

**Addendum #1 to the
Technical Drainage Study
for
Mabel Hoggard Elementary School
950 North Tonopah Drive
Las Vegas, Nevada**

APN: 139-28-210-007

**Prepared by:
Atkins**

2270 Corporate Circle, #200
Henderson, NV 89074
(702) 551-0365

**Prepared for:
Clark County School District**

Real Property Mgt.
1180 Military Tribute Pl.
Henderson, NV 89074
(702) 799-5214

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Mabel Hoggard School Replacement Date: March 25, 2020

Location of Development: a) Descriptive (Cross Streets) North/South: Tonopah

East/West: Washington

b) Section: 28 Township: 20 South Range: 61 East

c) APN : 139-28-210-007

Name of Owner: School Board of Trustees c/o Clark County School District real Property Management

Telephone No.: (702) 799-5214 Fax No.: _____ E-Mail Address: _____

Address: 1180 Miliatry Tribute Pl., Henderson, NV 89074

Contact Person-Name: Janelle Klein, PE Telephone No.: (702) 551-0365

* E-Mail Address: Janelle.Klein@atkinsglobal.com Fax No.: (702) 263-7200

Firm: Atkins

Address: 2270 Corporate Circle, Ste. 200, Henderson, NV 89074

Type of Land Development/Land Disturbance Process:

☐	Rezoning	☐	Subdivision Map	☐	Clearing and Grading Only
☐	Parcel Map	☐	Planned Unit Development	☐	Other (Please specify below)
☐	Large Parcel Map	☒	Building Permit		

1. Total Owned Land Area: At Site: 7.03 Acres Being Developed/Disturbed: 7.03 Acres

2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No

3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☐ Yes** ☒ No

4. Proposed type of development (Residential, Commercial, Etc.): Civic District - School

5. Approximate upstream land area which drains to the subject site: +/- 1.9 Acres

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: Technical Drainage Study for Mabel Hoggard, by Martin & Martin, February 2001 (CLV DS #925)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing Washington Avenue storm drain at Tonopah Drive and Comstock Drive (via Virginia City Ave and Ophir Drive)

8. Briefly describe your proposed schedule for the subject project: ASAP



Engineer's Seal

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

***New Required Field**

****Review and concurrence of the Clark County Regional Flood Control District is required.**

DS# 05249 Local Entity File No.	Revision	Date

REFERENCE:

STANDARD FORM 1



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

Telephone: +1.702.263.7275
Fax: +1.702.263.7200

www.atkinsglobal.com/northamerica

March 19, 2020

Mr. Yuk (Albert) Sung, P.E., CFM
City of Las Vegas Public Works Department
333 N. Rancho Drive, 7th floor
Las Vegas, NV 89106

**RE: ADDENDUM #1 TO THE TECHNICAL DRAINAGE STUDY FOR MABEL HOGGARD
ELEMENTARY SCHOOL**
CITY OF LAS VEGAS #5249
ATKINS PROJECT NO: 100067217

Dear Mr. Sung:

Transmitted herewith is Addendum #1 to the Technical Drainage Study for Mabel Hoggard Elementary School. Following is the response to the first review comments.

1. Provide a copy of the zoning/planning conditions associated with this site (**SDR-76079; VAR-78137; VAR-76077 & PMP-78198**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the side drainage parameters will require that the drainage study be revised and resubmitted.

A copy of the zoning/planning conditions associated with this site are included with this submittal.

2. Identify Project location on all exhibits including the MPU maps.

The Project Location is identified on all exhibits included in this submittal.

3. Provide contours and flow arrows on **Figure 8 Existing Drainage Exhibit** and **Figure 9 Ultimate Drainage Exhibit**.

Figure 8 has been updated to include contours and flow arrows.

4. On **Figure 9 Ultimate Drainage Exhibit**, show the existing storm drain system within *Virginia City Avenue* that the onsite system is tying into.

Figure 9 has been updated to include the existing offsite storm drain.

5. The WSPGW provided for the *Ultimate Condition* does not match the provided **C5.01 Storm Drain Plan**. The junction structures on the exhibit do not appear to match those in the model, and the invert elevations shown on the plans range from 2063.00 to 2059.75 while the WSPG model runs a system that has a much steeper elevation change from 2063.937 to 2052.37. Provide reference material of any other upstream of downstream systems modelled and provide explanation/clarification.

The WSPGW has been updated to match the updated storm drain layout/inverts.

6. The WSPG for the proposed *Tonopah Drive* shows 14 cfs at the downstream end of system but should be modeling 15 cfs.

The HEC-1 model was updated per comments 9 and 10, and the downstream flows are only 14 cfs.

7. On Page 23 of the *Study*, the table for ultimate conditions flow summary is wrongfully referenced as 'Table 5'. That summary table is 'Table 4' on Page 24.

Tables 3 and 4 have been updated with the revised flows based on the updated HEC-1 model.

8. On *Standard Form 4* for existing condition, lag time for sub basin EX-ON 6 does not match the value input on the HEC-1 model.

The HEC-1 Model has been updated.

9. On *Standard Form 4* for ultimate condition, lag time for sub basin U-ON 2 does not match the value input on the HEC-1 model.

The HEC-1 Model has been updated.

10. On *Standard Form 4* for ultimate condition, area for sub basin U-ON 2 does not match the value input on the HEC-1 model.

The HEC-1 Model has been updated.

11. It appears that the onsite catch basin will have approximately 1' of ponding before it can overflow to perimeter streets, 1' of water in a school is problematic, the engineer should try to reduce the ponding depth to 6".

The grading in the courtyard has been revised, reducing the maximum ponding depth to 0.52'.

12. **Sheet C4.01:** A dual 12"-storm drain is proposed under a building. Obtain approval from *City Building Department* prior to final approval of the subject drainage study.

No storm drain lines will run under buildings. The dual 12" storm drain is proposed under parking and play yard.

13. **Sheet C4.01:** Provide TC/FL elevations at all control points such as the beginning of curbs in *Tonopah Drive*.

The curb return callouts are detailed on sheets C4.01, C4.03 and C4.05, additional elevation call outs have been added to clarify grading at control points.

14. **Sheet C4.02:** At the northeast corner of the plan, it is unclear how an elevation tag of "63.36 EG" drains to the adjacent *Virginia City Avenue*. Review and resolve in the next submittal.

Additional existing grades to the north are included to show positive drainage.

15. **Sheet C4.02:** An onsite storm drain is proposed (adjacent to the *Kindergarten Building*) to tie into an existing 24"-storm drain in *Tonopah Drive*. Provide a storm drain manhole for the connection. Revise all pertinent plans and construction notes accordingly.

A manhole connection is provided as shown on sheets C4.00, C5.01 and profiled on C6.02.

16. **Sheet C4.02:** Replace an existing NDOT Type 2 drop inlet with a Type CM drop inlet with equivalent capacity for continuous L-curb & gutter in *Tonopah Drive*.

There is no L-curb & gutter in the area of the existing NDOT Type 2 drop inlet, in order to maintain positive drainage and handicap accessibility no changes to the street/sidewalk were proposed in that area. The existing drop inlet was installed per the Freeway Channel – Washington, MLK to Rancho Drive plans in the accessible crossing area.

17. **Sheet C6.01 & Sheet C6.02:** Label the depth of the two proposed drop inlets in *Tonopah Drive*. Provide Street Name on all pertinent plan & profile sheets.

The plans have updated to show the drop inlet depths, and street names are provided on all pertinent plan & profile sheets.

18. **Sheet C8.00** was not included in this submittal and is referenced for most onsite cross section, therefore not all cross sections could be verified.

Sheet C8.00 is included with this submittal.

19. Show the HGL on the storm drain plan/profile sheets for the systems within *Tonopah Drive* and *Virginia City Avenue*.

The plans have updated to show the HGL on the storm drain plan/profile.

20. The following Finished Floors do not meet the twice the depth of flow, or minimum 6" above the adjacent TC:

<u>Location</u>	<u>TC</u>	<u>FF Shown</u>	<u>FF Required</u>
Central Plant	2066.77	2067.00	2067.37
Kindergarten Building	2066.69	2066.80	2067.19

The curbs indicated are flush curb, the grades have been clarified to show that drainage is maintained away from the buildings.

21. Note that all the drop inlets lengths are in multiple of 2.5'. Revise all pertinent construction notes accordingly.

The plans have updated to have the drop inlets in lengths in multiples of 2.5'.

22. Provide a separate chapter for the BMP calculations to show that the requirement for the large site is being met. Identify the proposed BMP landscape swales clearly on the grading plans.

A section on Best Management Practices is included in this submittal.

23. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).

The plans have updated to include the referenced detail.

24. Provide a note on the grading plans: **"All Onsite Storm Drainage and the associated facilities are Privately Owned and to be Privately Maintained by the School District."**

The plans have updated to include the required note.

This letter certifies that that all items in the Technical Drainage Study for Mabel Hoggard Elementary School electronic submittal matches the paper version bound into the study.

Please contact Atkins at 702-551-0365 if you have any question regarding this submittal.

Sincerely,

Atkins,

Janelle Klein, P.E.
Senior Engineer
Land Development

CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		March 9, 2020
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for:	COPIES TO:
	Mabel Hoggard Elementary School	Atkins
Cross Streets:	NEC of Washington Blvd. & Tonopah Road	Clark County School District
File Number:	F:\Depot\DSMemos\DS5249A.doc	Bart Anderson, P.E., DevCo
Parcel Number:	139-28-210-007	
Zoning Action:	SDR-76079; VAR-78137; VAR-76077 & PMP-78198	
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES X NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	2/13/2020	3/9/2020	See Comments Below	\$400.00	3744256: \$400
			TOTAL FEES (LDDRS):	\$400.00	----

REMARKS:

The Drainage Study for the subject project has been reviewed and:

	is approved subject to conformance to all City standards and the following conditions:
X	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	is conditionally approved subject to Clark County Public Works Department concurrence.

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2. Identify Project location on all exhibits including the MPU maps.
3. Provide contours and flow arrows on **Figure 8 Existing Drainage Exhibit** and **Figure 9 Ultimate Drainage Exhibit**.
4. On **Figure 9 Ultimate Drainage Exhibit**, show the existing storm drain system within *Virginia City Avenue* that the onsite system is tying into.
5. The WSPGW provided for the *Ultimate Condition* does not match the provided **C5.01 Storm Drain Plan**. The junction structures on the exhibit do not appear to match those in the model, and the invert elevations shown on the plans range from 2063.00 to 2059.72 while the WSPG model runs a system that has a much steeper elevation change from 2063.937 to 2052.37. Provide reference material of any other upstream or downstream systems modeled and provide explanation/clarification.

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21. Note that all the drop inlets lengths are in the multiple of 2.5'. Revise all pertinent construction notes accordingly.
22. Provide a separate chapter for the BMP calculations to show that the requirement for the large site is being met. Identify the proposed BMP landscape swales clearly on the grading plans.

23. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).
24. Provide a note on the grading plans: **"All Onsite Storm Drains and the associated facilities are Privately Owned and to be Privately Maintained by the School District"**.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS
HDR/AYS

T/R/S: T20S/R61E/28
AREA M-28

Best Management Practices

The Total Site Size is 7.03 acres, the north parking lot is approximately 0.67 acres, the south parking lot is approximately 0.85 acres, for a total Parking Lot Size of 1.52 acres; based on the Low Impact Development (LID) criteria presented in the HCDDM the site is classified as a Large development.

There is a landscaped swale along the north and south sides of the site that accept flow from a portion of each parking lot. The landscaped swales act as BMPs to treat the runoff before it is discharged offsite. More than 75% of the total parking lot area will be treated in the landscape swales. The entire north parking lot drains to the landscape swale, which runs approximately 200-feet before being collected into the storm drain system; approximately 40% of the south parking lot is directly collected in the storm drain system, the remaining approximately 60% drains to the landscape swale, which runs more than 150-feet before discharging. The design of the landscape swales is within the design criteria presented in section 1503.4.5 of the HCDDM, less than 9" flow depth for the 2-year storm flow, 4- to 6-feet wide at the top, 4:1 side slopes. The slope of the swales is less than 0.5% to maximize settlement of sediment. Normal depth hydraulic calculations are provided in **Appendix A-5**.

NOTES

This map is for assessment use only and does NOT represent a survey.

No liability is assumed for the accuracy of the data delineated herein. Information on roads and other non-assessed parcels may be obtained from the Road Document Listing in the Assessor's Office.

This map is compiled from official records, including surveys and deeds, but only contains the information required for assessment. See the recorded documents for more detailed legal information.

MAP LEGEND

Parcel Boundary

Sub Boundary

PM/LD Boundary

Road Easement

Match / Leader Line

Historic Lot Line

Historic Sub Boundary

Historic PM/LD Boundary

Section Line

Condominium Unit

Air Space PCL

Right of Way PCL

Sub-Surface PCL

ASSESSOR'S PARCELS - CLARK COUNTY, NV.

Briana Johnson - Assessor

001 ROAD PARCEL NUMBER

001 PARCEL NUMBER

1.00 ACREAGE

202 PARCEL SUB/SEQ NUMBER

PB 24-45 PLAT RECORDING NUMBER

5 BLOCK NUMBER

5 LOT NUMBER

GL5 GOV. LOT NUMBER

BOOK

T20S R61E

125 124 123

138 139 140

163 162 161

Scale: 1" = 200'

SEC.

28

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Rev: 1/8/2019

MAP

S 2 NW 4

8	4	8	4
5	1	5	1
6	2	6	2
7	3	7	3
8	4	8	4
5	1	5	1

139-28-2

The map displays the Bonanza Village Tract and surrounding areas. Key features include:

- Streets:** Mills Cir, Fair Ave, Virginia City Ave, Comstock Dr, Ophir Dr, Washington Ave, Ralston Dr, Sharon Rd, Martin L King Blvd, Tonopah Dr.
- Tracts and Parcels:** Bonanza Village Tract (containing parcels 001-013, 060-074, 076-083, 085-099), and various other tracts like 602, 201, 210, 200, 11, 10, 60, 604.
- Parcel Numbers:** Red numbers indicate parcel numbers, while blue numbers indicate lot numbers.
- Other Labels:** "SITE 007", "LEASE", "VAC 860123:00667", "PT18", "PB 2-69", "SUNNY".

TAX DIST 200

FIGURE 2

National Flood Hazard Layer FIRMette



Legend

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

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
OTHER FEATURES		Levee, Dike, or Floodwall
		Cross Sections with 1% Annual Chance Water Surface Elevation
MAP PANELS		20.2
		17.5
		513
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/11/2019 at 4:29:43 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

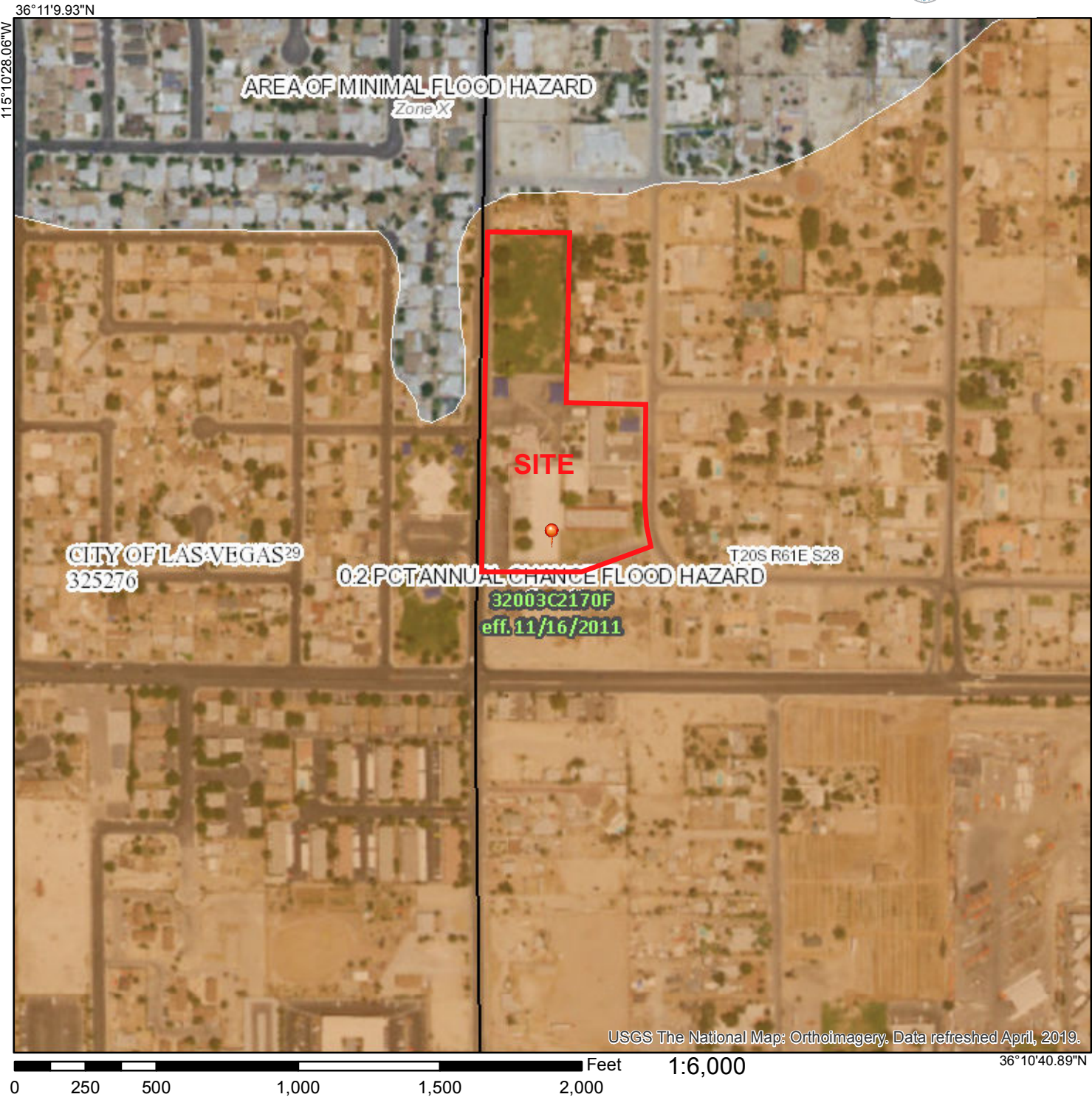


FIGURE 4



2018
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F-24

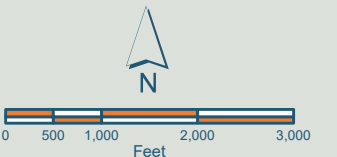
FLOOD CONTROL FACILITIES

LEGEND

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

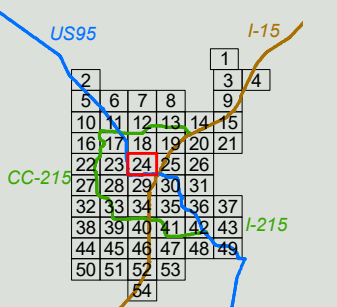
Remove & Replace/Parallel Facilities

- | Category A | Category B |
|------------|------------|
| Channel | Channel |
| Stormdrain | Stormdrain |
| Crossing | Crossing |



Scale: 1 inch = 2,000 feet

AerialSource: Esri World Imagery 2017



ATKINS

Member of the SNC-Lavalin Group



FIGURE 5A

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOOF		GOWAN OUTFALL FACILITIES						
0485	E	90" RCP	1080	630	DGOW2A	GOW3B	1.37	0.47
0486	E	8" X 5' RCB	3200	630	DGOW2A	GOW3B	1.37	0.60
0511	E	8" X 5' RCB	8390	740	CPT6B-C	GOW3B	1.08	0.50
LAAS		NORTH LAS VEGAS AIR TERMINAL - SIMMONS						
0000	E	14" X 6" RCB	580	728	CR2-CA	NW3	2.57	0.50
0014	E	9" X 6" RCB	1489	728	CR2-CA	NW3	2.57	1.44
0040	E	8" X 6" RCB	1111	728	CR2-CA	NW3	2.57	1.74
0060	E	10" X 6" RCB	864	728	CR2-CA	NW3	2.57	0.60
0080	E	66" RCP	157	294	R-C	NW3	0.27	0.50
0083	E	60" RCP	627	294	R-C	NW3	0.27	1.42
0095	E	54" RCP	373	294	R-C	NW3	0.27	1.44
0103	E	48" RCP	400	294	R-C	NW3	0.27	1.75
LAAT		NORTH LAS VEGAS AIR TERMINAL						
0000	E	3: 8" X 5' RCB	650	1364	CB3-1	NW3	4.17	0.50
0006	E	CONC CHNL 20"W 8"D 1.5:1 SS	380	1364	CB3-1	NW3	4.17	0.50
0014	E	10" X 6" RCB	934	1364	CB3-1	NW3	4.17	1.84
0031	E	10" X 6" RCB	1618	1105	CB3-2	NW3	3.87	1.05
0062	E	12" X 8" RCB	511	1105	CB3-2	NW3	3.87	0.50
0070	E	12" X 6" RCB	376	1105	CB3-2	NW3	3.87	0.56
0078	E	10" X 6" RCB	1055	1105	CB3-2	NW3	3.87	0.58
0098	E	10" X 4" RCB	2207	696	CCA1-C	NW3	2.98	0.60
0140	E	CONC CHNL 6"W 4"D 1.5:1 SS	338	696	CCA1-C	NW3	2.98	0.64
0146	E	CONC CHNL 6"W 3"D 1.5:1 SS	1388	696	CCA1-C	NW3	2.98	0.68
0172	E	76" X 48" HERCP	536	494	CA1-C	NW3	2.77	0.75
0182	E	CONC CHNL 6"W 3"D 1.5:1 SS	997	494	CA1-C	NW3	2.77	0.83
0201	E	CONC CHNL 6"W 3"D 1.5:1 SS	184	494	CA1-C	NW3	2.77	0.37
0204	E	48" RCP	425	494	CA1-C	NW3	2.77	0.37
LANO		NORTH LAS VEGAS AIR TERMINAL NORTH						
0000	E	CONC CHNL 0"W 3"D 1.5:1 SS	470	494	CA1-C	NW3	2.77	0.30
0010	P	6" X 4' RCB	3375	211	DA1-C	NW3	2.46	1.13
LCCH		LAS VEGAS CREEK CHANNEL						
0013	E	2: 12" X 6" RCB	2035	3050	CLC20-C	MEADOWS4	9.60	0.82
0051	E	2: 14" X 7" RCB	3113	3050	CLC20-C	MEADOWS4	9.60	0.60
0110	E	TRANSITION STRUCTURE	220	3001	COLC16-C	MEADOWS4	9.50	
0114	E	2: 14" X 7" RCB	670	2386	CRMEDET	MEADOWS4	8.19	0.80
0127	E	TRANSITION STRUCTURE	110	2386	CRMEDET	MEADOWS4	8.19	
0129	E	2: 14" X 7" RCB	1130	2386	CRMEDET	MEADOWS4	8.19	0.50
0150	E	2: 13" X 7" RCB	200	2386	CRMEDET	MEADOWS4	8.19	0.95
0154	E	TRANSITION STRUCTURE	190	2386	CRMEDET	MEADOWS4	8.19	
0157	E	2: 12" X 6" RCB	1650	1700	COLC14-C	SW3	2.93	1.06
0188	E	2: 12" X 6" RCB	2225	1700	COLC14-C	SW3	2.93	1.36
0230	E	12" X 6" RCB	2140	1450	CLC14-C	SW3	2.53	1.74
0270	E	12" X 6" RCB	1705	814	CCWA02-C	SW3	1.84	0.54
0302	E	8" X 6" RCB	3940	814	CCWA02-C	SW3	1.84	2.49
0377	E	10" X 7" RCB	1226	814	CCWA02-C	SW3	1.84	0.74
0400	E	TRANSITION STRUCTURE	110	458	CWA02-C	SW3	1.47	0.49
0402	E	8" X 6" RCB @ JONES	535	458	CWA02-C	SW3	1.47	0.49
0412	E	60" RCP	1370	458	CWA02-C	SW3	1.47	1.08
0438	E	60" RCP	1090	171	CLC01-C	SW3	1.20	1.60
0458	E	60" RCP	1060	171	CLC01-C	SW3	1.20	1.60
0478	E	60" RCP	1110	171	CLC01-C	SW3	1.20	0.55
0499	E	42" RCP OUTLET	660	87	RAINBOWDB	SW3	1.11	1.88
0513	E	102 AC-FT RAINBOW DETENTION BASIN		1027	RAINBWIN	SW3	1.11	
LCDE		LAS VEGAS CREEK - DECATUR						
0000	E	6" X 5' RCB	1800	430	LC11-C	SW3	0.38	1.26
0034	E	72" RCP	700	430	LC11-C	SW3	0.38	0.50
LCJO		LAS VEGAS CREEK - JONES						
0000	E	6" X 6" RCB	380	381	AL01B-C	SW3	0.37	0.50
0007	E	6" X 5' RCB	675	381	AL01B-C	SW3	0.37	0.62
LCLO		LAS VEGAS CREEK - LORENZI						
0000	E	7" X 6" RCB	445	285	DAL00A	SW3	0.41	3.37
LCLO		LAS VEGAS CREEK - LORENZI						
0008	E	7" X 6" RCB	2983	285	DAL00A	SW3	0.41	0.40
LCLT		LAS VEGAS CREEK - LATERAL						
0000	E	6" X 6" RCB	620	250	WA10D	SW3	0.40	0.50
0006	E	CONC CHNL 10"W 4"D 0:1 SS	1230	125^	WA10D^	SW3	0.40	0.62
0007	E	23" x 14" HERCP	1230	125^	WA10D^	SW3	0.40	0.62
0033	E	10" X 4' RCBC @ WASHINGTON	96	372	WA10-C	SW3	0.40	0.50
0034	E	GRASS CHNL 12"W 5"D 1:1 SS	1750	372	WA10-C	SW3	0.40	0.20
LCME		LAS VEGAS CREEK - MEADOWS						
0000	E	14" X 8" RCB	895	1484	MEADOWDB	SW3SC	5.67	0.72
0016	E	STILLING BASIN	140	1484	MEADOWDB	SW3SC	5.67	0.21
0017	E	3,300 CFS SPILLWAY (REPLACE W/ LCME0018)		3300	MEADOWDB	SW3SC	5.67	
0018	P	MODIFY SPILLWAY, RAISE HEIGHT BY 1' (REPLACES LCME0017)		3300	MEADOWDB	SW3SC	5.67	
0019	E	1: 11" X 5' RCB AND 1: 11.5' X 5' RCB	110	1484	MEADOWDB	SW3SC	5.67	0.81
0020	E	213 AC-FT MEADOWS DETENTION BASIN		4909	MEADOWIN	SW3SC	7.55	
LCRA		LAS VEGAS CREEK - RANCHO						
0000	E	12" X 8" RCB	380	931	CLC16-C	SW3	1.71	0.60
0004	E	12" X 6" RCB	2367	931	CLC16-C	SW3	1.71	0.77
0050	E	8" X 6" RCB	355	694	WA13D	SW3	1.39	0.50
LMDE		LAKE MEAD BOULEVARD - DECATUR BRANCH						
0000	P	10" X 5' RCB	2640	673	DCVG04-C	NW3	1.25	0.90
LV15		FREEWAY CHANNEL						
0372	E	9" X 6" RCB	1970	1152	CWA20-C	NW3	4.52	0.66
0409	E	7" X 6" RCB	815	841	CVG07	NW3	4.09	0.91
0424	E	10" X 5' RCB	130	841	CVG07	NW3	4.09	0.40
0427	E	8" X 6" RCB	2411	841	CVG07	NW3	4.09	0.60
0460	E	6" X 5' RCB	1242	253	CCWA13-C	NW3	3.31	1.50
0472	E	60" RCP	713	410	WA15A-C	NW3	0.43	0.30
0474	E	5" X 5' RCB	1625	253	CCWA13-C	NW3	3.31	1.00
0528	P	8" X 8" RCB	4420	959	CWA13-C	SW3	1.39	1.19
0602	P	2: 66" RCP	5980	551	CWA09-C	SW3	0.63	1.59
LVLN		LAS VEGAS WASH - LAKE MEAD						
0059	E	72" RCP (REPLACE W/ LVLN0060)	5952	1159	CLM20-C	NW3SC	1.36	0.66
0060	P0	12" X 7" RCB (REPLACES LVLN0059)	5952	1159	CLM20-C	NW3SC	1.36	0.66
0170	E	78" RCP	2421	454	CLM16A-C	NW5	12.15	1.17
0221	P	48" RCP OUTLET	270	195	DR2	NW4	11.77	
0222	E	48" RCP OUTLET	500	368	DCAREY	NW4	11.77	
0224	E	36" RCP	2429					0.53
0225	E	90" RCP (REPLACE W/ LVLN0226)	641	2077	CLM10-C	NW3	3.01	1.35
0226	P0	2: 10" X 9" RCB (REPLACES LVLN0225)	641	2077	CLM10-C	NW3	3.01	0.50
0227	E	10,000 CFS PMF SPILLWAY		10000	CARYLMD8	NW4	11.77	
0228	E	607 AC-FT CAREY-LAKE MEAD DETENTION BASIN		5499	CARYLMIN	NW4	11.78	
0270	E	90" RCP (REPLACE W/ LVLN0271)	3473	2077	CLM10-C	NW3	3.01	1.35
0271	P0	12" X 8" RCB (REPLACES LVLN0270)	3473	2077	CLM10-C	NW3	3.01	1.35
0336	E	84" RCP (REPLACE W/ LVLN0337)	1050	1769	CLM06-C	NW3	2.60	1.16
0337	P0	12" X 8" RCB (REPLACES LVLN0336)	1050	1769	CLM06-C	NW3	2.60	1.16
0355	E	90" RCP (REPLACE W/ LVLN0356)	1840	1769	CLM06-C	NW3	2.60	0.40
0356	P0	12" X 11" RCB (REPLACES LVLN0355)	1840	1769	CLM06-C	NW3	2.60	0.40
0388	E	84" RCP	520	913	CLM05-C	NW3	1.00	1.40
0399	E	78" RCP	803	913	CLM05-C	NW3	1.00	1.07
0416	E	72" RCP	1320	913	CLM05-C	NW3	1.00	1.00
0442	E	60" RCP	725	591	CLM03-C	NW3	0.63	1.28
0453	E	54" RCP	589	591	CLM03-C	NW3	0.63	2.37
0460	E	54" RCP	1464	591	CLM03-C	NW3	0.63	2.05
0475	E	48" RCP	2632	242	LM02-C	NW3	0.29	1.24
0525	E	48" RCP	2600	565	CLM01-C	NW3	0.64	1.24
LVOW		OWENS AVENUE SYSTEM						
0003	E	96" RCP	7500	1219	CLM16B-C	NW3	2.43	0.70
0146	E	84" RCP	4800	570	DCVG20-C	NW3	2.04	0.90
0241	E	72" RCP	4832	416	CVG20-C	NW3	1.56	1.65
0327	E	7" X 5' RCB	360	416	CVG20-C	NW3	1.56	1.26
0351	E	72" RCP	2250	837	CVG04-C	NW3	1.25	1.44
LVOW		OWENS AVENUE SYSTEM						
0355	E	8" X 5' RCB	491	837	CVG04-C	NW3	1.25	0.40
0360	P	8" X 6" RCB	2300	837	CVG04-C	NW3	1.25	1.48
0460	P	7" X 6" RCB	2700	615	CVG03-C	NW3	0.95	1.48
0513	P	6" X 5' RCB	2615	463	CVG02-C	NW3	0.68	1.68
LVPK		PEAK DRIVE SYSTEM						
0000	E	CONC CHNL 15"W 6"D 0:1 SS	606	1081	CPD04B-C	NW3	1.59	1.22
0019	E	CONC CHNL 20"W 5.5"D 0:1 SS	2190	1081	CPD04B-C	NW3	1.59	0.57
0056	E	10" X 5' RCB	103	723	CCY04A-C	NW3	1.12	0.40
0058	E	9" X 6" RCB	2542	723	CCY04A-C	NW3	1.12	0.95
0104	E	10" X 6" RCB	76	723	CCY04A-C	NW3	1.12	1.26
0106	E	7" X 5' RCB	1235	723	CCY04A-C	NW3	1.12	0.61
0130	E	7" X 5' RCB	1435	383	CPD01-C	NW3	0.67	0.61
LVRA		LAS VEGAS WASH - RANCHO						
0000	E	12" X 8" RCB	612	1438	CCPD04BC	NW3	3.77	1.56
0012	E	12" X 8" RCB	2838	1438	CCPD04BC	NW3	3.77	0.78
0066	E	14" X 5' RCB	65	1438	CCPD04BC	NW3	3.77	1.22
LVSR		LAS VEGAS WASH - SMOKE RANCH						
0070	E	66" RCP (REPLACE W/ LVSR0071)	4118	1086	CS1-C	NW3SC	1.42	0.73
0071	P	10" X 8" RCB (REPLACES LVSR0070)	4118	1086	CS1-C	NW3SC	1.42	0.73
0148	E	54" RCP (REPLACE W/ LVSR0149)	2587	823	CS	NW3SC	0.95	0.58
0149	P	11" X 6" RCB (REPLACES LVSR0148)	2587	823	CS	NW3SC	0.95	0.58
0197	E	30" RCP (REPLACE W/ LVSR0198)	581	368	CR2-C	NW3SC	0.38	0.86
0198	P	8" X 4" RCB (REPLACES LVSR0197)	581	368	CR2-C	NW3SC	0.38	0.86
0208	E	54" RCP (REPLACE W/ LVSR0209)	2060	368	CR2-C	NW3SC	0.38	1.41
0209	P	7" X 4" RCB (REPLACES LVSR0208)	2060	368	CR2-C	NW3SC	0.38	1.41
0210	E	14" X 8" RCB	800	3092	CB1-C	NW3	6.34	1.73
0221	E	TRANSITION STRUCTURE	100	3092	CB1-C	NW3	6.34	7.08
0223	E	CONC CHNL 14"W 8"D 1.5:1 SS	2150	3092	CB1-C	NW3	6.34	0.96
0263	E	14" X 8" RCB	707					

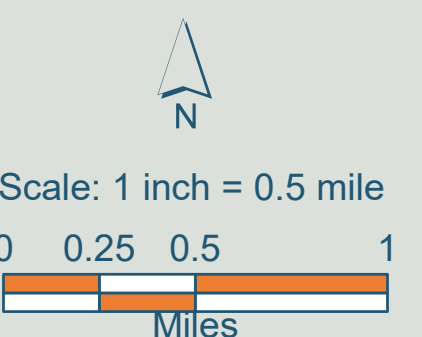
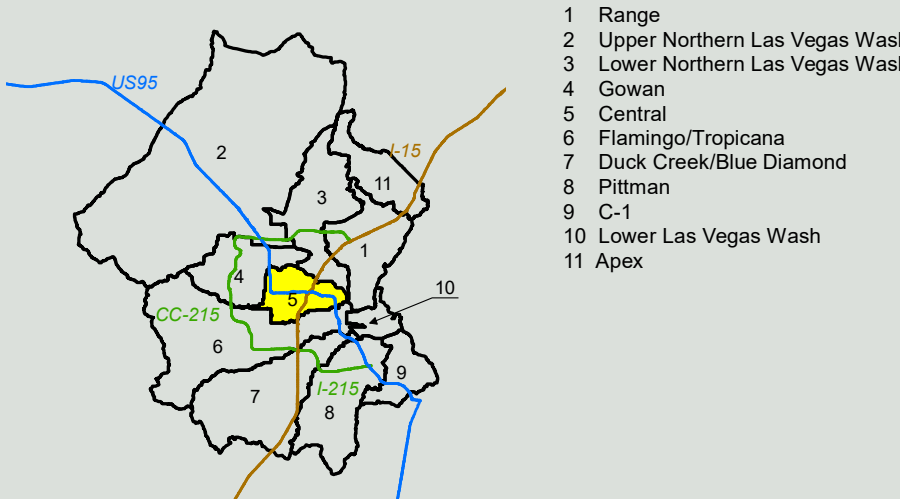


2018 Las Vegas Valley Master Plan Update

Figure W-5
Central Watershed

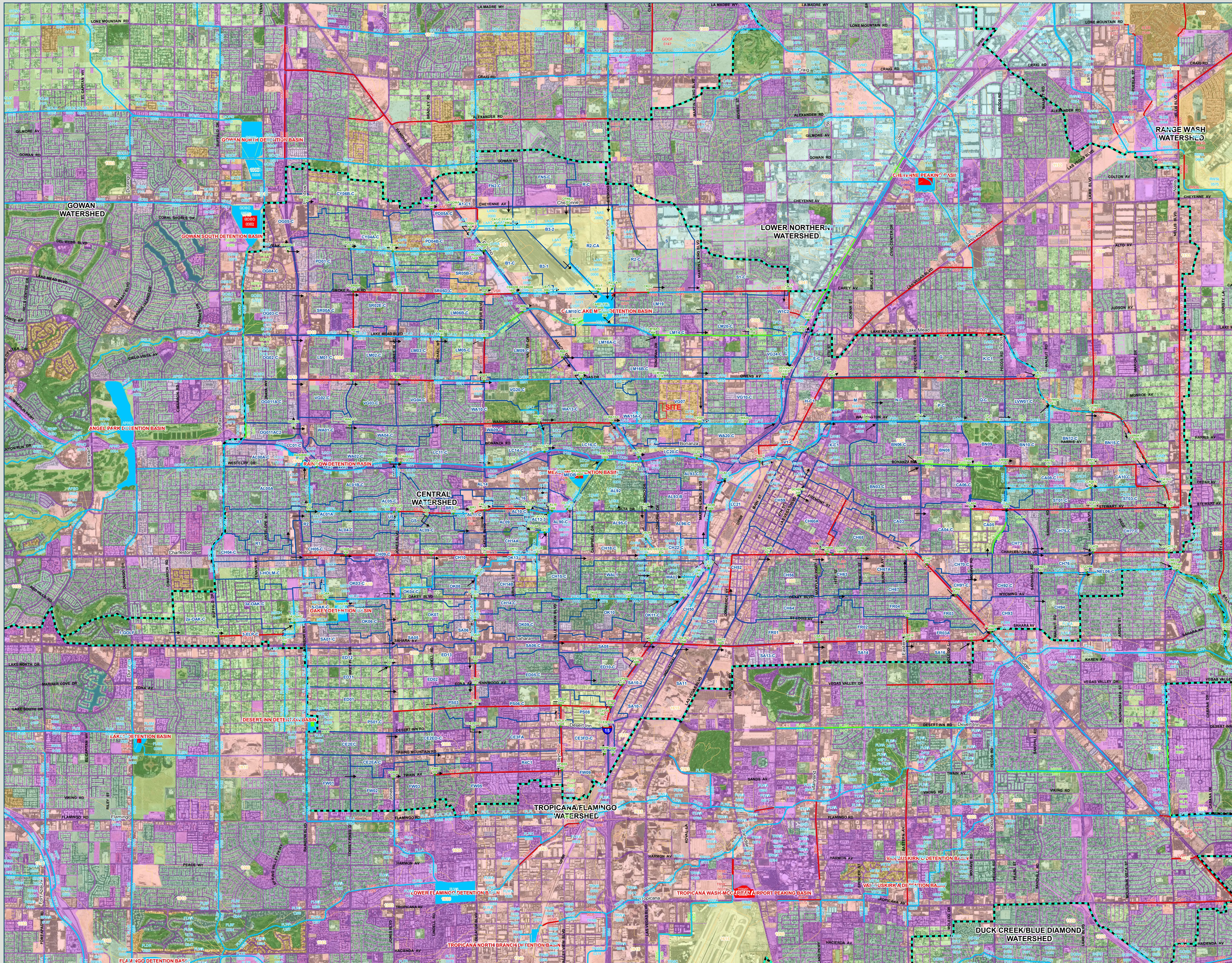
Legend

- Flow Arrows
- Concentration Points
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Ultimate Development Boundary
- Watershed
- Subbasins
- Soils
- 1: Undeveloped Land, Open desert
- 2: Parks, Golf Courses
- 3: Rural, 0.5-1 units per acre (uses 1 unit/acre)
- 4: Low-Density Residential, 1-2 units per acre (uses 2 units/acre)
- 5: Medium-Density Residential, 2-4 units per acre (uses 3 units/acre)
- 6: High-Density Residential, 4-8 units per acre (uses 6 units/acre)
- 7: Public Facility and Residential, 8-12 units/acre
- 8: Very High-Density Residential, 12 units/acre or more
- 9: Commercial, Retail, Casino, High Rise Condominiums
- 10: Light Industrial
- 11: Heavy Industrial
- 12: Schools
- 13: Lakes



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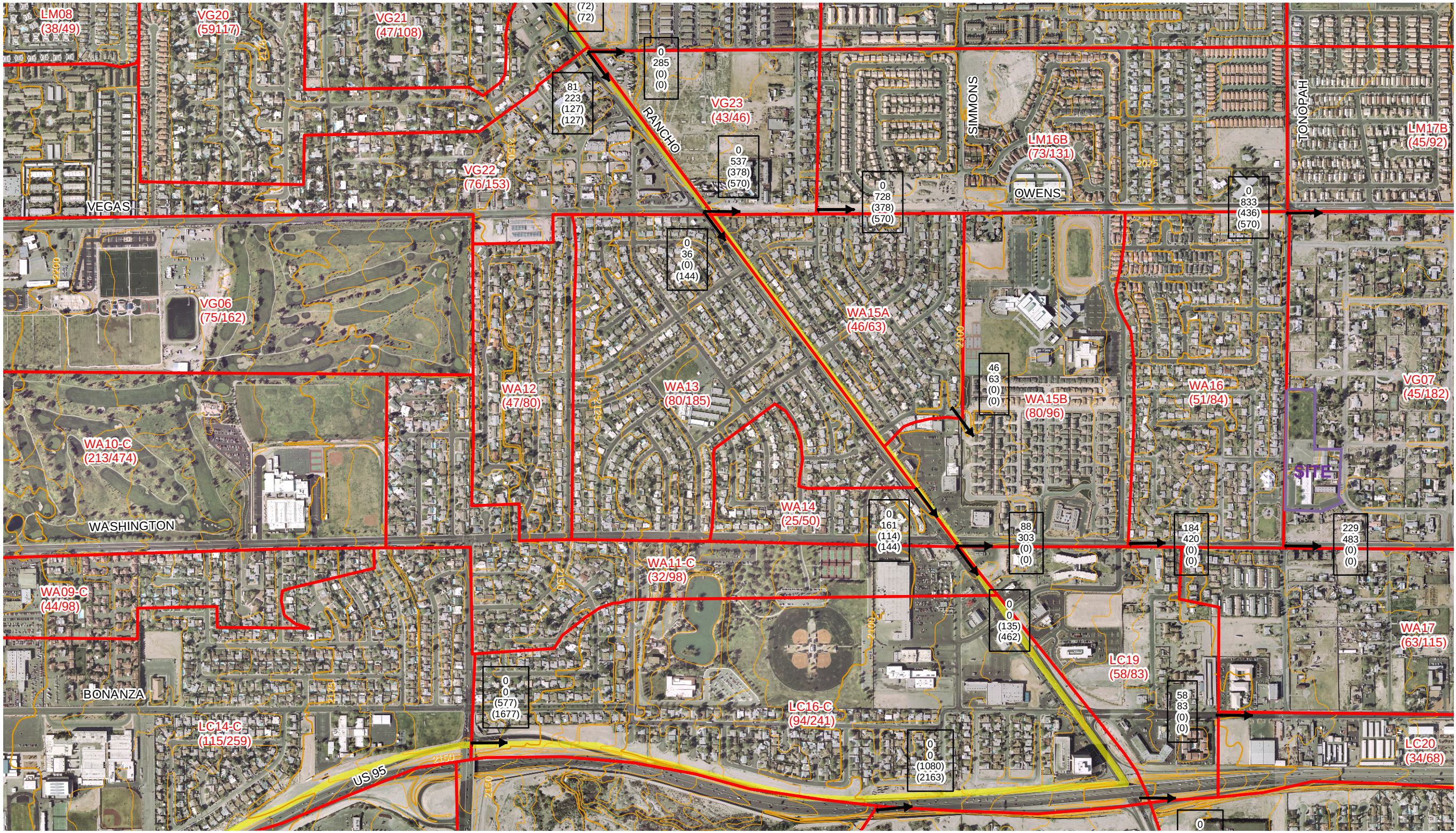
CENTRAL
NEIGHBORHOOD
FLOOD CONTROL
MASTER PLAN

LEGEND

- Sub-basin Boundary
- Basin ID
- (10yr./100yr.) Contributing flow from the basin (cfs)
- Flow Arrow
- 10-Year Street Flow
100-Year Street Flow
10-Year Facility Flow
100-Year Facility Flow
(Flows in CFS)
- Study Area Limit

PHOTO DATE: SPRING 2004

FIGURE E-3



EXISTING DRAINAGE CONDITIONS

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	Durango	Rainbow	Decatur	Tonopah	5th	Pecos	Nellis
Lake Mead				1	2		
Washington				3	4	5	6
Charleston	7	8	9	10	11	12	
Sahara	13	14	15	16	17		
Desert Inn		18	19				

NOTE:
Existing conditions are based on future
Curve Number values with only existing local and
CCRFCD facilities in place.

100-Year flows at locations where a 100-Year
subbasin concentration point does not exist in the
hydrology model were based on an area-weighted
ratio of the 100-Year flows from concentration points
upstream and downstream of the location. See
Volume I for a more detailed explanation.

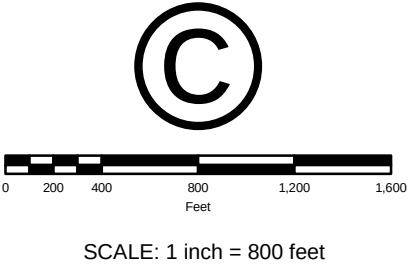


FIGURE 7A



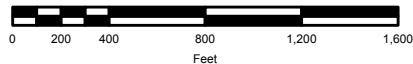
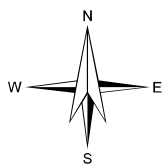
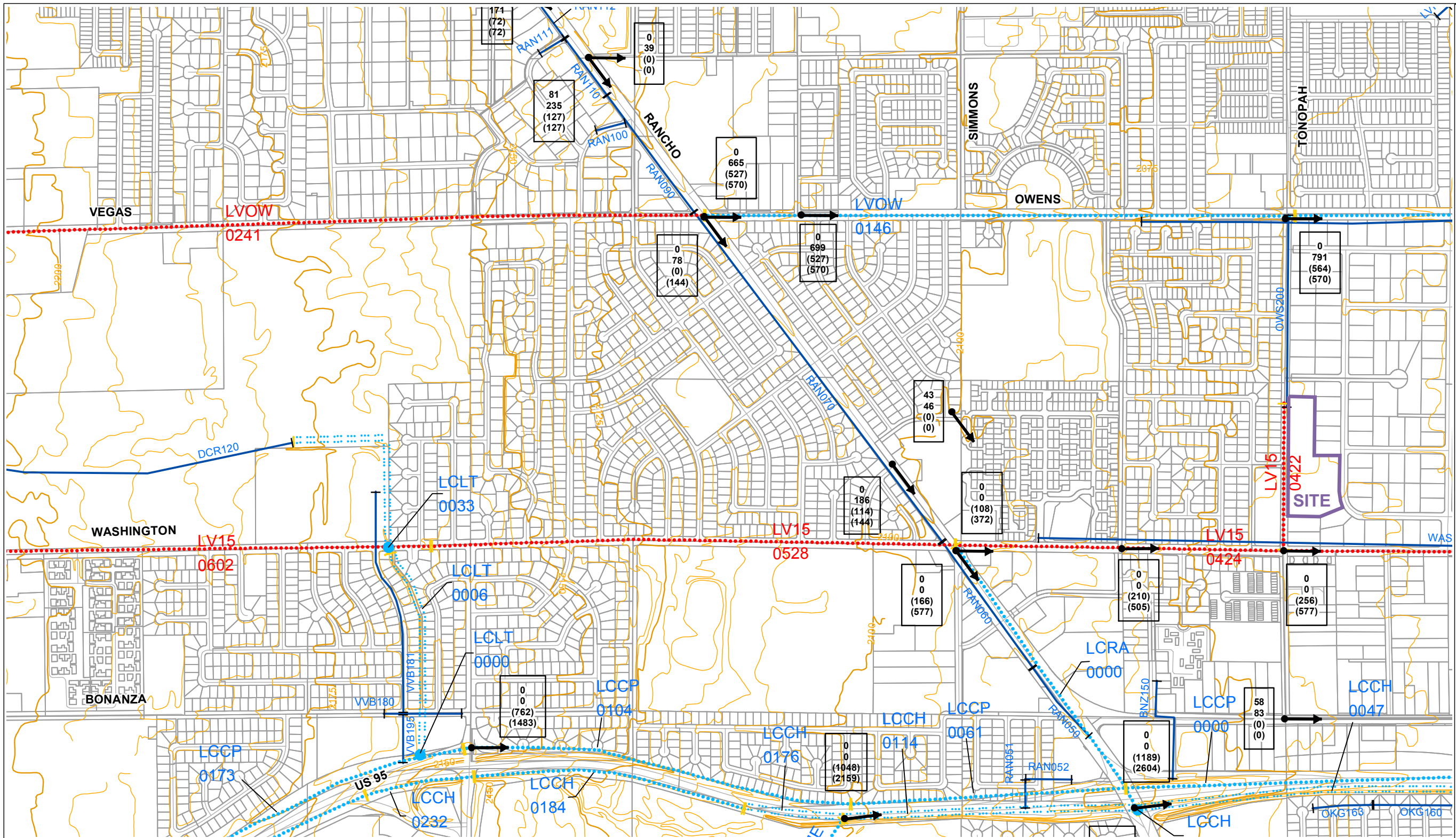
City of Las Vegas

CENTRAL NEIGHBORHOOD FLOOD CONTROL MASTER PLAN

LEGEND

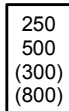
- Existing Regional Facility
- Category A Proposed Regional Facility (2002 MPU)
- Category B Proposed Regional Facility (2002 MPU)
- Category A Proposed Regional Facility (2004 CNFCMP)
- Existing Local Facility
- Proposed Local Facility
- Regional Culvert
- Regional Bridge
- Regional Pipeline
- Regional Channel
- Regional Levee
- Regional Detention Basin
- Local Storm Drain
- Local Culvert
- Proposed Local Storm Drain
- Regional ID-Mile Separator
- Local Facility Separator

FIGURE F-3



SCALE: 1 inch = 800 feet

Flow Arrow

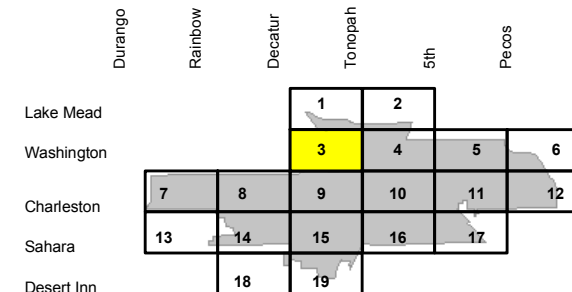


10-Year Street Flow
100-Year Street Flow
10-Year Facility Flow
100-Year Facility Flow

(Flows in CFS)

NOTE:
Ultimate drainage conditions are based on future Curve Number values with all flood control facilities in place.

100-Year flows at locations where a 100-Year subbasin concentration point does not exist in the hydrology model were based on an area-weighted ratio of the 100-Year flows from concentration points upstream and downstream of the location. See Volume I for a more detailed explanation.



FUTURE DRAINAGE CONDITIONS



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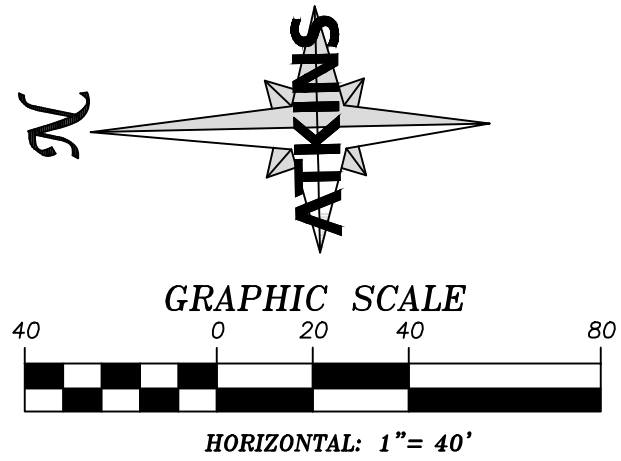
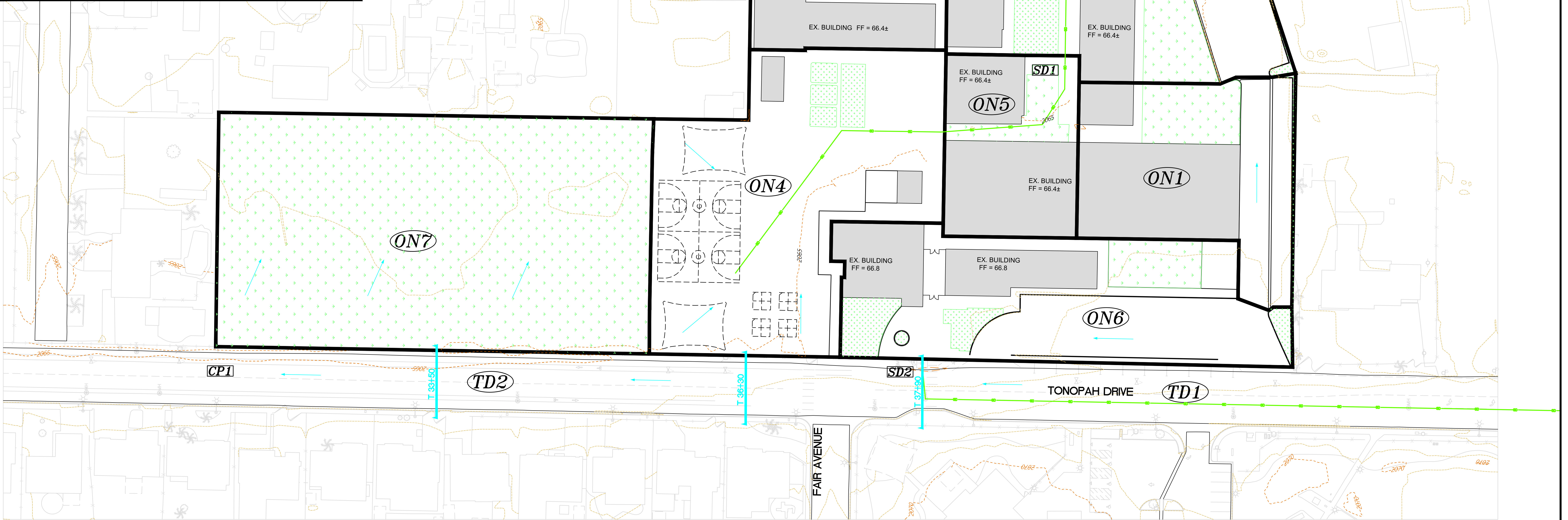
Table 3. Existing Condition Flow Summary

HEC-1 Node	Tributary Area (acres)	Tributary Area (mi ²)	10-year Discharge (cfs)	100-year Discharge (cfs)
EX-ON7	1.92	0.0030	1	3
TD-2	0.39	0.0006	1	1
CP1	-	-	2	4
EX-ON6	1.02	0.0016	2	3
TD-1	0.28	0.0004	0	1
SD2	-	-	2	4
EX-ON5	0.46	0.0007	1	1
EX-ON4	1.30	0.0002	3	5
SD1	-	-	3	6
EX-ON3	0.61	0.0009	1	2
EX-ON1	0.71	0.0011	1	2
EX-ON2	1.13	0.0018	1	3
BVT	1.67	0.0026	1	3
VCA	0.22	0.0003	0	0
CP3	-	-	5	10

Table 4. Ultimate Condition Flow Summary

HEC-1 Node	Tributary Area (acres)	Tributary Area (mi ²)	10-year Discharge (cfs)	100-year Discharge (cfs)
U-ON7	1.64	0.0026	2	4
TD-2	0.39	0.0006	1	1
U-ON1	0.39	0.0006	1	1
SD-TD1	-	-	4	7
U-ON2	0.32	0.0014	1	1
TD-1	0.28	0.0004	0	1
SD-TD2	-	-	1	2
U-ON3	1.35	0.0021	3	5
SD-T3	-	-	7	14
U-ON6	0.59	0.0009	1	2
U-ON5	0.92	0.0014	1	2
CP1	-	-	2	4
BVT	1.67	0.0026	1	3
VCA	0.22	0.0003	0	0
CP2	-	-	4	8
U-ON4	1.92	0.0030	4	6

EXISTING CONDITION HYDROLOGY SUMMARY				
HEC-1 NODE	AREA (ACRES)	AREA (MI ²)	10-YEAR DISCHARGE (CFS)	100-YEAR DISCHARGE (CFS)
EX-ON7	1.92	0.0030	1	3
TD-2	0.39	0.0006	1	1
CP1	COMBINE EX-ON7 & TD2		2	4
EX-ON6	1.02	0.0016	2	3
TD-1	0.28	0.0004	0	1
SD2	COMBINE EX-ON6 & TD1		2	4
EX-ON5	0.46	0.0007	1	1
EX-ON4	1.30	0.0002	3	5
SD1	COMBINE EX-ON5 & ON4		3	6
EX-ON3	0.61	0.0009	1	2
EX-ON1	0.71	0.0011	1	2
EX-ON2	1.13	0.0018	1	3
BVT	1.67	0.0026	1	3
VCA	0.22	0.0003	0	0
CP3	COMBINE EX-ON3, ON1, ON2, BVT, & VCA		5	10



EXISTING CONDITION HYDRAULIC SUMMARY					
SECTION	SLOPE	FLOW (FT ³ /SEC)	VELOCITY (FT/SEC)	DEPTH (FT)	DxV
T 33+50	0.13%	2	0.83	0.32	0.27
T 36+30	0.31%	3	1.28	0.25	0.32
T 37+90	0.18%	2	1.19	0.20	0.24
V 18+50	0.40%	3	0.94	0.16	0.15

LEGEND:

- ON4

DRAINAGE SUB-BASIN
- CP2

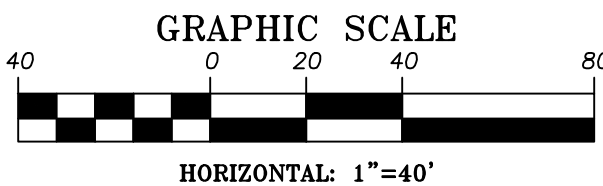
CONCENTRATION POINT
- T 33+50

STREET SECTION
- EXISTING STORM DRAIN

CENTERLINE

ROW

EDGE OF PAVEMENT

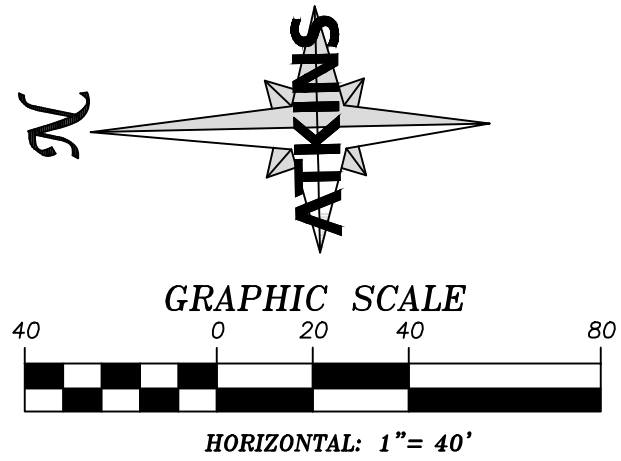
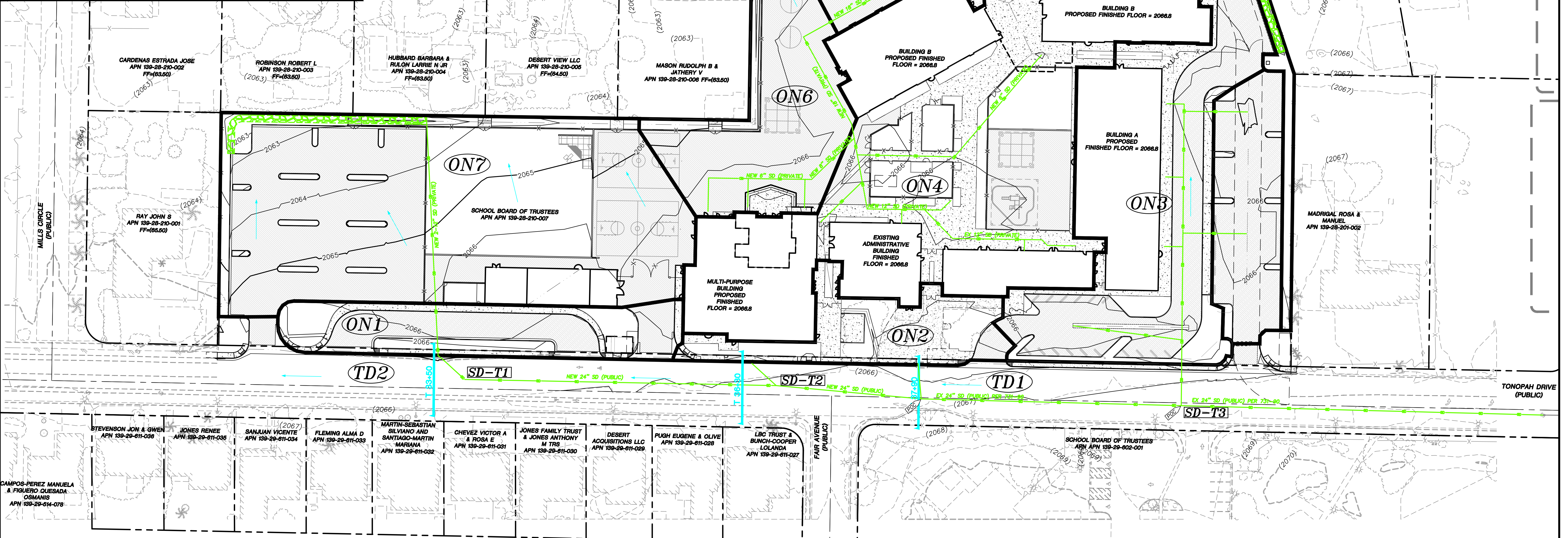


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TITLE: **FIGURE 8**
EXISTING DRAINAGE
MABEL HOGGARD
ES REPLACEMENT

ULTIMATE CONDITION HYDROLOGY SUMMARY				
HEC-1 NODE	AREA (ACRES)	AREA (MI ²)	10-YEAR DISCHARGE (CFS)	100-YEAR DISCHARGE (CFS)
U-ON7	1.64	0.0026	2	4
TD-2	0.39	0.0006	1	1
U-ON1	0.39	0.0006	1	1
SD-TD1	COMBINE ON7,ON1,&TD2		4	7
U-ON2	0.32	0.0014	1	1
TD-1	0.28	0.0004	0	1
SD-TD2	COMBINE U-ON2 & TD1		1	2
U-ON3	1.35	0.0021	3	5
SD-T3	COMBINE SDT2 & U-ON3		7	14
U-ON6	0.59	0.0009	1	2
U-ON5	0.92	0.0014	1	2
CP1	COMBINE U-ON5 & ON6		2	4
BVT	1.67	0.0026	1	3
VCA	0.22	0.0003	0	0
CP2	COMBINE BVT & VCA		4	8
U-ON4	1.92	0.0030	4	6



ULTIMATE CONDITION HYDRAULIC SUMMARY					
SECTION	SLOPE	FLOW (FT ³ /SEC)	VELOCITY (FT/SEC)	DEPTH (FT)	DxV
T 33+50	0.13%	2	1.00	0.40	0.40
T 36+30	0.31%	3	1.65	0.42	0.69
T 37+90	0.18%	2	1.10	0.19	0.21
V 18+50	0.40%	3	0.94	0.16	0.15

LEGEND:

ON4

CONCENTRATION POINT

CP2

CONCENTRATION POINT

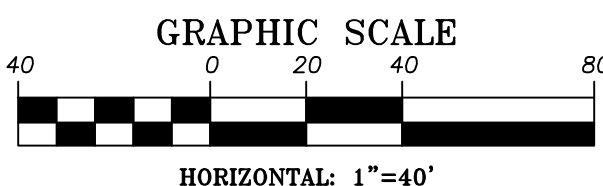
BMP LANDSCAPE SWALE

EXISTING STORM DRAIN

CENTERLINE

ROW

EDGE OF PAVEMENT



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TITLE

FIGURE 9
ULTIMATE DRAINAGE
MABEL HOGGARD
ES REPLACEMENT

Appendix A

Drainage Study Appendix

- Appendix A-1: Existing Condition Hydrologic Parameters
- Appendix A-2: Existing Condition Hydrologic Model
- Appendix A-3: Ultimate Condition Hydrologic Parameters
- Appendix A-4: Ultimate Condition Hydrologic Model
- Appendix A-5: Normal Depth Calculations
- Appendix A-6: Ultimate Condition Hydraulic Model

Existing Condition Hydrologic Parameters

Hoggard Elementary School Existing Condition

Atkins Job # 100067217

Calculated by: JLK

Checked by: MMA

Subbasin Data						Initial Overland Time (t _i)			Travel Time (t _t)					t _c check (Urbanized basins)				Remarks
Subbasin	Dev. or Ex.	CN	K	Area (Acres)	Area (mi ²)	Length (ft)	Slope (%)	time (min)	Length (ft)	Slope (%)	V ₁ (fps)	V ₂ (fps)	Travel Time	t _c (calc)	Max t _c	Min t _c	Lag Time (hr)	
EX-ON1	D	95.81	0.875	0.71	0.0011	120	1.00	4.44	301	1.00	2.02	3.06	5.02	9.46	13.90	5.00	0.095	
EX-ON2	D	94.44	0.857	1.13	0.0018	455	1.00	9.35	425	1.00	2.02	3.06	7.08	16.43	18.15	5.00	0.164	
EX-ON3	D	95.97	0.877	0.61	0.0009	195	1.00	5.61	230	0.50	1.43	2.16	7.67	13.28	13.94	5.00	0.133	
EX-ON4	D	97.55	0.898	1.30	0.0020	30	2.00	1.58	630	1.00	2.02	3.06	4.10	5.68	16.11	5.00	0.057	
EX-ON5	D	95.70	0.873	0.46	0.0007	140	0.50	6.08	350	0.50	1.43	2.16	11.67	17.75	14.54	5.00	0.145	
EX-ON6	D	96.05	0.878	1.02	0.0016	275	0.55	8.09	660	0.80	1.81	2.74	4.57	12.66	18.66	5.00	0.127	
EX-ON7	D	84.0	0.719	1.92	0.0030	195	0.50	12.07	390	0.50	1.43	2.16	13.00	25.07	15.42	5.00	0.154	
TD-1	D	98	0.904	0.28	0.0004	30	2.00	1.54	400	0.50	1.43	2.16	13.33	14.87	13.98	5.00	0.140	
TD-2	D	98	0.904	0.39	0.0006	30	2.00	1.54	565	0.50	1.43	2.16	5.80	7.34	15.51	5.00	0.073	
BVT	D	85	0.732	1.67	0.0026	100	0.50	8.35	200	0.50	1.43	2.16	6.67	15.01	12.78	5.00	0.128	
VCA	D	93	0.838	0.22	0.0003	30	2.00	2.05	325	0.50	1.43	2.16	10.83	12.89	13.29	5.00	0.129	
Tc = Ti + Tt Tlag = 0.6 Tc Ti = 1.8 (1.1 - K) L^{1/2} / S^{1/3} K = 0.0132 (CN) - 0.39 Tc Check = L/180+10 For the travel time (Tt) calculations, V1 applies to the first 500 feet of travel distance; V2 applies to the remaining travel distance. Existing V1 = 14.8*(S/100)^{1/2} Existing V2 = 29.4*(S/100)^{1/2} Developed V1 = 20.2*(S/100)^{1/2} Developed V2 = 30.6*(S/100)^{1/2}																		
															STANDARD FORM 4			

Existing Condition Hydrologic Model

1*****

*

FLOOD HYDROGRAPH PACKAGE (HEC-1)

JUN 1998

VERSION 4.1

RUN DATE 17MAR20 TIME 16:31:21

*

Existing.OUT

*

U.S. ARMY CORPS OF ENGINEERS

HYDROLOGIC ENGINEERING CENTER

609 SECOND STREET

DAVIS, CALIFORNIA 95616

(916) 756-1104

*

```

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

```

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION

KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1

HEC-1 INPUT

PAGE 1

LINE

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

1

ID

2

ID

*

3

ID

*

4

ID

*

5

ID

*

6

ID

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7

ID

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8

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9

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11

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12

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13

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14

ID

*

15

ID

16

ID

*

17

IT

5 0 0 300

18

IO

5

19

IN

5 0 0

20

JR

PREC .57 1

21

KK

EX-ON7

22

KM

EXISTING

23

KM

ONSITE

24

PB

2.77

25

PC

.000

26

PC

.130

27

PC

.190

28

PC

.251

29

PC

.499

30

PC

.860

31

PC

.982

32

PC

.998

33

BA

.0030

34

LS

0 84.0

35

UD

.154

36

KK

TD-2

37

KM

EXISTING

38

KM

TONOPAH

39

BA

.0006

40

LS

0 98.0

41

UD

.073

42

KK

CP1

43

KM

COMBINES

44

HC

2

22

PLAYGROUND

1.92 AC

23

SUBBASIN

ON7

24

AREA

25

.057

26

.070

27

.087

28

.108

29

.124

30

.130

31

.130

32

.130

33

.130

34

.130

35

.130

36

.130

37

.130

38

.130

39

.130

40

.130

41

.130

42

.130

43

.130

44

.130

45

.130

46

.130

47

.130

48

.130

49

.130

50

.130

1

HEC-1 INPUT

PAGE 2

LINE

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

45

KK

EX-ON6

46

KM

EXISTING

47

KM

ONSITE

48

BA

.0016

49

LS

0 96.0

50

UD

.127

46

PAVED PARKING, BUILDINGS, AND LANDSCAPING

47

AREA

1.02 AC

Existing.OUT

51	KK	TD-1			
52	KM	EXISTING	TONOPAH DRIVE	ADJACENT TO SOUTH PORTION OF SITE	
53	KM		AREA	0.28 AC	
54	BA	.0004			
55	LS	0	98.0		
56	UD	.140			
	*				
57	KK	SD2			
58	KM	COMBINES	FLows FROM EX-ON6 AND TD-1		
59	HC	2			
	*				
60	KK	EX-ON5			
61	KM	EXISTING	ONSITE BUILDING, AND LANDSCAPE AREA		
62	KM		AREA	0.46 AC	
63	BA	.0007			
64	LS	0	95.7		
65	UD	.145			
	*				
66	KK	EX-ON4			
67	KM	EXISTING	ONSITE PAVED PLAY AREA, GREENHOUSE AND GARDEN		
68	KM		AREA	1.30 AC	
69	BA	.0020			
70	LS	0	97.6		
71	UD	.057			
	*				
72	KK	SD1			
73	KM	COMBINES	FLows FROM EX-ON5 AND EX-ON4		
74	HC	2			
	*				
75	KK	EX-ON3			
76	KM	EXISTING	ONSITE PLAYGOURND, BUILDING, AND PAVED AREA		
77	KM		AREA	0.61 AC	
78	BA	.0009			
79	LS	0	96.0		
80	UD	.133			
	*				

1

HEC-1 INPUT

PAGE 3

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
81	KK EX-ON1
82	KM EXISTING
83	KM ONSITE BUILDING, PARKING AND LANDSCAPE AREA
84	BA .0011
85	LS 0
86	UD .095
	*
87	KK EX-ON2
88	KM EXISTING
89	KM ONSITE BUILDING, LANDSCAPING, AND PARKING AREA
90	BA .0018
91	LS 0
92	UD .164
	*
93	KK BVT
94	KM EXISTING
95	KM ADJACENT BONAZA VILLAGE TRACT 1/2 ACRE RESIDENTIAL LOTS
96	BA .0026
97	LS 0
98	UD .128
	*
99	KK VCA
100	KM EXISTING
101	KM ADJACENT VIRGINIA CITY LANE SUBBASIN
102	BA .0003
103	LS 0
104	UD .129
	*
105	KK CP3
106	KM COMBINES
107	HC 5
	*
108	ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
21	EX-ON7	
	.	
36	.	TD-2
	.	.
42	CP1	
	.	
45	.	EX-ON6
	.	.

Existing.OUT

```

51      .      .      TD-1
      .      .      .
57      .      SD2 .....
      .      .      .
60      .      .      EX-ON5
      .      .      .
66      .      .      .      EX-ON4
      .      .      .      .
72      .      .      SD1 .....
      .      .      .
75      .      .      .      EX-ON3
      .      .      .      .
81      .      .      .      .      EX-ON1
      .      .      .      .      .
87      .      .      .      .      .      EX-ON2
      .      .      .      .      .      .
93      .      .      .      .      .      .      BVT
      .      .      .      .      .      .      .
99      .      .      .      .      .      .      .      VCA
      .      .      .      .      .      .      .      .
105     .      .      .      .      .      .      .      .      CP3 .....

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*      JUN 1998                *
*      VERSION 4.1             *
* RUN DATE 17MAR20 TIME 16:31:21 *
*****

```

```

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

```

```

*****
* HOGGARD ELEMENTARY SCHOOL    *
* DRAINAGE STUDY               *
* EXISTING CONDITIONS          *
* RETURN PERIOD_ _ _ 100-YEAR & 10-YEAR *
* DISTRIBUTION_ _ _ 6-HOUR SDN3 *
* PROJECT NO_ _ _ 100067217 *
* FILENAME_ _ _ EXISTING.H1 *
* DATE MODELED_ _ _ 03/17/20 *
* MODELED BY_ _ _ JLK *
*****

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```

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

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

          COMPUTATION INTERVAL .08 HOURS
          TOTAL TIME BASE     24.92 HOURS

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

JP         MULTI-PLAN OPTION
          NPLAN      1  NUMBER OF PLANS

JR         MULTI-RATIO OPTION
          RATIOS OF PRECIPITATION
          .57        1.00

```

1

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

Existing.OUT

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION	
					RATIO 1 .57	RATIO 2 1.00
HYDROGRAPH AT +	EX-ON7	.00	1	FLOW TIME	1. 3.58	3. 3.58
HYDROGRAPH AT +	TD-2	.00	1	FLOW TIME	1. 3.50	1. 3.50
2 COMBINED AT +	CP1	.00	1	FLOW TIME	2. 3.58	4. 3.58
HYDROGRAPH AT +	EX-ON6	.00	1	FLOW TIME	2. 3.58	3. 3.58
HYDROGRAPH AT +	TD-1	.00	1	FLOW TIME	0. 3.58	1. 3.58
2 COMBINED AT +	SD2	.00	1	FLOW TIME	2. 3.58	4. 3.58
HYDROGRAPH AT +	EX-ON5	.00	1	FLOW TIME	1. 3.58	1. 3.58
HYDROGRAPH AT +	EX-ON4	.00	1	FLOW TIME	3. 3.50	5. 3.50
2 COMBINED AT +	SD1	.00	1	FLOW TIME	3. 3.50	6. 3.50
HYDROGRAPH AT +	EX-ON3	.00	1	FLOW TIME	1. 3.58	2. 3.58
HYDROGRAPH AT +	EX-ON1	.00	1	FLOW TIME	1. 3.50	2. 3.50
HYDROGRAPH AT +	EX-ON2	.00	1	FLOW TIME	1. 3.58	3. 3.58
HYDROGRAPH AT +	BVT	.00	1	FLOW TIME	1. 3.58	3. 3.58
HYDROGRAPH AT +	VCA	.00	1	FLOW TIME	0. 3.58	0. 3.58
5 COMBINED AT +	CP3	.01	1	FLOW TIME	5. 3.58	10. 3.58

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

Ultimate Condition Hydrologic Parameters

Hoggard Elementary School Ultimate Condition

Calculated by: JLK 1/23/2018

Checked by: _____

Atkins Job # 100062041

Subbasin Data						Initial Overland Time (t_i)			Travel Time (t_t)					t_c check (Urbanized basins)				Remarks
Subbasin	Dev. or Ex.	CN	K	Area (Acres)	Area (mi ²)	Length (ft)	Slope (%)	time (min)	Length (ft)	Slope (%)	V_1 (fps)	V_2 (fps)	Travel Time	t_c (calc)	Max t_c	Min t_c	Lag Time (hr)	
U-ON1	D	95.9	0.876	0.39	0.0006	23	2.00	1.52	100	0.70	1.69	2.56	2.33	3.84	11.13	5.00	*0.050	
U-ON2	D	94.6	0.859	0.32	0.0005	52	0.79	3.38	82	0.40	1.28	1.94	2.92	6.31	11.24	5.00	0.063	
U-ON3	D	97.3	0.895	1.35	0.0021	32	1.00	2.09	176	1.00	2.02	3.06	2.36	4.45	11.93	5.00	*0.050	
U-ON4	D	97.0	0.890	1.92	0.0030	70	0.40	4.29	85	0.50	1.43	2.16	2.64	6.93	11.44	5.00	0.069	
U-ON5	D	95.0	0.863	0.92	0.0014	85	1.00	3.93	370	0.45	1.35	2.04	13.83	17.76	14.21	5.00	0.142	
U-ON6	D	96.8	0.888	0.59	0.0009	85	1.00	3.52	219	0.42	1.32	1.99	8.60	12.11	12.81	5.00	0.121	
U-ON7	D	93.6	0.846	1.64	0.0026	146	1.70	4.63	170	0.40	1.28	1.94	7.08	11.71	12.93	5.00	0.117	
TD-1	D	98	0.904	0.28	0.0004	30	2.00	1.54	400	0.50	1.43	2.16	13.33	14.87	13.98	5.00	0.140	
TD-2	D	98	0.904	0.39	0.0006	30	2.00	1.54	565	0.50	1.43	2.16	5.80	7.34	15.51	5.00	0.073	
BVT	D	85	0.732	1.67	0.0026	100	0.50	8.35	200	0.50	1.43	2.16	6.67	15.01	12.78	5.00	0.128	
VCA	D	93	0.838	0.22	0.0003	30	2.00	2.05	325	0.50	1.43	2.16	10.83	12.89	13.29	5.00	0.129	
$T_c = T_i + T_t$ $T_{lag} = 0.6 T_c$ $T_i = 1.8 (1.1 - K) L^{1/2} / S^{1/3}$ $K = 0.0132 (CN) - 0.39$ $T_c \text{ Check} = L/180 + 10$ For the travel time (T_t) calculations, V_1 applies to the first 500 feet of travel distance; V_2 applies to the remaining travel distance. Existing $V_1 = 14.8(S/100)^{1/2}$ Existing $V_2 = 29.4(S/100)^{1/2}$ Developed $V_1 = 20.2(S/100)^{1/2}$ Developed $V_2 = 30.6(S/100)^{1/2}$																		
															STANDARD FORM 4			

Ultimate Condition Hydrologic Model


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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 17MAR20 TIME 16:32:16
*
*****

Ultimate.OUT

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

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION

KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

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

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*DIAGRAM
1 ID *****
2 ID *
3 ID *
4 ID *
5 ID *
6 ID *
7 ID *
8 ID *
9 ID *
10 ID *
11 ID *
12 ID *
13 ID *
14 ID *
15 ID *****
16 ID *****
17 IT 5 0 0 300
18 IO 5
19 IN 5 0 0
20 JR PREC .57 1
*

21 KK U-ON7
22 KM PROPOSED ONSITE NORTH PARKING LOT AND PLAYGROUND
23 KM AREA 1.64 AC
24 PB 2.77
25 PC .000 .020 .057 .070 .087 .108 .124 .130 .130 .130
26 PC .130 .130 .130 .133 .140 .142 .148 .158 .172 .181
27 PC .190 .197 .199 .200 .201 .204 .214 .229 .241 .249
28 PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
29 PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
30 PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
31 PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
32 PC .998 .999 1.00
33 BA .0026
34 LS 0 93.6
35 UD .117
*

36 KK TD-2
37 KM TONOPAH DRIVE ADJACENT TO NORTH PORTION OF SITE
38 KM AREA 0.39 AC
39 BA .0006
40 LS 0 98.0
41 UD .073
*

42 KK U-ON1
43 KM PROPOSED BUS PULL OUT AREA
44 KM AREA 0.39 AC
45 BA .0006
46 LS 0 95.9
47 UD .050
*

```

1 HEC-1 INPUT PAGE 2

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

```

48 KK SD-T1
49 KM COMBINES FLOWS FROM U-ON7, TD-2 AND U-ON1 - COLLECTED IN STORM DRAIN
50 HC 3
*

```


Ultimate.OUT

51	KK	U-ON2			
52	KM	PROPOSED	ONSITE	PARKING AND LANDSCAPE	
53	KM		AREA	0.32 AC	
54	BA	.0005			
55	LS	0	95.0		
56	UD	.063			
	*				
57	KK	TD-1			
58	KM	TONOPAH DRIVE	ADJACENT TO SOUTH PORTION OF SITE		
59	KM		AREA	0.28 AC	
60	BA	.0004			
61	LS	0	98.0		
62	UD	.140			
	*				
63	KK	SD-T2			
64	KM	COMBINES	FLows FROM U-ON3, AND U-ON4 - COLLECTED IN STORM DRAIN		
65	HC	2			
	*				
66	KK	U-ON3			
67	KM	PROPOSED	ONSITE	SOUTH PARKING AND BUILDINGS	
68	KM		AREA	1.35 AC	
69	BA	.0021			
70	LS	0	97.3		
71	UD	.050			
	*				
72	KK	SD-T3			
73	KM	COMBINES	FLows FROM U-ON3, AND U-ON4 - COLLECTED IN STORM DRAIN		
74	HC	3			
	*				
75	KK	U-ON6			
76	KM	PROPOSED	ONSITE	PAVED PLAY AREA	
77	KM		AREA	0.59 AC	
78	BA	.0009			
79	LS	0	96.8		
80	UD	.121			
	*				
81	KK	U-ON5			
82	KM	PROPOSED	ONSITE	PAVED PLAY AREA AND GARDEN	
83	KM		AREA	0.92 AC	
84	BA	.0014			
85	LS	0	95.0		
86	UD	.142			
	*				

1

HEC-1 INPUT

PAGE 3

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
87	KK CP1
88	KM COMBINES
89	HC 2
	*
90	KK BVT
91	KM EXISTING
92	KM ADJACENT BONAZA VILLAGE TRACT 1/2 ACRE RESIDENTIAL LOTS
93	BA .0026
94	LS 0
95	UD .128
	*
96	KK VCA
97	KM EXISTING
98	KM ADJACENT VIRGINIA CITY LANE SUBBASIN
99	BA .0003
100	LS 0
101	UD .129
	*
102	KK CP2
103	KM COMBINES
104	HC 3
	*
105	KK U-ON4
106	KM PROPOSED
107	KM ONSITE
108	BA .0030
109	LS 0
110	UD .069
	*
111	ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
21	U-ON7	
	.	
36	.	TD-2
	.	.
	.	.

42 . . . U-ON1
 . . .
 48 SD-T1
 . . .
 51 . . . U-ON2
 . . .
 57 . . . TD-1
 . . .
 63 . . . SD-T2
 . . .
 66 . . . U-ON3
 . . .
 72 SD-T3
 . . .
 75 . . . U-ON6
 . . .
 81 . . . U-ON5
 . . .
 87 . . . CP1
 . . .
 90 . . . BVT
 . . .
 96 . . . VCA
 . . .
 102 . . . CP2
 . . .
 105 . . . U-ON4

```

*****
*      FLOOD HYDROGRAPH PACKAGE   (HEC-1)      *
*      JUN      1998               *
*      VERSION  4.1                *
*      RUN DATE  17MAR20   TIME   16:32:16      *
*****

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*****
*
*      U.S. ARMY CORPS OF ENGINEERS
*      HYDROLOGIC ENGINEERING CENTER
*      609 SECOND STREET
*      DAVIS, CALIFORNIA 95616
*      (916) 756-1104
*
*****
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*****  
*  
*  
* WASDEN ELEMENTARY SCHOOL *  
* DRAINAGE STUDY          *  
* ULTIMATE CONDITIONS     *  
*  
*-----*  
* RETURN PERIOD_ _ _ _100-YEAR & 10-YEAR *  
* DISTRIBUTION_ _ _ _6-HOUR SDN3         *  
* PROJECT NO_ _ _ _100067217            *  
* FILENAME_ _ _ _ULTIMATE.H1             *  
* DATE MODELED_ _ _ _01/23/20           *  
* MODELED BY_ _ _ _JLK                  *  
*  
*****
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Page 3

JR MULTI-RATIO OPTION
 RATIOS OF PRECIPITATION
 .57 1.00

1

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1 .57	RATIO 2 1.00
HYDROGRAPH AT +	U-ON7	.00	1	FLOW TIME	2. 3.58 4. 3.58
HYDROGRAPH AT +	TD-2	.00	1	FLOW TIME	1. 3.50 1. 3.50
HYDROGRAPH AT +	U-ON1	.00	1	FLOW TIME	1. 3.50 1. 3.50
3 COMBINED AT +	SD-T1	.00	1	FLOW TIME	4. 3.50 7. 3.50
HYDROGRAPH AT +	U-ON2	.00	1	FLOW TIME	1. 3.50 1. 3.50
HYDROGRAPH AT +	TD-1	.00	1	FLOW TIME	0. 3.58 1. 3.58
2 COMBINED AT +	SD-T2	.00	1	FLOW TIME	1. 3.50 2. 3.50
HYDROGRAPH AT +	U-ON3	.00	1	FLOW TIME	3. 3.50 5. 3.50
3 COMBINED AT +	SD-T3	.01	1	FLOW TIME	7. 3.50 14. 3.50
HYDROGRAPH AT +	U-ON6	.00	1	FLOW TIME	1. 3.58 2. 3.58
HYDROGRAPH AT +	U-ON5	.00	1	FLOW TIME	1. 3.58 2. 3.58
2 COMBINED AT +	CP1	.00	1	FLOW TIME	2. 3.58 4. 3.58
HYDROGRAPH AT +	BVT	.00	1	FLOW TIME	1. 3.58 3. 3.58
HYDROGRAPH AT +	VCA	.00	1	FLOW TIME	0. 3.58 0. 3.58
3 COMBINED AT +	CP2	.01	1	FLOW TIME	4. 3.58 8. 3.58
HYDROGRAPH AT +	U-ON4	.00	1	FLOW TIME	4. 3.50 6. 3.50

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

Normal Depth Calculations

Cross Section for North BMP swale

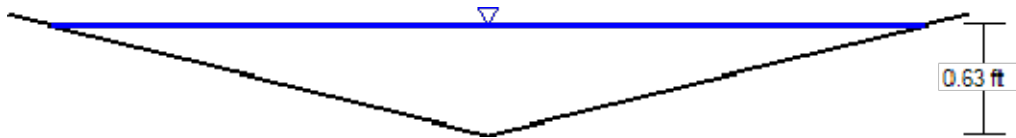
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035
Channel Slope	0.00440 ft/ft
Normal Depth	0.63 ft
Left Side Slope	4.00 ft/ft (H:V)
Right Side Slope	4.00 ft/ft (H:V)
Discharge	2.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for North BMP swale

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.00440	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Discharge	2.00	ft ³ /s

Results

Normal Depth	0.63	ft
Flow Area	1.57	ft ²
Wetted Perimeter	5.17	ft
Hydraulic Radius	0.30	ft
Top Width	5.01	ft
Critical Depth	0.43	ft
Critical Slope	0.03091	ft/ft
Velocity	1.27	ft/s
Velocity Head	0.03	ft
Specific Energy	0.65	ft
Froude Number	0.40	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.63	ft
Critical Depth	0.43	ft
Channel Slope	0.00440	ft/ft
Critical Slope	0.03091	ft/ft

Cross Section for South BMP swale

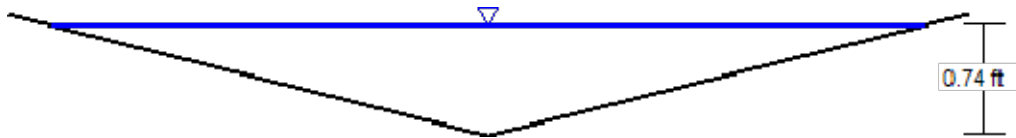
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035
Channel Slope	0.00400 ft/ft
Normal Depth	0.74 ft
Left Side Slope	4.00 ft/ft (H:V)
Right Side Slope	4.00 ft/ft (H:V)
Discharge	3.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for South BMP swale

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.00400	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Discharge	3.00	ft ³ /s

Results

Normal Depth	0.74	ft
Flow Area	2.21	ft ²
Wetted Perimeter	6.13	ft
Hydraulic Radius	0.36	ft
Top Width	5.94	ft
Critical Depth	0.51	ft
Critical Slope	0.02928	ft/ft
Velocity	1.36	ft/s
Velocity Head	0.03	ft
Specific Energy	0.77	ft
Froude Number	0.39	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.74	ft
Critical Depth	0.51	ft
Channel Slope	0.00400	ft/ft
Critical Slope	0.02928	ft/ft

Storm Drain System Hydraulic Model

Hoggard-Virginia.WSW

0

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T1 MABEL HOGGARD ES REBUILD
T2 100-YEAR ULTIMATE CONDITION
T3 ATKINS PROJECT 100067217 - JLK
SO      .0002052.370 1
R      19.9902055.800 1 .013
R      55.5602056.630 1 .013
R      399.5602057.700 1 .013
R      749.0202058.800 1 .013
R      754.0202058.930 1 .013
R      927.9702059.490 1 .013
R      932.9702059.610 1 .013
R      1001.5102059.840 1 .013
R      1006.5102060.040 1 .013
R      1041.0102060.158 1 .013
JX      1043.0102060.258 1 4 .013 .800 2060.437 -86.9 .000
REM      ***** RD6
R      1046.0102060.358 1 .013
R      1093.1902060.500 1 .013
R      1217.9402060.835 1 .013
JX      1218.4402060.840 1 2 .013 .800 2062.000 -90.0 .000
REM      ***** RD5
R      1316.7602061.135 1 .013
R      1406.8602061.516 1 .013
R      1419.6002061.582 1 .013
JX      1420.1002061.587 3 4 .013 .900 2062.660 56.4 .000
REM      ***** MP
R      1434.9002061.664 3 .013
JX      1435.4002061.669 3 4 .013 1.200 2062.660 -78.5 .000
REM      ***** ZOO
R      1459.6702061.710 3 .013
JX      1460.1702061.715 3 2 .013 .010 2062.660 56.4 .000
REM      ***** SD3
R      1485.2502061.914 3 .013
R      1516.1402062.071 3 .013
JX      1516.6402062.076 3 2 .013 .400 2062.983 90.0 .000
REM      ***** RD3
R      1536.8402062.179 3 .013
JX      1537.3402062.184 3 4 .013 .800 2063.096 -22.5 .000
REM      ***** SD2
R      1537.8402062.189 3 .013
R      1573.6302062.366 3 .013
R      1582.8002062.411 3 .013
JX      1583.3002062.416 3 4 .013 .700 2063.424 90.0 .000
REM      ***** SD1
R      1638.9702062.692 3 .013
JX      1639.4702062.697 2 2 .013 .200 2063.615 90.0 .000
REM      ***** RD2
R      1645.8002062.726 2 .013
R      1652.8402062.762 2 .013
R      1687.5302062.935 2 .013
R      1692.4202062.960 2 .013
SH      1692.4202062.960 2 2062.960
CD      1 4 1 .000 1.500 .000 .000 .000 .00
CD      2 4 1 .000 .500 .000 .000 .000 .00
CD      3 4 1 .000 1.000 .000 .000 .000 .00
CD      4 4 1 .000 0.667 .000 .000 .000 .00
Q      .200 .0

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Hoggard-Virginia.OUT

FILE: Hoggard-Virginia.WSW

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PAGE 1

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 3-18-2020 Time: 5:19:25

MABEL HOGGARD ES REBUILD

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

*****																	*****	
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				
*****																	*****	
.000	2052.370	.425	2052.796	6.01	14.57	3.30	2056.09	.00	.95	1.35	1.500	.000	.00	1	.0			
3.448	.1716					.1006	.35	.43	4.65	.38	.013	.00	.00	PIPE				
3.448	2052.962	.438	2053.400	6.01	14.01	3.05	2056.45	.00	.95	1.36	1.500	.000	.00	1	.0			
3.171	.1716					.0891	.28	.44	4.40	.38	.013	.00	.00	PIPE				
6.620	2053.506	.453	2053.959	6.01	13.35	2.77	2056.73	.00	.95	1.38	1.500	.000	.00	1	.0			
2.521	.1716					.0780	.20	.45	4.12	.38	.013	.00	.00	PIPE				
9.141	2053.939	.469	2054.407	6.01	12.73	2.52	2056.93	.00	.95	1.39	1.500	.000	.00	1	.0			
2.056	.1716					.0683	.14	.47	3.85	.38	.013	.00	.00	PIPE				
11.197	2054.292	.485	2054.777	6.01	12.14	2.29	2057.07	.00	.95	1.40	1.500	.000	.00	1	.0			
1.708	.1716					.0598	.10	.49	3.60	.38	.013	.00	.00	PIPE				
12.905	2054.584	.503	2055.087	6.01	11.58	2.08	2057.17	.00	.95	1.42	1.500	.000	.00	1	.0			
1.438	.1716					.0524	.08	.50	3.37	.38	.013	.00	.00	PIPE				
14.343	2054.831	.520	2055.352	6.01	11.04	1.89	2057.24	.00	.95	1.43	1.500	.000	.00	1	.0			
1.221	.1716					.0459	.06	.52	3.15	.38	.013	.00	.00	PIPE				
15.564	2055.041	.539	2055.580	6.01	10.52	1.72	2057.30	.00	.95	1.44	1.500	.000	.00	1	.0			
1.043	.1716					.0403	.04	.54	2.94	.38	.013	.00	.00	PIPE				
16.607	2055.220	.558	2055.778	6.01	10.03	1.56	2057.34	.00	.95	1.45	1.500	.000	.00	1	.0			
.895	.1716					.0353	.03	.56	2.75	.38	.013	.00	.00	PIPE				

Hoggard-Virginia.OUT

FILE: Hoggard-Virginia.WSW

W S P G W - CIVILDESIGN Version 14.08

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 3-18-2020 Time: 5:19:25

MABEL HOGGARD ES REBUILD

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

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
17.503	2055.373	.578	2055.951	6.01	9.57	1.42	2057.37	.00	.95	1.46	1.500	.000	.00	1 .0
	.770	.1716				.0310	.02	.58	2.57	.38	.013	.00	.00	PIPE
18.273	2055.505	.599	2056.104	6.01	9.12	1.29	2057.40	.00	.95	1.47	1.500	.000	.00	1 .0
	.662	.1716				.0272	.02	.60	2.40	.38	.013	.00	.00	PIPE
18.935	2055.619	.621	2056.240	6.01	8.70	1.17	2057.41	.00	.95	1.48	1.500	.000	.00	1 .0
	.569	.1716				.0239	.01	.62	2.24	.38	.013	.00	.00	PIPE
19.504	2055.717	.644	2056.360	6.01	8.29	1.07	2057.43	.00	.95	1.48	1.500	.000	.00	1 .0
	.486	.1716				.0210	.01	.64	2.09	.38	.013	.00	.00	PIPE
19.990	2055.800	.668	2056.468	6.01	7.91	.97	2057.44	.00	.95	1.49	1.500	.000	.00	1 .0
	2.239	.0233				.0195	.04	.67	1.95	.64	.013	.00	.00	PIPE
22.229	2055.852	.670	2056.523	6.01	7.86	.96	2057.48	.00	.95	1.49	1.500	.000	.00	1 .0
	12.046	.0233				.0182	.22	.67	1.94	.64	.013	.00	.00	PIPE
34.276	2056.133	.695	2056.829	6.01	7.50	.87	2057.70	.00	.95	1.50	1.500	.000	.00	1 .0
	7.234	.0233				.0160	.12	.70	1.80	.64	.013	.00	.00	PIPE
41.510	2056.302	.721	2057.023	6.01	7.15	.79	2057.82	.00	.95	1.50	1.500	.000	.00	1 .0
	4.822	.0233				.0141	.07	.72	1.68	.64	.013	.00	.00	PIPE
46.332	2056.415	.749	2057.163	6.01	6.82	.72	2057.88	.00	.95	1.50	1.500	.000	.00	1 .0
	3.366	.0233				.0124	.04	.75	1.57	.64	.013	.00	.00	PIPE

Hoggard-Virginia.OUT

FILE: Hoggard-Virginia.WSW

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 3-18-2020 Time: 5:19:25

MABEL HOGGARD ES REBUILD

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

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		

49.698	2056.493	.778	2057.271	6.01	6.50	.66	2057.93	.00	.95	1.50	1.500	.000	.00	1	.0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2.367	.0233					.0109	.03	.78	1.46	.64	.013	.00	.00	PIPE		
52.065	2056.548	.808	2057.356	6.01	6.20	.60	2057.95	.00	.95	1.50	1.500	.000	.00	1	.0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1.640	.0233					.0096	.02	.81	1.36	.64	.013	.00	.00	PIPE		
53.705	2056.587	.839	2057.426	6.01	5.91	.54	2057.97	.00	.95	1.49	1.500	.000	.00	1	.0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1.069	.0233					.0085	.01	.84	1.26	.64	.013	.00	.00	PIPE		
54.774	2056.612	.873	2057.484	6.01	5.63	.49	2057.98	.00	.95	1.48	1.500	.000	.00	1	.0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
.593	.0233					.0075	.00	.87	1.17	.64	.013	.00	.00	PIPE		
55.368	2056.625	.908	2057.534	6.01	5.37	.45	2057.98	.00	.95	1.47	1.500	.000	.00	1	.0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
.192	.0233					.0066	.00	.91	1.08	.64	.013	.00	.00	PIPE		
55.560	2056.630	.947	2057.577	6.01	5.11	.41	2057.98	.00	.95	1.45	1.500	.000	.00	1	.0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1.077	.0031					.0059	.01	.95	1.00	1.27	.013	.00	.00	PIPE		
56.637	2056.633	.987	2057.620	6.01	4.88	.37	2057.99	.00	.95	1.42	1.500	.000	.00	1	.0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
4.319	.0031					.0052	.02	.99	.92	1.27	.013	.00	.00	PIPE		
60.956	2056.647	1.029	2057.676	6.01	4.65	.34	2058.01	.00	.95	1.39	1.500	.000	.00	1	.0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10.018	.0031					.0047	.05	1.03	.85	1.27	.013	.00	.00	PIPE		
70.974	2056.678	1.075	2057.753	6.01	4.43	.31	2058.06	.00	.95	1.35	1.500	.000	.00	1	.0	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
21.057	.0031					.0042	.09	1.08	.78	1.27	.013	.00	.00	PIPE		

Hoggard-Virginia.OUT

FILE: Hoggard-Virginia.WSW

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Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 3-18-2020 Time: 5:19:25

MABEL HOGGARD ES REBUILD

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

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
92.031	2056.743	1.125	2057.869	6.01	4.23	.28	2058.15	.00	.95	1.30	1.500	.000	.00	1 .0
47.258	.0031					.0037	.18	1.13	.71	1.27	.013	.00	.00	PIPE
139.289	2056.890	1.180	2058.071	6.01	4.03	.25	2058.32	.00	.95	1.23	1.500	.000	.00	1 .0
143.545	.0031					.0034	.49	1.18	.64	1.27	.013	.00	.00	PIPE
282.834	2057.337	1.242	2058.579	6.01	3.84	.23	2058.81	.00	.95	1.13	1.500	.000	.00	1 .0
116.726	.0031					.0032	.37	1.24	.58	1.27	.013	.00	.00	PIPE
399.560	2057.700	1.255	2058.955	6.01	3.81	.22	2059.18	.00	.95	1.11	1.500	.000	.00	1 .0
185.513	.0031					.0031	.58	1.26	.56	1.26	.013	.00	.00	PIPE
585.073	2058.284	1.258	2059.542	6.01	3.80	.22	2059.77	.00	.95	1.10	1.500	.000	.00	1 .0
163.947	.0031					.0031	.51	1.26	.56	1.26	.013	.00	.00	PIPE
749.020	2058.800	1.258	2060.058	6.01	3.80	.22	2060.28	.00	.95	1.10	1.500	.000	.00	1 .0
1.819	.0260					.0033	.01	1.26	.56	.62	.013	.00	.00	PIPE
750.839	2058.847	1.194	2060.042	6.01	3.98	.25	2060.29	.00	.95	1.21	1.500	.000	.00	1 .0
1.418	.0260					.0036	.01	1.19	.63	.62	.013	.00	.00	PIPE
752.257	2058.884	1.138	2060.022	6.01	4.18	.27	2060.29	.00	.95	1.28	1.500	.000	.00	1 .0
1.090	.0260					.0041	.00	1.14	.70	.62	.013	.00	.00	PIPE
753.347	2058.913	1.087	2060.000	6.01	4.38	.30	2060.30	.00	.95	1.34	1.500	.000	.00	1 .0
.673	.0260					.0045	.00	1.09	.76	.62	.013	.00	.00	PIPE

Hoggard-Virginia.OUT

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WATER SURFACE PROFILE LISTING

Date: 3-18-2020 Time: 5:19:25

MABEL HOGGARD ES REBUILD

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

*****																	*****	
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				
*****																	*****	
754.020	2058.930	1.048	2059.978	6.01	4.56	.32	2060.30	.00	.95	1.38	1.500	.000	.00	1	.0			
14.909	.0032					.0044	.07	1.05	.82	1.24	.013	.00	.00	PIPE				
768.929	2058.978	1.096	2060.074	6.01	4.34	.29	2060.37	.00	.95	1.33	1.500	.000	.00	1	.0			
33.430	.0032					.0040	.13	1.10	.75	1.24	.013	.00	.00	PIPE				
802.359	2059.086	1.148	2060.233	6.01	4.14	.27	2060.50	.00	.95	1.27	1.500	.000	.00	1	.0			
92.372	.0032					.0036	.33	1.15	.68	1.24	.013	.00	.00	PIPE				
894.731	2059.383	1.205	2060.588	6.01	3.95	.24	2060.83	.00	.95	1.19	1.500	.000	.00	1	.0			
33.239	.0032					.0034	.11	1.21	.62	1.24	.013	.00	.00	PIPE				
927.970	2059.490	1.214	2060.704	6.01	3.92	.24	2060.94	.00	.95	1.18	1.500	.000	.00	1	.0			
1.684	.0240					.0035	.01	1.21	.61	.63	.013	.00	.00	PIPE				
929.654	2059.531	1.155	2060.686	6.01	4.11	.26	2060.95	.00	.95	1.26	1.500	.000	.00	1	.0			
1.304	.0240					.0039	.01	1.16	.67	.63	.013	.00	.00	PIPE				
930.958	2059.562	1.103	2060.665	6.01	4.32	.29	2060.95	.00	.95	1.32	1.500	.000	.00	1	.0			
.976	.0240					.0044	.00	1.10	.74	.63	.013	.00	.00	PIPE				
931.934	2059.585	1.055	2060.640	6.01	4.53	.32	2060.96	.00	.95	1.37	1.500	.000	.00	1	.0			
.664	.0240					.0049	.00	1.05	.81	.63	.013	.00	.00	PIPE				
932.597	2059.601	1.010	2060.611	6.01	4.75	.35	2060.96	.00	.95	1.41	1.500	.000	.00	1	.0			
.352	.0240					.0055	.00	1.01	.88	.63	.013	.00	.00	PIPE				

Hoggard-Virginia.OUT

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WATER SURFACE PROFILE LISTING

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MABEL HOGGARD ES REBUILD

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

*****																	*****	
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				
*****																	*****	
932.949	2059.610	.969	2060.578	6.01	4.98	.38	2060.96	.00	.95	1.43	1.500	.000	.00	1	.0			
	.021	.0240				.0059	.00	.97	.96	.63	.013	.00	.00	PIPE				
932.970	2059.610	.964	2060.574	6.01	5.01	.39	2060.96	.00	.95	1.44	1.500	.000	.00	1	.0			
	2.541	.0034				.0056	.01	.96	.97	1.21	.013	.00	.00	PIPE				
935.511	2059.619	1.005	2060.624	6.01	4.77	.35	2060.98	.00	.95	1.41	1.500	.000	.00	1	.0			
	7.397	.0034				.0050	.04	1.01	.89	1.21	.013	.00	.00	PIPE				
942.907	2059.644	1.049	2060.693	6.01	4.55	.32	2061.01	.00	.95	1.38	1.500	.000	.00	1	.0			
	17.051	.0034				.0044	.08	1.05	.82	1.21	.013	.00	.00	PIPE				
959.958	2059.701	1.097	2060.797	6.01	4.34	.29	2061.09	.00	.95	1.33	1.500	.000	.00	1	.0			
	34.454	.0034				.0042	.14	1.10	.75	1.21	.013	.00	.00	PIPE				
994.412	2059.816	1.097	2060.913	6.01	4.34	.29	2061.21	.00	.95	1.33	1.500	.000	.00	1	.0			
HYDRAULIC JUMP																		
994.412	2059.816	.759	2060.576	6.01	6.69	.70	2061.27	.00	.95	1.50	1.500	.000	.00	1	.0			
	2.935	.0034				.0125	.04	.76	1.53	1.21	.013	.00	.00	PIPE				
997.347	2059.826	.759	2060.586	6.01	6.69	.70	2061.28	.00	.95	1.50	1.500	.000	.00	1	.0			
	4.163	.0034				.0134	.06	.76	1.52	1.21	.013	.00	.00	PIPE				
1001.510	2059.840	.732	2060.572	6.01	7.02	.77	2061.34	.00	.95	1.50	1.500	.000	.00	1	.0			
	1.025	.0400				.0137	.01	.73	1.64	.55	.013	.00	.00	PIPE				

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MABEL HOGGARD ES REBUILD

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

*****															*****	
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		
*****															*****	
1002.535	2059.881	.749	2060.630	6.01	6.82	.72	2061.35	.00	.95	1.50	1.500	.000	.00	1 .0		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
1.335	.0400					.0124	.02	.75	1.57	.55	.013	.00	.00	PIPE		
1003.870	2059.935	.778	2060.712	6.01	6.50	.66	2061.37	.00	.95	1.50	1.500	.000	.00	1 .0		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
1.011	.0400					.0109	.01	.78	1.46	.55	.013	.00	.00	PIPE		
1004.881	2059.975	.808	2060.783	6.01	6.20	.60	2061.38	.00	.95	1.50	1.500	.000	.00	1 .0		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
.740	.0400					.0096	.01	.81	1.36	.55	.013	.00	.00	PIPE		
1005.621	2060.005	.839	2060.844	6.01	5.91	.54	2061.39	.00	.95	1.49	1.500	.000	.00	1 .0		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
.504	.0400					.0085	.00	.84	1.26	.55	.013	.00	.00	PIPE		
1006.125	2060.025	.873	2060.897	6.01	5.63	.49	2061.39	.00	.95	1.48	1.500	.000	.00	1 .0		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
.289	.0400					.0075	.00	.87	1.17	.55	.013	.00	.00	PIPE		
1006.414	2060.036	.908	2060.944	6.01	5.37	.45	2061.39	.00	.95	1.47	1.500	.000	.00	1 .0		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
.096	.0400					.0066	.00	.91	1.08	.55	.013	.00	.00	PIPE		
1006.510	2060.040	.947	2060.987	6.01	5.11	.41	2061.39	.00	.95	1.45	1.500	.000	.00	1 .0		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
1.211	.0034					.0059	.01	.95	1.00	1.20	.013	.00	.00	PIPE		
1007.721	2060.044	.987	2061.031	6.01	4.88	.37	2061.40	.00	.95	1.42	1.500	.000	.00	1 .0		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
5.053	.0034					.0052	.03	.99	.92	1.20	.013	.00	.00	PIPE		
1012.774	2060.062	1.029	2061.091	6.01	4.65	.34	2061.43	.00	.95	1.39	1.500	.000	.00	1 .0		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
12.503	.0034					.0047	.06	1.03	.85	1.20	.013	.00	.00	PIPE		

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MABEL HOGGARD ES REBUILD

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

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
1025.277	2060.104	1.075	2061.179	6.01	4.43	.31	2061.48	.00	.95	1.35	1.500	.000	.00	1 .0
15.733	.0034					.0042	.07	1.08	.78	1.20	.013	.00	.00	PIPE
1041.010	2060.158	1.106	2061.264	6.01	4.30	.29	2061.55	.00	.95	1.32	1.500	.000	.00	1 .0
JUNCT STR	.0500					.0034	.01	1.11	.74		.013	.00	.00	PIPE
1043.010	2060.258	1.173	2061.431	5.21	3.51	.19	2061.62	.00	.88	1.24	1.500	.000	.00	1 .0
1.152	.0333					.0028	.00	1.17	.57	.53	.013	.00	.00	PIPE
1044.162	2060.296	1.119	2061.415	5.21	3.68	.21	2061.63	.00	.88	1.31	1.500	.000	.00	1 .0
.940	.0333					.0032	.00	1.12	.62	.53	.013	.00	.00	PIPE
1045.103	2060.328	1.070	2061.397	5.21	3.86	.23	2061.63	.00	.88	1.36	1.500	.000	.00	1 .0
.754	.0333					.0035	.00	1.07	.68	.53	.013	.00	.00	PIPE
1045.856	2060.353	1.024	2061.377	5.21	4.05	.26	2061.63	.00	.88	1.40	1.500	.000	.00	1 .0
.154	.0333					.0038	.00	1.02	.74	.53	.013	.00	.00	PIPE
1046.010	2060.358	1.014	2061.372	5.21	4.10	.26	2061.63	.00	.88	1.40	1.500	.000	.00	1 .0
33.052	.0030					.0036	.12	1.01	.76	1.12	.013	.00	.00	PIPE
1079.062	2060.458	1.058	2061.516	5.21	3.91	.24	2061.75	.00	.88	1.37	1.500	.000	.00	1 .0
14.128	.0030					.0034	.05	1.06	.70	1.12	.013	.00	.00	PIPE
1093.190	2060.500	1.069	2061.569	5.21	3.87	.23	2061.80	.00	.88	1.36	1.500	.000	.00	1 .0
57.276	.0027					.0032	.18	1.07	.68	1.18	.013	.00	.00	PIPE

Hoggard-Virginia.OUT

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MABEL HOGGARD ES REBUILD

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

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
1150.466	2060.654	1.118	2061.772	5.21	3.69	.21	2061.98	.00	.88	1.31	1.500	.000	.00	1 .0
67.474	.0027					.0029	.20	1.12	.63	1.18	.013	.00	.00	PIPE
1217.940	2060.835	1.144	2061.979	5.21	3.60	.20	2062.18	.00	.88	1.28	1.500	.000	.00	1 .0
JUNCT STR	.0103					.0023	.00	1.14	.60		.013	.00	.00	PIPE
1218.440	2060.840	1.274	2062.115	4.41	2.76	.12	2062.23	.00	.81	1.07	1.500	.000	.00	1 .0
42.879	.0030					.0017	.07	1.27	.40	.98	.013	.00	.00	PIPE
1261.319	2060.969	1.209	2062.177	4.41	2.89	.13	2062.31	.00	.81	1.19	1.500	.000	.00	1 .0
41.392	.0030					.0019	.08	1.21	.45	.98	.013	.00	.00	PIPE
1302.711	2061.093	1.151	2062.244	4.41	3.03	.14	2062.39	.00	.81	1.27	1.500	.000	.00	1 .0
14.049	.0030					.0020	.03	1.15	.50	.98	.013	.00	.00	PIPE
1316.760	2061.135	1.133	2062.268	4.41	3.08	.15	2062.42	.00	.81	1.29	1.500	.000	.00	1 .0
17.717	.0042					.0022	.04	1.13	.52	.88	.013	.00	.00	PIPE
1334.477	2061.210	1.082	2062.292	4.41	3.23	.16	2062.45	.00	.81	1.34	1.500	.000	.00	1 .0
17.182	.0042					.0025	.04	1.08	.56	.88	.013	.00	.00	PIPE
1351.659	2061.283	1.036	2062.319	4.41	3.39	.18	2062.50	.00	.81	1.39	1.500	.000	.00	1 .0
17.348	.0042					.0028	.05	1.04	.62	.88	.013	.00	.00	PIPE
1369.007	2061.356	.993	2062.349	4.41	3.55	.20	2062.54	.00	.81	1.42	1.500	.000	.00	1 .0
18.519	.0042					.0031	.06	.99	.67	.88	.013	.00	.00	PIPE

Hoggard-Virginia.OUT

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WATER SURFACE PROFILE LISTING

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MABEL HOGGARD ES REBUILD

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

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
1387.526	2061.435	.952	2062.387	4.41	3.73	.22	2062.60	.00	.81	1.44	1.500	.000	.00	1 .0
19.333	.0042					.0035	.07	.95	.73	.88	.013	.00	.00	PIPE
1406.860	2061.516	.919	2062.435	4.41	3.88	.23	2062.67	.00	.81	1.46	1.500	.000	.00	1 .0
9.843	.0052					.0039	.04	.92	.78	.82	.013	.00	.00	PIPE
1416.703	2061.567	.883	2062.450	4.41	4.07	.26	2062.71	.00	.81	1.48	1.500	.000	.00	1 .0
2.897	.0052					.0042	.01	.88	.84	.82	.013	.00	.00	PIPE
1419.600	2061.582	.874	2062.456	4.41	4.13	.26	2062.72	.00	.81	1.48	1.500	.000	.00	1 .0
JUNCT STR	.0098					.0063	.00	.87	.86		.013	.00	.00	PIPE
1420.100	2061.587	.946	2062.532	3.51	4.57	.32	2062.86	.00	.80	.45	1.000	.000	.00	1 .0
11.891	.0052					.0086	.10	.95	.62	1.00	.013	.00	.00	PIPE
1431.991	2061.649	1.000	2062.649	3.51	4.47	.31	2062.96	.00	.80	.00	1.000	.000	.00	1 .0
2.909	.0052					.0093	.03	1.00	.00	1.00	.013	.00	.00	PIPE
1434.900	2061.664	1.016	2062.680	3.51	4.47	.31	2062.99	.00	.80	.00	1.000	.000	.00	1 .0
JUNCT STR	.0098					.0070	.00	1.02	.00		.013	.00	.00	PIPE
1435.400	2061.669	1.366	2063.035	2.31	2.94	.13	2063.17	.00	.65	.00	1.000	.000	.00	1 .0
24.270	.0017					.0042	.10	1.37	.00	1.00	.013	.00	.00	PIPE
1459.670	2061.710	1.427	2063.137	2.31	2.94	.13	2063.27	.00	.65	.00	1.000	.000	.00	1 .0
JUNCT STR	.0103					.0042	.00	1.43	.00		.013	.00	.00	PIPE

Hoggard-Virginia.OUT

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WATER SURFACE PROFILE LISTING

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MABEL HOGGARD ES REBUILD

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

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
1460.170	2061.715	1.427	2063.142	2.30	2.93	.13	2063.27	.00	.65	.00	1.000	.000	.00	1 .0
25.080	.0079					.0042	.10	1.43	.00	.63	.013	.00	.00	PIPE
1485.250	2061.914	1.367	2063.281	2.30	2.93	.13	2063.41	.00	.65	.00	1.000	.000	.00	1 .0
30.890	.0051					.0042	.13	1.37	.00	.75	.013	.00	.00	PIPE
1516.140	2062.071	1.338	2063.409	2.30	2.93	.13	2063.54	.00	.65	.00	1.000	.000	.00	1 .0
JUNCT STR	.0098					.0035	.00	1.34	.00		.013	.00	.00	PIPE
1516.640	2062.076	1.420	2063.496	1.90	2.42	.09	2063.59	.00	.59	.00	1.000	.000	.00	1 .0
20.200	.0051					.0028	.06	1.42	.00	.64	.013	.00	.00	PIPE
1536.840	2062.179	1.374	2063.553	1.90	2.42	.09	2063.64	.00	.59	.00	1.000	.000	.00	1 .0
JUNCT STR	.0103					.0019	.00	1.37	.00		.013	.00	.00	PIPE
1537.340	2062.184	1.491	2063.675	1.10	1.40	.03	2063.71	.00	.44	.00	1.000	.000	.00	1 .0
.500	.0098					.0010	.00	1.49	.00	.38	.013	.00	.00	PIPE
1537.840	2062.189	1.491	2063.680	1.10	1.40	.03	2063.71	.00	.44	.00	1.000	.000	.00	1 .0
35.790	.0049					.0010	.03	1.49	.00	.46	.013	.00	.00	PIPE
1573.630	2062.366	1.353	2063.719	1.10	1.40	.03	2063.75	.00	.44	.00	1.000	.000	.00	1 .0
9.170	.0049					.0010	.01	1.35	.00	.46	.013	.00	.00	PIPE
1582.800	2062.411	1.316	2063.727	1.10	1.40	.03	2063.76	.00	.44	.00	1.000	.000	.00	1 .0
JUNCT STR	.0103					.0005	.00	1.32	.00		.013	.00	.00	PIPE

Hoggard-Virginia.OUT

FILE: Hoggard-Virginia.WSW

W S P G W - CIVILDESIGN Version 14.08

PAGE 12

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 3-18-2020 Time: 5:19:25

MABEL HOGGARD ES REBUILD

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

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		
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****		
1583.300	2062.416	1.364	2063.780	.40	.51	.00	2063.78	.00	.26	.00	1.000	.000	.00	1	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
55.670	.0050					.0001	.01	1.36	.00	.27	.013	.00	.00	PIPE		
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
1638.970	2062.692	1.095	2063.787	.40	.51	.00	2063.79	.00	.26	.00	1.000	.000	.00	1	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
JUNCT STR	.0103					.0007	.00	1.10	.00	.013	.00	.00	.00	PIPE		
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
1639.470	2062.697	1.091	2063.788	.20	1.02	.02	2063.80	.00	.22	.00	.500	.000	.00	1	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
6.330	.0046					.0013	.01	1.09	.00	.26	.013	.00	.00	PIPE		
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
1645.800	2062.726	1.070	2063.796	.20	1.02	.02	2063.81	.00	.22	.00	.500	.000	.00	1	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
7.040	.0051					.0013	.01	1.07	.00	.25	.013	.00	.00	PIPE		
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
1652.840	2062.762	1.043	2063.805	.20	1.02	.02	2063.82	.00	.22	.00	.500	.000	.00	1	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
34.690	.0050					.0013	.04	1.04	.00	.25	.013	.00	.00	PIPE		
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	
1687.530	2062.935	.918	2063.854	.20	1.02	.02	2063.87	.00	.22	.00	.500	.000	.00	1	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	

Hoggard-Tonopah.WSW

0

T1 Mabel Hoggard ES Rebuild
T2 100-YEAR ULTIMATE CONDITION
T3 ATKINS PROJECT 100067217 - JLK
SO .0002053.810 1 2061.000
R 57.5102054.010 1 .013 .000 2.470 1
R 62.5102054.210 1 .013 .000 .000 0
R 180.4002054.640 1 .013 .000 -2.040 1
R 185.4002054.840 1 .013 .000 .000 0
R 385.7102055.560 1 .013 .000 .000 0
JX 387.7102055.660 1 2 .013 5.000 2055.967 89.5 .000
R 390.7102055.760 1 .013 .000 .000 0
R 618.4302056.580 1 .013 .000 .000 1
JX 620.4302056.730 1 1 .013 1.000 2057.310 84.4 .000
R 623.4302056.740 1 .013 .000 4.060 0
R 753.8502057.286 1 .013 .000 .000 0
JX 755.8502057.386 1 2 .013 2.000 2058.087 39.9 .000
R 758.8502057.486 1 .013 .000 -3.890 1
R 1036.5102058.334 1 .013 .000 .000 0
R 1041.5102058.434 1 .013 .000 .000 1
R 1069.4202058.533 1 .013 .000 43.870 1
JX 1071.4202058.633 4 3 .013 2.000 2059.965 90.0 .000
R 1074.4202058.733 4 .013 .000 41.950 0
R 1285.1102059.365 4 .013 .000 .000 0
SH 1285.1102059.365 4 2060.906
CD 1 4 1 .000 2.000 .000 .000 .000 .00
CD 2 4 1 .000 1.500 .000 .000 .000 .00
CD 3 2 0 .000 3.000 2.000 .000 .000 -.10
CD 4 4 2 .000 1.500 .000 .000 .000 .00
Q 4.000 .0

HOGGARD-TONOPAH.OUT

FILE: Hoggard-Tonopah.WSW

W S P G W - CIVILDESIGN Version 14.08

PAGE 1

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 3-19-2020 Time:12:20:43

Mabel Hoggard ES Rebuild

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

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
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
	.000	2053.810	7.190	2061.000	14.00	4.46	.31	2061.31	.00	1.35	.00	2.000	.000	.00 1 .0
57.510	.0035					.0038	.22	7.19	.00	1.75	.013	.00	.00	PIPE
57.510	2054.010	7.228	2061.238	14.00	4.46	.31	2061.55	.00	1.35	.00	2.000	.000	.00	1 .0
5.000	.0400					.0038	.02	7.23	.00	.76	.013	.00	.00	PIPE
62.510	2054.210	7.047	2061.257	14.00	4.46	.31	2061.57	.00	1.35	.00	2.000	.000	.00	1 .0
117.890	.0036					.0038	.45	7.05	.00	1.69	.013	.00	.00	PIPE
180.400	2054.640	7.086	2061.726	14.00	4.46	.31	2062.03	.00	1.35	.00	2.000	.000	.00	1 .0
5.000	.0400					.0038	.02	7.09	.00	.76	.013	.00	.00	PIPE
185.400	2054.840	6.905	2061.745	14.00	4.46	.31	2062.05	.00	1.35	.00	2.000	.000	.00	1 .0
200.310	.0036					.0038	.77	6.91	.00	1.70	.013	.00	.00	PIPE
385.710	2055.560	6.952	2062.512	14.00	4.46	.31	2062.82	.00	1.35	.00	2.000	.000	.00	1 .0
JUNCT STR	.0499					.0027	.01	6.95	.00		.013	.00	.00	PIPE
387.710	2055.660	7.219	2062.879	9.00	2.86	.13	2063.01	.00	1.07	.00	2.000	.000	.00	1 .0
3.000	.0334					.0016	.00	7.22	.00	.63	.013	.00	.00	PIPE
390.710	2055.760	7.123	2062.883	9.00	2.86	.13	2063.01	.00	1.07	.00	2.000	.000	.00	1 .0
227.720	.0036					.0016	.36	7.12	.00	1.19	.013	.00	.00	PIPE
618.430	2056.580	6.670	2063.250	9.00	2.86	.13	2063.38	.00	1.07	.00	2.000	.000	.00	1 .0
JUNCT STR	.0750					.0014	.00	6.67	.00		.013	.00	.00	PIPE

HOGGARD-TONOPAH.OUT

FILE: Hoggard-Tonopah.WSW

W S P G W - CIVILDESIGN Version 14.08

PAGE 2

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 3-19-2020 Time:12:20:43

Mabel Hoggard ES Rebuild

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

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
620.430	2056.730	6.576	2063.306	8.00	2.55	.10	2063.41	.00	1.01	.00	2.000	.000	.00	1 .0
3.000	.0033					.0013	.00	6.58	.00	1.13	.013	.00	.00	PIPE
623.430	2056.740	6.571	2063.311	8.00	2.55	.10	2063.41	.00	1.01	.00	2.000	.000	.00	1 .0
130.420	.0042					.0013	.16	6.57	.00	1.05	.013	.00	.00	PIPE
753.850	2057.286	6.188	2063.474	8.00	2.55	.10	2063.57	.00	1.01	.00	2.000	.000	.00	1 .0
JUNCT STR	.0500					.0010	.00	6.19	.00		.013	.00	.00	PIPE
755.850	2057.386	6.161	2063.547	6.00	1.91	.06	2063.60	.00	.87	.00	2.000	.000	.00	1 .0
3.000	.0334					.0007	.00	6.16	.00	.51	.013	.00	.00	PIPE
758.850	2057.486	6.067	2063.553	6.00	1.91	.06	2063.61	.00	.87	.00	2.000	.000	.00	1 .0
277.660	.0031					.0007	.20	6.07	.00	.98	.013	.00	.00	PIPE
1036.510	2058.334	5.414	2063.748	6.00	1.91	.06	2063.80	.00	.87	.00	2.000	.000	.00	1 .0
5.000	.0200					.0007	.00	5.41	.00	.59	.013	.00	.00	PIPE
1041.510	2058.434	5.321	2063.755	6.00	1.91	.06	2063.81	.00	.87	.00	2.000	.000	.00	1 .0
27.910	.0035					.0007	.02	5.32	.00	.94	.013	.00	.00	PIPE
1069.420	2058.533	5.252	2063.785	6.00	1.91	.06	2063.84	.00	.87	.00	2.000	.000	.00	1 .0
JUNCT STR	.0500					.0005	.00	5.25	.00		.013	.00	.00	PIPE
1071.420	2058.633	5.218	2063.851	4.00	1.13	.02	2063.87	.00	.53	.00	1.500	.000	.00	2 .0
3.000	.0333					.0004	.00	5.22	.00	.33	.013	.00	.00	PIPE

HOGGARD-TONOPAH.OUT

FILE: Hoggard-Tonopah.WSW

W S P G W - CIVILDESIGN Version 14.08

PAGE 3

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 3-19-2020 Time:12:20:43

Mabel Hoggard ES Rebuild

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

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*****
| Invert | Depth | Water | Q | Vel | Vel | Energy | Super | Critical | Flow Top | Height/ | Base Wt | | No Wth
Station | Elev | (FT) | Elev | (CFS) | (FPS) | Head | Grd.El. | Elev | Depth | Width | Dia.-FT | or I.D. | ZL | Prs/Pip
-|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|-
L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch
*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****
| | | | | | | | | | | | | | | |
1074.420 | 2058.733 | 5.122 | 2063.855 | 4.00 | 1.13 | .02 | 2063.87 | .00 | .53 | .00 | 1.500 | .000 | .00 |

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HOGGARD-SOUTHWEST.WSW

0

T1 MABEL HOGGARD ES REBUILD
T2 100 YEAR ULTIMATE CONDITION
T3 ATKINS PROJECT 100067217 - JLK

SO	390.7102055.760	1				2062.883			
R	448.4602060.210	1	.013				.000	.000	1
JX	449.9602060.410	3	2	.013	1.100	2059.579	-83.3		.000
R	532.9802060.830	3		.013			.000	.000	0
JX	533.4802060.835	3	2	.013	.300	2060.011	-90.0		.000
R	545.3002060.890	3		.013			.000	.000	0
JX	545.8002060.895	3	2	.013	1.000	2060.072	90.0		.000
R	595.9202061.140	3		.013			.000	.000	0
JX	596.4202061.145	3	2	.013	.400	2060.325	-90.0		.000
R	655.6802061.440	3		.013			.000	.000	0
JX	656.1802061.445	2	2	.013	1.700	2060.624	90.0		.000
R	662.3102061.480	2		.013			.000	-89.000	1
R	677.9902061.790	2		.013			.000	.000	0
SH	677.9902061.790	2				2061.790			
CD	1 4 1	.000	1.500	.000	.000	.000	.000	.00	
CD	2 4 1	.000	.500	.000	.000	.000	.00		
CD	3 4 1	.000	1.000	.000	.000	.000	.00		
CD	4 4 1	.000	.667	.000	.000	.000	.00		
Q		.400	.0						

hoggard-southwest.OUT

FILE: Hoggard-Southwest.WSW

W S P G W - CIVILDESIGN Version 14.08

PAGE 1

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 3-19-2020 Time: 8:24:40

MABEL HOGGARD ES REBUILD

100 YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/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
390.710	2055.760	7.123	2062.883	4.90	2.77	.12	2063.00	.00	.85	.00	1.500	.000	.00	1 .0
57.750	.0771					.0022	.13	7.12	.00	.42	.013	.00	.00	PIPE
448.460	2060.210	2.805	2063.015	4.90	2.77	.12	2063.13	.00	.85	.00	1.500	.000	.00	1 .0
JUNCT STR	.1333					.0068	.01	2.80	.00		.013	.00	.00	PIPE
449.960	2060.410	2.481	2062.891	3.80	4.84	.36	2063.25	.00	.83	.00	1.000	.000	.00	1 .0
83.020	.0051					.0114	.94	2.48	.00	1.00	.013	.00	.00	PIPE
532.980	2060.830	3.005	2063.835	3.80	4.84	.36	2064.20	.00	.83	.00	1.000	.000	.00	1 .0
JUNCT STR	.0098					.0105	.01	3.00	.00		.013	.00	.00	PIPE
533.480	2060.835	3.116	2063.950	3.50	4.46	.31	2064.26	.00	.80	.00	1.000	.000	.00	1 .0
11.820	.0046					.0097	.11	3.12	.00	1.00	.013	.00	.00	PIPE
545.300	2060.890	3.175	2064.064	3.50	4.46	.31	2064.37	.00	.80	.00	1.000	.000	.00	1 .0
JUNCT STR	.0103					.0073	.00	3.17	.00		.013	.00	.00	PIPE
545.800	2060.895	3.475	2064.370	2.50	3.18	.16	2064.53	.00	.68	.00	1.000	.000	.00	1 .0
50.120	.0049					.0049	.25	3.48	.00	.82	.013	.00	.00	PIPE
595.920	2061.140	3.477	2064.617	2.50	3.18	.16	2064.77	.00	.68	.00	1.000	.000	.00	1 .0
JUNCT STR	.0103					.0042	.00	3.48	.00		.013	.00	.00	PIPE
596.420	2061.145	3.567	2064.712	2.10	2.67	.11	2064.82	.00	.62	.00	1.000	.000	.00	1 .0
59.260	.0050					.0035	.21	3.57	.00	.70	.013	.00	.00	PIPE

hoggard-southwest.OUT

FILE: Hoggard-Southwest.WSW

W S P G W - CIVILDESIGN Version 14.08

PAGE 2

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 3-19-2020 Time: 8:24:40

MABEL HOGGARD ES REBUILD

100 YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

*****																	*****	
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				
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****		
655.680	2061.440	3.478	2064.917	2.10	2.67	.11	2065.03	.00	.62	.00	1.000	.000	.00	1	.0			
JUNCT STR	.0103					.0043	.00	3.48	.00		.013	.00	.00	PIPE				
656.180	2061.445	3.778	2065.223	.40	2.04	.06	2065.29	.00	.32	.00	.500	.000	.00	1	.0			
6.130	.0057					.0051	.03	3.78	.00	.39	.013	.00	.00	PIPE				
662.310	2061.480	3.797	2065.277	.40	2.04	.06	2065.34	.00	.32	.00	.500	.000	.00	1	.0			
15.680	.0198					.0051	.08	3.80	.00	.25	.013	.00	.00	PIPE				
677.990	2061.790	3.566	2065.356	.40	2.04	.06	2065.42	.00	.32	.00	.500	.000	.00	1	.0			

Hoggard-LATERAL-T.WSW

0

T1 Mabel Hoggard ES Rebuild											
T2 100-YEAR ULTIMATE CONDITION											
T3 ATKINS PROJECT 100067217 - JLK											
SO			758.8502057.486	2					2063.553		
R			790.0502058.110	2		.013				.000	.000 0
SH			790.0502058.110	2					2063.564		
CD	1	4	1		.000	2.000		.000	.000	.000	.00
CD	2	4	1		.000	1.500		.000	.000	.000	.00
CD	3	2	0		.000	3.000		2.000	.000	.000	-.10
CD	4	4	2		.000	1.500		.000	.000	.000	.00
Q					2.000	.0					

Hoggard-LATERAL-T.OUT

FILE: Hoggard-LATERAL-T.WSW

W S P G W - CIVILDESIGN Version 14.08

PAGE 1

Program Package Serial Number: 7271

WATER SURFACE PROFILE LISTING

Date: 3-25-2020 Time:11:24:36

Mabel Hoggard ES Rebuild

100-YEAR ULTIMATE CONDITION

ATKINS PROJECT 100067217 - JLK

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*****
| Invert | Depth | Water | Q | Vel | Vel | Energy | Super | Critical | Flow Top | Height/ | Base Wt | | No Wth
Station | Elev | (FT) | Elev | (CFS) | (FPS) | Head | Grd.El. | Elev | Depth | Width | Dia.-FT | or I.D. | ZL | Prs/Pip
-|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|-
L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch
*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****
| | | | | | | | | | | | | | | |
758.850 | 2057.486 | 6.067 | 2063.553 | 2.00 | 1.13 | .02 | 2063.57 | .00 | .53 | .00 | 1.500 | .000 | .00 | 1 | .0
-|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|-
31.200 | .0200 | | | | | .0004 | .01 | 6.07 | .00 | .37 | .013 | .00 | .00 | PIPE
| | | | | | | | | | | | | | | |
790.050 | 2058.110 | 5.454 | 2063.564 | 2.00 | 1.13 | .02 | 2063.58 | .00 | .53 | .00 | 1.500 | .000 | .00 | 1 | .0
-|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|-

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Appendix B

Reference Material

- Zoning/Planning conditions
- Freeway Channel – Washington, MLK to Rancho Drive, 2015
- Freeway Channel – Washington, MLK to Rancho Drive Update #1

Zoning/Planning Conditions



City of Las Vegas Development Services

Permit: 76079 - SITE DEVELOPMENT PLAN REVIEW (SDR)
 Project Name: MABEL HOGGARD ELEMENTARY SCHOOL
 Project Address:

Review Info						
Review Type	Review#	Plan Submittal Data to City	City Review Start Date	City Review Completion Date	City Plans Reviewer	Plan Review Result
TRAFFIC	1	04/01/2019	04/01/2019	04/01/2019	SCHRODER	Cond. Approval
Comments: TIA required.						
TRAFFIC	1	04/01/2019	04/01/2019	04/01/2019	SCHRODER	Cond. Approval
Comments: TIA required.						
TEFO	1	04/01/2019	04/01/2019	04/01/2019	WHITLOCK	Approved
Comments:						
TEFO	1	04/01/2019	04/01/2019	04/01/2019	WHITLOCK	Approved
Comments:						
SURVEY	1	04/01/2019	01/01/1900	01/01/1900		Awaiting Review
Comments:						
SURVEY	1	04/01/2019	01/01/1900	01/01/1900		Awaiting Review
Comments:						
SID	1	04/01/2019	04/04/2019	04/04/2019	PETRIE	Approved
Comments:						
SID	1	04/01/2019	04/04/2019	04/04/2019	PETRIE	Approved
Comments:						
SEWER	1	04/01/2019	04/10/2019	04/10/2019	LETUS	Cond. Approval
Comments: 1. Mapping required, prior to approval of civil improvement plans. 2. School must send all wastewater to the 8-inch public sewer in Virginia City Ave. Abandon private sewer connection to the private sewer manhole near the south property line. 3. Design and Construct an off-site relief sewer in Martin L King Blvd from Fair Avenue to Owens Avenue, at a depth and location acceptable to the Sanitary Sewer Planning Section of the Department of Public Works. Meet with Sanitary Sewer Planning to discuss reimbursement for constructing an oversized sewer in Martin L King Blvd."						
SEWER	1	04/01/2019	04/10/2019	04/10/2019	LETUS	Cond. Approval
Comments: 1. Mapping required, prior to approval of civil improvement plans. 2. School must send all wastewater to the 8-inch public sewer in Virginia City Ave. Abandon private sewer connection to the private sewer manhole near the south property line.						

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Review Info						
Review Type	Review#	Plan Submittal Data to City	City Review Start Date	City Review Completion Date	City Plans Reviewer	Plan Review Result
3. Design and Construct an off-site relief sewer in Martin L King Blvd from Fair Avenue to Owens Avenue, at a depth and location acceptable to the Sanitary Sewer Planning Section of the Department of Public Works. Meet with Sanitary Sewer Planning to discuss reimbursement for constructing an oversized sewer in Martin L King Blvd."						
ROW	1	04/01/2019	04/01/2019	04/01/2019	LOGAN	Approved
Comments:						
ROW	1	04/01/2019	04/01/2019	04/01/2019	LOGAN	Approved
Comments:						
NEIGH P&S	1	04/01/2019	01/01/1900	01/01/1900		Awaiting Review
Comments:						
NEIGH P&S	1	04/01/2019	01/01/1900	01/01/1900		Awaiting Review
Comments:						
LAND DEV	1	04/01/2019	01/01/1900	01/01/1900		Awaiting Review
Comments:						
LAND DEV	1	04/01/2019	01/01/1900	01/01/1900		Awaiting Review
Comments:						
FLOOD	1	04/01/2019	04/09/2019	04/09/2019	SHINN	Cond. Approval
Comments: TDS required						
FLOOD	1	04/01/2019	04/09/2019	04/09/2019	SHINN	Cond. Approval
Comments: TDS required						
FIRE ENG	1	04/01/2019	04/16/2019	04/16/2019	HALVORSON	Approved
Comments:						
FIRE ENG	1	04/01/2019	04/16/2019	04/16/2019	HALVORSON	Approved
Comments:						
ENGDESIGN	1	04/01/2019	04/24/2019	04/24/2019	VENGLASS	Approved
Comments:						
ENGDESIGN	1	04/01/2019	04/24/2019	04/24/2019	VENGLASS	Approved
Comments:						
DEVCO	1	04/01/2019	04/11/2019	04/11/2019	BAILEY	Cond. Approval
Comments: COMMENTS: We note that there are several underlying lot lines on this site and recommend Planning impose the condition that the applicant shall coordinate with the City Surveyor and other city staff to determine the most appropriate mapping action necessary to consolidate the existing lots. The mapping action shall be completed and recorded prior to the issuance of any building permits. We note that this site is related to VAR-76077 and the Department of Public Works has no comment on this action.						

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CONDITIONS OF APPROVAL: 1. Appropriate Mapping action(s), if required, shall record prior to the approval of off-site construction drawings for this site. 2. Construct all incomplete half street improvements on Tonopah Drive and Virginia City Avenue meeting current City Standards adjacent to this site concurrent with development of this site. All existing paving damaged or removed by this development shall be restored at its original location and to its original width concurrent with development of this site. 3. The school shall send all wastewater to the 8-inch public sewer in Virginia City Avenue and abandon the private sewer connection to the private sewer manhole near the south property line. 4. Design and construct an off-site relief sewer in Martin Luther King Boulevard from Fair Avenue to Owens Avenue, at a depth and location acceptable to the Sanitary Sewer Planning Section of the Department of Public Works. Meet with Sanitary Sewer Planning to discuss reimbursement for constructing an oversized sewer in Martin Luther King Boulevard. 5. All private improvements and landscaping installed with this project shall be situated and maintained so as to not create sight visibility obstructions for vehicular traffic at all development access drives and abutting street intersections. 6. A Traffic Impact Analysis or other information acceptable to the City Traffic Engineer must be submitted to and approved by the Department of Public Works prior to issuance of any building or grading permits. Comply with the recommendation of the City Traffic Engineer. 7. A Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits or submittal of any construction drawings, whichever may occur first. Provide and improve all drainageways recommended in the approved drainage plan/study. The developer of this site shall be responsible to construct such neighborhood or local drainage facility improvements as are recommended by the City of Las Vegas Neighborhood Drainage Studies and approved Drainage Plan/Study concurrent with development of this site.						
DEVCO	1	04/01/2019	04/11/2019	04/11/2019	BAILEY	Cond. Approval
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B&S PLAN	1	04/01/2019	01/01/1900	01/01/1900		Awaiting Review
Comments:						
B&S PLAN	1	04/01/2019	01/01/1900	01/01/1900		Awaiting Review
Comments:						

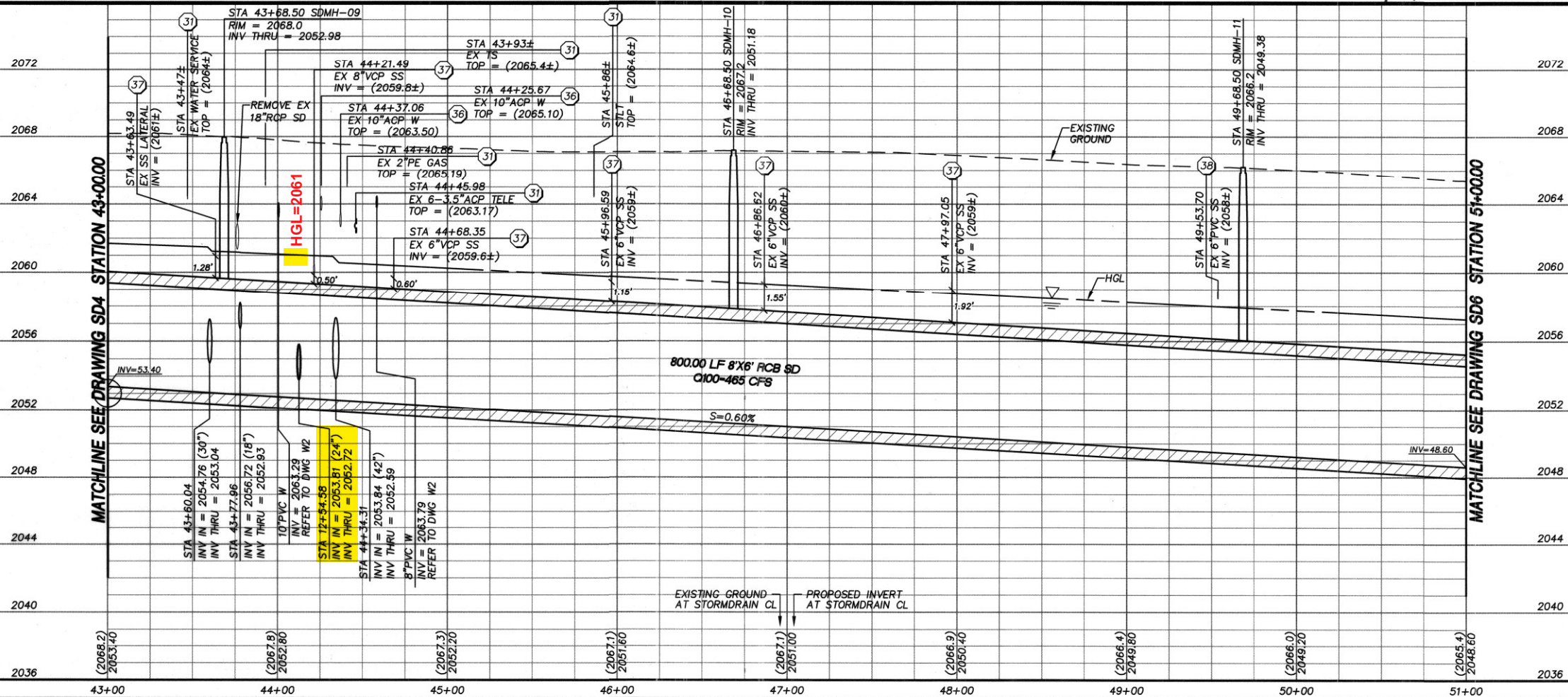
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Freeway Channel – Washington, MLK to Rancho, 2015

X:\Projects\10022151_WashAve\Sheets\22151-3-SD5 *2-24-15 02:33pm

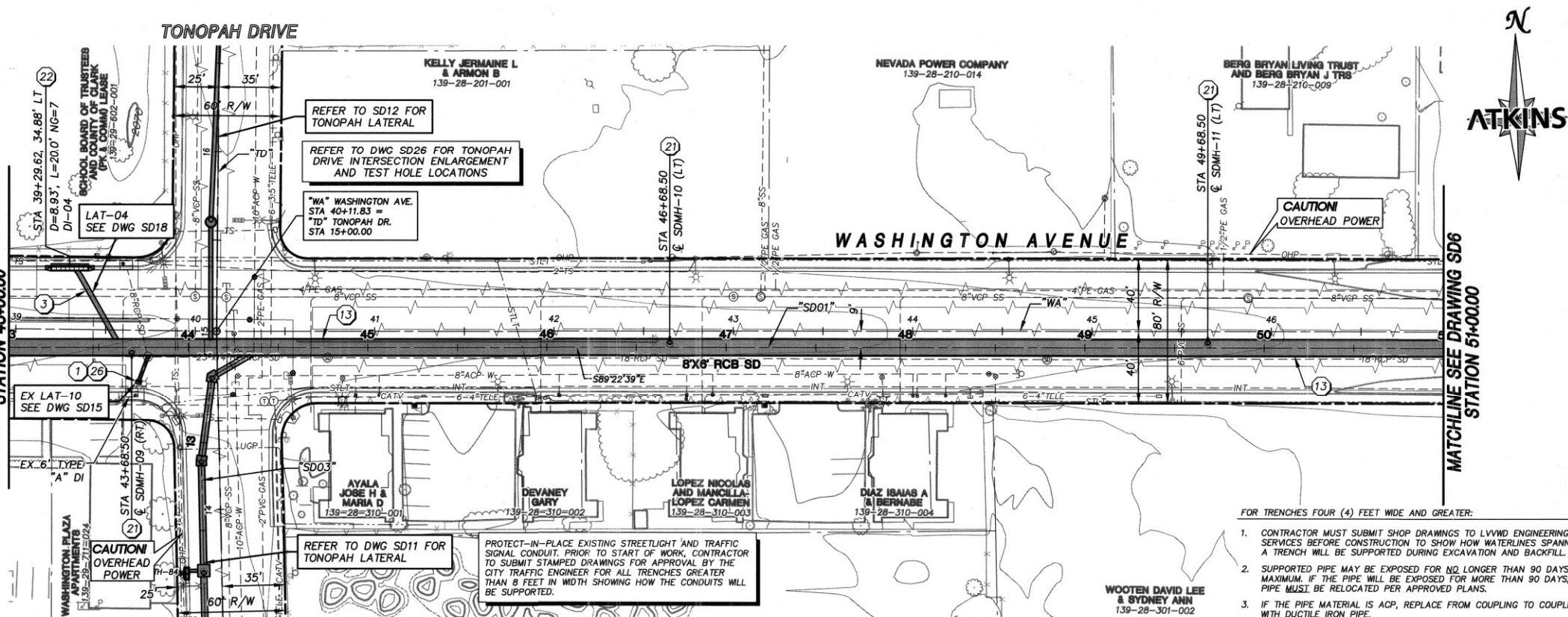
MATCHLINE SEE DRAWING SD4
STATION 43+00.00

MATCHLINE SEE DRAWING SD6
STATION 51+00.00



MATCHLINE SEE DRAWING SD4
STATION 43+00.00

MATCHLINE SEE DRAWING SD6
STATION 51+00.00



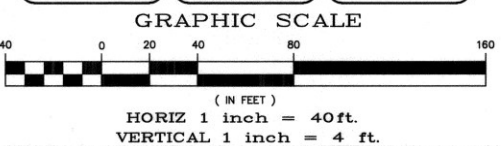
- FOR TRENCHES FOUR (4) FEET WIDE AND GREATER:
1. CONTRACTOR MUST SUBMIT SHOP DRAWINGS TO LVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW WATERLINES SPANNING A TRENCH WILL BE SUPPORTED DURING EXCAVATION AND BACKFILL.
 2. SUPPORTED PIPE MAY BE EXPOSED FOR NO LONGER THAN 90 DAYS MAXIMUM. IF THE PIPE WILL BE EXPOSED FOR MORE THAN 90 DAYS, PIPE MUST BE RELOCATED PER APPROVED PLANS.
 3. IF THE PIPE MATERIAL IS ACP, REPLACE FROM COUPLING TO COUPLING WITH DUCTILE IRON PIPE.

APPROVED FOR CONSTRUCTION
DISNEY BRIDGE
Las Vegas Valley Water District Engineering Services Manager
Date: 3/23/15 Project No. 12356 ESN 018

STORM DRAIN CONSTRUCTION NOTES

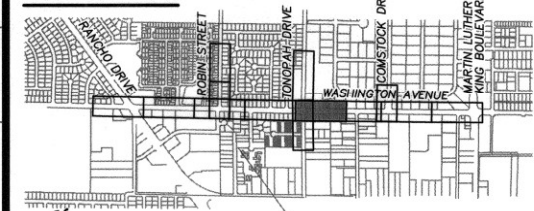
1. INSTALL 18" RCP SD PER TRENCH DETAIL 1 DRAWING SD21
2. INSTALL 24" RCP SD PER TRENCH DETAIL 1 DRAWING SD21
3. INSTALL 30" RCP SD PER TRENCH DETAIL 1 DRAWING SD21
4. INSTALL 36" RCP SD PER TRENCH DETAIL 1 DRAWING SD21
5. INSTALL 42" RCP SD PER TRENCH DETAIL 1 DRAWING SD21
6. INSTALL 48" RCP SD PER TRENCH DETAIL 1 DRAWING SD21
7. INSTALL 60" RCP SD PER TRENCH DETAIL 1 DRAWING SD21
8. INSTALL 45"x29" HE RCP SD PER TRENCH DETAIL 1 DRAWING SD21
9. INSTALL 53"x34" HE RCP SD PER TRENCH DETAIL 1 DRAWING SD21
10. INSTALL 5'x5' PRECAST RCB SD PER TRENCH DETAIL 2 DRAWING SD21
11. INSTALL 6'x6' PRECAST RCB SD PER TRENCH DETAIL 2 DRAWING SD21
12. INSTALL 7'x6' PRECAST RCB SD PER TRENCH DETAIL 2 DRAWING SD21
13. INSTALL 8'x6' PRECAST RCB SD PER TRENCH DETAIL 2 DRAWING SD21
14. INSTALL 10'x5' PRECAST RCB SD PER TRENCH DETAIL 2 DRAWING SD21
15. INSTALL PRECAST RCB TRANSITION
16. CONSTRUCT TYPE I SDMH PER USD #403.1
17. CONSTRUCT TYPE II SDMH PER USD #405.1
18. CONSTRUCT TYPE III SDMH PER USD #406.1
19. CONSTRUCT JUNCTION STRUCTURE PER DRAWING ST02
20. CONSTRUCT 36" ACCESS MANHOLE PER DETAIL 3 DRAWING SD21
21. CONSTRUCT 48" ACCESS MANHOLE PER DETAIL 4 DRAWING SD21
22. CONSTRUCT TYPE "D" MODIFIED DROP INLET PER USD #412.1
23. INSTALL PRECAST CURB INLET PER DETAIL 1 DRAWING SD22
24. CONSTRUCT TYPE 2 INLET PER NDOT STD. DRAWING R-4.2.1 & R-4.2.7
25. PLUG EXISTING/PROPOSED STORM DRAIN PER DETAIL 6 DRAWING SD21
26. CONSTRUCT CONCRETE COLLAR PER DETAIL 5 DRAWING SD21
27. CONNECT EXISTING 6"x3" RCB STORM DRAIN TO PROPOSED 5'x5' RCB PER DRAWING ST03
28. CONSTRUCT RCB END CAP PER DETAIL A DRAWING ST01
29. CONNECT EXISTING 7'x6" RCB TO PROPOSED 7'x6" RCB PER DETAIL D DRAWING ST01
30. RELOCATE EXISTING UTILITY (BY OTHERS)
31. PROTECT-IN-PLACE. CONTRACTOR TO SUPPORT UTILITY ACROSS THE TRENCH. ANY DESIGN REQUIRED TO SUPPORT THE UTILITY SHALL BE DONE BY THE CONTRACTOR'S ENGINEER AND SHALL BE LICENSED IN THE STATE OF NEVADA. (NO DIRECT PAYMENT)
32. PIPE PENETRATION PER DETAIL C DRAWING ST01
33. INSTALL SANITARY SEWER PROTECTION PER DCSWCS SD-21
34. INSTALL PRECAST MANHOLE TEE PER USD #407.1
35. REMOVE AND REPLACE EXISTING ACP WATERLINE PER DETAIL 1 DRAWING W4
36. EXISTING WATER UTILITY TO BE RELOCATED. SEE "W" SHEETS
37. REMOVE AND REPLACE EXISTING VCP SANITARY SEWER PER DCSWCS SD-20
38. INSTALL SANITARY SEWER PROTECTION PER DETAIL 3 DRAWING SD22
39. SNWA WATERLINE CROSSING. REFER TO DETAIL 2 DRAWING SD23
40. INSTALL 18" C-905 PVC SD PER TRENCH DETAIL 1 DRAWING SD21

STORM DRAIN NOTES:
1. ALL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO GRADE BREAK OR TO INSIDE EDGE OF DL, RCB, OR STRUCTURE.
2. ALL DROP INLETS SHALL INCLUDE STORM WATER MANAGEMENT STAMP AND DETAIL PER USDOCA STD. DWG. NO. 421



UTILITY NOTE:
ALL EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION.
NO REPRESENTATION IS MADE THAT ALL UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN IN THEIR PROPER LOCATIONS.
THE DEPTH BELOW GRADE OF THE VARIOUS UTILITIES DEPICTED ON THE PLANS VARIES THROUGHOUT THE PROJECT AREA. THE CONTRACTOR SHALL EXERCISE EXTREME CARE WHEN EXCAVATING AND GRADING THE SUBBASE IN THE VICINITY TO AVOID DAMAGE TO THE LATTER.

SHEET INDEX



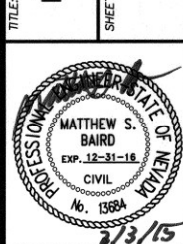
ATKINS
2270 Corporate Circle Suite
200 Henderson, Nevada
89074 Telephone:
702/263-7275
Fax: 702/263-7200

DEPARTMENT OF PUBLIC WORKS

CAPITAL PROJECT MANAGEMENT SECTION

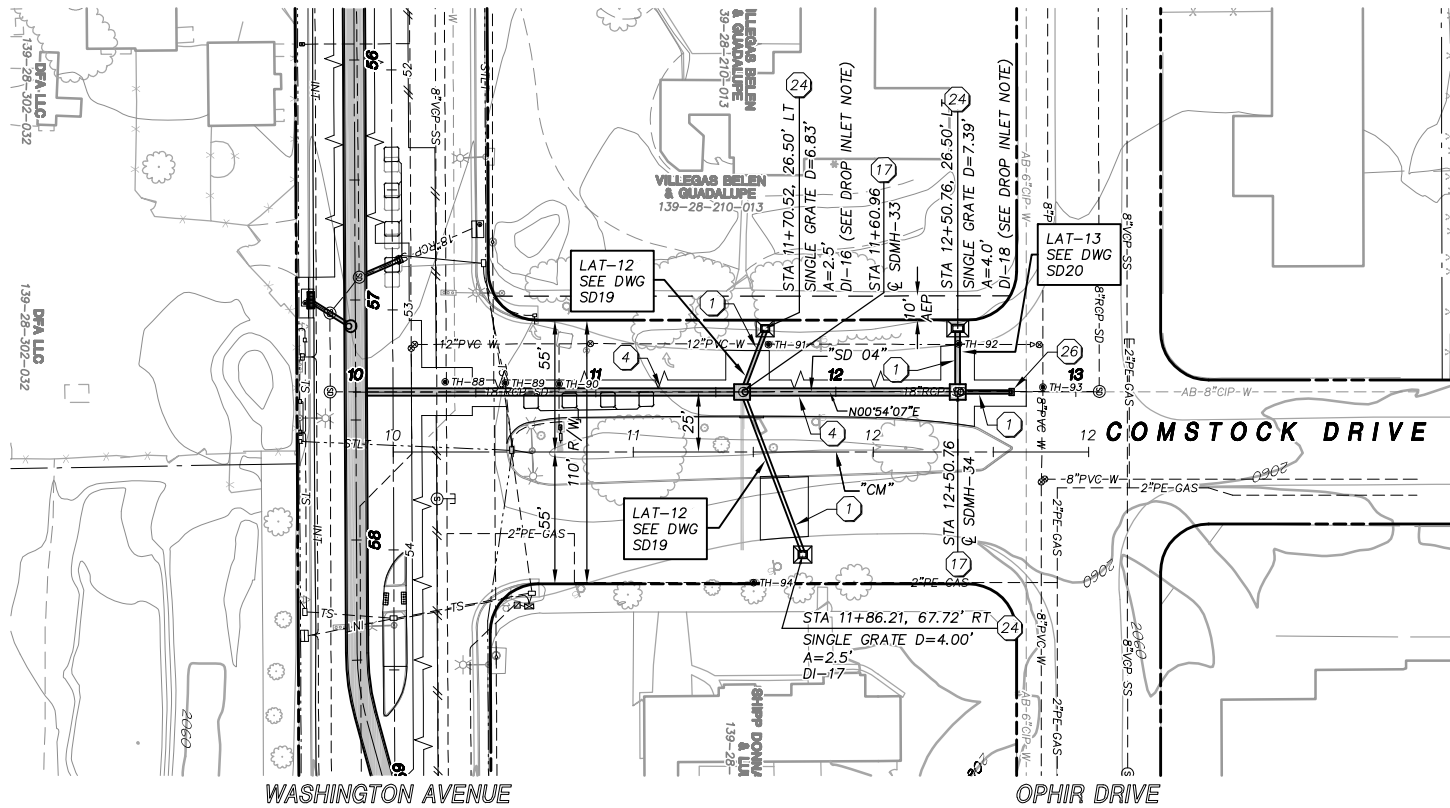


**FREEWAY CHANNEL - WASHINGTON
MLK BOULEVARD TO RANCHO DRIVE
(WASHINGTON AVE. STORM DRAIN)**
**STORM DRAIN PLAN AND PROFILE
WASHINGTON AVENUE
STA 43+00.00 TO STA 51+00.00**



SD5
19 of 75
DRAWING# 731-90

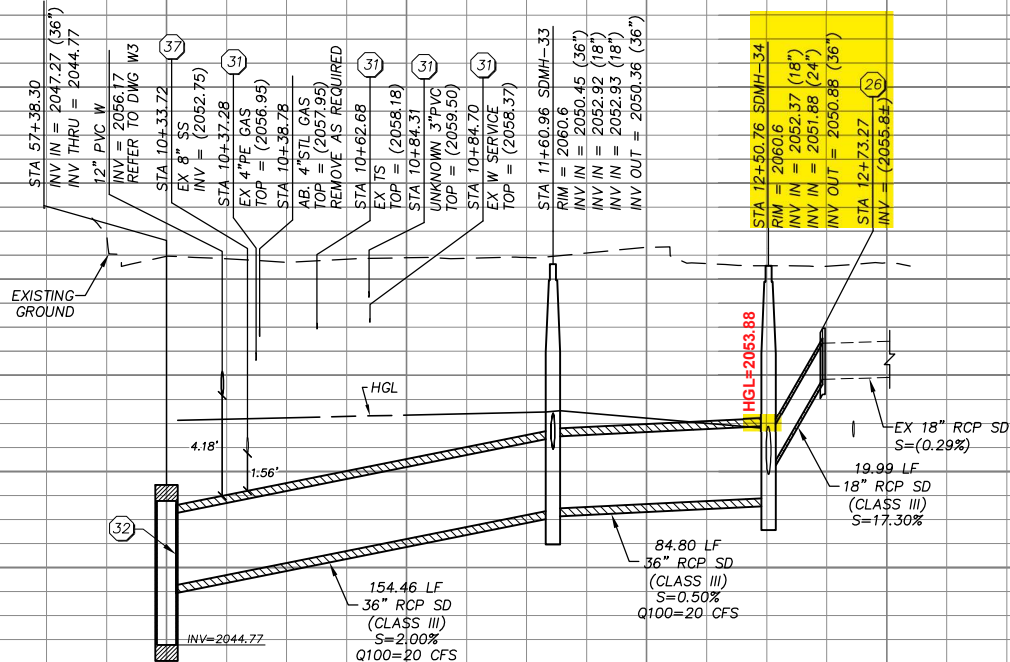
Update#1 Freeway Channel – Washington, MLK to
Rancho, 2015



- DROP INLET NOTE
- WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE, CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP (VINYLEX, GREENSTREAK, PLASTIC PRODUCTS OR APPROVED EQUAL)
- FOR TRENCHES FOUR (4) FEET WIDE AND GREATER:
- CONTRACTOR MUST SUBMIT SHOP DRAWINGS TO LVVWD ENGINEERING SERVICES BEFORE CONSTRUCTION TO SHOW HOW MUCH WATERLINES SPANNING A TRENCH WILL BE SUPPORTED DURING EXCAVATION AND BACKFILL.
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APPROVED FOR CONSTRUCTION

Las Vegas Valley Water District Engineering Services Manager
Date: 12/25/22 Project No. 22052 ESN 078

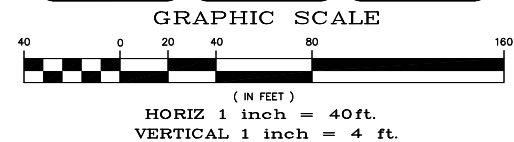


STORM DRAIN CONSTRUCTION NOTES

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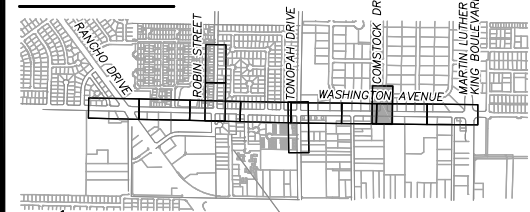
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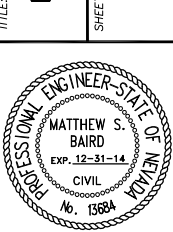
DEPARTMENT OF PUBLIC WORKS

CAPITAL PROJECT MANAGEMENT SECTION



TITLE: FREEWAY CHANNEL - WASHINGTON
MLK BOULEVARD TO RANCHO DRIVE
(WASHINGTON AVE. STORM DRAIN)

SHEET: STORM DRAIN PLAN AND PROFILE
COMSTOCK DRIVE
STA 10+00.00 TO STA 15+00.00



SHEET: SD12
25 of 73
DRAWING# 731-90

Civil Improvement Plans