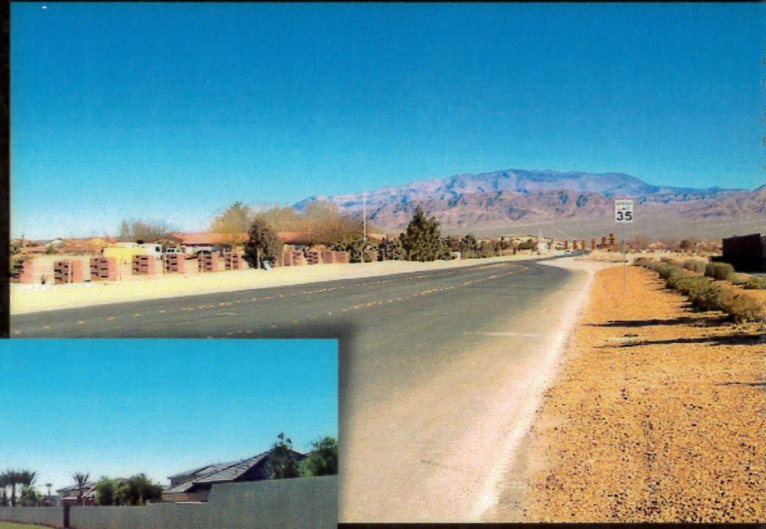


*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

**Rainbow Storm Drain
Elkhorn to Grand Teton**



November 2008

prepared for



prepared by



*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

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Elkhorn to Grand Teton**

November 2008

Prepared for



City of Las Vegas

Prepared by



W.O. #6952



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n=0.013
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1.0 INTRODUCTION

This Addendum Number 1 has been prepared to document the progress of the design for the Rainbow Storm Drain, Elkhorn Road to Grand Teton Drive. The purpose of this addendum is to provide updated project design analysis that has been performed since the 90% Design Submittal, which included, the Final Design Report and the 90% - Civil Plans, Cost Estimate, and Specifications. The Final Design Report for the Las Vegas Wash Middle Branch – Rainbow Storm Drain, Elkhorn to Grand Teton was dated July 2008 and should be used with this addendum for reference. (Refer to the Final Design Report for unchanged calculations not contained within this addendum). This addendum contains updated calculations and reference information that has changed due to the progress of the design, approval of the 2008 MPU, or to comments received since the 90% Design Submittal.

2.0 HYDROLOGIC SUMMARY

The 100-year surface flow rates were derived from the HEC-1 models in the Final Design Report; refer to that document for the HEC-1 files. A summary table has been provided below illustrating design flows at each particular combination point as well as the adjusted depth area reduction factor (DARF). Also included in this summary table is the corresponding tributary area.

TABLE 2.0.1 – HEC-1 SUMMARY TABLE

Location	Design Point	100-year Flow Rate (cfs)	Trib. Area (mi ²)	DARF Area ¹ (mi ²)	DARF Value
Golf Course north of Grand Teton	CNW163-C	938	5.86	2.22	0.928
Grand Teton west of Golf Course	CNW139-C	1124	1.24	1.24	0.960
Grand Teton and Golf Course	2C163-C	1921	7.10	3.46	0.915
Whispering Sands west of Rainbow	NW162-C	134	0.25	0.25	0.990
Whispering Sands and Rainbow	CNW162-C	2001	7.35	3.71	0.913
Farm west of Rainbow	DNW161-C	115	0.33	0.33	0.987
Farm and Rainbow	CD161-C	2063	7.68	4.04	0.910
Severance west of Rainbow	CNW150-C	270	1.16	1.16	0.964
Severance and Rainbow	CCNW150-	2282	8.84	5.20	0.904
Elkhorn west of Rainbow	NW159-C	145	0.25	0.25	0.990
Elkhorn and Rainbow	CNW159	2385	9.08	5.44	0.903

¹ DARF Area subtracts the area from upstream detention basins to obtain a higher flow

2.1 HYDROLOGIC STUDY COMPARISON

Several hydrologic Master Plan Models have been produced for the project tributary area including the 1999 Northwest Neighborhood Study Phase II, 2002 Master Plan Update, 2007 Racel Street Collector Master Plan Amendment, and the 2008 Master Plan Update. Each of these master plan models was referenced for the hydrologic model for this project; refer to the Final Design Report for the design HEC-1 model. The project HEC-1 model features a design flow rate of 1124 cubic feet per second in the Grand Teton System based on the Racel Street Collector Master Plan Amendment approved in January of 2007. The 1999 Northwest Neighborhood Study Phase II has a significantly higher flow rate of 1754 cfs at this location. The Northwest Neighborhood Study included a larger tributary area. A portion of the area was diverted into master planned detention basins upstream, thus reducing the ultimate flow rate. The 2008 MPU flow rates for the area were compared against the 2007 Racel Street Collector MPA flows, and were found to be a couple hundred cubic feet per second lower in general. In a conservative approach, the CLV and the CCRFCD collectively agreed the 2007 MPA flows should be used for the design of the Rainbow Storm Drain facilities; refer to Meeting Memorandum Number 8 in Appendix C. Table 2.1.1 below is a comparison of flow rates between the different hydrologic studies.

TABLE 2.1.1 – HYDROLOGIC STUDY COMPARISON TABLE

Location	Design Point	2002 MPU Flow Rate (cfs)	2007 MPA Flow Rate ^{††} (cfs)	2008 MPU Flow Rate (cfs)
Golf Course north of Grand Teton	CNW163-C	2555	938	679
Grand Teton west of Golf Course	CNW139-C	1359	1124	968
Grand Teton and Golf Course	2C163-C	3528	1921	1585
Whispering Sands west of Rainbow	NW162-C	133	134	134
Whispering Sands and Rainbow	CNW162-C	3528	2001	1664
Farm west of Rainbow	DNW161-C	116	115	115
Farm and Rainbow	CD161-C	3528	2063	1664
Severance west of Rainbow	CNW150-C	197	270	181
Severance and Rainbow	CCNW150-	3528	2282	1664
Elkhorn west of Rainbow	NW159-C	144	145	129
Elkhorn and Rainbow	CNW159	3528	2385	1916

^{††}These numbers indicate design flow rates used for this project.

Appendix A contains maps and figures that pertain to this project including: the FEMA Flood-Zone Map, 2002 and 2008 Master Plan Update Figures, 2007 Racel Street Collector Master Plan Amendment Figures, and a Drop Inlet Summary Figure. The Master Plan Update and Master Plan Amendment figures included in Appendix A were obtained from the original document so that they are more distinct and clear. All hydrologic and hydraulic calculations were derived from and done in accordance with the "Hydrologic Criteria and Drainage Design Manual" published by the Clark County Regional Flood Control District. The updated hydraulic calculations can be found in Appendix B and include: Drop Inlet Calculations, Modified Standard Form 6, D-Load Calculations, WSPGW Models, and HY8 Analysis. Pre-Final Storm Drain Plan and Profile Drawings have been included in Appendix D as well.

3.0 SUPPLEMENTAL DOCUMENTATION

Since the 90% submittal, there have been several meetings between CLV, VTN, and various utility companies; the associated meeting minutes have been provided in Appendix C. This Addendum also includes the responses to all review comments that were provided to VTN for the Final Design Report, the 90% - Civil Plans, Cost Estimate, and Specifications. (Refer to Appendix C for all comment responses and matrices). In addition to the meeting minutes and review comment matrices, additional potholes were completed for several water and gas crossings that are in potential conflict. This pothole data and an updated Utility Conflict Matrix have also been included in Appendix C.

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Appendix A

Maps and Figures

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A.1

FEMA - Firm Map

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevation (BFE)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevation (CBFE) shown on this map apply only landward of 0.0' North American Vertical Datum (NAVD). Users of this FIRM should be aware that coastal flood elevations may also be provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map is Universal Transverse Mercator (UTM) Zone 11. The horizontal datum is NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Vertical Network Branch, N/G13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by Clark County Regional Flood Control District. This information was obtained using Orthophotography, dated 1999 or newer, and GIB/DIME data. Segments were digitized off of the orthophotography based on center of pavement.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and Internet address for information on all related products available from FEMA:

Phone: 800-358-8616
FAX: 800-358-9620
www.fema.gov/mis

If you have **questions** about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at www.fema.gov.

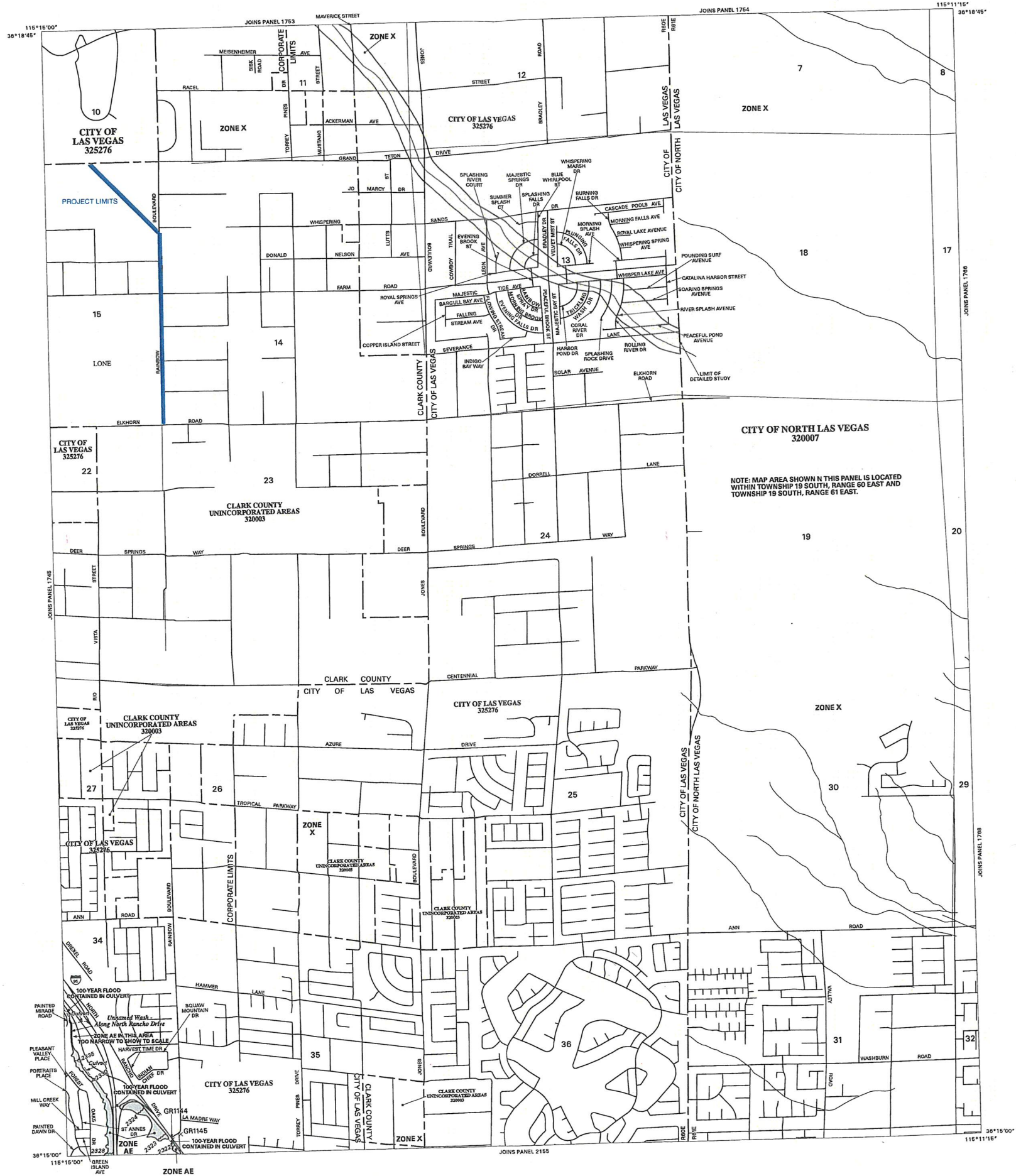
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report may reflect stream channel distances that differ from what is shown on this map.

This Digital Flood Insurance Rate Map (DFIRM) was produced through a unique partnership between Clark County and the Federal Emergency Management Agency (FEMA). Clark County has developed a long-term approach of floodplain management to decrease the costs associated with flooding. This is demonstrated by the Clark County commitment to share and maintain floodplain layers within their Geographic Information System Management Office (GISMO).

This DFIRM reflects several innovative features. These include:
+ Southern Nevada GIS - Cooperation among local governmental agencies throughout Clark County. The foundation of cooperation is the GIS Interlocal Agreements formed between fourteen regional participants. In part, the agreements specify that the Clark County GIS Management Office (GISMO) will be responsible for maintaining a GIS data warehouse and associated Southern Nevada GIS Metadata.

+ The GISMO's responsibilities go beyond maintaining the GIS data warehouse. GISMO also maintains the Street Centerline Database used by 911 dispatch services. This centerline database serves as the base map for this DFIRM.

DIGITAL DATA AVAILABILITY: <http://www.co.clark.nv.us/cit/gis/gismo.htm>



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 Zone 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.
- ~~~~~ 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

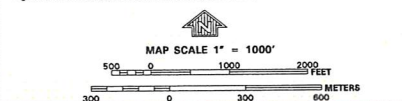
- (A) — (A) Cross Section Line
- (25) — (25) Transect Line
- 97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4276000M 1000-meter Universal Transverse Mercator grid values, zone 11
- 600000 FT 5000-foot grid ticks
- DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel).
- 0 M1.5 River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
AUGUST 16, 1995

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 27, 2002: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to delete special flood hazard areas, to change zone designations, to add roads and road names, to incorporate previously issued letters of map revision, to incorporate previously issued letters of map amendment, and to change floodway.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at (800) 638-6620.



PANEL 1765 E

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

PANEL 1765 OF 4090
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS	NUMBER	PANEL	SUFFIX
CITY OF LAS VEGAS, CITY OF NORTH LAS VEGAS, CITY OF CLARK COUNTY, UNINCORPORATED AREAS	32007	1765	E
	32579	1765	E
	32003	1765	E

Notice to User: The Map Number shown below should be used when placing the order. The Community Number shown above should be used in insurance applications for the subject community.

MAP NUMBER
32003C1765 E

MAP REVISED:
SEPTEMBER 27, 2002

Federal Emergency Management Agency

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A.2

CCRFC Master Plan Figures

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A.2.1

2002 MPU Figures

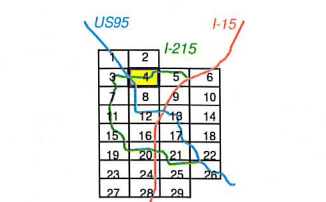
2002
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE
(AMENDED 2005)

LEGEND

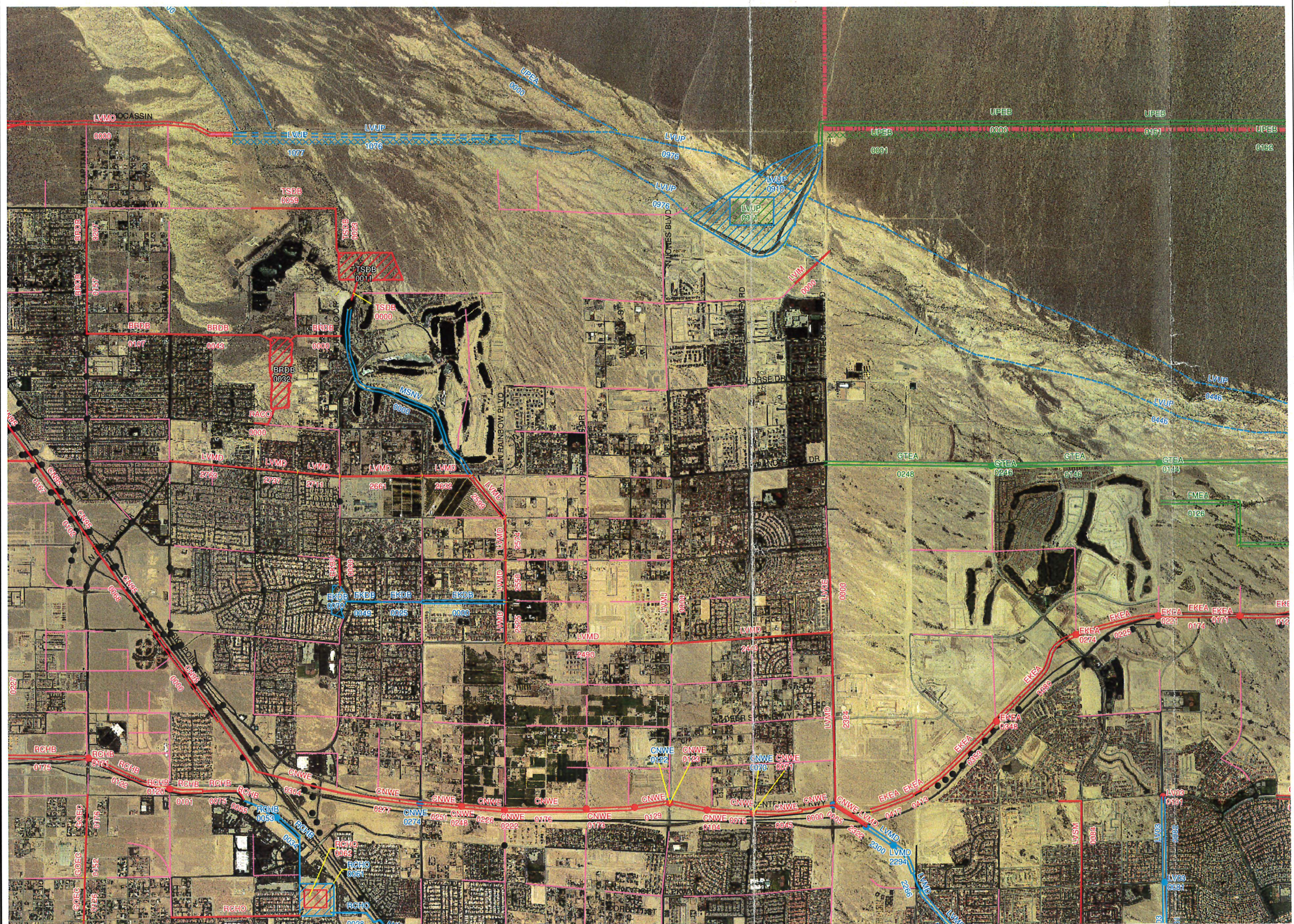
- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin

- Culvert
- Bridge
- Pipeline
- Lined Channel
- Unlined Channel
- Dike
- Natural Wash
- ID-Mile Separator

SCALE: 1 inch = 3000 feet



Amended MPU
Flood Control Facilities
Figure F-4



ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
CN95								
0000	P3	Conc Chnl 22"W 10'D 0:1 SS	3600	3533	CDBB3-C	CWEST3	4.68	0.84
0068	P1	3: 8" X 7" RCBC	1800	3192	CNW103-C	CWEST3	4.12	2.12
0102	P1	3: 8" X 6" RCBC	3400	2850	2CNW89-C	CWEST3	3.73	2.09
0167	P1	2: 10" X 7" RCBC	1700	2421	3CNW72-C	CWEST3	3.03	1.50
0199	P1	10" X 9" RCBC	1703	2081	2CNW72-C	CWEST3	2.20	1.84
0259	P1	96" RCP	1688	923	CNW74-C	CWEST3	0.80	1.53
CNEA								
0176	P3	Conc Chnl 15"W 6.5'D 0:1 SS	1500	948	CNN078-C	CWEST3	1.13	0.86
CNGT								
0000	P1	66" RCP	3640	399	CNW71-C	CWEST3	0.84	3.09
CNWE								
0000	E	2: 27" X 10" RCBC @ Beltway	278	4834	CNW3D3-C	CWEST3	7.73	1.50
0005	P2	2: 27" X 10" RCB	764	4834	CNW3D3-C	CWEST3	7.73	1.10
0020	E	2: 27" X 10" RCB @ Decatur	308	4834	CNW3D3-C	CWEST3	7.73	2.60
0026	P2	2: 27" X 10" RCB	953	4834	CNW3D3-C	CWEST3	7.73	0.60
0045	P2	Conc Chnl 56"W 10'D 0:1 SS	1404	4834	CNW3D3-C	CWEST3	7.73	0.59
0070	E	27" X 10" RCBC @ Bradley	220	4834	CNW3D3-C	CWEST3	7.73	0.40
0071	P1	Add 27" X 10" RCBC @ Bradley	220	4834	CNW3D3-C	CWEST3	7.73	0.40
0075	P2	Conc Chnl 56"W 10'D 0:1 SS	1498	4735	2C3B4-C	CWEST3	7.47	0.40
0104	P2	56" X 10" RCBC	350	4735	2C3B4-C	CWEST3	7.47	0.40
0110	P2	Conc Chnl 56"W 10'D 0:1 SS	641	4735	2C3B4-C	CWEST3	7.47	0.40
0122	E	20" X 10" RCBC @ Jones	350	4735	2C3B4-C	CWEST3	7.47	0.40
0123	P2	36" X 10" RCBC @ Jones	350	4735	2C3B4-C	CWEST3	7.47	0.40
0129	P2	Conc Chnl 56"W 10'D 0:1 SS	763	4547	CNW3B3-C	CWEST3	6.71	0.40
0143	P2	56" X 10" RCBC	352	4547	CNW3B3-C	CWEST3	6.71	0.40
0150	P2	Conc Chnl 42"W 10'D 0:1 SS	1182	4547	CNW3B3-C	CWEST3	6.71	0.40
0173	P2	42" X 10" RCBC @ Torrey Pines	190	4547	CNW3B3-C	CWEST3	6.71	0.40
0176	P2	Conc Chnl 32"W 10'D 0:1 SS	2440	4547	CNW3B3-C	CWEST3	6.71	0.60
0222	P2	32" X 10" RCBC @ Rainbow	200	4520	CNW2D4-C	CWEST3	6.47	0.60
0226	P2	Conc Chnl 12"W 12'D 2:1 SS	1165	4390	CNW2D3-C	CWEST3	5.97	1.00
0248	P2	36" X 8" RCBC @ Rio	150	4390	CNW2D3-C	CWEST3	5.97	0.59
0251	P2	Conc Chnl 12"W 12'D 2:1 SS	1219	4390	CNW2D3-C	CWEST3	5.97	0.59
0274	E	32" X 10" RCBC @ Tenaya	140	4390	CNW2D3-C	CWEST3	5.97	0.45
0277	P2	Conc Chnl 13"W 10'D 2:1 SS	1430	3853	CNW2B2-C	CWEST3	5.16	0.45
0304	P2	32" X 10" RCB	6510	3853	CNW2B2-C	CWEST3	5.16	1.00
EKBU								
0000	P1	84" RCP	800	444	NW134-C	CWEST3	0.54	1.00
EKDB								
0000	P3	Grass Chnl 15"W 5'D 4:1 SS	2640	269	CNW150-C	WEST3	1.16	0.57
0025	P1	54" RCP	1320	129	ELKBASIN	WEST3	0.91	1.50
0049	E	60" RCP	938	129	ELKBASIN	WEST3	0.91	0.13
0068	E	7,200 cfs PMF Spillway		7200	CNW133-C	WEST3	0.91	
0069	E	60" RCP Outlet	100	129	ELKBASIN	WEST3	0.91	
0070	E	48 ac-ft Elkhorn Springs Detention Basin		720	CNW133-C	WEST3	0.91	
EKEA								
0124	P2	Conc Chnl 40"W 7.5'D 0:1 SS	2440	2017	CELK06E	CWEST3	3.01	0.80
0171	P2	40" X 7.5' RCBC	190	1888	CELK06D	CWEST3	2.76	0.80
0174	P2	Conc Chnl 30"W 7.5'D 0:1 SS	2480	1888	CELK06D	CWEST3	2.76	0.50
0221	P2	30" X 7.5' RCBC	195	1727	CNN048-C	CWEST3	2.51	0.50
0225	P2	Conc Chnl 30"W 7.5'D 0:1 SS	2600	1727	CNN048-C	CWEST3	2.51	0.38
0274	P2	30" X 7.5' RCBC	305	1486	2C035-C	CWEST3	2.16	0.38
0280	P2	Conc Chnl 20"W 8.5'D 0:1 SS	3570	826	CNN035-C	CWEST3	1.04	0.25
0348	P2	16" X 9" RCBC	270	568	CNN020-C	CWEST3	0.65	0.30

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
EKEA								
0353	P2	ELKHORN ROAD CHANNEL EAST - continued						
0413	P2	Conc Chnl 16"W 7'D 0:1 SS	3160	378	NN021-C	CWEST3	0.41	0.30
0417	P2	10" X 5" RCBC	265	378	NN021-C	CWEST3	0.41	0.30
0417	P2	Conc Chnl 10"W 5'D 0:1 SS	1485	378	NN021-C	CWEST3	0.41	0.30
FMEA								
0076	P0	FARM ROAD CHANNEL EAST						
0076	P0	Conc Chnl 12"W 5'D 2:1 SS	2640	805	CELK06B	CWEST3	1.11	0.80
0126	P0	Conc Chnl 12"W 4.5'D 2:1 SS	4000	645	CELK06A	CWEST3	0.86	0.60
GOEC								
GOWAN NORTH - EL CAPITAN BRANCH								
0126	P1	10" X 7" RCB	1320	652	CTFRF-C	GW3SC	0.96	0.38
0152	P1	7" X 6" RCB	1320	502	CARFP-C	GW3SC	0.70	0.77
0176	P1	78" RCP	1320	376	CCPFR-C	GW3SC	0.46	1.15
GTEA								
GRAND TETON DRIVE CHANNEL EAST								
0000	P0	Conc Chnl 12"W 5.5'D 2:1 SS	7483	1307	CGT03E	CWEST3	2.89	1.03
0144	P0	12" X 7" RCBC	100	1141	CGT03D	CWEST3	2.55	1.50
0146	P0	Conc Chnl 12"W 5.5'D 2:1 SS	5300	1141	CGT03D	CWEST3	2.55	0.97
0246	P0	12" X 8" RCBC	100	1042	CGT03B	CWEST3	2.27	0.70
0248	P0	Conc Chnl 12"W 5.5'D 2:1 SS	5200	1042	CGT03B	CWEST3	2.27	0.74
LV03								
CLAYTON STREET CHANNEL								
0031	E	Conc Chnl 8"W 8.1'D 1.5:1 SS	2600	948	CNN054-C	CWEST3	1.00	0.40
0081	E	2: 10" X 7" RCBC @ Tropical	100	731	CNN052-C	CWEST3	0.74	0.42
0082	E	Conc Chnl 7"W 7.1'D 1.5:1 SS	2600	731	CNN052-C	CWEST3	0.74	2.80
0131	P1	7" X 7" RCBC @ Centennial	100	731	CNN052-C	CWEST3	0.74	2.00
LVDE								
LAS VEGAS WASH - DECATUR								
0000	P1	96" RCP	2640	509	CNW198-C	CWEST3	0.68	0.60
LVIM								
LAS VEGAS WASH AND IRON MOUNTAIN								
0000	P1	90" RCP	1300	555	CNW206-C	CWEST3	1.16	1.10
LVMD								
LAS VEGAS WASH - MIDDLE								
2197	E	Conc Chnl 50"W 10'D 0:1 SS	3629	5759	CNN030-C	CWEST5	19.66	1.04
2266	E	2: 24.5" X 10" RCBC @ Tropical	575	5698	CNN011-C	CWEST5	19.37	1.04
2276	E	Conc Chnl 50"W 10'D 0:1 SS	985	5698	CNN011-C	CWEST5	19.37	1.04
2294	E	2: 24.5" X 10" RCBC @ Ranchhouse	292	5698	CNN011-C	CWEST5	19.37	1.04
2300	E	Conc Chnl 50"W 10'D 0:1 SS	1100	5698	CNN011-C	CWEST5	19.37	1.48
2322	P2	2: 24.5" X 10" RCB	1200	3937	CNW3D4-C	WEST4	11.39	1.50
2324	P1	3: 12" X 10" RCB	5280	3937	CNW3D4-C	WEST4	11.39	0.36
2443	P1	3: 12" X 9 RCB	5280	3571	CNW188-C	WEST4	9.95	0.39
2490	P1	3: 12" X 9" RCB	5280	3528	CNW162-C*	WEST3	6.70	0.36
2525	P1	3: 12" X 9" RCB	1320	3528	CNW162-C*	WEST3	6.70	0.39
2550	P1	3: 12" X 9" RCB	1320	3528	CNW162-C*	WEST3	6.70	0.38
2574	P1	2: 12" X 10" RCB	1320	3528	CNW162-C*	WEST3	6.70	0.61
2599	P1	Conc Chnl 20"W 10.5'D 0:1 SS	1700	3528	CNW162-C	WEST3	6.70	0.70
2632	P1	11" X 9" RCBC	1400	1359	CNW139-C	WEST3	1.66	0.59
2661	P1	9" X 9" RCBC	2640	1359	CNW139-C	WEST3	1.66	1.00
2711	P1	9" X 7" RCBC	1320	1359	CNW139-C	WEST3	1.66	1.80
2737	P1	8" X 8" RCBC	1320	1359	CNW139-C	WEST3	1.66	1.81
2763	P1	78" RCP	2640	654	CNW109-C	WEST3	0.77	2.40
LVMJ								
LAS VEGAS WASH - JONES								
0000	P1	7" X 6" RCB	2600	310	CNW178-C	CWEST3	0.50	0.40
LVMO								
LAS VEGAS WASH - MOCCASIN								
0000	P1	Conc Chnl 30"W 12.5'D 0:1 SS	6800	12113	CNW130-C	VSPRING5	76.52	2.10
0127	P1	Conc Chnl 27"W 12.5'D 0:1 SS	7700	12092	3CNW64-C	VSPRING5	75.87	3.10
LVSM								
LAS VEGAS WASH-SIMMONS								
0000	P1	8" X 8" RCB	4000	699	CNN044-C	CWEST3	0.82	0.63
0084	P1	6" X 5" RCB	2700	490	CNN040-C	CWEST3	0.51	2.22

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
LVUP		UPPER LAS VEGAS WASH						
0446	E	Floodway	24000	4259	ULWDB	SPRING5	199.03	1.04
0908	E	182,000 cfs PMF Spillway		182000	ULWIN	LOWER	200.44	
0909	E	3: 108" RCP Outlet	100	4259	ULWDB	SPRING5	199.03	
0910	E	1,760 ac-ft Upper Las Vegas Wash Detention Basin		15918	ULWIN	LOWER	200.44	
0911	P0	Upgrade to 2,190 ac-ft Upper Las Vegas Wash Detention Basin		15918	ULWIN	LOWER	200.44	
0976	E	Floodway	7000	13317	ULWIN	SPRING5	199.03	0.71
1076	E	Unlined Chnl 300'W 8.5'D 3:1 SS	9200	13317	ULWIN	SPRING5	199.03	0.80
1077	E	Soil Cement Levee 8.5' with 300'W Chnl	9200	13317	ULWIN	SPRING5	199.03	0.82
MOKC		MOCCASIN AND KYLE CANYON						
0000	P1	12" X 10' RCB	6000	3891	2CNW64-C	VSPRING3	4.62	2.70
MSBU		MOUTAIN SPA AND BUFFALO						
0000	P1	9' X 8' RCB	2640	897	CCNW128	CWEST3	1.52	0.60
MSIM		MOUNTAIN SPA AND IRON MOUNTAIN						
0000	P1	10' X 9' RCBC	700	1755	CNW147-C	CWEST3	2.87	1.14
0004	P1	90" RCP	5280	857	2C113-C	CWEST3	0.91	2.27
0106	P1	90" RCP	1320	857	2C113-C	CWEST3	0.91	2.30
MSLC		MOUNTAIN SPA AND LOG CABIN						
0000	P1	90" RCP	2640	622	CNW148-C	CWEST3	0.84	1.03
MSNV		MOUNTAIN SPAVISTA RANCH						
0000	E	Grass Chnl 100'W 4.5'D 10:1 SS	6960	2555	CNW163-C	CWEST3	4.79	0.40
RCBC		RANCHO ROAD SYSTEM - BELTWAY CHANNEL						
0000	E	82 ac-ft Ft. Apache Detention Basin		1031	FADBIN	WEST3	1.23	
0001	E	10,310 cfs PMF Spillway		10310	FADBIN	WEST3	1.23	
0002	E	66" RCP Outlet with 42" Orifice	100	204	FADBIN	WEST3	1.23	
RCHB		RANCHO ROAD SYSTEM - BELTWAY CHANNEL						
0000	E	2: 12' X 8' RCB	1800	2543	CNW1C1-C	WEST3	4.81	0.50
0034	E	Conc Chnl 21'W 7.6'D 0:1 SS	1000	2282	CNWBE2-C	WEST3	4.50	0.80
0053	E	2: 12' X 8' RCBC	80	2282	CNWBE2-C	WEST3	4.50	1.38
0054	E	Conc Chnl 21'W 7.6'D 0:1 SS	600	2282	CNWBE2-C	WEST3	4.50	1.51
0065	E	2: 12' X 8' RCB	500	1985	CNWBC6-C	WEST3	4.16	0.30
0075	P2	2: 10' X 6' RCB	1400	1985	CNWBC6-C	WEST3	4.16	2.53
0101	P2	Conc Chnl 20'W 7.0'D 0:1 SS	1000	1985	CNWBC6-C	WEST3	4.16	0.94
0120	P2	2: 10' X 6' RCBC	100	1985	CNWBC6-C	WEST3	4.16	0.94
0122	P2	Conc Chnl 16'W 6'D 0:1 SS	2600	1985	CNWBC6-C	WEST3	4.16	2.27
0171	P1	16' X 7' RCBC	200	1767	CNWBC3	WEST3	3.91	1.75
0175	P2	Conc Chnl 16'W 6'D 0:1 SS	2700	1767	CNWBC3	WEST3	3.91	2.40
RCHO		RANCHO ROAD SYSTEM						
0028	E	54" RCP	1500	150	RCHDOB	WEST3	5.19	0.80
0056	P1	60" RCP	4000	227	NW1A-4-C	CWEST3	0.80	1.57
0059	P1	70,000 cfs PMF Spillway		70000	RCHOIN	WEST3	5.19	
0060	E	60" RCP Outlet	200	150	RCHODB	WEST3	5.19	
0061	E	125 ac-ft Rancho Road Detention Basin		2692	RCHOIN	WEST3	5.19	
0062	P1	Upgrade to 250 ac-ft Rancho Road Detention Basin		2692	RCHOIN	WEST3	5.19	
UPEA		UPPER LAS VEGAS WASH - EAST						
0000	E	Natural Wash 582'W	9600	4088	C116-9	VSHEEP5	14.84	1.00
UPEB		UPPER LAS VEGAS WASH - EAST BRANCH						
0000	P0	Rip Rap Chnl 140'W 5'D 3:1 SS	8500	4206	C102A	VSHEEP4	10.92	1.18
0001	P0	Rip Rap Levee 12'	8500	4206	C102A	VSHEEP4	10.92	1.18
0161	P0	Rip Rap Chnl 100'W 5'D 3:1 SS	10600	2790	102B	VSHEEP3	5.64	0.94
0162	P0	Rip Rap Levee 12'	10600	2790	102B	VSHEEP3	5.64	0.94
UPWE		UPPER LAS VEGAS WASH - WEST						
0000	E	Natural Wash 1001'W	24000	13460	C125A-15	VSHEEP5	190.36	1.30

2002 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

LEGEND

-  Ultimate Development Boundary
-  Watershed Boundary
-  Subarea Boundary
-  Flow Arrows

Flood Control Facilities

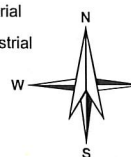
- Existing Facilities
— Proposed Facilities

Type Hydrologic Soil Groups

- Hydrologic Soil Groups**
- A** Low Runoff Potential
 - B** Moderately Low Runoff Potential
 - C** Moderately High Runoff Potential
 - D** High Runoff Potential

Typical Land Use

- Typical Land Use**
- 1 Undeveloped Land, Open Desert
 - 2 Parks, Golf Courses
 - 3 Rural
 - 4 Low Density Residential
 - 5 Medium Density Residential
 - 6 High Density Residential
 - 7 Public Facility, Multi Family
 - 8 Commercial, Office, Retail, Casino
 - 9 Light Industrial
 - 10 Heavy Industrial
 - 11 Schools
 - 12 Lakes
- 



0 1,000 2,000 3,000 4,000 5,000

Feet

SCALE: 1 inch = 3000 feet

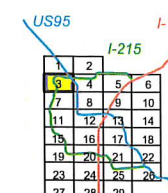
HYDROLOGIC SUBAREAS,
LAND USE & SOILS

FIGURE H-3

PBS

G. C. WALLACE



LEGEND

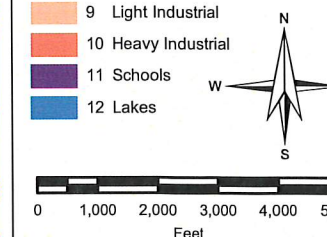
- Ultimate Development Boundary
- Watershed Boundary
- Subarea Boundary
- Flow Arrows

Flood Control Facilities

- Existing Facilities
— Proposed Facilities
Type Hydrologic Soil Groups
A Low Runoff Potential
B Moderately Low Runoff Potential
C Moderately High Runoff Potential
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Typical Land Use

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2 Parks, Golf Courses
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5 Medium Density Residential
6 High Density Residential
7 Public Facility, Multi Family
8 Commercial, Office, Retail, Casino
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11 Schools
12 Lakes
- 



SCALE: 1 inch = 3000 feet

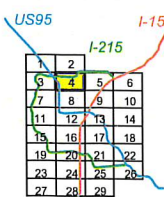
HYDROLOGIC SUBAREAS,
LAND USE & SOILS

FIGURE H-4



*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

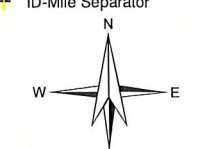
Rainbow Storm Drain
Elkhorn to Grand Teton

A.2.2

2007 Racel Street Collector MPA Figures

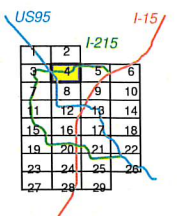
2002 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE (RECOMMENDED)

LEGEND

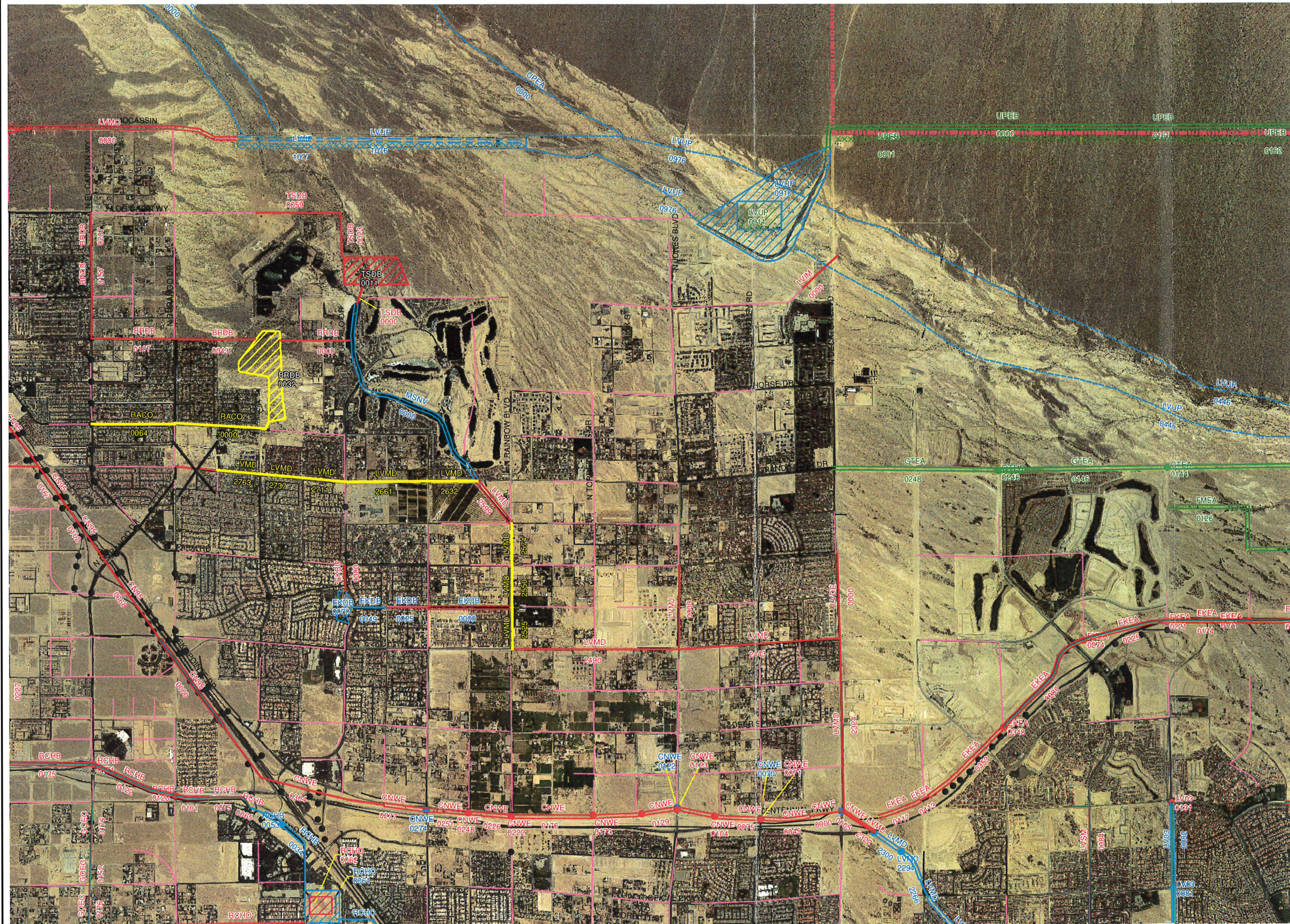
- Ultimate Development Boundary
 - Existing Facilities
 - Category A Proposed Facilities
 - Category B Proposed Facilities
 - Local Existing Facilities
 - Local Proposed Facilities
 - Amendment Proposed Facilities
 - Detention Basin
 - Culvert
 - Bridge
 - Pipeline
 - Lined Channel
 - Unlined Channel
 - Dike
 - Natural Wash
 - ID-Mile Separator
- 

0 1,000 2,000 3,000 4,000 5,000
Feet

SCALE: 1 inch = 3000 feet



FLOOD CONTROL FACILITIES
FIGURE F-4A



LEGEND

- Amendment Hydrology Change
- Amendment Facilities Change
- Ultimate Development Boundary
- Watershed Boundary
- ID Subarea Boundary
- Flow Arrows

Flood Control Facilities

- Existing Facilities
- Proposed Facilities

Type Hydrologic Soil Groups

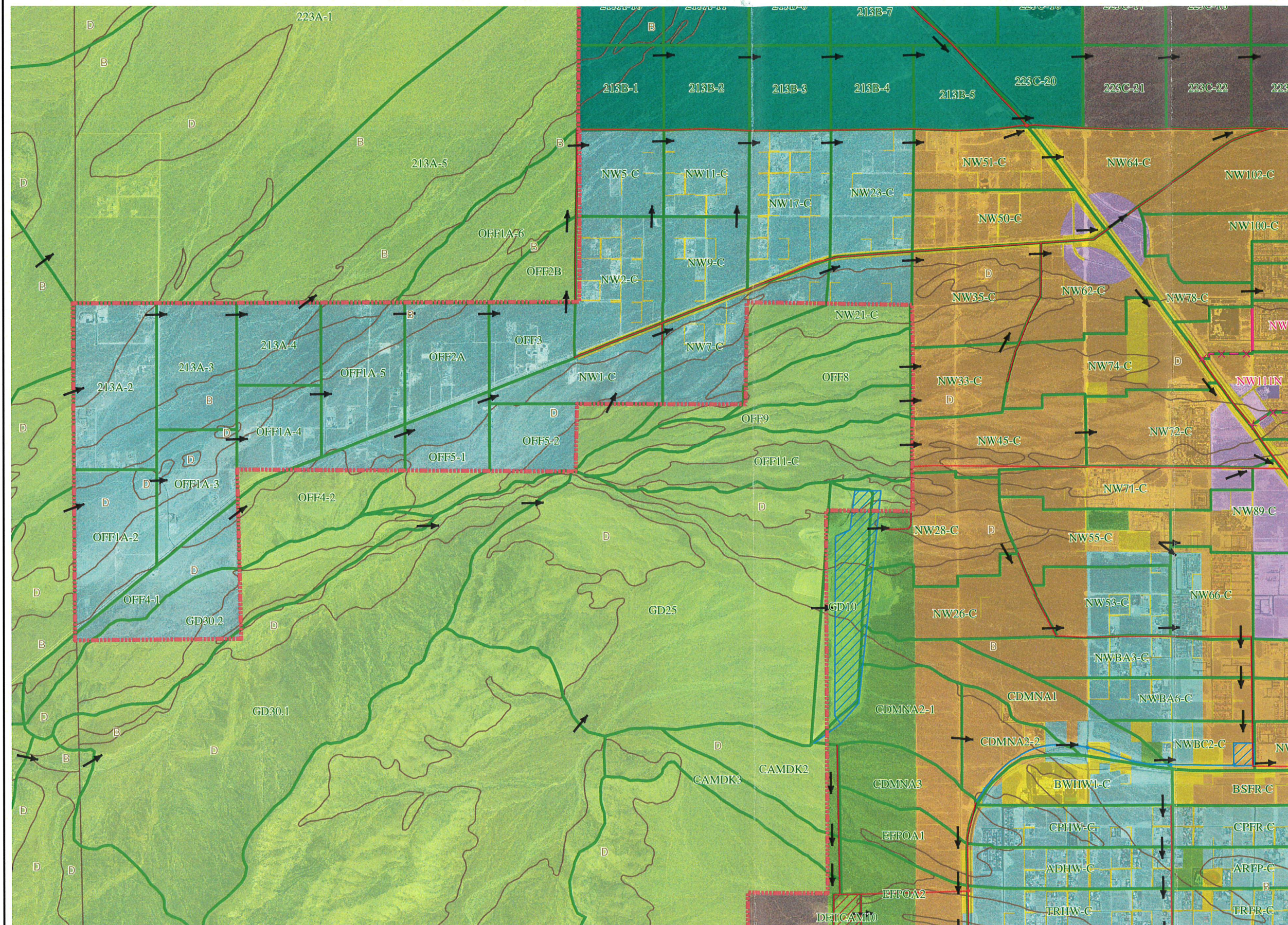
- A Low Runoff Potential
- B Moderately Low Runoff Potential
- C Moderately High Runoff Potential
- D High Runoff Potential

Typical Land Use

- 1 Undeveloped Land, Open Desert
- 2 Parks, Golf Courses
- 3 Rural
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- 5 Medium Density Residential
- 6 High Density Residential
- 7 Public Facility, Multi Family
- 8 Commercial, Office, Retail, Casino
- 9 Light Industrial
- 10 Heavy Industrial
- 11 Schools
- 12 Lakes

0 1,000 2,000 3,000 4,000 5,000
Feet

SCALE: 1 inch = 3000 feet



LEGEND

- Amendment Hydrology Change
- Amendment Facilities Change
- Ultimate Development Boundary
- Watershed Boundary
- ID Subarea Boundary
- Flow Arrows

Flood Control Facilities

- Existing Facilities
- Proposed Facilities

Type Hydrologic Soil Groups

- A** Low Runoff Potential
- B** Moderately Low Runoff Potential
- C** Moderately High Runoff Potential
- D** High Runoff Potential

Typical Land Use

- 1 Undeveloped Land, Open Desert
- 2 Parks, Golf Courses
- 3 Rural
- 4 Low Density Residential
- 5 Medium Density Residential
- 6 High Density Residential
- 7 Public Facility, Multi Family
- 8 Commercial, Office, Retail, Casino
- 9 Light Industrial
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- 11 Schools
- 12 Lakes

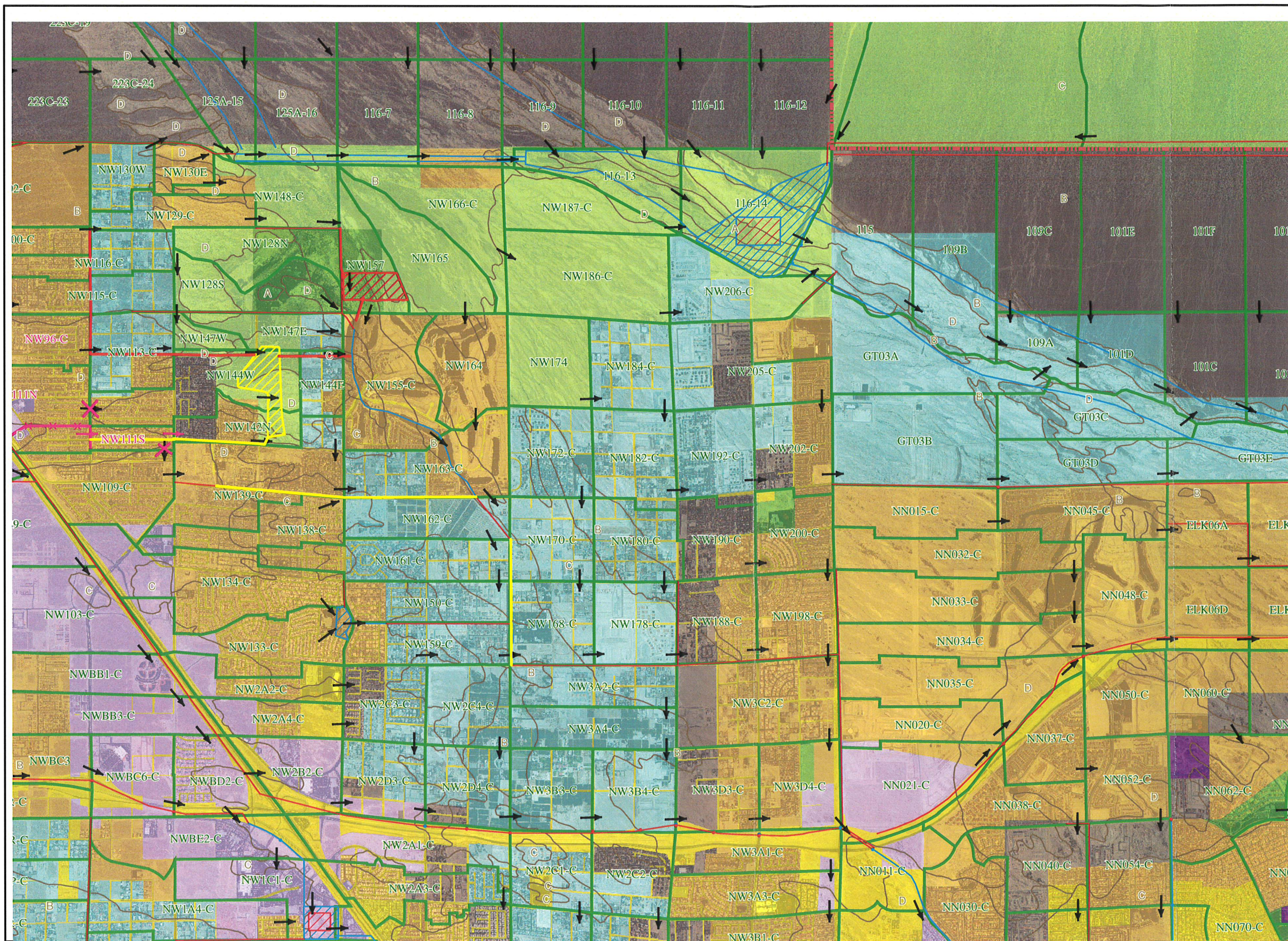
SCALE: 1 inch = 3000 feet

0 1,000 2,000 3,000 4,000 5,000 Feet

US95 **I-215** **I-15**

HYDROLOGIC SUBAREAS, LAND USE & SOILS

FIGURE H-4A



*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

**Rainbow Storm Drain
Elkhorn to Grand Teton**

A.2.3

2008 MPU Figures



2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

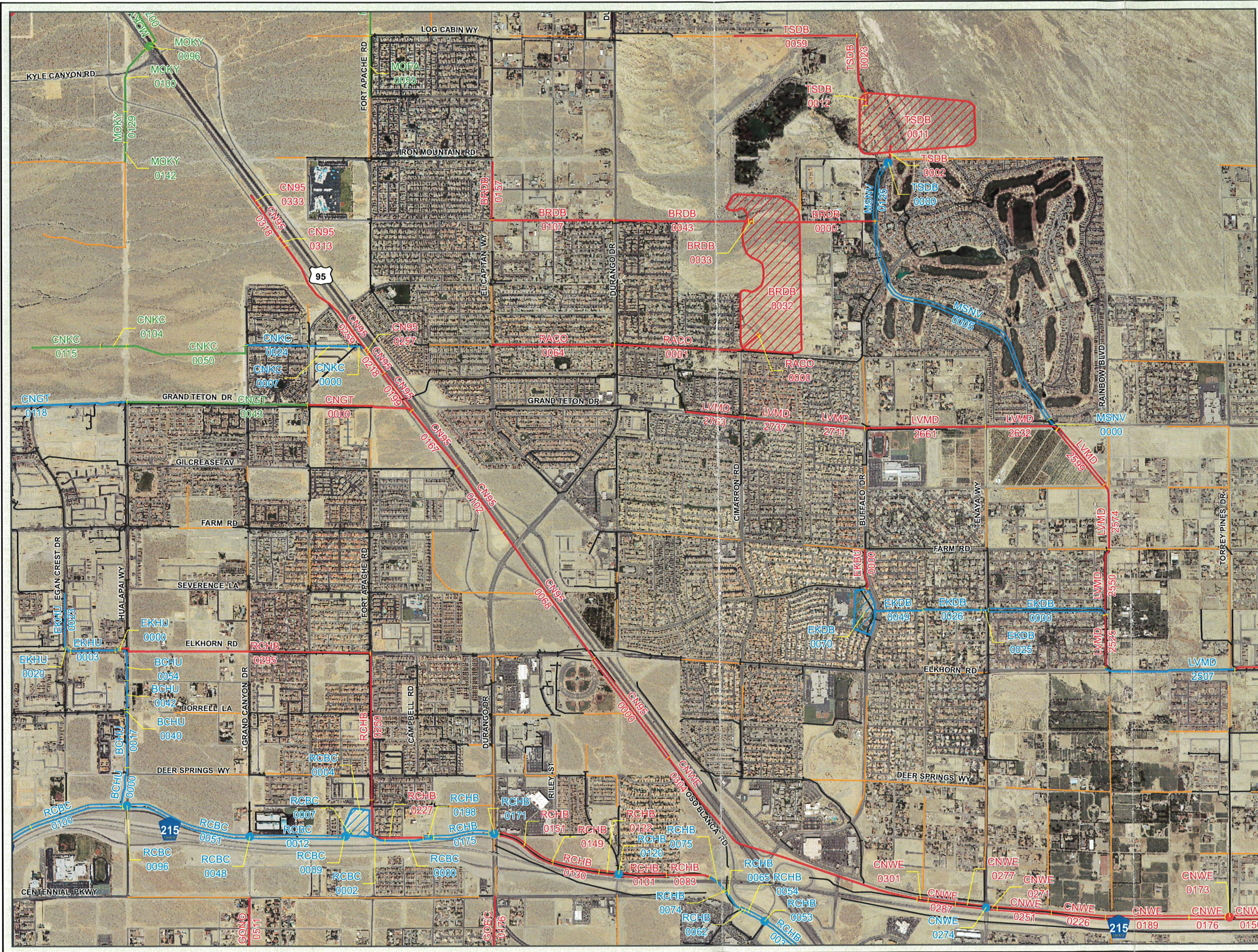
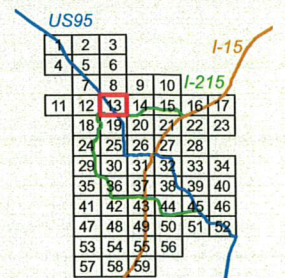
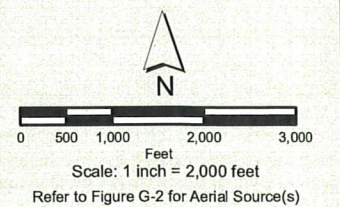
**FIGURE F-13
FLOOD CONTROL FACILITIES**

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 |



ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%)**
BCHU		BELTWAY CHANNEL - HUALAPAI						
0000	E	12' X 5' RCAP	853	501	CBA3-C	WEST3	0.84	1.11
0017	E	8' X 5' RCAP	1216	501	CBA3-C	WEST3	0.84	1.33
0040	E	66" RCP	60	222	DNW26-C	WEST3	0.51	1.04
0042	E	60" RCP	615	222	DNW26-C	WEST3	0.51	1.42
0054	E	54" RCP	770	222	DNW26-C	WEST3	0.51	1.23
BRDB		BRENT DRAINAGE SYSTEM						
0000	P3	36" RCP with 18" Orifice Plate	2170	37	BRDB	WEST3	2.48	0.40
0031	P3	45,080 cfs PMF Spillway		45080	CBRDB	WEST3	2.48	
0032	P3	450 ac-ft South Environmental Enhancement Area		1902	CBRDB	WEST3	2.48	
0033	P3	Energy Dissipator	100	957	CNW113-C	WEST3	1.58	
0043	P1	8' X 6' RCB	2920	957	CNW113-C	WEST3	1.58	2.10
0107	P1	8' X 6' RCB	2680	957	CNW113-C	WEST3	1.58	2.40
0157	P1	12' X 6' RCB	1260	741	CNW96-C	WEST3	0.95	0.25
CN95		CENTENNIAL PKWY CHANNEL WEST / U.S 95 BRANCH						
0000	P2	Conc Chnl 22W 10'D 0:1 SS	2690	3340	CNWBB3-C	WEST3	3.36	2.17
0068	P1	3: 8' X 7' RCB	3380	3216	CNW103-C	WEST3	3.05	2.12
0102	P1	3: 8' X 6' RCB	1710	2888	2CNW89-C	WEST3	2.66	2.09
0167	P1	2: 10' X 6' RCB	1580	2160	2CNW71-E	WEST3	1.64	1.50
0199	P3	Conc Chnl 15W 11'D 0:1 SS	1015	1609	2CNW72-C	WEST3	1.17	0.82
0218	P3	16' X 8' RCB	556	1609	2CNW72-C	WEST3	1.17	0.77
0257	P3	Transition Structure	100	1609	2CNW72-C	WEST3	1.17	0.77
0259	P3	16' X 8' RCB	2848	674	CNW74-C	WEST3	0.45	2.06
0313	P3	Transition Structure	240	674	CNW74-C	WEST3	0.45	1.50
0318	P3	14' X 6' RCB	797	333	NW62-S	WEST3	0.21	1.47
0333	P3	12' X 6' RCB	300	333	NW62-S	WEST3	0.21	5.50
CNGT		CENTENNIAL PKWY CHANNEL WEST / GRAND TETON BRANCH						
0000	P3	10' X 5' RCB	2290	600	CNW71-E	WEST3	0.47	2.63
0043	P0	6' X 6' RCB	3980	600	CNW71-E	WEST3	0.47	3.00
0118	E	6' X 5' RCAP	5472	363	KYLEDET*	KYLEDB	57.73	3.72
CNKC		CENTENNIAL PKWY CHANNEL WEST / KYLE CANYON BRANCH						
0000	E	12' X 4' RCB	377	999	CNW72-C	WEST3	0.71	4.58
0007	E	10' X 5' RCB	874	999	CNW72-C	WEST3	0.71	3.28
0024	E	8' X 5' RCB	1385	999	CNW72-C	WEST3	0.71	2.40
0050	P0	6' X 6' RCB	2830	999	CNW72-C	WEST3	0.71	3.00
0104	P0	6' X 5' RCB	565	452	NW45-S	WEST3	0.27	3.00
0115	P0	72" RCP	1513	452	NW45-S	WEST3	0.27	3.00
CNWE		CENTENNIAL PKWY CHANNEL WEST						
0150	P2	Conc Chnl 42W 10'D 0:1 SS	720	4233	CNW3B3-C	WEST3	5.64	0.40
0173	P2	42' X 10' RCBC @ Torrey Pines	190	4233	CNW3B3-C	WEST3	5.64	0.40
0176	P2	Conc Chnl 32W 12'D 0:1 SS	795	4233	CNW3B3-C	WEST3	5.64	0.40
0189	P2	Conc Chnl 32W 10'D 0:1 SS	1845	4067	CNW2D4-C	WEST3	5.15	0.54
0226	P2	Conc Chnl 12W 12'D 2:1 SS	1165	4067	CNW2D4-C	WEST3	5.15	1.00
0251	P2	Conc Chnl 12W 12'D 2:1 SS	1135	3951	CNW2D3-C	WEST3	4.65	0.59
0271	P2	Conc Chnl 32W 10'D 0:1 SS	185	3951	CNW2D3-C	WEST3	4.65	0.59
0274	E	32' X 10' RCBC @ Tenaya	130	3951	CNW2D3-C	WEST3	4.65	0.45
0277	P2	Conc Chnl 13W 10'D 2:1 SS	590	3951	CNW2D3-C	WEST3	4.65	0.45
0287	P2	Conc Chnl 13W 10'D 2:1 SS	605	3593	CNW2B2-C	WEST3	3.84	1.19
0301	P2	Conc Chnl 32W 10'D 0:1 SS	235	3593	CNW2B2-C	WEST3	3.84	1.19
0304	P2	32' X 10' RCB	6510	3593	CNW2B2-C	WEST3	3.84	1.75
EKBH		ELKHORN SPRINGS AND BUFFALO						
0000	P1	78" RCP	860	375	NW134-C	WEST3	0.46	1.00
EKDB		ELKHORN SPRINGS DETENTION BASIN						
0000	E	Grass Chnl 15W 5.8'D 3.5:1 SS	2575	238	CNW150-C	WEST3	1.41	0.39
0025	E	4' X 3' RCB	160	120	ELKBASIN	WEST3	0.84	0.50
0026	E	48" RCP	1270	120	ELKBASIN	WEST3	0.84	1.23
0049	E	60" RCP	1095	120	ELKBASIN	WEST3	0.84	0.13
0070	E	48 ac-ft Elkhorn Springs Detention Basin		629	CNW133-C	WEST3	0.84	
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

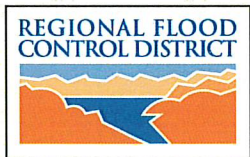
ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%)**
EKHU		ELKHORN AND HUALAPAI						
0003	E	6' X 4' RCAP	980	638	CNW26-C	WEST3	0.51	3.61
0020	E	6' X 5' RCAP	150	638	CNW26-C	WEST3	0.51	3.61
0023	E	8' X 5' RCAP	1200	638	CNW26-C	WEST3	0.51	0.90
GOEC		GOWAN NORTH - EL CAPITAN BRANCH						
0176	P1	78" RCP	1320	363	CCPFR-C	ALLGOW3	0.46	1.15
GONO		GOWAN NORTH SYSTEM						
0511	P1	7' X 6' RCB	1320	546	CCPHW-C	ALLGOW3	0.60	1.14
LVMD		LAS VEGAS WASH - MIDDLE						
2490	P2	2: 13' X 7' RCB	2555	2278	CNW168-C	CWEST3	4.69	0.40
2507	E	2: 13' X 9' RCB	2831	2278	CNW168-C	CWEST3	4.69	0.36
2525	P1	21' X 6' RCB	1140	1913	CNW159-C	CWEST3	3.91	0.40
2550	P1	21' X 6' RCB	1445	1664	CD161-C	CWEST3	3.41	0.40
2574	P1	21' X 6' RCB	1430	1664	CD161-C	CWEST3	3.41	0.60
2599	P1	Conc Chnl 30'W 5'D 2:1 SS	1577	1585	CNW162-C	CWEST3	3.08	0.40
2632	P1	13' X 5' RCB	1580	968	CNW138-C	WEST3	1.16	0.59
2661	P1	11' X 5' RCB	2640	968	CNW138-C	WEST3	1.16	1.00
2711	P1	8' X 5' RCB	1320	968	CNW138-C	WEST3	1.16	1.80
2737	P1	8' X 5' RCB	1320	818	CNW139-C	WEST3	0.93	1.81
2763	P1	78" RCP	1320	818	CNW139-C	WEST3	0.93	2.40
MOFA		MOCCASIN - FORT APACHE						
0024	P0	12' X 6' RCB	1520	394	DNW100-W	LOWER3	0.46	0.25
0053	P0	10' X 6' RCB	1345	258	DNW78-C	LOWER3	0.24	0.25
MOKY		MOCCASIN - KYLE CANYON BRANCH						
0078	P0	2: 13' X 7' RCB	985	1205	CNW50-E	LOWER3	1.06	0.40
0096	P0	2: 13' X 7' RCBC @ US 95	210	1066	CNW35-C	LOWER3	0.89	1.70
0100	P0	2: 13' X 7' RCB	1515	1066	CNW35-C	LOWER3	0.89	0.40
0129	P0	2: 11' X 7' RCB	675	779	CNW33-C	LOWER3	0.64	0.40
0142	P0	2: 9' X 7' RCB	430	779	CNW33-C	LOWER3	0.64	0.40
MSNV		MOUNTAIN SPA/VISTA RANCH						
0000	E	6: 12' X 5' RCBC @ Grand Teton	273	679	CNW163-C	CWEST3	1.67	0.40
0005	E	Grass Chnl 100'W 4.5'D 10:1 SS	6325	679	CNW163-C	CWEST3	1.67	0.40
0125	E	Grass Chnl 100'W 4.5'D 10:1 SS	1300	116	CNW147-E	WEST3	1.54	0.40
RACO		RACEL STREET COLLECTOR						
0000	P3	96" RCP Baffled Energy Dissipator	54	497	CNW111S	WEST3	0.55	4.20
0001	P3	78" RCP	3245	497	CNW111S	WEST3	0.55	2.46
0064	P3	78" RCP	2650	423	DNW111S	WEST3	0.44	2.09
RCBC		RANCHO ROAD SYSTEM - BELTWAY CHANNEL						
0000	E	6' X 5' RCB	1062	222	FADB	WEST3	1.60	1.04
0002	E	54" RCP Outlet with 41" Orifice	503	222	FADB	WEST3	1.60	2.38
0003	E	2,341 cfs PMF Spillway		2341	FADBIN	WEST3	1.60	
0004	E	76 ac-ft Fort Apache Detention Basin		1255	FADBIN	WEST3	1.60	
0007	E	Energy Dissipator	100	1255	FADBIN	WEST3	1.60	
0009	E	12' X 6' RCBC @ Fort Apache Detention Basin	133	1255	FADBIN	WEST3	1.60	1.79
0012	E	Conc Chnl 12W 6'-7'D 0:1 SS	1937	1255	FADBIN	WEST3	1.60	3.15
0048	E	12' X 6' RCBC @ Grand Canyon	140	1040	CMNA1	WEST3	1.32	3.15
0051	E	Conc Chnl 12W 6'-8'D 0:1 SS	2660	1040	CMNA1	WEST3	1.32	3.44
0096	E	1: 10' X 6' and 1: 6' X 6' RCBC @ Hualapai Way	190	1040	CMNA1	WEST3	1.32	1.93
0100	E	Conc Chnl 12W 5.5'D 0:1 SS	2085	598	CDMNA1	WEST3	0.48	2.88
0140	E	Conc Chnl 10'W 5'D 0:1 SS	2155	598	CDMNA1	WEST3	0.48	1.65
RCHB		RANCHO ROAD SYSTEM - BELTWAY						
0034	E	Conc Chnl 21'W 8'D 0:1 SS	1000	2631	CNW1C-W	WEST3	4.68	1.19
0053	E	2: 12' X 8' RCBC @ South Ramp Connector	85	2304	CDW1C1	WEST3	4.31	1.40
0054	E	Conc Chnl 21'W 8'D 0:1 SS	432	2304	CDW1C1	WEST3	4.31	1.51
0062	E	Transition Structure	130	2304	CDW1C1	WEST3	4.31	1.51
0065	E	24' X 7' RCB	480	2304	CDW1C1	WEST3	4.31	0.30
0074	E	24' X 6' RCB	50	2226	CNWBC6-C	WEST3	4.17	0.30
0075	E	20' X 6' RCBC @ Beltway	428	2226	CNWBC6-C	WEST3	4.17	2.81
0083	P2	20' X 6' RCB	950	2226	CNWBC6-C	WEST3	4.17	2.49
0101	P2	Conc Chnl 20'W 7'D 0:1 SS	980	2226	CNWBC6-C	WEST3	4.17	2.38
0120	E	20' X 6' RCBC @ Grand Montecito	120	2226	CNWBC6-C	WEST3	4.17	1.00

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%)**
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	2.85
0171	E	16' X 6' RCBC @ El Capitan 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
TSDB		TULE SPRINGS DRAINAGE SYSTEM						
0000	E	2: 10' X 4' RCBC @ Echo Grande	100	26	TULEDB	WEST3	1.35	1.04
0002	P3	36" RCP with 22" Orifice Plate	320	26	TULEDB	WEST3	1.35	0.33
0010	P3	14,013 cfs PMF Spillway		14013	CTULEDB	WEST3	1.35	
0011	P3	117 ac-ft North Environmental Enhancement Area		804	CTULEDB	WEST3	1.35	
0012	P3	Energy Dissipator	260	376	CNW148-C	WEST3	0.52	
0023	P1	84" RCP	1320	376	CNW148-C	WEST3	0.52	0.80
0059	P1	78" RCP	2640	376	CNW148-C	WEST3	0.52	1.03

* The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.

** As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.

^ For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e., HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).



2008 LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FACILITY INVENTORY
FIGURE F - 13

LEGEND

ID (Facility Identifier)
Parent Stream Name
Stream Name
River Mile
Distance Above Confluence
with Parent Stream (Miles)
Miles in Hundredths

Existing Facility..... E
Proposed or Modified Facility..... P
Contingency Level
Category B..... P0
Master Plan..... P1
Preliminary Design..... P2
Design..... P3

Bottom Width..... W
Depth..... D
Side Slope, H:V..... SS

Construction Features

Cast in Place Concrete Pipe..... CIPCP
Corrugated Metal Arch Pipe Culvert..... CMAP
Corrugated Metal Pipe Culvert..... CMPC



2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

**FIGURE H- 11
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

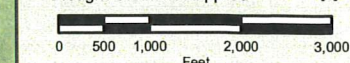
Hydrologic Soil Groups

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

Typical Land Use

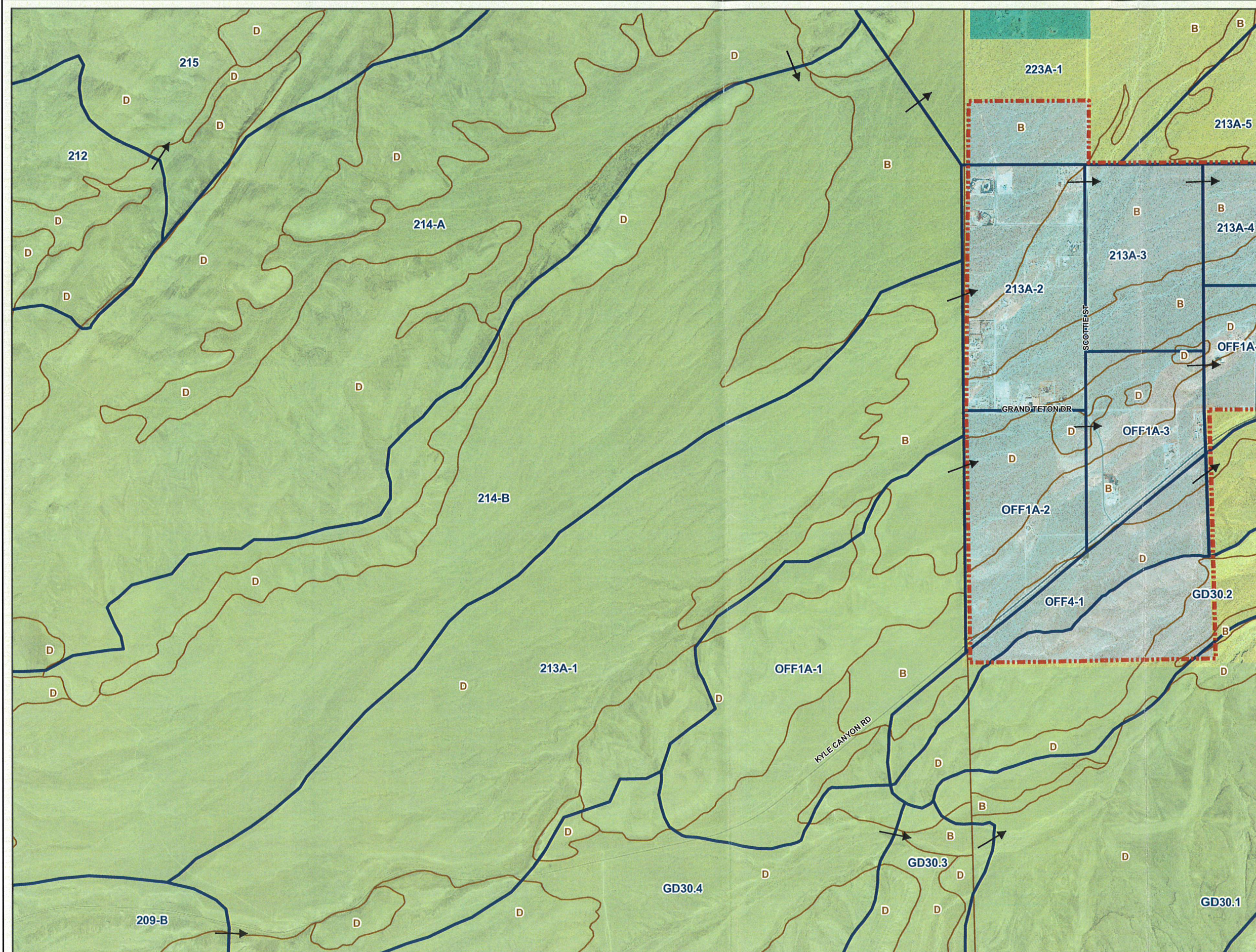
- 1 Undeveloped Land, Open Desert
- 2 Parks, Golf Courses
- 3 Rural
- 4 / 14* Low Density Residential
- 5 / 15* Medium Density Residential
- 6 / 16* High Density Residential
- 7 / 17* Public Facility, Residential
- 8 / 18* Very High Density Residential
- 9 / 19* Commercial, Retail, Casino, High Rise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

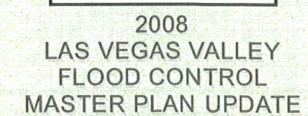
* Drought Ordinance Applied



Scale: 1 inch = 2,000 feet

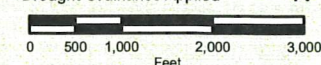
Refer to Figure G-2 for Aerial Source(s)





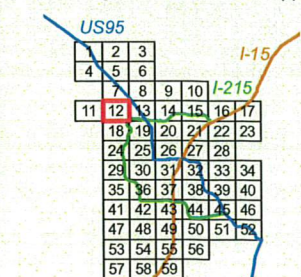
LEGEND

- ### 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* | Commercial, Retail, Casino, High Rise Condominiums |
| 10 / 20* | Light Industrial |
| 11 / 21* | Heavy Industrial |
| 12 / 22* | Schools |
| 13 | Lakes |
- * Drought Ordinance Applied



Scale: 1 inch = 2,000 feet

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





2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE H-13
HYDROLOGIC SUMMARY

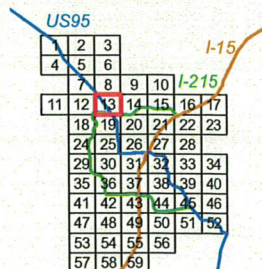
LEGEND

- 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
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 - 3 Rural
 - 4 / 14* Low Density Residential
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 - 6 / 16* High Density Residential
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 - 8 / 18* Very High Density Residential
 - 9 / 19* Commercial, Retail, Casino, High Rise Condominiums
 - 10 / 20* Light Industrial
 - 11 / 21* Heavy Industrial
 - 12 / 22* Schools
 - 13 Lakes

* Drought Ordinance Applied

Scale: 1 inch = 2,000 feet

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



*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

**Rainbow Storm Drain
Elkhorn to Grand Teton**

A.3

Drop Inlet Summary Figure

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

Appendix B

Hydraulic Calculations

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

B.1

Hydraulic Design Spreadsheets

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

**Rainbow Storm Drain
Elkhorn to Grand Teton**

B.1.1

On Grade Drop Inlet Design

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

Appendix B

Hydraulic Calculations

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

B.1

Hydraulic Design Spreadsheets

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

**Rainbow Storm Drain
Elkhorn to Grand Teton**

B.1.1

On Grade Drop Inlet Design

LAS VEGAS WASH MIDDLE BRANCH - RAINBOW STORM DRAIN, ELKHORN TO GRAND TETON - 100% PRE-FINAL

On Grade Drop Inlet Flow Interception Calculations (100 - Year Ultimate Flows Used)

All calculations are based on FHWA HEC-22 method

n = 0.016
Splash-over velocity V_0 = 8.00 ft/s (CHART 7)
unit system = English (metric or English)

Calculations By: D.A.B.
Date: 11/10/2008

INLET Type1	Location	Q cfs	Q _{bypass} cfs	L _{grate} ft	L _{curb} ft	S _i ft/ft	S _x ft/ft	L ₁ ² ft	L _{gr} ³ ft	E ⁴	T ⁵ ft	Q _s ⁶ cfs	Q _s ⁷ cfs	E _o ⁸	V ⁹ ft/s	R _f ¹⁰	R _s ¹¹	Q _{grate} ¹² cfs	Q _{curb} ¹³ cfs	Clogging Factor	Interception cfs	Bypass cfs	DI Outlet Pipe Calculation			Actual Conditions		
																							Pipe Size in	Head ft	Capacity ¹⁴ cfs	Interception cfs	Bypass cfs	Street Flow
20" "Type DM2"	CONST. ITEM 3.2 - W.S. 17+39.80; 24.19' LT	67.00	67.00	17.5	20.0	1.80%	2.00%	131.40	2.50	0.02	31.06	65.86	57.70	0.12	6.83	1	0.38	30.16	1.14	50%	31.31	35.69	30	4.79	48.15	31.31	35.69	71.39
20" "Type DM2"	CONST. ITEM 3.6 - W.S. 17+40.63; 24.19' RT	67.00	67.00	17.5	20.0	1.80%	2.00%	131.40	2.50	0.02	31.06	65.86	57.70	0.12	6.83	1	0.38	30.16	1.14	50%	31.31	35.69	30	6.62	59.31	31.31	35.69	
20" "Type DM2"	CONST. ITEM 3.3 - W.S. 17+78.74; 24.19' LT	35.69	35.69	17.5	20.0	1.80%	2.00%	100.86	2.50	0.02	24.49	34.90	29.48	0.16	5.82	1	0.45	18.72	0.79	50%	19.51	16.19	30	4.79	48.15	19.51	16.19	32.37
20" "Type DM2"	CONST. ITEM 3.7 - W.S. 17+79.57; 24.19' RT	35.69	35.69	17.5	20.0	1.80%	2.00%	100.86	2.50	0.02	24.49	34.90	29.48	0.16	5.82	1	0.45	18.72	0.79	50%	19.51	16.19	30	5.28	51.38	19.51	16.19	
20" "Type DM2"	CONST. ITEM 3.1 - SS 116+98.26; 43.19' RT	32.37	32.37	17.5	20.0	0.40%	2.00%	61.65	2.50	0.04	31.12	31.20	27.35	0.12	3.22	1	0.70	23.12	1.17	50%	24.29	8.09	30	7.40	63.47	24.29	8.09	8.09
20" "Type DM2"	CONST. ITEM 4.1 - D.N. 18+94.25; 24.19' LT	10.00	10.00	17.5	20.0	1.33%	2.00%	53.98	2.50	0.04	15.97	9.59	7.37	0.23	3.76	1	0.64	6.96	0.41	50%	7.37	2.63	24	4.25	29.53	7.37	2.63	5.25
20" "Type DM2"	CONST ITEM 4.3 - D.N. 18+67.81; 23.94' RT	10.00	10.00	17.5	20.0	1.33%	2.00%	53.98	2.50	0.04	15.97	9.59	7.37	0.23	3.76	1	0.64	6.96	0.41	50%	7.37	2.63	24	4.27	29.62	7.37	2.63	
20" "Type DM2"	CONST. ITEM 4.7 - F.R. 18+43.16; 34.34' RT	57.50	57.50	17.5	20.0	0.40%	2.00%	78.48	2.50	0.03	38.70	55.86	50.27	0.10	3.73	1	0.65	38.11	1.64	50%	39.74	17.76	30	7.22	62.53	39.74	17.76	35.51
20" "Type DM2"	CONST. ITEM 4.12 - F.R. 18+36.82; 35.00' LT	57.50	57.50	17.5	20.0	0.40%	2.00%	78.48	2.50	0.03	38.70	55.86	50.27	0.10	3.73	1	0.65	38.11	1.64	50%	39.74	17.76	36	4.79	66.84	39.74	17.76	
20" "Type DM2"	CONST. ITEM 4.10 - F.R. 18+89.99; 34.55' RT	17.76	17.76	17.5	20.0	0.40%	2.00%	47.91	2.50	0.05	24.75	16.93	14.33	0.15	2.76	1	0.76	13.47	0.83	50%	14.30	3.46	30	3.35	37.04	14.30	3.46	6.92
20" "Type DM2"	CONST. ITEM 4.13 - F.R. 18+83.64; 35.00' LT	17.76	17.76	17.5	20.0	0.40%	2.00%	47.91	2.50	0.05	24.75	16.93	14.33	0.15	2.76	1	0.76	13.47	0.83	50%	14.30	3.46	30	3.23	36.00	14.30	3.46	
15" "Type DM2"	CONST. ITEM 7.1 - E.R. 18+90.64; 49.83' LT	72.50	72.50	12.5	15.0	0.40%	2.00%	86.50	2.50	0.03	40.00	61.00	55.08	0.10	3.81	1	0.45	30.59	1.87	50%	32.47	40.03	30	10.47	77.71	32.47	40.03	80.06
15" "Type DM2"	CONST. ITEM 7.3 - E.R. 18+96.28; 43.17' RT	72.50	72.50	12.5	15.0	0.40%	2.00%	86.50	2.50	0.03	40.00	61.00	55.08	0.10	3.81	1	0.45	30.59	1.87	50%	32.47	40.03	30	10.87	79.38	32.47	40.03	
15" "Type DM2"	CONST. ITEM 7.4 - E.R. 19+20.51; 49.93' LT	40.03	40.03	12.5	15.0	0.40%	2.00%	67.40	2.50	0.03	33.73	38.71	34.28	0.11	3.40	1	0.50	21.54	1.33	50%	22.86	17.17	30	10.55	78.05	22.86	17.17	34.34
15" "Type DM2"	CONST. ITEM 7.5 - E.R. 19+26.13; 43.17' RT	40.03	40.03	12.5	15.0	0.40%	2.00%	67.40	2.50	0.03	33.73	38.71	34.28	0.11	3.40	1	0.50	21.54	1.33	50%	22.86	17.17	30	10.87	79.38	22.86	17.17	

¹Starts at the upstream end

²L_T = Curb opening length required to intercept 100% of the gutter flow

$$L_T = KQ^{0.42}S_i^{-0.3}(1/nS_x)^{0.6}$$

$$K = (0.82 \text{ metric}, 0.60 \text{ English}) = 0.60$$

³Slotted drain length upstream of the grate

⁴E = Slotted drain inlet interception efficiency

$$E = 1 - (1 - L/L_T)^{1.8}$$

⁵T = Width of flow

$$T = (Qn/(K_c S_x^{1.67} S_i^{0.5}))^{1/2.67}$$

$$K_c = (0.376 \text{ metric}, 0.56 \text{ English}) = 0.56$$

⁶Q_s = Gutter flow

$$Q_s = (K_c/n)S_x^{1.67}S_i^{0.5}T^{2.67}$$

$$K_c = (0.376 \text{ metric}, 0.56 \text{ English}) = 0.56$$

⁷Q_s = Side flow

$$Q_s = (K_c/n)S_x^{1.67}S_i^{0.5}(T-2)^{2.67}$$

$$K_c = (0.376 \text{ metric}, 0.56 \text{ English}) = 0.56$$

⁸E_o = Ratio of frontal flow to total gutter flow

$$E_o = (Q_s - Q_g)/Q_s$$

⁹V = Average gutter velocity

$$V = Q_g/(T^2 S_x/2)$$

¹⁰R_f = Frontal flow interception efficiency

$$R_f = 1 - K_f(V - V_0)$$

(note: R_f can not exceed 1.0)

$$K_f = (0.295 \text{ metric}, 0.09 \text{ English}) = 0.09$$

¹¹R_s = Side flow interception efficiency

$$R_s = 1/(1 + K_g V^{1.8}/S_x(L_{\text{grate}}(1 - C_f))^{2.3})$$

(note: C_f (%) = Clogging Factor)

$$K_g = (0.0828 \text{ metric}, 0.15 \text{ English}) = 0.15$$

Q_{grate}¹² = Total ideal flow interception capacity of grate inlet

$$Q_{\text{grate}} = (R_f E_o + R_s(1 - E_o))Q_s$$

Q_{slotted drain}¹³ = Total ideal flow interception capacity of curb opening, upstream of grate inlet

$$Q_{\text{slotted drain}} = EQ_{\text{w/bypass}}$$

Orifice Equation

Constants

¹⁴ Captured Flow = Cd * A (2 * g * h)^{0.5}

Cd = 0.65 g = 32.2

h = Head above centerline orifice opening

A = area of orifice

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

**Rainbow Storm Drain
Elkhorn to Grand Teton**

B.1.2

Sump Drop Inlet Design

W.O. #6952 Las Vegas Wash Main Branch - Rainbow Storm Drain - 100% Design

Inlet Calculation for NDOT Drop Inlets in Sump Condition

Inlet interception for the 100 yr event based on HEC-22 in accordance with NDOT Drainage Manual

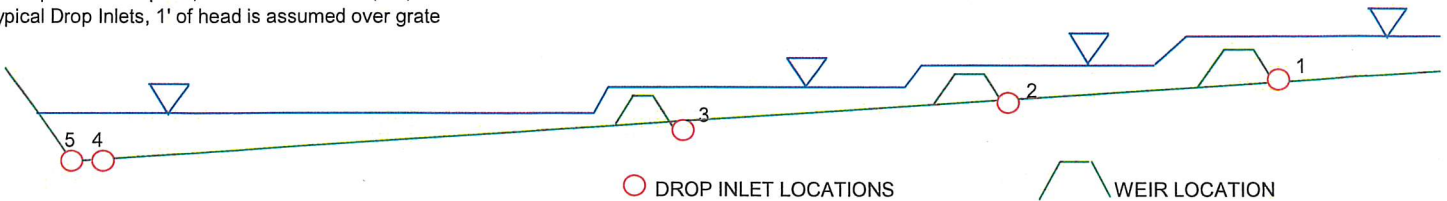
By: D.Bergh
Date: 11/10/2008

Determination of Flow Interception Capacity of NDOT Drop Inlets

Severance Channel	Drop Inlet I.D. (See Below)	Location	Inlet Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Controlling Interception (cfs)					
				Q ₁₀₀	Pipe Size	Equivalent Pipe Size	Perimeter	Usable Perimeter	Ag	Clogging Factor Grate	Depth	Depth Available	Q _{grate}	Q _{grate}	Weir vs. Orifice Control	Grate Interception	H	C		Operating Head over Weir	Height Above Centroid	No. of Outlet Pipes	Outlet Pipe Capacity	Actual Interception
				(cfs)	(in)	(in)	(ft)	(ft)	(ft²)	(%)	(ft)	(ft)	(cfs)	(cfs)		(cfs)				(ft)	(ft)	(Ea)	(cfs)	(cfs)
Peaking	1 (6.2)	RB - 144+50.78; 82.40' RT	NDOT Type 8	270.00	14 x 23	18	25	15	20	50%	3.170	6	253.95	92.87	Orifice	92.87	2.2	2.64	2.170	7.913	2	51.83	51.83	Outlet Pipe
	2 (7.12)	RB - 147+34.93; 81.82' RT	NDOT Type 8	218.17	24 x 38	30	25	15	20	50%	2.882	6	220.20	88.56	Orifice	88.56	1.9	2.64	1.882	8.032	2	145.06	88.56	Grate
	3 (7.17)	RB - 149+25.22; 81.18' RT	NDOT Type 8	129.61	29 x 45	36	25	15	20	50%	2.317	6	158.70	79.40	Orifice	79.40	1.3	2.68	1.317	5.880	1	89.36	79.40	Grate
	4 (7.7)	RB - 150+38.36; 82.52' RT	NDOT Type 8	25.11	36	36	25	15	20	50%	0.678	6	25.11	42.94	Weir	25.11	~	~	~	2.178	1	54.38	25.11	Grate
	5 (7.9)	RB - 150+55.86; 82.52' RT	NDOT Type 8	25.11	36	36	25	15	20	50%	0.678	6	25.11	42.94	Weir	25.11	~	~	~	2.178	1	54.38	25.11	Grate
	4 or 5	4 OR 5 (7.7 OR 7.9)	NDOT Type 8	50.21	36	36	25	15	20	50%	1.076	6	50.21	54.10	Weir	50.21	~	~	~	2.576	1	59.15	50.21	Grate
MPU Facility	1 (6.2)	RB - 144+50.78; 82.40' RT	NDOT Type 8	219.00	14 x 23	18	25	15	20	50%	2.887	6	220.75	88.63	Orifice	88.63	1.9	2.64	1.887	4.470	2	38.96	38.96	Outlet Pipe
	2 (7.12)	RB - 147+34.93; 81.82' RT	NDOT Type 8	180.04	24 x 38	30	25	15	20	50%	2.656	6	194.79	85.01	Orifice	85.01	1.7	2.64	1.656	4.656	2	110.44	85.01	Outlet Pipe
	3 (7.17)	RB - 149+25.22; 81.18' RT	NDOT Type 8	95.03	29 x 45	36	25	15	20	50%	2.071	6	134.10	75.06	Orifice	75.06	1.1	2.68	1.071	4.279	1	76.23	75.06	Outlet Pipe
	4 (7.7)	RB - 150+38.36; 82.52' RT	NDOT Type 8	9.98	36	36	25	15	20	50%	0.675	6	24.95	42.86	Weir	9.98	~	~	~	3.841	1	72.23	9.98	Grate
	5 (7.9)	RB - 150+55.86; 82.52' RT	NDOT Type 8	9.98	36	36	25	15	20	50%	0.675	6	24.95	42.86	Weir	9.98	~	~	~	3.841	1	72.23	9.98	Grate
	4 or 5	4 OR 5 (7.7 OR 7.9)	NDOT Type 8	19.97	36	36	25	15	20	50%	1.071	6	49.91	53.99	Weir	19.97	~	~	~	4.237	1	75.86	19.97	Grate
Other Inlets within Project	Typical	Throughout Project	NDOT Type 2	6.46	18	18	9	5	2.40	50%	1.000	1	15.00	6.46	Orifice	6.46	~	~	~	2.750	1	15.28	6.46	Grate
	Typical	Throughout Project	NDOT Type 2	8.35	24	24	9	5	3.11	50%	1.000	1	15.00	8.35	Orifice	8.35	~	~	~	3.000	1	28.37	8.35	Grate
	Typical	Throughout Project	NDOT Type 2	9.98	30	30	9	5	3.71	50%	1.000	1	15.00	9.98	Orifice	9.98	~	~	~	3.250	1	46.14	9.98	Grate
	Bubbler	Elkhorn and Rainbow	25' x 5' Grate	17.17	60	60	60	55	121.56	50%	0.171	1	11.63	130.97	Weir	11.63	~	~	~	3.671	1	196.13	11.63	Grate
		SD1 - 40+00.00; 52.85' RT	NDOT Type 8	15.91	30	30	25	15	20	50%	0.500	1	15.91	36.88	Weir	15.91	~	~	~	2.750	1	42.44	15.91	Grate

Notes:

- Total flow that gets to sump inlet
- Outflow Pipe Size
- Actual perimeter of the grate
- This is the perimeter of the grate accounting for clogging and structures which are expected to impede the flow
- Ag = Clear opening area of grate = Area of grate - Area of bars
- Clogging Factor of Grate in Sump Condition
- Ponding depth to capture 100 - year flow
- The available depth for ponding to occur in the channel
- Capacity of grate inlet operating as a weir: $Q_i = C_w P d^{1.5}$ where $C_w = 3.0$, P = Usable Perimeter, d = flow depth Hec-22 Eq. 4-26 Pg. 4-46
- Capacity of grate inlet operating as an orifice: $Q_i = C_o A_g (1 - \text{CLOGGING FACTOR})(2gd)^{0.5}$ where $C_o = 0.65$, A_g = Clear opening of grate, $g = 32.2 \text{ ft/s}^2$, d = flow depth, Hec-22 Eq. 4-27 Pg. 4-46
- This column shows if the flow is by weir control or orifice control
- The flow captured is the lesser of the total flow that gets to the sump, the expected weir flow capture, and the expected orifice capture (units as shown)
- Severance weir Calculation: $Q_i = CLH^{1.5}$ where C = varies from Table 5.3 of Handbook of Hydraulics by Brater and King, $L = 32$, H = Head, Note: Breadth of Weir = 10
- Drop inlet outlet pipe capacity: $Q_p = CA(2GH)^{0.5}$ where $C = 0.65$ per HCDDM, A = area of opening, $G = 32.2 \text{ ft/s}^2$, H = head above centroid of orifice
- Actual drop inlet interception, lesser of columns 9, 10, and 14
On Typical Drop Inlets, 1' of head is assumed over grate



RED indicates either inlet 4 or 5 getting clogged

Table 5-3. Values of C in the Formula $Q = CLH^{3/2}$ for Broad-crested Weirs

Measured head in feet, H	Breadth of crest of weir in feet										
	0.50	0.75	1.00	1.50	2.00	2.50	3.00	4.00	5.00	10.00	15.00
0.2	2.80	2.75	2.69	2.62	2.54	2.48	2.44	2.38	2.34	2.49	2.68
0.4	2.92	2.80	2.72	2.64	2.61	2.60	2.58	2.54	2.50	2.58	2.70
0.6	3.08	2.89	2.75	2.64	2.61	2.60	2.68	2.60	2.70	2.70	2.70
0.8	3.30	3.04	2.85	2.68	2.60	2.60	2.67	2.68	2.68	2.69	2.64
1.0	3.32	3.14	2.98	2.75	2.66	2.64	2.65	2.67	2.68	2.68	2.63
1.2	3.32	3.20	3.08	2.86	2.70	2.65	2.64	2.67	2.60	2.69	2.64
1.4	3.32	3.26	3.20	2.92	2.77	2.68	2.64	2.65	2.65	2.67	2.64
1.6	3.32	3.29	3.28	3.07	2.89	2.75	2.69	2.66	2.65	2.64	2.63
1.8	3.32	3.32	3.31	3.07	2.88	2.74	2.68	2.66	2.65	2.64	2.63
2.0	3.32	3.31	3.30	3.03	2.85	2.76	2.72	2.68	2.65	2.64	2.63
2.5	3.32	3.32	3.31	3.28	3.07	2.89	2.81	2.72	2.67	2.64	2.63
3.0	3.32	3.32	3.32	3.32	3.20	3.05	2.92	2.73	2.60	2.64	2.63
3.5	3.32	3.32	3.32	3.32	3.32	3.19	2.97	2.76	2.68	2.64	2.63
4.0	3.32	3.32	3.32	3.32	3.32	3.32	3.07	2.79	2.70	2.64	2.63
4.5	3.32	3.32	3.32	3.32	3.32	3.32	3.32	2.85	2.74	2.64	2.63
5.0	3.32	3.32	3.32	3.32	3.32	3.32	3.32	3.07	2.70	2.64	2.63
5.5	3.32	3.32	3.32	3.32	3.32	3.32	3.32	3.32	2.88	2.64	2.63

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

B.1.3

Modified Standard Form 6

LAS VEGAS WASH - MIDDLE BRANCH, RAINBOW STORM DRAIN - ELKHORN TO GRAND TETON
100-YR HGL CALCULATIONS FOR STORM DRAIN LATERALS
MODIFIED STANDARD FORM 6 - 100% Design Ultimate Conditions

Work Order: 6952

Date: 17-Nov-08

Calculated By: DAB

LATERAL #	EACH ROW REPRESENTS A SEGMENT OF PIPE AND AN UPSTREAM INLET - REFER TO "SDX" THRU "SDX" FOR STORM DRAIN LATERAL PLAN AND PROFILE															FLOW DATA										ENERGY LOSS DATA			ENERGY AND HYDRAULIC DATA			CHECK - CONSIDER LATERAL AS CULVERT		CONTROL U/S HGL	COMMENTS		
	LOCATION		EQUIV PIPE SIZE (IN)	INVERTS (English)				D/S HGL ELEVATION			CRITICAL DEPTH					D (FT)	TOP WIDTH (FT)	A (FT²)	Φ**	Q (CFS)	V (FPS)	H _v = V²/2g (FT)	S _f *** (FT/FT)	PIPE		INLET		PIPE / TRANSITION			INLET CONTROL		METHOD CONTROL U/S HGL		U/S GRATE, MH RIM, OR TBC ELEV	DEPTH BELOW GRATE	
	OUTLET STATION	INLET STATION		D/S ELEV (FT)	U/S ELEV (FT)	PIPE LENGTH (FT)	PIPE SLOPE (%)	CONTROL D/S HGL ELEV (FT)	CALC ⁽¹⁾ D/S HGL ELEV (FT)	CRITICAL D/S HGL ELEV (FT)	D _c * (FT)	TOP WIDTH (FT)	FLOW AREA (FT²)	Q _{calc} (CFS)	Q-Q									H _f (FT)	K _i	H _i (FT)	D/S EGL ELEV (FT)	U/S EGL ELEV (FT)	U/S HGL ELEV (FT)	H _w /D (fig. 1005)	U/S HGL ELEV (FT)	U/S HGL ELEV (FT)					
2	WS 17+45.84; 8.29' RT	WS 17+39.80; 24.19' LT	30	2363.06	2365.71	31.56	8.40	2365.91	2365.91	2364.97	1.91	2.1267	4.0180	31.31	0.00	2.50	0.00	4.91	0.0049	31.31	6.38	0.63	0.0058	0.18	0.4	0.25	2366.54	2366.98	2366.34	1.31	2368.99	2368.99	INLET	2370.50 +/-	1.51		
2	WS 17+45.84; 8.29' RT	WS 17+40.63; 24.19' RT	30	2363.06	2363.88	15.32	5.35	2365.91	2365.91	2364.97	1.91	2.1267	4.0180	31.31	0.00	2.50	0.00	4.91	0.0049	31.31	6.38	0.63	0.0058	0.09	0.4	0.25	2366.54	2366.88	2366.25	1.31	2367.16	2367.16	INLET	2370.50 +/-	3.34		
3	WS 17+84.79; 8.29' RT	WS 17+78.74; 24.19' LT	30	2362.51	2365.11	31.56	8.24	2364.06	2364.06	2364.01	1.50	2.4498	3.0733	19.51	0.00	1.55	2.43	3.20	0.0049	19.51	6.09	0.58	0.0053	0.17	0.4	0.23	2364.64	2365.04	2364.46	0.92	2367.41	2367.41	INLET	2369.90 +/-	2.49		
3	WS 17+84.79; 8.29' RT	WS 17+79.57; 24.19' RT	30	2362.51	2364.62	15.32	13.77	2364.06	2364.06	2364.01	1.50	2.4498	3.0733	19.51	0.00	1.55	2.43	3.20	0.0049	19.51	6.09	0.58	0.0053	0.08	0.4	0.23	2364.64	2364.95	2364.37	0.92	2366.92	2366.92	INLET	2369.90 +/-	2.98		
4	WS 20+07.43; 39.97' RT	WS 20+22.72; 33.68' RT	30	2360.10	2360.24	17.53	0.80	NUISANCE FLOW																													
4	WS 20+22.72; 33.68' RT	WS 20+77.14; 24.19' RT	24	2360.74	2361.24	53.82	0.93	NUISANCE FLOW																													
4	WS 20+77.14; 24.19' RT	WS 20+76.81; 24.19' LT	18	2361.84	2362.26	48.39	0.87	NUISANCE FLOW																													
5	WS 20+22.72; 33.68' RT	WS 20+34.15; 57.12' RT	18	2361.24	2361.67	26.24	1.64	NUISANCE FLOW																													
6	RB 116+98.26; 2.40' RT	RB 116+98.62; 43.19' RT	30	2356.09	2359.10	39.30	7.66	2358.98	2358.98	2357.77	1.68	2.3479	3.5062	24.29	0.00	2.50	0.00	4.91	0.0049	24.29	4.95	0.38	0.0035	0.14	0.4	0.15	2359.36	2359.65	2359.27	1.10	2361.85	2361.85	INLET	2366.50 +/-	4.65		
7	DN 19+25.96; 5.65' RT	DN 18+94.25, 24.19' LT	24	2358.19	2361.25	28.92	10.58	2359.16	2358.98	2359.16	0.97	1.9989	1.5044	7.37	0.00	0.97	2.00	1.50	0.0049	7.37	4.90	0.37	0.0046	0.13	0.4	0.15	2359.53	2359.81	2359.44	0.79	2362.83	2362.83	INLET	2365.50 +/-	2.67		
8	DN 18+77.60; 5.65' RT	DN 18+67.81; 24.19' RT	24	2358.31	2361.23	19.36	15.08	2359.62	2359.62	2359.28	0.97	1.9989	1.5045	7.37	0.00	1.31	1.90	2.18	0.0049	7.37	3.38	0.18	0.0022	0.04	0.4	0.07	2359.80	2359.91	2359.74	0.79	2362.81	2362.81	INLET	2365.50 +/-	2.69		
8	DN 19+00.00; 5.65' RT	DN 18+77.60; 5.65' RT	30	2357.69	2357.81	22.55	0.53	2359.59	2359.59	2358.59	0.90	2.4018	1.5984	7.37	0.00	1.90	2.14	4.00	0.0049	7.37	1.84	0.05	0.0005	0.01	0.4	0.02	2359.64	2359.67	2359.62	0.58	2359.25	2359.62	OUTLET	2366.00 +/-	6.38		
8	DN 19+96.58; 5.65' RT	DN 19+00.00; 5.65' RT	30	2354.84	2357.69	97.58	2.92	2358.07	2358.07	2356.14	1.30	2.4983	2.5680	14.75	0.00	2.50	0.00	4.91	0.0049	14.75	3.00	0.14	0.0013	0.13	0.4	0.06	2358.21	2358.39	2358.25	0.76	2359.59	2359.59	INLET	NA +/-	NA		
9	RB 126+13.26; 2.40' RT	FR 20+36.81; 51.70' LT	18	2352.40	2352.73	15.36	2.15	NUISANCE FLOW																													
9	RB 126+13.26; 21.60' LT	FR 19+56.03; 51.77' LT	18	2352.40	2354.13	41.80	4.14	NUISANCE FLOW																													
10	FR 18+57.92; 16.26' RT	FR 18+43.16; 34.34' RT	30	2353.77	2353.90	17.76	0.73	2358.21	2358.21	2355.89	2.12	1.7875	4.4451	39.74	0.00	2.50	0.00	4.91	0.0049	39.74	8.10	1.02	0.0094	0.17	0.4	0.41	2359.23	2359.80	2358.78	1.63	2357.98	2358.78	OUTLET	2361.62 +/-	2.84		
10	FR 18+57.92; 16.26' RT	FR 18+48.38; 20.97' LT	36	2354.29	2356.91	38.42	6.82	2358.21	2358.21	2356.34	2.05	2.7887	5.1550	39.74	0.00	3.00	0.00	7.07	0.0049	39.74	5.62	0.49	0.0035	0.14	0.4	0.20	2358.70	2359.04	2358.54	1.07	2360.12	2360.12	INLET	2361.62 +/-	1.50		
12	FR 19+04.75; 16.26' RT	FR 18+95.32; 20.56' LT	30	2354.52	2356.86	38.00	6.16	2357.09	2357.09	2355.79	1.27	2.4995	2.5161	14.30	0.00	2.50	0.00	4.91	0.0049	14.30	2.91	0.13	0.0012	0.05	0.4	0.05	2357.22	2357.32	2357.19	0.71	2358.64	2358.64	INLET	2361.17 +/-	2.53		
12	FR 19+04.75; 16.26' RT	FR 18+89.99; 34.55' RT	30	2354.03	2354.13	19.34	0.52	2357.09	2357.09	2355.30	1.27	2.4995	2.5155	14.30	0.00	2.50	0.00	4.91	0.0049	14.30	2.91	0.13	0.0012	0.02	0.4	0.05	2357.22	2357.30	2357.17	0.71	2355.91	2357.17	OUTLET	2361.17 +/-	4.00		
13	RB 127+48.23; 2.90' RT	RB 127+48.23; 34.86' RT	18	2351.79	2356.19	31.93	13.78	NUISANCE FLOW																													
14	RB 144+18.25; 7.00' LT	RB 144+18.25; 34.99' RT	18	2343.63	2344.59	82.01	1.17	NUISANCE FLOW																													
15	RB 144+46.97; 84.15' RT	RB 144+50.78; 7.00' LT; DUAL 14" X 23"	27	2343.53	2343.98	89.15	0.50	2348.56	2348.56	2345.72	2.19	0.7347	3.9457	51.83	0.00	2.25	0.00	3.98	0.0049	51.83	13.04	2.64	0.0279	2.49	0.4	1.06	2351.20	2354.75	2352.11	3.10	2350.96	2352.11	OUTLET	2350.00 +/-	-2.11		
16	RB 146+63.49; 7.00' LT	RB 146+63.62; 35.26' LT	18	2347.73	2349.90	42.67	5.09	NUISANCE FLOW																													
17	RB 147+33.03; 7.00' LT	RB 147+34.93; 81.82' RT; DUAL 24" X 38"	42	2342.41	2342.85	88.58	0.50	2347.87	2347.87	2345.33	2.92	2.5958	8.5858	88.56	0.00	3.50	0.00	9.62	0.0049	88.56	9.20	1.32	0.0077	0.69	0.4	0.53	2349.18	2350.40	2349.08	1.68	2348.73	2349.08	OUTLET	2349.00 +/-	-0.08		
18	RB 149+25.22; 7.00' LT	RB149+25.22; 81.18' RT	36	2341.80	2342.23	87.94	0.49	2347.85	2347.85	2344.56	2.76	1.6124	6.8117	79.40	0.00	3.00	0.00	7.07	0.0049	79.40	11.23	1.96	0.0141	1.24	0.4	0.78	2349.81	2351.84	2349.88	2.35	2349.28	2349.88	OUTLET	2348.21 +/-	-1.67		
19	RB 149+64.25; 7.00' LT	RB 149+64.25; 35.10' RT	18	2341.80	2341.99	40.74	0.47	NUISANCE FLOW																													
20	RB 150+62.57; 7.00' LT	RB 150+47.11; 82.52; RT	36	2341.13	2341.50	91.83	0.40	2347.32	2347.32	2343.44	2.31	2.5295	5.8314	50.21	0.00	3.00	0.00	7.07	0.0049	50.21	7.10	0.78	0.0057	0.52	0.4	0.31	2348.11	2348.94	2348.16	1.35	2345.55	2348.16	OUTLET	2346.00 +/-	-2.16		
21	RB 150+47.11; 82.52; RT	RB 150+38.36; 82.52' RT	36	2341.50	2341.55	7.50	0.67	2348.16	2348.16	2343.12	1.62	2.9908	3.8852	25.11	0.00	3.00	0.00	7.07	0.0049	25.11	3.55	0.20	0.0014	0.01	0.4	0.08	2348.35	2348.44	2348.24	1.28	2345.39	2348.24	OUTLET	2345.70 +/-	-2.54		

LAS VEGAS WASH - MIDDLE BRANCH, RAINBOW STORM DRAIN - ELKHORN TO GRAND TETON
100-YR HGL CALCULATIONS FOR STORM DRAIN LATERALS
MODIFIED STANDARD FORM 6 - 100% Design Ultimate Conditions

Work Order: 6952
Date: 17-Nov-08

Calculated By: DAB

LATERAL #	EACH ROW REPRESENTS A SEGMENT OF PIPE AND AN UPSTREAM INLET - REFER TO "SDX" THRU "SDX" FOR STORM DRAIN LATERAL PLAN AND PROFILE															FLOW DATA										ENERGY LOSS DATA			ENERGY AND HYDRAULIC DATA			CHECK - CONSIDER LATERAL AS CULVERT		CONTROL U/S HGL	COMMENTS		
	LOCATION		EQUIV PIPE SIZE (IN)	INVERTS (English)				D/S HGL ELEVATION			CRITICAL DEPTH				PIPE											INLET		PIPE / TRANSITION			INLET CONTROL						
	OUTLET STATION	INLET STATION		D/S ELEV (FT)	U/S ELEV (FT)	PIPE LENGTH (FT)	PIPE SLOPE (%)	CONTROL D/S HGL ELEV (FT)	CALC ⁽¹⁾ D/S HGL ELEV (FT)	CRITICAL D/S HGL ELEV (FT)	D _c * (FT)	TOP WIDTH (FT)	FLOW AREA (FT ²)	Q _{calc} (CFS)	Q-Q	D (FT)	TOP WIDTH (FT)	A (FT ²)	Φ**	Q (CFS)	V (FPS)	H _v = V ² /2g (FT)	S _f *** (FT/FT)	H _f (FT)	K _i	H _i (FT)	D/S EGL ELEV (FT)	U/S EGL ELEV (FT)	U/S HGL ELEV (FT)	H _w /D (fig. 1005)	U/S HGL ELEV (FT)	U/S HGL ELEV (FT)	METHOD CONTROL U/S HGL	U/S GRATE, MH RIM, OR TBC ELEV	DEPTH BELOW GRATE		
21	RB 150+47.11; 82.52; RT	RB 150+55.86; 82.52' RT	36	2341.50	2341.74	7.50	3.20	2348.16	2348.16	2343.12	1.62	2.9908	3.8852	25.11	0.00	3.00	0.00	7.07	0.0049	25.11	3.55	0.20	0.0014	0.01	0.4	0.08	2348.35	2348.44	2348.24	1.28	2345.58	2348.24	OUTLET	2346.10 +/-	-2.14		
22	ER 19+09.66; 2.53' RT	ER 18+96.26; 43.17' RT	30	2338.91	2340.63	41.36	4.16	2345.67	2345.67	2340.85	1.94	2.0838	4.0885	32.47	0.00	2.50	0.00	4.91	0.0049	32.47	6.61	0.68	0.0063	0.26	0.4	0.27	2346.35	2346.88	2346.20	1.75	2345.01	2346.20	OUTLET	2351.50 +/-	5.30		
22	ER 19+09.66; 2.53' RT	ER 18+90.64; 49.83' LT	30	2340.41	2340.75	53.64	0.63	2345.67	2345.67	2342.35	1.94	2.0838	4.0885	32.47	0.00	2.50	0.00	4.91	0.0049	32.47	6.61	0.68	0.0063	0.34	0.4	0.27	2346.35	2346.96	2346.28	1.32	2344.05	2346.28	OUTLET	2351.72 +/-	5.44		
23	ER 19+39.53; 2.53' RT	ER 19+26.13; 43.17' RT	30	2338.79	2340.63	41.36	4.45	2344.19	2344.19	2340.42	1.63	2.3830	3.3846	22.86	0.00	2.50	0.00	4.91	0.0049	22.86	4.66	0.34	0.0031	0.13	0.4	0.13	2344.52	2344.79	2344.45	1.08	2343.33	2344.45	OUTLET	2351.50 +/-	7.05		
23	ER 19+39.53; 2.53' RT	ER 19+20.51' 49.93' LT	30	2340.29	2340.63	53.67	0.63	2344.19	2344.19	2341.92	1.63	2.3830	3.3846	22.86	0.00	2.50	0.00	4.91	0.0049	22.86	4.66	0.34	0.0031	0.17	0.4	0.13	2344.52	2344.83	2344.49	0.92	2342.93	2344.49	OUTLET	2351.68 +/-	7.19		
25	RB 119+83.36; 45.00' LT	RB 119+83.36; 45.00' LT	24	2354.94	2356.41	21.39	6.87	NUISENCE FLOW																													
26	RB 132+74.45; 33.00' LT	RB 132+74.45; 44.19' LT	18	2349.63	2350.97	12.19	10.99	NUISENCE FLOW																													
27	RB 139+77.22; 33.00' LT	RB 139+77.22; 44.19' LT	18	2346.75	2348.00	12.19	10.25	NUISENCE FLOW																													
28	RB 127+18.27; 22.61' LT	RB 127+18.27; 37.00' LT	18	2351.91	2353.00	15.39	7.08	NUISENCE FLOW																													
29	RB 142+88.60; 33.00' LT	RB 142+88.60; 44.19' LT	18	2345.47	2346.75	12.19	10.50	NUISENCE FLOW																													
30	RB 113+03.07; 38.68' RT	RB 112+89.12; 31.49' RT	18	2357.74	2358.87	14.37	7.86	NUISENCE FLOW																													
31	RB 152+20.85; 5.92' LT	RB 152+14.25; 32.73' RT	18	2340.10	2340.26	39.98	0.40	NUISENCE FLOW																													

Red indicates input

Green indicates Goal Seek

De, use Goal Seek → By Changing Set Cell To Value

Manning's n = 0.013

g = 32.17 ft / s²

⁽¹⁾ Calculated D/S HGL elevation determined from trunkline WSPGW

*D_c = g*A³ - T*Q²

**Φ = 2*g*n²/2.21

***S_f = Φ * H_v/R^{1.33}

MODIFIED STANDARD FORM 6 - 100% Design Ultimate Conditions**MODIFIED STANDARD FORM 6 - 100% Design Ultimate Conditions**

Date: 17-Nov-08

Calculated By: **DAB**

LAS VEGAS WASH - MIDDLE BRANCH, RAINBOW STORM DRAIN - ELKHORN TO GRAND TETON
100-YR HGL CALCULATIONS FOR STORM DRAIN LATERALS
MODIFIED STANDARD FORM 6 - 100% Design Ultimate Conditions

Work Order: 6952
Date: 17-Nov-08

Calculated By: DAB

LATERAL #	EACH ROW REPRESENTS A SEGMENT OF PIPE AND AN UPSTREAM INLET - REFER TO "SDX" THRU "SDX" FOR STORM DRAIN LATERAL PLAN AND PROFILE															FLOW DATA										ENERGY LOSS DATA			ENERGY AND HYDRAULIC DATA			CHECK - CONSIDER LATERAL AS CULVERT		CONTROL U/S HGL	COMMENTS		
	LOCATION		EQUIV PIPE SIZE (IN)	INVERTS (English)				D/S HGL ELEVATION			CRITICAL DEPTH				PIPE											INLET		PIPE / TRANSITION			INLET CONTROL						
	OUTLET STATION	INLET STATION		D/S ELEV (FT)	U/S ELEV (FT)	PIPE LENGTH (FT)	PIPE SLOPE (%)	CONTROL D/S HGL ELEV (FT)	CALC ⁽¹⁾ D/S HGL ELEV (FT)	CRITICAL D/S HGL ELEV (FT)	D _c * (FT)	TOP WIDTH (FT)	FLOW AREA (FT ²)	Q _{calc} (CFS)	Q-Q	D (FT)	TOP WIDTH (FT)	A (FT ²)	Φ**	Q (CFS)	V (FPS)	H _v = V ² /2g (FT)	S _f *** (FT/FT)	H _f (FT)	K _i	H _i (FT)	D/S EGL ELEV (FT)	U/S EGL ELEV (FT)	U/S HGL ELEV (FT)	H _w /D (fig. 1005)	U/S HGL ELEV (FT)	U/S HGL ELEV (FT)	METHOD CONTROL U/S HGL	U/S GRATE, MH RIM, OR TBC ELEV	DEPTH BELOW GRATE		
21	RB 150+47.11; 82.52; RT	RB 150+55.86; 82.52' RT	36	2341.50	2341.74	7.50	3.20	2348.16	2348.16	2343.12	1.62	2.9908	3.8852	25.11	0.00	3.00	0.00	7.07	0.0049	25.11	3.55	0.20	0.0014	0.01	0.4	0.08	2348.35	2348.44	2348.24	1.28	2345.58	2348.24	OUTLET	2346.10 +/-	-2.14		
22	ER 19+09.66; 2.53' RT	ER 18+96.26; 43.17' RT	30	2338.91	2340.63	41.36	4.16	2345.67	2345.67	2340.85	1.94	2.0838	4.0885	32.47	0.00	2.50	0.00	4.91	0.0049	32.47	6.61	0.68	0.0063	0.26	0.4	0.27	2346.35	2346.88	2346.20	1.75	2345.01	2346.20	OUTLET	2351.50 +/-	5.30		
22	ER 19+09.66; 2.53' RT	ER 18+90.64; 49.83' LT	30	2340.41	2340.75	53.64	0.63	2345.67	2345.67	2342.35	1.94	2.0838	4.0885	32.47	0.00	2.50	0.00	4.91	0.0049	32.47	6.61	0.68	0.0063	0.34	0.4	0.27	2346.35	2346.96	2346.28	1.32	2344.05	2346.28	OUTLET	2351.72 +/-	5.44		
23	ER 19+39.53; 2.53' RT	ER 19+26.13; 43.17' RT	30	2338.79	2340.63	41.36	4.45	2344.19	2344.19	2340.42	1.63	2.3830	3.3846	22.86	0.00	2.50	0.00	4.91	0.0049	22.86	4.66	0.34	0.0031	0.13	0.4	0.13	2344.52	2344.79	2344.45	1.08	2343.33	2344.45	OUTLET	2351.50 +/-	7.05		
23	ER 19+39.53; 2.53' RT	ER 19+20.51' 49.93' LT	30	2340.29	2340.63	53.67	0.63	2344.19	2344.19	2341.92	1.63	2.3830	3.3846	22.86	0.00	2.50	0.00	4.91	0.0049	22.86	4.66	0.34	0.0031	0.17	0.4	0.13	2344.52	2344.83	2344.49	0.92	2342.93	2344.49	OUTLET	2351.68 +/-	7.19		
25	RB 119+83.36; 45.00' LT	RB 119+83.36; 45.00' LT	24	2354.94	2356.41	21.39	6.87	NUISANCE FLOW																													
26	RB 132+74.45; 33.00' LT	RB 132+74.45; 44.19' LT	18	2349.63	2350.97	12.19	10.99	NUISANCE FLOW																													
27	RB 139+77.22; 33.00' LT	RB 139+77.22; 44.19' LT	18	2346.75	2348.00	12.19	10.25	NUISANCE FLOW																													
28	RB 127+18.27; 22.61' LT	RB 127+18.27; 37.00' LT	18	2351.91	2353.00	15.39	7.08	NUISANCE FLOW																													
29	RB 142+88.60; 33.00' LT	RB 142+88.60; 44.19' LT	18	2345.47	2346.75	12.19	10.50	NUISANCE FLOW																													
30	RB 113+03.07; 38.68' RT	RB 112+89.12; 31.49' RT	18	2357.74	2358.87	14.37	7.86	NUISANCE FLOW																													
31	RB 152+20.85; 5.92' LT	RB 152+14.25; 32.73' RT	18	2340.10	2340.26	39.98	0.40	NUISANCE FLOW																													

Red indicates input

Green indicates Goal Seek

De, use Goal Seek → By Changing Set Cell To Value

Manning's n = 0.013

g = 32.17 ft / s²

⁽¹⁾ Calculated D/S HGL elevation determined from trunkline WSPGW

*D_c = g*A³ - T*Q²

**Φ = 2*g*n²/2.21

***S_f = Φ * H_v/R^{1.33}

T1 LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
T2 HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
T3 FILE: 6952-ULT-12.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)
SO -17139.48 2297.52 12

REM *****
REM END VTN DESIGN

REM *****
R -17139.48 2297.52 12 .012
R -17129.48 2297.56 12 .012
TS -17109.48 2297.65 10 12 .012
R -14709.48 2307.97 10 .012
R -14659.48 2308.66 10 .012
R -12119.48 2316.52 10 .012
JX -12119.48 2316.52 10 11 .012 70.0 2318.520 90.0 .000
R -12099.48 2317.04 10 .012
R -10954.48 2320.51 10 .012
JX -10954.48 2320.51 10 14 .012 124.0 2322.510 90.0 .000
R -10934.48 2321.33 10 .012
R -9569.61 2326.65 10 .012
JX -9569.61 2326.65 10 14 .012 124.0 2328.650 90.0 .000
TS -9519.61 2328.60 8 .012

REM *****
REM END LOUIS BERGER DESIGN, BEGIN VTN DESIGN AT ELKHORN AND TORREY PINES; Q=2637

REM *****
R -9429.48 2328.93 8 .012
JX -9424.48 2328.97 8 9 .012 252.00 2328.97 90
R -7852.06 2334.274 8 .012
R -7812.13 2334.418 8 .012 -2.00
R -7251.42 2336.433 8 .012
R -7211.94 2336.575 8 .012 2.00
R -6786.22 2338.108 8 .012
R -6734.51 2338.22 8 .012
JX -6729.51 2338.30 8 14 .012 103.00 2338.22 37.00
R -6729.51 2338.30 8 .012 -57
R -6649.40 2339.649 8 .012 53.00
R -6626.76 2340.027 8 .012
R -6623.76 2340.08 8 .012

REM *****
REM END VTN DESIGN, BEGIN LOUIS BERGER DESIGN AT RAINBOW AND ELKHORN

REM *****
R -6618.22 2340.17 8 .012
TS -6600.00 2340.24 1 8 .012
R -6468.35 2340.788 1 .012
JX -6465.35 2340.80 1 2 .012 19.97 2341.13 -80.0
R -6331.00 2341.41 1 .012
JX -6328.00 2341.42 1 2 .012 75.06 2341.80 -90
R -6139.85 2342.13 1 .012
JX -6135.81 2342.14 1 18 .012 85.01 2342.21 -90
R -5855.94 2343.29 1 .012
JX -5853.56 2343.30 1 17 .012 38.96 2343.53 -90
R -4208.35 2350.05 1 .012
R -4173.49 2350.19 1 .012 -17.00
R -4138.62 2350.34 1 .012 17.00
R -4086.79 2350.55 1 .012
JX -4082.79 2350.57 1 3 .012 22.96 2352.07 -90
R -3408.45 2353.33 1 .012
JX -3405.95 2353.34 1 18 .012 14.75 2354.84 -90
R -3102.50 2354.58 1 .012
JX -3100.00 2354.59 1 18 .012 24.29 2356.09 -90
R -2853.77 2355.60 1 .012
R -2731.27 2356.104 1 .012 -36.00
JX -2727.27 2356.12 1 3 .012 80.00 2358.51 -50
R -2713.66 2356.18 1 .012 -4.00
R -2655.18 2356.42 1 .012
TS -2555.18 2361.42 4 1 .012
R -1426.86 2367.18 4 .012

REM *****
REM REQUIRED TRANSITION LENGTH = 15 x DELTA BW = (52 - 24)/2 = 210'

REM *****
TS -1217.09 2370.12 5 4 .012
TS -1078.92 2372.00 19 5 .012
WX -1078.92 2372.00 5 .012
JX -1078.92 2372.00 6 13 .012 983.00 2372.03 0.00
R -815.65 2372.97 6 .012
BE -815.65 6
WE -815.65 7
R -700.00 2374.00 7 .033

REM *****
REM BEGIN VTN DESIGN, GRAND TETON AND GOLF COARSE

REM *****
SH -700.00 2374.00 7 .033
CD 1 3 0 .000 8.000 24.000
CD 2 4 1 .000 3.000
CD 3 4 1 .000 4.000
CD 4 1 0 .000 7.000 24.000 2.000 2.000 -2.88
CD 5 2 0 .000 7.000 52.000 -6.24
CD 6 3 3 1.000 5.000 51.000
CD 7 1 0 .000 8.000 85.000 3.000 3.000
CD 8 3 1 2.000 9.000 26.000
CD 9 4 1 .000 5.000
CD 10 3 0 .000 8.000 24.000
CD 11 3 0 .000 4.000 6.000
CD 12 3 1 2.250 8.000 28.250
CD 13 3 1 1.000 5.000 25.000
CD 14 4 1 .000 4.000
CD 15 2 0 .000 8.000 24.000
CD 17 4 1 .000 1.500
CD 18 4 1 .000 2.500
CD 19 2 0 .000 7.000 73.920
Q 938.000 .0

Program Package Serial Number: 1513

Date: 11- 7-2008 Time: 2:26: 6

WATER SURFACE PROFILE LISTING
 LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
 HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
 FILE: 6952-ULT-12.wsw; DATE: NOV-08; BY: VIN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-17139.480	2297.520	5.325	2302.845	2955.00	21.34	7.07	2309.92	.00	7.38	28.25	8.000	28.250	.00	1 2.3
10.000	.0040					.0071	.07	5.33	1.70	6.58	.012	.00	.00	BOX
-17129.480	2297.560	5.306	2302.866	2955.00	21.42	7.12	2309.99	.00	7.38	28.25	8.000	28.250	.00	1 2.3
TRANS STR	.0045					.0057	.11	5.31	1.71		.012	.00	.00	BOX
-17109.480	2297.650	6.012	2303.662	2955.00	20.48	6.51	2310.17	.00	7.78	24.00	8.000	24.000	.00	0 .0
1282.917	.0043					.0043	5.52	6.01	1.47	6.01	.012	.00	.00	BOX
-15826.560	2303.167	6.012	2309.178	2955.00	20.48	6.51	2315.69	.00	7.78	24.00	8.000	24.000	.00	0 .0
1117.083	.0043					.0042	4.71	6.01	1.47	6.01	.012	.00	.00	BOX
-14709.480	2307.970	6.098	2314.068	2955.00	20.19	6.33	2320.40	.00	7.78	24.00	8.000	24.000	.00	0 .0
3.438	.0138					.0041	.01	6.10	1.44	4.05	.012	.00	.00	BOX
-14706.040	2308.018	6.129	2314.146	2955.00	20.09	6.27	2320.41	.00	7.78	24.00	8.000	24.000	.00	0 .0
27.077	.0138					.0038	.10	6.13	1.43	4.05	.012	.00	.00	BOX
-14678.960	2308.391	6.428	2314.819	2955.00	19.15	5.70	2320.52	.00	7.78	24.00	8.000	24.000	.00	0 .0
19.484	.0138					.0033	.06	6.43	1.33	4.05	.012	.00	.00	BOX
-14659.480	2308.660	6.742	2315.402	2955.00	18.26	5.18	2320.58	.00	7.78	24.00	8.000	24.000	.00	0 .0
1734.070	.0031					.0031	5.37	6.74	1.24	6.74	.012	.00	.00	BOX
-12925.410	2314.026	6.742	2320.768	2955.00	18.26	5.18	2325.95	.00	7.78	24.00	8.000	24.000	.00	0 .0
805.930	.0031					.0031	2.47	6.74	1.24	6.74	.012	.00	.00	BOX

FILE: 6952-ULT-12.WSW

W S P G W - CIVILDESIGN Version 14.05

PAGE 2

Program Package Serial Number: 1513

Date: 11- 7-2008 Time: 2:26: 6

WATER SURFACE PROFILE LISTING
 LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
 HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
 FILE: 6952-ULT-12.wsw; DATE: NOV-08; BY: VIN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-12119.480	2316.520	6.790	2323.311	2955.00	18.13	5.11	2328.42	.00	7.78	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0000					.0035	.00	6.79	1.23		.012	.00	.00	BOX
-12119.480	2316.520	6.065	2322.585	2885.00	19.82	6.10	2328.69	.00	7.66	24.00	8.000	24.000	.00	0 .0
11.423	.0260					.0037	.04	6.06	1.42	3.23	.012	.00	.00	BOX
-12108.060	2316.817	6.355	2323.172	2885.00	18.92	5.56	2328.73	.00	7.66	24.00	8.000	24.000	.00	0 .0
8.577	.0260					.0033	.03	6.35	1.32	3.23	.012	.00	.00	BOX
-12099.480	2317.040	6.665	2323.705	2885.00	18.04	5.05	2328.76	.00	7.66	24.00	8.000	24.000	.00	0 .0
447.141	.0030					.0031	1.37	6.66	1.23	6.68	.012	.00	.00	BOX
-11652.340	2318.395	6.630	2325.025	2885.00	18.13	5.10	2330.13	.00	7.66	24.00	8.000	24.000	.00	0 .0
697.859	.0030					.0033	2.32	6.63	1.24	6.68	.012	.00	.00	BOX
-10954.480	2320.510	6.322	2326.832	2885.00	19.01	5.61	2332.45	.00	7.66	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0000					.0044	.00	6.32	1.33		.012	.00	.00	BOX
-10954.480	2320.510	5.369	2325.879	2761.00	21.43	7.13	2333.01	.00	7.43	24.00	8.000	24.000	.00	0 .0
1.189	.0410					.0052	.01	5.37	1.63	2.71	.012	.00	.00	BOX
-10953.290	2320.559	5.395	2325.954	2761.00	21.32	7.06	2333.01	.00	7.43	24.00	8.000	24.000	.00	0 .0
10.461	.0410					.0048	.05	5.39	1.62	2.71	.012	.00	.00	BOX
-10942.830	2320.988	5.658	2326.646	2761.00	20.33	6.42	2333.07	.00	7.43	24.00	8.000	24.000	.00	0 .0
8.350	.0410					.0042	.03	5.66	1.51	2.71	.012	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-12.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Date: 11- 7-2008 Time: 2:26: 6

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-10934.480	2321.330	5.934	2327.264	2761.00	19.39	5.84	2333.10	.00	7.43	24.00	8.000	24.000	.00	0 .0
366.509	.0039					.0039	1.43	5.93	1.40	5.93	.012	.00	.00	BOX
-10567.970	2322.759	5.934	2328.693	2761.00	19.39	5.84	2334.53	.00	7.43	24.00	8.000	24.000	.00	0 .0
998.361	.0039					.0038	3.79	5.93	1.40	5.93	.012	.00	.00	BOX
-9569.610	2326.650	6.047	2332.697	2761.00	19.02	5.62	2338.32	.00	7.43	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0000					.0046	.00	6.05	1.36		.012	.00	.00	BOX
-9569.610	2326.650	5.129	2331.779	2637.00	21.42	7.12	2338.90	.00	7.21	24.00	8.000	24.000	.00	0 .0
TRANS STR	.0390					.0045	.22	5.13	1.67		.012	.00	.00	BOX
-9519.610	2328.600	6.861	2335.461	2637.00	16.01	3.98	2339.44	.00	7.21	26.00	9.000	26.000	.00	1 2.0
14.727	.0037					.0035	.05	6.86	1.12	6.78	.012	.00	.00	BOX
-9504.884	2328.654	6.873	2335.527	2637.00	15.99	3.97	2339.50	.00	7.21	26.00	9.000	26.000	.00	1 2.0
75.403	.0037					.0033	.25	6.87	1.12	6.78	.012	.00	.00	BOX
-9429.480	2328.930	7.209	2336.139	2637.00	15.24	3.61	2339.75	.00	7.21	26.00	9.000	26.000	.00	1 2.0
JUNCT STR	.0080					.0015	.01	7.21	1.04		.012	.00	.00	BOX
-9424.480	2328.970	8.812	2337.782	2385.00	11.28	1.97	2339.76	.00	6.74	26.00	9.000	26.000	.00	1 2.0
121.170	.0034					.0015	.18	8.81	.70	6.48	.012	.00	.00	BOX

----- WARNING - Flow depth near top of box conduit -----

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-12.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Date: 11- 7-2008 Time: 2:26: 6

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-9303.311	2329.379	8.402	2337.781	2385.00	11.83	2.17	2339.95	.00	6.74	26.00	9.000	26.000	.00	1 2.0
112.476	.0034					.0017	.19	8.40	.75	6.48	.012	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-9190.835	2329.758	8.011	2337.769	2385.00	12.40	2.39	2340.16	.00	6.74	26.00	9.000	26.000	.00	1 2.0
102.442	.0034					.0019	.20	8.01	.80	6.48	.012	.00	.00	BOX
-9088.393	2330.104	7.638	2337.742	2385.00	13.01	2.63	2340.37	.00	6.74	26.00	9.000	26.000	.00	1 2.0
89.437	.0034					.0022	.20	7.64	.86	6.48	.012	.00	.00	BOX
-8998.956	2330.405	7.283	2337.688	2385.00	13.64	2.89	2340.58	.00	6.74	26.00	9.000	26.000	.00	1 2.0
58.932	.0034					.0025	.15	7.28	.93	6.48	.012	.00	.00	BOX
-8940.024	2330.604	7.016	2337.619	2385.00	14.17	3.12	2340.74	.00	6.74	26.00	9.000	26.000	.00	1 2.0
HYDRAULIC JUMP														
-8940.024	2330.604	6.478	2337.082	2385.00	15.34	3.65	2340.74	.00	6.74	26.00	9.000	26.000	.00	1 2.0
852.078	.0034					.0034	2.87	6.48	1.11	6.48	.012	.00	.00	BOX
-8087.947	2333.478	6.478	2339.956	2385.00	15.34	3.65	2343.61	.00	6.74	26.00	9.000	26.000	.00	1 2.0
235.887	.0034					.0035	.82	6.48	1.11	6.48	.012	.00	.00	BOX
-7852.060	2334.274	6.323	2340.597	2385.00	15.72	3.84	2344.43	.16	6.74	26.00	9.000	26.000	.00	1 2.0
39.930	.0036					.0036	.14	6.48	1.15	6.32	.012	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-12.wsw; DATE: NOV-08; BY: VVN NEVADA (D.BERGH)

Date: 11-7-2008 Time: 2:26:6

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7812.130	2334.418	6.325	2340.743	2385.00	15.71	3.83	2344.58	.00	6.74	26.00	9.000	26.000	.00	1 2.0
204.014	.0036	-	-	-	-	.0036	.73	6.32	1.15	6.32	.012	.00	.00	BOX
-7608.116	2335.151	6.325	2341.476	2385.00	15.71	3.83	2345.31	.00	6.74	26.00	9.000	26.000	.00	1 2.0
356.696	.0036	-	-	-	-	.0038	1.36	6.32	1.15	6.32	.012	.00	.00	BOX
-7251.420	2336.433	6.066	2342.500	2385.00	16.38	4.17	2346.67	.18	6.74	26.00	9.000	26.000	.00	1 2.0
39.480	.0036	-	-	-	-	.0041	.16	6.24	1.22	6.33	.012	.00	.00	BOX
-7211.940	2336.575	6.019	2342.594	2385.00	16.51	4.23	2346.83	.00	6.74	26.00	9.000	26.000	.00	1 2.0
145.185	.0036	-	-	-	-	.0043	.62	6.02	1.23	6.32	.012	.00	.00	BOX
-7066.755	2337.098	5.808	2342.906	2385.00	17.11	4.55	2347.45	.00	6.74	26.00	9.000	26.000	.00	1 2.0
151.427	.0036	-	-	-	-	.0048	.73	5.81	1.30	6.32	.012	.00	.00	BOX
-6915.328	2337.643	5.537	2343.180	2385.00	17.95	5.00	2348.18	.00	6.74	26.00	9.000	26.000	.00	1 2.0
129.107	.0036	-	-	-	-	.0055	.71	5.54	1.40	6.32	.012	.00	.00	BOX
-6786.220	2338.108	5.280	2343.388	2385.00	18.82	5.50	2348.89	1.65	6.74	26.00	9.000	26.000	.00	1 2.0
51.710	.0022	-	-	-	-	.0061	.32	6.93	1.50	7.67	.012	.00	.00	BOX
-6734.510	2338.220	5.109	2343.329	2385.00	19.45	5.88	2349.20	.00	6.74	26.00	9.000	26.000	.00	1 2.0
JUNCT STR	.0160	-	-	-	-	.0071	.04	5.11	1.58		.012	.00	.00	BOX
-6729.510	2338.300	4.582	2342.881	2282.00	20.75	6.69	2349.57	3.71	6.55	26.00	9.000	26.000	.00	1 2.0
15.350	.0168	-	-	-	-	.0077	.12	8.29	1.78	3.49	.012	.00	.00	BOX

FILE: 6952-ULT-12.WSW

W S P G W - CIVILDESIGN Version 14.05
Program Package Serial Number: 1513

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WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-12.wsw; DATE: NOV-08; BY: VVN NEVADA (D.BERGH)

Date: 11-7-2008 Time: 2:26:6

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6714.160	2338.558	4.657	2343.216	2282.00	20.42	6.47	2349.69	3.59	6.55	26.00	9.000	26.000	.00	1 2.0
36.909	.0168	-	-	-	-	.0071	.26	8.24	1.74	3.49	.012	.00	.00	BOX
-6677.251	2339.180	4.885	2344.065	2282.00	19.47	5.88	2349.95	3.26	6.55	26.00	9.000	26.000	.00	1 2.0
27.851	.0168	-	-	-	-	.0062	.17	8.15	1.62	3.49	.012	.00	.00	BOX
-6649.400	2339.649	5.123	2344.772	2282.00	18.56	5.35	2350.12	.00	6.55	26.00	9.000	26.000	.00	1 2.0
2.274	.0167	-	-	-	-	.0058	.01	5.12	1.50	3.50	.012	.00	.00	BOX
-6647.126	2339.687	5.146	2344.833	2282.00	18.48	5.30	2350.13	.00	6.55	26.00	9.000	26.000	.00	1 2.0
20.366	.0167	-	-	-	-	.0054	.11	5.15	1.49	3.50	.012	.00	.00	BOX
-6626.760	2340.027	5.397	2345.425	2282.00	17.62	4.82	2350.24	.00	6.55	26.00	9.000	26.000	.00	1 2.0
3.000	.0177	-	-	-	-	.0050	.01	5.40	1.39	3.43	.012	.00	.00	BOX
-6623.760	2340.080	5.447	2345.527	2282.00	17.45	4.73	2350.26	.00	6.55	26.00	9.000	26.000	.00	1 2.0
5.540	.0162	-	-	-	-	.0048	.03	5.45	1.37	3.54	.012	.00	.00	BOX
-6618.220	2340.170	5.538	2345.708	2282.00	17.17	4.58	2350.28	.00	6.55	26.00	9.000	26.000	.00	1 2.0
TRANS STR	.0038	-	-	-	-	.0040	.07	5.54	1.34		.012	.00	.00	BOX
-6600.000	2340.240	5.530	2345.770	2282.00	17.19	4.59	2350.36	.00	6.55	24.00	8.000	24.000	.00	0 .0
131.650	.0042	-	-	-	-	.0031	.40	5.53	1.29	5.09	.012	.00	.00	BOX
-6468.350	2340.788	5.794	2346.582	2282.00	16.41	4.18	2350.76	.00	6.55	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040	-	-	-	-	.0030	.01	5.79	1.20		.012	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-12.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Date: 11- 7-2008 Time: 2:26: 6

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6465.350	2340.800	5.520	2346.320	2262.03	17.08	4.53	2350.85	.00	6.51	24.00	8.000	24.000	.00	0 .0
78.237	.0045					.0031	.24	5.52	1.28	4.91	.012	.00	.00	BOX
-6387.113	2341.155	5.728	2346.884	2262.03	16.45	4.20	2351.09	.00	6.51	24.00	8.000	24.000	.00	0 .0
56.113	.0045					.0027	.15	5.73	1.21	4.91	.012	.00	.00	BOX
-6331.000	2341.410	6.008	2347.418	2262.03	15.69	3.82	2351.24	.00	6.51	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0033					.0030	.01	6.01	1.13		.012	.00	.00	BOX
-6328.000	2341.420	5.240	2346.660	2186.97	17.39	4.70	2351.36	.00	6.37	24.00	8.000	24.000	.00	0 .0
188.150	.0038					.0034	.65	5.24	1.34	5.11	.012	.00	.00	BOX
-6139.850	2342.130	5.326	2347.455	2186.97	17.11	4.55	2352.00	.00	6.37	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0025					.0037	.01	5.33	1.31		.012	.00	.00	BOX
-6135.810	2342.140	4.876	2347.016	2101.96	17.96	5.01	2352.03	.00	6.20	24.00	8.000	24.000	.00	0 .0
279.870	.0041					.0040	1.11	4.88	1.43	4.84	.012	.00	.00	BOX
-5855.940	2343.290	4.914	2348.205	2101.96	17.82	4.93	2353.14	.00	6.20	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0042					.0040	.01	4.91	1.42		.012	.00	.00	BOX
-5853.560	2343.300	4.777	2348.077	2063.00	17.99	5.03	2353.10	.00	6.12	24.00	8.000	24.000	.00	0 .0
788.297	.0041					.0041	3.23	4.78	1.45	4.78	.012	.00	.00	BOX
-5065.263	2346.534	4.777	2351.311	2063.00	17.99	5.03	2356.34	.00	6.12	24.00	8.000	24.000	.00	0 .0
856.913	.0041					.0040	3.42	4.78	1.45	4.78	.012	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
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Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-4208.350	2350.050	4.869	2354.919	2063.00	17.65	4.84	2359.76	1.98	6.12	24.00	8.000	24.000	.00	0 .0
34.860	.0040					.0039	.13	6.85	1.41	4.81	.012	.00	.00	BOX
-4173.490	2350.190	4.874	2355.064	2063.00	17.64	4.83	2359.89	1.97	6.12	24.00	8.000	24.000	.00	0 .0
34.870	.0043					.0038	.13	6.85	1.41	4.70	.012	.00	.00	BOX
-4138.620	2350.340	4.891	2355.231	2063.00	17.58	4.80	2360.03	.00	6.12	24.00	8.000	24.000	.00	0 .0
51.830	.0041					.0038	.20	4.89	1.40	4.80	.012	.00	.00	BOX
-4086.790	2350.550	4.904	2355.454	2063.00	17.53	4.77	2360.23	.00	6.12	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0050					.0040	.02	4.90	1.40		.012	.00	.00	BOX
-4082.790	2350.570	4.709	2355.280	2040.04	18.05	5.06	2360.34	.00	6.08	24.00	8.000	24.000	.00	0 .0
674.340	.0041					.0045	3.01	4.71	1.47	4.74	.012	.00	.00	BOX
-3408.450	2353.330	4.517	2357.847	2040.04	18.82	5.50	2363.35	.00	6.08	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0049	.01	4.52	1.56		.012	.00	.00	BOX
-3405.950	2353.340	4.416	2357.756	2025.29	19.11	5.67	2363.43	.00	6.05	24.00	8.000	24.000	.00	0 .0
32.573	.0041					.0050	.16	4.42	1.60	4.72	.012	.00	.00	BOX
-3373.377	2353.473	4.397	2357.870	2025.29	19.19	5.72	2363.59	.00	6.05	24.00	8.000	24.000	.00	0 .0
270.877	.0041					.0054	1.47	4.40	1.61	4.72	.012	.00	.00	BOX
-3102.500	2354.580	4.192	2358.772	2025.29	20.13	6.29	2365.06	.00	6.05	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0060	.02	4.19	1.73		.012	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-12.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Date: 11- 7-2008 Time: 2:26: 6

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-3100.000	2354.590	4.061	2358.651	2001.00	20.53	6.55	2365.20	.00	6.00	24.00	8.000	24.000	.00	0
84.905	.0041					.0065	.55	4.06	1.80	4.68	.012	.00	.00	BOX
-3015.095	2354.938	3.974	2358.912	2001.00	20.98	6.84	2365.75	.00	6.00	24.00	8.000	24.000	.00	0
161.325	.0041					.0072	1.16	3.97	1.85	4.68	.012	.00	.00	BOX
-2853.770	2355.600	3.789	2359.389	2001.00	22.00	7.52	2366.91	1.85	6.00	24.00	8.000	24.000	.00	0
122.500	.0041					.0082	1.01	5.64	1.99	4.68	.012	.00	.00	BOX
-2731.270	2356.104	3.633	2359.737	2001.00	22.95	8.18	2367.92	.00	6.00	24.00	8.000	24.000	.00	0
JUNCT STR	.0040					.0091	.04	5.65	2.12		.012	.00	.00	BOX
-2727.270	2356.120	3.443	2359.563	1921.00	23.25	8.39	2367.96	2.07	5.84	24.00	8.000	24.000	.00	0
13.610	.0044					.0096	.13	5.51	2.21	4.45	.012	.00	.00	BOX
-2713.660	2356.180	3.425	2359.605	1921.00	23.37	8.48	2368.09	.00	5.84	24.00	8.000	24.000	.00	0
58.480	.0041					.0100	.59	3.42	2.23	4.55	.012	.00	.00	BOX
-2655.180	2356.420	3.341	2359.761	1921.00	23.96	8.91	2368.67	.00	5.84	24.00	8.000	24.000	.00	0
TRANS STR	.0500					.0077	.77	3.34	2.31		.012	-2.88	.00	BOX
-2555.180	2361.420	3.700	2365.120	1921.00	17.48	4.75	2369.87	.00	5.20	37.84	7.000	24.000	2.00	0
856.036	.0051					.0048	4.10	3.70	1.81	3.70	.012	-2.88	2.00	TRAP
-1699.144	2365.790	3.832	2369.622	1921.00	16.72	4.34	2373.96	.00	5.20	38.37	7.000	24.000	2.00	0
272.284	.0051					.0042	1.14	3.83	1.70	3.70	.012	-2.88	2.00	TRAP

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-12.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Date: 11- 7-2008 Time: 2:26: 6

*****															*****	
Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip		
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch		
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****		
-1426.860	2367.180	3.977	2371.157	1921.00	15.94	3.95	2375.10	.00	5.20	38.95	7.000	24.000	2.00	0 .0		
TRANS STR	.0140					.0038	.80	3.98	1.60		.012	-6.24	2.00	TRAP		
-1217.090	2370.120	2.945	2373.065	1921.00	13.76	2.94	2376.00	.00	3.75	52.00	7.000	52.000	.00	0 .0		
TRANS STR	.0136					.0042	.58	2.95	1.48		.012	.00	.00	RECTANG		
-1078.920	2372.000	2.003	2374.003	1921.00	12.97	2.61	2376.62	.00	2.76	73.92	7.000	73.920	.00	0 .0		
WALL EXIT																
-1078.920	2372.000	3.747	2375.747	1921.00	10.59	1.74	2377.49	.00	3.75	52.00	7.000	52.000	.00	0 .0		
JUNCT STR	.0000					.0005	.00	3.75	1.00		.012	.00	.00	RECTANG		
----- WARNING - Junction Analysis - Change in Channel Type -----																
-1078.920	2372.000	5.254	2377.254	938.00	3.91	.24	2377.49	.00	2.28	51.00	5.000	51.000	.00	3 1.0		
78.812	.0037					.0005	.04	5.25	.32	1.99	.012	.00	.00	BOX		
-1000.109	2372.290	5.000	2377.290	938.00	3.91	.24	2377.53	.00	2.28	51.00	5.000	51.000	.00	3 1.0		
61.363	.0037					.0003	.02	5.00	.32	1.99	.012	.00	.00	BOX		
-938.746	2372.516	4.766	2377.283	938.00	4.10	.26	2377.54	.00	2.28	51.00	5.000	51.000	.00	3 1.0		
58.153	.0037					.0003	.02	4.77	.34	1.99	.012	.00	.00	BOX		

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:26: 6

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-12.wsw; DATE: NOV-08; BY: VIN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
-880.593	2372.731	4.545	2377.275	938.00	4.30	.29	2377.56	.00	2.28	51.00	5.000	51.000	.00	3 1.0
55.043	.0037				.0003	.02	4.54	.37	1.99	.012	.00	.00	BOX	
----- WARNING - Flow depth near top of box conduit -----														
-825.550	2372.934	4.333	2377.267	938.00	4.51	.32	2377.58	.00	2.28	51.00	5.000	51.000	.00	3 1.0
9.900	.0037				.0004	.00	4.33	.39	1.99	.012	.00	.00	BOX	
-815.650	2372.970	4.295	2377.265	938.00	4.55	.32	2377.59	.00	2.28	51.00	5.000	51.000	.00	3 1.0
BRIDGE ENTRANCE														
-815.650	2372.970	4.379	2377.349	938.00	4.20	.27	2377.62	.00	2.19	51.00	5.000	51.000	.00	0 .0
WALL ENTRANCE														
-815.650	2372.970	4.777	2377.747	938.00	1.98	.06	2377.81	.00	1.53	113.66	8.000	85.000	3.00	0 .0
22.023	.0089				.0003	.01	4.78	.17	1.75	.033	.00	3.00	TRAP	
-793.628	2373.166	4.582	2377.748	938.00	2.07	.07	2377.81	.00	1.53	112.49	8.000	85.000	3.00	0 .0
21.238	.0089				.0004	.01	4.58	.18	1.75	.033	.00	3.00	TRAP	
-772.389	2373.355	4.393	2377.749	938.00	2.17	.07	2377.82	.00	1.53	111.36	8.000	85.000	3.00	0 .0
20.481	.0089				.0004	.01	4.39	.19	1.75	.033	.00	3.00	TRAP	
-751.908	2373.538	4.212	2377.750	938.00	2.28	.08	2377.83	.00	1.53	110.27	8.000	85.000	3.00	0 .0
19.752	.0089				.0005	.01	4.21	.21	1.75	.033	.00	3.00	TRAP	

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:26: 6

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-12.wsw; DATE: NOV-08; BY: VIN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
-732.156	2373.714	4.038	2377.751	938.00	2.39	.09	2377.84	.00	1.53	109.23	8.000	85.000	3.00	0 .0
19.052	.0089				.0006	.01	4.04	.22	1.75	.033	.00	3.00	TRAP	
-713.105	2373.883	3.870	2377.753	938.00	2.51	.10	2377.85	.00	1.53	108.22	8.000	85.000	3.00	0 .0
13.105	.0089				.0006	.01	3.87	.24	1.75	.033	.00	3.00	TRAP	
-700.000	2374.000	3.755	2377.755	938.00	2.59	.10	2377.86	.00	1.53	107.53	8.000	85.000	3.00	0 .0

November 11, 2008

Values in English Units

HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Velocity Check - Trunkline with Trunkline Peaking)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; 6952-ULT-12.WSW; n=.012

WO # 6952

By: D.Bergh

WSPGW STATION	REMARKS	DESIGN FLOW	DEPTH OF FLOW	DEPTH W/AIR ⁽¹⁾	INVERT ELEV	VELOCITY	H.G.L.	E.G.L.	CHANNEL TYPE	BASE WIDTH/DIA.	SIDE SLOPE	FLOW AREA	WETTED PERIMETER	TOP WIDTH	FROUDE NUMBER	ANGLE OF CURVE	CURVE RADIUS	SUPER ELEV ⁽⁴⁾	ROLL WAVE ⁽²⁾	CCRFD MIN FB ⁽³⁾	MIN WALL HT	DESIGN WALL HT	ACTUAL FB	FB CHECK	RESOLUTION
-7+00.00	SYSTEM HEADWORKS	1921	3.755	3.755	2374.00	2.59	2377.76	2377.86	TRAP	85	3	741.70	108.75	107.53	0.17					0.60	4.36	8.00	4.25	OK	NA
-7+00.00	BEGIN TRAP CHANNEL AT GOLF COURSE	1921	3.755	3.755	2374.00	2.59	2377.76	2377.86	TRAP	85	3	741.70	108.75	107.53	0.17					0.60	4.36	8.00	4.25	OK	NA
					0.89%																				
-8+15.65	END TRAP CHANNEL; WALL ENTRANCE	1921	4.777	4.777	2372.97	1.98	2377.75	2377.81	TRAP	85	0	970.20	94.55	85.00	0.10					0.56	5.34	8.00	3.22	OK	NA
-8+15.65	BRIDGE ENTRANCE; BEGIN RCB; GB	1921	4.295	4.295	2372.97	4.55	2377.27	2377.59	RCB	48	0	422.20	56.59	48.00	0.27					0.82	5.12	5.00	0.71	FIX WALL HEIGHT	NA
					0.37%																				
-10+78.92	END RCB; WALL EXIT	1921	5.254	5.254	2372.00	3.91	2377.25	2377.49	RCB	48	0	491.30	58.51	48.00	0.22					0.74	5.99	5.00	-0.25	FIX WALL HEIGHT	NA
-10+78.92	BEGIN WIDTH TRANSITION STRUCTURE	1921	2.003	2.004	2372.00	12.97	2374.00	2376.62	RECT	73.92	0	148.11	77.93	73.92	1.61					1.41	3.41	7.00	5.00	OK	NA
					1.36%																				
-12+17.09	END WIDTH TRANSITION STRUCTURE	1921	2.945	2.945	2370.12	13.76	2373.07	2376.01	RECT	52	0	139.61	57.89	52.00	1.48					1.49	4.44	7.00	4.06	OK	NA
-12+17.09	BEGIN TRANSITION STRUCTURE	1921	2.945	2.945	2370.12	13.76	2373.07	2376.01	RECT	52	0	139.61	57.89	52.00	1.48					1.49	4.44	7.00	4.06	OK	NA
					1.40%																				
-14+26.86	END TRANSITION STRUCTURE	1921	3.977	3.981	2367.18	15.94	2371.16	2375.10	TRAP	24	2	120.51	41.79	39.91	1.62					1.63	5.61	7.00	3.02	OK	NA
-14+26.86	BEGIN TRAPEZOIDAL CHANNEL; GB	1921	3.977	3.981	2367.18	15.94	2371.16	2375.10	TRAP	24	2	120.51	41.79	39.91	1.62					1.63	5.61	7.00	3.02	OK	NA
					0.51%																				
-25+55.18	END TRAPEZOIDAL CHANNEL	1921	3.700	3.752	2361.42	17.48	2365.12	2369.86	TRAP	24	2	109.90	40.55	38.80	1.83					1.68	5.38	7.00	3.30	OK	NA
-25+55.18	BEGIN TRANSITION STRUCTURE; GB	1921	3.700	3.752	2361.42	17.48	2365.12	2369.86	TRAP	24	2	109.90	40.55	38.80	1.83					1.68	5.38	7.00	3.30	OK	NA
					5.00%																				
-26+55.18	END TRANSITION STRUCTURE	1921	3.341	3.489	2356.42	23.96	2359.76	2368.68	RCB	24	0	80.18	30.68	24.00	2.31					1.90	5.24	8.00	4.66	OK	NA
-26+55.18	BEGIN 24' X 8' RCB; GB	1921	3.341	3.489	2356.42	23.96	2359.76	2368.68	RCB	24	0	80.18	30.68	24.00	2.31					1.90	5.24	8.00	4.66	NA	NA
					0.41%																				
-27+13.66		1921	3.425	3.559	2356.18	23.37	2359.61	2368.09	RCB	24	0	82.20	30.85	24.00	2.23					1.88	5.31	8.00	4.58	NA	NA
-27+13.66	PC	1921	3.425	3.559	2356.18	23.37	2359.61	2368.09	RCB	24	0	82.20	30.85	24.00	2.23	40.00	200	2.035		1.88	7.34	8.00	2.54	NA	NA
					0.44%																				
-27+27.27	48" RCP LATERAL	1921	3.443	3.573	2356.12	23.25	2359.56	2367.96	RCB	24	0	82.62	30.89	24.00	2.21					1.88	5.32	8.00	4.56	NA	NA
-27+31.27		2001	3.633	3.750	2356.10	22.95	2359.74	2367.92	RCB	24	0	87.19	31.27	24.00	2.12					1.88	5.52	8.00	4.37	NA	NA
					0.41%																				
-28+53.77	PT	2001	3.789	3.880	2355.60	22.00	2359.39	2366.90	RCB	24	0	90.95	31.58	24.00	1.99	40.00	200	1.804		1.86	7.45	8.00	2.41	NA	NA
-28+53.77		2001	3.789	3.880	2355.60	22.00	2359.39	2366.90	RCB	24	0	90.95	31.58	24.00	1.99					1.86	5.65	8.00	4.21	NA	NA
					0.41%																				
-31+00.00	30" RCP LATERAL	2001	4.061	4.110	2354.59	20.53	2350.57	2357.11	RCB	24	0	97.47	32.12	24.00	1.80					1.82	5.88	8.00	3.94	NA	NA
-31+02.50		2025	4.192	4.224	2354.58	20.13	2350.55	2356.84	RCB	24	0	100.61	32.38	24.00	1.73					1.81	6.00	8.00	3.81	NA	NA
					0.41%																				
-34+05.95	30" RCP LATERAL	2025	4.416	4.415	2353.34	19.11	2350.57	2356.24	RCB	24	0	105.98	32.83	24.00	1.60					1.78	6.20	8.00	3.58	NA	NA
-34+08.45		2040	4.517	4.517	2353.33	18.82	2350.55	2356.05	RCB	24	0	108.40	33.03	24.00	1.56					1.78	8.28	8.00	3.48	NA	NA
					0.41%																				
-40+82.79	48" RCP LATERAL	2040	4.709	4.709	2350.57	18.05	2350.57	2355.63	RCB	24	0	113.02	33.42	24.00	1.47					1.76	6.47	8.00	3.29	NA	NA
-40+86.79		2063	4.904	4.904	2350.55	17.53	2350.55	2355.32	RCB	24	0	117.68	33.81	24.00	1.40					1.74	8.63	8.00	3.10	NA	NA
					0.41%																				
-41+38.62		2063	4.891	4.891	2350.34	17.58	2355.23	2360.03	RCB	24	0	117.35	33.78	24.00	1.40					1.75	8.64	8.00	3.11	NA	NA
-41+38.62	PC	2063	4.891	4.891	2350.34	17.58	2355.23	2360.03	RCB	24	0	117.35	33.78	24.00	1.40	17.00	116	1.986		1.75	8.62	8.00	1.12	NA	NA
					0.43%																				
-41+73.49	PRC	2063	4.874	4.874	2350.19	17.64	2355.06	2359.90	RCB	24	0	116.95	33.75	24.00	1.41	17.00	116	1.999		1.75	8.62	8.00	1.13	NA	NA
-41+73.49	PRC	2063	4.874	4.874	2350.19	17.64	2355.06	2359.90	RCB	24	0	116.95	33.75	24.00	1.41	17.00	116	1.999		1.75	#REF!	8.00	1.13	NA	NA
					0.40%																				
-42+08.35	PT	2063	4.869	4.869	2350.05	17.65	2354.92	2359.76	RCB	24	0	116.88	33.74	24.00	1.41	-17.00	116	2.002		1.75	6.62	8.00	1.13	NA	NA
-42+08.35		2063	4.869	4.869	2350.05	17.65	2354.92	2359.76	RCB	24	0	116.88	33.74	24.00	1.41					1.75	6.62	8.00	3.13	NA	NA
					0.41%																				
-58+53.56	DUAL 14" X 23" HERCP LATERAL	2063	4.777	4.777	2343.30	17.99	2348.08	2353.10	RCB	24	0	114.67	33.55	24.00	1.45					1.76	6.53	8.00	3.22	NA	NA
-58+55.94		2102	4.914	4.914	2343.29	17.82	2348.20	2353.13	RCB	24	0	117.95	33.83	24.00	1.42					1.76	6.67	8.00	3.09	NA	NA
					0.41%																				
-61+35.81	DUAL 24" X 38" HERCP LATERAL	2102	4.876	4.876	2342.14	17.96	2347.02	2352.02	RCB	24	0	117.04	33.75	24.00	1.43					1.76	6.64	8.00	3.12	NA	NA
-61+39.85		2187	5.326	5.326	2342.13	17.11	2347.46	2352.00	RCB	24	0	127.82	34.65	24.00	1.31					1.75	7.07	8.00	2.67	NA	NA
					0.38%																				
-63+28.00	28" X 45" HERCP LATERAL	2187	5.240	5.240	2341.42	17.39	2346.66	2351.36	RCB	24	0	125.76	34.48	24.00	1.34					1.76	7.00	8.00	2.76	NA	NA

HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Velocity Check - Trunkline with Trunkline Peaking)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; 6952-ULT-12.WSW; n=.012

WSPGW STATION	REMARKS	DESIGN FLOW	DEPTH OF FLOW	DEPTH W/AIR ⁽¹⁾	INVERT ELEV	VELOCITY	H.G.L.	E.G.L.	CHANNEL TYPE	BASE WIDTH/DIA.	SIDE SLOPE	FLOW AREA	WETTED PERIMETER	TOP WIDTH	FROUDE NUMBER	ANGLE OF CURVE	CURVE RADIUS	SUPER ELEV ⁽⁴⁾	ROLL WAVE ⁽²⁾	CCRFCD MIN FB ⁽³⁾	MIN WALL HT	DESIGN WALL HT	ACTUAL FB	FB CHECK	RESOLUTION
-63+31.00		2262	6.008	6.008	2341.41	15.69	2347.42	2351.24	RCB	24	0	144.17	36.02	24.00	1.13					1.71	7.72	8.00	1.99	NA	NA
					0.45%																				
-64+65.35	36" RCP LATERAL	2262	5.520	5.520	2340.80	17.08	2346.32	2350.85	RCB	24	0	132.44	35.04	24.00	1.28					1.75	7.27	8.00	2.48	NA	NA
-64+68.35		2282	5.794	5.794	2340.79	16.41	2346.58	2350.76	RCB	24	0	139.06	35.59	24.00	1.20					1.74	7.53	8.00	2.21	NA	NA
					0.42%																				
-66+00.00	END 24' X 8' RCB	2282	5.530	5.530	2340.24	17.19	2345.77	2350.36	RCB	24	0	132.75	35.06	24.00	1.29					1.76	7.29	8.00	2.47	NA	NA
-66+00.00	BEGIN TRANSITION STRUCTURE	2282	5.530	5.530	2340.24	17.19	2345.77	2350.36	RCB	24	0	132.75	35.06	24.00	1.29					1.76	7.29	8.00	2.47	NA	NA
					0.38%																				
-66+18.22	END TRANSITION STRUCTURE	2282	5.538	5.538	2340.17	17.17	2345.71	2350.29	RCB	26	0	132.91	37.08	26.00	1.34					1.76	10.58	9.00	0.17	NA	NA
-66+18.22	BEGIN 2 - 13' X 9' RCB	2282	5.538	5.538	2340.17	17.17	2345.71	2350.29	RCB	26	0	132.91	37.08	26.00	1.34					1.76	7.30	9.00	3.46	NA	NA
					1.68%																				
-66+23.76		2282	5.447	5.447	2340.08	17.45	2345.52	2350.25	RCB	26	0	130.77	36.89	26.00	1.37					1.77	10.50	9.00	3.55	NA	NA
-66+23.76		2282	5.447	5.447	2340.08	17.45	2345.52	2350.25	RCB	26	0	130.77	36.89	26.00	1.37					1.77	7.21	9.00	3.55	NA	NA
					1.67%																				
-66+49.40		2282	5.123	5.123	2339.65	18.56	2344.77	2350.12	RCB	26	0	122.95	36.25	26.00	1.50					1.80	6.92	9.00	3.88	NA	NA
-66+49.40	PC	2282	5.123	5.123	2339.65	18.56	2344.77	2350.12	RCB	26	0	122.95	36.25	26.00	1.50	53.00	87	2.591		1.80	7.06	9.00	1.29	NA	NA
					1.68%																				
-67+29.51	60" RCP LATERAL	2282	4.582	4.632	2338.30	20.75	2342.88	2349.57	RCB	26	0	109.98	35.16	26.00	1.78					1.86	6.44	9.00	4.42	NA	NA
-67+34.51		2385	5.109	5.109	2338.22	19.45	2343.33	2349.20	RCB	26	0	122.62	36.22	26.00	1.58					1.84	6.95	9.00	3.89	NA	NA
					0.22%																				
-67+86.22	PT	2385	5.280	5.280	2338.11	18.82	2343.39	2348.89	RCB	26	0	126.73	36.56	26.00	1.50	37.00	87	3.287		1.82	7.10	9.00	0.43	NA	NA
-67+86.22		2385	5.280	5.280	2338.11	18.82	2343.39	2348.89	RCB	26	0	126.73	36.56	26.00	1.50					1.82	7.10	9.00	3.72	NA	NA
					0.36%																				
-72+11.94		2385	6.019	6.019	2336.58	16.51	2342.59	2346.83	RCB	26	0	144.46	38.04	26.00	1.23					1.75	7.77	9.00	2.98	NA	NA
-72+11.94	PC	2385	6.019	6.019	2336.58	16.51	2342.59	2346.83	RCB	26	0	144.46	38.04	26.00	1.23	2.00	1250	0.176		1.75	7.95	9.00	2.80	NA	NA
					0.36%																				
-72+51.42	PT	2385	6.066	6.066	2336.43	16.38	2342.50	2346.67	RCB	26	0	145.60	38.13	26.00	1.22	2.00	1250	0.173		1.75	7.99	9.00	2.76	NA	NA
-72+51.42		2385	6.066	6.066	2336.43	16.38	2342.50	2346.67	RCB	26	0	145.60	38.13	26.00	1.22					1.75	7.81	9.00	2.93	NA	NA
					0.36%																				
-78+12.13		2385	6.325	6.325	2334.42	15.71	2340.74	2344.58	RCB	26	0	151.81	38.65	26.00	1.15					1.73	8.05	9.00	2.68	NA	NA
-78+12.13	PC	2385	6.325	6.325	2334.42	15.71	2340.74	2344.58	RCB	26	0	151.81	38.65	26.00	1.15	2.00	1250	0.159		1.73	8.21	9.00	2.52	NA	NA
					0.36%																				
-78+52.06	PT	2385	6.323	6.323	2334.27	15.72	2340.60	2344.43	RCB	26	0	151.72	38.65	26.00	1.15	2.00	1250	0.160		1.73	8.05	9.00	2.68	NA	NA
-78+52.06		2385	6.323	6.323	2334.27	15.72	2340.60	2344.43	RCB	26	0	151.72	38.65	26.00	1.15					1.73	8.05	9.00	2.68	NA	NA
					0.34%																				
-89+40.02	HYDRAULIC JUMP	2385	6.478	6.478	2330.60	15.34	2337.08	2340.74	RCB	26	0	155.48	38.96	26.00	1.11					1.71	8.19	9.00	2.52	NA	NA
-89+40.02		2367	7.016	7.016	2330.60	14.17	2337.62	2340.74	RCB	26	0	167.04	40.03	26.00	0.99					3.62	10.63	9.00	1.98	NA	NA
					0.34%																				
-94+24.48	60" RCP LATERAL	2385	8.812	8.812	2328.97	11.28	2337.78	2339.76	RCB	26	0	211.44	43.62	26.00	0.70					2.48	11.29	9.00	0.19	NA	NA
-94+24.48		2367	7.209	7.209	2328.93	15.24	2336.14	2339.75	RCB	26	0	155.31	40.42	26.00	1.10					1.74	8.95	9.00	1.79	NA	NA
					0.35%																				
-95+19.61	END 2 - 13' X 9' RCB	2367	6.861	6.861	2328.60	16.01	2335.46	2339.44	RCB	26	0	147.85	39.72	26.00	1.18					1.76	8.62	9.00	2.14	NA	NA
-95+19.61	BEGIN TRANSITION STRUCTURE	2367	6.861	6.861	2328.60	16.01	2335.46	2339.44	RCB	26	0	147.85	39.72	26.00	1.18					1.76	8.62	9.00	2.14	NA	NA
					3.90%																				
-95+69.61	END TRANSITION STRUCTURE	2367	5.129	5.200	2326.65	21.42	2331.78	2338.90	RCB	26	0	110.50	36.26	26.00	1.83					1.92	7.05	9.00	3.87	NA	NA
-95+69.61	BEGIN 24' X 8' RCB; 48" RCP LATERAL	2761	6.047	6.047	2326.65	19.02	2332.70	2338.31	RCB	26	0	145.16	38.09	26.00	1.42					1.87	7.91	8.00	1.95	NA	NA
					0.44%																				
-109+54.48		2761	5.399	5.400	2320.51	21.43	2326.88	2333.01	RCB	26	0	128.84	36.74	26.00	1.70					1.94	7.31	8.00	2.63	NA	NA
-109+54.48	48" RCP LATERAL	2885	6.322	6.322	2320.51	19.01	2326.83	2332.44	RCB	26	0	151.76	38.64	26.00	1.39					1.88	8.20	8.00	1.68	NA	NA
					0.34%																				
-120+99.48		2885	6.665	6.665	2317.04	18.04	2323.71	2328.76	RCB	26	0	159.92	39.33	26.00	1.28					1.85	8.51	9.00	2.34	NA	NA
-120+99.48	GB	2885	6.665	6.665	2317.04	18.04	2323.71	2328.76	RCB	26	0	159.92	39.33	26.00	1.28					1.85	8.51	8.00	1.34	NA	NA
					2.60%																				
-121+19.48		2885	6.065	6.065	2316.52	19.82	2322.59	2328.68	RCB	26	0	145.56	38.13	26.00	1.48					1.90	7.97	8.00	1.94	NA	NA
-121+19.48	48" RCP LATERAL	2955	6.790	6.790	2316.52	18.13	2323.31	2328.41	RCB	26	0	162.99	39.58	26.00	1.28					1.86	8.65	8.00	1.21	NA	NA

November 11, 2008

Values in English Units

HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Velocity Check - Trunkline with Trunkline Peaking)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; 6952-ULT-12.WSW; n=.012

WO # 6952

By: D.Bergh

WSPGW STATION	REMARKS	DESIGN FLOW	DEPTH OF FLOW	DEPTH W/AIR ⁽¹⁾	INVERT ELEV	VELOCITY	H.G.L.	E.G.L.	CHANNEL TYPE	BASE WIDTH/DIA.	SIDE SLOPE	FLOW AREA	WETTED PERIMETER	TOP WIDTH	FROUDE NUMBER	ANGLE OF CURVE	CURVE RADIUS	SUPER ELEV ⁽⁴⁾	ROLL WAVE ⁽²⁾	CCRFCD MIN FB ⁽³⁾	MIN WALL HT	DESIGN WALL HT	ACTUAL FB	FB CHECK	RESOLUTION
					0.31%																				
-146+59.48		2955	6.742	6.742	2308.66	18.26	2315.40	2320.58	RCB	26	0	161.83	39.48	26.00	1.29					1.86	8.60	8.00	1.26	NA	NA
-146+59.48	GB	2955	6.742	6.742	2308.66	18.26	2315.40	2320.58	RCB	26	0	161.83	39.48	26.00	1.29					1.86	8.60	8.00	1.26	NA	NA
					1.38%																				
-147+09.48		2955	6.098	6.098	2307.97	20.19	2314.07	2320.40	RCB	26	0	146.36	38.20	26.00	1.50					1.92	8.02	8.00	1.90	NA	NA
-147+09.48		2955	6.098	6.098	2307.97	20.19	2314.07	2320.40	RCB	26	0	146.36	38.20	26.00	1.50					1.92	8.02	8.00	1.90	NA	NA
					0.43%																				
-171+09.48	END 24' X 8' RCB	2955	6.012	6.012	2297.65	20.48	2303.66	2310.17	RCB	26	0	144.29	38.02	26.00	1.53					1.93	7.94	8.00	1.99	NA	NA
-171+09.48	BEGIN TRANSITION STRUCTURE	2955	6.012	6.012	2297.65	20.48	2303.66	2310.17	RCB	26	0	144.29	38.02	26.00	1.53					1.93	7.94	8.00	1.99	NA	NA
					0.45%																				
-171+29.48	END TRANSITION STRUCTURE	2955	5.306	5.317	2297.56	21.42	2302.87	2309.99	RCB	26	0	137.96	36.61	26.00	1.64					1.93	7.24	8.00	2.69	NA	NA
-171+29.48	BEGIN 28.25' X 8' RCB	2955	5.306	5.317	2297.56	21.42	2302.87	2309.99	RCB	26	0	137.96	36.61	26.00	1.64					1.93	7.24	8.00	2.69	NA	NA
					0.40%																				
-171+39.48	END 28.25' X 8' RCB	2955	5.325	5.333	2297.52	21.34	2302.85	2309.92	RCB	26	0	138.47	36.65	26.00	1.63					1.93	7.26	8.00	2.68	NA	NA
-171+39.48	SYSTEM OUTLET	2955	5.325	5.333	2297.52	21.34	2302.85	2309.92	RCB	26	0	138.47	36.65	26.00	1.63					1.93	7.26	8.00	2.68	NA	NA

Notes:

- (1) Depth with air entrainment, $y^*/y = 0.906(e)^{0.0616}$ ($Fr \geq 1.60$; $y^* = y$, $Fr < 1.60$). See *WASURO User's Manual (Draft)*, US Army Corps of Engineers Los Angeles District, July 1985.
- (2) To be calculated in the future.
- (3) For supercritical flow, $F_b = 1+0.025V(V^{1/3})$; for subcritical flow, $FB = 0.5+V^2/2g$. See *Hydrologic Criteria and Drainage Design Manual*, CCRFCD, 1999.
- (4) Super-Elevation = $C * (V^2 * Tw) / (g * r)$; $C = 1$, V = Mean Channel Velocity, Tw = Top Width of Channel, r = Radius of Curve, g = gravity constant

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

B.2.2

MPU Alignment, Ultimate Conditions Mainline Peaking

File: 6952-ULT-13.wsw

$n=0.013$

T1 LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
 T2 HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
 T3 FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)
 SO -17139.48 2297.52 12
 REM *****
 REM END VTN DESIGN
 REM *****
 R -17139.48 2297.52 12 .013
 R -17129.48 2297.56 12 .013
 TS -17109.48 2297.65 10 12 .013
 R -14709.48 2307.97 10 .013
 R -14659.48 2308.66 10 .013
 R -12119.48 2316.52 10 .013
 JX -12119.48 2316.52 10 11 .013 70.0 2318.520 90.0 .000
 R -12099.48 2317.04 10 .013
 R -10954.48 2320.51 10 .013
 JX -10954.48 2320.51 10 14 .013 124.0 2322.510 90.0 .000
 R -10934.48 2321.33 10 .013
 R -9569.61 2326.65 10 .013
 JX -9569.61 2326.65 10 14 .013 124.0 2328.650 90.0 .000
 TS -9519.61 2328.60 8 .013
 REM *****
 REM END LOUIS BERGER DESIGN, BEGIN VTN DESIGN AT ELKHORN AND TORREY PINES; Q=2637
 REM *****
 R -9429.48 2328.93 8 .013
 JX -9424.48 2328.97 8 9 .013 252.00 2328.97 90
 R -7852.06 2334.274 8 .013
 R -7812.13 2334.418 8 .013 -2.00
 R -7251.42 2336.433 8 .013
 R -7211.94 2336.575 8 .013 2.00
 R -6786.22 2338.108 8 .013
 R -6734.51 2338.22 8 .013
 JX -6729.51 2338.30 8 14 .013 103.00 2338.22 37.00
 R -6729.51 2338.30 8 .013 -57
 R -6649.40 2339.649 8 .013 53.00
 R -6626.76 2340.027 8 .013
 R -6623.76 2340.08 8 .013
 REM *****
 REM END VTN DESIGN, BEGIN LOUIS BERGER DESIGN AT RAINBOW AND ELKHORN
 REM *****
 R -6618.22 2340.17 8 .013
 TS -6600.00 2340.24 1 8 .013
 R -6468.35 2340.788 1 .013
 JX -6465.35 2340.80 1 2 .013 19.97 2341.13 -80.0
 R -6331.00 2341.41 1 .013
 JX -6328.00 2341.42 1 2 .013 75.06 2341.80 -90
 R -6139.85 2342.13 1 .013
 JX -6135.81 2342.14 1 18 .013 85.01 2342.21 -90
 R -5855.94 2343.29 1 .013
 JX -5853.56 2343.30 1 17 .013 38.96 2343.53 -90
 R -4208.35 2350.05 1 .013
 R -4173.49 2350.19 1 .013 -17.00
 R -4138.62 2350.34 1 .013 17.00
 R -4086.79 2350.55 1 .013
 JX -4082.79 2350.57 1 3 .013 22.96 2352.07 -90
 R -3408.45 2353.33 1 .013
 JX -3405.95 2353.34 1 18 .013 14.75 2354.84 -90
 R -3102.50 2354.58 1 .013
 JX -3100.00 2354.59 1 18 .013 24.29 2356.09 -90
 R -2853.77 2355.60 1 .013
 R -2731.27 2356.104 1 .013
 JX -2727.27 2356.12 1 3 .013 80.00 2358.51 -36.00
 R -2713.66 2356.18 1 .013 -50
 R -2655.18 2356.42 1 .013 -4.00
 TS -2555.18 2361.42 4 1 .013
 R -1426.86 2367.18 4 .013
 REM *****
 REM REQUIRED TRANSITION LENGTH = 15 x DELTA BW = (52 - 24)/2 = 210'
 REM *****
 TS -1217.09 2370.12 5 4 .013
 TS -1078.92 2372.00 19 5 .013
 WX -1078.92 2372.00 5 .013
 JX -1078.92 2372.00 6 13 .013 983.00 2372.03 0.00
 R -815.65 2372.97 6 .013
 BE -815.65 6
 WE -815.65 7
 R -700.00 2374.00 7 .033
 REM *****
 REM BEGIN VTN DESIGN, GRAND TETON AND GOLF COARSE
 REM *****
 SH -700.00 2374.00 7 .033
 CD 1 3 0 .000 8.000 24.000
 CD 2 4 1 .000 3.000
 CD 3 4 1 .000 4.000
 CD 4 1 0 .000 7.000 24.000 2.000 2.000 -2.88
 CD 5 2 0 .000 7.000 52.000 -6.24
 CD 6 3 3 1.000 5.000 51.000
 CD 7 1 0 .000 8.000 85.000 3.000 3.000
 CD 8 3 1 2.000 9.000 26.000
 CD 9 4 1 .000 5.000
 CD 10 3 0 .000 8.000 24.000
 CD 11 3 0 .000 4.000 6.000
 CD 12 3 1 2.250 8.000 28.250
 CD 13 3 1 1.000 5.000 25.000
 CD 14 4 1 .000 4.000
 CD 15 2 0 .000 8.000 24.000
 CD 17 4 1 .000 1.500
 CD 18 4 1 .000 2.500
 CD 19 2 0 .000 7.000 73.920
 Q 938.000 .0

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:26:16

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-17139.480	2297.520	5.566	2303.086	2955.00	20.42	6.47	2309.56	.00	7.38	28.25	8.000	28.250	.00	1 2.3
10.000	.0040					.0074	.07	5.57	1.59	6.99	.013	.00	.00	BOX
-17129.480	2297.560	5.540	2303.100	2955.00	20.51	6.53	2309.64	.00	7.38	28.25	8.000	28.250	.00	1 2.3
TRANS STR	.0045					.0059	.12	5.54	1.60		.013	.00	.00	BOX
-17109.480	2297.650	6.356	2304.005	2955.00	19.37	5.83	2309.83	.00	7.78	24.00	8.000	24.000	.00	0 .0
1528.031	.0043					.0043	6.57	6.36	1.35	6.36	.013	.00	.00	BOX
-15581.450	2304.220	6.356	2310.576	2955.00	19.37	5.83	2316.40	.00	7.78	24.00	8.000	24.000	.00	0 .0
871.969	.0043					.0044	3.82	6.36	1.35	6.36	.013	.00	.00	BOX
-14709.480	2307.970	6.271	2314.241	2955.00	19.63	5.99	2320.23	.00	7.78	24.00	8.000	24.000	.00	0 .0
18.244	.0138					.0043	.08	6.27	1.38	4.27	.013	.00	.00	BOX
-14691.240	2308.222	6.484	2314.705	2955.00	18.99	5.60	2320.31	.00	7.78	24.00	8.000	24.000	.00	0 .0
19.267	.0138					.0038	.07	6.48	1.31	4.27	.013	.00	.00	BOX
-14671.970	2308.488	6.800	2315.288	2955.00	18.11	5.09	2320.38	.00	7.78	24.00	8.000	24.000	.00	0 .0
12.489	.0138					.0033	.04	6.80	1.22	4.27	.013	.00	.00	BOX
-14659.480	2308.660	7.132	2315.792	2955.00	17.26	4.63	2320.42	.00	7.78	24.00	8.000	24.000	.00	0 .0
2059.197	.0031					.0031	6.37	7.13	1.14	7.13	.013	.00	.00	BOX
-12600.280	2315.032	7.132	2322.164	2955.00	17.26	4.63	2326.79	.00	7.78	24.00	8.000	24.000	.00	0 .0
480.803	.0031					.0031	1.48	7.13	1.14	7.13	.013	.00	.00	BOX

FILE: 6952-ULT-13.WSW

W S P G W - CIVILDESIGN Version 14.05

PAGE 2

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:26:16

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-12119.480	2316.520	7.151	2323.671	2955.00	17.22	4.60	2328.27	.00	7.78	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0000					.0037	.00	7.15	1.13		.013	.00	.00	BOX
-12119.480	2316.520	6.236	2322.756	2885.00	19.28	5.77	2328.53	.00	7.66	24.00	8.000	24.000	.00	0 .0
6.559	.0260					.0042	.03	6.24	1.36	3.40	.013	.00	.00	BOX
-12112.920	2316.690	6.422	2323.113	2885.00	18.72	5.44	2328.55	.00	7.66	24.00	8.000	24.000	.00	0 .0
8.130	.0260					.0037	.03	6.42	1.30	3.40	.013	.00	.00	BOX
-12104.790	2316.902	6.736	2323.637	2885.00	17.85	4.95	2328.58	.00	7.66	24.00	8.000	24.000	.00	0 .0
5.312	.0260					.0033	.02	6.74	1.21	3.40	.013	.00	.00	BOX
-12099.480	2317.040	7.064	2324.104	2885.00	17.02	4.50	2328.60	.00	7.66	24.00	8.000	24.000	.00	0 .0
223.221	.0030					.0030	.68	7.06	1.13	7.06	.013	.00	.00	BOX
-11876.260	2317.717	7.064	2324.781	2885.00	17.02	4.50	2329.28	.00	7.66	24.00	8.000	24.000	.00	0 .0
462.549	.0030					.0031	1.41	7.06	1.13	7.06	.013	.00	.00	BOX
-11413.710	2319.118	7.019	2326.137	2885.00	17.13	4.55	2330.69	.00	7.66	24.00	8.000	24.000	.00	0 .0
459.230	.0030					.0033	1.52	7.02	1.14	7.06	.013	.00	.00	BOX
-10954.480	2320.510	6.692	2327.202	2885.00	17.96	5.01	2332.21	.00	7.66	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0000					.0045	.00	6.69	1.22		.013	.00	.00	BOX
-10954.480	2320.510	5.551	2326.061	2761.00	20.72	6.67	2332.73	.00	7.43	24.00	8.000	24.000	.00	0 .0
5.564	.0410					.0053	.03	5.55	1.55	2.85	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:26:16

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-10948.920	2320.738	5.703	2326.441	2761.00	20.17	6.32	2332.76	.00	7.43	24.00	8.000	24.000	.00	0 .0
8.180	.0410					.0048	.04	5.70	1.49	2.85	.013	.00	.00	BOX
-10940.740	2321.073	5.981	2327.055	2761.00	19.23	5.74	2332.80	.00	7.43	24.00	8.000	24.000	.00	0 .0
6.255	.0410					.0042	.03	5.98	1.39	2.85	.013	.00	.00	BOX
-10934.480	2321.330	6.273	2327.603	2761.00	18.34	5.22	2332.83	.00	7.43	24.00	8.000	24.000	.00	0 .0
590.237	.0039					.0039	2.30	6.27	1.29	6.27	.013	.00	.00	BOX
-10344.240	2323.631	6.273	2329.904	2761.00	18.34	5.22	2335.13	.00	7.43	24.00	8.000	24.000	.00	0 .0
774.633	.0039					.0040	3.13	6.27	1.29	6.27	.013	.00	.00	BOX
-9569.610	2326.650	6.125	2332.775	2761.00	18.78	5.48	2338.25	.00	7.43	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0000					.0052	.00	6.12	1.34		.013	.00	.00	BOX
-9569.610	2326.650	5.172	2331.822	2637.00	21.24	7.01	2338.83	.00	7.21	24.00	8.000	24.000	.00	0 .0
TRANS STR	.0390					.0049	.25	5.17	1.65		.013	.00	.00	BOX
-9519.610	2328.600	7.206	2335.807	2637.00	15.25	3.61	2339.42	.00	7.21	26.00	9.000	26.000	.00	1 2.0
87.422	.0037					.0037	.32	7.21	1.04	7.21	.013	.00	.00	BOX
-9432.188	2328.920	7.206	2336.126	2637.00	15.25	3.61	2339.74	.00	7.21	26.00	9.000	26.000	.00	1 2.0
2.708	.0037					.0037	.01	7.21	1.04	7.21	.013	.00	.00	BOX
-9429.480	2328.930	7.209	2336.139	2637.00	15.24	3.61	2339.75	.00	7.21	26.00	9.000	26.000	.00	1 2.0
JUNCT STR	.0080					.0018	.01	7.21	1.04		.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:26:16

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-9424.480	2328.970	8.815	2337.785	2385.00	11.27	1.97	2339.76	.00	6.74	26.00	9.000	26.000	.00	1 2.0
144.291	.0034					.0018	.26	8.82	.70	6.88	.013	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-9280.189	2329.457	8.405	2337.862	2385.00	11.82	2.17	2340.03	.00	6.74	26.00	9.000	26.000	.00	1 2.0
141.557	.0034					.0020	.28	8.41	.75	6.88	.013	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-9138.633	2329.934	8.014	2337.948	2385.00	12.40	2.39	2340.34	.00	6.74	26.00	9.000	26.000	.00	1 2.0
141.180	.0034					.0023	.32	8.01	.80	6.88	.013	.00	.00	BOX
-8997.453	2330.411	7.641	2338.052	2385.00	13.01	2.63	2340.68	.00	6.74	26.00	9.000	26.000	.00	1 2.0
146.934	.0034					.0026	.38	7.64	.86	6.88	.013	.00	.00	BOX
-8850.520	2330.906	7.286	2338.192	2385.00	13.64	2.89	2341.08	.00	6.74	26.00	9.000	26.000	.00	1 2.0
185.195	.0034					.0029	.54	7.29	.93	6.88	.013	.00	.00	BOX
-8665.324	2331.531	6.946	2338.478	2385.00	14.31	3.18	2341.66	.00	6.74	26.00	9.000	26.000	.00	1 2.0
110.149	.0034					.0033	.36	6.95	1.00	6.88	.013	.00	.00	BOX
-8555.175	2331.903	6.885	2338.787	2385.00	14.43	3.24	2342.02	.00	6.74	26.00	9.000	26.000	.00	1 2.0
703.115	.0034					.0034	2.37	6.88	1.01	6.88	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:26:16

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7852.060	2334.274	6.885	2341.158	2385.00	14.43	3.24	2344.39	.14	6.74	26.00	9.000	26.000	.00	1 2.0
28.792	.0036					.0034	.10	7.02	1.01	6.71	.013	.00	.00	BOX
-7823.269	2334.378	6.744	2341.122	2385.00	14.73	3.37	2344.49	.14	6.74	26.00	9.000	26.000	.00	1 2.0
HYDRAULIC JUMP														
-7823.269	2334.378	6.711	2341.088	2385.00	14.81	3.41	2344.49	.14	6.74	26.00	9.000	26.000	.00	1 2.0
11.139	.0036					.0036	.04	6.85	1.05	6.71	.013	.00	.00	BOX
-7812.130	2334.418	6.720	2341.138	2385.00	14.79	3.40	2344.53	.00	6.74	26.00	9.000	26.000	.00	1 2.0
545.511	.0036					.0036	1.96	6.72	1.05	6.72	.013	.00	.00	BOX
-7266.619	2336.378	6.720	2343.099	2385.00	14.79	3.40	2346.49	.00	6.74	26.00	9.000	26.000	.00	1 2.0
15.199	.0036					.0036	.05	6.72	1.05	6.72	.013	.00	.00	BOX
-7251.420	2336.433	6.721	2343.154	2385.00	14.79	3.39	2346.55	.14	6.74	26.00	9.000	26.000	.00	1 2.0
23.281	.0036					.0036	.08	6.87	1.05	6.72	.013	.00	.00	BOX
-7228.139	2336.517	6.721	2343.238	2385.00	14.79	3.39	2346.63	.14	6.74	26.00	9.000	26.000	.00	1 2.0
16.199	.0036					.0036	.06	6.87	1.05	6.72	.013	.00	.00	BOX
-7211.940	2336.575	6.715	2343.290	2385.00	14.80	3.40	2346.69	.00	6.74	26.00	9.000	26.000	.00	1 2.0
36.741	.0036					.0036	.13	6.72	1.05	6.72	.013	.00	.00	BOX
-7175.199	2336.707	6.715	2343.423	2385.00	14.80	3.40	2346.82	.00	6.74	26.00	9.000	26.000	.00	1 2.0
101.708	.0036					.0038	.39	6.72	1.05	6.72	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:26:16

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7073.491	2337.073	6.444	2343.518	2385.00	15.42	3.69	2347.21	.00	6.74	26.00	9.000	26.000	.00	1 2.0
101.477	.0036					.0043	.43	6.44	1.11	6.72	.013	.00	.00	BOX
-6972.015	2337.439	6.144	2343.583	2385.00	16.17	4.06	2347.65	.00	6.74	26.00	9.000	26.000	.00	1 2.0
95.251	.0036					.0049	.46	6.14	1.20	6.72	.013	.00	.00	BOX
-6876.763	2337.782	5.858	2343.640	2385.00	16.96	4.47	2348.11	.00	6.74	26.00	9.000	26.000	.00	1 2.0
90.543	.0036					.0055	.50	5.86	1.29	6.72	.013	.00	.00	BOX
-6786.220	2338.108	5.586	2343.694	2385.00	17.79	4.91	2348.61	1.47	6.74	26.00	9.000	26.000	.00	1 2.0
51.710	.0022					.0062	.32	7.06	1.38	8.17	.013	.00	.00	BOX
-6734.510	2338.220	5.346	2343.566	2385.00	18.59	5.37	2348.93	.00	6.74	26.00	9.000	26.000	.00	1 2.0
JUNCT STR	.0160					.0075	.04	5.35	1.47		.013	.00	.00	BOX
-6729.510	2338.300	4.755	2343.055	2282.00	20.00	6.21	2349.26	3.44	6.55	26.00	9.000	26.000	.00	1 2.0
30.362	.0168					.0079	.24	8.20	1.68	3.69	.013	.00	.00	BOX
-6699.148	2338.811	4.939	2343.751	2282.00	19.25	5.75	2349.50	3.19	6.55	26.00	9.000	26.000	.00	1 2.0
28.821	.0168					.0071	.20	8.13	1.59	3.69	.013	.00	.00	BOX
-6670.327	2339.297	5.180	2344.477	2282.00	18.35	5.23	2349.71	2.90	6.55	26.00	9.000	26.000	.00	1 2.0
20.927	.0168					.0062	.13	8.08	1.48	3.69	.013	.00	.00	BOX
-6649.400	2339.649	5.433	2345.082	2282.00	17.50	4.76	2349.84	.00	6.55	26.00	9.000	26.000	.00	1 2.0
11.839	.0167					.0055	.07	5.43	1.38	3.70	.013	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VIN NEVADA (D.BERGH)

Date: 11-7-2008 Time: 2:26:16

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6637.561	2339.847	5.634	2345.481	2282.00	16.88	4.42	2349.90	.00	6.55	26.00	9.000	26.000	.00	1 2.0
10.801	.0167					.0049	.05	5.63	1.30	3.70	.013	.00	.00	BOX
-6626.760	2340.027	5.909	2345.936	2282.00	16.09	4.02	2349.96	.00	6.55	26.00	9.000	26.000	.00	1 2.0
3.000	.0177					.0045	.01	5.91	1.21	3.63	.013	.00	.00	BOX
-6623.760	2340.080	6.033	2346.113	2282.00	15.76	3.86	2349.97	.00	6.55	26.00	9.000	26.000	.00	1 2.0
3.139	.0162					.0042	.01	6.03	1.18	3.74	.013	.00	.00	BOX
-6620.621	2340.131	6.198	2346.329	2282.00	15.34	3.65	2349.98	.00	6.55	26.00	9.000	26.000	.00	1 2.0
2.401	.0162					.0038	.01	6.20	1.13	3.74	.013	.00	.00	BOX
-6618.220	2340.170	6.500	2346.670	2282.00	14.63	3.32	2349.99	.00	6.55	26.00	9.000	26.000	.00	1 2.0
TRANS STR	.0038					.0035	.06	6.50	1.05		.013	.00	.00	BOX
-6600.000	2340.240	5.719	2345.959	2282.00	16.63	4.29	2350.25	.00	6.55	24.00	8.000	24.000	.00	0 .0
22.926	.0042					.0034	.08	5.72	1.23	5.38	.013	.00	.00	BOX
-6577.074	2340.335	5.753	2346.088	2282.00	16.53	4.24	2350.33	.00	6.55	24.00	8.000	24.000	.00	0 .0
108.724	.0042					.0032	.35	5.75	1.21	5.38	.013	.00	.00	BOX
-6468.350	2340.788	6.034	2346.822	2282.00	15.76	3.86	2350.68	.00	6.55	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0032	.01	6.03	1.13		.013	.00	.00	BOX
-6465.350	2340.800	5.677	2346.477	2262.03	16.60	4.28	2350.76	.00	6.51	24.00	8.000	24.000	.00	0 .0
80.881	.0045					.0033	.27	5.68	1.23	5.19	.013	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VIN NEVADA (D.BERGH)

Date: 11-7-2008 Time: 2:26:16

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6384.469	2341.167	5.917	2347.084	2262.03	15.93	3.94	2351.02	.00	6.51	24.00	8.000	24.000	.00	0 .0
42.212	.0045					.0029	.12	5.92	1.15	5.19	.013	.00	.00	BOX
-6342.257	2341.359	6.206	2347.565	2262.03	15.19	3.58	2351.15	.00	6.51	24.00	8.000	24.000	.00	0 .0
11.257	.0045					.0025	.03	6.21	1.07	5.19	.013	.00	.00	BOX
-6331.000	2341.410	6.510	2347.920	2262.03	14.48	3.25	2351.17	.00	6.51	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0033					.0015	.00	6.51	1.00		.013	.00	.00	BOX
-6328.000	2341.420	7.504	2348.924	2186.97	12.14	2.29	2351.21	.00	6.37	24.00	8.000	24.000	.00	0 .0
47.380	.0038					.0015	.07	7.50	.78	5.40	.013	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-6280.620	2341.599	7.207	2348.806	2186.97	12.64	2.48	2351.29	.00	6.37	24.00	8.000	24.000	.00	0 .0
HYDRAULIC JUMP														
----- WARNING - Flow depth near top of box conduit -----														
-6280.620	2341.599	5.590	2347.188	2186.97	16.30	4.13	2351.31	.00	6.37	24.00	8.000	24.000	.00	0 .0
140.770	.0038					.0033	.46	5.59	1.22	5.40	.013	.00	.00	BOX
-6139.850	2342.130	5.740	2347.870	2186.97	15.87	3.91	2351.78	.00	6.37	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0025					.0036	.01	5.74	1.17		.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:26:16

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6135.810	2342.140	5.144	2347.284	2101.96	17.03	4.50	2351.79	.00	6.20	24.00	8.000	24.000	.00	0 .0
279.870	.0041					.0040	1.11	5.14	1.32	5.11	.013	.00	.00	BOX
-5855.940	2343.290	5.204	2348.494	2101.96	16.83	4.40	2352.89	.00	6.20	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0042					.0040	.01	5.20	1.30		.013	.00	.00	BOX
-5853.560	2343.300	5.044	2348.344	2063.00	17.04	4.51	2352.85	.00	6.12	24.00	8.000	24.000	.00	0 .0
1012.170	.0041					.0041	4.15	5.04	1.34	5.04	.013	.00	.00	BOX
-4841.390	2347.453	5.044	2352.497	2063.00	17.04	4.51	2357.01	.00	6.12	24.00	8.000	24.000	.00	0 .0
633.040	.0041					.0039	2.49	5.04	1.34	5.04	.013	.00	.00	BOX
-4208.350	2350.050	5.188	2355.238	2063.00	16.57	4.26	2359.50	1.74	6.12	24.00	8.000	24.000	.00	0 .0
34.860	.0040					.0038	.13	6.93	1.28	5.08	.013	.00	.00	BOX
-4173.490	2350.190	5.202	2355.392	2063.00	16.52	4.24	2359.63	1.73	6.12	24.00	8.000	24.000	.00	0 .0
34.870	.0043					.0037	.13	6.93	1.28	4.96	.013	.00	.00	BOX
-4138.620	2350.340	5.235	2355.575	2063.00	16.42	4.19	2359.76	.00	6.12	24.00	8.000	24.000	.00	0 .0
51.830	.0041					.0036	.19	5.24	1.26	5.07	.013	.00	.00	BOX
-4086.790	2350.550	5.271	2355.821	2063.00	16.31	4.13	2359.95	.00	6.12	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0050					.0039	.02	5.27	1.25		.013	.00	.00	BOX
-4082.790	2350.570	5.009	2355.579	2040.04	16.97	4.47	2360.05	.00	6.08	24.00	8.000	24.000	.00	0 .0
674.340	.0041					.0043	2.90	5.01	1.34	5.01	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:26:16

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-3408.450	2353.330	4.844	2358.174	2040.04	17.55	4.78	2362.96	.00	6.08	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0047	.01	4.84	1.41		.013	.00	.00	BOX
-3405.950	2353.340	4.718	2358.058	2025.29	17.89	4.97	2363.03	.00	6.05	24.00	8.000	24.000	.00	0 .0
74.369	.0041					.0049	.36	4.72	1.45	4.99	.013	.00	.00	BOX
-3331.581	2353.644	4.665	2358.309	2025.29	18.09	5.08	2363.39	.00	6.05	24.00	8.000	24.000	.00	0 .0
229.081	.0041					.0054	1.23	4.66	1.48	4.99	.013	.00	.00	BOX
-3102.500	2354.580	4.448	2359.028	2025.29	18.97	5.59	2364.62	.00	6.05	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0060	.01	4.45	1.59		.013	.00	.00	BOX
-3100.000	2354.590	4.296	2358.886	2001.00	19.41	5.85	2364.74	.00	6.00	24.00	8.000	24.000	.00	0 .0
115.857	.0041					.0066	.76	4.30	1.65	4.94	.013	.00	.00	BOX
-2984.143	2355.065	4.144	2359.209	2001.00	20.12	6.29	2365.50	.00	6.00	24.00	8.000	24.000	.00	0 .0
130.373	.0041					.0074	.97	4.14	1.74	4.94	.013	.00	.00	BOX
-2853.770	2355.600	3.951	2359.551	2001.00	21.10	6.92	2366.47	1.70	6.00	24.00	8.000	24.000	.00	0 .0
10.332	.0041					.0080	.08	5.65	1.87	4.94	.013	.00	.00	BOX
-2843.438	2355.643	3.935	2359.577	2001.00	21.19	6.97	2366.55	1.72	6.00	24.00	8.000	24.000	.00	0 .0
112.168	.0041					.0087	.98	5.65	1.88	4.94	.013	.00	.00	BOX
-2731.270	2356.104	3.752	2359.856	2001.00	22.22	7.67	2367.52	.00	6.00	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0097	.04	5.64	2.02		.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:26:16

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-2727.270	2356.120	3.560	2359.680	1921.00	22.48	7.85	2367.53	1.93	5.84	24.00	8.000	24.000	.00	0 .0
13.610	.0044					.0102	.14	5.49	2.10	4.69	.013	.00	.00	BOX
-2713.660	2356.180	3.537	2359.717	1921.00	22.63	7.95	2367.67	.00	5.84	24.00	8.000	24.000	.00	0 .0
58.480	.0041					.0108	.63	3.54	2.12	4.80	.013	.00	.00	BOX
-2655.180	2356.420	3.432	2359.852	1921.00	23.32	8.44	2368.30	.00	5.84	24.00	8.000	24.000	.00	0 .0
TRANS STR	.0500					.0082	.82	3.43	2.22		.013	-2.88	.00	BOX
-2555.180	2361.420	3.862	2365.282	1921.00	16.55	4.25	2369.54	.00	5.20	38.49	7.000	24.000	2.00	0 .0
735.296	.0051					.0050	3.66	3.86	1.68	3.86	.013	-2.88	2.00	TRAP
-1819.884	2365.174	3.917	2369.091	1921.00	16.26	4.10	2373.19	.00	5.20	38.71	7.000	24.000	2.00	0 .0
393.024	.0051					.0045	1.78	3.92	1.64	3.86	.013	-2.88	2.00	TRAP
-1426.860	2367.180	4.065	2371.245	1921.00	15.50	3.73	2374.98	.00	5.20	39.30	7.000	24.000	2.00	0 .0
TRANS STR	.0140					.0041	.87	4.06	1.54		.013	-6.24	2.00	TRAP
-1217.090	2370.120	3.005	2373.125	1921.00	13.46	2.81	2375.94	.00	3.75	52.00	7.000	52.000	.00	0 .0
TRANS STR	.0136					.0048	.66	3.01	1.43		.013	.00	.00	RECTANG
-1078.920	2372.000	2.003	2374.003	1921.00	12.97	2.61	2376.62	.00	2.76	73.92	7.000	73.920	.00	0 .0
WALL EXIT														
-1078.920	2372.000	3.747	2375.747	1921.00	10.59	1.74	2377.49	.00	3.75	52.00	7.000	52.000	.00	0 .0
JUNCT STR	.0000					.0005	.00	3.75	1.00		.013	.00	.00	RECTANG

WARNING - Junction Analysis - Change in Channel Type

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:26:16

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-1078.920	2372.000	5.254	2377.254	938.00	3.91	.24	2377.49	.00	2.28	51.00	5.000	51.000	.00	3 1.0
80.849	.0037					.0005	.04	5.25	.32	2.10	.013	.00	.00	BOX
-998.071	2372.298	5.000	2377.298	938.00	3.91	.24	2377.54	.00	2.28	51.00	5.000	51.000	.00	3 1.0
62.251	.0037					.0003	.02	5.00	.32	2.10	.013	.00	.00	BOX
-935.820	2372.527	4.766	2377.293	938.00	4.10	.26	2377.55	.00	2.28	51.00	5.000	51.000	.00	3 1.0
59.126	.0037					.0003	.02	4.77	.34	2.10	.013	.00	.00	BOX
WARNING - Flow depth near top of box conduit														
-876.694	2372.745	4.545	2377.289	938.00	4.30	.29	2377.58	.00	2.28	51.00	5.000	51.000	.00	3 1.0
56.110	.0037					.0004	.02	4.54	.37	2.10	.013	.00	.00	BOX
WARNING - Flow depth near top of box conduit														
-820.584	2372.952	4.333	2377.285	938.00	4.51	.32	2377.60	.00	2.28	51.00	5.000	51.000	.00	3 1.0
4.934	.0037					.0005	.00	4.33	.39	2.10	.013	.00	.00	BOX
-815.650	2372.970	4.315	2377.285	938.00	4.53	.32	2377.60	.00	2.28	51.00	5.000	51.000	.00	3 1.0

BRIDGE ENTRANCE

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:26:16

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-815.650	2372.970	4.398	2377.368	938.00	4.18	.27	2377.64	.00	2.19	51.00	5.000	51.000	.00	0 .0
WALL ENTRANCE														
-815.650	2372.970	4.793	2377.762	938.00	1.97	.06	2377.82	.00	1.53	113.76	8.000	85.000	3.00	0 .0
22.086	.0089					.0003	.01	4.79	.17	1.75	.033	.00	3.00	TRAP
-793.565	2373.167	4.597	2377.763	938.00	2.07	.07	2377.83	.00	1.53	112.58	8.000	85.000	3.00	0 .0
21.299	.0089					.0004	.01	4.60	.18	1.75	.033	.00	3.00	TRAP
-772.266	2373.356	4.408	2377.764	938.00	2.17	.07	2377.84	.00	1.53	111.45	8.000	85.000	3.00	0 .0
20.540	.0089					.0004	.01	4.41	.19	1.75	.033	.00	3.00	TRAP
-751.726	2373.539	4.226	2377.766	938.00	2.27	.08	2377.85	.00	1.53	110.36	8.000	85.000	3.00	0 .0
19.809	.0089					.0005	.01	4.23	.21	1.75	.033	.00	3.00	TRAP
-731.917	2373.716	4.051	2377.767	938.00	2.38	.09	2377.86	.00	1.53	109.31	8.000	85.000	3.00	0 .0
19.106	.0089					.0006	.01	4.05	.22	1.75	.033	.00	3.00	TRAP
-712.812	2373.886	3.883	2377.769	938.00	2.50	.10	2377.87	.00	1.53	108.30	8.000	85.000	3.00	0 .0
12.812	.0089					.0006	.01	3.88	.24	1.75	.033	.00	3.00	TRAP
-700.000	2374.000	3.771	2377.771	938.00	2.58	.10	2377.87	.00	1.53	107.62	8.000	85.000	3.00	0 .0

November 11, 2008

Values In English Units

HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Design Condition - Trunkline with Trunkline Peaking)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; 6952-ULT-13.WSW; n = 0.013

WO # 6952

By: D.Bergh

WSPGW STATION	REMARKS	DESIGN FLOW	DEPTH OF FLOW	DEPTH W/AIR ⁽¹⁾	INVERT ELEV	VELOCITY	H.G.L.	E.G.L.	CHANNEL TYPE	BASE WIDTH/DIA.	SIDE SLOPE	FLOW AREA	WETTED PERIMETER	TOP WIDTH	FROUDE NUMBER	ANGLE OF CURVE	CURVE RADIUS	SUPER ELEV ⁽⁴⁾	ROLL WAVE ⁽²⁾	CCRFD MIN FB ⁽³⁾	MIN WALL HT	DESIGN WALL HT	ACTUAL FB	FB CHECK	RESOLUTION
-7+00.00	SYSTEM HEADWORKS	938	3.771	3.771	2374.00	2.58	2377.77	2377.87	TRAP	85	3	363.57	108.85	107.63	0.25					0.60	4.37	8.00	4.23	OK	NA
-7+00.00	BEGIN TRAP CHANNEL AT GOLF COURSE	938	3.771	3.771	2374.00	2.58	2377.77	2377.87	TRAP	85	3	363.57	108.85	107.63	0.25					0.60	4.37	8.00	4.23	OK	NA
					0.89%																				
-8+15.65	END TRAP CHANNEL; WALL ENTRANCE	938	4.793	4.793	2372.97	1.97	2377.76	2377.82	TRAP	85	0	476.14	94.59	85.00	0.15					0.56	5.35	8.00	3.21	OK	NA
-8+15.65	BRIDGE ENTRANCE; BEGIN RCB; GB	938	4.315	4.315	2372.97	4.53	2377.29	2377.60	RCB	48	0	207.06	56.63	48.00	0.38					0.82	5.13	5.00	0.69	FIX WALL HEIGHT	NA
					0.37%																				
-10+78.92	END RCB; WALL EXIT	938	5.254	5.254	2372.00	3.91	2377.25	2377.49	RCB	48	0	239.90	58.51	48.00	0.31					0.74	5.99	5.00	-0.25	FIX WALL HEIGHT	NA
-10+78.92	BEGIN CONFLUENCE STRUCTURE; GB	1921	3.747	3.747	2372.00	10.59	2375.75	2377.49	RECT	73.92	0	181.40	81.41	73.92	1.19					1.41	5.16	7.00	3.25	OK	NA
					1.36%																				
-12+17.09	END CONFLUENCE STRUCTURE	1921	3.005	3.005	2370.12	13.46	2373.13	2375.94	RECT	52	0	142.72	58.01	52.00	1.43					1.49	4.49	7.00	4.00	OK	NA
-12+17.09	BEGIN TRANSITION STRUCTURE	1921	3.005	3.005	2370.12	13.46	2373.13	2375.94	RECT	52	0	142.72	58.01	52.00	1.43					1.49	4.49	7.00	4.00	OK	NA
					1.40%																				
-14+26.86	END TRANSITION STRUCTURE	1921	4.065	4.065	2367.18	15.50	2371.25	2374.98	TRAP	24	2	123.94	42.18	40.26	1.56					1.62	5.68	7.00	2.94	OK	NA
-14+26.86	BEGIN TRAPEZOIDAL CHANNEL; GB	1921	4.065	4.065	2367.18	15.50	2371.25	2374.98	TRAP	24	2	123.94	42.18	40.26	1.56					1.62	5.68	7.00	2.94	OK	NA
					0.51%																				
-25+55.18	END TRAPEZOIDAL CHANNEL	1921	3.862	3.885	2361.42	16.55	2365.28	2369.54	TRAP	24	2	116.07	41.27	39.45	1.70					1.65	5.51	7.00	3.14	OK	NA
-25+55.18	BEGIN TRANSITION STRUCTURE; GB	1921	3.862	3.885	2361.42	16.55	2365.28	2369.54	TRAP	24	2	116.07	41.27	39.45	1.70					1.65	5.51	7.00	3.14	OK	NA
					5.00%																				
-26+55.18	END TRANSITION STRUCTURE	1921	3.432	3.564	2356.42	23.32	2359.85	2368.30	RCB	24	0	82.38	30.86	24.00	2.22					1.88	5.31	8.00	4.57	OK	NA
-26+55.18	BEGIN 24' X 8' RCB; GB	1921	3.432	3.564	2356.42	23.32	2359.85	2368.30	RCB	24	0	82.38	30.86	24.00	2.22					1.88	5.31	8.00	4.57	NA	NA
					0.41%																				
-27+13.66		1921	3.537	3.651	2356.18	22.63	2359.72	2367.67	RCB	24	0	84.89	31.07	24.00	2.12					1.86	5.40	8.00	4.46	NA	NA
-27+13.66	PC	1921	3.537	3.651	2356.18	22.63	2359.72	2367.67	RCB	24	0	84.89	31.07	24.00	2.12		40.00	200	1.909	1.86	7.31	8.00	2.55	NA	NA
					0.44%																				
-27+27.27	48" RCP LATERAL	1921	3.560	3.670	2356.12	22.48	2359.68	2367.53	RCB	24	0	85.45	31.12	24.00	2.10					1.86	5.42	8.00	4.44	NA	NA
-27+31.27		2001	3.752	3.849	2356.10	22.22	2359.86	2367.52	RCB	24	0	90.05	31.50	24.00	2.02					1.86	5.62	8.00	4.25	NA	NA
					0.41%																				
-28+53.77	PT	2001	3.935	4.000	2355.60	21.10	2359.54	2366.45	RCB	24	0	94.83	31.87	24.00	1.87		40.00	200	1.659	1.83	7.43	8.00	2.41	NA	NA
-28+53.77		2001	3.935	4.000	2355.60	21.10	2359.54	2366.45	RCB	24	0	94.83	31.87	24.00	1.87					1.83	5.77	8.00	4.07	NA	NA
					0.41%																				
-31+00.00	30" RCP LATERAL	2001	4.296	4.308	2354.59	19.41	2350.57	2356.42	RCB	24	0	103.09	32.59	24.00	1.65					1.79	6.08	8.00	3.70	NA	NA
-31+02.50		2025	4.844	4.844	2354.58	18.97	2350.55	2356.14	RCB	24	0	106.76	33.69	24.00	1.59					1.80	6.65	8.00	3.16	NA	NA
					0.41%																				
-34+05.95	30" RCP LATERAL	2025	4.718	4.718	2353.34	17.89	2350.57	2355.54	RCB	24	0	113.21	33.44	24.00	1.45					1.75	6.47	8.00	3.28	NA	NA
-34+08.45		2040	4.844	4.844	2353.33	17.55	2350.55	2355.33	RCB	24	0	116.24	33.69	24.00	1.41					1.74	8.32	8.00	3.16	NA	NA
					0.41%																				
-40+82.79	48" RCP LATERAL	2040	5.009	5.009	2350.57	16.97	2350.57	2355.04	RCB	24	0	120.21	34.02	24.00	1.34					1.73	6.73	8.00	2.99	NA	NA
-40+86.79		2063	5.271	5.271	2350.55	16.31	2350.55	2354.68	RCB	24	0	126.49	34.54	24.00	1.25					1.71	8.71	8.00	2.73	NA	NA
					0.41%																				
-41+38.62		2063	5.235	5.235	2350.34	16.42	2355.58	2359.76	RCB	24	0	125.64	34.47	24.00	1.26					1.71	8.70	8.00	2.77	NA	NA
-41+38.62	PC	2063	5.235	5.235	2350.34	16.42	2355.58	2359.76	RCB	24	0	125.64	34.47	24.00	1.26		17.00	116	1.732	1.71	8.68	8.00	1.03	NA	NA
					0.43%																				
-41+73.49	PRC	2063	5.202	5.202	2350.19	16.52	2355.39	2359.63	RCB	24	0	124.88	34.40	24.00	1.28		17.00	116	1.754	1.72	8.67	8.00	1.04	NA	NA
-41+73.49	PRC	2063	5.202	5.202	2350.19	16.52	2355.39	2359.63	RCB	24	0	124.88	34.40	24.00	1.28		17.00	116	1.754	1.72	#REF!	8.00	1.04	NA	NA
					0.40%																				
-42+08.35	PT	2063	5.188	5.188	2350.05	16.57	2355.24	2359.50	RCB	24	0	124.50	34.38	24.00	1.28		-17.00	116	1.764	1.72	6.91	8.00	1.05	NA	NA
-42+08.35		2063	5.188	5.188	2350.05	16.57	2355.24	2359.50	RCB	24	0	124.50	34.38	24.00	1.28					1.72	6.91	8.00	2.81	NA	NA
					0.41%																				
-58+53.56	DUAL 14" X 23" HERCP LATERAL	2063	5.044	5.044	2343.30	17.04	2348.34	2352.85	RCB	24	0	121.07	34.09	24.00	1.34					1.73	6.77	8.00	2.96	NA	NA
-58+55.94		2102	5.204	5.204	2343.29	16.83	2348.49	2352.89	RCB	24	0	124.89	34.41	24.00	1.30					1.73	6.93	8.00	2.80	NA	NA
					0.41%																				
-61+35.81	DUAL 24" X 38" HERCP LATERAL	2102	5.144	5.144	2342.14	17.03	2347.28	2351.79	RCB	24	0	123.43	34.29	24.00	1.32					1.73	6.88	8.00	2.86	NA	NA
-61+39.85		2187	5.740	5.740	2342.13	15.87	2347.87	2351.78	RCB	24	0	137.81	35.48	24.00	1.17					1.71	7.45	8.00	2.26	NA	NA
					0.38%																				
-62+80.62	HYDRAULIC JUMP	2187	5.590	5.590	2341.60	16.30	2347.19	2351.31	RCB	24	0	134.17	35.18	24.00	1.21					1.72	7.31	8.00	2.41	NA	NA

HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Design Condition - Trunkline with Trunkline Peaking)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; 6952-ULT-13.WSW; n = 0.013

-62+80.62		2187	7.207	7.207	2341.60	12.64	2348.81	2351.29	RCB	24	0	173.02	38.41	24.00	0.83		2.98	10.19	8.00	0.79	NA	NA		
					0.38%																			
-63+28.00	29" X 45" HEROP LATERAL	2187	7.504	7.504	2341.42	12.14	2348.92	2351.21	RCB	24	0	180.15	39.01	24.00	0.78		2.79	10.29	8.00	0.50	NA	NA		
-63+31.00		2262	6.510	6.510	2341.41	14.48	2347.92	2351.18	RCB	24	0	156.22	37.02	24.00	1.00		1.68	8.19	8.00	1.49	NA	NA		
					0.45%																			
-64+65.36	36" RCP LATERAL	2262	5.677	5.677	2340.80	16.60	2346.48	2350.76	RCB	24	0	136.27	35.35	24.00	1.23		1.74	7.42	8.00	2.32	NA	NA		
-64+68.35		2282	6.034	6.034	2340.79	15.79	2346.82	2350.69	RCB	24	0	144.52	36.07	24.00	1.13		1.72	7.75	8.00	1.97	NA	NA		
					0.42%																			
-66+00.00	END 24' X 8' RCB	2282	5.719	5.719	2340.24	16.63	2345.96	2350.25	RCB	24	0	137.22	35.44	24.00	1.23		1.74	7.46	8.00	2.28	NA	NA		
-66+00.00	BEGIN TRANSITION STRUCTURE	2282	5.719	5.719	2340.24	16.63	2345.96	2350.25	RCB	24	0	137.22	35.44	24.00	1.23		1.74	7.46	8.00	2.28	NA	NA		
					0.38%																			
-66+18.22	END TRANSITION STRUCTURE	2282	6.500	6.500	2340.17	14.63	2346.67	2349.99	RCB	26	0	155.98	39.00	26.00	1.05		1.68	11.12	9.00	-0.44	NA	NA		
-66+18.22	BEGIN 2 - 13' X 9' RCB	2282	6.500	6.500	2340.17	14.63	2346.67	2349.99	RCB	26	0	155.98	39.00	26.00	1.05		1.68	8.18	9.00	2.50	NA	NA		
					1.68%																			
-66+23.76		2282	6.033	6.033	2340.08	15.76	2346.11	2349.97	RCB	26	0	144.80	38.07	26.00	1.18		1.72	10.69	9.00	2.97	NA	NA		
-66+23.76		2282	6.033	6.033	2340.08	15.76	2346.11	2349.97	RCB	26	0	144.80	38.07	26.00	1.18		1.72	7.75	9.00	2.97	NA	NA		
					1.67%																			
-66+49.40		2282	5.433	5.433	2339.65	17.50	2345.08	2349.84	RCB	26	0	130.40	36.87	26.00	1.38		1.77	7.20	9.00	3.57	NA	NA		
-66+49.40	PC	2282	5.433	5.433	2339.65	17.50	2345.08	2349.84	RCB	26	0	130.40	36.87	26.00	1.38	53.00	87	1.263	1.77	7.38	9.00	2.30	NA	NA
					1.68%																			
-67+29.51	60" RCP LATERAL	2282	4.755	4.777	2338.30	20.00	2343.06	2349.27	RCB	26	0	114.10	35.51	26.00	1.68		1.84	6.60	9.00	4.25	NA	NA		
-67+34.51		2385	5.346	5.346	2338.22	18.59	2343.57	2348.93	RCB	26	0	128.29	36.69	26.00	1.47		1.81	7.16	9.00	3.65	NA	NA		
					0.22%																			
-67+86.22	PT	2385	5.586	5.586	2338.11	17.79	2343.69	2348.61	RCB	26	0	134.06	37.17	26.00	1.38	37.00	87	2.937	1.79	7.38	9.00	0.48	NA	NA
-67+86.22		2385	5.586	5.586	2338.11	17.79	2343.69	2348.61	RCB	26	0	134.06	37.17	26.00	1.38		1.79	7.38	9.00	3.41	NA	NA		
					0.36%																			
-72+11.94		2385	6.715	6.715	2336.58	14.80	2343.29	2346.69	RCB	26	0	161.15	39.43	26.00	1.05		1.70	8.55	#REF!	#REF!	NA	NA		
-72+11.94	PC	2385	6.715	6.715	2336.58	14.80	2343.29	2346.69	RCB	26	0	161.15	39.43	26.00	1.05	2.00	1250	0.141	1.70	8.55	#REF!	#REF!	NA	NA
					0.31%																			
-72+51.42	PT	2385	6.721	6.721	2336.45	14.79	2343.18	2346.57	RCB	26	0	161.26	39.44	26.00	1.05	2.00	1250	0.141	1.70	8.56	6.00	-0.86	NA	NA
-72+51.42		2385	6.721	6.721	2336.45	14.79	2343.18	2346.57	RCB	26	0	161.26	39.44	26.00	1.05		1.70	8.42	6.00	-0.72	NA	NA		
					0.36%																			
-78+12.13		2385	6.720	6.720	2334.42	14.79	2341.14	2344.53	RCB	26	0	161.26	39.44	26.00	1.05		1.70	8.42	6.00	-0.72	NA	NA		
-78+12.13	PC	2385	6.720	6.720	2334.42	14.79	2341.14	2344.53	RCB	26	0	161.26	39.44	26.00	1.05	2.00	1250	0.141	1.70	8.56	6.00	-0.86	NA	NA
					0.36%																			
-78+23.27	HYDRAULIC JUMP	2385	6.711	6.711	2334.38	14.81	2341.09	2344.49	RCB	26	0	161.04	39.42	26.00	1.05		1.70	8.55	6.00	-0.85	NA	NA		
-78+23.27		2385	6.744	6.744	2334.38	14.73	2341.12	2344.49	RCB	26	0	161.91	39.49	26.00	1.04		1.70	8.44	6.00	-0.74	NA	NA		
					0.36%																			
-78+52.06	PT	2385	6.885	6.885	2334.27	14.43	2341.16	2344.39	RCB	26	0	165.28	39.77	26.00	1.01	2.00	1250	0.142	1.69	8.57	6.00	-0.89	NA	NA
-78+52.06		2385	6.885	6.885	2334.27	14.43	2341.16	2344.39	RCB	26	0	165.28	39.77	26.00	1.01		1.69	8.57	6.00	-0.89	NA	NA		
					0.34%																			
-94+24.48	60" RCP LATERAL	2385	8.815	8.815	2328.97	11.27	2337.79	2339.76	RCB	26	0	211.62	43.63	26.00	0.70		2.47	11.29	9.00	0.19	NA	NA		
-94+24.48		2367	7.209	7.209	2328.93	15.24	2336.14	2339.75	RCB	26	0	155.31	40.42	26.00	1.10		1.74	8.95	9.00	1.79	NA	NA		
					0.35%																			
-95+19.61	END 2 - 13' X 9' RCB	2367	7.206	7.206	2328.60	15.25	2335.81	2339.42	RCB	26	0	155.21	40.41	26.00	1.10		1.74	8.94	9.00	1.79	NA	NA		
-95+19.61	BEGIN TRANSITION STRUCTURE	2367	7.206	7.206	2328.60	15.25	2335.81	2339.42	RCB	26	0	155.21	40.41	26.00	1.10		1.74	8.94	9.00	1.79	NA	NA		
					3.90%																			
-95+69.61	END TRANSITION STRUCTURE	2367	5.172	5.238	2326.65	21.24	2331.82	2338.83	RCB	26	0	111.44	36.34	26.00	1.81		1.92	7.09	9.00	3.83	NA	NA		
-95+69.61	BEGIN 24' X 8' RCB; 48" RCP LATERAL	2761	6.125	6.125	2326.65	18.78	2332.78	2338.25	RCB	26	0	147.02	38.25	26.00	1.39		1.86	7.98	8.00	1.88	NA	NA		
					0.44%																			
-109+54.48		2761	5.551	5.553	2320.51	20.72	2326.06	2332.73	RCB	26	0	133.25	37.10	26.00	1.61		1.92	7.47	8.00	2.45	NA	NA		
-109+54.48	48" RCP LATERAL	2885	6.692	6.692	2320.51	17.96	2327.20	2332.21	RCB	26	0	160.63	39.38	26.00	1.27		1.85	8.54	8.00	1.31	NA	NA		
					0.34%																			
-120+99.48		2885	7.064	7.064	2317.04	17.02	2324.10	2328.60	RCB	26	0	169.51	40.13	26.00	1.17		1.82	8.88	9.00	1.94	NA	NA		
-120+99.48	GB	2885	7.064	7.064	2317.04	17.02	2324.10	2328.60	RCB	26	0	169.51	40.13	26.00	1.17		1.82	8.88	8.00	0.94	NA	NA		
					2.60%																			
-121+19.48		2885	6.236	6.236	2316.52	19.28	2322.76																	

HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Design Condition - Trunkline with Trunkline Peaking)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; 6952-ULT-13.WSW; n = 0.013

-121+19.48	48" RCP LATERAL	2955	7.151	7.151	2316.52	17.22	2323.67	2328.28	RCB	26	0	171.60	40.30	26.00	1.18	1.83	8.98	8.00	0.85	NA	NA
					0.31%																
-146+59.48		2955	7.132	7.132	2308.66	17.26	2315.79	2320.42	RCB	26	0	171.21	40.26	26.00	1.19	1.83	8.96	8.00	0.87	NA	NA
-146+59.48	GB	2955	7.132	7.132	2308.66	17.26	2315.79	2320.42	RCB	26	0	171.21	40.26	26.00	1.19	1.83	8.96	8.00	0.87	NA	NA
					1.38%																
-147+09.48		2955	6.271	6.271	2307.97	19.63	2314.24	2320.22	RCB	26	0	150.53	38.54	26.00	1.44	1.90	8.18	8.00	1.73	NA	NA
-147+09.48		2955	6.271	6.271	2307.97	19.63	2314.24	2320.22	RCB	26	0	150.53	38.54	26.00	1.44	1.90	8.18	8.00	1.73	NA	NA
					0.43%																
-171+09.48	END 24' X 8' RCB	2955	6.356	6.356	2297.65	19.37	2304.01	2309.83	RCB	26	0	152.56	38.71	26.00	1.41	1.90	8.25	8.00	1.64	NA	NA
-171+09.48	BEGIN TRANSITION STRUCTURE	2955	6.356	6.356	2297.65	19.37	2304.01	2309.83	RCB	26	0	152.56	38.71	26.00	1.41	1.90	8.25	8.00	1.64	NA	NA
					0.45%																
-171+29.48	END TRANSITION STRUCTURE	2955	5.540	5.540	2297.56	20.51	2303.10	2309.63	RCB	26	0	144.08	37.08	26.00	1.54	1.91	7.45	8.00	2.46	NA	NA
-171+29.48	BEGIN 28.25' X 8' RCB	2955	5.540	5.540	2297.56	20.51	2303.10	2309.63	RCB	26	0	144.08	37.08	26.00	1.54	1.91	7.45	8.00	2.46	NA	NA
					0.40%																
-171+39.48	END 28.25' X 8' RCB	2955	5.566	5.566	2297.52	20.42	2303.09	2309.56	RCB	26	0	144.71	37.13	26.00	1.53	1.90	7.47	8.00	2.43	NA	NA
-171+39.48	SYSTEM OUTLET	2955	5.566	5.566	2297.52	20.42	2303.09	2309.56	RCB	26	0	144.71	37.13	26.00	1.53	1.90	7.47	8.00	2.43	NA	NA

Notes:

(1) Depth with air entrainment, $y^*/y = 0.906(e)^{0.0615}$ ($Fr \geq 1.60$; $y^* = y$, $Fr < 1.60$). See *WASURO User's Manual (Draft)*, US Army Corps of Engineers Los Angeles District, July 1985.

(2) To be calculated in the future.

(3) For supercritical flow, $F_B = 1 + 0.025V(Y^{1/3})$; for subcritical flow, $F_B = 0.5 + V^2/2g$. See *Hydrologic Criteria and Drainage Design Manual*, CCRFCD, 1999.

(4) Super-Elevation = $C * (V^2 * Tw) / (g * r)$; $C = 1$, V = Mean Channel Velocity, Tw = Top Width of Channel, r = Radius of Curve, g = gravity constant

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

B.2.3

MPU Alignment, Ultimate Conditions Mainline Peaking

File: 6952-ULT-15.wsw

$n=0.015$

T1 LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
T2 HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
T3 FILE: 6952-ULT-15.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)
SO -17139.48 2297.52 12

REM *****
REM END VTN DESIGN

REM *****
R -17139.48 2297.52 12 .015
R -17129.48 2297.56 12 .015
TS -17109.48 2297.65 10 12 .015
R -14709.48 2307.97 10 .015
R -14659.48 2308.66 10 .015
R -12119.48 2316.52 10 .015
JX -12119.48 2316.52 10 11 .015 70.0 2318.520 90.0 .000
R -12099.48 2317.04 10 .015
R -10954.48 2320.51 10 .015
JX -10954.48 2320.51 10 14 .015 124.0 2322.510 90.0 .000
R -10934.48 2321.33 10 .015
R -9569.61 2326.65 10 .015
JX -9569.61 2326.65 10 14 .015 124.0 2328.650 90.0 .000
TS -9519.61 2328.60 8 .015

REM *****
REM END LOUIS BERGER DESIGN, BEGIN VTN DESIGN AT ELKHORN AND TORREY PINES; Q=2637

REM *****
R -9429.48 2328.93 8 .015
JX -9424.48 2328.97 8 9 .015 252.00 2328.97 90
R -7852.06 2334.274 8 .015
R -7812.13 2334.418 8 .015 -2.00
R -7251.42 2336.433 8 .015
R -7211.94 2336.575 8 .015 2.00
R -6786.22 2338.108 8 .015
R -6734.51 2338.22 8 .015
JX -6729.51 2338.30 8 14 .015 103.00 2338.22 37.00
R -6729.51 2338.30 8 .015 -57
R -6649.40 2339.649 8 .015 53.00
R -6626.76 2340.027 8 .015
R -6623.76 2340.08 8 .015

REM *****
REM END VTN DESIGN, BEGIN LOUIS BERGER DESIGN AT RAINBOW AND ELKHORN

REM *****
R -6618.22 2340.17 8 .015
TS -6600.00 2340.24 1 8 .015
R -6468.35 2340.788 1 .015
JX -6465.35 2340.80 1 2 .015 19.97 2341.13 -80.0
R -6331.00 2341.41 1 .015
JX -6328.00 2341.42 1 2 .015 75.06 2341.80 -90
R -6139.85 2342.13 1 .015
JX -6135.81 2342.14 1 18 .015 85.01 2342.21 -90
R -5855.94 2343.29 1 .015
JX -5853.56 2343.30 1 17 .015 38.96 2343.53 -90
R -4208.35 2350.05 1 .015
R -4173.49 2350.19 1 .015 -17.00
R -4138.62 2350.34 1 .015 17.00
R -4086.79 2350.55 1 .015
JX -4082.79 2350.57 1 3 .015 22.96 2352.07 -90
R -3408.45 2353.33 1 .015
JX -3405.95 2353.34 1 18 .015 14.75 2354.84 -90
R -3102.50 2354.58 1 .015
JX -3100.00 2354.59 1 18 .015 24.29 2356.09 -90
R -2853.77 2355.60 1 .015
R -2731.27 2356.104 1 .015 -36.00
JX -2727.27 2356.12 1 3 .015 80.00 2358.51 -50
R -2713.66 2356.18 1 .015 -4.00
R -2655.18 2356.42 1 .015
TS -2555.18 2361.42 4 1 .015
R -1426.86 2367.18 4 .015

REM *****
REM REQUIRED TRANSITION LENGTH = 15 x DELTA BW = (52 - 24)/2 = 210'

REM *****
TS -1217.09 2370.12 5 4 .015
TS -1078.92 2372.00 19 5 .015
WX -1078.92 2372.00 5 .015
JX -1078.92 2372.00 6 13 .015 983.00 2372.03 0.00
R -815.65 2372.97 6 .015
BE -815.65 6
WE -815.65 7
R -700.00 2374.00 7 .033

REM *****
REM BEGIN VTN DESIGN, GRAND TETON AND GOLF COARSE

REM *****
SH -700.00 2374.00 7 .033
CD 1 3 0 .000 8.000 24.000
CD 2 4 1 .000 3.000
CD 3 4 1 .000 4.000
CD 4 1 0 .000 7.000 24.000 2.000 2.000 -2.88
CD 5 2 0 .000 7.000 52.000 -6.24
CD 6 3 3 1.000 5.000 51.000
CD 7 1 0 .000 8.000 85.000 3.000 3.000
CD 8 3 1 2.000 9.000 26.000
CD 9 4 1 .000 5.000
CD 10 3 0 .000 8.000 24.000
CD 11 3 0 .000 4.000 6.000
CD 12 3 1 2.250 8.000 28.250
CD 13 3 1 1.000 5.000 25.000
CD 14 4 1 .000 4.000
CD 15 2 0 .000 8.000 24.000
CD 17 4 1 .000 1.500
CD 18 4 1 .000 2.500
CD 19 2 0 .000 7.000 73.920
Q 938.000 .0

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:21:49

LAS VEGAS WASH - RAINBOW STORM DRAIN: 90% ULTIMATE CONDITIONS:

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH:

FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd. El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No With Pns/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-17139.480	2297.520	5.961	2303.481	2955.00	19.07	5.65	2309.13	.00	7.38	28.25	8.000	28.250	.00	1 2.3
10.000	.0040					.0082	.08	5.96	1.43	7.80	.015	.00	.00	BOX
-17129.480	2297.560	5.914	2303.474	2955.00	19.22	5.73	2309.21	.00	7.38	28.25	8.000	28.250	.00	1 2.3
TRANS STR	.0045					.0063	.13	5.91	1.45		.015	.00	.00	BOX
-17109.480	2297.650	7.025	2304.675	2955.00	17.53	4.77	2309.44	.00	7.78	24.00	8.000	24.000	.00	0 .0
1699.158	.0043					.0043	7.31	7.03	1.17	7.03	.015	.00	.00	BOX
-15410.320	2304.956	7.025	2311.982	2955.00	17.53	4.77	2316.75	.00	7.78	24.00	8.000	24.000	.00	0 .0
470.835	.0043					.0046	2.15	7.03	1.17	7.03	.015	.00	.00	BOX
-14939.490	2306.981	6.742	2313.723	2955.00	18.26	5.18	2318.90	.00	7.78	24.00	8.000	24.000	.00	0 .0
230.007	.0043					.0052	1.19	6.74	1.24	7.03	.015	.00	.00	BOX
-14709.480	2307.970	6.429	2314.399	2955.00	19.15	5.70	2320.09	.00	7.78	24.00	8.000	24.000	.00	0 .0
.032	.0138					.0055	.00	6.43	1.33	4.70	.015	.00	.00	BOX
-14709.450	2307.970	6.429	2314.399	2955.00	19.15	5.70	2320.09	.00	7.78	24.00	8.000	24.000	.00	0 .0
23.684	.0138					.0052	.12	6.43	1.33	4.70	.015	.00	.00	BOX
-14685.760	2308.297	6.743	2315.040	2955.00	18.26	5.18	2320.22	.00	7.78	24.00	8.000	24.000	.00	0 .0
15.271	.0138					.0045	.07	6.74	1.24	4.70	.015	.00	.00	BOX
-14670.490	2308.508	7.072	2315.580	2955.00	17.41	4.71	2320.29	.00	7.78	24.00	8.000	24.000	.00	0 .0
8.404	.0138					.0040	.03	7.07	1.15	4.70	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:21:49

LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd. El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-14662.090	2308.624	7.417	2316.041	2955.00	16.60	4.28	2320.32	.00	7.78	24.00	8.000	24.000	.00	0 .0
2.609	.0138					.0035	.01	7.42	1.07	4.70	.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-14659.480	2308.660	7.780	2316.440	2955.00	15.83	3.89	2320.33	.00	7.78	24.00	8.000	24.000	.00	0 .0
39.133	.0031					.0031	.12	7.78	1.00	7.89	.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-14620.350	2308.781	7.894	2316.675	2955.00	15.60	3.78	2320.45	.00	7.78	24.00	8.000	24.000	.00	0 .0
2491.586	.0031					.0031	7.71	7.89	.98	7.89	.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-12128.760	2316.491	7.894	2324.385	2955.00	15.60	3.78	2328.16	.00	7.78	24.00	8.000	24.000	.00	0 .0
HYDRAULIC JUMP														
----- WARNING - Flow depth near top of box conduit -----														
-12128.760	2316.491	7.666	2324.157	2955.00	16.06	4.01	2328.16	.00	7.78	24.00	8.000	24.000	.00	0 .0
9.281	.0031					.0034	.03	7.67	1.02	7.89	.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														

LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

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FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-12119.480	2316.520	7.627	2324.147	2955.00	16.14	4.05	2328.19	.00	7.78	24.00	8.000	24.000	.00	0 .0
HYDRAULIC DROP														
----- WARNING - Flow depth near top of box conduit -----														
-12119.480	2316.520	7.894	2324.414	2955.00	15.60	3.78	2328.19	.00	7.78	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0000					.0053	.00	7.89	.98		.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-12119.480	2316.520	8.340	2324.860	2885.00	15.03	3.51	2328.37	.00	7.66	24.00	8.000	24.000	.00	0 .0
	.086 .0260					.0053	.00	8.34	.94	3.74	.015	.00	.00	BOX
-12119.390	2316.522	8.337	2324.859	2885.00	15.03	3.51	2328.37	.00	7.66	24.00	8.000	24.000	.00	0 .0
HYDRAULIC JUMP														
-12119.390	2316.522	6.354	2322.876	2885.00	18.92	5.56	2328.43	.00	7.66	24.00	8.000	24.000	.00	0 .0
	8.565 .0260					.0051	.04	6.35	1.32	3.74	.015	.00	.00	BOX
-12110.830	2316.745	6.636	2323.381	2885.00	18.11	5.10	2328.48	.00	7.66	24.00	8.000	24.000	.00	0 .0
	6.483 .0260					.0045	.03	6.64	1.24	3.74	.015	.00	.00	BOX

LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

Date:11- 7-2008 Time: 2:21:49

FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No With Prs/Pip
L/Elem	Ch Slope	-	-	-	-	SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-12104.350	2316.914	6.960	2323.874	2885.00	17.27	4.63	2328.51	.00	7.66	24.00	8.000	24.000	.00	0 .0
3.689	.0260	- -	- -	- -	- -	.0039	.01	6.96	1.15	3.74	.015	.00	.00	BOX
-12100.660	2317.010	7.300	2324.309	2885.00	16.47	4.21	2328.52	.00	7.66	24.00	8.000	24.000	.00	0 .0
1.176	.0260	- -	- -	- -	- -	.0034	.00	7.30	1.07	3.74	.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-12099.480	2317.040	7.657	2324.697	2885.00	15.70	3.83	2328.52	.00	7.66	24.00	8.000	24.000	.00	0 .0
55.366	.0030	- -	- -	- -	- -	.0030	.17	7.66	1.00	7.82	.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-12044.110	2317.208	7.818	2325.026	2885.00	15.38	3.67	2328.70	.00	7.66	24.00	8.000	24.000	.00	0 .0
1089.634	.0030	- -	- -	- -	- -	.0030	3.30	7.82	.97	7.82	.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-10954.480	2320.510	7.818	2328.328	2885.00	15.38	3.67	2332.00	.00	7.66	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0000	- -	- -	- -	- -	.0049	.00	7.82	.97		.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date:11- 7-2008 Time: 2:21:49

LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No With Prs/Pip	
L/Elem	Ch Slope	-	-	-	-	SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	
-10954.480	2320.510	8.580	2329.090	2761.00	14.38	3.21	2332.30	.00	7.43	24.00	8.000	24.000	.00	0 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3.112	.0410					.0049	.02	8.58	.90	3.13	.015	.00	.00	BOX	
-10951.370	2320.638	8.464	2329.102	2761.00	14.38	3.21	2332.31	.00	7.43	24.00	8.000	24.000	.00	0 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
HYDRAULIC JUMP															
-10951.370	2320.638	5.891	2326.529	2761.00	19.53	5.92	2332.45	.00	7.43	24.00	8.000	24.000	.00	0 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3.239	.0410					.0060	.02	5.89	1.42	3.13	.015	.00	.00	BOX	
-10948.130	2320.771	6.010	2326.780	2761.00	19.14	5.69	2332.47	.00	7.43	24.00	8.000	24.000	.00	0 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6.309	.0410					.0055	.03	6.01	1.38	3.13	.015	.00	.00	BOX	
-10941.820	2321.029	6.303	2327.332	2761.00	18.25	5.17	2332.51	.00	7.43	24.00	8.000	24.000	.00	0 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
4.491	.0410					.0048	.02	6.30	1.28	3.13	.015	.00	.00	BOX	
-10937.330	2321.213	6.610	2327.824	2761.00	17.40	4.70	2332.53	.00	7.43	24.00	8.000	24.000	.00	0 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2.849	.0410					.0042	.01	6.61	1.19	3.13	.015	.00	.00	BOX	
-10934.480	2321.330	6.933	2328.263	2761.00	16.59	4.28	2332.54	.00	7.43	24.00	8.000	24.000	.00	0 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
626.155	.0039					.0039	2.44	6.93	1.11	6.93	.015	.00	.00	BOX	
-10308.330	2323.771	6.933	2330.704	2761.00	16.59	4.28	2334.98	.00	7.43	24.00	8.000	24.000	.00	0 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
319.617	.0039					.0040	1.28	6.93	1.11	6.93	.015	.00	.00	BOX	
-9988.708	2325.016	6.819	2331.836	2761.00	16.87	4.42	2336.25	.00	7.43	24.00	8.000	24.000	.00	0 .0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
256.312	.0039					.0044	1.12	6.82	1.14	6.93	.015	.00	.00	BOX	

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:21:49

LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt/ or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-9732.396	2326.015	6.502	2332.518	2761.00	17.69	4.86	2337.38	.00	7.43	24.00	8.000	24.000	.00	0 .0
162.786	.0039					.0050	.82	6.50	1.22	6.93	.015	.00	.00	BOX
-9569.610	2326.650	6.200	2332.849	2761.00	18.56	5.35	2338.20	.00	7.43	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0000					.0067	.00	6.20	1.31		.015	.00	.00	BOX
-9569.610	2326.650	5.212	2331.862	2637.00	21.08	6.90	2338.76	.00	7.21	24.00	8.000	24.000	.00	0 .0
TRANS STR	.0390					.0065	.32	5.21	1.63		.015	.00	.00	BOX
-9519.610	2328.600	7.209	2335.809	2637.00	15.24	3.61	2339.42	.00	7.21	26.00	9.000	26.000	.00	1 2.0
25.896	.0037					.0043	.11	7.21	1.04	8.05	.015	.00	.00	BOX
-9493.715	2328.695	7.561	2336.256	2637.00	14.53	3.28	2339.53	.00	7.21	26.00	9.000	26.000	.00	1 2.0
64.234	.0037					.0040	.26	7.56	.97	8.05	.015	.00	.00	BOX
-9429.480	2328.930	7.757	2336.687	2637.00	14.16	3.12	2339.80	.00	7.21	26.00	9.000	26.000	.00	1 2.0
JUNCT STR	.0080					.0023	.01	7.76	.93		.015	.00	.00	BOX
-9424.480	2328.970	8.904	2337.874	2385.00	11.16	1.93	2339.81	.00	6.74	26.00	9.000	26.000	.00	1 2.0
242.701	.0034					.0023	.56	8.90	.69	7.68	.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-9181.779	2329.789	8.490	2338.278	2385.00	11.71	2.13	2340.41	.00	6.74	26.00	9.000	26.000	.00	1 2.0
308.081	.0034					.0026	.80	8.49	.74	7.68	.015	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
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Date: 11- 7-2008 Time: 2:21:49

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-8873.698	2330.828	8.094	2338.922	2385.00	12.28	2.34	2341.26	.00	6.74	26.00	9.000	26.000	.00	1 2.0
621.073	.0034					.0030	1.83	8.09	.79	7.68	.015	.00	.00	BOX
-8252.625	2332.923	7.718	2340.641	2385.00	12.88	2.57	2343.22	.00	6.74	26.00	9.000	26.000	.00	1 2.0
400.564	.0034					.0033	1.34	7.72	.85	7.68	.015	.00	.00	BOX
-7852.060	2334.274	7.691	2341.965	2385.00	12.92	2.59	2344.56	.05	6.74	26.00	9.000	26.000	.00	1 2.0
39.930	.0036					.0034	.13	7.75	.85	7.49	.015	.00	.00	BOX
-7812.130	2334.418	7.663	2342.081	2385.00	12.97	2.61	2344.69	.00	6.74	26.00	9.000	26.000	.00	1 2.0
487.046	.0036					.0034	1.65	7.66	.86	7.50	.015	.00	.00	BOX
-7325.084	2336.168	7.499	2343.667	2385.00	13.25	2.73	2346.39	.00	6.74	26.00	9.000	26.000	.00	1 2.0
73.664	.0036					.0036	.26	7.50	.89	7.50	.015	.00	.00	BOX
-7251.420	2336.433	7.499	2343.932	2385.00	13.25	2.73	2346.66	.06	6.74	26.00	9.000	26.000	.00	1 2.0
39.480	.0036					.0036	.14	7.56	.89	7.50	.015	.00	.00	BOX
-7211.940	2336.575	7.499	2344.074	2385.00	13.25	2.73	2346.80	.00	6.74	26.00	9.000	26.000	.00	1 2.0
289.078	.0036					.0036	1.04	7.50	.89	7.49	.015	.00	.00	BOX
-6922.862	2337.616	7.493	2345.109	2385.00	13.26	2.73	2347.84	.00	6.74	26.00	9.000	26.000	.00	1 2.0
126.260	.0036					.0036	.45	7.49	.89	7.49	.015	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
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Date: 11- 7-2008 Time: 2:21:49

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6796.602	2338.071	7.493	2345.564	2385.00	13.26	2.73	2348.29	.00	6.74	26.00	9.000	26.000	.00	1 2.0
HYDRAULIC JUMP														
-6796.602	2338.071	6.045	2344.116	2385.00	16.44	4.20	2348.31	.00	6.74	26.00	9.000	26.000	.00	1 2.0
10.381	.0036					.0064	.07	6.05	1.23	7.49	.015	.00	.00	BOX
-6786.220	2338.108	5.981	2344.089	2385.00	16.62	4.29	2348.38	1.28	6.74	26.00	9.000	26.000	.00	1 2.0
17.485	.0022					.0068	.12	7.27	1.25	9.00	.015	.00	.00	BOX
-6768.735	2338.146	5.818	2343.964	2385.00	17.08	4.53	2348.49	1.36	6.74	26.00	9.000	26.000	.00	1 2.0
34.226	.0022					.0075	.26	7.18	1.30	9.00	.015	.00	.00	BOX
-6734.510	2338.220	5.547	2343.767	2385.00	17.91	4.98	2348.75	.00	6.74	26.00	9.000	26.000	.00	1 2.0
JUNCT STR	.0160					.0091	.05	5.55	1.40		.015	.00	.00	BOX
-6729.510	2338.300	4.885	2343.186	2282.00	19.46	5.88	2349.07	3.26	6.55	26.00	9.000	26.000	.00	1 2.0
22.172	.0168					.0100	.22	8.15	1.62	4.09	.015	.00	.00	BOX
-6707.337	2338.673	4.999	2343.672	2282.00	19.02	5.62	2349.29	3.11	6.55	26.00	9.000	26.000	.00	1 2.0
34.404	.0168					.0091	.31	8.11	1.56	4.09	.015	.00	.00	BOX
-6672.933	2339.253	5.243	2344.496	2282.00	18.13	5.11	2349.60	2.83	6.55	26.00	9.000	26.000	.00	1 2.0
23.533	.0168					.0080	.19	8.07	1.45	4.09	.015	.00	.00	BOX
-6649.400	2339.649	5.499	2345.148	2282.00	17.29	4.64	2349.79	.00	6.55	26.00	9.000	26.000	.00	1 2.0
10.824	.0167					.0072	.08	5.50	1.35	4.10	.015	.00	.00	BOX

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WATER SURFACE PROFILE LISTING

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LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6638.576	2339.830	5.667	2345.497	2282.00	16.78	4.37	2349.87	.00	6.55	26.00	9.000	26.000	.00	1 2.0
11.816	.0167					.0065	.08	5.67	1.29	4.10	.015	.00	.00	BOX
-6626.760	2340.027	5.943	2345.970	2282.00	16.00	3.97	2349.94	.00	6.55	26.00	9.000	26.000	.00	1 2.0
3.000	.0177					.0059	.02	5.94	1.20	4.02	.015	.00	.00	BOX
-6623.760	2340.080	6.061	2346.141	2282.00	15.69	3.82	2349.96	.00	6.55	26.00	9.000	26.000	.00	1 2.0
3.506	.0162					.0055	.02	6.06	1.17	4.15	.015	.00	.00	BOX
-6620.253	2340.137	6.243	2346.380	2282.00	15.23	3.60	2349.98	.00	6.55	26.00	9.000	26.000	.00	1 2.0
2.033	.0162					.0050	.01	6.24	1.12	4.15	.015	.00	.00	BOX
-6618.220	2340.170	6.548	2346.718	2282.00	14.52	3.27	2349.99	.00	6.55	26.00	9.000	26.000	.00	1 2.0
TRANS STR	.0038							6.55	1.04		.015	.00	.00	BOX
-6600.000	2340.240	6.048	2346.288	2282.00	15.72	3.84	2350.13	.00	6.55	24.00	8.000	24.000	.00	0 .0
103.070	.0042					.0038	.39	6.05	1.13	5.93	.015	.00	.00	BOX
-6496.930	2340.669	6.243	2346.912	2282.00	15.23	3.60	2350.51	.00	6.55	24.00	8.000	24.000	.00	0 .0
28.580	.0042					.0034	.10	6.24	1.07	5.93	.015	.00	.00	BOX
-6468.350	2340.788	6.548	2347.336	2282.00	14.52	3.27	2350.61	.00	6.55	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0023	.01	6.55	1.00		.015	.00	.00	BOX
-6465.350	2340.800	7.222	2348.022	2262.03	13.05	2.64	2350.67	.00	6.51	24.00	8.000	24.000	.00	0 .0
9.687	.0045					.0023	.02	7.22	.86	5.72	.015	.00	.00	BOX

----- WARNING - Flow depth near top of box conduit -----

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:21:49

LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6455.664	2340.844	7.145	2347.989	2262.03	13.19	2.70	2350.69	.00	6.51	24.00	8.000	24.000	.00	0 .0
HYDRAULIC JUMP														
-6455.664	2340.844	5.913	2346.757	2262.03	15.94	3.95	2350.70	.00	6.51	24.00	8.000	24.000	.00	0 .0
3.793	.0045					.0041	.02	5.91	1.16	5.72	.015	.00	.00	BOX
-6451.871	2340.861	5.917	2346.779	2262.03	15.93	3.94	2350.72	.00	6.51	24.00	8.000	24.000	.00	0 .0
101.607	.0045					.0039	.39	5.92	1.15	5.72	.015	.00	.00	BOX
-6350.263	2341.323	6.206	2347.529	2262.03	15.19	3.58	2351.11	.00	6.51	24.00	8.000	24.000	.00	0 .0
19.263	.0045					.0034	.06	6.21	1.07	5.72	.015	.00	.00	BOX
-6331.000	2341.410	6.510	2347.920	2262.03	14.48	3.25	2351.17	.00	6.51	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0033					.0020	.01	6.51	1.00		.015	.00	.00	BOX
-6328.000	2341.420	7.508	2348.928	2186.97	12.14	2.29	2351.22	.00	6.37	24.00	8.000	24.000	.00	0 .0
71.785	.0038					.0020	.14	7.51	.78	5.96	.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-6256.215	2341.691	7.159	2348.849	2186.97	12.73	2.52	2351.37	.00	6.37	24.00	8.000	24.000	.00	0 .0
59.160	.0038					.0022	.13	7.16	.84	5.96	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:21:49

LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6197.055	2341.914	6.826	2348.740	2186.97	13.35	2.77	2351.51	.00	6.37	24.00	8.000	24.000	.00	0 .0
36.130	.0038					.0026	.09	6.83	.90	5.96	.015	.00	.00	BOX
-6160.925	2342.050	6.556	2348.606	2186.97	13.90	3.00	2351.61	.00	6.37	24.00	8.000	24.000	.00	0 .0
HYDRAULIC JUMP														
-6160.925	2342.050	6.176	2348.226	2186.97	14.75	3.38	2351.61	.00	6.37	24.00	8.000	24.000	.00	0 .0
21.075	.0038					.0033	.07	6.18	1.05	5.96	.015	.00	.00	BOX
-6139.850	2342.130	6.366	2348.496	2186.97	14.31	3.18	2351.68	.00	6.37	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0025					.0019	.01	6.37	1.00		.015	.00	.00	BOX
-6135.810	2342.140	7.333	2349.473	2101.96	11.94	2.22	2351.69	.00	6.20	24.00	8.000	24.000	.00	0 .0
58.601	.0041					.0019	.11	7.33	.78	5.63	.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-6077.209	2342.381	6.991	2349.372	2101.96	12.53	2.44	2351.81	.00	6.20	24.00	8.000	24.000	.00	0 .0
42.213	.0041					.0022	.09	6.99	.83	5.63	.015	.00	.00	BOX
-6034.996	2342.554	6.705	2349.260	2101.96	13.06	2.65	2351.91	.00	6.20	24.00	8.000	24.000	.00	0 .0
HYDRAULIC JUMP														
-6034.996	2342.554	5.716	2348.270	2101.96	15.32	3.65	2351.92	.00	6.20	24.00	8.000	24.000	.00	0 .0
151.163	.0041					.0038	.57	5.72	1.13	5.63	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:21:49

LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-5883.833	2343.175	5.911	2349.086	2101.96	14.82	3.41	2352.50	.00	6.20	24.00	8.000	24.000	.00	0 .0
27.893	.0041					.0033	.09	5.91	1.07	5.63	.015	.00	.00	BOX
-5855.940	2343.290	6.200	2349.490	2101.96	14.13	3.10	2352.59	.00	6.20	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0042					.0023	.01	6.20	1.00		.015	.00	.00	BOX
-5853.560	2343.300	6.850	2350.150	2063.00	12.55	2.45	2352.60	.00	6.12	24.00	8.000	24.000	.00	0 .0
20.918	.0041					.0023	.05	6.85	.84	5.56	.015	.00	.00	BOX
-5832.642	2343.386	6.716	2350.103	2063.00	12.80	2.54	2352.65	.00	6.12	24.00	8.000	24.000	.00	0 .0
HYDRAULIC JUMP														
-5832.642	2343.386	5.562	2348.948	2063.00	15.45	3.71	2352.66	.00	6.12	24.00	8.000	24.000	.00	0 .0
1338.175	.0041					.0041	5.49	5.56	1.15	5.56	.015	.00	.00	BOX
-4494.467	2348.876	5.562	2354.438	2063.00	15.45	3.71	2358.15	.00	6.12	24.00	8.000	24.000	.00	0 .0
286.117	.0041					.0040	1.14	5.56	1.15	5.56	.015	.00	.00	BOX
-4208.350	2350.050	5.671	2355.721	2063.00	15.16	3.57	2359.29	1.46	6.12	24.00	8.000	24.000	.00	0 .0
34.860	.0040					.0039	.13	7.13	1.12	5.60	.015	.00	.00	BOX
-4173.490	2350.190	5.692	2355.882	2063.00	15.10	3.54	2359.42	1.45	6.12	24.00	8.000	24.000	.00	0 .0
34.870	.0043					.0038	.13	7.14	1.12	5.47	.015	.00	.00	BOX
-4138.620	2350.340	5.781	2356.121	2063.00	14.87	3.43	2359.55	.00	6.12	24.00	8.000	24.000	.00	0 .0
22.179	.0041					.0036	.08	5.78	1.09	5.59	.015	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Date:11- 7-2008 Time: 2:21:49

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-4116.441	2350.430	5.837	2356.267	2063.00	14.73	3.37	2359.63	.00	6.12	24.00	8.000	24.000	.00	0 .0
29.651	.0041					.0033	.10	5.84	1.07	5.59	.015	.00	.00	BOX
-4086.790	2350.550	6.123	2356.673	2063.00	14.04	3.06	2359.73	.00	6.12	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0050					.0023	.01	6.12	1.00		.015	.00	.00	BOX
-4082.790	2350.570	6.795	2357.365	2040.04	12.51	2.43	2359.79	.00	6.08	24.00	8.000	24.000	.00	0 .0
20.690	.0041					.0023	.05	6.79	.85	5.52	.015	.00	.00	BOX
-4062.100	2350.655	6.662	2357.317	2040.04	12.76	2.53	2359.84	.00	6.08	24.00	8.000	24.000	.00	0 .0
HYDRAULIC JUMP														
-4062.100	2350.655	5.524	2356.179	2040.04	15.39	3.68	2359.86	.00	6.08	24.00	8.000	24.000	.00	0 .0
400.541	.0041					.0041	1.64	5.52	1.15	5.52	.015	.00	.00	BOX
-3661.560	2352.294	5.524	2357.818	2040.04	15.39	3.68	2361.49	.00	6.08	24.00	8.000	24.000	.00	0 .0
253.110	.0041					.0039	.98	5.52	1.15	5.52	.015	.00	.00	BOX
-3408.450	2353.330	5.756	2359.086	2040.04	14.77	3.39	2362.47	.00	6.08	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0039	.01	5.76	1.08		.015	.00	.00	BOX
-3405.950	2353.340	5.420	2358.760	2025.29	15.57	3.76	2362.52	.00	6.05	24.00	8.000	24.000	.00	0 .0
90.580	.0041					.0043	.39	5.42	1.18	5.50	.015	.00	.00	BOX
-3315.370	2353.710	5.367	2359.078	2025.29	15.72	3.84	2362.92	.00	6.05	24.00	8.000	24.000	.00	0 .0
212.870	.0041					.0047	1.00	5.37	1.20	5.50	.015	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Date:11- 7-2008 Time: 2:21:49

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-3102.500	2354.580	5.118	2359.698	2025.29	16.49	4.22	2363.92	.00	6.05	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0054	.01	5.12	1.28		.015	.00	.00	BOX
-3100.000	2354.590	4.873	2359.464	2001.00	17.11	4.54	2364.01	.00	6.00	24.00	8.000	24.000	.00	0 .0
49.528	.0041					.0059	.29	4.87	1.37	5.45	.015	.00	.00	BOX
-3050.472	2354.793	4.778	2359.572	2001.00	17.45	4.73	2364.30	.00	6.00	24.00	8.000	24.000	.00	0 .0
105.174	.0041					.0065	.68	4.78	1.41	5.45	.015	.00	.00	BOX
-2945.298	2355.225	4.556	2359.781	2001.00	18.30	5.20	2364.98	.00	6.00	24.00	8.000	24.000	.00	0 .0
91.528	.0041					.0075	.68	4.56	1.51	5.45	.015	.00	.00	BOX
-2853.770	2355.600	4.344	2359.944	2001.00	19.19	5.72	2365.66	1.41	6.00	24.00	8.000	24.000	.00	0 .0
44.155	.0041					.0083	.37	5.75	1.62	5.44	.015	.00	.00	BOX
-2809.615	2355.782	4.237	2360.019	2001.00	19.68	6.01	2366.03	1.48	6.00	24.00	8.000	24.000	.00	0 .0
78.345	.0041					.0093	.73	5.72	1.68	5.44	.015	.00	.00	BOX
-2731.270	2356.104	4.040	2360.144	2001.00	20.64	6.61	2366.76	.00	6.00	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0106	.04	5.67	1.81		.015	.00	.00	BOX
-2727.270	2356.120	3.778	2359.898	1921.00	21.18	6.97	2366.87	1.72	5.84	24.00	8.000	24.000	.00	0 .0
13.610	.0044					.0114	.15	5.49	1.92	5.17	.015	.00	.00	BOX
-2713.660	2356.180	3.744	2359.924	1921.00	21.38	7.10	2367.02	.00	5.84	24.00	8.000	24.000	.00	0 .0
58.480	.0041					.0123	.72	3.74	1.95	5.30	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:21:49

LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
-2655.180	2356.420	3.586	2360.006	1921.00	22.32	7.74	2367.74	.00	5.84	24.00	8.000	24.000	.00	0 .0
TRANS STR	.0500					.0091	.91	3.59	2.08		.015	-2.88	.00	BOX
-2555.180	2361.420	4.172	2365.592	1921.00	14.99	3.49	2369.08	.00	5.20	39.73	7.000	24.000	2.00	0 .0
626.644	.0051					.0051	3.20	4.17	1.47	4.17	.015	-2.88	2.00	TRAP
-1928.536	2364.619	4.172	2368.791	1921.00	14.99	3.49	2372.28	.00	5.20	39.73	7.000	24.000	2.00	0 .0
501.676	.0051					.0049	2.46	4.17	1.47	4.17	.015	-2.88	2.00	TRAP
-1426.860	2367.180	4.264	2371.444	1921.00	14.57	3.30	2374.74	.00	5.20	40.10	7.000	24.000	2.00	0 .0
TRANS STR	.0140					.0046	.96	4.26	1.42		.015	-6.24	2.00	TRAP
-1217.090	2370.120	3.188	2373.308	1921.00	12.62	2.47	2375.78	.00	3.75	52.00	7.000	52.000	.00	0 .0
TRANS STR	.0136					.0058	.81	3.19	1.30		.015	.00	.00	RECTANG
-1078.920	2372.000	2.003	2374.003	1921.00	12.97	2.61	2376.62	.00	2.76	73.92	7.000	73.920	.00	0 .0
WALL EXIT														
-1078.920	2372.000	3.747	2375.747	1921.00	10.59	1.74	2377.49	.00	3.75	52.00	7.000	52.000	.00	0 .0
JUNCT STR	.0000					.0007	.00	3.75	1.00		.015	.00	.00	RECTANG
----- WARNING - Junction Analysis - Change in Channel Type -----														
-1078.920	2372.000	5.254	2377.254	938.00	3.91	.24	2377.49	.00	2.28	51.00	5.000	51.000	.00	3 1.0
85.820	.0037					.0007	.06	5.25	.32	2.31	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:21:49

LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
-993.100	2372.316	5.000	2377.316	938.00	3.91	.24	2377.55	.00	2.28	51.00	5.000	51.000	.00	3 1.0
64.336	.0037					.0004	.03	5.00	.32	2.31	.015	.00	.00	BOX
-928.763	2372.553	4.766	2377.320	938.00	4.10	.26	2377.58	.00	2.28	51.00	5.000	51.000	.00	3 1.0
61.427	.0037					.0005	.03	4.77	.34	2.31	.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-867.337	2372.780	4.545	2377.324	938.00	4.30	.29	2377.61	.00	2.28	51.00	5.000	51.000	.00	3 1.0
51.687	.0037					.0005	.03	4.54	.37	2.31	.015	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-815.650	2372.970	4.358	2377.328	938.00	4.48	.31	2377.64	.00	2.28	51.00	5.000	51.000	.00	3 1.0
BRIDGE ENTRANCE														
-815.650	2372.970	4.439	2377.409	938.00	4.14	.27	2377.68	.00	2.19	51.00	5.000	51.000	.00	0 .0
WALL ENTRANCE														
-815.650	2372.970	4.827	2377.797	938.00	1.95	.06	2377.86	.00	1.53	113.96	8.000	85.000	3.00	0 .0
22.224	.0089					.0003	.01	4.83	.17	1.75	.033	.00	3.00	TRAP
-793.426	2373.168	4.630	2377.798	938.00	2.05	.07	2377.86	.00	1.53	112.78	8.000	85.000	3.00	0 .0
21.433	.0089					.0004	.01	4.63	.18	1.75	.033	.00	3.00	TRAP

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:21:49

LAS VEGAS WASH - RAINBOW STORM DRAIN; 90% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-15.wsw; DATE: JULY-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd. El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-771.993	2373.359	4.440	2377.799	938.00	2.15	.07	2377.87	.00	1.53	111.64	8.000	85.000	3.00	0 .0
20.669	.0089					.0004	.01	4.44	.19	1.75	.033	.00	3.00	TRAP
-751.323	2373.543	4.257	2377.800	938.00	2.25	.08	2377.88	.00	1.53	110.54	8.000	85.000	3.00	0 .0
19.933	.0089					.0005	.01	4.26	.20	1.75	.033	.00	3.00	TRAP
-731.390	2373.720	4.081	2377.802	938.00	2.36	.09	2377.89	.00	1.53	109.49	8.000	85.000	3.00	0 .0
19.225	.0089					.0005	.01	4.08	.22	1.75	.033	.00	3.00	TRAP
-712.165	2373.892	3.912	2377.803	938.00	2.48	.10	2377.90	.00	1.53	108.47	8.000	85.000	3.00	0 .0
12.165	.0089					.0006	.01	3.91	.23	1.75	.033	.00	3.00	TRAP
-700.000	2374.000	3.805	2377.805	938.00	2.56	.10	2377.91	.00	1.53	107.83	8.000	85.000	3.00	0 .0

November 11, 2008

Values In English Units

HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Freeboard Check - Trunkline with Trunkline Peaking)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; 6952-ULT-15.WSW; n=.015

WO # 6952

By: D.Bergh

WSPGW STATION	REMARKS	DESIGN FLOW	DEPTH OF FLOW	DEPTH W/AIR ⁽¹⁾	INVERT ELEV	VELOCITY	H.G.L.	E.G.L.	CHANNEL TYPE	BASE WIDTH/DIA.	SIDE SLOPE	FLOW AREA	WETTED PERIMETER	TOP WIDTH	FROUDE NUMBER	ANGLE OF CURVE	CURVE RADIUS	SUPER ELEV ⁽⁴⁾	ROLL WAVE ⁽²⁾	CCR FCD MIN FB ⁽³⁾	MIN WALL HT	DESIGN WALL HT	ACTUAL FB	FB CHECK	RESOLUTION
-7+00.00	SYSTEM HEADWORKS	938	3.805	3.805	2374.00	2.56	2377.81	2377.91	TRAP	85	3	366.41	109.06	107.83	0.24					0.60	4.41	8.00	4.20	OK	NA
-7+00.00	BEGIN TRAP CHANNEL AT GOLF COURSE	938	3.805	3.805	2374.00	2.56	2377.81	2377.91	TRAP	85	3	366.41	109.06	107.83	0.24					0.60	4.41	8.00	4.20	OK	NA
					0.89%																				
-8+15.65	END TRAP CHANNEL; WALL ENTRANCE	938	4.827	4.827	2372.97	2.05	2377.80	2377.86	TRAP	85	0	457.56	94.65	85.00	0.16					0.57	5.39	8.00	3.17	OK	NA
-8+15.65	BRIDGE ENTRANCE; BEGIN RCB; GB	938	4.358	4.358	2372.97	4.48	2377.33	2377.64	RCB	48	0	209.38	56.72	48.00	0.38					0.81	5.17	5.00	0.64	FIX WALL HEIGHT	NA
					0.37%																				
-10+78.92	END RCB; WALL EXIT	938	5.254	5.254	2372.00	3.91	2377.26	2377.49	RCB	48	0	239.90	58.51	48.00	0.31					0.74	5.99	5.00	-0.25	FIX WALL HEIGHT	NA
-10+78.92	BEGIN CONFLUENCE STRUCTURE; GB	1921	2.003	2.004	2372.00	12.97	2374.00	2376.62	RECT	73.92	0	148.11	77.93	73.92	1.61					1.41	3.41	7.00	5.00	OK	NA
					1.36%																				
-12+17.09	END CONFLUENCE STRUCTURE	1921	3.188	3.188	2370.12	12.62	2373.31	2375.78	RECT	52	0	152.22	58.38	52.00	1.30					1.46	4.65	7.00	3.81	OK	NA
-12+17.09	BEGIN TRANSITION STRUCTURE	1921	3.188	3.188	2370.12	12.62	2373.31	2375.78	RECT	52	0	152.22	58.38	52.00	1.30					1.46	4.65	7.00	3.81	OK	NA
					1.40%																				
-14+26.86	END TRANSITION STRUCTURE	1921	4.264	4.264	2367.18	14.57	2371.44	2374.74	TRAP	24	2	131.85	43.07	41.06	1.43					1.59	5.85	7.00	2.74	OK	NA
-14+26.86	BEGIN TRAPEZOIDAL CHANNEL; GB	1921	4.264	4.264	2367.18	14.57	2371.44	2374.74	TRAP	24	2	131.85	43.07	41.06	1.43					1.59	5.85	7.00	2.74	OK	NA
					0.51%																				
-25+55.18	END TRAPEZOIDAL CHANNEL	1921	4.172	4.172	2361.42	14.99	2365.59	2369.08	TRAP	24	2	128.15	42.66	40.69	1.49					1.60	5.78	7.00	2.83	OK	NA
-25+55.18	BEGIN TRANSITION STRUCTURE; GB	1921	4.172	4.172	2361.42	14.99	2365.59	2369.08	TRAP	24	2	128.15	42.66	40.69	1.49					1.60	5.78	7.00	2.83	OK	NA
					5.00%																				
-26+55.18	END TRANSITION STRUCTURE	1921	3.586	3.692	2356.42	22.32	2360.01	2367.74	RCB	24	0	86.07	31.17	24.00	2.08					1.85	5.44	8.00	4.41	OK	NA
-26+55.18	BEGIN 24' X 8' RCB; GB	1921	3.586	3.692	2356.42	22.32	2360.01	2367.74	RCB	24	0	86.07	31.17	24.00	2.08					1.85	5.44	8.00	4.41	NA	NA
					0.41%																				
-27+13.66		1921	3.744	3.824	2356.18	21.38	2359.92	2367.02	RCB	24	0	89.85	31.49	24.00	1.95					1.83	5.57	8.00	4.26	NA	NA
-27+13.66	PC	1921	3.744	3.824	2356.18	21.38	2359.92	2367.02	RCB	24	0	89.85	31.49	24.00	1.95	40.00	200	1.703		1.83	7.28	8.00	2.55	NA	NA
					0.44%																				
-27+27.27	48" RCP LATERAL	1921	3.778	3.852	2356.12	21.18	2359.90	2366.86	RCB	24	0	90.70	31.56	24.00	1.92					1.82	5.60	8.00	4.22	NA	NA
-27+31.27		2001	4.040	4.091	2356.10	20.64	2360.14	2366.76	RCB	24	0	96.95	32.08	24.00	1.81					1.82	5.86	8.00	3.96	NA	NA
					0.41%																				
-28+53.77	PT	2001	4.344	4.348	2355.60	19.19	2359.94	2365.66	RCB	24	0	104.27	32.69	24.00	1.62	40.00	200	1.372		1.78	7.50	8.00	2.28	NA	NA
-28+53.77		2001	4.344	4.348	2355.60	19.19	2359.94	2365.66	RCB	24	0	104.27	32.69	24.00	1.62					1.78	6.13	8.00	3.66	NA	NA
					0.41%																				
-31+00.00	30" RCP LATERAL	2001	4.873	4.873	2354.59	17.11	2350.57	2355.11	RCB	24	0	116.95	33.75	24.00	1.37					1.73	6.60	8.00	3.13	NA	NA
-31+02.50		2025	5.118	5.118	2354.58	16.49	2350.55	2354.77	RCB	24	0	122.82	34.24	24.00	1.28					1.71	6.83	8.00	2.88	NA	NA
					0.41%																				
-34+05.95	30" RCP LATERAL	2025	5.420	5.420	2353.34	15.57	2350.57	2354.33	RCB	24	0	130.08	34.84	24.00	1.18					1.68	7.10	8.00	2.58	NA	NA
-34+08.45		2040	5.756	5.756	2353.33	14.77	2350.55	2353.94	RCB	24	0	138.12	35.51	24.00	1.08					1.66	8.84	8.00	2.24	NA	NA
					0.41%																				
-40+62.10	HYDRAULIC JUMP	2040	5.524	5.524	2350.66	15.39	2350.57	2354.25	RCB	24	0	132.56	35.05	24.00	1.15					1.68	7.20	8.00	2.48	NA	NA
-40+62.10		2040	6.662	6.662	2350.66	12.76	2350.55	2353.08	RCB	24	0	159.88	37.32	24.00	0.87					3.03	9.69	8.00	1.34	NA	NA
					0.42%																				
-40+82.79	48" RCP LATERAL	2040	6.795	6.795	2350.57	12.51	2350.57	2353.00	RCB	24	0	163.07	37.59	24.00	0.85					2.93	9.73	8.00	1.21	NA	NA
-40+86.79		2063	6.123	6.123	2350.55	14.04	2350.55	2353.61	RCB	24	0	146.94	36.25	24.00	1.00					1.64	9.19	8.00	1.88	NA	NA
					0.41%																				
-41+38.62		2063	5.781	5.781	2350.34	14.87	2356.12	2359.55	RCB	24	0	138.74	35.56	24.00	1.09					1.67	8.91	8.00	2.22	NA	NA
-41+38.62	PC	2063	5.781	5.781	2350.34	14.87	2356.12	2359.55	RCB	24	0	138.74	35.56	24.00	1.09	17.00	116	1.421		1.67	8.87	8.00	0.80	NA	NA
					0.43%																				
-41+73.49	PRC	2063	5.692	5.692	2350.19	15.10	2355.88	2359.42	RCB	24	0	136.62	35.38	24.00	1.12	17.00	116	1.465		1.67	8.83	8.00	0.84	NA	NA
-41+73.49	PRC	2063	5.692	5.692	2350.19	15.10	2355.88	2359.42	RCB	24	0	136.62	35.38	24.00	1.12	17.00	116	1.465		1.67	#REF!	8.00	0.84	NA	NA
					0.40%																				
-42+08.35	PT	2063	5.671	5.671	2350.05	15.16	2355.72	2359.29	RCB	24	0	136.08	35.34	24.00	1.12	-17.00	116	1.477		1.68	7.35	8.00	0.85	NA	NA
-42+08.35		2063	5.671	5.671	2350.05	15.16	2355.72	2359.29	RCB	24	0	136.08	35.34	24.00	1.12					1.68	7.35	8.00	2.33	NA	NA
					0.41%																				
-58+32.64	HYDRAULIC JUMP	2063	5.562	5.562	2343.39	15.45	2350.57	2354.28	RCB	24	0	133.53	35.12	24.00	1.15					1.68	7.25	8.00	2.44	NA	NA
-58+32.64		2063	6.716	6.716	2343.39	12.80	2350.55	2353.09	RCB	24	0	161.17	37.43	24.00	0.87					3.04	9.76	8.00	1.28	NA	NA
					0.41%																				
-58+53.56	DUAL 14" X 23" HERCP LATERAL	2063	6.850	6.850	2343.30	12.55	2350.15	2352.60	RCB	24	0	164.38	37.70	24.00	0.85					2.95	9.80	8.00	1.15	NA	NA

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WSPGW STATION	REMARKS	DESIGN FLOW	DEPTH OF FLOW	DEPTH W/AIR ⁽¹⁾	INVERT ELEV	VELOCITY	H.G.L.	E.G.L.	CHANNEL TYPE	BASE WIDTH/DIA.	SIDE SLOPE	FLOW AREA	WETTED PERIMETER	TOP WIDTH	FROUDE NUMBER	ANGLE OF CURVE	CURVE RADIUS	SUPER ELEV ⁽⁴⁾	ROLL WAVE ⁽²⁾	CCRFGD MIN FB ⁽³⁾	MIN WALL HT	DESIGN WALL HT	ACTUAL FB	FB CHECK	RESOLUTION
-58+55.94		2102	6.200	6.200	2343.29	14.13	2349.49	2352.59	RCB	24	0	148.76	36.40	24.00	1.00					1.65	7.85	8.00	1.80	NA	NA
					0.41%																				
-60+35.00	HYDRAULIC JUMP	2102	5.716	5.716	2342.55	15.32	2350.57	2354.21	RCB	24	0	137.20	35.43	24.00	1.13					1.68	7.40	8.00	2.28	NA	NA
-60+35.00		2102	6.705	6.705	2342.55	13.06	2350.55	2353.20	RCB	24	0	160.95	37.41	24.00	0.89					3.15	9.85	8.00	1.30	NA	NA
					0.41%																				
-61+35.81	DUAL 24" X 38" HERCP LATERAL	2102	7.333	7.333	2342.14	11.94	2349.47	2351.69	RCB	24	0	176.04	38.67	24.00	0.78					2.71	10.05	8.00	0.67	NA	NA
-61+39.85		2187	6.366	6.366	2342.13	14.31	2348.50	2351.68	RCB	24	0	152.83	36.73	24.00	1.00					1.66	8.03	8.00	1.63	NA	NA
					0.38%																				
-61+60.93	HYDRAULIC JUMP	2187	6.176	6.176	2342.05	14.75	2348.23	2351.60	RCB	24	0	148.27	36.35	24.00	1.05					1.68	7.85	8.00	1.82	NA	NA
-61+60.93		2187	6.556	6.556	2342.05	13.90	2348.61	2351.61	RCB	24	0	157.34	37.11	24.00	0.96					3.50	10.06	8.00	1.44	NA	NA
					0.38%																				
-63+28.00	29" X 45" HERCP LATERAL	2187	7.508	7.508	2341.42	12.14	2348.93	2351.22	RCB	24	0	180.15	39.02	24.00	0.78					2.79	10.30	8.00	0.49	NA	NA
-63+31.00		2262	6.510	6.510	2341.41	14.48	2347.92	2351.18	RCB	24	0	156.22	37.02	24.00	1.00					1.68	8.19	8.00	1.49	NA	NA
					0.45%																				
-64+55.66	HYDRAULIC JUMP	2262	5.913	5.913	2340.84	15.94	2346.76	2350.70	RCB	24	0	141.91	35.83	24.00	1.16					1.72	7.63	8.00	2.09	NA	NA
-64+55.66		2262	7.145	7.145	2340.84	13.13	2347.99	2350.67	RCB	24	0	172.28	38.29	24.00	0.86					3.18	10.32	8.00	0.86	NA	NA
					0.45%																				
-64+65.35	36" RCP LATERAL	2262	7.222	7.222	2340.80	13.05	2348.02	2350.67	RCB	24	0	173.34	38.44	24.00	0.86					3.14	10.37	8.00	0.78	NA	NA
-64+68.35		2282	6.548	6.548	2340.79	14.52	2347.34	2350.61	RCB	24	0	157.16	37.10	24.00	1.00					1.68	8.23	8.00	1.45	NA	NA
					0.42%																				
-66+00.00	END 24" X 8" RCB	2282	6.048	6.048	2340.24	15.72	2346.29	2350.13	RCB	24	0	145.17	36.10	24.00	1.13					1.72	7.76	8.00	1.95	NA	NA
-66+00.00	BEGIN TRANSITION STRUCTURE	2282	6.048	6.048	2340.24	15.72	2346.29	2350.13	RCB	24	0	145.17	36.10	24.00	1.13					1.72	7.76	8.00	1.95	NA	NA
					0.38%																				
-66+18.22	END TRANSITION STRUCTURE	2282	6.548	6.548	2340.17	14.45	2346.72	2349.96	RCB	26	0	157.92	39.10	26.00	1.03					1.68	10.79	9.00	-0.11	NA	NA
-66+18.22	BEGIN 2 - 13' X 9' RCB	2282	6.548	6.548	2340.17	14.45	2346.72	2349.96	RCB	26	0	157.92	39.10	26.00	1.03					1.68	8.22	9.00	2.45	NA	NA
					1.68%																				
-66+23.76		2282	6.061	6.061	2340.08	15.69	2346.14	2349.96	RCB	26	0	145.44	38.12	26.00	1.17					1.72	10.34	#REF!	#REF!	NA	NA
-66+23.76		2282	6.061	6.061	2340.08	15.69	2346.14	2349.96	RCB	26	0	145.44	38.12	26.00	1.17					1.72	7.78	#REF!	#REF!	NA	NA
					1.67%																				
-66+49.40		2282	5.499	5.499	2339.65	17.29	2345.15	2349.79	RCB	26	0	131.98	37.00	26.00	1.35					1.76	7.26	#REF!	#REF!	NA	NA
-66+49.40	PC	2282	5.499	5.499	2339.65	17.29	2345.15	2349.79	RCB	26	0	131.98	37.00	26.00	1.35		53.00	87	1.263	1.76	7.44	#REF!	#REF!	NA	NA
					1.68%																				
-67+29.51	60" RCP LATERAL	2282	4.885	4.886	2338.30	19.46	2343.19	2349.07	RCB	26	0	117.27	35.77	26.00	1.61					1.83	6.71	#REF!	#REF!	NA	NA
-67+34.51		2385	5.547	5.547	2338.22	17.19	2343.77	2348.36	RCB	26	0	138.74	37.09	26.00	1.31					1.76	7.31	#REF!	#REF!	NA	NA
					0.22%																				
-67+86.22	PT	2385	5.891	5.891	2338.11	16.62	2344.00	2348.29	RCB	26	0	143.50	37.78	26.00	1.25		37.00	87	2.564	1.75	7.64	#REF!	#REF!	NA	NA
-67+86.22		2385	5.891	5.891	2338.11	16.62	2344.00	2348.29	RCB	26	0	143.50	37.78	26.00	1.25					1.75	7.64	#REF!	#REF!	NA	NA
					0.36%																				
-67+96.60	HYDRAULIC JUMP	2385	6.045	6.045	2338.07	16.44	2344.12	2348.31	RCB	26	0	145.07	38.09	26.00	1.23					1.75	7.79	#REF!	#REF!	NA	NA
-67+96.60		2385	7.493	7.493	2338.07	13.26	2345.56	2348.29	RCB	26	0	179.86	40.99	26.00	0.89					3.23	10.72	#REF!	#REF!	NA	NA
					0.36%																				
-72+11.94		2385	7.499	7.499	2336.58	13.25	2344.07	2346.80	RCB	26	0	180.00	41.00	26.00	0.89					3.23	10.83	#REF!	#REF!	NA	NA
-72+11.94	PC	2385	7.499	7.499	2336.58	13.25	2344.07	2346.80	RCB	26	0	180.00	41.00	26.00	0.89		2.00	1250	0.113	3.23	10.84	#REF!	#REF!	NA	NA
					0.36%																				
-72+51.42	PT	2385	7.499	7.499	2336.43	13.25	2343.93	2346.66	RCB	26	0	180.00	41.00	26.00	0.89		2.00	1250	0.113	3.23	10.84	#REF!	#REF!	NA	NA
-72+51.42		2385	7.499	7.499	2336.43	13.25	2343.93	2346.66	RCB	26	0	180.00	41.00	26.00	0.89					3.23	10.73	#REF!	#REF!	NA	NA
					0.36%																				
-78+12.13		2385	7.663	7.663	2334.42	12.97	2342.08	2344.69	RCB	26	0	183.89	41.33	26.00	0.86					3.11	10.78	#REF!	#REF!	NA	NA
-78+12.13	PC	2385	7.663	7.663	2334.42	12.97	2342.08	2344.69	RCB	26	0	183.89	41.33	26.00	0.86		2.00	1250	0.109	3.11	10.88	#REF!	#REF!	NA	NA
					0.36%																				
-78+52.06	PT	2385	7.691	7.691	2334.27	12.92	2341.97	2344.56	RCB	26	0	184.60	41.38	26.00	0.85		2.00	1250	0.108	3.09	10.78	#REF!	#REF!	NA	NA
-78+52.06		2385	7.691	7.691	2334.27	12.92	2341.97	2344.56	RCB	26	0	184.60	41.38	26.00	0.85					3.09	10.78	#REF!	#REF!	NA	NA
					0.34%																				
-94+24.48	60" RCP LATERAL	2385	8.904	8.904	2328.97	11.16	2337.87	2339.81	RCB	26	0	213.71	43.81	26.00	0.69					2.43	11.34	9.00	0.10	NA	NA
-94+24.48		2367	7.757	7.757	2328.93	14.16	2336.69	2339.80	RCB	26	0	167.16	41.51	26.00	0.98					3.61	11.37	9.00	1.24	NA	NA

November 11, 2008

Values In English Units

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WO # 6952

By: D.Bergh

WSPGW STATION	REMARKS	DESIGN FLOW	DEPTH OF FLOW	DEPTH WAIR ⁽¹⁾	INVERT ELEV	VELOCITY	H.G.L.	E.G.L.	CHANNEL TYPE	BASE WIDTH/DIA.	SIDE SLOPE	FLOW AREA	WETTED PERIMETER	TOP WIDTH	FROUDE NUMBER	ANGLE OF CURVE	CURVE RADIUS	SUPER ELEV ⁽⁴⁾	ROLL WAVE ⁽²⁾	CCRFCD/MIN FB ⁽³⁾	MIN WALL HT	DESIGN WALL HT	ACTUAL FB	FB CHECK	RESOLUTION
-95+19.61	END 2 - 13' X 9' RCB	2367	7.209	7.209	2328.60	15.24	2335.81	2339.42	RCB	26	0	155.31	40.42	26.00	1.10					1.74	8.95	9.00	1.79	NA	NA
-95+19.61	BEGIN TRANSITION STRUCTURE	2367	7.209	7.209	2328.60	15.24	2335.81	2339.42	RCB	26	0	155.31	40.42	26.00	1.10					1.74	8.95	9.00	1.79	NA	NA
					3.90%																				
-95+69.61	END TRANSITION STRUCTURE	2367	5.212	5.272	2326.65	21.08	2331.86	2338.76	RCB	26	0	112.29	36.42	26.00	1.79					1.91	7.13	9.00	3.79	NA	NA
-95+69.61	BEGIN 24' X 8' RCB; 48" RCP LATERAL	2781	6.200	6.200	2326.65	18.56	2332.85	2338.20	RCB	26	0	148.76	38.40	26.00	1.37					1.85	8.05	8.00	1.80	NA	NA
					0.40%																				
-109+37.33	GB	2761	6.610	6.610	2321.21	17.40	2327.82	2332.52	RCB	26	0	158.68	39.22	26.00	1.24					1.82	8.43	9.00	2.39	NA	NA
-109+37.33		2761	6.610	6.610	2321.21	17.40	2327.82	2332.52	RCB	26	0	158.68	39.22	26.00	1.24					1.82	8.43	9.00	2.39	NA	NA
					4.10%																				
-109+51.37	HYDRAULIC JUMP	2761	5.891	5.891	2320.64	19.53	2326.53	2332.45	RCB	26	0	141.37	37.78	26.00	1.48					1.88	7.77	8.00	2.11	NA	NA
-109+51.37		2761	8.464	8.464	2320.64	14.38	2329.10	2332.31	RCB	26	0	192.00	42.93	26.00	0.93					3.71	12.17	8.00	-0.46	NA	NA
					4.12%																				
-109+54.48		2761	8.580	8.580	2320.51	14.38	2329.09	2332.30	RCB	26	0	192.00	43.16	26.00	0.93					3.71	12.29	8.00	-0.58	NA	NA
-109+54.48	48" RCP LATERAL	2885	7.818	7.818	2320.51	15.38	2326.33	2332.00	RCB	26	0	187.58	41.64	26.00	1.01					1.76	9.58	8.00	0.18	NA	NA
					0.30%																				
-120+99.48		2885	7.657	7.657	2317.04	15.70	2324.70	2328.52	RCB	26	0	183.76	41.31	26.00	1.04					1.77	9.43	8.00	0.34	NA	NA
-120+99.48	GB	2885	7.657	7.657	2317.04	15.70	2324.70	2328.52	RCB	26	0	183.76	41.31	26.00	1.04					1.77	9.43	8.00	0.34	NA	NA
					2.60%																				
-121+19.39	HYDRAULIC JUMP	2885	6.354	6.354	2316.52	15.03	2322.88	2326.38	RCB	26	0	191.95	38.71	26.00	0.97					4.01	10.36	8.00	1.65	NA	NA
-121+19.39		2885	8.337	8.337	2316.52	18.92	2324.86	2330.42	RCB	26	0	152.48	42.67	26.00	1.38					1.96	10.30	8.00	-0.34	NA	NA
					2.56%																				
-121+19.48		2885	8.340	8.340	2316.52	15.03	2324.86	2328.37	RCB	26	0	191.95	42.68	26.00	0.97					4.01	12.35	8.00	-0.34	NA	NA
-121+19.48	48" RCP LATERAL	2955	7.894	7.894	2316.52	15.60	2324.41	2328.19	RCB	26	0	189.42	41.79	26.00	1.02					1.78	9.67	8.00	0.11	NA	NA
					0.31%																				
-121+28.76	HYDRAULIC JUMP	2955	7.666	7.666	2316.49	15.06	2324.16	2327.68	RCB	26	0	196.22	41.33	26.00	0.97					4.02	11.69	8.00	0.33	NA	NA
-121+28.76		2955	7.894	7.894	2316.49	15.60	2324.39	2328.16	RCB	26	0	189.42	41.79	26.00	1.02					1.78	9.67	8.00	0.11	NA	NA
					0.31%																				
-146+59.48		2955	7.780	7.780	2308.66	15.83	2316.44	2320.33	RCB	26	0	186.67	41.56	26.00	1.04					1.78	9.56	8.00	0.22	NA	NA
-146+59.48	GB	2955	7.780	7.780	2308.66	15.83	2316.44	2320.33	RCB	26	0	186.67	41.56	26.00	1.04					1.78	9.56	8.00	0.22	NA	NA
					1.38%																				
-147+09.48		2955	6.429	6.429	2307.97	19.15	2314.40	2320.09	RCB	26	0	154.31	38.86	26.00	1.39					1.89	8.32	8.00	1.57	NA	NA
-147+09.48		2955	6.429	6.429	2307.97	19.15	2314.40	2320.09	RCB	26	0	154.31	38.86	26.00	1.39					1.89	8.32	8.00	1.57	NA	NA
					0.43%																				
-171+09.48	END 24' X 8' RCB	2955	7.025	7.025	2297.65	17.53	2304.68	2309.45	RCB	26	0	168.57	40.05	26.00	1.21					1.84	8.86	8.00	0.98	NA	NA
-171+09.48	BEGIN TRANSITION STRUCTURE	2955	7.025	7.025	2297.65	17.53	2304.68	2309.45	RCB	26	0	168.57	40.05	26.00	1.21					1.84	8.86	8.00	0.98	NA	NA
					0.45%																				
-171+29.48	END TRANSITION STRUCTURE	2955	5.914	5.914	2297.56	19.22	2303.47	2309.21	RCB	26	0	153.75	37.83	26.00	1.39					1.87	7.78	8.00	2.09	NA	NA
-171+29.48	BEGIN 28.25' X 8' RCB	2955	5.914	5.914	2297.56	19.22	2303.47	2309.21	RCB	26	0	153.75	37.83	26.00	1.39					1.87	7.78	8.00	2.09	NA	NA
					0.40%																				
-171+39.48	END 28.25' X 8' RCB	2955	5.961	5.961	2297.52	19.07	2303.48	2309.13	RCB	26	0	154.96	37.92	26.00	1.38					1.86	7.83	8.00	2.04	NA	NA
-171+39.48	SYSTEM OUTLET	2955	5.961	5.961	2297.52	19.07	2303.48	2309.13	RCB	26	0	154.96	37.92	26.00	1.38					1.86	7.83	8.00	2.04	NA	NA

Notes:

(1) Depth with air entrainment, $y^*/y = 0.906(e)^{0.0615}$ ($Fr \geq 1.60$; $y^* = y$, $Fr < 1.60$). See *WASURO User's Manual (Draft)*, US Army Corps of Engineers Los Angeles District, July 1985.

(2) To be calculated in the future.

(3) For supercritical flow, $F_b = 1 + 0.025V(Y^{1/3})$; for subcritical flow, $FB = 0.5 + V^2/2g$. See *Hydrologic Criteria and Drainage Design Manual*, CCRFCD, 1999.

(4) Super-Elevation = $C * (V^2 * Tw) / (g * r)$; $C = 1$, V = Mean Channel Velocity, Tw = Top Width of Channel, r = Radius of Curve, g = gravity constant

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

B.2.4

MPU Alignment, Ultimate Conditions Laterals Peaking

File: 6952-ULT-13-A.wsw

$n=0.013$

T1 LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
T2 HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
T3 FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)
SO -17139.48 2297.52 12

REM *****
REM END VTN DESIGN

REM *****
R -17139.48 2297.52 12 .013
R -17129.48 2297.56 12 .013
TS -17109.48 2297.65 10 12 .013
R -14709.48 2307.97 10 .013
R -14659.48 2308.66 10 .013
R -12119.48 2316.52 10 .013
JX -12119.48 2316.52 10 11 .013 70.0 2318.520 90.0 .000
R -12099.48 2317.04 10 .013
R -10954.48 2320.51 10 .013
JX -10954.48 2320.51 10 14 .013 124.0 2322.510 90.0 .000
R -10934.48 2321.33 10 .013
R -9569.61 2326.65 10 .013
JX -9569.61 2326.65 10 14 .013 124.0 2328.650 90.0 .000
TS -9519.61 2328.60 8 .013

REM *****
REM END LOUIS BERGER DESIGN, BEGIN VTN DESIGN AT ELKHORN AND TORREY PINES; Q=2637

REM *****
R -9429.48 2328.93 8 .013
JX -9424.48 2328.97 8 9 .013 252.00 2328.97 90
R -7852.06 2334.274 8 .013
R -7812.13 2334.418 8 .013 -2.00
R -7251.42 2336.433 8 .013
R -7211.94 2336.575 8 .013 2.00
R -6786.22 2338.108 8 .013
R -6734.51 2338.22 8 .013 37.00
JX -6729.51 2338.30 8 14 .013 110.66 2338.22 -57
R -6729.51 2338.30 8 .013
R -6649.40 2339.649 8 .013 53.00
R -6626.76 2340.027 8 .013
R -6623.76 2340.08 8 .013

REM *****
REM END VTN DESIGN, BEGIN LOUIS BERGER DESIGN AT RAINBOW AND ELKHORN

REM *****
R -6618.22 2340.17 8 .013
TS -6600.00 2340.24 1 8 .013
R -6468.35 2340.788 1 .013
JX -6465.35 2340.80 1 2 .013 50.21 2341.13 -80.0
R -6331.00 2341.41 1 .013
JX -6328.00 2341.42 1 2 .013 79.40 2341.80 -90
R -6139.85 2342.13 1 .013
JX -6135.81 2342.14 1 18 .013 88.56 2342.21 -90
R -5855.94 2343.29 1 .013
JX -5853.56 2343.30 1 17 .013 51.83 2343.53 -90
R -4208.35 2350.05 1 .013
R -4173.49 2350.19 1 .013 -17.00
R -4138.62 2350.34 1 .013 17.00
R -4086.79 2350.55 1 .013
JX -4082.79 2350.57 1 3 .013 108.08 2352.07 -90
R -3408.45 2353.33 1 .013
JX -3405.95 2353.34 1 18 .013 14.75 2354.84 -90
R -3102.50 2354.58 1 .013
JX -3100.00 2354.59 1 18 .013 24.29 2356.09 -90
R -2853.77 2355.60 1 .013
R -2731.27 2356.104 1 .013 -36.00
JX -2727.27 2356.12 1 3 .013 101.63 2358.51 -50
R -2713.66 2356.18 1 .013 -4.00
R -2655.18 2356.42 1 .013
TS -2555.18 2361.42 4 1 .013
R -1426.86 2367.18 4 .013

REM *****
REM REQUIRED TRANSITION LENGTH = 15 x DELTA BW = (52 - 24)/2 = 210'

REM *****
TS -1217.09 2370.12 5 4 .013
TS -1078.92 2372.00 19 5 .013
WX -1078.92 2372.00 5 .013
JX -1078.92 2372.00 6 13 .013 983.00 2372.03 0.00
R -815.65 2372.97 6 .013
BE -815.65 6
WE -815.65 7
R -700.00 2374.00 7 .033

REM *****
REM BEGIN VTN DESIGN, GRAND TETON AND GOLF COARSE

REM *****
SH -700.00 2374.00 7 .033
CD 1 3 0 .000 8.000 24.000
CD 2 4 1 .000 3.000
CD 3 4 1 .000 4.000
CD 4 1 0 .000 7.000 24.000 2.000 2.000 -2.88
CD 5 2 0 .000 7.000 52.000 -6.24
CD 6 3 3 1.000 5.000 51.000
CD 7 1 0 .000 8.000 85.000 3.000 3.000
CD 8 3 1 2.000 9.000 26.000
CD 9 4 1 .000 5.000
CD 10 3 0 .000 8.000 24.000
CD 11 3 0 .000 4.000 6.000
CD 12 3 1 2.250 8.000 28.250
CD 13 3 1 1.000 5.000 25.000
CD 14 4 1 .000 4.000
CD 15 2 0 .000 8.000 24.000
CD 17 4 1 .000 1.500
CD 18 4 1 .000 2.500
CD 19 2 0 .000 7.000 73.920
Q 772.590 .0

Program Package Serial Number: 1513

Date: 11-7-2008 Time: 2:30:13

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt./I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-17139.480	2297.520	5.566	2303.086	2955.00	20.42	6.47	2309.56	.00	7.38	28.25	8.000	28.250	.00	1 2.3
10.000	.0040					.0074	.07	5.57	1.59	6.99	.013	.00	.00	BOX
-17129.480	2297.560	5.540	2303.100	2955.00	20.51	6.53	2309.64	.00	7.38	28.25	8.000	28.250	.00	1 2.3
TRANS STR	.0045					.0059	.12	5.54	1.60		.013	.00	.00	BOX
-17109.480	2297.650	6.356	2304.005	2955.00	19.37	5.83	2309.83	.00	7.78	24.00	8.000	24.000	.00	0 .0
1528.089	.0043					.0043	6.57	6.36	1.35	6.36	.013	.00	.00	BOX
-15581.390	2304.221	6.356	2310.576	2955.00	19.37	5.83	2316.40	.00	7.78	24.00	8.000	24.000	.00	0 .0
871.911	.0043					.0044	3.82	6.36	1.35	6.36	.013	.00	.00	BOX
-14709.480	2307.970	6.271	2314.241	2955.00	19.63	5.99	2320.23	.00	7.78	24.00	8.000	24.000	.00	0 .0
18.244	.0138					.0043	.08	6.27	1.38	4.27	.013	.00	.00	BOX
-14691.240	2308.222	6.484	2314.705	2955.00	18.99	5.60	2320.31	.00	7.78	24.00	8.000	24.000	.00	0 .0
19.267	.0138					.0038	.07	6.48	1.31	4.27	.013	.00	.00	BOX
-14671.970	2308.488	6.800	2315.288	2955.00	18.11	5.09	2320.38	.00	7.78	24.00	8.000	24.000	.00	0 .0
12.489	.0138					.0033	.04	6.80	1.22	4.27	.013	.00	.00	BOX
-14659.480	2308.660	7.132	2315.792	2955.00	17.26	4.63	2320.42	.00	7.78	24.00	8.000	24.000	.00	0 .0
2058.919	.0031					.0031	6.37	7.13	1.14	7.13	.013	.00	.00	BOX
-12600.560	2315.031	7.132	2322.163	2955.00	17.26	4.63	2326.79	.00	7.78	24.00	8.000	24.000	.00	0 .0
481.081	.0031					.0031	1.48	7.13	1.14	7.13	.013	.00	.00	BOX

Program Package Serial Number: 1513

Date: 11-7-2008 Time: 2:30:13

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt./I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-12119.480	2316.520	7.151	2323.671	2955.00	17.22	4.60	2328.27	.00	7.78	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0000					.0037	.00	7.15	1.13		.013	.00	.00	BOX
-12119.480	2316.520	6.236	2322.756	2885.00	19.28	5.77	2328.53	.00	7.66	24.00	8.000	24.000	.00	0 .0
6.559	.0260					.0042	.03	6.24	1.36	3.40	.013	.00	.00	BOX
-12112.920	2316.690	6.422	2323.113	2885.00	18.72	5.44	2328.55	.00	7.66	24.00	8.000	24.000	.00	0 .0
8.130	.0260					.0037	.03	6.42	1.30	3.40	.013	.00	.00	BOX
-12104.790	2316.902	6.736	2323.637	2885.00	17.85	4.95	2328.58	.00	7.66	24.00	8.000	24.000	.00	0 .0
5.312	.0260					.0033	.02	6.74	1.21	3.40	.013	.00	.00	BOX
-12099.480	2317.040	7.064	2324.104	2885.00	17.02	4.50	2328.60	.00	7.66	24.00	8.000	24.000	.00	0 .0
222.587	.0030					.0030	.67	7.06	1.13	7.06	.013	.00	.00	BOX
-11876.890	2317.715	7.064	2324.779	2885.00	17.02	4.50	2329.28	.00	7.66	24.00	8.000	24.000	.00	0 .0
462.301	.0030					.0031	1.41	7.06	1.13	7.06	.013	.00	.00	BOX
-11414.590	2319.116	7.020	2326.135	2885.00	17.12	4.55	2330.69	.00	7.66	24.00	8.000	24.000	.00	0 .0
460.112	.0030					.0033	1.52	7.02	1.14	7.06	.013	.00	.00	BOX
-10954.480	2320.510	6.693	2327.203	2885.00	17.96	5.01	2332.21	.00	7.66	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0000					.0045	.00	6.69	1.22		.013	.00	.00	BOX
-10954.480	2320.510	5.551	2326.061	2761.00	20.72	6.67	2332.73	.00	7.44	24.00	8.000	24.000	.00	0 .0
5.564	.0410					.0053	.03	5.55	1.55	2.85	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:30:13

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-10948.920	2320.738	5.703	2326.441	2761.00	20.17	6.32	2332.76	.00	7.44	24.00	8.000	24.000	.00	0 .0
8.180	.0410					.0048	.04	5.70	1.49	2.85	.013	.00	.00	BOX
-10940.740	2321.073	5.981	2327.055	2761.00	19.23	5.74	2332.80	.00	7.44	24.00	8.000	24.000	.00	0 .0
6.255	.0410					.0042	.03	5.98	1.39	2.85	.013	.00	.00	BOX
-10934.480	2321.330	6.273	2327.603	2761.00	18.34	5.22	2332.83	.00	7.44	24.00	8.000	24.000	.00	0 .0
590.199	.0039					.0039	2.30	6.27	1.29	6.27	.013	.00	.00	BOX
-10344.280	2323.630	6.273	2329.903	2761.00	18.34	5.22	2335.13	.00	7.44	24.00	8.000	24.000	.00	0 .0
774.671	.0039					.0040	3.13	6.27	1.29	6.27	.013	.00	.00	BOX
-9569.610	2326.650	6.124	2332.774	2761.00	18.78	5.48	2338.25	.00	7.44	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0000					.0052	.00	6.12	1.34		.013	.00	.00	BOX
-9569.610	2326.650	5.172	2331.822	2637.00	21.24	7.01	2338.83	.00	7.21	24.00	8.000	24.000	.00	0 .0
TRANS STR	.0390					.0049	.25	5.17	1.65		.013	.00	.00	BOX
-9519.610	2328.600	7.206	2335.807	2637.00	15.25	3.61	2339.42	.00	7.21	26.00	9.000	26.000	.00	1 2.0
88.448	.0037					.0037	.32	7.21	1.04	7.21	.013	.00	.00	BOX
-9431.162	2328.924	7.206	2336.130	2637.00	15.25	3.61	2339.74	.00	7.21	26.00	9.000	26.000	.00	1 2.0
1.682	.0037					.0037	.01	7.21	1.04	7.21	.013	.00	.00	BOX
-9429.480	2328.930	7.212	2336.142	2637.00	15.24	3.60	2339.75	.00	7.21	26.00	9.000	26.000	.00	1 2.0
JUNCT STR	.0080					.0018	.01	7.21	1.04		.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:30:13

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-9424.480	2328.970	8.815	2337.785	2385.00	11.27	1.97	2339.76	.00	6.74	26.00	9.000	26.000	.00	1 2.0
144.291	.0034					.0018	.26	8.82	.70	6.88	.013	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-9280.189	2329.457	8.405	2337.862	2385.00	11.82	2.17	2340.03	.00	6.74	26.00	9.000	26.000	.00	1 2.0
141.557	.0034					.0020	.28	8.41	.75	6.88	.013	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-9138.633	2329.934	8.014	2337.948	2385.00	12.40	2.39	2340.34	.00	6.74	26.00	9.000	26.000	.00	1 2.0
141.180	.0034					.0023	.32	8.01	.80	6.88	.013	.00	.00	BOX
-8997.453	2330.411	7.641	2338.052	2385.00	13.01	2.63	2340.68	.00	6.74	26.00	9.000	26.000	.00	1 2.0
146.937	.0034					.0026	.38	7.64	.86	6.88	.013	.00	.00	BOX
-8850.517	2330.906	7.286	2338.192	2385.00	13.64	2.89	2341.08	.00	6.74	26.00	9.000	26.000	.00	1 2.0
185.196	.0034					.0029	.54	7.29	.93	6.88	.013	.00	.00	BOX
-8665.320	2331.531	6.946	2338.478	2385.00	14.31	3.18	2341.66	.00	6.74	26.00	9.000	26.000	.00	1 2.0
110.165	.0034					.0033	.36	6.95	1.00	6.88	.013	.00	.00	BOX
-8555.155	2331.903	6.885	2338.787	2385.00	14.43	3.24	2342.02	.00	6.74	26.00	9.000	26.000	.00	1 2.0
703.096	.0034					.0034	2.37	6.88	1.01	6.88	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:30:13

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7852.060	2334.274	6.885	2341.158	2385.00	14.43	3.24	2344.39	.14	6.74	26.00	9.000	26.000	.00	1 2.0
28.838	.0036					.0034	.10	7.02	1.01	6.71	.013	.00	.00	BOX
-7823.222	2334.378	6.744	2341.122	2385.00	14.74	3.37	2344.49	.14	6.74	26.00	9.000	26.000	.00	1 2.0
HYDRAULIC JUMP														
-7823.222	2334.378	6.711	2341.089	2385.00	14.81	3.41	2344.49	.14	6.74	26.00	9.000	26.000	.00	1 2.0
11.092	.0036					.0036	.04	6.85	1.05	6.71	.013	.00	.00	BOX
-7812.130	2334.418	6.720	2341.138	2385.00	14.79	3.40	2344.53	.00	6.74	26.00	9.000	26.000	.00	1 2.0
547.448	.0036					.0036	1.97	6.72	1.05	6.72	.013	.00	.00	BOX
-7264.682	2336.385	6.720	2343.106	2385.00	14.79	3.40	2346.50	.00	6.74	26.00	9.000	26.000	.00	1 2.0
13.262	.0036					.0036	.05	6.72	1.05	6.72	.013	.00	.00	BOX
-7251.420	2336.433	6.721	2343.154	2385.00	14.79	3.39	2346.55	.14	6.74	26.00	9.000	26.000	.00	1 2.0
23.305	.0036					.0036	.08	6.87	1.05	6.72	.013	.00	.00	BOX
-7228.115	2336.517	6.721	2343.238	2385.00	14.79	3.39	2346.63	.14	6.74	26.00	9.000	26.000	.00	1 2.0
16.175	.0036					.0036	.06	6.87	1.05	6.72	.013	.00	.00	BOX
-7211.940	2336.575	6.715	2343.290	2385.00	14.80	3.40	2346.69	.00	6.74	26.00	9.000	26.000	.00	1 2.0
44.072	.0036					.0036	.16	6.72	1.05	6.72	.013	.00	.00	BOX
-7167.868	2336.734	6.715	2343.449	2385.00	14.80	3.40	2346.85	.00	6.74	26.00	9.000	26.000	.00	1 2.0
92.630	.0036					.0038	.35	6.72	1.05	6.72	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:30:13

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7075.238	2337.067	6.474	2343.542	2385.00	15.35	3.66	2347.20	.00	6.74	26.00	9.000	26.000	.00	1 2.0
102.284	.0036					.0042	.43	6.47	1.11	6.72	.013	.00	.00	BOX
-6972.954	2337.436	6.173	2343.609	2385.00	16.10	4.02	2347.63	.00	6.74	26.00	9.000	26.000	.00	1 2.0
95.763	.0036					.0048	.46	6.17	1.19	6.72	.013	.00	.00	BOX
-6877.190	2337.780	5.886	2343.666	2385.00	16.88	4.43	2348.09	.00	6.74	26.00	9.000	26.000	.00	1 2.0
90.970	.0036					.0055	.50	5.89	1.28	6.72	.013	.00	.00	BOX
-6786.220	2338.108	5.612	2343.720	2385.00	17.71	4.87	2348.59	1.46	6.74	26.00	9.000	26.000	.00	1 2.0
51.710	.0022					.0062	.32	7.07	1.37	8.17	.013	.00	.00	BOX
-6734.510	2338.220	5.369	2343.589	2385.00	18.51	5.32	2348.91	.00	6.74	26.00	9.000	26.000	.00	1 2.0
JUNCT STR	.0160					.0074	.04	5.37	1.46		.013	.00	.00	BOX
-6729.510	2338.300	4.741	2343.041	2274.34	19.99	6.20	2349.24	3.44	6.53	26.00	9.000	26.000	.00	1 2.0
30.196	.0168					.0079	.24	8.18	1.68	3.68	.013	.00	.00	BOX
-6699.314	2338.808	4.924	2343.732	2274.34	19.25	5.75	2349.48	3.19	6.53	26.00	9.000	26.000	.00	1 2.0
28.911	.0168					.0071	.20	8.11	1.59	3.68	.013	.00	.00	BOX
-6670.403	2339.295	5.164	2344.459	2274.34	18.35	5.23	2349.69	2.90	6.53	26.00	9.000	26.000	.00	1 2.0
21.003	.0168					.0062	.13	8.06	1.48	3.68	.013	.00	.00	BOX
-6649.400	2339.649	5.416	2345.065	2274.34	17.50	4.75	2349.82	.00	6.53	26.00	9.000	26.000	.00	1 2.0
11.705	.0167					.0055	.06	5.42	1.38	3.70	.013	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Date: 11-7-2008 Time: 2:30:13

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd. El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6637.695	2339.844	5.613	2345.457	2274.34	16.88	4.43	2349.88	.00	6.53	26.00	9.000	26.000	.00	1 2.0
10.936	.0167					.0050	.05	5.61	1.31	3.70	.013	.00	.00	BOX
-6626.760	2340.027	5.887	2345.914	2274.34	16.10	4.02	2349.94	.00	6.53	26.00	9.000	26.000	.00	1 2.0
3.000	.0177					.0045	.01	5.89	1.22	3.62	.013	.00	.00	BOX
-6623.760	2340.080	6.007	2346.087	2274.34	15.77	3.86	2349.95	.00	6.53	26.00	9.000	26.000	.00	1 2.0
2.115	.0162					.0043	.01	6.01	1.18	3.73	.013	.00	.00	BOX
-6621.645	2340.115	6.106	2346.221	2274.34	15.52	3.74	2349.96	.00	6.53	26.00	9.000	26.000	.00	1 2.0
3.424	.0162					.0040	.01	6.11	1.15	3.73	.013	.00	.00	BOX
-6618.220	2340.170	6.404	2346.574	2274.34	14.80	3.40	2349.97	.00	6.53	26.00	9.000	26.000	.00	1 2.0
TRANS STR	.0038					.0035	.06	6.40	1.07		.013	.00	.00	BOX
-6600.000	2340.240	5.785	2346.025	2274.34	16.38	4.17	2350.19	.00	6.53	24.00	8.000	24.000	.00	0 .0
62.887	.0042					.0032	.20	5.79	1.20	5.36	.013	.00	.00	BOX
-6537.113	2340.502	5.939	2346.441	2274.34	15.96	3.95	2350.39	.00	6.53	24.00	8.000	24.000	.00	0 .0
54.911	.0042					.0029	.16	5.94	1.15	5.36	.013	.00	.00	BOX
-6482.203	2340.730	6.229	2346.959	2274.34	15.21	3.59	2350.55	.00	6.53	24.00	8.000	24.000	.00	0 .0
13.853	.0042					.0025	.03	6.23	1.07	5.36	.013	.00	.00	BOX
-6468.350	2340.788	6.534	2347.322	2274.34	14.50	3.27	2350.59	.00	6.53	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0015	.00	6.53	1.00		.013	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Date: 11-7-2008 Time: 2:30:13

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd. El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6465.350	2340.800	7.577	2348.377	2224.13	12.23	2.32	2350.70	.00	6.44	24.00	8.000	24.000	.00	0 .0
40.711	.0045					.0015	.06	7.58	.78	5.13	.013	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-6424.639	2340.985	7.224	2348.209	2224.13	12.83	2.56	2350.76	.00	6.44	24.00	8.000	24.000	.00	0 .0
1.845	.0045					.0017	.00	7.22	.84	5.13	.013	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-6422.793	2340.993	7.204	2348.198	2224.13	12.86	2.57	2350.77	.00	6.44	24.00	8.000	24.000	.00	0 .0
HYDRAULIC JUMP														
----- WARNING - Flow depth near top of box conduit -----														
-6422.793	2340.993	5.723	2346.717	2224.13	16.19	4.07	2350.79	.00	6.44	24.00	8.000	24.000	.00	0 .0
39.243	.0045					.0032	.13	5.72	1.19	5.13	.013	.00	.00	BOX
-6383.551	2341.171	5.852	2347.023	2224.13	15.84	3.89	2350.92	.00	6.44	24.00	8.000	24.000	.00	0 .0
41.519	.0045					.0029	.12	5.85	1.15	5.13	.013	.00	.00	BOX
-6342.032	2341.360	6.138	2347.497	2224.13	15.10	3.54	2351.04	.00	6.44	24.00	8.000	24.000	.00	0 .0
11.032	.0045					.0025	.03	6.14	1.07	5.13	.013	.00	.00	BOX

Program Package Serial Number: 1513

Date: 11- 7-2008 Time: 2:30:13

WATER SURFACE PROFILE LISTING

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6331.000	2341.410	6.438	2347.848	2224.13	14.39	3.22	2351.07	.00	6.44	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0033					.0015	.00	6.44	1.00		.013	.00	.00	BOX
-6328.000	2341.420	7.430	2348.850	2144.73	12.03	2.25	2351.10	.00	6.28	24.00	8.000	24.000	.00	0 .0
54.652	.0038					.0015	.08	7.43	.78	5.33	.013	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-6273.348	2341.626	7.084	2348.710	2144.73	12.61	2.47	2351.18	.00	6.28	24.00	8.000	24.000	.00	0 .0
2.468	.0038					.0017	.00	7.08	.84	5.33	.013	.00	.00	BOX
-6270.880	2341.635	7.068	2348.704	2144.73	12.64	2.48	2351.19	.00	6.28	24.00	8.000	24.000	.00	0 .0
HYDRAULIC JUMP														
-6270.880	2341.635	5.558	2347.193	2144.73	16.08	4.01	2351.21	.00	6.28	24.00	8.000	24.000	.00	0 .0
131.030	.0038					.0032	.42	5.56	1.20	5.33	.013	.00	.00	BOX
-6139.850	2342.130	5.740	2347.870	2144.73	15.57	3.76	2351.63	.00	6.28	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0025					.0035	.01	5.74	1.15		.013	.00	.00	BOX
-6135.810	2342.140	5.111	2347.251	2056.17	16.76	4.36	2351.61	.00	6.11	24.00	8.000	24.000	.00	0 .0
279.870	.0041					.0038	1.05	5.11	1.31	5.03	.013	.00	.00	BOX
-5855.940	2343.290	5.269	2348.560	2056.17	16.26	4.10	2352.66	.00	6.11	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0042					.0038	.01	5.27	1.25		.013	.00	.00	BOX

FILE: 6952-ULT-13-A.WSW

W S P G W - CIVILDESIGN Version 14.05

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Program Package Serial Number: 1513

Date: 11- 7-2008 Time: 2:30:13

WATER SURFACE PROFILE LISTING

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-5853.560	2343.300	4.946	2348.246	2004.34	16.89	4.43	2352.67	.00	6.01	24.00	8.000	24.000	.00	0 .0
777.251	.0041					.0041	3.19	4.95	1.34	4.95	.013	.00	.00	BOX
-5076.309	2346.489	4.946	2351.435	2004.34	16.89	4.43	2355.86	.00	6.01	24.00	8.000	24.000	.00	0 .0
623.031	.0041					.0040	2.46	4.95	1.34	4.95	.013	.00	.00	BOX
-4453.277	2349.045	5.076	2354.121	2004.34	16.45	4.20	2358.32	.00	6.01	24.00	8.000	24.000	.00	0 .0
244.927	.0041					.0036	.87	5.08	1.29	4.95	.013	.00	.00	BOX
-4208.350	2350.050	5.323	2355.374	2004.34	15.69	3.82	2359.20	1.56	6.01	24.00	8.000	24.000	.00	0 .0
34.860	.0040					.0032	.11	6.88	1.20	4.98	.013	.00	.00	BOX
-4173.490	2350.190	5.388	2355.578	2004.34	15.50	3.73	2359.31	1.52	6.01	24.00	8.000	24.000	.00	0 .0
34.870	.0043					.0031	.11	6.91	1.18	4.87	.013	.00	.00	BOX
-4138.620	2350.340	5.514	2355.854	2004.34	15.15	3.56	2359.42	.00	6.01	24.00	8.000	24.000	.00	0 .0
38.373	.0041					.0028	.11	5.51	1.14	4.97	.013	.00	.00	BOX
-4100.248	2350.496	5.726	2356.221	2004.34	14.59	3.30	2359.52	.00	6.01	24.00	8.000	24.000	.00	0 .0
13.458	.0041					.0025	.03	5.73	1.07	4.97	.013	.00	.00	BOX
-4086.790	2350.550	6.006	2356.556	2004.34	13.90	3.00	2359.56	.00	6.01	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0050					.0012	.00	6.01	1.00		.013	.00	.00	BOX
-4082.790	2350.570	7.194	2357.764	1896.26	10.98	1.87	2359.64	.00	5.79	24.00	8.000	24.000	.00	0 .0
41.013	.0041					.0012	.05	7.19	.72	4.77	.013	.00	.00	BOX

WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Date:11- 7-2008 Time: 2:30:13

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-4041.777	2350.738	6.943	2357.682	1896.26	11.38	2.01	2359.69	.00	5.79	24.00	8.000	24.000	.00	0 .0
HYDRAULIC JUMP														
-4041.777	2350.738	4.767	2355.505	1896.26	16.57	4.27	2359.77	.00	5.79	24.00	8.000	24.000	.00	0 .0
7.018	.0041					.0041	.03	4.77	1.34	4.77	.013	.00	.00	BOX
-4034.760	2350.767	4.767	2355.534	1896.26	16.57	4.27	2359.80	.00	5.79	24.00	8.000	24.000	.00	0 .0
626.310	.0041					.0041	2.59	4.77	1.34	4.77	.013	.00	.00	BOX
-3408.450	2353.330	4.736	2358.066	1896.26	16.68	4.32	2362.39	.00	5.79	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0043	.01	4.74	1.35		.013	.00	.00	BOX
-3405.950	2353.340	4.595	2357.935	1881.51	17.06	4.52	2362.46	.00	5.76	24.00	8.000	24.000	.00	0 .0
303.450	.0041					.0048	1.46	4.59	1.40	4.74	.013	.00	.00	BOX
-3102.500	2354.580	4.396	2358.976	1881.51	17.84	4.94	2363.92	.00	5.76	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0054	.01	4.40	1.50		.013	.00	.00	BOX
-3100.000	2354.590	4.225	2358.815	1857.22	18.32	5.21	2364.02	.00	5.71	24.00	8.000	24.000	.00	0 .0
100.552	.0041					.0059	.59	4.22	1.57	4.70	.013	.00	.00	BOX
-2999.448	2355.002	4.112	2359.114	1857.22	18.82	5.50	2364.61	.00	5.71	24.00	8.000	24.000	.00	0 .0
145.677	.0041					.0066	.96	4.11	1.64	4.70	.013	.00	.00	BOX
-2853.770	2355.600	3.920	2359.521	1857.22	19.74	6.05	2365.57	1.49	5.71	24.00	8.000	24.000	.00	0 .0
.490	.0041					.0070	.00	5.41	1.76	4.69	.013	.00	.00	BOX

FILE: 6952-ULT-13-A.WSW

W S P G W - CIVILDESIGN Version 14.05
Program Package Serial Number: 1513

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WATER SURFACE PROFILE LISTING
LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Date:11- 7-2008 Time: 2:30:13

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-2853.280	2355.602	3.920	2359.522	1857.22	19.74	6.05	2365.57	1.49	5.71	24.00	8.000	24.000	.00	0 .0
122.010	.0041					.0076	.92	5.41	1.76	4.69	.013	.00	.00	BOX
-2731.270	2356.104	3.737	2359.841	1857.22	20.71	6.66	2366.50	.00	5.71	24.00	8.000	24.000	.00	0 .0
JUNCT STR	.0040					.0093	.04	5.38	1.89		.013	.00	.00	BOX
-2727.270	2356.120	3.303	2359.424	1755.59	22.14	7.61	2367.04	1.87	5.50	24.00	8.000	24.000	.00	0 .0
13.610	.0044					.0107	.15	5.18	2.15	4.42	.013	.00	.00	BOX
-2713.660	2356.180	3.280	2359.460	1755.59	22.30	7.72	2367.18	.00	5.50	24.00	8.000	24.000	.00	0 .0
58.480	.0041					.0114	.66	3.28	2.17	4.52	.013	.00	.00	BOX
-2655.180	2356.420	3.173	2359.593	1755.59	23.06	8.25	2367.85	.00	5.50	24.00	8.000	24.000	.00	0 .0
TRANS STR	.0500					.0085	.85	3.17	2.28		.013	-2.88	.00	BOX
-2555.180	2361.420	3.679	2365.099	1755.59	16.10	4.02	2369.12	.00	4.94	37.76	7.000	24.000	2.00	0 .0
541.826	.0051					.0051	2.75	3.68	1.67	3.68	.013	-2.88	2.00	TRAP
-2013.354	2364.186	3.689	2367.875	1755.59	16.04	4.00	2371.87	.00	4.94	37.79	7.000	24.000	2.00	0 .0
586.494	.0051					.0047	2.77	3.69	1.66	3.68	.013	-2.88	2.00	TRAP
-1426.860	2367.180	3.829	2371.009	1755.59	15.30	3.63	2374.64	.00	4.94	38.36	7.000	24.000	2.00	0 .0
TRANS STR	.0140					.0043	.91	3.83	1.56		.013	-6.24	2.00	TRAP
-1217.090	2370.120	2.815	2372.935	1755.59	13.21	2.71	2375.65	.00	3.54	52.00	7.000	52.000	.00	0 .0
TRANS STR	.0136					.0049	.68	2.82	1.46		.013	.00	.00	RECTANG

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WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:30:13

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13-A.WSW; DATE: NOV-08; BY: VIN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd. El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia. - FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-1078.920	2372.000	1.883	2373.883	1755.59	12.61	2.47	2376.35	.00	2.60	73.92	7.000	73.920	.00	0 .0
WALL EXIT														
-1078.920	2372.000	3.544	2375.544	1755.59	10.28	1.64	2377.19	.00	3.54	52.00	7.000	52.000	.00	0 .0
JUNCT STR	.0000					.0004	.00	3.54	1.00		.013	.00	.00	RECTANG
----- WARNING - Junction Analysis - Change in Channel Type -----														
-1078.920	2372.000	5.025	2377.025	772.59	3.22	.16	2377.19	.00	2.00	51.00	5.000	51.000	.00	3 1.0
7.509	.0037					.0004	.00	5.02	.26	1.84	.013	.00	.00	BOX
-1071.411	2372.028	5.000	2377.028	772.59	3.22	.16	2377.19	.00	2.00	51.00	5.000	51.000	.00	3 1.0
62.556	.0037					.0002	.01	5.00	.26	1.84	.013	.00	.00	BOX
-1008.855	2372.258	4.766	2377.024	772.59	3.38	.18	2377.20	.00	2.00	51.00	5.000	51.000	.00	3 1.0
59.498	.0037					.0002	.01	4.77	.28	1.84	.013	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														
-949.356	2372.477	4.545	2377.022	772.59	3.54	.19	2377.22	.00	2.00	51.00	5.000	51.000	.00	3 1.0
56.561	.0037					.0003	.02	4.54	.30	1.84	.013	.00	.00	BOX
----- WARNING - Flow depth near top of box conduit -----														

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WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:30:13

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13-A.WSW; DATE: NOV-08; BY: VIN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd. El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia. - FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-892.795	2372.686	4.333	2377.019	772.59	3.71	.21	2377.23	.00	2.00	51.00	5.000	51.000	.00	3 1.0
53.736	.0037					.0003	.02	4.33	.32	1.84	.013	.00	.00	BOX
-839.059	2372.884	4.131	2377.015	772.59	3.90	.24	2377.25	.00	2.00	51.00	5.000	51.000	.00	3 1.0
23.409	.0037					.0004	.01	4.13	.35	1.84	.013	.00	.00	BOX
-815.650	2372.970	4.043	2377.013	772.59	3.98	.25	2377.26	.00	2.00	51.00	5.000	51.000	.00	3 1.0
BRIDGE ENTRANCE														
-815.650	2372.970	4.106	2377.076	772.59	3.69	.21	2377.29	.00	1.92	51.00	5.000	51.000	.00	0 .0
WALL ENTRANCE														
-815.650	2372.970	4.412	2377.382	772.59	1.78	.05	2377.43	.00	1.35	111.47	8.000	85.000	3.00	0 .0
20.510	.0089					.0003	.01	4.41	.16	1.56	.033	.00	3.00	TRAP
-795.140	2373.153	4.230	2377.383	772.59	1.87	.05	2377.44	.00	1.35	110.38	8.000	85.000	3.00	0 .0
19.769	.0089					.0003	.01	4.23	.17	1.56	.033	.00	3.00	TRAP
-775.371	2373.329	4.055	2377.384	772.59	1.96	.06	2377.44	.00	1.35	109.33	8.000	85.000	3.00	0 .0
19.054	.0089					.0004	.01	4.06	.18	1.56	.033	.00	3.00	TRAP
-756.317	2373.498	3.887	2377.385	772.59	2.06	.07	2377.45	.00	1.35	108.32	8.000	85.000	3.00	0 .0
18.365	.0089					.0004	.01	3.89	.19	1.56	.033	.00	3.00	TRAP
-737.952	2373.662	3.725	2377.387	772.59	2.16	.07	2377.46	.00	1.35	107.35	8.000	85.000	3.00	0 .0
17.703	.0089					.0005	.01	3.72	.21	1.56	.033	.00	3.00	TRAP

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WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:30:13

LAS VEGAS WASH - RAINBOW STORM DRAIN; 100% ULTIMATE CONDITIONS;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: 6952-ULT-13-A.wsw; DATE: NOV-08; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-720.248	2373.820	3.569	2377.388	772.59	2.26	.08	2377.47	.00	1.35	106.41	8.000	85.000	3.00	0 .0
17.069	.0089					.0006	.01	3.57	.22	1.56	.033	.00	3.00	TRAP
-703.180	2373.972	3.419	2377.390	772.59	2.37	.09	2377.48	.00	1.35	105.51	8.000	85.000	3.00	0 .0
3.180	.0089					.0006	.00	3.42	.24	1.56	.033	.00	3.00	TRAP
-700.000	2374.000	3.391	2377.391	772.59	2.39	.09	2377.48	.00	1.35	105.35	8.000	85.000	3.00	0 .0

HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Design Conditions - Trunkline with Laterals Peaking)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; 6952-ULT-13-A.WSW; n = 0.013

WSPGW STATION	REMARKS	DESIGN FLOW	DEPTH OF FLOW	DEPTH W/AIR ⁽¹⁾	INVERT ELEV	VELOCITY	H.G.L.	E.G.L.	CHANNEL TYPE	BASE WIDTH/DIA.	SIDE SLOPE	FLOW AREA	WETTED PERIMETER	TOP WIDTH	FROUDE NUMBER	ANGLE OF CURVE	CURVE RADIUS	SUPER ELEV ⁽¹⁾	ROLL WAVE ⁽²⁾	CCR FCD MIN FB ⁽³⁾	MIN WALL HT	DESIGN WALL HT	ACTUAL FB	FB CHECK	RESOLUTION
-7+00.00	SYSTEM HEADWORKS	773	3.391	3.391	2374.00	2.39	2377.39	2377.48	TRAP	85	3	323.26	106.45	105.35	0.24					0.59	3.98	8.00	4.61	OK	NA
-7+00.00	BEGIN TRAP CHANNEL AT GOLF COURSE	773	3.391	3.391	2374.00	2.39	2377.39	2377.48	TRAP	85	3	323.26	106.45	105.35	0.24					0.59	3.98	8.00	4.61	OK	NA
					0.89%																				
-8+15.65	END TRAP CHANNEL; WALL ENTRANCE	773	4.412	4.412	2372.97	1.78	2377.38	2377.43	TRAP	85	0	434.04	93.82	85.00	0.14					0.55	4.96	8.00	3.59	OK	NA
-8+15.65	BRIDGE ENTRANCE; BEGIN RCB; GB	773	4.043	4.043	2372.97	3.98	2377.01	2377.26	RCB	48	0	194.12	56.09	48.00	0.35					0.75	4.79	5.00	0.96	OK	NA
					0.37%																				
-10+78.92	END RCB; WALL EXIT	773	5.025	5.025	2372.00	3.22	2377.03	2377.19	RCB	48	0	239.93	58.05	48.00	0.25					0.66	5.69	5.00	-0.03	FIX WALL HEIGHT	NA
-10+78.92	BEGIN CONFLUENCE STRUCTURE; GB	1756	1.883	1.885	2372.00	12.61	2373.88	2376.35	RECT	73.92	0	139.22	77.69	73.92	1.62					1.39	3.27	7.00	5.12	OK	NA
					1.36%																				
-12+17.09	END CONFLUENCE STRUCTURE	1756	2.815	2.815	2370.12	13.21	2372.94	2375.64	RECT	52	0	132.90	57.63	52.00	1.46					1.47	4.28	7.00	4.19	OK	NA
-12+17.09	BEGIN TRANSITION STRUCTURE	1756	2.815	2.815	2370.12	13.21	2372.94	2375.64	RECT	52	0	132.90	57.63	52.00	1.46					1.47	4.28	7.00	4.19	OK	NA
					1.40%																				
-14+26.86	END TRANSITION STRUCTURE	1756	3.829	3.829	2367.18	15.30	2371.01	2374.64	TRAP	24	2	114.74	41.12	39.32	1.58					1.60	5.43	7.00	3.17	OK	NA
-14+26.86	BEGIN TRAPEZOIDAL CHANNEL; GB	1756	3.829	3.829	2367.18	15.30	2371.01	2374.64	TRAP	24	2	114.74	41.12	39.32	1.58					1.60	5.43	7.00	3.17	OK	NA
					0.51%																				
-25+55.18	END TRAPEZOIDAL CHANNEL	1756	3.679	3.698	2361.42	16.10	2365.10	2369.12	TRAP	24	2	109.04	40.45	38.72	1.69					1.62	5.30	7.00	3.32	OK	NA
-25+55.18	BEGIN TRANSITION STRUCTURE; GB	1756	3.679	3.698	2361.42	16.10	2365.10	2369.12	TRAP	24	2	109.04	40.45	38.72	1.69					1.62	5.30	7.00	3.32	OK	NA
					5.00%																				
-26+55.18	END TRANSITION STRUCTURE	1756	3.173	3.307	2356.42	23.06	2359.59	2367.85	RCB	24	0	76.13	30.35	24.00	2.28					1.85	5.02	8.00	4.83	OK	NA
-26+55.18	BEGIN 24' X 8' RCB; GB	1756	3.173	3.307	2356.42	23.06	2359.59	2367.85	RCB	24	0	76.13	30.35	24.00	2.28					1.85	5.02	8.00	4.83	NA	NA
					0.41%																				
-27+13.66		1756	3.280	3.396	2356.18	22.30	2359.46	2367.18	RCB	24	0	78.73	30.56	24.00	2.17					1.83	5.11	8.00	4.72	NA	NA
-27+13.66	PC	1756	3.280	3.396	2356.18	22.30	2359.46	2367.18	RCB	24	0	78.73	30.56	24.00	2.17		40.00	200	1.853	1.83	6.96	8.00	2.67	NA	NA
					0.44%																				
-27+27.27	48" RCP LATERAL	1756	3.303	3.416	2356.12	22.14	2359.42	2367.03	RCB	24	0	79.29	30.61	24.00	2.15					1.82	5.13	8.00	4.70	NA	NA
-27+31.27		1857	3.737	3.803	2356.10	20.71	2359.84	2366.50	RCB	24	0	89.68	31.47	24.00	1.89					1.80	5.54	8.00	4.26	NA	NA
					0.41%																				
-28+53.77	PT	1857	3.920	3.958	2355.60	19.74	2359.52	2365.57	RCB	24	0	94.08	31.84	24.00	1.76		40.00	200	1.452	1.78	7.15	8.00	2.63	NA	NA
-28+53.77		1857	3.920	3.958	2355.60	19.74	2359.52	2365.57	RCB	24	0	94.08	31.84	24.00	1.76					1.78	5.70	8.00	4.08	NA	NA
					0.41%																				
-31+00.00	30" RCP LATERAL	1857	4.225	4.225	2354.59	18.32	2350.57	2355.78	RCB	24	0	101.38	32.45	24.00	1.57					1.74	5.97	8.00	3.78	NA	NA
-31+02.50		1882	4.396	4.396	2354.58	17.84	2350.55	2355.49	RCB	24	0	105.47	32.79	24.00	1.50					1.73	6.13	8.00	3.60	NA	NA
					0.41%																				
-34+05.95	30" RCP LATERAL	1882	4.595	4.595	2353.34	17.06	2350.57	2355.09	RCB	24	0	110.29	33.19	24.00	1.40					1.71	6.30	8.00	3.41	NA	NA
-34+08.45		1896	4.736	4.736	2353.33	16.68	2350.55	2354.87	RCB	24	0	113.68	33.47	24.00	1.35					1.70	7.91	8.00	3.26	NA	NA
					0.41%																				
-40+41.78	HYDRAULIC JUMP	1896	4.767	4.759	2350.74	16.57	2350.57	2354.83	RCB	24	0	114.44	33.53	24.00	1.34					1.70	6.46	8.00	3.23	NA	NA
-40+41.78		1896	6.943	6.953	2350.74	11.38	2350.55	2352.56	RCB	24	0	166.63	37.89	24.00	0.76					2.51	9.45	8.00	1.06	NA	NA
					0.41%																				
-40+82.79	48" RCP LATERAL	1896	7.194	7.194	2350.57	13.90	2350.57	2353.57	RCB	24	0	136.42	38.39	24.00	1.03					1.67	8.86	8.00	0.81	NA	NA
-40+86.79		2004	6.006	6.006	2350.55	10.98	2350.55	2352.42	RCB	24	0	182.54	36.01	24.00	0.70					2.37	9.85	8.00	1.99	NA	NA
					0.41%																				
-41+38.62		2004	5.514	5.514	2350.34	15.15	2355.85	2359.42	RCB	24	0	132.30	35.03	24.00	1.14					1.67	8.73	8.00	2.49	NA	NA
-41+38.62	PC	2004	5.514	5.514	2350.34	15.15	2355.85	2359.42	RCB	24	0	132.30	35.03	24.00	1.14		17.00	116	1.475	1.67	8.66	8.00	1.01	NA	NA
					0.43%																				
-41+73.49	PRC	2004	5.388	5.388	2350.19	15.50	2355.58	2359.31	RCB	24	0	129.31	34.78	24.00	1.18		17.00	116	1.544	1.68	8.61	8.00	1.07	NA	NA
-41+73.49	PRC	2004	5.388	5.388	2350.19	15.50	2355.58	2359.31	RCB	24	0	129.31	34.78	24.00	1.18		17.00	116	1.544	1.68	#REF!	8.00	1.07	NA	NA
					0.40%																				
-42+08.35	PT	2004	5.323	5.323	2350.05	15.69	2355.37	2359.20	RCB	24	0	127.75	34.65	24.00	1.20		-17.00	116	1.582	1.68	7.01	8.00	1.10	NA	NA
-42+08.35		2004	5.323	5.323	2350.05	15.69	2355.37	2359.20	RCB	24	0	127.75	34.65	24.00	1.20					1.68	7.01	8.00	2.68	NA	NA
					0.41%																				
-58+53.56	DUAL 14" X 23" HERCP LATERAL	2004	4.946	4.946	2343.30	16.89	2348.25	2352.68	RCB	24	0	118.67	33.89	24.00	1.34					1.72	6.67	8.00	3.05	NA	NA
-58+55.94		2056	5.269	5.269	2343.29	16.26	2348.56	2352.66	RCB	24	0	126.46	34.54	24.00	1.25					1.71	6.98	8.00	2.73	NA	NA
					0.41%																				

HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Design Conditions - Trunkline with Laterals Peaking)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; 6952-ULT-13-A.WSW; n = 0.013

-61+35.81	DUAL 24" X 38" HERCP LATERAL	2056	5.111	5.111	2342.14	16.76	2347.25	2351.61	RCB	24	0	122.68	34.22	24.00	1.31		1.72	6.83	8.00	2.89	NA	NA		
-61+39.60		2145	5.740	5.740	2342.13	15.57	2347.87	2351.63	RCB	24	0	137.75	35.48	24.00	1.15		1.70	7.44	8.00	2.26	NA	NA		
					0.38%																			
-62+70.88	HYDRAULIC JUMP	2145	5.558	5.558	2341.64	16.08	2347.19	2351.21	RCB	24	0	133.38	35.12	24.00	1.20		1.71	7.27	8.00	2.44	NA	NA		
-62+70.88		2145	7.068	7.068	2341.64	12.64	2348.70	2351.18	RCB	24	0	169.68	38.14	24.00	0.84		2.98	10.05	8.00	0.93	NA	NA		
					0.38%																			
-63+28.00	29" X 45" HERCP LATERAL	2145	7.430	7.430	2341.42	12.03	2348.85	2351.10	RCB	24	0	178.28	38.86	24.00	0.78		2.75	10.18	8.00	0.57	NA	NA		
-63+31.00		2224	6.438	6.438	2341.41	14.39	2347.85	2351.06	RCB	24	0	154.56	36.88	24.00	1.00		1.67	8.11	8.00	1.56	NA	NA		
					0.45%																			
-64+22.79	HYDRAULIC JUMP	2224	5.723	5.723	2340.99	16.19	2346.72	2350.79	RCB	24	0	137.38	35.45	24.00	1.19		1.72	7.45	8.00	2.28	NA	NA		
-64+22.79		2224	7.204	7.204	2340.99	12.86	2348.20	2350.77	RCB	24	0	172.95	38.41	24.00	0.84		3.07	10.27	8.00	0.80	NA	NA		
					0.45%																			
-64+65.35	36" RCP LATERAL	2224	7.577	7.577	2340.80	12.23	2348.38	2350.70	RCB	24	0	181.86	39.15	24.00	0.78		2.82	10.40	8.00	0.42	NA	NA		
-64+68.35		2224	6.534	6.534	2340.79	14.50	2347.32	2350.59	RCB	24	0	153.39	37.07	24.00	1.01		1.68	8.21	8.00	1.47	NA	NA		
					0.42%																			
-66+00.00	END 24' X 8' RCB	2224	5.785	5.785	2340.24	16.38	2346.03	2350.19	RCB	24	0	135.78	35.57	24.00	1.21		1.74	7.52	8.00	2.22	NA	NA		
-66+00.00	BEGIN TRANSITION STRUCTURE	2224	5.785	5.785	2340.24	16.38	2346.03	2350.19	RCB	24	0	135.78	35.57	24.00	1.21		1.74	7.52	8.00	2.22	NA	NA		
					0.38%																			
-66+18.22	END TRANSITION STRUCTURE	2224	6.404	6.404	2340.17	14.80	2346.57	2349.98	RCB	26	0	150.28	38.81	26.00	1.08		1.69	11.00	9.00	-0.31	NA	NA		
-66+18.22	BEGIN 2 - 13' X 9' RCB	2224	6.404	6.404	2340.17	14.80	2346.57	2349.98	RCB	26	0	150.28	38.81	26.00	1.08		1.69	8.09	9.00	2.60	NA	NA		
					1.68%																			
-66+23.76		2274	5.887	5.887	2340.08	16.10	2345.96	2349.99	RCB	26	0	141.26	37.77	26.00	1.22		1.73	10.52	9.00	3.11	NA	NA		
-66+23.76		2274	5.887	5.887	2340.08	16.10	2345.96	2349.99	RCB	26	0	141.26	37.77	26.00	1.22		1.73	7.61	9.00	3.11	NA	NA		
					1.67%																			
-66+49.40		2274	5.416	5.416	2339.65	17.50	2345.07	2349.82	RCB	26	0	129.96	36.83	26.00	1.38		1.77	7.18	9.00	3.58	NA	NA		
-66+49.40	PC	2274	5.416	5.416	2339.65	17.50	2345.07	2349.82	RCB	26	0	129.96	36.83	26.00	1.38	53.00	87	1.240	1.77	7.36	9.00	2.34	NA	NA
					1.68%																			
-67+29.51	60" RCP LATERAL	2274	4.741	4.763	2338.30	19.99	2343.04	2349.25	RCB	26	0	113.77	35.48	26.00	1.68		1.84	6.58	9.00	4.26	NA	NA		
-67+34.51		2385	5.369	5.369	2338.22	18.51	2343.59	2348.91	RCB	26	0	128.85	36.74	26.00	1.47		1.81	7.18	9.00	3.63	NA	NA		
					0.22%																			
-67+86.22	PT	2385	5.612	5.612	2338.11	17.71	2343.72	2348.59	RCB	26	0	134.67	37.22	26.00	1.37	37.00	87	2.911	1.79	7.40	9.00	0.48	NA	NA
-67+86.22		2385	5.612	5.612	2338.11	17.71	2343.72	2348.59	RCB	26	0	134.67	37.22	26.00	1.37		1.79	7.40	9.00	3.39	NA	NA		
					0.36%																			
-72+11.94		2385	6.715	6.715	2336.58	14.80	2343.29	2346.69	RCB	26	0	161.15	39.43	26.00	1.05		1.70	8.55	#REF!	#REF!	NA	NA		
-72+11.94	PC	2385	6.715	6.715	2336.58	14.80	2343.29	2346.69	RCB	26	0	161.15	39.43	26.00	1.05	2.00	1250	0.141	1.70	8.55	#REF!	#REF!	NA	NA
					0.31%																			
-72+51.42	PT	2385	6.721	6.721	2336.45	14.79	2343.18	2346.57	RCB	26	0	161.26	39.44	26.00	1.05	2.00	1250	0.141	1.70	8.56	6.00	-0.86	NA	NA
-72+51.42		2385	6.721	6.721	2336.45	14.79	2343.18	2346.57	RCB	26	0	161.26	39.44	26.00	1.05		1.70	8.42	6.00	-0.72	NA	NA		
					0.36%																			
-78+12.13		2385	6.720	6.720	2334.42	14.79	2341.14	2344.53	RCB	26	0	161.26	39.44	26.00	1.05		1.70	8.42	6.00	-0.72	NA	NA		
-78+12.13	PC	2385	6.720	6.720	2334.42	14.79	2341.14	2344.53	RCB	26	0	161.26	39.44	26.00	1.05	2.00	1250	0.141	1.70	8.56	6.00	-0.86	NA	NA
					0.36%																			
-78+23.22	HYDRAULIC JUMP	2385	6.711	6.711	2334.38	14.81	2341.09	2344.49	RCB	26	0	161.04	39.42	26.00	1.05		1.70	8.55	6.00	-0.85	NA	NA		
-78+23.22		2385	6.744	6.744	2334.38	14.74	2341.12	2344.50	RCB	26	0	161.80	39.49	26.00	1.04		1.70	8.44	6.00	-0.74	NA	NA		
					0.36%																			
-78+52.06	PT	2385	6.885	6.885	2334.27	14.43	2341.16	2344.39	RCB	26	0	165.28	39.77	26.00	1.01	2.00	1250	0.142	1.69	8.57	6.00	-0.89	NA	NA
-78+52.06		2385	6.885	6.885	2334.27	14.43	2341.16	2344.39	RCB	26	0	165.28	39.77	26.00	1.01		1.69	8.57	6.00	-0.89	NA	NA		
					0.34%																			
-94+24.48	60" RCP LATERAL	2385	8.815	8.815	2328.97	11.27	2337.79	2339.76	RCB	26	0	211.62	43.63	26.00	0.70		2.47	11.29	9.00	0.19	NA	NA		
-94+24.48		2367	7.209	7.209	2328.93	15.24	2336.14	2339.75	RCB	26	0	155.31	40.42	26.00	1.10		1.74	8.95	9.00	1.79	NA	NA		
					0.35%																			
-95+19.61	END 2 - 13' X 9' RCB	2367	7.206	7.206	2328.60	15.25	2335.81	2339.42	RCB	26	0	155.21	40.41	26.00	1.10		1.74	8.94	9.00	1.79	NA	NA		
-95+19.61	BEGIN TRANSITION STRUCTURE	2367	7.206	7.206	2328.60	15.25	2335.81	2339.42	RCB	26	0	155.21	40.41	26.00	1.10		1.74	8.94	9.00	1.79	NA	NA		
					3.90%																			
-95+69.61	END TRANSITION STRUCTURE	2367	5.172	5.238	2326.65	21.24	2331.82	2338.83	RCB	26	0	111.44	36.34	26.00	1.81		1.92	7.09	9.00	3.83	NA	NA		
-95+69.61	BEGIN 24' X 8' RCB; 48" RCP LATERAL	2761	6.125	6.125	2326.65	18.78	2332.78	2338.25	RCB	26	0	147.02	38.25	26.00	1.39		1.86	7.98	8.00	1.88	NA	NA		

HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Design Conditions - Trunkline with Laterals Peaking)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; 6952-ULT-13-A.WSW; n = 0.013

		0.44%																				
-109+54.48		2761	5.551	5.553	2320.51	20.72	2326.06	2332.73	RCB	26	0	133.25	37.10	26.00	1.61		1.92	7.47	8.00	2.45	NA	NA
-109+54.48	48" RCP LATERAL	2885	6.692	6.692	2320.51	17.96	2327.20	2332.21	RCB	26	0	160.63	39.38	26.00	1.27		1.85	8.54	8.00	1.31	NA	NA
		0.34%																				
-120+99.48		2885	7.064	7.064	2317.04	17.02	2324.10	2328.60	RCB	26	0	169.51	40.13	26.00	1.17		1.82	8.88	9.00	1.94	NA	NA
-120+99.48	GB	2885	7.064	7.064	2317.04	17.02	2324.10	2328.60	RCB	26	0	169.51	40.13	26.00	1.17		1.82	8.88	8.00	0.94	NA	NA
		2.60%																				
-121+19.48		2885	6.236	6.236	2316.52	19.28	2322.76	2328.53	RCB	26	0	149.64	38.47	26.00	1.42		1.89	8.12	8.00	1.76	NA	NA
-121+19.48	48" RCP LATERAL	2955	7.151	7.151	2316.52	17.22	2323.67	2328.28	RCB	26	0	171.60	40.30	26.00	1.18		1.83	8.98	8.00	0.85	NA	NA
		0.31%																				
-146+59.48		2955	7.132	7.132	2308.66	17.26	2315.79	2320.42	RCB	26	0	171.21	40.26	26.00	1.19		1.83	8.96	8.00	0.87	NA	NA
-146+59.48	GB	2955	7.132	7.132	2308.66	17.26	2315.79	2320.42	RCB	26	0	171.21	40.26	26.00	1.19		1.83	8.96	8.00	0.87	NA	NA
		1.38%																				
-147+09.48		2955	6.271	6.271	2307.97	19.63	2314.24	2320.22	RCB	26	0	150.53	38.54	26.00	1.44		1.90	8.18	8.00	1.73	NA	NA
-147+09.48		2955	6.271	6.271	2307.97	19.63	2314.24	2320.22	RCB	26	0	150.53	38.54	26.00	1.44		1.90	8.18	8.00	1.73	NA	NA
		0.43%																				
-171+09.48	END 24' X 8' RCB	2955	6.356	6.356	2297.65	19.37	2304.01	2309.83	RCB	26	0	152.56	38.71	26.00	1.41		1.90	8.25	8.00	1.64	NA	NA
-171+09.48	BEGIN TRANSITION STRUCTURE	2955	6.356	6.356	2297.65	19.37	2304.01	2309.83	RCB	26	0	152.56	38.71	26.00	1.41		1.90	8.25	8.00	1.64	NA	NA
		0.45%																				
-171+29.48	END TRANSITION STRUCTURE	2955	5.540	5.540	2297.56	20.51	2303.10	2309.63	RCB	26	0	144.08	37.08	26.00	1.54		1.91	7.45	8.00	2.46	NA	NA
-171+29.48	BEGIN 28.25' X 8' RCB	2955	5.540	5.540	2297.56	20.51	2303.10	2309.63	RCB	26	0	144.08	37.08	26.00	1.54		1.91	7.45	8.00	2.46	NA	NA
		0.40%																				
-171+39.48	END 28.25' X 8' RCB	2955	5.566	5.566	2297.52	20.42	2303.09	2309.56	RCB	26	0	144.71	37.13	26.00	1.53		1.90	7.47	8.00	2.43	NA	NA
-171+39.48	SYSTEM OUTLET	2955	5.566	5.566	2297.52	20.42	2303.09	2309.56	RCB	26	0	144.71	37.13	26.00	1.53		1.90	7.47	8.00	2.43	NA	NA

Notes:
(1) Depth with air entrainment, $y^*/y = 0.906(e)^{0.0015}$ ($Fr \geq 1.60$; $y^* = y$, $Fr < 1.60$). See *WASURO User's Manual (Draft)*, US Army Corps of Engineers Los Angeles District, July 1985.
(2) To be calculated in the future.
(3) For supercritical flow, $F_b = 1 + 0.025V(Y^{1/2})$; for subcritical flow, $F_b = 0.5 + V^2/2g$. See *Hydrologic Criteria and Drainage Design Manual*, CCRFCD, 1999.
(4) Super-Elevation = $C * (V^2 * Tw) / (g * r)$; $C = 1$, V = Mean Channel Velocity, Tw = Top Width of Channel, r = Radius of Curve, g = gravity constant

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

B.2.5

MPU Alignment, Ultimate Conditions Elkhorn Laterals

File: ELKHORN.wsw

n=0.013


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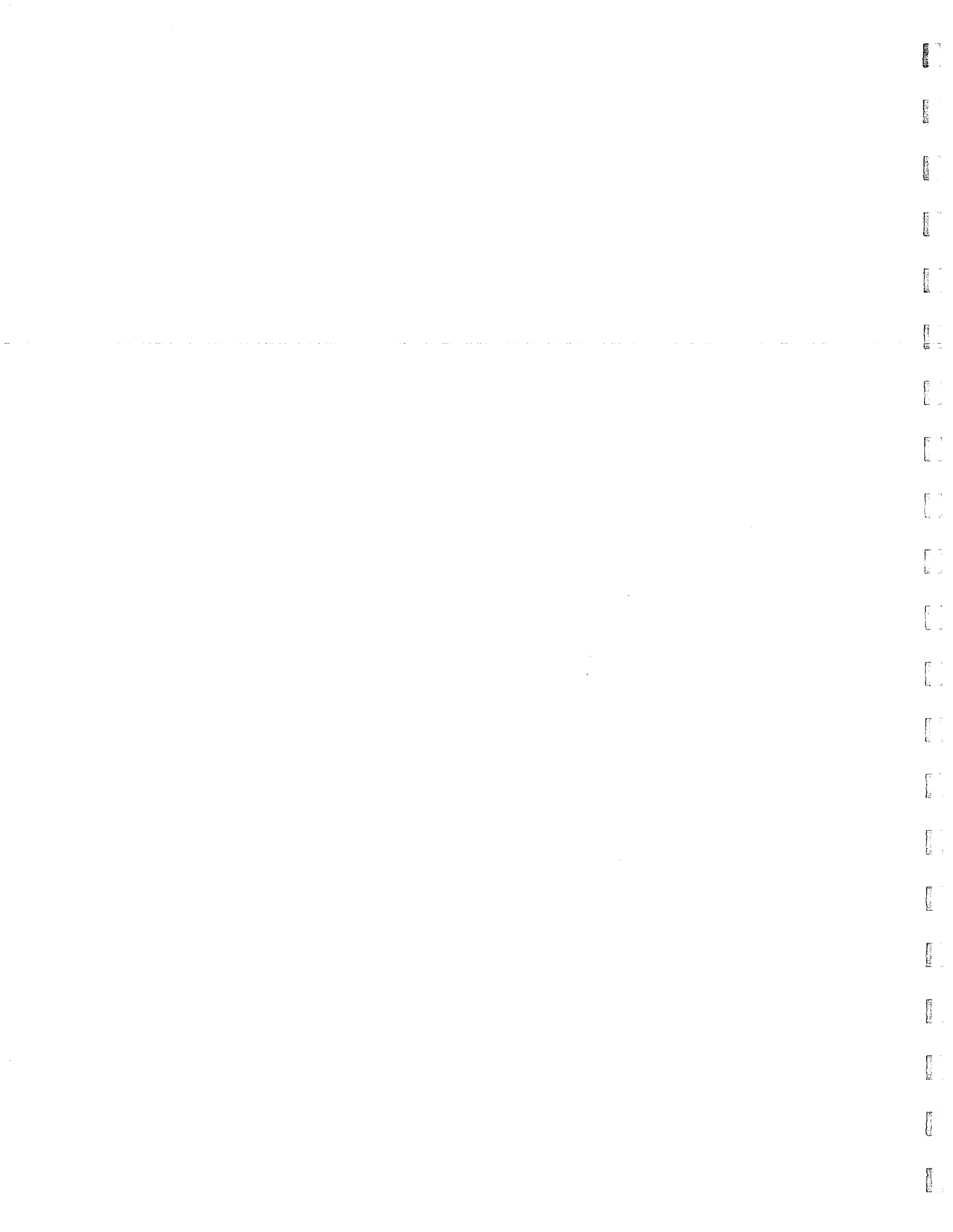
T1 LAS VEGAS WASH - RAINBOW STORM DRAIN; ELKHORN ROAD LATERAL;
T2 HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
T3 FILE: ELKHORN.wsw; DATE: 11/08; 100% DESIGN; BY: VTN NEVADA (D.BERGH)
SO      -247.58 2338.30      3              2343.589
R      -223.00 2338.40      3              .013
R      -188.35 2338.57      1              .013
R      -129.83 2338.79      1              .013
JX      -129.83 2338.79      1 2  2.013      22.86      22.86 2340.29 2338.79      71.0 75.0
R      -100.00 2338.91      1              .013
SH      -100.00 2338.91      1
CD      1  4      1      .000      4.000
CD      2  4      1      .000      2.500
CD      3  4      1      .000      5.000
Q              64.94

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Date: 11- 7-2008 Time: 2:40: 3

FILE: ELKHORN.wsw; DATE: 11/08; 100% DESIGN; BY: VTN NEVADA (D.BERGH)

[illegible]



HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Design Conditions - Elkhorn Lateral)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; ELKHORN.WSW; n = 0.013

WSPGW STATION	REMARKS	DESIGN FLOW	DEPTH OF FLOW	DEPTH WAIR ⁽¹⁾	INVERT ELEV	VELOCITY	H.G.L.	E.G.L.	CHANNEL TYPE	BASE WIDTH/DIA.	SIDE SLOPE	FLOW AREA	WETTED PERIMETER	TOP WIDTH	FROUDE NUMBER	ANGLE OF CURVE	CURVE RADIUS	SUPER ELEV ⁽⁴⁾	ROLL WAVE ⁽²⁾	CCRFCD MIN FB ⁽³⁾	MIN WALL HT	DESIGN WALL HT	ACTUAL FB	FB CHECK	RESOLUTION
-1+00.00	SYSTEM HEADWORKS	65	6.673	#DIV/0!	2338.91	5.17	2345.58	2346.00	RCP	4	0	12.56	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-2.67	NA	NA
-1+00.00	BEGIN 48" RCP	65	6.673	#DIV/0!	2338.91	5.17	2345.58	2346.00	RCP	4	0	12.56	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-2.67	NA	NA
					0.40%																				
-1+29.83	BEGIN JUNCTION STRUCTURE	65	6.822	#DIV/0!	2338.79	5.17	2345.61	2346.03	RCP	4	0	12.56	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-2.82	NA	NA
-1+29.83	30" RCP LATERALS (N & S)	111	5.396	#DIV/0!	2338.79	8.81	2344.19	2345.39	RCP	4	0	12.56	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-1.40	NA	NA
					0.42%																				
-2+23.00	TIE INTO EX MH; END 48" RCP	111	5.234	#DIV/0!	2338.40	8.81	2343.63	2344.84	RCP	4	0	12.56	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-1.23	NA	NA
-2+23.00	BEGIN EX 60" RCP	111	5.234	#DIV/0!	2338.40	8.81	2343.63	2344.84	RCP	5	0	12.56	15.71	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-1.23	NA	NA
					0.41%																				
-2+47.58	END 48" RCP; SYSTEM OUTLET	111	5.289	#DIV/0!	2338.30	5.64	2343.59	2344.08	RCP	5	0	19.62	15.71	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-1.29	NA	NA
-2+47.58	TIE LATERAL INTO MAINLINE AT 27+27.27	111	5.289	#DIV/0!	2338.30	5.64	2343.59	2344.08	RCP	5	0	19.62	15.71	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-1.29	NA	NA

Notes:

(1) Depth with air entrainment, $y^*/y = 0.906(e)^{0.0615}$ ($Fr \geq 1.60$; $y^* = y$, $Fr < 1.60$). See *WASURO User's Manual (Draft)*, US Army Corps of Engineers Los Angeles District, July 1985.

(2) To be calculated in the future.

(3) For supercritical flow, $F_0 = 1 + 0.025V(Y^{1/3})$; for subcritical flow, $FB = 0.5 + V^2/2g$. See *Hydrologic Criteria and Drainage Design Manual*, CCRFCD, 1999.

(4) Super-Elevation = $C * (V^2 * Tw) / (g * r)$; $C = 1$, V = Mean Channel Velocity, Tw = Top Width of Channel, r = Radius of Curve, g = gravity constant

(5) #DIV/0! = PRESSURE FLOW

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

**Rainbow Storm Drain
Elkhorn to Grand Teton**

B.2.6

MPU Alignment, Ultimate Conditions Farm Road Laterals

File: FARM.wsw

n=0.013

T1 LAS VEGAS WASH - RAINBOW STORM DRAIN; FARM ROAD LATERAL;
 T2 HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
 T3 FILE: FARM.wsw; DATE: 11/08; 100% DESIGN; BY: VTN NEVADA (D.BERGH)
 SO -257.39 2352.07 1 2356.556
 R -208.83 2352.31 1 .013 1
 R -172.66 2352.53 1 .013
 JX -172.66 2352.53 1 2 2.013 14.30 14.30 2354.52 2354.03 67.0 67.0 1
 R -125.83 2352.77 1 .013
 SH -125.83 2352.77 1 .013
 CD 1 4 1 .000 4.000
 CD 2 4 1 .000 2.500
 Q 79.49

WATER SURFACE PROFILE LISTING

Date: 11- 7-2008 Time: 2:45:42

LAS VEGAS WASH - RAINBOW STORM DRAIN; FARM ROAD LATERAL;
HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: FARM.wsw; DATE: 11/08; 100% DESIGN; BY: VTN NEVADA (D.BERGH)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SS Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-257.390	2352.070	4.486	2356.556	108.09	8.60	1.15	2357.70	.00	3.14	.00	4.000	.000	.00	1 .0
48.560	.0049					.0057	.27	4.49	.00	3.64	.013	.00	.00	PIPE
-208.830	2352.310	4.578	2356.888	108.09	8.60	1.15	2358.04	.00	3.14	.00	4.000	.000	.00	1 .0
36.170	.0061					.0057	.20	4.58	.00	3.16	.013	.00	.00	PIPE
-172.660	2352.530	4.563	2357.093	108.09	8.60	1.15	2358.24	.00	3.14	.00	4.000	.000	.00	1 .0
JUNCT STR	.0000					.0044	.00	4.56	.00		.013	.00	.00	PIPE
-172.660	2352.530	5.538	2358.068	79.49	6.33	.62	2358.69	.00	2.70	.00	4.000	.000	.00	1 .0
46.830	.0051					.0031	.14	5.54	.00	2.64	.013	.00	.00	PIPE
-125.830	2352.770	5.441	2358.211	79.49	6.33	.62	2358.83	.00	2.70	.00	4.000	.000	.00	1 .0

HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Design Conditions - Farm Road Lateral)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; FARM.WSW; n = 0.013

WSPGW STATION	REMARKS	DESIGN FLOW	DEPTH OF FLOW	DEPTH W/AIR ⁽¹⁾	INVERT ELEV	VELOCITY	H.G.L.	E.G.L.	CHANNEL TYPE	BASE WIDTH/DIA.	SIDE SLOPE	FLOW AREA	WETTED PERIMETER	TOP WIDTH	FROUDE NUMBER	ANGLE OF CURVE	CURVE RADIUS	SUPER ELEV ⁽⁴⁾	ROLL WAVE ⁽²⁾	CCRFGD MIN FB ⁽³⁾	MIN WALL HT	DESIGN WALL HT	ACTUAL FB	FB CHECK	RESOLUTION
-1+25.83	SYSTEM HEADWORKS	79	5.541	#DIV/0!	2355.04	6.33	2360.58	2361.20	RCP	4	0	12.56	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-1.54	NA	NA
-1+25.83	BEGIN 48" RCP	79	5.541	#DIV/0!	2355.04	6.33	2360.58	2361.20	RCP	4	0	12.56	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-1.54	NA	NA
					0.47%																				
-1+72.66	BEGIN JUNCTION STRUCTURE	79	5.538	#DIV/0!	2354.82	6.33	2360.36	2360.98	RCP	4	0	12.56	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-1.54	NA	NA
-1+72.66	30" RCP LATERALS (N & S)	108	4.563	#DIV/0!	2354.82	8.60	2359.38	2360.53	RCP	4	0	12.57	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-0.56	NA	NA
					0.61%																				
-2+08.83	MH	108	4.578	#DIV/0!	2354.60	8.60	2359.18	2360.33	RCP	4	0	12.57	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-0.58	NA	NA
-2+08.83	GB	108	4.578	#DIV/0!	2354.60	8.60	2359.18	2360.33	RCP	4	0	12.57	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-0.58	NA	NA
					2.99%																				
-2+57.39	END 48" RCP; SYSTEM OUTLET	108	4.486	#DIV/0!	2353.15	8.60	2357.64	2358.78	RCP	4	0	12.57	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-0.49	NA	NA
-2+57.39	TIE LATERAL INTO MAINLINE AT 27+27.27	108	4.486	#DIV/0!	2353.15	8.60	2357.64	2358.78	RCP	4	0	12.57	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-0.49	NA	NA

Notes:
(1) Depth with air entrainment, $y^*/y = 0.906(e)^{0.0615}$ ($Fr \geq 1.60$; $y^* = y$, $Fr < 1.60$). See *WASURO User's Manual (Draft)*, US Army Corps of Engineers Los Angeles District, July 1985.
(2) To be calculated in the future.
(3) For supercritical flow, $F_B = 1 + 0.025V(Y^{1/2})$; for subcritical flow, $F_B = 0.5 + V^2/2g$. See *Hydrologic Criteria and Drainage Design Manual*, CCRFGD, 1999.
(4) Super-Elevation = $C * (V^2 * Tw) / (g * r)$; $C = 1$, V = Mean Channel Velocity, Tw = Top Width of Channel, r = Radius of Curve, g = gravity constant
(5) #DIV/0! = PRESSURE FLOW

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

**Rainbow Storm Drain
Elkhorn to Grand Teton**

B.2.7

MPU Alignment, Ultimate Conditions Whispering Sands Drive Laterals

File: WHISPERING.wsw

n=0.013



T1 LAS VEGAS WASH - RAINBOW STORM DRAIN; WHISPERING SANDS LATERAL;
 T2 HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;
 T3 FILE: WHISPERING.wsw; DATE: 11/08; 100% DESIGN; BY: VTN NEVADA (D.BERGH)
 SO -314.64 2358.51 1 2359.841
 R -138.68 2361.01 1 .013 .000 .000 1
 JX -138.68 2361.01 1 2 2.013 19.51 19.51 2362.51 2362.51 71.0 79.0
 R -100.00 2361.56 1 .013
 SH -100.00 2361.56 1 2363.23
 CD 1 4 1 .000 4.000
 CD 2 4 1 .000 2.500
 CD 3 4 1 .000 3.500
 Q 62.610

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:45:35

LAS VEGAS WASH - RAINBOW STORM DRAIN; WHISPERING SANDS LATERAL;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: WHISPERING.wsw; DATE: 11/08; 100% DESIGN; BY: VTN NEVADA (D.BERG)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-314.640	2358.510	2.290	2360.801	101.63	13.66	2.90	2363.70	.00	3.05	3.96	4.000	.000	.00	1 .0
70.220	.0142					.0122	.86	2.29	1.76	2.22	.013	.00	.00	PIPE
-244.420	2359.508	2.363	2361.871	101.63	13.15	2.68	2364.56	.00	3.05	3.93	4.000	.000	.00	1 .0
45.213	.0142					.0110	.50	2.36	1.65	2.22	.013	.00	.00	PIPE
-199.208	2360.150	2.460	2362.610	101.63	12.54	2.44	2365.05	.00	3.05	3.89	4.000	.000	.00	1 .0
26.625	.0142					.0097	.26	2.46	1.53	2.22	.013	.00	.00	PIPE
-172.583	2360.528	2.562	2363.090	101.63	11.95	2.22	2365.31	.00	3.05	3.84	4.000	.000	.00	1 .0
16.568	.0142					.0086	.14	2.56	1.42	2.22	.013	.00	.00	PIPE
-156.015	2360.764	2.671	2363.435	101.63	11.40	2.02	2365.45	.00	3.05	3.77	4.000	.000	.00	1 .0
10.135	.0142					.0077	.08	2.67	1.31	2.22	.013	.00	.00	PIPE
-145.880	2360.908	2.788	2363.696	101.63	10.87	1.83	2365.53	.00	3.05	3.68	4.000	.000	.00	1 .0
5.517	.0142					.0068	.04	2.79	1.20	2.22	.013	.00	.00	PIPE
-140.363	2360.986	2.914	2363.900	101.63	10.36	1.67	2365.57	.00	3.05	3.56	4.000	.000	.00	1 .0
1.683	.0142					.0061	.01	2.91	1.10	2.22	.013	.00	.00	PIPE
-138.680	2361.010	3.053	2364.063	101.63	9.88	1.51	2365.58	.00	3.05	3.40	4.000	.000	.00	1 .0
JUNCT STR	.0000					.0038	.00	3.05	1.00		.013	.00	.00	PIPE
-138.680	2361.010	4.824	2365.834	62.61	4.98	.39	2366.22	.00	2.39	.00	4.000	.000	.00	1 .0
38.680	.0142					.0019	.07	4.82	.00	1.67	.013	.00	.00	PIPE

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING

Date: 11-7-2008 Time: 2:45:35

LAS VEGAS WASH - RAINBOW STORM DRAIN; WHISPERING SANDS LATERAL;

HYDROLOGY FROM 2004 MPA FROM LAS VEGAS WASH MIDDLE BRANCH;

FILE: WHISPERING.wsw; DATE: 11/08; 100% DESIGN; BY: VTN NEVADA (D.BERG)

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-100.000	2361.560	4.347	2365.907	62.61	4.98	.39	2366.29	.00	2.39	.00	4.000	.000	.00	1 .0

HYDRAULICS SUMMARY - 100% DESIGN - (Ultimate Design Conditions - Whispering Sands Lateral)
Las Vegas Wash - Middle Branch; Rainbow Storm Drain; WHISPERING.WSW; n = 0.013

WSPGW STATION	REMARKS	DESIGN FLOW	DEPTH OF FLOW	DEPTH W/AIR ⁽¹⁾	INVERT ELEV	VELOCITY	H.G.L.	E.G.L.	CHANNEL TYPE	BASE WIDTH/DIA.	SIDE SLOPE	FLOW AREA	WETTED PERIMETER	TOP WIDTH	FROUDE NUMBER	ANGLE OF CURVE	CURVE RADIUS	SUPER ELEV ⁽⁴⁾	ROLL WAVE ⁽²⁾	CCRFGD MIN FB ⁽³⁾	MIN WALL HT	DESIGN WALL HT	ACTUAL FB	FB CHECK	RESOLUTION
-1+00.00	SYSTEM HEADWORKS	63	4.347	#DIV/0!	2361.56	4.98	2365.91	2366.29	RCP	4	0	12.57	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-0.35	NA	NA
-1+00.00	BEGIN 48" RCP	63	4.347	#DIV/0!	2361.56	4.98	2365.91	2366.29	RCP	4	0	12.57	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-0.35	NA	NA
					1.42%																				
-1+38.68	BEGIN JUNCTION STRUCTURE	63	4.824	#DIV/0!	2361.01	4.98	2365.83	2366.22	RCP	4	0	12.57	12.57	0.00	#DIV/0!					#DIV/0!	#DIV/0!	4.00	-0.82	NA	NA
-1+38.68	30" RCP LATERALS (N & S)	102	3.053	3.053	2361.01	9.88	2364.06	2365.58	RCP	4	0	10.29	8.50	3.40	1.00					1.36	4.41	4.00	0.95	NA	NA
					1.42%																				
-3+14.64	END 48" RCP; SYSTEM OUTLET	102	2.290	2.312	2358.51	13.66	2360.80	2363.70	RCP	4	0	7.44	6.87	3.96	1.76					1.45	3.74	4.00	1.71	NA	NA
-3+14.64	TIE LATERAL INTO MAINLINE AT 27+27.27	102	2.290	2.312	2358.51	13.66	2360.80	2363.70	RCP	4	0	7.44	6.87	3.96	1.76					1.45	3.74	4.00	1.71	NA	NA

Notes:
(1) Depth with air entrainment, $y^*/y = 0.906(e)^{0.0516}$ ($Fr \geq 1.60$; $y^* = y$, $Fr < 1.60$). See *WASURO User's Manual (Draft)*, US Army Corps of Engineers Los Angeles District, July 1985.
(2) To be calculated in the future.
(3) For supercritical flow, $F_B = 1 + 0.025V(Y^{1/3})$; for subcritical flow, $F_B = 0.5 + V^2/2g$. See *Hydrologic Criteria and Drainage Design Manual*, CCRFGD, 1999.
(4) Super-Elevation = $C * (V^2 * Tw) / (g * r)$; $C = 1$, V = Mean Channel Velocity, Tw = Top Width of Channel, r = Radius of Curve, g = gravity constant
(5) #DIV/0! = PRESSURE FLOW

PROJECT: Las Vegas Wash Middle Branch - Rainbow Storm Drain .: Utility Matrix

PROJECT NO: 6952 - 100% PRE-FINAL - SUBMITTAL

COMPLETED BY: D. BERGH

CHECKED BY:

DATE: 11/11/2008

DATE:

	CONFLICT NUMBER	LOCATION		UTILITY	EXISTING ELEVATION		SOURCE OF INFO		IMPROVEMENT	IMPROVEMENT ELEVATION		REQ. CLEARANCE		LENGTH OF TIME FOR RELOCATION	RELOCATION BY		PRIOR RIGHTS (Y OR N)	CONFLICT (Y OR N)	RESOLUTION / COMMENT
		STATION	ALIGNMENT	OFFSET	SIZE AND TYPE	TOP	BOTTOM	POTHOLE	OTHER	SIZE AND TYPE	TOP	BOTTOM	H						
WATER	1	27+20	SD1 - STORM DRAIN MANLINE	CL	60" SNWA	2347.40	2340.20	YES	QUADMAP	24' X 8' RCB	2365.29	2355.12	10'	3'	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	2	40+40	SD1 - STORM DRAIN MANLINE	CL	24" WATER	2344.65	2342.65	YES	QUADMAP	24' X 8' RCB	2359.91	2349.75	10'	3'	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	3	1+15	LATERAL 2	CL	60" SNWA	2360.40	2353.20	YES	QUADMAP	30" RCP	2367.21	2364.13	10'	3'	NONE	CCRFGD	TBD	N	USING ELASTOMERIC JOINT SEALANT
	4	1+15	LATERAL 3	CL	60" SNWA	2362.00	2354.80	YES	QUADMAP	30" RCP	2366.63	2363.55	10'	3'	NONE	CCRFGD	TBD	N	USING ELASTOMERIC JOINT SEALANT
	5	1+70	LATERAL 10	CL	24" WATER	2356.10	2354.10	YES	QUADMAP	FUTURE - 29" X 45" HERCP	2360.06	2357.00	10'	3'	NONE	CCRFGD	TBD	N	USING ELASTOMERIC JOINT SEALANT, AND CONCRETE ENCASE 10 EACH WAY
	6	1+70	LATERAL 12	CL	24" WATER	2355.70	2353.70	YES	QUADMAP	FUTURE 24" X 38" HERCP	2358.21	2357.25	10'	3'	TBD	CCRFGD	TBD	N	USING ELASTOMERIC JOINT SEALANT, AND CONCRETE ENCASE 10 EACH WAY
	7	1+40	LATERAL 14	CL	12" WATER	2349.70	2348.70	YES	QUADMAP	14" X 23" HERCP	2345.47	2343.85	10'	3'	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	8	24+80	SS1 - PROPOSED SEWER	CL	24" WATER	2344.65	2342.65	YES	QUADMAP	PROPOSED 30" SS	2350.06	2347.56	10'	3'	TBD	CCRFGD	TBD	N	CONCRETE ENCASE 10' EACH DIRECTION OF CROSSING
	9	1+70	SS2 - PROPOSED SEWER LATEARAL	CL	12" WATER	2360.30	2359.30	YES	QUADMAP	PROPOSED 8" SS	2351.40	2350.73	10'	3'	TBD	CCRFGD	TBD	N	ENCASE 10' EACH WAY OF CROSSING
SEWER	10	27+05	SD1 - STORM DRAIN MANLINE	CL	24" SEWER	2357.78	2355.78	DIPPED	QUADMAP	24' X 8' RCB	2365.38	2355.21	6"	6"	TBD	CCRFGD	TBD	Y	RELOCATION REQUIRED
	11	35+56	SD1 - STORM DRAIN MANLINE	CL	8" SEWER	2353.00	2352.33	DIPPED	QUADMAP	24' X 8' RCB	2363.89	2353.73	6"	6"	TBD	CCRFGD	TBD	Y	RELOCATION REQUIRED
	12	1+35	LATERAL 4	CL	8" SS	2357.87	2357.20	DIPPED	QUADMAP	18" RCP	2363.94	2362.00	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	13	1+10	LATERAL 6	CL	PROPOSED 30"SS	2351.60	2349.10	DESIGN PLANS	QUADMAP	30" RCP	2361.48	2358.40	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	14	1+65	LATERAL 8	CL	PROPOSED 30"SS	2351.12	2348.62	DESIGN PLANS	QUADMAP	30" RCP	2358.61	2355.52	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	15	1+15	LATERAL 9	CL	PROPOSED 30"SS	2350.08	2347.58	DESIGN PLANS	QUADMAP	30" RCP	2354.13	2353.42	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	16	2+15	LATERAL 11	CL	PROPOSED 30"SS	2350.02	2347.52	DESIGN PLANS	QUADMAP	48" RCP	2356.62	2351.78	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	17	1+10	LATERAL 13	CL	PROPOSED 30"SS	2349.96	2347.46	DESIGN PLANS	QUADMAP	18" RCP	2356.90	2354.90	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	18	1+60	LATERAL 14	CL	PROPOSED 30"SS	2348.13	2345.63	DESIGN PLANS	QUADMAP	14" X 23" HERCP	2345.48	2343.66	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	19	1+70	LATERAL 15	CL	PROPOSED 30"SS	2348.11	2345.61	DESIGN PLANS	QUADMAP	DUAL 14" X 23" HERCP	2345.78	2343.41	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	20	1+25	LATERAL 16	CL	PROPOSED 30"SS	2347.97	2345.47	DESIGN PLANS	QUADMAP	18" RCP	2350.50	2348.58	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	21	1+70	LATERAL 17	CL	PROPOSED 30"SS	2347.93	2345.43	DESIGN PLANS	QUADMAP	DUAL 24" X 38" HERCP	2344.78	2342.24	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	22	1+70	LATERAL 18	CL	PROPOSED 30"SS	2347.81	2345.31	DESIGN PLANS	QUADMAP	29" X 45" HERCP	2344.68	2341.52	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	23	1+25	LATERAL 19	CL	PROPOSED 30"SS	2347.78	2345.28	DESIGN PLANS	QUADMAP	18" RCP	2343.60	2341.68	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	24	1+70	LATERAL 20	CL	EXISTING 30" SS	2347.75	2345.25	DIPPED	QUADMAP	36" RCP	2344.55	2340.95	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	25	1+30	LATERAL 22	CL	27" SS	2346.35	2344.10	DIPPED	QUADMAP	30" RCP	2342.17	2339.09	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	26	1+30	LATERAL 23	CL	27" SS	2346.45	2344.20	DIPPED	QUADMAP	30" RCP	2342.09	2339.00	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE
	27	1+95	LATERAL 24	CL	EXISTING 30" SS	2347.20	2344.70	DIPPED	QUADMAP	48" RCP	2342.96	2338.12	6"	6"	NONE	CCRFGD	TBD	N	PROTECT IN PLACE

	CONFLICT NUMBER	LOCATION	ALIGNMENT	OFFSET	UTILITY	TOP	BOTTOM	POTHOLE	OTHER	IMPROVEMENT	IMPROVEMENT ELEVATION		REQ. CLEARANCE		LENGTH OF TIME FOR RELOCATION	RELOCATION BY	PRIOR RIGHTS (Y OR N)	CONFLICT (Y OR N)	RESOLUTION / COMMENT
		STATION			SIZE AND TYPE					SIZE AND TYPE	TOP	BOTTOM	H	V					
SEWER	28	8+01.86 TO 50+31.61	SS1 - PROPOSED SEWER MAIN	VARIES	24" SS	VARIES	VARIES	DIPPED	QUADMAP	24' X 8' RCB	VARIES	VARIES	6"	6"	TBD	CCRFGD	TBD	Y	RELOCATION REQUIRED
UNDER GROUND UTILITIES	29	27+25	SD1 - STORM DRAIN MANLINE	CL	3 - 4" UGELEC	2365.04	2364.71	YES	QUADMAP	24' X 8' RCB	2365.31	2355.15	NA	NA	TBD	NEVADA POWER	TBD	Y	CONTRACTOR TO SUPPORT IN PLACE, PLACE ABOVE RCB, AND CONCRETE ENCASE
	30	27+25	SD1 - STORM DRAIN MANLINE	CL	4" UGTEL	2364.87	2364.20	YES	QUADMAP	24' X 8' RCB	2365.31	2355.14	NA	NA	TBD	EMBARQ	TBD	Y	CONTRACTOR TO SUPPORT IN PLACE, PLACE ABOVE RCB, AND CONCRETE ENCASE
	31	27+50	SD1 - STORM DRAIN MANLINE	CL	3" UGELEC	2364.21	2363.88	YES	QUADMAP	24' X 8' RCB	2365.18	2355.01	NA	NA	TBD	NEVADA POWER	TBD	Y	CONTRACTOR TO SUPPORT IN PLACE, PLACE ABOVE RCB, AND CONCRETE ENCASE
	32	27+50	SD1 - STORM DRAIN MANLINE	CL	4" UGTEL	2364.45	2364.12	YES	QUADMAP	24' X 8' RCB	2365.19	2355.02	NA	NA	TBD	EMBARQ	TBD	Y	CONTRACTOR TO SUPPORT IN PLACE, PLACE ABOVE RCB, AND CONCRETE ENCASE
	33	34+30	SD1 - STORM DRAIN MANLINE	CL	UNKNOWN UTILITY	NOT FOUND	NOT FOUND	YES	QUADMAP	24' X 8' RCB	2362.39	2352.23	NA	NA	TBD	OTHERS	TBD	UNKNOWN	CONTRACTOR TO VERIFY IF UTILITY EXISTS
	34	34+35	SD1 - STORM DRAIN MANLINE	CL	UNKNOWN UTILITY	NOT FOUND	NOT FOUND	YES	QUADMAP	24' X 8' RCB	2362.38	2352.21	NA	NA	TBD	OTHERS	TBD	UNKNOWN	CONTRACTOR TO VERIFY IF UTILITY EXISTS
	35	34+40	SD1 - STORM DRAIN MANLINE	CL	4" UGELEC	2360.11	2359.78	YES	QUADMAP	24' X 8' RCB	2362.37	2352.20	NA	NA	TBD	NEVADA POWER	TBD	Y	CONTRACTOR TO SUPPORT IN PLACE, PLACE ABOVE RCB, AND CONCRETE ENCASE
	36	35+20	SD1 - STORM DRAIN MANLINE	CL	UG TEL	NOT FOUND	NOT FOUND	YES	QUADMAP	24' X 8' RCB	2362.02	2351.86	NA	NA	TBD	EMBARQ	TBD	UNKNOWN	CONTRACTOR TO VERIFY IF UTILITY EXISTS
	37	35+30	SD1 - STORM DRAIN MANLINE	CL	UGCATV	NOT FOUND	NOT FOUND	YES	QUADMAP	24' X 8' RCB	2362.00	2351.84	NA	NA	TBD	COX	TBD	UNKNOWN	CONTRACTOR TO VERIFY IF UTILITY EXISTS
	38	36+10	SD1 - STORM DRAIN MANLINE	CL	2" UGELEC	2360.15	2359.98	YES	QUADMAP	24' X 8' RCB	2361.67	2351.51	NA	NA	TBD	NEVADA POWER	TBD	Y	CONTRACTOR TO SUPPORT IN PLACE, PLACE ABOVE RCB, AND CONCRETE ENCASE
	39	36+15	SD1 - STORM DRAIN MANLINE	CL	UGCATV	2361.17	2360.84	YES	QUADMAP	24' X 8' RCB	2361.66	2351.49	NA	NA	TBD	COX	TBD	Y	CONTRACTOR TO SUPPORT IN PLACE, PLACE ABOVE RCB, AND CONCRETE ENCASE
	40	41+05	SD1 - STORM DRAIN MANLINE	CL	3" INTERCONNECT CONDUIT	2359.35	2359.10	YES	DESIGN PLANS	24' X 8' RCB	2359.65	2349.48	NA	NA	TBD	CCRFGD	TBD	TBD	CONTRACTOR TO SUPPORT IN PLACE, PLACE ABOVE RCB, AND CONCRETE ENCASE
	41	41+10	SD1 - STORM DRAIN MANLINE	CL	2 - 3" TRAFFIC SIGNAL CONDUIT	2359.35	2359.10	YES	DESIGN PLANS	24' X 8' RCB	2359.64	2349.47	NA	NA	TBD	CCRFGD	TBD	TBD	CONTRACTOR TO SUPPORT IN PLACE, PLACE ABOVE RCB, AND CONCRETE ENCASE
	42	41+20	SD1 - STORM DRAIN MANLINE	CL	2" STREET LIGHT CONDUIT	2359.27	2359.10	YES	DESIGN PLANS	24' X 8' RCB	2359.58	2349.41	NA	NA	TBD	CCRFGD	TBD	TBD	CONTRACTOR TO SUPPORT IN PLACE, PLACE ABOVE RCB, AND CONCRETE ENCASE
	43	58+20	SD1 - STORM DRAIN MANLINE	CL	4" UGELEC	NOT FOUND	NOT FOUND	YES	QUADMAP	24' X 8' RCB	2352.61	2342.44	NA	NA	TBD	NEVADA POWER	TBD	UNKNOWN	CONTRACTOR TO VERIFY IF UTILITY EXISTS
	44	2+10	LATERAL 4	CL	4" UGTEL	2364.50	2364.17	YES	QUADMAP	30" RCP	2363.01	2359.93	NA	NA	NONE	EMBARQ	TBD	N	PROTECT IN PLACE
	45	1+80	LATERAL 4	CL	3" UGELEC	2364.20	2363.95	YES	QUADMAP	24" RCP	2363.23	2360.67	NA	NA	NONE	NEVADA POWER	TBD	N	PROTECT IN PLACE
	46	0+90	LATERAL 6	CL	4" UGTEL	2363.00	2362.67	YES	QUADMAP	NDOT TYPE 2 DROP INLET	NA	NA	NA	NA	NONE	EMBARQ	TBD	N	PROTECT IN PLACE
	47	0+90	LATERAL 6	CL	4" UGELEC	2363.00	2362.67	YES	QUADMAP	NDOT TYPE 2 DROP INLET	NA	NA	NA	NA	NONE	NEVADA POWER	TBD	N	PROTECT IN PLACE
	48	0+48	LATERAL 8	CL	4" UGTEL	2361.90	2361.57	YES	QUADMAP	NDOT TYPE 2 DROP INLET	NA	NA	NA	NA	NONE	EMBARQ	TBD	N	PROTECT IN PLACE
	49	1+50	LATERAL 8	CL	4" UGTEL	2361.90	2361.57	YES	QUADMAP	30" RCP	2359.05	2355.97	NA	NA	NONE	EMBARQ	TBD	N	PROTECT IN PLACE
	50	1+50	LATERAL 8	CL	4" UGELEC	2361.90	2361.57	YES	QUADMAP	30" RCP	2359.05	2355.97	NA	NA	NONE	NEVADA POWER	TBD	N	PROTECT IN PLACE
	51	1+55	LATERAL 8	CL	4" UGELEC	2361.10	2360.77	YES	QUADMAP	30" RCP	2358.98	2355.90	NA	NA	NONE	NEVADA POWER	TBD	N	PROTECT IN PLACE
	52	1+85	LATERAL 11	CL	3" INTERCONNECT CONDUIT	2359.35	2359.10	YES	DESIGN PLANS	48" RCP	2356.75	2351.91	NA	NA	TBD	OTHERS	TBD	Y	RELOCATION REQUIRED
	53	1+90	LATERAL 11	CL	2 - 3" TRAFFIC SIGNAL CONDUIT	2359.35	2359.10	YES	DESIGN PLANS	48" RCP	2356.75	2351.92	NA	NA	TBD	OTHERS	TBD	Y	RELOCATION REQUIRED
	54	1+95	LATERAL 11	CL	2" STREET LIGHT CONDUIT	2359.27	2359.10	YES	DESIGN PLANS	NDOT TYPE 4 STORM DRAIN MANHOLE	2361.32	2351.83	NA	NA	TBD	OTHERS	TBD	Y	RELOCATION REQUIRED
	55	0+95	LATERAL 12	CL	UG CATV	NOT FOUND	NOT FOUND	YES	QUADMAP	NDOT TYPE 2 DROP INLET	NA	NA	NA	NA	NONE	COX	TBD	N	PROTECT IN PLACE
	56	0+95	LATERAL 26	CL	4" UGTEL	NOT FOUND	NOT FOUND	YES	QUADMAP	NDOT TYPE 2 DROP INLET	NA	NA	NA	NA	NONE	EMBARQ	TBD	N	PROTECT IN PLACE

	CONFLICT NUMBER	LOCATION	ALIGNMENT	OFFSET	UTILITY	TOP	BOTTOM	POTHOLE	OTHER	IMPROVEMENT	IMPROVEMENT ELEVATION		REQ. CLEARANCE		LENGTH OF TIME FOR RELOCATION	RELOCATION BY	PRIOR RIGHTS (Y OR N)	CONFLICT (Y OR N)	RESOLUTION / COMMENT
		STATION			SIZE AND TYPE					SIZE AND TYPE	TOP	BOTTOM	H	V					
UG UTILITIES	57	1+75	SS2 - PROPOSED SEWER LATEARAL	CL	UGCABLE	2359.40	2359.07	YES	QUADMAP	PROPOSED 8" SS	2351.65	2350.99	NA	NA	NONE	COX	TBD	N	PROTECT IN PLACE
	58	1+80	SS2 - PROPOSED SEWER LATEARAL	CL	4" UGTEL	2359.40	2359.07	YES	QUADMAP	PROPOSED 8" SS	2351.65	2350.99	NA	NA	NONE	EMBARQ	TBD	N	PROTECT IN PLACE
GAS	59	40+40	SD1 - STORM DRAIN MANLINE	CL	4" PEGAS	2359.12	2358.79	YES	QUADMAP	24' X 8' RCB	2359.88067	2349.71	6"	6"	3 DAYS	SOUTHWEST GAS	TBD	Y	RELOCATION REQUIRED
	60	1+60	LATERAL 10	CL	4" PEGAS	2358.30	2357.97	YES	QUADMAP	NDOT TYPE 2 DROP INLET	2360.90	2355.80	6"	6"	TBD	SOUTHWEST GAS	TBD	Y	RELOCATION REQUIRED
	61	1+60	LATERAL 12	CL	4" PEGAS	2357.50	2357.17	YES	QUADMAP	NDOT TYPE 2 DROP INLET	2360.90	2356.31	6"	6"	TBD	SOUTHWEST GAS	TBD	Y	RELOCATION REQUIRED
	62	1+45	LATERAL 14	CL	4" PEGAS	2348.70	2348.37	YES	QUADMAP	14" X 23" HERCP	2345.44	2343.82	6"	6"	NONE	SOUTHWEST GAS	TBD	N	PROTECT IN PLACE
	63	1+60	LATERAL 15	CL	4" PEGAS	2348.60	2348.27	YES	QUADMAP	DUAL 14" X 23" HERCP	2345.11	2343.48	6"	6"	NONE	SOUTHWEST GAS	TBD	N	PROTECT IN PLACE
	64	1+10	LATERAL 16	CL	4" PEGAS	2346.80	2347.13	YES	QUADMAP	18" RCP	2351.29	2348.58	6"	6"	NONE	SOUTHWEST GAS	TBD	N	PROTECT IN PLACE
	65	1+55	LATERAL 17	CL	4" PEGAS	2346.80	2346.47	YES	QUADMAP	DUAL 24" X 38" HERCP	2344.86	2342.32	6"	6"	NONE	SOUTHWEST GAS	TBD	N	PROTECT IN PLACE
	66	1+55	LATERAL 18	CL	4" PEGAS	2347.00	2346.67	YES	QUADMAP	29" X 45" HERCP	2344.76	2341.60	6"	6"	NONE	SOUTHWEST GAS	TBD	N	PROTECT IN PLACE
	67	1+05	LATERAL 19	CL	4" PEGAS	2347.10	2346.77	YES	QUADMAP	18" RCP	2343.68	2341.76	6"	6"	NONE	SOUTHWEST GAS	TBD	N	PROTECT IN PLACE
	68	1+55	LATERAL 20	CL	4" PEGAS	2347.30	2346.97	YES	QUADMAP	36" RCP	2344.61	2340.95	6"	6"	NONE	SOUTHWEST GAS	TBD	N	PROTECT IN PLACE
	69	1+10	LATERAL 22	CL	6" STL HPG	2347.60	2347.10	YES	QUADMAP	30" RCP	2342.92	2339.84	6"	6"	NONE	SOUTHWEST GAS	TBD	N	PROTECT IN PLACE
	70	1+85	LATERAL 22	CL	4" PEGAS	2347.60	2347.27	YES	QUADMAP	30" RCP	2343.51	2340.42	6"	6"	NONE	SOUTHWEST GAS	TBD	N	PROTECT IN PLACE
	71	1+10	LATERAL 23	CL	6" STL HPG	2346.80	2346.30	YES	QUADMAP	30" RCP	2343.82	2339.87	6"	6"	NONE	SOUTHWEST GAS	TBD	N	PROTECT IN PLACE
	72	1+85	LATERAL 23	CL	4" PEGAS	2347.60	2347.27	YES	QUADMAP	30" RCP	2343.39	2340.30	6"	6"	NONE	SOUTHWEST GAS	TBD	N	PROTECT IN PLACE
	73	24+80	SS1 - PROPOSED SEWER	CL	4" PEGAS	2359.12	2358.79	YES	QUADMAP	PROPOSED 30" SS	2350.05	2347.55	6"	6"	NONE	SOUTHWEST GAS	TBD	N	PROTECT IN PLACE
	74	1+72	SS2 - PROPOSED SEWER LATEARAL	CL	4" PEGAS	2360.70	2360.37	YES	QUADMAP	PROPOSED 8" SS	2351.51	2350.85	6"	6"	NONE	SOUTHWEST GAS	TBD	TBD	PROTECT IN PLACE

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

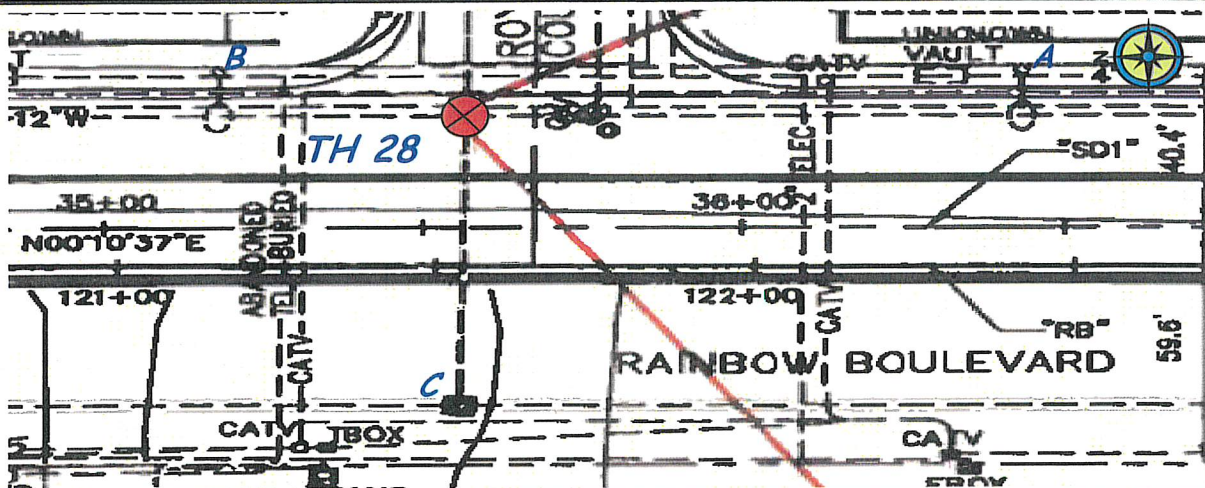
C.4.2

Additional Pothole

TEST HOLE DATA SHEET

Test Hole No.	28	 TBE GROUP, Inc. 2875 East Patrick Lane Ste. K Las Vegas NV. 89120 702.458.4092 702.895.8415 fax	SUE Crew	CP / If
Date Excavated	10/13/08		City	Las Vegas
Client Project No.	6952		County	Clark
TBE Project No	NV02106100		Route No.	Rainbow
TBE Truck No	33-263		Location	Royal Stallion

LOCATION PLAN - NOT TO SCALE



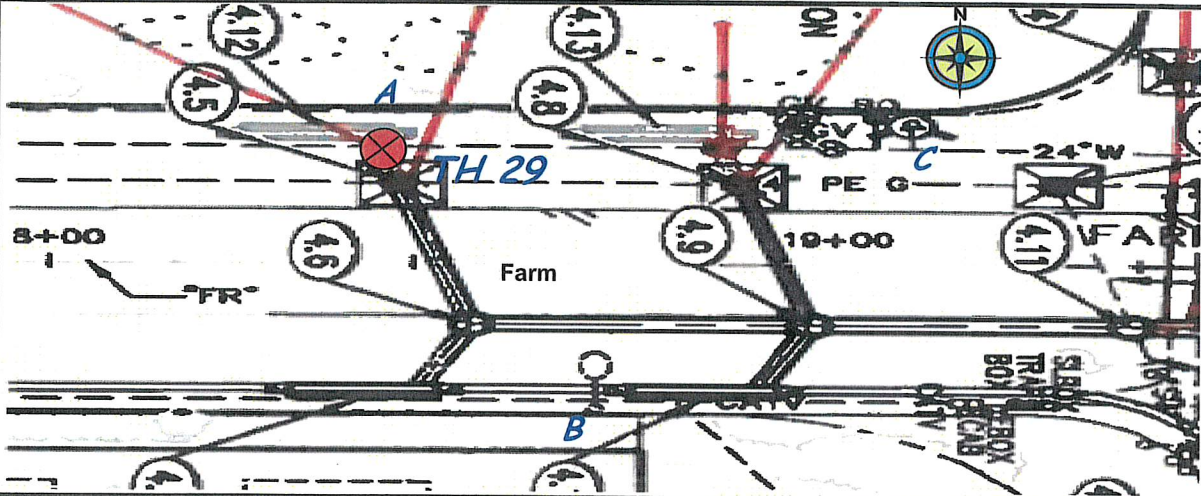
Monument Elev.	/		Rod @ UTL-Top		Marker Set	Nail & Disc
Rod @ Monument	/		Rod @ UTL-Bot.		Elev.	/
English / Metric	English		Rod @ Marker			
Surface Type	Asphalt		Calc. UTL-Top	3.14'	Hand Meas.Top	
Thickness	6"		Calc. UTL-Bot.		Hand Meas.Bot	
Soil Conditions	Type II		Swing Ties from Structure		Dist.	
UTL Type	Water		A	St. Light	88'	
Nominal Pipe Size	12"		B	St. Light	40'	
UTL Material	PVC		C	Sanitary Manhole	73'	

Remarks:	
	Pic. #
	Pic. #

Data Entered By: CP

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	29	 TBE GROUP, Inc. 2875 East Patrick Lane Ste. K Las Vegas NV. 89120 702.458.4092 702.895.8415 fax	SUE Crew	CP / If		
Date Excavated	10/10/08		City	Las Vegas		
Client Project No.	6952		County	Clark		
TBE Project No	NV02106100		Route No.	Farm		
TBE Truck No	33-263		Location	W. of Rainbow		
LOCATION PLAN - NOT TO SCALE						
						
Monument Elev.	/		Rod @ UTL-Top		Marker Set	Rebar & Cap
Rod @ Monument	/		Rod @ UTL-Bot.		Elev.	/
English / Metric	English		Rod @ Marker			
Surface Type	Natural Ground		Calc. UTL-Top	5.78'	Hand Meas.Top	
Thickness	N/A		Calc. UTL-Bot.		Hand Meas.Bot	
Soil Conditions	Type II		Swing Ties from Structure		Dist.	
UTL Type	Water		A	Block Wall	10'	
Nominal Pipe Size	24"		B	St. Light	74'	
UTL Material	DIP		C	Fire Hydrant	71'	
Remarks:						
					Pic. #	
					Pic. #	

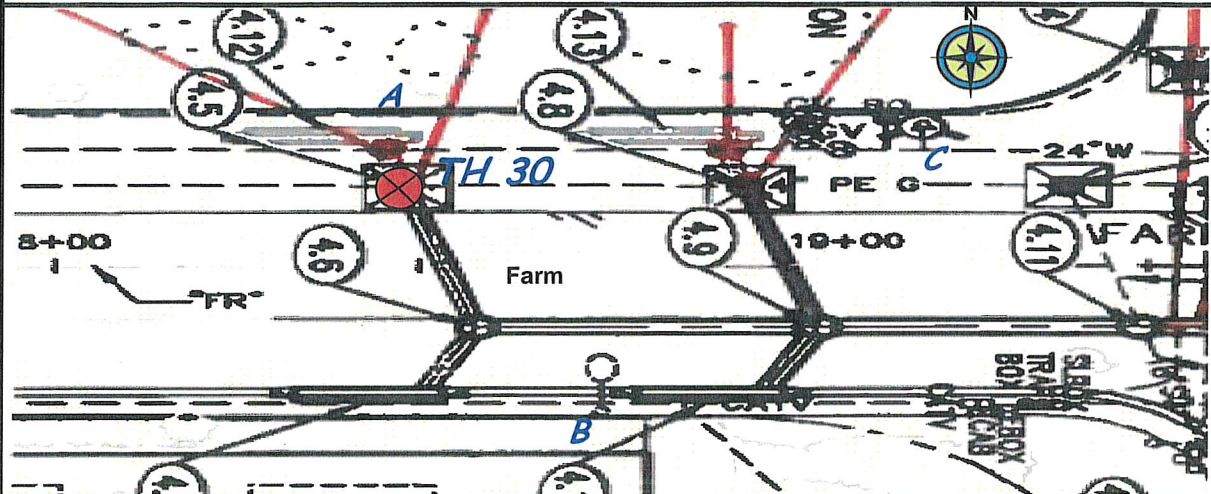
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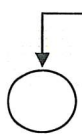
Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	30	 TBE GROUP, Inc. 2875 East Patrick Lane Ste. K Las Vegas NV. 89120 702.458.4092 702.895.8415 fax	SUE Crew	CP / If
Date Excavated	10/10/08		City	Las Vegas
Client Project No.	6952		County	Clark
TBE Project No	NV02106100		Route No.	Farm
TBE Truck No	33-263		Location	W. of Rainbow

LOCATION PLAN - NOT TO SCALE



Monument Elev.	/		Rod @ UTL-Top		Marker Set	Rebar & Cap
Rod @ Monument	/		Rod @ UTL-Bot.		Elev.	/
English / Metric	English		Rod @ Marker			
Surface Type	Natural Ground		Calc. UTL-Top	2.81'	Hand Meas.Top	
Thickness	N/A		Calc. UTL-Bot.		Hand Meas.Bot	
Soil Conditions	Type II		Swing Ties from Structure		Dist.	
UTL Type	Gas		A	Block Wall	19'	
Nominal Pipe Size	4"		B	St. Light	65'	
UTL Material	PE		C	Fire Hydrant	72'	

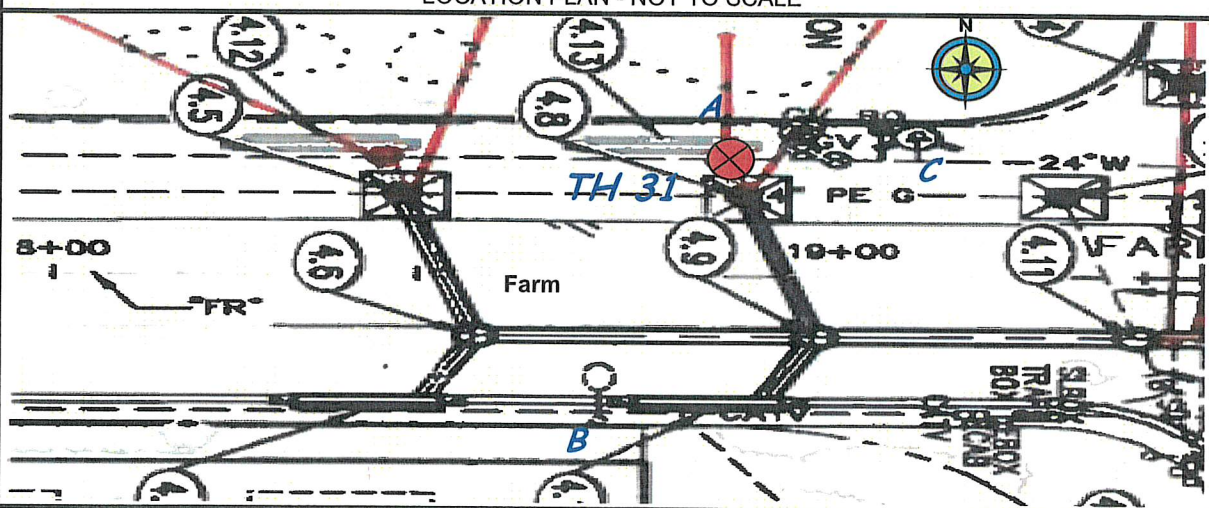
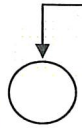
Remarks:

	Pic. #	
	Pic. #	

Data Entered By: CP

Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	31	 TBE GROUP, Inc. 2875 East Patrick Lane Ste. K Las Vegas NV. 89120 702.458.4092 702.895.8415 fax	SUE Crew	CP / If		
Date Excavated	10/10/08		City	Las Vegas		
Client Project No.	6952		County	Clark		
TBE Project No	NV02106100		Route No.	Farm		
TBE Truck No	33-263		Location	W. of Rainbow		
LOCATION PLAN - NOT TO SCALE						
						
Monument Elev.	/		Rod @ UTL-Top		Marker Set	Rebar & Cap
Rod @ Monument	/		Rod @ UTL-Bot.		Elev.	/
English / Metric	English		Rod @ Marker			
Surface Type	Natural Ground		Calc. UTL-Top	5.85'	Hand Meas.Top	
Thickness	N/A		Calc. UTL-Bot.		Hand Meas.Bot	
Soil Conditions	Type II		Swing Ties from Structure		Dist.	
UTL Type	Water		A	Block Wall	11'	
Nominal Pipe Size	24"		B	St. Light	72'	
UTL Material	DIP		C	Fire Hydrant	24'	
Remarks:						
					Pic. #	
					Pic. #	

Data Entered By: CP

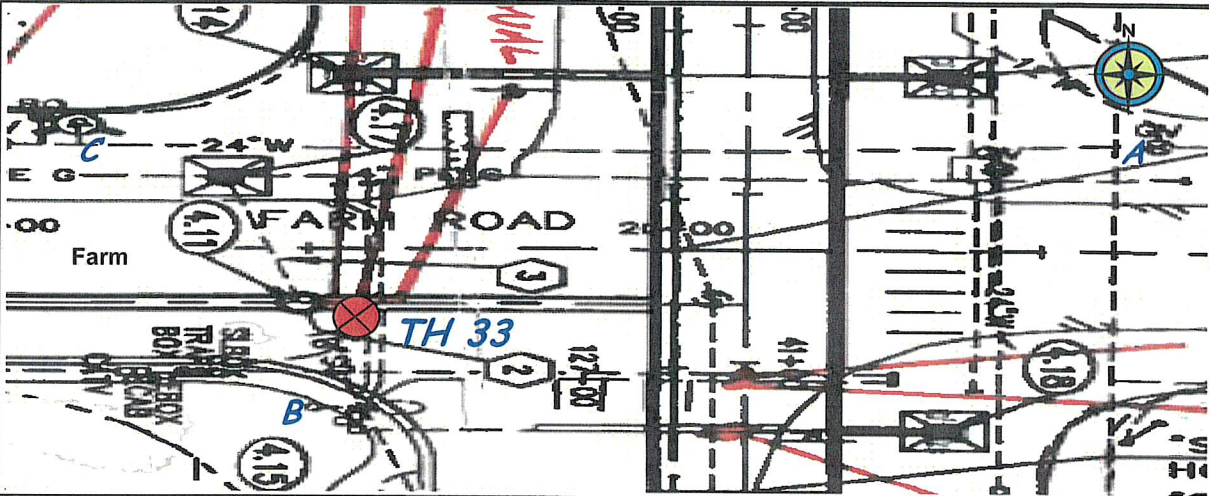
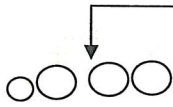
Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	32	 TBE GROUP, Inc. 2875 East Patrick Lane Ste. K Las Vegas NV. 89120 702.458.4092 702.895.8415 fax	SUE Crew	CP / lf
Date Excavated	10/10/08		City	Las Vegas
Client Project No.	6952		County	Clark
TBE Project No	NV02106100		Route No.	Farm
TBE Truck No	33-263		Location	W. of Rainbow

LOCATION PLAN - NOT TO SCALE

TEST HOLE DATA SHEET

Test Hole No.	33	 TBE GROUP, Inc. 2875 East Patrick Lane Ste. K Las Vegas NV. 89120 702.458.4092 702.895.8415 fax	SUE Crew	CP / lf		
Date Excavated	10/10/08		City	Las Vegas		
Client Project No.	6952		County	Clark		
TBE Project No	NV02106100		Route No.	Farm		
TBE Truck No	33-263		Location	W. side of Rainbow		
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	2.02'	Hand Meas.Top	
Thickness	4"		Calc. UTL-Bot.		Hand Meas.Bot	
Soil Conditions	Type II		Swing Ties from Structure		Dist.	
UTL Type	TS/St. Light		A	Water Valve	107'	
Nominal Pipe Size	1-2" / 3-3"		B	St. Light	28'	
UTL Material	PVC		C	Fire Hydrant	65'	
Remarks:						
Traffic Signal and St. Light conduit are empty at time of pothole.					Pic. #	
					Pic. #	

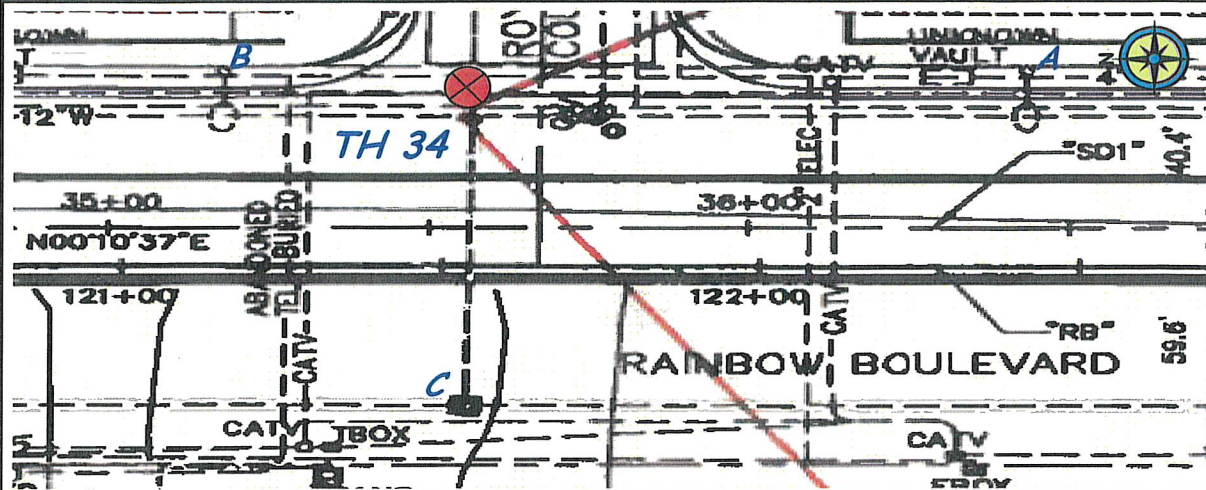
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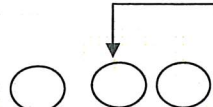
Reviewed By: RT

TEST HOLE DATA SHEET

Test Hole No.	34	 TBE GROUP, Inc. 2875 East Patrick Lane Ste. K Las Vegas NV. 89120 702.458.4092 702.895.8415 fax	SUE Crew	CP / If
Date Excavated	10/13/08		City	Las Vegas
Client Project No.	6952		County	Clark
TBE Project No	NV02106100		Route No.	Rainbow
TBE Truck No	33-263		Location	Royal Stallion

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	3.87'	Hand Meas.Top	
Thickness	6"		Calc. UTL-Bot.		Hand Meas.Bot	
Soil Conditions	Type II		Swing Ties from Structure		Dist.	
UTL Type	Telephone / CATV		A	St. Light	87'	
Nominal Pipe Size	3-4"		B	St. Light	40'	
UTL Material	PVC		C	Sanitary Manhole	77'	

Remarks:	
Found PVC conduit while potholing gas main.	Pic. #
	Pic. #

Data Entered By: CP

Reviewed By: RT

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

Appendix D

Storm Drain Plan and Profile Drawings

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

B.3

HY8 Analysis for Crossing at Grand Teton Drive

HY-8 Culvert Analysis Report

Table 1 - Summary of Culvert Flows at Crossing: Grand Teton

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2374.00	0.00	0.00	0.00	1
2374.05	93.80	93.80	0.00	1
2374.14	187.60	187.60	0.00	1
2374.32	281.40	281.40	0.00	1
2374.59	375.20	375.20	0.00	1
2374.85	469.00	469.00	0.00	1
2375.10	562.80	562.80	0.00	1
2375.32	656.60	656.60	0.00	1
2375.53	750.40	750.40	0.00	1
2375.74	844.20	844.20	0.00	1
2375.93	938.00	938.00	0.00	1

Rating Curve Plot for Crossing: Grand Teton

Total Rating Curve
Crossing: Grand Teton

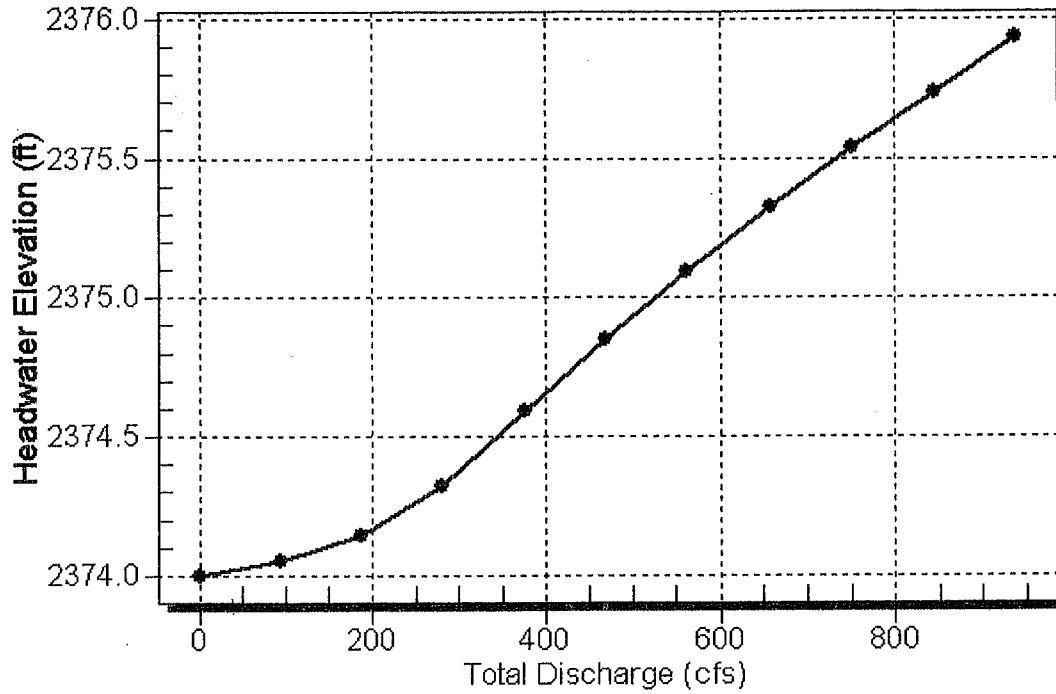
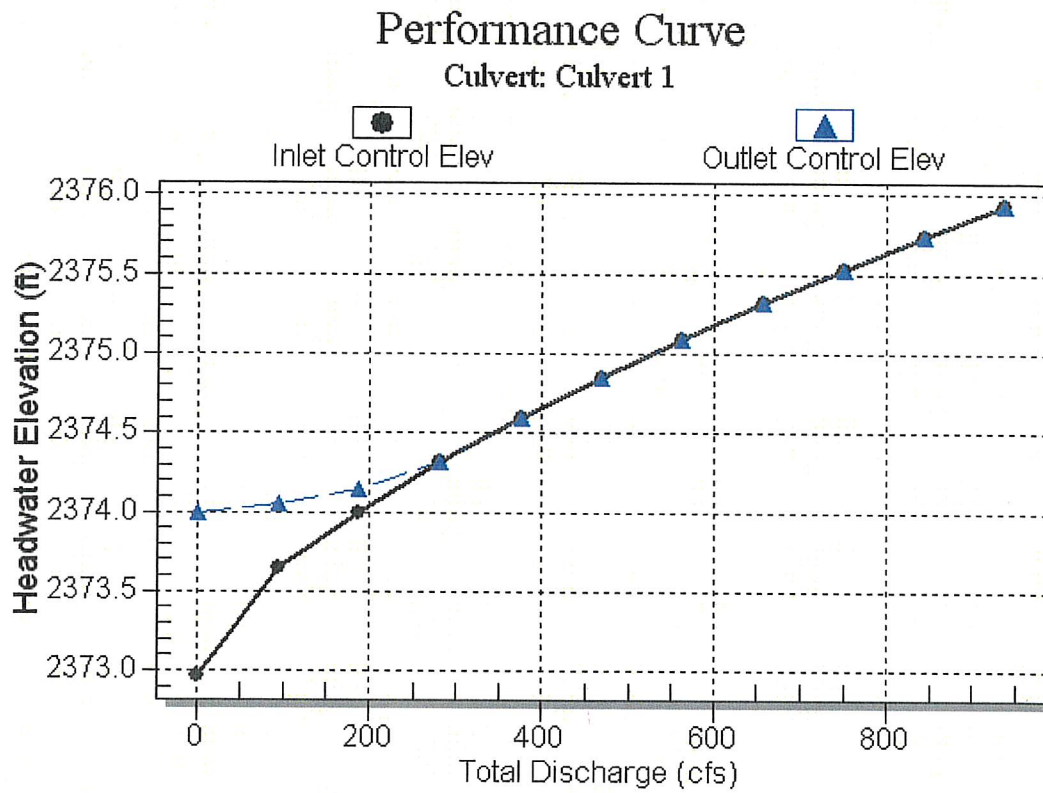


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2374.00	0.000	1.030	0-NF	0.000	0.000	0.000	2.000	0.000	0.000
93.80	93.80	2374.05	0.681	1.082	1-S1t	0.314	0.376	2.000	2.000	0.651	0.000
187.60	187.60	2374.14	1.025	1.172	1-S1t	0.563	0.596	2.000	2.000	1.303	0.000
281.40	281.40	2374.32	1.345	1.354	1-S1t	0.718	0.782	2.000	2.000	1.954	0.000
375.20	375.20	2374.59	1.621	1.621	1-S2n	0.873	0.947	0.877	2.000	5.943	0.000
469.00	469.00	2374.85	1.880	1.880	1-S2n	1.022	1.099	1.028	2.000	6.338	0.000
562.80	562.80	2375.10	2.125	2.125	1-S2n	1.140	1.241	1.141	2.000	6.853	0.000
656.60	656.60	2375.32	2.353	2.353	1-S2n	1.259	1.375	1.265	2.000	7.209	0.000
750.40	750.40	2375.53	2.565	2.565	1-S2n	1.377	1.503	1.393	2.000	7.482	0.000
844.20	844.20	2375.74	2.766	2.766	1-S2n	1.495	1.626	1.496	2.000	7.839	0.000
938.00	938.00	2375.93	2.961	2.961	1-S2n	1.597	1.744	1.603	2.000	8.127	0.000

Inlet Elevation (invert): 2372.97 ft, Outlet Elevation (invert): 2372.00 ft
Culvert Length: 263.27 ft, Culvert Slope: 0.0037

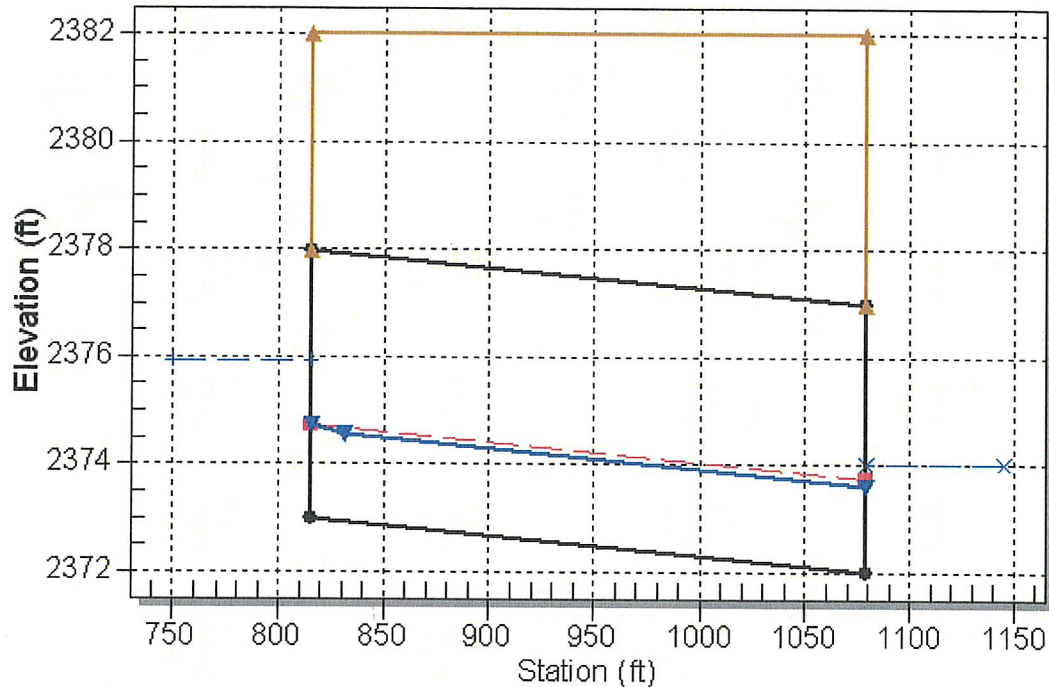
Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1

Crossing - Grand Teton, Design Discharge - 938.0 cfs

Culvert - Culvert 1, Culvert Discharge - 938.0 cfs



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 815.65 ft

Inlet Elevation: 2372.97 ft

Outlet Station: 1078.92 ft

Outlet Elevation: 2372.00 ft

Number of Barrels: 6

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0130

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (90°) Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Grand Teton)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
0.00	2374.00	2.00
93.80	2374.00	2.00
187.60	2374.00	2.00
281.40	2374.00	2.00
375.20	2374.00	2.00
469.00	2374.00	2.00
562.80	2374.00	2.00
656.60	2374.00	2.00
750.40	2374.00	2.00
844.20	2374.00	2.00
938.00	2374.00	2.00

Tailwater Channel Data - Grand Teton

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 2374.00 ft

Roadway Data for Crossing: Grand Teton

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 24.00 ft

Crest Elevation: 2382.00 ft

Roadway Surface: Paved

Roadway Top Width: 263.27 ft

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

Appendix C

Supplemental Documentation

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

C.1

Meeting Minutes

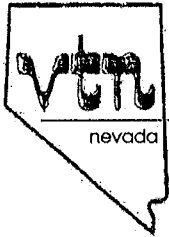
*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

C.1.1

CLV Meeting Minutes



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MEETING MEMORANDUM NO. 1

Las Vegas Wash Middle Branch
Rainbow Storm Drain, Elkhorn to Grand Teton
Hansen #08-23161

VTN NEVADA
W.O. #6952
December 18, 2007

TO: Distribution

FROM: Dan Bender, PE
Project Manager

SUBJECT: Kickoff Meeting for Las Vegas Wash Middle Branch, Rainbow Storm Drain –
Elkhorn to Grand Teton, held at 8:00 A.M. on Monday, December 10, 2007 in the
City of Las Vegas City Engineer's Office - CE Small Conference Room.

Meeting Attendees:

Valerie Flock – CLV (Design)
Rosa Cortez – CLV (Design)
Tim Parks – CLV (Collection Systems Planning)
Todd Myers - CCRFCD
Dan Bender - VTN

Eric Meyer – CLV (Traffic)
Rob Welch – CLV (Flood)
Peter Jackson – CLV (Flood)
Ken Gilbreth - VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify Dan Bender at 253-2357 for any revisions or corrections to these minutes.

Project Team Introduction

- Ken Gilbreth will oversee the project for VTN. Dan Bender will be the Project Manager and primary contact for VTN on this project. Valerie Flock will be the Program Manager for the City, and Rosa Cortez will be the Project Manager for the City.

Project Overview

- The project will begin in the intersection of Rainbow Boulevard and Elkhorn Road. VTN's design will tie-into the channel being designed by the Louis Berger Group (LBG). The City will provide VTN with electronic files and a paper copy of the plans from LBG.
- There is a sewer line that is in conflict with a major portion of the proposed RCB in Rainbow Boulevard. A small segment of that sewer will be relocated by the project being designed by LBG. VTN will extend this sewer re-alignment along Rainbow Boulevard beginning north of the Rainbow/Elkhorn intersection.
- The existing grass-lined channel on the west side of the Rainbow Boulevard right-of-way will need to be considered in the final design. There is an existing headwall and multiple pipes that cross Elkhorn Road. These pipes will need to be removed (or abandoned) to accommodate the proposed storm drain facilities on Elkhorn Road, west of Rainbow Boulevard.

- At the Severance Lane alignment, VTN will need to add a culvert entrance to accept approximately 200 cfs that approaches Rainbow Boulevard from the west.
- There is a low point that ponds water after rain storm in the intersection of Rainbow Boulevard and Whispering Sands Drive. VTN will include appropriate drainage facilities in the Rainbow Storm Drain project to drain this low point.
- VTN will verify if the County installed some drop inlets in the intersection of Rainbow Boulevard and Farm Road.
- There is an approved subdivision on the southwest corner of Whispering Sands Drive and Rainbow Boulevard. This project has approved plans for sewer relocation. VTN's sewer relocation plans will need to coordinate with these subdivision plans and verify if the sewer relocation has been completed. Tim Parks provided VTN with a copy of sheet PP1 from that plan set.
- The New Vista Ranch development is located immediately east of the Project, and south of Grand Teton Drive. CLV Flood Control stated that there has been some activity with a drainage study from the VTN Land Development department. VTN will coordinate with the land development group on the status of New Vista Ranch.
- The existing drainage easement between Whispering Sands Drive and Grand Teton Drive is 100' wide.
- The Project will connect to existing RCB culverts at Grand Teton Drive. The CCRFCD Master Plan shows a large RCB culvert will be extended west on Grand Teton Drive. There are currently six RCB culverts that cross Grand Teton Drive. VTN's design will analyze the ultimate condition and accommodate the extension of RCB(s) to the west on Grand Teton Drive.

Schedule

- VTN provided a copy of the project schedule for review. The City will review and provide comments to VTN to accommodate the City's timeframes and deadlines for advertising/bidding. The funding presentations to CCRFCD's Technical Advisory Committee, Citizens Advisory Committee and Board may adjust on the schedule depending funding availability.

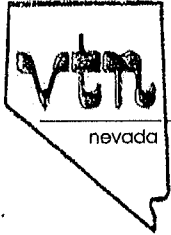
Next Meeting

- Progress meetings will be held monthly, on the second Tuesday at 3:00 P.M. The next progress meeting will be on January 8th.

Distribution:

Attendees

File



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MEETING MEMORANDUM NO. 2

Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA
W.O. # 6952
January 17, 2008

TO: Distribution

FROM: David Bergh, El
Project Engineer, VTN Nevada

SUBJECT: **CLV Progress Meeting #1 for the Las Vegas Wash Middle Branch, Rainbow Storm Drain, held at 3:00 pm on January 8, 2008, at the City of Las Vegas City Engineer's Office – CE Small Conference Room.**

Meeting Attendees:

Rosa Cortez – CLV (Design)
Tim Parks – CLV (Collection Systems Planning)
Peter Jackson – CLV (Flood)
Rob Welch – CLV (Flood)

Todd Myers – CCRFCD
Dan Bender – VTN
Dave Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify David Bergh at 253-2367 for any revisions or corrections to these minutes.

This coordination meeting was held to discuss the project status, emphasizing on: utility coordination, environmental issues, Geotech, and discuss the hydrology and hydraulics of the project. The following is a brief summary of the discussions at this meeting:

Utility Coordination

- Status: Utility Coordination began about one month ago by sending out plans to be redlined. VTN has received comments and redlines back from approximately half of the utility entities.

Environmental Investigation Update

- Section 8: NewFields has discovered that there could be geologic faults crossing the storm drain alignment. In the event a geologic fault is crossed by the storm drain, an appropriate engineering solution will be employed to

mitigate the impact. CCRFCD may require a monitor be sent out to the project during the excavation phase.

- There also could be paleontologic fossils that could be discovered during the excavation process of the storm drain construction. To address this, a field survey will be required. This will be addressed in the Geotechnical Report, and in the Section 8 environmental analysis.
- 404 Conditions: Since the open channel (east side of Gilcrease Orchards) has a surface area of more than 0.1 acre based on the high water mark, there will need to be a coordination meeting with RFCD to discuss if a 404 needs to be submitted to the Army Corps of Engineers. The project will likely be eligible under general permit # 7 and will require an application to the Corps of Engineers.

Geotechnical Analysis Status

- The field and lab work has been completed and the Geotech Report is anticipated in about two weeks. Two copies will need to be sent to Rosa Cortez with CLV and two copies to Tim Sutko at CCRFCD.

Hydrology and Hydraulics

- Drainage facilities for the Rainbow Boulevard and Grand Teton Drive Intersection will not be included in this project. The project scope refers to the bridge at Grand Teton Drive crossing the open channel on the east side of the Gilcrease Orchards.
- Existing flow conditions will be used to model the existing culverts at Grand Teton Drive. The ultimate flow rates from the Amendment to the 2002 Master Plan Update for the Racel Street Collector prepared in 2007 will be used in the design of the ultimate MPU facilities.
- The status of the North and South Environmental Enhancement Areas (EEAs) at Floyd Lamb Park are in the 70% design phase with anticipated construction to begin March 2009. The project has an 18 month construction duration. The EEAs should be considered existing for this project. VTN will recommend closing/blocking 4 of the 6 cells of the existing 6-12' x 5' RCBs at the Grand Teton/open channel bridge when the future 2-12' x 5' RCBs (LVMD2632) are added. The closing/blocking of the cells will help with the hydraulic efficiency of the confluence by keeping the flow depths approximately equal in both systems.
- Several items were discussed regarding hydraulics of the Severance Channel, and how to intercept the flow coming down the grass-lined channel. The options for collecting the flow include: 1) collection in the grass-lined channel before it reaches the Rainbow Boulevard intersection in a series of drop inlets; 2) collection within the grass-lined channel at Severance via a confluence structure and direct it into the Rainbow Storm Drain; 3) combination of the previous two options. VTN will review the alternatives and make a recommendation based on the known constraints.
- VTN plans to produce a hydraulic model of the Las Vegas Wash Middle Branch system beginning at the upstream end at Grand Teton Drive and continuing all the way through the Elkhorn Storm Drain system and down Decatur Boulevard.

Schedule

- The 70% Design is on schedule for submittal on 3/17/08.

Next Meeting

- The next meeting will be on February 12th @ 3:00 pm

Distribution:

Attendees

Valerie Flock, CLV (Design)

Ken Gilbreth, VTN



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MEETING MEMORANDUM NO. 3

Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA
W.O. # 6952
February 15, 2008

TO: Distribution

FROM: Dan Bender, PE
Project Manager, VTN Nevada

SUBJECT: CLV Progress Meeting #2 for the Las Vegas Wash Middle Branch, Rainbow Storm Drain, held at 3:00 pm on February 12, 2008, at the City of Las Vegas City Engineer's Office – CE Small Conference Room.

Meeting Attendees:

Rosa Cortez – CLV (Design)
Tim Parks – CLV (Collection Systems Planning)
Peter Jackson – CLV (Flood)
Valerie Flock, CLV (Design)

Todd Myers – CCRFCD
Dan Bender – VTN
Dave Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify Dan Bender at 253-2357 for any revisions or corrections to these minutes.

Utility Coordination

- Status: VTN has received comments and redlines back from all of the utility entities. Potholing has begun and will be completed within the next two weeks. Upon receipt of the pothole data, VTN will finalize the 70% design level plans.

Environmental Investigation Update

- Section 8: VTN has received review comments from CCRFCD on the Section 8. The comments are being addressed and will be resubmitted by the end of this week.
- 404 Permit: CCRFCD concurs that this project is not connected to waters of the US, and as a result, will not require a US Army Corps of Engineers 404 Permit.

Geotechnical Analysis Status

- The draft report was submitted to the City and CCRFCD on January 21, 2008. VTN requested review comments by the first week in March to allow the geotechnical engineer time to address comments prior to the 70% submittal (March 17th, 2008).

Hydrology and Hydraulics

- VTN is in the middle of developing a hydraulic model of the Las Vegas Wash Middle Branch system beginning at the upstream end at Grand Teton Drive and continuing all the way through the Elkhorn Storm Drain system and down Decatur Boulevard. Once the pothole data is received, VTN will finish detailing this model and include it with the 70% design submittal.

Schedule

- The 70% Design is on schedule for submittal on 3/17/08.

Clark County Coordination

- The City sent an email to Clark County to invite them to participate in the project progress meetings, and to coordinate utility conflicts with respect to the County's franchise agreements and traffic constraints during construction. The City has not received a response from the County yet.

Next Meeting

- The next meeting will be on March 11th @ 3:00 pm, approximately one week before the 70% submittal.

Distribution:

Attendees

Rob Welch – CLV (Flood)

Ken Gilbreth, VTN



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MEETING MEMORANDUM NO. 4

Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA
W.O. # 6952
March 21, 2008

TO: Distribution

FROM: Dan Bender, PE
Project Manager, VTN Nevada

SUBJECT: CLV Progress Meeting #3 for the Las Vegas Wash Middle Branch, Rainbow Storm Drain, held at 3:00 pm on March 11, 2008, at the City of Las Vegas City Engineer's Office – CE Small Conference Room.

Meeting Attendees:

Rosa Cortez – CLV (Design)
Tim Parks – CLV (Collection Systems Planning)
Robert Welch – CLV (Flood)

Todd Myers – CCRFCD
Dan Bender – VTN
Dave Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify Dan Bender at 253-2357 for any revisions or corrections to these minutes.

Overall Project Review

- **Progress Prints:** VTN reviewed a set of the preliminary progress prints with the City and CCRFCD. The City asked VTN to add a field drop inlet on the west side of Rainbow Boulevard, just south of Whispering Sands Drive. There is a construction conflict between the 24" water line on Farm and the proposed drop inlets. VTN will move the field inlet from Farm Road to Rainbow Boulevard to avoid the water line. The City and CCRFCD agree to place the excess excavated soil into the existing grass lined channel area that the HOA want to eliminate. CCRFCD agreed to pay the cost of placing and

spreading the material in that location, but CCRFCD will not pay for the existing landscaping and irrigation facility removal, or any landscaping improvements to that area.

- **Environmental:** The Section 8 was accepted by CCRFCD on February 19, 2008. The following mediation measures are recommended:
 1. Geology & Soils – standard engineering design and construction practices should provide adequate mitigation.
 2. Air Quality – the construction contractor will be required to secure the appropriate ground disturbance permits from CCDAQEM and comply with all mitigation measures stipulated.
 3. Surface Water – implementation of BMPs should minimize potential impacts to erosion, sediment load and water quality concerns.
- **Geotechnical:** The draft report was submitted to the City and CCRFCD on January 21, 2008. The City and CCRFCD are in the process of reviewing the report.

Hydrology and Hydraulics

- VTN has developed a hydraulic model of the Las Vegas Wash Middle Branch system beginning at the upstream end at Grand Teton Drive and continuing all the way through the Elkhorn Storm Drain system and down Decatur Boulevard. A preliminary hydraulic summary of the model was distributed at the meeting.

Schedule

- The 70% Design is on schedule for submittal on 3/17/08.

HOA Coordination Elkhorn/Rainbow

- The City of Las Vegas has scheduled a meeting with the HOA on Tuesday, March 18, 2008 to discuss the existing grass lined channel in Rainbow Boulevard and the Severance Lane alignment.

Clark County Coordination

- All submittals and coordination should be sent to Denis Cederburg.

Next Meeting

- The next meeting will be a review meeting for the 70% submittal. The date of the meeting is to be determined.

Distribution:

Attendees

Peter Jackson – CLV (Flood)

Ken Gilbreth, VTN



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MEETING MEMORANDUM NO. 5

Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA
W.O. # 6952
March 20, 2008

TO: Distribution

FROM: Dan Bender, PE
Project Manager, VTN Nevada

SUBJECT: CLV/Wyeth Ranch HOA Coordination Meeting for the Las Vegas Wash Middle Branch, Rainbow Storm Drain, held at 9:00 am on March 18, 2008, in the Development Services Center – Conference Room 2C.

Meeting Attendees:

Rosa Cortez – CLV (Design)
Sheila Lambert – CLV (Councilman Ross Liaison)
Robert Welch – CLV (Flood)
Dan Bender - VTN

Mike Schwamm – HOA
Bill Payne – HOA
Dave Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify Dan Bender at 253-2357 for any revisions or corrections to these minutes.

Background

- **Rainbow Channel Project:** The City of Las Vegas (CLV) and the Clark County Regional Flood Control District (CCRFCD) are planning to construct the Las Vegas Wash Middle Branch – Grand Teton to Elkhorn (a.k.a. Rainbow Storm Drain) flood control project in 2009. The City has contracted with VTN Nevada to perform the design services for this project. This project will include a Reinforced Concrete Box (RCB) storm drain between Elkhorn Road and Whispering Sands Drive, and an open channel between Whispering Sands Drive and Grand Teton Road. The Rainbow Storm Drain Project is currently at the 70% design level.

- **Wyeth Ranch HOA:** The Wyeth Ranch HOA (HOA) is responsible for maintaining a grass-lined channel along Rainbow Boulevard between Elkhorn Road and Farm Road. The drainage need for this grass-lined channel will be significantly reduced, north of the Serene alignment, once the Rainbow Storm Drain project is constructed. HOA would like to remove the grass within the existing channel because it is expensive to maintain. Further, HOA would like to replace the grass-lined channel with desert landscaping.

Meeting Summary

- At the request of HOA, the City has investigated the possibility of re-aligning the Rainbow Storm Drain facility into the grass-lined channel area. However, there is a 24" sanitary sewer transmission main that is located between the storm drain alignment and the grass-lined channel, which makes it impossible to re-align the storm drain facility in the grass-lined channel area.
- The grass-lined channel along Rainbow Boulevard between Elkhorn Road and the Severance alignment will need to be used to collect the storm flows conveyed within the Severance grass-lined channel. The grass can be eliminated in this area, as long as sufficient erosion protection such as riprap is substituted for the grass. These changes will have to be supported by a drainage study prepared by a licensed engineer.
- The City cannot pay for improvements to private property that are above and beyond that what is needed for the Rainbow Storm Drain Project. In working with the HOA, the City has offered to provide excess dirt from the storm drain excavation and the excess riprap from the channel reconstruction, to be used within the existing grass-lined channel area. The HOA will be responsible for hiring an engineer to update the current drainage study, and to design any proposed landscaping and trails, not associated with the Rainbow Storm Drain Project. In addition, The HOA will need to either 1) hire a contractor to prepare the area (remove irrigation facilities and grass, if required) before the City's Contractor begins work, or 2) the HOA can enter an agreement and pay for the improvements by contributing toward the cost of the Rainbow Storm Drain Project. The City will provide a cost estimate for the added improvements to the HOA.
- The HOA will need to coordinate efforts with the City Planning Department regarding proposed changes. The HOA may need to submit an application for Open Space Waiver/Variance to the CLV Planning Department to address the proposed changes. Councilman Ross has agreed to support this action.
- Councilman Ross's office will work with HOA to contact the developers (Toll Brothers and Pulte) to determine what assistance they will be able to provide with the proposed modifications. However, the City cannot compel the developers to assist at this time.
- The HOA plans to seek a rebate from the Southern Nevada Water Authority on their Water Smart Landscape Program. The City volunteered to help HOA with this process in any way they can.
- The City stated that the Rainbow Storm Drain project cannot be delayed to accommodate the landscape improvements. The HOA will need to be ready when the City bids the project in early 2009.

Distribution:

Attendees

Peter Jackson – CLV (Flood)

Tom Perrigo – CLV (Planning)

Todd Myers - CCRFCD

Ken Gilbreth, VTN



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MEETING MEMORANDUM NO. 6

Las Vegas Wash Middle Branch, Rainbow
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA
W.O. # 6952
April 18, 2008

TO: Distribution

FROM: Dan Bender, PE
Project Manager, VTN Nevada

SUBJECT: CLV/CCPW Coordination Meeting for the Las Vegas Wash Middle Branch, Rainbow Storm Drain, held at 9:00 am on April 15, 2008, in the Clark County Survey Conference Room.

Meeting Attendees:

Rosa Cortez – CLV (Design)
Robert Welch – CLV (Flood)
Dan Bender - VTN

Allen Pavelka – CCPW
Bill Pennington – CCPW

The purpose of this memorandum is to document the above-mentioned meeting. Please notify Dan Bender at 253-2357 for any revisions or corrections to these minutes.

Background

- **Rainbow Storm Drain Project:** The City of Las Vegas (CLV) and the Clark County Regional Flood Control District (CCRFCD) are planning to construct the Las Vegas Wash Middle Branch – Grand Teton to Elkhorn (a.k.a. Rainbow Storm Drain) flood control project in 2009. The City has contracted with VTN Nevada to perform the design services for this project. This project will include a Reinforced Concrete Box (RCB) storm drain between Elkhorn Road and Whispering Sands Drive, and an open channel between Whispering Sands Drive and Grand Teton Road. The Rainbow Storm Drain Project is currently at the 70% design level.
- **Elkhorn Storm Drain Project:** The City recently opened bids on the Elkhorn Storm Drain project and will give a notice to proceed to the Contractor around May 12th.

The City coordinated the Elkhorn Storm Drain Project with Clark County because the majority of that project is located within Clark County right-of-way (ROW).

Meeting Summary

- **Utility Franchise Letters:** The County agreed to send out the franchise letters for the Rainbow Storm Drain Project since the east half of Rainbow Boulevard is County ROW and the majority of the work will be done in this area.
- **Maintenance:** The drop inlets will be maintained by jurisdictional boundaries (the City will maintain the drop inlets in the City, and County will maintain the drop inlets in the County). During a special meeting for the Elkhorn Storm Drain Project, the County agreed to maintain the Elkhorn Storm Drain between Rainbow Boulevard and Torrey Pines Drive until the entire system was built, at which point the maintenance responsibility would be revisited. The City asked the County to also maintain the Rainbow Storm Drain until the entire Las Vegas Wash Middle Branch System is constructed. Allen Pavelka stated that he would review this issue with the County's Maintenance Group.
- **Construction Inspections:** The City indicated that any work performed in County ROW will be inspected by the City with the exception of the pavement and roadway structural section within the County ROW which will be performed by County inspectors.
- **Traffic Control:** Both agencies (City and County) will review the Contractor's proposed traffic control designs.
- **Design Coordination:** Dave Betley from the County Development Services group will review the plans. Dave will be invited to the progress meetings. At 90% design level, Rosa will deliver plans to Dave for review. Also at the 90% design level, the City will provide three copies of the plans and specs to Bill Pennington for review. Bill will coordinate with the County's Traffic Department for review of the proposed striping and signage.
- **Interlocal Agreement:** Independent of this project, the City and County are currently working on an Overall Interlocal Agreement between the County and City for projects that are designed/constructed by one entity but are located in another entity's jurisdiction. The City and County are in the beginning stages of this Interlocal Agreement; thus, the City is proposing to handle the Rainbow Storm Drain project like the Elkhorn Storm Drain project with an understanding between the City and County on these coordination issues. Allen will discuss this proposal with Denis Cederburg and report back to Rosa.

Distribution:

Attendees

Todd Myers - CCRFCD

Ken Gilbreth, VTN



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MEETING MEMORANDUM NO. 7

Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA
W.O. # 6952
May 28, 2008

TO: Distribution

FROM: David Bergh, EI
Project Engineer, VTN Nevada

SUBJECT: CLV Comment Review Meeting for the Las Vegas Wash Rainbow Storm Drain, held at 11:00 am on May 21, 2008, at the City of Las Vegas City Engineer's Small Conference Room.

Meeting Attendees:

Rosa Cortez – CLV (Design)
Peter Jackson – CLV (Flood)
Rob Welch – CLV (Flood)

Dan Bender – VTN
David Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify David Bergh at 253-2367 for any revisions or corrections to these minutes.

This review meeting was held to discuss some of the 70% submittal review comments and concerns from the CLV Flood Control Section. The following is a brief summary of the discussions at this meeting:

Labeling Future Drop Inlets on Plans

- VTN was concerned about labeling future inlets on the plans because it could cause confusion to the contractor. After discussion with the CLV, VTN will show the future inlets in a different lineweight and linetype on the plans. This will provide a future reference to the engineer who designs the roadway to full street improvements.

Construction Joint in Transition at Grand Teton RCBs

- After discussions with the CLV, VTN will analyze the transition downstream of Grand Teton as if no boxes will be closed or capped. The City requested this approach due to the long timeframe of getting complete build-out of all MPU facilities. Although this is less hydraulically efficient through the transition, it does provide additional conveyance capacity under Grand Teton in the future. VTN will analyze this option and submit the results at the 90% submittal.

Detail Sheets for Inlets

- The City verified that full detail sheets should be provided for all CLV CM and DM drop inlets as well as NDOT Type 8, 2A and 2 drop inlets. NDOT Type 8, 2A, and 2 inlets and manholes can be pulled off the NDOT website in AutoCAD. VTN has detail sheets for all CLV inlets. Field type inlets located near the pedestrian paths will need to be fitted with pedestrian safe grates. All details will be included in the 90% Submittal.

Need for Authorization to Enter Property (AEP's)

- VTN assumed there would be a need for an AEP for a portion of the channel where an existing structure belonging to New Vista Ranch; after discussion it is the responsibility of New Vista Ranch to remove the structure from the public drainage easement. This eliminates the need for an AEP for this area.
- VTN designed all inlets to be spaced 7' from the edge of the ROW line this will be the future gutter flow-line allowing for an easy connection with future drop inlets. No inlets are on ROW lines; therefore, no AEP will be needed to construct these inlets. VTN will verify all inlets are off the ROW lines by 7 feet.
- The existing fence around the open channel will remain in place if it is in good condition. The plans will show removal and replacement of the existing fence in the vicinity of Grand Teton and Whispering Sands.

Beehive Drop Inlet at Farm Road and Rainbow Boulevard

- The City would like the existing beehive drop inlet at this intersection to be modified by removing the beehive grate and installing a flat grate with an apron. VTN will install a grate and apron on the existing drop inlet riser.

Plug and Remove Existing Dual HERCP at Elkhorn

- A proposed storm drain lateral will cross the Dual 48" x 76" HERCP. Discussions were held on what to do with the HERCP. One option would be to remove the entire pipe, but this would impact the entire intersection.
- Another option would be to cap the pipe at the inlet, remove the portion needed to get the proposed lateral across and cap the pipe at the limits of removal, and finally cap the outlet at the existing bubbler.
- The final option would be to cap at the inlet, and remove the pipe from where the proposed lateral crosses to the bubbler; this however, may impact the 6" high-pressure gas-line.
- The 90% plans will show the preferred alternative by VTN.

Schedule

- VTN is addressing comments for the 70% Submittal
- The 90% Design is on schedule for submittal on 7/22/08

Next Meeting

- The next meeting will be on June 10th at 3:00 pm to discuss the progress of the project.

Distribution:

Attendees

Ken Gilbreth, VTN



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MEETING MEMORANDUM NO. 8

Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA
W.O. # 6952
August 28, 2008

TO: Distribution

FROM: David Bergh, EI
Project Engineer, VTN Nevada

SUBJECT: CLV Comment Review Meeting for the Las Vegas Wash Rainbow Storm Drain, held at 10:30 am on August 28, 2008, at the City of Las Vegas Development Service Center Small Conference Room.

Meeting Attendees:

Rosa Cortez – CLV (Design)
Peter Jackson – CLV (Flood)
Rob Welch – CLV (Flood)

Dan Bender – VTN
David Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify David Bergh at 253-2367 for any revisions or corrections to these minutes.

This review meeting was held to discuss some of the 90% submittal review comments and concerns from the CLV. The following is a brief summary of the discussions at this meeting:

2008 MPU

- Clark County Department of Development Services commented on verifying flow-rates against the 2008 MPU flow-rates. This will not be done because Clark County Regional Flood Control District has accepted VTN's methods and uses the hydrology from Racel Street Collector MPA (2005). Discussions with Peter Jackson also iterated that we would not use the 2008 MPU. VTN is going towards 100% design and at this point would make no logical sense to change flow rates. In addition, the 2008 MPU is non-approved document at this point.

10 – Year Hydrology

- Clark County Department of Development Services commented on using 10-year street flow to determine dry lane criterion. While VTN agrees, this falls outside the scope of the project. This project is designing a CCRFCD Master Plan 100-year flood control facility not a minor storm collection system. Future development of

roadways within the watershed also limits the practicality of analyzing a 10-year system since there is no timetable of when roads will be built out.

HOA Channel

- After discussions with the City, a 3" rock mulch will be used between the riprap berms in the HOA Channel after the Severance Confluence. The rock mulch will be salvaged by the contractor from the riprap channel between Grand Teton and Whispering Sands.

Inlets at north side of Farm Road east of Rainbow Boulevard

- In the 70% submittal VTN was recommending building stubs for future inlets on the north side of Farm Road. Peter Jackson recommends building NDOT Type 2B inlets here not because there is a swale all the way down Farm Road. VTN will need to get additional potholes here to verify location of existing waterline.

Sewer Stub for LBG at Elkhorn Road

- Tim Parks informed VTN that the minimum slope of the existing 24" sewer is 0.0026 ft/ft instead of 0.0020 that VTN was assuming as the minimum slope. VTN will redesign sewer plans to account for increase in capacity. VTN will use a slope 0.000865 ft/ft instead of 0.00063 ft/ft to account for the increase in capacity. The minimum slope for a 30" to carry the same capacity as a 24" at 0.0026 ft/ft is 0.00079 ft/ft. VTN has sent sewer information to Rosa Cortez and Tim Park regarding this change. Rosa will be sending information over to LBG.

Inlets at South End of Rainbow Grass Lined Channel

- VTN discussed new location of inlets and how filling the channel at the southern most end would be beneficial. The location at with the lateral will tie into the mainline will be located between two retaining walls. This location will be field verified next Thursday during the project walk through.

Schedule

- VTN is addressing comments for the 90% Submittal
- The 100% Design is on schedule for submittal on 11/18/08

Next Meeting

- The next meeting has yet to be determined for this project.

Distribution:

Attendees

Ken Gilbreth, VTN

Tim Parks, CLV (Collection Systems Planning)



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MEETING MEMORANDUM NO. 9

Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA
W.O. # 6952
September 16, 2008

TO: Distribution

FROM: David Bergh, EI
Project Engineer, VTN Nevada

SUBJECT: Coordination Meeting for the Las Vegas Wash Rainbow Storm Drain, held at 9:30 am on September 16, 2008, at the City of Las Vegas Development Service Center, Conference Room 2D.

Meeting Attendees:

Valerie Flock – CLV (Design)
Rosa Cortez – CLV (Design)
Rob Welch – CLV (Flood)

Ken Gilbreth – VTN
David Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify David Bergh at 253-2367 for any revisions or corrections to these minutes.

This review meeting was held to discuss flow-rates, design options, questions, and concerns with the HOA grass-lined channel located within the Wyeth Ranch and Toscana developments at the northwest corner of Rainbow Boulevard and Elkhorn Road. The following is a brief summary of the discussions at this meeting:

Flow-rates

- VTN calculated the ultimate flow-rates within the HOA channel assuming that all MPU facilities are in place and discussed results with the CLV.
- For the interim flow-rate, VTN will analyze the same system without the US 95 system and assume the Las Vegas Wash Middle Branch facilities are installed to Decatur/215. This flow-rate will be derived from Northwest Neighborhood Study Phase II that was completed for the City of Las Vegas in 1999. Once determined, a normal depth calculation will be made in HOA channel to check capacity.

SNWA Rebate for Grass-Lined Channel

- SNWA has two different options with replacing the grass-lined channel. First, the Water Smart Program offers a reimbursement to the HOA of \$1.50 per square foot of grass replaced with a 50% canopy coverage (i.e., trees, shrubs).
- Second, since the grass functions as erosion control, SNWA would consider riprap or other lining to be a low-water use technology for controlling erosion. If riprap is used to line the channel, SNWA will reimburse the HOA half the cost of the riprap, excluding labor and materials, or \$25 per 1000 gallons of water conserved annually, whichever is less. This type of rebate is classified under their Water Efficient Technologies Program. The HOA will be responsible for providing the CLV their annual water consumption.

Schedule

- VTN will be analyzing interim flow-rates within the HOA channel and discuss their findings at the next coordination meeting. An additional service request will be given to the CLV for this work since it lies outside the original scope of work for this project.
- VTN is addressing comments for the 90% Submittal
- The 100% Design is on schedule for submittal on 11/18/08

Next Meeting

- The next coordination meeting is scheduled for September 30, 2008 at 10:00 am.
- The next progress meeting is scheduled for October 14, 2008 at 3:00 pm.

Distribution:

Attendees
File



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MEETING MEMORANDUM NO. 10
Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA
W.O. # 6952
October 15, 2008

TO: Distribution

FROM: David Bergh, EI
Assistant Project Manager, VTN Nevada

SUBJECT: CLV Progress Meeting #4 for the Las Vegas Wash Middle Branch, Rainbow Storm Drain, held at 3:00 pm on October 14, 2008, at the City of Las Vegas City Engineer's Small Conference Room.

Meeting Attendees:

Rosa Cortez – CLV (Design)
Rob Welch – CLV (Flood)

Ken Gilbreth – VTN
David Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify David Bergh at 253-2367 for any revisions or corrections to these minutes.

This progress meeting was held to discuss ongoing questions, concerns, comments, and issues for the Rainbow Storm Drain. The following is a brief summary of the discussions at this meeting:

Sewer Issues

- Regarding the stub left for VTN to connect to at Elkhorn and Rainbow, Rosa will contact Louis Berger Group to get CAD files over to VTN.
- A new sewer alignment was shown to the CITY at Whispering Sands and Rainbow; the new sewer alignment eliminates the need for any easement and unorthodox alignment to get around storm drain. VTN dropped the sewer line to go under the RCB at Whispering Sands and had to chase the sewer at maximum slope north on Rainbow.
- Service Laterals to 3 parcels will be field verified on the next field meeting.

New Roadway Alignment

- VTN discussed with the CITY on a new pavement section and striping around Whispering Sands and Rainbow. Since the entire pavement section is being removed, it has been discussed on removing the curvilinear alignment and replacing with a more straightened alignment. The minimum pavement width will be 32' per comments from Clark County Development Services.

- A field visit is required to verify existing striping at the intersection of Whispering Sands and Rainbow. During the field visit, the northeast corner of the intersection needs to be verified on what landscaping has been done per the new Eagle Ranch III development.

Fencing

- The existing fence on the Gilcrease Orchards side (west side) of the open channel between Grand Teton and Whispering Sands will need to be removed and replaced with a 6' chain link fence that meets or exceeds Clark County Regional Flood Control District Criteria.
- There is an existing structure within the public drainage easement (east side of open channel) that needs to be moved; the CITY informed VTN that talks between the property owner and CITY have taken place. The property owner knows they are responsible for moving the structure out of public drainage easement before construction.

Burrowing Owls

- The burrowing owls found during the 90% walkthrough will be addressed by NewFields, VTN's environmental sub-consultant for the project, prior to construction. An additional service request has been submitted to the CITY.

Review Comments

- VTN discussed with CITY on various review comments from the 90% submittal. Most questions have been answered with a few more that will be answered during the next field visit.

Clark County Coordination

- The CITY updated VTN on the coordination that is going on with Clark County Public Works. The County wants to maintain the roadway and requests that the CITY maintain the storm drain. The CITY will continue to coordinate with Clark County on the maintenance issues.

HOA Coordination

- A meeting was held on October 7th with the Toscana-Wyeth Ranch LMA, Southwest Engineering, and the City Council's office. It was discussed that Southwest Engineering would provide an engineer's cost estimate for the proposed improvements within the grass-lined channel along the east side of Rainbow Boulevard. The CITY still has not received Southwest Engineering's cost estimate. The CITY will provide VTN this information once it becomes available.

Schedule

- VTN is addressing comments from the 90% Submittal
- The 100% Pre-Final Design is on schedule for submittal on 11/18/08

Next Meeting

- A coordination meeting with the LVVWD will be scheduled in the near future to discuss proximity of the storm drain improvements and existing water mains. VTN will set this meeting up and send an invite to Rosa at CITY.
- Follow up meetings will be scheduled with the utility companies prior to the next submittal once a majority of the comments have been addressed. VTN will invite Rosa at the CITY to these meetings.
- The next progress meeting is scheduled for November 11, 2008 at 3:00 pm.

Distribution:

Attendees

Peter Jackson, CLV (Flood)

Todd Myers, CCRFCD

File

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

**Rainbow Storm Drain
Elkhorn to Grand Teton**

C.1.2

Utility Meeting Minutes



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Embarq Utility Coordination Meeting # 1

Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA

W.O. # 6952

July 8, 2008

TO: Distribution

FROM: David Bergh, EI
Project Engineer, VTN Nevada

**SUBJECT: Utility Coordination Meeting with Embarq for the Las Vegas Wash
Rainbow Storm Drain, held at 10:00 am on July 8, 2008, at Embarq's
Conference Room.**

Meeting Attendees:

Janie Stokes – Embarq
Scott Gifford – Embarq

Dan Bender – VTN
David Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify David Bergh at 253-2367 for any revisions or corrections to these minutes.

This purpose of this meeting was to document and discuss Embarq utility conflicts with the proposed storm drain and sewer improvements. The following is a brief summary of the discussions at this meeting:

Conflict Resolution

- There are only a few conflicts with Embarq Telephone Utilities throughout the project. There are two underground Embarq Telephone Lines that cross the storm drain at Whispering Sands Drive. It is acceptable with Embarq for the Contractor to support these conduit in place during construction, and then place telephone conduit on top of the box culvert and backfill with a concrete encasement. VTN will revise the plans and specifications accordingly.
- There are 2 – 1 ¼" lines that cross the storm drain and sewer proposed facilities just south of Donald Nelson Drive. The pothole company did not find the line, but there is a underground cable and underground electric in the vicinity. VTN will determine if the underground cable and underground telephone was placed in the same trench as the underground electric. The underground electric pothole was found, but the underground cable and telephone were not, thus leading us to believe that they were all placed in the same trench. VTN will do some research of this situation as will

Embarq. Embarq usually does not use 1 1/4" conduit. VTN will research the as-built plans to verify the sizes of these conduit.

Schedule

- The 90% Design is on schedule for submittal on 7/22/08.

Next Meeting

- The next meeting will be held after the 90% submittal.
- VTN will submit copies of the 90% plans to Embarq.

Distribution:

Attendees

Ken Gilbreth, VTN

Rosa Cortez, CLV



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Southwest Gas Utility Coordination Meeting # 1

Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA

W.O. # 6952

July 8, 2008

TO: Distribution

FROM: David Bergh, EI
Project Engineer, VTN Nevada

SUBJECT: Utility Coordination Meeting with Southwest Gas for the Las Vegas Wash Rainbow Storm Drain, held at 2:00 pm on July 8, 2008, at Southwest Gas Engineering Conference Room.

Meeting Attendees:

Bob Middag – Southwest Gas

Dan Bender – VTN

David Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify David Bergh at 253-2367 for any revisions or corrections to these minutes.

This purpose of this meeting was to document and discuss Southwest Gas utility conflicts with the proposed storm drain and sewer improvements. The following is a brief summary of the discussions at this meeting:

Plan Labels

- Southwest Gas wants to see type of material on all plan and profiles of gas lines; either polyethylene (PE) or steel (STL).
- Southwest Gas also wants just a leader and no pipe shown in profile where the gas line has not been located. This will resolve any discrepancies on location of pipe and will clear up confusion with the contractor.

Utility Relocations

- The 4" polyethylene gas conflict at Farm Road and Rainbow Boulevard with the storm drain will need to be relocated under the box culvert because of clearance issues.
- Bob Middag indicated that Southwest Gas would like to do this relocation concurrently with the excavation for the box culvert. VTN will contact Rosa Cortez at the City of Las Vegas to determine the feasibility of this relocation. This will be a

quicker relocation if done concurrently, and reduces the need for two traffic control plans.

- Bob is going to supply the latest "Caution High-Pressure Gas Line" note and Signature box that will be applied to sheets containing high-pressure gas lines.
- The existing 4" poly gas line at Farm Road that crosses the storm drain also crosses the proposed sanitary sewer; Bob said it would be acceptable to use the same pothole elevation on the sanitary sewer crossing that is on the storm drain crossing.

Schedule

- The 90% Design is on schedule for submittal on 7/22/08.

Next Meeting

- The next meeting will be held after the 90% submittal.
- VTN will submit copies of the 90% plans to Southwest Gas.

Distribution:

Attendees

Ken Gilbreth, VTN

Rosa Cortez, CLV



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Nevada Power Company Coordination Meeting # 1

Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA

W.O. # 6952

July 10, 2008

TO: Distribution

FROM: David Bergh, EI
Project Engineer, VTN Nevada

SUBJECT: Utility Coordination Meeting with Nevada Power Company for the Las Vegas Wash Rainbow Storm Drain, held at 2:00 pm on July 10, 2008, at Nevada Power Company's Conference Room.

Meeting Attendees:

Rosa Cortez – CLV (Design)
Maggie Crittle – NPC

Dan Bender – VTN
David Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify David Bergh at 253-2367 for any revisions or corrections to these minutes.

This purpose of this meeting was to document and discuss NPC utility conflicts with the proposed storm drain and sewer improvements. The following is a brief summary of the discussions at this meeting:

Conflict Resolution

- There are a few conflicts with Nevada Power Utilities throughout the project. There are two underground Nevada Power Lines that cross the storm drain at Whispering Sands Drive and Rainbow Boulevard. It is acceptable with Nevada Power for the Contractor to support these conduits in place during construction, and then place the conduit on top of the box culvert, and concrete encase before backfill. VTN will revise the plans and specifications accordingly to make the contractor aware of what to do at each underground power crossing. NPC does not have an official standard detail for concrete encasing their power lines, but Maggie said she would provide VTN with a sample detail once she discusses it with her supervisor.
- There is another conflict with an underground power line on Rainbow Boulevard near Donald Nelson Drive. NPC agreed that it would be acceptable to support this conduit above the RCB and concrete encase like the ones at Whispering Sands and Rainbow.

- Rosa Cortez and Maggie Crittle discussed who would be financially responsible for supporting these utilities, placing on top of box, and concrete encasing. The City of Las Vegas Construction Manager will coordinate with NPC and the Contractor during construction.

Schedule

- The 90% Design is on schedule for submittal on 7/22/08.

Next Meeting

- The next meeting will be held after the 90% submittal.
- VTN will submit copies of the 90% plans to Nevada Power Company.

Distribution:

Attendees

Ken Gilbreth, VTN



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Cox Utility Coordination Meeting # 1
Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA
W.O. # 6952
July 11, 2008

TO: Distribution

FROM: David Bergh, EI
Project Engineer, VTN Nevada

SUBJECT: Utility Coordination Meeting with Cox Communications for the Las Vegas Wash Rainbow Storm Drain, held at 9:00 am on July 11, 2008, at VTN's Public Works Executive Conference Room.

Meeting Attendees:

Doney Villareal – Cox

Dan Bender – VTN

David Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify David Bergh at 253-2367 for any revisions or corrections to these minutes.

This purpose of this meeting was to document and discuss Cox utility conflicts with the proposed storm drain and sewer improvements. The following is a brief summary of the discussions at this meeting:

Conflict Resolution

- There are only a few conflicts with Cox Cable Utilities throughout the project. It is acceptable with Cox for the Contractor to support these conduits in place during construction, and then place telephone conduit on top of the box culvert and backfill with a concrete encasement. VTN will revise the plans and specifications accordingly.
- Doney will field verify the cable crossings at Donald Nelson Drive and Rainbow Boulevard that could not be located from the potholes. Doney will then redline our 90% plans of his findings.

Schedule

- The 90% Design is on schedule for submittal on 7/22/08.

Next Meeting

- The next meeting will be held after the 90% submittal.



- VTN will submit copies of the 90% plans to Cox Communications.

Distribution:

Attendees

Ken Gilbreth, VTN

Rosa Cortez, CLV



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Las Vegas Valley Water District Coordination Meeting # 1
Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA
W.O. # 6952
October 27, 2008

TO: Distribution

FROM: David Bergh, EIT
Assistant Project Manager, VTN Nevada

SUBJECT: Utility Coordination Meeting with the Las Vegas Valley Water District for the Las Vegas Wash Rainbow Storm Drain, held at 9:00 am on October 27, 2008, at LVVWD Small Conference Room.

Meeting Attendees:

Phillip Orme – LVVWD
Jason Ghadery – LVVWD
Joe Morgan – LVVWD

Lyle Wilcox – VTN
David Bergh – VTN
Rosa Cortez – CNLV

The purpose of this memorandum is to document the above-mentioned meeting. Please notify David Bergh at 253-2367 for any revisions or corrections to these minutes.

This purpose of this meeting was to document and discuss LVVWD water utility conflicts and clearances with the proposed storm drain and sewer improvements. The following is a brief summary of the discussions at this meeting:

Horizontal Clearance

- LVVWD redlined plans at the 90% submittal requiring 5' minimum horizontal clearance between proposed drop inlets and the water main in question. VTN discussed the construction of drop inlets would be a monolithic cast-in-place structure. The LVVWD will require a concrete slurry mix on the storm drain pipe until the horizontal distance of 10 feet is obtained.
- If the vertical distance is within 18", the LVVWD will require both the waterline and the storm drain pipe be encased with CLSM 10 feet in each direction.

- LVVWD checked to see what the absolute minimum horizontal clearance could be, and per email from Jason Ghadery, it was determined that 3' would be acceptable for this occasion only. VTN will show on the civil plans the CLSM protection and the clearance available.

Schedule

- The 100% pre-final submittal is on schedule for submittal on 11/18/08.

Next Meeting

- There will be no future meeting unless comments or questions arise with the preparation of the Final Design Submittal.

Distribution:

Attendees

Ken Gilbreth, VTN



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Southwest Gas Utility Coordination Meeting # 2

Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA

W.O. # 6952

November 12, 2008

TO: Distribution

FROM: David Bergh, EIT
Assistant Project Manager, VTN Nevada

SUBJECT: Utility Coordination Meeting with Southwest Gas for the Las Vegas Wash Rainbow Storm Drain, held at 10:30 am on November 12, 2008, at Southwest Gas Engineering Conference Room.

Meeting Attendees:

Bob Middag – Southwest Gas
Rosa Cortez – CLV

David Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify David Bergh at 253-2367 for any revisions or corrections to these minutes.

This purpose of this meeting was to document and discuss Southwest Gas utility conflicts with the proposed storm drain and sewer improvements. The following is a brief summary of the discussions at this meeting:

Conflicts Resolution

- VTN discussed the conflicts with Southwest Gas regarding the storm drain. VTN potholed the conflicts and will provide Bob the pothole information.
- In the previous submittal, there was only one conflict, which is the 4" PE Gas that crosses the 24' x 8' RCB, but this will be relocated concurrently with construction.
- The new conflict is with a 4" PE Gas and two proposed field drop inlets. This relocation will be done prior to construction.

Schedule

- The 100% Pre-Final Design is on schedule for submittal on 11/18/08.

Next Meeting

- The next meeting will be held after the 100% Pre-Final submittal.
- VTN will submit copies of the 100% Pre-Final plans to Southwest Gas.

Distribution:

Attendees

Ken Gilbreth, VTN



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Embarq Utility Coordination Meeting # 2

Las Vegas Wash, Rainbow Storm Drain
Grand Teton to Elkhorn
Hansen #08-23161

VTN NEVADA

W.O. # 6952

November 12, 2008

TO: Distribution

FROM: David Bergh, EIT
Assistant Project Manager, VTN Nevada

SUBJECT: Utility Coordination Meeting with Embarq for the Las Vegas Wash Middle Branch, Rainbow Storm Drain – Elkhorn to Grand Teton, held at 1:00 pm on November 12, 2008, at VTN in the 3rd Building Conference Room.

Meeting Attendees:

Scott Gifford – Embarq
Rosa Cortez – CLV

David Bergh – VTN

The purpose of this memorandum is to document the above-mentioned meeting. Please notify David Bergh at 253-2367 for any revisions or corrections to these minutes.

This purpose of this meeting was to document and discuss Embarq utility conflicts with the proposed storm drain and sewer improvements. The following is a brief summary of the discussions at this meeting:

Conflict Resolution

- VTN wanted to discuss with Embarq the plans for relocating existing telephone lines that are in conflict at Whispering Sand Drive and Rainbow Boulevard and at Donald Nelson Drive and Rainbow Boulevard. VTN is proposing to, support in place, place above RCB, and concrete encase. Scott Gifford supports this design and does not have a problem this design.

Schedule

- The 100% Pre-Final Design is on schedule for submittal on 11/18/08.

Next Meeting

- If another meeting is needed it will be held after the 100% Pre-Final submittal
- VTN will submit copies of the 100% Pre-Final Plans to Embarq.

Distribution:

Attendees

Ken Gilbreth, VTN

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

C.2

Review Comment Matrices

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CCPW – Glenn S. Hale, P.E.

Documents: 90% Submittal Plans & Final Design Report

Date Reviewed: 8/18/08

Date Received: 8/18/08

Discipline: Design

Comment Number	Comment	Response	Implemented By
	GENERAL		
1.	The flows used in the storm drain design should be verified against the 2008 MPU.	Outside scope of work, 2008 MPU isn't approved yet	VTN – DAB
2.	The flow summary table from the 2004 MPA should be included, since the HEC-1 model doesn't identify which DARF value was selected for the concentration node used. A drainage map from the MPA study should be included which identifies the concentration node points.	DARF values will be added to Table in the drainage supplement. See MPA map in Appendix A	VTN – DAB
3.	It's unclear what was used as the downstream boundary condition in the WSPG storm drain model. The study should clarify what if any downstream starting water surface elevation was used.	The wspgw model was extended for enough downstream to negate the affects of a downstream starting water surface elevation.	VTN – DAB
4.	The Standard Form 6 calculation sheet for storm drain laterals shows negative differences in HGL verses grate elevation. The resulting weir discharge will have added by-pass flow to inlets downstream. The study should address this condition in subsequent calculations.	These inlets are within the grass-lined channel, bypassed flow is considered in inlet design and in Standard Form 6.	VTN – DAB
5.	The grate rim elevations should be included on the storm drain plan and profile sheets.	Agree, rim elevations added	VTN – DAB
6.	The flows summarized on the Drop Inlet Summary sheet at inlet ID's 23 (Sta. 61+37.71) and 24 (Sta. 63+28) don't appear to match what was entered into the WSPG model. This should be addressed.	Drop inlet sheet fixed	VTN – DAB
7.	It should be noted that the headwater depth at the entrance to the existing 6 barrel culvert at Grand Teton Drive may be higher than what was modeled in the HEC-RAS analysis when compared to a nomograph. In addition, the HEC-RAS modeled the culverts using "Energy only," for high flow which may account for the lower water surface elevation.	Noted	VTN – DAB
8.	Table 4.1.1 shows a flow of 1124 cfs in Grand Teton west of the golf course. Address why the NWNS Phase 2 shows 2534 cfs at this location when both analyses represent developed conditions with RFCF facilities in place.	Addressed in text of drainage supplement	VTN – DAB
9.	Section 6.5 of the report states that the 100-year D _x V criterion of less than 8 was used to size drop inlets. It should be noted that the 10-year dry lane criteria is often the deciding factor for drop inlet sizing and by exclusively using the 100-year D _x V criteria may cause future dry lane problems.	Agree, but 10 year hydrology not included in this contract, outside of scope of work.	VTN – DAB
10.	It is unclear why WSPG Station 6328.0 shows a flow depth of 5.24-ft using a Manning's of 0.012 and a flow depth of 7.504 using a Manning's of 0.013 and 0.015. Please explain the 2.3-foot lower WSE when comparing WSPG Files 6952-ULT-12.doc and 6952-ULT-13.doc.	There is a hydraulic jump upstream due to the increase in roughness coefficient.	VTN – DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CCPW – Glenn S. Hale, P.E.

Documents: 90% Submittal Plans & Final Design Report

Date Reviewed: 8/18/08

Date Received: 8/18/08

Discipline: Design

Comment Number	Comment	Response	Implemented By
11.	The total discharge labeled on the plan profile does not appear to match the WSPG models. Consider revising the WSPG model.	Discrepancy fixed	VTN – DAB
12.	It is unclear why WSPG CD card 2 (36-inch equivalent lateral), shows that 1 pier is added.	2 piers to be shown and modeled - pier equals number of pipes	VTN – DAB
13.	It is unclear why WSPG CD card 17 (8-inch equivalent lateral), shows that 1 pier is added. The location on the plan shows that two 18-inch laterals should be added. Note CD card 17 defines only one lateral at 1.5-ft diameter. Please consider revising the WSPG model.	2 piers to be shown and modeled - pier equals number of pipes	VTN – DAB
14.	It is unclear why WSPG CD card 18 (30-inch equivalent lateral), shows 1 pier is added. The location on the plan shows that two 30-inch laterals should be added at station 61+35.81. Note CD card 18 defines only one lateral at 2.5-ft diameter. Please consider revising the WSPG model.	WSPG revised	VTN – DAB
15.	It is unclear why WSPG CD card 3 (48-inch lateral), shows that 1 pier is added. The plans show that one 48-inch lateral is designed at this location.	This input is for how many pipes there are not piers. When using a box or rectangular channel this input is for piers, when using a pipe it is how many parallel pipes there are.	VTN – DAB
16.	It appears the lower HGL is plotted on the plan profile. For example, WSPG File 6952-ULT-15.doc shows a WSE of 2357.365-ft at Station 40+82.79 and the profile shows the HGL below 2356-ft at this location. Consider revising the profile to show worst case analysis.	N = 0.013 – Design conditions; N = 0.015 – Freeboard check; N = 0.012 – Velocity Check. HGL labeled using design conditions.	VTN – DAB
17.	The WSPG models do not represent the worst case hydrologic analysis utilizing the channel and lateral peak flow rates. Please consider providing a WSPG model that utilizes a worst case hydrologic scenario of the channel and lateral peak flows and revise design accordingly.	See comment no 16	VTN – DAB
18.	The site design should consider providing an equipment access point for maintenance for the proposed Rainbow Boulevard storm drain.	There is one located just downstream of connection to existing box at Elkhorn and just east of Rainbow. The open channel at the upstream end of the box can provide access as well.	VTN – DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CLV – Scott Chitwood

Documents: 90% Submittal Specifications & Plans

Date Reviewed: 8/18/08

Date Received: 8/19/08

Discipline: Construction Management

Comment Number	Comment	Response	Implemented By
	<u>SPECIFICATIONS</u>		
1.	<u>SP 636:</u> Please add section 636 in Special Provisions for Support of existing utilities.	636 was mistakenly left out, it will be in the next submittal	VTN – DAB
2.	<u>SP203-1:</u> Please change wording to “The cost of the excavation, including cemented soils and rock encountered shall be considered as incidental to the unit prices bid for pay items requiring excavation and no additional compensation will be allowed”.	Wording changed	VTN – DAB
	<u>PLANS</u>		
3.	<u>Sheet SD4:</u> Do we need to abandon in place existing SDMH in common area at approx. Sta. 41+60 RT.?	Yes, protect in place	VTN – DAB
4.	<u>Sheets SD4 thru SD6:</u> Misc. construction notes show fill ex. Grass lined channel, are we removing existing grass first and what are filling it with and how are we paying for it?	Channel no longer to be filled but lined with riprap instead	VTN – DAB
5.	<u>Sheet S9:</u> I believe the stations given at the End of Transition and Beginning of Transition are incorrect and should be 26+55.18 for the former and 25+55.18 for the latter.	Station fixed	VTN – DAB
6.	<u>Sheet SS7:</u> Please show CLSM to be class 2, 6” minimum for Sanitary Sewer Cap Detail.	Noted	VTN – DAB
7.	<u>Sheet R1 thru R5:</u> These sheets show the newly installed RCB's are 13' X 9', not 24' X 8'.	Discrepancy fixed	VTN – DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Date Reviewed: 8/8/08

Reviewer: CLV – John Day (Collection System Planning)

Date Received: 8/19/08

Documents: 90% Submittal Plans & Specifications

Discipline: Sewer

Comment Number	Comment	Response	Implemented By
	PLANS		
1.	<u>Sheet SD3:</u> Two ssmhs at Whispering Sands to be removed do not exist, never constructed.	Manholes deleted	VTN – DAB
2.	<u>Sheet SD4:</u> Note 4.2, add “see lateral 8 SD9”	Note fixed	VTN – DAB
3.	<u>Sheet SD4:</u> Note 4.8, change to “see lateral 12 SD10”	Note fixed	VTN – DAB
4.	<u>Sheet SD4:</u> Still indicating sewer lateral at sta 38+62.85?	Discrepancy fixed	VTN – DAB
5.	<u>Sheet SD11:</u> Lateral 19, separation under prop 30” greater than 1 foot	Noted	VTN – DAB
6.	<u>Sheet SD12:</u> Lateral 22 and 23, 6” min separation, project ex ss per DCSWCS SD-21	Noted	VTN – DAB
7.	<u>Sheet SS1:</u> First segment of 30” isn’t required, use 8”	8” used now	VTN – DAB
8.	<u>Sheet SS1:</u> Change all reference from CCSD to DCSWCS (typ)	Noted	VTN – DAB
9.	<u>Sheet SS1:</u> Revise sewer relocation alignment, change in direction must be 90 degrees maximum	Alignment completely changed to straight through design	VTN – DAB
10.	<u>Sheet SS1:</u> Manhole in Whispering Sands not necessary	Manhole deleted	VTN – DAB
11.	<u>Sheet SS1:</u> C905 or concrete encase ss over 60” water (10’ both sides)	C905 used	VTN – DAB
12.	<u>Sheet SS1:</u> 670’ max (for 30”) between manholes	Manhole added to meet required distances	VTN – DAB
13.	<u>Sheet SS1:</u> Existing laterals for parcels 125-14-201-006 and 125-15-604-004 need to be shown for reinstatement to new main	Approximate locations shown	VTN – DAB
14.	<u>Sheet SS2:</u> See comment 13 for apn 125-15-608-007	Approximate locations shown	VTN – DAB
15.	<u>Sheet SS2:</u> C905 acceptable also over 24” water	C905 used	VTN – DAB
16.	<u>Sheet SS2:</u> Profile note regarding detail for utility replacement over rcb doesn’t have sheet reference	Sheet reference added	VTN – DAB
17.	<u>Sheet SS4:</u> No drop for ssmh #11, provide ssmh adjacent and tie into 30” with 8” lateral	Drop manhole eliminated	VTN – DAB
18.	<u>Sheet SS4:</u> Change ssmh #11 inv in diameter from 18” to 10”	Discrepancy fixed	VTN – DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CLV – John Day (Collection System Planning)

Documents: 90% Submittal Plans & Specifications

Date Reviewed: 8/8/08

Date Received: 8/19/08

Discipline: Sewer

Comment Number	Comment	Response	Implemented By
19.	<u>Sheet SS4:</u> C905 to 10' both sides of sd lateral crossings	C905 now used	VTN – DAB
20.	<u>Sheet SS5:</u> See comment 19 where > 1' separations	Noted	VTN – DAB
21.	<u>Sheet SS5:</u> Separations shown are greater than actual, see laterals 17 and 18, sheet SD11	Actual distance now shown	VTN – DAB
22.	<u>Sheet SS6:</u> Make change in slope > 4% so T-Lock lining of manhole SS2 not required	Slope change to less than 4%	VTN – DAB
23.	<u>Sheet SS6:</u> Use C900 with DCSWCS SD-20 under rcb	C900 used	VTN – DAB
24.	<u>Sheet SS7:</u> Modify mh modification detail to match ex ssmh layout	MH modification changed to match	VTN – DAB
	<u>SPECIFICATIONS</u>		
25.	<u>SP 630.01.01:</u> Modify second paragraph for plural manholes	Spec changed	VTN – DAB
26.	<u>SP 630.04.01:</u> C900 and C905 pipe material also (typ)	Spec changed	VTN – DAB
27.	<u>SP 630.04.01:</u> 1 manhole adjustment required, add to work and payment	Added to spec	VTN – DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CLV – Eric Meyer

Documents: 90% Submittal Specifications & Plans

Date Reviewed: 8/18/08

Date Received: 8/19/08

Discipline: Traffic Engineering

Comment Number	Comment	Response	Implemented By
	GENERAL		
1.	The following 70% comment has not been addressed: 3. <i>Show the existing traffic signal, interconnect and streetlight conduit crossing at the Farm-Rainbow intersection on all applicable plan sheets. Be sure to note to protect in place or to replace as necessary. Refer to the attached improvements plans, CLV drawing No. 207y-4663-OSS, sheets 18 and 19, Belle Vista.</i> Conduits seem to have been added to the plans but still need to be labeled as to what they are.	Conduits now labeled	VTN – DAB
	SPECIFICATIONS		
2.	Add the following 70% to special provision section 107.07: “The contractor shall maintain a minimum of one travel lane in each direction at all times on Rainbow Blvd., Farm Road and Elkhorn Road for all work requiring lane closures.”	Paragraph added to specs	VTN – DAB
3.	Replace SP 628 with current version. The reference to TYPE I pavement marking film is no longer valid with the retirement of the RTC qualified products list. All pavement markings shall be per the NDOT QPL which is covered in the current SP 628.	Old spec replaced with the new spec	VTN – DAB
	PLANS		
4.	The existing paved roadway on Rainbow Blvd. between Farm Road and Whispering Sands is unnecessarily curvilinear (possible due to work done by separate projects) on what otherwise should be a straight segment of roadway. The plans currently show this same “curvilinear” geometry being replaced as part of the stormdrain construction. I do not believe it would be outside the scope of this project to replace the existing 2-lane road with a somewhat improved alignment; this segment is in Clark County, but I don’t think they would have a problem. Please advise.	Roadway has been improved	VTN – DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CLV – Jim Von Tobel

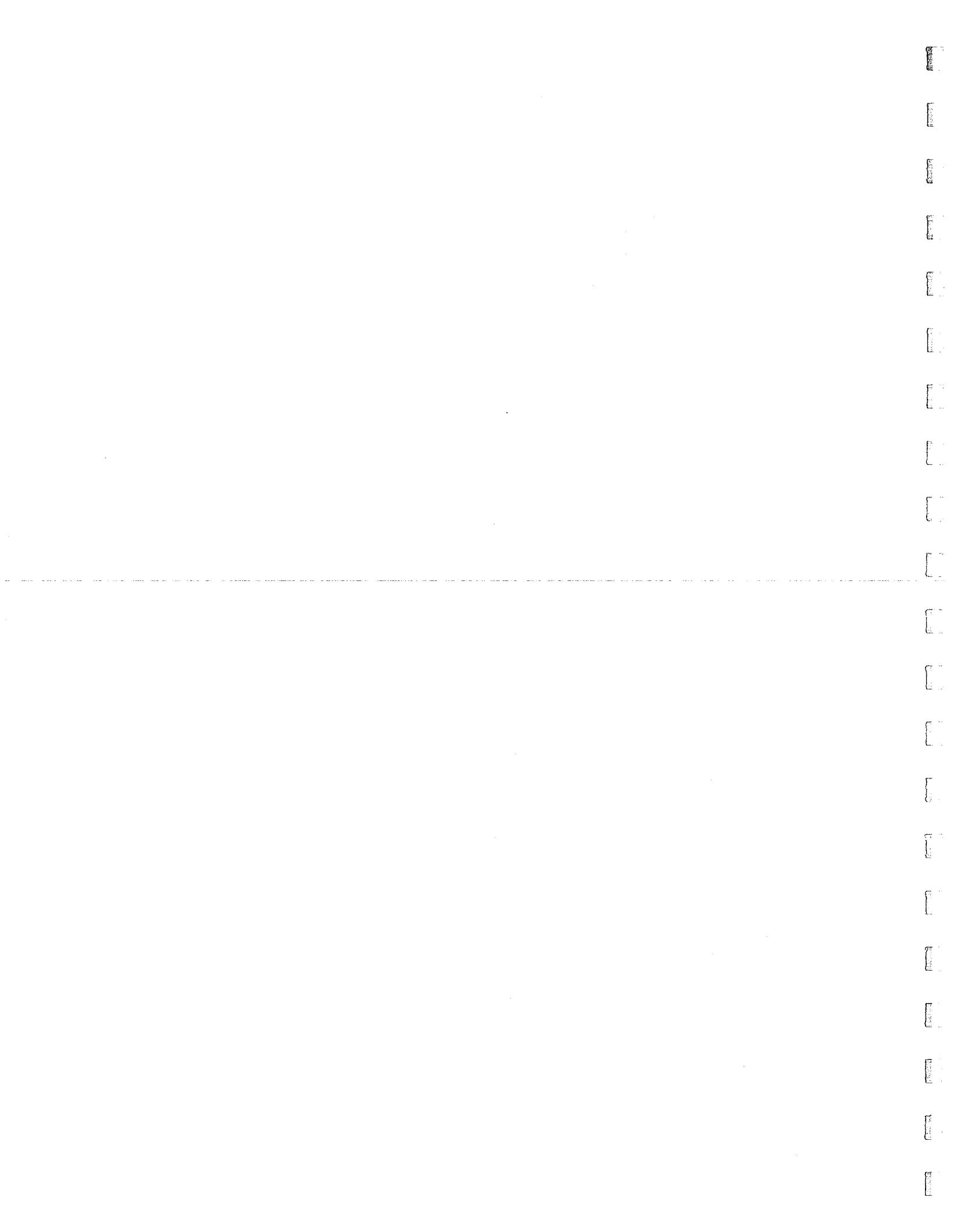
Documents: 90% Submittal Plans

Date Reviewed: 8/11/08

Date Received: 8/19/08

Discipline: Survey

Comment Number	Comment	Response	Implemented By
	PLANS		
1.	<u>Sheet HC1:</u> Basis of Bearing needs to be shown on plan (East centerline of Whispering Sands?) This is also required in order to create “WS” alignment.	Basis of Bearing now shown	VTN – JF
2.	<u>Sheet HC1:</u> Please show bearing and beginning stationing for “DN” alignment which is the centerline of Donald Nelson Drive, West of Rainbow	Basis of Bearing now shown	VTN – JF
3.	<u>Sheet HC1:</u> Change reference to sheet SC2 to HC2 at the match line. Same goes for sheet HC2	Discrepancy fixed	VTN – JF
4.	<u>Sheet HC2:</u> Please show bearing for center line of Farm, West of Rainbow. This needed to create “FR” alignment. Same needed for Elkhorn Road.	Bearing now shown, alignments created	VTN – JF



**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CCPW – Frank Shin, P.E.

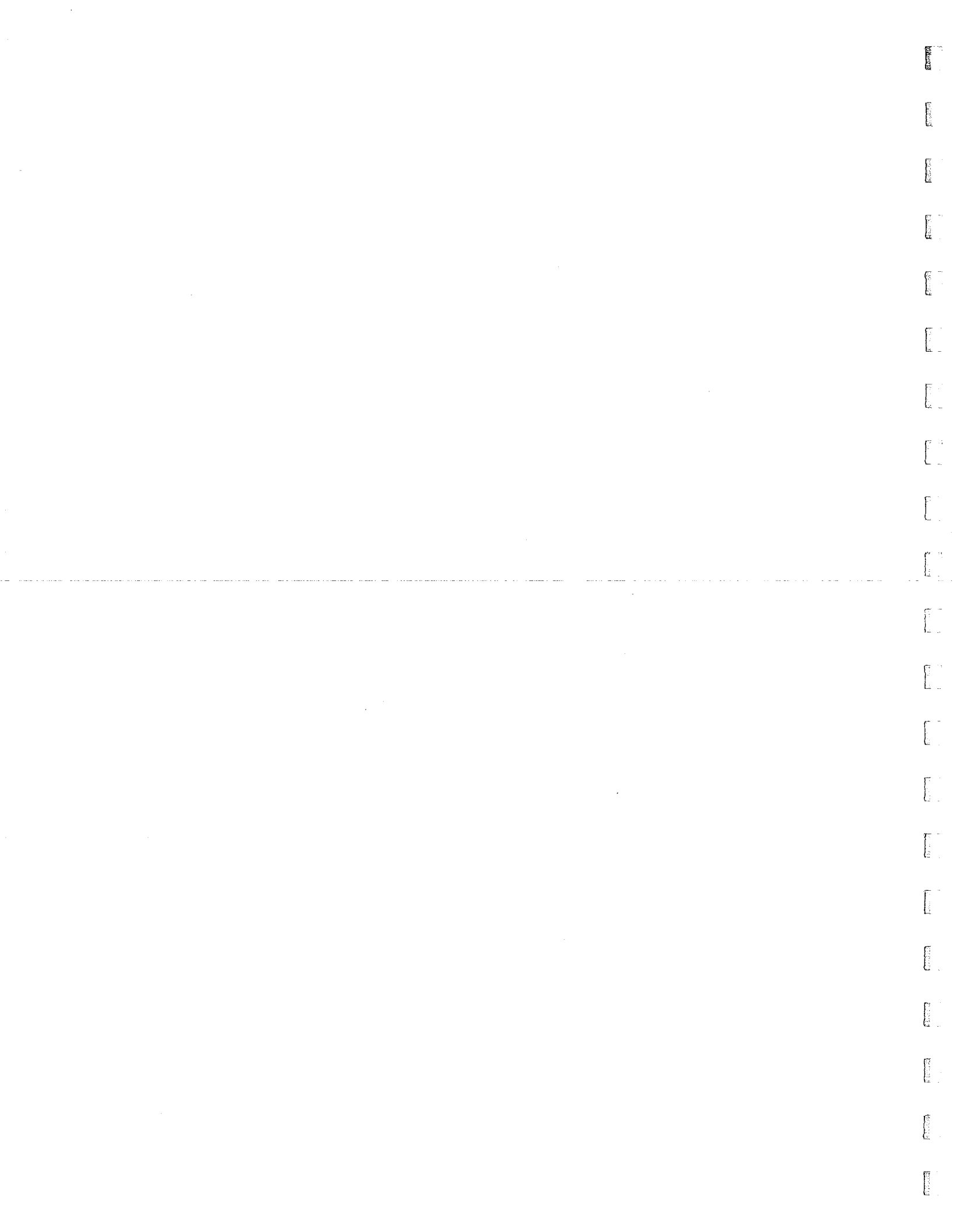
Documents: 90% Submittal Plans & Specifications

Date Reviewed: 8/26/08

Date Received: 8/26/08

Discipline: Design

Comment Number	Comment	Response	Implemented By
	PLANS		
1.	Sheet TYP1: Inconsistency found in the distances shown on the typical section for the trapezoidal channel. 50' easement and 46.40' are shown for the same distance on the left half of the channel and also 50' easement and 53.60' are shown for the same distance on the right half of the channel.	Discrepancy fixed	VTN – DAB
2.	Sheet TYP1: Missing distances on the left most and right most sides of said typical channel section.	Distances now shown	VTN – DAB
3.	Sheet SD3: Please locate the proposed drop inlets #3.8 and 3.9 a minimum 10' away from the PC/PT of future curb returns per USD #402 (typical comment where applicable).	These are field inlets only, cannot move 3.9 because of driveway. A stub will be left on 3.8 so future curb inlet can be constructed.	VTN – DAB
4.	Sheet SD4: For the proposed drop inlets #4.14, 4.16 and 4.18, see the comment on Sheet SD3.	These are interim field inlets	VTN – DAB
5.	Sheet SD5: For the proposed drop inlets #5.1, see the comment on Sheet SD3.	These are interim field inlets	VTN – DAB
6.	Sheet SD5: It appears that the existing grass lined channel is to be filled. Please clarify how the channel is to be filled. Please consider adding a plan and profile including fill elevations (grading plan), flow line grade and alignment, fill limits, fill materials, typical cross sections, etc if required.	Channel no longer filled, to be lined with riprap	VTN – DAB
7.	Sheet SD7: For the proposed drop inlet #7.4, see the comment on Sheet SD3.	Need 2 inlet at this location, limited because of curb space	VTN – DAB
8.	Sheet D5: Please clarify the location for the distance "min. distance = 1/2 of largest lateral pipe distance" indicated in the "Existing Manhole Lateral Pipe Connection Detail". Please consider giving a minimum distance (numerical value) instead of such wording.	Distance and Location to be shown	VTN – DAB
9.	Sheet D5: Please consider adding the spacing requirement "Min 10' to PC/PT of nearest Curb Return" to the "Ultimate Drop Inlet Connection Detail"	Noted	VTN – DAB
10.	Sheet D6: The County requires 30" min manhole access and 18" min storm drain. This sheet shows 24" manhole access and 12" min laterals. Please consider revising the sheet per County requirements if appropriate. This sheet should be called "Modified NDOT Type 4" with these changes.	Revisions made	VTN – DAB
11.	Sheet D6: Please consider adding the following Manhole Step Note: "The vertical distance between top of manhole and first step shall be a maximum of sixteen (16) inches. The vertical distance between invert of manhole and last step shall be a maximum of sixteen (16) inches. Steps shall be installed on the	Note added	VTN – DAB



**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CCPW – Frank Shin, P.E.

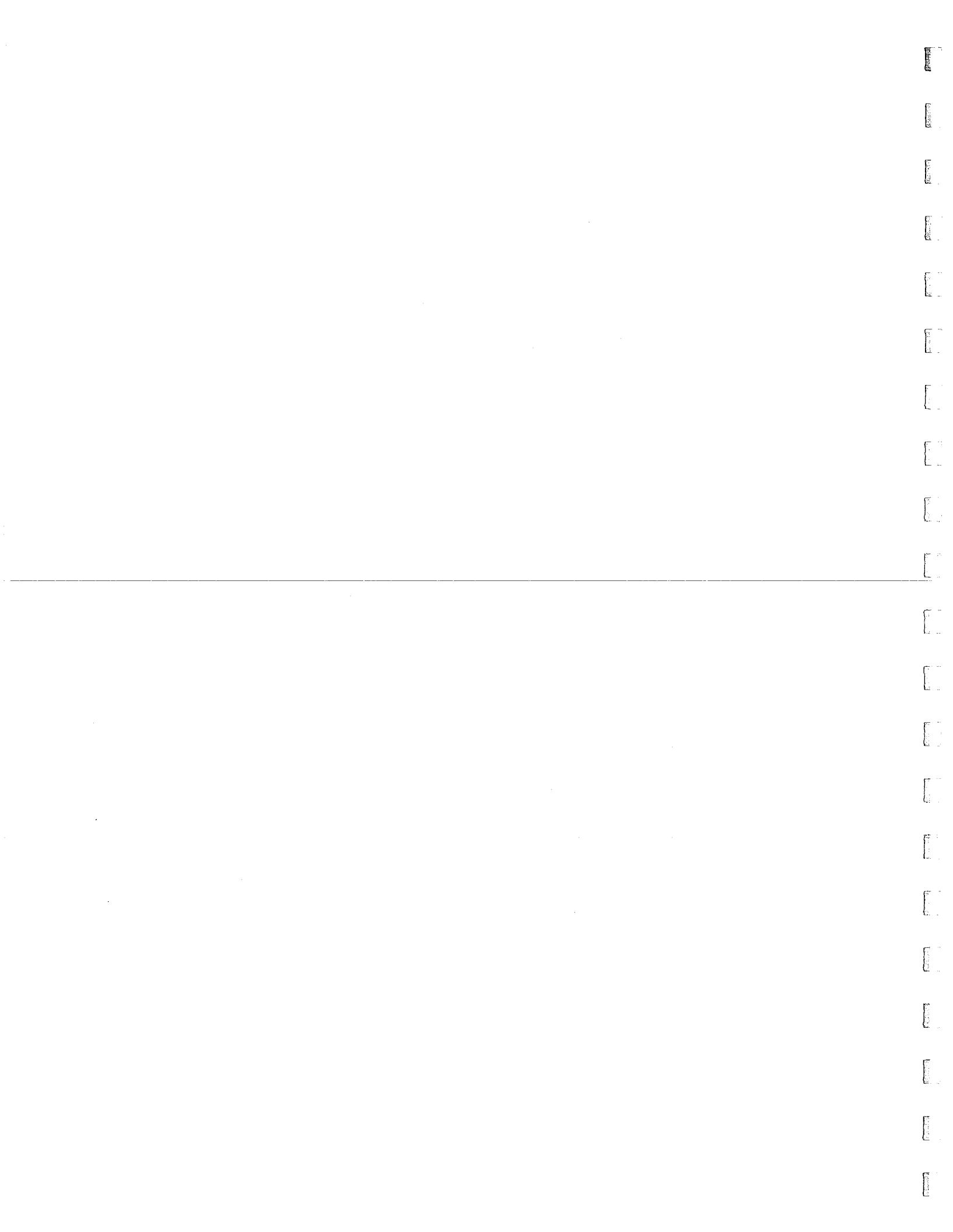
Documents: 90% Submittal Plans & Specifications

Date Reviewed: 8/26/08

Date Received: 8/26/08

Discipline: Design

Comment Number	Comment	Response	Implemented By
	upstream wall of the manhole near inflow main storm drain. No steps shall be installed directly above pipes. The horizontal clearance between steps and pipes shall be a minimum of twelve (12) inches."		
12.	<u>Sheet S10:</u> It appears that the proposed 24' x 8' RCB uses considerably more concrete than the NDOT Standard Double 12' x 8' RCB. The difference was estimated to be approximately 2,670 CY.	Cast-in-place - 24' x 8' uses 11,480 cyd Precast – 24' x 8' uses 12,760 cyd 2 - 12' x 8' uses 13,452 cyd Additionally one box is more hydraulically efficient	VTN – DAB
13.	<u>Sheet S10:</u> Please consider proposing the Double 12' x 8' RCB as an Alternate Bid Item to compare bid prices before project award.	There isn't a benefit of using 2 boxes	VTN – DAB
14.	<u>Sheet R1:</u> The dust control regulation requires a minimum of 32' wide AC pavement. The width of some AC pavements to be replaced appears to be less than 32' wide. Please discuss this issue and revise where necessary.	Pavement section will change and have a minimum of 32'	VTN – DAB
<u>SPECIFICATIONS</u>			
15.	<u>SP-100-4:</u> The remarks "Permit from Clark County Public Works" shown on the upper right-hand side of the page is misleading. The Encroachment Permit is issued by Clark County Development Services.	Text changed	VTN – DAB
16.	<u>SP-104-1:</u> The existing grass lined channel is proposed to be filled according to the plans. Please consider mentioning this work in Subsection 104.00, Location and Scope of Work, and provide necessary bid item(s) and specs if required.	No longer filling the channel, lining with riprap	VTN – DAB



**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: PBS&J – JDP / SJM / MN

Documents: 90% Submittal Plans, Specifications & Cost Estimate

Date Reviewed: 8/27/08

Date Received: 8/27/08

Discipline: Construction

Comment Number	Comment	By	Response	Implemented By
	<u>PLANS</u>			
1.	Nuisance is spelled incorrectly through out drawings (Nuisance)	JDP/SJM	Spelling Fixed	VTN/DAB
2.	<u>Sheet I2:</u> Sheet numbers are missing on all 58 sheets.	JDP/SJM	Sheet numbers added	VTN/DAB
3.	<u>Sheet I2:</u> HGL is not mentioned in the Abbreviations or sheets.	JDP/SJM	HGL added	VTN/DAB
4.	<u>Sheet I2:</u> GV, Gas Valve and WV Water Valve shown on the Abbreviations sheet are noted as GV Gate Valves on multiple sheets.	JDP/SJM	Discrepancy Fixed	VTN/DAB
5.	<u>Sheet HC1:</u> Verify City of Las Vegas (CLV) and Clark County (CC) are correct on every sheet?	JDP/SJM	Verified	VTN/DAB
6.	<u>Sheet HC1:</u> Match line should refer to HC2	JDP/SJM	Matchline fixed	VTN/DAB
7.	<u>Sheet HC2:</u> Match line should refer to HC1	JDP/SJM	Matchline fixed	VTN/DAB
8.	<u>Sheet HC2:</u> Clark County Boundary there are references to City Of Las Vegas ROW on this sheet.	JDP/SJM	Sheet checked and verified	VTN/DAB
9.	<u>Sheet HC2:</u> Clark County Boundary is shown at 37+46 and there are references to City Of Las Vegas ROW north of this station.	JDP/SJM	Sheet checked and verified	VTN/DAB
10.	<u>Sheet HC2:</u> Is the 55'(CLV) correct or should it be 50'(CLV) there is no curve data shown.	JDP/SJM	Correct per Book 111 Page 93 of Plats	VTN/DAB
11.	<u>Sheet TYP1:</u> Typical Trapezoidal channel, Drain rock should note Detail 3/S2.	JDP/SJM	Note fixed	VTN/DAB
12.	<u>Sheet TYP1:</u> "See Structural section below" should be at Left.	JDP/SJM	Section now shown below	VTN/DAB
13.	<u>Sheet TYP1:</u> 6" MIN type II compacted to MIN. 95% (typ.) both sides, consider adding	JDP/SJM	Noted	VTN/DAB
14.	<u>Sheet TYP1:</u> Structural section: Scarify 6" exposed native soil and recompact of 95% of MAX dry density per ASTM D-1557. Very hard to get.	JDP/SJM	90% now used per Geotech report	VTN/DAB
15.	<u>Sheet TYP1:</u> Typical Rectangular channel, Wall Drain and Drain rock should note Detail 1/S1 Type 1 or 2.	JDP/SJM	Note fixed	VTN/DAB
16.	<u>Sheet TYP1:</u> See Structural section below should be at Left.	JDP/SJM	Section now shown below	VTN/DAB
17.	<u>Sheet TYP1:</u> Hatchings don't match for same materials.	JDP/SJM	Because they are at a different scale	VTN/DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: PBS&J – JDP / SJM / MN

Documents: 90% Submittal Plans, Specifications & Cost Estimate

Date Reviewed: 8/27/08

Date Received: 8/27/08

Discipline: Construction

Comment Number	Comment	By	Response	Implemented By
18.	<u>Sheet TYP1:</u> Why type II / Why not fill.	JDP/SJM	Type II per Geotech report	VTN/DAB
19.	<u>Sheet TYP1:</u> Please state the specification addressed at the end of Note #4. It would read much easier/clearer if it read, "...placed per USS Section 203 and as modified in the Special Provisions" or similar verbiage.	MN	Wording changed	VTN/DAB
20.	<u>Sheet TYP1:</u> Notes: (2) PBS&J does not have GEOTEK report for this project	JDP/SJM	Geotech to be provided by Rosa Cortez	VTN/DAB
21.	<u>Sheet TYP1:</u> Notes: (3) Herbicide is payment in Tech Spec 637.03? Tech Spec section 637 does not mention Herbicide in General comments or payment.	JDP/SJM	Incidental to channel construction	VTN/DAB
22.	<u>Sheet TYP1:</u> Notes: (5) this note should not be on this page. Should be on sheet S1	JDP/SJM	Note changed	VTN/DAB
23.	<u>Sheet TYP1:</u> Typical Rectangular channel, Footing per structural details (typ). What sheet # and no detail specified. S7 shows 6" of concrete footer and 18" of Drain Rock. This does not match TYP1.	JDP/SJM	Discrepancy fixed	VTN/DAB
24.	<u>Sheet TYP1:</u> The end of note #3 should also state that the Herbicide needs to be applied per manufacturer's recommendations. Please add.	MN	Note added, herbicide is incidental to the channel construction	VTN/DAB
25.	<u>Sheets TYP1, SD1, SD3:</u> The beginning station shown for "SD1" does not match sheet SD1 and the ending station does not match sheet SD3. It appears that sheet TYP1 is incorrect. Also, there are no stations associated with the typical rectangular section. Please check/add.	MN	Stations fixed	VTN/DAB
26.	<u>Sheet TYP2:</u> Is there a reason the excavation for the RCB's is shown at a 1:1 slope?	MN	This is typical section	VTN/DAB
27.	<u>Sheet TYP2:</u> Paved area's show 2' of type II. On D4 it shows 13" of type II. Which is correct.	JDP/SJM	Two feet is for pavement section over a box and 13" is used for pavement not over the box	VTN/DAB
28.	<u>Sheet TYP2:</u> "Select or Granular Backfill compacted to 90% per ASTM D-1557" Is this needed and why not just use General embankment specification of 90% compaction for all details.	JDP/SJM	90% to be used per GEOTECH	VTN/DAB
29.	<u>Sheet TYP2:</u> How do you compact in the haunches under the SDRCP section details?	JDP/SJM	Contractor know how to do this	VTN/DAB
30.	<u>Sheet TYP2:</u> Scarify 6" exposed native soil and recompact of 95% of MAX dry density per ASTM D-1557. Very hard to get.	JDP/SJM	90% to be used per GEOTECH	VTN/DAB
31.	<u>Sheet TYP2:</u> Why not use General embankment material in place of the 6' of type II compacted to 95% of dry density per ASTM -1557? All details	JDP/SJM	GEOTECH requirement is Type II	VTN/DAB
32.	<u>Sheet TYP2:</u> "RCB details" NDOT specification with different detail.	JDP/SJM		VTN/DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: PBS&J – JDP / SJM / MN

Documents: 90% Submittal Plans, Specifications & Cost Estimate

Date Reviewed: 8/27/08

Date Received: 8/27/08

Discipline: Construction

Comment Number	Comment	By	Response	Implemented By
33.	<u>Sheet SD1:</u> There is no leader with reference to D3 Channel Identification sign.	JDP/SJM	They are located on the gates, refer to the detail sheets	VTN/DAB
34.	<u>Sheet SD1:</u> Legend, Undistinguishable shading on drawings SD1 thru SD3 for Riprap removal and Ext type II maintenance road.	JDP/SJM	Distinguishable on original copies	VTN/DAB
35.	<u>Sheet SD1:</u> It appears that the last sentence at "SD1" 14+26.86 should read, "SEE DETAIL A ON SHT. S1" as opposed to how it reads now. There is no additional information contained on sheet S3. Please check.	MN	Noted	VTN/DAB
36.	<u>Sheet SD3:</u> There is no leader with reference to D3 Channel Identification sign.	JDP/SJM	They are located on the gates, refer to the detail sheets	VTN/DAB
37.	<u>Sheet SD3:</u> In Abbreviations GV is gas valve, what kind of valves are these for all referenced drawing sheets.	JDP/SJM	Contractor to verify	VTN/DAB
38.	<u>Sheet SD3:</u> Missing Detail sheet # on profile all SD1-SD7 for all references.	JDP/SJM	Details #'s added throughout	VTN/DAB
39.	<u>Sheet SD3:</u> item 3.8 Lateral 4 is on SD8 not SD6	JDP/SJM	Discrepancy fixed	VTN/DAB
40.	<u>Sheet SD3:</u> item 3.17 Shouldn't this be SD1 sta in stead of a WS sta since the gate is on the channel?	JDP/SJM	Previous submittal comment wanted roadway stationing	VTN/DAB
41.	<u>Sheet SD3:</u> item 3.19 should be a SD1 sta. or a WS sta. and does not match stations on the "channel ladder location schedule on D2.	JDP/SJM	Previous submittal comment wanted roadway stationing	VTN/DAB
42.	<u>Sheet SD3:</u> item 3.20 should be a SD1 sta. or a RB sta. and does not match stations on the "channel ladder location schedule on D2. which sta. are appropriate?	JDP/SJM	Previous submittal comment wanted roadway stationing	VTN/DAB
43.	<u>Sheet SD3:</u> Missing 6' fence at gate 3.13 towards SD1.	JDP/SJM	Discrepancy fixed	VTN/DAB
44.	<u>Sheet SD3:</u> Missing 6' fence at gate 3.17 towards Rainbow BLVD.	MN	Discrepancy fixed	VTN/DAB
45.	<u>Sheet SD3:</u> What is the size of the property entrance authorizations? Please add stationing or state size of each.	JDP/SJM	Refer to Final Design Report for AEP info	VTN/DAB
46.	<u>Sheet SD4:</u> ... item 4.1 NDOT type "2" DI or "2A",	JDP/SJM	All inlets will be changed to type 2	VTN/DAB
47.	<u>Sheet SD4:</u> Item 4.3 NDOT type "2" DI or "2A" as per Lateral 7 on SD9.	JDP/SJM	All inlets will be changed to type 2	VTN/DAB
48.	<u>Sheet SD4:</u> item 4.4 station connection is detailed 33+87.61 and 33+87.64 on SD12. RB sta # is 45' LT, but Lateral 25 on SD12 shows it at 22.6 LT. Which is correct.	JDP/SJM	45' LT	VTN/DAB
49.	<u>Sheet SD4:</u> item 4.8 lateral 10 on SD9 should be lateral 12 on SD10.	JDP/SJM	Discrepancy fixed	VTN/DAB



**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: PBS&J – JDP / SJM / MN

Documents: 90% Submittal Plans, Specifications & Cost Estimate

Date Reviewed: 8/27/08

Date Received: 8/27/08

Discipline: Construction

Comment Number	Comment	By	Response	Implemented By
50.	<u>Sheet SD4:</u> item 4.11 FR 18+57.92 should be 19+57.92 on SD4 and lateral 11 on SD10.	JDP/SJM	Discrepancy fixed	VTN/DAB
51.	<u>Sheet SD4:</u> item 4.14 FR 19+96.83 is RCP tie in or DI location also on lateral 9 on SD10 station appears to be wrong..	JDP/SJM	Discrepancy fixed	VTN/DAB
52.	<u>Sheet SD4:</u> item 4.16 FR 20+22.44 is RCP tie in or DI location also on lateral 9 on SD10 station appears to be wrong.	JDP/SJM	Discrepancy fixed	VTN/DAB
53.	<u>Sheet SD4:</u> It would be helpful not to trim the digit "1" from station 18+00 on Farm Road	MN	Station fixed	VTN/DAB
54.	<u>Sheets SD4, SD9, SD10:</u> Please reverse the views of laterals 10 and 12 so that 4.12 and 4.13 are shown on the left (similar to lateral 7) as viewed on sheet SD4. It seems odd to change the direction of the various views. Is there a reason for this?	MN	Laterals reversed	VTN/DAB
55.	<u>Sheet SD6:</u> No abbreviation for PE on sheet 12.	JDP/SJM	Abbreviation added	VTN/DAB
56.	<u>Sheet SD6:</u> item 6.2 RB sta. does not match the RB sta detail for the type 8 drop inlet lateral 15 on SD10.	JDP/SJM	Discrepancy fixed	VTN/DAB
57.	<u>Sheet SD6:</u> item 6.2 CL to CL of the HERCP is 2.38'. In order to build detail on S12, CL to CL will need to be a min of 3'.	JDP/SJM	Drawing fixed	VTN/DAB
58.	<u>Sheet SD6:</u> item 6.3 verify that new 18" RCP is accurate. Is it 14 x 23 HERCP instead?	JDP/SJM	It's a 14" x 23" HERCP, Discrepancy fixed	VTN/DAB
59.	<u>Sheet SD6:</u> item 6.6 RB sta 144+25.38 does not match Detail RB sta for lateral 14 on SD10.	JDP/SJM	Discrepancy fixed	VTN/DAB
60.	<u>Sheet SD6:</u> item 6.6 What do you do with the existing 18" SD heading to the west not shown on SD10 Lateral 14. No note to protect in place.	JDP/SJM	Construction note added, protect in place	VTN/DAB
61.	<u>Sheet SD6:</u> Removal item R-2 is there is no SDMH to be removed.	JDP/SJM	Discrepancy fixed	VTN/DAB
62.	<u>Sheet SD7:</u> item 7.2 SDMH #18 does not match lateral 22 on SD12.	JDP/SJM	Discrepancy fixed	VTN/DAB
63.	<u>Sheet SD7:</u> item 7.14 SDMH #19 does not match lateral 22 on SD12. may be switched per lateral 22, and lateral 24 on SD12.	JDP/SJM	Discrepancy fixed	VTN/DAB
64.	<u>Sheets SD7, S10:</u> The profile view of the RCB appears to show the bottom and top slabs to be the same thickness upstream of the end transition as well as the transition itself. This is inconsistent with Sections A and B shown on sheet S10. Please check.	MN	Discrepancy fixed	VTN/DAB
65.	<u>Sheets SD7, SD12:</u> Please reverse the views of laterals 21, 22, and 23 so that 7.7, 7.1, and 7.4 are shown on the left (similar to lateral 7) as viewed on sheet SD7.	MN	Laterals reversed	VTN/DAB

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83.	<u>Sheet D4:</u> Typical Roadway Section: Prime Coat is not required per 406.01.01.	JDP/SJM	Prime coat removed because of thickness of pavement	VTN/DAB
84.	<u>Sheet D4:</u> Please show a detail face on of the "Typical RCP Straight Connection Collar Detail" similar to the one shown in the "Brick and Mortar RCP End Plug Detail"	MN	Detail face added	VTN/DAB
85.	<u>Sheet D4:</u> In the Riprap Detail, what exactly is "sandy gravel"? Please explain. Type II is often used under riprap.	MN	Bedding that is commonly used	VTN/DAB
86.	<u>Sheet D5:</u> Please consider adding an inch of sand or dirt between the RCB and utility & encasement as a bond breaker. Do you really want the utility directly on the box culvert?	MN	Contractor usually places an epoxy bondbreaker on top of the box	VTN/DAB
87.	<u>Sheet S1:</u> Slab Opening Detail, Additional bars. Are these to be #6 bar or more of the specified bars?	JDP/SJM	The size of the additional bars that provide 1/2 the area interrupted by the opening match the size of the bars that were interrupted.	R2H/DA
88.	<u>Sheet S1:</u> Footer detail from Typ1, is this the sheet that should have the footer detail?	JDP/SJM	R2H	R2H/DA
89.	<u>Sheet S1:</u> Post Mounting Detail: Consider CIP embedment as Drilling may damage structural rebar.	JDP/SJM	The anchors are located 1 1/4" each side of the centerline of the wall. At this position they fall well inside reinforcement placed on each face of the wall preventing damage to the wall reinforcement.	R2H/DA
90.	<u>Sheet S1:</u> For ease of Construction specify Rebar Lap Splices.	JDP/SJM	The required lap lengths are specified by General Note 8 on sheet S1. Shop drawings will be prepared for each segment and required lap lengths are included in the shop drawings.	R2H/DA
91.	<u>Sheet S1:</u> In the Expansion Joint, Section at Bottom Slab detail, are the variable thicknesses shown anywhere? Where does it state whether the slab gets one or two mats of rebar? It appears that there are only four of these on the project and all have one mat of rebar and a thickness of 7". Please check/consider.	MN	The expansion joint section is a typical detail utilized at various locations. The thickness of the bottom slab on each side of the joint as well as the reinforcement in each section is shown in the structural sections for the elements located on each side of the joint.	R2H/DA
92.	<u>Sheet S1:</u> In the Post Mounting Detail, please consider adding a requirement for minimum exposed thread length, similar to the minimum embedment length.	MN	A minimum exposed length for the post anchor bolts has been added.	R2H/DA
93.	<u>Sheet S2:</u> Longitudinal cut-off wall detail: Font size for 10 3/8, 1' is a bucket width.	JDP/SJM	The 10 3/8" dimension provides horizontal clearance between the cutoff wall and the angle point in the channel lining. This allows the channel lining to expand freely in the transverse direction and reduces cracking in the channel lining.	R2H/DA

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94.	<u>Sheet S2</u> : Longitudinal cut-off wall detail: Consider turning down structural steel.	JDP/SJM	Allowing the channel lining to move independently at the joint between the lining and the cutoff wall reduces cracking in the lining. Placing reinforcement through the joint would prevent the free movement.	R2H/DA
95.	<u>Sheet S2</u> : Slab control joint detail: formed groove have clear distance at rebar?	JDP/SJM	Clear distances are shown for the reinforcement in the various sections and the depth of the groove is shown. The clear distance at the groove is set by these distances	R2H/DA
96.	<u>Sheets SD5, S9</u> : Please rearrange the naming of the three Section views through the transition form trapezoidal channel to box culvert so that "A" is on the left and "C" is on the right. In addition, please rearrange the Wall Section details on S9 to have the lowest station (upstream) view on the top of the sheet and the highest station at the bottom.	MN	The sections have been rearranged.	R2H/DA
97.	<u>Sheet S6</u> : Please consider reversing the order of the various Wall Sections so that they have the lowest station on the top of the page and the highest station at the bottom. The same concept applies to the "Sections at Transition Channel" drawings on the right side of sheet S9.	MN	The sections have been rearranged.	R2H/DA
98.	<u>Sheet S7</u> : Section 1/S7, "wall drain cast in wall" should this be 1/S1 or is 2/S1 correct?	JDP/SJM	Detail reference has been corrected to 1/S1.	R2H/DA
99.	<u>Sheet S7</u> : Wall drain 15' OC per 1/S1 instead of 20' OC.	JDP/SJM	Spacing has been correct to 15' OC.	R2H/DA
100.	<u>Sheet S7</u> : Section A: Why no 6" section of type II?	JDP/SJM	6" of type II is now shown in the sections.	R2H/DA
101.	<u>Sheet S10</u> : Why no Scarify and Recompact existing Native to 95% compaction?	JDP/SJM	R2H	R2H/DA
102.	<u>Sheet S10</u> : It appears that Section C/S10 is missing the width toe wall. The reinforcing shown in the same toe wall does not seem to be specified. Please add/check.	MN	The reinforcement and dimensions for the toe wall are provided in the expansion joint detail A/S1.	R2H/DA
103.	<u>Sheet S10</u> : It appears that Section D/S10 is missing the specific reinforcing shown in the toe wall. Please add/check.	MN	The reinforcement and dimensions for the toe wall are provided in the expansion joint detail A/S1.	R2H/DA
104.	<u>Sheets S11, S12, SD6, SD7, SD12</u> : I didn't notice the Sections or details shown on S11 or S12 on either SD6, SD7 or SD12. Isn't that where they should also be addressed? The two "S" sheets address notes on SD6 and SD7. It appears that the note on sheet S12 should refer to construction note 6.2 rather than note 6.1. Please consider adding/check.	MN	The note on sheet S12 has been corrected to refer to construction note 6.2.	R2H/DA

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105.	<u>Sheet SS1:</u> SSMH #1, RB Sta. 112+35.05 is shown graphically at 112+65.	JDP/SJM	Discrepancy fixed	VTN/DAB
106.	<u>Sheet SS1:</u> Street names are missing. The street names are on all other drawings why not on SS1?	JDP/SJM	Street names added	VTN/DAB
107.	<u>Sheet SS1:</u> Does the existing 24" SS tie in to the new SSMH #2? Show connection on the Profile. If so then the existing 24" should be "Protect in Place"	JDP/SJM	MH being replaced	VTN/DAB
108.	<u>Sheet SS1:</u> Why not connect the new SS to the Existing SSMH to be removed? This would save a SSMH and Line.	JDP/SJM	SS alignment changed to different alignment	VTN/DAB
109.	<u>Sheet SS1:</u> What is the line west of SSMH #5 and does it tie into the new SSMH#5? If it does not tie into SSMH #5 can this MH be deleted?	JDP/SJM	It is an existing 24" sewer that is being replaced	VTN/DAB
110.	<u>Sheet SS1:</u> Shows 30" SS removal but has not Bid item on QTY list	JDP/SJM	Discrepancy fixed	VTN/DAB
111.	<u>Sheet SS2:</u> SSMH #14, SSMH #15 and SSMH #7, Do not match stations per detail on SS6.	JDP/SJM	Stations checked	VTN/DAB
112.	<u>Sheet SS2:</u> Profile, SD1 33+87.61 is shown as 30" RCP on SD4 it is shown as 24" RCP. Which is correct?	JDP/SJM	Size checked	VTN/DAB
113.	<u>Sheet SS2:</u> Profile, SD1 40+15.00 is shown as 30" RCP on SD4 it is shown as 24" RCP. Which is correct?	JDP/SJM	Size checked	VTN/DAB
114.	<u>Sheet SS2:</u> Middle in title block is spelled wrong.	JDP/SJM	Spelling fixed	VTN/DAB
115.	<u>Sheet SS2:</u> SS1 23+07.19 on profile has an 8" invert elevation. Where is this line and what is this line?	JDP/SJM	8" removed	VTN/DAB
116.	<u>Sheet SS2:</u> SS1 23+07.19 SSMH #8. Does the 24" existing SS have to be removed or can it be capped and abandoned in place?	JDP/SJM	Yes it has to be removed	VTN/DAB
117.	<u>Sheet SS2:</u> SS2 on Royal Stallion Court- The clearance of the 8" SS under the RCB may not be correct? Can the 8" be dropped	JDP/SJM	Clearance checked	VTN/DAB
118.	<u>Sheet SS2:</u> SS2 on Royal Stallion Court- The 8" SS is shown to have a concrete cap on sheet SD4, but on Sheet SS2 there is no concrete cap called for. ?	JDP/SJM	Concrete cap removed	VTN/DAB
119.	<u>Sheet SS4:</u> Connect EX 10" SS to new 60" SDMH. Should be corrected to read new 60" SSMH.	JDP/SJM	Discrepancy fixed	VTN/DAB
120.	<u>Sheet SS4:</u> SSMH #11 profile shows an 18" invert elevation tie in. Is this 18" or 10" ? Invert needs to be shown graphically on profile.	JDP/SJM	10", Discrepancy fixed	VTN/DAB
121.	<u>Sheet SS4:</u> Profile: SS1 42+70.35 is shown graphically at 1' clearance and Mathematically is calculated to 0.10' of clearance.	JDP/SJM	Clearance checked	VTN/DAB

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122.	<u>Sheet SS4:</u> Profile: SS1 49+97.75 is shown graphically at 1' clearance and Mathematically is calculated to 0.54' of clearance.	JDP/SJM	Clearance checked	VTN/DAB
123.	<u>Sheet SS4:</u> Shows 10" SS removal but has not Bid item on QTY list		This will be added to bid abstract	VTN/DAB
124.	<u>Sheet SS5:</u> 30" SS: Leader is in the wrong place? Looks like it is pointing to the curb and gutter.	JDP/SJM	Discrepancy fixed	VTN/DAB
125.	<u>Sheet SS5:</u> 30" SS: Leader is in the wrong place? Looks like it is pointing to the curb and gutter.	JDP/SJM	Discrepancy fixed	VTN/DAB
126.	<u>Sheet SS5:</u> Profile: SS1 47+72.19 is shown graphically at 1.00' clearance and Mathematically is calculated to 0.55' of clearance.	JDP/SJM	Clearance checked	VTN/DAB
127.	<u>Sheet SS6:</u> Royal Stallion Court, Has no Station #'s on it.	JDP/SJM	Stationing added	VTN/DAB
128.	<u>Sheet SS6:</u> Royal Stallion Court Profile does not show or refer to the 8" SS having a concrete cap as per sheet SD4	JDP/SJM	No concrete cap, using C900 pipe	VTN/DAB
129.	<u>Sheet SS6:</u> Royal Stallion Court Profile calculation are incorrect. They need to be re-calculated.	JDP/SJM	Profile to be recalculated	VTN/DAB
130.	<u>Sheet SS6:</u> Royal Stallion Court Sanitary Sewer is called (SS2) on sheet SS2 the Sanitary Sewer is called (SS1) which is correct.	JDP/SJM	Discrepancy fixed	VTN/DAB
131.	<u>Sheet SS6:</u> Profile "SS2" 1+64.17 has two 8" invert elevations at SSMH #14. One of them should be invert out which one?	JDP/SJM	Invert fixed	VTN/DAB
132.	<u>Sheet SS6:</u> 24' x 8' RCB is shown in inches not feet in the profile.	JDP/SJM	Discrepancy fixed	VTN/DAB
133.	<u>Sheet SS7:</u> Details on this page are not mentioned on sheets SS1 - SS6	JDP/SJM	Noted	VTN/DAB
134.	<u>Sheet R1:</u> Sign, the extra sign near 118+85 has no leader, is this sign to be protected in place or removed and replaced as the others?	JDP/SJM	Protect in place	VTN/DAB
135.	<u>Sheet R2:</u> Signs, the signs between 19+00 and 20+00 have no leaders, are these signs to be protected in place or removed and replaced as the others on R1 and T1?	JDP/SJM	Protect in place	VTN/DAB
136.	<u>R sheets:</u> Plan sheets R1 thru R5 call for AC removal and replacement but does not address the need for any type II under the new AC. Should this be included/mentioned? Is it known if there is existing type II under the asphalt now?	MN	Type II will be used under new pavement	VTN/DAB
137.	<u>Sheet T2:</u> Should the call outs at stations 124+78.53 and 124+80.54 state "END" rather than "BEGIN"? Please check.	MN	Discrepancy fixed	VTN/DAB
138.	<u>Sheet T2:</u> Please show stationing on Farm Road.	MN	Stationing added	VTN/DAB

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139.	<u>Sheets T-1 – T-5:</u> Hard to verify the Reflective Raised pavement markers	JDP/SJM	Calculated using a spreadsheet	VTN/DAB
140.	<u>Sheets T-1 – T-5:</u> Hard to verify the Non-Reflective Raised pavement markers	JDP/SJM	Calculated using a spreadsheet	VTN/DAB
141.	The CPM schedule was built with the assumption that a detour (or detours) will be constructed within the ROW for traffic during the various work stages.	MN	Noted	VTN/DAB
<u>SPECIFICATIONS</u>				
142.	<u>100.02.01:</u> Applicable Sections: 108.03 on page SP-100-2 should read 108.03.01 and 108.03 on page SP-100-3 should read 108.03.02	JDP	Change made	VTN/DAB
143.	<u>100.02.02:</u> Applicable Sections: 108.03 should read 108.03.02.	JDP	Change made	VTN/DAB
144.	<u>100.02.03:</u> Applicable Sections: 108.03 should read 108.03.02. 212, 213, 210, 603.03.06, 623 G.01.01, 106.08, 203.03.71, 107.14, 692.03.04, 695.02.01 are not in the special provisions. Should reference Blue book?	JDP	To discuss at B & C meeting 12/2/2008	VTN/DAB
145.	<u>100.02.04:</u> Applicable Sections: 704, 272, 271, 424, 403, 403-2, 570, 623, 690.01.03, 691.01.06, 695.02.01 and 692.03.04 are not in the special provisions. Should reference Blue book?	JDP	To discuss at B & C meeting 12/2/2008	VTN/DAB
146.	<u>100.02.05:</u> Applicable Sections: 108.03 should read 108.03.06, 108.03.04 and 108.03.05 respectively.	JDP	Changes made	VTN/DAB
147.	<u>100.02.06:</u> Applicable Sections: 690.01.03, 687.01.06 and 692.03.04 are not in the special provisions. Should reference Blue book?	JDP	To discuss at B & C meeting 12/2/2008	VTN/DAB
148.	<u>101.13, 101.16, 101.59:</u> Please consider adding the verbiage from the Special Provisions to the existing definitions, as opposed to replacing them.	MN	To discuss at B & C meeting 12/2/2008	VTN/DAB
149.	<u>103:</u> I was not able to find the "INSTRUCTIONS TO BIDDERS" contained within the Bid Documents. Did I miss something? Please check.	MN	To discuss at B & C meeting 12/2/2008	VTN/DAB
150.	<u>104:</u> In the 3rd paragraph, line 1 it appears that the verbiage should be changed from "at the following the locations" to "at the following locations". Please check.	MN	Changes made	VTN/DAB
151.	<u>105.03:</u> Spelling error should read: "Add the following to this subsection"	JDP	Changes made	VTN/DAB
152.	<u>105.04:</u> In the first line, it appears that the comma should be after the word "Work" and not after the word "Phase". Please check.	MN	Changes made	VTN/DAB

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153.	105.06: Fourth paragraph should read stations as: Storm drain stations: SD3 - 27+25, SD3 - 27+50, SD4 - 34+40, SD4 - 36+10, and SD6 - 58+20. Seventh paragraph should read stations as: storm drain stations: SD3 - 27+25, SD3 - 27+50 and SD4 - 24+60. Tenth paragraph should read as: Storm drain stations: SD4 - 34+50, SD4 - 35+30 and SD4 - 36+15. Thirteenth paragraph should read as: Storm drain alignment at SD3 - 27+20. Sixteenth paragraph should read as: Storm drain mainline at SD4 - 40+40. Twentieth paragraph should read as: Storm drain mainline at SD4 - 40+45.	JDP	Changes not made, stations are correct as are	VTN/DAB
154.	107.07: Please consider changing the word "Owner" to "Engineer" in the last sentence of this section.	MN	Changes made	VTN/DAB
155.	108.03: Please consider adding the word "within" between "submitted" and "14" in the third paragraph, similar to the first sentence of 108.03.02.	MN	Changes made	VTN/DAB
156.	108.03.01: Should 3.5 floppy disk be deleted and leave "single-write compact disk."?	JDP	Changes made	VTN/DAB
157.	108.71: First paragraph should read as: per Section 105.04 of the Special Provisions.	JDP	Changes made	VTN/DAB
✓ 158.	110.70: Last paragraph: Should Clark County and/or consultant inspector and inspections be added?	JDP	To discuss at B & C meeting 12/2/2008	VTN/DAB
159.	201.05.01: Since this Special Provision only adds two paragraphs to the existing USS Section 201, I don't understand why there is a statement that reads, "...and shall conform to the requirements of subsection 201.05.01..." Shouldn't the work conform to the entire Section of USS 201? Isn't that implied by the Special Provision only adding two paragraphs? The subsection referenced in 201.05.01 is 201.05.01 - this does not seem correct. Please consider eliminating the words "and shall conform to the requirements of subsection 201.05.01"	MN	Changes made	VTN/DAB

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160.	<u>202.05.01:</u> Since this Special Provision only adds several paragraphs to the existing USS Section 202, I don't understand why there is a statement that reads, "...and shall conform to the requirements of subsection 202.05.01..." Shouldn't the work conform to the entire Section of USS 202? Isn't that implied by the Special Provision only adding several paragraphs? The subsection referenced in 202.05.01 is 202.05.01 - this does not seem correct. Please consider eliminating the words "and shall conform to the requirements of subsection 202.05.01" in each of the three paragraphs where used.	MN	Changes made	VTN/DAB
161.	<u>203.03.70:</u> Sentence starting with "Unless otherwise provided in the Special Provisions," This should be specified in 203.05.01	JDP/SJM	To discuss at B & C meeting 12/2/2008	VTN/DAB
162.	<u>203.03.71:</u> Should a phone number be listed in addition to the fax number? Please consider.	MN	To discuss at B & C meeting 12/2/2008	VTN/DAB
163.	<u>Section 206:</u> Section 206 is missing, but referenced in the Table of Contents.	JDP	206 Removed	VTN/DAB
164.	<u>208.02.10:</u> It appears that this subsection should be in a Special Provision for USS Section 207. Please check.	MN	To discuss at B & C meeting 12/2/2008	VTN/DAB
165.	<u>Section 216:</u> Section 216 is missing, but referenced in the Table of Contents.	JDP	216 Removed	VTN/DAB
166.	<u>302.04.01:</u> Subsection 302.04.01 Needs to be cleaned up to match 502.	JDP/SJM	Noted	VTN/DAB
167.	<u>302.04.01:</u> Subsection 302.04.01 Does this include all of the channel as in 502?	JDP/SJM	No, channel Type II is incidental to the channel construction	VTN/DAB
168.	<u>302.05.01:</u> Subsection 302.05.01 should read 302.04.01?	JDP	Changes made	VTN/DAB
169.	<u>402.05.01</u> Subsection 402.05.01 Does not mention the Seal Coat.	JDP	Changes made	VTN/DAB
170.	<u>402.05.01:</u> Subsection 402.05.01 should read 402.04.01. Should payment be per Ton or Square yard?	JDP	Square yard	VTN/DAB
171.	<u>Section 403:</u> Section 403 is missing, but referenced in the Table of Contents	JDP	403 Removed	VTN/DAB
172.	<u>405.04.01:</u> Shouldn't this read "Delete and Replace with the following"?	JDP	Changes made	VTN/DAB
173.	<u>405.05.01:</u> Shouldn't this read "Delete and Replace with the following"?	JDP	Changes made	VTN/DAB
174.	<u>406.02.01:</u> Shouldn't this read "Delete and Replace with the following"?	JDP	Section removed	VTN/DAB

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175.	<u>406.04.01:</u> Shouldn't this read "Delete and Replace with the following" ?	JDP	Section removed	VTN/DAB
176.	<u>406.05.01:</u> Shouldn't this read "Delete and Replace with the following" ?	JDP	Section removed	VTN/DAB
177.	<u>407.02.01:</u> Missing paragraph. 407.04.01 Measurement " No Direct measurement will be made for Seal Coat"	JDP	Changes made	VTN/DAB
178.	<u>501.03.15:</u> The section doesn't say much about the equipment to be used for tamping and vibrating. Please consider adding verbiage to address this.	MN	This is typically up to the contractor the goal is to reach a certain compaction percentage not discuss how the contractor goes about reaching the required compaction	VTN/DAB
179.	<u>502.03.27:</u> In line 2 of the second paragraph, it appears that the word "intestate" should be replaced with "interstate". Please check.	MN	Changes made	VTN/DAB
180.	<u>502.05.01:</u> All Excavation and Type II Aggregate is this covered under 302.05.01? Or are they separate items?	JDP/SJM	No direct measurement of Type II will be taken as its considered incidental to the construction of the structure	VTN/DAB
181.	<u>502.05.01:</u> Pay items: 502.05 should read "Transition Structure SD3 25+55.18 to SD3 26+55.18". 502.06 should read "Transition Structure SD7 60+00.00 to SD7 66+18.22". 502.07 should read "Channel Maintenance Ramp SD1 14+97.34 to SD2 16+26.69"	JDP	NO	VTN/DAB
182.	<u>610.01.01:</u> It appears that the second paragraph written in the Special Provision should have the words "Add the Following to this Section" or similar verbiage. Please check.	MN	Changes made	VTN/DAB
183.	<u>610.02.04:</u> Stones for Riprap: Should there be "Add the following Subsection to this Section" OR "Delete this Subsection in its entirety and replace with the following" ?	JDP	Changes made	VTN/DAB
184.	<u>610.03.07:</u> It appears that the line "add the following subsection to this section" should be below the title "Filter Fabric". Please check.	MN	Changes made	VTN/DAB
185.	<u>613.02.70:</u> It appears that the line "add the following subsection to this section" should be below the title "Detectable Tactile Warning Strips". Please check.	MN	Changes made	VTN/DAB
186.	<u>616.05.01:</u> Does Aggregate base materials need to be listed for fence? Shouldn't the list include concrete for the posts? Please check.	MN	Changes made	VTN/DAB
187.	<u>621.04.01:</u> Sentence starting with "Add" should be BOLD.	JDP	Changes made	VTN/DAB
188.	<u>621.05.01:</u> Sentence starting with "Add" should be BOLD.	JDP	Changes made	VTN/DAB
189.	<u>624.03.01:</u> Special Detours prepared by the Contractor shouldn't they also be approved by the Engineer?	JDP	To discuss at B & C meeting 12/2/2008	VTN/DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: PBS&J – JDP / SJM / MN

Documents: 90% Submittal Plans, Specifications & Cost Estimate

Date Reviewed: 8/27/08

Date Received: 8/27/08

Discipline: Construction

Comment Number	Comment	By	Response	Implemented By
190.	<u>624.03.01:</u> Do the 1.5" temporary detours need to have type II underneath them? Much of the existing soil appears visually to have a low R-value. Please check/address.	MN	To discuss at B & C meeting 12/2/2008	VTN/DAB
191.	<u>624.04.01:</u> Missing paragraph: "Add the following Subsection to this Section" OR "Delete this Subsection in its entirety and replace with the following" ?	JDP	Changes made	VTN/DAB
192.	<u>Section 626:</u> Final Cleanup: Missing 626.01.01 General.	JDP	Not changing this subsection therefore not included	VTN/DAB
193.	<u>628.01.01:</u> "The Eighth Paragraph of this Subsection is changed to read as follows" There is no Eighth Paragraph in this Subsection. Or should the Warranty replace 628.03.08?	JDP	Section changed from previous submittal, no longer replacing 8 th paragraph	VTN/DAB
194.	<u>628.02.03:</u> Missing the Paragraph: "Add the following Subsection to this Section"	JDP	Section changed from previous submittal, comment no longer applies	VTN/DAB
195.	<u>628.03.09:</u> This should read: "Delete this Subsection in its entirety and replace with the following"	JDP	Section changed from previous submittal, comment no longer applies	VTN/DAB
196.	<u>628.03.10:</u> This should read: "Add the following subsection to this section"	JDP	Section changed from previous submittal, comment no longer applies	VTN/DAB
197.	<u>628.04.01:</u> Should this read: "Add the following Subsection to this Section" OR "Delete this Subsection in its entirety and replace with the following" ?	JDP	Section changed from previous submittal, comment no longer applies	VTN/DAB
198.	<u>628.05.01:</u> Should this read: "Add the following Subsection to this Section" OR "Delete this Subsection in its entirety and replace with the following" ?	JDP	Section changed from previous submittal, comment no longer applies	VTN/DAB
199.	<u>Section 629:</u> Section 629 is missing, but referenced in the Table of Contents.	JDP	Section removed from TOC	VTN/DAB
200.	<u>630.05.01:</u> Does not show payment for concrete encasement of 8" sanitary sewer pipe on Royal Stallion or the concrete grout material for SS to MH.	JDP	No longer using concrete encasement, using C900 and C905 pipe	VTN/DAB
201.	<u>633.04.01:</u> This statement is the same as the 2008 USS and Revisions. Remove "The following is added to this subsection"	JDP	Changes made	VTN/DAB
202.	<u>634.05.01:</u> The number in front of the heading "Measurement" should be 634.04.01. Please check/change.	MN	Changes made	VTN/DAB
203.	<u>637.03:</u> Does not mention Herbicide in General comments or payment.	JDP	Incidental to the improvement being constructed and included the payment description of the improvement using the Herbicide	VTN/DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: PBS&J – JDP / SJM / MN

Documents: 90% Submittal Plans, Specifications & Cost Estimate

Date Reviewed: 8/27/08

Date Received: 8/27/08

Discipline: Construction

Comment Number	Comment	By	Response	Implemented By
	<u>COST ESTIMATE</u>			
204.	<u>202.03:</u> Calculations on Engineer seem to be incorrect.		Noted	
205.	<u>202.04:</u> Removal is higher than engineer qty from verifying against drawings.		Quantity to be checked	
206.	<u>202.05:</u> Hard to calculate because limits are not stationed.		Noted quantity to be rechecked	VTN/DAB
207.	<u>203.01:</u> Unable to calculate		Noted	VTN/DAB
208.	<u>302.01:</u> used 13 inches.		Noted	VTN/DAB
209.	<u>603.03:</u> This difference may be due to the manhole installation and 30" SS installation of LF.		Quantity to be checked	VTN/DAB
210.	<u>609.02:</u> I could not find CM2 DI on the drawings. Are these DM2? I found them.		These are DM2	VTN/DAB
211.	<u>609.03:</u> I could not find CM2 DI on the drawings. Found 1 DM2 for this size.		These are DM2	VTN/DAB
212.	<u>610.01:</u> Hard to calculate because limits are not stationed.		Noted quantity to be rechecked	VTN/DAB
213.	<u>613.01:</u> 5 areas for concrete sidewalk rehab.		Included in the price of the improvement	VTN/DAB
214.	<u>616.01:</u> I found two area's of fence not shown but must be installed.		Fence installation has changed and will be recalculated	VTN/DAB
215.	<u>624.01:</u> Cost estimate may be too low if a temporary detour(s) are constructed. Please check.		To discuss at B & C meeting 12/2/2008 \$300K	VTN/DAB
216.	<u>630.01:</u> Looks like pipe is measured center to center of manhole and may be confused in pay items.		Noted	VTN/DAB
217.	<u>633.01:</u> This is hard to support with no details on drawings for placement.		Noted	VTN/DAB
218.	<u>633.02:</u> This is hard to support with no details on drawings for placement.		Noted	VTN/DAB
219.	<u>202:</u> No Engineer QTY or Bid item but shows removal on Drawing sheet SS4.		Noted	VTN/DAB
220.	<u>202:</u> No Engineer QTY or Bid item but shows removal on Drawing sheet SS1.		Noted	VTN/DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CLV – Peter Jackson, CFM

Documents: 90% Submittal Specifications & Plans

Date Reviewed: 10/3/08

Date Received: 10/6/08

Discipline: Flood Control

Comment Number	Comment	Response	Implemented By
	<u>GENERAL</u>		
1.	Provide and label the proposed project limit on FEMA FIRM exhibit	FEMA FIRM Map project limits added	VTN – DAB
2.	Address the following comments regarding "On Grade Drop Inlet Flow Interception Calculations (100- Year Ultimate Flows Used)": a) Revise "LGrate" length to match "LCurb" length. City's Type CM or DM drop inlet have a curb opening length that is equal to the length of grate. It appears that 50-percent clogging factor was not applied to the drop inlet calculations. Provide 50-percent clogging factor to reflect into the drop inlet calculations.	A 5' sweeper is used to collect debris for on grade inlets, a recommendation received from CCRFCD. 50% clogging factor used refer to Appendix C of the Final Design Report	VTN – DAB
3.	Flood Control has received a reference copy of the Structural Calculations. Although Flood Control does not review the Structural Calculations, we did notice that the provided structural calculations include numerous sheets that have the incorrect job referenced. Provide a revised set for our file.	Structural Cales will be submitted to the CLV and CCRFCD with the next submittal	VTN – DAB
4.	Flood Control recommends providing 10 foot wide AEP's along the channel section for constructability. Coordinate the required legal descriptions and exhibits with the Right-of-Way Section.	AEP added	VTN – DAB
5.	Provide grading around the proposed area drop inlets and show swales where needed along the existing rural roads to direct the storm water into the proposed area drop inlets. Show impacts to the existing driveways with the graded swale construction.	Grading to be shown	VTN – DAB
6.	The proposed channel section between the New Vista Ranch and the Gilcrease Farm needs to include a chain link fence that meets the CCRFCD manual requirements. At a minimum, replace the wire fence along the Gilcrease Farm with a 6-foot chain link fence to secure the channel facility. Review the appropriateness of the existing New Vista Ranch fencing and replace the fencing if required	Fencing issues addressed	VTN – DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CLV – Peter Jackson, CFM

Documents: 90% Submittal Specifications & Plans

Date Reviewed: 10/3/08

Date Received: 10/6/08

Discipline: Flood Control

7.	Replace the NDOT Type 2A with a modified NDOT Type 2B inlet. The Modified Type 2B inlet needs to use a maximum bar spacing of 2 7/8" instead of the 39/16" spacing shown on section B-B. This will provide a more pedestrian friendly inlet while maintaining increased flow capacity for this rural area. Attached is a copy of the NDOT Type 2B inlet.	All inlets will be a NDOT Type 2 because of discussions held with the CLV, the CLV wanted safer more friendly inlets. Higher maintenance will be needed to clean inlets at a more frequent interval to ensure flow interception is adequate.	VTN – DAB
8.	Eliminate the low drop manhole shown on Sheet SS4 and provide a short section of steeper sewer main. Coordinate the sewer alignment and manhole requirements with Collection System Planning (contact Tim Parks or Joe Pena @ 229-2178).	Drop manhole eliminated	VTN – DAB
9.	Any required Sewer Easements and AEP's must be acquired prior to the request for Construction Funding from the CCRFCD.	Sewer was re-aligned to go under the RCB instead of jogging around like in previous submittal refer to the civil plans	VTN – DAB
10.	The placement of excess fill material within the existing 54' drainage easement from Farm Road to near Station 51 +50 is approved in concept. The fill placement may also include rip rap material for use by the HOA within their easement areas. The coordination and approval of the HOA is required. Flood Control understands that Engineering Design is working with the HOA on this process.	Channel to be lined with riprap no longer filling channel in	VTN – DAB
11.	The existing drop inlets along Rainbow between Farm and Elkhorn have existing laterals that extend to the east side of the existing Rainbow improvements. Add a Construction Note for the Removal of these laterals, as they appear to conflict with the new lateral connections into the proposed RCB.	Construction note added	VTN – DAB
12.	The existing drop inlets along Rainbow between Farm and Elkhorn need to be connected to the proposed RCB within Rainbow. This will reduce City maintenance within the existing drainage easement. Add a Construction Note for these new laterals.	All drop inlets connect to RCB whenever possible	VTN – DAB
13.	The City does not accept Type A & B inlets. Replace with 3' Neenah or CM/DM inlets. Revise the Construction Notes and plans accordingly. Revise the Type D drop inlets to Type CM or DM drop inlets. Revise callout throughout the plan and the report.	DI replaced with 5' Type D	VTN – DAB
14.	The Engineer should acquire additional utility pothole information as soon as practical to determine any constraints on the storm drain system design. Consideration on utility relocations and impacts must be identified.	Potholes completed	VTN – DAB
15.	Provide an area inlet at the northwest corner of Whispering Sands and Rainbow on the north side of the proposed RCB installation.	Inlet added	VTN – DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CLV – Peter Jackson, CFM

Documents: 90% Submittal Specifications & Plans

Date Reviewed: 10/3/08

Date Received: 10/6/08

Discipline: Flood Control

	SPECIFICATIONS		
16.	Sheet GR1: Flood Control recommends that the collection system at the lower end of the existing Rainbow Channel be modified to reduce the construction impacts to the existing retaining walls by shifting the channel inlets northward and filling the southern portion of the channel. Reference the red lines on Sheet GRI.	Channel Modified	VTN – DAB
17.	Sheet S5: Include a structural detail for the end cap connection between the existing twin 13" x 9' RCB's at the transition structure between the twin RCB's and the single 24' x 8' RCB. See Sheet S5.	Connection detail provide on page S10	R2H - DA
18	Sheet SD4; Sheet SD9; Sheet SD10: Extend the storm drain laterals on the north side of Farm Road to include area inlets. Revise the storm drain plan on Sheet SD4 and lateral 10 on Sheet SD9 and lateral 12 on Sheet SD10.	Laterals revised	VTN – DAB
19.	Sheet SD4: Review the inlet locations on Donald Nelson Drive on Sheet SD4 to clear the existing telephone vault and existing chain link fence gate.	Location moved to avoid conflicts	VTN – DAB
20.	Sheet SS1: Coordinate the sewer relocation at the Whispering Sands and Rainbow intersection. It is recommended that the 30" sewer be adjusted to reduce angle changes and manholes. See Sheet SS 1 for a suggested alignment for the 30-inch sewer main. A sewer easement would be necessary from the New Vista Ranch property. Coordinate the sewer alignment and easement requirements with Collection System Planning (contact Tim Parks or Joe Pena@ 229-2178).	Sewer alignment changed dramatically no need for easement	VTN – DAB
21.	Sheet SD10: Connect the existing 8" storm drain located along the south side of Farm Road, within the existing drainage easement, into the proposed drop inlet (4.10). Add the 8" storm drain and connection to lateral 12 on Sheet SD10.	Existing 8" to be connected into proposed drop inlet	VTN – DAB
22.	Sheet D2: Revise the area inlet apron details to include Object Markers at the corners and add a note for painting the aprons similar to the channel access ladder on Sheet D2.	Robert Welch to provide VTN with object marker detail	VTN – DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN – ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CLV – Peter Jackson, CFM

Documents: 90% Submittal Specifications & Plans

Date Reviewed: 10/3/08

Date Received: 10/6/08

Discipline: Flood Control

<u>DROP INLET SUMMARY</u>		
23.	Address the following comments regarding "Drop Inlet Summary": a) Provide an explanation on where the combine bypass flow (20-cfs) from drop inlets 9, 10, 15, and 17 drains to. It appears to drain to the Severance Channel and impact drop inlets 22 thru 26. Please address. b) Drop inlet 11 shows 10-ft Type DM2 in proposed condition, but 5-ft Type D in ultimate condition. Revise ultimate condition drop inlet size to proposed condition drop inlet size.	Drop inlet summary has been updated in drainage supplement, as well as a brief discussion of flow-rates. VTN – DAB
<u>PLANS</u>		
24.	Address the following comments on the plan: a) Provide the HGL on all storm drain laterals including cross-sections for nuisance drop inlets. b) Check the invert elevation for the proposed RCB at "SD1" 27+13.66. It should be at 2356.18 according to the slope shown on the RCB. c) Replace Type 2A drop inlets with Modified Type 2B drop inlets. d) Check the invert elevation for the proposed RCB at "SD1" 41+38.33. It should be at 2350.34 according to the slope shown on the RCB. e) Additional comments are shown on the attached plans.	Changes made to plans to address these items. VTN – DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN - ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CCRFCD - Todd Myers

Documents: 90% Submittal Plans

Date Reviewed: 10/20/08

Date Received: 10/21/08

Discipline: Flood Control

Comment Number	Comment	Response	Implemented By
	GENERAL		
1.	Provide latest engineers cost estimate. This must be reviewed and approved by District prior to City's request for construction funding.	Cost Estimate to be provided with next submittal	VTN - DAB
2.	Provide status of all ROW/AEP/Easement acquisitions. All rights-of-entry must be acquired prior to City's request for construction funding.	CLV is handling AEP's and is the process of acquiring	VTN - DAB
	PLANS		
3.	<u>Sheet TYP1:</u> The fence on west side of channel may need to be replaced. It doesn't look like adequate room is available to "match existing grade" in all locations. Additionally, the existing fence doesn't appear to meet District's fencing requirements	Fence on west side of channel now being replaced	VTN - DAB
4.	<u>Sheet TYP2:</u> Plans indicate that trenches are to be laid back with 1: 1 side slopes. If contractor chooses to use pre-cast RCB's, he is likely to trench with vertical walls and utilize trench box or some sort of shoring. The trench sections seem to dictate a laid back section, which may not be the most economical method of construction. I recommend the sections be changed to vertical sections and specifications indicate that OSHA requirements be met; this will allow contractor to decide most economical method of construction. Also, consider allowing a 3-inch leveling course of sand or crushed rock above Type 2 base.	Typical section shown for both cast-in-place and for a precast option. Leveling coarse added	VTN - DAB
5.	<u>Sheet SD2:</u> Have owners been notified regarding removal of existing structure on east side of channel near Sta. 17+207 Provide status.	Yes, they will move the structure prior to construction	VTN - DAB
6.	<u>Sheet SD3:</u> Consider using NDOT Type 2B inlets instead of NDOT Type 2 inlets to reduce potential for clogging. Typical all field inlets. Provide finished grade above proposed RCB. Typical all.	NDOT Type 2 was chosen from discussions with the CLV because of safety issues. There are a lot of horses and children in the area. Maintenance will be required more often to keep inlets clean at the expense of safety.	VTN - DAB
7.	<u>Sheet SD4:</u> Construction Note 3 instructs contractor to fill existing grass lined channel. Coordination including cost sharing, plans, specifications ... etc. for this effort must be finalized prior to City's request for construction funding. Are street improvements planned for north halfstreet of Farm road in the near future? If not, provide field inlets instead of stub-outs.	Channel to be lined with riprap at HOA expense. Field inlets provided on the north side of Farm.	VTN - DAB
8.	<u>Sheet SD7:</u> Provide revised design for channel, as discussed on 9/4/08 walkthrough. Provide and refer to RCB transition details.	Refer to structural details	VTN - DAB
9.	<u>Sheet SD9:</u> Revise laterals to penetrate RCB below mainline design WSE where feasible.	Laterals changed where possible	VTN - DAB

**LAS VEGAS WASH MIDDLE BRANCH
RAINBOW STORM DRAIN - ELKHORN ROAD TO GRAND TETON DRIVE**

Package: 90% Submittal (submitted on 7/22/08)

Reviewer: CCRFCD - Todd Myers

Documents: 90% Submittal Plans

Date Reviewed: 10/20/08

Date Received: 10/21/08

Discipline: Flood Control

Comment Number	Comment	Response	Implemented By
	<u>SPECIFICATIONS</u>		
11.	Section 100.02.03: Revise remark regarding Clark County Encroachment Permit to indicate that permit is from Clark County Development Services (CCDS) instead of Clark County Public Works.	Section changed	VTN - DAB
12.	Section 100.02.09: A post installation storm drain lateral video will likely be required by CCDS inspection. Applicable Section is 603.03.07.	CCDS didn't have any comments regarding either section	VTN - DAB
13.	Section 105.05: Paragraph 12 indicates that 24-inch waterline could be in conflict with SD laterals and that all potential conflicts will be potholed to verify depth and location. The potholing should take place in design phase for this size waterline, not during construction. Provide pothole information and revise accordingly.	Potholes have been completed	VTN - DAB
14.	Section 624.01.02: A section should be included that addresses CCDS TCP requirements. Based on on-going projects within Clark County ROW, requirements differ greatly from these specifications. Coordinate with CCDS and revise accordingly.	Using current 624 received from CITY	VTN - DAB

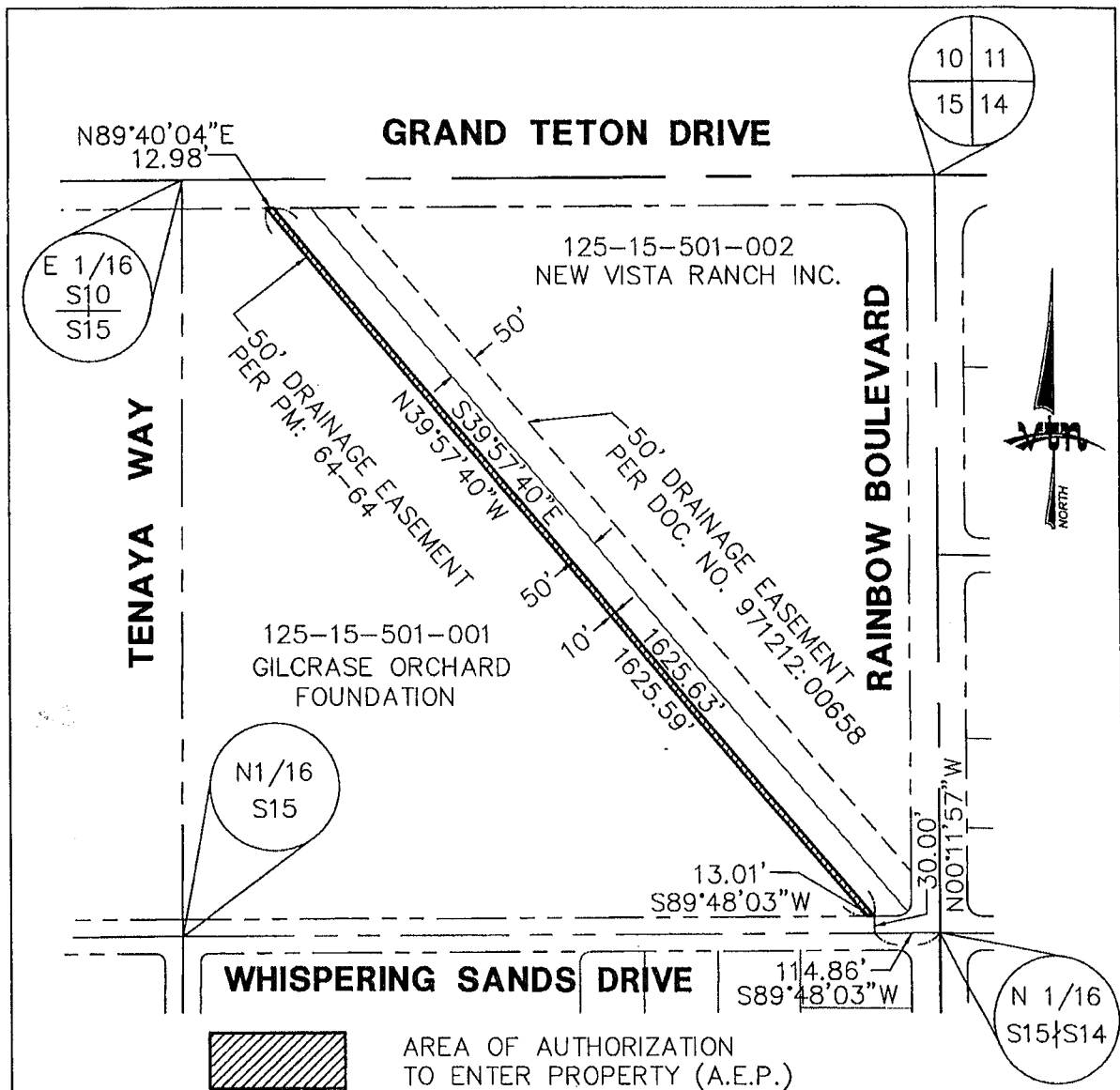
*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

**Rainbow Storm Drain
Elkhorn to Grand Teton**

C.3

Authorization to Enter Property Exhibits



OWNER GILCREASE ORCHARD FOUNDATION
 PARCEL NO. 125-15-501-001
 SECTION, TOWNSHIP, RANGE SECTION 15, T. 19 S., R. 60 E.
 TOTAL AREA OF PARCEL 58.16 ACRES (RECORD)
 AREA OF A.E.P. 16,256 SQUARE FEET (0.373 ACRES)
 REFERENCE: 20021023:01195

G:\6952\6952CTRL.DWG(BR-125-15-501-001AEP)



2727 S. RAINBOW BOULEVARD
 LAS VEGAS, NEVADA 89146-5148

PROJECT: **A.E.P. EXHIBIT**
RAINBOW STORM DRAIN
APN 125-15-501-001
 FOR: **CITY OF LAS VEGAS**
DEPARTMENT OF PUBLIC WORKS

SCALE	HORZ. 1"=300'
	VERT. -
W.O. NO.	6952
DRAWN BY:	KAK
DATE:	8/22/08
SHEET 1 OF 1	

GENERAL INFORMATION	
PARCEL NO.	125-15-501-001
OWNER AND MAILING ADDRESS	GILCREASE ORCHARD FOUNDATION P O BOX 750129 LAS VEGAS NV 89136-0129
LOCATION ADDRESS CITY/UNINCORPORATED TOWN	7810 N TENAYA WY UNINCORP. COUNTY
ASSESSOR DESCRIPTION	PARCEL MAP FILE 64 PAGE 64 LOT 2 SEC 15 TWP 19 RNG 60
RECORDED DOCUMENT NO.	* 20021023:01195
RECORDED DATE	10/23/2002
VESTING	NO STATUS

*Note: Only documents from September 15, 1999 through present are available for viewing.

ASSESSMENT INFORMATION AND SUPPLEMENTAL VALUE	
TAX DISTRICT	125
APPRAISAL YEAR	2007
FISCAL YEAR	08-09
SUPPLEMENTAL IMPROVEMENT VALUE	0
SUPPLEMENTAL IMPROVEMENT ACCOUNT NUMBER	N/A

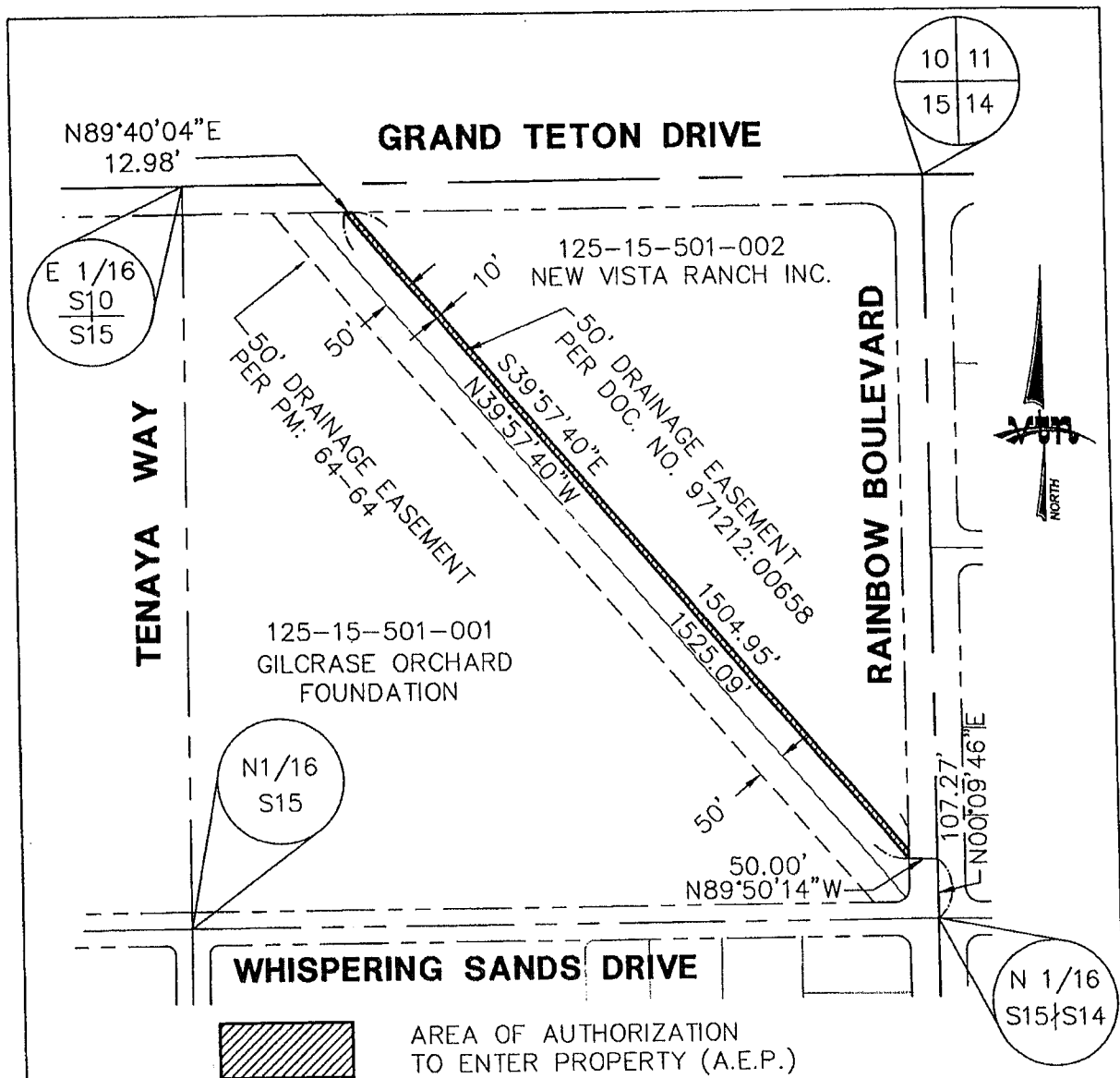
REAL PROPERTY ASSESSED VALUE		
FISCAL YEAR	2007-08	2008-09
LAND	7908	8198
IMPROVEMENTS	64450	66582
PERSONAL PROPERTY	0	0
EXEMPT	0	0
GROSS ASSESSED	72358	74780
TAXABLE VALUE LAND+IMP	206737	213657
ESTIMATED LOT SIZE AND APPRAISAL INFORMATION		
ESTIMATED SIZE	58.16 Acres	
ORIGINAL CONST. YEAR	1998	
LAST SALE PRICE MONTH/YEAR	1545531 10/02	
LAND USE	5-10 AGRICULTURE	
DWELLING UNITS	0	

Parcel name: 125-15-501-001AEP

North:	26816864.5939	East :	756717.9771
Line Course:	S 89-48-03 W	Length:	13.01
North:	26816864.5487	East :	756704.9672
Line Course:	N 39-57-40 W	Length:	1625.59
North:	26818110.5318	East :	755660.9035
Line Course:	N 89-40-04 E	Length:	12.98
North:	26818110.6071	East :	755673.8833
Line Course:	S 39-57-40 E	Length:	1625.63
North:	26816864.5933	East :	756717.9727
Line Course:	S 40-09-22 E	Length:	0.00
North:	26816864.5933	East :	756717.9727

Perimeter: 3277.21 Area: 16,256 sq.ft. 0.373 acres

Mapcheck Closure - (Uses listed courses, radii, and deltas)
Error Closure: 0.0045 Course: S 82-03-16 W
Error North: -0.00062 East : -0.00445
Precision 1: 728,268.89



OWNER NEW VISTA RANCH INC.
 PARCEL NO. 125-15-501-002
 SECTION, TOWNSHIP, RANGE SECTION 15, T. 19 S., R. 60 E.
 TOTAL AREA OF PARCEL 15.05 ACRES (RECORD)
 AREA OF A.E.P. 15,150 SQUARE FEET (0.348 ACRES)
 REFERENCE: 19871008:00690

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2727 S. RAINBOW BOULEVARD
 LAS VEGAS, NEVADA 89146-5148

PROJECT: **A.E.P. EXHIBIT**
RAINBOW STORM DRAIN
APN 125-15-501-002
 FOR: **CITY OF LAS VEGAS**
DEPARTMENT OF PUBLIC WORKS

SCALE	HORZ. 1"=300'
	VERT. -
W.O. NO.	6952
DRAWN BY:	KAK
DATE:	8/22/08
SHEET 1 OF 1	

GENERAL INFORMATION	
PARCEL NO.	125-15-501-002
OWNER AND MAILING ADDRESS	NEW VISTA RANCH INC 3085 S VALLEY VIEW BLVD LAS VEGAS NV 89102-7890
LOCATION ADDRESS CITY/UNINCORPORATED TOWN	7875 N RAINBOW BLVD LAS VEGAS
ASSESSOR DESCRIPTION	PARCEL MAP FILE 64 PAGE 64 LOT 1 SEC 15 TWP 19 RNG 60
RECORDED DOCUMENT NO.	* 19871008:00690
RECORDED DATE	10/08/1987
VESTING	NO STATUS

*Note: Only documents from September 15, 1999 through present are available for viewing.

ASSESSMENT INFORMATION AND SUPPLEMENTAL VALUE	
TAX DISTRICT	200
APPRAISAL YEAR	2007
FISCAL YEAR	08-09
SUPPLEMENTAL IMPROVEMENT VALUE	0
SUPPLEMENTAL IMPROVEMENT ACCOUNT NUMBER	N/A

REAL PROPERTY ASSESSED VALUE		
FISCAL YEAR	2007-08	2008-09
LAND	2238688	2107000
IMPROVEMENTS	215600	228124
PERSONAL PROPERTY	0	0
EXEMPT	2454288	2335124
GROSS ASSESSED	2454288	2335124
TAXABLE VALUE LAND+IMP	7012251	6671783
ESTIMATED LOT SIZE AND APPRAISAL INFORMATION		
ESTIMATED SIZE	15.05 Acres	
ORIGINAL CONST. YEAR	1991	
LAST SALE PRICE MONTH/YEAR	0	
LAND USE	4-20 NON-PROFIT RELIGIOUS	
DWELLING UNITS	0	

Parcel name: 125-15-501-002AEP

North:	26818111.3614	East :	755803.7243
Line Course:	S 39-57-40 E	Length:	1525.09
North:	26816942.4095	East :	756783.2401
Line Course:	N 00-09-46 E	Length:	15.52
North:	26816957.9295	East :	756783.2842
Line Course:	N 39-57-40 W	Length:	1504.95
North:	26818111.4444	East :	755816.7037
Line Course:	S 89-40-04 W	Length:	12.98
North:	26818111.3691	East :	755803.7239
Line Course:	S 30-41-59 E	Length:	0.00
North:	26818111.3691	East :	755803.7239

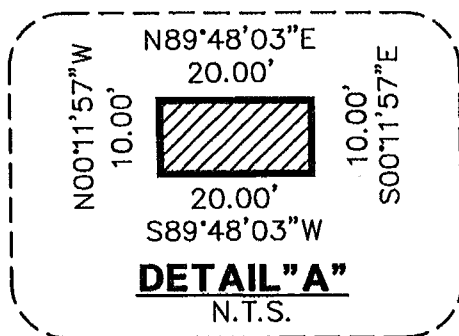
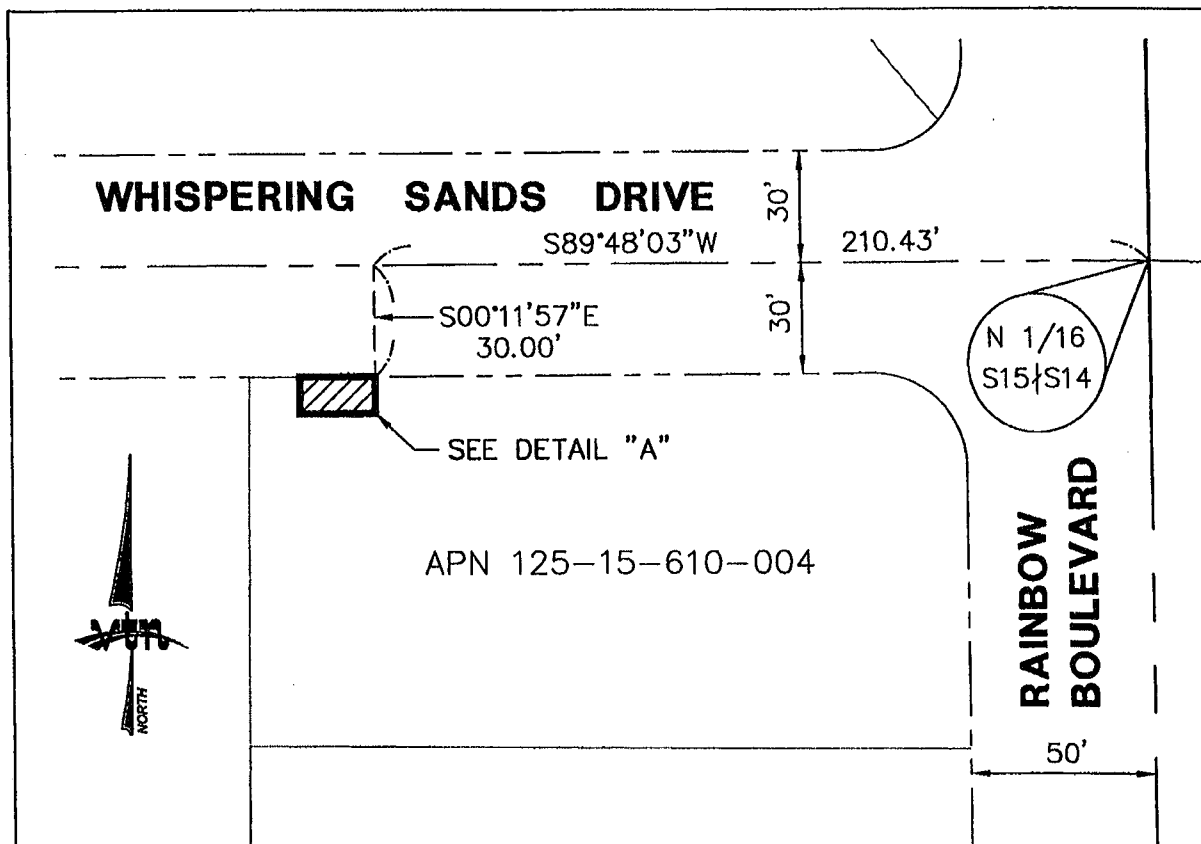
Perimeter: 3058.54 Area: 15,150 sq.ft. 0.348 acres

Mapcheck Closure - (Uses listed courses, radii, and deltas)

Error Closure:	0.0078	Course:	N 03-06-41 W
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Error North:	0.00776	East :	-0.00042
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Precision 1: 392,120.51



AREA OF
AUTHORIZATION
TO ENTER
PROPERTY (A.E.P.)

OWNER LYON WILLIAM HOMES INC.

PARCEL NO. 125-15-610-004

SECTION, TOWNSHIP, RANGE SECTION 15, T. 19 S., R. 60 E.

TOTAL AREA OF PARCEL 0.45 ACRES (RECORD)

AREA OF A.E.P. 200 SQUARE FEET (0.005 ACRES)

REFERENCE: 20050930:03782

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2727 S. RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148

PROJECT: **A.E.P. EXHIBIT**
RAINBOW STORM DRAIN
APN 125-15-610-004

FOR: **CITY OF LAS VEGAS**
DEPARTMENT OF PUBLIC WORKS

SCALE **HORZ. 1"=50'**
VERT. -

W.O. NO. **6952**

DRAWN BY: **KAK**

DATE: **6/19/08**

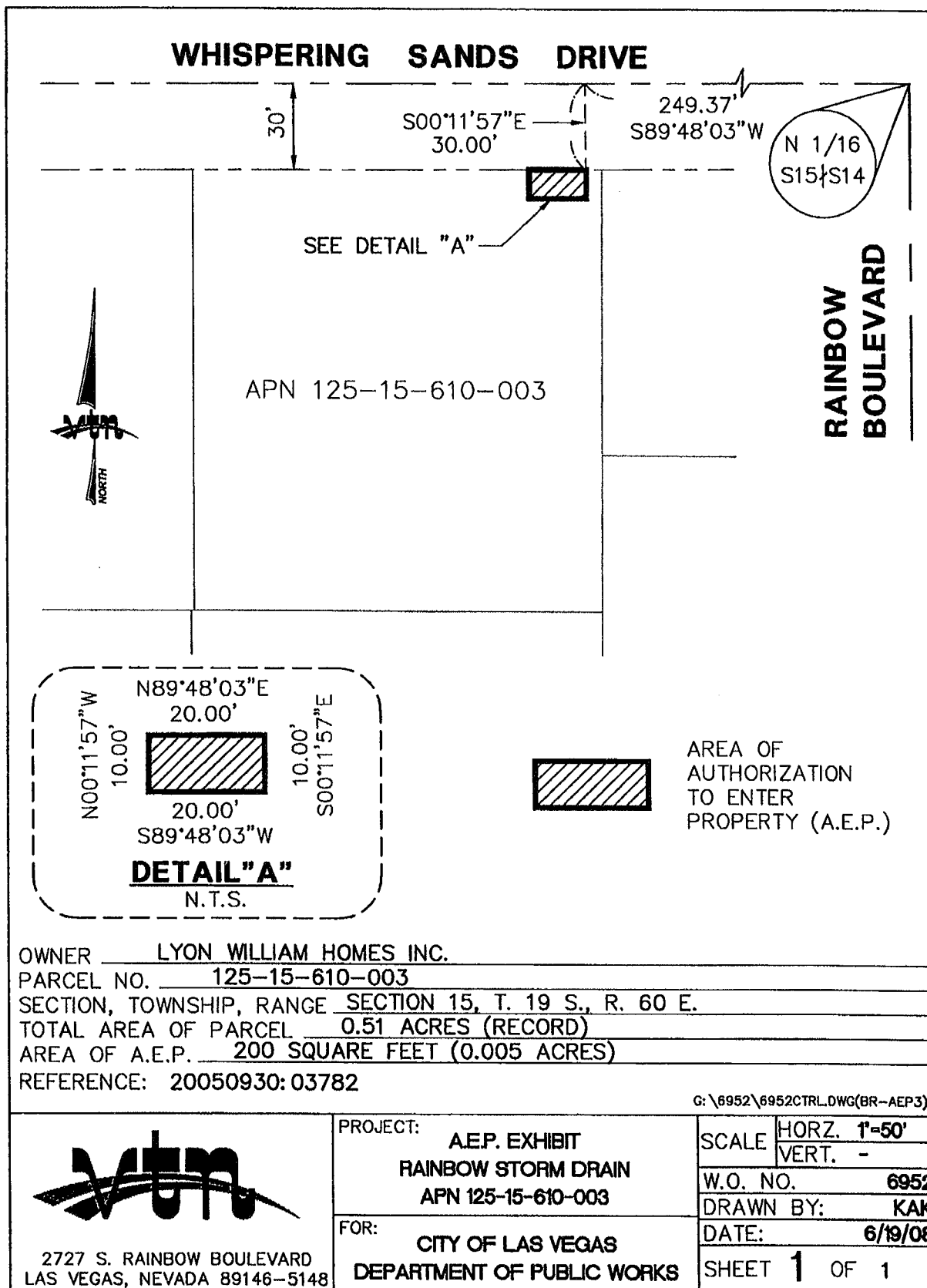
SHEET **1** OF **1**

Parcel name: 15-610-004AEP

North: 26816804.2620 East : 756622.6148
Line Course: S 00-11-57 E Length: 10.00
North: 26816794.2621 East : 756622.6495
Line Course: S 89-48-03 W Length: 20.00
North: 26816794.1925 East : 756602.6496
Line Course: N 00-11-57 W Length: 10.00
North: 26816804.1925 East : 756602.6149
Line Course: N 89-48-03 E Length: 20.00
North: 26816804.2620 East : 756622.6148

Perimeter: 60.00 Area: 200 sq.ft. 0.005 acres

Mapcheck Closure - (Uses listed courses, radii, and deltas)
Error Closure: 0.0000 Course: S 90-00-00 E
Error North: 0.00000 East : 0.00000
Precision 1: 60,000,000.00

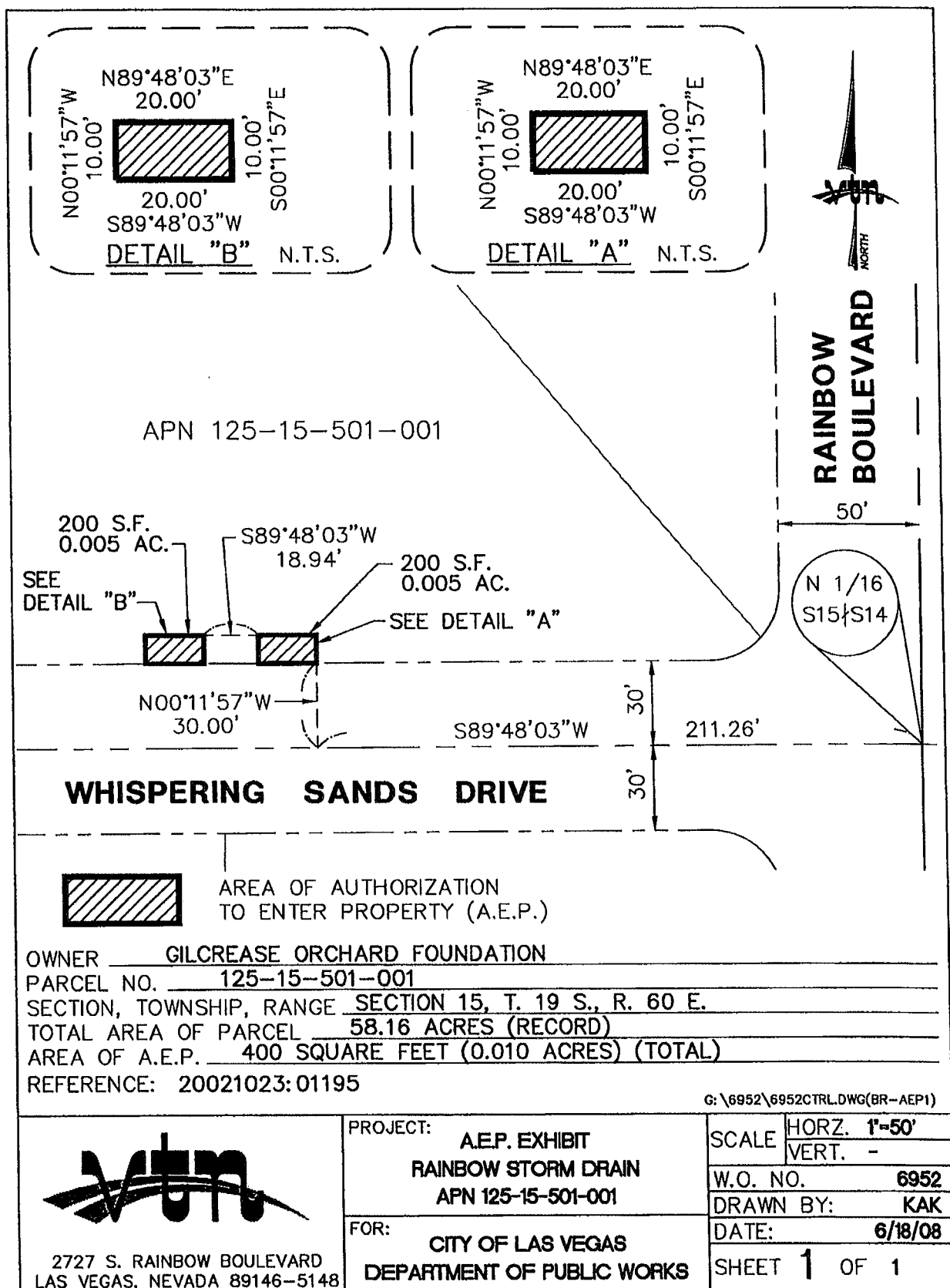


Parcel name: 15-610-003AEP

North: 26816804.1266 East : 756583.6682
Line Course: S 00-11-57 E Length: 10.00
North: 26816794.1267 East : 756583.7030
Line Course: S 89-48-03 W Length: 20.00
North: 26816794.0571 East : 756563.7031
Line Course: N 00-11-57 W Length: 10.00
North: 26816804.0571 East : 756563.6683
Line Course: N 89-48-03 E Length: 20.00
North: 26816804.1266 East : 756583.6682

Perimeter: 60.00 Area: 200 sq.ft. 0.005 acres

Mapcheck Closure - (Uses listed courses, radii, and deltas)
Error Closure: 0.0000 Course: S 90-00-00 E
Error North: 0.00000 East : 0.00000
Precision 1: 60,000,000.00



Parcel name: 15-501-001A-AEP

North: 26816864.2587 East : 756621.5760
Line Course: N 00-11-57 W Length: 10.00
North: 26816874.2587 East : 756621.5412
Line Course: S 89-48-03 W Length: 20.00
North: 26816874.1892 East : 756601.5413
Line Course: S 00-11-57 E Length: 10.00
North: 26816864.1892 East : 756601.5761
Line Course: N 89-48-03 E Length: 20.00
North: 26816864.2587 East : 756621.5760

Perimeter: 60.00 Area: 200 sq.ft. 0.005 acres

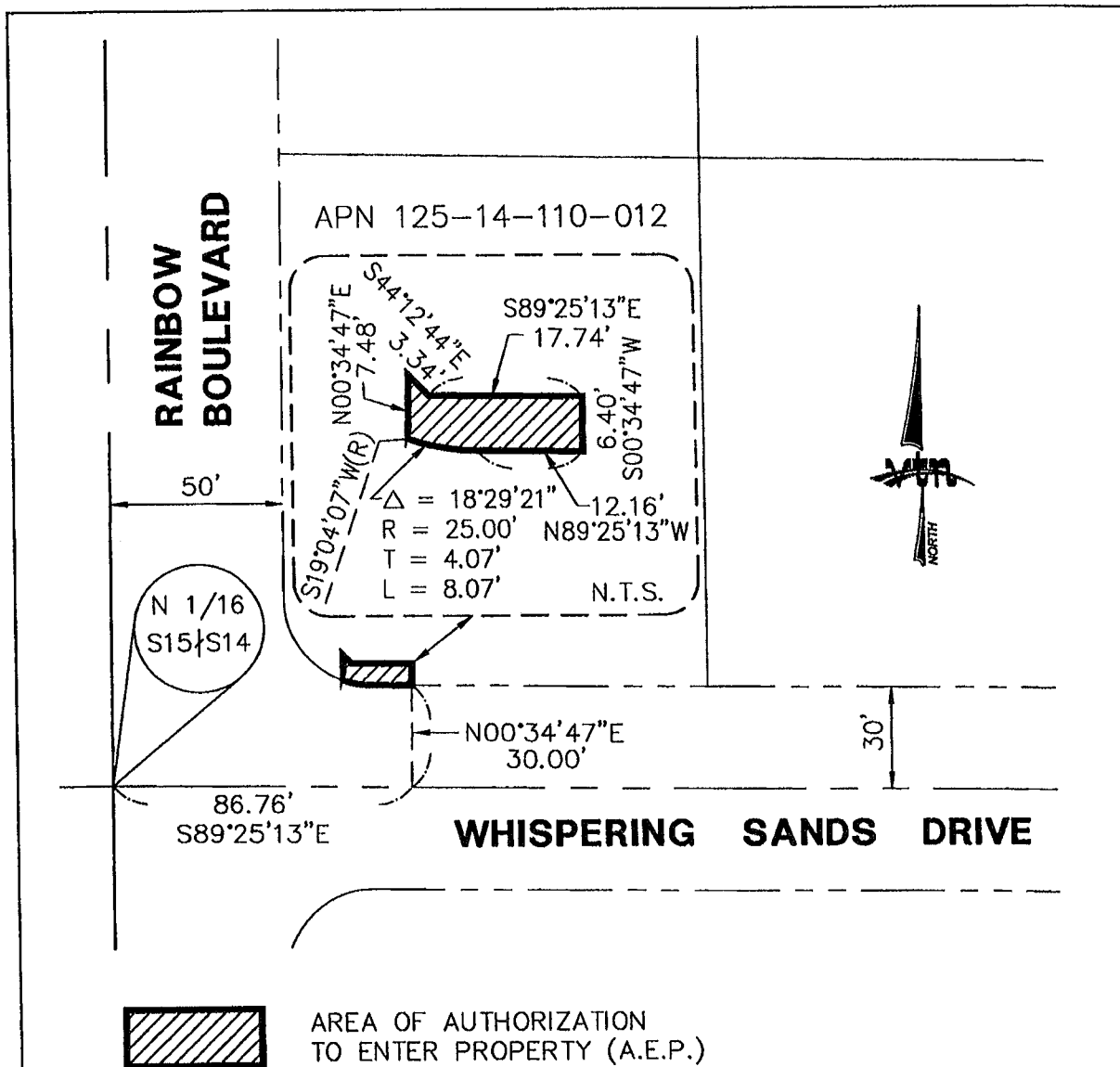
Mapcheck Closure - (Uses listed courses, radii, and deltas)
Error Closure: 0.0000 Course: S 90-00-00 E
Error North: 0.00000 East : 0.00000
Precision 1: 60,000,000.00

Parcel name: 15-501-001B-AEP

North: 26816874.1233 East : 756582.5984
Line Course: S 00-11-57 E Length: 10.00
North: 26816864.1234 East : 756582.6332
Line Course: S 89-48-03 W Length: 20.00
North: 26816864.0538 East : 756562.6333
Line Course: N 00-11-57 W Length: 10.00
North: 26816874.0538 East : 756562.5986
Line Course: N 89-48-03 E Length: 20.00
North: 26816874.1233 East : 756582.5984

Perimeter: 60.00 Area: 200 sq.ft. 0.005 acres

Mapcheck Closure - (Uses listed courses, radii, and deltas)
Error Closure: 0.0000 Course: S 90-00-00 E
Error North: 0.00000 East : 0.00000
Precision 1: 60,000,000.00



OWNER PLASTER DEVELOPMENT COMPANY INC.

PARCEL NO. 125-14-110-012

SECTION, TOWNSHIP, RANGE SECTION 14, T. 19 S., R. 60 E.

TOTAL AREA OF PARCEL 0.43 ACRES (RECORD)

AREA OF A.E.P. 128 SQUARE FEET (0.003 ACRES)

REFERENCE: 20050405:03802

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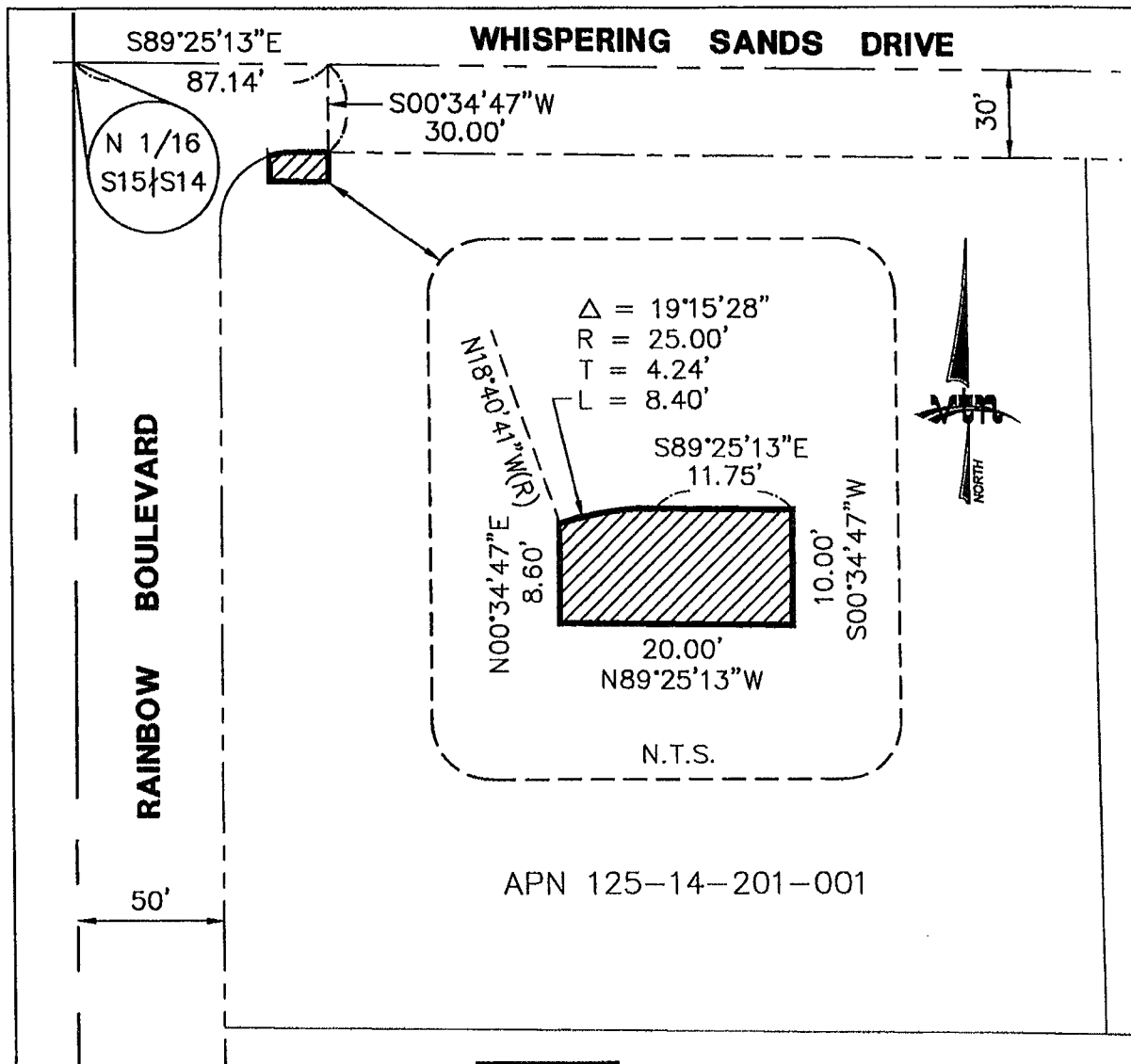


2727 S. RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148

PROJECT: **A.E.P. EXHIBIT**
RAINBOW STORM DRAIN
APN 125-14-110-012

FOR: **CITY OF LAS VEGAS**
DEPARTMENT OF PUBLIC WORKS

SCALE	HORZ. 1"=50'
	VERT. -
W.O. NO.	6952
DRAWN BY:	KAK
DATE:	6/19/08
SHEET 1 OF 1	



OWNER THOMAS RICK ROBERTS

PARCEL NO. 125-14-201-001

SECTION, TOWNSHIP, RANGE SECTION 14, T. 19 S., R. 60 E.

TOTAL AREA OF PARCEL 2.06 ACRES (RECORD)

AREA OF A.E.P. 196 SQUARE FEET (0.005 ACRES)

REFERENCE: 20070620:02036

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2727 S. RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148

PROJECT: **A.E.P. EXHIBIT**
RAINBOW STORM DRAIN
APN 125-14-201-001

FOR: **CITY OF LAS VEGAS**
DEPARTMENT OF PUBLIC WORKS

SCALE **HORIZ. 1"=60'**
VERT. -

W.O. NO. **6952**

DRAWN BY: **KAK**

DATE: **6/19/08**

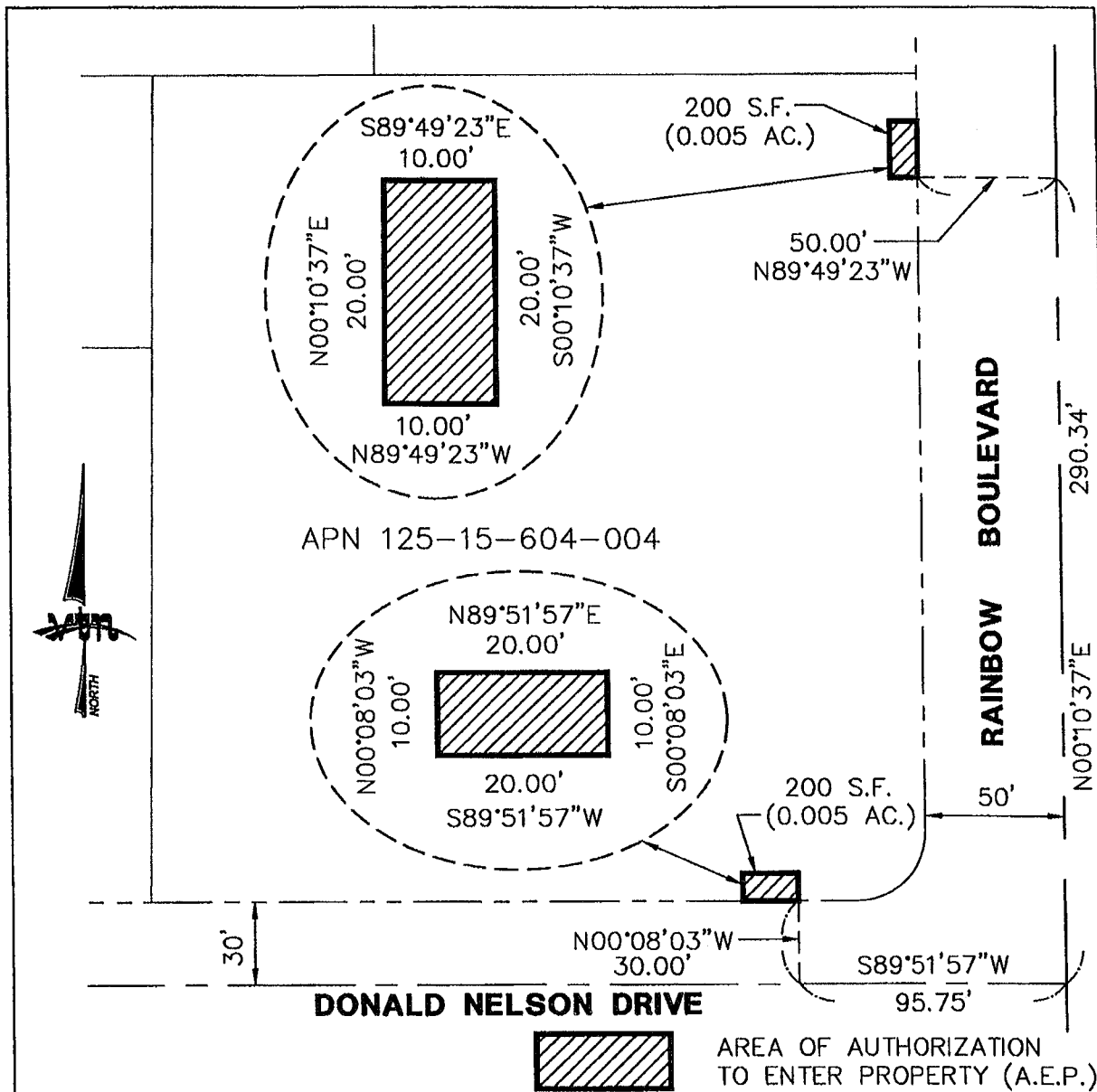
SHEET **1** OF **1**

Parcel name: 14-201-001AEP

North: 26816794.1138 East : 756919.6701
Line Course: N 00-34-47 E Length: 10.00
North: 26816804.1133 East : 756919.7712
Line Course: N 89-25-13 W Length: 11.75
North: 26816804.2322 East : 756908.0218
Curve Length: 8.40 Radius: 25.00
Delta: 19-15-28 Tangent: 4.24
Chord: 8.36 Course: S 80-57-03 W
Course In: S 00-34-47 W Course Out: N 18-40-41 W
RP North: 26816779.2335 East : 756907.7689
End North: 26816802.9168 East : 756899.7626
Line Course: S 00-34-47 W Length: 8.60
North: 26816794.3173 East : 756899.6756
Line Course: S 89-25-13 E Length: 20.00
North: 26816794.1149 East : 756919.6746

Perimeter: 58.76 Area: 196 sq.ft. 0.005 acres

Mapcheck Closure - (Uses listed courses, radii, and deltas)
Error Closure: 0.0047 Course: N 76-51-16 E
Error North: 0.00106 East : 0.00454
Precision 1: 12,500.00



OWNER RYAN TIMOTHY G & MAUREEN

PARCEL NO. 125-15-604-004

SECTION, TOWNSHIP, RANGE SECTION 15, T. 19 S., R. 60 E.

TOTAL AREA OF PARCEL 1.93 ACRES (RECORD)

AREA OF A.E.P. 400 SQUARE FEET (0.010 ACRES) (TOTAL)

REFERENCE: 20040204:01911

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2727 S. RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148

PROJECT: **A.E.P. EXHIBIT**
RAINBOW STORM DRAIN
APN 125-15-604-004

FOR: **CITY OF LAS VEGAS**
DEPARTMENT OF PUBLIC WORKS

SCALE **HORZ. 1"=60'**
VERT. -

W.O. NO. **6952**

DRAWN BY: **KAK**

DATE: **6/19/08**

SHEET **1** OF **1**

Parcel name: 15-604-004A-AEP

North: 26816198.5283 East : 756735.0587
Line Course: N 00-08-03 W Length: 10.00
North: 26816208.5282 East : 756735.0353
Line Course: S 89-51-57 W Length: 20.00
North: 26816208.4814 East : 756715.0354
Line Course: S 00-08-03 E Length: 10.00
North: 26816198.4814 East : 756715.0588
Line Course: N 89-51-57 E Length: 20.00
North: 26816198.5283 East : 756735.0587

Perimeter: 60.00 Area: 200 sq.ft. 0.005 acres

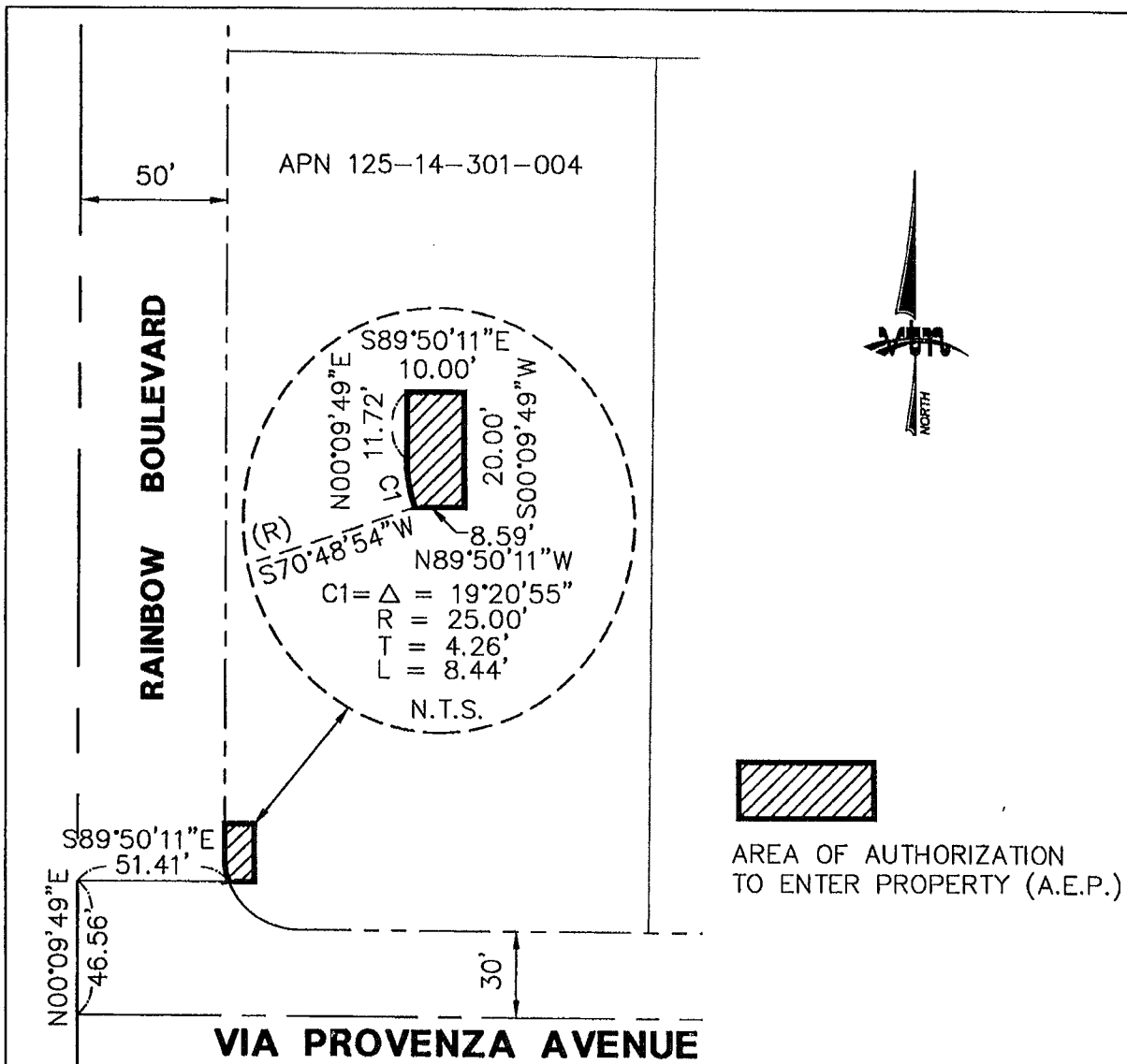
Mapcheck Closure - (Uses listed courses, radii, and deltas)
Error Closure: 0.0000 Course: S 90-00-00 E
Error North: 0.00000 East : 0.00000
Precision 1: 60,000,000.00

Parcel name: 15-604-004B-AEP

North: 26816479.2470 East : 756781.8372
Line Course: S 00-10-37 W Length: 20.00
North: 26816459.2471 East : 756781.7754
Line Course: N 89-49-23 W Length: 10.00
North: 26816459.2780 East : 756771.7755
Line Course: N 00-10-37 E Length: 20.00
North: 26816479.2779 East : 756771.8373
Line Course: S 89-49-23 E Length: 10.00
North: 26816479.2470 East : 756781.8372
Line Course: N 90-00-00 W Length: 0.00
North: 26816479.2470 East : 756781.8372

Perimeter: 60.00 Area: 200 sq.ft. 0.005 acres

Mapcheck Closure - (Uses listed courses, radii, and deltas)
Error Closure: 0.0000 Course: S 90-00-00 E
Error North: 0.00000 East : 0.00000
Precision 1: 60,000,000.00



OWNER BARNEY PAULINE

PARCEL NO. 125-14-301-004

SECTION, TOWNSHIP, RANGE SECTION 14 T. 19 S., R. 60 E.

TOTAL AREA OF PARCEL 1.02 ACRES (RECORD)

AREA OF A.E.P. 196 SQUARE FEET (0.005 ACRES)

REFERENCE: 20070328: 03198

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 2727 S. RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148	PROJECT:	A.E.P. EXHIBIT RAINBOW STORM DRAIN APN 125-14-301-004	SCALE	HORZ. 1"=60' VERT. -
	FOR:	CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS	W.O. NO.	6952
			DRAWN BY:	KAK
			DATE:	6/23/08
			SHEET	1 OF 1

Parcel name: 14-301-004AEP

North:	26814882.7647	East :	756878.4622
Curve Length:	8.44	Radius:	25.00
Delta:	19-20-55	Tangent:	4.26
Chord:	8.40	Course:	N 09-30-38 W
Course In:	N 70-48-54 E	Course Out:	N 89-50-11 W
RP North:	26814890.9802	East :	756902.0737
End North:	26814891.0516	East :	756877.0738
Line Course:	N 00-09-49 E	Length:	11.72
North:	26814902.7715	East :	756877.1073
Line Course:	S 89-50-11 E	Length:	10.00
North:	26814902.7430	East :	756887.1073
Line Course:	S 00-09-49 W	Length:	20.00
North:	26814882.7430	East :	756887.0502
Line Course:	N 89-50-11 W	Length:	8.59
North:	26814882.7676	East :	756878.4602
Line Course:	N 15-42-31 W	Length:	0.00
North:	26814882.7676	East :	756878.4602

Perimeter: 58.75 Area: 196 sq.ft. 0.005 acres

Mapcheck Closure - (Uses listed courses, radii, and deltas)
Error Closure: 0.0035 Course: N 34-35-28 W
Error North: 0.00288 East : -0.00199
Precision 1: 16,785.71

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

**Rainbow Storm Drain
Elkhorn to Grand Teton**

C.4

Utilities

*Final Design Report
Addendum #1*

Las Vegas Wash Middle Branch

Rainbow Storm Drain
Elkhorn to Grand Teton

C.4.1

Utility Conflict Matrix

