hydrology exhibit.

Jeff

Jeffrey S. Douglas, P.E., CFM
Project Engineer
Phone: 702.736.6632
Direct: 702.430.2034
Facsimile: 702.736.0704

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Mark Failla

From: Randy McConnell <rmcconnell@LasVegasNevada.GOV>
Sent: Monday, February 25, 2013 10:19 AM
To: Mark Failla
Cc: Jerrod Ratcliffe; Oh-Sang Kwon; Peter Jackson
Subject: RE: Rancho Rd. System - Elkhorn Branch SD

I think the drop manhole is ruled out. The concern is the drop manhole will corrode the manhole over time thus making a maintenance issue.

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Saturday, February 23, 2013 1:40 PM
To: Randy McConnell
Cc: Jerrod Ratcliffe; Oh-Sang Kwon; Peter Jackson
Subject: RE: Rancho Rd. System - Elkhorn Branch SD

Randy,

The replace the drop inlet option would be about $3,000 more than the drop manhole option.

We will double check if any of the connections could be accommodated with a collar at 45 degrees or less, but first check indicated an angle greater than 60 degrees. If we can install with collar at 45 degrees or less that will be preference#1. Based on Peter's comment, preference #2 would be to replace the existing DI. Let us know if the cost differential changes this preference.

Thanks again,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Randy McConnell [mailto:rmcconnell@LasVegasNevada.GOV]
Sent: Wednesday, February 20, 2013 1:07 PM
To: Mark Failla
Cc: Jerrod Ratcliffe; Oh-Sang Kwon; Peter Jackson
Subject: FW: Rancho Rd. System - Elkhorn Branch SD

Mark,

Please see Peter's response below, let us know which way would be more cost efficient.

Thanks
Randy

From: Peter Jackson
Sent: Wednesday, February 20, 2013 9:56 AM
To: Randy McConnell
Cc: Oh-Sang Kwon; 'Todd L. Myers'
Subject: RE: Rancho Rd. System - Elkhorn Branch SD

I talked with Mike Alert as well and we both prefer the concrete collar and angle point in the lateral if we are to use the existing inlets. It is constructible up to about 45 degrees for a drop into the RCB. Generally the steep lateral is fine as usually we need to use CLSM for the backfill.
If a new inlet is to replace the old inlet at a deeper depth that is also acceptable.
I do not recommend a new manhole as the lateral is connecting into the top of the manhole, and this is always more maintenance in the future.

Peter Jackson, CFM
Senior Engineering Associate
Department of Public Works
Flood Control Section
333 North Rancho Drive, 7th Floor
Las Vegas, Nevada 89106
(702) - 229 - 5266

pjackson@lasvegasnevada.gov

From: Randy McConnell
Sent: Thursday, February 14, 2013 11:21 AM
To: Peter Jackson
Cc: Oh-Sang Kwon
Subject: FW: Rancho Rd. System - Elkhorn Branch SD

I like the new manhole, thoughts?

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Thursday, February 14, 2013 11:01 AM
To: Randy McConnell
Cc: Peter Jackson; tmyers@regionalflood.org; Jerrod Ratcliffe
Subject: Rancho Rd. System - Elkhorn Branch SD

Randy/Peter/Todd,

We are running into a minor issue with three (3) storm drain lateral connections to the proposed mainline from existing drop inlets along the north side of Elkhorn. Initially the plan was to connect via a concrete collar, however in order to avoid conflict with a 6" gas the pipe slope would be in excess of 60% which we believe results in some constructability issues. The attached exhibit depicts three alternative designs that I would like to get your input on as to most preferred.

We are not considering keeping the existing drop inlets and laterals connected to the existing 18-inch storm drain on the south side of Elkhorn (unless you think otherwise) since that system is not a 100-year conveyance design, storm drain crossing storm drain is typically not desirable, and a portion of the storm drain would have to be removed and replaced to construct the mainline. If we do keep connected, the system would surcharge during the 100-year event, however street flow criteria on the south side of Elkhorn would still be met and remaining surface flow could be captured by the drop inlet on the south side of Elkhorn at the Elkhorn/Ft. Apache intersection proposed by the LBG design.

Please let me know your thoughts on this issue.

Thanks,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Jerrod Ratcliffe
Sent: Thursday, February 14, 2013 10:17 AM
To: Mark Failla
Subject:

Jerrod Ratcliffe
Assistant Project Manager

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Mark Failla

From: Peter Jackson <pjackson@LasVegasNevada.GOV>
Sent: Tuesday, February 26, 2013 11:30 AM
To: Mark Failla
Cc: Jerrod Ratcliffe; Todd L. Myers; Randy McConnell; Oh-Sang Kwon
Subject: RE: Rancho Rd System - Elkhorn Branch

Mark;
Flood Control supports your recommendation to go to a 7' x 6' RCB.

Peter Jackson, CFM
Senior Engineering Associate
Department of Public Works
Flood Control Section
333 North Rancho Drive, 7th Floor
Las Vegas, Nevada 89106
(702) - 229 - 5266

pjackson@lasvegasnevada.gov

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Tuesday, February 26, 2013 8:46 AM
To: Todd L. Myers; Randy McConnell
Cc: Jerrod Ratcliffe; Peter Jackson
Subject: RE: Rancho Rd System - Elkhorn Branch

Thanks for taking a look at this Todd. I do agree...I think the 7'x6' section is the way to go. Note that the 2008 MPU estimated a 7'x6' RCB for this facility.

Randy, Peter...any additional feedback regarding this issue before we proceed?

Thanks,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Todd L. Myers [mailto:TMyers@regionalflood.org]
Sent: Monday, February 25, 2013 3:54 PM
To: Mark Failla; rmcconnell@LasVegasNevada.GOV
Cc: Jerrod Ratcliffe; Peter Jackson (pjackson@LasVegasNevada.GOV)
Subject: RE: Rancho Rd System - Elkhorn Branch

Based on the WSPG, the system is extremely sensitive to roughness. I agree with Mark. If we use a pre-cast RCB, we will have joints every 6- to 8 ft. I think the .015 "n" value is a more representative model of what we will end up with. Considering this, and the relatively steep slopes and high velocities I concur (If Mark is, in fact, recommending this) with upsizing the RCB to a 7' x 6' section. With a 2500 LF reach, the cost of upsizing shouldn't be too bad (< $100 LF). Give me a call if you want to discuss it.

Todd L. Myers, P.E.
Engineering Project Manager
Clark County Regional Flood Control District
600 South Grand Central Pkwy, Suite 300
Las Vegas, Nevada 89106
www.regionalflood.org

Tmyers@regionalflood.org
702-685-0000 (phone)
702-685-0001 (fax)

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Monday, February 25, 2013 12:08 PM
To: rmcconnell@LasVegasNevada.GOV
Cc: Jerrod Ratcliffe; Peter Jackson (pjackson@LasVegasNevada.GOV); Todd L. Myers
Subject: Rancho Rd System - Elkhorn Branch

Randy,
Per my telephone conversation with Peter this morning, I have attached preliminary storm drain models for the mainline storm drain utilizing a Manning's "n" value of 0.015. The WSPG model named MAIN-015.OUT is with a 7'x5' RCB. As discussed, this model indicates issues with the HGL based on the tie-in starting HGL (2679.21) established by the LBG design. A copy of the preliminary corresponding plan and profile with the 7'x5' RCB is also attached. I have also attached the WSPG model for the 0.015 Manning's "n" value but with a 7'x6' RCB, named MAIN-015B.OUT. This model indicates that the HGL issues would be resolved with the slightly bigger box. Utilizing a 7'x6' RCB also would eliminate a transition structure at the tie-in location as the stub is also a 7'x6' RCB. As discussed, the 7'x5' RCB design hydraulics works well when modeling with an "n" value of 0.013; however the 0.015 "n" value may be more appropriate if a pre-cast RCB is used due to the joints. I have also attached this WSPG model, MAIN-013.OUT.

I have copied Peter and Todd this email for their review and direction. Let me know what you think.

Thanks,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Jerrod Ratcliffe
Sent: Monday, February 25, 2013 11:32 AM
To: Mark Failla
Subject:

Jerrod Ratcliffe
Assistant Project Manager

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CLV/CCRFCD Progress Meeting#5 Minutes – April 3, 2013

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Mark J. Failla

Project Number: CLV1201.01

SUBJECT:	Rancho Road System – Elkhorn (Fort Apache to Grand Canyon) Progress Meeting #5
MTG. PLACE:	City of Las Vegas Public Works Gravel Room 333 N. Rancho Drive Las Vegas, NV 89106
MTG. TIME:	3:30 PM
MTG. DATE:	April 3, 2013
ATTENDING:	Todd Myers, CCRFCD Mark Failla, SHG Peter Jackson, CLV Flood Randy McConnell, CLV Engineering Jerrod Ratcliffe, SHG

The progress meeting was held to update the project team on the project progress. The following items were discussed:

1. Mark F. provided a summary of primary meeting goals: 1.) Project Status, 2.) Project Coordination, and 3.) Project Schedule.

2. Project Status:
   - 70% Submittal to CLV & CCRFCD on 3/11/13.
   - 70% Submittal to CCPW on 3/14/13.

3. Project Coordination:
   - NVE: SHG/CLV met with NVE last month. NVE is proceeding with design.
   - SWG: Discussed SWG slack raise option for conflict resolution for drop inlet/lateral design at northwest corner of Grand Canyon/Elkhorn. Todd mentioned slack raise often doesn't work in field, but this alternative is acceptable. SHG will get final design info to SWG at receipt of 70% comments from CLV/CCRFCD. SWG will be paying for conflict resolution.
   - CLV/CCRFCD:
     - As of now, FASD & ESD projects will be bid separate. No changes have occurred with FASD project since 70% submittal that would impact ESD project.
     - CLV/RFCD decided that this project will bid RCB as pre-cast only. SHG will remove all cast in place options from plans & specs.
     - CLV/SHG needs to begin processing AEP at Grand Canyon ASAP. SHG will get exhibit to CLV to begin AEP acquisition process once 70% comments have been received. If there are no comments in the area the grading design will be finalized and the AEP exhibit will be prepared.
     - All abandoned pipes are to be filled with CSLM, or filled with sand if plugs on both ends.
     - Marker balls are to be used only for storm drain in Clark County. County general note for marker balls is to be added on plan sheet.

- In CLV general notes, edit marker ball notes for not using in CLV.

4. Project Schedule:
   - CLV Flood comments: +/- 2-3 weeks from receiving, Other CLV Departments and CCRFCD +/- 1-2 weeks from receiving. SHG should have all comments by end of April.

Action Items:

CLV
- Complete 70% Submittal review.

CCRFCD
- Complete 70% Submittal review.

SHG
- Prepare exhibit for AEP and forward to CLV for processing.

cc: Attendees

CLV/CCRFCD Progress Meeting#6 Minutes – August 7, 2013

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

MEETING NOTES
By: Mark J. Failla

Project Number: CLV1201.01

SUBJECT:	Rancho Road System – Elkhorn (Fort Apache to Grand Canyon) Progress Meeting #6	
MTG. PLACE:	City of Las Vegas Public Works Gravel Room 333 N. Rancho Drive Las Vegas, NV 89106	
MTG. TIME:	9:30 AM	
MTG. DATE:	August 7, 2013	
ATTENDING:	Todd Myers, CCRFCD Mark Failla, SHG Peter Jackson, CLV Flood	Randy McConnell, CLV Engineering Jerrod Ratcliffe, SHG Cheri Edelman, SHG

The progress meeting was held to update the project team on the project progress. The following items were discussed:

1. Mark F. provided a summary of primary meeting goals: 1.) Project Status, 2.) Project Coordination, and 3.) Project Schedule.

2. Project Status:
   - Received 70% Comments from CLV Survey on 3/26/13.
   - Received 70% Comments from CLV Traffic on 5/8/13.
   - Received 70% Comments from CCPW on 6/5/13.
   - Received 70% Comments from CCRFCD on 6/11/13.
   - Received 70% Comments from CLV Sewer on 6/20/13.
   - Pending 70% Comments from CLV Flood/Eng. (Received comments at meeting).

3. Project Coordination:
   - NVE:
     - (Per coordination with NVE subsequent to progress meeting) NVE design is complete; however they recently uncovered a buried manhole to the west of the drop inlet near Grand Canyon. Their crews are mapping the manhole and expect it to confirm the detail on their current design. If this is the case, the design will be ready for distribution in about a week. NVE also noticed the north side of the street and driveway entrances for the properties on the south side of Elkhorn (west of Grand Canyon) have been asphalted. SHG will verify if this is consistent with the new final grade; however if necessary NVE will adjust the previously buried manhole to final grade so it will not be buried again.
     - SHG will coordinate with NVE regarding design issues related to a future ultimate condition +/- 20-foot drop inlet on the southwest corner of Elkhorn/Grand Canyon that will be coordinated by SHG with the adjacent Savona project currently under design.
   - SWG: SHG is in continued coordination with SWG regarding the slack raise for conflict resolution for drop inlet/lateral design at northwest corner of Grand Canyon/Elkhorn. SHG will get final design info to SWG at receipt of 70% comments from CLV/CCRFCD.

Per coordination, SWG noted that they do not have any problem completing their design to meet our project schedule. SWG will be paying for conflict resolution.

- CCPW:
  - Per CCPW comments to match lateral storm drain inverts to mainline inverts, Todd will coordinate resolution with CCPW to address issue.
  - Todd will coordinate with CCPW to ensure the CCPW drainage study approval letter includes CLV concurrence.
  - Randy said he talked with Joe Yatson of CCPW, and Joe said that CCPW does not need to sign off on the approved plan set and that they will just issue a permit. Randy prefers that we keep the CCPW signature block on the plans and obtain signature from CCPW.
- Savona Project by Toll Brothers (SW Corner of Elkhorn/Grand Canyon):
  - Mark summarized coordination efforts with RCI Engineering who is currently processing a technical drainage study for the Savona Project by Toll Brothers located on the SW corner of Elkhorn/Grand Canyon.
  - Mark noted minor modifications to contributing drainage areas upstream of Grand Canyon. SHG will incorporate the revisions to the drainage areas. The impacts will be limited to the drop inlet size located on the SW corner of Elkhorn/Grand Canyon.
  - Mark noted that the Savona Study proposes no drop inlet at the SW corner of Elkhorn/Grand Canyon and that the project defers design/construction of the drop inlet to this Elkhorn Storm Drain (ESD) project. After group discussion, it was decided that the Savona project should assume that the ESD project is existing per current design plans. The Savona project should provide drop inlet design and include as a proposed facility on their plans considering removal of the interim drop inlet proposed by the ESD project and connection to the storm drain stub. The Savona project design should also include consideration for the drop inlet location based on incorporation of a right turn lane and potential utility conflicts, if required by CCPW. Should the Savona project be constructed first, the drop inlet should be constructed with a storm drain lateral stub in coordination (size, location and invert) with that proposed by the ESD project. SHG will coordinate this issue with RCI Engineering. SHG will provide sizing requirements (based on interception of entire 100-yr event interim condition flow determined by ESD study) for the ultimate condition drop inlet to RCI. It is expected that RCI will provide ultimate condition drop inlet design and supporting computations in their drainage study and design plans.
  - SHG verify planned construction schedule for Savona PH1, PH2 and PH3. Based on answer, we may need to show paving design on ESD plans as existing.
- Ft. Apache Storm Drain Project (FASD):
  - No noteworthy coordination issues have come up. ESD tie-in invert to FASD project invert was verified in the meeting.
  - Todd noted that the FASD project is funded and awaiting 90% agency comments.
- CLV/CCRFCD:
  - Randy is still reviewing 70% specs and will provide comment to SHG ASAP.
  - SHG will provide an AEP exhibit for the NW corner of Elkhorn/Grand Canyon.
  - Peter requested adding RCB curve/radius data on storm drain plan sheets. SHG noted that the curve data is included on Horizontal Control Sheets. It was acceptable to Peter to just add note on Storm Drain Plan Sheets referencing curve data located on Horizontal Control Plan sheets.

- CLV and CCRFCD agreed that this project will only provide for a pre-cast RCB. Randy confirmed that the specs reference ASTM/AASHTO which provide for a 3-sided box alternative.
- Marker balls are to be used only for storm drain in Clark County. A special note depicting which laterals need marker balls is to be provided on plans. The note should include verbiage to coordinate with County inspector.
- Clark County general notes need to be added to plans.
- Station 44+00; Include sanitary sewer removal/replacement and bypass as incidental to RCB construction in specs in the event that RCB excavation requires replacement. The specs should also include support of the sanitary sewer during construction.
- Due to high velocities in RCB, CLV and CCRFCD will require the use of either sacrificial concrete along the bottom of the RCB or specification of higher strength concrete (6000 psi). Todd noted that he thinks Rinker uses 6000 psi concrete as a standard in their pre-cast RCB's. Mark will verify with Rinker. SHG will identify in specs which segments of RCB require higher strength/sacrificial concrete.

4. Project Schedule:
   - 90% Submittal date set at October 7, 2013 (Based on 60 calendar days following receipt of all City comments. All comments were received 8/7/13.)
   - CCRFCD Project Presentations - TBD
   - 100% (Pre-final) Submittal – 30 calendar days following receipt of all 90% City comments
   - 100% (Final) Submittal - 30 calendar days following receipt of all 100% (Pre-Final) City comments

Action Items:

CLV
- Randy to complete review of 70% specs.

CCRFCD
- Coordinate with CCPW regarding comment to match lateral storm drain inverts to mainline invert.
- Coordinate with CCPW to ensure CCPW drainage study approval letter includes CLV concurrence.

SHG
- Prepare exhibit for AEP and forward to CLV for processing.
- Coordinate with RCI Engineering on Savona project. Provide RCI drop inlet flow interception requirements based on ESD design.
- Call Rinker to verify 6000 psi concrete in RCB.
- Coordinate NVE relocation design to include ultimate drop inlet size/location.

cc: Attendees

Rinker Materials Email Correspondence –
August 21, 2013

Mark Failla

From: Mario F Ramirez <mariof.ramirez@cemex.com>
Sent: Wednesday, August 21, 2013 10:34 AM
To: Mark Failla
Cc: Michael Mula
Subject: Re: Rancho Rd System - Elkhorn Branch (Ft. Apache to Grand Canyon) Storm Drain Project
Attachments: 2203_001.pdf.zip

Mark,

This email is to verify to you that we do use a 6000 psi mix design for our precast boxes. I have attached a copy of our mix design for your reference. Please treat the mix design sheet as proprietary information. Let us know if you need anything else.

Thanks,

Mario Ramirez
Rinker Materials - Concrete Pipe Division - Account Manager
Office : +702(565)8721 Fax: +702(565)3076 Mobile: +702(499)6121
Address: 2100 Burns Avenue - Henderson, NV 89011
e-Mail: mariof.ramirez@cemex.com
www.cemex.com

Please consider the environment before printing this email.

From: Mark Failla <mfailla@shg-inc.com>
To: Mario F Ramirez/US/Cemex@CEMEX
Cc: Jerrod Ratcliffe <jratcliffe@shg-inc.com>
Date: 08/21/2013 10:20 AM
Subject: Rancho Rd System - Elkhorn Branch (Ft. Apache to Grand Canyon) Storm Drain Project

Mario,
Per our telephone conversation, would you please verify the concrete strength design for your pre-cast box storm pipe. As discussed, our design proposes a 7'x6' RCB with 100-year storm event velocities exceeding 25 fps in some locations. CLV and CCRFCD have agreed that a concrete strength of 6000 psi or greater is acceptable in lieu of a thicker "sacrificial" layer of concrete to guard against the high velocity impacts. If you could also provide a copy of the technical data sheet for the mix design that would be great.

Thanks again,
Mark

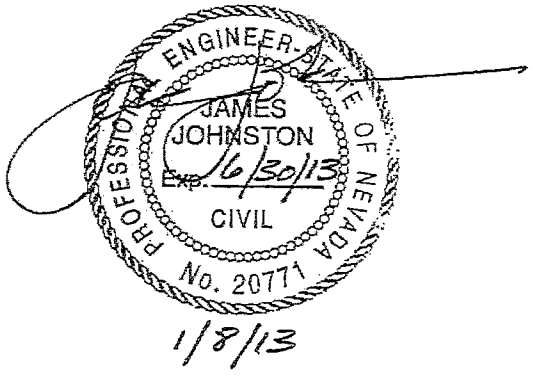
Mark Failla, P.E., CFM
Associate/Director of Flood Control

Rinker MATERIALS™

REVISION -	QUANTEC PL-450
DATE -	1/7/2013

PROD ID	MIX DESIGN - DRY CAST 6000psi (41.4 Mpa)	PROJECT	STATION
2008-3-12	DRY CAST 6.18 Sack mix w/ 20% FLYASH		

					1.00 YD³ DESIGN			1.00 M³ DESIGN		
SILO		MATERIAL	SUPPLIER	MOISTURE	LBS	KILOS	CY	LBS	KILOS	CM
SILO # 1	TYPE V	CEMENT	CEMEX		463	210	0.087	606	275	0.087
SILO # 3	CLASS F	FLY ASH	ISG - PAGE AZ		118	54	0.030	154	70	0.030
ADMIX1		QUANTEC PL-450	W R GRACE		0.25	0.11		0.33	0.15	
AG34		SAND	BARDON / SLOAN	6.00%	1592	722	0.365	2082	945	0.365
AG1		ROCK	BARDON / SLOAN	-1.00%	1778	806	0.376	2325	1055	0.376
W2		WATER			242	110	0.144	317	144	0.144
W/C RATIO					0.42	0.42		0.42	0.42	
TOTAL WEIGHT					4193	1902	1.001	5485	2488	1.000



1/8/13

CLV/CCRFCD Email Correspondence –
August 28, 2013

Mark Failla

From: Todd L. Myers <TMyers@regionalflood.org>
Sent: Wednesday, August 28, 2013 3:35 PM
To: Mark Failla
Cc: rmcconnell@LasVegasNevada.GOV; Jerrod Ratcliffe
Subject: RE: Rancho Rd. System - Elkhorn Branch

Yea I did. I talked to Wade regarding the laterals and explained that we were avoiding the HP gas with the lateral from DI#2, and DI#1 collects only minor flows (compared to the mainline flow) and we may have a conflict with the UGE bank. He was fine with them the way they are. Just explain it in your response letter. Also, he is requiring CLV concurrence.

Todd L. Myers, P.E.
Engineering Project Manager
Clark County Regional Flood Control District
600 South Grand Central Pkwy, Suite 300
Las Vegas, Nevada 89106
www.regionalflood.org

Tmyers@regionalflood.org
702-685-0000 (phone)
702-685-0001 (fax)

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Wednesday, August 28, 2013 11:50 AM
To: Todd L. Myers
Cc: rmcconnell@LasVegasNevada.GOV; Jerrod Ratcliffe
Subject: Rancho Rd. System - Elkhorn Branch

Todd,
Have you had a chance to contact CCPW with regard to their comment #8 (attached) to connect laterals to mainline invert? We are ready to prepare 90% updates and need this answer. Let me know what you find out.

Thanks,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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RCI Email Correspondence –
August 16, 2013 thru September 11, 2013

Mark Failla

From: Rick J. Read <rread@rcinevada.com>
Sent: Thursday, August 22, 2013 2:39 PM
To: Mark Failla
Cc: Jerrod Ratcliffe; Chris Zrinyi; John Land
Subject: RE: Elkhorn Storm Drain Project/Savona Project Coordination

Mark,

1. RCI Engineering will provide the drop inlet on the Savona Unit 3 plans on the southwest corner of Elkhorn and Grand Canyon. The drop inlet will be designed to intercept the 17 cfs interim storm flow.
2. Savona Unit 2 is scheduled for rough grading in September and plan approval and offsite construction in the middle of October.
3. I believe the asphalt you are talking about was placed in Elkhorn Road with the Savona Unit 1 (Quencia Ridge) improvements. Baughman Turner originally prepared those plans and then Wood Rogers finished them up. We should have PDF's around here and I'll get a copy of them over to you.
4. RCI does not anticipate that a right hand turn lane will be required for Elkhorn Road, since entitlements for the project do not require one.

Rick J. Read, PE
RCI Engineering

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Friday, August 16, 2013 2:07 PM
To: Rick J. Read
Cc: Jerrod Ratcliffe; Chris Zrinyi
Subject: Elkhorn Storm Drain Project/Savona Project Coordination

Rick,
Thanks again for forwarding your project drainage study and grading plans in coordination of the above subject projects. I have had a chance to review the information and discuss with both CLV and CCRFCD at our last progress meeting held on 8/7/13. The following provides a summary of our meeting discussion:

- The Elkhorn Storm Drain (ESD) project is planned to be 90% complete and funded by the end of this year, with construction anticipated in the first half of 2014.
- The ESD hydrologic modeling will be revised to update the contributing areas to Elkhorn Road in coordination with the Savona grading plans and drainage study.
- Based on our meeting, CLV/CCRFCD is requesting that the Savona PH3 project assume that the ESD storm drain improvements are constructed per current design plans (90% design plans will be available 10/7). The Savona project should provide the drop inlet design at the SW corner of Elkhorn/Grand Canyon) and include as a proposed facility on their plans considering removal of the interim drop inlet proposed by the ESD project and connection to the storm drain stub. The drop inlet design should also include consideration for the drop inlet location based on potential utility conflicts. Should the Savona project be constructed first, the drop inlet should be constructed with a storm drain lateral stub in coordination (size, location and invert) with that proposed by the ESD project, and covered to prevent interception of storm flow prior to connection to the ESD facilities. The drop inlet sizing should be based on interception of the entire 100-yr event interim condition flow determined by ESD study (17 cfs per revised hydrology). It is expected that RCI will provide ultimate condition drop inlet design and supporting computations in their drainage study and design plans.
- CLV and CCRFCD concurrence of the Savona PH3 project is required.
- Question#1: You noted that the construction schedule for Savona PH3 is November of this year (2013). What is the construction schedule for the Savona PH PH2 site? On a site visit we noticed that asphalt had been placed along Elkhorn west of Grand Canyon; was this constructed per the Savona PH1 project? If so, is the design grade of the asphalt set at ultimate grade? Also, if so, what is status of dry utility coordination?...NV Energy has

indicated that they recently uncovered a buried manhole, and are currently re-mapping it and plan on adjusting the rim elevation, but are also wondering if the road is at finished grade. Our plans currently do not depict the asphalt as existing (since it wasn't there at time of our 70% design). We will be obtaining additional survey to as-built the asphalt improvements that have occurred since our 70% design.

- Question#2: At our meeting, CLV questioned whether a right turn lane is required on Elkhorn, although not indicated on your design plans. If required by CCPW, this would impact the drop inlet location. Do you anticipate a right turn lane to be required by CCPW?

I will follow up this email with a phone call to discuss, but thought writing it down light initially be more clear and give you time to think about it.

Thanks,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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Mark Failla

From: Rick Read <rread@rcinevada.com>
Sent: Wednesday, September 11, 2013 10:34 AM
To: Mark Failla
Subject: RE: Quencia 1 plans
Attachments: S007_P-1.pdf; S007_P-2.pdf; S007_P-3.pdf; S007_P-4.pdf; S007_P-5.pdf; S007_P-6.pdf; S007_P-7.pdf; addendum-revised.pdf

Mark,

I think you meant Savona 3 plans. Please see attached. I will send two more e-mails with the rest of the files.

Rick

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Wednesday, September 11, 2013 10:01 AM
To: Rick Read
Subject: RE: Quencia 1 plans

Hi Rick.

Can you provide me with a copy of the updated plans and report that you prepared and submitted to CC for inclusion of the drop inlet. We are preparing our 90% submittal over the course of the next two weks and I plan on including your info as reference as to our coordination. I will forward our 90% submittal to you when it is complete. If you need anything from me let me know.

Thanks again,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Rick Read [mailto:rread@rcinevada.com]
Sent: Wednesday, August 28, 2013 2:39 PM
To: Mark Failla
Cc: John Land; Chris Zrinyi
Subject: RE: Quencia 1 plans

Mark,

We are adding the inlet to our plans and swapping the updated design out with the drainage study addendum #1 that was submitted on July 31. We are swapping those out tomorrow before the review starts, so we can get it approved this run through. We will design the inlet and storm drain in Elkhorn to match what you previously sent to us. If there are

any changes to your plans due to the additional field work, we will make adjustments to our plans at that time to tie your design.

Rick Read, PE

From: Mark Failla [mailto:mfailla@shg-inc.com]
Sent: Monday, August 26, 2013 9:14 AM
To: Rick Read
Cc: Chris Zrinyi; Jerrod Ratcliffe
Subject: RE: Quencia 1 plans

Thanks Rick.

We are getting additional field work done along Elkhorn early this week to account for the addition of the paving. When it is complete, we will be verifying that the interim drop inlet/stub locations are still good from the 70% design plans. Before you finalize incorporation of the ultimate drop inlet on your plans, I would like to verify that the stub location/invert still work. Hopefully you have the time to spare while we await the field work.

Thanks again,
Mark

Mark Failla, P.E., CFM
Associate/Director of Flood Control

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From: Rick Read [mailto:rread@rcinevada.com]
Sent: Saturday, August 24, 2013 7:53 AM
To: Mark Failla
Cc: Chris Zrinyi
Subject: Quencia 1 plans

Mark,

Attached are PDF's of the grading in Elkhorn Road for the Quencia 1 Project. We are adding the DI on Elkhorn to the plans and will get that file to you when we get it done. Good seeing you the other day. Lets go swim laps one of these days.
We are
Rick

Rick J. Read, P.E.

RCI Engineering

Main# 702.453.0800
Fax# 702.453.0801

APPENDIX H

Response to CLV/CCRFCD/CCPW 70% Review Comments

Response to CLV/CCRFCD/CCPW 70% Review Comments

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
			DRAFT FINAL DESIGN REPORT & DRAINAGE REPORT	
1	General	Flood (PJ)	Flood Control concurs with the overall hydrology for this MPU facility and detailed local analysis of the hydrology for the drop inlet collection system.	No action.
2	General	Flood (PJ)	The provided WSPG analysis shows the velocities consistently above 25 fps. With the design process, the engineer must recommend the preferred alternative for mitigating the higher velocity flows on these proposed facilities. Per the CCRFCD Design Manual, design considerations must be reviewed to reduce the velocity and/or provide facility protection. Provide special details and the supporting hydraulic calculations to show how the higher velocities are being mitigated.	A-Per meeting coordination with CLV/CCRFCD, the use of 6000 psi strength or greater concrete is acceptable mitigation for velocities exceeding 25 fps. The project allows for pre-cast RCB only. The standard concrete strength spec for pre-cast RCB is 6000 psi per data spec sheet provided by Rinker Materials. No further mitigation is considered necessary. A copy of the pre-cast RCB spec sheet and correspondence from Rinker has been included in the appendix of the drainage study for your information.
3	General	Flood (PJ)	Flood Control noted CCRFCD's acceptance of the Environmental Screening on November 6,2012	No action.
4	General	Flood (PJ)	Continue to coordinate this project with the Rancho Road System Fort Apache - Echelon Point Drive to Elkhorn Road project for Fort Apache Road prepared by LBG.	A-Coordination will continue.
5	General	Flood (PJ)	Provide enlarged detailed grading plans for Storm Drain Lateral #6 at the northwest corner of Tee Pee Lane and Elkhorn Road. Review clearance issues with the 16" HP Gas line.	A-Details have been provided. Gas lines have been coordinated with SWG.
6	General	Flood (PJ)	Provide detailed grading plans for the area drop inlets that include the concrete collar, rip-rap and grading swale transitions.	A-Details have been provided.
7	General	Flood (PJ)	The construction of the curved RCB section near Station 44+00 crosses the existing 12-inch Sanitary Sewer at a shallow angle. This could require the sewer to be removed and replaced. The associated costs are incidental to the RCB construction and need to be covered within the Specifications.	C-It is anticipated that the 35-foot span of the 12-inch sewer will be able to be supported during construction without removal and replacement of the sewer. As such, no separte specification for sewer bypass has been added at this time, nor has the bypass been included as incidental to the RCB construction. This issue is currently being coordinated to confirm and will be updated as necessary with the next submittal.
8	General	Flood (PJ)	Review the marker ball requirements with Clark County Public Works for those inlets located within County Right-of-Way. Provide County Notes as required.	A-Notes have been added.
9	General	Flood (PJ)	Show the RCB angle points and/or curved segments by station location and angle/degree change. Include the radius information and discuss how the curved sections are to be completed using curved forms or multiple angled segments. This needs to be explained within the Specifications.	A-RCB alignment is included on the horizontal control plan. Additional information has been added to the plan and profile in the curved section.
10	General	Flood (PJ)	Plans reference NDOT standard plans for the detail of the RCB construction. System design needs to accommodate the construction option of pre-cast or cast-in-place improvements. Verify that the Specifications and schedule accommodate the construction methods.	A-After comment was made, the team decided to remove the cast-in-place option and RCB will be specified as precast only.
11	General	Flood (PJ)	Provide Access Manholes along the RCB at 400-foot spacing. Adjust spacing to include Manholes near the junction structures for maintenance consideration. Consider using Manhole openings that are cast with the RCB's to reduce costs.	A-Manhole locations have been revised. RCB is proposed pre-cast only and manhole openings will be pre-cast.
12	General	Flood (PJ)	Review the storm drain removals to include cap & slurry for storm drain abandoned in place.	A-Cap and slurry abandonment has been added to the removal plans.
13	General	Flood (PJ)	Provide detail sheets showing typical details needed for the construction, connection and any special transition structure details. Structural details, if required, must be submitted by the 90% submittal.	A-Structural details have been included in the 90% submittal.
14	General	Flood (PJ)	Add a note for all storm drain drop inlets that references the newly adopted USDCCA Drawing No. 421 (Stormwater Quality Management Stamp and Sign Detail). Include the USDCCA Drawing No. 421 (Stormwater Quality Management Stamp and Sign Detail) note to the concrete collar detail for the NDOT Type 2B inlets.	A-Reference has been added to the drop inlet and concrete apron details.
15	General	Flood (PJ)	Provide an updated cost estimate with the next submittal. The cost estimate must be refined for the 90% submittal and prior to requesting the construction funding to assure that the requested and allocated storm drain funds are sufficient for construction.	A-Updated cost estimate provided with 90% submittal.
16	General	Flood (PJ)	The Final Design report needs to include an electronic copy of the entire report with the input and output files for the hydraulics and hydrology.	A-Electronic copy is provided with the 90% submittal.
17	General	Flood (PJ)	See the plans for additional comments.	A-Plan comments have been addressed.
18	General	Traffic (DP)	Construction shall be daytime only and must maintained minimum of one travel lane in each direction, for left turn maintain 100' storage typical at major intersection.	A-Specifications include reference to day work only.
19	General	Traffic (DP)	Construction must be day work (residential). Pavement on the south side in?? Victor to coordinate striping and bike lane on the south side.	A-Specifications include reference to day work only. Plans have been revised to show striping improvements done by DR Horton.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
20	General	Traffic (DP)	Town Center 40/50 #1 permit have been extended to 2-27-14.	No action.
21	General	Traffic (DP)	E.S.School boundary Thompson and Danell(CC), and Escobedo for M.S.	No action.
22	General	Survey (JT)	No corrections needed at this time.	No action.
23	General	RFCD (TM)	Special Provisions 104.04F & 624.03.72B - The provisions give a maximum of 300-ft of open trench during working hours and no open trench during non-working hours. Typically, contractor is allowed 100-ft open trench during non-working hours. Also, consider allowing 500-ft open during working hours. If we end up allowing cast-in-place construction, we will need to revise this SP to allow for open trench intersection to intersection in order to make it a viable option.	A-Specifications have been revised to allow a maximum of 500-feet of open trench during working hours and 100-feet of open trench during non-working hours. Per CLV/CCRFCD, project will allow for pre-cast option only.
24	General	RFCD (TM)	Once the Clark County permit is obtained, we will want to coordinate with inspection group (Art Alvarez) to determine what his group is going to require, and what exactly they will want to inspect. The encroachment permit will likely say call 24-hrs in advance for inspections. However, they have been taking as long as 5-days because of increased workload and under staffing. We just need to make sure contractor is aware. It should be a discussion item at Pre-Bid meeting.	A-Discuss at pre-bid with contractor.
25	General	Drainage (WG)	The basin delineations, CN's and flow rates were not reviewed as it appears CLV and RFCD are in agreement with the design flows.	No action.
26	General	Drainage (WG)	Only the portions within Clark County were reviewed (west of Grand Canyon centerline on Elkhorn, Sheets SD-01 and SD-04).	No action.
30	General	Drainage (WG)	The flow on Sheet SD-01 of 668 cfs minus 631 cfs shows 37 cfs enters per 24-inch RCP. The profile for this lateral on Sheet SD-04 shows 45 cfs.	B-The mainline storm drain was designed based on Reginal design flows and the lateral storm drains were designed based on the higher local design flows. The design flows for each respective system is what is identified on the profiles. No action required.
34	General	Drainage (WG)	It does not appear 10-year street analysis has been completed to size the drop inlets and laterals. Typically the 10-year criteria is the limiting factor in inlet design. The drop inlets and laterals may be undersized with respect to meeting the 10-year street criteria.	B-Interim condition sump drop inlets located in Clark County have been designed to intercept the entire 100-year strom event flow. Since these inlets are based on weir and orifice equations they also have capacity to intercept the entire 10-year storm event flow rate. Per street flow discussion provided in Section 4.3 of the drainage study, the maximum 10-year storm event capacity in Elkhorn meeting criteria ranges from 47 to 67 cfs. In all cases along Elkhorn, the maximum flow rate meeting 10-year criteria far exceeds design surface flows at any location even for the 100-year storm event. Even if all continuous grade drop inlets along Elkhorn intercepted zero flow, the cumulative flow along the entire reach to Fort Apache would still meet 10-year criteria. No further evaluation is considered necessary.
			DRAWINGS (70%)	
1	G-01	Civil (RM)	Is "Freeway and Arterial System of Transportation" required for signature, how much work done/affected for this entity?	B-There is some existing ITS conduit. FAST has reviewed and is ready to approve the plans so best just to get approval.
2	G-02	Civil (RM)	Verify all line types for existing are dashed not solid (e.g., existing curb & gutter).	A-Linetype revised.
3	Typical of all sheets	Civil (RM)	Add utility disclaimer notes to all sheets with excavation.	A-Disclaimer notes has been added to removal plans.
4	R-01	Civil (RM)	Adjust 2" Cold Mill hatch pattern (lighten) so existing utilities can be legible.	A-Hatch has been lightened.
5	R-01	Civil (RM)	Add "protect-in-place" note to existing 30-inch SD that remains in Grand Canyon Drive.	A-Protect in place note added to 30" storm drain.
6	SD-Typical	Civil (RM)	Can you lighten up the hatch for the 2-inch Mill/Overlay (will other stuff be legible on mylar?)	A-Hatch has been lightened.
7	SD-Typical	Civil (RM)	Should we just plug existing SD lateral at the manhole?	A-Cap and slurry abandonment has been added to the removal plans.
8	SD-02	Civil (RM)	Note for 20-ft Drain Esmt work states to "see R-01 for additional information", what information is on sheet R-01?	A-Note has been removed.
9	SD-02	Civil (RM)	What is Ex. 18" SD note near ST A. 52+00 for?	B-Comment was made at earlier submittal to identify existing storm drain pipe sizes and locations.
10	SD-03	Civil (RM)	Verify the rubber joints is all the LVVWD will require for the 8-inch wtr crossing near ST A 63+25.	A-LVVWD has accepted the crossing details.
11	SD-03	Civil (RM)	May need to add a note to either plug or remove plug at tie-in location.	A-Plug removal has been added to removal plans and storm drain plan and profile.
12	SD-04	Civil (RM)	Lateral Profile 3 - is there enough room from the existing sanitary sewer line and the proposed manhole?	B-Since we are replacing an existing manhole it is assumed that the new manhole can be constructed in the same location.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
13	SD-06	Civil (RM)	Remove cast-in-place box section, we are only using pre-cast sections. Any connections that will require cast-in-place need to be detailed (e .g., tie-in, etc.).	A-Cast-in-place has been removed.
14	SD-06	Civil (RM)	Any notes on: protecting trench walls, OSHA, CLSM back-fill, etc. for the RCB & Pipe sections?	C-Section 208 of the special provisions covers OSHA, CLSM notes have been added. Can further discuss adding OSHA references to plans.
15	SD-07	Civil (RM)	Profile mentions stationing but nothing provided for profile.	C-Not sure what comment refers to.
16	ST-Typical	Civil (RM)	Will hatch color be reproducible (will it be too dark)?	A-Hatch has been lightened.
17	SS-01	Civil (RM)	Provide stations for the profile?	B-The sanitary sewer alignment and profile is projected to the RCB alignment so grid is for reference.
18	SS-01	Civil (RM)	Add utility disclaimer.	A-Disclaimer notes have been added.
19	G-02	Flood (PJ)	You should add another benchmark. Construction will likely require replacement.	C-Benchmark called out will not be impacted by construction.
20	G-03	Flood (PJ)	Remove Note 22 from the City of Las Vegas General Notes.	A-Note has been removed.
21	G-03	Flood (PJ)	Add County General Note for marker balls.	A-Note has been added.
22	G-04	Flood (PJ)	Label Clark County and City of Las Vegas limits.	A-Limits have been identified.
23	G-04	Flood (PJ)	Is this the only location an AEP is needed?	A-This is the only area requiring an AEP.
24	R-01	Flood (PJ)	Extend limit of 2" Cold Mill near Station 21+00 for the removal of existing storm drain pipe.	A-Limits have been revised.
25	SD-Typical	Flood (PJ)	Cap and slurry storm drain that is not removed. Typical cover in specs. Same as sewer.	A-Cap and slurry abandonment has been added to the removal plans.
26	SD-01	Flood (PJ)	Provided detail grading around proposed area inlet proposed in Grand Canyon Drive just north of Elkhorn Road.	A-Detailed grading has been provided.
27	SD-01	Flood (PJ)	Add riprap to the upstream side of the area inlet proposed in Grand Canyon Drive just north of Elkhorn Road.	B-Area inlet is located in Clark County. Per coordination with CCPW, Clark County does not desire riprap in ROW/Patent Easement. Area inlet design includes concrete apron with cutoff walls for inlet protection.
28	SD-01	Flood (PJ)	Label Clark County and City of Las Vegas limits.	A-Limits have been identified.
29	SD-01	Flood (PJ)	Show the relocation of the NVE facility crossing the proposed area inlet in the south half of Elkhorn Road just west Grand Canyon Drive.	A-NVE relocation has been added.
30	SD-01	Flood (PJ)	Constructability. If segment is removed, cost is incidental.	A-Incidentals for removal/replacement/bypass of existing sewer has been added to RCB installation.
31	SD-02	Flood (PJ)	Label 8" sewer line crossing near Station 55+60 as 'new' per sheet SS-01.	A-Sewer has been identified as new.
32	SD-02/SD-03	Flood (PJ)	Label Improvements by DR Horton as 'Existing'.	A-Improvements are existing and plans have been revised.
33	SD-04	Flood (PJ)	For Lateral #3, it is recommended that the separation from the existing 16" high pressure gas line be increased to a minimum of 1'.	A-Storm drain have been raised and SWG is relocating 4" gas line.
34	SD-04	Flood (PJ)	For Lateral #3, the existing 4" gas line may need to be relocated.	A-Storm drain have been raised and SWG is relocating 4" gas line.
35	SD-07	Flood (PJ)	Review and revise so that details on Sheet SD-07 and SD-09 match.	A-SD-09 has been revised.
36	SD-07	Flood (PJ)	Provide detail grading. Why are conc. Elevations below grate. See SD-09.	A-Detailed grading has been provided and grates have been revised to be flat.
37	SD-08	Flood (PJ)	Call out grate type for drop inlet. Grate openings are needed to be perpendicular to opening.	A-Detail has been updated.
38	SS-01	Flood (PJ)	Show proposed inlet in the sewer line profile.	A-Inlet has been added.
39	R-01	Construction Management (TH)	Show the extent of the NVE line relocation.	A-NVE relocation has been added.
40	R-01/R-02	Construction Management (TH)	Show caps at the end of the storm drain removal.	A-Cap and slurry abandonment has been added to the removal plans.
41	SD-01	Construction Management (TH)	Provide Construction Note 4 to the manhole at "ER" Station 20+31 92' LT.	C-Not sure what comment refers to.
42	SD-01	Construction Management (TH)	Provide Construction Note 12 to Existing 18" SD call out near "ER" Station 20+31 92' LT.	A-Connection of existing pipes to new manhole has been added to lateral #3 on SD-04.
43	SD-01	Construction Management (TH)	Where is sewer near "ER" Station 40+40.	A-Sewer is shown on lateral #3 on SD-04.
44	SD-04	Construction Management (TH)	Can the proposed 30" RCP lateral extending from Special Drop Inlet #3 be a 24" RCP?	B- No. Pipe has been raised and SWG is relocating 4" gas line. Storm pipe has been revised to a 29"x45" HERCP due to separation requirements from gas line and to provide adequate freeboard to HGL.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

Rancho Rd. System
Elkhorn Branch-Ft. Apache to Grand Canyon
Response to 70% Comments

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
45	SS-01	Construction Management (TH)	Bypass as required.	B-Cast-in-place manhole bases have been specified so that manholes can be constructed without impacting existing flows. Minor flow stoppage can be done during daytime hours as needed to channelize the bases if needed.
46	General	Sewer (KL)	Upon further consideration, Sewer will not require any type CLSM fill or concrete encasement when sewer passes over Storm Drain. The engineers can remove this from the 90% plans.	A-CLSM backfill has been removed.
47	General	Traffic (DP)	Patch limits not quite on lane line but ok, lane line transitions.	No action.
48	General	Traffic (DP)	Pavement marking are shown to be replaced - in kind. For ST-01, call out 100' of skip bike lane line for westbound before Tee Pee Ln, and also west bound before Val River, the right turn Arrow and Only, should not have existed. So remove from plans.	A-Plans have been revised. Arrow and only is provided for forced right turn lane.
49	G-03	RFCD (TM)	Revise Note 22 in the City of Las Vegas General Notes to the latest version.	A-Note has been removed per CLV comment.
50	R-01	RFCD (TM)	Consider adjusting 2" Cold Mill hatch. Hard to see all removal items.	A-Hatch has been lightened.
51	R-01/SD-01	RFCD (TM)	Clearly show CLV/Clark County limits.	A-Limits have been identified.
52	SD-01	RFCD (TM)	Because the Elkhorn Rd and Grand Canyon Dr intersection is so busy, consider providing a blow-up.	A-Detailed grading for each drop inlet at the intersection has been provided.
53	SD-01	RFCD (TM)	Clarify whether the high pressure gas line is an 16" or a 6"	A-Plans have bee revised.
54	SD-02	RFCD (TM)	Show proposed 8" sewer line on the plan view	A-Sewer has been added.
55	SD-04	RFCD (TM)	For Lateral #3, consider raising 4" gas line to get more clearance over 16" high pressure gas line.	A-Storm drain have been raised and SWG is relocating 4" gas line.
56	SD-04	RFCD (TM)	For Lateral #3, is 6" clearance acceptable for a high pressure gas line? Note that the high pressure gas line is in the (scarified) trench section.	A-Storm drain have been raised and SWG is relocating 4" gas line.
57	SD-04	RFCD (TM)	For Lateral #2, show 6" gas line.	A-Gas has been added.
58	SD-04	RFCD (TM)	For Lateral #2, plan view on Sheet SD-01 shows 6" high pressure gas line. Verify.	A-Plans have been revised.
59	SD-06	RFCD (TM)	Are we going to allow cast-in-place? Discuss at next meeting.	A-Cast-in-place has been removed.
60	SD-07	RFCD (TM)	Provide maximum slope % for Section A.	A-Maximum slope has been provided.
61	G-01	Drainage (WG)	Why is 'Rancho' in the title of the project when the project is not near Rancho?	B-Per the CCRFCD MPU, the Elkhorn storm drain has Facility ID RCHB0295 as it is part of the Rancho Road System-Beltway storm drain system.
62	General	Drainage (WG)	Provide overall sheet in plan set.	C-A vicinity map is included on Sheet G-02 and Key Maps identifying the overall project limits are provided on R, SD, SS and ST sheets. An additional overall project limits sheet is considered unneccesary.
63	SD-01	Drainage (WG)	Revise Sheet SD-01 to label CLV and County.	A-CLV/CC limits have been added.
64	SD-01	Drainage (WG)	Revise Sheet SD-01 to add future flow in profile upstream of Station 39+15.	C-Per report discussion and Exhibit H, the mainline system was designed based on regional flow analysis. Flow changes in the mainline system are only reported between segments (Hualapai to Grand Canyon, Grand Canyon to Tee Pee, and Tee Pee to Fort Apache) that correspond to the regional hydrologic analysis. The future extension of the facility should be designed for 631 cfs. No further action required.
65	SD-Typical	Drainage (WG)	The Criteria Manual requires manholes at all grades breaks. There are several locations where criteria is not met.	C-Manholes have been relocated to accommodate CLV comment to locate manholes near junction structures and at max. 400-ft spacing. Providing additional manholes at all grade breaks along the mainline RCB would result in an unnecessary and excessive number of manholes. CLV and CCRFCD did not provide similiar comment to provide additional manholes at all grade break locations, therefore manholes have not been added at these locations. No grade breaks along the RCB mainline are proposed within the portion of the project located in Clark County.
66	SD-04	Drainage (WG)	Connect laterals to the mainline at the inverts within Clark County.	C-Per coorindation between Todd Myers of CCRFCD and Wade Gerstenkorn of CCPW, the lateral designs as proposed with the 70% submittal are acceptable.
67	SD-04 & SD05	Drainage (WG)	Label HGL within drop inlets on profiles.	A-HGL's have been added thru the drop inlets on all profiles.
68	R-03	Drainage (WG)	Use precast concrete plug for RCP plugs, not brick and mortar.	A-No RCP plugs are proposed within Clark County. Brick and mortar RCP plug option is acceptable to CLV/CCRFCD. A note has been added to the detail stating that a pre-cast plug is an acceptable alternative.
SPECIFICATIONS (70%)				
1	TOC	Civil (RM)	I didn't see the need for SP 204 Rounded and Transition Slopes.	A-SP 204 removed.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

No.	Drawing/ Spec.	Comment By (Initials)	Comment	Design A/E Action & Explanation
2	SP 104	Civil (RM)	Revise open trench length to 500 feet.	A-Open trench revised to 500 feet.
3	SP 105	Civil (RM)	Fill in unknown areas in construction coordination area.	A-Missing information has been added.
4	SP 108	Civil (RM)	Should redirection of storm drain flows be moved somewhere else in the specs?	A-Has been moved to 107.12
5	SP 203	Civil (RM)	Add SP 203 for off-site grading.	A-SP 203 added.
6	SP 212	Civil (RM)	Should pay item be added for landscaping?	A-Pay item has been added for large palm tree in median area for the sanitary sewer installation. All other landscaping restoration is included as incidental to other storm drain items.
7	SP 213	Civil (RM)	Should pay item be added for irrigation?	B-All irrigation restoration is included as incidental to storm drain items.
8	SP 270	Civil (RM)	Add SP 270.	A-SP 270 added.
9	SP 502	Civil (RM)	Make concrete collar incidental to storm drain pipe installation.	A-Collars have been removed and added as incidental to storm drain pipe.
10	SP 633	Civil (RM)	Add blue reflective RPM.	A-Blue RPM has been added.
11	SP 671	Civil (RM)	Are we installing anything for utilities or are they paying for relocations.	B-Relocations are being payed by utility companies. We are adjusting an electrical manhole to grade for the paving operations.
12	SP 692	Civil (RM)	Why is this section included? Are we doing any CIPP?	B-No CIPP is being done. Section is included for cleaning the manhole modifications and new sewer infrastructure prior to the required internal video inspections.
13	SP 693	Civil (RM)	Why is this section included? Are we doing any CIPP?	B-No CIPP is being done. Section is included for the manhole modifications and new sewer infrastructure for the required internal video inspections.

Actions:
A = A/E agrees, comments incorporated
B = A/E disagrees (explanation provided)
C=A/E needs clarification or more information

Memorandum

City of Las Vegas
Department of Public Works
Engineering Planning

To: Randy McConnell, P.E.
Engineering Project Manager

From: Peter Jackson, CFM
Flood Control Section

Date: August 7, 2013

Re: Rancho Road System, Elkhorn – Fort Apache to Grand Canyon
Design Report and 70% Plans
Hansen # 41990, WU8202

We have reviewed the Rancho Road System, Elkhorn – Fort Apache to Grand Canyon Design Report and 70% Plans for the proposed CCRFCD drainage facility within the Elkhorn Road alignment and offer the following comments:

1. Flood Control concurs with the overall hydrology for this MPU facility and detailed local analysis of the hydrology for the drop inlet collection system.
2. The provided WSPG analysis shows the velocities consistently above 25 fps. With the design process, the engineer must recommend the preferred alternative for mitigating the higher velocity flows on these proposed facilities. Per the CCRFCD Design Manual, design considerations must be reviewed to reduce the velocity and/or provide facility protection. Provide special details and the supporting hydraulic calculations to show how the higher velocities are being mitigated.
3. Flood Control noted CCRFCD's acceptance of the Environmental Screening on November 6, 2012.
4. Continue to coordinate this project with the Rancho Road System Fort Apache – Echelon Point Drive to Elkhorn Road project for Fort Apache Road prepared by LBG.
5. Provide enlarged detailed grading plans for Storm Drain Lateral #6 at the northwest corner of Tee Pee Lane and Elkhorn Road. Review clearance issues with the 16" HP Gas line.
6. Provide detailed grading plans for the area drop inlets that include the concrete collar, rip-rap and grading swale transitions.
7. The construction of the curved RCB section near Station 44+00 crosses the existing 12-inch Sanitary Sewer at a shallow angle. This could require the sewer to be removed and replaced. The associated costs are incidental to the RCB construction and need to be covered within the Specifications.
8. Review the marker ball requirements with Clark County Public Works for those inlets located within County Right-of-Way. Provide County Notes as required.

9. Show the RCB angle points and/or curved segments by station location and angle/degree change. Include the radius information and discuss how the curved sections are to be completed using curved forms or multiple angled segments. This needs to be explained within the Specifications.
10. Plans reference NDOT standard plans for the detail of the RCB construction. System design needs to accommodate the construction option of pre-cast or cast-in-place improvements. Verify that the Specifications and schedule accommodate the construction methods.
11. Provide Access Manholes along the RCB at 400-foot spacing. Adjust spacing to include Manholes near the junction structures for maintenance consideration. Consider using Manhole openings that are cast with the RCB's to reduce costs.
12. Review the storm drain removals to include cap & slurry for storm drain abandoned in place.
13. Provide detail sheets showing typical details needed for the construction, connection and any special transition structure details. Structural details, if required, must be submitted by the 90% submittal.
14. Add a note for all storm drain drop inlets that references the newly adopted USDCCA Drawing No. 421 (Stormwater Quality Management Stamp and Sign Detail). Include the USDCCA Drawing No. 421 (Stormwater Quality Management Stamp and Sign Detail) note to the concrete collar detail for the NDOT Type 2B inlets.
15. Provide an updated cost estimate with the next submittal. The cost estimate must be refined for the 90% submittal and prior to requesting the construction funding to assure that the requested and allocated storm drain funds are sufficient for construction.
16. The Final Design report needs to include an electronic copy of the entire report with the input and output files for the hydraulics and hydrology.
17. See the plans for additional comments.

CC: Oh-Sang Kwon, P.E. – CLV
Mark Sorensen, P.E. – CLV
Tim Parks, P.E. - CLV
Todd Myers, P.E. – CCRFCD
Mark Failla, P.E. – SHG

F:\#Depot\Engineering_Planning\Flood\CIP Projects\Rancho System - Elkhorn, Grand Canyon to Fort Apache\Comments\30% Rancho Road System, Elkhorn - Fort Apache to Grand Canyon.docx

Mark Failla

From: Todd L. Myers <TMyers@regionalflood.org>
Sent: Tuesday, June 11, 2013 9:10 AM
To: Mark Failla; Randy McConnell
Subject: Rancho Road System - Elkhorn - Ft Apache to Grand Canyon
Attachments: RFCD 70% CheckPrints.pdf

Mark/Randy, I've attached my 70% Check prints. Nothing major, they should be self-explanatory, but give me a call if you have any questions. Just to touch on a couple key items:

- Sheets SD-01 & 04: The lateral coming from Special Drop Inlet # 3 crosses over the 16" HP Gas with 6-inches of clearance. This puts the 16" HP in the disturbed (scarified) trench section. Consider raising the 4" Gas line, and revising the lateral profile, to allow for better clearance over the HP line.

- Is it City's intent to allow for Cast-in-place RCB, or is Pre-cast going to be required under pavement? We should discuss at next meeting.

- Special Provisions 104.04F & 624.03.72B - The provisions give a maximum of 300-ft of open trench during working hours and **no** open trench during non-working hours. Typically, contractor is allowed 100-ft open trench during non-working hours. Also, consider allowing 500-ft open during working hours.
    - If we end up allowing cast-in-place construction, we will need to revise this SP to allow for open trench intersection to intersection in order to make it a viable option.
- Once the Clark County permit is obtained, we will want to coordinate with inspection group (Art Alvarez) to determine what his group is going to require, and what exactly they will want to inspect. The encroachment permit will likely say call 24-hrs in advance for inspections. However, they have been taking as long as 5-days because of increased workload and under staffing. We just need to make sure contractor is aware. It should be a discussion item at Pre-Bid meeting.

Give me a call or email if you have any questions.

Todd L. Myers, P.E.
Engineering Project Manager
Clark County Regional Flood Control District
600 South Grand Central Pkwy, Suite 300
Las Vegas, Nevada 89106
www.regionalflood.org

Tmyers@regionalflood.org
702-685-0000 (phone)
702-685-0001 (fax)

Mark Failla

From: Layne Weber <wlweber@ClarkCountyNV.gov>
Sent: Friday, June 07, 2013 4:10 PM
To: Mark Failla
Cc: Wade Gerstenkorn; Robert Thompson
Subject: FW: Rancho Road System Elkhorn -Ft Apache to Grand Canyon 70%

These are the comments and the plans are at the counter for PU

From: Wade Gerstenkorn
Sent: Wednesday, June 05, 2013 7:58 AM
To: Layne Weber
Subject: Rancho Road System Elkhorn -Ft Apache to Grand Canyon 70%

Layne, I have reviewed this study and here are my comments:

1. The basin delineations, CN's and flow rates were not reviewed as it appears CLV and RFCD are in agreement with the design flows.
2. Only the portions within Clark County were reviewed (west of Grand Canyon centerline on Elkhorn, Sheets SD-01 and SD-04)
3. Provide overall sheet in plan set.
4. Revise Sheet SD-01 to label CLV and County.
5. Revise Sheet SD-01 to add future flow in profile upstream of Station 39+15.
6. The flow on Sheet SD-01 of 668 cfs minus 631 cfs shows **37 cfs** enters per 24-inch RCP. The profile for this lateral on Sheet SD-04 shows **45 cfs**.
7. The Criteria Manual requires manholes at all grades breaks. There are several locations where criteria is not met.
8. Revise Sheet SD-04 to connect laterals to the mainline at the inverts within Clark County.
9. Label HGL within drop inlets on profiles.
10. It does not appear 10-year street analysis has been completed to size the drop inlets and laterals. Typically the 10-year criteria is the limiting factor in inlet design. The drop inlets and laterals **may** be undersized with respect to meeting the 10-year street criteria.

Wade Gerstenkorn
Associate - Flood Control
CCPW Development Review
P 702-455-4899
F 702-380-9747
wade@clarkcountynv.gov

| DESIGN REVIEW COMMENTS | | |

Mark Failla

From: Randy McConnell <rmcconnell@LasVegasNevada.GOV>
Sent: Wednesday, June 19, 2013 5:04 PM
To: Mark Failla
Subject: FW: 41990 Rancho Road (SD) System - Elkhorn/Ft Apache

FYI

From: Keith Letus
Sent: Wednesday, June 19, 2013 5:03 PM
To: Randy McConnell
Subject: FW: 41990 Rancho Road (SD) System - Elkhorn/Ft Apache

Randy,

Upon further consideration, Sewer will not require any type CLSM fill or concrete encasement when sewer passes over Storm Drain.
The engineers can remove this from the 90% plans.

From: Keith Letus
Sent: Wednesday, May 29, 2013 5:45 PM
To: Randy McConnell
Cc: Tim Parks
Subject: FW: 41990 Rancho Road (SD) System - Elkhorn/Ft Apache

Here are Sewer's comments.

From: Tim Parks
Sent: Wednesday, May 29, 2013 5:23 PM
To: Keith Letus
Subject: FW: 41990 Rancho Road (SD) System - Elkhorn/Ft Apache

---

From: Randy McConnell
Sent: Wednesday, May 29, 2013 5:23 PM
To: Oh-Sang Kwon; Tim Parks
Cc: Peter Jackson
Subject: RE: 41990 Rancho Road (SD) System - Elkhorn/Ft Apache

Any luck with getting to these plans?

From: Randy McConnell
Sent: Monday, May 13, 2013 3:39 PM
To: Oh-Sang Kwon; Tim Parks; Tom Hayes
Cc: Peter Jackson
Subject: 41990 Rancho Road (SD) System - Elkhorn/Ft Apache

I would like to get comments back to the consultant for the 70% plans within the next two weeks. Could you please get them to me by 05/24.

Thanks

DATE: **5/2/2013**

CITY OF LAS VEGAS

TRAFFIC OPERATION TRANSMITTAL

To:	PROGRAM MANAGER: RANDY MCCONNELL	**From:**	Diane Phomninh, PE Phone: 229-2199 TRAFFIC PLANNING

PROJECT INFORMATION

PROJECT NUMBER: **41990**

PROJECT NAME: **RANCHO ROAD (STORM DRAIN) SYSTEM - ELKHORN/FT. AP**

APPLICATION TYPE: **CIP**

NUMBER OF REVIEW(S) PERFORMED ON THIS PROJECT:

1	**TRAFAD 2**	REC:**9/10/12**	RET: **9/25/12**	Result: **Approvable with Condition(s)**
2	**TRAFAD 3**	REC:**3/14/13**	RET: **5/2/13**	Result: **Approvable with Condition(s)**

DESCRIPTION OF ITEMS ATTACHED

☐ **TRAFFIC OPERATION COMMENTS & REDLINES**

REMARK (S):

70% plans comments.

1. Town Center 44/50 #1 permit have been extended to 2-27-14. H16761.
2. E.S.School boundary Thompson and Danell(CC), and Escobedo for M.S.
3. Patch limits not quite on lane line but ok, lane line transitions.
4. Pavement marking are shown to be replaced - in kind. For ST-01, call out 100' of skip bike lane line for westbound before Tee Pee Ln, and also west bound before Val River, the right turn Arrow and Only, should not have existed. So remove from plans.
5. Construction must be day work (residential). Pavement on the southside in?? Victor to coordinate striping and bike lane on the southside.
6. Construction shall be daytime only and must maintained minimum of one travel lane in each direction, for left turn maintain 100' storage typical at major intersection.

DESIGN REVIEW COMMENTS

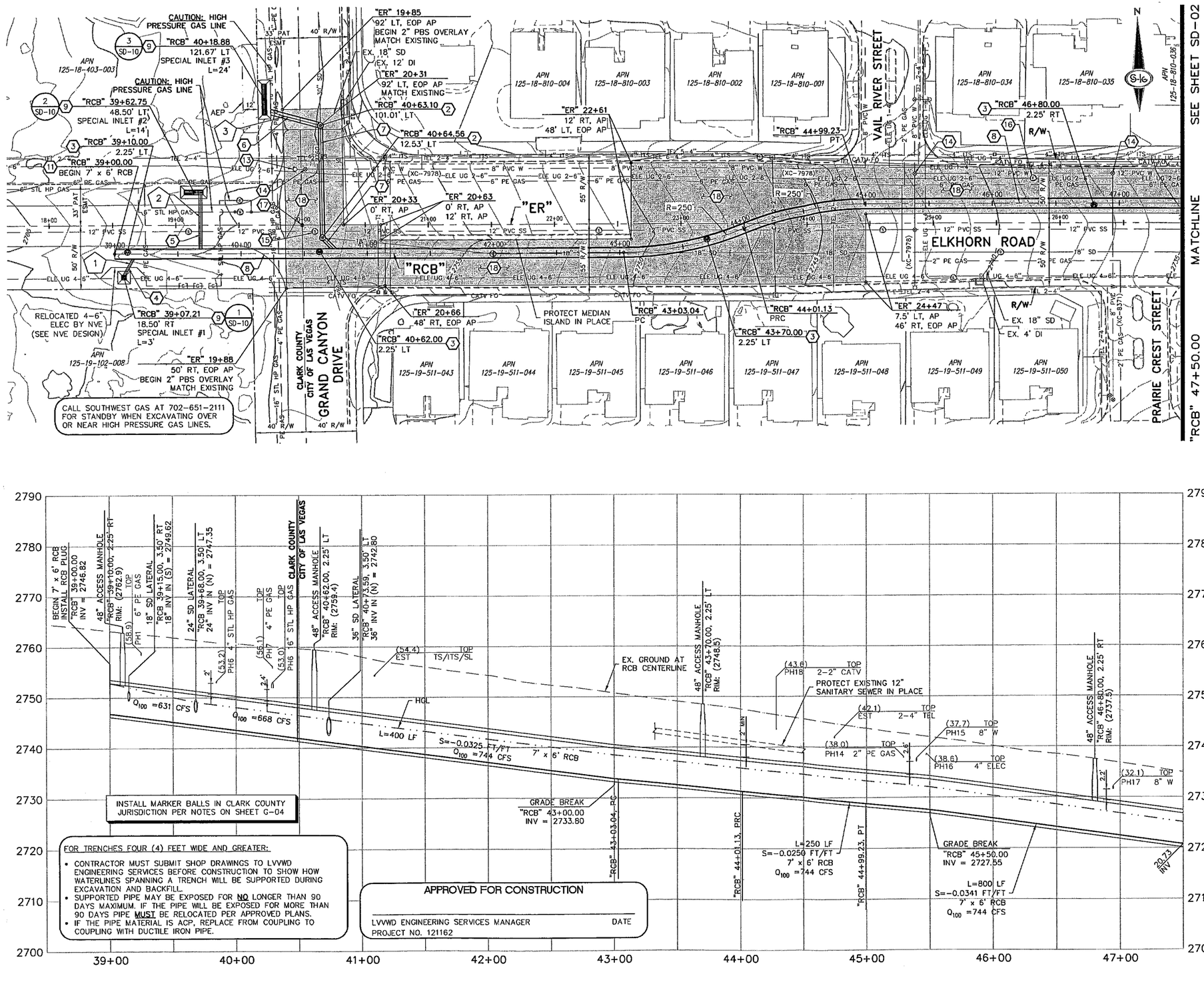
PROJECT NAME:	Rancho Storm Drain System Elkhorn/Ft Apache to Grand Canyon		
HANSEN NUMBER:	41990	**REVIEW STAGE:**	70%
REVIEWER'S NAME:	Jim Von Tobel	**DATE:**	3/26/2013

COMMENT NUMBER	SHEET NUMBER	REVEIWER'S COMMENT	DESIGNER'S RESPONSE
1	1	No corrections needed at this time	

APPENDIX I

90% Storm Drain Plan & Profile

90% Storm Drain Plan & Profile



FOR TRENCHES FOUR (4) FEET WIDE AND GREATER:

- CONTRACTOR MUST SUBMIT SHOP DRAWINGS TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINES SPANNING A TRENCH WILL BE SUPPORTED DURING EXCAVATION AND BACKFILL.
- SUPPORTED PIPE MAY BE EXPOSED FOR **NO** LONGER THAN 90 DAYS MAXIMUM. IF THE PIPE WILL BE EXPOSED FOR MORE THAN 90 DAYS PIPE **MUST** BE RELOCATED PER APPROVED PLANS.
- IF THE PIPE MATERIAL IS ACP, REPLACE FROM COUPLING TO COUPLING WITH DUCTILE IRON PIPE.

APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER DATE

PROJECT NO. 121162

CONSTRUCTION NOTES

1. CONSTRUCT 60" TYPE III MANHOLE WITH TYPE IA RISER (USDCCA STD. DWG. NO. 406.1 AND 403.1)
2. CONSTRUCT 60" TYPE III MANHOLE (USDCCA STD. DWG. NO. 406.1)
3. CONSTRUCT 48" ACCESS MANHOLE (SEE DETAIL 2, SHEET SD-08)
4. INSTALL 18" RCP (USDCCA STD. DWG. NO. 503.2 AND DETAILS ON SHEET SD-06)
5. INSTALL 24" RCP (USDCCA STD. DWG. NO. 503.2 AND DETAILS ON SHEET SD-06)
6. INSTALL 29" X 45" HERCP (USDCCA STD. DWG. NO. 503.2 AND DETAILS ON SHEET SD-06)
7. INSTALL 36" RCP (USDCCA STD. DWG. NO. 503.2 AND DETAILS ON SHEET SD-06)
8. CONSTRUCT 7' X 6' PRECAST RCB (SEE DETAILS ON SHEET SD-06)
9. CONSTRUCT SPECIAL DROP INLET W/ CONCRETE APRON (SEE DETAIL 1, SHEET SD-07 AND SHEET SD-09)
10. CONSTRUCT MODIFIED TYPE DM2 DROP INLET (SEE DETAIL 5, SHEET SD-08)
11. CONSTRUCT RCB PLUG (SEE DETAIL 4, SHEET SD-08)
12. CONSTRUCT CONCRETE COLLAR (SEE DETAIL 3, SHEET SD-08)
13. ADJUST 2" MANUAL BLOW-OFF TO FINISHED GRADE (UDACS PLATE NO. 36)
14. ADJUST WATER VALVE BOX TO FINISHED GRADE (UDACS PLATE NO. 39) VALVE SHALL BE ACCESSIBLE AT ALL TIMES
15. ADJUST SANITARY SEWER MANHOLE TO FINISHED GRADE (DCSWCS STD. DWG. SD-5)
16. ADJUST ELECTRIC MANHOLE TO FINISHED GRADE
17. SET TYPE III SURVEY MONUMENT
18. CONSTRUCT 2" PBS OVERLAY

STORM DRAIN GENERAL NOTES:

1. ALL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE OR GRADE BREAK OR TO INSIDE EDGE OF DI, RCB, OR STRUCTURE.
2. ALL DROP INLETS AND CONCRETE APRONS SHALL INCLUDE STORM WATER MANAGEMENT STAMP AND DETAIL PER USDCCA STD. DWG. NO. 421.
3. ALL STORM DRAIN SHALL BE CLASS III UNLESS OTHERWISE NOTED.
4. NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS SHOWN FOR INFORMATIONAL ONLY. REFERENCE NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS DRAWINGS FOR CONSTRUCTION DETAILS. CONTRACTOR TO COORDINATE WITH UTILITIES FOR REMOVAL AND INSTALLATION OF FACILITIES.
5. ALL EXISTING UTILITY LOCATIONS SHOW HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION. THE DEPTH BELOW GRADE OF THE VARIOUS UTILITIES DEPICTED ON THE PLANS VARIES THROUGHOUT THE PROJECT AREA. THE CONTRACTOR SHALL EXERCISE EXTREME CARE WHERE EXCAVATING AND GRADING THE SUBBASE IN THE VICINITY OF UTILITIES TO AVOID DAMAGE TO THE LATTER.
6. ALL EXISTING UTILITIES SHALL BE PROTECTED IN PLACE UNLESS OTHERWISE NOTED.
7. SEE G-04 FOR RCB GEOMETRY AND R-SHEETS FOR REMOVAL INFORMATION.

LEGEND

2" PBS OVERLAY

LATERAL RUN PROFILE INDEX

LATERAL RUN NO	SEE SHEET
1 THRU 5	SD-04
6 THRU 8	SD-05



KEY MAP

SCALE 40 0 40 80 FEET

FAST Call before you UnderGround. 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig Avoid cutting underground utility lines. It's easy. Call 811 1-800-227-2600

AVOID FATAL OVERHEAD POWER LINES. IT'S EASY! CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

NO.	DATE:	DESCRIPTION	APP'D
		REVISIONS	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.

DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: STORM DRAIN PLAN AND PROFILE
"RCB" 38+50.00 TO "RCB" 47+50.00

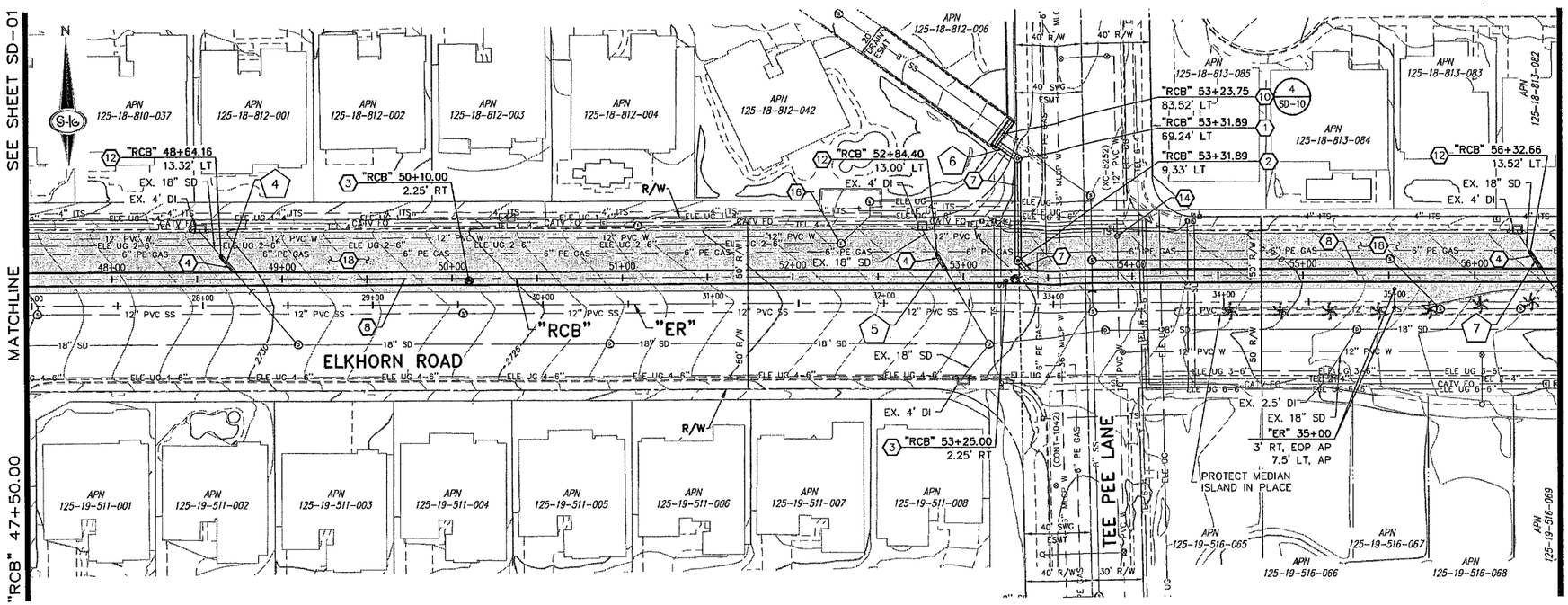
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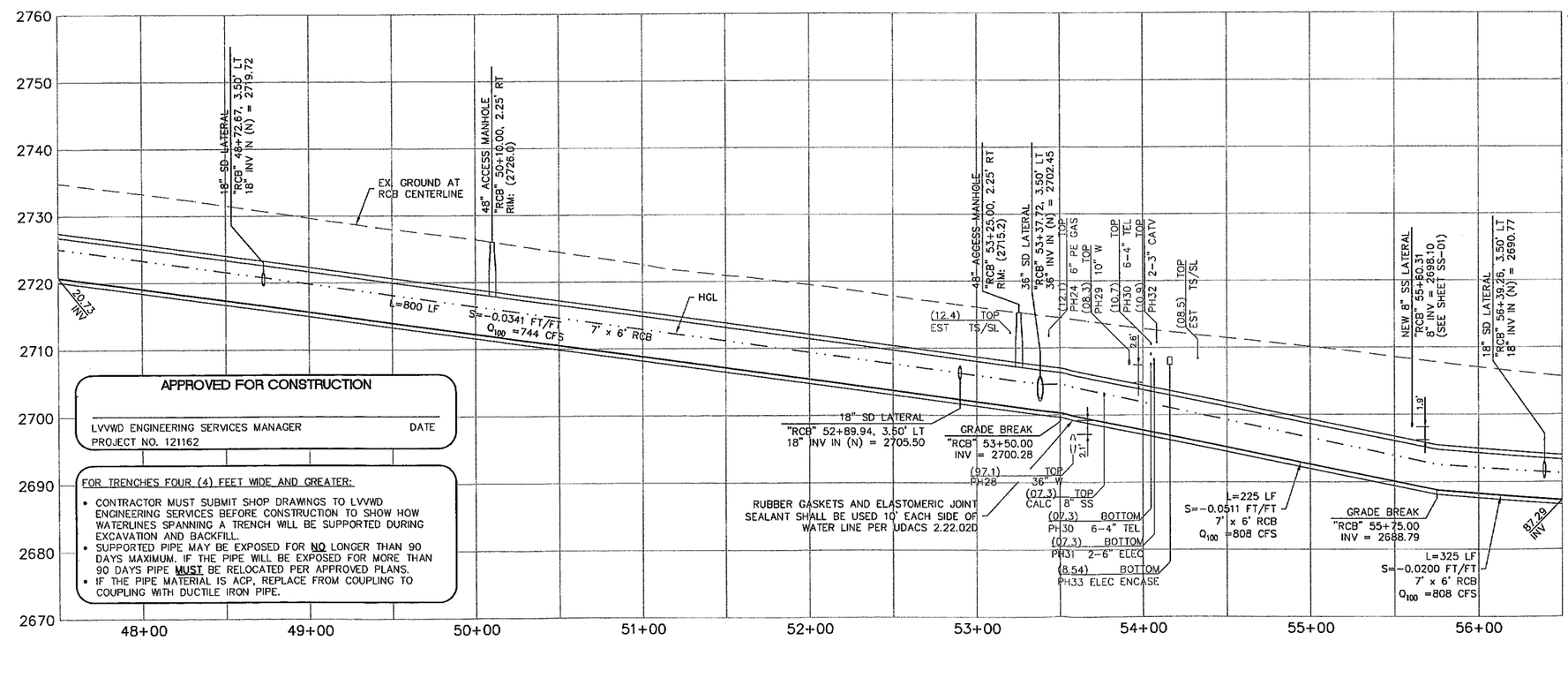
90% SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

Sheet SD-01
9 of 21

DRAWING NO. 327V290

F:\CLV12011\Dwg\Impr-01.dwg, 10/3/2013 9:41:46 AM, jstutheit





APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER — DATE

PROJECT NO. 121162

FOR TRENCHES FOUR (4) FEET WIDE AND GREATER:

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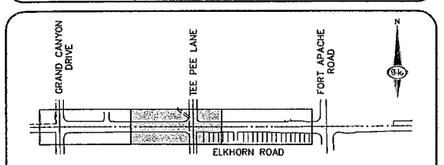
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LEGEND

2" PBS OVERLAY

LATERAL RUN PROFILE INDEX

LATERAL RUN NO	SEE SHEET
1 THRU 5	SD-04
6 THRU 8	SD-05



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REVISIONS			
NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.

DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

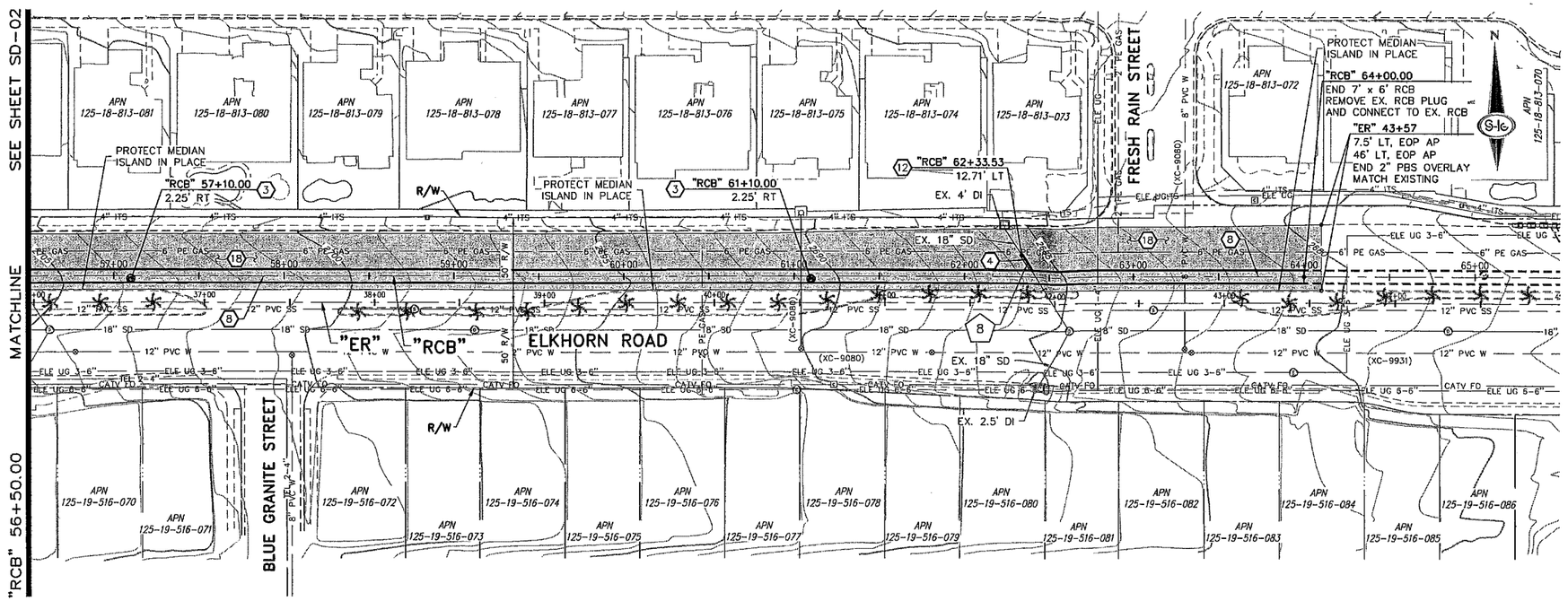
SHEET: STORM DRAIN PLAN AND PROFILE
"RCB" 47+50.00 TO "RCB" 56+50.00

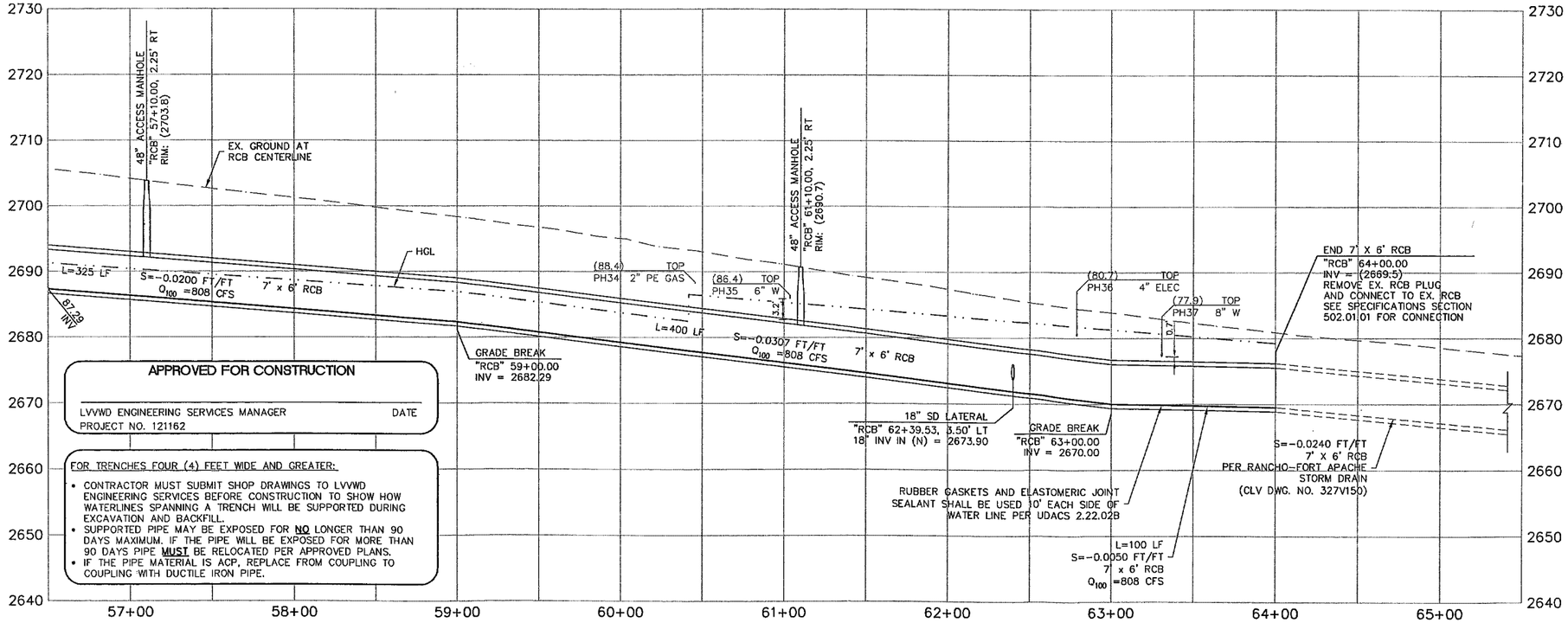
SEAL

90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION

Sheet SD-02
10 of 21
DRAWING NO. 327V290

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APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER DATE

PROJECT NO. 121162

FOR TRENCHES FOUR (4) FEET WIDE AND GREATER:

- CONTRACTOR MUST SUBMIT SHOP DRAWINGS TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINES SPANNING A TRENCH WILL BE SUPPORTED DURING EXCAVATION AND BACKFILL.
- SUPPORTED PIPE MAY BE EXPOSED FOR NO LONGER THAN 90 DAYS MAXIMUM. IF THE PIPE WILL BE EXPOSED FOR MORE THAN 90 DAYS PIPE MUST BE RELOCATED PER APPROVED PLANS.
- IF THE PIPE MATERIAL IS ACP, REPLACE FROM COUPLING TO COUPLING WITH DUCTILE IRON PIPE.

CONSTRUCTION NOTES

1. CONSTRUCT 60" TYPE III MANHOLE WITH TYPE IA RISER (USDCCA STD. DWG. NO. 406.1 AND 403.1)
2. CONSTRUCT 60" TYPE III MANHOLE (USDCCA STD. DWG. NO. 406.1)
3. CONSTRUCT 48" ACCESS MANHOLE (SEE DETAIL 2, SHEET SD-08)
4. INSTALL 18" RCP (USDCCA STD. DWG. NO. 503.2 AND DETAILS ON SHEET SD-06)
5. INSTALL 24" RCP (USDCCA STD. DWG. NO. 503.2 AND DETAILS ON SHEET SD-06)
6. INSTALL 29" X 45" HERCP (USDCCA STD. DWG. NO. 503.2 AND DETAILS ON SHEET SD-06)
7. INSTALL 36" RCP (USDCCA STD. DWG. NO. 503.2 AND DETAILS ON SHEET SD-06)
8. CONSTRUCT 7' X 6' PRECAST RCB (SEE DETAILS ON SHEET SD-06)
9. CONSTRUCT SPECIAL DROP INLET W/ CONCRETE APRON (SEE DETAIL 1, SHEET SD-07 AND SHEET SD-09)
10. CONSTRUCT MODIFIED TYPE DM2 DROP INLET (SEE DETAIL 5, SHEET SD-08)
11. CONSTRUCT RCB PLUG (SEE DETAIL 4, SHEET SD-08)
12. CONSTRUCT CONCRETE COLLAR (SEE DETAIL 3, SHEET SD-08)
13. ADJUST 2" MANUAL BLOW-OFF TO FINISHED GRADE (UDACS PLATE NO. 36)
14. ADJUST WATER VALVE BOX TO FINISHED GRADE (UDACS PLATE NO. 39) VALVE SHALL BE ACCESSIBLE AT ALL TIMES
15. ADJUST SANITARY SEWER MANHOLE TO FINISHED GRADE (DCSWCS STD. DWG. SD-5)
16. ADJUST ELECTRIC MANHOLE TO FINISHED GRADE
17. SET TYPE III SURVEY MONUMENT
18. CONSTRUCT 2" PBS OVERLAY

STORM DRAIN GENERAL NOTES:

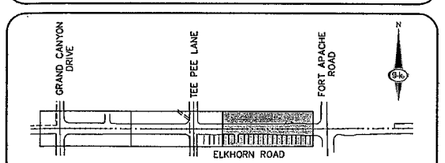
1. ALL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE OR GRADE BREAK OR TO INSIDE EDGE OF DI, RCB, OR STRUCTURE.
2. ALL DROP INLETS AND CONCRETE APRONS SHALL INCLUDE STORM WATER MANAGEMENT STAMP AND DETAIL PER USDCCA STD. DWG. NO. 421.
3. ALL STORM DRAIN SHALL BE CLASS III UNLESS OTHERWISE NOTED.
4. NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS SHOWN FOR INFORMATIONAL ONLY. REFERENCE NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS DRAWINGS FOR CONSTRUCTION DETAILS. CONTRACTOR TO COORDINATE WITH UTILITIES FOR REMOVAL AND INSTALLATION OF FACILITIES.
5. ALL EXISTING UTILITY LOCATIONS SHOW HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION. THE DEPTH BELOW GRADE OF THE VARIOUS UTILITIES DEPICTED ON THE PLANS VARIES THROUGHOUT THE PROJECT AREA. THE CONTRACTOR SHALL EXERCISE EXTREME CARE WHERE EXCAVATING AND GRADING THE SUBBASE IN THE VICINITY OF UTILITIES TO AVOID DAMAGE TO THE LATTER.
6. ALL EXISTING UTILITIES SHALL BE PROTECTED IN PLACE UNLESS OTHERWISE NOTED.
7. SEE G-04 FOR RCB GEOMETRY AND R-SHEETS FOR REMOVAL INFORMATION.

LEGEND

2" PBS OVERLAY

LATERAL RUN PROFILE INDEX

LATERAL RUN NO	SEE SHEET
1 THRU 5	SD-04
6 THRU 8	SD-05



KEY MAP

SCALE 40 0 40 80 FEET

FAST
Call before you UnderGround.
1-702-432-5300
Call before you Dig
Avoid cutting underground utility lines. It's easy.
Call 811
or 1-800-227-2600
AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.

DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM

DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: STORM DRAIN PLAN AND PROFILE
"RCB" 56+50.00 TO "RCB" 65+50.00

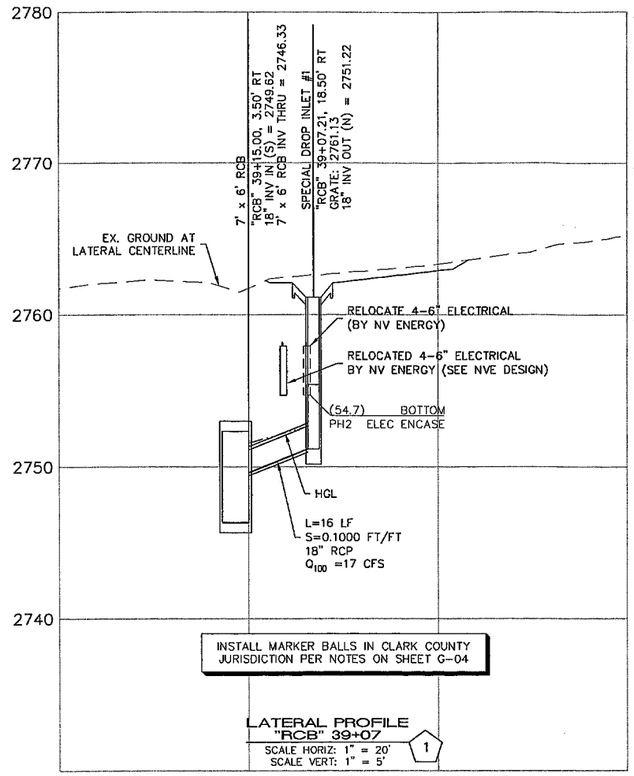
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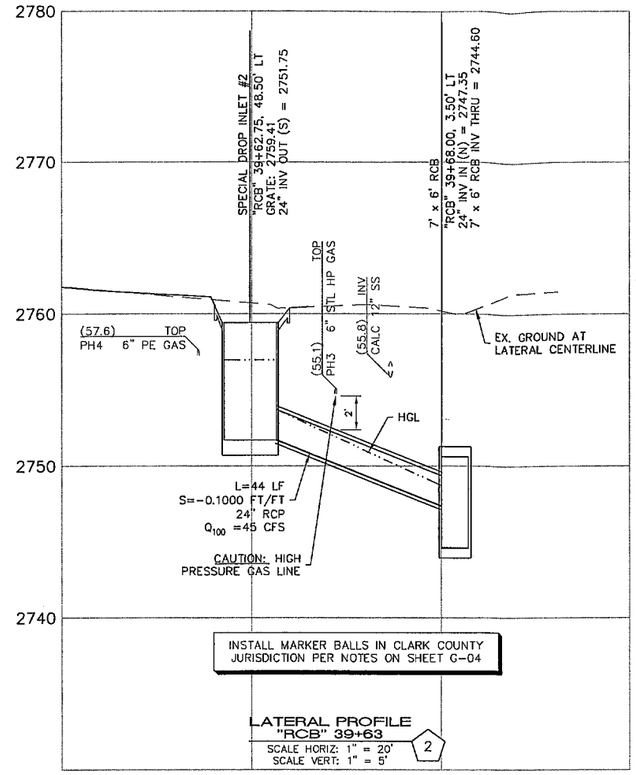
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PRELIMINARY
NOT FOR CONSTRUCTION

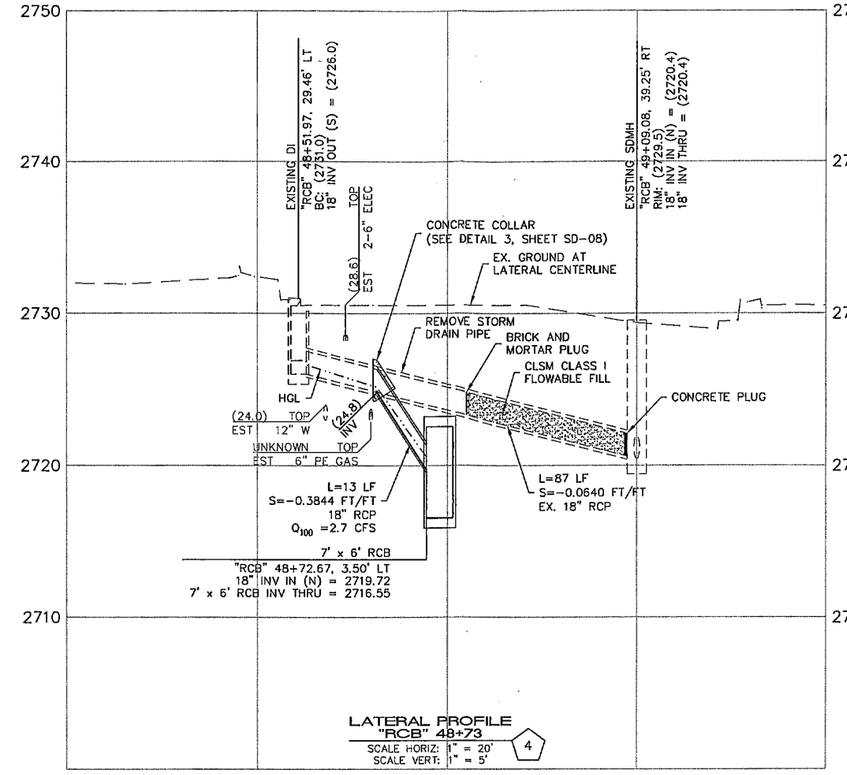
Sheet SD-03
11 of 21

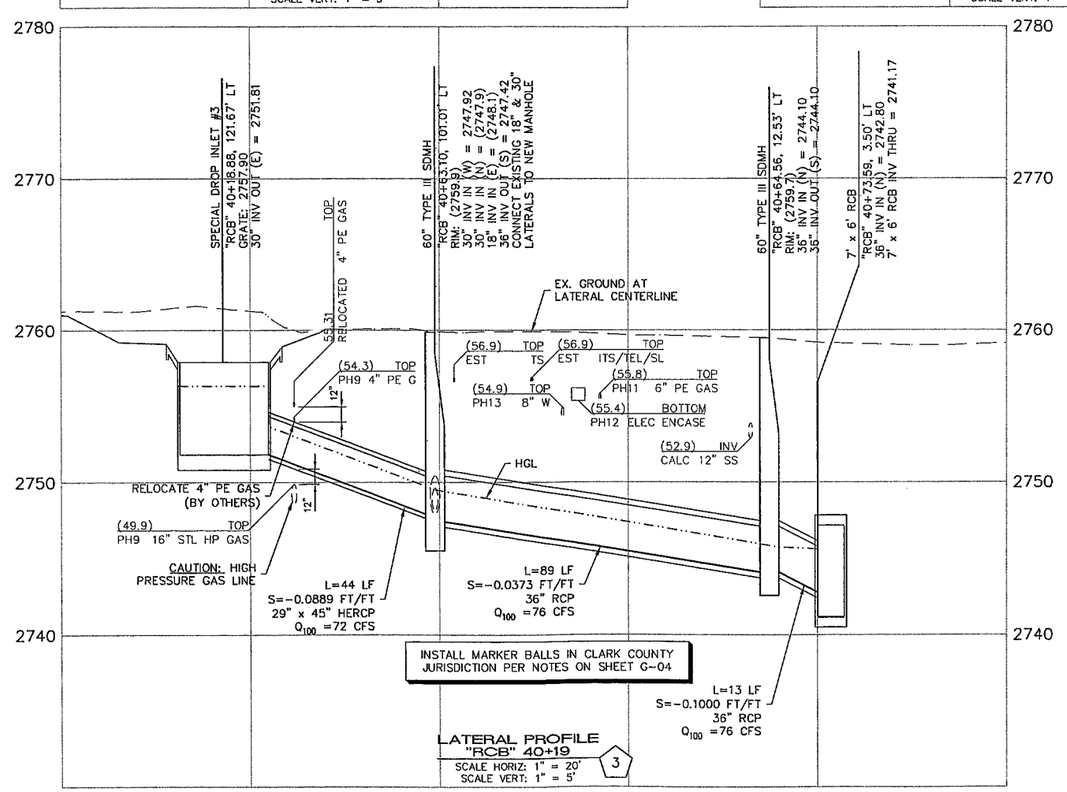
DRAWING NO. 327V290

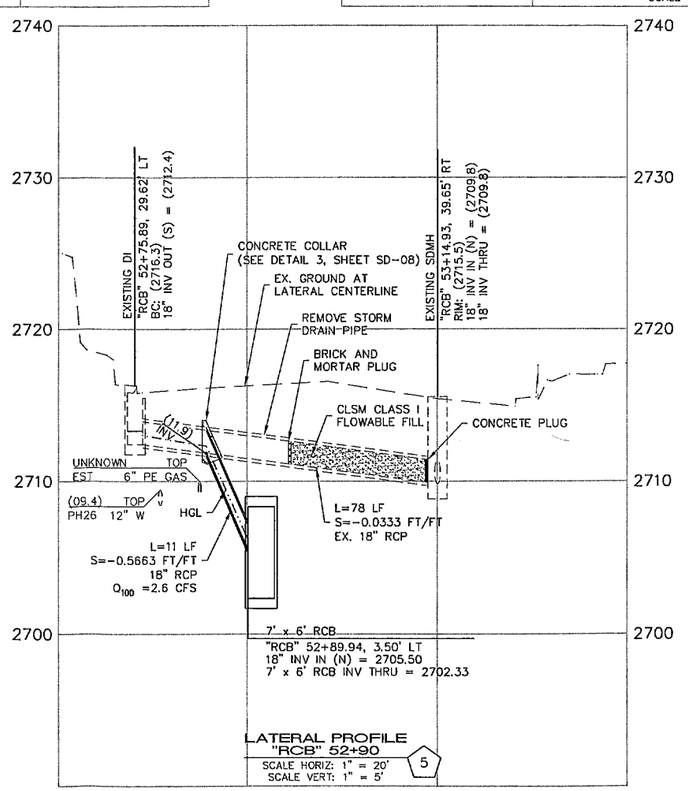
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CALL SOUTHWEST GAS AT 702-651-2111 FOR STANDBY WHEN EXCAVATING OVER OR NEAR HIGH PRESSURE GAS LINES.

FOR TRENCHES FOUR (4) FEET WIDE AND GREATER:

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APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER DATE

PROJECT NO. 121162

REVISIONS

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DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM ELKHORN - FT APACHE TO GRAND CANYON

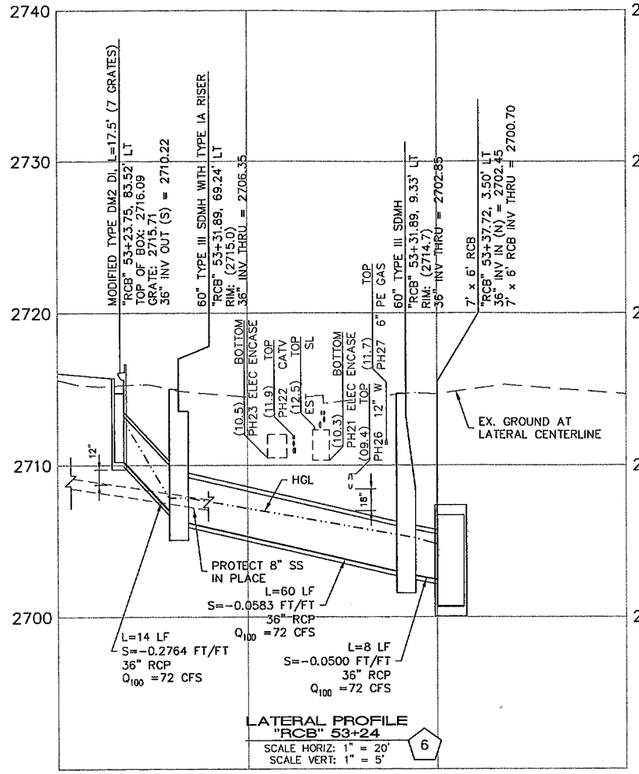
SHEET: STORM DRAIN LATERAL PROFILES

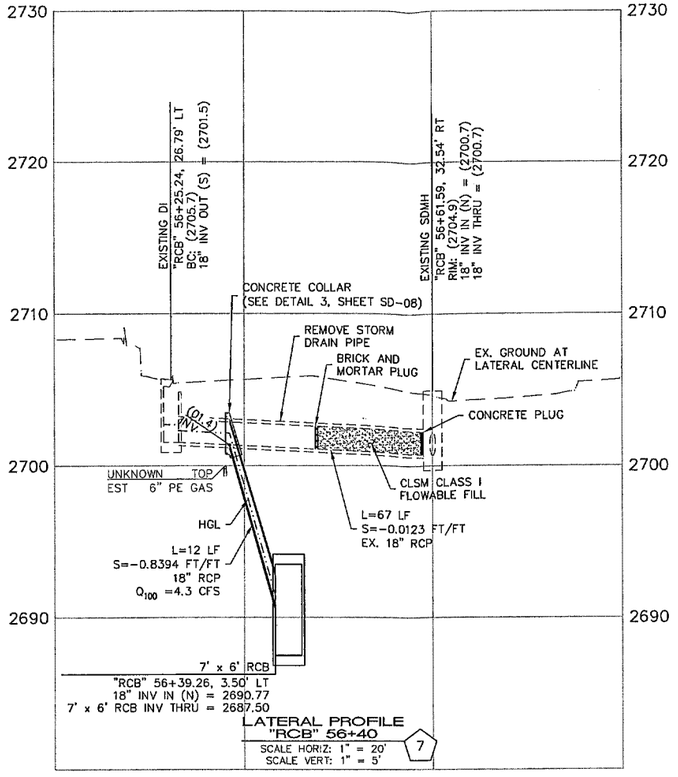
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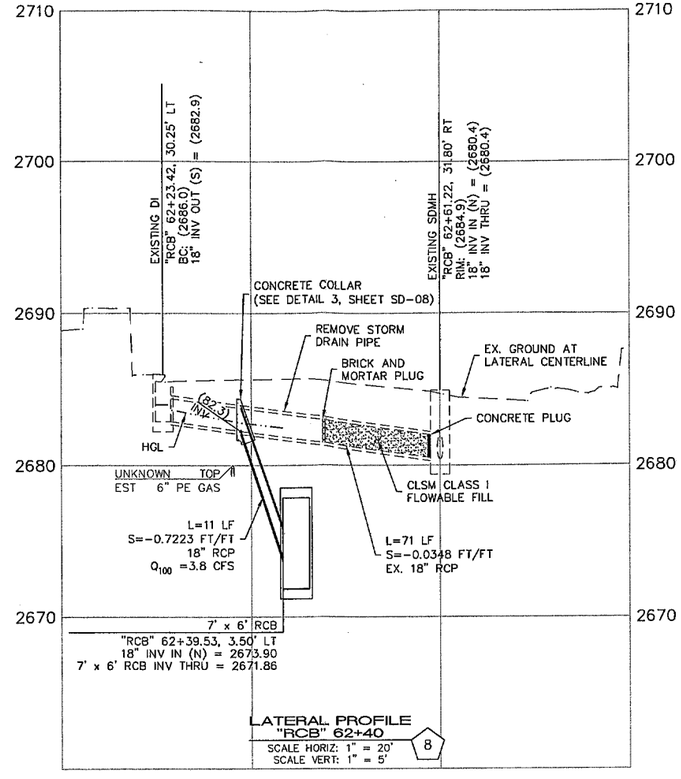
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Sheet SD-04
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FOR TRENCHES FOUR (4) FEET WIDE AND GREATER:

- CONTRACTOR MUST SUBMIT SHOP DRAWINGS TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINES SPANNING A TRENCH WILL BE SUPPORTED DURING EXCAVATION AND BACKFILL.
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APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER DATE

PROJECT NO. 121162

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.

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CHECKED BY: MDM

DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: STORM DRAIN LATERAL PROFILES

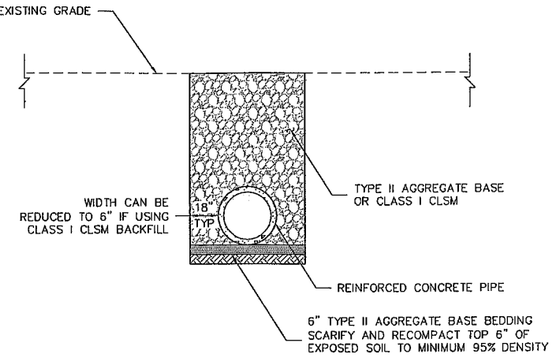
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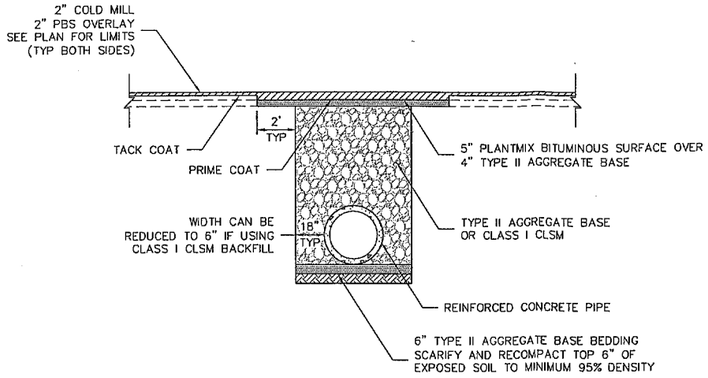
Sheet SD-05
13 of 21

DRAWING NO. 327V290

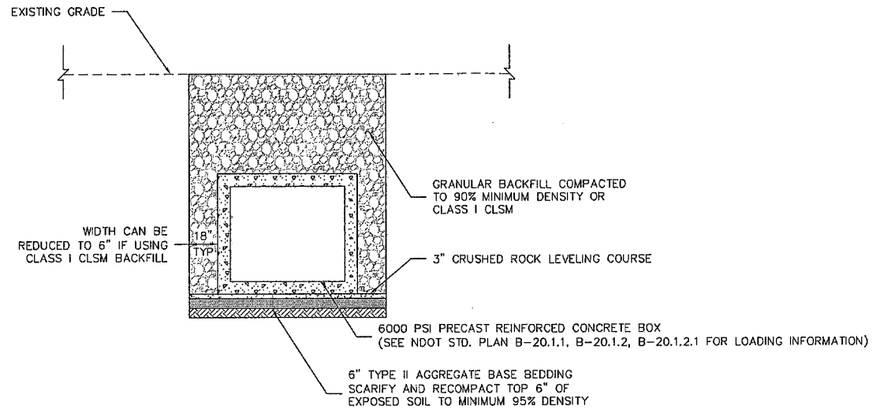
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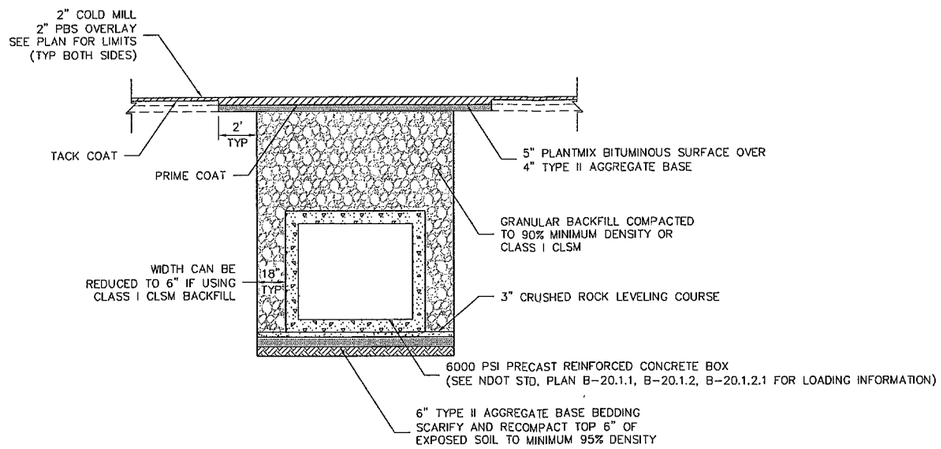
REINFORCED CONCRETE PIPE SECTION (UNPAVED AREAS)



REINFORCED CONCRETE PIPE SECTION (PAVED AREAS)



PRECAST REINFORCED CONCRETE BOX SECTION (UNPAVED AREAS)



PRECAST REINFORCED CONCRETE BOX SECTION (PAVED AREAS)

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.

DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM

DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

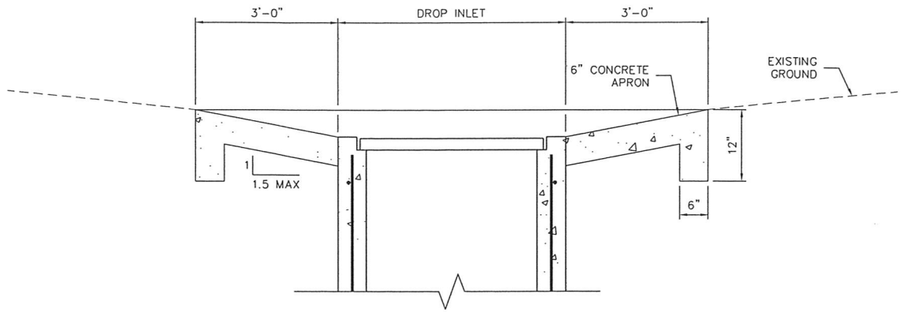
SHEET: STORM DRAIN DETAILS

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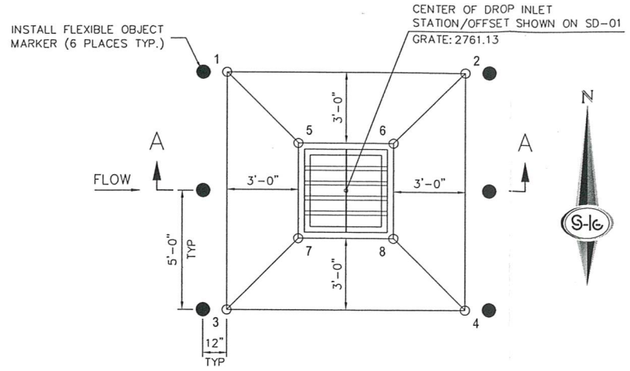
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NOT FOR CONSTRUCTION

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SD-06
14 of 21
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327V290

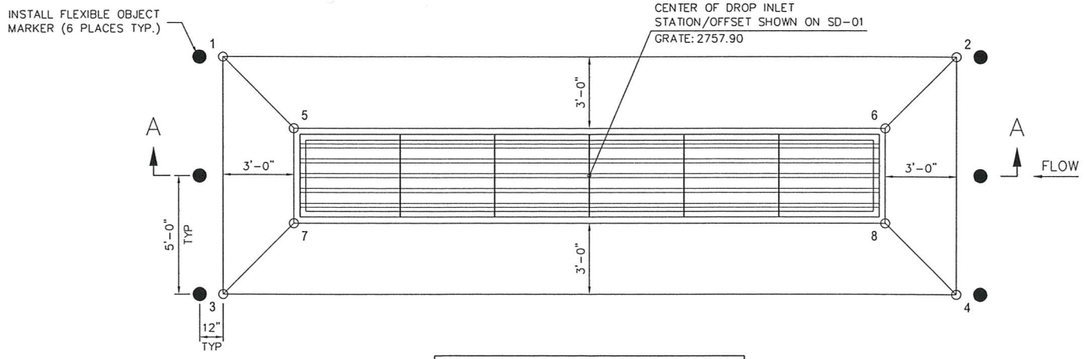
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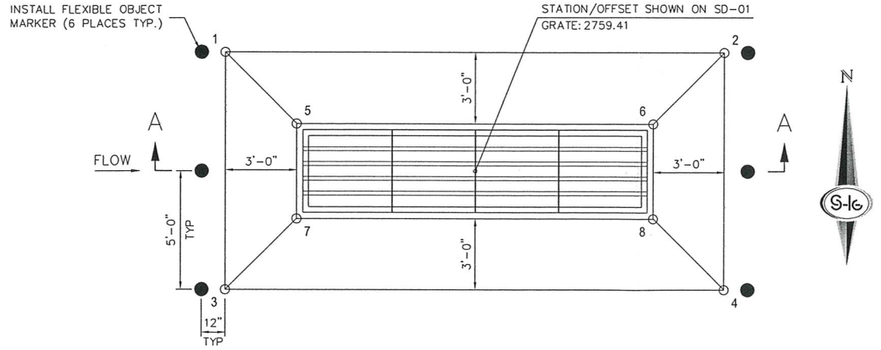
SECTION A



APRON ELEVATION TABLE SPECIAL DROP INLET #1	
POINT	ELEVATION
1	2762.11
2	2762.06
3	2762.01
4	2761.96
5	2761.13
6	2761.13
7	2761.13
8	2761.13



APRON ELEVATION TABLE SPECIAL DROP INLET #3	
POINT	ELEVATION
1	2758.95
2	2759.10
3	2758.90
4	2759.05
5	2757.90
6	2757.90
7	2757.90
8	2757.90



APRON ELEVATION TABLE SPECIAL DROP INLET #2	
POINT	ELEVATION
1	2761.43
2	2760.89
3	2760.78
4	2760.24
5	2759.41
6	2759.41
7	2759.41
8	2759.41

NOTES:

1. ALL DROP INLETS AND CONCRETE APRONS SHALL INCLUDE STORM WATER MANAGEMENT STAMP AND DETAIL PER USDCCA STD. DWG. NO. 421.

CONCRETE APRONS
NOT TO SCALE

1
SD-07

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

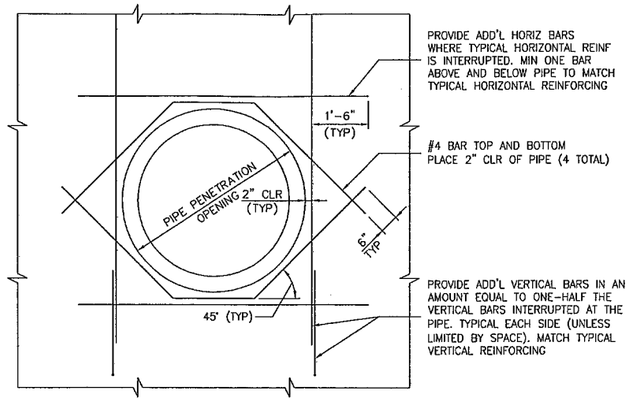
TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: STORM DRAIN DETAILS

SEAL
90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION

Sheet
SD-07
15 of 21
DRAWING NO.
327V290

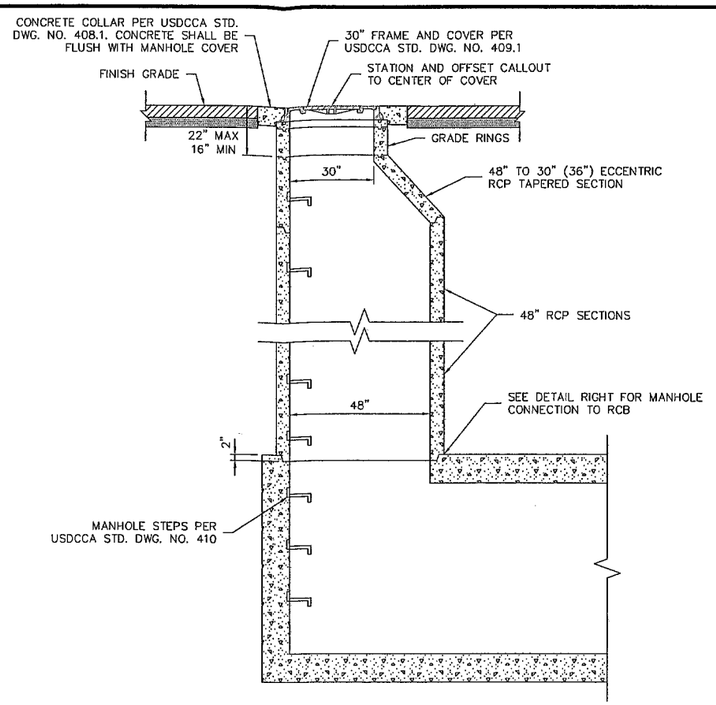
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NOTES:

1. TYPICAL WALL REINFORCING NOT SHOWN FOR CLARITY.
2. FIELD CUT TYPICAL WALL REINFORCING 2" CLEAR OF PIPE.

RCB PIPE PENETRATION — 1 / SD-08
NOT TO SCALE

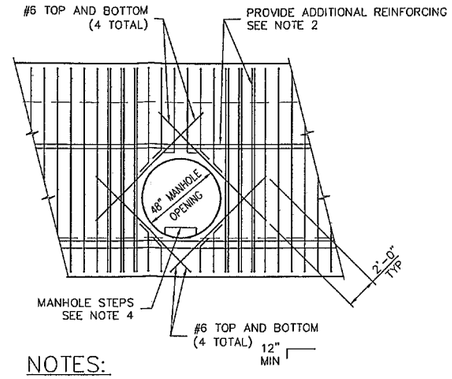


NOTES:

1. SEE USDCCA STD. DWG. NO. 403.1 FOR ADDITIONAL MANHOLE CONSTRUCTION NOTES AND DETAILS.

SECTION

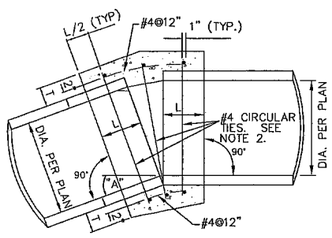
48" ACCESS MANHOLE — 2 / SD-08
NOT TO SCALE



NOTES:

1. FIELD BEND OR CUT ALL REINFORCING 2" CLR OF OPENINGS.
2. EVERY REBAR DISCONTINUED AT OPENING SHALL BE REPLACED BY AN EXTRA REBAR PLACED AT THE SIDE OF THE OPENING AS SHOWN. THE LENGTH OF THE EXTRA REBARS SHALL EQUAL THE LENGTH OF THE SCHEDULE REBARS THAT ARE NOT DISCONTINUED AT THE OPENING.
3. PROVIDE MINIMUM 2" CLEARANCE BETWEEN ALL REINFORCING BARS.
4. MANHOLE STEPS SHALL BE PER USDCCA STD. DWG. NO. 410.

CONNECTION TO RCB



PLAN

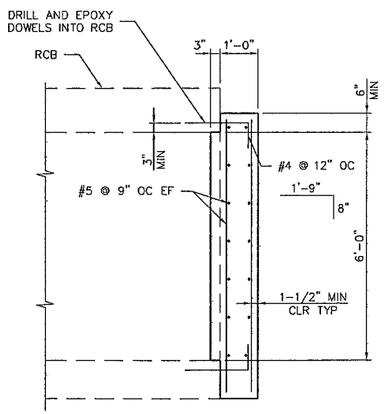
NOTES:

1. WHERE THE SLOPE OF THE UPSTREAM PIPE IS GREATER THAN THE SLOPE OF THE DOWNSTREAM PIPE, JOIN SOFFITS. WHERE THE SLOPE OF THE UPSTREAM PIPE IS LESS THAN THE SLOPE OF THE DOWNSTREAM PIPE, JOIN INVERTS.
2. WHERE THE SPACE BETWEEN THE PIPE EXTREMITIES EXCEEDS 2 1/2 INCHES, THE NUMBER OF CIRCULAR TIES SHALL BE INCREASED TO MAINTAIN A MAXIMUM SPACING OF 6 INCHES CENTER TO CENTER. CIRCULAR TIES SHALL HAVE A DIAMETER 5 INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE LARGER PIPE.

CIRCULAR TIES

PIPE DIAMETER	SPACE BETWEEN PIPE EXTREMITIES	NO. OF CIRCULAR TIES	L	T
18"	2 1/2"	3	12"	5"
24"	2 1/2"	3	12"	6"
30"	2 1/2"	3	12"	7"
36"	2 1/2" or less	4	18"	9"
60"	2 1/2" or less	5	21"	11"

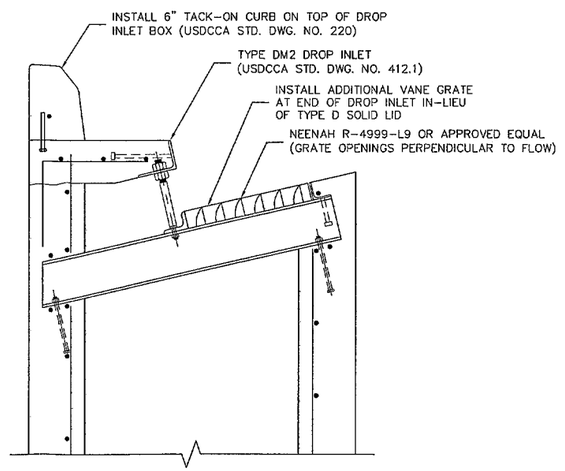
CONCRETE COLLAR — 3 / SD-08
NOT TO SCALE



NOTES:

1. PRECAST RCB PLUG IS AN ACCEPTABLE ALTERNATIVE TO A CAST-IN-PLACE PLUG. PRECAST PLUG SHALL BE APPROVED BY ENGINEER PRIOR TO INSTALLATION.

RCB PLUG — 4 / SD-08
NOT TO SCALE



NOTES:

1. ALL DROP INLETS AND CONCRETE APRONS SHALL INCLUDE STORM WATER MANAGEMENT STAMP AND DETAIL PER USDCCA STD. DWG. NO. 421.

MODIFIED TYPE DM2 DROP INLET — 5 / SD-08
NOT TO SCALE

GENERAL STRUCTURAL NOTES

1. DESIGN SPECIFICATIONS: AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 2002". REINFORCED CONCRETE DESIGN BASED ON LOAD FACTOR DESIGN.
2. CONSTRUCTION SPECIFICATIONS: UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA.
3. EXISTING UTILITIES: THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES WITHIN THE WORK AREA, AND PROVIDING PROTECTION FOR THE VARIOUS UTILITIES AFFECTED PRIOR TO PROCEEDING WITH THE WORK.
4. CONCRETE: CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF f'c=4,500 PSI AND A MAXIMUM WATER TO CEMENT RATIO, BY WEIGHT, OF 0.45. USE TYPE V CEMENT PER ASTM C-150. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4", UNLESS NOTED OTHERWISE.
5. REINFORCING STEEL: ALL REINFORCING STEEL SHALL BE ASTM A615 GRADE 60. DIMENSIONS ARE FROM OUT TO OUT OF BARS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 2" UNLESS NOTED OTHERWISE. HOOKS MAY BE ROTATED OR TILTED AS NECESSARY TO PROVIDE THE PROPER CLEARANCES.
6. BEDDING MATERIAL: BEDDING MATERIAL SHALL BE MINIMUM OF 6-INCHES OF CLARK COUNTY TYPE II AGGREGATE BASE COMPACTED TO AT LEAST 95% OF THE MAXIMUM DRY DENSITY AS ESTABLISHED BY ASTM TEST METHOD D-1557. EXPOSED NATIVE SOILS IN BOTTOMS OF EXCAVATIONS SHALL BE SCARIFIED TO A DEPTH OF 6-INCHES, MOISTURE-CONDITIONED TO WITHIN 2% OF OPTIMUM MOISTURE CONTENT AND COMPACTED TO 95% PER ASTM D-1557.
7. STRUCTURAL STEEL: WIDE FLANGE SHAPES SHALL CONFORM TO ASTM A992. ALL MISCELLANEOUS STEEL SHALL CONFORM TO ASTM A36 UNLESS NOTED OTHERWISE.
8. GALVANIZING: ALL EXPOSED METAL PARTS SHALL BE GALVANIZED. GALVANIZING DAMAGED BY FABRICATION SHALL RECEIVE TWO COATS OF ZINC RICH PAINT (GALVANOX OR EQUAL).
9. THIS IS A TYPICAL DETAIL. PIPE SIZES, INVERT ELEVATIONS, INLET LENGTH, AND TOP OF GRATE ELEVATION SHALL BE PER CIVIL DRAWINGS.
10. CONTRACTOR SHALL PROVIDE SLOPE STABILIZATION, SHEETING, BRACING, AND/OR SHORING AS REQUIRED TO PROTECT EXISTING EMBANKMENTS, STRUCTURES, AND UNDERGROUND ITEMS.

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

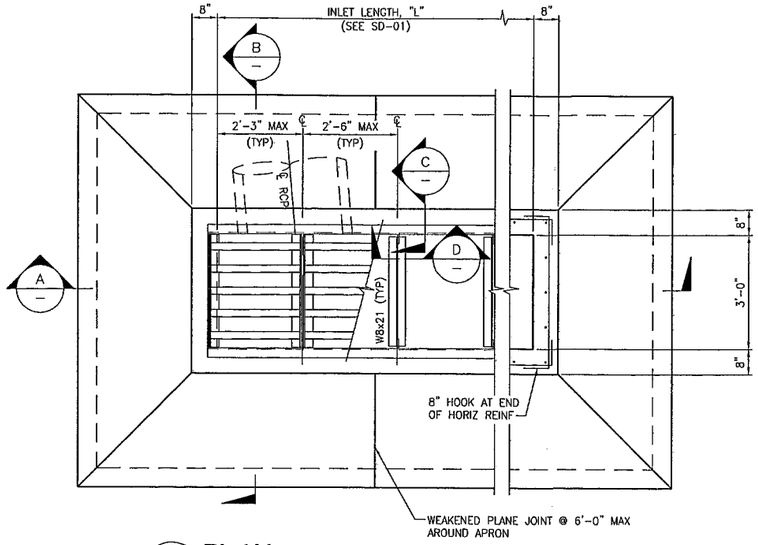
RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM ELKHORN - FT APACHE TO GRAND CANYON
SHEET: STORM DRAIN DETAILS

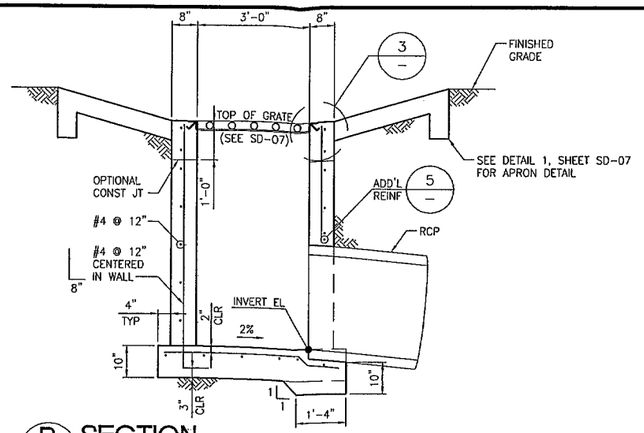
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90% SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

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16 of 21
DRAWING NO. 327V290

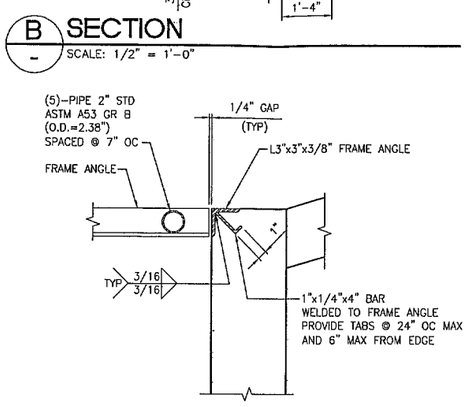
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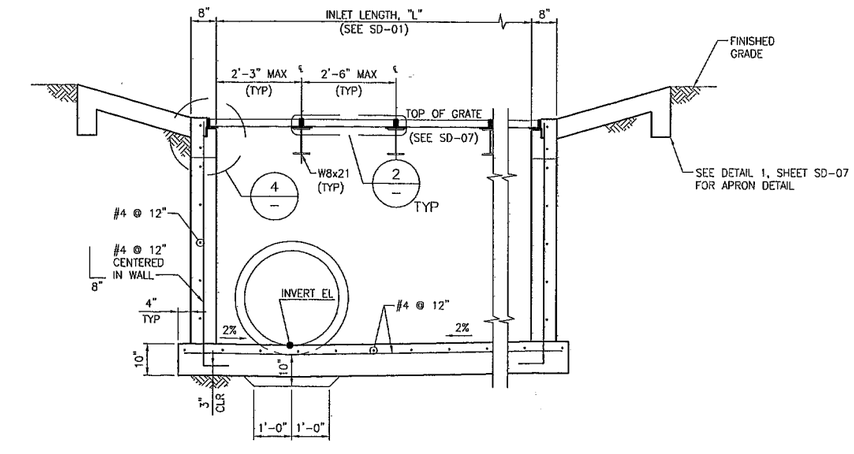
1 PLAN
SCALE: 1/2" = 1'-0"



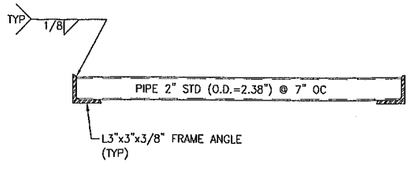
B SECTION
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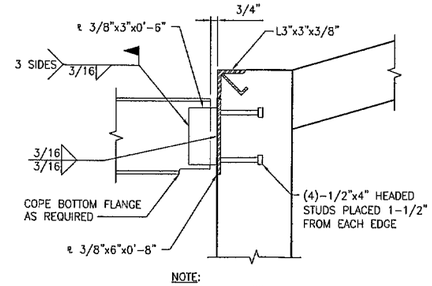
3 DETAIL
SCALE: 1 1/2" = 1'-0"



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

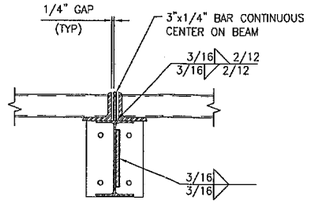


2 TYPICAL GRATE DETAIL
SCALE: 1 1/2" = 1'-0"



NOTE:
GRATE NOT SHOWN.

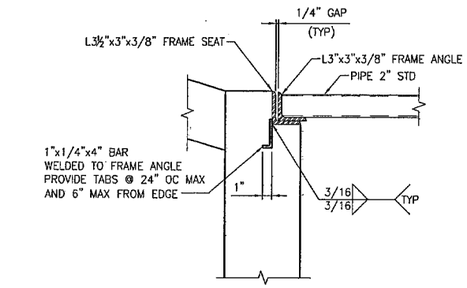
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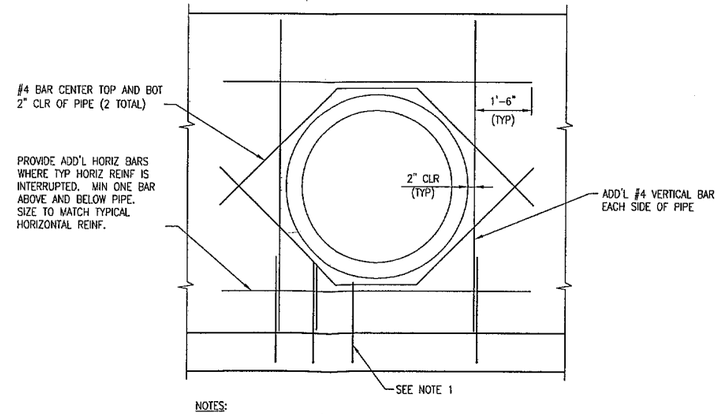
D SECTION
SCALE: 1 1/2" = 1'-0"

GENERAL STRUCTURAL NOTES

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



NOTES:
1. FIELD CUT TYPICAL WALL REINFORCING 2" CLR OF PIPE.
2. IF BARS CANNOT EXTEND BEYOND PIPE AS SHOWN, EXTEND AS FAR AS POSSIBLE AND PROVIDE STANDARD HOOK AT END.

5 PIPE PENETRATION DETAIL
SCALE: NONE

REVISIONS

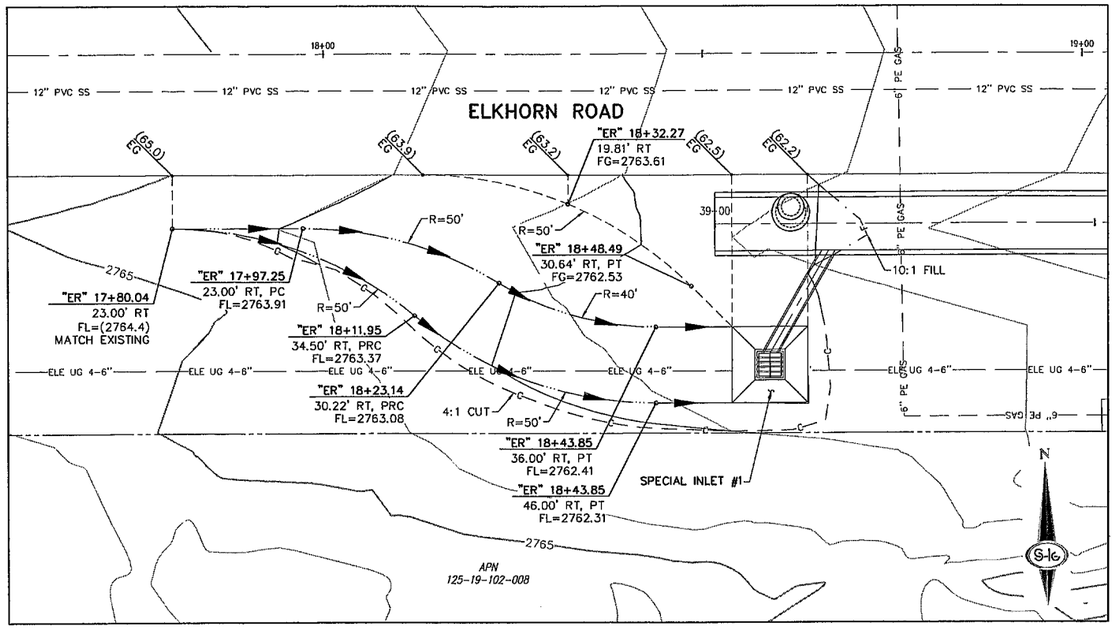
DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT
CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/3/13

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON
SHEET: STORM DRAIN DETAILS

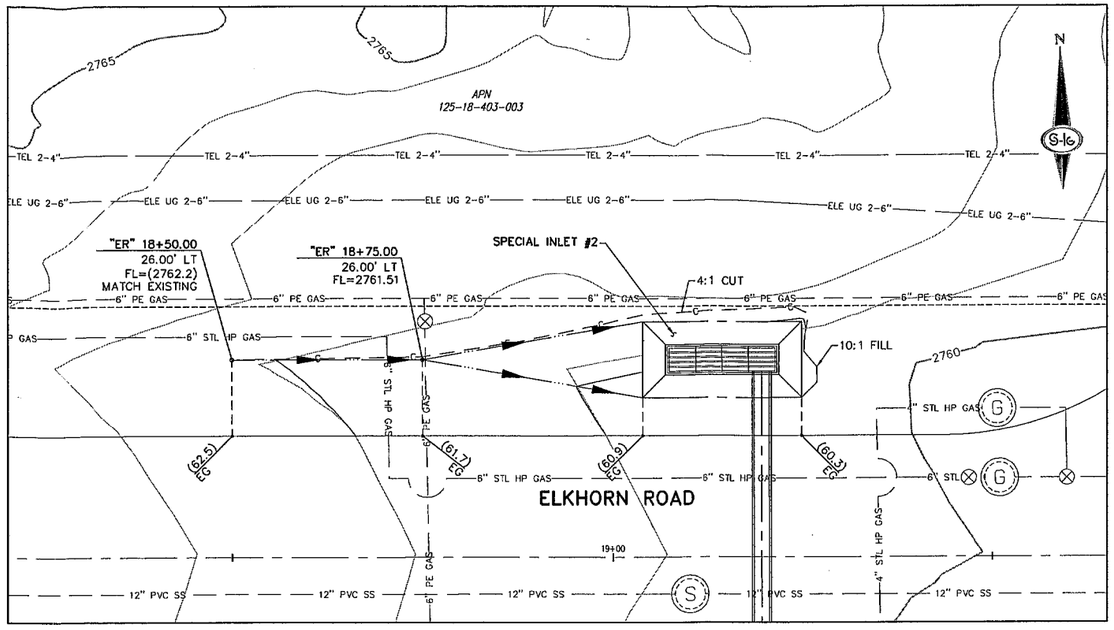
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327V290

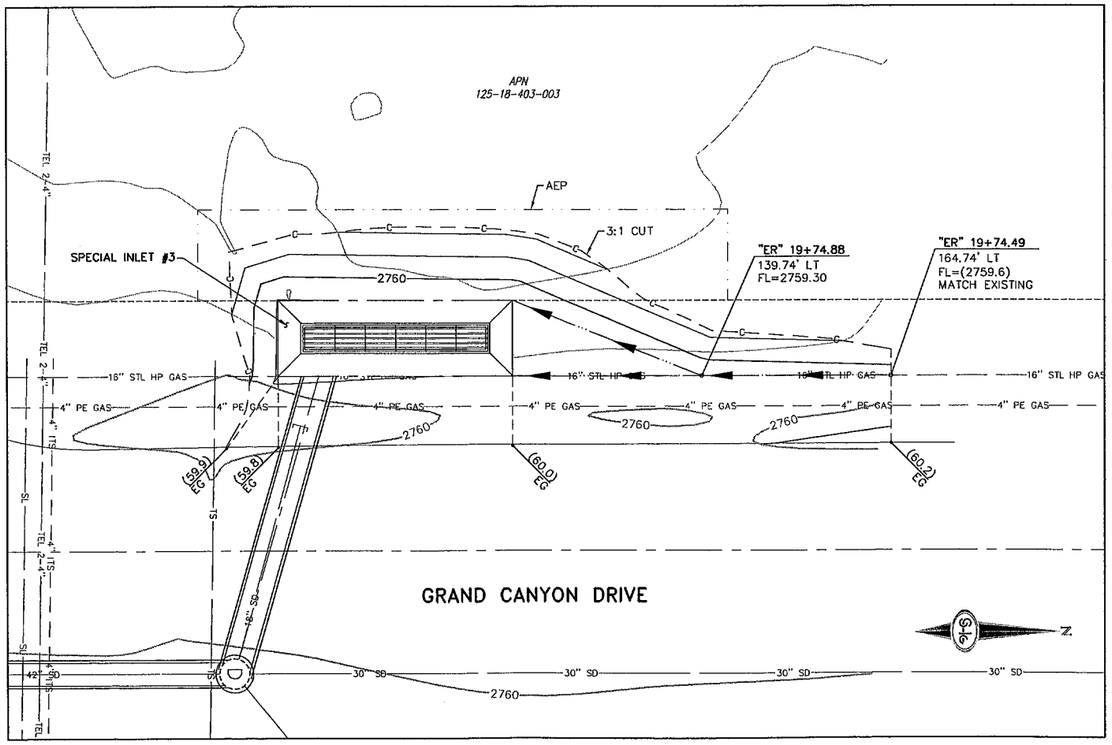
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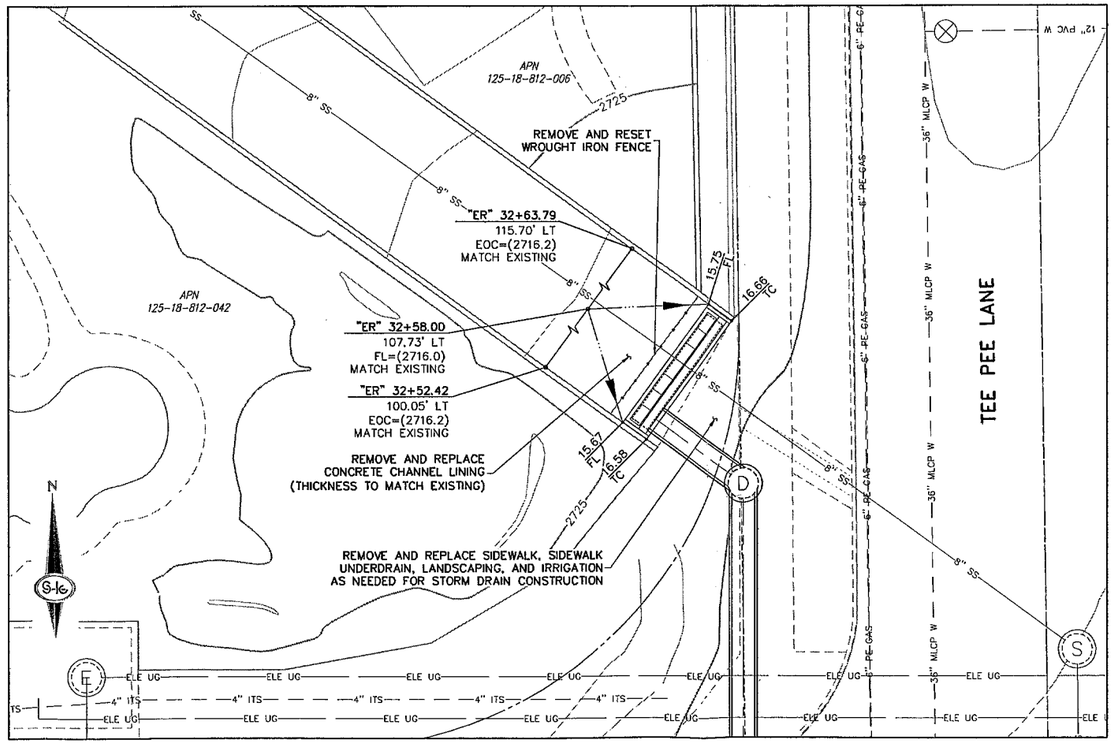
DROP INLET GRADING DETAIL (1 / SD-10)
SCALE: 1" = 10'-0"



DROP INLET GRADING DETAIL (2 / SD-10)
SCALE: 1" = 10'-0"



DROP INLET GRADING DETAIL (3 / SD-10)
SCALE: 1" = 10'-0"



DROP INLET GRADING DETAIL (4 / SD-10)
SCALE: 1" = 10'-0"

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN – FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: DROP INLET GRADING DETAILS

SEAL
90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION

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CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS

UTILITY CONFLICT SCHEDULE - 90% SUBMITTAL

PROJECT: Rancho Road System Elkhorn - Fort Apache to Grand Canyon

PROJECT #: CLV1201

PREPARED BY: Jerrod Ratcliffe, Slater Hanifan Group

CHECKED BY: Mark Failla, P.E., Slater Hanifan Group

DATE 10/7/2013

UTILITY	SIZE AND TYPE	LOCATION		ELEVATION				SOURCE OF INFO		IMPROVEMENT	CONFLICT	ELEVATION			PROPOSED CLEARANCE		REQUIRED CLEARANCE		RESOLUTION
		STATION	OFFSET	FG	TOP	BOTTOM	COVER	POTHOLE	OTHER			TOP	BOTTOM	COVER	ABOVE	BELOW	HORZ	VERT	
CENTURYLINK	(2) 4" TEL	"ER" 20+15	52.8' LT	60.0	56.2	55.9	3.8'	PH 5		36" RCP	NO								PROTECT IN PLACE
CENTURYLINK	(2) 4" TEL	"ER" 24+21	14.3' LT	44.6	42.1	41.8	2.5'		EST	7' X 6' RCB	NO								PROTECT IN PLACE
CENTURYLINK	(4) 4" TEL ENCASED	"ER" 32+79	46.0' LT	15.0	12.6	10.3	2.4'	PH 21		36" RCP	NO								PROTECT IN PLACE
CENTURYLINK	(6) 4" TEL	"ER" 33+51	26.9' LT	12.5	10.7	7.3	1.8'	PH 30		7' X 6' RCB 8" SS	NO								PROTECT IN PLACE
SWG	6" PE	"ER" 18+77	22.5' RT	62.6	58.9	58.4	3.7'	PH 1		7' X 6' RCB	NO								PROTECT IN PLACE
SWG	4" STL HP	"ER" 19+36	22.5' RT	61.1	53.2	52.74	7.8'	PH 6		7' X 6' RCB	NO								PROTECT IN PLACE
SWG	16" STL HP	"ER" 19+81	22.5' RT	60.1	53.0	51.64	7.1'	PH 7		7' X 6' RCB	NO								PROTECT IN PLACE
SWG	4" PE	"ER" 19+81	22.5' RT	60.1	56.1	55.81	3.9'	PH 7		7' X 6' RCB	NO								PROTECT IN PLACE
SWG	2" PE	"ER" 24+76	15.5' LT	43.0	38.0	37.83	5.0'	PH 14		7' X 6' RCB	NO								PROTECT IN PLACE
SWG	6" PE	"ER" 32+90	15.5' LT	14.5	12.1	11.61	2.4'	PH 24		7' X 6' RCB	NO								PROTECT IN PLACE
SWG	2" PE	"ER" 39+92	15.5' LT	93.1	88.4	88.19	4.7'	PH 34		7' X 6' RCB	NO								PROTECT IN PLACE
SWG	6" STL HP	"ER" 19+20	10.4' LT	62.0	55.1	54.60	6.9'	PH 3		24" RCP	NO								PROTECT IN PLACE
SWG	6" PE	"ER" 19+18	34.8' LT	62.2	57.8	57.3	4.3'	PH 4		DROP INLET	NO								PROTECT IN PLACE
SWG	16" STL HP	"ER" 19+79	88.8' LT	59.8	49.9	48.6	9.9'	PH 9		29" x 45" HERCP	NO								PROTECT IN PLACE
SWG	4" PE	"ER" 19+79	88.8' LT	59.8	54.3	54.0	5.5'	PH 9		29" x 45" HERCP	YES								RELOCATE BY SWG
SWG	6" PE	"ER" 20+16	34.8' LT	59.8	55.8	55.3	4.0'	PH 11		36" RCP	NO								PROTECT IN PLACE
SWG	6" PE	"ER" 32+79	30.0' LT	14.1	11.7	11.2	2.4'	PH 27		36" RCP	NO								PROTECT IN PLACE
LVVWD	8" WATER	"ER" 24+86	15.5' LT	42.6	37.7	37.0	4.9'	PH 15		7' X 6' RCB	NO								PROTECT IN PLACE
LVVWD	8" WATER	"ER" 26+41	15.5' LT	37.1	32.1	31.5	5.0'	PH 17		7' X 6' RCB	NO								PROTECT IN PLACE
LVVWD	36" WATER	"ER" 33+04	15.5' LT	113.9	97.1	94.1	16.8'	PH 28		7' X 6' RCB	NO								RUBBER GASKETS AND ELASTOMERIC JOINT SEALANT 10' EACH SIDE OF WATER LINE
LVVWD	10" WATER	"ER" 33+38	15.5' LT	12.9	8.3	7.4	4.7'	PH 29		7' X 6' RCB 8" SS	NO								PROTECT IN PLACE
LVVWD	6" WATER	"ER" 40+50	15.5' LT	90.9	86.4	85.9	4.5'	PH 35		7' X 6' RCB	NO								PROTECT IN PLACE
LVVWD	8" WATER	"ER" 42+77	15.5' LT	82.5	77.9	77.2	4.6'	PH 37		7' X 6' RCB	NO								RUBBER GASKETS AND ELASTOMERIC JOINT SEALANT 10' EACH SIDE OF WATER LINE
LVVWD	8" WATER	"ER" 20+16	44.6' LT	59.8	54.9	59.1	4.9'	PH 13		36" RCP	NO								PROTECT IN PLACE
LVVWD	12" WATER	"ER" 32+79	39.0' LT	14.0	9.4	8.4	4.5'	PH 26		36" RCP	NO								PROTECT IN PLACE

CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS

UTILITY CONFLICT SCHEDULE - 90% SUBMITTAL

PROJECT: Rancho Road System Elkhorn - Fort Apache to Grand Canyon

PROJECT #: CLV1201

PREPARED BY: Jerrod Ratcliffe, Slater Hanifan Group

CHECKED BY: Mark Failla, P.E., Slater Hanifan Group

DATE 10/7/2013

UTILITY	SIZE AND TYPE	LOCATION		ELEVATION				SOURCE OF INFO		IMPROVEMENT	CONFLICT	ELEVATION			PROPOSED CLEARANCE		REQUIRED CLEARANCE		RESOLUTION
		STATION	OFFSET	FG	TOP	BOTTOM	COVER	POTHOLE	OTHER			TOP	BOTTOM	COVER	ABOVE	BELOW	HORZ	VERT	
NVE	4" CONDUIT	"ER" 24+94	15.5' LT	42.3	38.6	38.3	3.6'	PH 16		7' X 6' RCB	NO								PROTECT IN PLACE
NVE	(2) 6" CONDUIT	"ER" 33+53	15.5' LT	12.4	8.4	7.3	4.0'	PH 31		7' X 6' RCB 8" SS	NO								PROTECT IN PLACE
NVE	ENCASED ELEC	"ER" 33+63	15.5' LT	12.1	8.5	7.4	3.5'	PH 33		7' X 6' RCB 8" SS	NO								PROTECT IN PLACE
NVE	4" CONDUIT	"ER" 42+26	15.5' LT	84.2	80.7	80.4	3.5'	PH 36		7' X 6' RCB	NO								PROTECT IN PLACE
NVE	(2) 6" CONDUIT	"ER" 19+17	46.9' LT	62.4	58.6	56.7	3.8'	PH 5		DROP INLET	NO								PROTECT IN PLACE
NVE	(2) 6" CONDUIT ENCASED	"ER" 20+16	40.5' LT	59.9	56.2	55.4	3.7'	PH 12		36" RCP	NO								PROTECT IN PLACE
NVE	ELEC CONDUIT ENCASED	"ER" 32+79	47.6' LT	16.1	12.5	11.3	3.5'	PH 20		36" RCP	NO								PROTECT IN PLACE
NVE	ELEC CONDUIT ENCASED	"ER" 32+79	59.5' LT	16.8	12.0	10.5	4.8'	PH 23		36" RCP	NO								PROTECT IN PLACE
NVE	(4) 6" CONDUIT ENCASED	"ER" 18+59	41.0' RT	62.0	58.2	54.7	3.8'	PH 2		DROP INLET	YES								RELOCATE BY NV ENERGY
COX	(2) 2" CATV	"ER" 23+72	4.8' LT	46.6	43.6	43.4	3.0'	PH 18		7' X 6' RCB	NO								PROTECT IN PLACE
COX	(2) 3" CATV	"ER" 33+55	15.5' LT	12.3	10.9	10.7	1.4'	PH 32		7' X 6' RCB	NO								PROTECT IN PLACE
COX	(2) 3" CATV	"ER" 32+79	54.4' LT	15.5	12.0	11.7	3.5'	PH 22		36" RCP	NO								PROTECT IN PLACE
SEWER	12" SEWER	"ER" 23+47	4.98' RT	47.6	41.4	40.4	6.2'		EST	7' X 6' RCB	NO								PROTECT IN PLACE
SEWER	8" SEWER	"ER" 33+23	15.5' LT	13.6	3.3	2.6	10.3'		EST	7' X 6' RCB	YES								CAP AND REMOVE 8" SEWER AND INSTALL NEW 8" SEWER ALONG RCB AND CONNECT TO EXISTING 12" SS "ER" 35+27
SEWER	12" SEWER	"ER" 19+20	4.9' RT	61.5	56.8	55.8	4.7'		EST	24" RCP	NO								PROTECT IN PLACE
SEWER	12" SEWER	"ER" 20+16	4.7' RT	59.5	53.8	52.8	5.7'		EST	36" RCP	NO								PROTECT IN PLACE
SEWER	8" SEWER	"ER" 32+71	100.0' LT	15.2	8.6	8.0	6.6'		EST	DROP INLET	NO								PROTECT IN PLACE
STORM DRAIN	18" STORM DRAIN	"ER" 20+16 TO "ER" 23+39	10.0' RT TO 22.9' RT							7' X 6' RCB	YES								HORIZONTAL CONFLICT WITH NEW RCB. REMOVE EXISTING STORM DRAIN
STORM DRAIN	18" STORM DRAIN	"ER" 28+22	15.5' LT	30.6	25.5	24.0	5.1'		EST	7' X 6' RCB	YES								VERTICAL CONFLICT WITH NEW RCB. REMOVE EXISTING STORM DRAIN AND CONNECT TO NEW RCB
STORM DRAIN	18" STORM DRAIN	"ER" 32+39	15.5' LT	16.4	13.0	11.5	3.4'		EST	7' X 6' RCB	YES								VERTICAL CONFLICT WITH NEW RCB. REMOVE EXISTING STORM DRAIN AND CONNECT TO NEW RCB
STORM DRAIN	18" STORM DRAIN	"ER" 35+88	15.5' LT	5.9	2.7	1.2	3.2'		EST	7' X 6' RCB	YES								VERTICAL CONFLICT WITH NEW RCB. REMOVE EXISTING STORM DRAIN AND CONNECT TO NEW RCB
STORM DRAIN	18" STORM DRAIN	"ER" 41+88	15.5' LT	85.8	83.4	81.9	2.4'		EST	7' X 6' RCB	YES								VERTICAL CONFLICT WITH NEW RCB. REMOVE EXISTING STORM DRAIN AND CONNECT TO NEW RCB
STORM DRAIN	42" STORM DRAIN	"ER" 20+15	78.5' LT TO 10.0' RT							36" RCP	YES								HORIZONTAL CONFLICT WITH NEW RCP. REMOVE EXISTING STORM DRAIN

CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS

UTILITY CONFLICT SCHEDULE - 90% SUBMITTAL

PROJECT: Rancho Road System Elkhorn - Fort Apache to Grand Canyon

PREPARED BY: Jerrod Ratcliffe, Slater Hanifan Group

PROJECT #: CLV1201

CHECKED BY: Mark Failla, P.E., Slater Hanifan Group

DATE 10/7/2013

UTILITY	SIZE AND TYPE	LOCATION		ELEVATION				SOURCE OF INFO		IMPROVEMENT	CONFLICT	ELEVATION			PROPOSED CLEARANCE		REQUIRED CLEARANCE		RESOLUTION
		STATION	OFFSET	FG	TOP	BOTTOM	COVER	POTHOLE	OTHER			TOP	BOTTOM	COVER	ABOVE	BELOW	HORZ	VERT	
STREETLIGHT	STLT CONDUIT	"ER" 20+70	22.5' RT	57.2	55.2	55.0	2.0'		EST	7' X 6' RCB	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"ER" 32+68	15.5' LT	15.3	13.3	13.1	2.0'		EST	7' X 6' RCB	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"ER" 33+83	15.5' LT	11.8	9.8	9.6	2.0'		EST	7' X 6' RCB	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"ER" 20+15	50.5' LT	59.9	57.9	57.7	2.0'		EST	36" RCP	NO								PROTECT IN PLACE
STREETLIGHT	STLT CONDUIT	"ER" 32+79	43.6' LT	14.1	12.1	11.9	2.0'		EST	36" RCP	NO								PROTECT IN PLACE
TRAFFIC SIGNAL	TS CONDUIT	"ER" 20+60	22.5' RT	57.6	55.6	55.4	2.0'		EST	7' X 6' RCB	NO								PROTECT IN PLACE
TRAFFIC SIGNAL	TS CONDUIT	"ER" 32+65	15.5' LT	15.4	13.4	13.2	2.0'		EST	7' X 6' RCB	NO								PROTECT IN PLACE
TRAFFIC SIGNAL	TS CONDUIT	"ER" 33+79	15.5' LT	11.9	9.9	9.7	2.0'		EST	7' X 6' RCB	NO								PROTECT IN PLACE
TRAFFIC SIGNAL	TS CONDUIT	"ER" 20+15	75.38' LT	59.9	57.9	57.7	2.0'		EST	36" RCP	NO								PROTECT IN PLACE
TRAFFIC SIGNAL	TS CONDUIT	"ER" 32+79	41.6' LT	14.2	12.2	12.0	2.0'		EST	36" RCP	NO								PROTECT IN PLACE

Note: Elevations shown are to outside of pipe.

RANCHO ROAD SYSTEM
ELKHORN (FORT APACHE TO GRAND CANYON)
90% Construction Cost Estimate

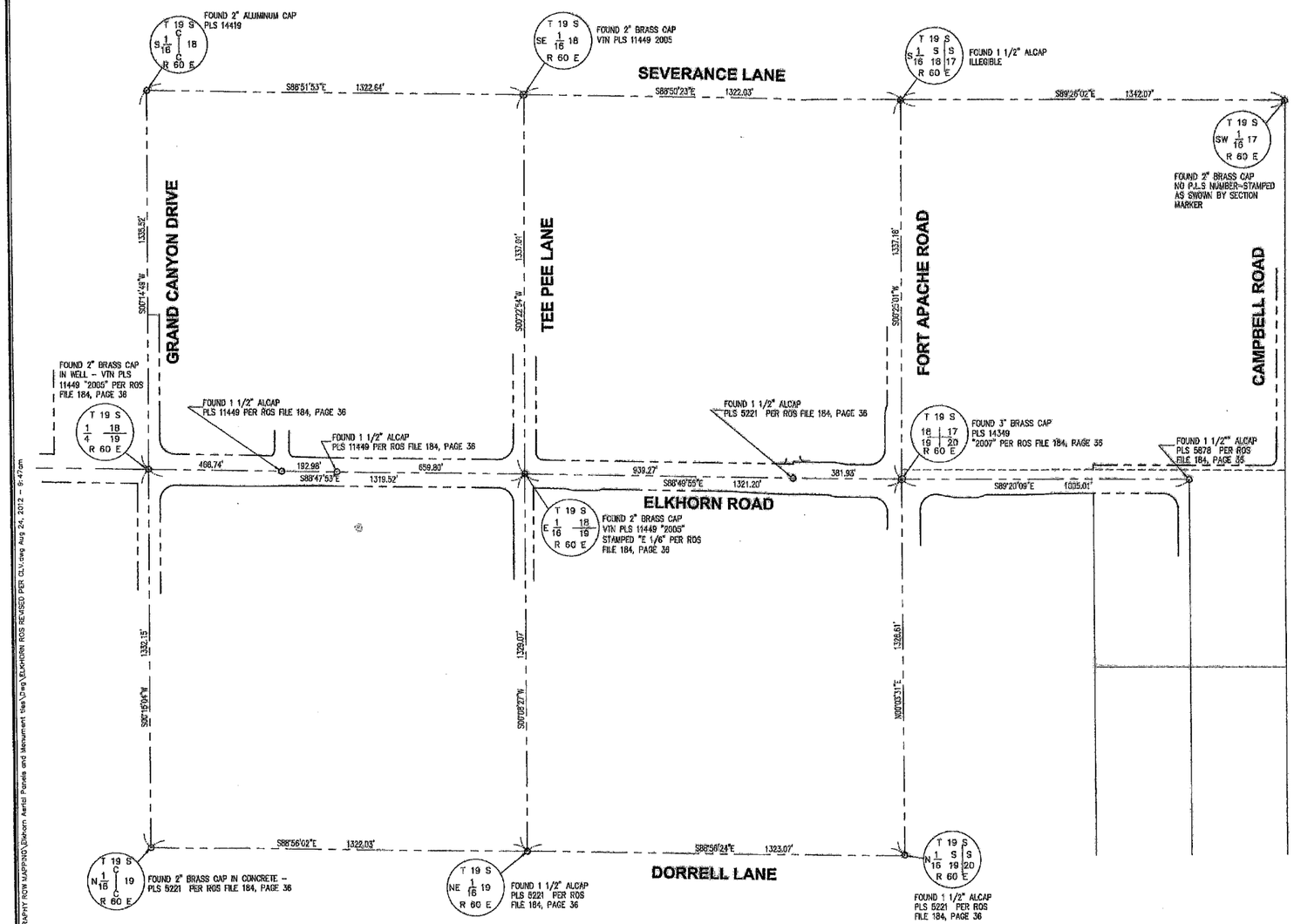
10/7/13

Item Number	Description	Unit	Unit Price	CCRFCD Funding		City Funding		Total Quantity	Total Cost
				Quantity	Cost	Quantity	Cost		
109.01	OWNER INITIATED TIME EXTENSION ALLOWANCE	DAY	$500.00	30	$15,000.00		$0.00	30	$15,000.00
109.02	OWNER INITIATED TIME EXTENSION AMOUNT IN ADDITION TO ALLOWANCE	DAY	$1,500.00	30	$45,000.00		$0.00	30	$45,000.00
200.01	MOBILIZATION AND DEMOBILIZATION	LS	$95,000.00	1	$95,000.00		$0.00	1	$95,000.00
202.01	REMOVE STORM DRAIN MANHOLE	EA	$500.00	3	$1,500.00		$0.00	3	$1,500.00
202.02	REMOVE STORM DRAIN PIPE	LF	$40.00	650	$26,000.00		$0.00	650	$26,000.00
202.03	REMOVE SEWER PIPE (8-INCH)	LF	$30.00	20	$600.00		$0.00	20	$600.00
202.04	ROTOMILL PAVEMENT (2-INCH)	SY	$3.00	11170	$33,510.00		$0.00	11170	$33,510.00
202.05	REMOVE RCB PLUG	EA	$300.00	1	$300.00		$0.00	1	$300.00
212.01	REMOVE AND RESET PALM TREE	EA	$1,500.00	1	$1,500.00		$0.00	1	$1,500.00
402.01	PLANTMIX BITUMINOUS SURFACE (2-INCH)	SY	$10.00	11170	$111,700.00		$0.00	11170	$111,700.00
502.01	7-FOOT X 6-FOOT REINFORCED CONCRETE BOX	LF	$500.00	2500	$1,250,000.00		$0.00	2500	$1,250,000.00
502.02	RCB PLUG	EA	$1,500.00	1	$1,500.00		$0.00	1	$1,500.00
603.01	18-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	$250.00	55	$13,750.00		$0.00	55	$13,750.00
603.02	24-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	$260.00	50	$13,000.00		$0.00	50	$13,000.00
603.03	29-INCH X 45-INCH HORIZONTAL ELLIPTICAL REINFORCED CONCRETE PIPE (CLASS III)	LF	$350.00	50	$17,500.00		$0.00	50	$17,500.00
603.04	36-INCH REINFORCED CONCRETE PIPE (CLASS III)	LF	$300.00	200	$60,000.00		$0.00	200	$60,000.00
603.05	PLUG AND ABANDON STORM DRAIN PIPE	LF	$50.00	260	$13,000.00		$0.00	260	$13,000.00
609.01	48-INCH RCB ACCESS MANHOLE	EA	$2,500.00	8	$20,000.00		$0.00	8	$20,000.00
609.02	60-INCH TYPE III STORM DRAIN MANHOLE	EA	$5,000.00	3	$15,000.00		$0.00	3	$15,000.00
609.03	60-INCH TYPE III STORM DRAIN MANHOLE WITH TYPE 1A RISER	EA	$5,200.00	1	$5,200.00		$0.00	1	$5,200.00
609.04	3-FOOT X 3-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	$5,500.00	1	$5,500.00		$0.00	1	$5,500.00
609.05	3-FOOT X 14-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	$20,000.00	1	$20,000.00		$0.00	1	$20,000.00
609.06	3-FOOT X 24-FOOT SPECIAL DROP INLET WITH CONCRETE APRON	EA	$35,000.00	1	$35,000.00		$0.00	1	$35,000.00
609.07	17.5-FOOT MODIFIED TYPE DM2 DROP INLET	EA	$30,000.00	1	$30,000.00		$0.00	1	$30,000.00
622.01	CONSTRUCTION SURVEYING	LS	$25,000.00	1	$25,000.00		$0.00	1	$25,000.00
624.01	TRAFFIC CONTROL AND MAINTENANCE	LS	$75,000.00	1	$75,000.00		$0.00	1	$75,000.00
627.01	PERMANENT SIGN (GROUND MOUNTED)	EA	$250.00	1	$250.00		$0.00	1	$250.00
628.01	PAVEMENT MARKINGS (6-INCH SOLID WHITE) (POLYUREA)	LF	$1.00	2100	$2,100.00		$0.00	2100	$2,100.00
628.02	PAVEMENT MARKINGS (6-INCH SKIP WHITE) (POLYUREA)	LF	$1.00	215	$215.00		$0.00	215	$215.00
628.03	TYPE 2 PAVEMENT MARKING FILM (24-INCH SOLID WHITE) (CROSSWALK)	LF	$8.00	320	$2,560.00		$0.00	320	$2,560.00
628.04	TYPE 2 PAVEMENT MARKING FILM (BIKE LEGEND)	EA	$250.00	6	$1,500.00		$0.00	6	$1,500.00
628.05	TYPE 2 PAVEMENT MARKING FILM (ARROW)	EA	$150.00	1	$150.00		$0.00	1	$150.00
628.06	TYPE 2 PAVEMENT MARKING FILM ("ONLY")	EA	$150.00	1	$150.00		$0.00	1	$150.00
628.07	TYPE 2 PAVEMENT MARKING FILM STOP BAR	LF	$8.00	10	$80.00		$0.00	10	$80.00
629.01	VERTICALLY ADJUST WATER VALVE COVER	EA	$500.00	4	$2,000.00		$0.00	4	$2,000.00
629.02	VERTICALLY ADJUST BLOW-OFF AND RISER ASSEMBLY	EA	$500.00	1	$500.00		$0.00	1	$500.00
630.01	8-INCH C900 PVC SEWER PIPE	LF	$100.00	50	$5,000.00		$0.00	50	$5,000.00
630.02	8-INCH SDR 35 PVC SEWER PIPE	LF	$90.00	180	$16,200.00		$0.00	180	$16,200.00
630.03	ABANDON 8-INCH PVC SEWER PIPE	LF	$20.00	12	$240.00		$0.00	12	$240.00
630.04	48-INCH SANITARY SEWER MANHOLE	EA	$3,500.00	3	$10,500.00		$0.00	3	$10,500.00
630.05	RE-GROUT SANITARY SEWER MANHOLE BASE	EA	$1,500.00	1	$1,500.00		$0.00	1	$1,500.00
630.06	VERTICALLY ADJUST SANITARY SEWER MANHOLE	EA	$800.00	1	$800.00		$0.00	1	$800.00
633.01	NON-REFLECTIVE PAVEMENT MARKER	EA	$1.50	730	$1,095.00		$0.00	730	$1,095.00
633.02	REFLECTIVE PAVEMENT MARKER	EA	$2.50	280	$700.00		$0.00	280	$700.00
633.03	BLUE REFLECTIVE RAISED FIRE HYDRANT PAVEMENT MARKER	EA	$2.50	1	$2.50		$0.00	1	$2.50
637.01	DUST CONTROL	LS	$25,000.00	1	$25,000.00		$0.00	1	$25,000.00
637.02	NPDES DISCHARGE PERMIT	LS	$2,000.00	1	$2,000.00		$0.00	1	$2,000.00
671.01	VERTICALLY ADJUST ELECTRICAL MANHOLE	EA	$800.00	2	$1,600.00		$0.00	2	$1,600.00
			SUBTOTAL		$2,003,702.50		$0.00		$2,003,702.50
			CONTINGENCY (10%)		$200,370.25		$0.00		$200,370.25
			SUBTOTAL CONSTRUCTION		$2,204,072.75		$0.00		$2,204,072.75
			CONSTRUCTION MANAGEMENT (7%)		$154,285.09		$0.00		$154,285.09
			TOTAL		$2,358,357.84		$0.00		$2,358,357.84

RECORD OF SURVEY

FOR ELKHORN STORM DRAIN IMPROVEMENTS – GRAND CANYON TO FT. APACHE

THE SOUTH HALF (S 1/2) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 18, AND THE NORTH HALF (N 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA



1" = 200'

SURVEYOR'S CERTIFICATE

I, ALAN W. DILL, A PROFESSIONAL LAND SURVEYOR LICENSED IN THE STATE OF NEVADA, CERTIFY THAT:

1. THIS MAP REPRESENTS THE RESULTS OF A SURVEY CONDUCTED UNDER MY DIRECT SUPERVISION AT THE INSTANCE OF SLATER HANIFAN INC., FOR THE CITY OF LAS VEGAS.

2. THE LANDS SURVEYED LIE WITHIN THE SOUTH HALF (S 1/2) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 18, AND THE NORTH HALF (N 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA

3. THIS MAP COMPLIES WITH THE APPLICABLE STATE STATUTES AND ANY LOCAL ORDINANCES IN EFFECT ON THE DATE THAT THE SURVEY WAS COMPLETED ON JUNE 6TH, 2012.

4. THE MONUMENTS DEPICTED ON THE PLAT ARE OF THE CHARACTER SHOWN, OCCUPY THE POSITIONS INDICATED, AND ARE OF SUFFICIENT DURABILITY.

ALAN W. DILL
PROFESSIONAL LAND SURVEYOR
NEVADA CERTIFICATE NO. 7808



8-23-12

BASIS OF BEARINGS

NCRS, LAS VEGAS ZONE, NAD 83 (CORS96) EPOCH 2002.0

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM, LAS VEGAS ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN, THE REFERENCE FRAME BEING NAD 83 (CORS96) EPOCH 2002.0.

REFERENCES

R1) FILE 184, PAGE 36 OF SURVEYS
R2) FILE 114, PAGE 67 OF SURVEYS
R3) BOOK 106, PAGE 70 OF PLATS
R4) BOOK 114, PAGE 11 OF PLATS
R5) BOOK 115, PAGE 98 OF PLATS
R6) BOOK 123, PAGE 38 OF PLATS
R7) BOOK 115, PAGE 98 OF PLATS
R8) BOOK 118, PAGE 65 OF PLATS
R9) BOOK 136, PAGE 48 OF PLATS
R10) BOOK 109, PAGE 25 OF PLATS
R11) BOOK 118, PAGE 89 OF PLATS
R12) FILE 118, PAGE 89 OF SURVEYS

LEGEND

- ⊙ MONUMENTATION FOUND OR REFERENCED AS DESCRIBED
- SECTION LINE – CENTERLINE
- RIGHT-OF-WAY LINE
- ALIQUOT PART LINE
- ◇ DOCUMENT REFERENCE – PUBLIC RIGHT-OF-WAY

COUNTY RECORDER'S NOTE
ANY SUBSEQUENT CHANGES TO THIS MAP SHOULD BE EXAMINED AND MAY BE DETERMINED BY REFERENCE TO THE COUNTY RECORDER'S CUMULATIVE MAP INDEX. N.R.S. 278.5695

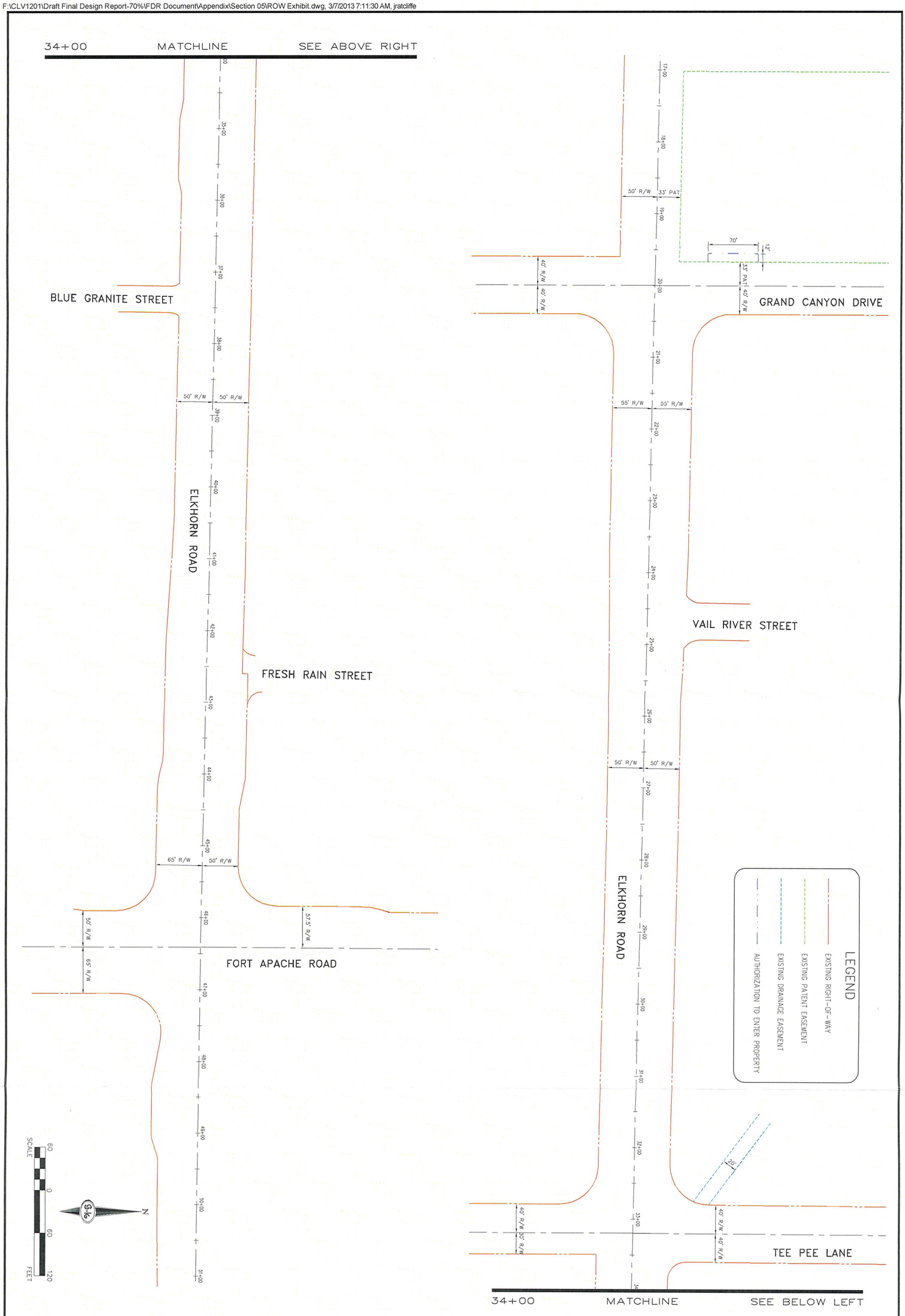
RECORD OF SURVEY
FOR ELKHORN STORM DRAIN IMPROVEMENTS
GRAND CANYON TO FT. APACHE
THE SOUTH HALF (S 1/2) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 18, AND THE NORTH HALF (N 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 19, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA

5820 S. Eastern Avenue, Suite 200
Las Vegas, Nevada 89119
(702) 369-9366 Fax (702) 369-9783
www.stanleygroup.com
Stanley Consultants INC.

NO. 0008780
Filed at the request of
STANLEY CONSULTANTS, INC.
Date 8/27/2012 At 10:30 AM
File 184 Page 17
of SURVEYS
Official Records Book 20120827-1
Clark County, Nevada Records
Dabbie Conway, Recorder
Fee 24.00 Deputy R.NG

H:\Job\project\23811\23811.05.00 ELKHORN TOPOGRAPHY ROW MAPPING\Elkhorn Aerial Panels and Monument Mark\Dwg\ELKHORN ROS REVISED PER CLV.dwg Aug 24, 2012 - 6:47pm

F:\CLV1201\Draft Final Design Report-70%\FDR Document\Appendix\Section 05\ROW Exhibit.dwg, 3/7/2013 7:11:30 AM, jratcliffe



Sheet 1 of 1 DRAWING NO. -

TITLE:
RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET:
RIGHT-OF-WAY EXHIBIT

SEAL

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.

DESIGNED BY: JSR
DRAWN BY: JSR
CHECKED BY: MJF
DATE: 3/1113

REVISIONS			
NO.	DATE:	DESCRIPTION	APP'D

APN 125-29-601-021

Stanley Consultants INC.
A Stanley Group Company
Engineering, Environmental and Construction Services - Worldwide

PROJECT No.: 21776
OCTOBER 2009
BY: CDK
CKD: AWD

PROFESSIONAL LAND SURVEYOR
ALAN W. DILL
Exp: 12/30/10
No. 7808
STATE OF NEVADA
10-20-09

EXHIBIT "A"

EXPLANATION

THIS DESCRIPTION DESCRIBES A PARCEL OF LAND GENERALLY LOCATED NORTH OF TROPICAL PARKWAY AND APPROXIMATELY 690.00 FEET WEST OF GRAND MONTECITO PARKWAY, FOR THE PURPOSE OF A BUREAU OF LAND MANAGEMENT, RIGHT-OF-WAY GRANT, AND TO ESTABLISH RIGHTS-OF-WAY FOR THE EAST HALF (E 1/2) OF BONITA VISTA STREET, BETWEEN TROPICAL PARKWAY AND BRIGHT ANGEL WAY.

DESCRIPTION
BONITA VISTA STREET

BEING A PORTION OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 29, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHWEST CORNER OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SAID SECTION 29, ALSO BEING THE INTERSECTION OF TROPICAL PARKWAY AND BONITA VISTA STREET; THENCE NORTH 00°08'17" EAST, ALONG THE WEST LINE OF SAID SOUTHEAST QUARTER (SE 1/4) AND THE WESTERLY LINE OF THAT CITY OF LAS VEGAS RIGHT-OF-WAY GRANT, PER BLM PERMIT No. N-74262, A DISTANCE OF 40.01 FEET TO THE NORTHERLY LINE OF SAID RIGHT-OF-WAY GRANT AND THE **POINT OF BEGINNING**;

THENCE CONTINUING NORTH 00°08'17" EAST, ALONG THE WEST LINE OF SAID SOUTHEAST QUARTER (SE 1/4), A DISTANCE OF 614.03 TO THE NORTHWEST CORNER OF SAID SOUTHEAST QUARTER (SE 1/4) AND THE INTERSECTION OF BONITA VISTA STREET AND BRIGHT ANGEL WAY; THENCE NORTH 89°10'30" EAST ALONG THE NORTH LINE OF SAID SOUTHEAST QUARTER (SE 1/4), A DISTANCE OF 38.32 FEET TO THE SOUTHEAST CORNER OF THAT

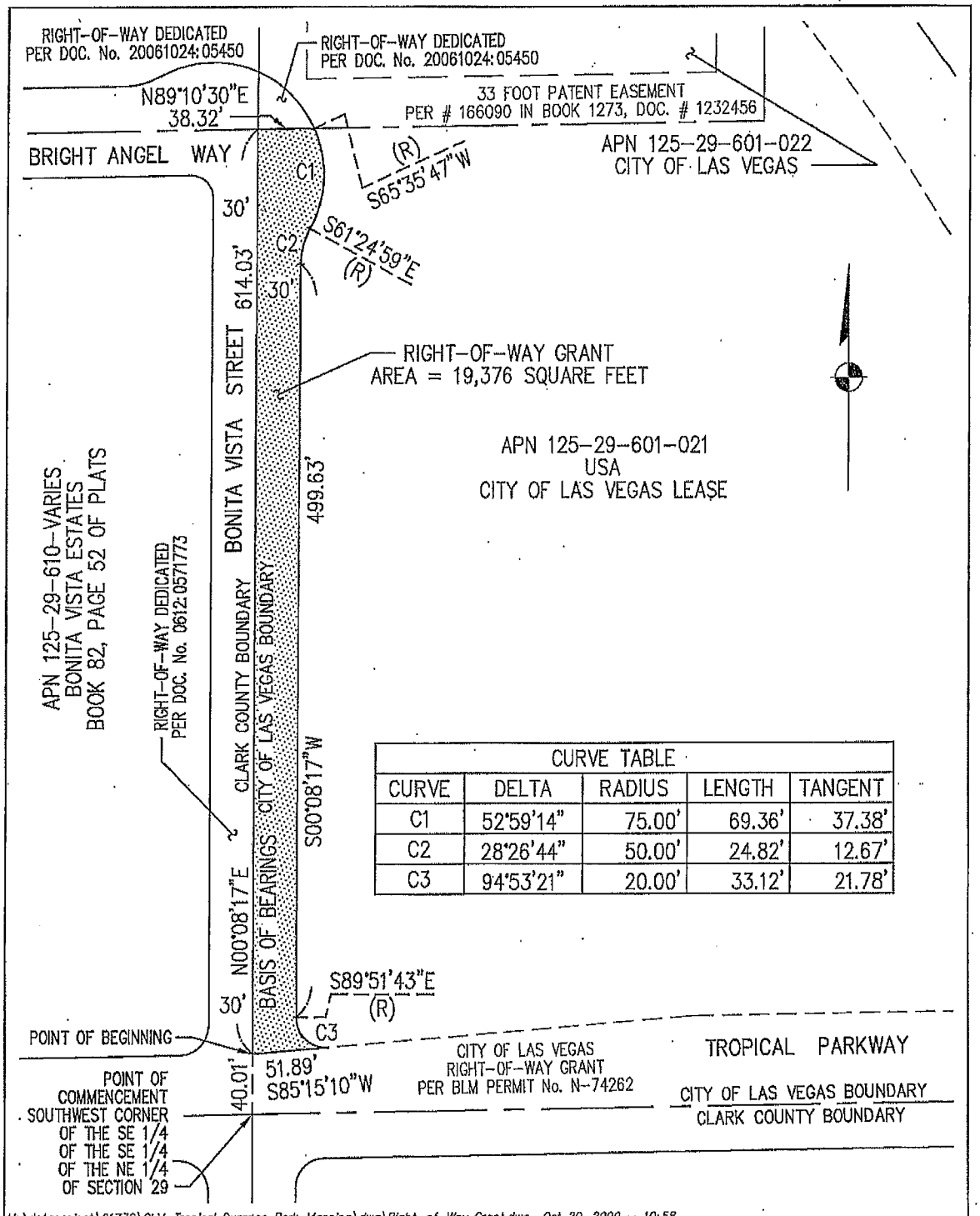
CERTAIN RIGHT-OF-WAY, DEDICATED PER DOCUMENT NO. 20061024:05450, AND THE BEGINNING OF A NON-TANGENT CURVE, CONCAVE WESTERLY, HAVING A RADIUS OF 75.00 FEET, A CENTRAL ANGLE OF 52°59'14", AND FROM WHICH A RADIAL LINE BEARS SOUTH 65°35'47" WEST; THENCE SOUTHERLY ALONG SAID CURVE, 69.36 FEET TO THE BEGINNING OF A REVERSE CURVE, CONCAVE SOUTHEASTERLY, HAVING A RADIUS OF 50.00 FEET AND A CENTRAL ANGLE OF 28°26'44"; THENCE SOUTHERLY ALONG SAID CURVE, 24.82 FEET; THENCE SOUTH 00°08'17" WEST, ALONG A LINE BEING PARALLEL TO, AND 30.00 FEET DISTANT FROM, THE WEST LINE OF SAID SOUTHEAST QUARTER (SE 1/4), A DISTANCE OF 499.63 FEET TO THE BEGINNING OF A CURVE, CONCAVE NORTHEASTERLY, HAVING A RADIUS OF 20.00 FEET AND A CENTRAL ANGLE OF 94°53'21"; THENCE SOUTHEASTERLY ALONG SAID CURVE, 33.12 FEET TO A POINT OF THE NORTHERLY LINE OF THE AFOREMENTIONED CITY OF LAS VEGAS RIGHT-OF-WAY GRANT; THENCE SOUTH 85°15'10" WEST, ALONG SAID NORTHERLY LINE, 51.89 FEET TO THE **POINT OF BEGINNING**.

CONTAINING 19,376 SQUARE FEET / 0.44 ACRES, MORE OR LESS.

BASIS OF BEARINGS

NORTH 00°08'17" EAST, BEING THE BEARING OF THE WEST LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 29, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AND THE CENTERLINE OF BONITA VISTA STREET, AS SHOWN BY BOOK 139, PAGE 48 OF PLATS, ON FILE IN THE COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

END OF DESCRIPTION



CURVE TABLE				
CURVE	DELTA	RADIUS	LENGTH	TANGENT
C1	52°59'14"	75.00'	69.36'	37.38'
C2	28°26'44"	50.00'	24.82'	12.67'
C3	94°53'21"	20.00'	33.12'	21.78'

H:\dataproject\21776\CLV-Tropical Durango Park_Mapping\dwg\Right-of-Way Grant.dwg Oct 20, 2009 - 10:58

PROJECT No.: 21776	EXHIBIT "A" RIGHT-OF-WAY GRANT	DRAWN BY: CDK
Stanley Consultants INC	SECTION 29, TOWNSHIP 19 SOUTH, RANGE 60 EAST, MDM CITY OF LAS VEGAS, CLARK COUNTY, NEVADA	CHECKED BY: AWD SCALE: N/A DATE: OCT 2009 PAGE: 3 of 3

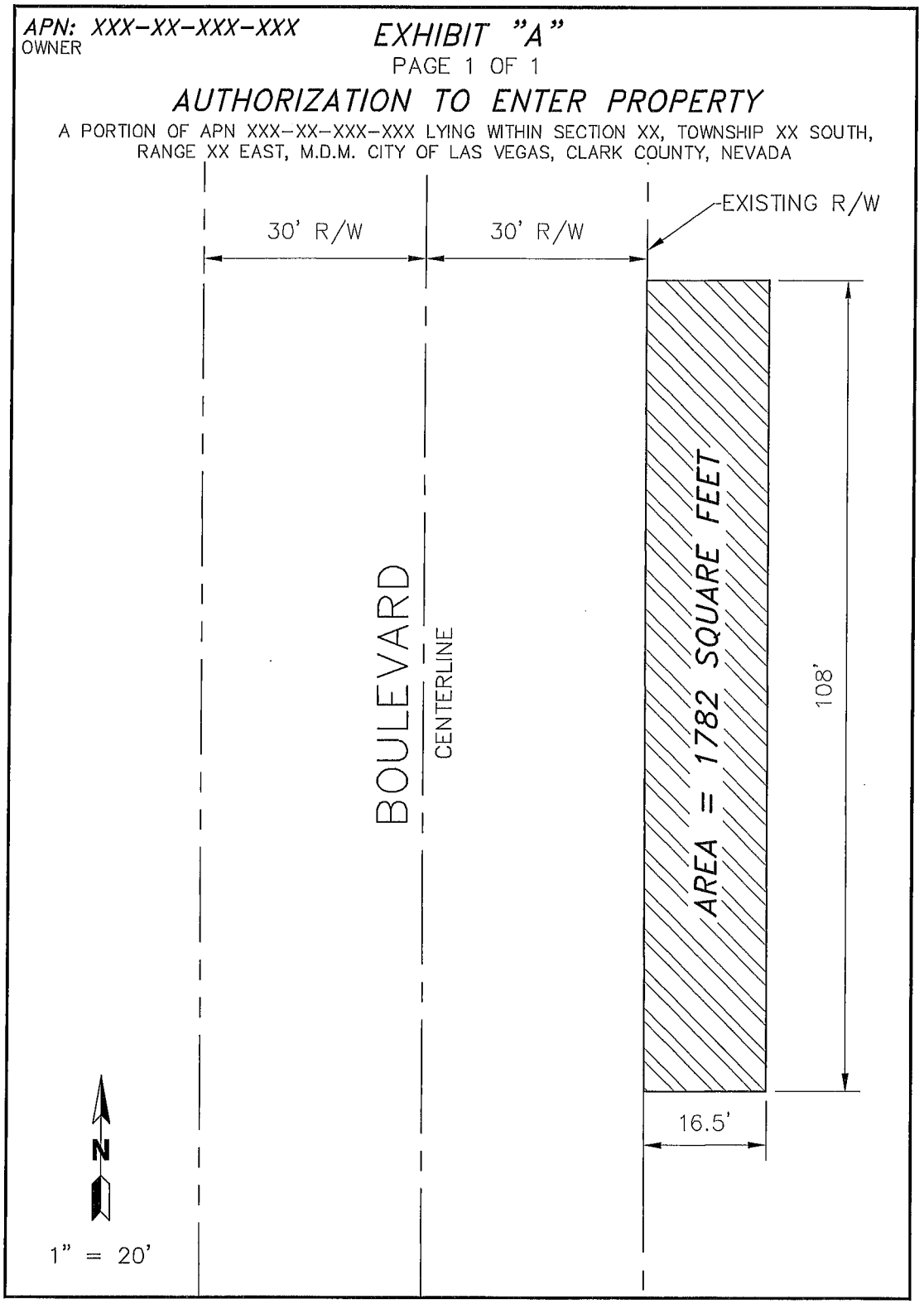
APN: XXX-XX-XXX-XXX
OWNER

EXHIBIT "A"

PAGE 1 OF 1

AUTHORIZATION TO ENTER PROPERTY

A PORTION OF APN XXX-XX-XXX-XXX LYING WITHIN SECTION XX, TOWNSHIP XX SOUTH, RANGE XX EAST, M.D.M. CITY OF LAS VEGAS, CLARK COUNTY, NEVADA



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Rancho Rd System – Elkhorn (Fort Apache to Grand Canyon)
Permit Matrix

Permit Type	Issuing Agency	Address/ Phone Number	Regulated Activity	Application Schedule	Responsible Party	Approximate Processing Time
City of Las Vegas Construction Permit	City of Las Vegas Development Services Center	333 N. Rancho Road Las Vegas, NV 89106 (702) 229-6371	Required for construction, excavation, installation within City of Las Vegas Right-of-way	After Conditional Notice-to-Proceed	Contractor	2 to 3 business working days
Clark County Encroachment Permit	Clark County Public Works	500 S. Grand Central Parkway PO Box 554000 Las Vegas, NV 89155 (702) 455-4615	Required for construction, excavation, installation within Clark County Right-of-way	After Conditional Notice-to-Proceed	Contractor	2 to 3 business working days
Dust Control Permit	Department of Air Quality	4701 W. Russell Road Las Vegas, NV 89118 (702) 455-5942	Required for dust emissions from construction, grading, and trenching for any soil disturbance of 1/4 acre or more	After Conditional Notice-to-Proceed	Contractor	1 to 3 business working days
NPDES Stormwater Discharge Permit for Construction Activities	Nevada Division of Environmental Protection	2030 E. Flamingo Rd. St. 230 Las Vegas, NV, 89119 (702) 486-2850	Required for storm water diversion / control from work site on any construction project 1 acre or more	Prior to Discharge	CLV Project Manager	7 to 14 business working days
Temporary Authority to Discharge	Nevada Division of Environmental Protection – Bureau of Water Pollution Control	2030 E. Flamingo Rd. St. 230 Las Vegas, NV, 89119 (702) 486-2850	Temporary (1 year) point-source discharge of Waters of the US	Prior to Discharge	CLV Project Manager	1 to 6 months
Drainage Review	Clark County Regional Flood Control District	600 S. Grand Central Pkwy Suite 300 Las Vegas NV, 89106-4511 (702) 685-0000		Design Phase	Consultant	2 weeks
Groundwater Discharge Permit	Nevada Division of Environmental Protection – Bureau of Water Pollution Control	2030 E. Flamingo Rd, Ste 230 Las Vegas, NV 89119-0837 (702) 486-2850	Long term (greater than 1 year) point-source discharge of Waters of the US	Prior to Discharge	CLV Project Manager	1 to 6 months
Traffic Control Plan	City of Las Vegas – Department of Public Works, Traffic Engineering Division	333 N. Rancho Dr Las Vegas, NV 89106 (702) 229-6327	Required for traffic control in public right-of-way	After Conditional Notice-to-Proceed	Contractor	2 weeks
Temporary Stock Pile Permit	City of Las Vegas – Development Services Center, Dept. of Building and Safety	333 N. Rancho Dr Las Vegas, NV 89106 (702) 229-6251	Required for temporary stock pile of excavated materials	Construction Phase	Contractor	2 weeks

Contractor is responsible for confirming fees.

GEOTECHNICAL DATA REPORT
RANCHO ROAD SYSTEM
ELKHORN ROAD FROM
FORT APACHE ROAD
TO GRAND CANYON DRIVE
LAS VEGAS, NEVADA

Project No. 20112895E1
September 24, 2013

Prepared for:

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

Slater Hanifan Group
5740 South Arville Street #216
Las Vegas, Nevada 89118

Prepared by:

GES

Geotechnical & Environmental Services, Inc.
7150 Placid Street
Las Vegas, Nevada 89119

GES

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September 24, 2013
Project No. 20112895E1

Mr. Mark Failla, P.E., CFM
Associate/Director of Flood Control
Slater Hanifan Group
5740 South Arville Street #216
Las Vegas, Nevada 89118

RE: Geotechnical Data Report, Rancho Road System, Elkhorn Road From Fort Apache Road to Grand Canyon Drive, Las Vegas, Nevada

Dear Mr. Failla:

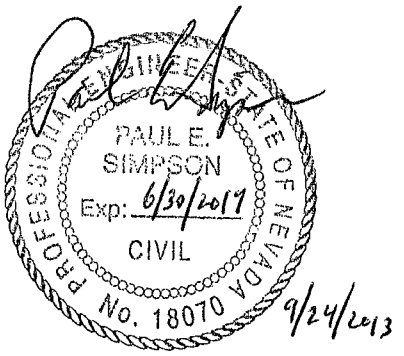
Geotechnical & Environmental Services, Inc. (GES) is pleased to present the Geotechnical Data Report for the proposed Rancho Road System, Elkhorn Road from Fort Apache Road to Grand Canyon Drive storm drain project to be located in northwest Las Vegas, Nevada.

The Geotechnical Data Report includes the findings of the field exploration and laboratory testing.

We appreciate this opportunity to provide our professional services. If you have any questions or comments regarding this information, please feel free to contact our office.

Sincerely,

Geotechnical & Environmental Services, Inc.



Paul E. Simpson, P.E.
Senior Staff Engineer

Daniel J. De Battista, P.E.
Engineering Manager

PES:DJD:sf

Dist: 4 originals delivered to addressee
PDF copy on CD delivered to addressee
PDF e-mailed to addressee at mfailla@shg-inc.com
1 cc to Project File

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GEOTECHNICAL DATA REPORT
RANCHO ROAD SYSTEM
ELKHORN ROAD FROM
FORT APACHE ROAD
TO GRAND CANYON DRIVE
LAS VEGAS, NEVADA

1. INTRODUCTION

This data report presents the findings of a geotechnical study performed by Geotechnical & Environmental Services, Inc. (GES) for improvements to a portion of the Clark County Regional Flood Control District (CCRFCD) Rancho Road System-Beltway designated RCHB 0295 in Las Vegas, Nevada. The portion is located at Elkhorn Road between Fort Apache Road and Grand Canyon Drive. Figure No. A-1 presents a vicinity map showing the approximate location of the project alignment within the Las Vegas Valley. This report includes the findings of boring explorations and results of laboratory tests.

1.1. PURPOSE AND SCOPE

The purpose of this data report is to provide subsurface soil information along the proposed storm drain alignment. The scope of this study included a review of referenced documents, a subsurface exploration, soil sampling, laboratory testing of selected soil samples, and preparation of this data report.

1.2. PROJECT DESCRIPTION

Our understanding of the project is based upon correspondence with Slater Hanifan Group; a review of the CCRFCD 2008 Master Plan; a review of an aerial photograph showing the project location; and our experience with similar projects in the area.

The proposed project will include the installation of a new reinforced concrete box (RCB) storm drain in the Elkhorn Road right-of-way (ROW) within APNs 125-18-899-001, -006, -008, -009, and -010 in Las Vegas, Nevada. We understand that the new RCB will be 7 foot by 6 foot with an anticipated invert depth of 15 to 20 feet beneath the existing asphalt concrete pavement surface. The RCB will extend from approximately Fort Apache Road to Grand Canyon Drive, a distance of approximately 2,600 feet.

The alignment location within the Elkhorn Road ROW is not known at this time, however, we understand that the RCB will likely be constructed generally in the north half of Elkhorn Road within the westbound traffic lanes. We anticipate that the RCB will be constructed using cut-and-cover

techniques, and that the construction will include repaving the ROW where existing pavements are removed.

1.3. SITE DESCRIPTION

Elkhorn Road is an arterial roadway with a ROW width of 100 feet. The ROW is fully improved from curbline to curbline from Grand Canyon Drive to Tee Pee Lane. Existing residential developments are located beyond either side of the ROW between Grand Canyon Drive and Tee Pee Lane. The ROW from Tee Pee Lane to Fort Apache Road is an improved half street with the north half improved from curbline to centerline and a single paved traffic lane without curbs or sidewalks on the south half of the ROW. An existing residential development is located beyond the north side of the ROW and a residential development is under construction beyond the south side of the ROW between Tee Pee Lane and Fort Apache Road.

The drainage of the alignment is generally directed toward the east. Underground utilities including gas, electric, water, sewer, communications, and storm drain were observed within or crossing the ROW.

1.4. FIELD EXPLORATION

GES evaluated the subsurface conditions between the dates of May 31 and June 1, 2012 by drilling five borings (B-1, B-2, B-3, B-4 and B-5) at the site to depths of approximately 25 feet, each, below the existing pavement surface. The total footage drilled was approximately 125 lineal feet. The asphalt concrete pavements were cored with a 12-inch diameter core barrel at each boring location prior to advancing the borings. Each boring was also potholed with an air-knife to depths of approximately 2 to 4 feet in order to evaluate potential conflicts with near-surface utility lines. Figure No. A-2 presents a site plan showing the approximate exploration locations. The exploration locations were recorded by GES staff using a hand held GPS unit at the time the exploration was performed. The ground surface elevations at the boring locations were estimated from aerial photography available on Google earth and is provided on the exploration logs.

A GES geologist directed and supervised the subsurface explorations, maintaining detailed logs of the subsurface conditions, classifying the soils encountered, and obtaining soil samples. The soils encountered were classified in general accordance with the Unified Soil Classification System (USCS). A Key to Symbols and Terms utilized on the exploration logs is presented on Figure No. A-3. The exploration logs are presented on Figure Nos. A-4 through A-8.

The borings along the alignment were drilled with a Diedrich D-120 truck-mounted drill rig using 7-inch nominal outside diameter hollow stem augers. Relatively undisturbed soil samples and penetration blow counts were obtained with a 3-inch outside diameter ring-lined drive sampler (California) and a 2-inch outside diameter unlined split spoon sampler (Standard Penetration Test) in general accordance with ASTM D 3550 and ASTM D 1586, respectively. The samplers were driven with a 140-pound automatic trip hammer falling approximately 30 inches. The penetration resistance measured by driving the sampler was used to evaluate the density and consistency of the in-place soil. Bulk soil samples were also obtained at selected subsurface intervals.

Auger cuttings from the drilling were removed from the alignment for disposal at the end of each work day. The borings were backfilled with Bonded Aggregate Fill (BAF) prepared in general accordance with Section 704.03.07 of the Uniform Standard Specifications for Public Works Construction, Off-Site Improvements (USS), Clark County Area, Nevada. The upper foot of each boring was patched with concrete.

1.5. LABORATORY TESTING

The laboratory testing program consisted of tests to classify the alignment soils and to evaluate engineering and physical properties. The tests performed and a summary of the results are tabulated below:

Table 1.5. Laboratory Test Summary

Type of Test		Range of Results
In-Place Moisture Content		0.8 to 5.2 percent
Gradation	Percent Gravel	31.3 to 57.1
	Percent Sand	30.7 to 54.1
	Percent Fines	10.0 to 14.6
Plasticity Index		Non-Plastic
Liquid Limit		No Value
Swell Potential (Section 1803.5.3.2 of the SNA to the 2009 IBC)		0 percent
R-Value		75
Water Soluble Salt	Sodium	0.00 and 0.01 percent
	Water Soluble Sulfate	0.00 and 0.38 percent
	Total Available Water Soluble Sodium Sulfate	0.00 and 0.01 percent
	Solubility	0.00 and 0.39 percent

The test results are presented in Appendix A on the boring logs and on test reports presented on Figures B-1 through B-12 in Appendix B. Detailed descriptions of the laboratory tests performed are also presented in Appendix B.

2. DISCUSSION

The following sections describe the geology and seismicity at the site and the encountered subsurface materials and conditions.

2.1. GEOLOGY AND SEISMICITY

The subject site is located in the northwest portion of the Las Vegas Valley, a fault-bounded graben structure surrounded by mountain ranges. The Las Vegas Valley is physiographically characteristic of the Basin and Range Province with generally northwest-trending parallel mountain ranges and an intervening basin. Unlike many basins within the Basin and Range Province which are internally draining, the Las Vegas Valley is unique in that the basin drains through the Las Vegas Wash to Lake Mead and the Colorado River.

Tertiary and Quaternary unconsolidated alluvial deposits, derived from the surrounding mountain ranges, fill the valley. These deposits may be up to 4,000 feet thick near the center of the valley. The surrounding mountain ranges are comprised of sedimentary and igneous rocks. Alluvial fan deposits, consisting of sand and gravel, slope down from the mountain fronts towards the valley floor. Sediments are typically less coarse, grading from fine sand and silt to clay near the valley bottom. Beds of amorphous and crystalline gypsum are common. Zones of calcareous cemented deposits (caliche) are present at various locations and depths throughout the valley.

The U.S. National Oceanic and Atmospheric Administration Earthquake Catalog lists about 800 events of magnitude greater than or equal to 4 with epicenters within about 120 miles of Las Vegas. Only 19 events greater than or equal to magnitude 4 are estimated to have occurred during the 1881 through 1938 period in the southern Nevada region.

After about 1947, nuclear testing began at the Nevada Test Site. Therefore, many of the recorded earthquakes after about 1947 may be due to nuclear blasts occurring more than about 60 miles from the subject site. Several hundred earthquakes occurred from 1936 to 1965 near Hoover Dam, presumably due to filling of the Lake Mead reservoir, with 24 of these events reportedly greater than or equal to magnitude 4.

Based on review of the Clark County Soil Guidelines Map, the project site is located in a previously mapped Standard Geotechnical Consideration Area containing mixed alluvial sand and gravel. Based on review of the Clark County Expansive Soil Guidelines Map, the project site is located in a

Special Geotechnical Consideration Area having 4 to 8 percent swell potential. The subject site is mapped on the referenced USDA web soil survey within an area mapped as Dalian very cobbly fine sandy loam, 2 to 8 percent slopes unit to a depth of approximately 5 feet, which is comprised of very cobbly fine sandy loam and very gravelly fine sandy loam.

The subject site is located on the referenced Geologic Map of the Tule Springs Park Quadrangle, Nevada within an area of alluvial-fan deposits of the Spring Mountains. The alluvial-fan deposits of the Spring Mountains are mapped as coarse-grained alluvial-fan deposits originating from principle drainages along the eastern side of the Spring Mountains; includes poorly to moderately sorted, rounded to subangular, sandy pebble-cobble gravels of the Kyle Canyon, Lyle Canyon and Box Canyon fans. The deposits are fan-terrace remnants characterized by subdued to nearly fully smoothed bar-and-channel surface morphology.

Based on a review of referenced geologic maps and literature, the nearest Quaternary-age (last 1.6 million years) fault is located approximately 1-¾ miles northwest of the site, a mapped spring lineament and possible concealed fault is mapped approximately 1-¼ miles west of the site. Other mapped Quaternary-age tectonic faults are the Eglington fault, which geologists have debated may also be potentially active, and Frenchman Mountain fault, which are located approximately 2-½ miles southeast and 17 miles southeast of the site, respectively. The nearest mapped Holocene active fault (i.e., a fault that has moved within the last 10,000 years) is the Black Hills fault, located approximately 31 miles southeast of the site (USGS). The nearest mapped fissure zone is located approximately 1-¾ miles northeast of the site, near Racel Street and Cimmaron Road. Based on the findings of our review of available literature, it is our opinion that the potential for fault-related surface rupture at the site is negligible.

2.2. EXISTING ASPHALT CONCRETE PAVEMENT

Existing asphalt concrete pavements were penetrated at each boring location within the Elkhorn Road ROW. Underlying the asphalt concrete pavements were aggregate base fill soils generally consisting of silty gravel with sand. The approximate thicknesses of the pavement and aggregate base were measured with a metal tape in the field at the time of coring. The approximate asphalt concrete pavement and aggregate base thicknesses encountered in each of the borings are summarized in the following table:

Table 2.2. Approximate Asphalt and Aggregate Base Thicknesses

Boring No.	Approximate Thickness of Asphalt (inches)	Approximate Thickness of Aggregate Base Fill (inches)
B-1	4 to 4-1/4	3-1/2 to 4
B-2	3-3/4 and 4	5-1/2 to 6
B-3	5 to 5-1/4	8
B-4	4-1/2 to 4-3/4	4-1/2
B-5	5 to 5-1/4	5 to 5-1/2

2.3. SUBSURFACE MATERIALS AND CONDITIONS

The following sections describe the fill and native soils encountered in the borings.

2.3.1 FILL

Fill was encountered in each boring consisting of the previously described asphalt concrete pavement and aggregate base.

2.3.2 NATIVE SOILS

The native soils encountered in the borings beneath the previously described fill (aggregate base) were generally coarse-grained. The native soils encountered in the borings were observed as layers of dry, medium dense to very dense poorly graded gravel with silt, sand, and cobbles; dry, very dense silty gravel with sand and cobbles; and dry, dense to very dense silty sand with gravel, and cobbles.

Although not encountered in our explorations, cemented soils may also be encountered beyond or between our boring locations. A detailed excavatability or rippability evaluation is beyond the scope of this study. The contractor should perform the independent investigations necessary to determine the type of equipment required to perform the work.

2.4. GROUNDWATER

Groundwater was not encountered within any of the borings during our field exploration. A review of water wells listed on the State of Nevada Department of Conservation & Natural Resources, Division of Water Resources website indicates that historical groundwater levels in 1974 in the area were previously measured at elevations as shallow as approximately 284 feet below the ground surface. Therefore, groundwater is not anticipated to affect the construction of the proposed improvements.

Groundwater levels should be anticipated to fluctuate due to seasonal precipitation, groundwater withdrawal and recharge, irrigation practices, and potential future dewatering efforts within and/or near the subject site. A detailed evaluation of possible groundwater fluctuations is beyond the scope of this study.

2.5. TRENCH BACKFILL SUITABILITY

GES evaluated the suitability of non-cemented soils collected from the borings for use as Selected Backfill and Granular Backfill, as specified in Section 207.02.01 and Section 207.02.02, respectively, of the Clark County Uniform Standard Specifications for Public Works Construction (USS). The samples tested were screened in the field of materials larger than 3-inches as excavated trench spoils are likely to have. Excavated trench spoils will have to be screened to remove materials larger than 3-inches before use as Selected Backfill and Granular Backfill. Specifications for gradation and plasticity, results of laboratory tests, and an evaluation of suitability are provided in the following tables.

Table 2.5.-1 Trench Backfill Suitability

Sieve Size	Specified Percent of Weight Passing		Percent Passing By Weight			
	Selected Backfill	Granular Backfill	B-1 6.5'-10.0'	B-2 16.0'-20.0'	B-4 1.0'-3.0'	B-5 15.5'-20.0'
6-inch	100	--	100	100	100	100
3-inch	80-100	100	100	100	100	100
No. 4	35-100	35-100	42.9	68.7	43.1	48.6
No. 16	--	25-100	23.6	35.0	26.4	26.7
No. 200	--	5-15	10.0	14.6	12.4	11.5
Plasticity Index*	See Table 2.5.-2		NP	NP	NP	NP
Liquid Limit*	50 max.	--	NV	NV	NV	NV
Meets Selected Backfill Requirements?			**Yes**	**Yes**	**Yes**	**Yes**
Meets Granular Backfill Requirements?			**No**	**Yes**	**Yes**	**Yes**
Remolded Swell (SNBCA 1803.5.3.2)			--	--	0	--
USCS			GP-GM	SM	GM	GP-GM
*NP indicates non-plastic, NV indicates no value						

Table 2.5.-2 Maximum PI for Selected and Granular Backfill

Selected Backfill	
Percent by Weight Passing No. 200 Sieve	**Maximum Plasticity Index**
10-10.0	15
10.1-20.0	12
20.1-50.0	10
50.1-80.0	8
81.1-100.0	6

Granular Backfill	
Percent by Weight Passing No. 200 Sieve	**Maximum Plasticity Index**
0.1 to 3.0	15
3.1 to 4.0	12
4.1 to 5.0	9
5.1 to 8.0	6
8.1 to 11.0	4
11.1 to 15.0	3

3. LIMITATIONS

The data contained in this report are based on field exploration, laboratory testing, research of pertinent maps and literature, and our understanding of the proposed construction. The soil data used in the preparation of this report were obtained from 5 borings performed along the anticipated alignment. It is possible that variation in the soil conditions will exist between the locations explored. This data report presents geotechnical data only and does not present geotechnical conclusions or recommendations for design or construction of the proposed project.

This Geotechnical Data Report is provided for inspection and review only. The City cannot and does not warrant the accuracy or reliability of the information included in the Geotechnical Data Report. Such borings and data are subject to sampling errors. The Geotechnical Data Report was prepared for design purposes and may not provide sufficient data for bid preparation by some contractors. Bidders and the Contractor are solely responsible for assumptions, deductions, interpretations and conclusions they may make or obtain from any such information. The information contained in the Geotechnical Data Report is not to be used by the Contractor for any design work including the design of temporary construction facilities. The Geotechnical Data Report is provided in the Contract Documents with the express understanding of the preceding.

Our services were performed using that degree of care and skill ordinarily exercised under similar circumstances by reputable engineering firms in this or similar localities. No other warranties, either express or implied, are included or intended in this report.

4. REFERENCES

American Society for Testing and Materials (ASTM), 2007, Annual Book of ASTM Standards, Section 4 - Construction: Volumes 04.02, 04.08, and 04.09

American Association of State Highway and Transportation Officials (AASHTO), 2007, Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Part 2B: Tests T216-T333, 27th Edition

Bell, John W., Ramelli, Alan R., and Caskey, John S., 1998, Geologic Map of the Tule Springs Park Quadrangle, Nevada: Scale 1:24,000

Clark County, Uniform Standard Specifications for Public Works Construction, Off-Site Improvements (USS), Clark County Area, Nevada

Clark County Building Department (CCBD), and Nevada Bureau of Mines and Geology (NBMG), 1998, Clark County Soil Guidelines Map: Revision Number 1, dated May 1.

Clark County Department of Development Services-Building Division, 2007, Technical Guideline TG-19-2007, Approved Chemical Test Methods of Soils and Reporting Criteria: revision date July 6

Clark County Department of Development Services-Building Division and the Nevada Bureau of Mines and Geology, 2006, Clark County Expansive Soil Guidelines Map: dated September 5.

Clark County Geographic Information Systems (GIS) Management Office, 2008, Open Web Info Mapper, http://gisgate.co.clark.nv.us/openweb/asp/openweb.asp

dePolo, C.M. and Bell, J.W., 2000, Map of Faults and Earth Fissures in the Las Vegas Area, Nevada Bureau of Mines and Geology prepared in cooperation with Las Vegas Valley Water District: Plate 1

Geotechnical & Environmental Services, Inc., proprietary in-house data

International Code Council, 2009 International Building Code (IBC)

Las Vegas Valley Subsidence Project, 1991, Subsidence-Related Faults and Fissures of the Las Vegas Valley Map: Nevada Bureau of Mines and Geology, Plate 2: June, Scale 1:62,500

Las Vegas Valley 2000 Subsidence Report, Nevada Bureau of Mines and Geology, 2001

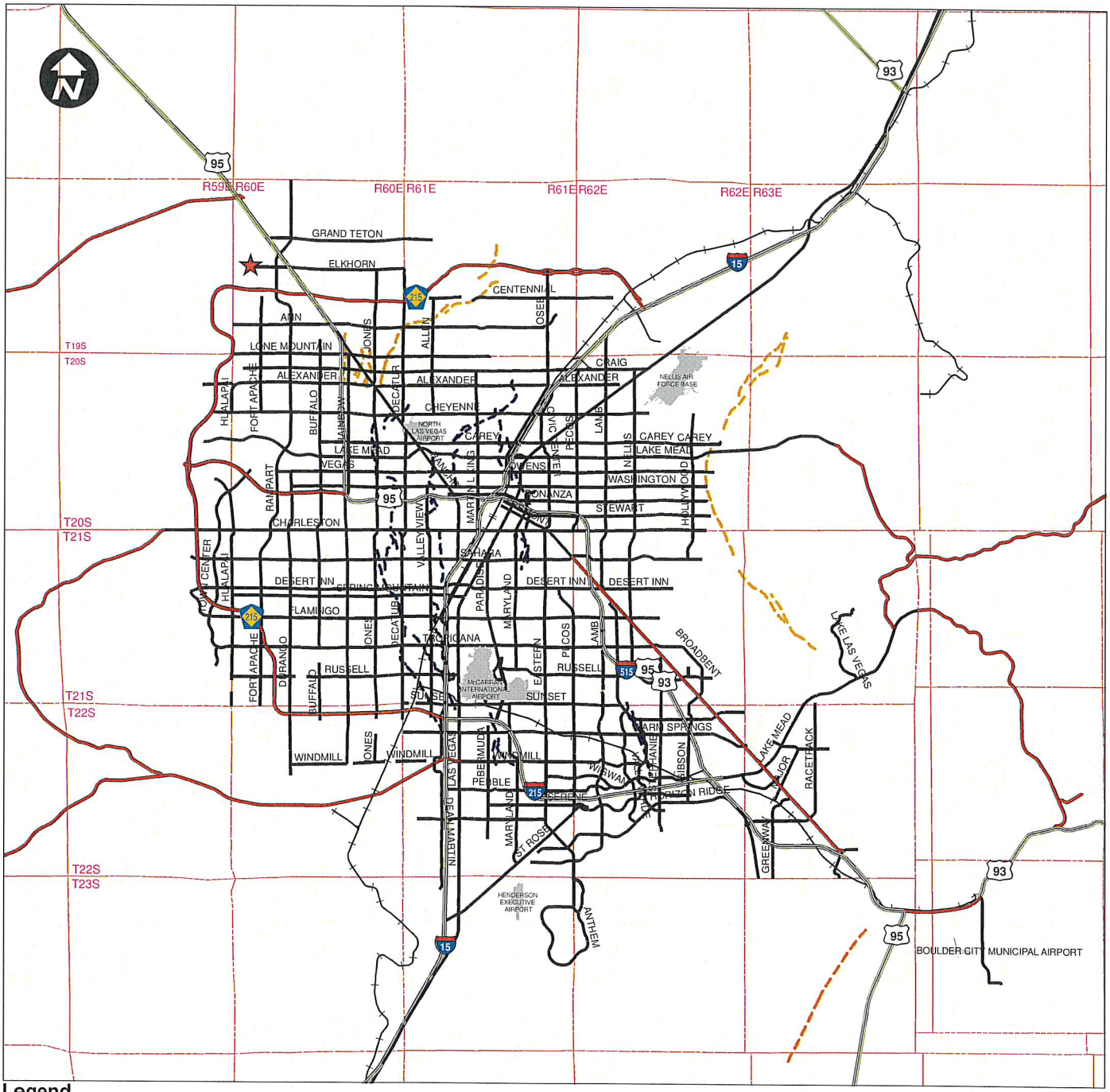
Southern Nevada Building Officials, 2010, Southern Nevada Amendments to the 2009 International Building Code (SNABC): dated September 21

State of Nevada Department of Conservation & Natural resources, Division of Water Resources, Well Log Database: http://water.nv.gov/engineering/wlog/wlog.cfm

United States Department of Agriculture (USDA), Web Soil Survey, http://websoilsurvey.nrcs.usda.gov/app/

United States Geological Survey (USGS), Quaternary Faults and Folds Database of the United States:http://earthquake.usgs.gov/qfaults/

APPENDIX A
SUBSURFACE STUDY



Legend

- Approximate Project Location
- Airports
- Township & Range
- Interstate
- Major Streets
- Railroad
- State Highway

0 2.5 5 10 15 20 Miles

Faults (USGS, 2010)

Linear Faults

Fault Age

- Class B years
- Less than 1,600,000 years
- Less than 750,000 years
- Less than 130,000 years
- Less than 15,000 years
- Less than 150 years
- Unknown

NOTE: Data presented on this map is a compilation of GIS Metadata extracted from a variety of sources. Major Streets, Airports, and Railroads is data obtained from the Southern Nevada GIS Management Office. This data is downloaded by GES for incorporation into drawings generated by GES. Data contained within this page is to be used for informational purposes only. GES has not modified the data contained herein and uses it as it is acquired from the respective agency.

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VICINITY MAP
RANCHO ROAD SYSTEM
ELKHORN - FORT APACHE TO GRAND CANYON
LAS VEGAS, NEVADA

Drawn By:	Date Drawn:
PES	6/14/2012
Project No.	Figure No.
20112895E1	A-1

j:\JOBS\2011_jobs\20112895\E1\GIS\Maps\Figure No A-1 (061412).mxd



0 137.5 275 550 825 1,100 Feet

Legend

B-5 Approximate Boring Locations

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.
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EXPLORATION LOCATION MAP RANCHO ROAD SYSTEM ELKHORN - FORT APACHE TO GRAND CANYON LAS VEGAS, NEVADA	Drawn By: PES	Date Drawn: 6/14/2012
	Project No. 20112895E1	Figure No. A-2

J:\JOBS\2011_Jobs\20112895\E1\GIS\Maps\Figure No A-2 (061412).mxd

KEY TO SYMBOLS AND TERMS

Terms used according to the Unified Soil Classification System

Consistency or Condition of Soils

Fine-Grained Soils (Silt and Clay): Major portion passing #200 sieve

California Sampler* (blows/foot)	SPT** (blows/foot)	Estimated Consistency	Unconfined Compressive Strength (tsf)	Manual Manipulation
< 2	< 2	Very Soft	< 0.25	Thumb will penetrate soil more than 1 in.
2-5	2-4	Soft	0.25-0.50	Thumb will penetrate soil about 1 in.
5-10	4-8	Firm	0.50-1.00	Thumb will penetrate soil about $\frac{1}{4}$ in.
10-20	8-15	Stiff	1.00-2.00	Thumb will not indent soil but readily indented with thumbnail.
>20	>15	Very Stiff	>2.00	Thumbnail will not indent soil.

*ASTM D 3550 using a 140-pound hammer falling 30 inches.
**ASTM D 1586

Coarse-Grained Soils (Sand and Gravel): Major portion retained on #200 sieve

California Sampler* (blows/foot)	SPT** (blows/foot)	Estimated Consistency	Behavior of $\frac{1}{2}$-inch Diameter Probe Rod
0-7	0-4	Very Loose	Easily penetrated when pushed by hand.
7-18	4-10	Loose	Firmly penetrated when pushed by hand.
18-50	10-30	Medium Dense	Easily penetrated when driven by 1 lb. hammer.
50-90	30-50	Dense	Penetrated less than 1 inch when driven with a 1 lb. hammer.
>90	>50	Very Dense	Penetrated less than $\frac{1}{4}$ inch when driven with a 1 lb. hammer.

*ASTM D 3550 using a 140-pound hammer falling 30 inches.
**ASTM D 1586

Cementation	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

Caliche and Cemented Sand and Gravel: Materials classified as medium hard, hard, or very hard caliche or cemented sand and gravel should be treated as rock per Appendix K of the Southern Nevada Amendments to the 2000 International Building Code, published February 11, 2003.

Misc. Symbols

- Exploration continues
- Initial groundwater depth
- Final groundwater depth

Constituent Percentages

- Trace - < 5%
- Few - 5 to 10%
- Little - 15-25%
- Some - 30-45%
- Mostly - 50-100%

Moisture Condition

- Dry - Absence of moisture, dusty, dry to the touch
- Moist - Damp but no visible water
- Wet - Visible free water, usually soil is below water table

Notes

1. Subsurface explorations were performed using the equipment listed on the exploration logs.
2. Subsurface explorations were performed on the date(s) shown on the exploration logs.
3. Soil sampler(s) were driven with a 140 pound hammer falling 30 inches (unless otherwise noted in the text of this report).
4. The transitions between soil types shown on the exploration logs as occuring abruptly at particular depths may in actuality be a gradual progression from one soil type to the next.
5. Exploration logs are subject to the limitations, conclusions, and recomendations presented in this report.

Strata Group Symbols

- Fill
- CL- Low plasticity clay
- CH - High plasticity clay
- ML - Silt
- MH - Elastic Silt
- SP - Poorly graded sand
- SW - Well - graded sand
- GP - Poorly graded gravel
- GW - Well - graded gravel
- Cemented sand and gravel
- Caliche

Soil Sampler Symbols

- Bulk Sample
- Sample from auger cutting
- California Sampler
- Standard Penetration test
- Shelby tube
- Sample from Sonic circular ring bit

GES

Disclaimer

This Key to Symbols is part of a report prepared by Geotechnical & Environmental Services, Inc. and should be used with the report. The descriptions on the exploration logs apply only at the specific exploration locations and at the time the explorations were made. They are not warranted to be representative of subsurface conditions at other locations or times.

Figure No. A-3

EXPLORATION LOG
B-1

PROJECT: RANCHO ROAD SYSTEM
PROJECT NO.: 20112895E1
BORING LOCATION: 36.2919 N, 115.2975 W
EXPLORATION DATE: 5/31/12
EXPLORATION SIZE (dia.): 7" NOMINAL O.D. H.S.A.
EQUIPMENT: DIEDRICH D-120 TRUCK MOUNTED
ELEVATION: 2,685 Feet (Approximately)
LOGGED BY: HAMMOND/DORRIS

INITIAL DEPTH TO WATER: NGE
DATE MEASURED: N/A
FINAL DEPTH TO WATER: NGE
DATE MEASURED: N/A

ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	USCS	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
2685 — 0		PAVE	Asphalt Concrete Pavement. Unit is approximately 4 to 4-1/4 inches thick.						
		FILL							
		GP-GM	Light brown silty GRAVEL with sand (GM), dry and dense. Aggregate base, unit is approximately 3-1/2 to 4 inches thick.						
			Light brown poorly graded GRAVEL with silt, sand and cobbles, dry and dense.			1.4			
2680 — 5	24 27 27			NP	NV				
			...increase in sand fraction.			3.5			
2675 — 10	24 40 43								
			...very dense.			5.0			
2670 — 15	50/2								
						5.2			
2665 — 20	50/2								
2660 — 25	50/3		END OF BORING AT 25.2 FEET			4.4			
2655 — 30									
2650 — 35									

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Figure No. A-4

EXPLORATION LOG
B-2

PROJECT: RANCHO ROAD SYSTEM
PROJECT NO.: 20112895E1
BORING LOCATION: 36.2919 N, 115.2997 W
EXPLORATION DATE: 5/31/12
EXPLORATION SIZE (dia.): 7" NOMINAL O.D. H.S.A.
EQUIPMENT: DIEDRICH D-120 TRUCK MOUNTED
ELEVATION: 2,706 Feet (Approximately)
LOGGED BY: HAMMOND/DORRIS

INITIAL DEPTH TO WATER: NGE
DATE MEASURED: N/A
FINAL DEPTH TO WATER: NGE
DATE MEASURED: N/A

ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	USCS	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
2705 / 0		PAVE / FILL	Asphalt Concrete Pavement. Unit is approximately 3-3/4 to 4 inches thick.						
	8 21 26	GP-GM	Light brown silty GRAVEL with sand (SM), dry and dense. Aggregate base, unit is approximately 5 1/2 to 6 inches thick.			0.8			
2700 / 5	5 11 15		Light brown poorly graded GRAVEL with silt, sand, and cobbles, dry and medium dense to dense.			2.3			
2695 / 10	50/3		...very dense.						
			...more cobbles from approximately 13' to 15'						
2690 / 15	50/2	SM	Light brown silty SAND with gravel, and cobbles, dry and dense.	NP	NV				
2685 / 20	50/2		...very dense.			5.2			
		GP-GM	Light brown poorly graded GRAVEL with silt, sand, and cobbles, dry and very dense.						
2680 / 25	50/3								
			END OF BORING AT 25.3 FEET			2.1			
2675 / 30									
35									

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Figure No. A-5

EXPLORATION LOG
B-3

PROJECT: RANCHO ROAD SYSTEM
PROJECT NO.: 20112895E1
BORING LOCATION: 36.2919 N, 115.3017 W
EXPLORATION DATE: 6/1/12
EXPLORATION SIZE (dia.): 7" NOMINAL O.D. H.S.A.
EQUIPMENT: DIEDRICH D-120 TRUCK MOUNTED
ELEVATION: 2,723 Feet (Approximately)
LOGGED BY: HAMMOND/DORRIS

INITIAL DEPTH TO WATER: NGE
DATE MEASURED: N/A
FINAL DEPTH TO WATER: NGE
DATE MEASURED: N/A

ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	USCS	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
2720 / 0		PAVE	Asphalt Concrete Pavement. Unit is approximately 5 to 5-1/4 inches thick.						
		FILL							
		GP-GM	Light brown silty GRAVEL with sand (GM) dry and dense. Aggregate base, unit is approximately 8 inches thick.						
2715 / 5	17 30 35		Light brown poorly graded GRAVEL with silt, sand and cobbles, dry and dense.			2.2			
2710 / 10	50/1		..very dense.						
2705 / 15	50/1	SM	Light brown silty SAND with gravel, gravel and cobbles, dry and very dense.						
2700 / 20	50/5	GP-GM	Light brown poorly graded GRAVEL with silt, sand, cobbles, dry and very dense.			4.5			
2695 / 25	50/2		**END OF BORING AT 25.2 FEET**						
2690 / 30									
35									

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Figure No. A-6

EXPLORATION LOG
B-4

PROJECT: RANCHO ROAD SYSTEM
BORING LOCATION: 36.2920 N, 115.3038 W
EXPLORATION SIZE (dia.): 7" NOMINAL O.D. H.S.A
ELEVATION: 2,742 Feet (Approximately)

PROJECT NO.: 20112895E1
EXPLORATION DATE: 6/1/12
EQUIPMENT: DIEDRICH D-120 TRUCK MOUNTED
LOGGED BY: HAMMOND/DORRIS

INITIAL DEPTH TO WATER: NGE
FINAL DEPTH TO WATER: NGE

DATE MEASURED: N/A
DATE MEASURED: N/A

ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	USCS	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
0 / 2740		PAVE	Asphalt Concrete Pavement. Unit is approximately 4-1/2 to 4-3/4 inches thick.					0R	
		FILL							
	50/5	GM	Light brown silty GRAVEL with sand (GM), dry and dense. Aggregate base, unit is approximately 4-1/2 inches thick.			1.3			
5 / 2735	50/5		Light brown silty GRAVEL with sand, and cobbles, dry and very dense .			3.5			
10 / 2730	50/2		...more cobbles from approximately 9 to 12'.						
15 / 2725	50/5					2.5			
20 / 2720	50/2								
25 / 2715	50/2		END OF BORING AT 25.2 FEET						
30 / 2710									
35									

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

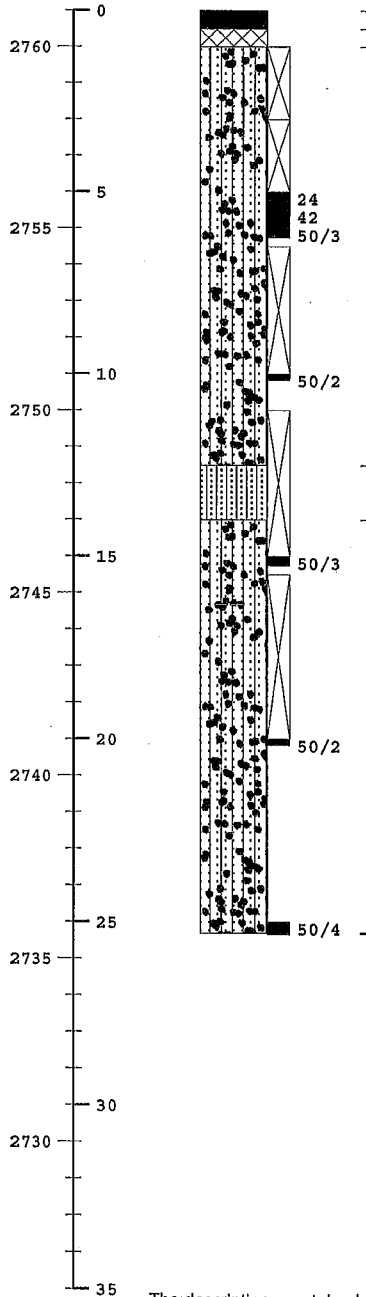
GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Figure No. A-7

EXPLORATION LOG
B-5

PROJECT: RANCHO ROAD SYSTEM
PROJECT NO.: 20112895E1
BORING LOCATION: 36.2920 N, 115.3056 W
EXPLORATION DATE: 6/1/12
EXPLORATION SIZE (dia.): 7" NOMINAL O.D. H.S.A.
EQUIPMENT: DIEDRICH D-120 TRUCK MOUNTED
ELEVATION: 2,761 Feet (Approximately)
LOGGED BY: HAMMOND/DORRIS

INITIAL DEPTH TO WATER: NGE
DATE MEASURED: N/A
FINAL DEPTH TO WATER: NGE
DATE MEASURED: N/A



ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	USCS	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
		PAVE	Asphalt concrete pavement. Unit is approximately 5 to 5-1/4 inches thick.						
		FILL							
		GP-GM	Light brown silty GRAVEL with sand (GM) dry and dense. Aggregate base, unit is approximately 5 to 5-1/2 thick.						
			Light brown poorly graded GRAVEL with silt, sand, and cobbles, dry and very dense.			2.6			
			...large cobble at approximately 11 feet.			2.6			
		SM	Light brown silty SAND with gravel, gravel and cobbles, dry and dense.						
		GP-GM	Light brown poorly graded GRAVEL with silt, sand, and cobbles, dry and very dense.						
			END OF BORING AT 25.3 FEET			4.2			

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Figure No. A-8

APPENDIX B
LABORATORY TEST RESULTS

GEOTECHNICAL DATA REPORT
RANCHO ROAD SYSTEM
ELKHORN ROAD FROM
FORT APACHE ROAD
TO GRAND CANYON DRIVE
LAS VEGAS, NEVADA

1. GRAIN SIZE DISTRIBUTION

Four grain size distribution tests were performed by sieve analysis in general accordance with AASHTO T27. Basically, a sample is oven dried to a constant weight and sieved through a number of different sized sieves. The amount of material retained on each sieve is measured and the percent of material passing each sieve is computed. The test results are presented as particle size distribution curves on Figures B-1 through B-4.

2. ATTERBERG LIMITS

Four Atterberg limit tests were performed in general accordance with AASHTO T89 and T90. The results of these tests are shown on the exploration logs at the respective sampling depths and on Figure B-5.

3. R-VALUE

One subgrade soil sample was tested in the laboratory to determine their R-value in accordance with ASTM D 2844. The R-value test result is an indication of the subgrade resistance to wheel loads and was used in the design of non-dedicated pavements. The result of the R-value test is presented on Figures B-6.

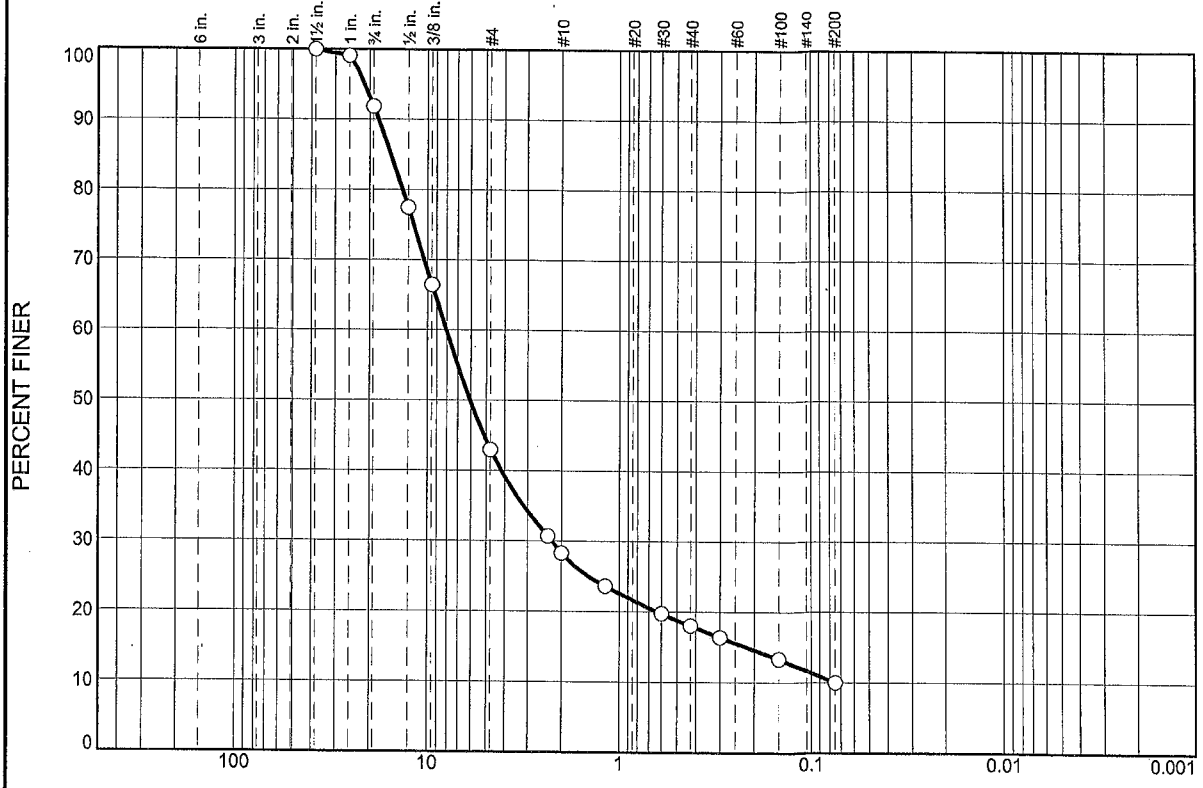
4. 60 PSF SWELL POTENTIAL

One swell test was performed on relatively undisturbed samples of the native soils in general accordance with Section 1802.3.3 of the Southern Nevada Amendments to the 2006 International Building Code. A vertical confining pressure of approximately 60 pounds per square foot was applied to the oven-dried sample and then the sample was inundated with water. The deformation of the sample was recorded for 24 hours. The results of the swell test is presented on Figure B-7.

5. WATER SOLUBLE SALT AND SOLUBILITY

Five tests were performed on selected soil samples to determine the contents of soluble sodium, soluble sulfate, total available sodium sulfate, and total soluble solids (i.e. solubility). The tests were performed by Silver State Analytical Laboratories. The results of the tests are shown on Figures B-8 through B-12.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.1	49.0	14.6	10.3	8.0	10.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	99.1		
.75	91.9		
.5	77.4		
.375	66.4		
#4	42.9		
#8	30.7		
#10	28.3		
#16	23.6		
#30	19.7		
#40	18.0		
#50	16.4		
#100	13.3		
#200	10.0		

* (no specification provided)

Material Description

Poorly graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 15.5709 D_{60}= 8.0480 D_{50}= 6.0609
D_{30}= 2.2532 D_{15}= 0.2185 D_{10}= 0.0756
C_u= 106.46 C_c= 8.34

Classification

USCS= GP-GM AASHTO= A-1-a

Remarks

ENTERED BY: A. SANDERS

Sample Number: B-1 **Depth:** 6.5'-10.0'
Location: BORING B-1 @ 6.5'-10.0'

Date: 06/06/12

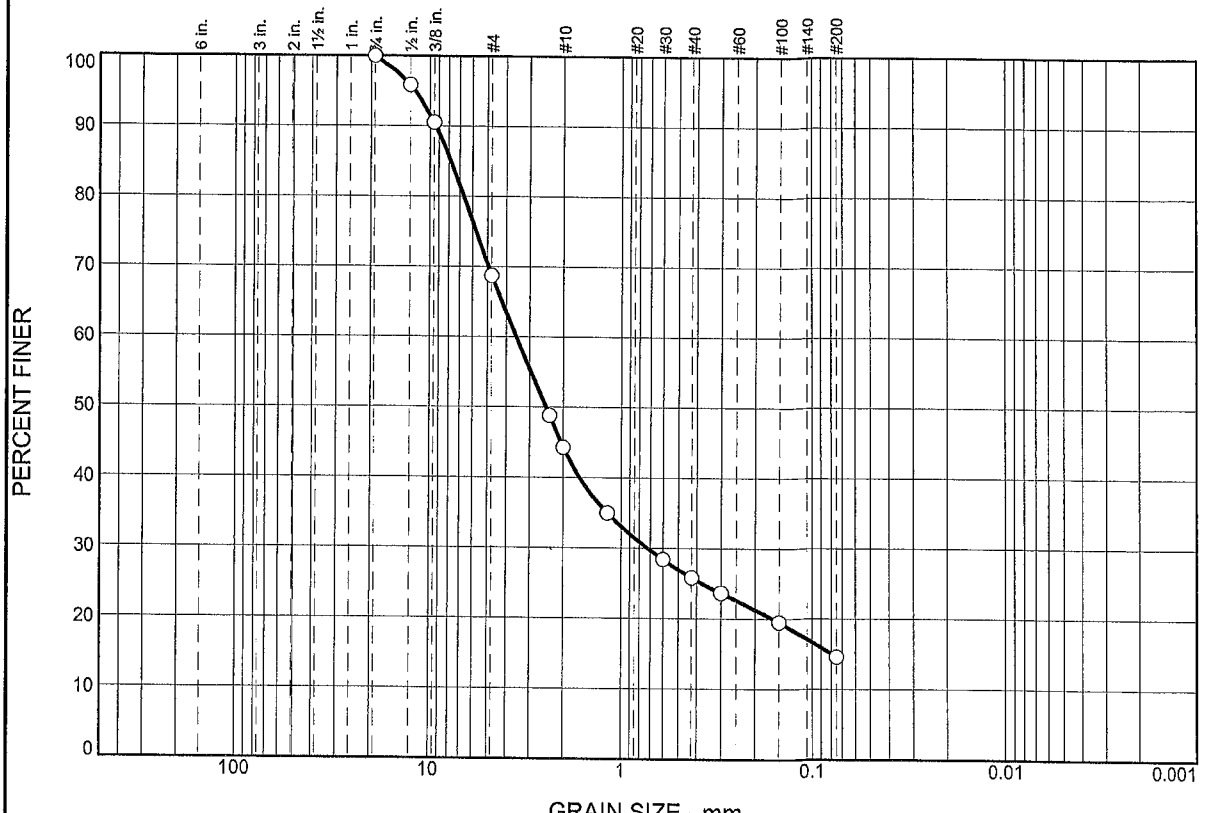
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: RANCHO ROAD SYSTEM

Project No: 20112895E1 **Figure** B-1

Tested By: M. JANOFF

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	31.3	24.4	18.5	11.2	14.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	95.9		
.375	90.6		
#4	68.7		
#8	48.8		
#10	44.3		
#16	35.0		
#30	28.4		
#40	25.8		
#50	23.7		
#100	19.6		
#200	14.6		

* (no specification provided)

Material Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 7.7861 D_{60}= 3.5462 D_{50}= 2.4643
D_{30}= 0.7268 D_{15}= 0.0791 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-a

Remarks

ENTERED BY: A. SANDERS

Sample Number: B-2 **Depth:** 16.0'-20.0'
Location: BORING B-2 @ 16.0'-20.0'

Date: 06/06/12

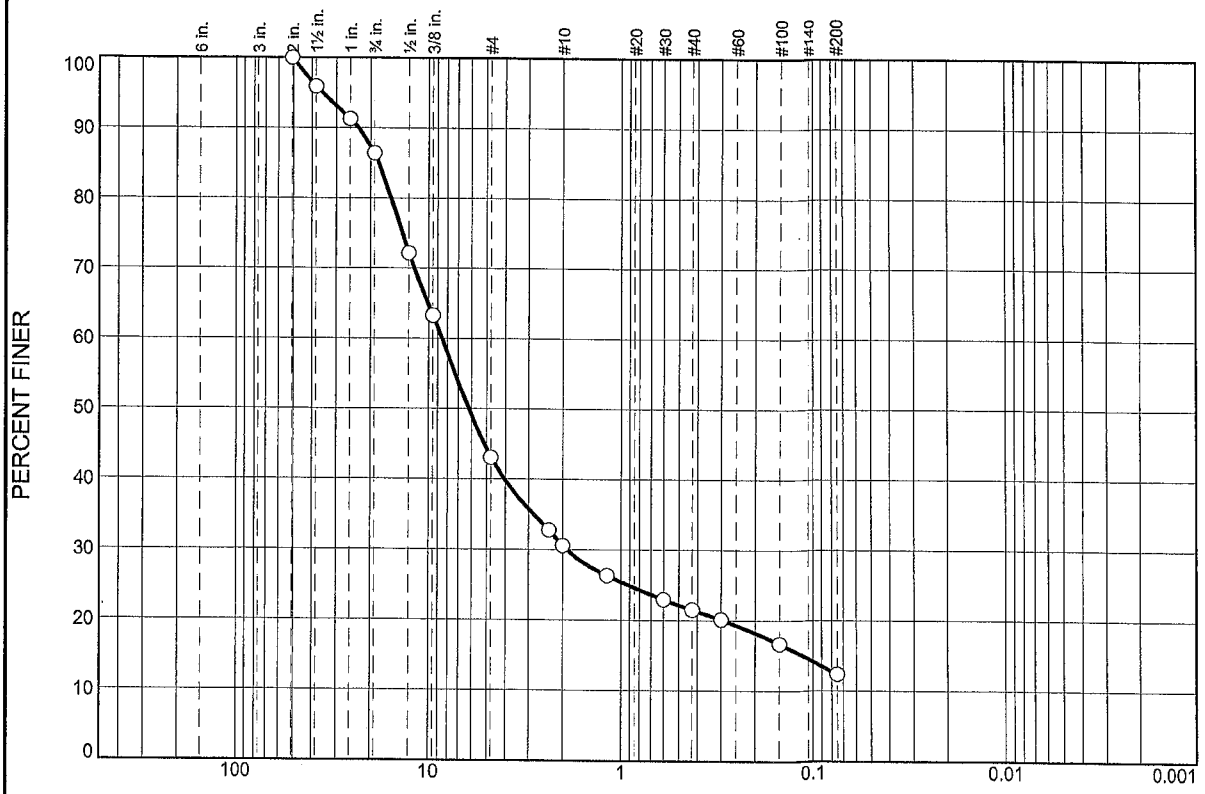
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: RANCHO ROAD SYSTEM

Project No: 20112895E1 **Figure** B-2

Tested By: M. JANOFF

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.6	43.3	12.5	9.1	9.1	12.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	95.9		
1	91.3		
.75	86.4		
.5	72.2		
.375	63.3		
#4	43.1		
#8	32.8		
#10	30.6		
#16	26.4		
#30	23.0		
#40	21.5		
#50	20.1		
#100	16.7		
#200	12.4		

* (no specification provided)

Material Description

Silty gravel with sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 18.1230 D_{60}= 8.5605 D_{50}= 6.1918
D_{30}= 1.9052 D_{15}= 0.1128 D_{10}=
C_u= C_c=

Classification

USCS= GM AASHTO= A-1-a

Remarks

ENTERED BY: A. SANDERS

Sample Number: B-4 **Depth:** 1.0'-3.0'
Location: BORING B-4 @ 1.0'-3.0'

Date: 06/08/12

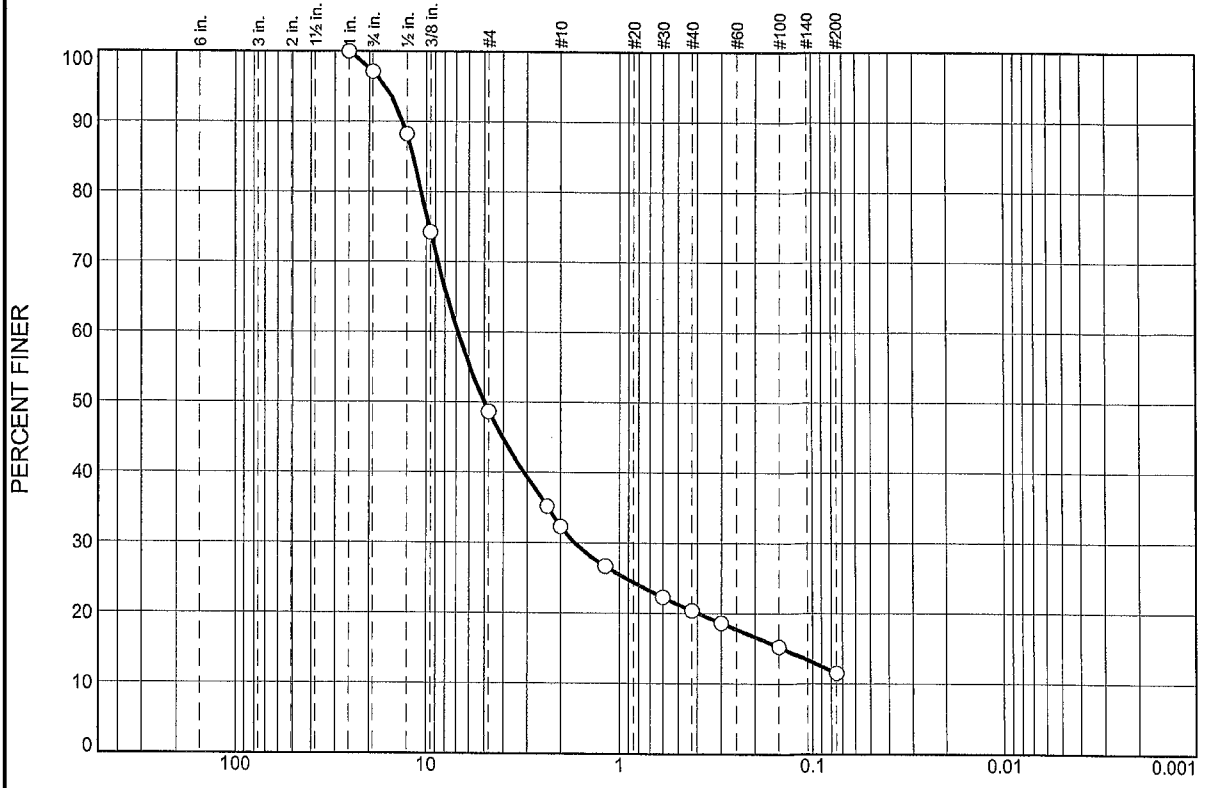
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: RANCHO ROAD SYSTEM

Project No: 20112895E1 **Figure** B-3

Tested By: M. JANOFF

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.9	48.5	16.3	11.9	8.9	11.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	97.1		
.5	88.2		
.375	74.2		
#4	48.6		
#8	35.2		
#10	32.3		
#16	26.7		
#30	22.3		
#40	20.4		
#50	18.6		
#100	15.3		
#200	11.5		

* (no specification provided)

Material Description

Poorly graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 11.7944 D_{60}= 6.8689 D_{50}= 5.0121
D_{30}= 1.6966 D_{15}= 0.1425 D_{10}=
C_u= C_c=

Classification

USCS= GP-GM AASHTO= A-1-a

Remarks

ENTERED BY: A. SANDERS

Sample Number: B-5 **Depth:** 15.5'-20.0'
Location: BORING B-5 @ 15.5'-20.0'

Date: 06/06/12

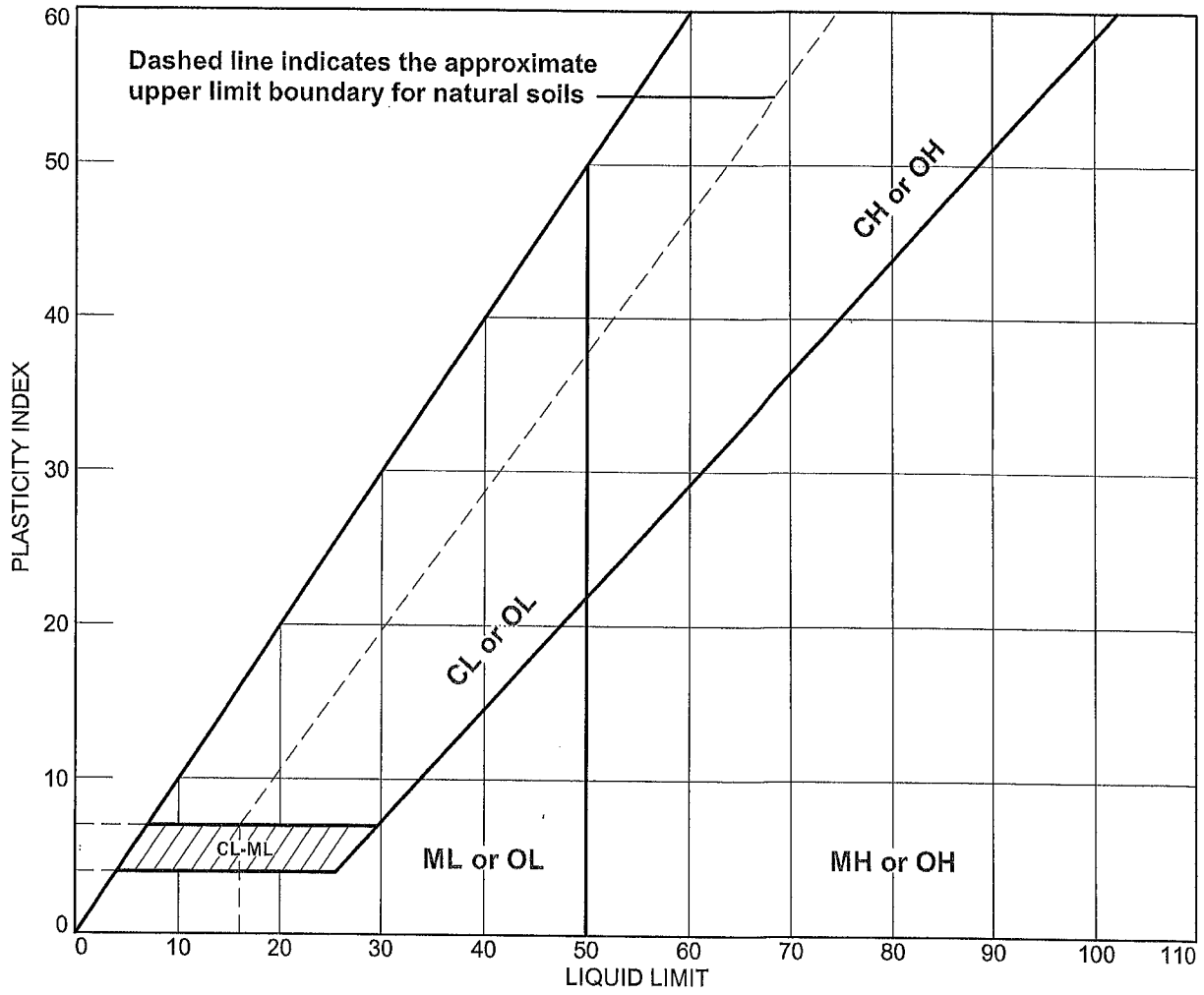
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: RANCHO ROAD SYSTEM

Project No: 20112895E1 **Figure** B-4

Tested By: M. JANOFF

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	LAB#12-053	B-1	6.5'-10.0'		NP	NV	NP	GP-GM
■	LAB#12-053	B-2	16.0'-20.0'		NP	NV	NP	SM
▲	LAB#12-053	B-4	1.0'-3.0'		NP	NV	NP	GM
◆	LAB#12-053	B-5	15.5'-20.0'		NP	NV	NP	GP-GM

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

GES

Client: SLATER HANIFAN GROUP

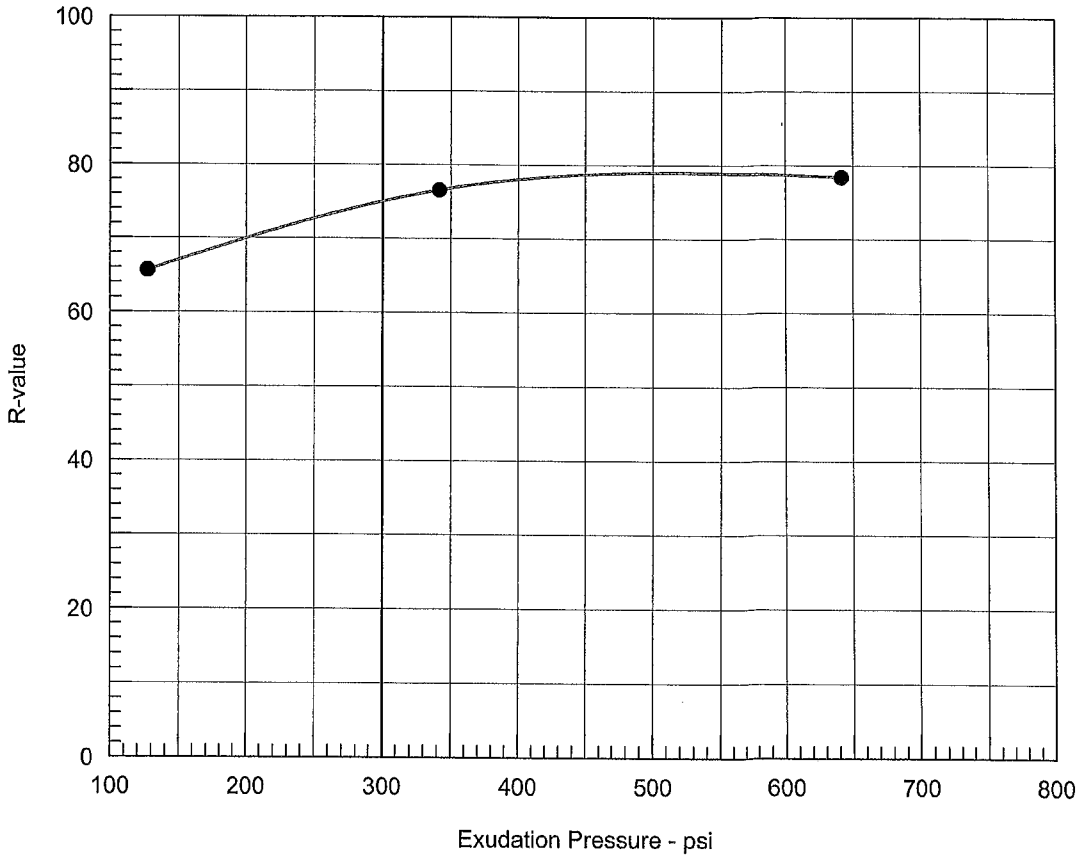
Project: RANCHO ROAD SYSTEM

Project No.: 20112895E1

Figure B-5

Tested By: A. SANDERS

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	350	135.2	5.6	0.00	25	2.40	642	80	78
2	350	126.2	6.0	0.00	28	2.50	342	77	77
3	350	138.1	6.5	0.00	35	2.40	127	68	66

Test Results	Material Description
R-value at 300 psi exudation pressure = 75	Silty gravel with sand

Project No.: 20112895E1
Project:RANCHO ROAD SYSTEM
Location: BORING B-4 @ 1.0'-3.0'
Sample Number: B-4 **Depth:** 1.0'-3.0'
Date: 6/20/2012

Tested by: A. SANDERS
Checked by:
Remarks:

R-VALUE TEST REPORT

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Figure B-6

GEOTECHNICAL &
ENVIRONMENTAL
SERVICES, INC.
GES

SWELL TEST SUMMARY

7150 Placid Street
Las Vegas, Nevada 89119
(702) 365-1001

Project Name: RANCHO ROAD SYSTEM
Project No.: 20112895E1
Sample Date: 6/1/2012
Client: SLATER HANIFAN GROUP
Test Method: SNBCA 1803.5.3.2
Report Date: 6/8/2012

LAB NUMBER	SAMPLE LOCATION	SAMPLE DEPTH (feet)	USCS	TEST CONDITION	SURCHARGE LOAD (psf)	INITIAL DRY DENSITY[1] (pcf)	INITIAL MOISTURE CONTENT[2] (%)	FINAL MOISTURE CONTENT (%)	EXPANSION[3] (%)
12-053	BORING B-4	1.0'-3.0'	GM	REMOLDED	60	121.8	3.9	10.6	0

1 Remolded samples were remolded to approximately 92% of the estimated soil maximum dry density
2 Moisture content prior to oven drying.
3 Positive values refer to swell. Negative values refer to collapse.

Figure No. B-7

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: June 07, 2012

REPORT NUMBER: 12-2363-1

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20112895E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 06/06/12
Time Received: 1600

Sample ID: 12-053, B1@6.5'-10.0'

Analysis	Result	Unit	Method
Sodium	0.00	%	ASTM D2791
Sulfate	0.00	%	SM 4500 E
Sodium Sulfate	0.00	%	Calculation
Total Salts (Solubility)	0.06	%	SM2540B

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120
Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

Figure No. B-8

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: June 07, 2012

REPORT NUMBER: 12-2363-2

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20112895E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 06/06/12
Time Received: 1600

Sample ID: 12-053, B2@1.0'-2.5'

Analysis	Result	Unit	Method
Sodium	0.00	%	ASTM D2791
Sulfate	0.20	%	SM 4500 E
Sodium Sulfate	0.01	%	Calculation
Total Salts (Solubility)	0.33	%	SM2540B

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director

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Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

Figure No. B-9

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: June 07, 2012

REPORT NUMBER: 12-2363-3

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20112895E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 06/06/12
Time Received: 1600

Sample ID: 12-053, B3@11.0'-15.0'

Analysis	Result	Unit	Method
Sodium	0.00	%	ASTM D2791
Sulfate	0.00	%	SM 4500 E
Sodium Sulfate	0.00	%	Calculation
Total Salts (Solubility)	0.01	%	SM2540B

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120
Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

Figure No. B-10

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: June 07, 2012

REPORT NUMBER: 12-2363-4

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20112895E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 06/06/12
Time Received: 1600

Sample ID: 12-053, B4@1.0'-3.0'

Analysis	Result	Unit	Method
Sodium	0.01	%	ASTM D2791
Sulfate	0.38	%	SM 4500 E
Sodium Sulfate	0.03	%	Calculation
Total Salts (Solubility)	0.39	%	SM2540B

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120
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Figure No. B-11

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: June 07, 2012

REPORT NUMBER: 12-2363-5

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20112895E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 06/06/12
Time Received: 1600

Sample ID: 12-053, B5@6.5'-10.0'

Analysis	Result	Unit	Method
Sodium	0.00	%	ASTM D2791
Sulfate	0.00	%	SM 4500 E
Sodium Sulfate	0.00	%	Calculation
Total Salts (Solubility)	0.06	%	SM2540B

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director

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Figure No. B-12

GEOTECHNICAL INTERPRETIVE REPORT
RANCHO ROAD SYSTEM
ELKHORN ROAD FROM
FORT APACHE ROAD
TO GRAND CANYON DRIVE
LAS VEGAS, NEVADA

Project No. 20112895E1
September 24, 2013

Prepared for:

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

Slater Hanifan Group
5740 South Arville Street #216
Las Vegas, Nevada 89118

Prepared by:

GES

Geotechnical & Environmental Services, Inc.
7150 Placid Street
Las Vegas, Nevada 89119

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September 24, 2013
Project No. 20112895E1

Mr. Mark Failla, P.E., CFM
Associate/Director of Flood Control
Slater Hanifan Group
5740 South Arville Street #216
Las Vegas, Nevada 89118

RE: Geotechnical Interpretive Report, Rancho Road System, Elkhorn Road From Fort Apache Road to Grand Canyon Drive, Las Vegas, Nevada

Dear Mr. Failla:

Geotechnical & Environmental Services, Inc. (GES) is pleased to present the Geotechnical Interpretive Report for the proposed Rancho Road System, Elkhorn Road from Fort Apache Road to Grand Canyon Drive storm drain project to be located in northwest Las Vegas, Nevada.

The Geotechnical Interpretive Report includes the findings of the geologic review, the results of the field exploration and laboratory testing programs, presents recommendations for design and construction for the proposed project. This Geotechnical Interpretive Report supplements the Geotechnical Data Report, which presented the findings of the field and laboratory test programs.

We appreciate this opportunity to provide our professional services. If you have any questions or comments regarding this information, please feel free to contact our office.

Sincerely,
Geotechnical & Environmental Services, Inc.

PROFESSIONAL ENGINEER STATE OF NEVADA
PAUL E. SIMPSON
Exp: 6/30/2014
CIVIL
No. 18070
9/24/2013

Paul E. Simpson, P.E.
Senior Staff Engineer

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Dist: 4 originals delivered to addressee
PDF on CD delivered to addressee
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1 cc to Project File

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GEOTECHNICAL INTERPRETIVE REPORT
RANCHO ROAD SYSTEM
ELKHORN ROAD FROM
FORT APACHE ROAD
TO GRAND CANYON DRIVE
LAS VEGAS, NEVADA

1. INTRODUCTION

This data report presents the findings of a geotechnical study performed by Geotechnical & Environmental Services, Inc. (GES) for improvements to a portion of the Clark County Regional Flood Control District (CCRFCD) Rancho Road System-Beltway designated RCHB 0295 in Las Vegas, Nevada. The portion is located at Elkhorn Road between Fort Apache Road and Grand Canyon Drive. Figure No. A-1 presents a vicinity map showing the approximate location of the project alignment within the Las Vegas Valley. This report includes the findings of boring explorations, results of laboratory tests, conclusions regarding the subsurface conditions along the alignment, and geotechnical recommendations for design and construction of the proposed project.

1.1. PURPOSE AND SCOPE

The purposes of our geotechnical study were to evaluate the subsurface soils along the alignment, provide a design level geotechnical evaluation to develop design plans and specifications for the project. The scope of this study included a review of referenced geologic literature and maps, subsurface exploration, soil sampling, laboratory testing of selected soil samples, and engineering evaluations and preparation of this report. This report supplements the Geotechnical Data Report presented by GES under separate cover; however, this report is not intended for use by contractors bidding on the construction phase of this project. In this regard, we have provided information and recommendations concerning:

- Geology and seismicity
- Subsurface material and conditions
- Subgrade preparation, bedding, and trench backfill
- Evaluation of existing materials encountered within the explorations for use as structural fill and/or trench backfill
- Excavation considerations
- Site earthwork, including, trench excavations, temporary excavation stability, pipe bedding and pipe zone backfill, final backfill, material volume changes, and structural fill and import fill
- Engineering parameters for the on-site soils to develop design parameters including:
  - Allowable bearing capacities for structures
  - Estimated total and differential settlements of structures
  - Coefficient of friction for foundations

- Static lateral earth pressures for unrestrained (active) and rigid (at-rest) cantilevered retaining walls
- Seismically induced lateral earth pressures for unrestrained (active) and rigid (at-rest) subsurface walls including vault structures
- Seismically induced peak horizontal ground accelerations
- Recommended minimum asphalt concrete pavement sections
- Concrete mix design criteria for sulfate exposure

1.2. PROJECT DESCRIPTION

Our understanding of the project is based upon correspondence with Slater Hanifan Group; a review of the CCRFCD 2008 Master Plan; a review of an aerial photograph showing the project location; and our experience with similar projects in the area.

The proposed project will include the installation of a new reinforced concrete box (RCB) storm drain in the Elkhorn Road right-of-way (ROW) within APNs 125-18-899-001, -006, -008, -009, and -010 in Las Vegas, Nevada. We understand that the new RCB will be 7 foot by 6 foot with an anticipated invert depth of 15 to 20 feet beneath the existing asphalt concrete pavement surface. The RCB will extend from approximately Fort Apache Road to Grand Canyon Drive, a distance of approximately 2,600 feet.

The alignment location within the Elkhorn Road ROW is not known at this time, however, we understand that the RCB will likely be constructed generally in the north half of Elkhorn Road within the westbound traffic lanes. We anticipate that the RCB will be constructed using cut-and-cover techniques, and that the construction will include repaving the ROW where existing pavements are removed.

1.3. SITE DESCRIPTION

Elkhorn Road is an arterial roadway with a ROW width of 100 feet. The ROW is fully improved from curbline to curbline from Grand Canyon Drive to Tee Pee Lane. Existing residential developments are located beyond either side of the ROW between Grand Canyon Drive and Tee Pee Lane. The ROW from Tee Pee Lane to Fort Apache Road is an improved half street with the north half improved from curbline to centerline and a single paved traffic lane without curbs or sidewalks on the south half of the ROW. An existing residential development is located beyond the north side of the ROW and a residential development is under construction beyond the south side of the ROW between Tee Pee Lane and Fort Apache Road.

The drainage of the alignment is generally directed toward the east. Underground utilities including gas, electric, water, sewer, communications, and storm drain were observed within or crossing the ROW.

1.4. FIELD EXPLORATION

GES evaluated the subsurface conditions between the dates of May 31 and June 1, 2012 by drilling five borings (B-1, B-2, B-3, B-4 and B-5) at the site to depths of approximately 25 feet, each, below the existing pavement surface. The total footage drilled was approximately 125 lineal feet. The asphalt concrete pavements were cored with a 12-inch diameter core barrel at each boring location prior to advancing the borings. Each boring was also potholed with an air-knife to depths of approximately 2 to 4 feet in order to evaluate potential conflicts with near-surface utility lines. Figure No. A-2 presents a site plan showing the approximate exploration locations. The exploration locations were recorded by GES staff using a hand held GPS unit at the time the exploration was performed. The ground surface elevations at the boring locations were estimated from aerial photography available on Google earth and is provided on the exploration logs.

A GES geologist directed and supervised the subsurface explorations, maintaining detailed logs of the subsurface conditions, classifying the soils encountered, and obtaining soil samples. The soils encountered were classified in general accordance with the Unified Soil Classification System (USCS). A Key to Symbols and Terms utilized on the exploration logs is presented on Figure No. A-3. The exploration logs are presented on Figures No. A-4 through A-8.

The borings along the alignment were drilled with a Diedrich D-120 truck-mounted drill rig using 7-inch nominal outside diameter hollow stem augers. Relatively undisturbed soil samples and penetration blow counts were obtained with a 3-inch outside diameter ring-lined drive sampler (California) and a 2-inch outside diameter unlined split spoon sampler (Standard Penetration Test) in general accordance with ASTM D 3550 and ASTM D 1586, respectively. The samplers were driven with a 140-pound automatic trip hammer falling approximately 30 inches. The penetration resistance measured by driving the sampler was used to evaluate the density and consistency of the in-place soil. Bulk soil samples were also obtained at selected subsurface intervals.

Auger cuttings from the drilling were removed from the alignment for disposal at the end of each work day. The borings were backfilled with Bonded Aggregate Fill (BAF) prepared in general accordance with Section 704.03.07 of the Uniform Standard Specifications for Public Works

Construction, Off-Site Improvements (USS), Clark County Area, Nevada. The upper foot of each boring was patched with concrete.

1.5. SOIL LABORATORY TESTING

The laboratory testing program consisted of tests to classify the on-site soils and to evaluate engineering and physical properties. The tests were performed on samples obtained from the on-site fill soils and the on-site native soils. The tests performed and a summary of the results are presented in the following table:

Table 1.5. Soil Laboratory Test Summary

Type of Test		Range of Results
In-Place Moisture Content		0.8 to 5.2 percent
Gradation	Percent Gravel	31.3 to 57.1
	Percent Sand	30.7 to 54.1
	Percent Fines	10.0 to 14.6
Plasticity Index		Non-Plastic
Liquid Limit		No Value
Swell Potential (Section 1803.5.3.2 of the SNA to the 2009 IBC)		0 percent
R-Value		75
Water Soluble Salt	Sodium	0.00 and 0.01 percent
	Water Soluble Sulfate	0.00 and 0.38 percent
	Total Available Water Soluble Sodium Sulfate	0.00 and 0.01 percent
	Solubility	0.00 and 0.39 percent

The test results are presented in Appendix A on the boring logs and on test reports presented on Figures B-1 through B-12 in Appendix B. Detailed descriptions of the laboratory tests performed are also presented in Appendix B.

2. DISCUSSION

The following sections describe the geology and seismicity at the site, the encountered subsurface materials and conditions, and trench backfill suitability evaluation.

2.1. GEOLOGY AND SEISMICITY

The subject site is located in the northwest portion of the Las Vegas Valley, a fault-bounded graben structure surrounded by mountain ranges. The Las Vegas Valley is physiographically characteristic of the Basin and Range Province with generally northwest-trending parallel mountain ranges and an intervening basin. Unlike many basins within the Basin and Range

Province which are internally draining, the Las Vegas Valley is unique in that the basin drains through the Las Vegas Wash to Lake Mead and the Colorado River.

Tertiary and Quaternary unconsolidated alluvial deposits, derived from the surrounding mountain ranges, fill the valley. These deposits may be up to 4,000 feet thick near the center of the valley. The surrounding mountain ranges are comprised of sedimentary and igneous rocks. Alluvial fan deposits, consisting of sand and gravel, slope down from the mountain fronts towards the valley floor. Sediments are typically less coarse, grading from fine sand and silt to clay near the valley bottom. Beds of amorphous and crystalline gypsum are common. Zones of calcareous cemented deposits (caliche) are present at various locations and depths throughout the valley.

The U.S. National Oceanic and Atmospheric Administration Earthquake Catalog lists about 800 events of magnitude greater than or equal to 4 with epicenters within about 120 miles of Las Vegas. Only 19 events greater than or equal to magnitude 4 are estimated to have occurred during the 1881 through 1938 period in the southern Nevada region.

After about 1947, nuclear testing began at the Nevada Test Site. Therefore, many of the recorded earthquakes after about 1947 may be due to nuclear blasts occurring more than about 60 miles from the subject site. Several hundred earthquakes occurred from 1936 to 1965 near Hoover Dam, presumably due to filling of the Lake Mead reservoir, with 24 of these events reportedly greater than or equal to magnitude 4.

Based on review of the Clark County Soil Guidelines Map, the project site is located in a previously mapped Standard Geotechnical Consideration Area containing mixed alluvial sand and gravel. Based on review of the Clark County Expansive Soil Guidelines Map, the project site is located in a Special Geotechnical Consideration Area having 4 to 8 percent swell potential. The subject site is mapped on the referenced USDA web soil survey within an area mapped as Dalian very cobbly fine sandy loam, 2 to 8 percent slopes unit to a depth of approximately 5 feet, which is comprised of very cobbly fine sandy loam and very gravelly fine sandy loam.

The subject site is located on the referenced Geologic Map of the Tule Springs Park Quadrangle, Nevada within an area of alluvial-fan deposits of the Spring Mountains. The alluvial-fan deposits of the Spring Mountains are mapped as coarse-grained alluvial-fan deposits originating from principle drainages along the eastern side of the Spring Mountains; includes poorly to moderately

sorted, rounded to subangular, sandy pebble-cobble gravels of the Kyle Canyon, Lyle Canyon and Box Canyon fans. The deposits are fan-terrace remnants characterized by subdued to nearly fully smoothed bar-and-channel surface morphology.

Based on a review of referenced geologic maps and literature, the nearest Quaternary-age (last 1.6 million years) fault is located approximately 1-¾ miles northwest of the site, a mapped spring lineament and possible concealed fault is mapped approximately 1-¼ miles west of the site. Other mapped Quaternary-age tectonic faults are the Eglington fault, which geologists have debated may also be potentially active, and Frenchman Mountain fault, which are located approximately 2-½ miles southeast and 17 miles southeast of the site, respectively. The nearest mapped Holocene active fault (i.e., a fault that has moved within the last 10,000 years) is the Black Hills fault, located approximately 31 miles southeast of the site (USGS). The nearest mapped fissure zone is located approximately 1-¾ miles northeast of the site, near Racel Street and Cimmaron Road. Based on the findings of our review of available literature, it is our opinion that the potential for fault-related surface rupture at the site is negligible.

2.2. EXISTING ASPHALT CONCRETE PAVEMENT

Existing asphalt concrete pavements were penetrated at each boring location within the Elkhorn Road ROW. Underlying the asphalt concrete pavements were aggregate base fill soils generally consisting of silty gravel with sand. The approximate thicknesses of the pavement and aggregate base were measured with a metal tape in the field at the time of coring. The approximate asphalt concrete pavement and aggregate base thicknesses encountered in each of the borings are summarized in the following table:

Table 2.2. Approximate Asphalt and Aggregate Base Thicknesses

Boring No.	Approximate Thickness of Asphalt (inches)	Approximate Thickness of Aggregate Base Fill (inches)
B-1	4 to 4-1/4	3-1/2 to 4
B-2	3-3/4 and 4	5-1/2 to 6
B-3	5 to 5-1/4	8
B-4	4-1/2 to 4-3/4	4-1/2
B-5	5 to 5-1/4	5 to 5-1/2

2.3. SUBSURFACE MATERIALS AND CONDITIONS

The following sections describe the fill and native soils encountered in the borings.

2.3.1. FILL

Fill was encountered in each boring consisting of the previously described asphalt concrete pavement and aggregate base.

2.3.2. NATIVE SOILS

The native soils encountered in the borings beneath the previously described fill (aggregate base) were generally coarse-grained. The native soils encountered in the borings were observed as layers of dry, medium dense to very dense poorly graded gravel with silt, sand, and cobbles; dry, very dense silty gravel with sand and cobbles; and dry, dense to very dense silty sand with gravel, and cobbles.

Although not encountered in our explorations, cemented soils may also be encountered beyond or between our boring locations. A detailed excavatability or rippability evaluation is beyond the scope of this study. The contractor should perform the independent investigations necessary to determine the type of equipment required to perform the work. If the contractor(s) have any questions regarding site conditions, site preparation, or the recommendations provided, they should contact a representative of GES for any needed clarifications prior to submitting earthwork bids.

2.4. GROUNDWATER

Groundwater was not encountered within any of the borings during our field exploration. A review of water wells listed on the State of Nevada Department of Conservation & Natural Resources, Division of Water Resources website indicates that historical groundwater levels in 1974 in the area were previously measured at elevations as shallow as approximately 284 feet below the ground surface. Therefore, groundwater is not anticipated to affect the construction of the proposed improvements.

Groundwater levels should be anticipated to fluctuate due to seasonal precipitation, groundwater withdrawal and recharge, irrigation practices, and potential future dewatering efforts within and/or near the subject site. A detailed evaluation of possible groundwater fluctuations is beyond the scope of this study.

2.5. TRENCH BACKFILL SUITABILITY

GES evaluated the suitability of non-cemented soils collected from the borings for use as Selected Backfill and Granular Backfill, as specified in Section 207.02.01 and Section 207.02.02, respectively, of the Clark County Uniform Standard Specifications for Public Works Construction (USS). The samples tested were screened in the field of materials larger than 3-inches as excavated trench spoils are likely to have. Excavated trench spoils will have to be screened to remove materials larger than 3-inches before use as Selected Backfill and Granular Backfill. Specifications for gradation and plasticity, results of laboratory tests, and an evaluation of suitability are provided in the following tables.

Table 2.5.-1 Trench Backfill Suitability

Sieve Size	Specified Percent of Weight Passing		Percent Passing By Weight			
	Selected Backfill	Granular Backfill	B-1 6.5'-10.0'	B-2 16.0'-20.0'	B-4 1.0'-3.0'	B-5 15.5'-20.0'
6-inch	100	--	100	100	100	100
3-inch	80-100	100	100	100	100	100
No. 4	35-100	35-100	42.9	68.7	43.1	48.6
No. 16	--	25-100	23.6	35.0	26.4	26.7
No. 200	--	5-15	10.0	14.6	12.4	11.5
Plasticity Index*	See Table 2.5.-2		NP	NP	NP	NP
Liquid Limit*	50 max.	--	NV	NV	NV	NV
Meets Selected Backfill Requirements?			**Yes**	**Yes**	**Yes**	**Yes**
Meets Granular Backfill Requirements?			**No**	**Yes**	**Yes**	**Yes**
Remolded Swell (SNBCA 1803.5.3.2)			--	--	0	--
USCS			GP-GM	SM	GM	GP-GM
*NP indicates non-plastic, NV indicates no value						

Table 2.5.-2 Maximum PI for Selected and Granular Backfill

Selected Backfill	
Percent by Weight Passing No. 200 Sieve	**Maximum Plasticity Index**
10-10.0	15
10.1-20.0	12
20.1-50.0	10
50.1-80.0	8
81.1-100.0	6

Granular Backfill	
Percent by Weight Passing No. 200 Sieve	**Maximum Plasticity Index**
0.1 to 3.0	15
3.1 to 4.0	12
4.1 to 5.0	9
5.1 to 8.0	6
8.1 to 11.0	4
11.1 to 15.0	3

3. CONCLUSIONS

Based on the results of our field exploration and laboratory testing programs, it is our opinion that there are no known geologic or geotechnical conditions that would prevent the proposed improvements to the alignment. It is also our opinion that there are some geotechnical considerations that will affect construction, including the presence of existing improvements, existing fill soils, and cobbles in the on-site soils.

- Based on our understanding of the project and the results of our laboratory tests performed on soil samples, it is our opinion that soil materials at the site classify as Category 4a soils based on Table 1704.7 of the Southern Nevada Amendments to the 2009 International Building Code.
- The subject alignment is currently improved with underground utilities, asphalt concrete pavement, and concrete curbs and gutters. To facilitate the construction of the proposed improvements many of the existing improvements will be demolished; the demolished improvements will not be suitable for incorporation into backfill.
- Based on the results of laboratory testing, the tested soils collected from the borings met the USS requirements for Selected Backfill. The tested soils were screened in the field of materials larger than 3-inches, however, excavated trench spoils are anticipated to contain oversize materials. Excavated trench spoils will need to be screened to remove materials larger than 3-inches prior to use as Selected Backfill. Soils proposed for trench backfill should be sampled and evaluated by the Geotechnical Engineer, and approved by the governing agency before placing.
- Based on the results of laboratory testing, the tested soils collected from the borings generally met the USS requirements for Granular Backfill with the exception of a sample from boring B-1. However, it is our opinion that excavated soils will generally meet the specifications for Granular Backfill provided they are screened to remove materials larger than 3-inches. The tested soils were screened in the field of materials larger than 3-inches, however, excavated trench spoils are anticipated to contain oversize materials. Soils proposed for trench backfill should be sampled and evaluated by the Geotechnical Engineer, and approved by the governing agency before placing.
- Cobbles were encountered in the subsurface soils. The excavation of cobbles from trenches may increase the trench width, and the excavated cobbles may not be suitable for placement in structure or trench backfill. Cobbles dislodged during excavation should be removed and replaced with structural fill meeting the criteria presented in the following sections of this report.
- RCBs should be supported on a minimum of 6 inches of bedding consisting of Type II Aggregate Base, Type III Aggregate Base, or controlled low strength material (CLSM) as described in the USS. Cobbles protruding more than 4-inches from the bottom of the excavation should be removed and the resulting void filled with compacted structural fill as described in this report, prior to placement of bedding.
- Due to the consistency of the soils and the historic groundwater depths, it is our opinion that the potential for liquefaction along the project alignment is low.
- Based on the laboratory test results, the tested on-site soils have a low solubility. Table 1804.3.1 of the SNA to the 2009 IBC defines soils as with less than 2.00 percent by dry weight soluble solids as determined by American Water Works Association (AWWA) standard test method 2540 C as having a low solubility.

- The tested soils along the alignment have a negligible to severe concrete sulfate exposure as defined in Tables 4.2.1 and 4.3.1 of American Concrete Institute (ACI) Publication 318-08 per Section 1904.2 and 1904.3 of the 2009 IBC. It is our opinion that concrete in contact with soils along the alignment should be designed for a severe sulfate exposure.
- Since subsurface information to a depth of at least 100 feet is not available for the site, a Seismic Site Class D as defined in Table 1613.5.2 and Table 1613.5.5 of the 2009 IBC is recommended for the project site.

4. RECOMMENDATIONS

The following sections present recommendations concerning the proposed improvements. These recommendations are based upon our understanding of the project, the engineering properties of the tested on-site soils, the geologic conditions that are presented in this report, and the assumption that an adequate number of tests and observations will be made during construction to evaluate compliance with these recommendations. Earthwork and site preparation along the proposed alignment should be performed in accordance with the requirements and specifications presented in this report and the USS.

4.1. EXCAVATION CONSIDERATIONS

Cemented soils were not encountered within our borings, however, layers of cemented soil may be encountered at locations between and beyond our borings. In general, to excavate moderately hard, hard, and very hard cemented rock-like materials, a heavy duty excavator or trencher, Caterpillar D-10 Dozer (or equivalent) or larger, ripper, hoe-ram, headache ball, rock-saw, blasting, or similar rock excavation techniques are typically needed dependent on hardness, thickness, weathering, and fracturing. Where thick layers of hard to very hard cemented rock-like materials are to be excavated, such techniques may be required for removal. If cemented soils are encountered, blasting is not recommended due to the proximity of structures to the alignment. The contactor should perform the necessary subsurface investigations to evaluate the types of excavation techniques required. Excavation techniques should consider the proximity of existing structures and other improvements to the site and methods to reduce the potential for vibrational damage. Dependent upon the excavation techniques and magnitude of vibrations, a pre-excavation survey may be warranted.

Vibrations and ground disturbances caused by the excavation of dense and very dense soils could cause damage and distress to nearby structures. Care should be taken by the contractor when excavating dense and very dense soils to prevent damage to existing structures by reducing ground vibrations transmitted to the existing structures. The contractor should perform a pre-

construction survey of existing structures, including residences near the alignment to document existing distress and to establish a baseline survey prior to excavating. Ground vibration monitoring at nearby structures should also be considered during construction activities to measure velocity and frequency in comparison to established threshold values.

The alignment is located in areas with existing roadway improvements, including asphalt concrete pavement and concrete sidewalks, curbs, and gutters. During construction of the proposed improvements, existing asphalt concrete pavement and concrete sidewalks, curbs and gutters will be removed. Excavated asphalt concrete pavement, and concrete should be removed from the site and is not suitable for reuse as structural fill, roadway embankment, or trench backfill. Any uncontrolled fill and all loose or disturbed native soil should be excavated from the alignment and replaced with structural fill meeting the recommendations outlined in this report. Cobbles protruding more than 4-inches from the bottom of the excavation should be removed and the resulting void filled with compacted structural fill as described in this report, prior to placement of bedding.

On-site safety is the responsibility of the contractor. Excavations for the RCB and reinforced concrete pipes are anticipated to be up to approximately 20 feet deep. Temporary excavations should be performed in accordance with Appendix B to Subpart P of Occupational Safety and Health Standards for the Construction Industry (OSHA) 29 CFR, State of Nevada, Division of Occupational Safety and Health, Part 1926. The soil type definitions in Appendix A to Subpart P of OSHA 29 CFR, Part 1926 should be applied to soils encountered in excavations to determine the maximum allowable slope ratio. Excavations deeper than 4 feet in non-cemented soils should be shored or laid back at a slope no steeper than 1 horizontal to 1 vertical measured from the bottom of the excavation. Alternatively, the excavations could be rigidly braced. Temporary earth retaining systems will be subject to lateral earth pressure loads. An experienced structural engineer should be consulted by the contractor for design and implementation of the bracing system. Worker protection, such as trench boxes, may be needed to protect against minor sloughing and/or falling materials.

Spoils from the excavations, heavy construction equipment, and other surcharge loading should not be placed adjacent to the excavations within a 1 horizontal to 1 vertical plane extending up and back from the bottom of the excavation to the ground surface. Surface drainage should be directed away from the excavations.

4.2. STRUCTURAL FILL

Based on the results of our field exploration and laboratory testing programs and our stated understanding of the proposed project, it is our opinion that the following earthwork recommendations are applicable for soils underlying structures for the project, including the overexcavation of soils for RCBs and other underground improvements.

Any existing uncontrolled fill, deleterious material, loose or disturbed native soils, landscaping and asphalt pavements should be excavated from within the improvement areas to expose native soils and either removed from the site or processed for use as structural fill as outlined in this report.

After the recommended excavations are performed, the native soils should be scarified to a depth of at least 6 inches, moisture conditioned to within 2 percent of the optimum moisture content, and compacted to at least 95 percent of the maximum dry density, as determined by AASHTO T 180. The excavation depths may be terminated on moderately or strongly cemented soil at the discretion of the Geotechnical Engineer.

If both cemented soils and uncemented materials are present at the bottom of improvements, the cemented material and/or bedrock should be removed to a depth of at least 12 inches below bottom of footing and replaced with compacted structural fill. As an alternative, the uncemented material may be removed to expose underlying cemented material and/or bedrock throughout the improvement areas, if any, and replaced with lean mix concrete.

Excavated on-site soils and imported soils may be used as structural fill after processing in areas underlying improvements, provided that the excavated soils meet the specifications for "Selected Backfill" or "Granular Backfill" described in the USS, have a remolded swell potential of less than 4 percent, have a solubility less than 2.00 percent, and are processed to remove materials larger than 3 inches in nominal dimension and all organic and other deleterious materials.

Structural fill should be placed in loose lifts up to 8 inches thick, uniformly moisture conditioned to at least the optimum moisture content and compacted to at least 95 percent of the maximum dry density as determined by AASHTO T 180.

In-place density and moisture tests should be performed in accordance with AASHTO T310. The test frequency should be at least one test per 200 cubic feet of fill material placed or at least 2 tests per lift of fill material placed, whichever is greater.

4.3. BEDDING

Based on the findings of our subsurface exploration, it is recommended that RCBs, manholes and drain inlets be supported on a minimum of 6 inches of bedding placed as wide as the trench. Pipe bedding should consist of Type II Aggregate Base or Type III Aggregate Base as described in the USS. As an alternative, controlled low strength material (CLSM) meeting the specifications presented in Section 704.03.07 of the USS may be used for pipe bedding. Cobbles protruding more than 4-inches from the bottom of the excavation should be removed and the resulting void filled with compacted structural fill as described in this report, prior to placement of bedding.

4.4. INITIAL BACKFILL

Initial backfill consists of the fill above the pipe bedding on either side of pipes and RCBs extending to at least 1 foot above the top of the pipes and RCBs. Initial backfill for pipes excluding RCBs should consist of Type II Aggregate Base or Type III Aggregate Base as described in the USS or alternatively, controlled low strength material (CLSM) meeting the specifications presented in Section 704.03.07 of the USS may be used for pipe bedding and pipe zone.

Initial backfill at the sides of RCBs should be materials meeting the specifications for "Selected Backfill" or "Granular Backfill" as described in the USS. Initial backfill placed along the sides of the RCBs should be placed equally in uniform layers such that the top of the backfill at either side does not differ by more than 6-inches in elevation at any given time.

Backfill for initial backfill and at the sides of the RCBs should be placed in loose lifts up to 8 inches thick, moisture conditioned to within 2 percent of optimum, and compacted to at least 90 percent of the maximum laboratory dry density. As an alternative, controlled low strength material (CLSM) meeting the specifications presented in Section 704.03.07 of the USS may be used for pipe bedding and pipe zone.

4.5. TRENCH BACKFILL

Trench backfill placed above the initial backfill should be free of organic material and debris and be free of material greater than 3 inches in nominal dimension. Material placed as trench backfill should meet the specifications for Selected Backfill or Granular Backfill presented in Section 207 of the USS. Based on the results of laboratory test results, it is anticipated that excavated materials along the proposed alignments will generally meet the Selected Backfill and Granular Backfill specifications. Soils proposed for trench backfill should be sampled and evaluated by the Geotechnical Engineer, and approved by the governing agency before placing.

Trench backfill should be placed in loose lifts up to 8 inches thick, moisture conditioned to within 2 percent of the optimum moisture content, and compacted to a minimum of 90 percent of the soils maximum dry density (AASHTO T180). The contractor should take care not to damage the pipe during backfilling. As an alternative, CLSM meeting the specifications presented in Section 704.03.07 of the USS may be used for trench backfill. Pipe bedding, pipe zone, and trench backfill should be compacted by mechanical means only; ponding or jetting should not be used to compact pipe bedding, pipe zone, or trench backfill. The upper 24 inches of backfill below the Type II Aggregate Base supporting the asphalt pavement should be backfilled with CLSM.

In-place density and moisture tests should be performed in accordance with AASHTO T310. The test frequency should be at least one test per 100 linear feet of fill material placed per lift.

4.6. SUBTERANEAN STRUCTURES

Subsurface structures, such as manholes and vaults associated with the proposed alignment should be founded on a zone of dense to very dense native soils that have been scarified, moisture conditioned and recompacted structural fill, as previously described. The bottoms of structures should be underlain by at least 6 inches of Type II Aggregate Base compacted to at least 95 percent of the maximum dry density. For structures embedded a minimum depth of 12 inches having a footing width of 12 inches, an allowable net bearing capacity of 2,500 psf should be used for design of foundations. This allowable net bearing capacity may be increased by 1,000 psf for each additional foot of embedment and by 500 psf for each additional foot of width up to a maximum value of 4,000 psf. RCBs having a minimum width of 6 feet and a buried depth of at least 7 feet to the bottom of the RCB may be designed using an allowable net bearing capacity of 4,000 psf. The allowable bearing pressure presented above includes a factor of safety against general bearing capacity failure of 2.5.

Foundations supporting these structures should not be founded partially on uncemented soil and partially on cemented soils. If both cemented and uncemented materials are present at the bottom of the foundation excavation, the cemented material should be removed to a depth of at least 12 inches below bottom of footing and replaced with compacted structural fill. As an alternative, the uncemented material may be removed to expose underlying cemented material throughout the foundation area, if any, and replaced with lean mix concrete.

Resistance to lateral loads may be calculated using both passive lateral earth support and friction developing between the foundations and underlying soil. Passive resistance may be used if foundation backfill soils in front of the foundation are compacted to at least 90 percent of the maximum laboratory dry density (AASHTO T180) or if the foundation is cast against undisturbed native soils, and if the ground surface in front of the footing is level. The passive lateral earth support for footings may be based upon an allowable equivalent fluid density of 280 pounds per cubic foot up to a maximum allowable passive lateral pressure of up to 2,800 pounds per square foot. A coefficient of friction of 0.27 may be used for the interface between the foundation and underlying properly compacted structural fill Type II or Type III Aggregate Base, Sand Backfill, or CLSM. The values for passive equivalent fluid density and base coefficient of friction include a factor of safety of 1.5

4.7. VERTICAL LOADS

Vertical loads on pipes and RCBs will be influenced by the type and dimensions of pipe, the method of pipe installation, subsurface conditions, the width of the trench, the height of backfill above the pipe, and the method of backfill placement. Vertical soil loads may be estimated using an average unit weight of 135 pounds per cubic foot (pcf) for soil compacted to 90 percent of the maximum dry density (AASHTO T310) and 140 pcf for CLSM backfill.

4.8. SETTLEMENT

Provided that the recommendations for excavation and backfilling, bedding, initial backfill, and trench backfill are performed as recommended in this report, total and differential settlement of the RCB is anticipated to be less than 1-inch. Similarly, settlement of the ground surface above the improvements is anticipated to be less than 1-inch.

4.9. MATERIAL VOLUME CHANGES

The volume of excavated native soils will be reduced from the screening of oversize cobbles. In addition, there will be a further reduction in volume from the compaction of excavated native soils. Shrinkage of the native soils not containing oversized materials is estimated to be in the range of 5 to 10 percent when compacted to at least 90 percent of the maximum dry density (AASHTO T180). Accordingly, with shrinkage of 5 to 10 percent, one cubic yard of excavated native soils compacted to 90 percent relative compaction (AASHTO T180) would generate approximately 0.95 to 0.90 cubic yards of compacted fill, respectively.

4.10. LATERAL EARTH PRESSURES

Lateral active earth pressures induced by adjacent uniform surface surcharge loads should be estimated as a uniformly distributed lateral load with a magnitude equal to the magnitude of the surface surcharge load multiplied by the earth pressure coefficient. The RCB and associated subterranean structures such as man-holes and drain inlets are rigid and will not deflect to relieve stresses from the backfill and should be designed to resist the lateral earth pressures presented in Figure C-1.

GES is also presenting earth pressure coefficients for "Active" and "At-Rest" wall conditions. In the "Active" condition the wall is able to deflect enough to lessen stresses from the adjacent soils. In the "At-Rest" condition the wall is rigid and deflection does not occur to relieve the stress from the wall backfill and adjacent soils. Walls with level backfill should be designed to resist the lateral earth pressures for the appropriate conditions presented in Figure C-2.

Resistance to lateral loads may be calculated using passive lateral support based upon an equivalent fluid density of 280 pounds per cubic foot (with an allowable passive pressure of up to 2,800 pounds per square foot) and a base coefficient of friction of 0.27. The value for the maximum passive lateral earth pressure and base coefficient of friction presented above includes a factor of safety of 1.5. Backfill against retaining walls should be moisture conditioned to within 2 percent of the optimum moisture content and compacted to at least 90 percent of the maximum dry density (AASHTO T180) using light hand operated equipment. The use of heavy compaction equipment could cause loads exceeding the design lateral pressures and result in distress or failure.

4.11. SEISMIC SITE CLASS

Since deep subsurface information was not obtained by GES, a Seismic Site Class D, as defined in Table 1613.5.2 and Table 1613.5.5 of the 2009 IBC may be assumed for design for this project as specified in the building code. The following seismic design parameters may be utilized using representative site coordinates of 36.2919 degrees latitude and -115.3017 degrees longitude.

Table 4.11. Spectral Response Accelerations and Site Coefficients

Spectral Response Acceleration at Short Periods, S_s [1]	Spectral Response Acceleration at 1-Second Period, S_1 [2]	Spectral Response Coefficient at Short Periods, SD_s	Spectral Response Coefficient at 1-Second Period, SD_1
0.490g	0.162g	0.460	0.232

(1) Per Figure 1613.5(3) of the 2009 IBC
(2) Per Figure 1613.5(4) of the 2009 IBC

4.12. PRELIMINARY ASPHALT CONCRETE PAVEMENT SECTIONS

As previously described, asphalt concrete pavement was penetrated in each of the borings drilled along the alignment. The thickness of asphalt concrete and underlying aggregate base measured in the boreholes is provided on the exploration logs and in Table 2.2.

Asphalt concrete material and placement procedures should conform to appropriate sections of the USS. Aggregate materials for asphalt concrete should conform to the requirements for Plant Mix Bituminous Pavements, Section 401 and Section 703 of the USS.

Where existing pavement sections are removed to facilitate the installation of improvements, the replacement pavement section should at least be equal to that removed or the section presented in Table 4.12., whichever section is greater. The new pavement section should be designed using R-values obtained during construction for the pavement section and that new section submitted to the governing entity for review and approval.

Table 4.12. Preliminary Minimum Flexible Pavement Section

Traffic Condition	Design R-Value	Traffic Index	Asphalt Thickness (inches)	Aggregate Base Thickness (inches)
Elkhorn Avenue	75	9.5	5	4

The preliminary minimum flexible pavement section in Table 4.12 is based on a design R-Value of 75, a traffic index of 9.5, reliability of 90 percent, standard deviation of 0.45, initial service index of 4.2 and final service index of 2.5.

Prior to placing the supportive Type II Aggregate Base, at least the upper 8 inches of subgrade soils should be uniformly moisture conditioned to within 2 percent of the optimum moisture content, and compacted to at least 95 percent of the maximum dry density. Scarification may be terminated at a shallower depth or omitted entirely if moderately to strongly cemented soil is encountered, at the discretion of the Engineer, based on actual soil conditions observed at the site.

4.13. AGGREGATE BASE FOR PAVEMENT SECTIONS

Aggregate base materials underlying asphalt concrete pavement should consist of Type II Aggregate Base meeting the requirements presented in Subsection 704.03.04 of the USS. Aggregate base should be placed in loose layers up to 6 inches thick, moisture conditioned to within 2 percent of the optimum moisture content and compacted to at least 95 percent of the maximum dry density. Compacted thickness of aggregate base materials must be observed under the direction of the Geotechnical Engineer prior to its incorporation into the pavement structure.

4.14. SOIL CORROSIVITY

Based on the results of chemical testing, the on-site soils have a negligible to severe sulfate exposure as defined in Tables 4.2.1 and 4.3.1 of American Concrete Institute (ACI) Publication 318-08. It is our opinion that concrete that may directly or indirectly contact the on-site soils should be designed for a severe sulfate exposure and contain Type V sulfate resistant cement, have a minimum 28-day compressive strength of 4,500 psi, and have a maximum water to cement ratio of 0.45. We recommend that the design consultant consult a Corrosion Engineer for protection recommendations for any buried pipe.

5. LIMITATIONS

The recommendations contained in this report are based on field exploration, laboratory testing, research of pertinent maps and literature, and our understanding of the proposed construction. The soil data used in the preparation of this report were obtained from 5 borings performed along the proposed alignment. It is possible that variations in the soil conditions will exist between the locations explored. Therefore, if any soil conditions are encountered at the site that are different from those outlined in this report, Geotechnical & Environmental Services, Inc. should be immediately notified so that we may review the situation that exists and make supplementary recommendations as needed. In addition, if the scope of the proposed construction, including the types of structures, anticipated loads and maximum cut and fill depths, changes from what is described in this report, our firm should be notified.

GES prepared this report as an aid in the design of the proposed project. This report is not a bidding document. Any contractor reviewing this report must draw his own conclusions regarding the site conditions and specific construction techniques to be used on this project.

The recommendations presented in this report are based on the assumption that an adequate number of tests and observations will be made during site construction to evaluate compliance with the recommendations. These tests and observations should be provided under the direction of a qualified Geotechnical Engineer. Such testing and observations should include but not be limited to the following:

- Review of site construction plans for conformance with the soils investigation.
- Observation and testing during site preparation, earthwork, drilled shaft and other excavations, and placement of aggregate base and concrete.
- Consultation as may be required during construction.

Our services were performed using that degree of care and skill ordinarily exercised under similar circumstances by reputable engineering firms in this or similar localities. No other warranties, either express or implied, are included or intended in this report.

6. REFERENCES

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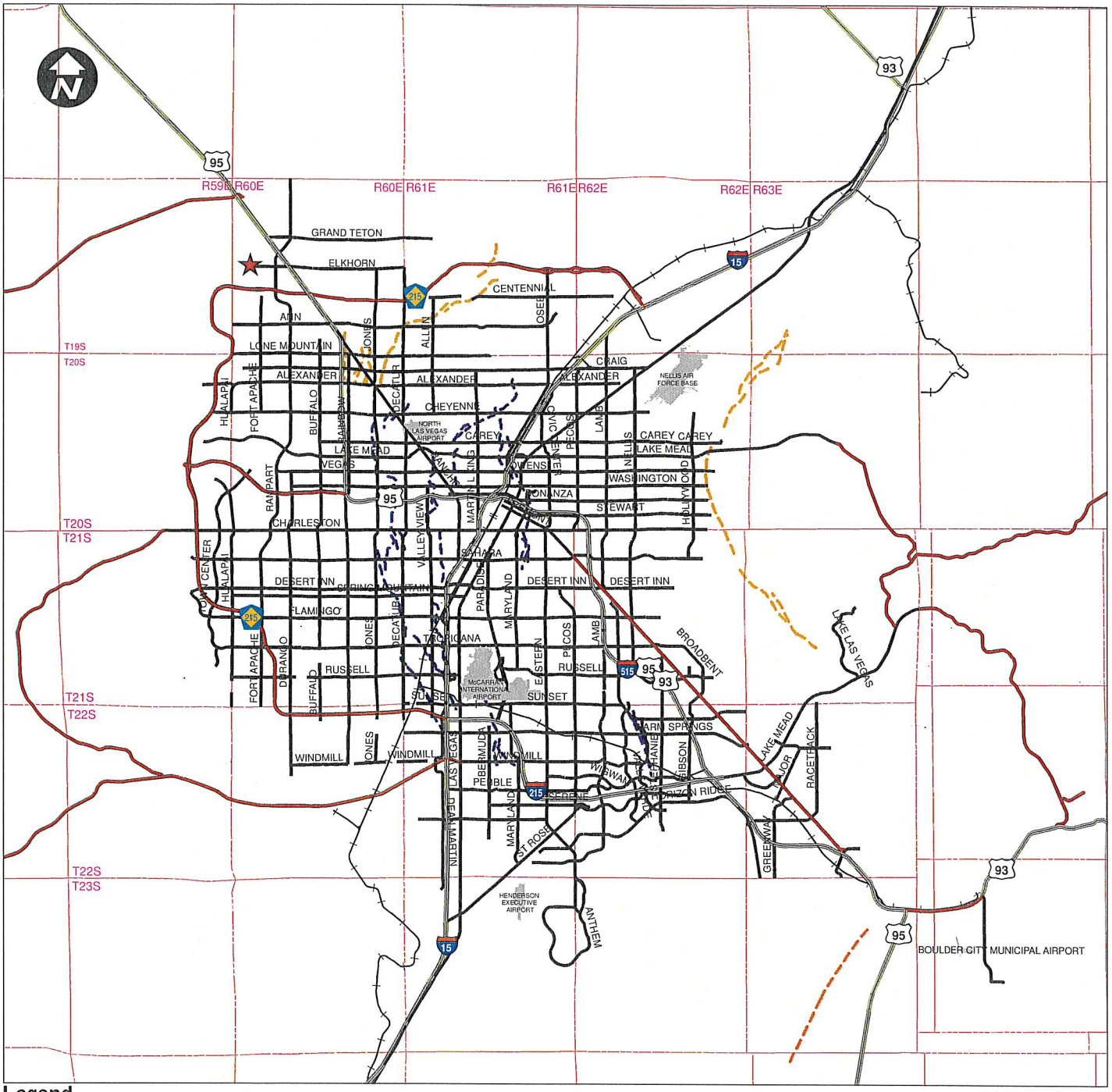
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APPENDIX A
SUBSURFACE STUDY



Legend

- Approximate Project Location
- Airports
- Township & Range
- Interstate
- Major Streets
- Railroad
- State Highway

0 2.5 5 10 15 20 Miles

Faults (USGS, 2010)

Linear Faults

Fault Age

- Class B years
- Less than 1,600,000 years
- Less than 750,000 years
- Less than 130,000 years
- Less than 15,000 years
- Less than 150 years
- Unknown

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NOTE: Data presented on this map is a compilation of GIS Metadata extracted from a variety of sources. Major Streets, Airports, and Railroads is data obtained from the Southern Nevada GIS Management Office. This data is downloaded by GES for incorporation into drawings generated by GES. Data contained within this page is to be used for informational purposes only. GES has not modified the data contained herein and uses it as it is acquired from the respective agency.

VICINITY MAP
RANCHO ROAD SYSTEM
ELKHORN - FORT APACHE TO GRAND CANYON
LAS VEGAS, NEVADA

Drawn By:	Date Drawn:
PES	6/14/2012
Project No.	Figure No.
20112895E1	A-1

j:\JOBS\2011_jobs\20112895\E1\GIS\Maps\Figure No A-1 (061412).mxd



0 137.5 275 550 825 1,100 Feet

Legend

B-5 Approximate Boring Locations

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EXPLORATION LOCATION MAP RANCHO ROAD SYSTEM ELKHORN - FORT APACHE TO GRAND CANYON LAS VEGAS, NEVADA	Drawn By: PES	Date Drawn: 6/14/2012
	Project No. 20112895E1	Figure No. A-2

J:\JOBS\2011_jobs\20112895\E1\GIS\Maps\Figure No A-2 (061412).mxd

KEY TO SYMBOLS AND TERMS

Terms used according to the Unified Soil Classification System

Consistency or Condition of Soils

Fine-Grained Soils (Silt and Clay): Major portion passing #200 sieve

California Sampler* (blows/foot)	SPT** (blows/foot)	Estimated Consistency	Unconfined Compressive Strength (tsf)	Manual Manipulation
< 2	< 2	Very Soft	< 0.25	Thumb will penetrate soil more than 1 in.
2-5	2-4	Soft	0.25-0.50	Thumb will penetrate soil about 1 in.
5-10	4-8	Firm	0.50-1.00	Thumb will penetrate soil about $\frac{1}{4}$ in.
10-20	8-15	Stiff	1.00-2.00	Thumb will not indent soil but readily indented with thumbnail.
>20	>15	Very Stiff	>2.00	Thumbnail will not indent soil.

*ASTM D 3550 using a 140-pound hammer falling 30 inches.
**ASTM D 1586

Coarse-Grained Soils (Sand and Gravel): Major portion retained on #200 sieve

California Sampler* (blows/foot)	SPT** (blows/foot)	Estimated Consistency	Behavior of $\frac{1}{2}$-inch Diameter Probe Rod
0-7	0-4	Very Loose	Easily penetrated when pushed by hand.
7-18	4-10	Loose	Firmly penetrated when pushed by hand.
18-50	10-30	Medium Dense	Easily penetrated when driven by 1 lb. hammer.
50-90	30-50	Dense	Penetrated less than 1 inch when driven with a 1 lb. hammer.
>90	>50	Very Dense	Penetrated less than $\frac{1}{4}$ inch when driven with a 1 lb. hammer.

*ASTM D 3550 using a 140-pound hammer falling 30 inches.
**ASTM D 1586

Cementation	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

Caliche and Cemented Sand and Gravel: Materials classified as medium hard, hard, or very hard caliche or cemented sand and gravel should be treated as rock per Appendix K of the Southern Nevada Amendments to the 2000 International Building Code, published February 11, 2003.

Misc. Symbols

- Exploration continues
- Initial groundwater depth
- Final groundwater depth

Constituent Percentages

- Trace - < 5%
- Few - 5 to 10%
- Little - 15-25%
- Some - 30-45%
- Mostly - 50-100%

Moisture Condition

- Dry - Absence of moisture, dusty, dry to the touch
- Moist - Damp but no visible water
- Wet - Visible free water, usually soil is below water table

Notes

1. Subsurface explorations were performed using the equipment listed on the exploration logs.
2. Subsurface explorations were performed on the date(s) shown on the exploration logs.
3. Soil sampler(s) were driven with a 140 pound hammer falling 30 inches (unless otherwise noted in the text of this report).
4. The transitions between soil types shown on the exploration logs as occuring abruptly at particular depths may in actuality be a gradual progression from one soil type to the next.
5. Exploration logs are subject to the limitations, conclusions, and recomendations presented in this report.

Strata Group Symbols

- Fill
- CL- Low plasticity clay
- CH - High plasticity clay
- ML - Silt
- MH - Elastic Silt
- SP - Poorly graded sand
- SW - Well - graded sand
- GP - Poorly graded gravel
- GW - Well - graded gravel
- Cemented sand and gravel
- Caliche

Soil Sampler Symbols

- Bulk Sample
- Sample from auger cutting
- California Sampler
- Standard Penetration test
- Shelby tube
- Sample from Sonic circular ring bit

GES

Disclaimer

This Key to Symbols is part of a report prepared by Geotechnical & Environmental Services, Inc. and should be used with the report. The descriptions on the exploration logs apply only at the specific exploration locations and at the time the explorations were made. They are not warranted to be representative of subsurface conditions at other locations or times.

Figure No. A-3

EXPLORATION LOG
B-1

PROJECT: RANCHO ROAD SYSTEM
BORING LOCATION: 36.2919 N, 115.2975 W
EXPLORATION SIZE (dia.): 7" NOMINAL O.D. H.S.A.
ELEVATION: 2,685 Feet (Approximately)

PROJECT NO.: 20112895E1
EXPLORATION DATE: 5/31/12
EQUIPMENT: DIEDRICH D-120 TRUCK MOUNTED
LOGGED BY: HAMMOND/DORRIS

INITIAL DEPTH TO WATER: NGE
FINAL DEPTH TO WATER: NGE

DATE MEASURED: N/A
DATE MEASURED: N/A

ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	USCS	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
2685 — 0		PAVE	Asphalt Concrete Pavement. Unit is approximately 4 to 4-1/4 inches thick.						
		FILL							
		GP-GM	Light brown silty GRAVEL with sand (GM), dry and dense. Aggregate base, unit is approximately 3-1/2 to 4 inches thick.						
2680 — 5	24 27 27		Light brown poorly graded GRAVEL with silt, sand and cobbles, dry and dense.	NP	NV	1.4			
2675 — 10	24 40 43		...increase in sand fraction.			3.5			
2670 — 15	50/2		...very dense.			5.0			
2665 — 20	50/2					5.2			
2660 — 25	50/3		END OF BORING AT 25.2 FEET			4.4			
2655 — 30									
2650 — 35									

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

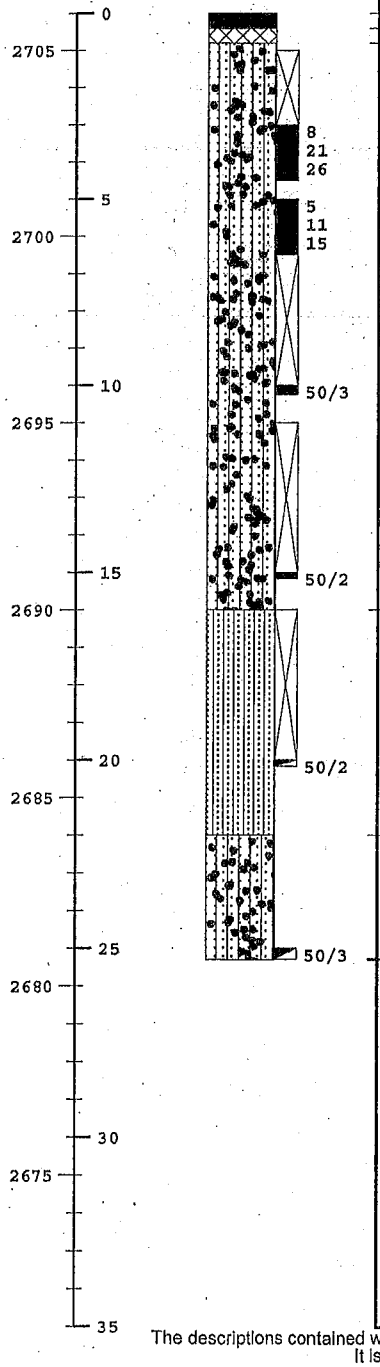
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Figure No. A-4

EXPLORATION LOG
B-2

PROJECT: RANCHO ROAD SYSTEM
PROJECT NO.: 20112895E1
BORING LOCATION: 36.2919 N, 115.2997 W
EXPLORATION DATE: 5/31/12
EXPLORATION SIZE (dia.): 7" NOMINAL O.D. H.S.A.
EQUIPMENT: DIEDRICH D-120 TRUCK MOUNTED
ELEVATION: 2,706 Feet (Approximately)
LOGGED BY: HAMMOND/DORRIS

INITIAL DEPTH TO WATER: NGE
DATE MEASURED: N/A
FINAL DEPTH TO WATER: NGE
DATE MEASURED: N/A



ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	USCS	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
		PAVE / FILL	Asphalt Concrete Pavement. Unit is approximately 3-3/4 to 4 inches thick.						
		GP-GM	Light brown silty GRAVEL with sand (SM), dry and dense. Aggregate base, unit is approximately 5 1/2 to 6 inches thick.						
			Light brown poorly graded GRAVEL with silt, sand, and cobbles, dry and medium dense to dense.			0.8			
						2.3			
			...very dense.						
			...more cobbles from approximately 13' to 15'						
		SM	Light brown silty SAND with gravel, and cobbles, dry and dense.	NP	NV				
			...very dense.			5.2			
		GP-GM	Light brown poorly graded GRAVEL with silt, sand, and cobbles, dry and very dense.						
			END OF BORING AT 25.3 FEET			2.1			

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

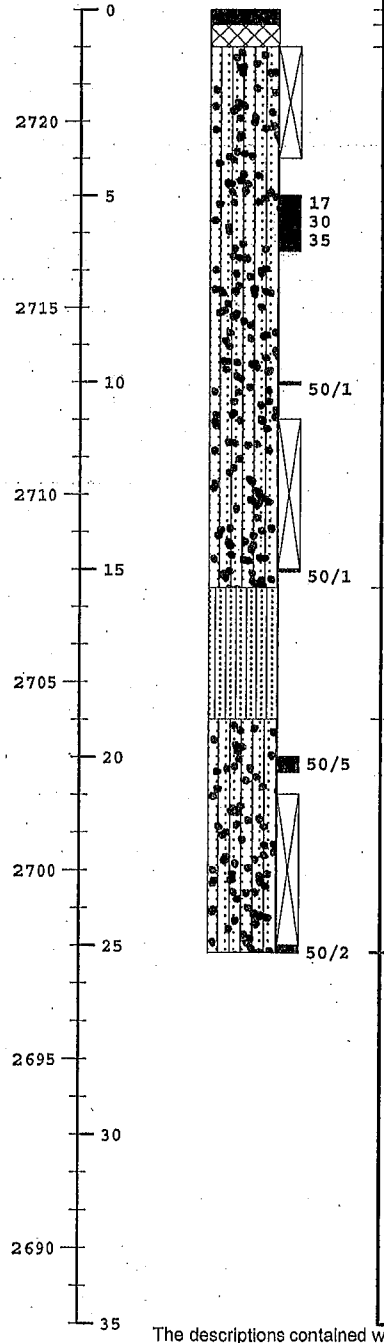
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Figure No. A-5

EXPLORATION LOG
B-3

PROJECT: RANCHO ROAD SYSTEM
PROJECT NO.: 20112895E1
BORING LOCATION: 36.2919 N, 115.3017 W
EXPLORATION DATE: 6/1/12
EXPLORATION SIZE (dia.): 7" NOMINAL O.D. H.S.A.
EQUIPMENT: DIEDRICH D-120 TRUCK MOUNTED
ELEVATION: 2,723 Feet (Approximately)
LOGGED BY: HAMMOND/DORRIS

INITIAL DEPTH TO WATER: NGE
DATE MEASURED: N/A
FINAL DEPTH TO WATER: NGE
DATE MEASURED: N/A



ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	USCS	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
		PAVE	Asphalt Concrete Pavement. Unit is approximately 5 to 5-1/4 inches thick.						
		FILL							
		GP-GM	Light brown silty GRAVEL with sand (GM) dry and dense. Aggregate base, unit is approximately 8 inches thick.						
			Light brown poorly graded GRAVEL with silt, sand and cobbles, dry and dense.			2.2			
			..very dense.						
		SM	Light brown silty SAND with gravel, gravel and cobbles, dry and very dense.						
		GP-GM	Light brown poorly graded GRAVEL with silt, sand, cobbles, dry and very dense.			4.5			
			END OF BORING AT 25.2 FEET						

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Figure No. A-6

EXPLORATION LOG
B-4

PROJECT: RANCHO ROAD SYSTEM
BORING LOCATION: 36.2920 N, 115.3038 W
EXPLORATION SIZE (dia.): 7" NOMINAL O.D. H.S.A
ELEVATION: 2,742 Feet (Approximately)

PROJECT NO.: 20112895E1
EXPLORATION DATE: 6/1/12
EQUIPMENT: DIEDRICH D-120 TRUCK MOUNTED
LOGGED BY: HAMMOND/DORRIS

INITIAL DEPTH TO WATER: NGE
FINAL DEPTH TO WATER: NGE

DATE MEASURED: N/A
DATE MEASURED: N/A

ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	USCS	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
0 / 2740	50/5	PAVE	Asphalt Concrete Pavement. Unit is approximately 4-1/2 to 4-3/4 inches thick.						
		FILL GM	Light brown silty GRAVEL with sand (GM) dry and dense. Aggregate base, unit is approximately 4-1/2 inches thick.			1.3		0R	
5 / 2735	50/5		Light brown silty GRAVEL with sand, and cobbles, dry and very dense .			3.5			
10 / 2730	50/2		...more cobbles from approximately 9 to 12'.						
15 / 2725	50/5					2.5			
20 / 2720	50/2								
25 / 2715	50/2		END OF BORING AT 25.2 FEET						
30 / 2710									
35									

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Figure No. A-7

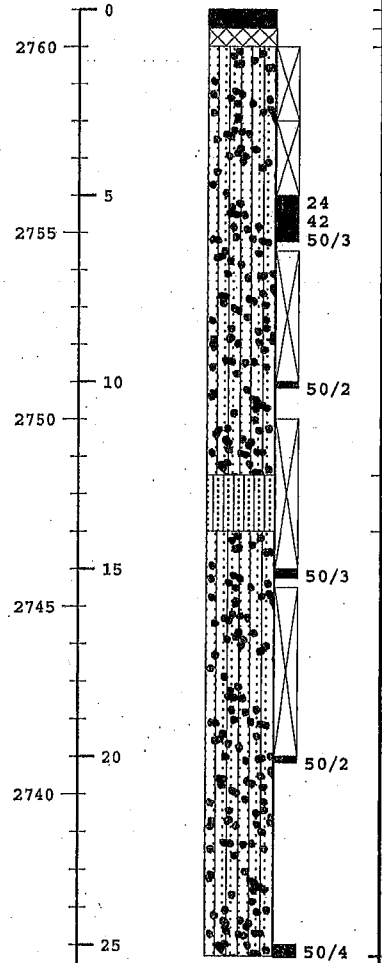
EXPLORATION LOG
B-5

PROJECT: RANCHO ROAD SYSTEM
BORING LOCATION: 36.2920 N, 115.3056 W
EXPLORATION SIZE (dia.): 7" NOMINAL O.D. H.S.A.
ELEVATION: 2,761 Feet (Approximately)

PROJECT NO.: 20112895E1
EXPLORATION DATE: 6/1/12
EQUIPMENT: DIEDRICH D-120 TRUCK MOUNTED
LOGGED BY: HAMMOND/DORRIS

INITIAL DEPTH TO WATER: NGE
FINAL DEPTH TO WATER: NGE

DATE MEASURED: N/A
DATE MEASURED: N/A



ELEVATION/ DEPTH	SOIL & SAMPLE SYMBOLS	USCS	DESCRIPTION	PI	LL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL (%)	POCKET PENETROMETER (tsf)
		PAVE	Asphalt concrete pavement. Unit is approximately 5 to 5-1/4 inches thick.						
		FILL							
		GP-GM	Light brown silty GRAVEL with sand (GM) dry and dense. Aggregate base, unit is approximately 5 to 5-1/2 thick.						
			Light brown poorly graded GRAVEL with silt, sand, and cobbles, dry and very dense.			2.6			
			...large cobble at approximately 11 feet.			2.6			
		SM	Light brown silty SAND with gravel, gravel and cobbles, dry and dense.						
		GP-GM	Light brown poorly graded GRAVEL with silt, sand, and cobbles, dry and very dense.						
			END OF BORING AT 25.3 FEET			4.2			

The descriptions contained within this exploration log apply only at the specific exploration location and at the time the exploration was made. It is not intended to be representative of subsurface conditions at other locations or times.

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Figure No. A-8

APPENDIX B
LABORATORY TEST RESULTS

GEOTECHNICAL INTERPRETIVE REPORT
RANCHO ROAD SYSTEM
ELKHORN ROAD FROM
FORT APACHE ROAD
TO GRAND CANYON DRIVE
LAS VEGAS, NEVADA

1. GRAIN SIZE DISTRIBUTION

Four grain size distribution tests were performed by sieve analysis in general accordance with AASHTO T27. Basically, a sample is oven dried to a constant weight and sieved through a number of different sized sieves. The amount of material retained on each sieve is measured and the percent of material passing each sieve is computed. The test results are presented as particle size distribution curves on Figures B-1 through B-4.

2. ATTERBERG LIMITS

Four Atterberg limit tests were performed in general accordance with AASHTO T89 and T90. The results of these tests are shown on the exploration logs at the respective sampling depths and on Figure B-5.

3. R-VALUE

One subgrade soil sample was tested in the laboratory to determine their R-value in accordance with ASTM D 2844. The R-value test result is an indication of the subgrade resistance to wheel loads and was used in the design of non-dedicated pavements. The result of the R-value test is presented on Figures B-6.

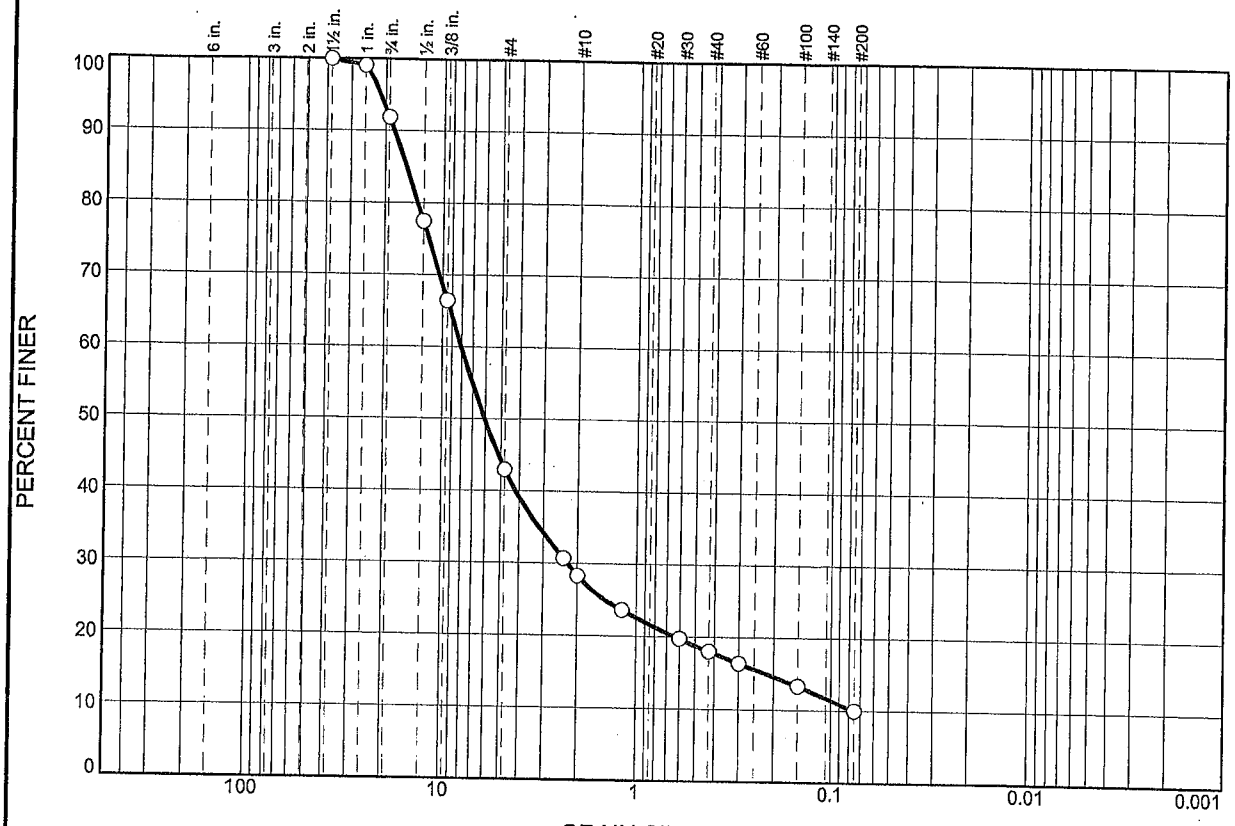
4. 60 PSF SWELL POTENTIAL

One swell test was performed on relatively undisturbed samples of the native soils in general accordance with Section 1802.3.3 of the Southern Nevada Amendments to the 2006 International Building Code. A vertical confining pressure of approximately 60 pounds per square foot was applied to the oven-dried sample and then the sample was inundated with water. The deformation of the sample was recorded for 24 hours. The results of the swell test is presented on Figure B-7.

5. WATER SOLUBLE SALT AND SOLUBILITY

Five tests were performed on selected soil samples to determine the contents of soluble sodium, soluble sulfate, total available sodium sulfate, and total soluble solids (i.e. solubility). The tests were performed by Silver State Analytical Laboratories. The results of the tests are shown on Figures B-8 through B-12.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.1	49.0	14.6	10.3	8.0	10.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	99.1		
.75	91.9		
.5	77.4		
.375	66.4		
#4	42.9		
#8	30.7		
#10	28.3		
#16	23.6		
#30	19.7		
#40	18.0		
#50	16.4		
#100	13.3		
#200	10.0		

* (no specification provided)

Material Description

Poorly graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 15.5709 D_{60}= 8.0480 D_{50}= 6.0609
D_{30}= 2.2532 D_{15}= 0.2185 D_{10}= 0.0756
C_u= 106.46 C_c= 8.34

Classification

USCS= GP-GM AASHTO= A-1-a

Remarks

ENTERED BY: A. SANDERS

Sample Number: B-1 **Depth:** 6.5'-10.0'
Location: BORING B-1 @ 6.5'-10.0'

Date: 06/06/12

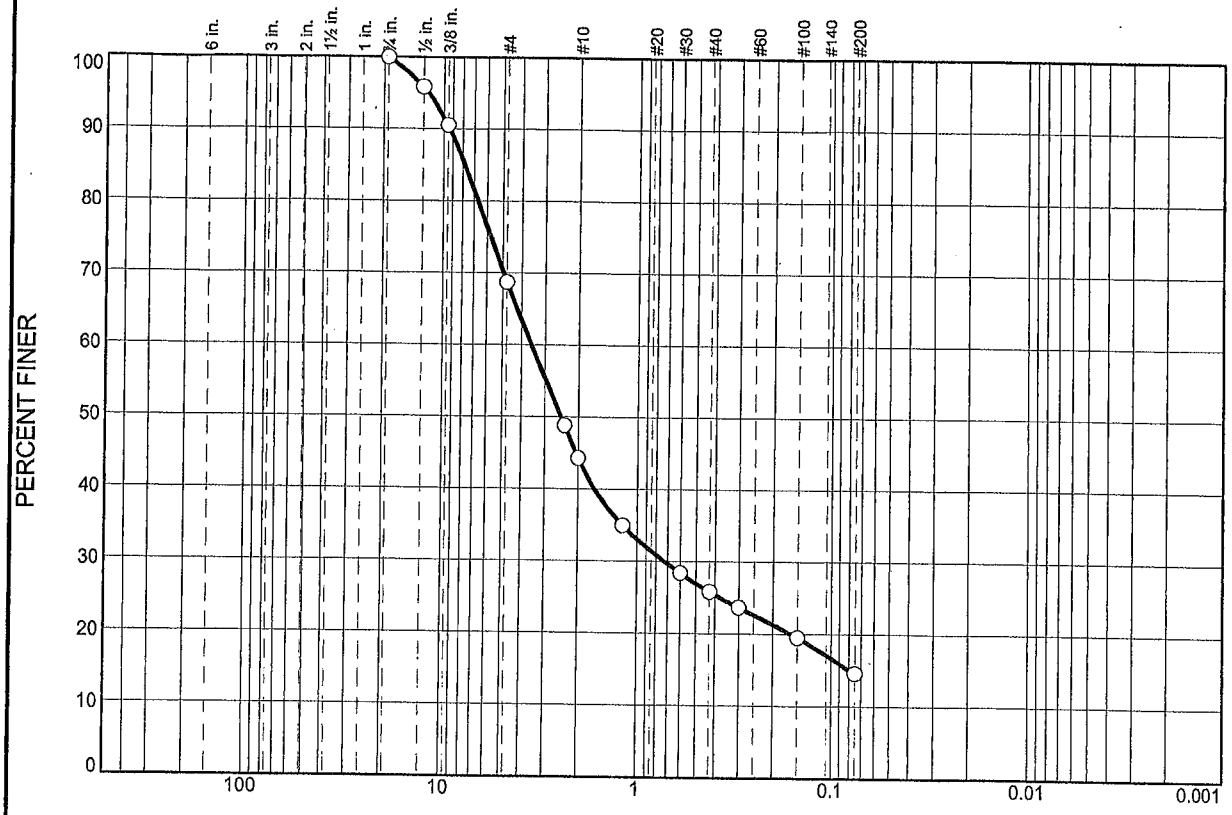
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: RANCHO ROAD SYSTEM

Project No: 20112895E1 **Figure** B-1

Tested By: M. JANOFF

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	31.3	24.4	18.5	11.2	14.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	95.9		
.375	90.6		
#4	68.7		
#8	48.8		
#10	44.3		
#16	35.0		
#30	28.4		
#40	25.8		
#50	23.7		
#100	19.6		
#200	14.6		

* (no specification provided)

Material Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 7.7861 D_{60}= 3.5462 D_{50}= 2.4643
D_{30}= 0.7268 D_{15}= 0.0791 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-a

Remarks

ENTERED BY: A. SANDERS

Sample Number: B-2 **Depth:** 16.0'-20.0'
Location: BORING B-2 @ 16.0'-20.0'

Date: 06/06/12

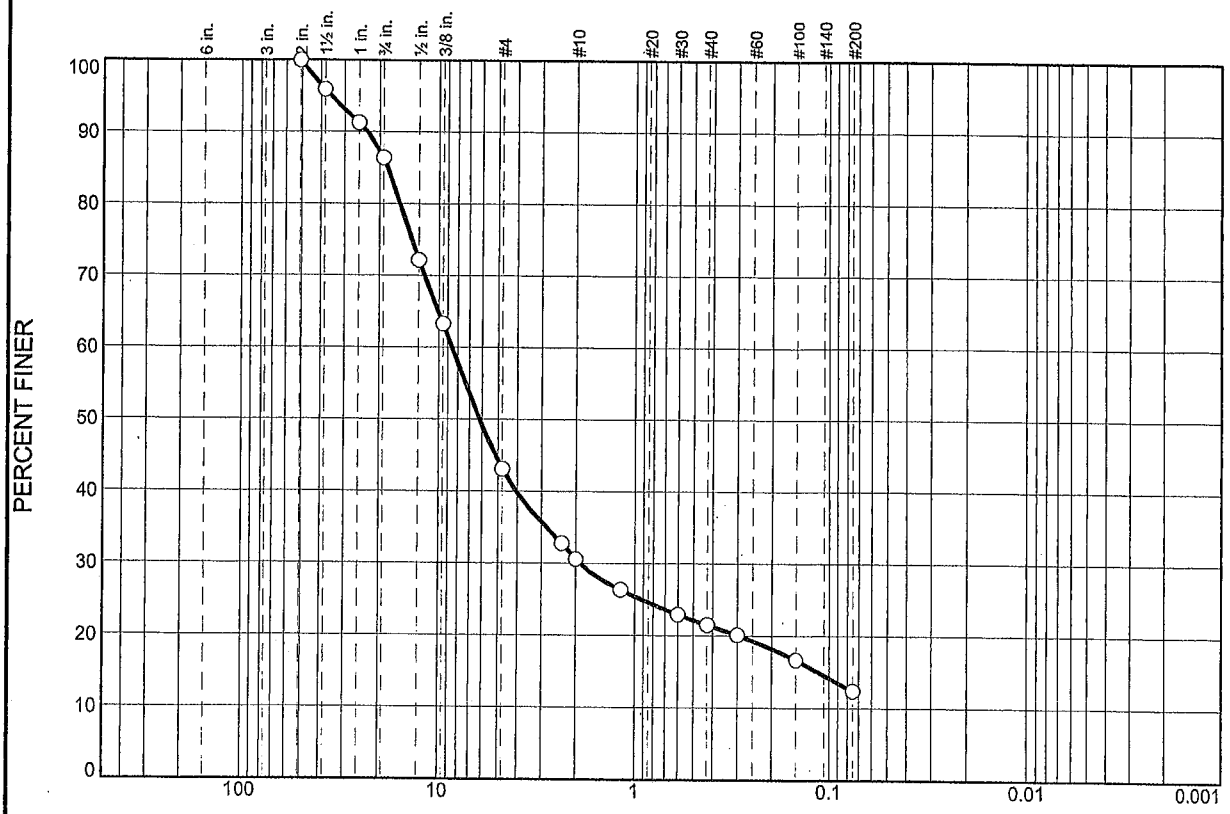
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: RANCHO ROAD SYSTEM

Project No: 20112895E1 **Figure** B-2

Tested By: M. JANOFF

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.6	43.3	12.5	9.1	9.1	12.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	95.9		
1	91.3		
.75	86.4		
.5	72.2		
.375	63.3		
#4	43.1		
#8	32.8		
#10	30.6		
#16	26.4		
#30	23.0		
#40	21.5		
#50	20.1		
#100	16.7		
#200	12.4		

* (no specification provided)

Material Description

Silty gravel with sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 18.1230 D_{60}= 8.5605 D_{50}= 6.1918
D_{30}= 1.9052 D_{15}= 0.1128 D_{10}=
C_u= C_c=

Classification

USCS= GM AASHTO= A-1-a

Remarks

ENTERED BY: A. SANDERS

Sample Number: B-4 **Depth:** 1.0'-3.0'
Location: BORING B-4 @ 1.0'-3.0'

Date: 06/08/12

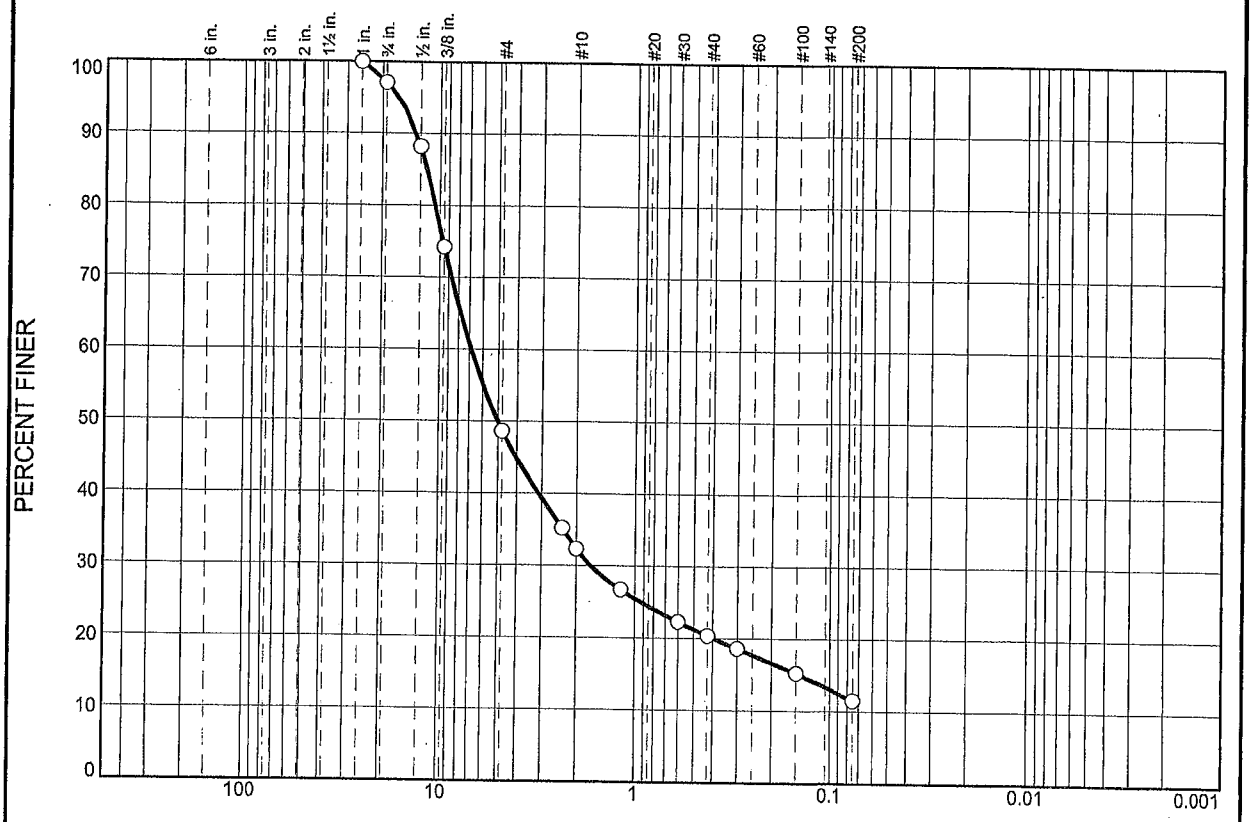
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: RANCHO ROAD SYSTEM

Project No: 20112895E1 **Figure** B-3

Tested By: M. JANOFF

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.9	48.5	16.3	11.9	8.9	11.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	97.1		
.5	88.2		
.375	74.2		
#4	48.6		
#8	35.2		
#10	32.3		
#16	26.7		
#30	22.3		
#40	20.4		
#50	18.6		
#100	15.3		
#200	11.5		

* (no specification provided)

Material Description

Poorly graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 11.7944 D_{60}= 6.8689 D_{50}= 5.0121
D_{30}= 1.6966 D_{15}= 0.1425 D_{10}=
C_u= C_c=

Classification

USCS= GP-GM AASHTO= A-1-a

Remarks

ENTERED BY: A. SANDERS

Sample Number: B-5 **Depth:** 15.5'-20.0'
Location: BORING B-5 @ 15.5'-20.0'

Date: 06/06/12

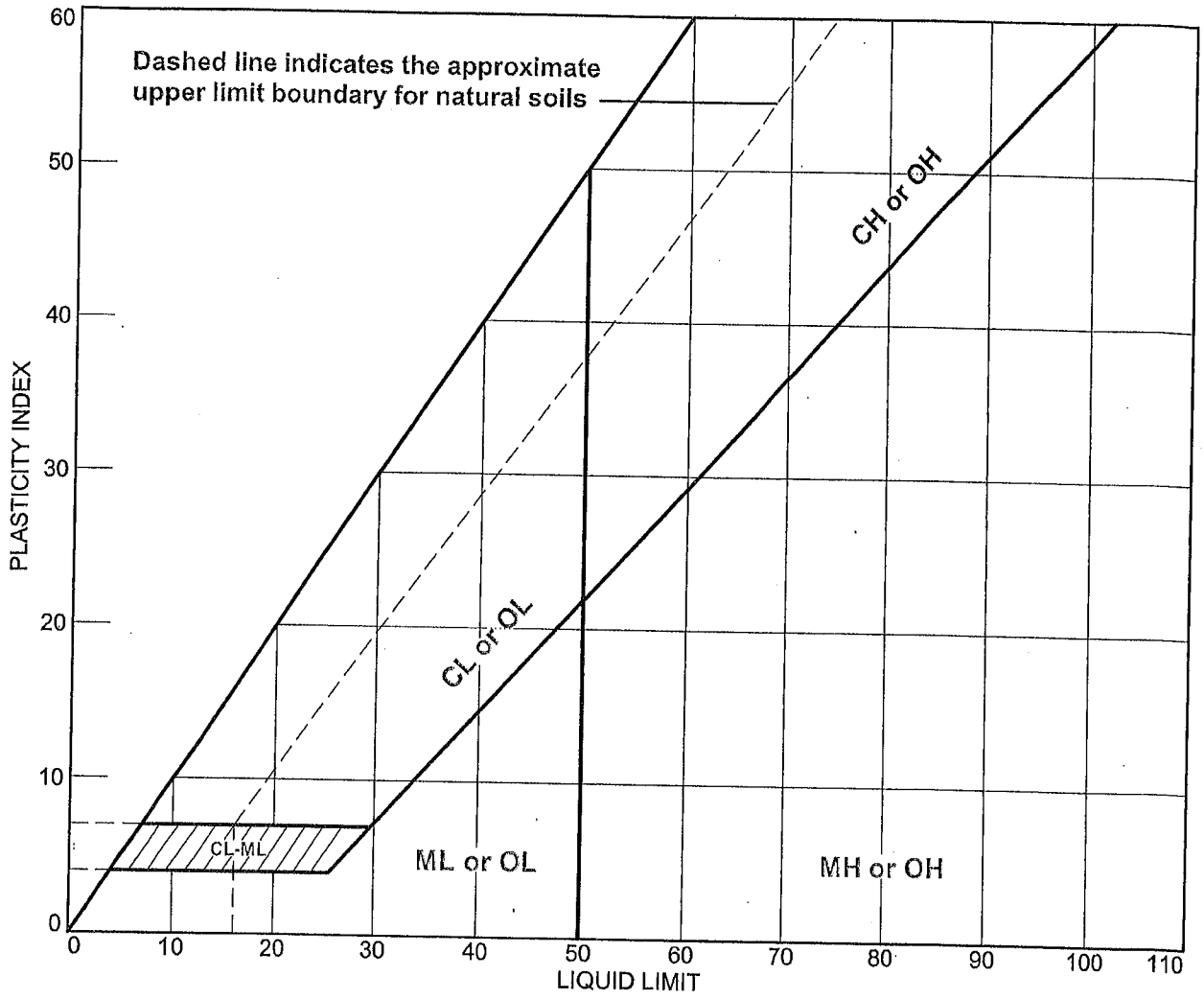
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: RANCHO ROAD SYSTEM

Project No: 20112895E1 **Figure** B-4

Tested By: M. JANOFF

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	LAB#12-053	B-1	6.5'-10.0'		NP	NV	NP	GP-GM
■	LAB#12-053	B-2	16.0'-20.0'		NP	NV	NP	SM
▲	LAB#12-053	B-4	1.0'-3.0'		NP	NV	NP	GM
◆	LAB#12-053	B-5	15.5'-20.0'		NP	NV	NP	GP-GM

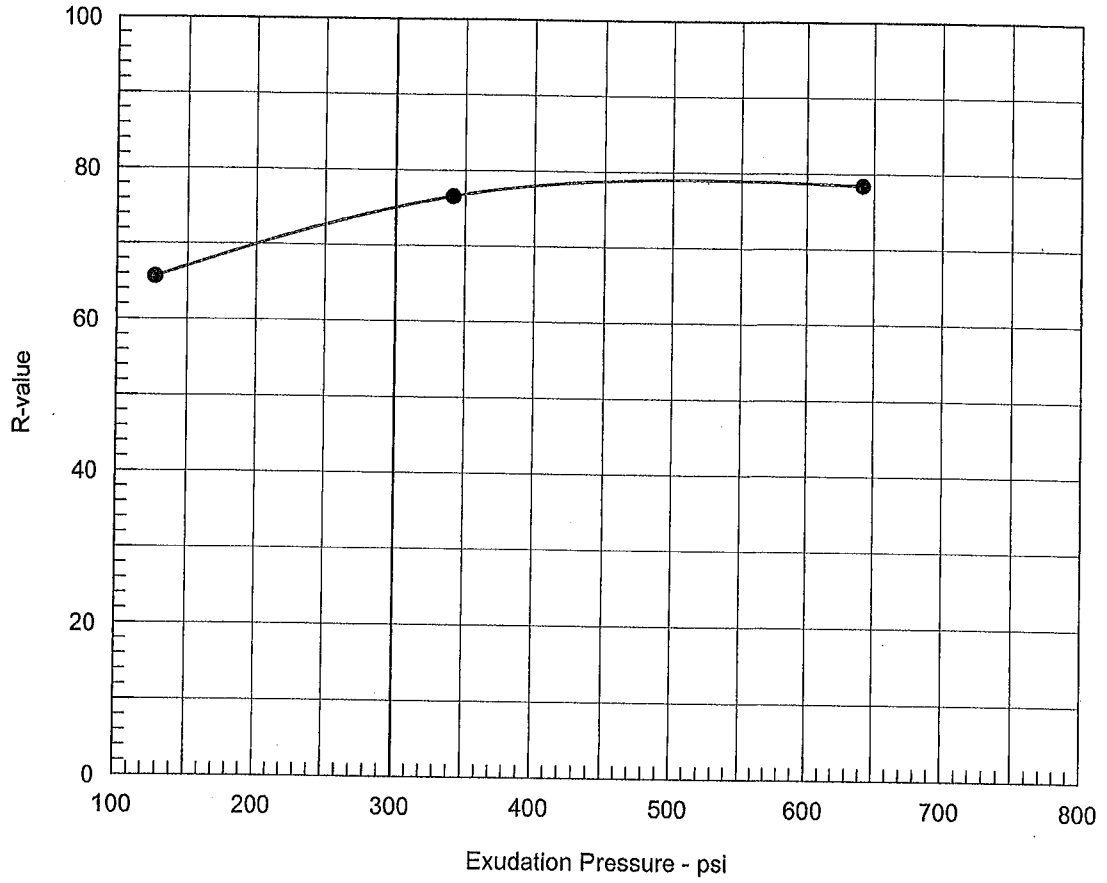
GES GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Client: SLATER HANIFAN GROUP
Project: RANCHO ROAD SYSTEM
Project No.: 20112895E1

Figure B-5

Tested By: A. SANDERS

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	350	135.2	5.6	0.00	25	2.40	642	80	78
2	350	126.2	6.0	0.00	28	2.50	342	77	77
3	350	138.1	6.5	0.00	35	2.40	127	68	66

Test Results	Material Description
R-value at 300 psi exudation pressure = 75	Silty gravel with sand

Project No.: 20112895E1
Project: RANCHO ROAD SYSTEM
Location: BORING B-4 @ 1.0'-3.0'
Sample Number: B-4 **Depth:** 1.0'-3.0'
Date: 6/20/2012

Tested by: A. SANDERS
Checked by:
Remarks:

R-VALUE TEST REPORT

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.

Figure B-6

GEOTECHNICAL &
ENVIRONMENTAL
SERVICES, INC.
GES

SWELL TEST SUMMARY

7150 Placid Street
Las Vegas, Nevada 89119
(702) 365-1001

Project Name: RANCHO ROAD SYSTEM
Project No.: 20112895E1
Sample Date: 6/1/2012
Client: SLATER HANIFAN GROUP
Test Method: SNBCA 1803.5.3.2
Report Date: 6/8/2012

LAB NUMBER	SAMPLE LOCATION	SAMPLE DEPTH (feet)	USCS	TEST CONDITION	SURCHARGE LOAD (psf)	INITIAL DRY DENSITY[1] (pcf)	INITIAL MOISTURE CONTENT[2] (%)	FINAL MOISTURE CONTENT (%)	EXPANSION[3] (%)
12-053	BORING B-4	1.0'-3.0'	GM	REMOLDED	60	121.8	3.9	10.6	0

1 Remolded samples were remolded to approximately 92% of the estimated soil maximum dry density
2 Moisture content prior to oven drying.
3 Positive values refer to swell. Negative values refer to collapse.

Figure No. B-7

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: June 07, 2012

REPORT NUMBER: 12-2363-1

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20112895E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 06/06/12
Time Received: 1600

Sample ID: 12-053, B1@6.5'-10.0'

Analysis	Result	Unit	Method
Sodium	0.00	%	ASTM D2791
Sulfate	0.00	%	SM 4500 E
Sodium Sulfate	0.00	%	Calculation
Total Salts (Solubility)	0.06	%	SM2540B

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120
Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

Figure No. B-8

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: June 07, 2012

REPORT NUMBER: 12-2363-2

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20112895E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 06/06/12
Time Received: 1600

Sample ID: 12-053, B2@1.0'-2.5'

Analysis	Result	Unit	Method
Sodium	0.00	%	ASTM D2791
Sulfate	0.20	%	SM 4500 E
Sodium Sulfate	0.01	%	Calculation
Total Salts (Solubility)	0.33	%	SM2540B

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120
Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

Figure No. B-9

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: June 07, 2012

REPORT NUMBER: 12-2363-3

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20112895E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 06/06/12
Time Received: 1600

Sample ID: 12-053, B3@11.0'-15.0'

Analysis	Result	Unit	Method
Sodium	0.00	%	ASTM D2791
Sulfate	0.00	%	SM 4500 E
Sodium Sulfate	0.00	%	Calculation
Total Salts (Solubility)	0.01	%	SM2540B

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director

Figure No. B-10

SilverState Analytical Laboratories

LABORATORY REPORT

DATE: June 07, 2012

REPORT NUMBER: 12-2363-4

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20112895E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 06/06/12
Time Received: 1600

Sample ID: 12-053, B4@1.0'-3.0'

Analysis	Result	Unit	Method
Sodium	0.01	%	ASTM D2791
Sulfate	0.38	%	SM 4500 E
Sodium Sulfate	0.03	%	Calculation
Total Salts (Solubility)	0.39	%	SM2540B

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director

3638 East Sunset Road, Suite 100 Las Vegas, NV 89120
Tel: 702-873-4478 Fax: 702-873-7967 www.ssalabs.com

Figure No. B-11

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: June 07, 2012

REPORT NUMBER: 12-2363-5

CLIENT: GES
7150 Placid St
Las Vegas, NV 89119

PAGE: 1 of 1

CLIENT PROJECT: 20112895E1

CLIENT PO #:

ANALYST: SW

Sampled By: Client
Date Sampled: --
Time Sampled: --

Date Received: 06/06/12
Time Received: 1600

Sample ID: 12-053, B5@6.5'-10.0'

Analysis	Result	Unit	Method
Sodium	0.00	%	ASTM D2791
Sulfate	0.00	%	SM 4500 E
Sodium Sulfate	0.00	%	Calculation
Total Salts (Solubility)	0.06	%	SM2540B

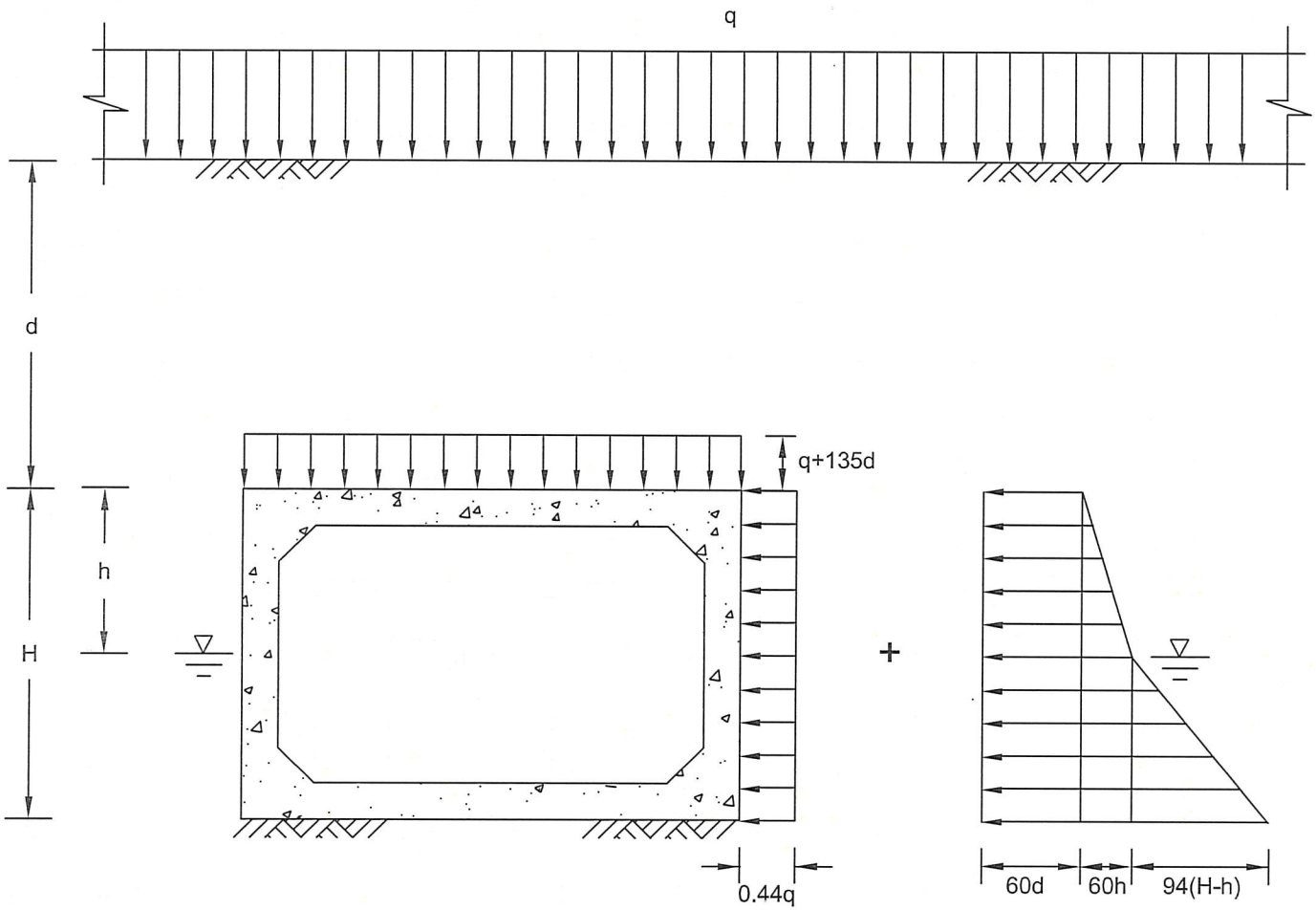
Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

John Sloan
Laboratory Director

Figure No. B-12

APPENDIX C
DESIGN FIGURES



Notes:
H is height of vault structure in feet.
h is depth to groundwater in feet from top of vault structure.
d is depth to top of vault structure in feet.
q is magnitude of uniform surcharge load in pounds per square foot (psf).
Earth pressures are in psf.

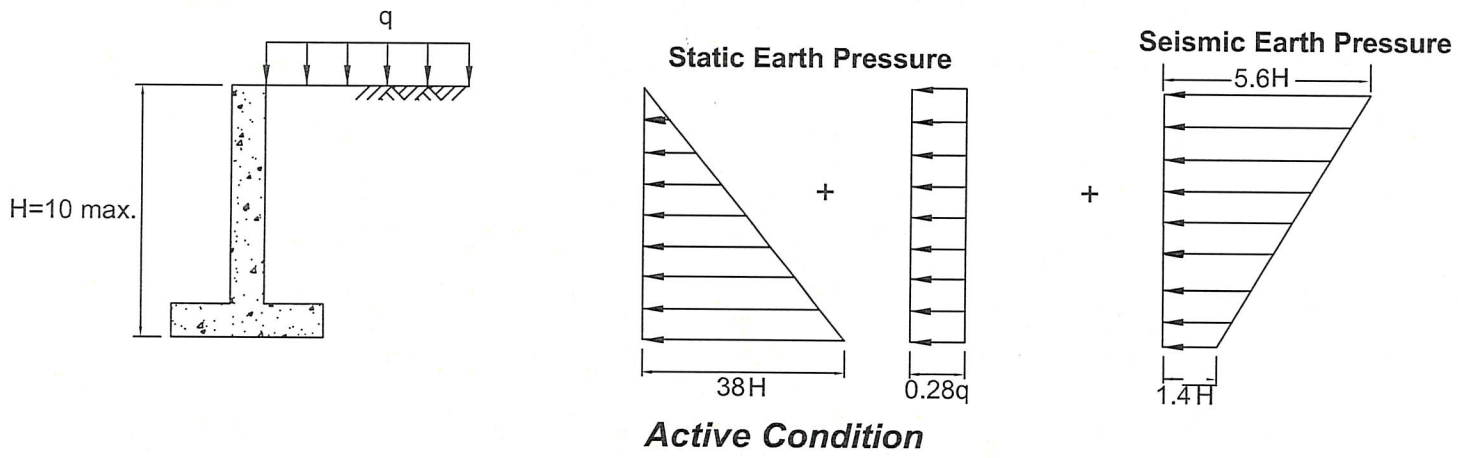
NOT TO SCALE

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.
(702) 365-1001
7150 Placid Street
Las Vegas, NV 89119
www.gesnevada.com

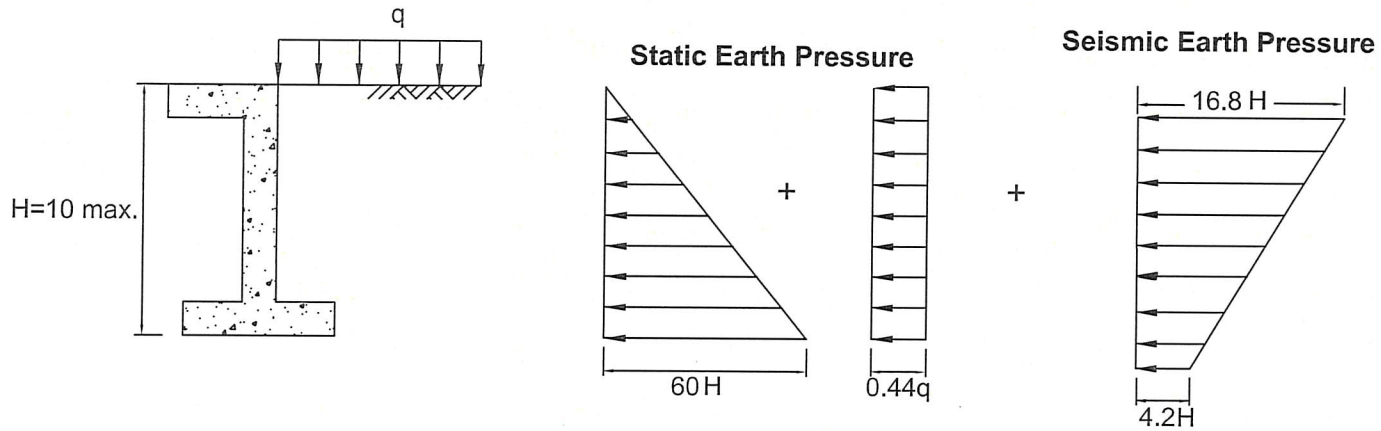
EARTH PRESSURE DIAGRAM FOR RCBS AND RIGID SUBSURFACE STRUCTURES
RANCHO ROAD SYSTEM
ELKHORN FROM FORT APACHE TO GRAND CANYON
LAS VEGAS, NEVADA

DRAWN BY:	REVIEWED BY:	DATE DRAWN:
PES	PES	6/19/2012
PROJECT NO. 20112895E1		FIGURE NO. C-1

j:\jobs\2011_jobs\20112895\e1\autocad\figure c-1.dwg



Active Condition



At-Rest Condition

Notes:
H is height of wall in feet.
q is magnitude of uniform surcharge load in pounds per square foot (psf).
Earth pressures are in psf.
Earth pressures shown assume that no hydrostatic pressure is exerted on the wall

NOT TO SCALE

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.
(702) 365-1001
7150 Placid Street
Las Vegas, NV 89119
www.gesnevada.com

LATERAL EARTH PRESSURE DIAGRAM
RANCHO ROAD SYSTEM
ELKHORN FROM FORT APACHE TO GRAND CANYON
LAS VEGAS, NEVADA

DRAWN BY:	REVIEWED BY:	DATE DRAWN:
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PROJECT NO. 20112895E1		FIGURE NO. C-2

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RANCHO ROAD SYSTEM

ELKHORN ROAD STORM DRAIN

(GRAND CANYON DRIVE TO FORT APACHE ROAD)

ENVIRONMENTAL SCREENING ANALYSIS

AUGUST 2012

CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS

RANCHO ROAD SYSTEM

ELKHORN ROAD STORM DRAIN

(GRAND CANYON DRIVE TO FORT APACHE ROAD)

ENVIRONMENTAL SCREENING ANALYSIS

AUGUST 2012

Prepared for:

Department of Public Works
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and

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ACRONYMS AND ABBREVIATIONS

BLM	Bureau of Land Management
CCRFCD	Clark County Regional Flood Control District
Corps	U.S. Army Corps of Engineers
EIS	environmental impact statement
MPU	Las Vegas Valley Flood Control Master Plan Update
NEPA	National Environmental Policy Act
RCB	reinforced concrete box
RCP	reinforced concrete pipe
SEIS	supplemental environmental impact statement

1.0 INTRODUCTION

The Clark County Regional Flood Control District (CCRFCD) released an update to the Las Vegas Valley Flood Control Master Plan in September 2008 (CCRFCD, 2008). The 2008 Master Plan Update (MPU) is the latest tool for planning, designing, and constructing a flood control system in the Las Vegas Valley to handle the 100-year frequency flood event. Revised growth and land development assumptions, updated hydrologic models, and new analyses result in size and alignment modifications to existing and planned facilities, and the addition of facilities to better mitigate flood hazards.

2.0 PROJECT DESCRIPTION AND LOCATION

The City of Las Vegas Department of Public Works plans to construct a flood control facility referred to as the Elkhorn Road Storm Drain in the northwest valley (see Figure 1). The facility is identified in the 2008 MPU as part of the Rancho Road System in the Upper Northern Las Vegas Wash Watershed. The facility is currently identified as RCHB (Rancho Road System-Beltway) 0275 and will be located in the Elkhorn Road public (City of Las Vegas) right-of-way between Grand Canyon Drive and Fort Apache Road (see Figure 2). The public right-of-way includes Clark County Assessor parcel numbers 125-18-899-001, -006, -008, -009, and -010 and 125-19-599-002, -004, -005, -013, -014, and -020.



Figure 1. Project Location

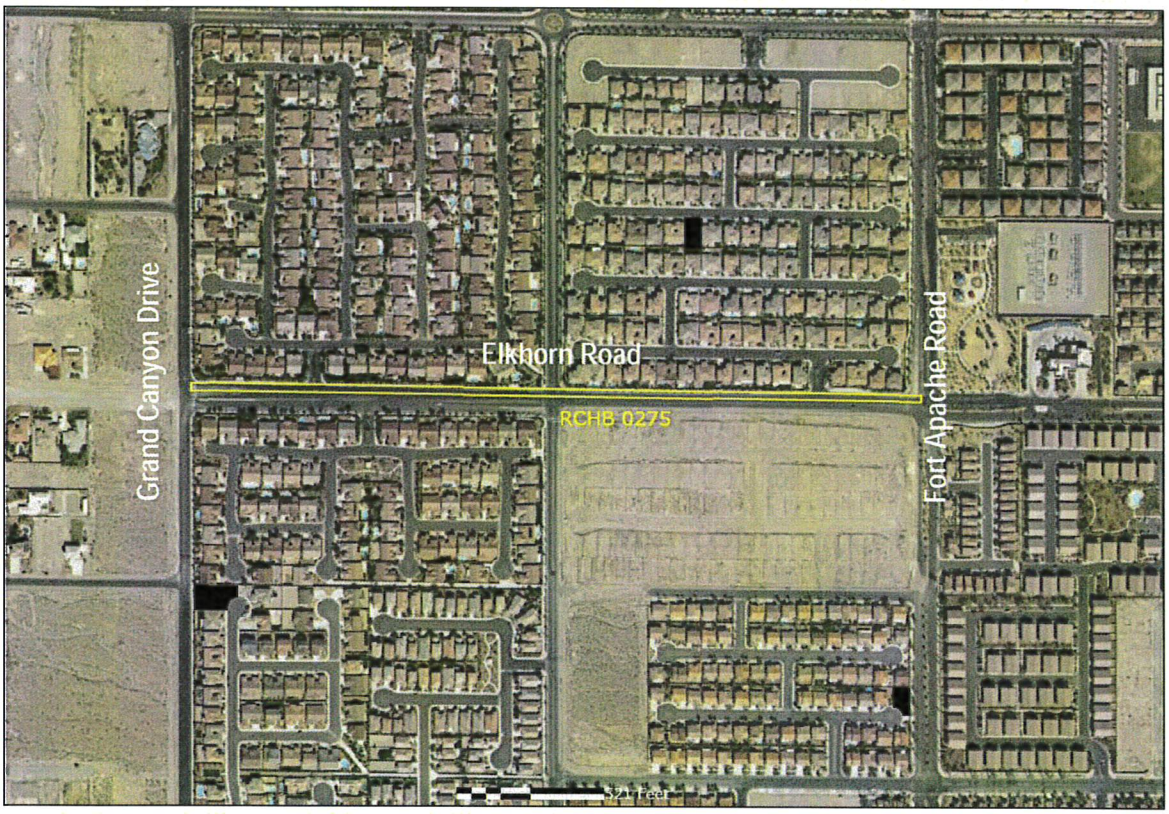


Figure 2. Location of Elkhorn Road Storm Drain (RCHB 0275)

Per the 2008 MPU, the facility is planned as a reinforced concrete box (RCB) storm drain, 7 feet wide by 6 feet high, and designed to carry 973 cubic feet per second during the 100-year storm event. The facility size and design flow may vary based on the final technical design. Appurtenant structures include drop inlets, manholes, and junctions. Figure 3 shows a typical cross-section for the facility.

The RCB will be installed 15 to 20 feet below the surface in the north half of the road for a distance of approximately 2,600 linear feet. The existing drop inlets in the north half of the road will be disconnected from an existing 18-inch reinforced concrete pipe (RCP) located along the south edge of Elkhorn Road, and reconnected to the RCB. The 18-inch RCP and drop inlets along the south edge of Elkhorn Road will remain in place.

Construction methods will include cut-and-cover techniques and re-paving the cut road surface.

3.0 ENVIRONMENTAL COMPLIANCE

Many of the flood control facilities identified in the Las Vegas Valley are located on federal land managed by the Bureau of Land Management (BLM). To address regulatory compliance and environmental issues associated with actions on federal land and/or requiring federal permits, the CCRFCD prepared an environmental impact statement (EIS) in accordance with the National Environmental Policy Act (NEPA) for the Flood Control Master Plan (BLM, 1991). The BLM approved the EIS in cooperation with the United States Army Corps of Engineers (Corps). A

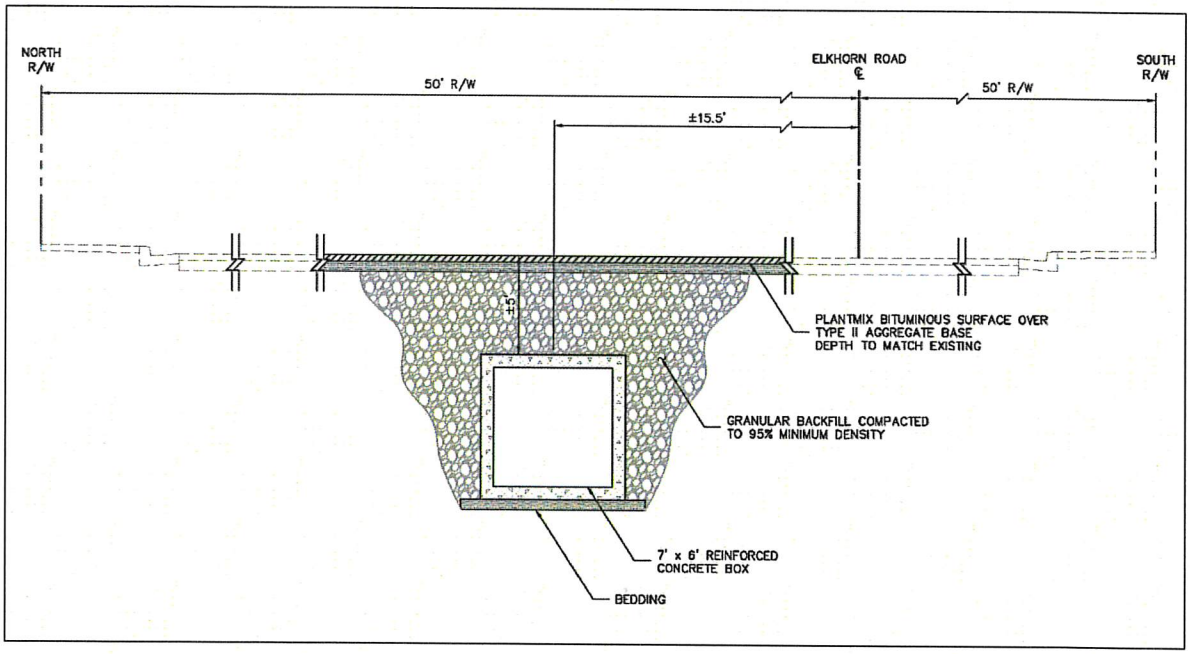


Figure 3. Typical Cross-Section for Elkhorn Road Storm Drain (RCHB 0275)

supplemental EIS (SEIS) was prepared in 2004 to address revised regulations and to analyze impacts of subsequent updates to the Master Plan.

The project area and proposed action analyzed in the SEIS (BLM, 2004) included the Las Vegas Valley watersheds and flood control facilities identified in the 2002 Las Vegas Valley MPU. The SEIS established a process by which to evaluate an individual flood control facility for regulatory compliance and potential environmental impacts. This process involved screening the facility to determine appropriate environmental documentation within the context of the impact analysis and mitigation measures in the SEIS. If potential impacts of the facility are bounded by the analysis in the SEIS, documenting the results of the environmental screening is sufficient and preparing an environmental assessment in accordance with NEPA is not necessary (BLM, 2004).

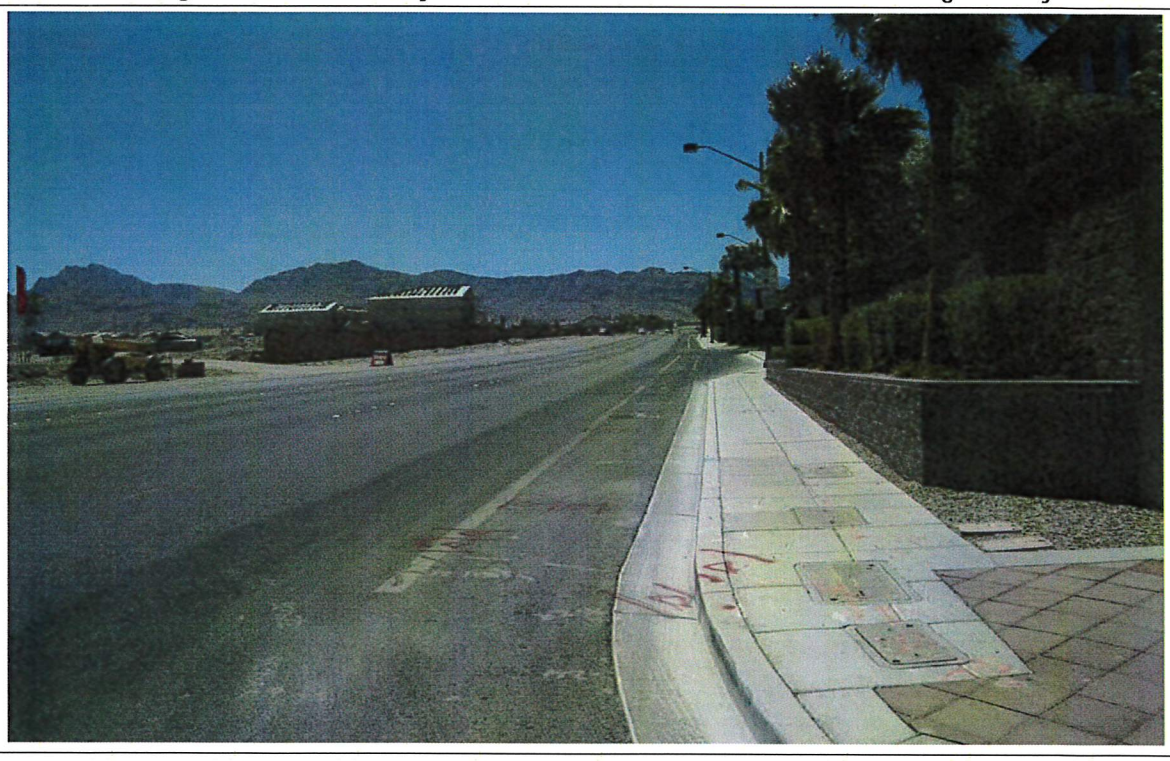
4.0 ENVIRONMENTAL SCREENING PROCESS

Actions that occur on non-federal land and that do not involve federal funding or federal permits are not subject to the provisions of NEPA. However, in keeping with the intent of avoiding and minimizing environmental harm, the screening process of the SEIS is hereby applied to the flood control facility that is part of the Rancho Road System in the Upper Northern Las Vegas Wash Watershed. The planned facility was identified in the 2002 MPU as part of RCHB 0295, and therefore, included in the environmental impact analysis and addressed by the mitigation measures in the SEIS.

The following sections summarize the results of the environmental screening process from Chapter 8 of the SEIS as applied against the planned flood control facility. Photographs of the existing Elkhorn Road right-of-way are shown in Figure 4.



Looking east from Grand Canyon Drive at the north half of the Elkhorn Road right-of-way.



Looking west from Fort Apache Road at the north half of the Elkhorn Road right-of-way.

Figure 4. Photos of Elkhorn Road Right-of-Way

4.1 Geology and Soils

There are no potential impacts to the geology and soils under the planned facility other than impacts analyzed in the SEIS, and existing geotechnical and soil properties would not impact the design and construction of the facility. The soils are mixed alluvium sand and gravel with moderate swell potential (4 to 8 percent), and standard geotechnical considerations for design and construction would apply (Clark County 2012a, 2012b). Measures set forth in the SEIS are adequate to minimize potential direct construction and operational impacts to soils.

4.2 Paleontological Resources

There are no potential impacts to paleontological resources as the planned facility is not located in an area with high potential of fossil-bearing geologic units.

4.3 Surface Water Hydrology

There are no potential impacts to surface water hydrology or water quality from the construction of the planned facility other than impacts analyzed in the SEIS. The planned facility would not change the existing surface water flow to storm drains, and there are no drainages in the area that could be jurisdictional waters of the U.S. subject to Section 404 of the Clean Water Act and regulatory authority of the Corps. The planned facility is not located in any special flood hazard area (FEMA, 2002). Measures set forth in the SEIS are adequate to minimize potential direct construction and operational impacts to surface water hydrology, including obtaining a construction stormwater general permit from the Nevada Division of Environmental Protection. Because more than one surface acre would be disturbed, a construction stormwater general permit and adherence to stormwater runoff controls would be required.

4.4 Groundwater Hydrology

There are no potential impacts to groundwater under the planned facility other than impacts analyzed in the SEIS, and existing groundwater depths would not impact the design and construction of the facility. The groundwater in the area is greater than 25 feet below ground surface (CLV, 2012), and therefore, would not impact the below grade structures. Measures set forth in the SEIS are adequate to minimize potential direct construction impacts to and from groundwater hydrology.

4.5 Biological Resources

There are no potential impacts to biological resources other than impacts analyzed in the SEIS. The planned facility is in a paved urban street so there is no potential for incidental take of desert tortoise (*Gopherus agassizii*). Typical residential landscaping of trees, shrubs, and palms that line the street and provide shelter for urban wildlife would not be disturbed during construction.

4.6 Cultural Resources

There are no potential impacts to cultural resources other than impacts analyzed in the SEIS. The area has low archaeological sensitivity and the ground surface has been disturbed for street and residential construction. It is extremely unlikely intact cultural resources of any significance would be unearthed during construction.

4.7 Air Quality

There are no potential impacts to air quality from construction of the planned facility other than impacts analyzed in the SEIS. Estimated construction emissions of particulate matter (<0.15 ton), carbon monoxide (<0.80 ton), and the ozone precursors of volatile organic compounds (<0.01 ton) and nitrogen oxides (<0.01 ton) would not exceed threshold levels (50 to 100 tons per year based on pollutant) in achieving or maintaining air quality standards. The planned facility would thereby conform to the State Implementation Plans for attaining compliance status of these pollutants. Measures set forth in the SEIS, including obtaining dust control permits, are adequate to minimize potential direct and indirect construction and operational impacts to air quality.

4.8 Visual Resources

There are no potential impacts to the visual resources around the planned facility other than impacts analyzed in the SEIS. The planned facility would be below grade and would not change or replace the existing urban and residential characteristics of the location.

4.9 Recreation

There are no potential impacts to recreation opportunities other than impacts analyzed in the SEIS. The planned facility would be in an urban street with a bicycle lane and adjacent sidewalk used for recreation and transportation. Temporary closure of the bicycle lane during construction would inconvenience users and the safety of bicyclists during construction would be addressed in the traffic control plan. The sidewalk is expected to remain open during construction.

4.10 Hazardous Materials

There are no potential impacts from hazardous materials other than impacts analyzed in the SEIS. The planned facility is not located in an area of known risks from past releases of hazardous substances. Measures set forth in the SEIS are adequate to minimize potential direct and indirect impacts from use and handling of hazardous materials during construction of the planned facility.

4.11 Land Use

There are no potential impacts to the designated land use where the facility is planned other than impacts analyzed in the SEIS. The planned facility would be located in the public right-of-way for Elkhorn Road. Measures set forth in the SEIS to address temporary impacts from construction noise and dust and temporary disruption to traffic patterns are adequate to minimize potential direct construction impacts to vehicle and bicycle users of the right-of-way.

5.0 CONCLUSIONS

Construction and operation of the planned flood control facility identified as RCHB 0275 as part of the Rancho Road System would have negligible impacts to environmental resources. No further environmental documentation is necessary.

6.0 REFERENCES

BLM (Bureau of Land Management). 1991. Final Environmental Impact Statement, Flood Control Master Plan. Prepared by Clark County Regional Flood Control District. 1991.

BLM (Bureau of Land Management). 2004. Supplemental Programmatic Environmental Impact Statement, Clark County Regional Flood Control District 2002 Master Plan Update, Final. Prepared by Clark County Regional Flood Control District. September 2004.

CCRFCD (Clark County Regional Flood Control District). 2008. Las Vegas Valley Flood Control Master Plan Update. Prepared by PBS&J. September 2008.

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Clark County. 2012b. Soil Guidelines. http://gisgate.co.clark.nv.us/soilspdf/bdsoilpage-178041.pdf. GISMO Open Web accessed June 11, 2012.

CLV (City of Las Vegas). 2012. Geotechnical Interpretive Report, Rancho Road System, Elkhorn Road from Fort Apache to Grand Canyon Drive. Prepared by GES for Slater Hanifan Group. June 22, 2012.

FEMA (Federal Emergency Management Agency). 2002. Flood Insurance Rate Map, Clark County, Nevada and Incorporated Areas. Map Number 32003C1745E, Revised September 27, 2002.

DEPARTMENT OF PUBLIC WORKS

Mayor:
CAROLYN G. GOODMAN

City Council:
STAVROS S. ANTHONY (MAYOR PRO-TEM)
LOIS TARKANIAN
STEVEN D. ROSS
RICKI Y. BARLOW
BOB COFFIN
BOB BEERS

City Manager:
ELIZABETH N. FRETWELL

Director of Public Works:
JORGE CERVANTES, P.E., P.T.O.E.

City Engineer:
DAVID BOWERS, P.E., P.T.O.E.



RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

Funded By:
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

Reviewed By:

CLV CITY ENGINEER	DATE
CLV PROJECT MANAGER	DATE
CLV CITY TRAFFIC ENGINEER	DATE
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT	DATE
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION	DATE
CLARK COUNTY PUBLIC WORKS	DATE
SOUTHWEST GAS CORPORATION	DATE
CENTURYLINK THE AFFIXED CENTURYLINK NEVADA APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION STANDARD REGULATIONS.	DATE
COX COMMUNICATIONS LAS VEGAS, INC.	DATE
LVVWD ENGINEERING SERVICES MANAGER LVVWD PROJECT NO. 121162 SHEETS: G-01 THRU G-03, R-01 THRU R-03, SD-01 THRU SD-05, AND SS-01	DATE
NV ENERGY – DISTRIBUTION NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.	DATE
NV ENERGY – TRANSMISSION THE SIGNATURE ABOVE ACKNOWLEDGES THAT THE UTILITY COMPANY REPRESENTATIVE HAS REVIEWED THE PLANS, AND THAT TO THE BEST OF HIS OR HER KNOWLEDGE THE UTILITY LINES ARE SHOWN IN THE CORRECT LOCATIONS AND ARE THE CORRECT SIZES. WHILE SUCH DATA HAS BEEN COLLECTED WITH REASONABLE CARE, THERE IS NO EXPRESSED OR IMPLIED GUARANTEE THAT THE LOCATIONS ARE EXACT. THE CONTRACTOR SHALL BEAR THE RESPONSIBILITY OF OBTAINING THE ACTUAL FIELD LOCATIONS. THE SIGNATURE ABOVE FURTHER ACKNOWLEDGES THAT THE UTILITY COMPANY DOES NOT ANTICIPATE CONSTRUCTION OR MAINTENANCE IN THE PROJECT AREA FOR FIVE (5) YEARS IN CONFORMANCE WITH THE CLV NO-CUT POLICY.	DATE

HANSEN #41990
BID NO. 13.41990

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT
CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON (ELKHORN - FT APACHE TO GRAND CANYON)
SHEET: COVER SHEET

SEAL
90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION

Sheet
G-01
1 of 21
DRAWING NO.
327V290

F:\CLV1201\Dwg\Improv\G-01.dwg, 10/4/2013 6:58:36 AM, jratcliffe

LEGEND

—TEL 5—4"—	EXISTING TELEPHONE CABLE
—12" SS—	EXISTING SANITARY SEWER LINE
—12" W—	EXISTING WATER LINE
—18" SD—	EXISTING STORM DRAIN LINE
—ELE UG 1—4"—	EXISTING UNDERGROUND ELECTRICAL LINE
—OHP—	EXISTING OVERHEAD POWER LINE
—OHP/TEL—	EXISTING OVERHEAD POWER AND TELEPHONE LINE
—4" PE GAS—	EXISTING GAS LINE
—CATV—	EXISTING CABLE TELEVISION LINE
	EXISTING CURB & GUTTER
	EXISTING RIGHT-OF-WAY LINE
	EXISTING PROPERTY LINE
—X—X—X—	EXISTING CHAIN-LINK FENCE
SL	EXISTING STREET LIGHT CONDUIT
MH	EXISTING MANHOLE OR VAULT
	EXISTING VALVE (GAS OR WATER)
FH	EXISTING FIRE HYDRANT
PP	EXISTING POWER OR TELEPHONE POLE
	EXISTING PADMOUNTED SERVICE PEDESTAL
	EXISTING NV ENERGY TRANSFORMER
	EXISTING SWING GATE
	EXISTING STREET LIGHT
	EXISTING ON-SITE LIGHT

	STREET CENTERLINE
	EASEMENT LINE
	AEP
	PROPOSED SIGN
	CONCRETE SURFACE
	PLANTMIX BITUMINOUS SURFACE OVERLAY
	COLD MILL
	FLOWLINE

BASIS OF BEARING

NCRS, LAS VEGAS ZONE, NAD 83 (CORS96) EPOCH 2002.0
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM, LAS VEGAS ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN. THE REFERENCE FRAME BEING NAD 83 (CORS96) EPOCH 2002.0.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK #SLV3018SSE6, BEING A RIVET AND PLATE IN THE TOP OF CURB, ON THE NORTHWEST CORNER OF TEE PEE LANE AND ELKHORN ROAD

ELEV. = 827.590 METERS = 2715.19 FEET (NAVD88)

APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER — DATE

PROJECT NO. 121162

SHEET INDEX

SHT NO.	SHEET	DESCRIPTION
1	G-01	COVER SHEET
2	G-02	ABBREVIATIONS, LEGEND, BASIS OF BEARING, BENCHMARK, VICINITY MAP, AND SHEET INDEX
3	G-03	GENERAL NOTES
4	G-04	CLARK COUNTY GENERAL NOTES
5	G-05	MONUMENTATION AND HORIZONTAL CONTROL PLAN
6	R-01	REMOVAL PLAN – "ER" 18+00.00 TO "ER" 36+00.00
7	R-02	REMOVAL PLAN – "ER" 36+00.00 TO "ER" 54+00.00
8	R-03	REMOVAL DETAILS
9	SD-01	STORM DRAIN PLAN AND PROFILE – "RCB" 38+50.00 TO "RCB" 47+50.00
10	SD-02	STORM DRAIN PLAN AND PROFILE – "RCB" 47+50.00 TO "RCB" 56+50.00
11	SD-03	STORM DRAIN PLAN AND PROFILE – "RCB" 56+50.00 TO "RCB" 65+50.00
12	SD-04	STORM DRAIN LATERAL PROFILES
13	SD-05	STORM DRAIN LATERAL PROFILES
14	SD-06	STORM DRAIN DETAILS
15	SD-07	STORM DRAIN DETAILS
16	SD-08	STORM DRAIN DETAILS
17	SD-09	STORM DRAIN DETAILS
18	SD-10	DROP INLET GRADING DETAILS
19	SS-01	SANITARY SEWER PLAN AND PROFILE – "RCB" 51+50.00 TO "RCB" 57+00.00
20	ST-01	SIGNING AND STRIPING PLAN – "ER" 18+00.00 TO "ER" 36+00.00
21	ST-02	SIGNING AND STRIPING PLAN – "ER" 36+00.00 TO "ER" 54+00.00

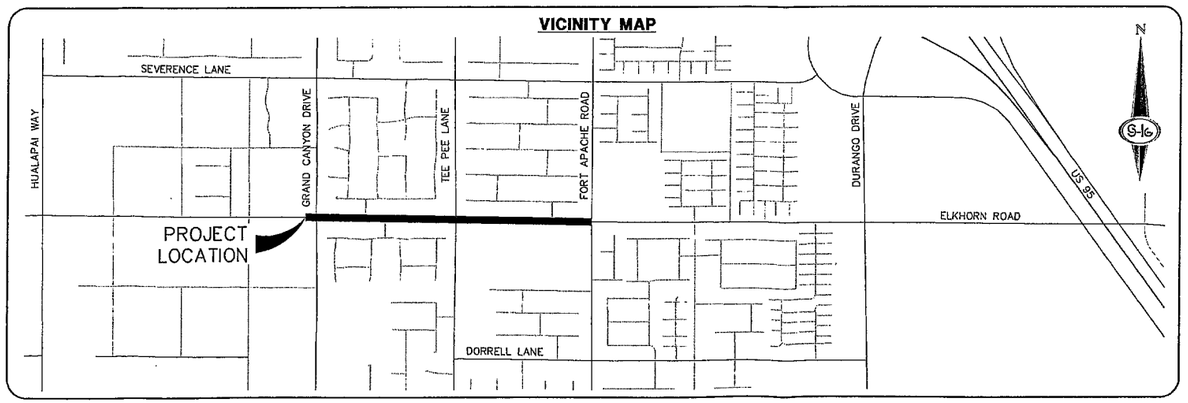
ABBREVIATIONS

ABUT	ABUTMENT
AC	ALUMINUM CAP/ASPHALTIC CONCRETE
AEP	AUTHORIZATION TO ENTER PROPERTY
AP	ANGLE POINT
APN	ASSESSORS PARCEL NUMBER
AVE	AVENUE
BC	BEGIN CURVE/BRASS CAP/BACK OF CURB
BCR	BEGIN CURB RETURN
BLVD	BOULEVARD
BM	BENCHMARK
BOT	BOTTOM
BRG	BEARING
BSW	BACK OF SIDEWALK
BVCE	BEGIN VERTICAL CURVE ELEVATION
BVCS	BEGIN VERTICAL CURVE STATION
CATV	UNDERGROUND CABLE TV
CG	CURB AND GUTTER
CCSD	DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS
CKT	CIRCUIT
CLR	CLEAR/CLEARANCE
CLBM	CITY OF LAS VEGAS BENCHMARK
CLV	CITY OF LAS VEGAS
CMU	CONCRETE MASONRY UNIT
CONC	CONCRETE
℄, C/L	CENTERLINE
COB	CENTER OF BOLLARD
COL	COLUMN
CONST	CONSTRUCT/CONSTRUCTION
COORD	COORDINATE
COR	CORNER
CY	CUBIC YARD(S)
Δ	DELTA
DB	DIRECT BURY
DBL	DOUBLE
DI	DROP INLET
DIA	DIAMETER
DIST	DISTANCE
DR	DRIVE
DW	DRIVEWAY
DWG	DRAWING
ECR	END CURB RETURN
E	EAST
EA	EACH
ESMT	EASEMENT
ECR	END CURB RETURN
ELEC	ELECTRICAL
ELEV/EL	ELEVATION
EP/EOP	EDGE OF PAVEMENT
EQ	EQUAL
EST	ESTIMATED
EVC	END VERTICAL CURVE
EX./EXIST	EXISTING
EXP	EXPANSION JOINT
EW	EACH WAY
FC	FACE OF CURB
FG	FINISH GRADE
FH	FIRE HYDRANT
FL	FLOW LINE
FO	FIBER OPTIC
FS	FINISH SURFACE
FT	FOOT/FEET
FTG	FOOTING
FW	FACE OF WALL
FYA	FLASHING YELLOW ARROW
G	GAS
GA	GAUGE
GB	GRADE BREAK
GND	GROUND
H	HEIGHT
HGL	HYDRAULIC GRADE LINE
HORIZ	HORIZONTAL
HWY	HIGHWAY
INV	INVERT
ITS	INTELLIGENT TRANSPORTATION SYSTEM
JT	JOINT
LF	LINEAR (LINEAL) FEET
LIP	LIP OF GUTTER
LT	LEFT
LUM	LUMINAIRE
LVVWD	LAS VEGAS VALLEY WATER DISTRICT
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MLCP	MULTI-LAYERED COMPOSITE PIPE
MOD	MODIFY/MODIFIED
MON	MONUMENT
MPH	MILES PER HOUR
N	NORTH
NDOT	NEVADA DEPARTMENT OF TRANSPORTATION
NO	NUMBER
NVE	NV ENERGY
NTS	NOT TO SCALE
OC	ON CENTER
OHP	OVERHEAD POWER LINE
PAT	PATENT
PB	PULL BOX
PBS	PLANTMIX BITUMINOUS SURFACE
PC	POINT OF CURVE, PHOTO CELL
PCC	POINT OF COMPOUND CURVE
PD	PONDING DEPTH
PE	PROJECT ENGINEER/POLYETHYLENE
PED	PEDESTRIAN
PG	PROFILE GRADE (FG ON CONTROL LINE)
PGL	PROFILE GRADE LINE
PH	POTHOLE
PI	POINT OF INTERSECTION
PKWY	PARKWAY
PL	PROPERTY LINE
PMF	PAVEMENT MARKING FILM
POB	POINT OF BEGINNING
POC	POINT ON CURVE
POE	POINT OF ENDING
POT	POINT ON TANGENT
PP	POWER POLE
PPCBR	PORTABLE PRECAST CONCRETE BARRIER RAIL
PPM	POLYUREA PAVEMENT MARKINGS
PR	PAIR
PROP	PROPOSED
PRC	POINT OF REVERSE CURVE
PRVC	POINT REVERSE VERTICAL CURVE
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENCY
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
R	RADIUS
RCB	REINFORCED CONCRETE BOX
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDWY	ROADWAY
REC	RECTANGULAR
REINF	REINFORCED
REQD	REQUIRED
RND	ROUND
RP	RADIUS POINT
RPM	RAISED PAVEMENT MARKERS
R/W	RIGHT-OF-WAY
RT	RIGHT
S	SOUTH
SCH	SCHEDULE
SD	STORM DRAIN
SDMH	STORM DRAIN MANHOLE
SECT	SECTION
SF	SQUARE FOOT/FEET
SHLDR	SHOULDER
SHT	SHEET
SIM	SIMILAR
SP	SERVICE POINT
SPA	SPACING
SQ	SQUARE
SS	SANITARY SEWER
SSMH	SANITARY SEWER MANHOLE
STA	STATION
STD	STANDARD
ST	STREET
STL	STEEL
SL	STREET LIGHT
STRUCT	STRUCTURE
SW	SIDEWALK
SNBORS	SOUTHERN NEVADA BUILDING OFFICIALS REGIONAL STANDARDS
SWG	SOUTHWEST GAS
T	TELEPHONE/TOP
TAN	TANGENT
TC	TOP OF CURB
TEMP	TEMPORARY
TF	TOP OF FOOTING
TG	TOP OF GRATE
TMH	TOP OF MANHOLE
TRANS	TRANSITION STRUCTURE
TRW	TOP OF RETAINING WALL
TW	TOP OF WALL
TS	TRAFFIC SIGNAL
TYP	TYPICAL
UDACS	UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR WATER DISTRIBUTION SYSTEMS
USDCCA	UNIFORM STD. DRAWINGS FOR PUBLIC WORKS' CONSTRUCTION OFF-SITE IMPROVEMENTS CLARK COUNTY AREA, NEVADA
UT	UNDERGROUND TELEPHONE
VAR	VARIABLE/VARIES
VC	VERTICAL CURVE
VERT	VERTICAL
VG	VALLEY GUTTER
W	WEST
WY	WAY
WT	WEIGHT
XING	CROSSING

ALIGNMENT ABBREVIATIONS

"ER"	ELKHORN ROAD (GRAND CANYON DRIVE TO FORT APACHE ROAD)
"RCB"	REINFORCED CONCRETE BOX (GRAND CANYON DRIVE TO FORT APACHE ROAD)

VICINITY MAP



NO.	DATE:	REVISIONS DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

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DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN – FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: ABBREVIATIONS, LEGEND, BASIS OF BEARING, BENCHMARK, VICINITY MAP, AND SHEET INDEX

SEAL

90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION

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CITY OF LAS VEGAS SEWER NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS' CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, AS AMENDED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENTS OF THE ABOVE SPECIFICATIONS.
2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CITY ENGINEER.
3. CHISEL "S" OR "G" IN CURBS WHERE SEWER OR GAS LATERALS PASS UNDER THE CURB.
4. POLYVINYL (PVC) SEWER PIPE SHALL MEET ASTM D-3034 SDR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACKFILL OF TYPE II AGGREGATE BASE.
5. ALL MANHOLES PAVED IN STREETS EIGHTY (80') FOOT R/W AND LARGER SHALL HAVE CONCRETE COLLARS. STREETS LESS THAN EIGHTY (80') FOOT R/W WILL REQUIRE RETROFIT IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.
6. TEE SADDLES SHALL BE USED TO CONNECT SEWER LATERALS TO EXISTING MAIN LINES UP TO TWELVE INCH (12") DIAMETER. CONNECTIONS TO FIFTEEN INCH (15") OR LARGER MAINS SHALL REQUIRE SPECIAL PROCEDURES. IN LINE "Y" 'S SHALL BE USED ON LINES TWELVE INCHES (12") OR ABOVE.
7. WATER MAINS SHALL BE PROTECTED IN ACCORDANCE WITH LVVWD STANDARDS WHENEVER A SEWER MAIN CROSSES OVER A WATER MAIN OR THE SEWER IS LESS THAN EIGHTEEN INCH (18") UNDER A WATER MAIN.
8. ALL CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE CITY OF LAS VEGAS MUST BE STATE OF NEVADA CLASS "A" CONTRACTORS.
9. THE CITY OF LAS VEGAS WILL NOT ACCEPT ANY SEWER MAINS WHICH HAVE A VERTICAL DEFLECTION OF MORE THAN ONE TENTH (0.1) OF A FOOT FROM THE APPROVED CONSTRUCTION PLANS AT ANY LOCATION. SEWER MAINS FOUND TO EXCEED THIS TOLERANCE WILL HAVE TO BE REPAIRED OR REMOVED OR REPLACED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO ACCEPTANCE BY THE CITY OF LAS VEGAS.
10. INSTALLATION OF CURVED SEWER REQUIRES THE USE OF C-900 PIPE WHICH ALLOWS FOR PIPE DEFLECTION AT THE JOINTS.

REVISED 04/15/10

STORMWATER MANAGEMENT NOTES

1. THE OWNER, SITE DEVELOPER, CONTRACTOR, AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO, OR ACCUMULATED IN, THE PUBLIC RIGHTS OF WAY OF CLARK COUNTY AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.
2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARD IN THE USDCCA AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BMP GUIDANCE MANUAL.
3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY, REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPs WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF OF LAND DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR 100000, SECTION III.A.12.
5. THE DEVELOPER SHALL BE RESPONSIBLE TO PROVIDE AND INSTALL ALL PERMANENT SIGNS SHOWN ON THE PLANS. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CLARK COUNTY AREA STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH CLARK COUNTY AREA STANDARDS. ALL SIGNS SHALL USE TYPE III SHEETING.

LAS VEGAS VALLEY WATER DISTRICT (LVVWD) STANDARD NOTES

LVVWD PROJECT #121162

1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN APPROVED FOR CONSTRUCTION BY THE LVVWD. FOLLOWING WATER PLAN APPROVAL, NOTICE SHALL BE GIVEN TO THE LVVWD COMMUNICATION SUPPORT CENTER (258-7171) TWO (2) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. FOR FUTURE INSPECTIONS, NOTICE MUST BE GIVEN BY 2:00 P.M. THE BUSINESS DAY PRIOR TO THE REQUESTED LVVWD INSPECTION. **WHEN REQUESTING INSPECTIONS, PLEASE REFER TO THE PROJECT # IDENTIFIED ABOVE.**
2. ALL WORK SHALL CONFORM TO LVVWD STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS. AND TO THE **2010** EDITION OF THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS). **THE LATEST EDITION OF UDACS SHALL SUPERSEDE ANY CONFLICTS CONTAINED IN THE APPROVED DRAWINGS AND/OR SPECIFICATIONS.**
3. ALL WORK, EXCEPT AS MODIFIED BY THESE PLANS OR BY NOTE 2 ABOVE, SHALL BE DONE IN ACCORDANCE WITH THE MOST RECENT DRAFT OR EDITION OF THE UNIFORM SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENT, CLARK COUNTY AREA.
4. A SINGLE PIPE MATERIAL SHALL BE USED THROUGHOUT THE PROJECT UNLESS OTHERWISE APPROVED BY THE LVVWD.
5. ALL SERVICE LATERALS TWO (2) INCHES IN DIAMETER AND SMALLER SHALL BE TYPE K COPPER TUBING WITH LVVWD APPROVED SERVICE SADDLES.
6. ALL WATER METER BOXES SHALL BE LOCATED OUTSIDE OF DRIVEWAY AREAS.
7. ALL VALVES SHALL BE LOCATED OUTSIDE OF DRIVEWAYS, VALLEY AND CURB GUTTERS.
8. ALL WATER AND STORM DRAIN OR SANITARY SEWER CROSSINGS SHALL CONFORM TO SECTION 2.22 OF THE **2010** EDITION OF THE UDACS
9. ALL WATER FACILITIES SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED, AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LVVWD DISTRIBUTION SYSTEM.
10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES AND SMALLER FROM LVVWD CENTRAL STORES. TELEPHONE 258-3152 OR 258-3802. TWO (2) WORKING DAYS PRIOR TO METER PICKUP.
11. ANY INTERRUPTION OF SERVICE MUST BE PERFORMED IN ACCORDANCE WITH UDACS SECTION 3.14.01, AND APPROVED BY THE LVVWD INSPECTION DIVISION PRIOR TO SHUTDOWN. PROPER WRITTEN NOTIFICATION MUST BE GIVEN TO ALL AFFECTED CUSTOMERS.
12. ALL WATER FACILITY CONSTRUCTION MATERIALS USED MUST BE LISTED ON THE LVVWD PRE-APPROVED MATERIALS AND MANUFACTURER'S LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.
13. TELEPHONE "CALL BEFORE YOU DIG" AT "811" OR 1-800-227-2600.
14. THE INSTALLATION OF LAS VEGAS VALLEY WATER DISTRICT (LVVWD) MUNICIPAL WATER FACILITIES WITHIN ALL STREETS IS ASSUMED TO BE IN COMPLIANCE WITH THE UNIFORM STANDARDS, INCLUDING THE PLACEMENT OF ASPHALT PAVING STREET SURFACES. ANY REPAIR WORK DONE BY THE LVVWD TO THE MUNICIPAL WATER FACILITIES WILL INCLUDE THE PLACEMENT OF AN APPROPRIATELY SIZED ASPHALT REPAIR PATCH ON THE STREET SURFACE. ANY DECORATIVE PAVING SURFACE WITHIN THE STREET IS THE RESPONSIBILITY OF THE OWNER'S ASSOCIATION, OR THE INDIVIDUAL PROPERTY OWNERS IF NO OWNER'S ASSOCIATION IS IN EXISTENCE, OR THE AGENCY HAVING JURISDICTION DECORATIVE SURFACE MATERIALS PLACED WITHIN THE TEN FOOT EASEMENT ABUTTING A PUBLIC OF PRIVATE STREET, IF DISTURBED BY THE LVVWD DURING THE REPAIR OR OPERATION OF ITS FACILITIES, WILL BE REPLACED BY LVVWD WITH AN APPROPRIATELY SIZED PLAIN FINISH CONCRETE PATCH. THE LVVWD WILL NOT RESTORE, AND WILL NOT BE RESPONSIBLE FOR THE RESTORATION OF ANY DECORATIVE PAVING SURFACE WITH THE STREET. THE LVVWD WILL NOT ATTEMPT TO MATCH COLOR OR FINISH OF ANY ADJACENT MATERIALS.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE_____ LVVWD PROJECT # 121162

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".
2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE BY THE CONTRACTOR'S. OPERATIONS UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCE'S WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.
8. AC PAVEMENT TO BE ONE-HALF INCH (½") ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.
9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.
10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.
11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.
12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY THE (GES, REPORT #20112895E1, SEPTEMBER 24, 2013) APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLANS.
13. EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.
14. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. STATUTE NO. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER. WALL NOTES:
16. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.
17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.
18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.
19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.
20. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC, THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.
21. SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S) SHALL BE PROVIDED TO THE OFFSITE INSPECTION AND TESTING SECTION PRIOR TO PROJECT ACCEPTANCE. THE MAP(S) SHALL INCLUDE THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, AND THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXITS THE PUBLIC RIGHT-OF-WAY. TOW LINE THE MAP(S) SHALL BE REFERENCED TO STATE PLANE COORDINATES WHICH SHALL BE BASED ON THE 'NEVADA COORDINATE SYSTEM OF 1983, EAST ZONE' AS DEFINED BY THE NEVADA REVISED STATUTES CHAPTER 327, AND TIED TO THE CITY OF LAS VEGAS VERTICAL CONTROL BENCHMARK NETWORK. COORDINATES MUST BE CERTIFIED BY A NEVADA PROFESSIONAL LAND SURVEYOR TO HAVE POSITIONAL CERTAINTIES OF +/- 0.1 METER (+/- 0.3 FEET). A SEPARATE ELECTRONIC COMMA DELIMITED FILE FOR THE SANITARY SEWER AND STORM DRAIN COORDINATES SHALL ALSO ACCOMPANY THE SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S).
22. NOT USED.
23. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST ADDITION.
24. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

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CITY OF LAS VEGAS STREETLIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION, AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA". LATEST REVISION, AND ANY ADOPTED SPECIAL AREA STANDARDS.
2. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS (ETC.) LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF TRAFFIC ENGINEERING AND THE CITY ENGINEER.
3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION.
4. ALL STREET LIGHTING CONDUITS STUB SHALL HAVE AT LEAST ONE GREEN #8 THW WIRE INSTALLED, AS TRACER WIRE. WHEN "EMPTY" CONDUIT IS COMPLETELY INSTALLED FROM PB TO PB, IT SHALL HAVE MINIMUM OF 2 #6 AND 1 #8 THW WIRE WITH THE ENDS TAPED OR "SAFE OFF" PRIOR TO FINAL INSPECTION.
5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE IN ACCORDANCE WITH THE USD NO. 320A.
6. AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE TEFO PRIOR TO ANY PRE-FINAL INSPECTION. THE AS-BUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.
7. SERVICE POINT SHALL BE COORDINATED WITH NV ENERGY COMPANY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICE POINTS SHALL BE SHOWN ON THE CIVIL PLANS.
8. IT SHALL BE ASSUMED THAT IN THE ABSENCE OF AN EXISTING, WORKABLE CIRCUIT TO ATTACH TO, ALL INSTALLATIONS SHALL REQUIRE A NEW SERVICE FOR OPERATION OF THE CIRCUIT.
9. WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREET LIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED, AT NO EXPENSE TO THE CITY OF LAS VEGAS, BEFORE STREETLIGHT BASES ARE INSTALLED.
10. THE CONTRACTOR SHALL FURNISH COMPLETE SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON PLANS.
11. THE DEVELOPER/OWNER WILL BE REQUIRED TO SUPPLY POWER TO ALL NEW PUBLIC STREET LIGHTS INSTALLED UNDER THIS DESIGN PRIOR TO BOND RELEASE OR PROJECT COMPLETION. THE DEVELOPER/OWNER WILL BE RESPONSIBLE FOR ALL ITEMS ASSOCIATED WITH THE INSTALLATION, CONSTRUCTION, ENERGIZING, MAINTENANCE AND OPERATIONAL COST OF SAID STREET LIGHTS PRIOR TO PROJECT COMPLETION. REFER TO THE PLAN FOR ANY NEW SERVICE REQUIREMENTS. THE TRANSFER OF OWNERSHIP FROM THE DEVELOPER/OWNER TO THE CITY OF LAS VEGAS FOR ALL NEW PUBLIC STREET LIGHT/S AND/OR SERVICE/S INSTALLED UNDER THIS PLAN DESIGN WILL BE IN CONJUNCTION WITH THIS PROJECT COMPLETION. COORDINATE ALL MAINTENANCE AND OPERATIONAL TRANSFERS WITH THE CITY OF LAS VEGAS TRAFFIC ENGINEERING DEPARTMENT (TEFO) AT (702) 229-6331.

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LAS VEGAS FIRE AND RESCUE GENERAL NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE CITY OF LAS VEGAS FIRE DEPARTMENT'S ORDINANCE # 5667, "HYDRANT SPECIFICATIONS", AND "HYDRANT INSTALLATION SPECIFICATION".
2. AUTHORIZED FIRE HYDRANTS FOR THIS PROJECT ARE:
   A. KENNEDY – GUARDIAN MODELS K81A AND K81D
   B. MUELLER – SUPER CENTURION 250 MODEL A-423
   C. CLOW – MEDALLION MODEL F-2546LVO
   D. TROY VALVE – PATRIOT MODEL PT8100N NEVADA HYDRANT
   E. U.S. PIPE – METROFLOW/M-03
3. ON ANY RESIDENTIAL OR COMMERCIAL INSTALLATIONS FIRE HYDRANTS SHALL BE INSTALLED AND FIRE APPARATUS ACCESS ROADS SHALL BE MAINTAINED BEFORE COMMENCEMENT OF ANY COMBUSTIBLE CONSTRUCTION. ALL FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER AND SHALL BE CAPABLE OF DELIVERING THE REQUIRED FIRE FLOW.
4. TO IDENTIFY THE FIRE HYDRANT LOCATIONS, CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTER LINE OF STREET ADJACENT TO THE FIRE HYDRANTS AS REQUIRED BY ORDINANCE # 5667.
5. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH VERIFICATIONS OF ALL FIRE HYDRANTS AND FIRE LINES, SHALL BE CONDUCTED BEFORE COVERING THE LINES. CALL THE CITY OF LAS VEGAS INSPECTION HOT-LINE AT 229-2071 TO REQUEST AN INSPECTION BY THE CITY OF LAS VEGAS FIRE DEPARTMENT.
6. PAINTING OF THE CURBS AND FIRE HYDRANTS AND ALL OTHER WORK NECESSARY AS REQUIRED BY ORDINANCE # 5667, FOR THE PROTECTION OF FIRE HYDRANTS FROM PHYSICAL DAMAGE, SHALL BE COMPLETED BEFORE APPROVAL BY THE CITY OF LAS VEGAS FIRE DEPARTMENT.
7. A PERMIT IS REQUIRED FROM THE CITY OF LAS VEGAS FIRE DEPARTMENT FOR THE ON-SITE WATER LINES AND FIRE HYDRANTS. THE PERMIT AND CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR UNDERGROUND PIPING FORM SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK.
8. PRIVATE FIRE HYDRANTS SHALL BE PAINTED RED.
9. PRIOR TO THE FINAL OCCUPANCY, A FLOW TEST MUST BE WITNESSED BY THE CITY OF LAS VEGAS FIRE DEPARTMENT TO VERIFY AVAILABILITY OF THE REQUIRED FIRE FLOW.
10. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A. APPROVED, AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE.
11. FIRE HYDRANTS SPACING SHALL BE:
    RESIDENTIAL – 500 FEET UNSPRINKLERED; 600 FEET SPRINKLERED.
    COMMERCIAL – 300 FEET UNSPRINKLERED; 400 FEET SPRINKLERED.
12. WHERE NEW WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF THE STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT MAXIMUM 1,000 FOOT SPACINGS, FOR TRANSPORTATION HAZARDS. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS OR HAVE FOUR OR MORE TRAFFIC LANES AND HAVE A TRAFFIC COUNT OF MORE THAN 30,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FEET ON AN ALTERNATING BASIS.
13. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN THE REQUIRED RADIUS OF A CUL-DE-SAC OR WITHIN 20 FEET OF THE PERIMETER OF THE RADIUS OF THE CUL-DE-SAC.
14. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FEET OF ANY CURB RETURN, DRIVEWAY, POWER POLE. STREETLIGHT OR ANY OTHER OBSTRUCTION.
15. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE-TWO FAMILY DWELLING SHALL NOT EXCEED 300 FEET, AS MEASURED BY AN APPROVED ROUTE.
16. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A FIRE DEPARTMENT CONNECTION (FDC) SHALL NOT EXCEED 100 FEET, AS MEASURED BY AN APPROVED ROUTE.
17. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO THE END OF A DEAD-END STREET SHALL NOT EXCEED 200 FEET.
18. TWO SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE ARE 4 OR MORE FIRE HYDRANTS/SPRINKLER LEAD-INS ARE INSTALLED ON A SINGLE SYSTEM. SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 2 FIRE HYDRANTS CAN BE OUT OF SERVICE DUE TO A BREAK IN A WATER MAIN.
19. ALL FIRE APPARATUS ACCESS ROADS SHALL BE PAVED TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES, AND SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF THE FIRE APPARATUS.
20. THE GRADIENT FOR THE FIRE APPARATUS ACCESS ROADS SHALL NOT EXCEED 12%. ANGLES OF APPROACH AND ANGLES OF DEPARTURE SHALL NOT EXCEED 6% FOR 25 FEET PRIOR TO OR AFTER THE GRADE CHANGE. ADJACENT TO THE STRUCTURES GRADIENT SHALL NOT EXCEED 6%.
21. THE TURNING RADIUS OF THE FIRE APPARATUS ACCESS ROADS SHALL BE NO LESS THAN 52 FEET OUTSIDE AND 28 FEET INSIDE TURNING RADIUS.
22. VERTICAL CLEARANCE OF ALL FIRE APPARATUS ACCESS ROADS SHALL BE NOT LESS THAN 13 FEET 6 INCHES.
23. FIRE DEPARTMENT ACCESS ROADS IN ALL RESIDENTIAL DEVELOPMENTS (EXCEPT FOR THE APARTMENT BUILDINGS) SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 36 FEET FLOW LINE TO THE FLOW LINE (THIS WIDTH MAY BE REDUCED TO 24 FEET, IF ALL BUILDINGS FRONTING THE STREET ARE SPRINKLERED) FOR MAIN RESIDENTIAL STREETS, WITH PARKING PERMITTED ON BOTH SIDES OF THE STREET. PRIVATE DRIVE AISLES, DRIVEWAYS, ETC. SHALL BE ALLOWED TO BE REDUCED TO A MINIMUM WIDTH OF 24 FEET WIDE FLOW LINE TO THE FLOW LINE WHEN SERVING NO MORE THAN 6 RESIDENCES, AND WHEN ON STREET PARKING IS DISALLOWED.
24. ALL FIRE APPARATUS ACCESS ROADS IN COMMERCIAL DEVELOPMENTS AND APARTMENT COMPLEXES SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 24 FEET (FLOW LINE TO THE FLOW LINE), PROVIDED NO PARKING IS ALLOWED ON EITHER SIDE; 32 FEET (FLOW LINE TO THE FLOW LINE), IF PARALLEL PARKING IS ALLOWED ON ONE SIDE ONLY; AND 40 FEET (FLOW LINE TO THE FLOW LINE), IF PARALLEL PARKING IS ALLOWED ON BOTH SIDES. THESE WIDTHS MAY BE REDUCED BY 4 FEET IF ALL BUILDINGS ARE SPRINKLERED.
25. A FIRE DEPARTMENT ACCESS ROAD SHALL EXTEND TO WITHIN 50 FEET OF A SINGLE EXTERIOR DOOR PROVIDING ACCESS TO THE INTERIOR OF THE BUILDING.
26. A FIRE APPARATUS ACCESS ROAD SHALL BE REQUIRED WHEN ANY PORTION OF AN EXTERIOR WALL OF THE FIRST STORY IS LOCATED MORE THAN 150 FEET FROM A FIRE DEPARTMENT VEHICLE ACCESS. THIS DISTANCE COULD BE INCREASE TO 250 FEET IF THE BUILDING IS SPRINKLERED.
27. APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 100 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS OR WITH A SINGLE POINT OF ACCESS IN EXCESS OF 600 FEET, AND FOR ALL COMMERCIAL, INDUSTRIAL, AND MULTI-FAMILY RESIDENTIAL DEVELOPMENTS.
28. ALL DEAD-END FIRE APPARATUS ACCESS ROADS AND OR FIRE LANES, PUBLIC OR PRIVATE, IN EXCESS OF 150 FEET IN LENGTH SHALL BE PROVIDED WITH AN APPROVED TURN AROUND AREA HAVING A MINIMUM DIAMETER OF 81 FEET.
29. ALL FIRE APPARATUS ACCESS ROADS SHALL BE MARKED BY PLACING APPROVED SIGNS AT THE START OF THE DESIGNATED FIRE LANE, ONE SIGN AT THE END OF THE FIRE LANE AND WITH SIGNS AT INTERVALS 100 FEET ALONG ALL DESIGNATED FIRE LANES. SIGNS TO BE PLACED ON BOTH SIDES OF AN ACCESS ROADWAY IF NEEDED TO PREVENT PARKING ON EITHER SIDE. SIGNS TO BE INSTALLED NO HIGHER THAN 10 FEET OR LESS THAN 6 FEET FROM ROADWAY LEVEL. THE CURB ALONG OR ON THE PAVEMENT OR CEMENT IF A CURB IS NOT P

CLARK COUNTY GENERAL NOTES (CLARK COUNTY JURSDICTION ONLY)

1. ALL REFERENCES TO STANDARD DRAWINGS ARE TO STATE OF NEVADA STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION LATEST ENGLISH EDITION, "THE UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA" OR "THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA" AS NOTED.
2. THE CONTRACTOR SHALL NOTIFY ALL AFFECTED PUBLIC ENTITIES, THE PROJECT ENGINEER, CLARK COUNTY AT LEAST 48 HOURS PRIOR TO THE COMMENCEMENT OF WORK.
3. LOCATIONS OF UNDERGROUND UTILITIES SHOWN ON THE DRAWINGS WERE OBTAINED FROM INFORMATION RECEIVED FROM THE APPLICABLE UTILITY COMPANIES. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES OR STRUCTURES NOT SHOWN, OR FOR UTILITIES OR STRUCTURES NOT SHOWN AT ACTUAL LOCATIONS ON THE DRAWINGS. EXISTING SERVICE LATERALS ARE NOT SHOWN ON THESE DRAWINGS. CONTRACTOR TO VERIFY THE EXACT LOCATION OF UTILITIES PRIOR TO START OF CONSTRUCTION. THE CONTRACTOR'S RESPONSIBILITY REGARDING UTILITIES SHALL BE AS REQUIRED UNDER SECTION 107.17 OF THE UNIFORM STANDARD SPECIFICATIONS FOR CLARK COUNTY AREA, NEVADA AND AS PROVIDED IN THE SPECIFICATIONS.
4. THE CONTRACTOR SHALL NOT REMOVE TREES, SHRUBS, LAWNS, WALLS, FENCES, SIGNS, STRUCTURES, LIGHTS, OR ANY EXISTING IMPROVEMENTS OUTSIDE OF STREET RIGHT-OF-WAY, EXCEPT WHERE REQUIRED TO DO SO BY THE CONTRACT DRAWINGS OR BY THE ENGINEER. REPLACEMENT, RELOCATION OR RECONSTRUCTION OF ALL EXISTING IMPROVEMENTS INCLUDING SPRINKLER SYSTEMS, LAWNS, FENCES, WALLS, SIGNS, STEPS, SIDEWALK, DRIVEWAYS, LAWN LIGHTS, AND ALL OTHER ITEMS APPLICABLE TO THIS CONTRACT SHALL BE AS REQUIRED BY THE ENGINEER.
5. THE CONTRACTOR SHALL BACKFILL AND FINE GRADE ALL CUT OR FILL SLOPES TO MATCH EXISTING CONDITIONS TO THE SATISFACTION OF THE ENGINEER. WHERE EXISTING LAWNS ARE DAMAGED BY THE CONTRACTOR'S OPERATIONS, THE CONTRACTOR SHALL SOD THE AFFECTED AREA TO A CONDITION EQUAL TO OR BETTER THAN THAT WHICH EXISTED PRIOR TO CONSTRUCTION.
6. ALL BARRICADING AND TEMPORARY TRAFFIC CONTROL DEVICES OR METHODS USED DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA, NEVADA" LATEST EDITION.
7. REMOVAL OR RELOCATIONS OF POWER POLES, TELEPHONE POLES, JOINTLY-OWNED POLES, AND APPURTENANCES WHICH INTERFERE WITH IMPROVEMENTS REQUIRED TO BE CONSTRUCTED UNDER THIS CONTRACT, SHALL BE THE RESPONSIBILITY OF THE RESPECTIVE UTILITY COMPANY. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE UTILITY COMPANIES FAR ENOUGH IN ADVANCE AS TO NOT IMPACT THE SCHEDULE.
8. NV ENERGY SHALL BE RESPONSIBLE FOR THE RELOCATION OF UNDERGROUND OR OVERHEAD POWER LINES THAT INTERFERE WITH THE REQUIRED IMPROVEMENTS AS SHOWN ON THE PLANS.
9. POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENT SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.
10. CENTURYLINK SHALL BE RESPONSIBLE FOR THE VERTICAL OR HORIZONTAL ADJUSTMENT OF ALL TELEPHONE FACILITIES WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.
11. COX COMMUNICATIONS SHALL BE RESPONSIBLE FOR THE VERTICAL OR HORIZONTAL ADJUSTMENT OF ALL CATV FACILITIES WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.
12. SOUTHWEST GAS CORPORATION SHALL PERFORM ANY NECESSARY WORK ON THE EXISTING AND PROPOSED GAS FACILITIES SHOWN ON THE DRAWINGS.
13. UNLESS OTHERWISE SHOWN ON THE CONTRACT DRAWINGS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OR RELOCATION OF ALL WATER SERVICES AND METERS WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE VERTICAL ADJUSTMENT OF ALL EXISTING SANITARY, WATER AND STORM SEWER MANHOLES TO THE FINAL FINISH GRADES IN ACCORDANCE WITH SECTION 600 OF THE "STANDARD SPECIFICATIONS".
15. ALL SANITARY SEWER CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CLARK COUNTY WATER RECLAMATION DISTRICT DESIGN AND CONSTRUCTION STANDARDS AND THE CITY OF LAS VEGAS AND CITY OF NORTH LAS VEGAS CONSTRUCTION STANDARDS.
16. THE PLANS DO NOT SHOW ALL SEWER LATERALS, SEWER FORCE MAINS AND WATER SERVICE LATERALS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY REPAIRS OR RELOCATIONS OF LATERALS BROKEN OR IN CONFLICT WITH THE PROPOSED STORM DRAIN OR ROADWAY CONSTRUCTION.
17. CONTRACTOR SHALL MAINTAIN CONTINUOUS SEWER SERVICE TO ALL CUSTOMERS. SEWER LATERALS CUT DURING CONSTRUCTION SHALL BE REPAIRED BY CONTRACTOR PER CCWRD DESIGN AND CONSTRUCTION STANDARDS. CONTRACTOR SHALL IMMEDIATELY REPORT ANY SANITARY SEWER OR SEWER LATERALS THAT CANNOT BE RECONNECTED TO SEWER MAIN DUE TO STORM DRAIN CONFLICT. CLARK COUNTY SHALL BE RESPONSIBLE FOR PROVIDING RESUBMITTED APPROVED MAIN LINE SEWER EXTENSION PLANS TO PROVIDE NEW MAIN TO REROUTE ANY SEWERS THAT CANNOT BE RECONNECTED.
18. EXACT LOCATIONS OF ALL SAWCUT LINES SHALL BE DETERMINED IN THE FIELD BY THE CLARK COUNTY INSPECTOR.
19. CURB AND GUTTER OF A GRADE OF LESS THAN 4/10 OF ONE PERCENT SHALL BE CONSTRUCTED BY FORMING. EACH JOINT SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TEST AS SOON AS POSSIBLE AFTER CONSTRUCTION.
20. OFFSET DIMENSIONS TO CURB AND GUTTER ARE MEASURED TO BACK OF CURB. OFFSET DIMENSIONS TO GLUE DOWN MEDIAN ARE MEASURED TO FACE OF CURB/MEDIAN.
21. THE CONTRACTOR SHALL VERIFY IN THE FIELD ALL DIMENSIONS, EXISTING CONDITIONS AND POINTS OF CONNECTION WITH ADJOINING PROPERTY (PUBLIC AND PRIVATE). ANY DISCREPANCIES SHALL BE CALLED TO THE ATTENTION OF THE PROJECT ENGINEER PRIOR TO PROCEEDING WITH THE WORK.
22. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE PROPER DRAINAGE, INGRESS AND EGRESS TO THE PROJECT.
23. FINAL PLANTMIX BITUMINOUS SURFACE (PBS) PAVEMENT SHALL BE ONE-HALF INCH ABOVE THE LIP OF GUTTER (INCLUDING OPEN GRADE) EXCEPT AT SIDEWALK RAMPS WHERE PBS PAVEMENT SHALL BE FLUSH WITH CONCRETE RAMP. PAVEMENT SURFACES SHALL BE FLUSH WITH EDGES OF CROSS GUTTERS.
24. PORTLAND CEMENT CONCRETE PAVING JOINTS SHALL CONFORM TO NDOT STD. PLAN R-10.1.2.
25. THE CONTRACTOR SHALL MAINTAIN AN ONGOING REMOVAL PROCESS OF ALL SPILLAGE OF EXCAVATION MATERIAL ON ALL PAVED STREETS.
26. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. STATUTE NO. 625.550.
27. ALL EXISTING TRAFFIC SIGNS, STREET LIGHTS & SIGNS TO BE REMOVED SHALL BE SALVAGED BY THE CONTRACTOR AND DELIVERED TO THE CLARK COUNTY TRAFFIC OPERATIONS DIVISION LOCATED AT 5821 E. FLAMINGO ROAD., LAS VEGAS, NEVADA WITHIN 48 HOURS OF THEIR REMOVAL.
28. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL EXISTING TRAFFIC SIGNS, NOT SPECIFICALLY NOTED ON THE DRAWINGS, WHICH ARE TO BE RELOCATED OR REMOVED.
29. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED THEREUNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR.
30. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL, OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE COUNTY TRAFFIC MANAGER.
31. F.A.S.T. INTELLIGENT TRANSPORTATION SYSTEM (ITS) POLICY IS IN EFFECT. COMMUNICATIONS FACILITIES, INCLUDING BUT NOT LIMITED TO, COPPER WIRE, FIBER OPTIC, MICROWAVE, AND RADIO SYSTEMS SHALL BE MAINTAINED AT ALL TIMES. ANY DAMAGE TO THE ITS SYSTEM OF COMMUNICATION CABLE IS CONSIDERED TO BE AN EMERGENCY AND LIQUIDATED DAMAGES OF $2,500 PER DAY FOR COPPER CABLE AND $7,500 PER DAY FOR FIBER OPTIC BREAKS SHALL BE ASSESSED TO THE CONTRACTOR BEGINNING 24 HOURS AFTER THE CONDUIT OR CABLE DAMAGE. DEVELOPER OR CONTRACTOR SHALL PROVIDE TEMPORARY OVERHEAD INTERCONNECT CABLE WHILE PERMANENT CABLE IS BEING RELOCATED OR REPAIRED. THE TEMPORARY AERIAL INSTALLATION MUST BE ACCEPTABLE TO CLARK COUNTY TRAFFIC MANAGEMENT, F.A.S.T., CITY OF LAS VEGAS, CITY OF NORTH LAS VEGAS AND NDOT AND MUST BE REPORTED AND REPAIRED IMMEDIATELY TO F.A.S.T. ACCEPTANCE. IMMEDIATELY CONTACT JESUS MARMOLEGIO (702-432-5300) TO REPORT ANY DAMAGE OF EXISTING FACILITIES.
32. ALL NEW OR REPLACEMENT TRAFFIC SIGNAL LOOPS SHALL BE INSTALLED USING CABLE-IN-DUCT WIRING, SHALL HAVE INDEPENDENT LEAD-IN WIRES FOR EACH LOOP FROM THE CONTROLLER TO THE PULL-BOX, AND EACH LEAD-IN SHALL BE INDIVIDUALLY TAGGED.
33. THE CONTRACTOR SHALL DETERMINE THE LOCATION AND DEPTH OF SUSPECTED UTILITY INTERFERENCES, AND SHALL FURNISH INFORMATION ON THE SAME TO THE ENGINEER, NOT LESS THAN TEN (10) DAY PRIOR TO THE ANTICIPATED IMPACT OF THESE SUSPECTED INTERFERENCES ON HIS WORK. IF CONFLICTS EXIST, THE CONTRACTOR WILL IMMEDIATELY CONTACT THE ENGINEER AND PROVIDE THE ENGINEER WITH ALL THE NECESSARY DATA SUCH AS ELEVATIONS, HORIZONTAL LOCATIONS, ETC., AND PROVIDE THE ENGINEER WITH SKETCHES INDICATING THE PROPOSED IMPROVEMENT AND THE UTILITY CONFLICT. THE ENGINEER WILL EXAMINE AND REVIEW ALL THE DATA AND SKETCHES PROVIDED, AND WILL PROVIDE THE CONTRACTOR WITH AN ALTERNATIVE DESIGN WITHIN FIVE (5) DAYS AFTER RECEIPT OF DATA AND SKETCHES.
34. PRIOR TO BEGINNING OF CONSTRUCTION, OR RELOCATION OF ANY TRAFFIC SIGNAL SYSTEM, WRITTEN NOTICE SHALL BE SUBMITTED TO THE CLARK COUNTY TRAFFIC MANAGEMENT DIVISION INFORMING OF THE DATE WORK WILL BEGIN.
35. THREE (3) WORKING DAYS PRIOR TO TURN-ON OR COMPLETION OF MODIFICATION(S) TO A TRAFFIC SIGNAL SYSTEM, WRITTEN NOTICE SHALL BE SUBMITTED TO THE CLARK COUNTY TRAFFIC MANAGEMENT DIVISION THAT WORK IS BEING COMPLETED AND SHALL INCLUDE THE PROPOSED DATE OF COMPLETION.
36. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY GROUND MOUNTED STOP SIGNS AT ALL STREET ENCROACHMENTS INTO EXISTING COUNTY STREETS IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED. STOP SIGNS SHALL BE INSTALLED IN GROUND. NO TEMPORARY MOUNTINGS WILL BE ALLOWED.

CLARK COUNTY MARKER BALL NOTE

1. STORM DRAIN LATERALS AND RCB IN CLARK COUNTY JURISDICTION SHALL INCLUDE PASSIVE 4-INCH 3M GENERAL PURPOSE BALL MARKER MODEL 1407-XR EWS EXTENDED RANGE AT ENDS OF STORM DRAIN PIPE AND/OR RCB AND AT EACH CHANGE IN HORIZONTAL ALIGNMENT WITH 200' MAXIMUM INTERVAL.
2. BALL MARKERS SHALL NOT BE INSTALLED LESS THAN 3' OR MORE THAN 5' BELOW FINISH GRADE.

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

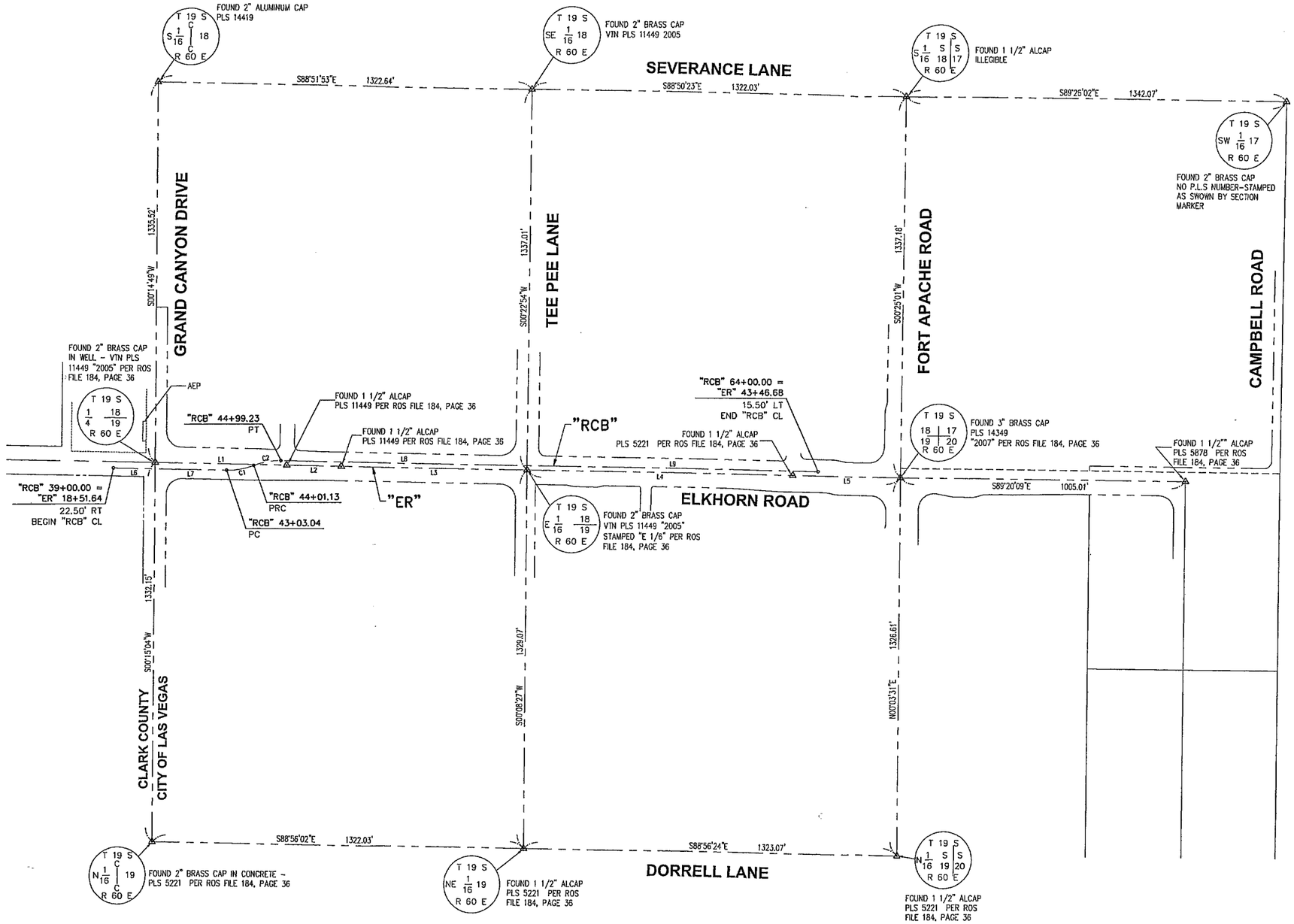
SHEET: CLARK COUNTY GENERAL NOTES

SEAL

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NOT FOR CONSTRUCTION

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4 of 21
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LINE TABLE			
CURVE	DESCRIPTION	LENGTH	BEARING
L1	"ER" CL	466.74'	S88°47'53"E
L2	"ER" CL	192.98'	S88°47'53"E
L3	"ER" CL	659.80'	S88°47'53"E
L4	"ER" CL	939.27'	S88°49'55"E
L5	"ER" CL	381.93'	S86°49'55"E
L6	"RCB" CL	148.36'	S88°51'29"E
L7	"RCB" CL	254.69'	S88°47'53"E
L8	"RCB" CL	873.62'	S88°47'53"E
L9	"RCB" CL	1027.16	S88°49'55"E

CURVE TABLE					
CURVE	DESCRIPTION	LENGTH	RADIUS	TANGENT	DELTA
C1	"RCB" CL	98.10'	250.00'	49.69	22°28'55"
C2	"RCB" CL	98.10'	250.00'	49.69	22°28'55"

BASIS OF BEARINGS

NCRS, LAS VEGAS ZONE, NAD 83 (CORS96) EPOCH 2002.0

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM, LAS VEGAS ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN. THE REFERENCE FRAME BEING NAD 83 (CORS96) EPOCH 2002.0.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK #GLV9018SSE6, BEING A RIVET AND PLATE IN THE TOP OF CURB, ON THE NORTHWEST CORNER OF TEE PEE LANE AND ELKHORN ROAD

ELEV. = 827.590 METERS = 2715.19 FEET (NAVD88)

REFERENCES

R1) FILE 184, PAGE 36 OF SURVEYS
R2) FILE 114, PAGE 57 OF SURVEYS
R3) BOOK 108, PAGE 70 OF PLATS
R4) BOOK 114, PAGE 11 OF PLATS
R5) BOOK 115, PAGE 98 OF PLATS
R6) BOOK 123, PAGE 38 OF PLATS
R7) BOOK 115, PAGE 98 OF PLATS
R8) BOOK 118, PAGE 55 OF PLATS
R9) BOOK 136, PAGE 48 OF PLATS
R10) BOOK 109, PAGE 25 OF PLATS
R11) BOOK 118, PAGE 89 OF PLATS
R12) FILE 118, PAGE 89 OF SURVEYS

LEGEND

- ⚠ MONUMENTATION FOUND OR REFERENCED AS DESCRIBED
- SECTION LINE – CENTERLINE
- CLV RIGHT-OF-WAY LINE
- CLARK COUNTY RIGHT-OF-WAY LINE
- ALIQUOT PART LINE
- PATENT EASEMENT
- ⟨1⟩ DOCUMENT REFERENCE – PUBLIC RIGHT-OF-WAY

REVISIONS

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DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: AD
DRAWN BY: AD
CHECKED BY: MDM
DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN – FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN – FT APACHE TO GRAND CANYON
MONUMENTATION AND HORIZONTAL CONTROL PLAN

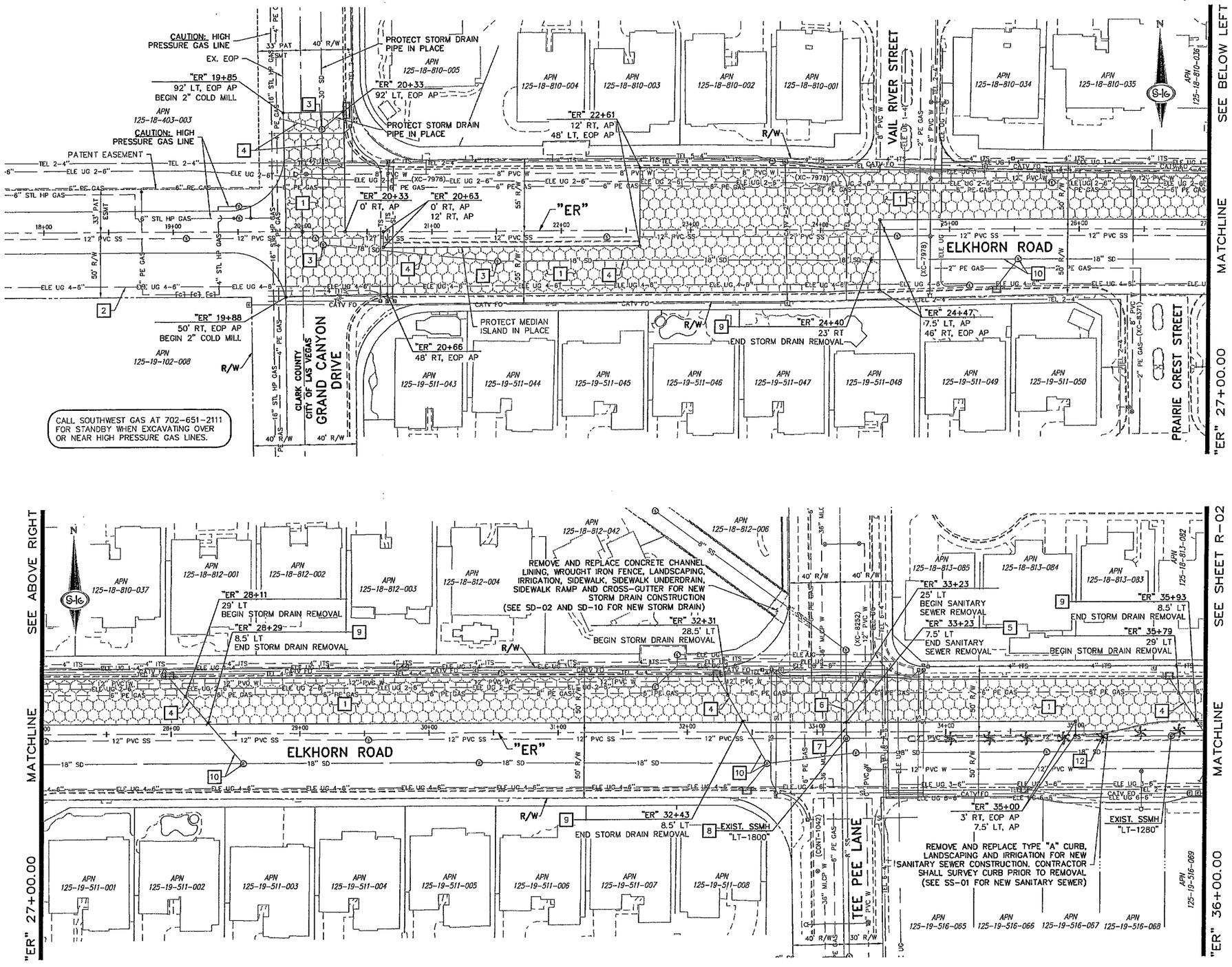
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SEAL

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Sheet G-05
5 of 21
DRAWING NO. 327V290

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REMOVAL NOTES

1. 2" COLD MILL (SEE DETAIL 3, SHEET R-03)
2. RELOCATE ELECTRICAL CONDUIT AND CONDUCTORS (BY NVE)
3. REMOVE STORM DRAIN MANHOLE
4. REMOVE STORM DRAIN PIPE
5. INSTALL SANITARY SEWER CAP
6. REMOVE SANITARY SEWER PIPE
7. ABANDON SANITARY SEWER PIPE (PER DCSWCS SECTION 3.18.1 METHOD C)
8. RE-GROUT SANITARY SEWER MANHOLE BASE TO REMOVE NORTH CHANNEL (SEE DETAIL 2, SHEET R-03)
9. CONSTRUCT BRICK AND MORTAR RCP PLUG (SEE DETAIL 1, SHEET R-03)
10. CONSTRUCT 3000 PSI CONCRETE PLUG IN STORM DRAIN MANHOLE AND ABANDON STORM DRAIN PIPE WITH CLSM CLASS I FLOWABLE FILL TO BRICK AND MORTAR RCP PLUG
11. REMOVE RCB PLUG
12. REMOVE AND RESET PALM TREE

GENERAL NOTES:

1. SEE SD AND SS SHEETS FOR STORM DRAIN AND SANITARY SEWER IMPROVEMENTS.
2. NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS SHOWN FOR INFORMATIONAL ONLY. REFERENCE NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS DRAWINGS FOR CONSTRUCTION DETAILS. CONTRACTOR TO COORDINATE WITH UTILITIES FOR REMOVAL AND INSTALLATION OF FACILITIES.
3. ALL EXISTING UTILITY LOCATIONS SHOW HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION. THE DEPTH BELOW GRADE OF THE VARIOUS UTILITIES DEPICTED ON THE PLANS VARIES THROUGHOUT THE PROJECT AREA. THE CONTRACTOR SHALL EXERCISE EXTREME CARE WHERE EXCAVATING AND GRADING THE SUBBASE IN THE VICINITY OF UTILITIES TO AVOID DAMAGE TO THE LATTER.
4. ALL EXISTING UTILITIES SHALL BE PROTECTED IN PLACE UNLESS OTHERWISE NOTED.

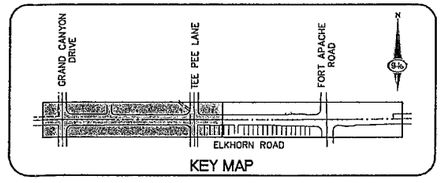
LEGEND

2" COLD MILL

APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER — DATE

PROJECT NO. 121162



SCALE: 40 0 40 80 FEET

FAST — Call before you UnderGround. 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig — Avoid cutting underground utility wires you supply. Call 811 or 1-800-227-2600

AVOID NITRIC OVERHEAD POWER LINES, IT'S COSTLY! CALL BEFORE YOU DO OVERHEAD — 1-702-227-2929

NO.	DATE:	DESCRIPTION	APP'D
		REVISIONS	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: REMOVAL PLAN
"ER" 18+00.00 TO "ER" 36+00.00

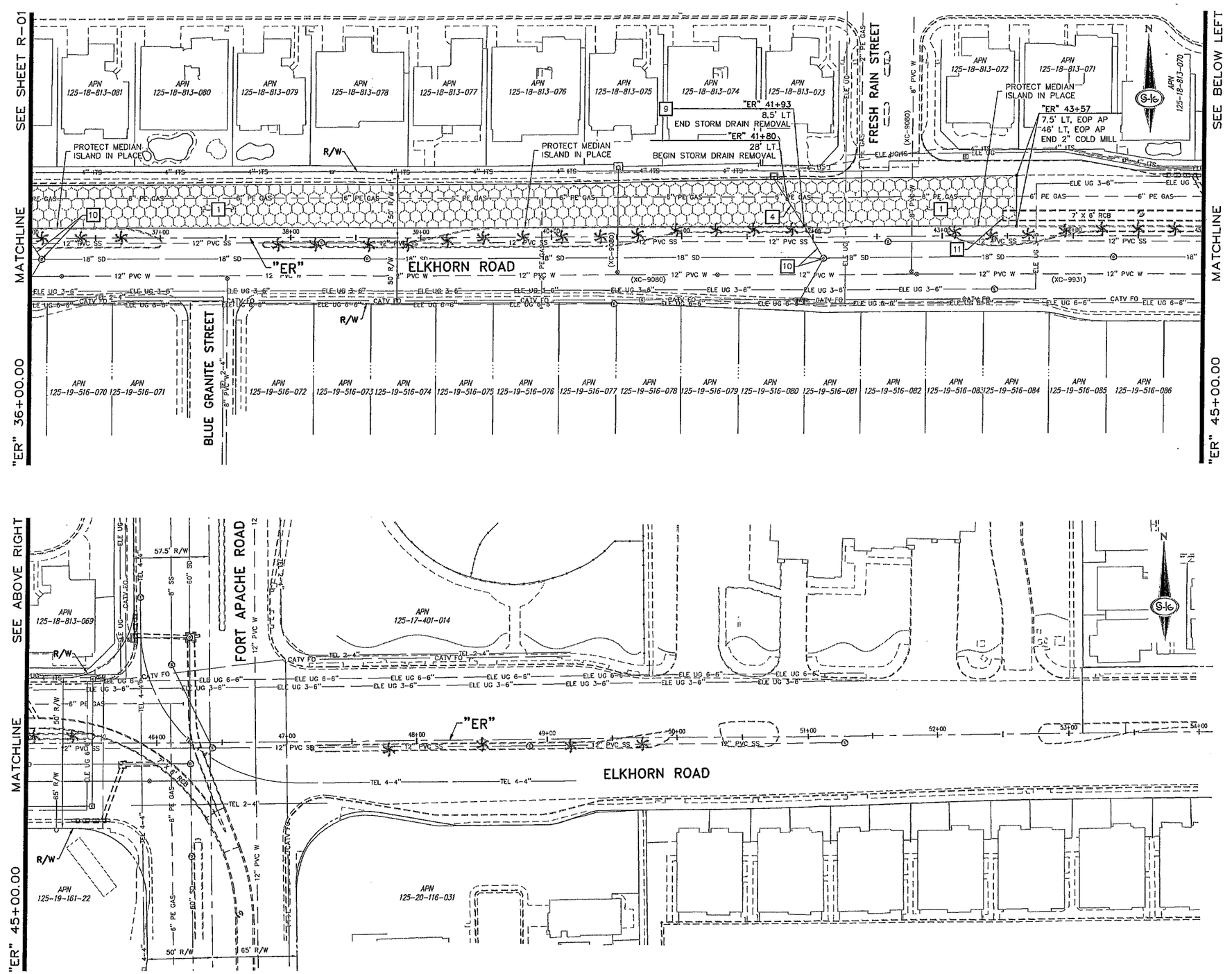
RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

SEAL

90% SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

Sheet R-01
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DRAWING NO. 327V290

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REMOVAL NOTES

1. 2" COLD MILL (SEE DETAIL 3, SHEET R-03)
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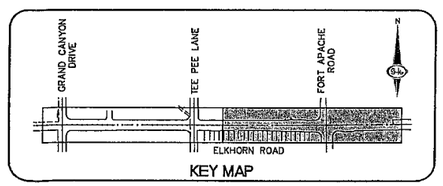
LEGEND

2" COLD MILL

APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER DATE

PROJECT NO. 121162



KEY MAP

SCALE: 40 0 40 80 FEET

Call before you UnderGround. 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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

NO.	DATE:	DESCRIPTION	APP'D
		REVISIONS	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.

DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM

DATE: 10/7/13

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: REMOVAL PLAN
"ER" 36+00.00 TO "ER" 54+00.00

SEAL

90% SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

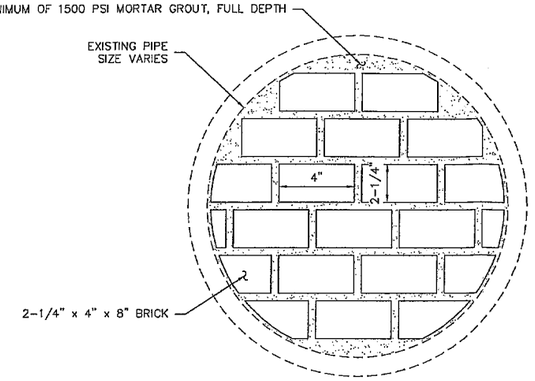
Sheet R-02
7 of 21

DRAWING NO. 327V290

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APPROVED FOR CONSTRUCTION

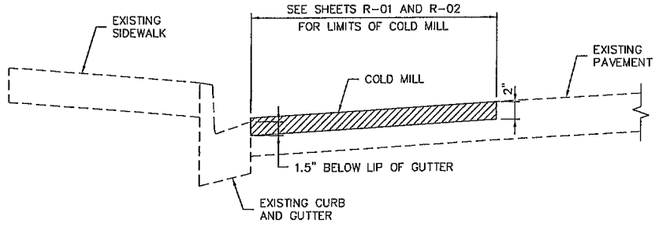
LVVWD ENGINEERING SERVICES MANAGER DATE
PROJECT NO. 121162



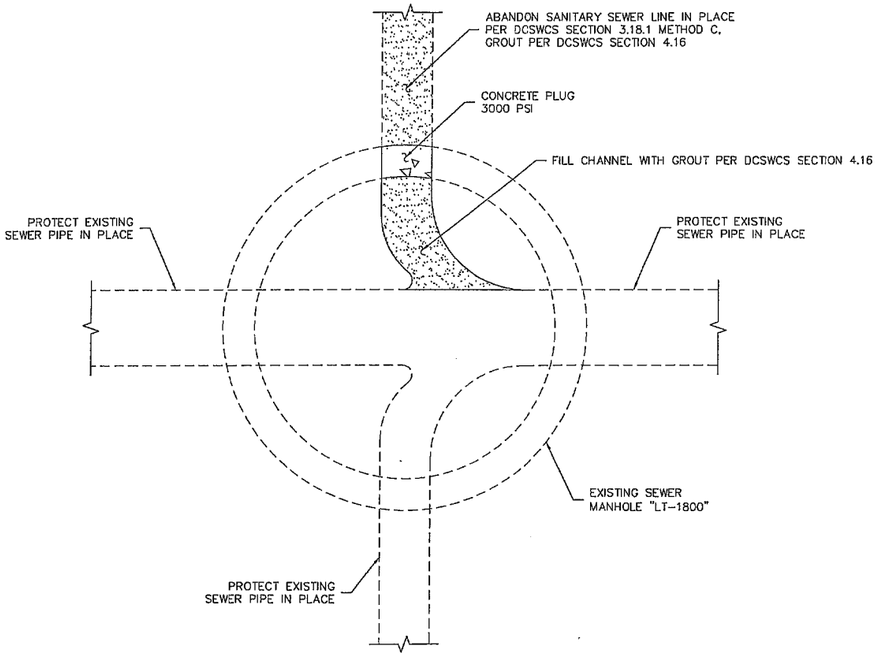
NOTES:

1. PRECAST RCP PLUG IS AN ACCEPTABLE ALTERNATIVE TO A BRICK AND MORTAR PLUG. PRECAST PLUG SHALL BE APPROVED BY ENGINEER PRIOR TO INSTALLATION.

BRICK AND MORTAR RCP PLUG (1 / R-03)
NOT TO SCALE



COLD MILL DETAIL (3 / R-03)
NOT TO SCALE



RE-GROUT SANITARY SEWER MANHOLE (2 / R-03)
NOT TO SCALE

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

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RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

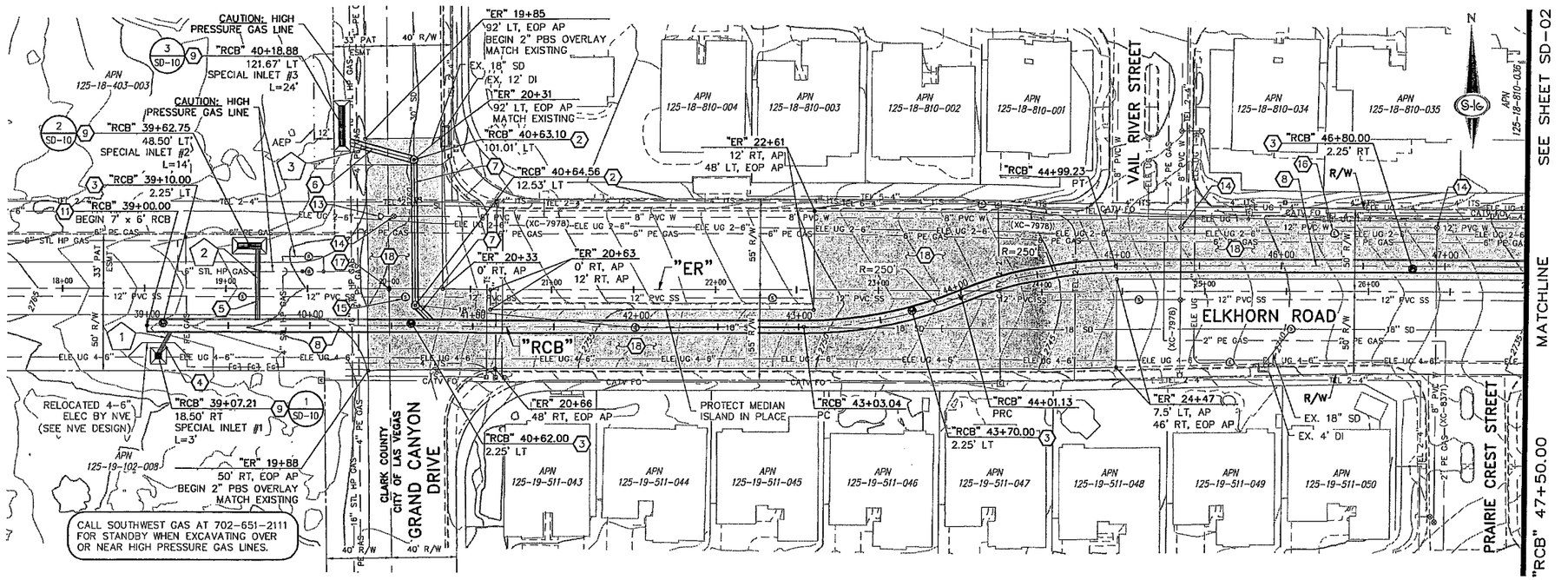
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SHEET: REMOVAL DETAILS

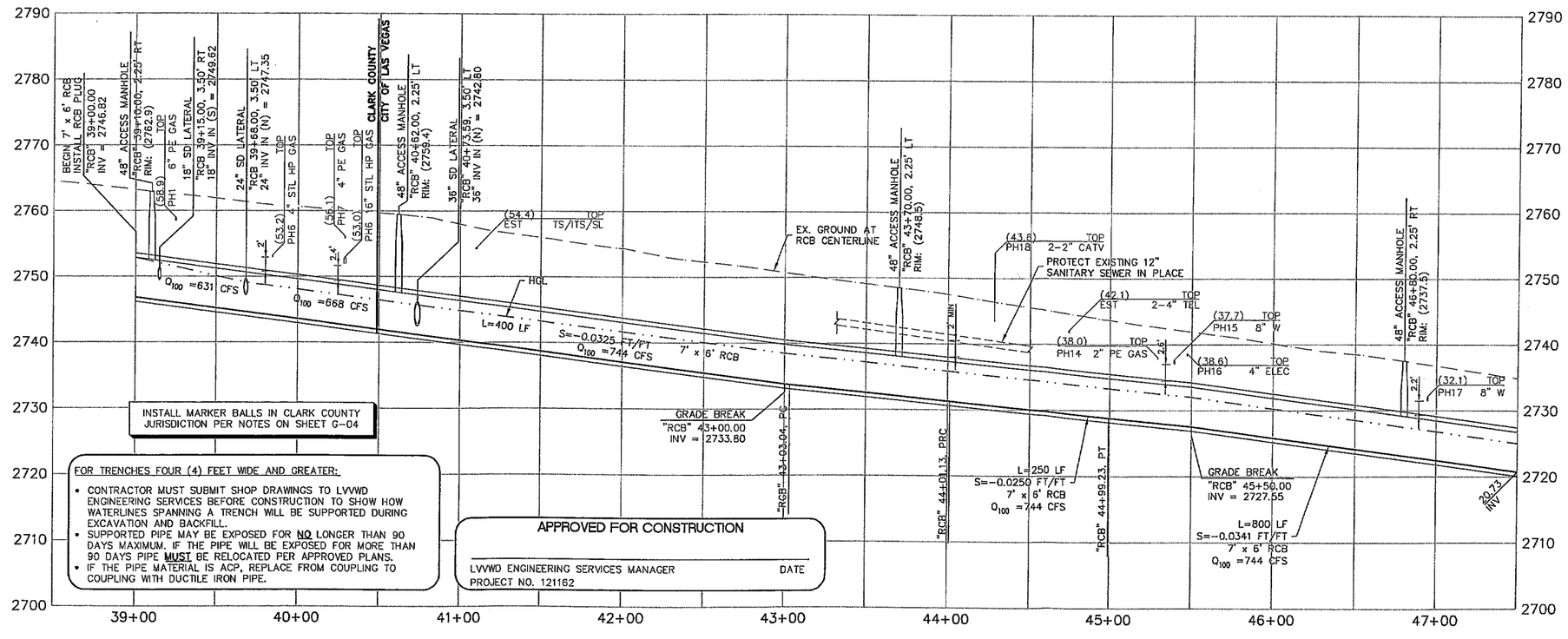
SEAL

90% SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

Sheet R-03
8 of 21
DRAWING NO. 327V290

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CONSTRUCTION NOTES

1. CONSTRUCT 60" TYPE III MANHOLE WITH TYPE IA RISER (USDCCA STD. DWG. NO. 406.1 AND 403.1)
2. CONSTRUCT 60" TYPE III MANHOLE (USDCCA STD. DWG. NO. 406.1)
3. CONSTRUCT 48" ACCESS MANHOLE (SEE DETAIL 2, SHEET SD-08)
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11. CONSTRUCT RCB PLUG (SEE DETAIL 4, SHEET SD-08)
12. CONSTRUCT CONCRETE COLLAR (SEE DETAIL 3, SHEET SD-08)
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16. ADJUST ELECTRIC MANHOLE TO FINISHED GRADE
17. SET TYPE III SURVEY MONUMENT
18. CONSTRUCT 2" PBS OVERLAY

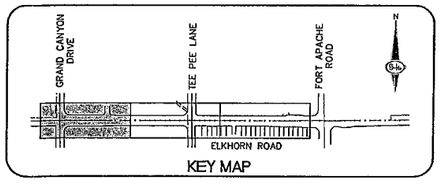
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3. ALL STORM DRAIN SHALL BE CLASS III UNLESS OTHERWISE NOTED.
4. NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS SHOWN FOR INFORMATIONAL ONLY. REFERENCE NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS DRAWINGS FOR CONSTRUCTION DETAILS. CONTRACTOR TO COORDINATE WITH UTILITIES FOR REMOVAL AND INSTALLATION OF FACILITIES.
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6. ALL EXISTING UTILITIES SHALL BE PROTECTED IN PLACE UNLESS OTHERWISE NOTED.
7. SEE G-04 FOR RCB GEOMETRY AND R-SHEETS FOR REMOVAL INFORMATION.

LEGEND

2" PBS OVERLAY

LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5	SD-04
6 THRU 8	SD-05



FAST
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1-702-432-5300
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CAPITAL PROJECT MANAGEMENT

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DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

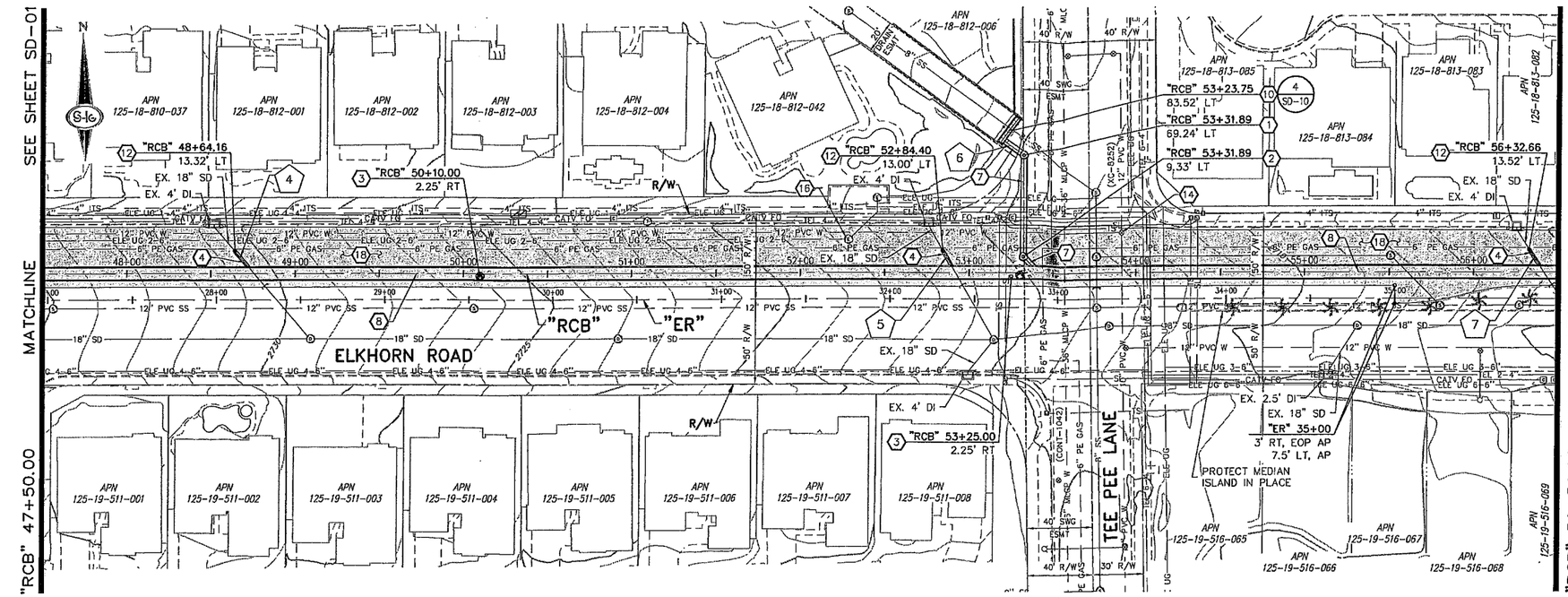
TITLE:
RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

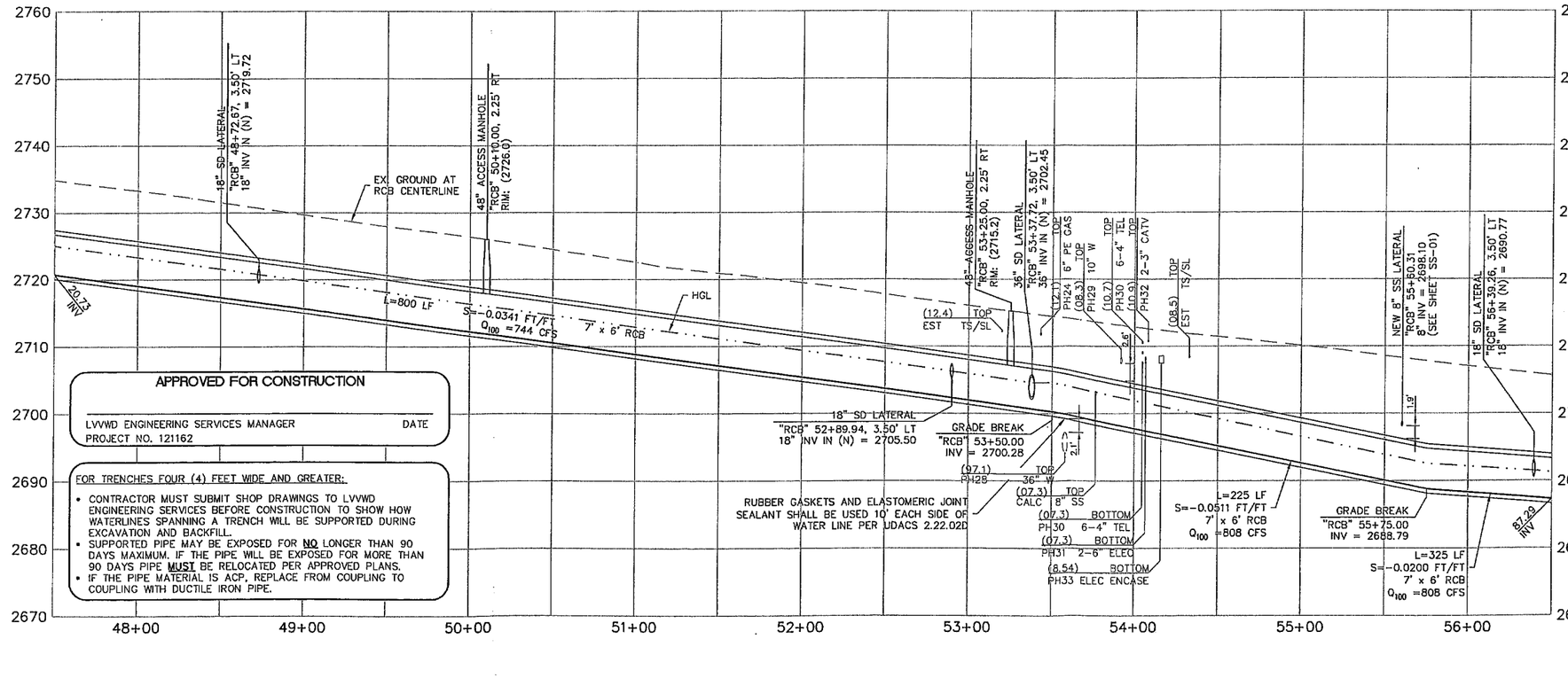
SHEET:
STORM DRAIN PLAN AND PROFILE
"RCB" 38+50.00 TO "RCB" 47+50.00

SEAL
90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION

Sheet
SD-01
9 of 21
DRAWING NO.
327V290

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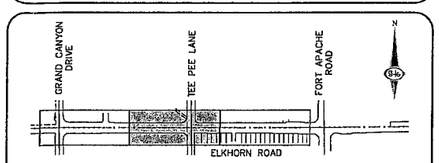
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LEGEND

2" PBS OVERLAY

LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5	SD-04
6 THRU 8	SD-05



KEY MAP

SCALE 40 0 40 80 FEET

APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER DATE
PROJECT NO. 121162

FOR TRENCHES FOUR (4) FEET WIDE AND GREATER:

- CONTRACTOR MUST SUBMIT SHOP DRAWINGS TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINES SPANNING A TRENCH WILL BE SUPPORTED DURING EXCAVATION AND BACKFILL.
- SUPPORTED PIPE MAY BE EXPOSED FOR NO LONGER THAN 90 DAYS MAXIMUM. IF THE PIPE WILL BE EXPOSED FOR MORE THAN 90 DAYS PIPE MUST BE RELOCATED PER APPROVED PLANS.
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REVISIONS			
NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

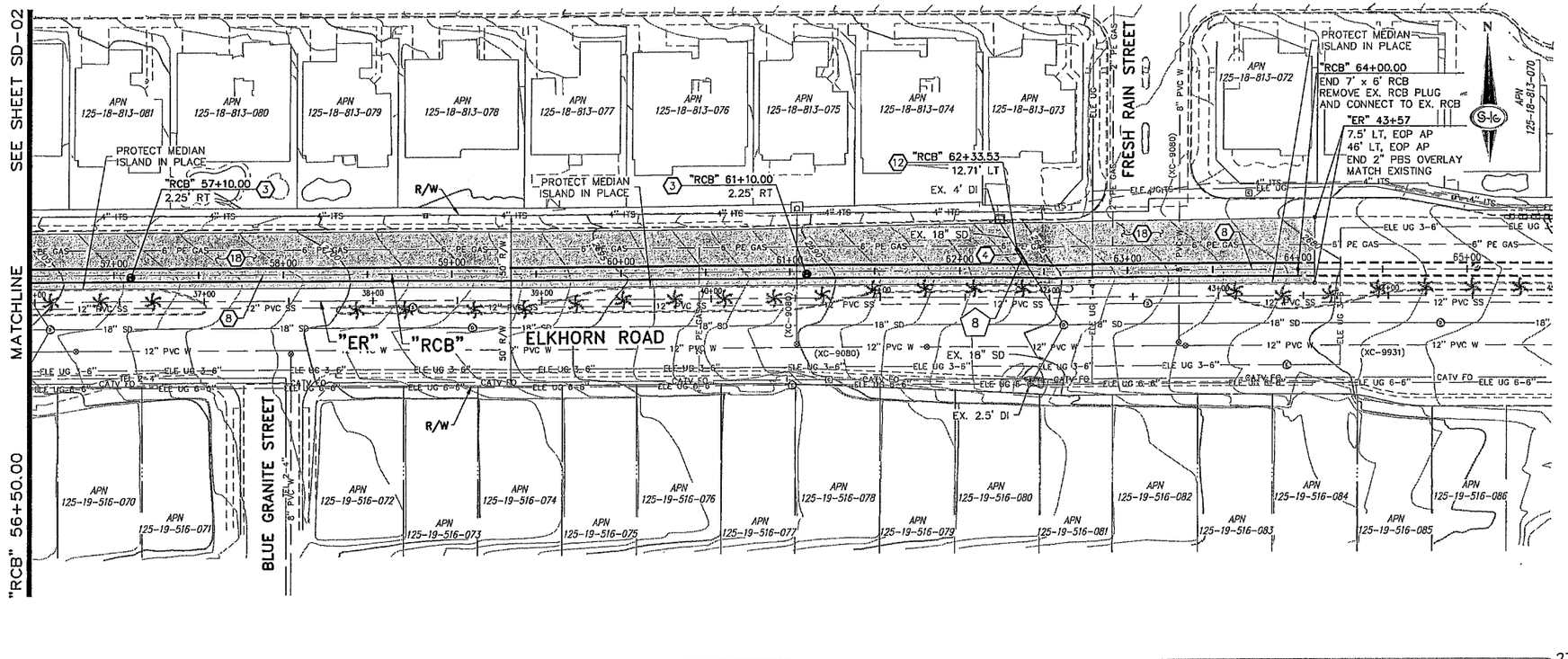
SHEET: STORM DRAIN PLAN AND PROFILE
"RCB" 47+50.00 TO "RCB" 56+50.00

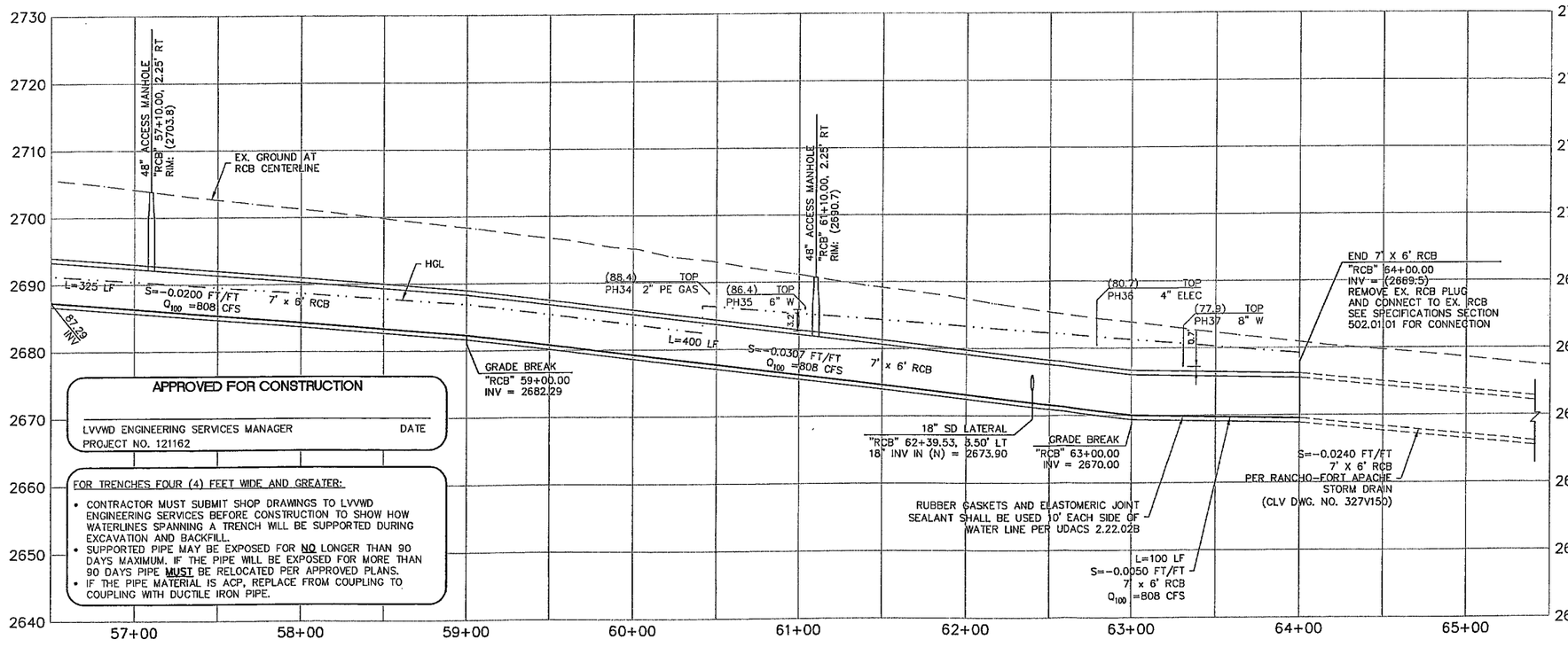
SEAL

90% SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

Sheet SD-02
10 of 21
DRAWING NO. 327V290

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CONSTRUCTION NOTES

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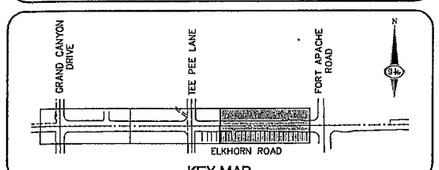
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LEGEND

2" PBS OVERLAY

LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5	SD-04
6 THRU 8	SD-05



KEY MAP

40 0 40 80
SCALE FEET

APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER DATE
PROJECT NO. 121162

FOR TRENCHES FOUR (4) FEET WIDE AND GREATER:

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REVISIONS

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RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

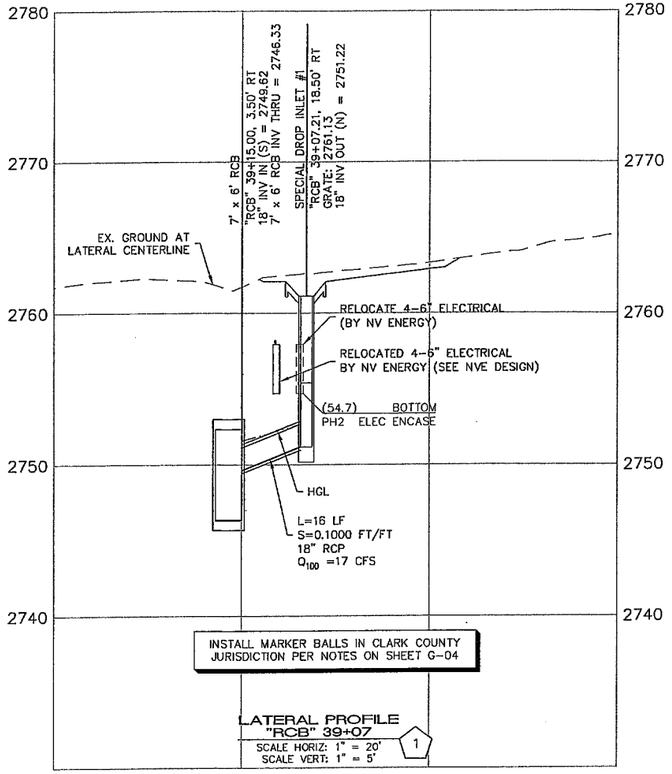
SHEET: STORM DRAIN PLAN AND PROFILE
"RCB" 56+50.00 TO "RCB" 65+50.00

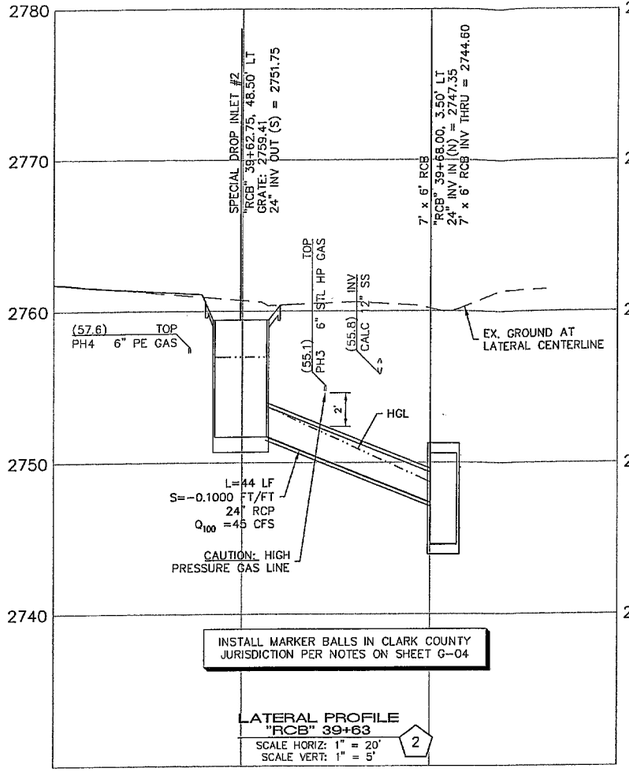
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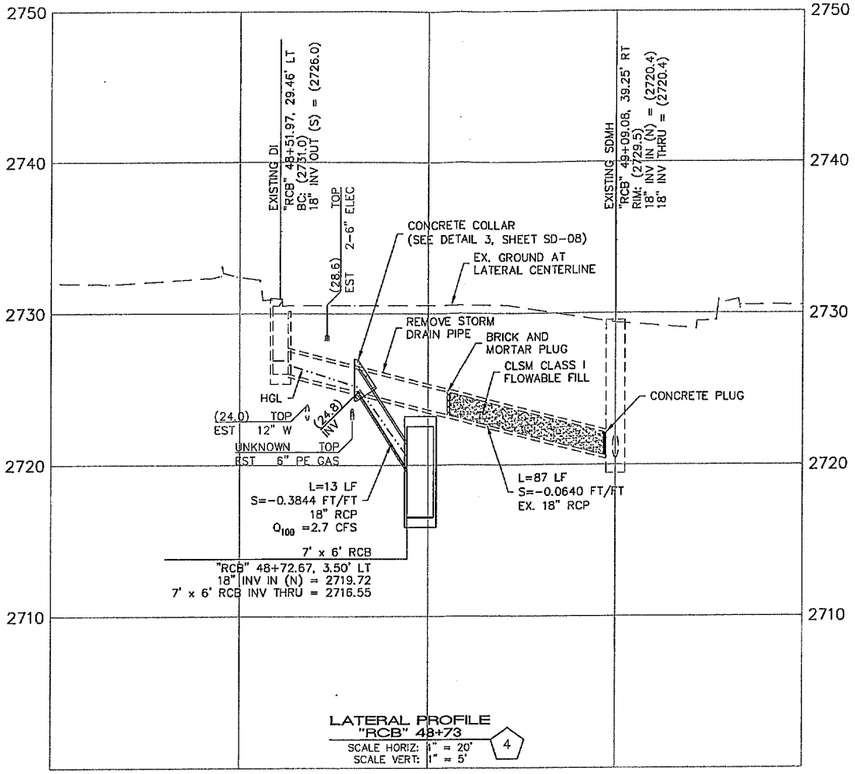
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PRELIMINARY
NOT FOR CONSTRUCTION

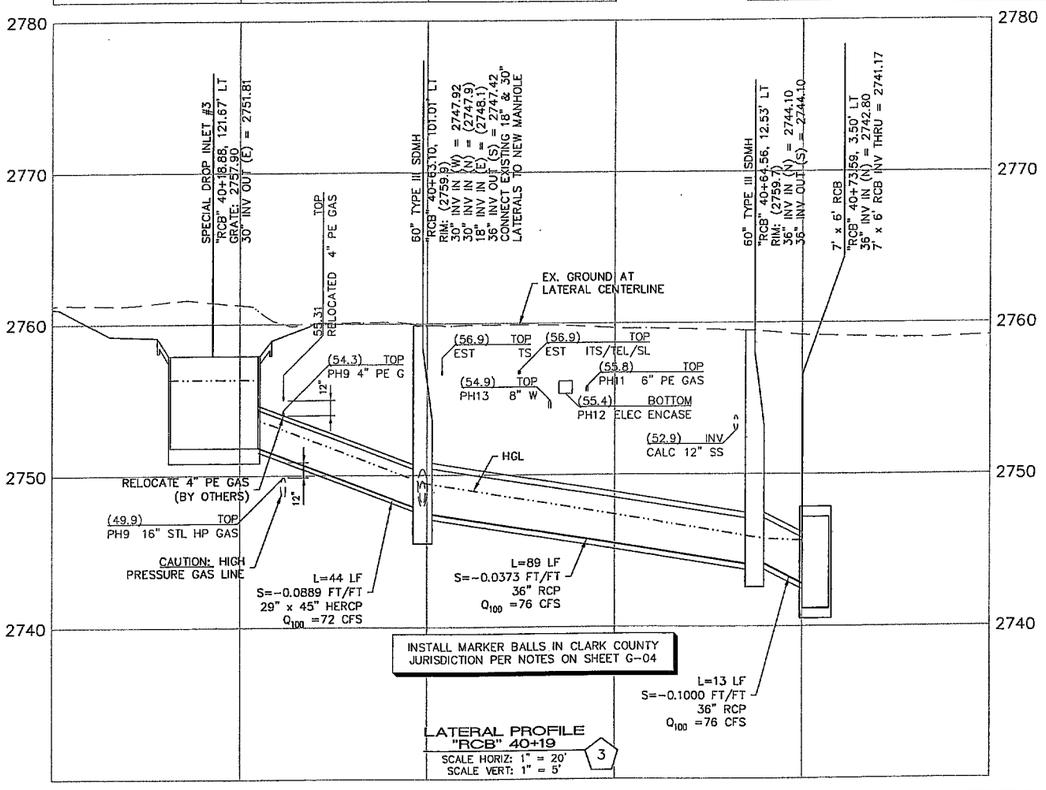
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11 of 21
DRAWING NO. 327V290

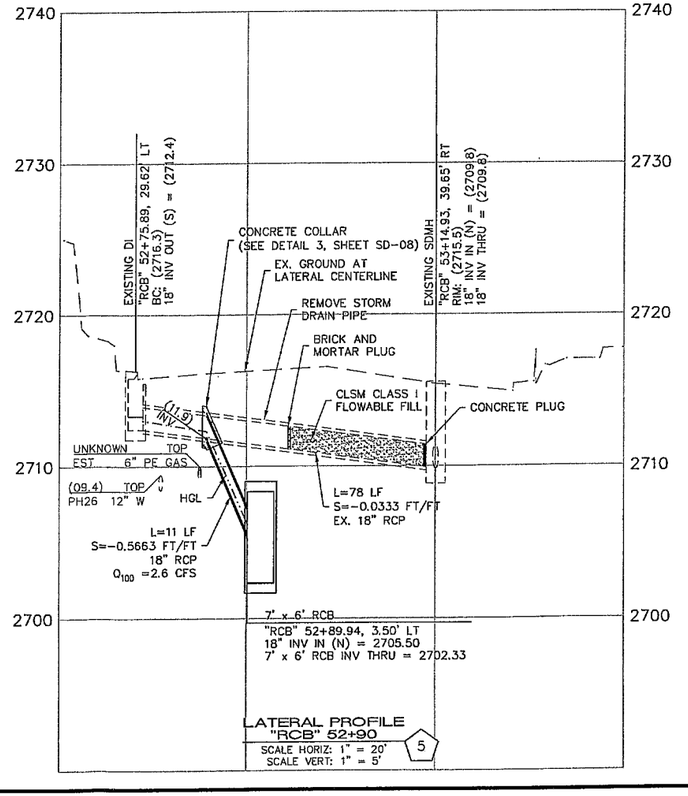
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CALL SOUTHWEST GAS AT 702-651-2111 FOR STANDBY WHEN EXCAVATING OVER OR NEAR HIGH PRESSURE GAS LINES.

FOR TRENCHES FOUR (4) FEET WIDE AND GREATER:

- CONTRACTOR MUST SUBMIT SHOP DRAWINGS TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINES SPANNING A TRENCH WILL BE SUPPORTED DURING EXCAVATION AND BACKFILL.
- SUPPORTED PIPE MAY BE EXPOSED FOR NO LONGER THAN 90 DAYS MAXIMUM. IF THE PIPE WILL BE EXPOSED FOR MORE THAN 90 DAYS PIPE MUST BE RELOCATED PER APPROVED PLANS.
- IF THE PIPE MATERIAL IS ACP, REPLACE FROM COUPLING TO COUPLING WITH DUCTILE IRON PIPE.

APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER DATE

PROJECT NO. 121162

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.

DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM

DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: STORM DRAIN LATERAL PROFILES

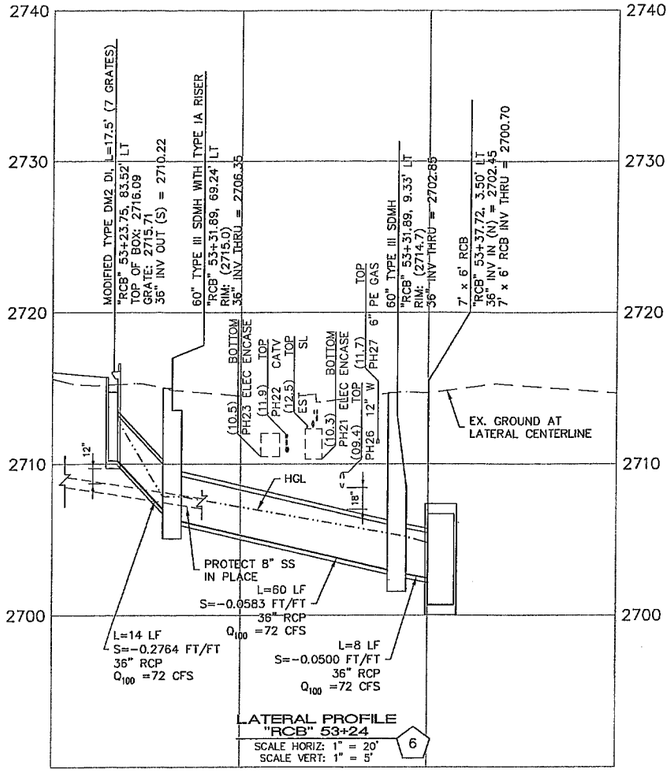
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PRELIMINARY
NOT FOR CONSTRUCTION

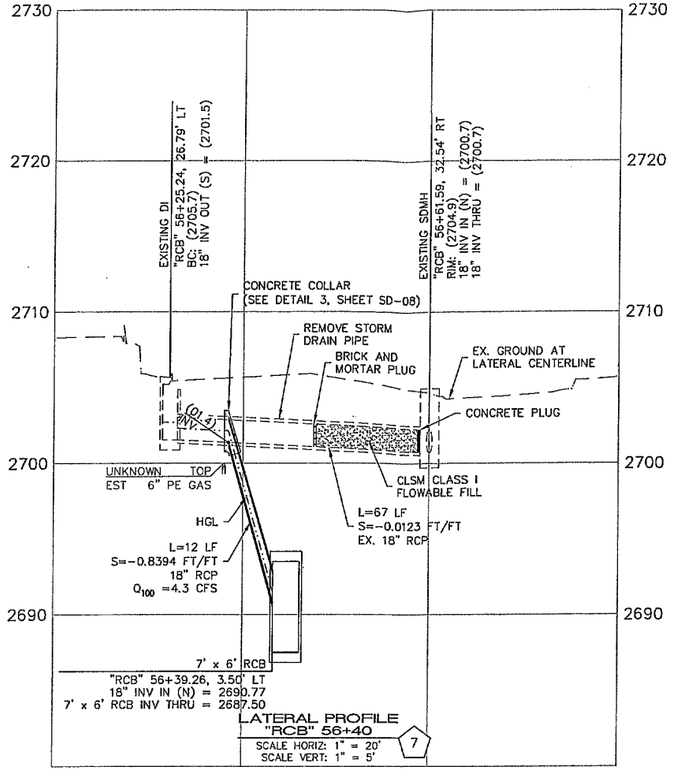
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SD-04
12 of 21

DRAWING NO.
327V290

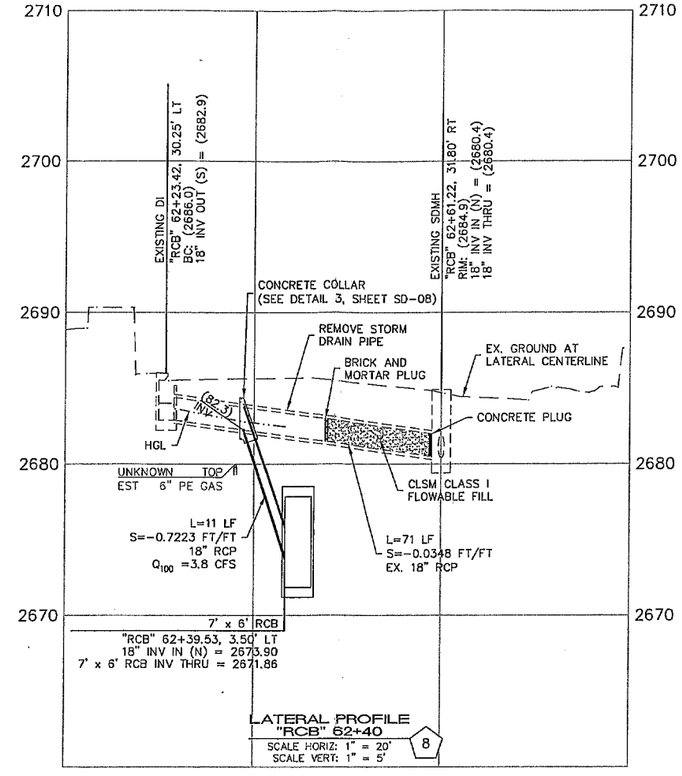
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LATERAL PROFILE
"RCB" 53+24
SCALE HORIZ: 1" = 20'
SCALE VERT: 1" = 5'
6



LATERAL PROFILE
"RCB" 56+40
SCALE HORIZ: 1" = 20'
SCALE VERT: 1" = 5'
7



LATERAL PROFILE
"RCB" 62+40
SCALE HORIZ: 1" = 20'
SCALE VERT: 1" = 5'
8

FOR TRENCHES FOUR (4) FEET WIDE AND GREATER:

- CONTRACTOR MUST SUBMIT SHOP DRAWINGS TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINES SPANNING A TRENCH WILL BE SUPPORTED DURING EXCAVATION AND BACKFILL.
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- IF THE PIPE MATERIAL IS ACP, REPLACE FROM COUPLING TO COUPLING WITH DUCTILE IRON PIPE.

APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER DATE

PROJECT NO. 121162

NO.	DATE:	REVISIONS DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.

DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

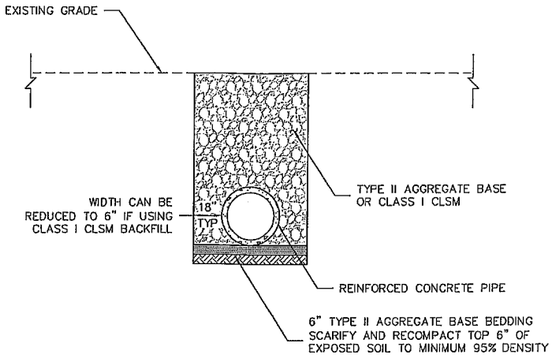
TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: STORM DRAIN LATERAL PROFILES

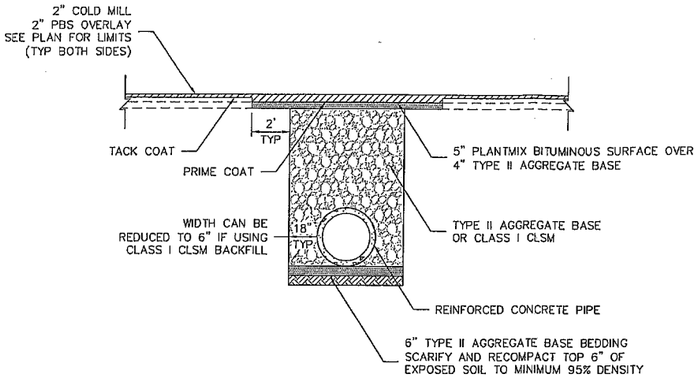
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PRELIMINARY
NOT FOR CONSTRUCTION

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SD-05
13 of 21
DRAWING NO.
327V290

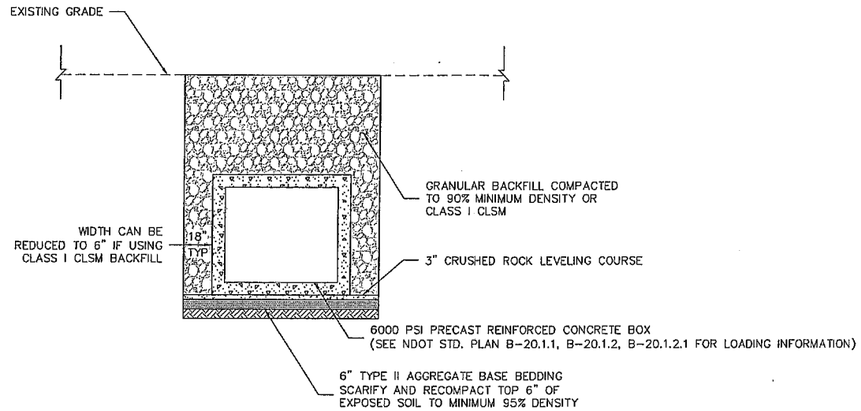
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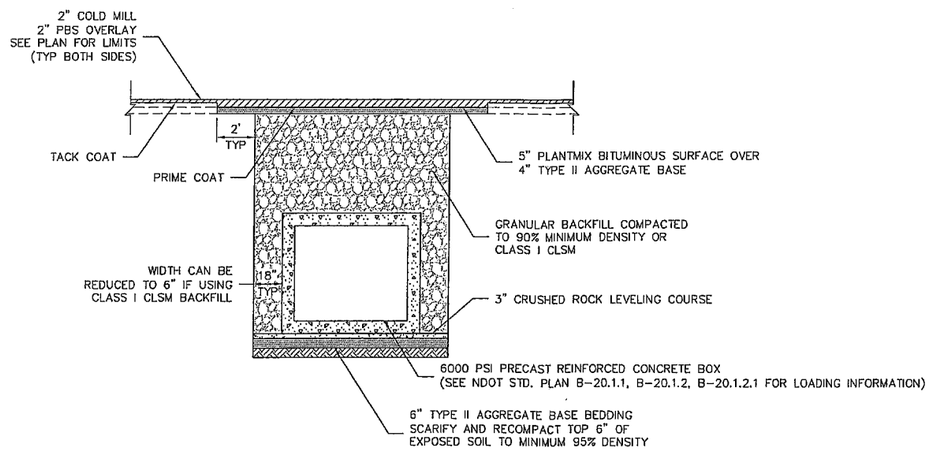
REINFORCED CONCRETE PIPE SECTION (UNPAVED AREAS)



REINFORCED CONCRETE PIPE SECTION (PAVED AREAS)



PRECAST REINFORCED CONCRETE BOX SECTION (UNPAVED AREAS)



PRECAST REINFORCED CONCRETE BOX SECTION (PAVED AREAS)

NO.	DATE:	DESCRIPTION	APP'D
		REVISIONS	

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
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DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

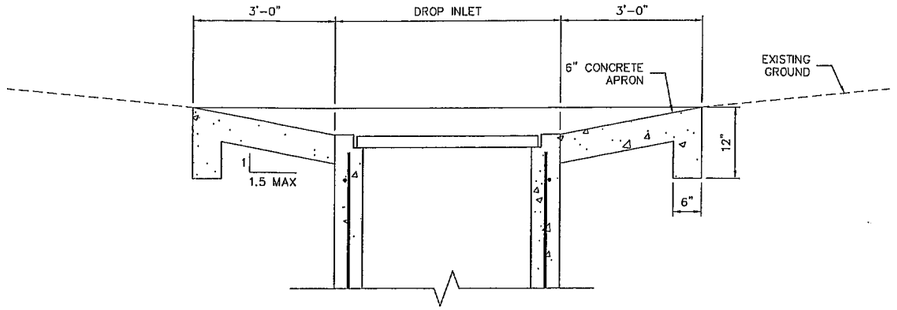
SHEET: STORM DRAIN DETAILS

SEAL

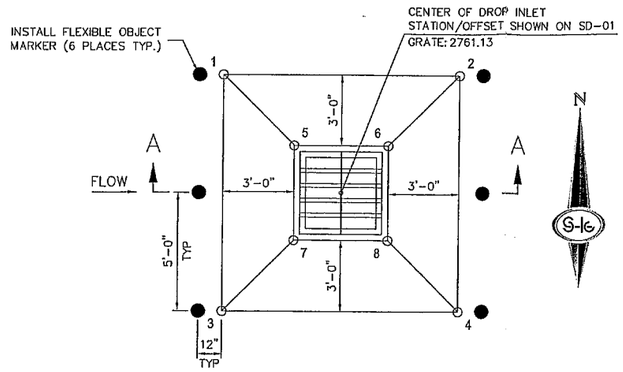
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PRELIMINARY
NOT FOR CONSTRUCTION

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SD-06
14 of 21
DRAWING NO.
327V290

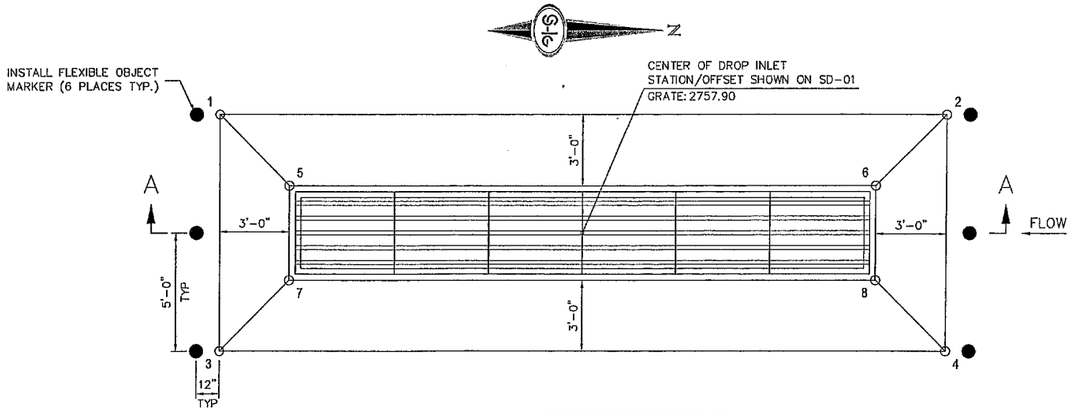
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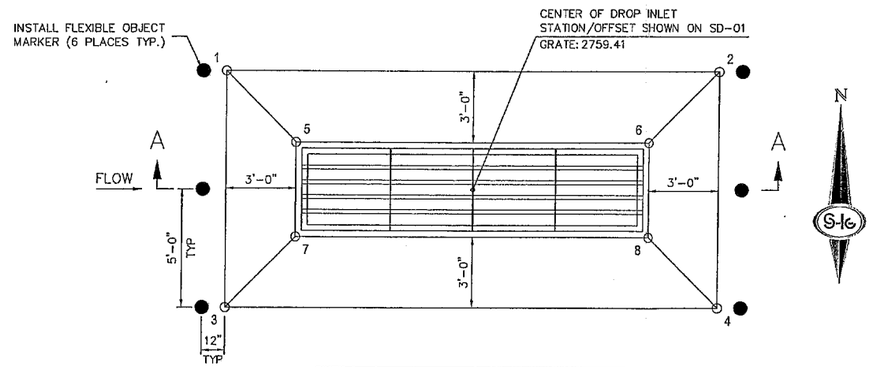
SECTION A



APRON ELEVATION TABLE SPECIAL DROP INLET #1	
POINT	ELEVATION
1	2762.11
2	2762.06
3	2762.01
4	2761.96
5	2761.13
6	2761.13
7	2761.13
8	2761.13



APRON ELEVATION TABLE SPECIAL DROP INLET #3	
POINT	ELEVATION
1	2758.95
2	2759.10
3	2758.90
4	2759.05
5	2757.90
6	2757.90
7	2757.90
8	2757.90



APRON ELEVATION TABLE SPECIAL DROP INLET #2	
POINT	ELEVATION
1	2761.43
2	2760.89
3	2760.78
4	2760.24
5	2759.41
6	2759.41
7	2759.41
8	2759.41

NOTES:

1. ALL DROP INLETS AND CONCRETE APRONS SHALL INCLUDE STORM WATER MANAGEMENT STAMP AND DETAIL PER USDCCA STD. DWG. NO. 421.

CONCRETE APRONS
NOT TO SCALE

1
SD-07

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN – FT APACHE TO GRAND CANYON)

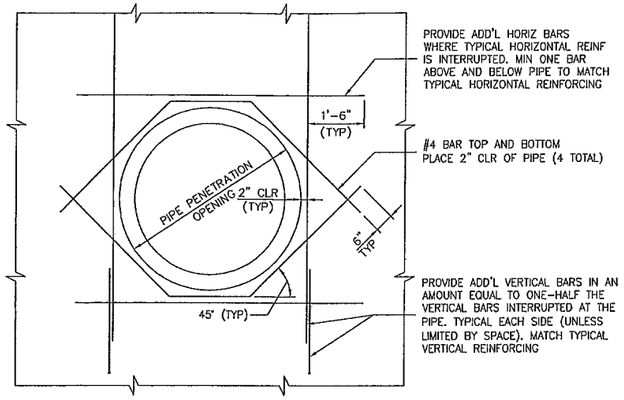
TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: STORM DRAIN DETAILS

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90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION

Sheet
SD-07
15 of 21
DRAWING NO.
327V290

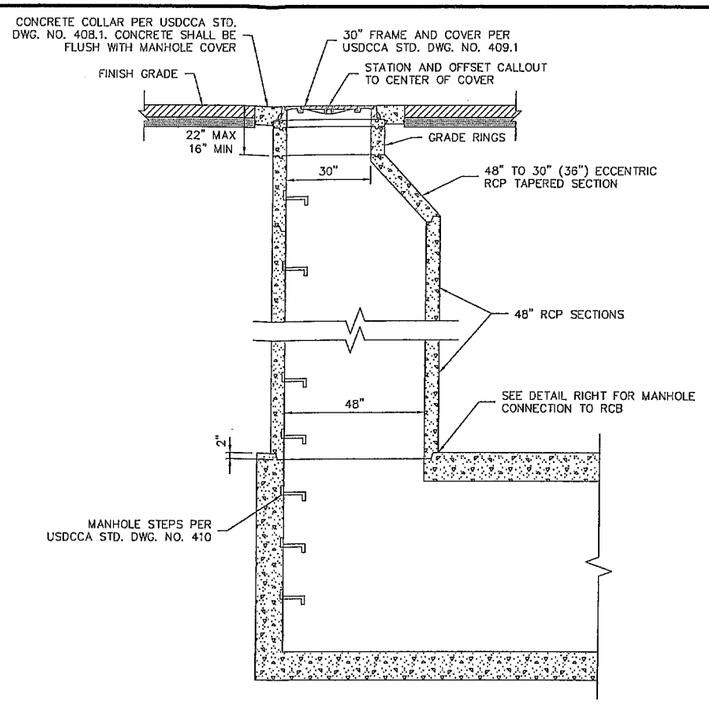
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NOTES:

1. TYPICAL WALL REINFORCING NOT SHOWN FOR CLARITY.
2. FIELD CUT TYPICAL WALL REINFORCING 2" CLEAR OF PIPE.

RCB PIPE PENETRATION — 1 / SD-08
NOT TO SCALE

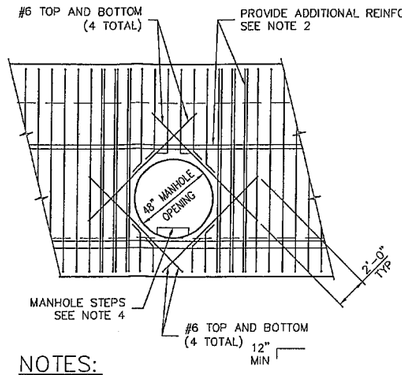


NOTES:

1. SEE USDCCA STD. DWG. NO. 403.1 FOR ADDITIONAL MANHOLE CONSTRUCTION NOTES AND DETAILS.

SECTION

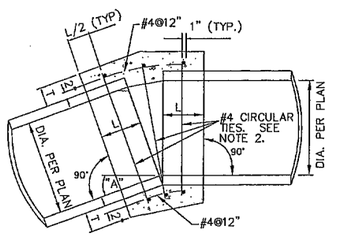
48" ACCESS MANHOLE — 2 / SD-08
NOT TO SCALE



NOTES:

1. FIELD BEND OR CUT ALL REINFORCING 2" CLR OF OPENINGS.
2. EVERY REBAR DISCONTINUED AT OPENING SHALL BE REPLACED BY AN EXTRA REBAR PLACED AT THE SIDE OF THE OPENING AS SHOWN. THE LENGTH OF THE EXTRA REBARS SHALL EQUAL THE LENGTH OF THE SCHEDULE REBARS THAT ARE NOT DISCONTINUED AT THE OPENING.
3. PROVIDE MINIMUM 2" CLEARANCE BETWEEN ALL REINFORCING BARS.
4. MANHOLE STEPS SHALL BE PER USDCCA STD. DWG. NO. 410.

CONNECTION TO RCB



PLAN

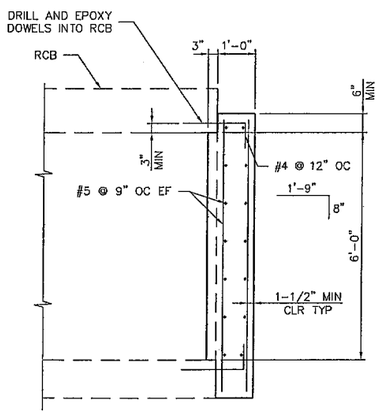
NOTES:

1. WHERE THE SLOPE OF THE UPSTREAM PIPE IS GREATER THAN THE SLOPE OF THE DOWNSTREAM PIPE, JOIN SOFFITS. WHERE THE SLOPE OF THE UPSTREAM PIPE IS LESS THAN THE SLOPE OF THE DOWNSTREAM PIPE, JOIN INVERTS.
2. WHERE THE SPACE BETWEEN THE PIPE EXTREMITIES EXCEEDS 2 1/2 INCHES, THE NUMBER OF CIRCULAR TIES SHALL BE INCREASED TO MAINTAIN A MAXIMUM SPACING OF 6 INCHES CENTER TO CENTER. CIRCULAR TIES SHALL HAVE A DIAMETER 5 INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE LARGER PIPE.

CIRCULAR TIES

PIPE DIAMETER	SPACE BETWEEN PIPE EXTREMITIES	NO. OF CIRCULAR TIES	L	T
18"	2 1/2"	3	12"	5"
24"	2 1/2"	3	12"	6"
30"	2 1/2"	3	12"	7"
36"	2 1/2" or less	4	18"	9"
50"	2 1/2" or less	5	21"	11"

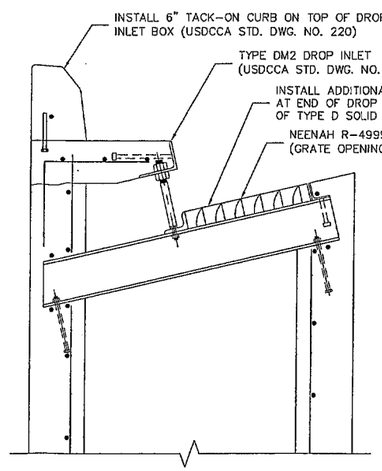
CONCRETE COLLAR — 3 / SD-08
NOT TO SCALE



NOTES:

1. PRECAST RCB PLUG IS AN ACCEPTABLE ALTERNATIVE TO A CAST-IN-PLACE PLUG. PRECAST PLUG SHALL BE APPROVED BY ENGINEER PRIOR TO INSTALLATION.

RCB PLUG — 4 / SD-08
NOT TO SCALE



NOTES:

1. ALL DROP INLETS AND CONCRETE APRONS SHALL INCLUDE STORM WATER MANAGEMENT STAMP AND DETAIL PER USDCCA STD. DWG. NO. 421.

MODIFIED TYPE DM2 DROP INLET — 5 / SD-08
NOT TO SCALE

GENERAL STRUCTURAL NOTES

1. DESIGN SPECIFICATIONS: AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 2002". REINFORCED CONCRETE DESIGN BASED ON LOAD FACTOR DESIGN.
2. CONSTRUCTION SPECIFICATIONS: UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA.
3. EXISTING UTILITIES: THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES WITHIN THE WORK AREA, AND PROVIDING PROTECTION FOR THE VARIOUS UTILITIES AFFECTED PRIOR TO PROCEEDING WITH THE WORK.
4. CONCRETE: CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF $f'c$=4,500 PSI AND A MAXIMUM WATER TO CEMENT RATIO, BY WEIGHT, OF 0.45. USE TYPE V CEMENT PER ASTM C-150. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4", UNLESS NOTED OTHERWISE.
5. REINFORCING STEEL: ALL REINFORCING STEEL SHALL BE ASTM A615 GRADE 60. DIMENSIONS ARE FROM OUT TO OUT OF BARS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 2" UNLESS NOTED OTHERWISE. HOOKS MAY BE ROTATED OR TILTED AS NECESSARY TO PROVIDE THE PROPER CLEARANCES.
6. BEDDING MATERIAL: BEDDING MATERIAL SHALL BE MINIMUM OF 6-INCHES OF CLARK COUNTY TYPE II AGGREGATE BASE COMPACTED TO AT LEAST 95% OF THE MAXIMUM DRY DENSITY AS ESTABLISHED BY ASTM TEST METHOD D-1557. EXPOSED NATIVE SOILS IN BOTTOMS OF EXCAVATIONS SHALL BE SCARIFIED TO A DEPTH OF 6-INCHES, MOISTURE-CONDITIONED TO WITHIN 2% OF OPTIMUM MOISTURE CONTENT AND COMPACTED TO 95% PER ASTM D-1557.
7. STRUCTURAL STEEL: WIDE FLANGE SHAPES SHALL CONFORM TO ASTM A992. ALL MISCELLANEOUS STEEL SHALL CONFORM TO ASTM A36 UNLESS NOTED OTHERWISE.
8. GALVANIZING: ALL EXPOSED METAL PARTS SHALL BE GALVANIZED. GALVANIZING DAMAGED BY FABRICATION SHALL RECEIVE TWO COATS OF ZINC RICH PAINT (GALVANOX OR EQUAL).
9. THIS IS A TYPICAL DETAIL. PIPE SIZES, INVERT ELEVATIONS, INLET LENGTH, AND TOP OF GRATE ELEVATION SHALL BE PER CIVIL DRAWINGS.
10. CONTRACTOR SHALL PROVIDE SLOPE STABILIZATION, SHEETING, BRACING, AND/OR SHORING AS REQUIRED TO PROTECT EXISTING EMBANKMENTS, STRUCTURES, AND UNDERGROUND ITEMS.

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E. P.T.O.E.
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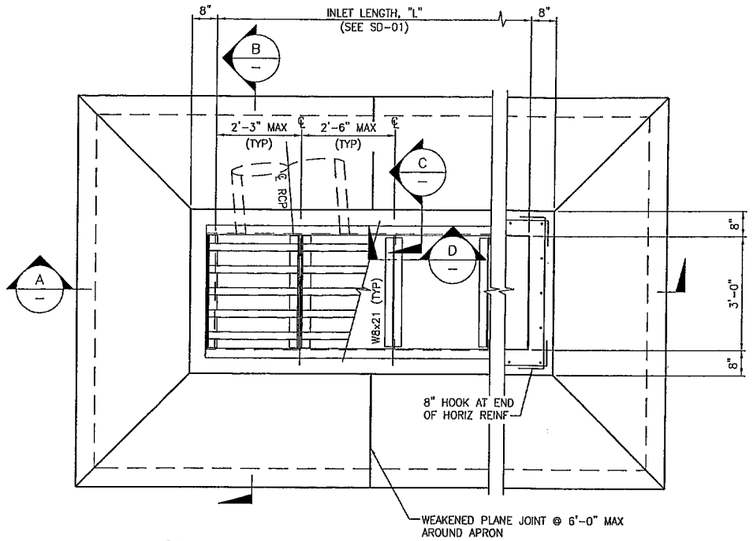
RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM ELKHORN - FT APACHE TO GRAND CANYON
SHEET: STORM DRAIN DETAILS

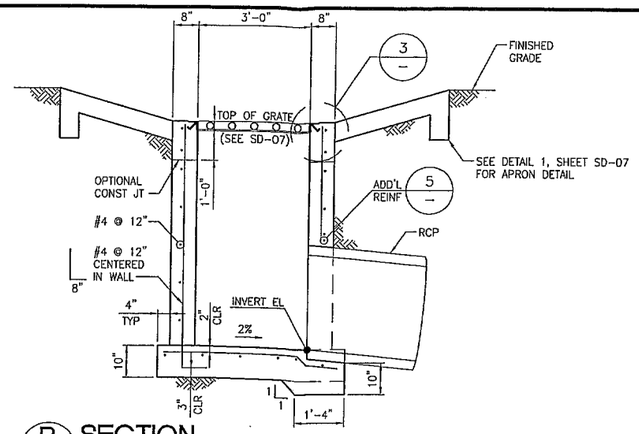
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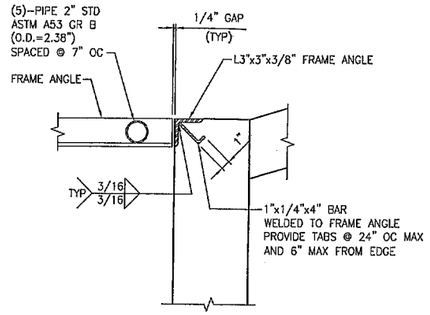
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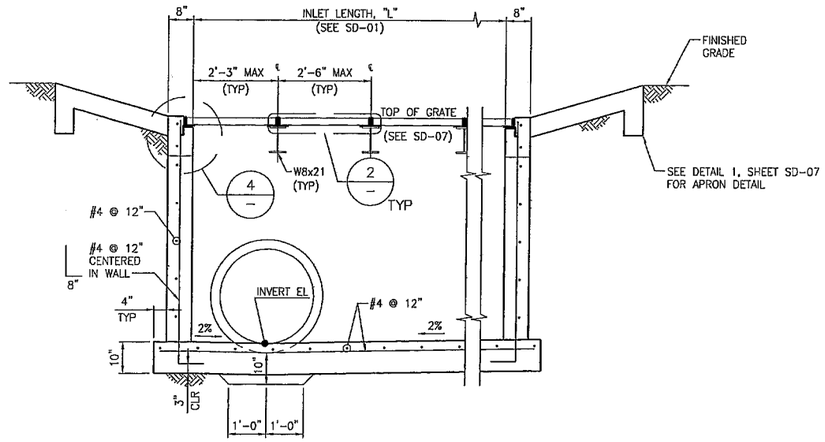
1 PLAN
SCALE: 1/2" = 1'-0"



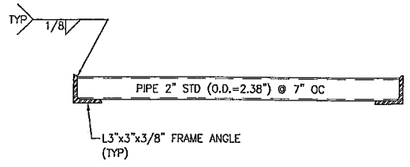
B SECTION
SCALE: 1/2" = 1'-0"



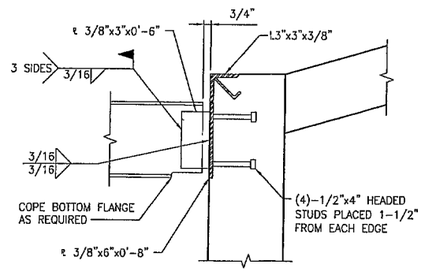
3 DETAIL
SCALE: 1 1/2" = 1'-0"



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

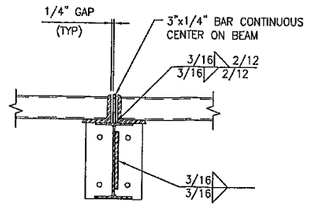


2 TYPICAL GRATE DETAIL
SCALE: 1 1/2" = 1'-0"



NOTE:
GRATE NOT SHOWN.

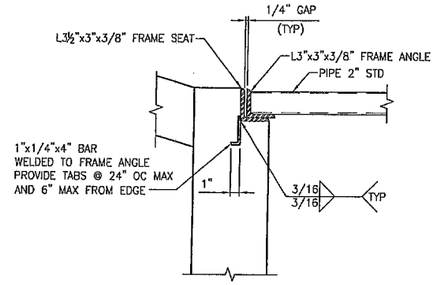
C SECTION
SCALE: 1 1/2" = 1'-0"



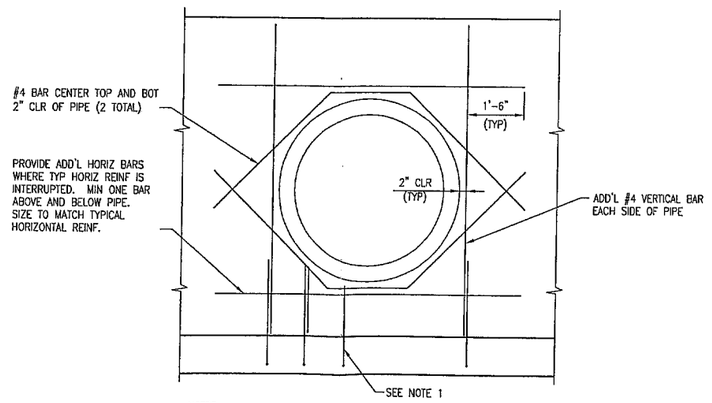
D SECTION
SCALE: 1 1/2" = 1'-0"

GENERAL STRUCTURAL NOTES

1. DESIGN SPECIFICATIONS: AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 2002". REINFORCED CONCRETE DESIGN BASED ON LOAD FACTOR DESIGN.
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3. EXISTING UTILITIES: THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES WITHIN THE WORK AREA, AND PROVIDING PROTECTION FOR THE VARIOUS UTILITIES AFFECTED PRIOR TO PROCEEDING WITH THE WORK.
4. CONCRETE: CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF f'c=4,500 PSI AND A MAXIMUM WATER TO CEMENT RATIO, BY WEIGHT, OF 0.45. USE TYPE V CEMENT PER ASTM C-150. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4", UNLESS NOTED OTHERWISE.
5. REINFORCING STEEL: ALL REINFORCING STEEL SHALL BE ASTM A615 GRADE 60. DIMENSIONS ARE FROM OUT TO OUT OF BARS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 2" UNLESS NOTED OTHERWISE. HOOKS MAY BE ROTATED OR TILTED AS NECESSARY TO PROVIDE THE PROPER CLEARANCES.
6. BEDDING MATERIAL: BEDDING MATERIAL SHALL BE MINIMUM OF 6-INCHES OF CLARK COUNTY TYPE II AGGREGATE BASE COMPACTED TO AT LEAST 95% OF THE MAXIMUM DRY DENSITY AS ESTABLISHED BY ASTM TEST METHOD D-1557. EXPOSED NATIVE SOILS IN BOTTOMS OF EXCAVATIONS SHALL BE SCARIFIED TO A DEPTH OF 6-INCHES, MOISTURE-CONDITIONED TO WITHIN 2% OF OPTIMUM MOISTURE CONTENT AND COMPACTED TO 95% PER ASTM D-1557.
7. STRUCTURAL STEEL: WIDE FLANGE SHAPES SHALL CONFORM TO ASTM A992. ALL MISCELLANEOUS STEEL SHALL CONFORM TO ASTM A36 UNLESS NOTED OTHERWISE.
8. GALVANIZING: ALL EXPOSED METAL PARTS SHALL BE GALVANIZED. GALVANIZING DAMAGED BY FABRICATION SHALL RECEIVE TWO COATS OF ZINC RICH PAINT (GALVANOX OR EQUAL).
9. THIS IS A TYPICAL DETAIL. PIPE SIZES, INVERT ELEVATIONS, INLET LENGTH, AND TOP OF GRATE ELEVATION SHALL BE PER CIVIL DRAWINGS.
10. CONTRACTOR SHALL PROVIDE SLOPE STABILIZATION, SHEETING, BRACING, AND/OR SHORING AS REQUIRED TO PROTECT EXISTING EMBANKMENTS, STRUCTURES, AND UNDERGROUND ITEMS.



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



NOTES:
1. FIELD CUT TYPICAL WALL REINFORCING 2" CLR OF PIPE.
2. IF BARS CANNOT EXTEND BEYOND PIPE AS SHOWN, EXTEND AS FAR AS POSSIBLE AND PROVIDE STANDARD HOOK AT END.

5 PIPE PENETRATION DETAIL
SCALE: NONE

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

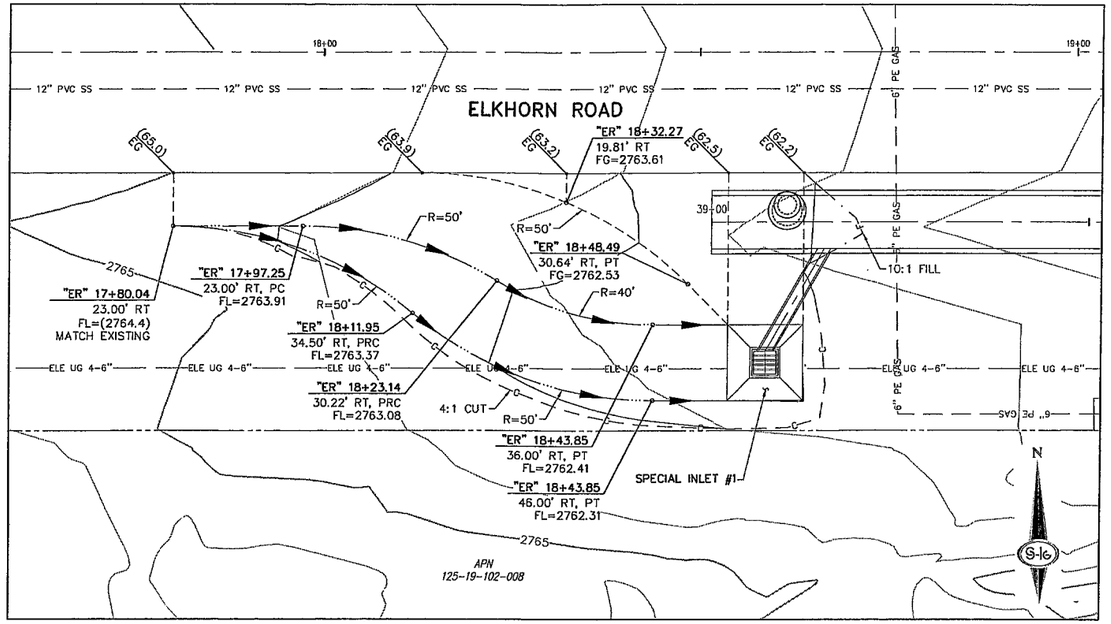
TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON
SHEET: STORM DRAIN DETAILS

SEAL

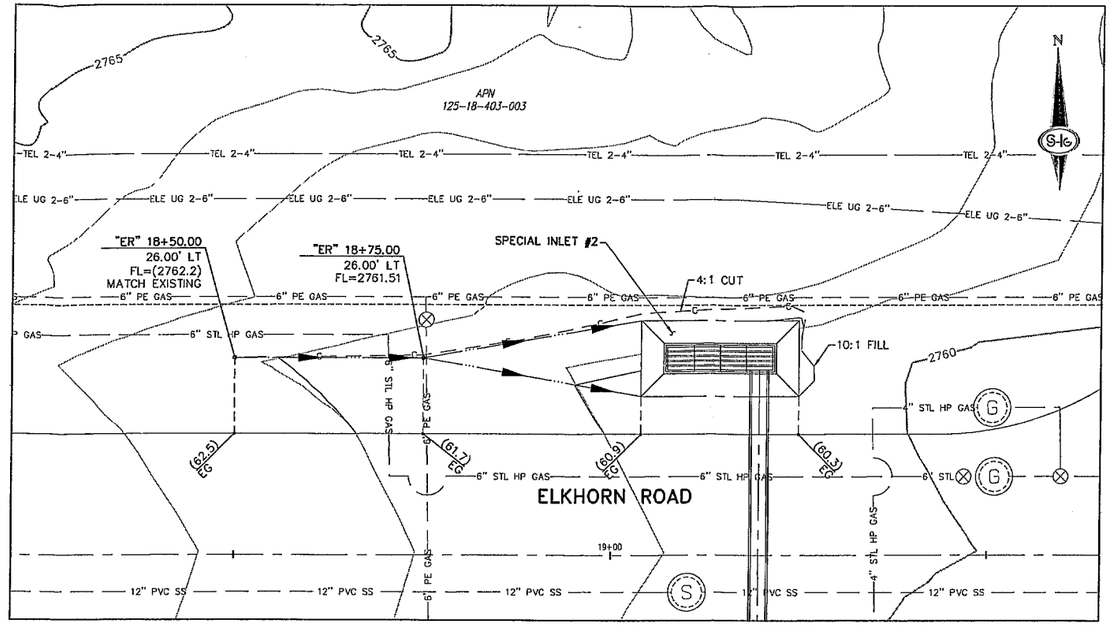
90% SUBMITTAL
PRELIMINARY
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Sheet
SD-09
17 of 21
DRAWING NO.
327V290

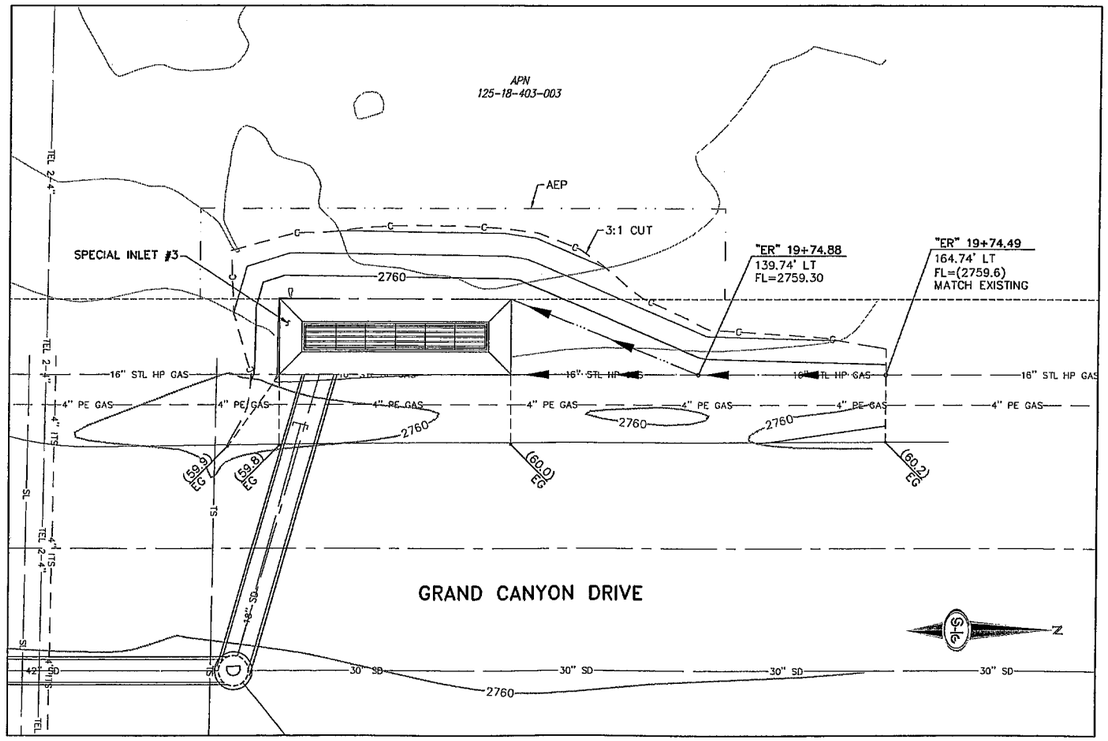
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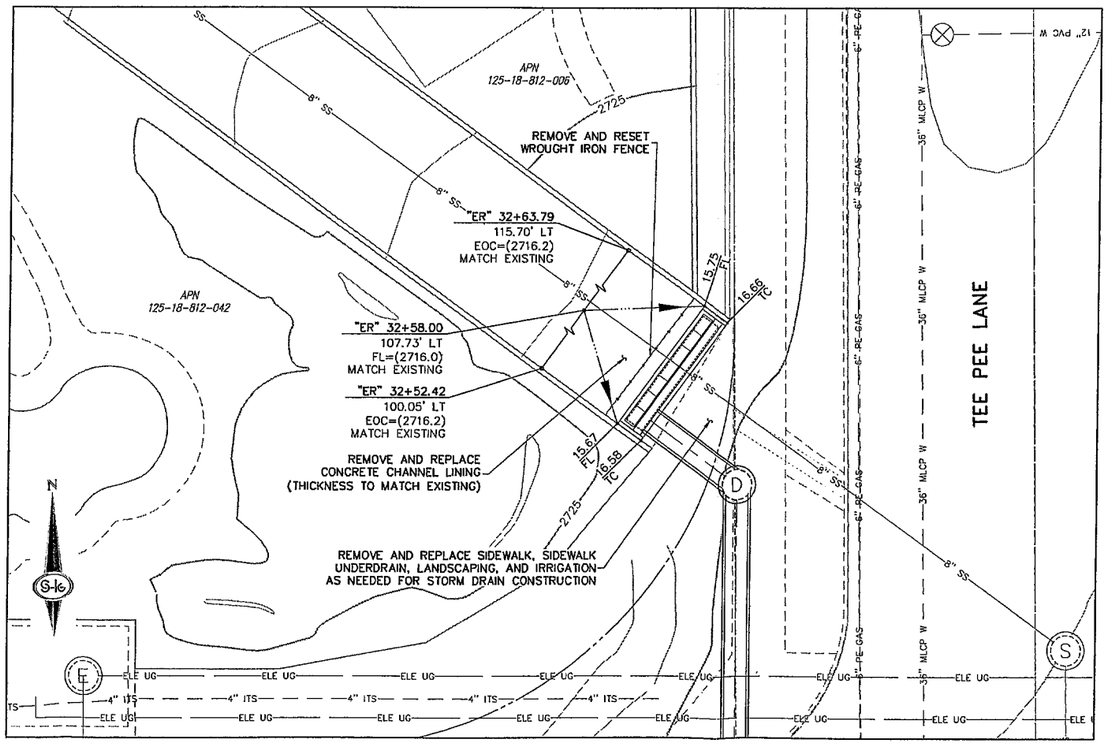
DROP INLET GRADING DETAIL 1
SCALE: 1" = 10'-0" SD-10



DROP INLET GRADING DETAIL 2
SCALE: 1" = 10'-0" SD-10



DROP INLET GRADING DETAIL 3
SCALE: 1" = 10'-0" SD-10



DROP INLET GRADING DETAIL 4
SCALE: 1" = 10'-0" SD-10

REVISIONS

NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
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DATE: 10/7/13

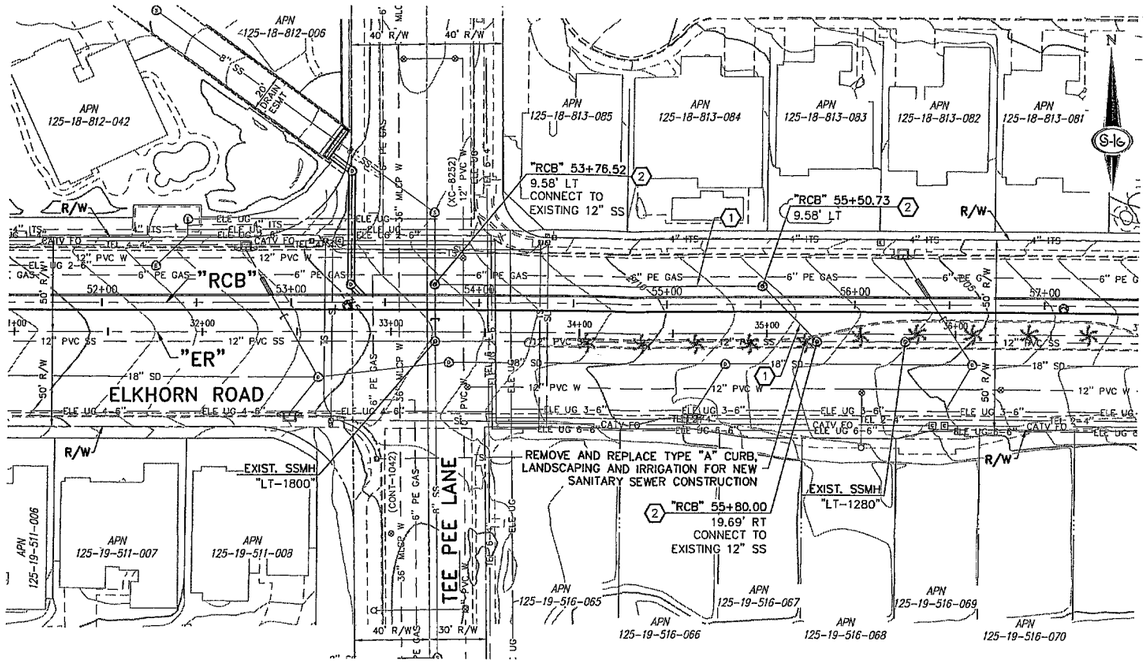
TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

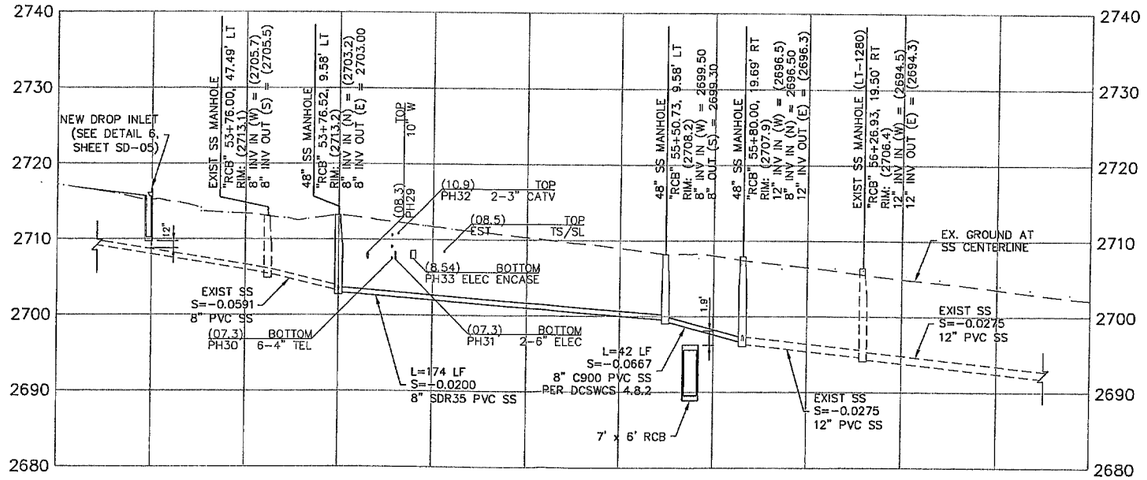
SHEET: DROP INLET GRADING DETAILS

SEAL
90% SUBMITTAL
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Sheet
SD-10
18 of 21
DRAWING NO.
327V290

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SANITARY SEWER NOTES

1. INSTALL 8" PVC SANITARY SEWER LINE (CLASS SPECIFIED IN PROFILE) (DCSWCS SD-14, SD-15 AND SD-18)
2. CONSTRUCT 48" SANITARY SEWER MANHOLE WITH CAST-IN-PLACE MANHOLE BASE (DCSWCS NO. SD-1A, SD-1B, SD-2, SD-4, SD-5, SD-7, AND SD-9)

GENERAL NOTES:

1. SEE SHEET R-03 FOR REMOVAL INFORMATION.
2. NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS SHOWN FOR INFORMATIONAL ONLY. REFERENCE NV ENERGY, CENTURYLINK TELEPHONE, AND SOUTHWEST GAS DRAWINGS FOR CONSTRUCTION DETAILS. CONTRACTOR TO COORDINATE WITH UTILITIES FOR REMOVAL AND INSTALLATION OF FACILITIES.
3. ALL EXISTING UTILITY LOCATIONS SHOW HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION. THE DEPTH BELOW GRADE OF THE VARIOUS UTILITIES DEPICTED ON THE PLANS VARIES THROUGHOUT THE PROJECT AREA. THE CONTRACTOR SHALL EXERCISE EXTREME CARE WHERE EXCAVATING AND GRADING THE SUBBASE IN THE VICINITY OF UTILITIES TO AVOID DAMAGE TO THE LATTER.
4. ALL EXISTING UTILITIES SHALL BE PROTECTED IN PLACE UNLESS OTHERWISE NOTED.

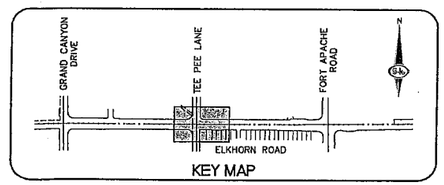
FOR TRENCHES FOUR (4) FEET WIDE AND GREATER:

- CONTRACTOR MUST SUBMIT SHOP DRAWINGS TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINES SPANNING A TRENCH WILL BE SUPPORTED DURING EXCAVATION AND BACKFILL.
- SUPPORTED PIPE MAY BE EXPOSED FOR NO LONGER THAN 90 DAYS MAXIMUM. IF THE PIPE WILL BE EXPOSED FOR MORE THAN 90 DAYS PIPE MUST BE RELOCATED PER APPROVED PLANS.
- IF THE PIPE MATERIAL IS ACP, REPLACE FROM COUPLING TO COUPLING WITH DUCTILE IRON PIPE.

APPROVED FOR CONSTRUCTION

LVVWD ENGINEERING SERVICES MANAGER DATE

PROJECT NO. 121162



KEY MAP

40 0 40 80

SCALE FEET

FAST
Call before you UnderGround.
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig
Avoid cutting underground utility lines. It's easy.
Call 811
OR
1-800-227-2600

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

NO.	DATE:	REVISIONS DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.

DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM

DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

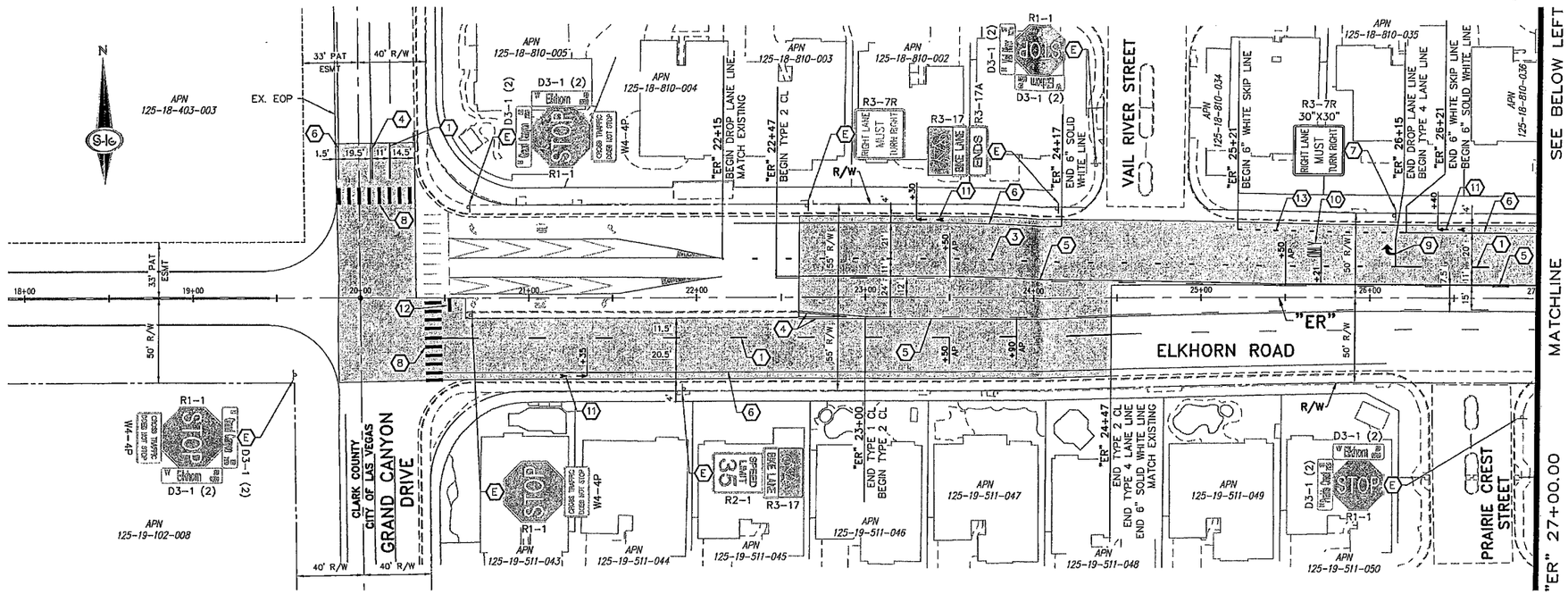
SHEET: SANITARY SEWER PLAN AND PROFILE
"RCB" 51+50.00 TO "RCB" 57+00.00

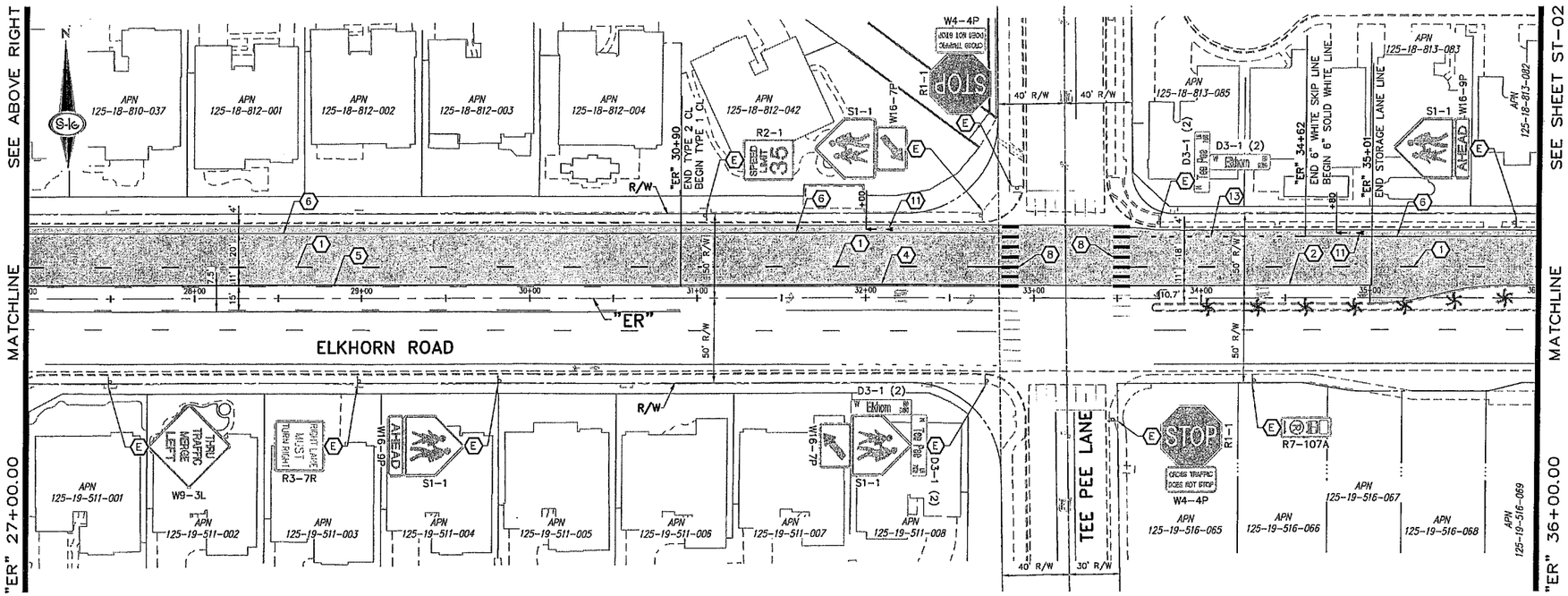
SEAL

90% SUBMITTAL
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Sheet SS-01
19 of 21
DRAWING NO. 327V290

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STRIPING NOTES

1. TYPE 4 LANE LINE (RPM) (STD. DWG. NO. 244.1)
2. STORAGE LANE LINE (RPM) (STD. DWG. NO. 246)
3. DROP LANE LINE (RPM) (STD. DWG. NO. 246.6)
4. TYPE 1 CENTERLINE (RPM) (STD. DWG. NO. 244)
5. TYPE 2 CENTERLINE (RPM) (STD. DWG. NO. 244)
6. 6-INCH SOLID WHITE LINE (PPM)
7. INSTALL NEW GROUND-MOUNTED SIGN(S)
8. CROSSWALK LINE (PMF-TYPE 2) (STD. DWG. NO. 254)
9. WHITE PAVEMENT ARROW (PMF-TYPE 2)
10. WHITE PAVEMENT "ONLY" (PMF-TYPE 2)
11. WHITE PAVEMENT BIKE LEGEND (PMF-TYPE 2)
12. 24-INCH WHITE STOP LINE (PMF-TYPE 2)
13. 6-INCH WHITE SKIP LINE (PMF-TYPE 2) (STD. DWG. NO. 244.9)
14. INSTALL BLUE REFLECTIVE FIRE HYDRANT MARKER

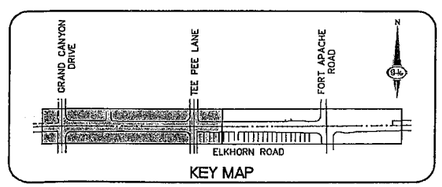
(E) EXISTING SIGN(S) TO REMAIN

GENERAL NOTES:

1. DIMENSIONS ARE TO FACE OF CURB OR LIP OF GUTTER UNLESS OTHERWISE NOTED.

LEGEND

LIMITS OF PAVEMENT REPLACEMENT



SCALE 40 0 40 80 FEET

FAST
Call before you Dig Underground. 1-702-432-5300
FEDERAL AID ARTERIAL SYSTEM OF TRANSPORTATION
Call before you Dig
Avoid cutting underground utility lines. It's easy.
Call 811 OR 1-800-227-2600
AVOID HITTING OVERHEAD POWER LINES AS YOU DIG!
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

REVISIONS			
NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.

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DATE: 10/7/13

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: SIGNING AND STRIPING PLAN
"ER" 18+00.00 TO "ER" 36+00.00

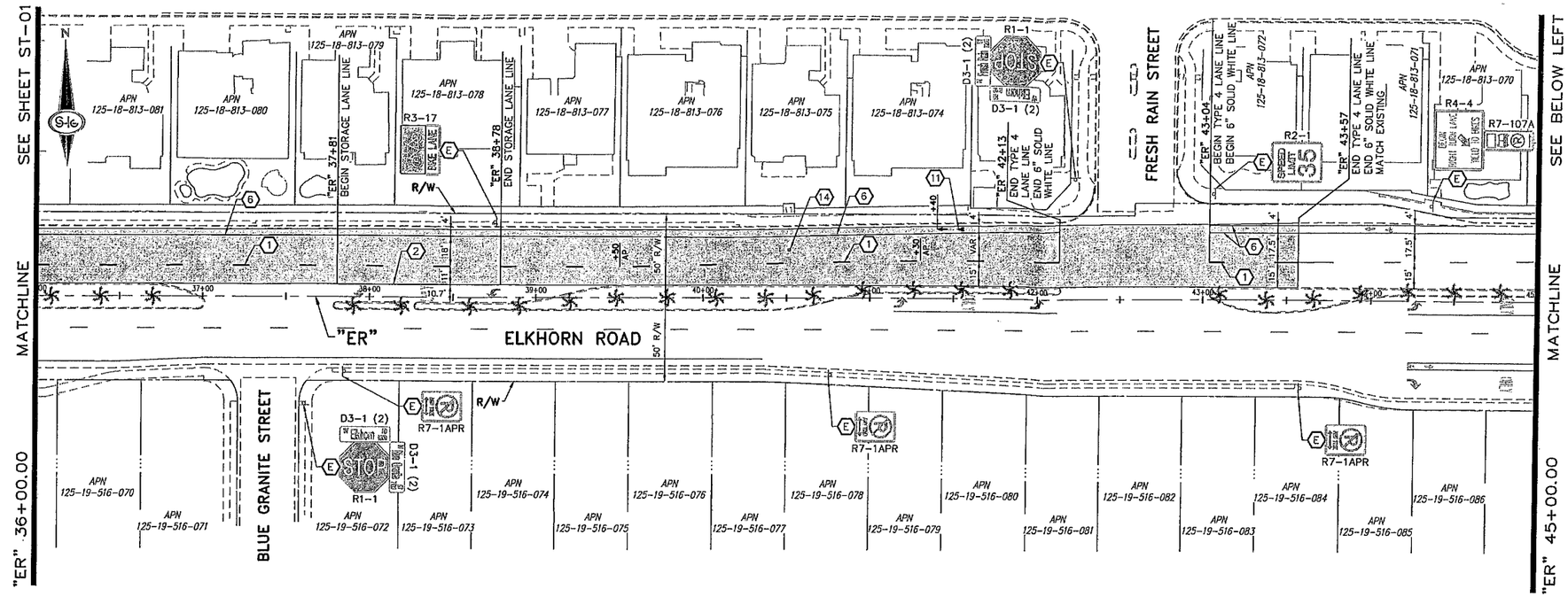
SEAL

90% SUBMITTAL
PRELIMINARY
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Sheet ST-01
20 of 21

DRAWING NO. 327V290

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STRIPING NOTES

1. TYPE 4 LANE LINE (RPM) (STD. DWG. NO. 244.1)
2. STORAGE LANE LINE (RPM) (STD. DWG. NO. 246)
3. DROP LANE LINE (RPM) (STD. DWG. NO. 246.6)
4. TYPE 1 CENTERLINE (RPM) (STD. DWG. NO. 244)
5. TYPE 2 CENTERLINE (RPM) (STD. DWG. NO. 244)
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7. INSTALL NEW GROUND-MOUNTED SIGN(S)
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9. WHITE PAVEMENT ARROW (PMF-TYPE 2)
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14. INSTALL BLUE REFLECTIVE FIRE HYDRANT MARKER

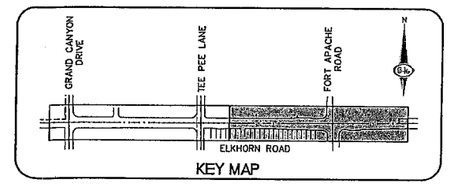
(E) EXISTING SIGN(S) TO REMAIN

GENERAL NOTES:

1. DIMENSIONS ARE TO FACE OF CURB OR LIP OF GUTTER UNLESS OTHERWISE NOTED.

LEGEND

LIMITS OF PAVEMENT REPLACEMENT



SCALE 40 0 40 80 FEET

FAST
Call before you Dig Underground.
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION
Call before you Dig
Avoid cutting underground utility lines. It's easy.
Call 811 or 1-800-227-2800
AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

NO.	DATE:	DESCRIPTION	APP'D

REVISIONS

RANCHO ROAD SYSTEM (ELKHORN - FT APACHE TO GRAND CANYON)

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MARK SORENSEN, P.E.
DESIGNED BY: JSR
DRAWN BY: JAS
CHECKED BY: MDM
DATE: 10/7/13

TITLE: RANCHO ROAD SYSTEM
ELKHORN - FT APACHE TO GRAND CANYON

SHEET: SIGNING AND STRIPING PLAN
"ER" 36+00.00 TO "ER" 54+00.00

SEAL
90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION

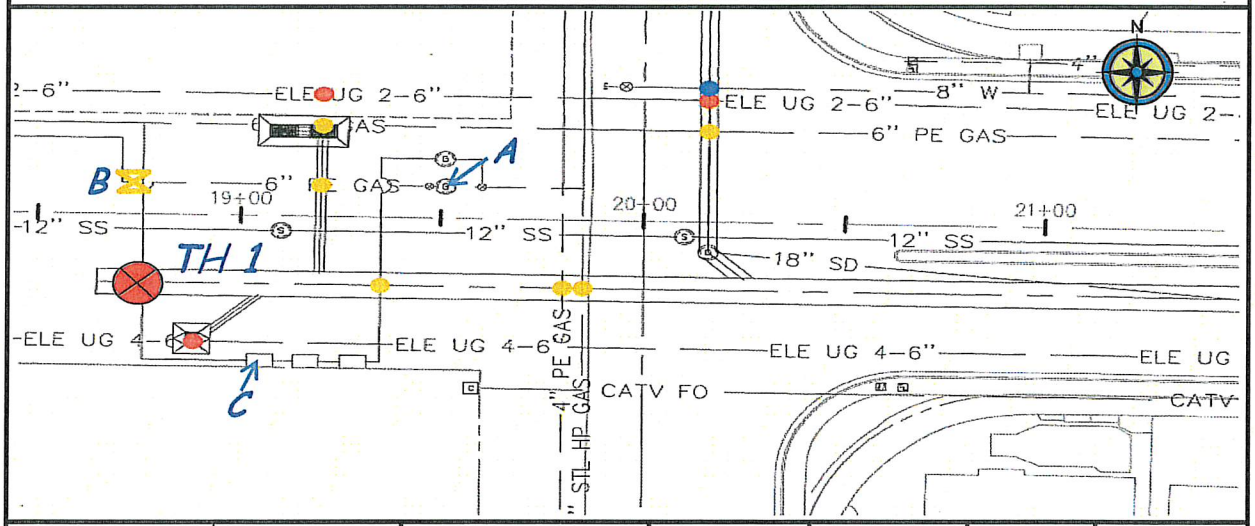
Sheet ST-02
21 of 21
DRAWING NO. 327V290

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TEST HOLE DATA SHEET

Test Hole No.	1	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/16/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Grand Canyon
Cardno TBE Truck No	550421		*Location*	Elkhorn

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Rod & Cap
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Natural Ground		*Calc. UTL - Top*	**3.68'**	*Hand Meas.Top*	
Thickness	NA		*Calc. UTL-Bot*		*Hand Meas.Bot*	
Soil Conditions	Rocky		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Gas		**A**	Gas Manhole		80'
Nominal Pipe Size	6"		**B**	Gas Valve		38'
UTL Material	Plastic		**C**	Gas Vault		39'

Remarks:

Data Entered By: JN

Reviewed By: RT

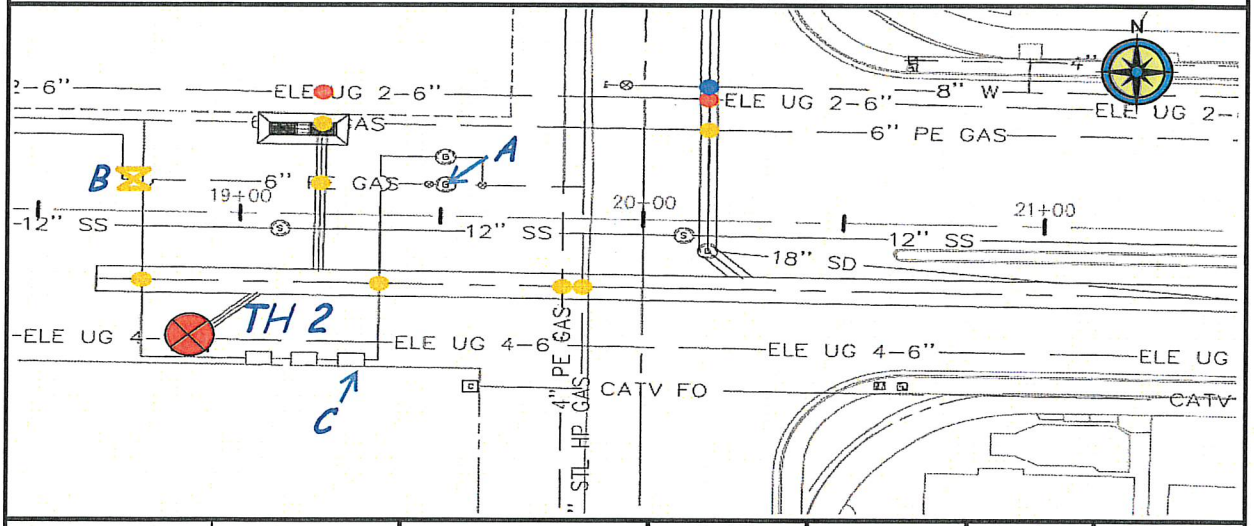
TEST HOLE DATA SHEET

Test Hole No.	2
Date Excavated	01/16/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

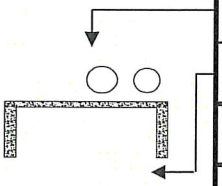
Cardno TBE
10649 Jeffreys Street
Henderson, NV. 89052
702.458.4092
702.895.8415 fax

SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Grand Canyon
Location	Elkhorn

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Natural Ground
Thickness	NA
Soil Conditions	Rocky
UTL Type	Fiber Optic/Electric
Nominal Pipe Size	2x3" / 1x50" wide
UTL Material	Plastic/Concrete



Rod @ UTL-Top		Marker Set	Rod & Cap
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**3.81'**	Hand Meas.Top	
Calc. UTL-Bot	**7.29'**	Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	Gas Manhole	77'
B	Gas Valve	63'
C	Gas Vault	11'

Remarks:

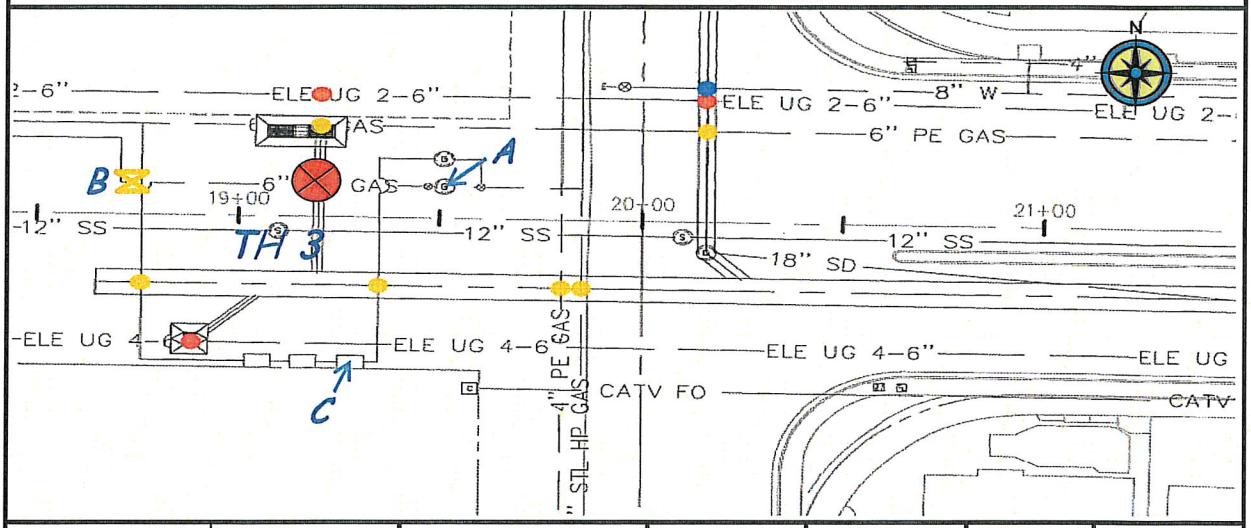
Data Entered By: JN

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	3	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	SUE Crew	SA\SG
Date Excavated	01/15/13		City	Las Vegas
Client Project No.	**CLV 1201**		County	Clark
Cardno TBE Project No	NV114-007-00		Route No.	Elkhorn
Cardno TBE Truck No	550421		Location	Grand Canyon

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		Rod @ UTL-Top		Marker Set	Rod & Cap
Rod @ Monument	/		Rod @ UTL-Bot.		Elev.	/
English / Metric	English		Rod @ Marker			
Surface Type	Natural Ground		Calc. UTL - Top	6.86'	Hand Meas.Top	
Thickness	NA		Calc. UTL-Top		Hand Meas.Bot	
Soil Conditions	Hard Pack/Sandy		Swing Ties From Structure			Approx. Dist.
UTL Type	HP Gas		A	Gas Manhole		35'
Nominal Pipe Size	6"		B	Gas Valve		43'
UTL Material	Steel		C	Gas Vault		58'

Remarks:

Data Entered By: CP

Reviewed By: RT

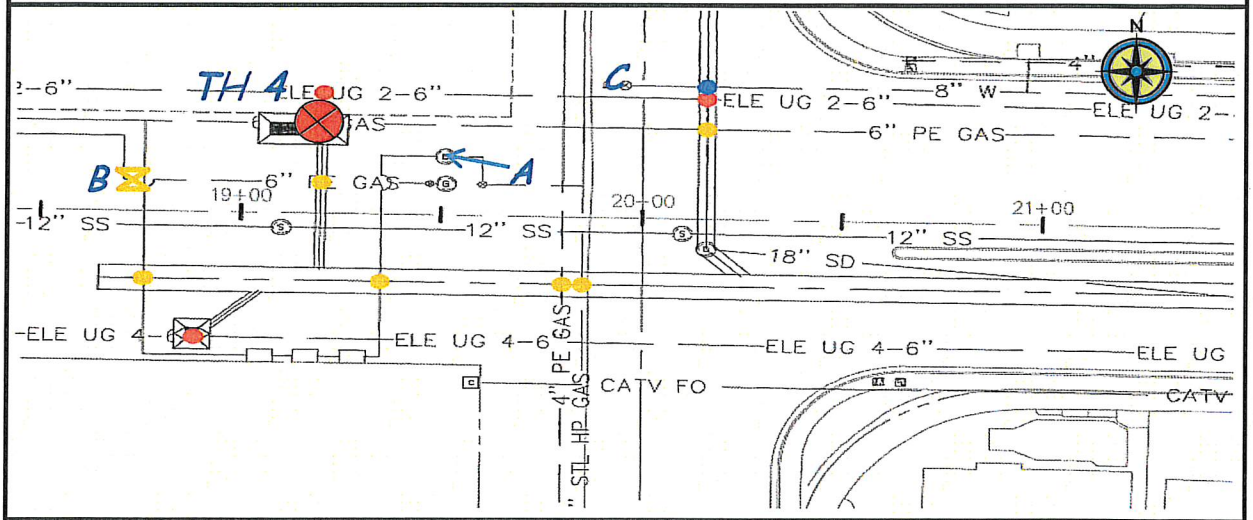
TEST HOLE DATA SHEET

Test Hole No.	4
Date Excavated	01/16/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

Cardno TBE
10649 Jeffreys Street
Henderson, NV. 89052
702.458.4092
702.895.8415 fax

SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Grand Canyon
Location	Elkhorn

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Natural Ground
Thickness	NA
Soil Conditions	Type II
UTL Type	Gas
Nominal Pipe Size	6"
UTL Material	Plastic

Rod @ UTL-Top		Marker Set	Rod & Cap
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**4.32'**	Hand Meas.Top	
Calc. UTL-Bot		Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	Gas Manhole	35'
B	Gas Valve	45'
C	Water Monument	77'

Remarks:

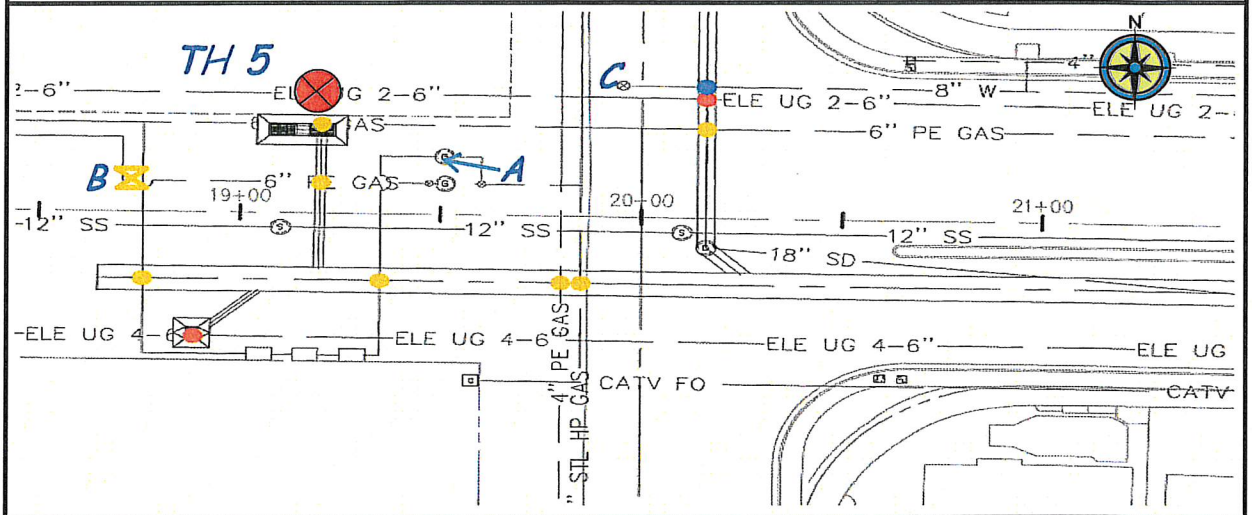
Data Entered By: JN

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	5	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/16/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Grand Canyon
Cardno TBE Truck No	550421		*Location*	Elkhorn

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Rod & Cap
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Natural Ground		*Calc. UTL - Top*	**3.80'**	*Hand Meas.Top*	
Thickness	NA		*Calc. UTL-Top*	**5.73'**	*Hand Meas.Bot*	
Soil Conditions	Type II		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	FO / Electric		**A**	Gas Manhole		42'
Nominal Pipe Size	2x3"/2x4"/1x6" 24" total width		**B**	Gas Valve		51'
UTL Material	Plastic		**C**	Water Monument		77'

Remarks:

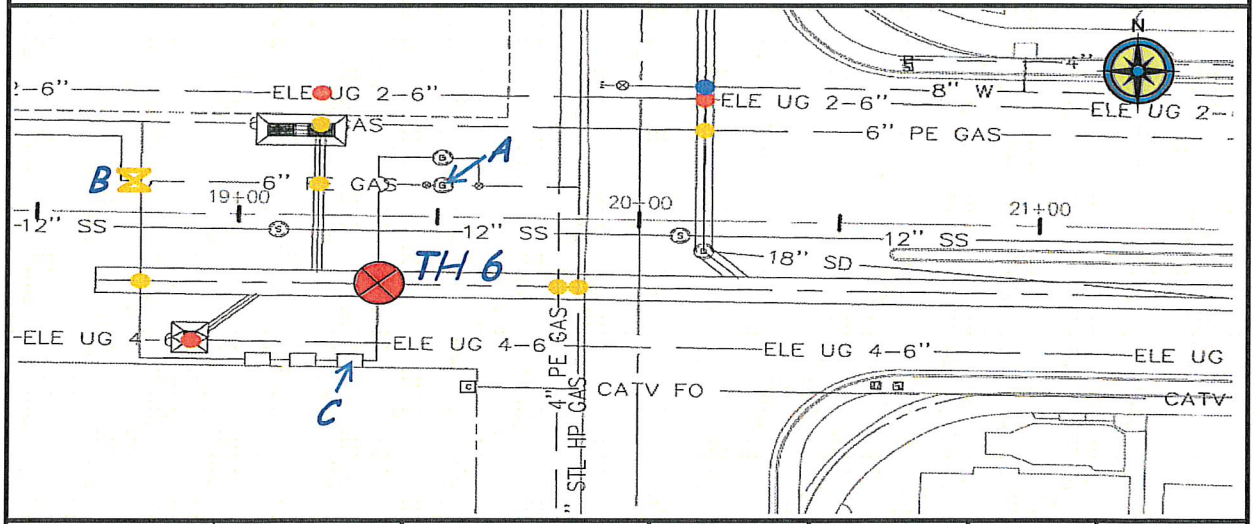
Data Entered By: JN

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	6	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/15/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Grand Canyon

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Rod & Cap
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Natural Ground		*Calc. UTL - Top*	**7.82'**	*Hand Meas.Top*	
Thickness	NA		*Calc. UTL-Top*		*Hand Meas.Bot*	
Soil Conditions	Rocky		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	HP Gas		**A**	Gas Manhole		37'
Nominal Pipe Size	6"		**B**	Gas Valve		72'
UTL Material	Steel		**C**	Gas Vault		25'

Remarks:

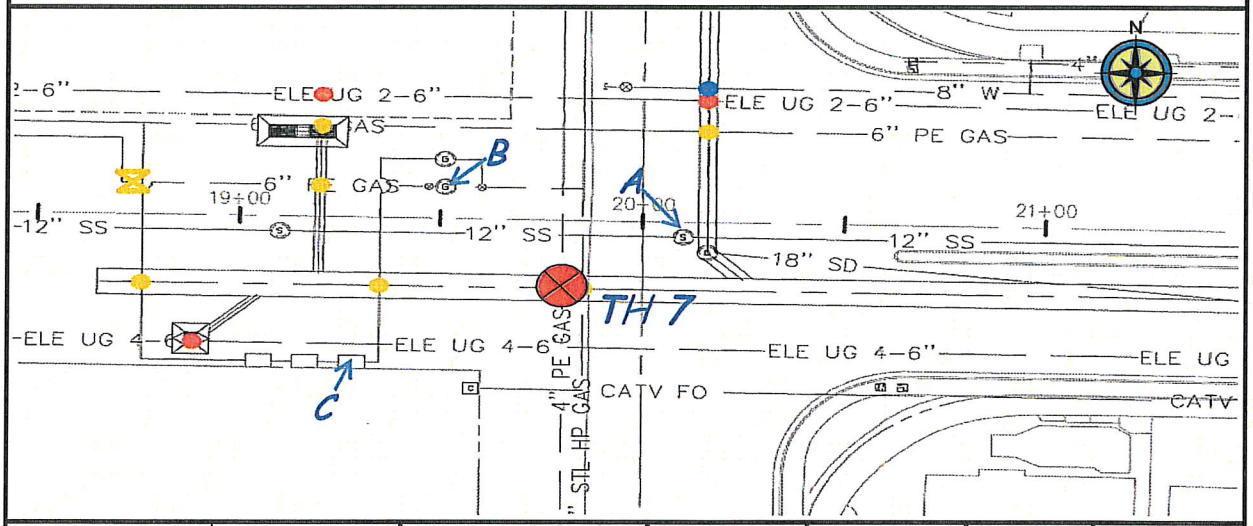
Data Entered By: CP

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	7	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/15/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Grand Canyon

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Rod & Cap
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Natural Ground		*Calc. UTL - Top*	**3.94'**	*Hand Meas.Top*	
Thickness	NA		*Calc. UTL-Top*	**7.11'**	*Hand Meas.Bot*	
Soil Conditions	Rocky		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Gas/HP Gas		**A**	Sewer Manhole		33'
Nominal Pipe Size	4"/ 16"		**B**	Gas Manhole		42'
UTL Material	Plastic/Steel		**C**	Gas Vault		57'

Remarks:

TH #8 not used. Both gas pipes found at this location.

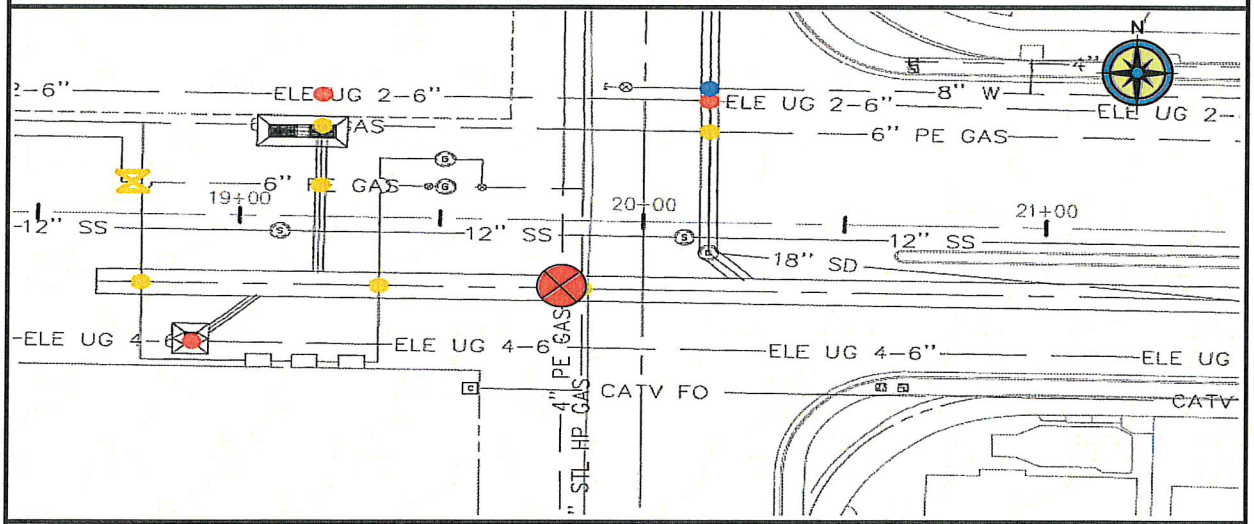
Data Entered By: CP

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	8	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/15/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Grand Canyon

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/	*Rod @ UTL-Top*		*Marker Set*	/
Rod @ Monument	/	*Rod @ UTL-Bot.*		*Elev.*	
English / Metric	English	*Rod @ Marker*			
Surface Type	Natural Ground	*Calc. UTL - Top*	**see note**	*Hand Meas.Top*	
Thickness	/	*Calc. UTL-Top*		*Hand Meas.Bot*	
Soil Conditions	Rocky	*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Gas	**A**	/		
Nominal Pipe Size	/	**B**	/		
UTL Material	/	**C**	/		

Remarks:

TH #8 not used. See TH #7 for utility data.

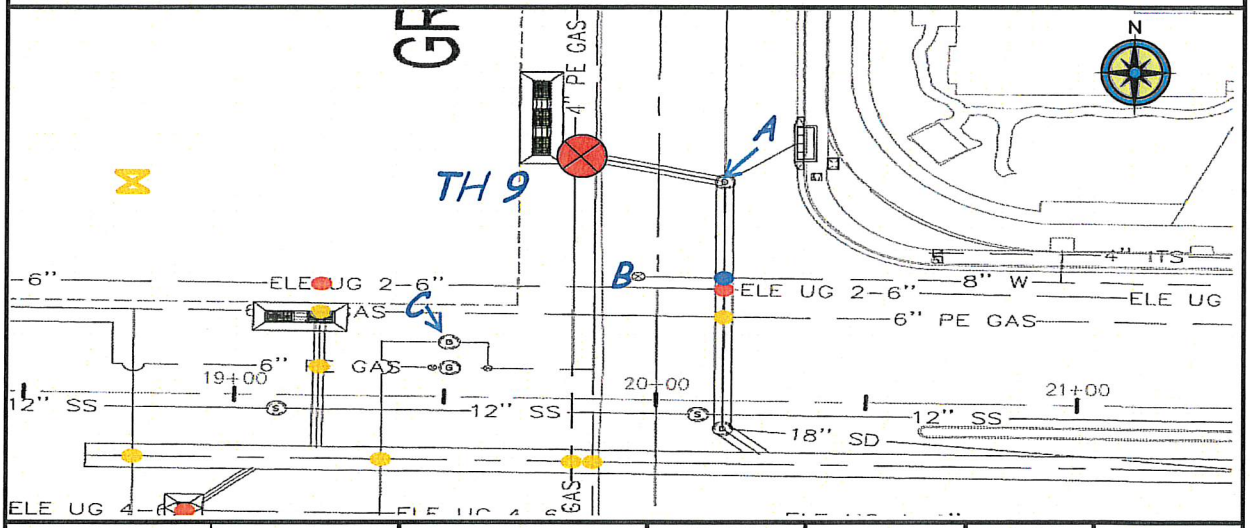
Data Entered By: CP

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	9	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/15/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Grand Canyon

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Rod & Cap
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Natural Ground		*Calc. UTL - Top*	**5.51'**	*Hand Meas.Top*	
Thickness	NA		*Calc. UTL-Top*	**9.90'**	*Hand Meas.Bot*	
Soil Conditions	Rocky		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Gas/HP Gas		**A**	Sewer Manhole		38'
Nominal Pipe Size	4" / 16"		**B**	Gas Manhole		47'
UTL Material	Plastic/Steel		**C**	Gas Vault		73'

Remarks:

TH #10 not used. Both gas pipes found at this location.

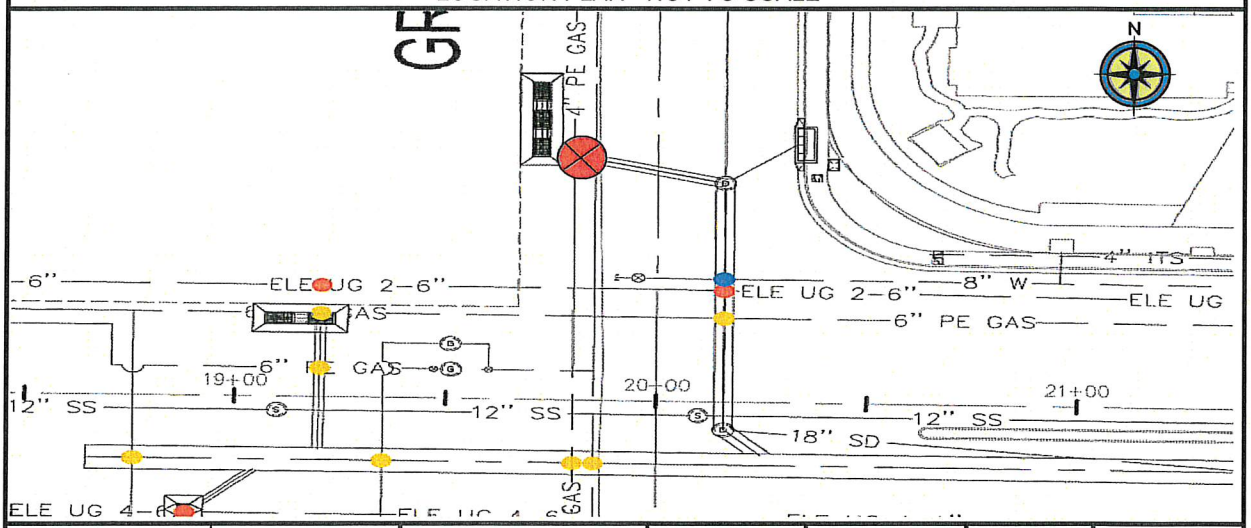
Data Entered By: CP

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	10	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/15/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Grand Canyon

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	/
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Natural Ground		*Calc. UTL - Top*	**see note**	*Hand Meas.Top*	
Thickness	/		*Calc. UTL-Top*		*Hand Meas.Bot*	
Soil Conditions	Rocky		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Gas		**A**			
Nominal Pipe Size			**B**			
UTL Material			**C**			

Remarks:

TH #10 not used. See TH #9 for utility data.

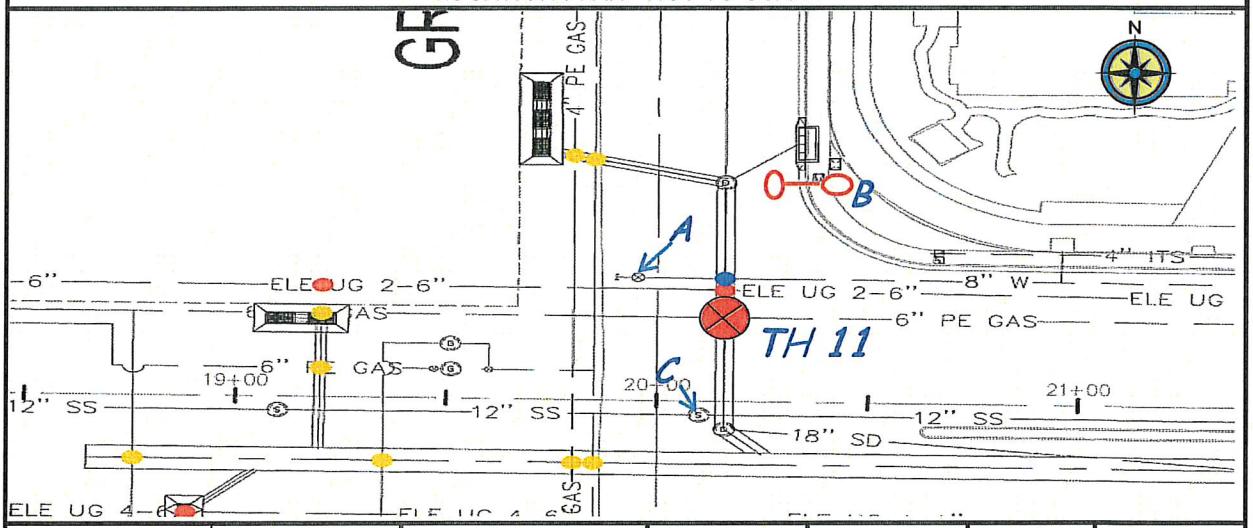
Data Entered By: CP

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	11	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/10/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Grand Canyon

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Nail/Disk
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Asphalt		*Calc. UTL - Top*	**3.98'**	*Hand Meas.Top*	
Thickness	7"		*Calc. UTL-Top*		*Hand Meas.Bot*	
Soil Conditions	Rocky/TypeII		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Gas		**A**	Water Valve		23'
Nominal Pipe Size	6"		**B**	Street Light		43'
UTL Material	Plastic		**C**	Sewer Manhole		41'

Remarks:

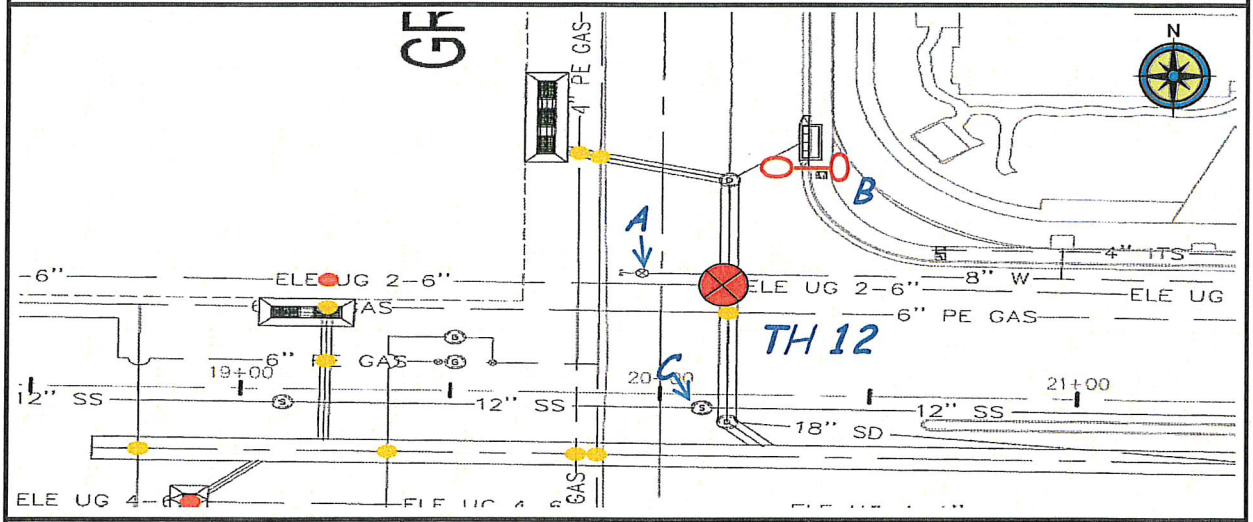
Data Entered By: CP

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	12	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG\CP
Date Excavated	01/10/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Grand Canyon

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Nail/Disk
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Asphalt		*Calc. UTL - Top*	**3.66'**	*Hand Meas.Top*	
Thickness	7"		*Calc. UTL-Top*	**4.50'**	*Hand Meas.Bot*	
Soil Conditions	Slurry		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Electric		**A**	Water Valve		21'
Nominal Pipe Size	42" Wide		**B**	Street Light		40'
UTL Material	Concrete		**C**	Sewer Manhole		46'

Remarks:

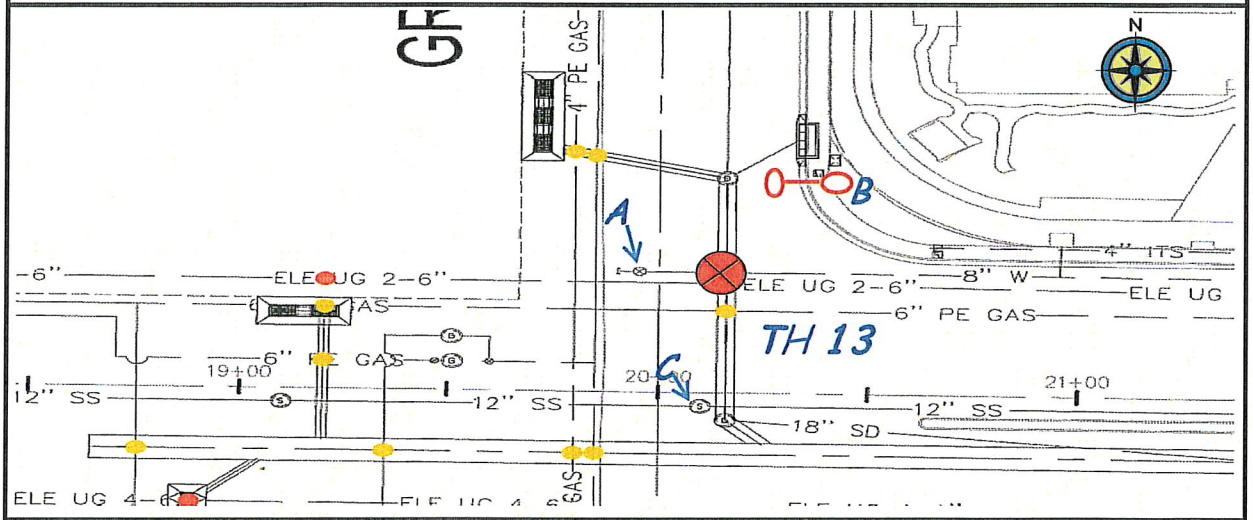
Data Entered By: CP

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	13	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG\CP
Date Excavated	01/10/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Grand Canyon

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Nail/Disk
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Asphalt		*Calc. UTL - Top*	**4.89'**	*Hand Meas.Top*	
Thickness	5"		*Calc. UTL-Top*		*Hand Meas.Bot*	
Soil Conditions	Type II		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Water		**A**	Water Valve		20'
Nominal Pipe Size	8"		**B**	Street Light		37'
UTL Material	Plastic		**C**	Sewer Manhole		51'

Remarks:

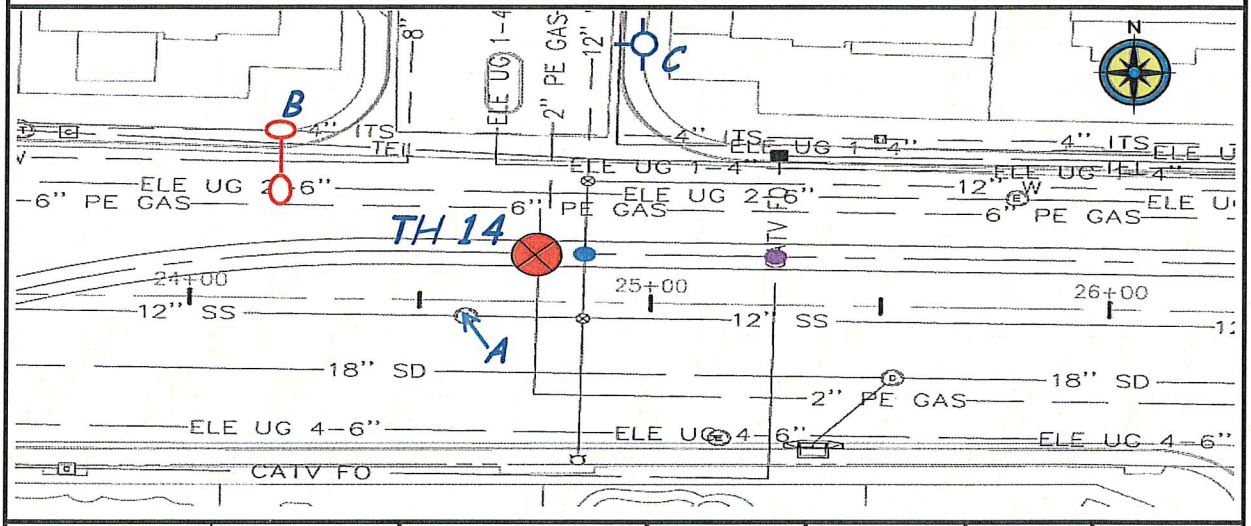
Data Entered By: CP

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	14	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/04/13		*City*	Las Vegas
Client Project No.	**CLV 1201**		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Vail River

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/	*Rod @ UTL-Top*		*Marker Set*	Nail/Disk
Rod @ Monument	/	*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English	*Rod @ Marker*			
Surface Type	Asphalt	*Calc. UTL - Top*	**4.98'**	*Hand Meas.Top*	
Thickness	5"	*Calc. UTL-Top*		*Hand Meas.Bot*	
Soil Conditions	Rocky/Type II	*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Gas	**A**	Sewer Manhole		28'
Nominal Pipe Size	2"	**B**	Street Light		73'
UTL Material	Plastic	**C**	Fire Hydrant		68'

Remarks:

Data Entered By: CP

Reviewed By: RT

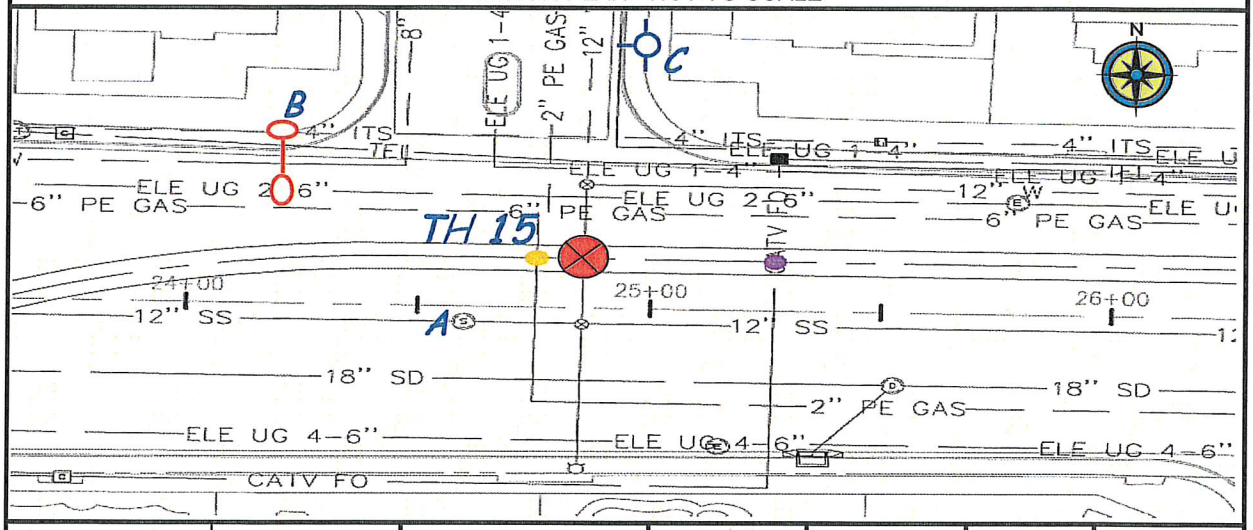
TEST HOLE DATA SHEET

Test Hole No.	15
Date Excavated	01/04/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

Cardno TBE
10649 Jeffreys Street
Henderson, NV. 89052
702.458.4092
702.895.8415 fax

SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Vail River

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Asphalt
Thickness	5"
Soil Conditions	Rocky
UTL Type	Water
Nominal Pipe Size	8"
UTL Material	Plastic

Rod @ UTL-Top		Marker Set	Nail/Disk
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**4.93'**	Hand Meas.Top	
Calc. UTL-Top		Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	Sewer Manhole	34'
B	Street Light	81'
C	Fire Hydrant	66'

Remarks:

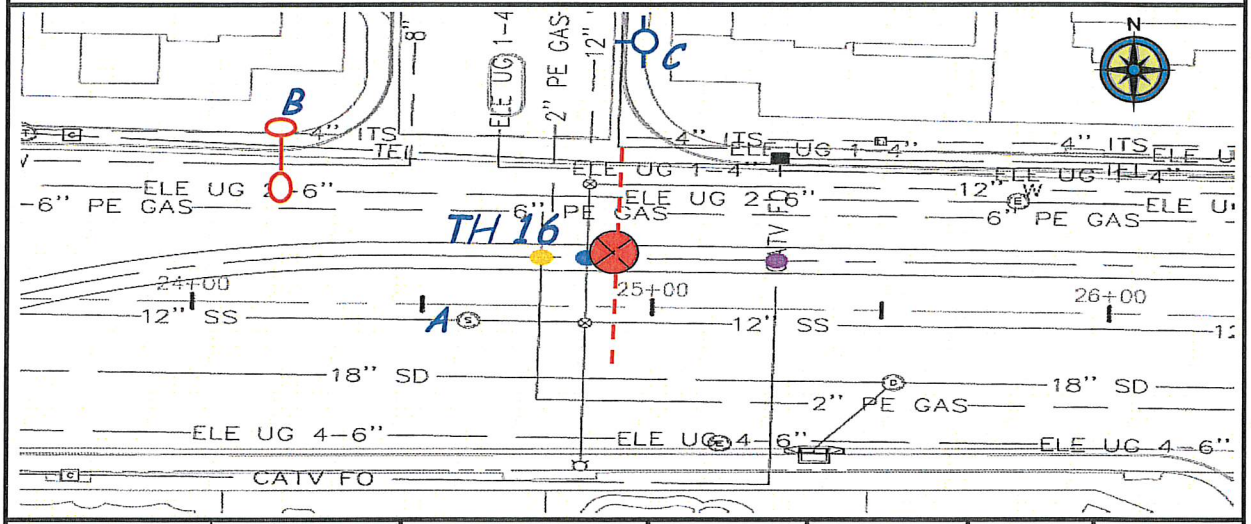
Data Entered By: CP

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	16	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/04/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Vail River

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Nail/Disk
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Asphalt		*Calc. UTL - Top*	**3.63'**	*Hand Meas.Top*	
Thickness	5"		*Calc. UTL-Top*		*Hand Meas.Bot*	
Soil Conditions	Rocky		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Electric		**A**	Sewer Manhole		40'
Nominal Pipe Size	4"		**B**	Street Light		90'
UTL Material	Plastic		**C**	Fire Hydrant		64'

Remarks:

Electric crossing originally shown east of actual location.

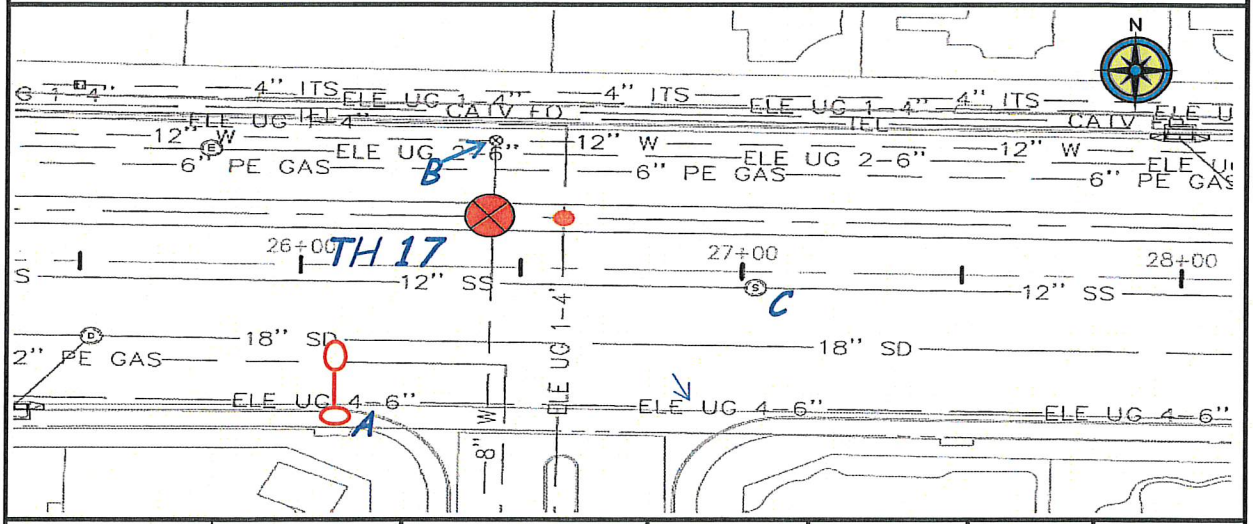
Data Entered By: CP

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	17	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/04/13		*City*	Las Vegas
Client Project No.	**CLV 1201**		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Prairie Crest

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Nail/Disk
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Asphalt		*Calc. UTL - Top*	**4.99'**	*Hand Meas.Top*	
Thickness	5"		*Calc. UTL-Top*		*Hand Meas.Bot*	
Soil Conditions	Rocky		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Water		**A**	Street Light		70'
Nominal Pipe Size	8"		**B**	Water Valve		25'
UTL Material	Plastic		**C**	Sewer Manhole		64'

Remarks:

Data Entered By: CP

Reviewed By: RT

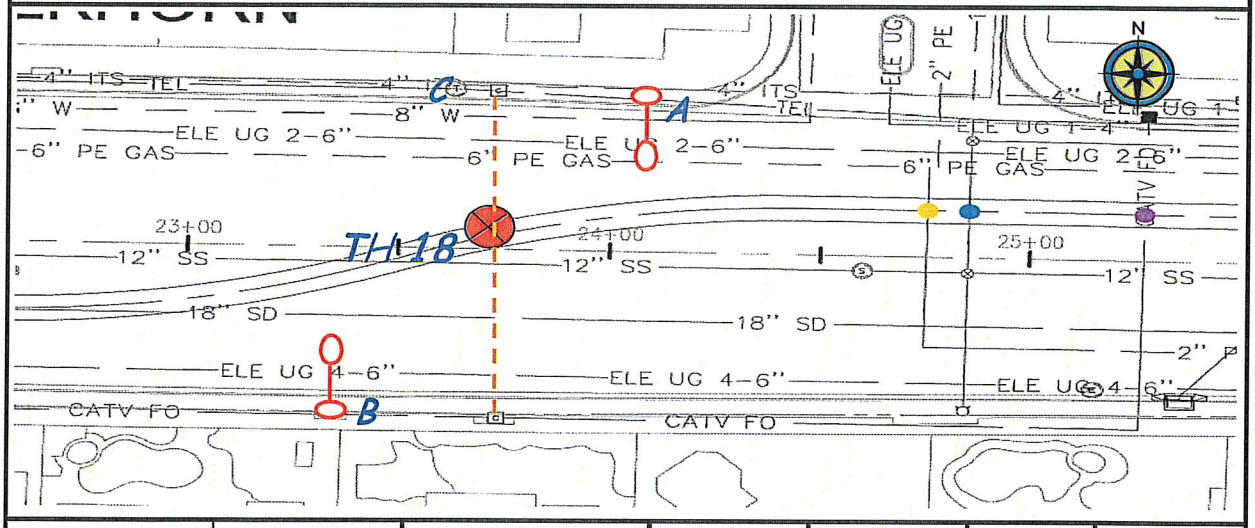
TEST HOLE DATA SHEET

Test Hole No.	18
Date Excavated	01/15/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

Cardno TBE
10649 Jeffreys Street
Henderson, NV. 89052
702.458.4092
702.895.8415 fax

SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	West Of Vail River

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Asphalt
Thickness	6"
Soil Conditions	Slurry
UTL Type	CATV
Nominal Pipe Size	2x2"
UTL Material	Plastic

Rod @ UTL-Top		Marker Set	Nail/Disk
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**3.01'**	Hand Meas.Top	
Calc. UTL-Top		Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	Street Light	52'
B	Street Light	80'
C	Electric Manhole	36'

Remarks:

CATV originally shown to cross approx Sta 25+/-25.

Data Entered By: CP

Reviewed By: RT

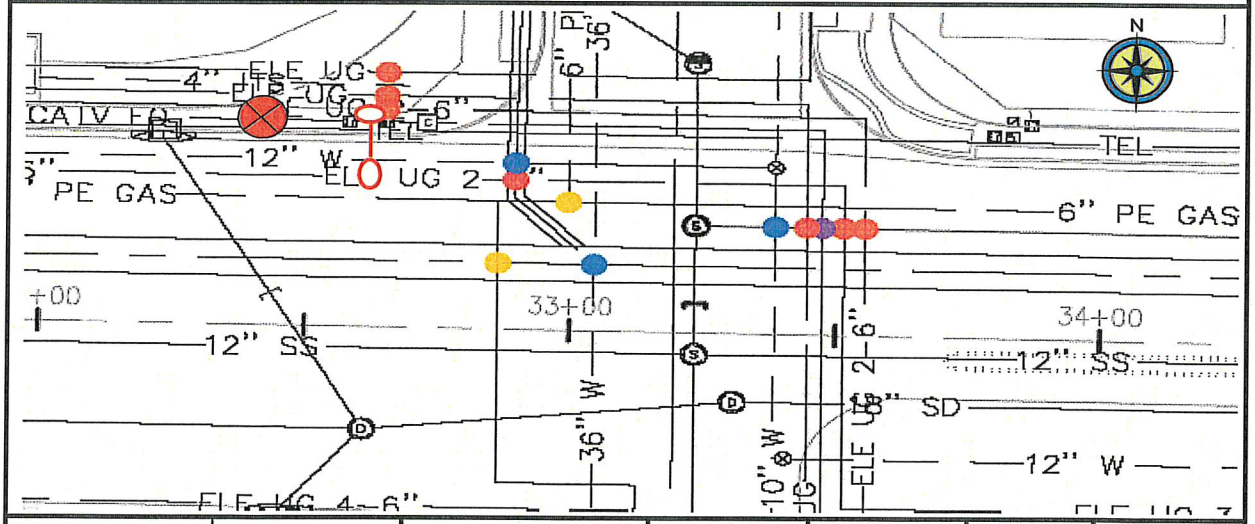
TEST HOLE DATA SHEET

Test Hole No.	19
Date Excavated	01/09/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

Cardno TBE
10649 Jeffreys Street
Henderson, NV. 89052
702.458.4092
702.895.8415 fax

SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/	Rod @ UTL-Top		Marker Set	/
Rod @ Monument	/	Rod @ UTL-Bot.		Elev.	/
English / Metric	English	Rod @ Marker			
Surface Type	/	Calc. UTL - Top	see note	Hand Meas.Top	
Thickness	/	Calc. UTL-Top		Hand Meas.Bot	
Soil Conditions	/	Swing Ties From Structure			Approx. Dist.
UTL Type	/	A			
Nominal Pipe Size	/	B			
UTL Material	/	C			

Remarks:

TH #19 not used. See TH #20 for utility data.

Data Entered By: CP

Reviewed By: RT

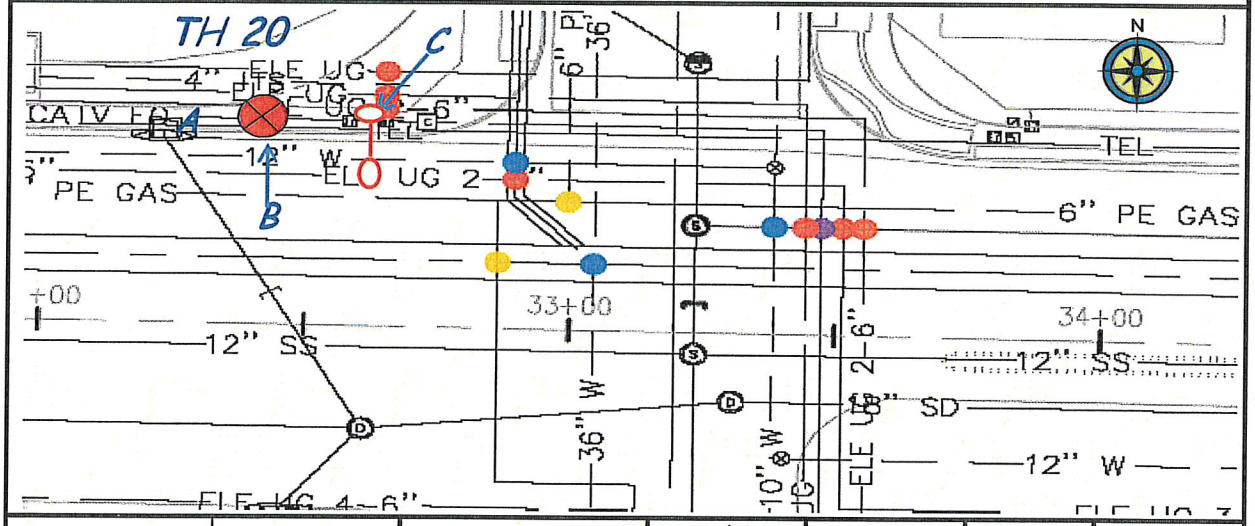
TEST HOLE DATA SHEET

Test Hole No.	20
Date Excavated	01/09/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

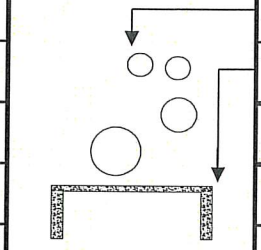
Cardno TBE
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Henderson, NV. 89052
702.458.4092
702.895.8415 fax

SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Concrete
Thickness	4"
Soil Conditions	Hard Pack/TypeII
UTL Type	FO/CATV/Elec
Nominal Pipe Size	1X5"/1X4"/2X3"/5 3" Wide Conc
UTL Material	Plastic/Red Conc



Rod @ UTL-Top		Marker Set	X in Concrete
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**3.54'**	Hand Meas.Top	
Calc. UTL-Top	**4.79'**	Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	East Corner Storm Inlet	14'
B	Face Of Curb	3'
C	Street Light	27'

Remarks:

Bottom shot of concrete cap or encasement not recorded,only top of concrete. Verified by Engineer to be sufficient depths while TH was open.

Data Entered By: CP

Reviewed By: RT

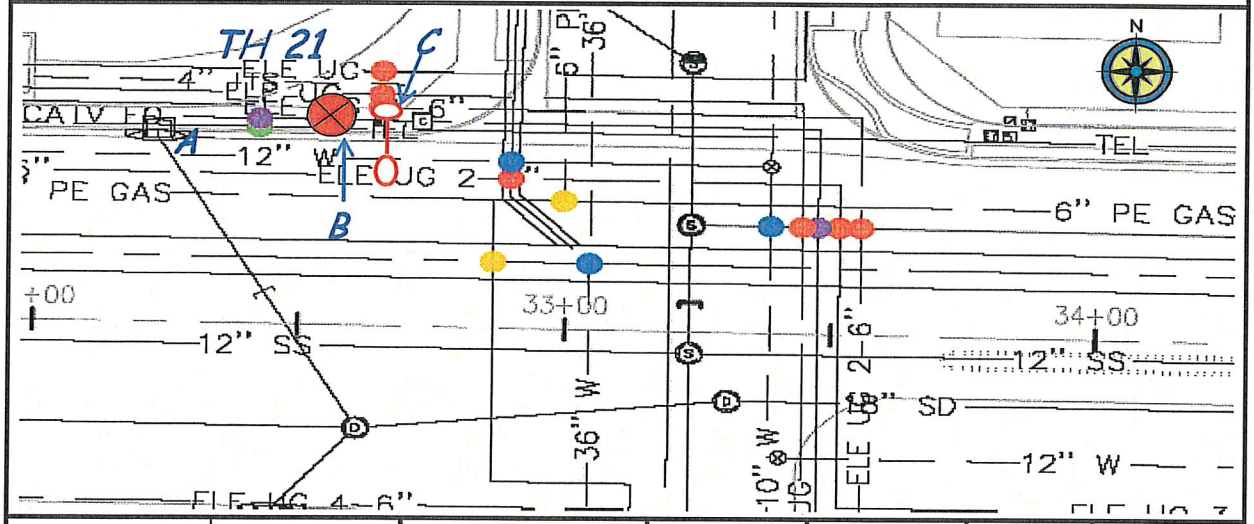
TEST HOLE DATA SHEET

Test Hole No.	21
Date Excavated	01/09/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

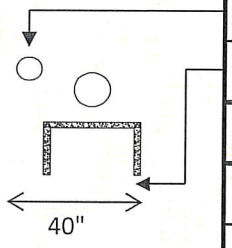
Cardno TBE
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SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Concrete
Thickness	5"
Soil Conditions	Rocky/TypeII
UTL Type	FO / SL / Elec.
Nominal Pipe Size	1X2"/1X4"/ 36" Wide Conc
UTL Material	Plastic/Red Conc



Rod @ UTL-Top		Marker Set	X in Concrete
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**2.41'**	Hand Meas.Top	
Calc. UTL-Bot	**4.72'**	Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	East Corner Storm Inlet	38'
B	Face Of Curb	3'
C	Street Light	3'

Remarks:

Data Entered By: CP

Reviewed By: RT

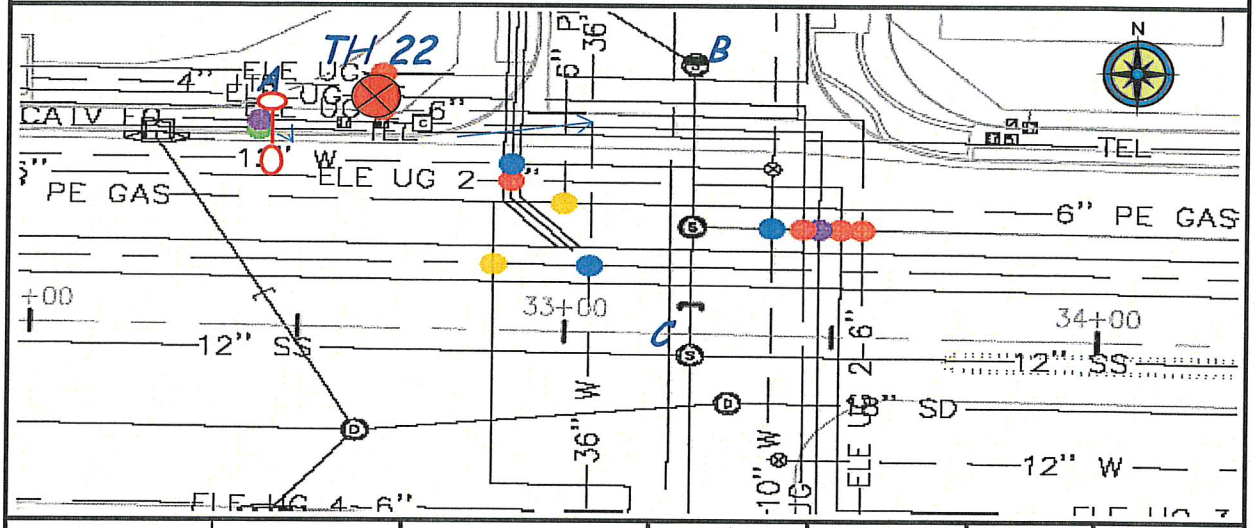
TEST HOLE DATA SHEET

Test Hole No.	22
Date Excavated	01/09/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

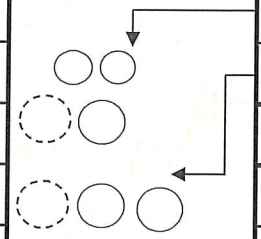
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702.458.4092
702.895.8415 fax

SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Natural Ground
Thickness	NA
Soil Conditions	Rocky
UTL Type	CATV / FO
Nominal Pipe Size	2 X 3" / 3 X 4" /1X?
UTL Material	Plastic



Rod @ UTL-Top		Marker Set	Rod & Cap
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**3.53'**	Hand Meas.Top	
UTL - Top	**4.70'**	Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	Street Light	5'
B	Sewer Manhole	55'
C	Sewer Manhole	82'

Remarks:

Unable to get full visual on all pipes due to configuration. Additional conduit may exist.

Data Entered By: JN

Reviewed By: RT

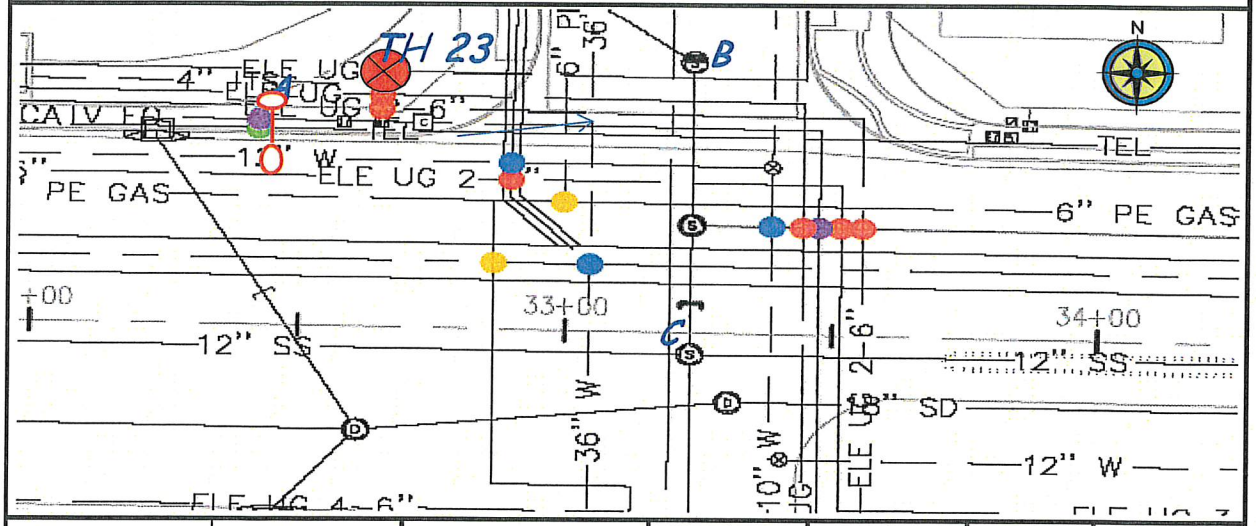
TEST HOLE DATA SHEET

Test Hole No.	23
Date Excavated	01/09/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

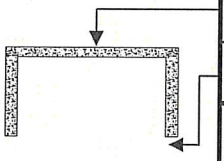
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SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Natural Ground
Thickness	NA
Soil Conditions	Rocky
UTL Type	Electric
Nominal Pipe Size	60" wide
UTL Material	Concrete



Rod @ UTL-Top		Marker Set	Rod & Cap
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**4.78'**	Hand Meas.Top	
UTL - Bot	**6.32'**	Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	Street Light	9'
B	Sewer Manhole	54'
C	Sewer Manhole	86'

Remarks:

Data Entered By: JN

Reviewed By: RT

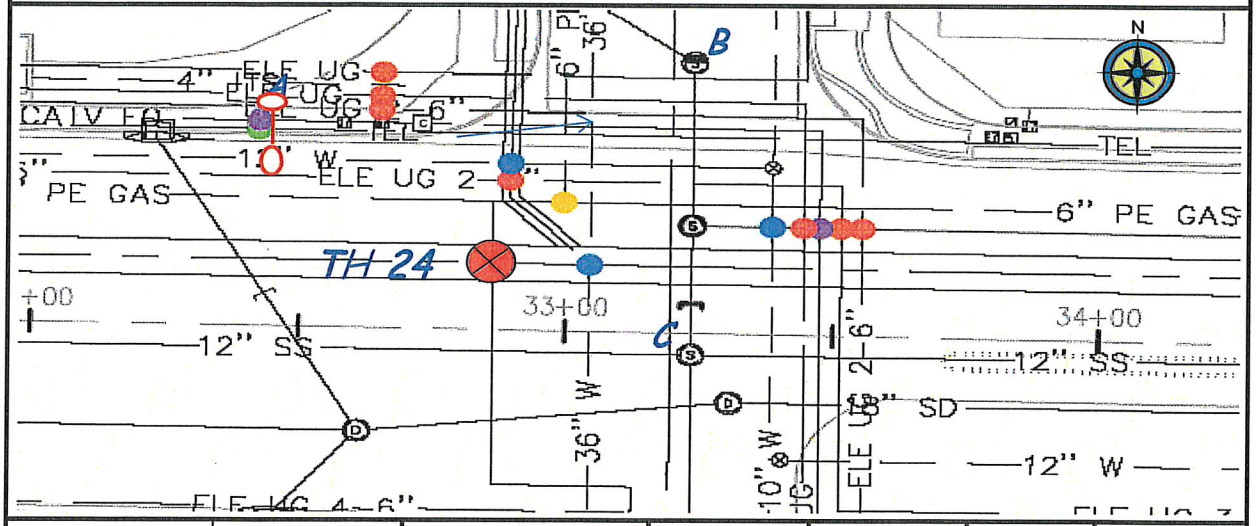
TEST HOLE DATA SHEET

Test Hole No.	24
Date Excavated	01/10/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

Cardno TBE
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SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Asphalt
Thickness	4"
Soil Conditions	Type II
UTL Type	Gas
Nominal Pipe Size	6"
UTL Material	Plastic

Rod @ UTL-Top		Marker Set	Nail / DisK
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**2.43'**	Hand Meas.Top	
UTL - Top Bottom		Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	Street Light	42'
B	Sewer Manhole	59'
C	Sewer Manhole	38'

Remarks:

Data Entered By: JN

Reviewed By: RT

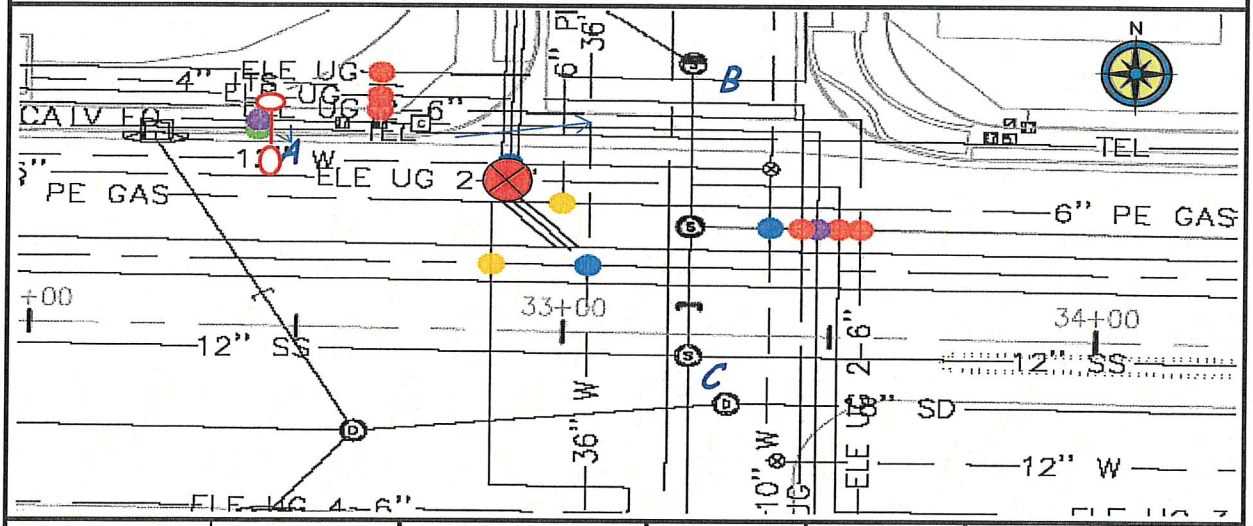
TEST HOLE DATA SHEET

Test Hole No.	25
Date Excavated	01/07/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

Cardno TBE
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SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/	Rod @ UTL-Top		Marker Set	/
Rod @ Monument	/	Rod @ UTL-Bot.		Elev.	/
English / Metric	English	Rod @ Marker			
Surface Type	/	Calc. UTL - Top	see note	Hand Meas.Top	
Thickness	/	UTL - Top Bottom		Hand Meas.Bot	
Soil Conditions	/	Swing Ties From Structure			Approx. Dist.
UTL Type	Electric	A			
Nominal Pipe Size	/	B			
UTL Material	/	C			

Remarks:

No electric marked by USA at this location. All location marked behind curb line. See TH #'s 21-23 for utility data.

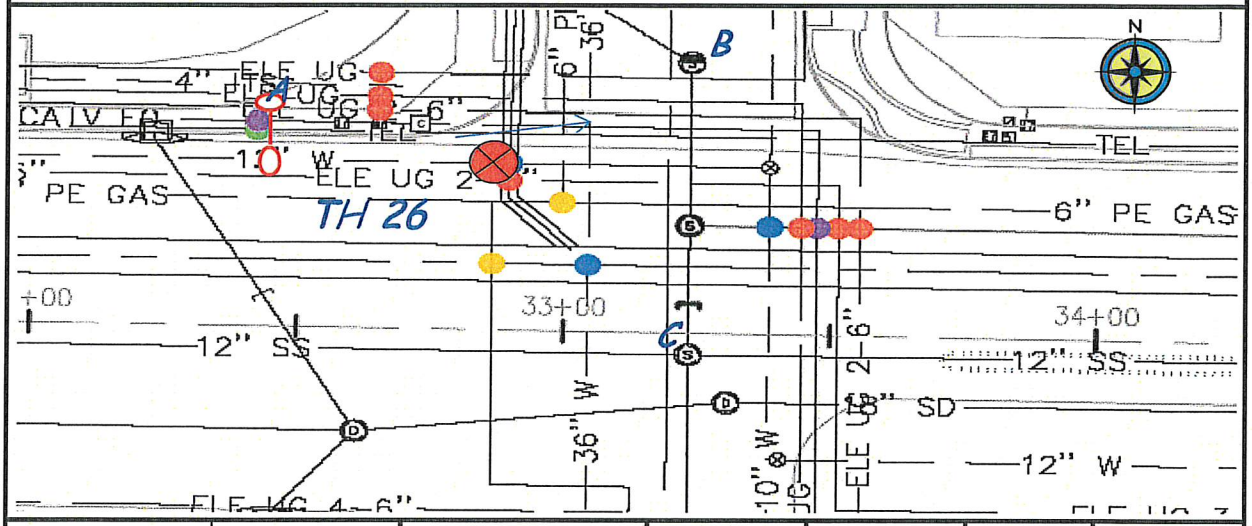
Data Entered By: JN

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	26	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/07/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Nail / Disc
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Asphalt		*Calc. UTL - Top*	**4.54'**	*Hand Meas.Top*	
Thickness	5"		*UTL - Top Bottom*		*Hand Meas.Bot*	
Soil Conditions	Type II		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Water		**A**	Street Light		26'
Nominal Pipe Size	12"		**B**	Sewer Manhole		39'
UTL Material	Plastic		**C**	Sewer Manhole		55'

Remarks:

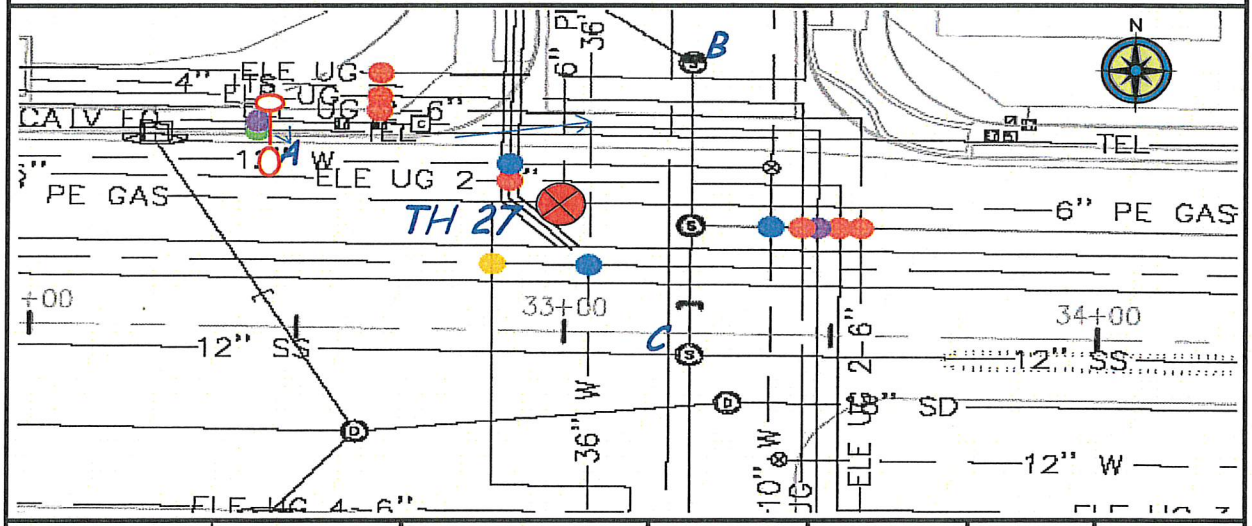
Data Entered By: JN

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	27	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/07/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Nail / Disc
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Asphalt		*Calc. UTL - Top*	**2.36'**	*Hand Meas.Top*	
Thickness	5"		*UTL - Top Bottom*		*Hand Meas.Bot*	
Soil Conditions	Type II		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Gas		**A**	Street Light		34'
Nominal Pipe Size	6"		**B**	Sewer Manhole		41'
UTL Material	Plastic		**C**	Sewer Manhole		45'

Remarks:

Reference point set 1 foot north of gas tee connection.

Data Entered By: CP

Reviewed By: RT

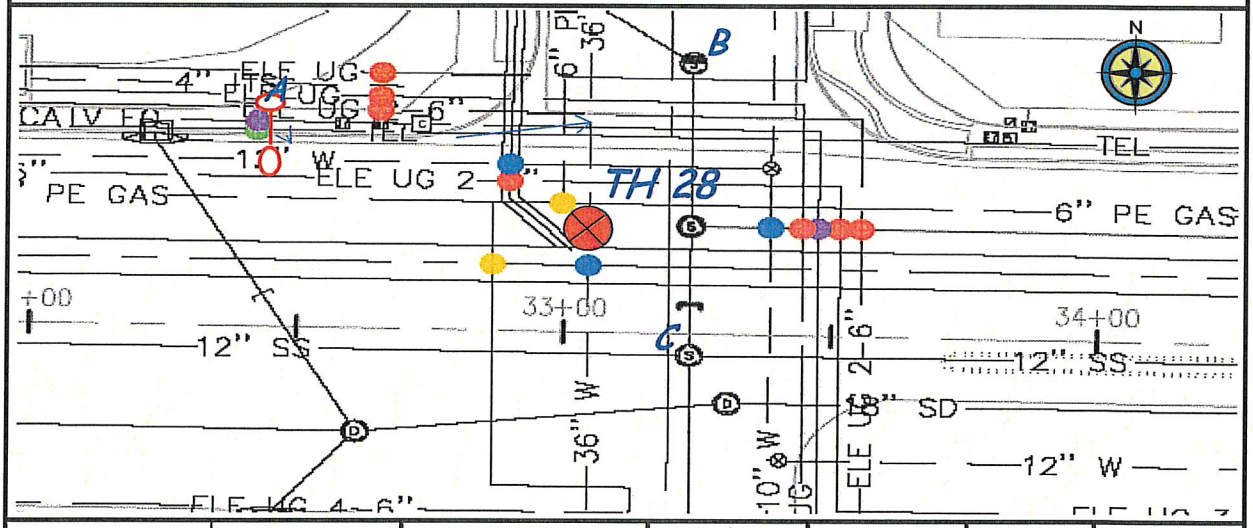
TEST HOLE DATA SHEET

Test Hole No.	28
Date Excavated	01/16/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

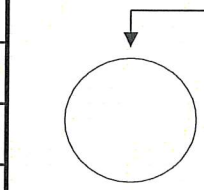
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SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Asphalt
Thickness	4"
Soil Conditions	Rocky
UTL Type	Water
Nominal Pipe Size	36" per plan
UTL Material	MLCP



Rod @ UTL-Top		Marker Set	Nail/Disc
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**16.81'**	Hand Meas.Top	
UTL - Top Bottom		Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	Street Light	44'
B	Sewer Manhole	40'
C	Sewer Manhole	32'

Remarks:

Attempted first pothole at requested location. Encountered large boulder at 9' deep. Moved second attempt north approx 10'. Unable to expose full width of pipe due to depth and soil conditions.

Data Entered By: JN

Reviewed By: RT

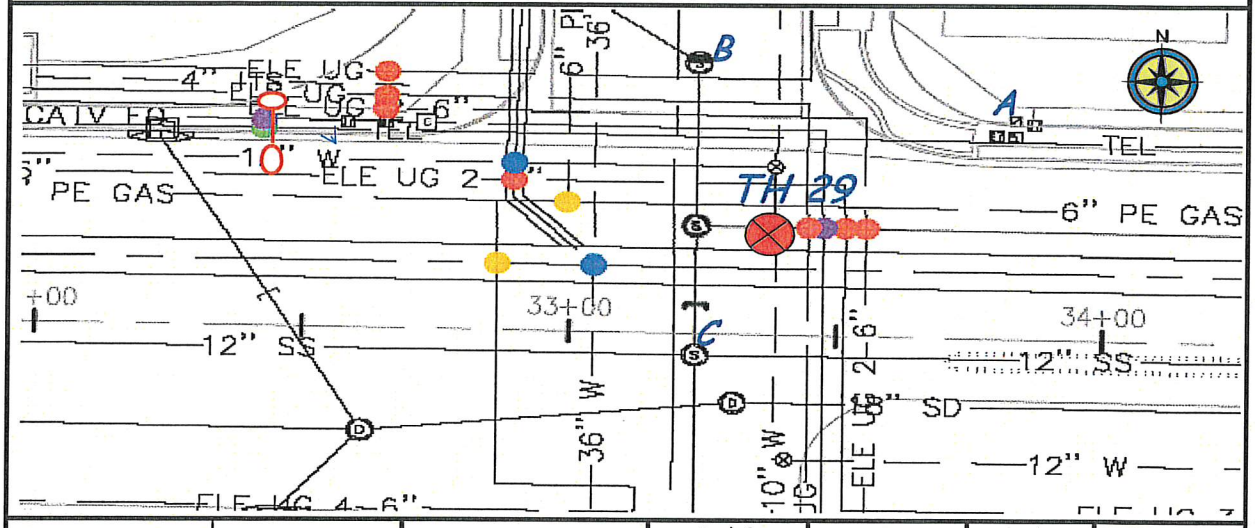
TEST HOLE DATA SHEET

Test Hole No.	29
Date Excavated	01/07/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

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SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		Rod @ UTL-Top		Marker Set	Nail & Disc
Rod @ Monument	/		Rod @ UTL-Bot.		Elev.	/
English / Metric	English		Rod @ Marker			
Surface Type	Asphalt		Calc. UTL - Top	**4.67'**	Hand Meas.Top	
Thickness	5"		UTL - Top Bottom		Hand Meas.Bot	
Soil Conditions	Rocky/Type II		Swing Ties From Structure			Approx. Dist.
UTL Type	Water		**A**	Electric Meter Box		51'
Nominal Pipe Size	10"		**B**	Sewer Manhole		41'
UTL Material	Plastic		**C**	Sewer Manhole		34'

Remarks:

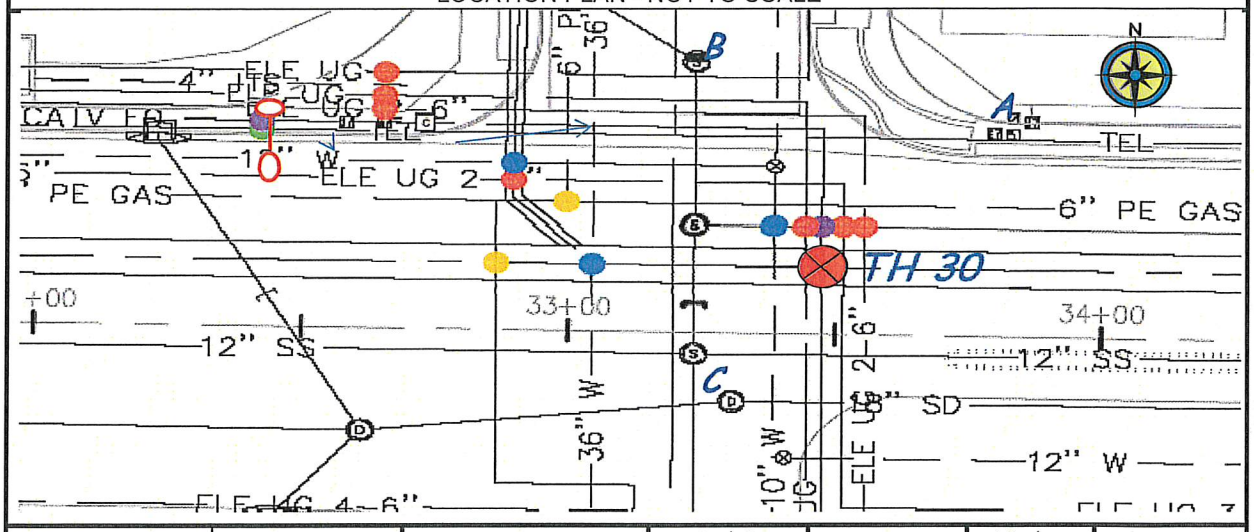
Data Entered By: JN

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	30	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	SUE Crew	SA\SG
Date Excavated	01/07/13		City	Las Vegas
Client Project No.	**CLV 1201**		County	Clark
Cardno TBE Project No	NV114-007-00		Route No.	Elkhorn
Cardno TBE Truck No	550421		Location	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		Rod @ UTL-Top		Marker Set	Nail & Disc
Rod @ Monument	/		Rod @ UTL-Bot.		Elev.	/
English / Metric	English		Rod @ Marker			
Surface Type	Asphalt		Calc. UTL - Top	**1.77'**	Hand Meas.Top	
Thickness	5"		Calc UTL - Bot	**5.15'**	Hand Meas.Bot	
Soil Conditions	Type II		Swing Ties From Structure			Approx. Dist.
UTL Type	Tele / FO		**A**	Electric Meter Box		38'
Nominal Pipe Size	6 X 4" / 3 X ?"		**B**	Sewer Manhole		47'
UTL Material	Plastic		**C**	Sewer Manhole		43'

Remarks:

Unable to get full visual on all pipes due to configuration.

Data Entered By: JN

Reviewed By: RT

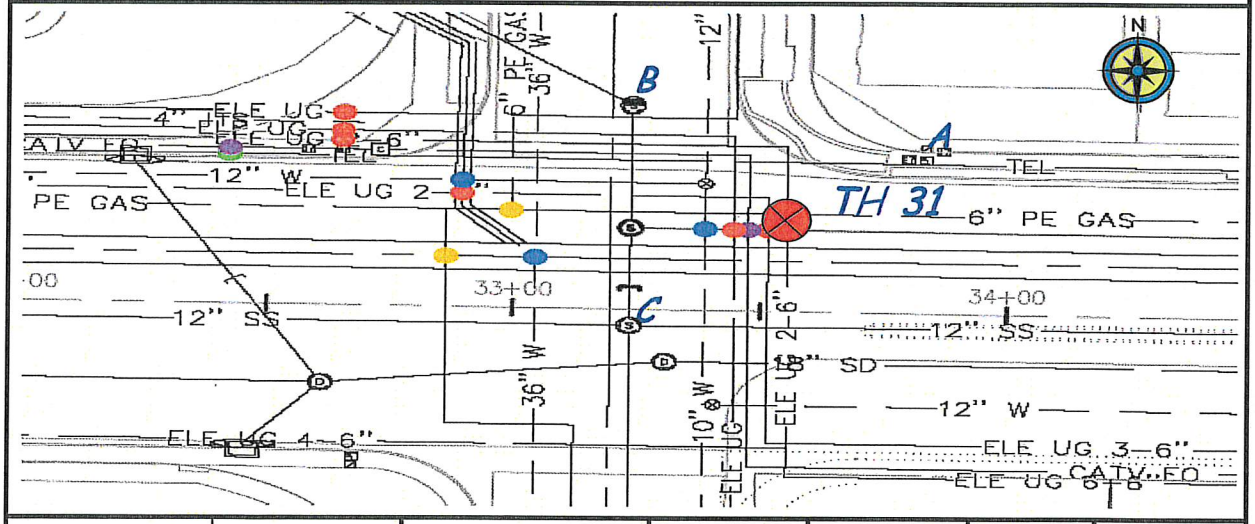
TEST HOLE DATA SHEET

Test Hole No.	31
Date Excavated	01/07/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

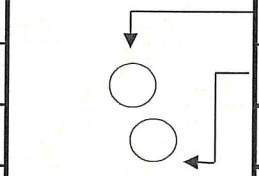
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SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Asphalt
Thickness	5"
Soil Conditions	TypeII\Rock
UTL Type	Electric
Nominal Pipe Size	2X6"
UTL Material	Plastic



Rod @ UTL-Top		Marker Set	Nail\Disk
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**4.00'**	Hand Meas.Top	
Calc. UTL-Bot	**5.04'**	Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	Electric Meter Box	37'
B	Sewer Manhole	49'
C	Sewer Manhole	43'

Remarks:

Data Entered By: CP

Reviewed By: RT

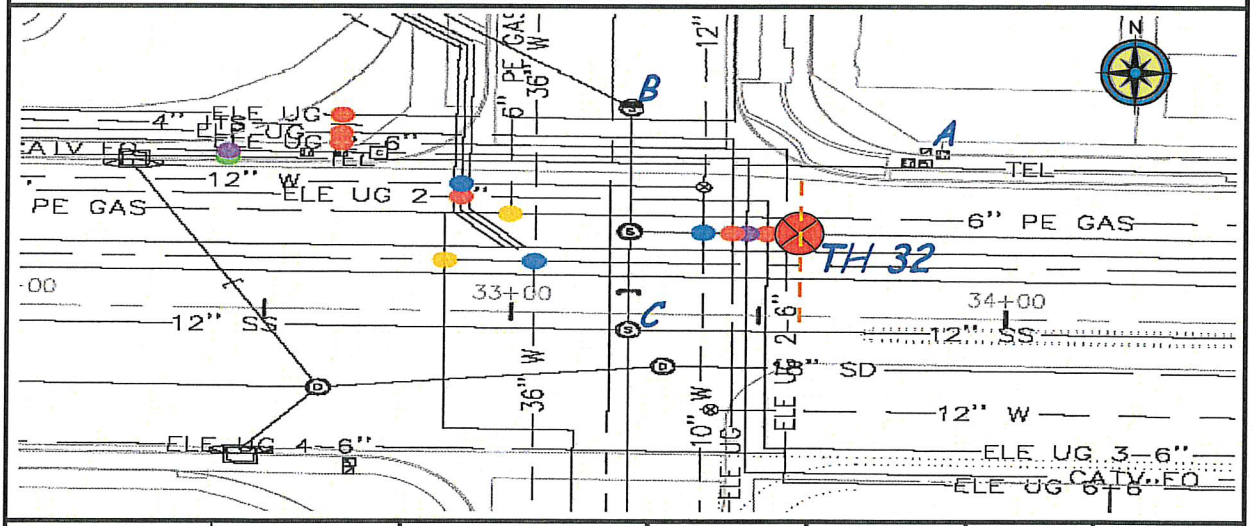
TEST HOLE DATA SHEET

Test Hole No.	32
Date Excavated	01/07/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

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SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Tee Pee

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Asphalt
Thickness	5"
Soil Conditions	Rocky
UTL Type	Fiber Optic
Nominal Pipe Size	2 x 3"
UTL Material	Plastic

Rod @ UTL-Top		Marker Set	Nail\Disk
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**1.42'**	Hand Meas.Top	
Calc. UTL-Top		Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	Electric Meter Box	36'
B	Sewer Manhole	51'
C	Sewer Manhole	44'

Remarks:

Data Entered By: CP

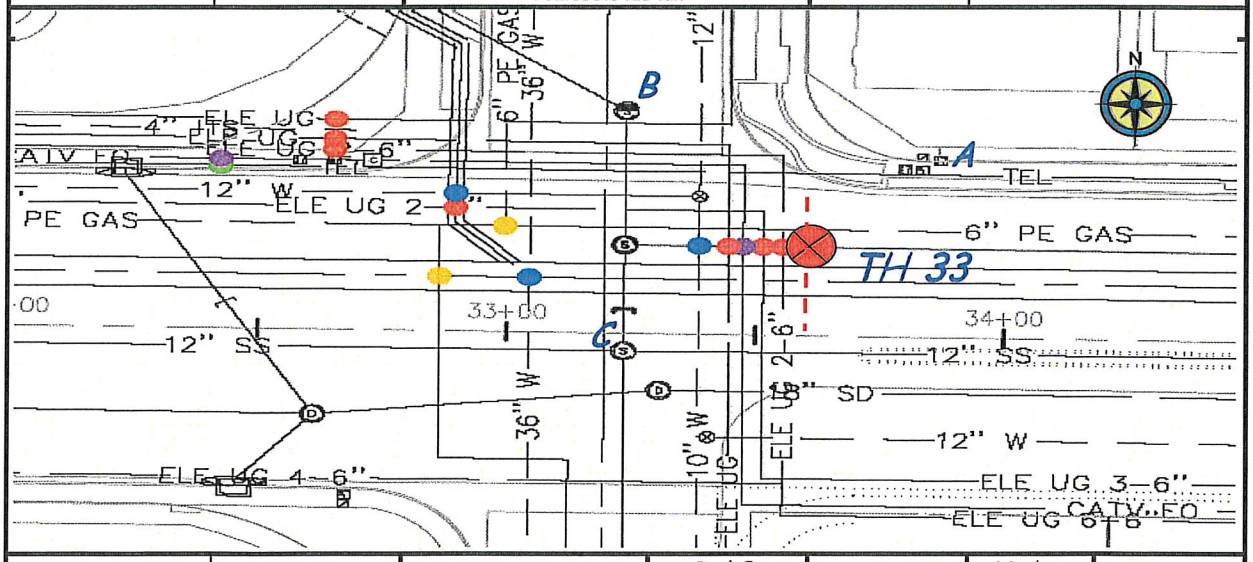
Reviewed By: RT

TEST HOLE DATA SHEET

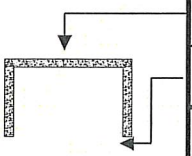
Test Hole No.	33
Date Excavated	01/07/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

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SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Tee Pee



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Asphalt
Thickness	5"
Soil Conditions	Rocky
UTL Type	Electric\Fiber Optic
Nominal Pipe Size	32" wide
UTL Material	Concrete



Rod @ UTL-Top		Marker Set	Nail\Disk
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**3.52'**	Hand Meas.Top	
UTL-Bot	**4.62'**	Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	Electric Meter Box	30'
B	Sewer Manhole	56'
C	Sewer Manhole	51'

Remarks:

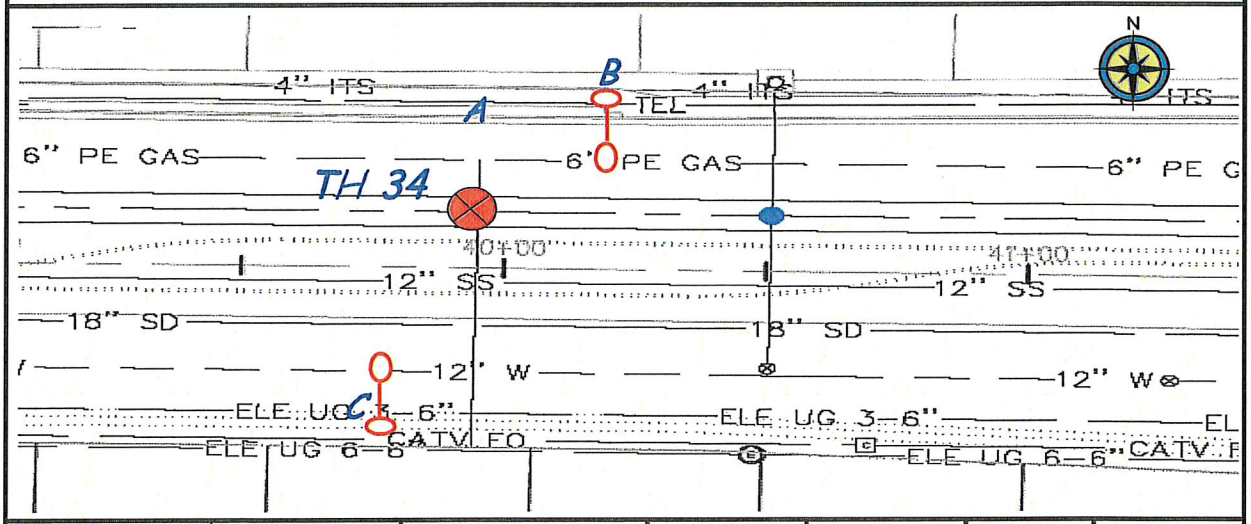
Data Entered By: JN

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	34	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/03/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Fresh Rain

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Nail\Disk
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Asphalt		*Calc. UTL - Top*	**4.70'**	*Hand Meas.Top*	
Thickness	4"		*UTL-Bot*		*Hand Meas.Bot*	
Soil Conditions	Rocky/Sandy		*Swing Ties From Structure*		*Approx. Dist.*	
UTL Type	Gas		**A**	Face Of Curb	29'	
Nominal Pipe Size	2"		**B**	Street Light	42'	
UTL Material	Plastic		**C**	Street Light	80'	

Remarks:

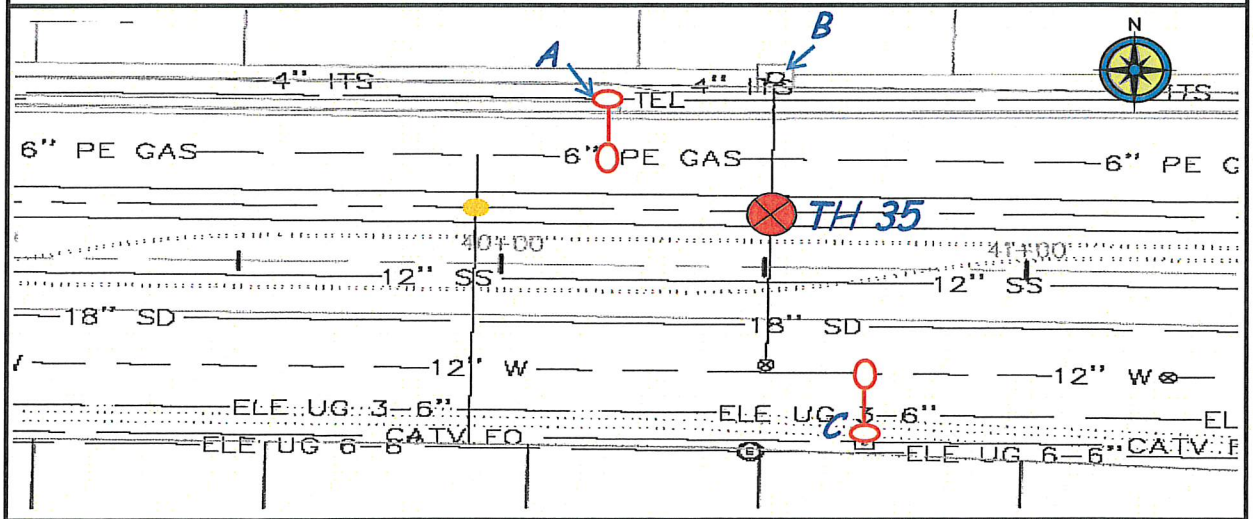
Data Entered By: JN

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	35	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	SUE Crew	SA\SG
Date Excavated	01/03/13		City	Las Vegas
Client Project No.	**CLV 1201**		County	Clark
Cardno TBE Project No	NV114-007-00		Route No.	Elkhorn
Cardno TBE Truck No	550421		Location	Fresh Rain

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		Rod @ UTL-Top		Marker Set	Nail\Disk
Rod @ Monument	/		Rod @ UTL-Bot.		Elev.	/
English / Metric	English		Rod @ Marker			
Surface Type	Asphalt		Calc. UTL - Top	**4.49'**	Hand Meas.Top	
Thickness	4"		UTL-Bot		Hand Meas.Bot	
Soil Conditions	Rocky\Type II		Swing Ties From Structure			Approx. Dist.
UTL Type	Water		**A**	Street Light		42'
Nominal Pipe Size	6"		**B**	Fire Hydrant		37'
UTL Material	Plastic		**C**	Street Light		69'

Remarks:

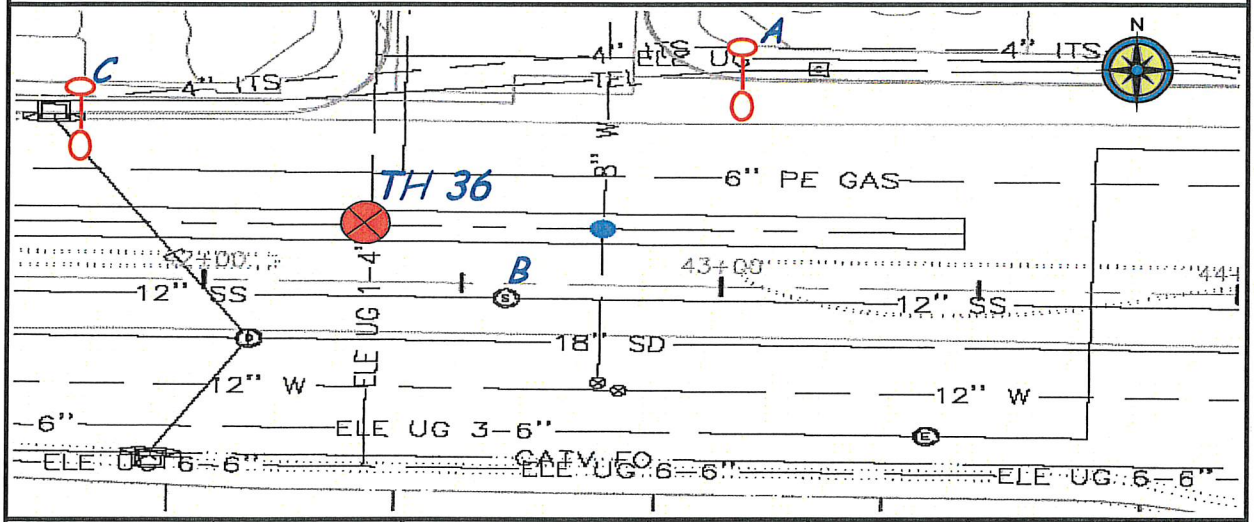
Data Entered By: JN

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	36	Cardno TBE 10649 Jeffreys Street Henderson, NV. 89052 702.458.4092 702.895.8415 fax	*SUE Crew*	SA\SG
Date Excavated	01/03/13		*City*	Las Vegas
Client Project No.	***CLV 1201***		*County*	Clark
Cardno TBE Project No	NV114-007-00		*Route No.*	Elkhorn
Cardno TBE Truck No	550421		*Location*	Fresh Rain

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		*Rod @ UTL-Top*		*Marker Set*	Nail\Disk
Rod @ Monument	/		*Rod @ UTL-Bot.*		*Elev.*	/
English / Metric	English		*Rod @ Marker*			
Surface Type	Asphalt		*Calc. UTL - Top*	**3.45'**	*Hand Meas.Top*	
Thickness	4"		*UTL-Bot*		*Hand Meas.Bot*	
Soil Conditions	Slurry		*Swing Ties From Structure*			*Approx. Dist.*
UTL Type	Electric		**A**	Street Light		93'
Nominal Pipe Size	4"		**B**	Sewer Manhole		40'
UTL Material	Plastic		**C**	Street Light		70'

Remarks:

Data Entered By: JN

Reviewed By: RT

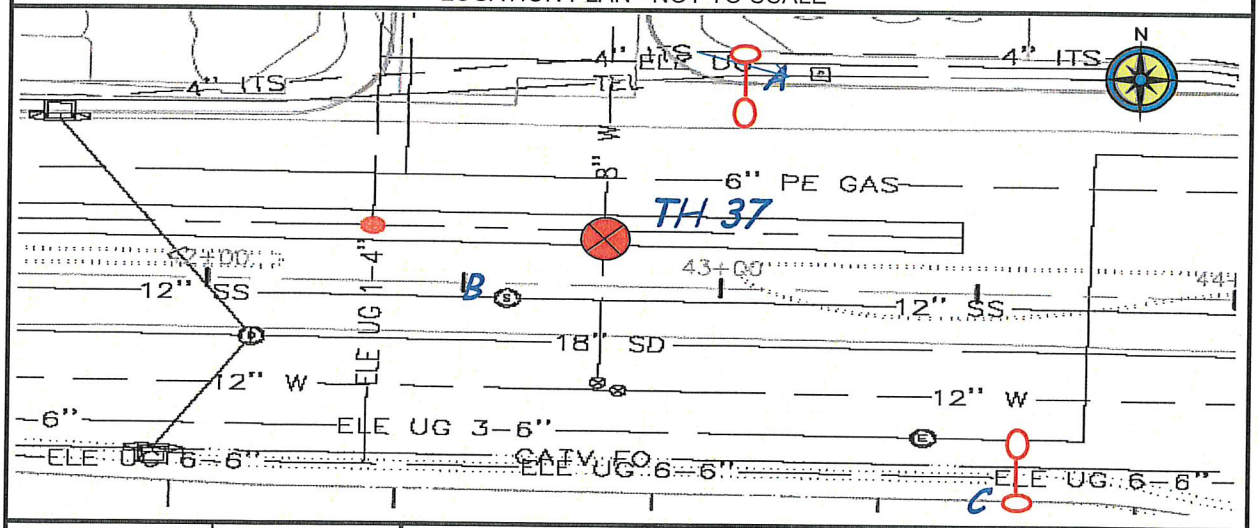
TEST HOLE DATA SHEET

Test Hole No.	37
Date Excavated	01/03/13
Client Project No.	**CLV 1201**
Cardno TBE Project No	NV114-007-00
Cardno TBE Truck No	550421

Cardno TBE
10649 Jeffreys Street
Henderson, NV. 89052
702.458.4092
702.895.8415 fax

SUE Crew	SA\SG
City	Las Vegas
County	Clark
Route No.	Elkhorn
Location	Fresh Rain

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/
Rod @ Monument	/
English / Metric	English
Surface Type	Asphalt
Thickness	5"
Soil Conditions	Type II\Rocky
UTL Type	Water
Nominal Pipe Size	8"
UTL Material	Plastic

Rod @ UTL-Top		Marker Set	Nail\Disk
Rod @ UTL-Bot.		Elev.	/
Rod @ Marker			
Calc. UTL - Top	**4.61'**	Hand Meas.Top	
UTL-Bot		Hand Meas.Bot	

Swing Ties From Structure		Approx. Dist.
A	Street Light	52'
B	Sewer Manhole	26'
C	Street Light	106'

Remarks:

Data Entered By: JN

Reviewed By: RT