DS #: 05226

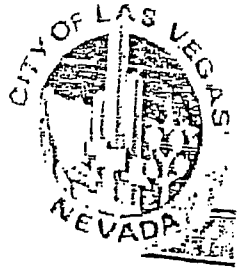
APN: 137-22-301-001

PROJECT: Summerlin West Grand Park Detention Basin - Inlet Pipe

SUBMITTAL: 2nd

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: March 30, 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:**
Summerlin West Grand Park Detention Basin - Inlet Pipe				VTN Nevada
Cross Streets:	I-215 and Summerlin Parkway			The Howard Hughes Corporation
File Number:	F:\Depot\DSMemos\DS5226B.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-22-301-001			CCRFCD
Zoning Action:	N/A			
FEMA Flood Zone	YES	NO X		
Proposed Storm Drain	YES X	NO		

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	11/27/2019	12/20/2019 & 12/30/2019	Not Approved	$400.00	3658677: $400
2nd Submittal	2/18/2020	3/26/2020	See Comments Below	$400.00	3747241: $400
			TOTAL FEES (LDDRS):	**$800.00**	----

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.

1. The project proposed to construct temporary drainage facilities including drainage berms/ditches along the west side of various perimeter streets. Prior to the final plans approval, the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City Flood Control* for approval. Once the drainage study is conditionally approved, the engineer/developer should contact the *City's Land Development Section* (702-229-6371) to begin the agreement process.

   In order for the maintenance bond to be released in the future, a drainage update/letter will be required to justify that the berm/swale are no longer necessary and can be removed.

2. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

   Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

http://gustfront.ccrfcd.org/LandDev/LandDev.aspx

3. **Sheet PP1**:
   - In the *Plan View*, at the sump pit, it is not understood why the proposed RCB begins with a 10LF of 7'x7'-RCB, followed by 5LF of 6'x7' to 5'x7'-RCB transition structures and then back to 7'x7'-RCB. While the *Profile* only shows 7'x7'-RCB consistently through. Review and revise accordingly.
   - Provide two laterals on both sides of the 7'x7'-RCB for future nuisance inlets connection at approximate Station 78+00 in *Fox Hill Drive*.
4. **Sheet PP3**:
   - Provide structural connection detail between the proposed and the existing 7'x7'-RCB at Station 64+18.84 in *Fox Hill Drive*.
5. **Sheet PP4 to Sheet PP6**:
   - The length of *Calico Bend Drive* from *Lake Mead Boulevard* to *Sunset Run Drive* is about 2,500 feet without any nuisance inlets. Extend the 30"-RCP stub from *Sunset Run Drive* to Station 25+00 in *Calico Bend Drive* for future inlets connection.
6. **Sheet PP7 to Sheet PP9**:
   - *Park Drift Trail* from Station 236+00 to the intersection with *Fox Hill Drive* (Station 252+50), a span of 1,650 feet without any drop inlets. Discuss any future provision of nuisance inlets in the next submittal.
7. **Sheet PP9 to Sheet PP10**:
   - Same comment applies to the stretch of about 1,250 feet in *Park Drift Trail* from Station 252+50 to the intersection with *Lake Mead Boulevard*. Address in the next submittal.
8. **Sheet PP11 to Sheet PP13**: Please address the same issue.
9. **Sheet PP14**:
   - Provide two stubs at both sides of SDMH #25 in *Lake Mead Boulevard* for future nuisance inlets connection.
10. **Sheet PP14 to Sheet PP16**:
    - Various transition structures are proposed to convert 5'x5' to 5'x6', 5'x6' to 5'x7' and 5'x7' to 6'x7' RCBs.

      However, structural detail sheets had not been available. Provide as such in the next submittal.
11. **Sheet PP17 to Sheet PP19**:
    - The length of *Sunset Run Drive* from *Park Drift Trail* to *Lake Mead Boulevard* is about 2,000 feet without any nuisance inlets.

      Address what will be done to provide nuisance inlets in *Sunset Run Drive* in the next submittal.
12. All offsite interim flood control facilities such as but not limited to berms/ditches, temporary sump and temporary sediment basins are privately owned and to be privately maintained by the *Howard Hughes Company*. Provide a note as such on the grading plans.

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/R59E/22
AREA K-22

Addendum #1 to the Technical Drainage Study for

Summerlin West
Grand Park Detention Basin Inlet Pipe

Las Vegas, Nevada

7809-GPDB

Prepared for:

Howard Hughes Company, LLC

10801 W Charleston Blvd Suite 300

Las Vegas, Nevada 89135

702-791-4000

Submitted to:

City of Las Vegas Public Works

333 N Rancho Dr

Las Vegas, Nevada 89106

702-229-6251

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Summerlin West - Grand Park Detention Basin Inlet Pipe Date: February 2020

Location of Development: a) Descriptive (Cross Streets) North/South: I215

East/West: Summerlin Parkway

b) Section: 22 Township: 20 Range: 59

c) APN : 137-22-101-001

Name of Owner: The Howard Hughes Corporation

Telephone No.: (702) 791-4336 Fax No.: (702) 791-4453 E-Mail Address: chris.anderson@howardhughes.com

Address: 10801 W. Charleston Blvd. LV, NV, 89135

Contact Person-Name: Paul Morton **Telephone No.:** (702)-873-7550

* **E-Mail Address:** paulm@vtnnv.com **Fax No.:** (702)-362-2597

Firm: VTN Nevada

Address: 2727 S. Rainbow Blvd, LV, NV, 89146

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	Detention basin and outflow facilities	

1. Total Owned Land Area: At Site: 5100+/- Acres Being Developed/Disturbed: +/-5100 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.): Detention basin inlet pipes, street rough grading, interim swales.
5. Approximate upstream land area which drains to the subject site: +/- 1.28 sq.mi.
6. Has the site drainage been evaluated in the past? ☒ **YES** ☐ **NO** If yes, please identify documentation: DS4926 - Summerlin West Master Plan Update, DS5089 - Conceptual Drainage Study for Grand Park Detention Basin
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Discharges into the Grand Park Detention Basin.
8. Briefly describe your proposed schedule for the subject project: As soon as possible

2-18-20

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.

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

PROVIDING QUALITY PROFESSIONAL
SERVICE SINCE 1960

February 10th, 2020
W.O. #7809-GPDB

City of Las Vegas
Land Development Services
Department of Building Safety

Attention: Albert Sung, P.E., CFM
Flood Control Project Engineer

Subject: Addendum #1 to the Technical Drainage Study for Summerlin West Grand Park Detention Basin Inlet Pipe.

Mr. Sung:

This letter certifies that all items on the *Addendum #1 to the Technical Drainage Study for Summerlin West Grand Park Detention Basin Inlet Pipe* electronic submittal matches the paper version bound into the study.

Respectfully submitted,

Paul Morton, P.E., CFM

ADDENDUM #1

TO THE TECHNICAL DRAINAGE STUDY

FOR

SUMMERLIN WEST

GRAND PARK DETENTION BASIN – INLET PIPE

CITY OF LAS VEGAS, NEVADA

W.O. # 7809-GPDB

Prepared for:
THE HOWARD HUGHES COMPANY, LLC
10801 W Charleston Blvd Suite 300
Las Vegas, Nevada 89135
Ph: 702-791-4000

Submitted To:
CITY OF LAS VEGAS PUBLIC WORKS
333 N Rancho Dr
Las Vegas, Nevada 89106
Ph: 702-229-6251

Developer Contact:
CHRISTOPHER W. ANDERSON
Director of Engineering Support Services
10801 W. Charleston Blvd Suite 300
Las Vegas, Nevada 89135
Ph: 702-791-4336 | Cell: 702-755-9501

PROVIDING QUALITY PROFESSIONAL SERVICE SINCE 1960

February 6, 2020
W.O. #7809-GPDB

City of Las Vegas
333 N. Rancho Drive
Las Vegas, NV 89106

Attention: Albert Sung, P.E.
Flood Control Project Engineer

SUBJECT: ADDENDUM #1 TO THE TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST GRAND PARK DETENTION BASIN – INLET PIPE (DS #5226)

Mr. Sung:

This *Addendum #1 to the Technical Drainage Study for Summerlin West Grand Park Detention Basin – Inlet Pipe* is being submitted to the City of Las Vegas to address review comments dated January 2, 2020.

REMARKS:

A field review of the watershed boundary conditions between DB #5 and GPDB has identified a probably fan flow near the northwest corner of the Development Boundary. The fan flow impact will have a significant impact on these two detention basins and the overall Summerlin West Planning Area. A field review by Flood Control Staff identified a fan apex at the discharge point for MPU Basin DB54-1. The rout9ing of flow from MPU Basin DB54-1 needs to be reviewed and shall be based upon the existing alluvial flow conditions. Adding flows to the GPDB watershed will have a significant impact to the size and design of drainage facilities.

Comment #1

FIGURE 7 (Interim #2 Condition Basin Map): Per a field trip conducted by the City Flood Control staff, it is apparent that the offsite basin "OFF3" should be revised to reflect additional flows. Combining field reconnaissance with contour lines presented in the Clark County Regional Flood Control District's GIS FloodView map, it appears that natural washes upstream of the tip of "OFF3" within MPU Basin DB54-1 can impact the "OFF3" basin of the subject study. This may substantially increase the flows to the proposed Inlet Facilities. This must be addressed and resolved in the next submittal.

RESPONSE: A 2D hydraulic model was completed by GCW that includes the area in question. Per that analysis the large offsite flow of 2,117-cfs approaching from the west splits in multiple directions with the majority of flow heading south. Out of the total approach flow the analysis determined that 73-cfs of un-channelized flow would impact the extents of Park Drift proposed by this study. It is not anticipated that this flow will negatively impact the detention basin which is designed for the larger developed/ultimate condition flows. In the developed/ultimate condition a berm will be proposed to ensure that all flow at the flow split is conveyed south towards detention basin DB5 following historic

flow patterns. Additionally due to the varying time to peak for the large offsite basin this flow has not been considered in the design of the detention basin. Please refer to *Appendix D.5* for reference 2D HEC-RAS flow split exhibit.

Comment #2

> **The project proposed to construct temporary drainage facilities including drainage berms/swales for the interim protection of the proposed segment of Kindle Corner Avenue and Kettle Ridge Drive. Prior to the final plans approval, the developer must complete a Maintenance & Liability Agreement for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to City Flood Control for approval. Once the drainage study is conditionally approved, the engineer/developer should contact the City's Land Development Section (702-229-6371) to begin the agreement process.**
>
> **In order for the maintenance bond to be release in the future, a drainage update/letter will be required to justify that the berm/swale are no longer necessary and can be removed.**

RESPONSE: Acknowledged.

Comment #3

> **The site is adjacent to or crosses an existing or proposed Clark County Regional Flood Control District (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.**
>
> **Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.**
>
> **http://gustfront.ccrfcd.org/LandDev/LandDev.aspx**

RESPONSE: Acknowledged.

Comment #4

> **The Study stated that when n=0.013 was used in the storm drain modeling, segments of the inflow pipes will have 100-year velocity greater than 35 ft/s. Using n=0.015, then the 100-year flow will not exceed 35 ft/s.**
>
> **Note that concrete roughness coefficient is 0.013 per manual, the subject study must use n=0.013 for modeling. If the 100-year flow is more than 35 ft/s, the engineer must clearly address the mitigation methods used for velocities above 35 ft/s in the next submittal. Using 6,000-psi concrete and providing additional 2"-sacrificial concrete to not suffice the super-fast and erosive velocity.**

RESPONSE: Inflow pipe WSPG storm drain hydraulic models have been revised to utilize a roughness coefficient of "0.013" in order to determine maximum velocity within the pipe. It was determined that velocities now reach 39-fps within the inlet pipes to the detention basin without additional mitigation. To limit velocities below 35-fps, sections of RCB with steep slopes are now proposed to be lined with 1/8" to ¼" grooves perpendicular to the direction of flow at no closer than 6" to walls and joints. For these RCB sections a manning's coefficient of "0.023" was utilized. The revised storm drain design with "0.013" for standard sections of RCB now limits peak velocity below 35-fps. 0.013 WSPG models have been provided in *Appendix C.2.1, C.2.3, and C.2.7* for outflow, northern inlet, and southern inlet respectively.

In addition to providing 2"-sacrificial 6,000-psi concrete within all segments of pipe in excess of 35-fps, sediment catch basins are now proposed at all interim inlet locations along both the northern and southern inflow pipes. Ensuring that "clean water" with minimal sediment is being conveyed through the storm drain. The sediment catch basins are to extend 20-ft in the upstream direction away from inlet sumps, be 2-ft deep, and be lined with D50=6" riprap.

Comment #5

> **The numbering system of the drainage basin maps are confusing: "FIGURE 7" is with "Sheet FIG 9" while FIGURE 9" is with "Sheet FIG 11". "FIGURE 8" is consistently with "Sheet FIG 8" though. Review and revise accordingly.**

RESPONSE: Figures 7, 8, and 9 have been revised to be consistent with their naming throughout the exhibits. Revised figures have been provided in *Appendix A.*

Comment #6

> **Provide development boundary on all pertinent basin maps.**

RESPONSE: Development boundary has been provided on all basin and facility maps. Revised maps have been provided in *Appendix A.*

Comment #7

Provide all tables and figures used from the HCDDM with the project location shown to verify how precipitation values were obtained.

RESPONSE: Precipitation values have been referenced from the Summerlin West Planning Area Master Plan Update (DS4926). Precipitation values established per that study have been applied to the small basins/parcels which comprise the larger master plan basins. This methodology is consistent with all other drainage studies for the Summerlin West Planning Area. Per that master study the precipitation values are adjusted depth from the 2006 MPU Grid (Atlas 2). Precipitation maps have been provided in *Appendix B.1.1* for the developed/ultimate condition and *Appendix B.2.1* for the interim condition.

Comment #8

Provide the Name of Development on the Drainage Study Information Form.

RESPONSE: Drainage study information form (SF1) has been updated.

Comment #9

Figure 7 Interim Condition #2 Conditional Basin Map shows 2 CP4 locations listing one as 1,277 cfs and one as 1,238 cfs. Update to only include one CP4 and verify the correct flow is provided.

RESPONSE: Figure 7 has been revised to only show 1,233-cfs for CP4. Revised Figure 7 has been provided in *Appendix A.* Note the value has been revised per response to Comment #13.

Comment #10

Figure 7 Interim #2 Condition identifies CP6 as 146 cfs in the table but shows 201 cfs on the exhibit.

RESPONSE: Figure 7 has been revised to only show 151-cfs for CP6. Revised Figure 7 has been provided in *Appendix A.* Note the value has been revised per response to Comment #13.

Comment #11

Distinguish between the different Summerlin Villages on Figure 8 Developed/Ultimate Condition Basin Map either using boundary lines or labeling the basins with V## before. This will provide clarification as to where the basin is referenced.

RESPONSE: Figure 8 has been revised to show the Summerlin West Village boundary lines and to label each village shown within the detention basin watershed. Revised Figure 8 has been provided in *Appendix A.*

Comment #12

Area and Q_{100} for V30A-E (SF2) and V30A-F (SF2) cannot be found on Figure 8.

RESPONSE: V30A-E and V30A-F shown on the Standard Form 4 represent basins E and F and are located on Figure 8 within the Village 30A – Little Red Rocks boundary. Specifically both parcels are along the unnamed street that connects to the southern tip of Park Drift. Basin E is 28.50-acres and produces a 100-year flow of 110-cfs and Parcel F is 28.69-acres and produces a 100-year flow of 110-cfs as provided on the HEC-1 summary table on Figure 8. Revised Figure 8 has been provided in *Appendix A.*

Comment #13

Verify routing in ultimate condition HEC-1. For example, CP1 routes through a storm drain to CP2 but the storm drain is defined as a trapezoid. In ultimate condition it would be assumed this facility is an RCB or RCP.

RESPONSE: Developed/ultimate HEC-1 has been revised for its Muskingum Cunge RD routing cards to call out rectangular sections for flow within proposed RCB storm drain and future streets. Proposed width of RCB was utilized where possible and a minimum width of 5-ft was used for future storm drain routing. Additionally the Interim #2 condition HEC-1 model has been revised. Revised hydrologic analysis has been provided in *Appendix B.1 and B.2* for the developed/ultimate and interim condition respectively. The HEC-1 summary tables on the basin maps have been updated. Per this revision flow values have changed at locations along the proposed northern and southern inlet pipes. The WSPG models for these storm drains have been updated per the new flow values and provided in *Appendix C.2.*

Comment #14

Stub/Lateral ID#1 5'x5' RCB considers 583 cfs per the summary table in the Appendix C1.2, per combination point CP4 in the ultimate condition. However, CP4 flow is 1,139 cfs in Figure 8, the Ultimate Condition Map. Additionally, the worksheet showing the calculations for this is not provided. Verify the flow at this location and update and provide the calculations.

RESPONSE: 553-cfs from concentration point CP4 is to be diverted from the future storm drain in Lake Mead via DVCP4 to CP9. This flow is to be conveyed to the storm drain within Fox Hill. The remaining 575-cfs (flow revised due to Comment #13) within the future Lake Mead storm drain reaches the intersection of Lake Mead and Park Drift and is utilized in the 5'x5' RCB labeled ID#1. The HEC-1 summary table on Figure 8 has been updated to include "DVCP4 – to CP9" and "DVCP4 – to CP5". The Stub/Lateral summary table has been updated to state that the 575-cfs for ID#1 is taken from "DVCP4 – to CP5".

Comment #15

Facility ID #12 considers combination point CP6A which it lists as 148 cfs on Figure 9. It is located at CP6 (776 cfs) shown on Figure 8. It is unclear how CP6A was derived to size lateral 12.

RESPONSE: Concentration point CP6A has been added to Figure 8: Developed/Ultimate Basin Map. CP6A combines flow from parcels/basins I, ST16, ST13, G, and N as flow to be conveyed in future storm drain within Sunset Run to Lake Mead and discharge into the northern RCB inflow facility.

Comment #16

Provide velocity mitigation measures for all flow velocities above 35 fps per the hydraulic model and calculation using the manning's coefficient 0.013.

RESPONSE: Per response to Comment #4 velocities are no longer above 35-fps in the "0.013" WSPG model. Velocity mitigation in the form of sediment catch basins are provided at storm drain inlets to ensure "clean water" is conveyed through storm drain system in addition to 2"-sacrificial 6,000-psi concrete being used.

Comment #17

Provide a typical section of the RCB with 2" sacrificial concrete.

RESPONSE: Detail L has been added to the improvement plans on Sheet DT1 which provides 2" sacrificial concrete. Detail K/DT1 has also been added for RCB section with 1/8" to ¼" grooves.

Comment #18

Provide transition structures when transitioning between box sizes.

RESPONSE: Transition structures are now proposed between all change in box sizes.

Comment #19

The Facilities Map lists the Lake Mead System as a 5'x5' RCB then a 5'x7' RCB. However, per the plans, the system in Lake Mead is a 5'x5' RCB then a 5'x6' RCB. Update the Facility Map accordingly.

RESPONSE: Additional RCB label for the section of 5'x6' RCB has been added to the facilities map. Revised facilities map has been provided in *Appendix A.*

Comment #20

Sheet PP18 the sacrificial concrete construction note is incomplete: BEGIN ADDITIONAL X" SACRIFICIAL X,XXX PSI CONCRETE FOR RCB INVERT. Update the note and place it above the profile in a very obvious location that stands out.

RESPONSE: Callouts for sacrificial concrete and groove sections per detail K/DT1 and L/DT1 have been placed above storm drain profiles in obvious locations.

Comment #21

Sheet PP18 and PP33: Provide a storm drain manhole at the angle point of the 42" RCP lateral. A collar is not acceptable.

RESPONSE: A 60" storm drain manhole is now proposed.

Comment #22

Provide a typical section of the proposed RCB and its placement as you are intending to install the box in a non-traditional way. Additionally, make sure all RCB labels are labeled as W' X H' (as intended in construction) to avoid confusion and better corresponding between hydraulic calculation and design plan set.

RESPONSE: Details K and L have been added to the improvement plans on Sheet DT1. All plans, hydraulic calculations, and figures have been revised to show RCB at W'xH'.

Comment #23

Provide grading plans and lateral profile for Facility stub/lateral 32 and the associated channel.

RESPONSE: The interim #2 channel west of the detention basin and stub/laterals 31 and 32 per Figure 9 – Facility Maps are included in the detention basin improvement plans. Per response to Comment #24 a copy of the detention basin plans has been provided in *Appendix D.2.*

Comment #24

Provided updated grading plans of the detention basin for reference.

RESPONSE: A copy of the current detention basin grading plans has been included with this submittal (refer to *Appendix D.2).*

Comment #25

HY-8 analysis is best performed under a steady head water condition. Provide additional calculation and/or supporting documentation for the hydraulic performance under the high velocity flows combined at the storm drain system laterals and entrances. Additionally, provide mitigation measures to minimize sedimentation from entering the proposed storm drain system to avoid clogging the entrance and the proposed storm drain systems.

RESPONSE: Per page 3.11 of FHWA Hydraulic Design of Highway Culverts Third Edition (Hydraulic Design Series 5, HDS5), of which HY8 derives its equations, the approach velocity head can be considered part of the available headwater to convey flow through a culvert. For this instance the high approach velocity when accounted for would allow for a lower headwater ponding depth thus improving the current design analysis. A conservative design method has been chosen to ignore the velocity head when determining peak ponding depth for the culvert inlet.

Per Section 3.3.2 of the HDS5 if the approach velocity needs to be considered and conserved through the culvert then a separate computer software such as HEC-RAS or equivalent should be used, as HY8 does not include conservation of approach velocity. It is not our intention to conserve velocity through the system. By neglecting the benefit of the approach velocity head to the headwater depth we are conservatively sizing the inlets. Refer to *Appendix D.6* for reference information from HDS5.

Per response to Comment #4 sediment catch basins are now proposed upstream of each interim condition inlet. In addition the proposed interim condition sumps at a 2:1 slope down to the pipe inlet are now proposed as grouted riprap to provide further mitigation to sediment entering the system.

Comment #26

All offsite interim flood control facilities such as but not limited to berms/ditches and temporary sump are privately owned and to be privately maintained by Howard Hughes Company. Provide a note as such on the grading plans.

RESPONSE: Acknowledged.

I hope this addresses your concerns regarding this project. If there are any questions or any additional information is required, please contact this office.

Respectfully Submitted,

VTN Consulting

Paul Morton, P.E., CFM

APPENDIX INDEX

CLV COMMENT LETTER TO TDS

APPENDIX A FIGURES

A.1 Figure 7: Interim #2 Basin Map
A.2 Figure 8: Developed/Ultimate Condition Basin Map
A.3 Figure 9: Grand Park and Roadway Facility Exhibit
A.4 Maintenance Bond Exhibit

APPENDIX B HYDROLOGICAL ANALYSES

B.1 Developed/Ultimate Hydrologic Analysis
- B.1.1 Precipitation Maps
- B.1.2 Soil and Curve Number Calculation
- B.1.3 Travel Time Calculation
- B.1.4 Standard Form 4 – Lag Time Calculations
- B.1.5 HEC-1
  - B.1.5.1 GPDB-10.out - 10-Year Developed/Ultimate Condition
  - B.1.5.2 GPDB-25.out - 25-Year Developed/Ultimate Condition
  - B.1.5.3 GPDB-100.out - 100-Year Developed/Ultimate Condition

B.2 Interim Hydrologic Analysis
- B.2.1 Rainfall Calculations
- B.2.2 Soil and Curve Number Calculations
- B.2.3 Travel Time Calculations
- B.2.4 Standard Form 4 – Lag Time Calculations
- B.2.5 HEC-1
  - B.2.5.1 Interim #2 HEC-1 Analysis – GPDB-INT2.out

B.3 Interim PMF Calculations
- B.3.5 HEC-1
  - B.3.5.1 Interim PMF HEC-1 Analysis – GPDB-PMF.out

APPENDIX C HYDRAULIC ANALYSES

C.1 Flowmaster Normal Depth Calculations
- C.1.1 Developed/Ultimate Stubs
- C.1.2 Interim #2 Detention Basin West Channel

C.2 Water Surface Pressure Gradient (WSPG)
- C.2.1 Detention Basin Outlet – 0.013 Roughness – GPDB-OUTLET-13
- C.2.2 Detention Basin Outlet – 0.015 Roughness – GPDB-OUTLET-15
- C.2.3 Detention Basin Inlet – North – 0.013 Roughness - GPDB-IN-NORTH-13
- C.2.4 Detention Basin Inlet – North – 0.015 Roughness - GPDB-IN-NORTH-15
- C.2.5 Detention Basin Inlet – North – Grate Tailwater - GPDB-IN-NORTH-GRATE
- C.2.6 Detention Basin Inlet – North – 100-yr Tailwater - GPDB-IN-NORTH-TW
- C.2.7 Detention Basin Inlet – South – 0.013 Roughness - GPDB-IN-SOUTH-13
- C.2.8 Detention Basin Inlet – South – 0.015 Roughness - GPDB-IN-SOUTH-15
- C.2.9 Detention Basin Inlet – South – Grate Tailwater - GPDB-IN-SOUTH-GRATE
- C.2.10 Detention Basin Inlet – South – 100-yr Tailwater - GPDB-IN-SOUTH-TW

C.3 HY8 Culvert Headwater Analysis

C.3.1 Detention Basin Low Flow Outlet
C.3.2 Interim Condition Stubs
C.4 HEC-RAS River Analysis System
C.4.1 PMF Spillway Analysis
C.5 Detention Basin Outlet Flow Summary
C.7 Water Quality Capture Volume Sizing
C.7.1 Figure 1207B from HCDDM
C.7.2 Percent Impervious Calculation
C.8 FHYA HEC-14 7.4.2 Outlet Weir
C.9 CCRFCD HCDDM Standard Form 6
C.9.1 Developed/Ultimate Condition
C.9.2 Interim Condition
C.10 Riprap Sizing Calculations
C.10.1 Riprap Apron for Weir Structure
C.10.2 Channel Riprap
C.11 Freeboard Calculations
C.12 WSPG Angle Point Loss

APPENDIX D REFERENCE INFORMATION

D.1 Village 25 – Zoning/Planning Documents
D.2 GPDB - Grading Plans
D.3 GCW Sky Vista Improvements (DS5187)
D.4 GCW Fox Hill Improvements (DS5218)
D.5 GCW 2D HEC-RAS WOTUS 4 and 5 Flow Split and Berm Analysis Exhibit
D.6 Hydraulic Design Series Number 5
D.7 Mass Grading Plans
D.8 Slug and Pulsating Flow in High Gradient Channel
D.9 ACB Sizing Calculations

CLV Comment Letter to TDS

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: January 2, 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:**
Summerlin West Grand Park Detention Basin - Inlet Pipe				VTN Nevada
Cross Streets:	I-215 and Summerlin Parkway			The Howard Hughes Corporation
File Number:	F:\Depot\DSMemos\DS5226A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-22-301-001			CCRFCD
Zoning Action:	N/A			
FEMA Flood Zone	YES	NO **X**		
Proposed Storm Drain	YES **X**	NO		

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	11/27/2019	12/20/2019 & 12/30/2019	See Comments Below	$400.00	3658677: $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.

A field review of the watershed boundary conditions between DB #5 and GPDB has identified a probable fan flow near the northwest corner of the Development Boundary. The fan flow impact will have a significant impact on these two detention basins and the overall Summerlin West Planning Area. A field review by Flood Control Staff identified a fan apex at the discharge point for MPU Basin DB54-1. The routing of flow from MPU Basin DB54-1 needs to be reviewed and shall be based upon the existing alluvial flow conditions. Adding flows to the GPDB watershed will have a significant impact to the size and design of drainage facilities

1. **FIGURE 7 (Interim #2 Condition Basin Map)**: Per a field trip conducted by the *City Flood Control* staff, it is apparent that the offsite basin "OFF3" should be revised to reflect additional flows. Combining field reconnaissance with contour lines presented in the *Clark County Regional Flood Control District's GIS FloodView* map, it appears that natural washes upstream of the tip of "OFF3" within MPU Basin DB54-1 can impact the "OFF3" basin of the subject study. This may substantially increase the flows to the proposed *Inlet Facilities*. This must be addressed and resolved in the next submittal.

2. The project proposed to construct temporary drainage facilities including drainage berms/ditches along the west side of various perimeter streets. Prior to the final plans approval, the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City Flood Control* for approval. Once the drainage study is conditionally approved, the engineer/developer should contact the *City's Land Development Section* (702-229-6371) to begin the agreement process.

   In order for the maintenance bond to be released in the future, a drainage update/letter will be required to justify that the berm/swale are no longer necessary and can be removed.

3. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

   Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

   http://gustfront.ccrfcd.org/LandDev/LandDev.aspx

4. The *Study* stated that when n=0.013 was used in the storm drain modeling, segments of the inflow pipes will have 100-year velocity greater than 35 ft/s. Using n=0.015, then the 100-year flow will not exceed 35 ft/s.

   Note that concrete roughness coefficient is 0.013 per manual, the subject study must use n=0.013 for modeling. If the 100-year flow is more than 35 ft/s, the engineer must clearly address the mitigation methods used for velocities above 35 ft/s in the next submittal. Using 6,000-psi concrete and providing additional 2"-sacrificial concrete do not suffice the super-fast and erosive velocity.

5. The numbering system of the drainage basin maps are confusing: "**FIGURE 7**" is with "**Sheet FIG 9**" while "**FIGURE 9**" is with "**Sheet FIG 11**". "FIGURE 8" is consistently with "Sheet FIG 8" though. Review and revise accordingly.
6. Provide development boundary on all pertinent basin maps.
7. Provide all tables and figures used from the HCDDM with the project location shown to verify how precipitation values were obtained.
8. Provide the Name of Development on the Drainage Study Information Form.
9. Figure 7 Interim #2 Condition Basin Map shows 2 CP4 locations listing one as 1,277 cfs and one as 1,238 cfs. Update to only include one CP4 and verify the correct flow is provided.
10. Figure 7 Interim #2 condition identifies CP6 as 146 cfs in the table but shows 201 cfs on the exhibit.
11. Distinguish between the different Summerlin Villages on Figure 8 Developed/Ultimate Condition Basin Map either using boundary lines or labeling the basins with V## before. This will provide clarification as to where the basin is referenced.
12. Area and Q_{100} for V30A-E (SF2) and V30A-F (SF2) cannot be found on Figure 8.
13. Verify routing in ultimate condition HEC-1. For example CP1 routes through a storm drain to CP2 but the storm drain is defined as a trapezoid. In ultimate condition it would be assumed this facility is an RCB or RCP.

14. Stub/Lateral ID#1 5'x5' RCB considers 583 cfs per the summary table in the Appendix C.1.2, per combination point CP4 in the ultimate condition. However, CP4 flow is 1,139 cfs in Figure 8, the Ultimate Condition Map. Additionally the worksheet showing the calculations for this is not provided. Verify the flow at this location and update and provide the calculations.
15. Facility ID 12 considers combination point CP6A which it lists as 148 cfs on Figure 9. It is located at CP6 (776 cfs) shown on Figure 8. It is unclear how CP6A was derived to size lateral 12.
16. Provide velocity mitigation measures for all flow velocities above 35 fps per the hydraulic model and calculation using the manning's coefficient 0.013.
17. Provide a typical section of the RCB with 2" sacrificial concrete.
18. Provide transition structures when transitioning between box sizes.
19. The Facilities Map lists the Lake Mead System as a 5'x5' RCB then a 5'x7' RCB however per the plans the system in Lake Mead is a 5'x5' RCB then a 5'x6' RCB. Update the Facility Map accordingly.
20. Sheet PP18 the sacrificial concrete construction note is incomplete: BEGIN ADDITIONAL X" SACRIFICIAL X,XXX PSI CONCRETE FOR RCB INVERT. Update the note and place it above the profile in a very obvious location that stands out.
21. Sheet PP18 and Sheet PP33: Provide a storm drain manhole at the angle point of the 42"-RCP lateral. A collar is not acceptable.
22. Provide a typical section of the proposed RCB and its placement as you are intending to install the box in a non-traditional way. Additionally make sure all RCB labels are labeled as W' x H' (as intended in construction) to avoid confusion and better corresponding between hydraulic calculation and design plan set.
23. Provide grading plans and lateral profile for Facility stub/lateral 32 and the associated channel.
24. Provide updated grading plans of the detention basin for reference.
25. HY-8 analysis is best performed under a steady head water condition. Provide additional calculation and/or supporting documentation for the hydraulic performance under the high velocity flows combined at the storm drain system laterals and entrances. Additionally, provide mitigation measures to minimize sedimentation from entering the proposed storm drain system to avoid clogging the entrance and the proposed storm drain systems.
26. All offsite interim flood control facilities such as but not limited to berms/ditches and temporary sump are privately owned and to be privately maintained by the *Howard Hughes Company*. Provide a note as such on the grading plans.

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

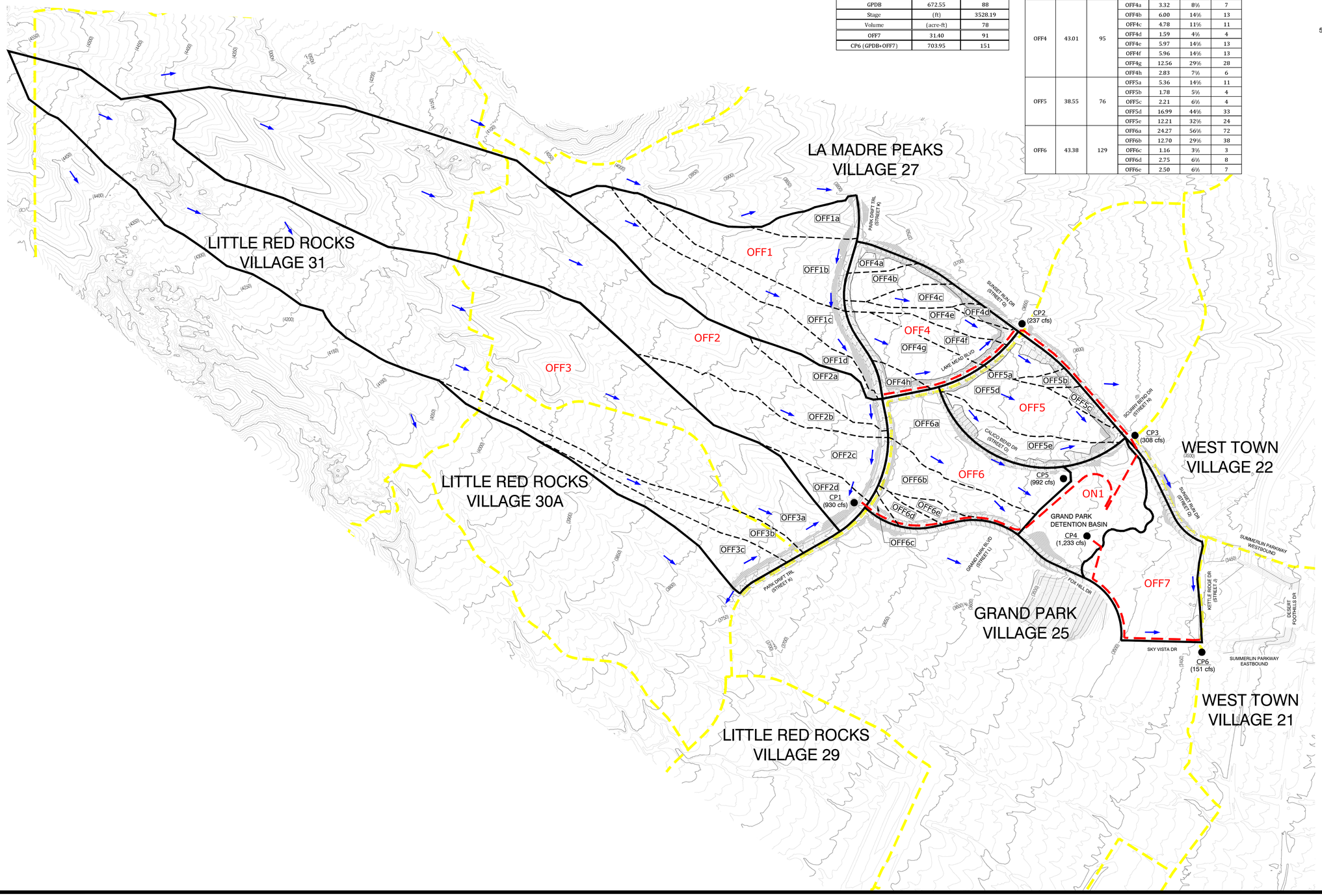
T/R/S: T20S/R59E/22
AREA K-22

APPENDIX A

FIGURES

INTERIM #2 CONDITION HEC-1 SUMMARY TABLE GRAND PARK DETENTION BASIN		
BASIN ID	AREA (ac)	Q100 (cfs)
OFF2	202.52	452
OFF3	242.36	499
CP1 (OFF2+OFF3)	444.88	930
OFF6	43.38	129
CP5 (CP1+OFF6)	488.26	992
OFF1	77.77	150
OFF4	43.01	95
CP2 (OFF1+OFF4)	120.78	237
OFF5	38.55	76
CP3 (CP2+OFF5)	159.33	308
ON1	24.96	85
CP4 (CP5+CP3+ON1)	672.55	1233
GPDB	672.55	88
Stage	(ft)	3528.19
Volume	(acre-ft)	78
OFF7	31.40	91
CP6 (GPDB+OFF7)	703.95	151

INTERIM #2 CONDITION - SUBBASIN FLOW SUMMARY GRAND PARK DETENTION BASIN						
BASIN ID	TOTAL AREA (ACRES)	Q_{100} (CFS)	SUBBASIN NAME	SUBBASIN AREA (ACRES)	AREA PERCENT OF TOTAL	SUBBASIN Q_{100} (CFS)
OFF1	77.77	150	OFF1a	7.06	9%	14
			OFF1b	21.72	28%	42
			OFF1c	18.7	24%	36
			OFF1d	30.29	39%	58
OFF2	202.52	452	OFF2a	10.21	5%	23
			OFF2b	159.75	79%	357
			OFF2c	25.36	13%	57
			OFF2d	7.2	4%	16
OFF3	242.36	499	OFF3a	215.43	89%	444
			OFF3b	15.22	6%	31
			OFF3c	11.71	5%	24
OFF4	43.01	95	OFF4a	3.32	8%	7
			OFF4b	6.00	14%	13
			OFF4c	4.78	11%	11
			OFF4d	1.59	4%	4
			OFF4e	5.97	14%	13
			OFF4f	5.96	14%	13
			OFF4g	12.56	29%	28
			OFF4h	2.83	7%	6
OFF5	38.55	76	OFF5a	5.36	14%	11
			OFF5b	1.78	5%	4
			OFF5c	2.21	6%	4
			OFF5d	16.99	44%	33
			OFF5e	12.21	32%	24
OFF6	43.38	129	OFF6a	24.27	56%	72
			OFF6b	12.70	29%	38
			OFF6c	1.16	3%	3
			OFF6d	2.75	6%	8
			OFF6e	2.50	6%	7



REVISION | BY | DATE | REV

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
10801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS NEVADA, 89135

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

FIGURE 7:
INTERIM #2 CONDITION BASIN MAP

GRAND PARK
DETENTION BASIN INLET PIPE

DRAWN BY: PLM
DESIGNED BY:
CHECKED BY:
PROJECT NO: 7809.GPDB
JANUARY 2020
SCALE: 1"=500'
HORIZ.
VERT.

SHEET
FIG 7
OF SHEETS
DRAWING NO.

H:\7809-GP Basin\Drainage\TDS\2_Outflow-Basin\3_ADD1\A_Figures\Figure 6-7 Interim #2 Basin Map.dwg

Legend

- ON1 — Basin Label
- CP — Concentration Point
- Flow Arrow
- Basin Boundary
- SWPA Boundary
- Existing Storm Drain Alignment per Basin and Outflow DS 5163
- Proposed Storm Drain Alignment
- Future Storm Drain Alignment
- Future Diversion
- Village Boundary

NORTH

GRAPHIC SCALE

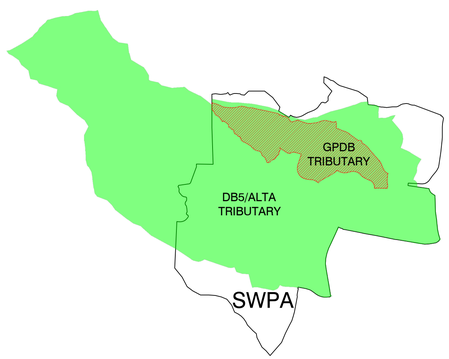
500 0 250 500 1000

1" = 500'

DEVELOPED/ULTIMATE CONDITION HEC-1 SUMMARY
GRAND PARK DETENTION BASIN

BASIN ID	AREA (ac)	Q100 (cfs)	BASIN ID	AREA (ac)	Q100 (cfs)
COS12	2.57	7	ST19	2.03	8
V31COS10	11.99	32	P	13.69	53
A	204.97	362	ST20	3.97	17
COS3	13.92	45	ST12	4.63	20
ST2A	0.23	1	E	28.50	110
ST1	4.42	19	F	28.69	110
V31COS14	6.1	20	COS4	45.82	132
COS2	14.22	42	ST7	4.89	20
DC1	5.28	21	ST6	3.19	14
ST2B	0.32	1	ST8	2.68	12
V27COS14	2.8	9	ST21	2.31	10
COS11	8.36	27	CP1A	44.86	131
ST2	1.9	9	CP1B	24.57	77
ST3	1.05	5	ST9	2.96	13
M	77.48	164	CP1C	28.88	90
COS8	3.25	7	ST10	2.20	10
COS9	2.89	10	ST11	3.34	15
V27COS10	14.78	47	DVCP4 - to CP9	n/a	553
ST4	1.7	8	DVCP4 - to CP5	n/a	575
COS6	7.65	25	CP1 (COS12, V31COS10, A, COS3, ST2A, ST1)	-	449
COS5	7.21	22	CP1A (COS2, DC1, ST2B, V27COS14)	-	75
COS7	9.94	29	CP2 (CP1, V31COS14, CP1A, COS11, ST2, ST3)	-	559
L	93.61	280	CP3 (CP2, M, COS8, COS9, V27COS10, ST4)	-	763
ST5	6.89	28	CP4 (CP3, COS6, COS5, COS7, L ,ST5, ST14)	-	1128
ST14	5	21	CP5 (CP4, K, ST17)	-	602
K	11.99	45	CP6A (I, ST16, ST13, G, N)	-	148
ST17	1.24	6	CP6 (CP5, H, ST18, CP6A)	-	756
I	11.97	37	CP7 (CP6, O, ST19)	-	831
H	10.39	37	CP8 (CP7, P, ST20, ST12)	-	879
ST16	0.76	4	CP9 (E, F, COS4, ST7, ST6, DVCP4)	-	928
ST13	4.59	20	CP10 (CP9, ST8, ST21, CP1A)	-	1066
ST18	6.22	28	CP11 (GPDB, ST9, CP1C, ST10)	-	181
G	19.51	76	GPDBIN (CP8, CP10, CP1B)	-	1916
N	2.9	12	GPDB (GPDBIN)	-	94
O	23.76	85			

	Unit	Interim	Developed/Ultimate		
		100-Year	10-Year	25-Year	100-Year
Inflow (GPDBIN)	(cfs)	1233	520	781	1916
Outflow (GPDB)	(cfs)	88	70	78	94
Stage	(ft)	3528.19	3520.32	3523.36	3530.93
Volume	(acre-ft)	78	22	36	108



THE HOWARD HUGHES CORPORATION
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REV	DATE	BY	REVISION

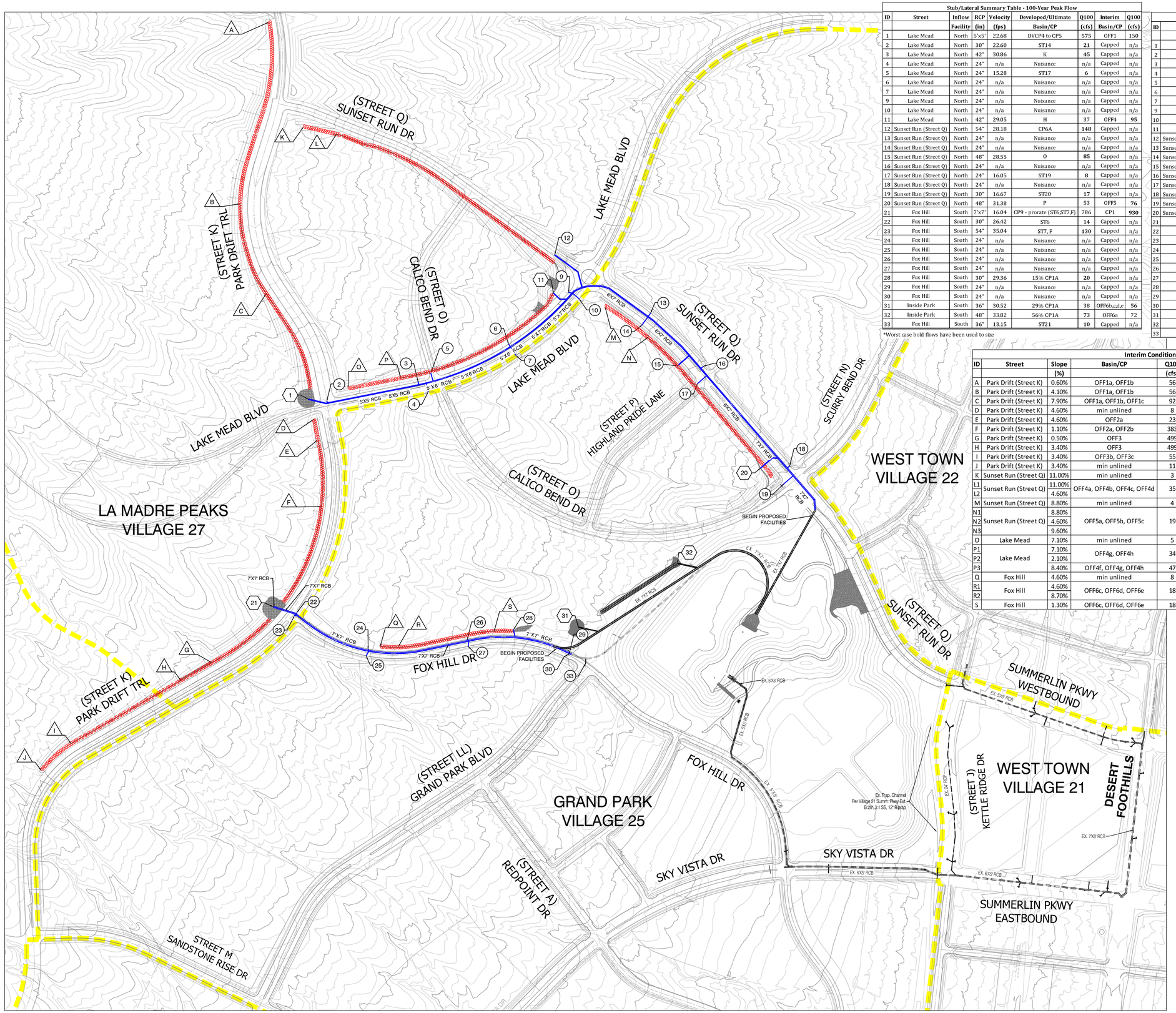
FIGURE 8:
DEVELOPED/ULTIMATE CONDITION BASIN MAP

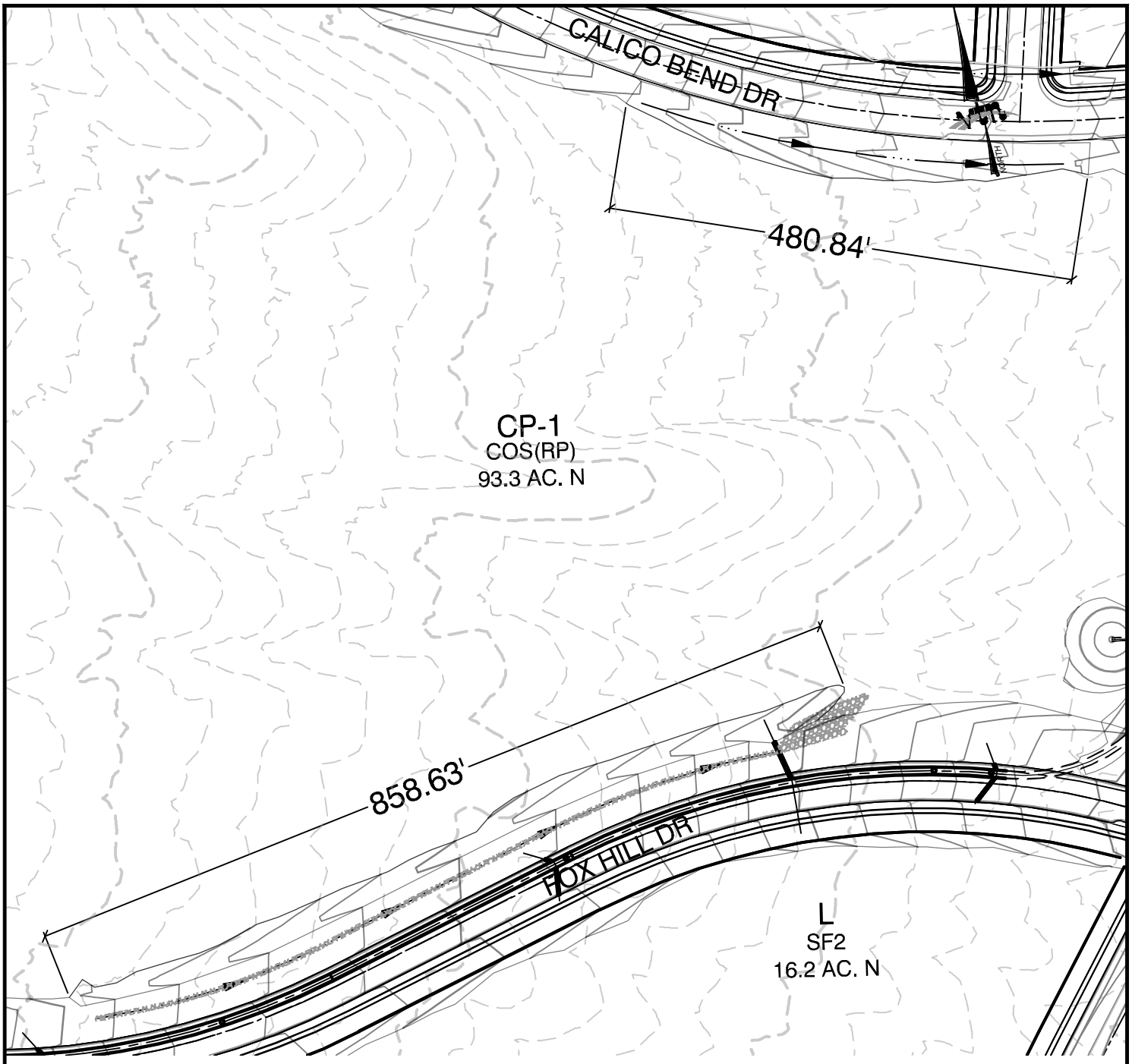
GRAND PARK
DETENTION BASIN INLET PIPE

DRAWN BY: PLM
DESIGNED BY:
CHECKED BY:
PROJECT NO: 7809.GPDB
SCALE: 1"=500' HORIZ. N/A VERT.
JANUARY 2020

SHEET
FIG. 8
OF SHEETS
DRAWING NO.

H:\7809.GP Basin\Drainage\TDS\2_Outflow-Basins\3_ADD1\A_Figures\Figure 10-8 Developed Basin Map.dwg


(STREET Q)
SUNSET RUN DR
LAKE MEAD BLVD
(STREET K)
PARK DRIFT TRL
(STREET O)
CALICO BEND DR
LAKE MEAD BLVD
(STREET Q)
SUNSET RUN DR
(STREET N)
SCURRY BEND DR
(STREET P)
HIGHLAND PRIDE LANE
LAKE MEAD BLVD
(STREET O)
CALICO BEND DR
LA MADRE PEAKS
VILLAGE 27
WEST TOWN
VILLAGE 22
BEGIN PROPOSED
FACILITIES
5'X5' RCB
5'X5' RCB
5'X6' RCB
5'X6' RCB
5'X7'RCB
5'X7'RCB
6'X7' RCB
6'X7' RCB
7'X7' RCB
7'X7' RCB
7'X7' RCB
7'X7' RCB
7'X7' RCB
7'X7' RCB
EX. 7'X7' RCB
EX. 7'X7' RCB
EX. 7'X7' RCB
7'X7' RCB
BEGIN PROPOSED
FACILITIES
FOX HILL DR
(STREET K)
PARK DRIFT TRL
(STREET LL)
GRAND PARK BLVD
GRAND PARK
VILLAGE 25
FOX HILL DR
(STREET A)
REDPOINT DR
SKY VISTA DR
SKY VISTA DR
STREET M
SANDSTONE RISE DR
EX. 5'X7' RCB
EX. 5'X5' RCB
EX. 5'X8' RCB
EX. 6'X8' RCB
EX. 6'X8' RCB
Ex. Trap. Channel
Per Village 21 Summ. Pkwy Ext.
B.20', 3:1 SS, 12" Riprap
EX. 7'X8' RCB
(STREET J)
KETTLE RIDGE DR
WEST TOWN
VILLAGE 21
DESERT
FOOTHILLS
SUMMERLIN PKWY
WESTBOUND
SUMMERLIN PKWY
EASTBOUND
EX. 5'X5' RCB
EX. 5'X7' RCB
EX. 7'X7' RCB
EX. 7'X7' RCB
EX. 7



GRAND PARK DETENTION BASIN QUANTITIES TOTALS			
Item	Quantity (CY)	Unit Cost	Cost
Riprap (D50=8")	3212	$94.49	$303,501.88
Rip Rap (D50=12")	206	$112.20	$23,113.20
Excavation & Embankment	156346	$14.19	$2,218,549.74
Total Cost:			$2,545,164.82
LF of Channel:			10485.61
Cost/LF:			$242.73

ESTIMATED CHANNEL MAINTENANCE BOND FEE			
PARCEL	REPAIR/MAINTENANCE FEE	LENGTH	COST ($)
	$/LF	LF	M & R ESTIMATE
V25 CP-1	$242.73	1339.47	$ 325,128.62
		50% OF TOTAL COST	$ 162,564.31
		PARCEL BOND TOTAL	$ 162,564.31

DS#7809

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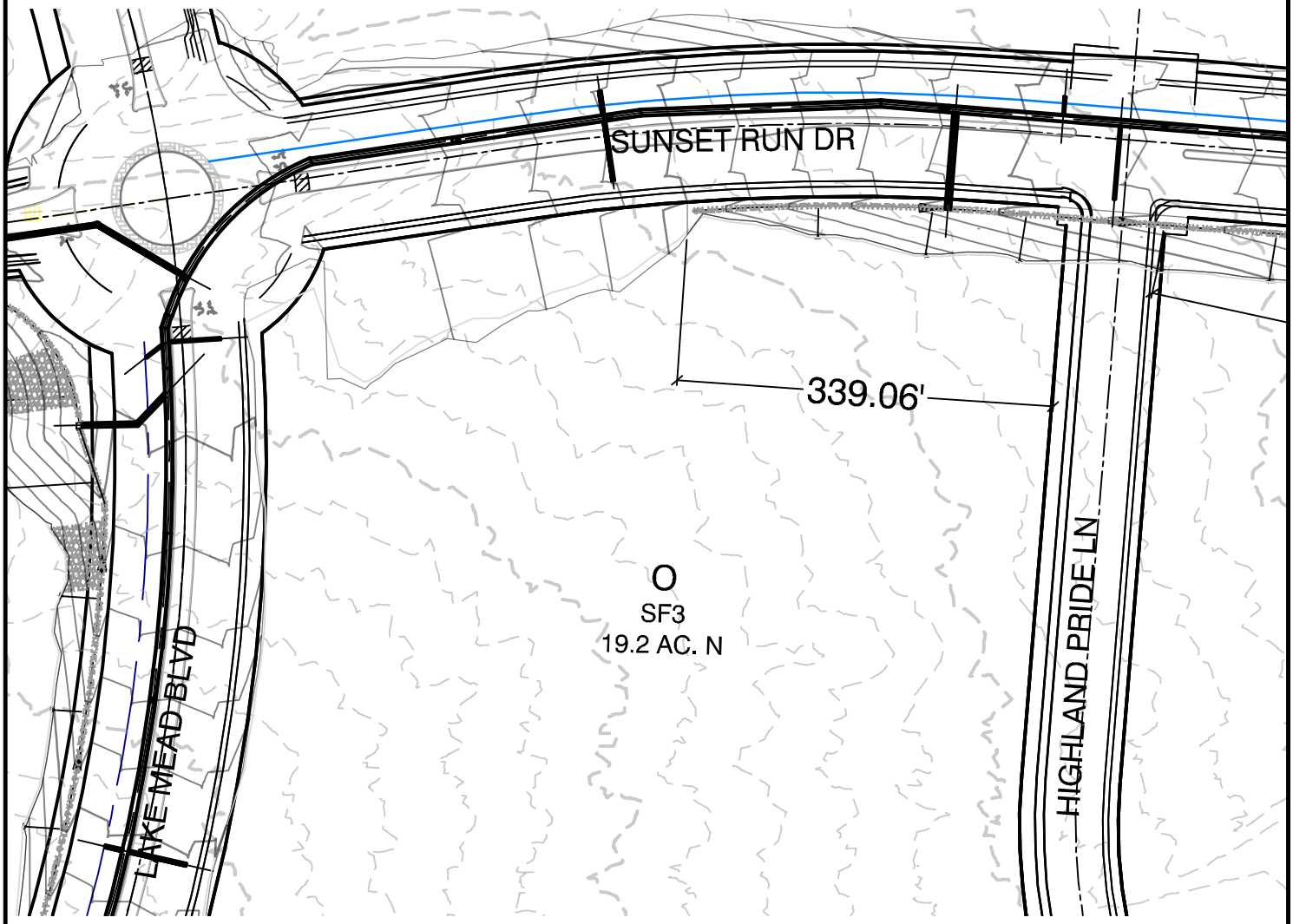
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

INTERIM DRAINAGE IMPROVEMENTS FOR SUMMERLIN WEST
GRAND PARK DETENTION BASIN INLET PIPE

MAINTENANCE BOND EXHIBIT
V25 PARCEL CP-1

SCALE	HORZ.	1"=150'
	VERT.	N/A
W.O. NO.		7809
DRAWN BY:		ACY
DATE:		02/06/2020
SHEET	1	OF 1



GRAND PARK DETENTION BASIN QUANTITIES TOTALS			
Item	Quantity (CY)	Unit Cost	Cost
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Rip Rap (D50=12")	206	$112.20	$23,113.20
Excavation & Embankment	156346	$14.19	$2,218,549.74
Total Cost:			$2,545,164.82
LF of Channel:			10485.61
Cost/LF:			$242.73
Total Cost:			$222,592.92
LF of Channel:			651.67
Cost/LF:			$341.57

ESTIMATED CHANNEL MAINTENANCE BOND FEE			
PARCEL	**REPAIR/MAINTENANCE FEE**	**LENGTH**	**COST ($)**
	$/LF	**LF**	**M & R ESTIMATE**
V25 O	$242.73	339.06	$ 82,299.80
		50% OF TOTAL COST	$ 41,149.90
		PARCEL BOND TOTAL	$ 50,000.00

*Minimum bond is $50,000

DS#7809

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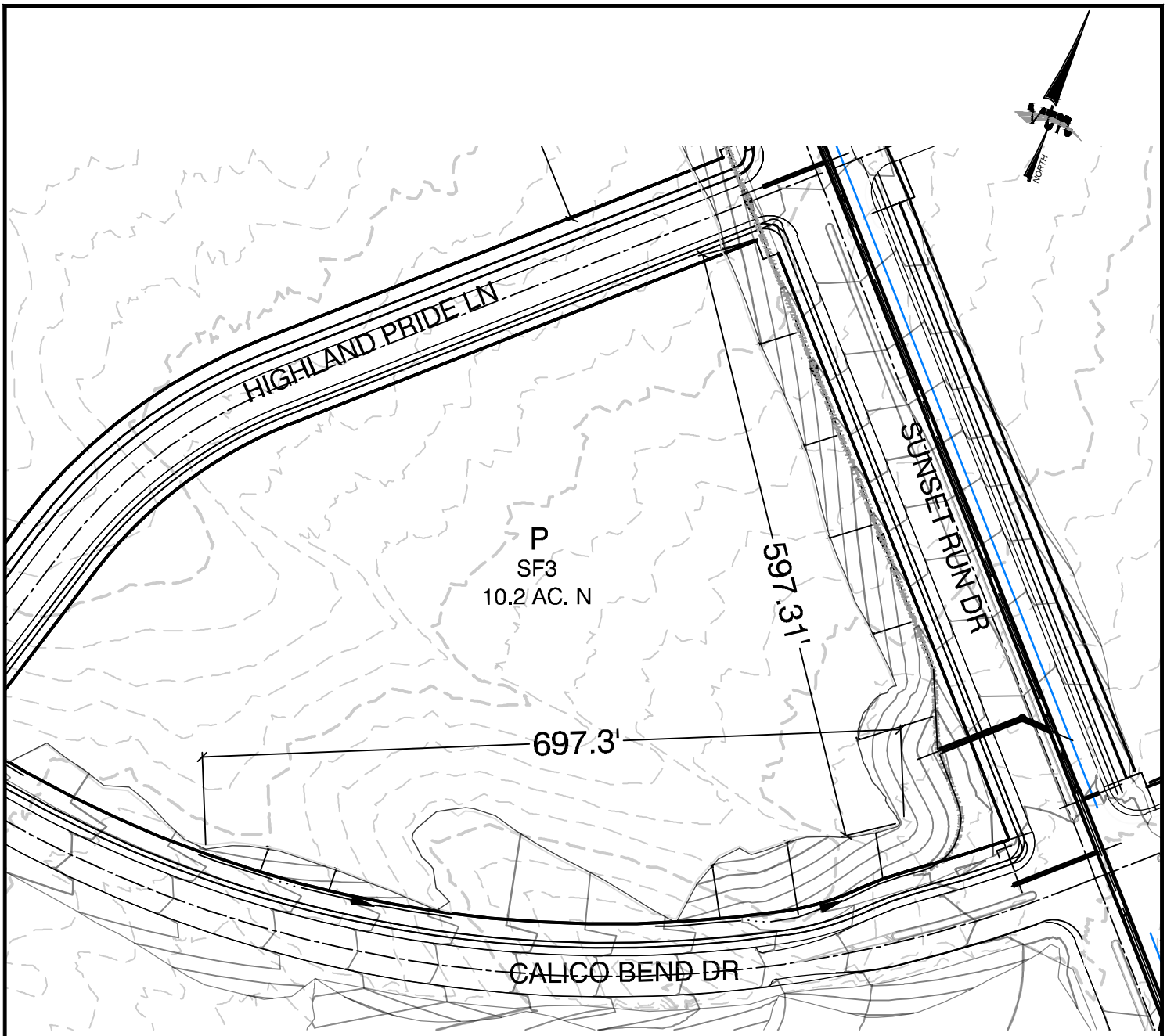
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

INTERIM DRAINAGE IMPROVEMENTS FOR SUMMERLIN WEST
GRAND PARK DETENTION BASIN INLET PIPE

MAINTENANCE BOND EXHIBIT
V25 PARCEL O

SCALE	HORZ.	1"=150'
	VERT.	N/A
W.O. NO.		7809
DRAWN BY:		ACY
DATE:		02/06/2020
SHEET	1	OF 1



GRAND PARK DETENTION BASIN QUANTITIES TOTALS			
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Rip Rap (D50=12")	206	$112.20	$23,113.20
Excavation & Embankment	156346	$14.19	$2,218,549.74
	Total Cost:		$2,545,164.82
	LF of Channel:		10485.61
	Cost/LF:		$242.73

ESTIMATED CHANNEL MAINTENANCE BOND FEE			
PARCEL	REPAIR/MAINTENANCE FEE	LENGTH	COST ($)
	$/LF	LF	M & R ESTIMATE
V25 P	$242.73	1294.61	$ 314,239.78
		50% OF TOTAL COST	$ 157,119.89
		PARCEL BOND TOTAL	$ 157,119.89

DS#7809

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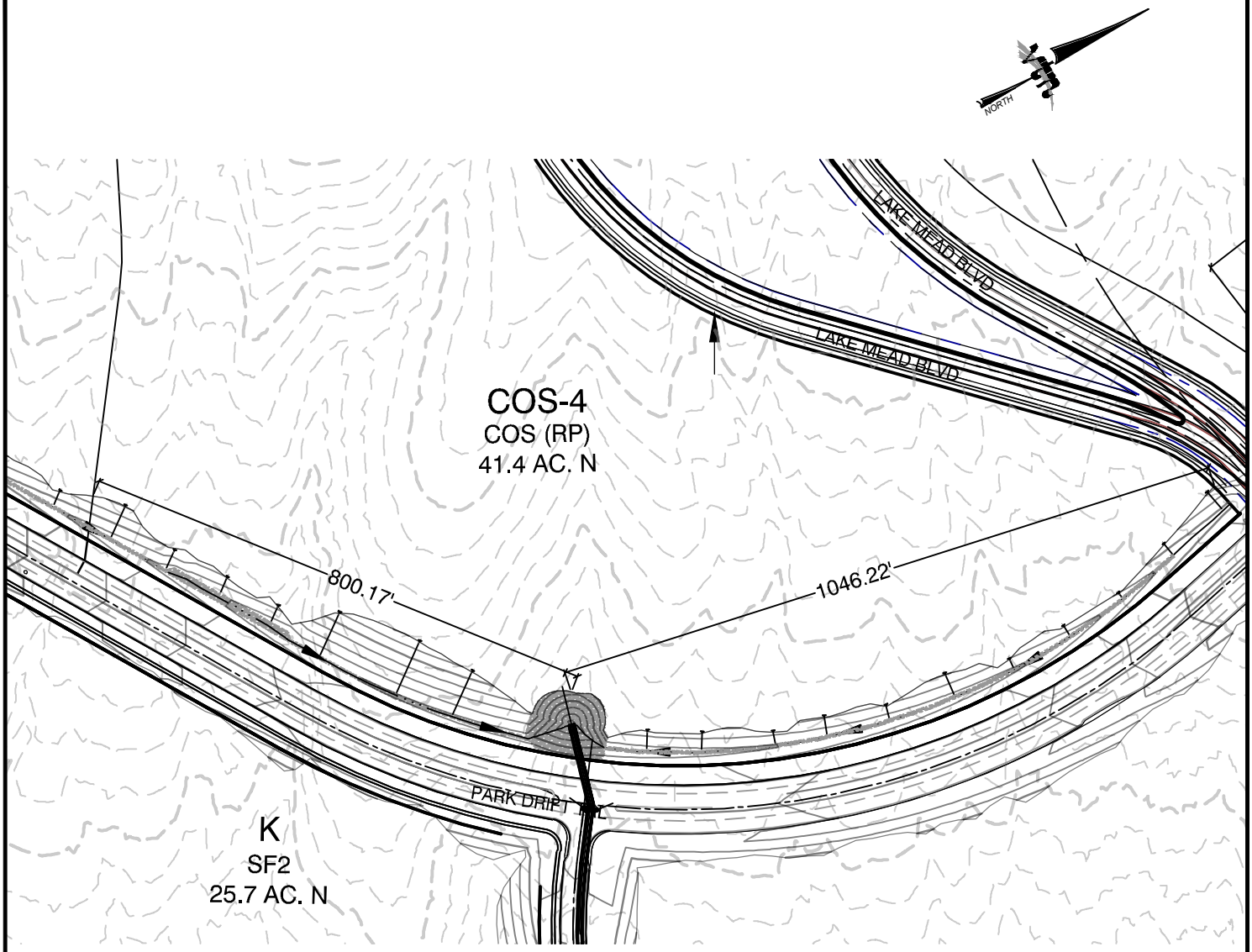
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

INTERIM DRAINAGE IMPROVEMENTS FOR SUMMERLIN WEST
GRAND PARK DETENTION BASIN INLET PIPE

MAINTENANCE BOND EXHIBIT
V25 PARCEL P

SCALE	HORZ. 1"=150'
	VERT. N/A
W.O. NO.	7809
DRAWN BY:	ACY
DATE:	02/06/2020
SHEET	1 OF 1



GRAND PARK DETENTION BASIN QUANTITIES TOTALS			
Item	Quantity (CY)	Unit Cost	Cost
Riprap (D50=8")	3212	$94.49	$303,501.88
Rip Rap (D50=12")	206	$112.20	$23,113.20
Excavation & Embankment	156346	$14.19	$2,218,549.74
	Total Cost:		$2,545,164.82
	LF of Channel:		10485.61
	Cost/LF:		$242.73

ESTIMATED CHANNEL MAINTENANCE BOND FEE				
PARCEL	REPAIR/MAINTENANCE FEE	LENGTH	COST ($)	
	$/LF	LF	M & R ESTIMATE	
V27 COS-4	$242.73	1846.39	$	448,172.96
		50% OF TOTAL COST	$	224,086.48
		PARCEL BOND TOTAL	$	224,086.48

DS#7809

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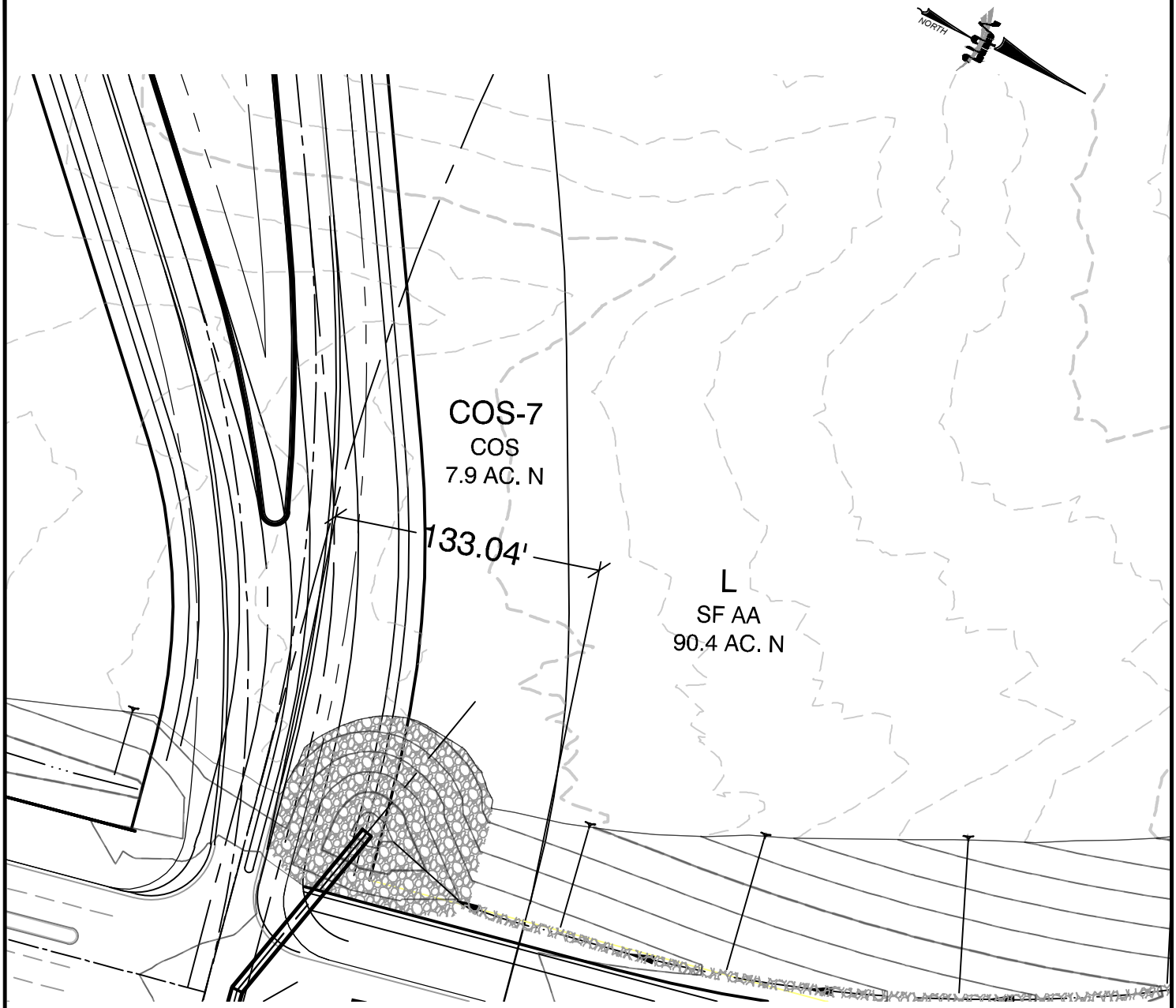
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

INTERIM DRAINAGE IMPROVEMENTS FOR SUMMERLIN WEST
GRAND PARK DETENTION BASIN INLET PIPE

MAINTENANCE BOND EXHIBIT
V27 PARCEL COS-4

SCALE	HORZ.	1"=250'
	VERT.	N/A
W.O. NO.		7809
DRAWN BY:		ACY
DATE:		02/06/2020
SHEET	1	OF 1



GRAND PARK DETENTION BASIN QUANTITIES TOTALS			
Item	Quantity (CY)	Unit Cost	Cost
Riprap (D50=8")	3212	$94.49	$303,501.88
Rip Rap (D50=12")	206	$112.20	$23,113.20
Excavation & Embankment	156346	$14.19	$2,218,549.74
Total Cost:			$2,545,164.82
LF of Channel:			10485.61
Cost/LF:			$242.73

ESTIMATED CHANNEL MAINTENANCE BOND FEE			
PARCEL	**REPAIR/MAINTENANCE FEE**	**LENGTH**	**COST ($)**
	$/LF	**LF**	**M & R ESTIMATE**
V27 COS-7	$242.73	133.04	$ 32,292.71
		50% OF TOTAL COST	$ 16,146.35
		PARCEL BOND TOTAL	$ 50,000.00

*Minimum bond is $50,000

DS#7809

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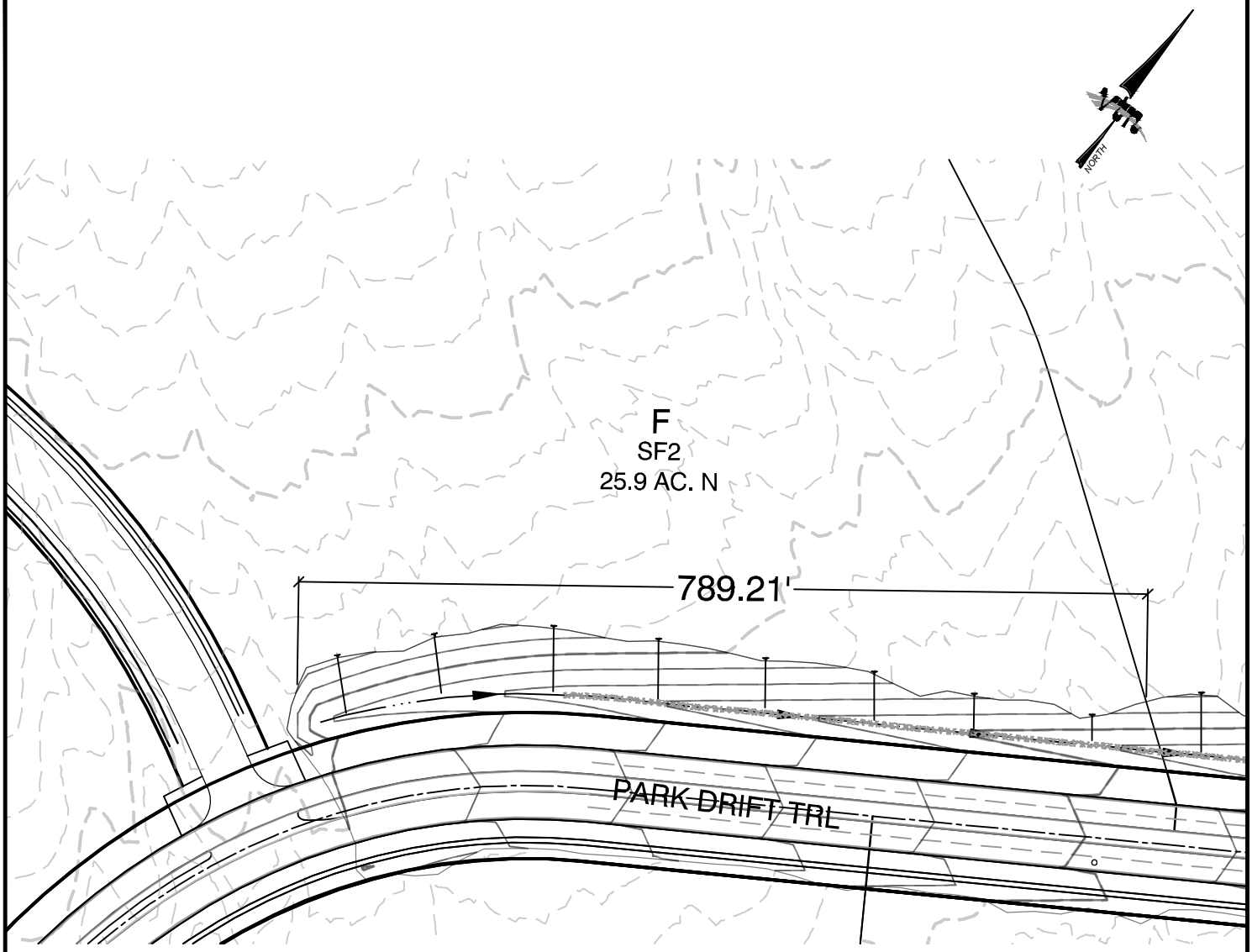
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

INTERIM DRAINAGE IMPROVEMENTS FOR SUMMERLIN WEST
GRAND PARK DETENTION BASIN INLET PIPE

MAINTENANCE BOND EXHIBIT
V27 PARCEL COS-7

SCALE	HORZ.	1"=250'
	VERT.	N/A
W.O. NO.		7809
DRAWN BY:		ACY
DATE:		02/06/2020
SHEET	1	OF 1



GRAND PARK DETENTION BASIN QUANTITIES TOTALS			
Item	Quantity (CY)	Unit Cost	Cost
Riprap (D50=8")	3212	$94.49	$303,501.88
Rip Rap (D50=12")	206	$112.20	$23,113.20
Excavation & Embankment	156346	$14.19	$2,218,549.74
Total Cost:			$2,545,164.82
LF of Channel:			10485.61
Cost/LF:			$242.73

ESTIMATED CHANNEL MAINTENANCE BOND FEE			
PARCEL	REPAIR/MAINTENANCE FEE	LENGTH	COST ($)
	$/LF	LF	M & R ESTIMATE
V27 F	$242.73	789.21	$ 191,564.39
		50% OF TOTAL COST	$ 95,782.20
		PARCEL BOND TOTAL	$ 95,782.20

DS#7809

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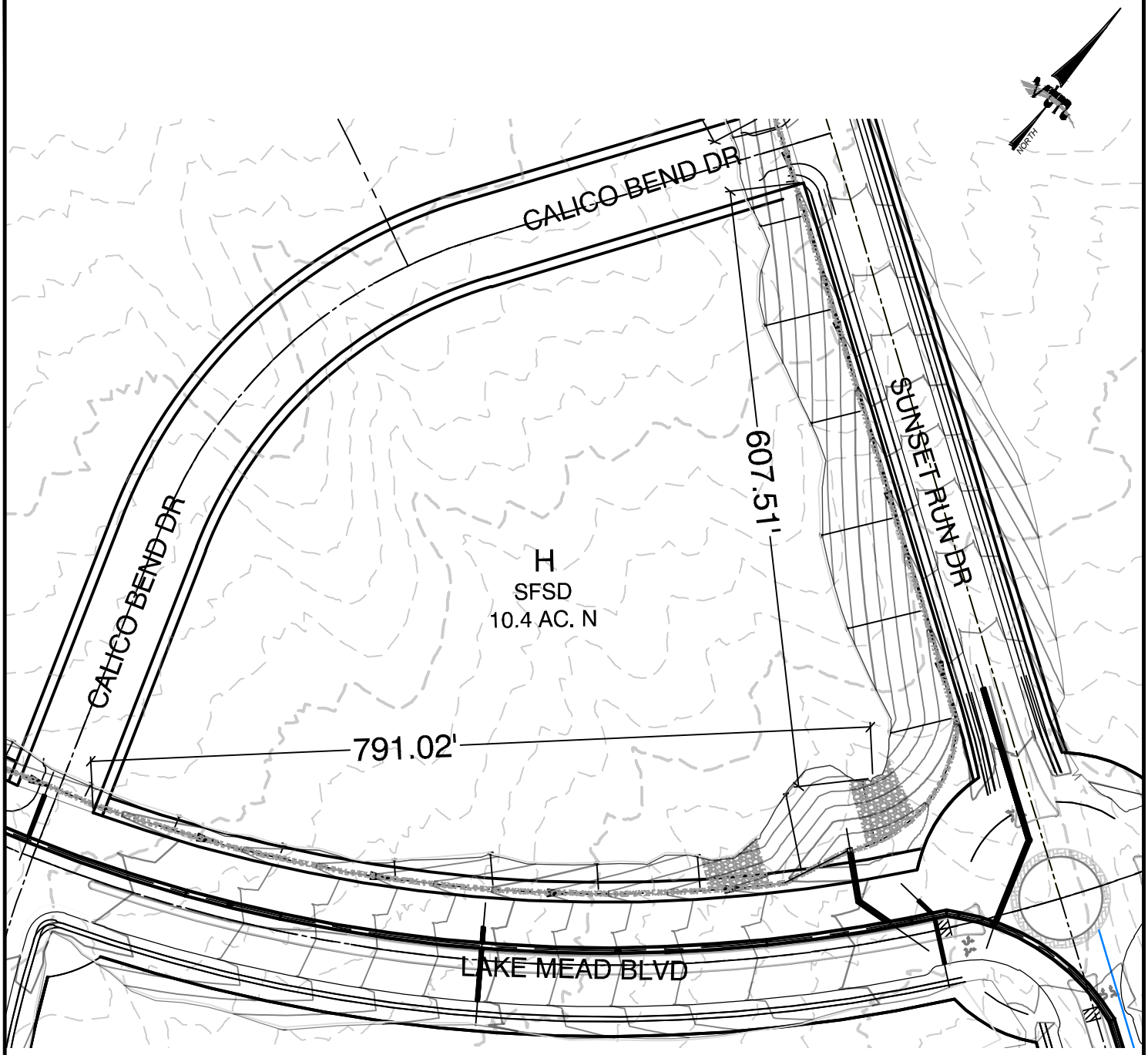
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

INTERIM DRAINAGE IMPROVEMENTS FOR SUMMERLIN WEST
GRAND PARK DETENTION BASIN INLET PIPE

MAINTENANCE BOND EXHIBIT
V27 PARCEL F

SCALE	HORZ.	1"=250'
	VERT.	N/A
W.O. NO.		7809
DRAWN BY:		ACY
DATE:		02/06/2020
SHEET	1	OF 1



GRAND PARK DETENTION BASIN QUANTITIES TOTALS			
Item	Quantity (CY)	Unit Cost	Cost
Riprap (D50=8")	3212	$94.49	$303,501.88
Rip Rap (D50=12")	206	$112.20	$23,113.20
Excavation & Embankment	156346	$14.19	$2,218,549.74
Total Cost:			$2,545,164.82
LF of Channel:			10485.61
Cost/LF:			$242.73

ESTIMATED CHANNEL MAINTENANCE BOND FEE			
PARCEL	REPAIR/MAINTENANCE FEE	LENGTH	COST ($)
	$/LF	LF	M & R ESTIMATE
V27 H	$242.73	1398.53	$ 339,464.21
		50% OF TOTAL COST	$ 169,732.11
		PARCEL BOND TOTAL	$ 169,732.11

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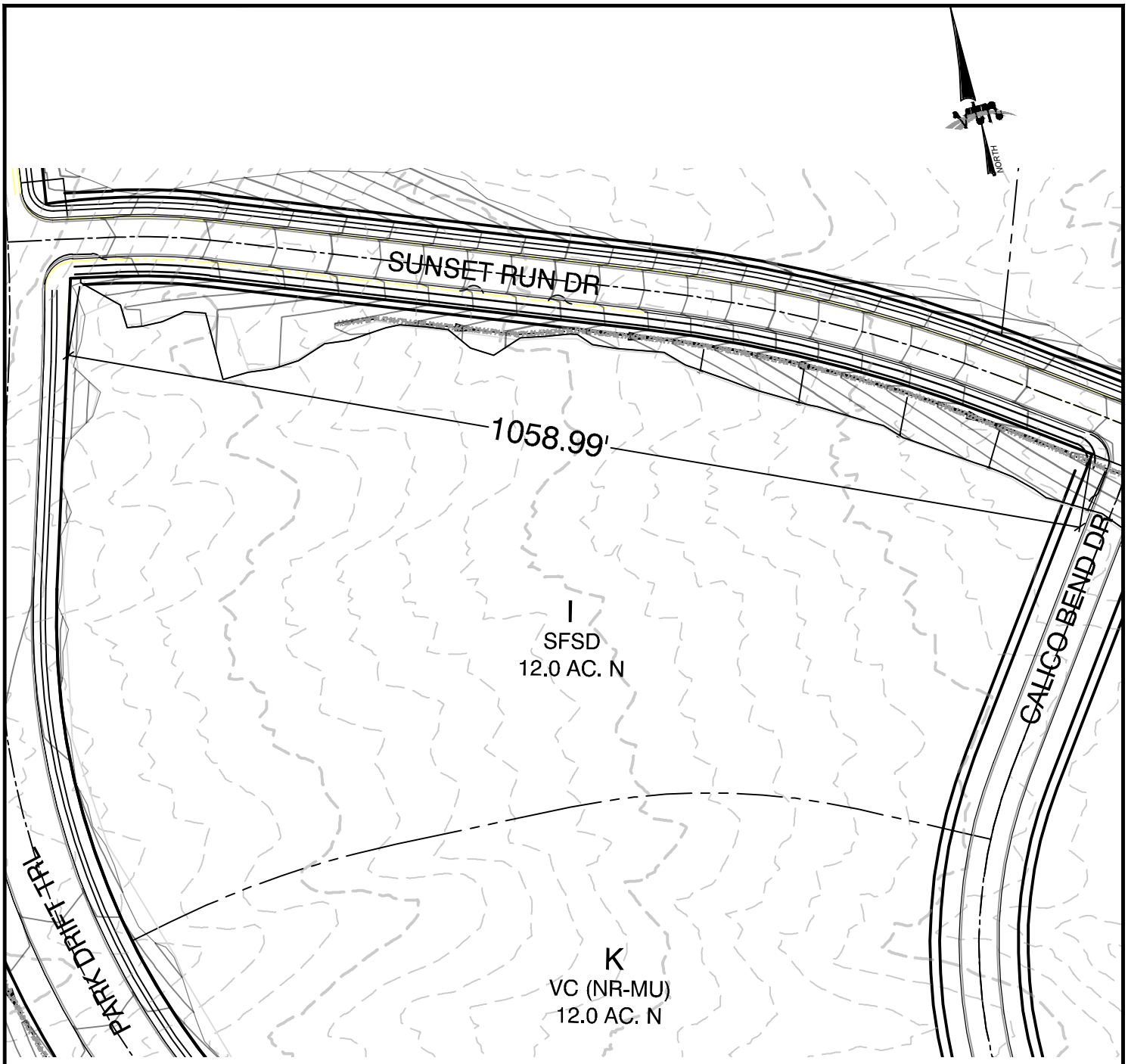
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

INTERIM DRAINAGE IMPROVEMENTS FOR SUMMERLIN WEST
GRAND PARK DETENTION BASIN INLET PIPE

MAINTENANCE BOND EXHIBIT
V27 PARCEL H

SCALE	HORZ.	1"=150'
	VERT.	N/A
W.O. NO.		7809
DRAWN BY:		ACY
DATE:		02/06/2020
SHEET	1	OF 1



GRAND PARK DETENTION BASIN QUANTITIES TOTALS			
Item	Quantity (CY)	Unit Cost	Cost
Riprap (D50=8")	3212	$94.49	$303,501.88
Rip Rap (D50=12")	206	$112.20	$23,113.20
Excavation & Embankment	156346	$14.19	$2,218,549.74
Total Cost:			$2,545,164.82
LF of Channel:			10485.61
Cost/LF:			$242.73

ESTIMATED CHANNEL MAINTENANCE BOND FEE			
PARCEL	REPAIR/MAINTENANCE FEE	LENGTH	COST ($)
	$/LF	LF	M & R ESTIMATE
V27 I	$242.73	1058.99	$ 257,047.91
		50% OF TOTAL COST	$ 128,523.95
		PARCEL BOND TOTAL	$ 128,523.95

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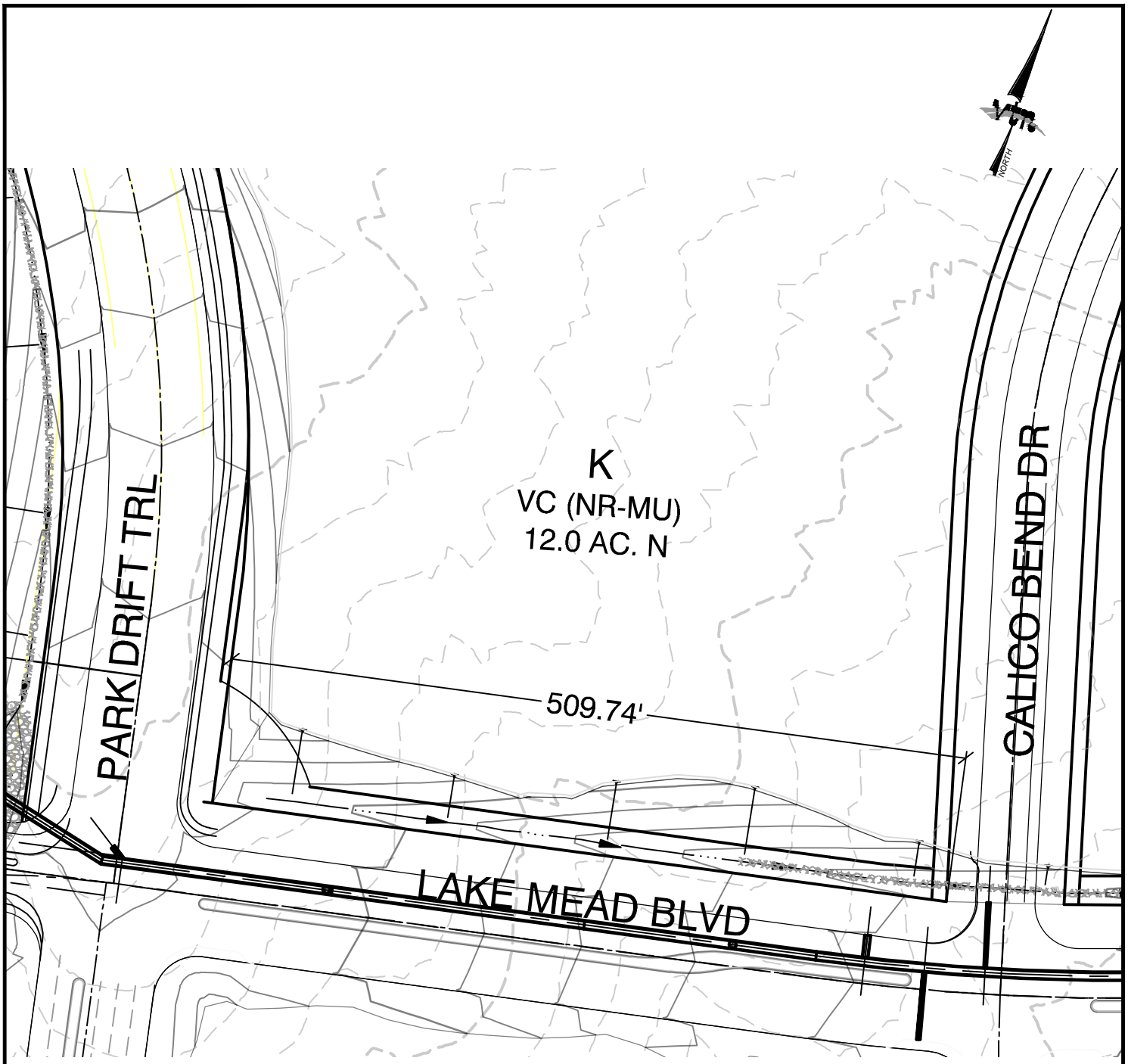
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

INTERIM DRAINAGE IMPROVEMENTS FOR SUMMERLIN WEST
GRAND PARK DETENTION BASIN INLET PIPE

MAINTENANCE BOND EXHIBIT
V27 PARCEL I

SCALE	HORZ.	1"=150'
	VERT.	N/A
W.O. NO.		7809
DRAWN BY:		ACY
DATE:		02/06/2020
SHEET	1	OF 1



GRAND PARK DETENTION BASIN QUANTITIES TOTALS			
Item	Quantity (CY)	Unit Cost	Cost
Riprap (D50=8")	3212	$94.49	$303,501.88
Rip Rap (D50=12")	206	$112.20	$23,113.20
Excavation & Embankment	156346	$14.19	$2,218,549.74
Total Cost:			$2,545,164.82
LF of Channel:			10485.61
Cost/LF:			$242.73

ESTIMATED CHANNEL MAINTENANCE BOND FEE			
PARCEL	REPAIR/MAINTENANCE FEE	LENGTH	COST ($)
	$/LF	LF	M & R ESTIMATE
V27 K	$242.73	509.74	$ 123,728.84
		50% OF TOTAL COST	$ 61,864.42
		PARCEL BOND TOTAL	$ 61,864.42

DS#7809

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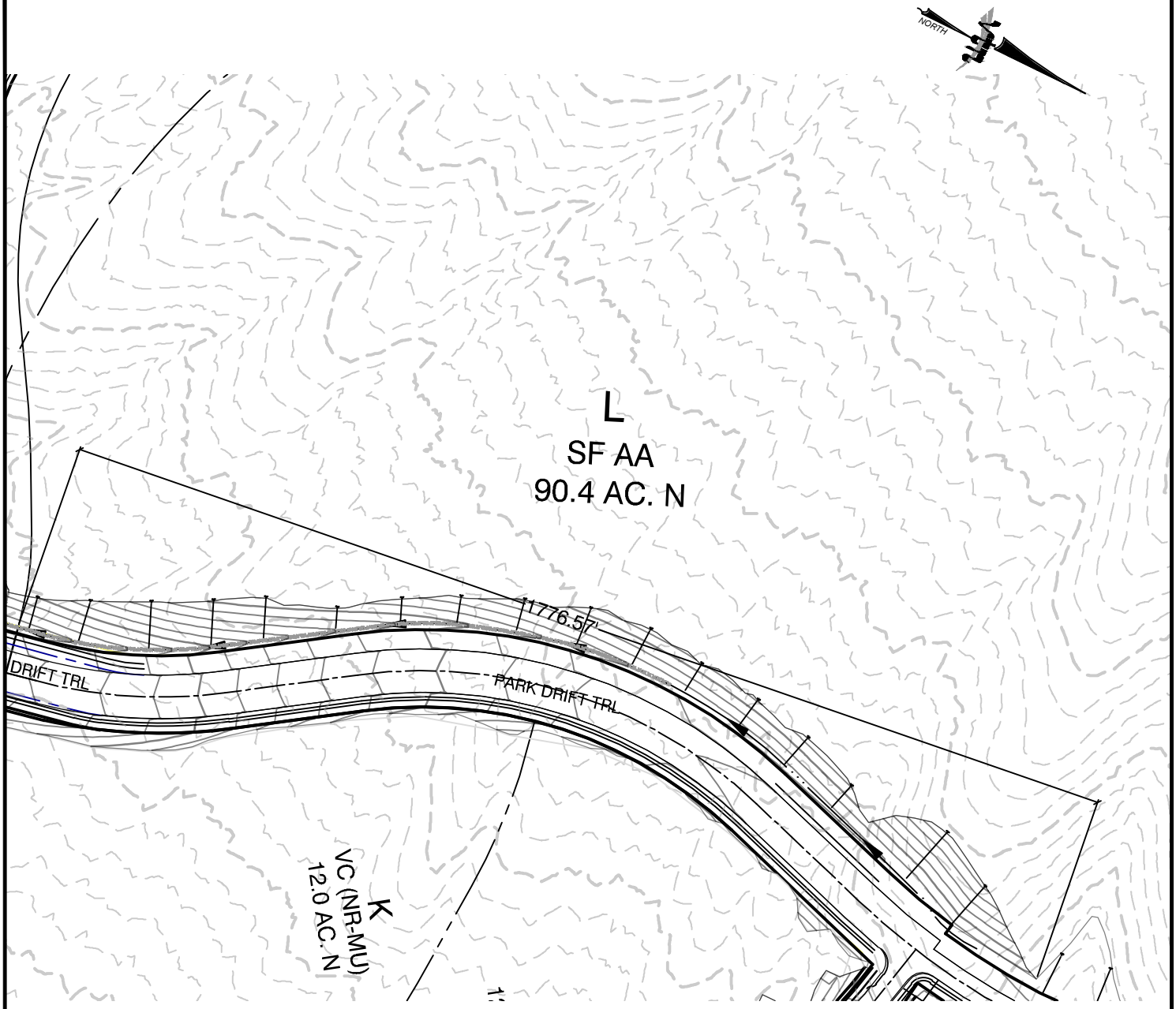
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

INTERIM DRAINAGE IMPROVEMENTS FOR SUMMERLIN WEST
GRAND PARK DETENTION BASIN INLET PIPE

MAINTENANCE BOND EXHIBIT
V27 PARCEL K

SCALE	HORZ.	1"=100'
	VERT.	N/A
W.O. NO.		7809
DRAWN BY:		ACY
DATE:		02/06/2020
SHEET	1	OF 1



GRAND PARK DETENTION BASIN QUANTITIES TOTALS			
Item	Quantity (CY)	Unit Cost	Cost
Riprap (D50=8")	3212	$94.49	$303,501.88
Rip Rap (D50=12")	206	$112.20	$23,113.20
Excavation & Embankment	156346	$14.19	$2,218,549.74
Total Cost:			$2,545,164.82
LF of Channel:			10485.61
Cost/LF:			$242.73

ESTIMATED CHANNEL MAINTENANCE BOND FEE			
PARCEL	REPAIR/MAINTENANCE FEE	LENGTH	COST ($)
	$/LF	LF	M & R ESTIMATE
V27 L	$242.73	1776.57	$ 431,225.60
		50% OF TOTAL COST	$ 215,612.80
		PARCEL BOND TOTAL	$ 215,612.80

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2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

INTERIM DRAINAGE IMPROVEMENTS FOR SUMMERLIN WEST
GRAND PARK DETENTION BASIN INLET PIPE

MAINTENANCE BOND EXHIBIT
V27 PARCEL L

SCALE	HORZ. 1"=250'
	VERT. N/A
W.O. NO.	7809
DRAWN BY:	ACY
DATE:	02/06/2020
SHEET	1 OF 1

APPENDIX B

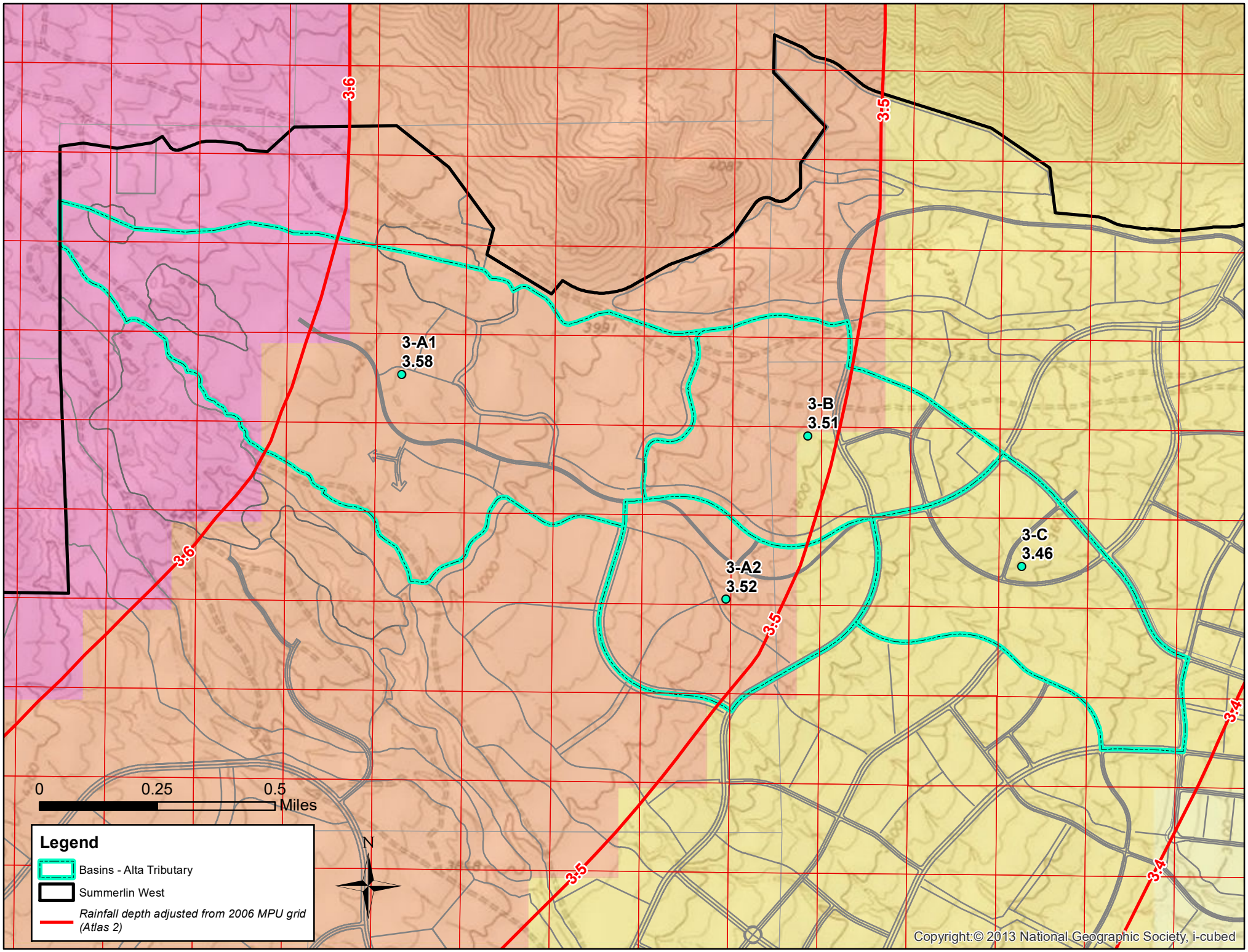
HYDROLOGIC CALCULATIONS

B.1

DEVELOPED/ULTIMATE CONDITION

B.1.1

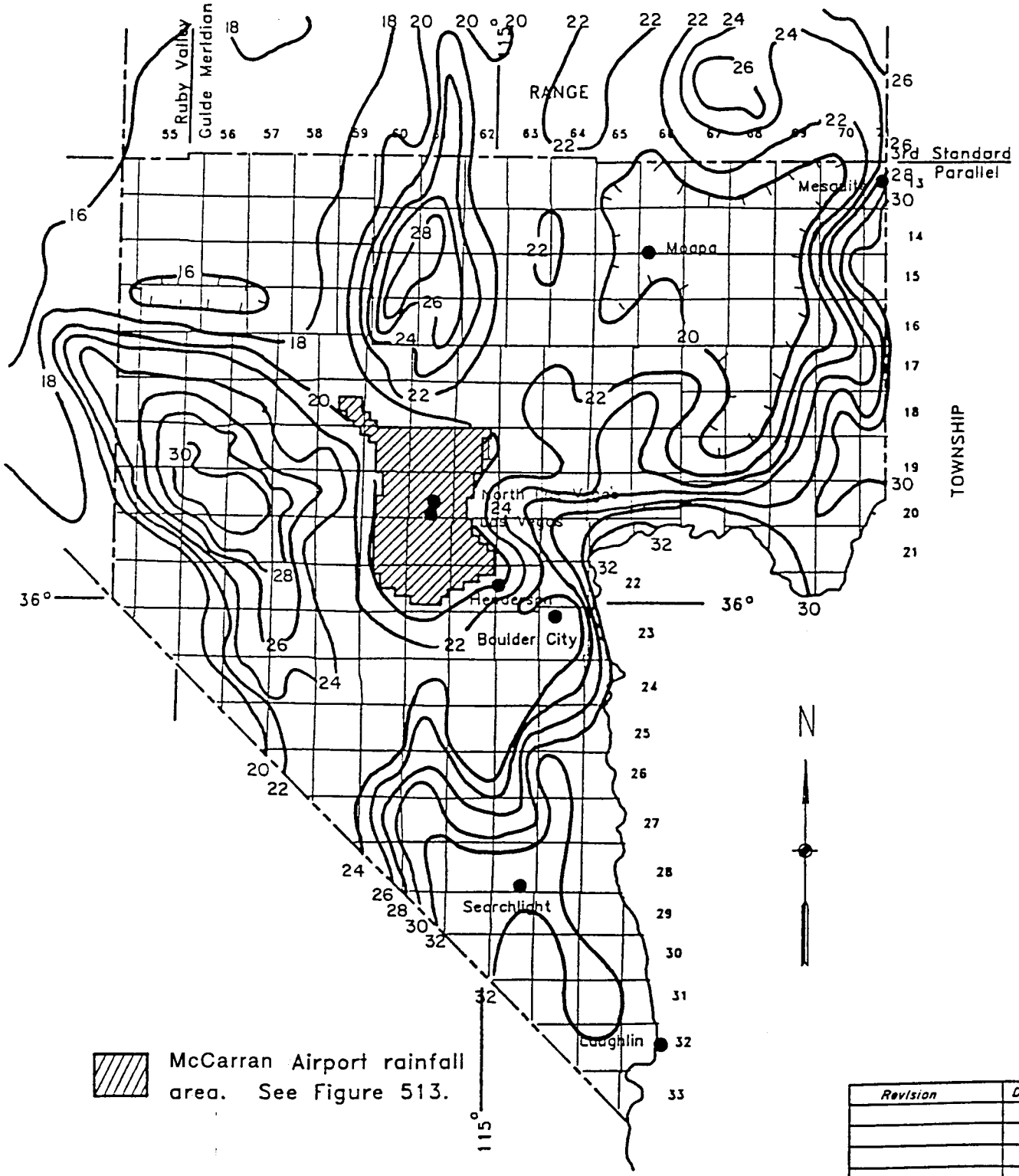
Precipitation Maps



H:\7809\GIS\Rainfall\Alta Tributary\Alta 3A3B3C Tributary-2006MPU-Precipitation.mxd Date: 8/6/2019

RAINFALL DEPTH-DURATION-FREQUENCY 100-YEAR, 6-HOUR

(DEPTHS IN TENTHS OF INCHES)



Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 506

B.1.2

Soil and Curve Number Calculation

CURVE NUMBERS FOR SOILS - W.O. #7809

Soil # 112 Arizo very gravelly loamy sand, flooded, 0 to 4 percent slopes												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (Townhouse)	Residential$_{6}$ (7,000 Ft^2)	Residential$_{7}$ (10,000 Ft^2)	Residential$_{8}$ (20,000 Ft^2)	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Arizo	100%	A	63	98	81	80	76	61	54	68	89	81
Total	**100%**		**63**	**98**	**81**	**80**	**76**	**61**	**54**	**68**	**89**	**81**

Soil # 152 Cave gravelly fine sandy loam, 0 to 4 percent slopes												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (Townhouse)	Residential$_{6}$ (7,000 Ft^2)	Residential$_{7}$ (10,000 Ft^2)	Residential$_{8}$ (20,000 Ft^2)	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Cave	100%	D	88	98	93	92	91	87	85	89	95	93
Total	**100%**		**88**	**98**	**93**	**92**	**91**	**87**	**85**	**89**	**95**	**93**

Soil # 155 Cave gravelly fine sandy loam, 4 to 15 percent slopes												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (Townhouse)	Residential$_{6}$ (7,000 Ft^2)	Residential$_{7}$ (10,000 Ft^2)	Residential$_{8}$ (20,000 Ft^2)	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Cave	100%	D	88	98	93	92	91	87	85	89	95	93
Total	**100%**		**88**	**98**	**93**	**92**	**91**	**87**	**85**	**89**	**95**	**93**

Soil # 156 Vace - Wechech association												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (Townhouse)	Residential$_{6}$ (7,000 Ft^2)	Residential$_{7}$ (10,000 Ft^2)	Residential$_{8}$ (20,000 Ft^2)	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Vace and Similar	45%	D	88	98	93	92	91	87	85	89	95	93
Wechech and Similar	25%	D	88	98	93	92	91	87	85	89	95	93
Wechech, steep, and similar	15%	D	88	98	93	92	91	87	85	89	95	93
Weiser	8%	B	77	98	88	87	84	75	70	79	92	88
Irongold	4%	D	88	98	93	92	91	87	85	89	95	93
Commski	2%	B	77	98	88	87	84	75	70	79	92	88
Threelakes	1%	A	63	98	81	80	76	61	54	68	89	81
Total	**100%**		**87**	**98**	**93**	**92**	**91**	**86**	**84**	**88**	**95**	**93**

Soil # 191 Dalian very cobbly fine sandy loam, 2 to 8 percent slopes												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (6,000 Ft^2 or Less)	Residential$_{6}$ (7,000 Ft^2)	Residential$_{7}$ (10,000 Ft^2)	Residential$_{8}$ (20,000 Ft^2)	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Dalian	100%	A	63	98	81	80	76	61	54	68	89	81
Total	**100%**		**63**	**98**	**81**	**80**	**76**	**61**	**54**	**68**	**89**	**81**

Soil # 294 Rock outcrop, sand stone												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (Townhouse)	Residential$_{6}$ (7,000 Ft^2)	Residential$_{7}$ (10,000 Ft^2)	Residential$_{8}$ (20,000 Ft^2)	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Rock outcrop	90%	D	88	98	93	92	91	87	85	89	95	93
Nupper	5%	D	88	98	93	92	91	87	85	89	95	93
Moentria	5%	D	88	98	93	92	91	87	85	89	95	93
Total	**100%**		**88**	**98**	**93**	**92**	**91**	**87**	**85**	**89**	**95**	**93**

Soil # 320 Boxspring - Zeheme - Rock outcrop association												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (Townhouse)	Residential$_{6}$ (7,000 Ft^2)	Residential$_{7}$ (10,000 Ft^2)	Residential$_{8}$ (20,000 Ft^2)	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Boxspring	50%	D	88	98	93	92	91	87	85	89	95	93
Zeheme	33%	D	88	98	93	92	91	87	85	89	95	93
Rock Outcrop	15%	D	88	98	93	92	91	87	85	89	95	93
Typic Haplocalcids	2%	B	77	98	88	87	84	75	70	79	92	88
Total	**100%**		**88**	**98**	**93**	**92**	**91**	**87**	**85**	**89**	**95**	**93**

Soil # 323 Boxspring - Scrapy - Rock Outcrop Association												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (Townhouse)	Residential$_{6}$ (7,000 Ft^2)	Residential$_{7}$ (10,000 Ft^2)	Residential$_{8}$ (20,000 Ft^2)	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Boxspring	40%	D	88	98	93	92	91	87	85	89	95	93
Scrapy	30%	D	88	98	93	92	91	87	85	89	95	93
Rock outcrop	15%	D	88	98	93	92	91	87	85	89	95	93
Lithic calciustolls	9%	D	88	98	93	92	91	87	85	89	95	93
Typic Haplustolls	6%	B	77	98	88	87	84	75	70	79	92	88
Total	**100%**		**88**	**98**	**93**	**92**	**91**	**87**	**85**	**89**	**95**	**93**

Soil # 351 Seralin extremeely gravelly loam, 30 to 75 percent slopes												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (Townhouse)	Residential$_{6}$ (7,000 Ft^{2})	Residential$_{7}$ (10,000 Ft^{2})	Residential$_{8}$ (20,000 Ft^{2})	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Seralin	85%	D	88	98	93	92	91	87	85	89	95	93
Potosi	7%	D	88	98	93	92	91	87	85	89	95	93
Lithic Torriorthents	4%	D	88	98	93	92	91	87	85	89	95	93
Rock Outcrop	4%	D	88	98	93	92	91	87	85	89	95	93
Total	**100%**		**88**	**98**	**93**	**92**	**91**	**87**	**85**	**89**	**95**	**93**

Soil # 360 Rock outcrop - St. Thomas Complex												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (Townhouse)	Residential$_{6}$ (7,000 Ft^{2})	Residential$_{7}$ (10,000 Ft^{2})	Residential$_{8}$ (20,000 Ft^{2})	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Rock outcrop	50%	D	88	98	93	92	91	87	85	89	95	93
St. Thomas	35%	D	88	98	93	92	91	87	85	89	95	93
Weiser	10%	A	63	98	81	80	76	61	54	68	89	81
Bracken	5%	A	63	98	81	80	76	61	54	68	89	81
Total	**100%**		**85**	**98**	**92**	**91**			**81**	**86**	**95**	**92**

Soil # 502 Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (Townhouse)	Residential$_{6}$ (7,000 Ft^{2})	Residential$_{7}$ (10,000 Ft^{2})	Residential$_{8}$ (20,000 Ft^{2})	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Canutio	55%	A	63	98	81	80	76	61	54	68	89	81
Cave	40%	D	88	98	93	92	91	87	85	89	95	93
Arizo	5%	A	63	98	81	80	76	61	54	68	89	81
Total	**100%**		**73**	**98**	**86**	**85**	**82**	**72**	**67**	**77**	**92**	**86**

Soil # 640 Rock outcrop, sand stone												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (Townhouse)	Residential$_{6}$ (7,000 Ft^{2})	Residential$_{7}$ (10,000 Ft^{2})	Residential$_{8}$ (20,000 Ft^{2})	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Rock outcrop	90%	D	88	98	93	92	91	87	85	89	95	93
Moentria	5%	D	88	98	93	92	91	87	85	89	95	93
Nupper	5%	D	88	98	93	92	91	87	85	89	95	93
Total	**100%**		**88**	**98**	**93**	**92**	**91**	**87**	**85**	**89**	**95**	**93**

Soil # 731 Purob-Irongold association												
Soil	Percent	Group	Existing$_{1}$	Impervious$_{2}$	Residential$_{4}$ (Apartment/Condo)	Residential$_{5}$ (Townhouse)	Residential$_{6}$ (7,000 Ft^{2})	Residential$_{7}$ (10,000 Ft^{2})	Residential$_{8}$ (20,000 Ft^{2})	Open Space$_{9}$ (Poor Condition)	Urban Districts$_{11}$ (Comercial and Business)	Industrial$_{12}$
Purob	60%	D	88	98	93	92	91	87	85	89	95	93
Irongold	25%	D	88	98	93	92	91	87	85	89	95	93
Typic torriorthents	5%	A	63	98	81	80	76	61	54	68	89	81
Arizo	3%	A	63	98	81	80	76	61	54	68	89	81
Purob	3%	D	88	98	93	92	91	87	85	89	95	93
Typic haplocalcids	2%	B	77	98	88	87	84	75	70	79	92	88
Xeric haplocambids	1%	A	63	98	81	80	76	61	54	68	89	81
Aridic calcixerolls	1%	A	63	98	81	80	76	61	54	68	89	81
Total	**100%**		**86**	**98**	**92**	**91**	**90**	**85**	**82**	**87**	**95**	**92**

1-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 4 of 4
* Desert Shrub in Poor Hydrologic Condition **(UNUSED)**
2-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page1 of 4
* Streets and Roads **(ROADS)**
4-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A
* Apartments / Condos **(MF3)**
5-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A
* Townhouses / 6,000 sq ft lots or less **(SFA)**
6-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A
* 7,000 sq ft lots **(SF1)**
7-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A
* 10,000 sq ft lots **(ER)**
8-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A
* 20,000 sq ft lots **(ER (RESTRICTED))**
9-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4
* Open spaces in poor condition (grass cover < 50%) **(COS (ALL))**
11-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4
* Commercial and Business **(SF2, SF3, VC, EC)**
12-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4
* Industrial **(DC)**

Curve Number calculations for basins															
Subbasin	**Area**	**Type**	**Soil Percentage**	**1**	**2**	**4**	**5**	**6**	**7**	**8**	**9**	**11**	**12**	**Soil Weighted CN**	**CN Value**
DEVELOPED CONDITION ONSITE															
V27-M (ER R)	77.48	155	1%							100%				0.6	**78.3**
		191	13%							100%				7.2	
		731	86%							100%				70.6	
V27-COS-8 (COS)	3.25	155	15%								100%			13.2	**82.5**
		191	25%								100%			17.2	
		731	60%								100%			52.0	
V27-COS-9 (COS)	2.89	731	100%								100%			87.0	**87.0**
V27-COS-10 (COS)	14.78	731	100%								100%			87.0	**87.0**
V27-COS-11 (COS)	8.36	731	100%								100%			87.0	**87.0**
V27-COS-14 (COS)	2.8	731	100%								100%			87.0	**87.0**
V31-A (ER R)	204.97	112	15%							100%				7.9	**77.3**
		640	1%							100%				0.5	
		731	84%							100%				68.9	
V31-COS-2 (COS RR)	14.22	191	6%								100%			4.1	**85.9**
		731	94%								100%			81.8	
V31-COS-3 (COS DP)	13.92	731	100%								100%			87.0	**87.0**
V31-COS-10 (COS RR)	11.99	112	30%								100%			20.1	**82.8**
		640	70%								100%			62.6	
V31-COS-12 (COS RR)	2.57	112	9%								100%			6.3	**85.2**
		731	91%								100%			78.9	
V31-COS-14 (COS)	6.10	731	100%								100%			87.0	**87.0**
V31-DC-1 (DC)	5.28	731	100%										100%	92.0	**92.0**
V27-COS-4 (COS)	45.82	156	1%								100%			0.9	**87.0**
		731	99%								100%			86.1	
V27-COS-5 (COS)	7.21	731	100%								100%			87.0	**87.0**
V27-COS-6 (COS)	7.65	731	100%								100%			87.0	**87.0**
V30A-E (SF2)	28.50	731	100%									100%		95.0	**95.0**
V30A-F (SF2)	28.69	731	100%									100%		95.0	**95.0**

Curve Number calculations for basins															
Subbasin	**Area**	**Type**	**Soil Percentage**	**1**	**2**	**4**	**5**	**6**	**7**	**8**	**9**	**11**	**12**	**Soil Weighted CN**	**CN Value**
DEVELOPED CONDITION ONSITE															
V27-H (SFSD)	10.39	155	58%				100%							53.5	**89.1**
		502	42%				100%							35.6	
V27-I (SFSD)	11.97	155	16%				100%							14.9	**86.1**
		502	84%				100%							71.2	
V27-K (VC NR-MU)	11.99	155	12%			50%						50%		11.7	**90.6**
		156	20%			50%						50%		18.9	
		502	67%			50%						50%		60.0	
V27-L (SFSD)	93.61	155	26%				100%							24.0	**89.3**
		156	2%				100%							1.5	
		191	5%				100%							4.3	
		502	23%				100%							19.8	
		731	44%				100%							39.6	
V27-COS-7 (COS)	9.94	156	3%								100%			3.0	**87.9**
		731	98%								100%			84.9	
V25-CP1A (OS-NF RP)	44.86	156	88%								100%			77.1	**87.9**
		731	12%								100%			10.7	
V25-CP1B (OS-NF RP)	24.57	156	100%								100%			88.0	**88.0**
V25-CP1C (OS-NF RP)	28.88	156	100%								100%			88.0	**88.0**
V25-O (SF3)	23.76	155	3%									100%		2.8	**93.1**
		156	33%									100%		31.6	
		502	64%									100%		58.6	
V25-P (SF3)	13.69	156	42%									100%		39.6	**93.3**
		502	58%									100%		53.6	
V27-N (EC)	2.90	155	62%									100%		58.9	**93.9**
		502	38%									100%		35.0	
V27-G (SF3)	19.51	155	98%									100%		93.1	**94.9**
		502	2%									100%		1.8	

Curve Number calculations for basins															
Subbasin	**Area**	**Type**	**Soil Percentage**	**1**	**2**	**4**	**5**	**6**	**7**	**8**	**9**	**11**	**12**	**Soil Weighted CN**	**CN Value**
DEVELOPED CONDITION ONSITE															
ST1	4.42	NA	100%		100%									NA	**98.0**
ST2	1.90	NA	100%		100%									NA	**98.0**
ST2A	0.23	NA	100%		100%									NA	**98.0**
ST2B	0.32	NA	100%		100%									NA	**98.0**
ST3	1.05	NA	100%		100%									NA	**98.0**
ST4	1.70	NA	100%		100%									NA	**98.0**
ST5	6.89	NA	100%		100%									NA	**98.0**
ST6	3.19	NA	100%		100%									NA	**98.0**
ST7	4.89	NA	100%		100%									NA	**98.0**
ST8	2.68	NA	100%		100%									NA	**98.0**
ST9	2.96	NA	100%		100%									NA	**98.0**
ST10	2.20	NA	100%		100%									NA	**98.0**
ST11	3.34	NA	100%		100%									NA	**98.0**
ST12	4.63	NA	100%		100%									NA	**98.0**
ST13	4.59	NA	100%		100%									NA	**98.0**
ST14	5.00	NA	100%		100%									NA	**98.0**
ST16	0.81	NA	100%		100%									NA	**98.0**
ST17	0.67	NA	100%		100%									NA	**98.0**
ST18	6.22	NA	100%		100%									NA	**98.0**
ST19	2.03	NA	100%		100%									NA	**98.0**
ST20	3.97	NA	100%		100%									NA	**98.0**
ST21	2.31	NA	100%		100%									NA	**98.0**

B.1.3

Travel Time Calculation

TRAVEL TIME CALCULATIONS

DEVELOPMENT: GPDB
W.O. # 7809-GPDB **CALCULATED BY:** PLM

$$Velocity = CS^{1/2}$$

C1 applies to the first 500 feet of travel distance
C2 applies to the remaining travel distance

Existing:		Developed	
C1=14.8	C2=29.4	C1=20.2	C2=30.6

Basin	Length (ft)	High Elev (ft)	Low Elev (ft)	Slope (ft/ft)	First 500 feet C1	First 500 feet V1 (fps)	Remaining Travel Distance C2	Remaining Travel Distance V2 (fps)
DEVELOPED CONDITION ONSITE								
V27-M (ER R)	2673	4068	3900	0.063	20.2	5.1	30.6	7.7
V27-COS-8 (COS)	1761	3932	3914	0.010	20.2	2.0	30.6	3.1
V27-COS-9 (COS)	807	3982	3902	0.099	20.2	6.4	30.6	9.6
V27-COS-10 (COS)	1500	3997	3884	0.075	20.2	5.5	30.6	8.4
V27-COS-11 (COS)	877	4027	3996	0.035	20.2	3.8	30.6	5.8
V27-COS-14 (COS)	700	4101	4060	0.059	20.2	4.9	30.6	7.4
V31-A (ER R)	5880	4526	4022	0.086	20.2	5.9	30.6	9.0
V31-COS-2 (COS RR)	1628	4200	4058	0.087	20.2	6.0	30.6	9.0
V31-COS-3 (COS DP)	1254	4158	4062	0.077	20.2	5.6	30.6	8.5
V31-COS-10 (COS RR)	1222	4393	4282	0.091	20.2	6.1	30.6	9.2
V31-COS-12 (COS RR)	408	4489	4446	0.105	20.2	6.6	30.6	9.9
V31-COS-14 (COS)	984	4108	4017	0.092	20.2	6.1	30.6	9.3
V31-DC-1 (DC)	512	4126	4077	0.096	20.2	6.3	30.6	9.5
V27-COS-4 (COS)	3056	3885	3704	0.059	20.2	4.9	30.6	7.4
V27-COS-5 (COS)	1070	3786	3755	0.029	20.2	3.4	30.6	5.2
V27-COS-6 (COS)	868	3860	3794	0.076	20.2	5.6	30.6	8.4
V30A-E (SF2)	1507	3853	3795	0.038	20.2	4.0	30.6	6.0
V30A-F (SF2)	1801	3822	3730	0.051	20.2	4.6	30.6	6.9
V27-H (SFSD)	622	3719	3661	0.093	20.2	6.2	30.6	9.3
V27-I (SFSD)	947	3782	3707	0.079	20.2	5.7	30.6	8.6
V27-K (VC NR-MU)	655	3756	3710	0.070	20.2	5.4	30.6	8.1
V27-L (SFSD)	3635	3921	3750	0.047	20.2	4.4	30.6	6.6
V27-COS-7 (COS)	2905	3914	3746	0.058	20.2	4.9	30.6	7.4
V25-CP1A (OS-NF RP)	2252	3725	3567	0.070	20.2	5.4	30.6	8.1
V25-CP1B (OS-NF RP)	1019	3552	3506	0.045	20.2	4.3	30.6	6.5
V25-CP1C (OS-NF RP)	1458	3535	3439	0.066	20.2	5.2	30.6	7.9
V25-O (SF3)	1717	3694	3614	0.047	20.2	4.4	30.6	6.6
V25-P (SF3)	912	3614	3561	0.058	20.2	4.9	30.6	7.4
V27-N (EC)	470	3665	3649	0.034	20.2	3.7	30.6	5.6
V27-G (SF3)	1390	3769	3715	0.039	20.2	4.0	30.6	6.0
ST1	2737	4260	4070	0.069	20.2	5.3	30.6	8.1
ST2	1654	4092	3995	0.059	20.2	4.9	30.6	7.4
ST2A	582	4170	4141	0.049	20.2	4.5	30.6	6.8
ST2B	428	4141	4092	0.114	20.2	6.8	30.6	10.4
ST3	881	4070	3990	0.091	20.2	6.1	30.6	9.2
ST4	967	3990	3895	0.098	20.2	6.3	30.6	9.6
ST5	3202	3895	3730	0.052	20.2	4.6	30.6	6.9
ST6	1210	3729	3707	0.018	20.2	2.7	30.6	4.1
ST7	1575	3749	3707	0.027	20.2	3.3	30.6	5.0
ST8	1546	3706	3600	0.069	20.2	5.3	30.6	8.0

TRAVEL TIME CALCULATIONS

DEVELOPMENT: **GPDB**

W.O. # **7809-GPDB** **CALCULATED BY:** **PLM**

$$Velocity = CS^{1/2}$$

C1 applies to the first 500 feet of travel distance
C2 applies to the remaining travel distance

Existing:		Developed	
C1=14.8	C2=29.4	C1=20.2	C2=30.6

					First 500 feet		Remaining Travel Distance	
Basin	**Length** (ft)	**High Elev** (ft)	**Low Elev** (ft)	**Slope** (ft/ft)	**C1**	**V1** (fps)	**C2**	**V2** (fps)
ST9	1813	3600	3491	0.060	20.2	5.0	30.6	7.5
ST10	919	3491	3440	0.055	20.2	4.8	30.6	7.2
ST11	1362	3547	3455	0.068	20.2	5.2	30.6	8.0
ST12	1567	3643	3547	0.061	20.2	5.0	30.6	7.6
ST13	2333	3796	3650	0.063	20.2	5.1	30.6	7.7
ST14	1727	3792	3732	0.035	20.2	3.8	30.6	5.7
ST16	459	3735	3710	0.054	20.2	4.7	30.6	7.1
ST17	719	3735	3702	0.046	20.2	4.3	30.6	6.6
ST18	1571	3730	3645	0.054	20.2	4.7	30.6	7.1
ST19	1024	3608	3596	0.012	20.2	2.2	30.6	3.3
ST20	2382	3701	3549	0.064	20.2	5.1	30.6	7.7
ST21	765	3605	3594	0.014	20.2	2.4	30.6	3.7

B.1.4

Standard Form 4

STANDARD FORM 4

DEVELOPMENT: GPDB

W.O. # 7809-GPDB CALCULATED BY: PLM

V1 applies to the first 500 feet of travel distance
V2 applies to the remaining travel distance

Existing:		Developed	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132 C_n - 0.39 \qquad T_c = T_i + T_t$$

	SUB-BASIN DATA				INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG. (1)	Cn	K (2)	AREA Ac. (3)	AREA Mi^2	LENGTH Ft (4)	SLOPE % (5)	Ti Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	V1 fps (9a)	V2 fps (9b)	Tt Min. (10)	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
DEVELOPED CONDITION ONSITE																	
V27-M (ER R)	78.3	0.644	77.48	0.1211	100	1.0	8.21	2673	6.3	5.1	7.7	6.37	2773	25.41	14.58	0.146	
V27-COS-8 (COS)	82.5	0.699	3.25	0.0051	100	1.0	7.22	1761	1.0	2.0	3.1	10.87	1861	20.34	18.09	0.181	
V27-COS-9 (COS)	87.0	0.758	2.89	0.0045	100	1.0	6.15	807	9.9	6.4	9.6	1.84	907	15.04	7.99	0.080	
V27-COS-10 (COS)	87.0	0.758	14.78	0.0231	100	1.0	6.15	1500	7.5	5.5	8.4	3.49	1600	18.89	9.64	0.096	
V27-COS-11 (COS)	87.0	0.758	8.36	0.0131	100	1.0	6.15	877	3.5	3.8	5.8	3.29	977	15.43	9.44	0.094	
V27-COS-14 (COS)	87.0	0.758	2.80	0.0044	100	1.0	6.15	700	5.9	4.9	7.4	2.15	800	14.44	8.30	0.083	
V31-A (ER R)	77.3	0.631	204.97	0.3203	100	1.0	8.44	5880	8.6	5.9	9.0	11.42	5980	43.22	19.86	0.199	
V31-COS-2 (COS RR)	85.9	0.743	14.22	0.0222	100	1.0	6.42	1628	8.7	6.0	9.0	3.48	1728	19.60	9.90	0.099	Tc Min=10min
V31-COS-3 (COS DP)	87.0	0.758	13.92	0.0218	100	1.0	6.15	1254	7.7	5.6	8.5	2.98	1354	17.52	9.12	0.091	
V31-COS-10 (COS RR)	82.8	0.703	11.99	0.0187	100	1.0	7.15	1222	9.1	6.1	9.2	2.67	1322	17.34	9.82	0.098	Tc Min=10min
V31-COS-12 (COS RR)	85.2	0.735	2.57	0.0040	100	1.0	6.57	408	10.5	6.6	9.9	1.04	508	12.82	7.61	0.076	Tc Min=10min
V31-COS-14 (COS)	87.0	0.758	6.10	0.0095	100	1.0	6.15	984	9.2	6.1	9.3	2.22	1084	16.02	8.37	0.084	
V31-DC-1 (DC)	92.0	0.824	5.28	0.0082	100	1.0	4.96	512	9.6	6.3	9.5	1.35	612	13.40	6.31	0.063	
V27-COS-4 (COS)	87.0	0.759	45.82	0.0716	100	1.0	6.15	3056	5.9	4.9	7.4	7.42	3156	27.53	13.56	0.136	
V27-COS-5 (COS)	87.0	0.758	7.21	0.0113	100	1.0	6.15	1070	2.9	3.4	5.2	4.25	1170	16.50	10.40	0.104	
V27-COS-6 (COS)	87.0	0.758	7.65	0.0120	100	1.0	6.15	868	7.6	5.6	8.4	2.22	968	15.38	8.37	0.084	
V30A-E (SF2)	95.0	0.864	28.50	0.0445	100	1.0	4.25	1507	3.8	4.0	6.0	4.90	1607	18.93	9.15	0.091	
V30A-F (SF2)	95.0	0.864	28.69	0.0448	100	1.0	4.25	1801	5.1	4.6	6.9	4.96	1901	20.56	9.21	0.092	
V27-H (SFSD)	89.1	0.786	10.39	0.0162	100	1.0	5.66	622	9.3	6.2	9.3	1.57	722	14.01	7.23	0.072	
V27-I (SFSD)	86.1	0.747	11.97	0.0187	100	1.0	6.35	947	7.9	5.7	8.6	2.33	1047	15.82	8.69	0.087	
V27-K (VC NR-MU)	90.6	0.806	11.99	0.0187	100	1.0	5.29	655	7.0	5.4	8.1	1.88	755	14.19	7.16	0.072	
V27-L (SFSD)	89.3	0.789	93.61	0.1463	100	1.0	5.61	3635	4.7	4.4	6.6	9.77	3735	30.75	15.38	0.154	
V27-COS-7 (COS)	87.9	0.770	9.94	0.0155	100	1.0	5.94	2905	5.8	4.9	7.4	7.16	3005	26.69	13.10	0.131	
V25-CP1A (OS-NF RP)	87.9	0.770	44.86	0.0701	100	1.0	5.94	2252	7.0	5.4	8.1	5.16	2352	23.07	11.10	0.111	
V25-CP1B (OS-NF RP)	88.0	0.772	24.57	0.0384	100	1.0	5.91	1019	4.5	4.3	6.5	3.27	1119	16.22	9.18	0.092	
V25-CP1C (OS-NF RP)	88.0	0.772	28.88	0.0451	100	1.0	5.91	1458	6.6	5.2	7.9	3.64	1558	18.66	9.55	0.096	
V25-O (SF3)	93.1	0.839	23.76	0.0371	100	1.0	4.70	1717	4.7	4.4	6.6	4.98	1817	20.09	9.68	0.097	
V25-P (SF3)	93.3	0.841	13.69	0.0214	100	1.0	4.66	912	5.8	4.9	7.4	2.64	1012	15.62	7.31	0.073	
V27-N (EC)	93.9	0.849	2.90	0.0045	100	1.0	4.52	470	3.4	3.7	5.6	2.10	570	13.17	6.62	0.066	
V27-G (SF3)	94.9	0.863	19.51	0.0305	100	1.0	4.26	1390	3.9	4.0	6.0	4.55	1490	18.28	8.81	0.088	
ST1	98.0	0.904	4.42	0.0069	16	2.0	1.12	2737	6.9	5.3	8.1	6.19	2753	25.29	7.31	0.073	
ST2	98.0	0.904	1.90	0.0030	12	2.0	0.97	1654	5.9	4.9	7.4	4.29	1666	19.26	5.26	0.053	
ST2A	98.0	0.904	0.23	0.0004	12	2.0	0.97	582	4.9	4.5	6.8	2.06	594	13.30	3.03	0.030	Tc Min=5min
ST2B	98.0	0.904	0.32	0.0005	12	2.0	0.97	428	11.4	6.8	10.4	1.04	440	12.44	2.02	0.020	Tc Min=5min
ST3	98.0	0.904	1.05	0.0016	16	2.0	1.12	881	9.1	6.1	9.2	2.06	897	14.98	3.18	0.032	Tc Min=5min
ST4	98.0	0.904	1.70	0.0027	16	2.0	1.12	967	9.8	6.3	9.6	2.13	983	15.46	3.25	0.033	Tc Min=5min
ST5	98.0	0.904	6.89	0.0108	16	2.0	1.12	3202	5.2	4.6	6.9	8.30	3218	27.88	9.42	0.094	
ST6	98.0	0.904	3.19	0.0050	38	2.0	1.72	1210	1.8	2.7	4.1	5.93	1248	16.93	7.65	0.076	
ST7	98.0	0.904	4.89	0.0076	38	2.0	1.72	1575	2.7	3.3	5.0	6.11	1613	18.96	7.83	0.078	
ST8	98.0	0.904	2.68	0.0042	20	2.0	1.25	1546	6.9	5.3	8.0	3.75	1566	18.70	5.01	0.050	
ST9	98.0	0.904	2.96	0.0046	20	2.0	1.25	1813	6.0	5.0	7.5	4.60	1833	20.18	5.85	0.059	
ST10	98.0	0.904	2.20	0.0034	36	2.0	1.68	919	5.5	4.8	7.2	2.72	955	15.31	4.40	0.044	Tc Min=5min
ST11	98.0	0.904	3.34	0.0052	49	2.0	1.96	1362	6.8	5.2	8.0	3.39	1411	17.84	5.36	0.054	

STANDARD FORM 4

DEVELOPMENT: GPDB

W.O. # 7809-GPDB CALCULATED BY: PLM

V1 applies to the first 500 feet of travel distance
V2 applies to the remaining travel distance

Existing:		Developed	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132C_n - 0.39 \qquad T_c = T_i + T_t$$

SUB-BASIN DATA					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG. (1)	Cn	K (2)	AREA Ac. (3)	AREA Mi^2	LENGTH Ft (4)	SLOPE % (5)	Ti Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	V1 fps (9a)	V2 fps (9b)	Tt Min. (10)	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
ST12	98.0	0.904	4.63	0.0072	40	2.0	1.76	1567	6.1	5.0	7.6	4.01	1607	18.93	5.78	0.058	
ST13	98.0	0.904	4.59	0.0072	17	2.0	1.14	2333	6.3	5.1	7.7	5.64	2350	23.05	6.78	0.068	
ST14	98.0	0.904	5.00	0.0078	36	2.0	1.68	1727	3.5	3.8	5.7	5.80	1763	19.79	7.48	0.075	
ST16	98.0	0.904	0.76	0.0012	19	2.0	1.21	459	5.4	4.7	7.1	1.62	478	12.65	2.83	0.028	Tc Min=5min
ST17	98.0	0.904	1.24	0.0019	21	2.0	1.27	719	4.6	4.3	6.6	2.48	740	14.11	3.75	0.038	Tc Min=5min
ST18	98.0	0.904	6.22	0.0097	36	2.0	1.67	1571	5.4	4.7	7.1	4.28	1607	18.93	5.95	0.060	
ST19	98.0	0.904	2.03	0.0032	19	2.0	1.21	1024	1.2	2.2	3.3	6.45	1043	15.79	7.65	0.077	
ST20	98.0	0.904	3.97	0.0062	21	2.0	1.27	2382	6.4	5.1	7.7	5.69	2403	23.35	6.96	0.070	
ST21	98.0	0.904	2.31	0.0036	38	2.0	1.73	765	1.4	2.4	3.7	4.64	803	14.46	6.37	0.064	
															Tc Min (DEV)= 5 min		
															Tc Min (UNDEV)= 10 min		

B.1.5

HEC-1 Models

B.1.5.1 GPDB-10.out - 10-Year Developed/Ultimate Condition
B.1.5.2 GPDB-25.out - 25-Year Developed/Ultimate Condition
B.1.5.3 GPDB-100.out - 100-Year Developed/Ultimate Condition

```
1****************************************                                    ****************************************
 *                                      *                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                    *          609 SECOND STREET           *
 *                                      *                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   05FEB20  TIME  11:14:57  *                                    *           (916) 756-1104             *
 *                                      *                                    *                                      *
 ****************************************                                    ****************************************

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


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

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

1                                                HEC-1 INPUT                                                PAGE  1

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

                        *DIAGRAM
 *** FREE ***
              1         ID          ************************************************
              2         ID                      GRAND PARK DETENTION BASIN
              3         ID          ************************************************
              4         ID
              5         ID    DEVELOPED CONDITION HYDROLOGIC MODEL
              6         ID    BY: VTN
              7         ID    DATE: FEBRUARY 2020
              8         ID    MODEL: GPDB-10.DAT
              9         ID    STORM EVENT: 10-YEAR
             10         ID
             11         ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
             12         ID
             13         ID                          AREA    DARF
             14         ID                          SQ. MI.
             15         ID                          0-0.5   0.990
             16         ID                          0.5-1   0.975
             17         ID                          1-2     0.950
             18         ID
             19         IT       5       0       0     300
             20         IN       5       0       0
             21         IO       5       0       0
             22         ID          0-0.5   0.5-1   1-2
             23         JR    PREC   0.990   0.975   0.950
                        *
             24         KK   COS12
             25         KM   COS (RR): PRESERVED RED ROCKS
             26         BA   .0040
             27         PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
             28         PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
             29         PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
             30         PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
             31         PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
             32         PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
             33         PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
             34         PC    .998    .999   1.00
             35         PB   1.58
             36         LS      0    85.2
             37         UD   0.100
                        *
             38         KKV31COS10
             39         KM   COS (RR): PRESERVED RED ROCKS
             40         BA   .0187
             41         PB    1.58
             42         LS      0    82.8
             43         UD   0.100
                        *
1                                                HEC-1 INPUT                                                PAGE  2

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

```
 44          KK       A
 45          KM   ER R: SINGLE FAMILY SPECIAL ESTATE
 46          BA   .3203
 47          PB    1.58
 48          LS       0    77.3
 49          UD   0.199
             *

 50          KK    COS3
 51          KM   COS DP: OPEN SPACE
 52          BA   .0218
 53          PB    1.58
 54          LS       0    87.0
 55          UD   0.091
             *

 56          KK    ST2A
 57          KM   PAVED STREET BASIN- ACCESS ROAD
 58          BA  0.0004
 59          PB    1.58
 60          LS       0    98.0
 61          UD   0.050
             *

 62          KK     ST1
 63          KM   PAVED STREET BASIN - LAKE MEAD
 64          BA   .0069
 65          PB    1.58
 66          LS       0    98.0
 67          UD   0.073
             *

 68          KK     CP1
 69          KM   COMBINE COS12, V31COS10, A, COS3, ST2A, AND ST1
 70          HC       6
             *

 71          KK    RCP1
 72          KM   ROUTE CP1 THROUGH ST3 IN STORM DRAIN TO CP2
 73          RD     881   0.091   0.013       0    DEEP       5       0
             *

 74          KKV31COS14
 75          KM   COS: OPEN SPACE
 76          BA   .0095
 77          PB    1.58
 78          LS       0    87.0
 79          UD   0.084
             *
1                                       HEC-1 INPUT                                          PAGE  3

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

 80          KK    COS2
 81          KM   COS (RR): PRESERVED RED ROCKS
 82          BA   .0222
 83          PB    1.58
 84          LS       0    85.9
 85          UD   0.100
             *

 86          KK     DC1
 87          KM   DC: DRAINAGE CORRIDOR
 88          BA   .0082
 89          PB    1.58
 90          LS       0    92.0
 91          UD   0.063
             *

 92          KK    ST2B
 93          KM   PAVED STREET BASIN- ACCESS ROAD
 94          BA   .0005
 95          PB    1.58
 96          LS       0    98.0
 97          UD   0.050
             *

 98          KKV27COS14
 99          KM   COS: OPEN SPACE
100          BA   .0044
101          PB    1.58
102          LS       0    87.0
103          UD   0.083
             *

104          KK    CP1A
105          KM   COMBINE CO2, DC1, ST2B, AND COS14
106          HC       4
```

```
                *
 107            KK   RCP1A
 108            KM   ROUTE CP1A THROUGH ST2 IN STORM DRAIN TO CP2
 109            RD    1835   0.057   0.013       0    DEEP       5       0
                *
 110            KK   COS11
 111            KM   COS: OPEN SPACE
 112            BA   .0131
 113            PB    1.58
 114            LS       0    87.0
 115            UD   0.094
                *
1                                       HEC-1 INPUT                                          PAGE  4

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


 116            KK     ST2
 117            KM   PAVED STREET BASIN - RESERVOIR ACCESS
 118            BA   .0030
 119            PB    1.58
 120            LS       0    98.0
 121            UD   0.053
                *
 122            KK     ST3
 123            KM   PAVED STREET BASIN - LAKE MEAD
 124            BA   .0016
 125            PB    1.58
 126            LS       0    98.0
 127            UD   0.050
                *
 128            KK     CP2
 129            KM   COMBINE RCP1, V31COS14, RCP1A, COS11, ST2, AND ST3
 130            HC       6
                *
 131            KK    RCP2
 132            KM   ROUTE CP2 THROUGH ST4 IN STORM DRAIN TO CP3
 133            RD     967   0.098   0.013       0    DEEP       5       0
                *
 134            KK       M
 135            KM   ER R: SINGLE FAMILY SPECIAL ESTATE
 136            BA   .1211
 137            PB    1.58
 138            LS       0    78.3
 139            UD   0.146
                *
 140            KK    COS8
 141            KM   COS: OPEN SPACE
 142            BA   .0051
 143            PB    1.58
 144            LS       0    82.5
 145            UD   0.181
                *
 146            KK    COS9
 147            KM   COS: OPEN SPACE
 148            BA   .0045
 149            PB    1.58
 150            LS       0    87.0
 151            UD   0.080
                *
1                                       HEC-1 INPUT                                          PAGE  5

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


 152            KKV27COS10
 153            KM   COS: OPEN SPACE
 154            BA   .0231
 155            PB    1.58
 156            LS       0    87.0
 157            UD   0.096
                *
 158            KK     ST4
 159            KM   PAVED STREET BASIN - LAKE MEAD
 160            BA   .0027
 161            PB    1.58
 162            LS       0    98.0
 163            UD   0.050
                *
 164            KK     CP3
 165            KM   COMBINE RCP2, M, COS8, COS9, V27COS10, AND ST4
```

```
 166          HC       6
              *

 167          KK    RCP3
 168          KM   ROUTE CP3 THROUGH ST5 IN STORM DRAIN TO CP4
 169          RD    3202   0.052   0.013       0    DEEP       5       0
              *

 170          KK    COS6
 171          KM   COS: OPEN SPACE
 172          BA   .0120
 173          PB    1.54
 174          LS       0    87.0
 175          UD   0.084
              *

 176          KK    COS5
 177          KM   COS: OPEN SPACE
 178          BA   .0113
 179          PB    1.54
 180          LS       0    87.0
 181          UD   0.104
              *

 182          KK    COS7
 183          KM   COS: OPEN SPACE
 184          BA   .0155
 185          PB    1.53
 186          LS       0    87.9
 187          UD   0.131
              *
1                                       HEC-1 INPUT                                          PAGE  6

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


 188          KK       L
 189          KM   SFSD: TOWNHOMES
 190          BA   .1463
 191          PB    1.53
 192          LS       0    89.3
 193          UD   0.154
              *

 194          KK     ST5
 195          KM   PAVED STREET BASIN - LAKE MEAD
 196          BA   .0108
 197          PB    1.54
 198          LS       0    98.0
 199          UD   0.094
              *

 200          KK    ST14
 201          KM   PAVED STREET BASIN - PARK DRIFT
 202          BA   .0078
 203          PB    1.53
 204          LS       0    98.0
 205          UD   0.075
              *

 206          KK     CP4
 207          KM   COMBINE RCP3, COS6, COS5, COS7, L, ST5, AND ST14
 208          HC       7
              *

 209          KK   DVCP4
 210          KM   DIVERT FLOW FROM LAKE MEAD STORM DRAIN THROUGH COS4 TO CP9
 211          DT   DVCP4
 212          DI       0     500     553     750    1000    1250    1600
 213          DQ       0     500     553     553     553     553     553
              *

 214          KK    RCP4
 215          KM   ROUTE CP4 THROUGH 1/2 ST18 IN STORM DRAIN TO CP5
 216          RD     850   0.054   0.013       0    DEEP       5       0
              *

 217          KK       K
 218          KM   VC NR-MU: COMMERCIAL
 219          BA   .0187
 220          PB    1.53
 221          LS       0    90.6
 222          UD   0.072
              *
1                                       HEC-1 INPUT                                          PAGE  7

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


 223          KK    ST17
 224          KM   PAVED STREET BASIN
```

```
225          BA   .0019
226          PB    1.53
227          LS       0    98.0
228          UD   0.050
             *

229          KK     CP5
230          KM   COMBINE RCP4, K, AND ST17
231          HC       3
             *

232          KK    RCP5
233          KM   ROUTE CP5 THROUGH 1/2 ST18 IN STORM DRAIN TO CP6
234          RD     850   0.054   0.013       0    DEEP       5       0
             *

235          KK       H
236          KM   SFHD: TOWNHOMES
237          BA   .0162
238          PB    1.53
239          LS       0    89.1
240          UD   0.072
             *

241          KK    ST18
242          KM   PAVED STREET BASIN - LAKE MEAD
243          BA   .0097
244          PB    1.53
245          LS       0    98.0
246          UD   0.060
             *

247          KK       I
248          KM   SFHD: TOWNHOMES
249          BA   .0187
250          PB    1.53
251          LS       0    86.1
252          UD   0.087
             *

253          KK    ST16
254          KM   PAVED STREET BASIN
255          BA   .0012
256          PB    1.53
257          LS       0    98.0
258          UD   0.050
             *
```



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

259          KK    ST13
260          KM   PAVED STREET BASIN - SUNSET RUN
261          BA   .0072
262          PB    1.53
263          LS       0    98.0
264          UD   0.068
             *

265          KK       G
266          KM   SFHD: HIGH DENSITY
267          BA   .0305
268          PB    1.53
269          LS       0    94.9
270          UD   0.088
             *

271          KK       N
272          KM   SFHD: GENERAL PUBLIC
273          BA   .0045
274          PB    1.53
275          LS       0    93.9
276          UD   0.066
             *

277          KK    CP6A
278          KM   COMBINE I, ST16, ST13, G, AND N
279          HC       5
             *

280          KK     CP6
281          KM   COMBINE RCP5, H, ST18, AND CP6A
282          HC       4
             *

283          KK    RCP6
284          KM   ROUTE CP6 THROUGH 1/2 ST12 IN STORM DRAIN TO CP7
285          RD     900   0.061   0.013       0    DEEP       5       0
             *
```

```
          286          KK       O
          287          KM   SF3: HIGH DENSITY
          288          BA   .0371
          289          PB    1.48
          290          LS       0    93.1
          291          UD   0.097
                       *

          292          KK    ST19
          293          KM   PAVED STREET BASIN - HIGHLAND PRIDE
          294          BA   .0032
          295          PB    1.48
          296          LS       0    98.0
          297          UD   0.077
                       *
1                                        HEC-1 INPUT                                          PAGE  9

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


          298          KK     CP7
          299          KM   COMBINE RCP6, O, AND ST19
          300          HC       3
                       *

          301          KK    RCP7
          302          KM   ROUTE CP7 THROUGH 1/2 ST12 IN STORM DRAIN TO CP8
          303          RD     900   0.061   0.013       0    DEEP       5       0
                       *

          304          KK       P
          305          KM   SF3: HIGH DENSITY
          306          BA   .0214
          307          PB    1.48
          308          LS       0    93.3
          309          UD   0.073
                       *

          310          KK    ST20
          311          KM   PAVED STREET BASIN - CALICO BEND
          312          BA   .0062
          313          PB    1.48
          314          LS       0    98.0
          315          UD   0.070
                       *

          316          KK    ST12
          317          KM   PAVED STREET BASIN - SUNSET RUN
          318          BA   .0072
          319          PB    1.48
          320          LS       0    98.0
          321          UD   0.058
                       *

          322          KK     CP8
          323          KM   COMBINE CP7, P, ST20, AND ST12
          324          KM   FLOW INTO BASIN VIA NORTHERN INLET
          325          HC       4
                       *

          326          KK    RCP8
          327          KM   ROUTE CP8 THROUGH BASIN IN STORM DRAIN TO GPDBIN
          328          RD     996   0.025   0.013       0    DEEP       6       0
                       *

          329          KK       E
          330          KM   SF2: MEDIUM DENSITY
          331          BA   .0445
          332          PB    1.54
          333          LS       0    95.0
          334          UD   0.091
                       *
1                                        HEC-1 INPUT                                          PAGE 10

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


          335          KK       F
          336          KM   SF2: MEDIUM DENSITY
          337          BA   .0448
          338          PB    1.54
          339          LS       0    95.0
          340          UD   0.092
                       *

          341          KK    COS4
          342          KM   COS: OPEN SPACE
          343          BA   .0716
          344          PB    1.54
          345          LS       0    87.0
          346          UD   0.136
```

```
                *
  347           KK     ST7
  348           KM   PAVED STREET BASIN - PARK DRIFT
  349           BA   .0076
  350           PB    1.54
  351           LS       0    98.0
  352           UD   0.078
                *
  353           KK     ST6
  354           KM   PAVED STREET BASIN - PARK DRIFT
  355           BA   .0050
  356           PB    1.54
  357           LS       0    98.0
  358           UD   0.076
                *
  359           KK   DVCP4
  360           KM   RETRIEVE DVCP4
  361           DR   DVCP4
                *
  362           KK     CP9
  363           KM   COMBINE E, F, COS4, ST7, ST6, AND DVCP4
  364           HC       6
                *
  365           KK    RCP9
  366           KM   ROUTE CP9 THROUGH ST8 AND BASIN IN STORM DRAIN TO CP10
  367           RD    2651   0.055   0.013       0    DEEP       5       0
                *
  368           KK     ST8
  369           KM   PAVED STREET BASIN - FOX HILL
  370           BA   .0042
  371           PB    1.48
  372           LS       0    98.0
  373           UD   0.050
                *
1                                       HEC-1 INPUT                                             PAGE 11

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

  374           KK    ST21
  375           KM   PAVED STREET BASIN - GRAND PARK
  376           BA   .0036
  377           PB    1.48
  378           LS       0    98.0
  379           UD   0.064
                *
  380           KK    CP1A
  381           KM   COS (RP): REGIONAL PARK - OPEN SPACE
  382           BA   .0701
  383           PB    1.48
  384           LS       0    87.9
  385           UD   0.111
                *
  386           KK    CP10
  387           KM   COMBINE RCP9, ST8, ST21, AND CP1A
  388           KM   FLOW INTO BASIN VIA SOUTHERN INLET
  389           HC       4
                *
  390           KK   RCP10
  391           KM   ROUTE CP10 THROUGH BASIN IN STORM DRAIN TO GPDBIN
  392           RD     708   0.046   0.013       0    DEEP       6       0
                *
  393           KK    CP1B
  394           KM   COS (RP): REGIONAL PARK - OPEN SPACE
  395           BA   .0384
  396           PB    1.48
  397           LS       0    88.0
  398           UD   0.092
                *
  399           KK  GPDBIN
  400           KM   COMBINE RCP8, RCP10, AND CP1B
  401           KM   TOTAL FLOW INTO GRAND PARK DETENTION BASIN
  402           KO       1
  403           HC       3
                *
  404           KK    GPDB
  405           KM   VILLAGE 25 DETENTION BASIN (GRAND PARK DETENTION BASIN)
  406           KM   STORAGE VOLUME = 155.0 AC-FT AT 3534 STAGE
  407           KM   SEDIMENT VOLUME = 9.0 AC-FT (REMOVED FROM EACH STAGE)
```

```
            408          KM   OUTLET = 5'X5' RCB WITH 26" ORIFICE PLATE
            409          KM   100-YEAR DISCHARGE = 94 CFS
            410          KM   SPILLWAY LENGTH = 300 FT WITH 10:1 SIDE SLOPES
            411          KM   SPILLWAY HEIGHT = 3 FT
            412          KM   SPILLWAY CREST ELEVATION = 3532.0'
            413          KM   SPILLWAY TYPE = BROAD CRESTED TRAPEZOIDAL WEIR
            414          KM   PMF DISCHARGE = 4544 CFS
            415          KM   TOP OF EMBANKMENT ELEVATION = 3535.0'
1                                              HEC-1 INPUT                                                PAGE 12

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

            416          KM   STAGE/STORAGE/DISCHARGE CALCULATED BY: PLM OF VTN
            417          KO       1
            418          RS       1    STOR       0
            419          SV     0.0     1.9     6.8    13.2    20.6    29.3    39.9    55.0    75.4    97.3
            420          SV   108.9   120.9   133.3   146.0
            421          SE    3506    3514    3516    3518    3520    3522    3524    3526    3528    3530
            422          SE    3531    3532    3533    3534
            423          SQ       0    50.6    57.4    63.5    69.1    74.3    79.1    83.6    88.0    92.1
            424          SQ    94.1    96.0   921.2  2665.6
                         *

            425          KK   RGPDB
            426          KM   ROUTE GPDB THROUGH ST9 AND ST10 IN STORM DRAIN TO CP11
            427          RD    1972   0.039   0.013       0    DEEP       5       0
                         *

            428          KK     ST9
            429          KM   PAVED STREET BASIN - FOX HILL
            430          BA   .0046
            431          PB    1.48
            432          LS       0    98.0
            433          UD   0.059
                         *

            434          KK    CP1C
            435          KM   COS (RP): REGIONAL PARK - OPEN SPACE
            436          BA   .0451
            437          PB    1.48
            438          LS       0    88.0
            439          UD   0.096
                         *

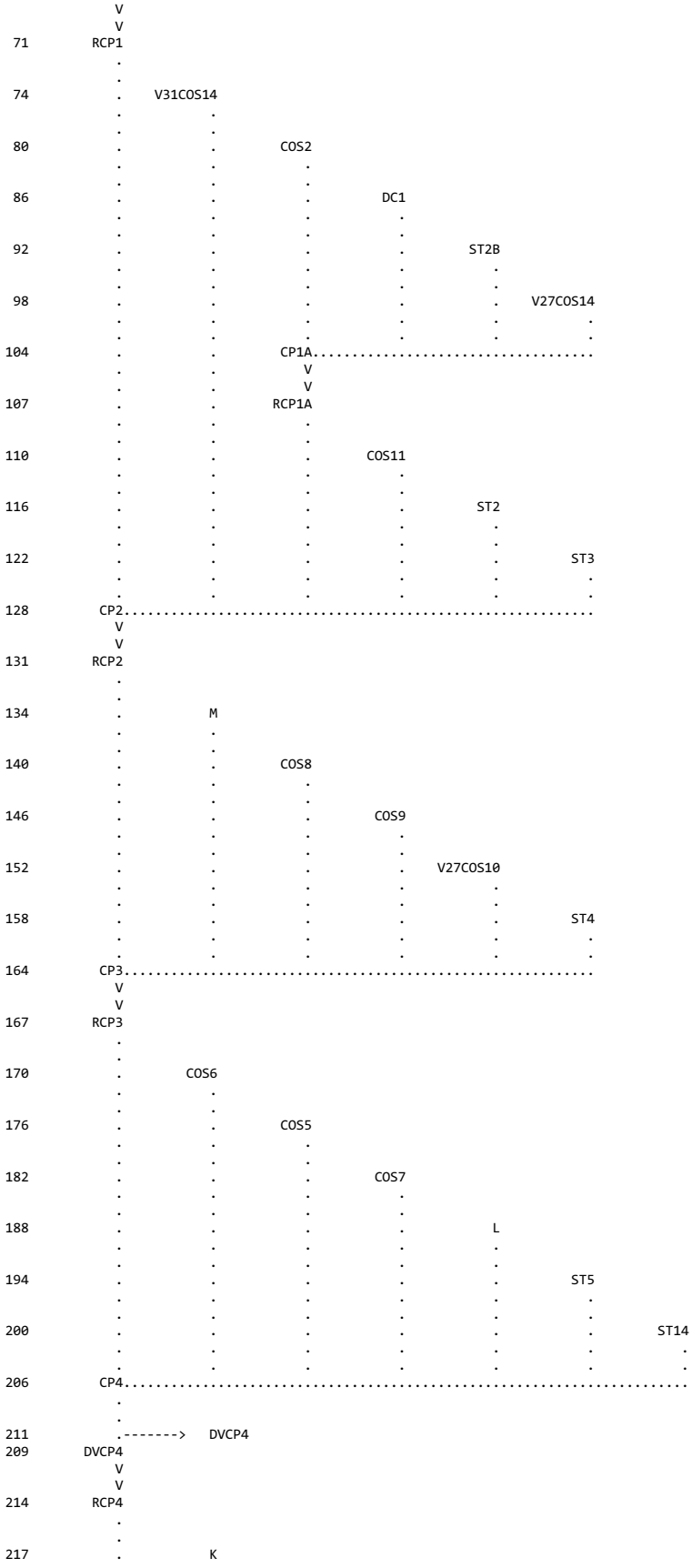
            440          KK    ST10
            441          KM   PAVED STREET BASIN - SKY VISTA
            442          BA   .0034
            443          PB    1.48
            444          LS       0    98.0
            445          UD   0.050
                         *

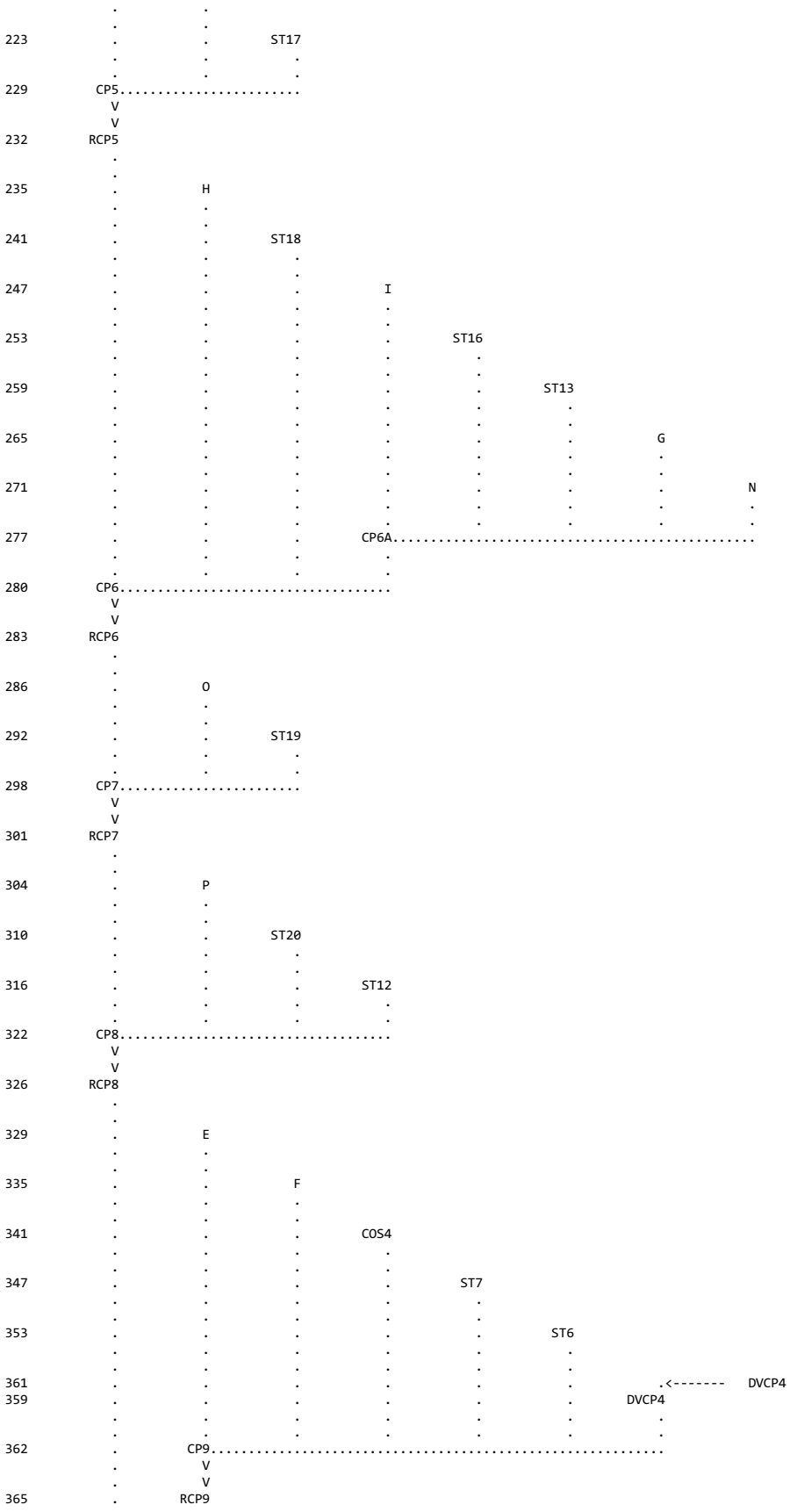
            446          KK    CP11
            447          KM   COMBINE RGPDB, ST9, CP1C, AND ST10
            448          HC       4
                         *

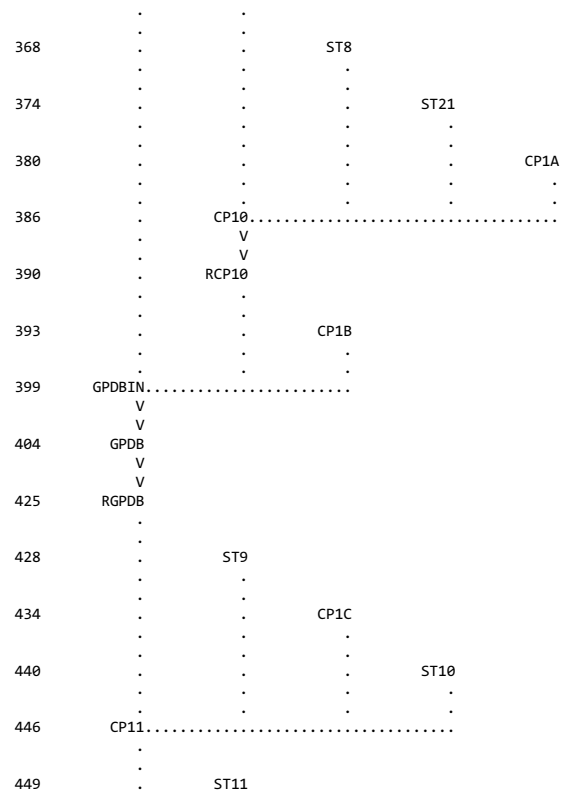
            449          KK    ST11
            450          KM   PAVED STREET BASIN - SUNSET RUN
            451          BA   .0052
            452          PB    1.48
            453          LS       0    98.0
            454          UD   0.054
                         *
            455          ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

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

    24       COS12
                 .
                 .
    38           .    V31COS10
                 .           .
                 .           .
    44           .           .           A
                 .           .           .
                 .           .           .
    50           .           .           .       COS3
                 .           .           .          .
                 .           .           .          .
    56           .           .           .          .       ST2A
                 .           .           .          .          .
                 .           .           .          .          .
    62           .           .           .          .          .        ST1
                 .           .           .          .          .          .
                 .           .           .          .          .          .
    68         CP1...........................................................
```


RCP1
V31COS14
COS2
DC1
ST2B
V27COS14
CP1A
RCP1A
COS11
ST2
ST3
CP2
RCP2
M
COS8
COS9
V27COS10
ST4
CP3
RCP3
COS6
COS5
COS7
L
ST5
ST14
CP4
DVCP4
RCP4
K


223 ST17
229 CP5
232 RCP5
235 H
241 ST18
247 I
253 ST16
259 ST13
265 G
271 N
277 CP6A
280 CP6
283 RCP6
286 O
292 ST19
298 CP7
301 RCP7
304 P
310 ST20
316 ST12
322 CP8
326 RCP8
329 E
335 F
341 COS4
347 ST7
353 ST6
361 DVCP4
359 DVCP4
362 CP9
365 RCP9



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *              JUN   1998              *
 *            VERSION 4.1               *
 *                                      *
 *  RUN DATE   05FEB20  TIME  11:14:57  *
 *                                      *
 ****************************************
```

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

****
GRAND PARK DETENTION BASIN
****

DEVELOPED CONDITION HYDROLOGIC MODEL
BY: VTN
DATE: FEBRUARY 2020
MODEL: GPDB-10.DAT
STORM EVENT: 10-YEAR

JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

AREA SQ. MI.	DARF
0-0.5	0.990
0.5-1	0.975
1-2	0.950

```
  21 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                                  0-0.5   0.5-1   1-2

     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
                  .99       .98       .95


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
399 KK    *    GPDBIN  *
          *            *
          **************

402 KO         OUTPUT CONTROL VARIABLES
                   IPRNT           1  PRINT CONTROL
                   IPLOT           0  PLOT CONTROL
                   QSCAL          0.  HYDROGRAPH PLOT SCALE

403 HC         HYDROGRAPH COMBINATION
                   ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                      ***

*********************************************************************************************************************************************

                                          HYDROGRAPH AT STATION   GPDBIN
                                               SUM OF  3 HYDROGRAPHS
                                              PLAN 1,   RATIO =   .99

*********************************************************************************************************************************************
                                *                               *                               *                               *
  DA MON HRMN  ORD      FLOW    *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW   *   DA MON HRMN  ORD      FLOW
                                *                               *                               *
   1     0000    1        0.   *    1     0615   76        5.   *    1     1230  151        0.   *    1     1845  226        0.
   1     0005    2        0.   *    1     0620   77        3.   *    1     1235  152        0.   *    1     1850  227        0.
   1     0010    3        1.   *    1     0625   78        2.   *    1     1240  153        0.   *    1     1855  228        0.
   1     0015    4        3.   *    1     0630   79        1.   *    1     1245  154        0.   *    1     1900  229        0.
   1     0020    5        5.   *    1     0635   80        1.   *    1     1250  155        0.   *    1     1905  230        0.
   1     0025    6        8.   *    1     0640   81        0.   *    1     1255  156        0.   *    1     1910  231        0.
   1     0030    7       12.   *    1     0645   82        0.   *    1     1300  157        0.   *    1     1915  232        0.
   1     0035    8       13.   *    1     0650   83        0.   *    1     1305  158        0.   *    1     1920  233        0.
   1     0040    9       10.   *    1     0655   84        0.   *    1     1310  159        0.   *    1     1925  234        0.
   1     0045   10        5.   *    1     0700   85        0.   *    1     1315  160        0.   *    1     1930  235        0.
   1     0050   11        2.   *    1     0705   86        0.   *    1     1320  161        0.   *    1     1935  236        0.
   1     0055   12        1.   *    1     0710   87        0.   *    1     1325  162        0.   *    1     1940  237        0.
   1     0100   13        0.   *    1     0715   88        0.   *    1     1330  163        0.   *    1     1945  238        0.
   1     0105   14        1.   *    1     0720   89        0.   *    1     1335  164        0.   *    1     1950  239        0.
   1     0110   15        3.   *    1     0725   90        0.   *    1     1340  165        0.   *    1     1955  240        0.
   1     0115   16        4.   *    1     0730   91        0.   *    1     1345  166        0.   *    1     2000  241        0.
   1     0120   17        5.   *    1     0735   92        0.   *    1     1350  167        0.   *    1     2005  242        0.
   1     0125   18        7.   *    1     0740   93        0.   *    1     1355  168        0.   *    1     2010  243        0.
   1     0130   19       12.   *    1     0745   94        0.   *    1     1400  169        0.   *    1     2015  244        0.
   1     0135   20       15.   *    1     0750   95        0.   *    1     1405  170        0.   *    1     2020  245        0.
   1     0140   21       16.   *    1     0755   96        0.   *    1     1410  171        0.   *    1     2025  246        0.
   1     0145   22       16.   *    1     0800   97        0.   *    1     1415  172        0.   *    1     2030  247        0.
   1     0150   23       13.   *    1     0805   98        0.   *    1     1420  173        0.   *    1     2035  248        0.
   1     0155   24        9.   *    1     0810   99        0.   *    1     1425  174        0.   *    1     2040  249        0.
   1     0200   25        6.   *    1     0815  100        0.   *    1     1430  175        0.   *    1     2045  250        0.
   1     0205   26        4.   *    1     0820  101        0.   *    1     1435  176        0.   *    1     2050  251        0.
   1     0210   27        7.   *    1     0825  102        0.   *    1     1440  177        0.   *    1     2055  252        0.
   1     0215   28       15.   *    1     0830  103        0.   *    1     1445  178        0.   *    1     2100  253        0.
   1     0220   29       24.   *    1     0835  104        0.   *    1     1450  179        0.   *    1     2105  254        0.
   1     0225   30       27.   *    1     0840  105        0.   *    1     1455  180        0.   *    1     2110  255        0.
   1     0230   31       23.   *    1     0845  106        0.   *    1     1500  181        0.   *    1     2115  256        0.
   1     0235   32       18.   *    1     0850  107        0.   *    1     1505  182        0.   *    1     2120  257        0.
   1     0240   33       19.   *    1     0855  108        0.   *    1     1510  183        0.   *    1     2125  258        0.
   1     0245   34       25.   *    1     0900  109        0.   *    1     1515  184        0.   *    1     2130  259        0.
   1     0250   35       25.   *    1     0905  110        0.   *    1     1520  185        0.   *    1     2135  260        0.
   1     0255   36       19.   *    1     0910  111        0.   *    1     1525  186        0.   *    1     2140  261        0.
   1     0300   37       19.   *    1     0915  112        0.   *    1     1530  187        0.   *    1     2145  262        0.
   1     0305   38       36.   *    1     0920  113        0.   *    1     1535  188        0.   *    1     2150  263        0.
   1     0310   39       67.   *    1     0925  114        0.   *    1     1540  189        0.   *    1     2155  264        0.
   1     0315   40      121.   *    1     0930  115        0.   *    1     1545  190        0.   *    1     2200  265        0.
```

1	0320	41	227.	*	1	0935	116	0.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	361.	*	1	0940	117	0.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	520.	*	1	0945	118	0.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	562.	*	1	0950	119	0.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	480.	*	1	0955	120	0.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	394.	*	1	1000	121	0.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	304.	*	1	1005	122	0.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	224.	*	1	1010	123	0.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	181.	*	1	1015	124	0.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	147.	*	1	1020	125	0.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	111.	*	1	1025	126	0.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	86.	*	1	1030	127	0.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	76.	*	1	1035	128	0.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	79.	*	1	1040	129	0.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	103.	*	1	1045	130	0.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	132.	*	1	1050	131	0.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	140.	*	1	1055	132	0.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	134.	*	1	1100	133	0.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	140.	*	1	1105	134	0.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	137.	*	1	1110	135	0.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	117.	*	1	1115	136	0.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	90.	*	1	1120	137	0.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	66.	*	1	1125	138	0.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	48.	*	1	1130	139	0.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	35.	*	1	1135	140	0.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	28.	*	1	1140	141	0.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	23.	*	1	1145	142	0.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	18.	*	1	1150	143	0.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	14.	*	1	1155	144	0.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	14.	*	1	1200	145	0.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	14.	*	1	1205	146	0.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	13.	*	1	1210	147	0.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	12.	*	1	1215	148	0.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	10.	*	1	1220	149	0.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	7.	*	1	1225	150	0.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

****

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 562.	3.58	79.	20.	19.	19.
		(INCHES) .577	.578	.578	.578
		(AC-FT) 39.	39.	39.	39.

CUMULATIVE AREA = 1.27 SQ MI

****

HYDROGRAPH AT STATION GPDBIN
SUM OF 3 HYDROGRAPHS
PLAN 1, RATIO = .98

****

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
					*						*						*					
1		0000	1	0.	*	1		0615	76	5.	*	1		1230	151	0.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	3.	*	1		1235	152	0.	*	1		1850	227	0.
1		0010	3	1.	*	1		0625	78	2.	*	1		1240	153	0.	*	1		1855	228	0.
1		0015	4	3.	*	1		0630	79	1.	*	1		1245	154	0.	*	1		1900	229	0.
1		0020	5	5.	*	1		0635	80	0.	*	1		1250	155	0.	*	1		1905	230	0.
1		0025	6	8.	*	1		0640	81	0.	*	1		1255	156	0.	*	1		1910	231	0.
1		0030	7	12.	*	1		0645	82	0.	*	1		1300	157	0.	*	1		1915	232	0.
1		0035	8	13.	*	1		0650	83	0.	*	1		1305	158	0.	*	1		1920	233	0.
1		0040	9	9.	*	1		0655	84	0.	*	1		1310	159	0.	*	1		1925	234	0.
1		0045	10	5.	*	1		0700	85	0.	*	1		1315	160	0.	*	1		1930	235	0.
1		0050	11	2.	*	1		0705	86	0.	*	1		1320	161	0.	*	1		1935	236	0.
1		0055	12	1.	*	1		0710	87	0.	*	1		1325	162	0.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	0.	*	1		1330	163	0.	*	1		1945	238	0.
1		0105	14	1.	*	1		0720	89	0.	*	1		1335	164	0.	*	1		1950	239	0.
1		0110	15	3.	*	1		0725	90	0.	*	1		1340	165	0.	*	1		1955	240	0.
1		0115	16	4.	*	1		0730	91	0.	*	1		1345	166	0.	*	1		2000	241	0.
1		0120	17	5.	*	1		0735	92	0.	*	1		1350	167	0.	*	1		2005	242	0.
1		0125	18	7.	*	1		0740	93	0.	*	1		1355	168	0.	*	1		2010	243	0.
1		0130	19	11.	*	1		0745	94	0.	*	1		1400	169	0.	*	1		2015	244	0.
1		0135	20	15.	*	1		0750	95	0.	*	1		1405	170	0.	*	1		2020	245	0.
1		0140	21	16.	*	1		0755	96	0.	*	1		1410	171	0.	*	1		2025	246	0.
1		0145	22	15.	*	1		0800	97	0.	*	1		1415	172	0.	*	1		2030	247	0.
1		0150	23	13.	*	1		0805	98	0.	*	1		1420	173	0.	*	1		2035	248	0.
1		0155	24	9.	*	1		0810	99	0.	*	1		1425	174	0.	*	1		2040	249	0.
1		0200	25	5.	*	1		0815	100	0.	*	1		1430	175	0.	*	1		2045	250	0.
1		0205	26	4.	*	1		0820	101	0.	*	1		1435	176	0.	*	1		2050	251	0.
1		0210	27	7.	*	1		0825	102	0.	*	1		1440	177	0.	*	1		2055	252	0.
1		0215	28	15.	*	1		0830	103	0.	*	1		1445	178	0.	*	1		2100	253	0.
1		0220	29	23.	*	1		0835	104	0.	*	1		1450	179	0.	*	1		2105	254	0.
1		0225	30	26.	*	1		0840	105	0.	*	1		1455	180	0.	*	1		2110	255	0.
1		0230	31	22.	*	1		0845	106	0.	*	1		1500	181	0.	*	1		2115	256	0.
1		0235	32	17.	*	1		0850	107	0.	*	1		1505	182	0.	*	1		2120	257	0.

1	0240	33	19.	*	1	0855	108	0.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	24.	*	1	0900	109	0.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	24.	*	1	0905	110	0.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	19.	*	1	0910	111	0.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	18.	*	1	0915	112	0.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	35.	*	1	0920	113	0.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	65.	*	1	0925	114	0.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	117.	*	1	0930	115	0.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	220.	*	1	0935	116	0.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	350.	*	1	0940	117	0.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	505.	*	1	0945	118	0.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	545.	*	1	0950	119	0.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	466.	*	1	0955	120	0.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	384.	*	1	1000	121	0.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	296.	*	1	1005	122	0.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	219.	*	1	1010	123	0.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	177.	*	1	1015	124	0.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	144.	*	1	1020	125	0.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	108.	*	1	1025	126	0.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	84.	*	1	1030	127	0.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	74.	*	1	1035	128	0.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	77.	*	1	1040	129	0.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	100.	*	1	1045	130	0.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	129.	*	1	1050	131	0.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	137.	*	1	1055	132	0.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	131.	*	1	1100	133	0.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	136.	*	1	1105	134	0.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	134.	*	1	1110	135	0.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	114.	*	1	1115	136	0.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	88.	*	1	1120	137	0.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	65.	*	1	1125	138	0.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	47.	*	1	1130	139	0.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	34.	*	1	1135	140	0.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	27.	*	1	1140	141	0.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	22.	*	1	1145	142	0.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	17.	*	1	1150	143	0.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	14.	*	1	1155	144	0.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	14.	*	1	1200	145	0.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	14.	*	1	1205	146	0.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	13.	*	1	1210	147	0.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	11.	*	1	1215	148	0.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	10.	*	1	1220	149	0.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	7.	*	1	1225	150	0.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 545.	3.58	77.	19.	18.	18.
		(INCHES) .561	.562	.562	.562
		(AC-FT) 38.	38.	38.	38.

CUMULATIVE AREA = 1.27 SQ MI

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HYDROGRAPH AT STATION GPDBIN
SUM OF 3 HYDROGRAPHS
PLAN 1, RATIO = .95

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	4.	*	1		1230	151	0.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	3.	*	1		1235	152	0.	*	1		1850	227	0.
1		0010	3	1.	*	1		0625	78	2.	*	1		1240	153	0.	*	1		1855	228	0.
1		0015	4	2.	*	1		0630	79	1.	*	1		1245	154	0.	*	1		1900	229	0.
1		0020	5	4.	*	1		0635	80	0.	*	1		1250	155	0.	*	1		1905	230	0.
1		0025	6	8.	*	1		0640	81	0.	*	1		1255	156	0.	*	1		1910	231	0.
1		0030	7	11.	*	1		0645	82	0.	*	1		1300	157	0.	*	1		1915	232	0.
1		0035	8	12.	*	1		0650	83	0.	*	1		1305	158	0.	*	1		1920	233	0.
1		0040	9	9.	*	1		0655	84	0.	*	1		1310	159	0.	*	1		1925	234	0.
1		0045	10	5.	*	1		0700	85	0.	*	1		1315	160	0.	*	1		1930	235	0.
1		0050	11	2.	*	1		0705	86	0.	*	1		1320	161	0.	*	1		1935	236	0.
1		0055	12	1.	*	1		0710	87	0.	*	1		1325	162	0.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	0.	*	1		1330	163	0.	*	1		1945	238	0.
1		0105	14	1.	*	1		0720	89	0.	*	1		1335	164	0.	*	1		1950	239	0.
1		0110	15	2.	*	1		0725	90	0.	*	1		1340	165	0.	*	1		1955	240	0.
1		0115	16	4.	*	1		0730	91	0.	*	1		1345	166	0.	*	1		2000	241	0.
1		0120	17	5.	*	1		0735	92	0.	*	1		1350	167	0.	*	1		2005	242	0.
1		0125	18	7.	*	1		0740	93	0.	*	1		1355	168	0.	*	1		2010	243	0.
1		0130	19	11.	*	1		0745	94	0.	*	1		1400	169	0.	*	1		2015	244	0.
1		0135	20	14.	*	1		0750	95	0.	*	1		1405	170	0.	*	1		2020	245	0.
1		0140	21	15.	*	1		0755	96	0.	*	1		1410	171	0.	*	1		2025	246	0.
1		0145	22	14.	*	1		0800	97	0.	*	1		1415	172	0.	*	1		2030	247	0.
1		0150	23	12.	*	1		0805	98	0.	*	1		1420	173	0.	*	1		2035	248	0.
1		0155	24	8.	*	1		0810	99	0.	*	1		1425	174	0.	*	1		2040	249	0.

1	0200	25	5.	*	1	0815	100	0.	*	1	1430	175	0.	*	1	2045	250	0.
1	0205	26	4.	*	1	0820	101	0.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	6.	*	1	0825	102	0.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	14.	*	1	0830	103	0.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	22.	*	1	0835	104	0.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	24.	*	1	0840	105	0.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	21.	*	1	0845	106	0.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	16.	*	1	0850	107	0.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	18.	*	1	0855	108	0.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	23.	*	1	0900	109	0.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	23.	*	1	0905	110	0.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	18.	*	1	0910	111	0.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	17.	*	1	0915	112	0.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	33.	*	1	0920	113	0.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	62.	*	1	0925	114	0.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	111.	*	1	0930	115	0.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	209.	*	1	0935	116	0.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	333.	*	1	0940	117	0.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	481.	*	1	0945	118	0.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	520.	*	1	0950	119	0.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	445.	*	1	0955	120	0.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	367.	*	1	1000	121	0.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	282.	*	1	1005	122	0.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	209.	*	1	1010	123	0.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	169.	*	1	1015	124	0.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	138.	*	1	1020	125	0.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	104.	*	1	1025	126	0.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	80.	*	1	1030	127	0.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	71.	*	1	1035	128	0.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	74.	*	1	1040	129	0.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	96.	*	1	1045	130	0.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	123.	*	1	1050	131	0.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	131.	*	1	1055	132	0.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	126.	*	1	1100	133	0.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	131.	*	1	1105	134	0.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	129.	*	1	1110	135	0.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	110.	*	1	1115	136	0.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	85.	*	1	1120	137	0.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	62.	*	1	1125	138	0.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	45.	*	1	1130	139	0.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	33.	*	1	1135	140	0.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	26.	*	1	1140	141	0.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	21.	*	1	1145	142	0.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	17.	*	1	1150	143	0.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	13.	*	1	1155	144	0.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	13.	*	1	1200	145	0.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	14.	*	1	1205	146	0.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	12.	*	1	1210	147	0.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	11.	*	1	1215	148	0.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	9.	*	1	1220	149	0.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	7.	*	1	1225	150	0.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*					

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 520.	3.58	73.	18.	18.	18.
		(INCHES) .536	.537	.537	.537
		(AC-FT) 36.	36.	36.	36.

CUMULATIVE AREA = 1.27 SQ MI

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           *            *
 404 KK    *      GPDB  *
           *            *
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 417 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

                HYDROGRAPH ROUTING DATA

 418 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC        .00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

 419 SV            STORAGE         .0      1.9      6.8     13.2     20.6     29.3     39.9     55.0     75.4     97.3
                                 108.9    120.9    133.3    146.0
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421 SE          ELEVATION     3506.00   3514.00   3516.00   3518.00   3520.00   3522.00   3524.00   3526.00   3528.00   3530.00
                              3531.00   3532.00   3533.00   3534.00

423 SQ          DISCHARGE        0.        51.       57.       64.       69.       74.       79.       84.       88.       92.
                                94.       96.      921.     2666.

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HYDROGRAPH AT STATION GPDB
PLAN 1, RATIO = .99

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	3506.0	1		0820	101	59.	8.9	3516.6	1		1640	201	0.	.0	3506.0
1		0005	2	0.	.0	3506.0	1		0825	102	59.	8.5	3516.5	1		1645	202	0.	.0	3506.0
1		0010	3	0.	.0	3506.0	1		0830	103	59.	8.1	3516.4	1		1650	203	0.	.0	3506.0
1		0015	4	0.	.0	3506.1	1		0835	104	58.	7.6	3516.3	1		1655	204	0.	.0	3506.0
1		0020	5	1.	.0	3506.2	1		0840	105	58.	7.2	3516.1	1		1700	205	0.	.0	3506.0
1		0025	6	2.	.1	3506.3	1		0845	106	57.	6.9	3516.0	1		1705	206	0.	.0	3506.0
1		0030	7	3.	.1	3506.5	1		0850	107	57.	6.5	3515.9	1		1710	207	0.	.0	3506.0
1		0035	8	5.	.2	3506.8	1		0855	108	56.	6.1	3515.7	1		1715	208	0.	.0	3506.0
1		0040	9	6.	.2	3507.0	1		0900	109	56.	5.7	3515.5	1		1720	209	0.	.0	3506.0
1		0045	10	6.	.2	3507.0	1		0905	110	55.	5.3	3515.4	1		1725	210	0.	.0	3506.0
1		0050	11	6.	.2	3506.9	1		0910	111	55.	4.9	3515.2	1		1730	211	0.	.0	3506.0
1		0055	12	5.	.2	3506.8	1		0915	112	54.	4.5	3515.1	1		1735	212	0.	.0	3506.0
1		0100	13	4.	.2	3506.7	1		0920	113	54.	4.2	3514.9	1		1740	213	0.	.0	3506.0
1		0105	14	4.	.1	3506.6	1		0925	114	53.	3.8	3514.8	1		1745	214	0.	.0	3506.0
1		0110	15	3.	.1	3506.5	1		0930	115	53.	3.4	3514.6	1		1750	215	0.	.0	3506.0
1		0115	16	3.	.1	3506.5	1		0935	116	52.	3.1	3514.5	1		1755	216	0.	.0	3506.0
1		0120	17	4.	.1	3506.6	1		0940	117	52.	2.7	3514.3	1		1800	217	0.	.0	3506.0
1		0125	18	4.	.2	3506.6	1		0945	118	51.	2.4	3514.2	1		1805	218	0.	.0	3506.0
1		0130	19	5.	.2	3506.8	1		0950	119	51.	2.0	3514.0	1		1810	219	0.	.0	3506.0
1		0135	20	6.	.2	3507.0	1		0955	120	45.	1.7	3513.1	1		1815	220	0.	.0	3506.0
1		0140	21	8.	.3	3507.3	1		1000	121	37.	1.4	3511.9	1		1820	221	0.	.0	3506.0
1		0145	22	9.	.4	3507.5	1		1005	122	31.	1.2	3510.9	1		1825	222	0.	.0	3506.0
1		0150	23	10.	.4	3507.6	1		1010	123	26.	1.0	3510.1	1		1830	223	0.	.0	3506.0
1		0155	24	10.	.4	3507.6	1		1015	124	21.	.8	3509.4	1		1835	224	0.	.0	3506.0
1		0200	25	10.	.4	3507.6	1		1020	125	18.	.7	3508.8	1		1840	225	0.	.0	3506.0
1		0205	26	9.	.3	3507.4	1		1025	126	15.	.6	3508.4	1		1845	226	0.	.0	3506.0
1		0210	27	8.	.3	3507.3	1		1030	127	12.	.5	3508.0	1		1850	227	0.	.0	3506.0
1		0215	28	9.	.3	3507.4	1		1035	128	10.	.4	3507.6	1		1855	228	0.	.0	3506.0
1		0220	29	11.	.4	3507.7	1		1040	129	9.	.3	3507.4	1		1900	229	0.	.0	3506.0
1		0225	30	13.	.5	3508.1	1		1045	130	7.	.3	3507.1	1		1905	230	0.	.0	3506.0
1		0230	31	15.	.6	3508.4	1		1050	131	6.	.2	3506.9	1		1910	231	0.	.0	3506.0
1		0235	32	16.	.6	3508.6	1		1055	132	5.	.2	3506.8	1		1915	232	0.	.0	3506.0
1		0240	33	17.	.6	3508.6	1		1100	133	4.	.2	3506.6	1		1920	233	0.	.0	3506.0
1		0245	34	18.	.7	3508.8	1		1105	134	3.	.1	3506.5	1		1925	234	0.	.0	3506.0
1		0250	35	19.	.7	3509.0	1		1110	135	3.	.1	3506.4	1		1930	235	0.	.0	3506.0
1		0255	36	19.	.7	3509.1	1		1115	136	2.	.1	3506.4	1		1935	236	0.	.0	3506.0
1		0300	37	19.	.7	3509.1	1		1120	137	2.	.1	3506.3	1		1940	237	0.	.0	3506.0
1		0305	38	21.	.8	3509.3	1		1125	138	2.	.1	3506.3	1		1945	238	0.	.0	3506.0
1		0310	39	26.	1.0	3510.1	1		1130	139	1.	.1	3506.2	1		1950	239	0.	.0	3506.0
1		0315	40	37.	1.4	3511.9	1		1135	140	1.	.0	3506.2	1		1955	240	0.	.0	3506.0
1		0320	41	51.	2.3	3514.2	1		1140	141	1.	.0	3506.1	1		2000	241	0.	.0	3506.0
1		0325	42	53.	4.0	3514.8	1		1145	142	1.	.0	3506.1	1		2005	242	0.	.0	3506.0
1		0330	43	57.	6.6	3515.9	1		1150	143	1.	.0	3506.1	1		2010	243	0.	.0	3506.0
1		0335	44	60.	9.9	3517.0	1		1155	144	1.	.0	3506.1	1		2015	244	0.	.0	3506.0
1		0340	45	63.	13.1	3518.0	1		1200	145	0.	.0	3506.1	1		2020	245	0.	.0	3506.0
1		0345	46	65.	15.7	3518.7	1		1205	146	0.	.0	3506.1	1		2025	246	0.	.0	3506.0
1		0350	47	67.	17.6	3519.2	1		1210	147	0.	.0	3506.0	1		2030	247	0.	.0	3506.0
1		0355	48	68.	19.0	3519.6	1		1215	148	0.	.0	3506.0	1		2035	248	0.	.0	3506.0
1		0400	49	69.	19.9	3519.8	1		1220	149	0.	.0	3506.0	1		2040	249	0.	.0	3506.0
1		0405	50	69.	20.5	3520.0	1		1225	150	0.	.0	3506.0	1		2045	250	0.	.0	3506.0
1		0410	51	69.	21.0	3520.1	1		1230	151	0.	.0	3506.0	1		2050	251	0.	.0	3506.0
1		0415	52	69.	21.2	3520.1	1		1235	152	0.	.0	3506.0	1		2055	252	0.	.0	3506.0
1		0420	53	69.	21.2	3520.1	1		1240	153	0.	.0	3506.0	1		2100	253	0.	.0	3506.0
1		0425	54	70.	21.3	3520.2	1		1245	154	0.	.0	3506.0	1		2105	254	0.	.0	3506.0
1		0430	55	70.	21.4	3520.2	1		1250	155	0.	.0	3506.0	1		2110	255	0.	.0	3506.0
1		0435	56	70.	21.8	3520.3	1		1255	156	0.	.0	3506.0	1		2115	256	0.	.0	3506.0
1		0440	57	70.	22.2	3520.4	1		1300	157	0.	.0	3506.0	1		2120	257	0.	.0	3506.0
1		0445	58	70.	22.7	3520.5	1		1305	158	0.	.0	3506.0	1		2125	258	0.	.0	3506.0
1		0450	59	71.	23.1	3520.6	1		1310	159	0.	.0	3506.0	1		2130	259	0.	.0	3506.0
1		0455	60	71.	23.6	3520.7	1		1315	160	0.	.0	3506.0	1		2135	260	0.	.0	3506.0
1		0500	61	71.	24.0	3520.8	1		1320	161	0.	.0	3506.0	1		2140	261	0.	.0	3506.0
1		0505	62	71.	24.2	3520.8	1		1325	162	0.	.0	3506.0	1		2145	262	0.	.0	3506.0
1		0510	63	71.	24.3	3520.8	1		1330	163	0.	.0	3506.0	1		2150	263	0.	.0	3506.0
1		0515	64	71.	24.2	3520.8	1		1335	164	0.	.0	3506.0	1		2155	264	0.	.0	3506.0
1		0520	65	71.	24.0	3520.8	1		1340	165	0.	.0	3506.0	1		2200	265	0.	.0	3506.0
1		0525	66	71.	23.7	3520.7	1		1345	166	0.	.0	3506.0	1		2205	266	0.	.0	3506.0
1		0530	67	71.	23.4	3520.6	1		1350	167	0.	.0	3506.0	1		2210	267	0.	.0	3506.0
1		0535	68	71.	23.0	3520.6	1		1355	168	0.	.0	3506.0	1		2215	268	0.	.0	3506.0
1		0540	69	70.	22.6	3520.5	1		1400	169	0.	.0	3506.0	1		2220	269	0.	.0	3506.0
1		0545	70	70.	22.3	3520.4	1		1405	170	0.	.0	3506.0	1		2225	270	0.	.0	3506.0
1		0550	71	70.	21.9	3520.3	1		1410	171	0.	.0	3506.0	1		2230	271	0.	.0	3506.0
1		0555	72	70.	21.5	3520.2	1		1415	172	0.	.0	3506.0	1		2235	272	0.	.0	3506.0
1		0600	73	69.	21.1	3520.1	1		1420	173	0.	.0	3506.0	1		2240	273	0.	.0	3506.0

1	0605	74	69.	20.7	3520.0	*	1	1425	174	0.	.0	3506.0	*	1	2245	274	0.	.0	3506.0
1	0610	75	69.	20.3	3519.9	*	1	1430	175	0.	.0	3506.0	*	1	2250	275	0.	.0	3506.0
1	0615	76	69.	19.8	3519.8	*	1	1435	176	0.	.0	3506.0	*	1	2255	276	0.	.0	3506.0
1	0620	77	68.	19.4	3519.7	*	1	1440	177	0.	.0	3506.0	*	1	2300	277	0.	.0	3506.0
1	0625	78	68.	18.9	3519.6	*	1	1445	178	0.	.0	3506.0	*	1	2305	278	0.	.0	3506.0
1	0630	79	68.	18.5	3519.4	*	1	1450	179	0.	.0	3506.0	*	1	2310	279	0.	.0	3506.0
1	0635	80	67.	18.0	3519.3	*	1	1455	180	0.	.0	3506.0	*	1	2315	280	0.	.0	3506.0
1	0640	81	67.	17.6	3519.2	*	1	1500	181	0.	.0	3506.0	*	1	2320	281	0.	.0	3506.0
1	0645	82	66.	17.1	3519.1	*	1	1505	182	0.	.0	3506.0	*	1	2325	282	0.	.0	3506.0
1	0650	83	66.	16.7	3518.9	*	1	1510	183	0.	.0	3506.0	*	1	2330	283	0.	.0	3506.0
1	0655	84	66.	16.2	3518.8	*	1	1515	184	0.	.0	3506.0	*	1	2335	284	0.	.0	3506.0
1	0700	85	65.	15.8	3518.7	*	1	1520	185	0.	.0	3506.0	*	1	2340	285	0.	.0	3506.0
1	0705	86	65.	15.3	3518.6	*	1	1525	186	0.	.0	3506.0	*	1	2345	286	0.	.0	3506.0
1	0710	87	65.	14.9	3518.4	*	1	1530	187	0.	.0	3506.0	*	1	2350	287	0.	.0	3506.0
1	0715	88	64.	14.4	3518.3	*	1	1535	188	0.	.0	3506.0	*	1	2355	288	0.	.0	3506.0
1	0720	89	64.	14.0	3518.2	*	1	1540	189	0.	.0	3506.0	*	2	0000	289	0.	.0	3506.0
1	0725	90	64.	13.5	3518.1	*	1	1545	190	0.	.0	3506.0	*	2	0005	290	0.	.0	3506.0
1	0730	91	63.	13.1	3518.0	*	1	1550	191	0.	.0	3506.0	*	2	0010	291	0.	.0	3506.0
1	0735	92	63.	12.7	3517.8	*	1	1555	192	0.	.0	3506.0	*	2	0015	292	0.	.0	3506.0
1	0740	93	63.	12.2	3517.7	*	1	1600	193	0.	.0	3506.0	*	2	0020	293	0.	.0	3506.0
1	0745	94	62.	11.8	3517.6	*	1	1605	194	0.	.0	3506.0	*	2	0025	294	0.	.0	3506.0
1	0750	95	62.	11.4	3517.4	*	1	1610	195	0.	.0	3506.0	*	2	0030	295	0.	.0	3506.0
1	0755	96	61.	10.9	3517.3	*	1	1615	196	0.	.0	3506.0	*	2	0035	296	0.	.0	3506.0
1	0800	97	61.	10.5	3517.2	*	1	1620	197	0.	.0	3506.0	*	2	0040	297	0.	.0	3506.0
1	0805	98	61.	10.1	3517.0	*	1	1625	198	0.	.0	3506.0	*	2	0045	298	0.	.0	3506.0
1	0810	99	60.	9.7	3516.9	*	1	1630	199	0.	.0	3506.0	*	2	0050	299	0.	.0	3506.0
1	0815	100	60.	9.3	3516.8	*	1	1635	200	0.	.0	3506.0	*	2	0055	300	0.	.0	3506.0
						*							*						

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
	(CFS)				
+ 71.	5.17	65.	20.	19.	19.
	(INCHES)	.476	.578	.578	.578
	(AC-FT)	32.	39.	39.	39.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
24.	5.17	16.	4.	4.	4.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
3520.84	5.17	3518.57	3509.70	3509.56	3509.56

CUMULATIVE AREA = 1.27 SQ MI

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HYDROGRAPH AT STATION GPDB
PLAN 1, RATIO = .98

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	3506.0	1		0820	101	59.	8.1	3516.4	1		1640	201	0.	.0	3506.0
1		0005	2	0.	.0	3506.0	1		0825	102	58.	7.7	3516.3	1		1645	202	0.	.0	3506.0
1		0010	3	0.	.0	3506.0	1		0830	103	58.	7.3	3516.2	1		1650	203	0.	.0	3506.0
1		0015	4	0.	.0	3506.1	1		0835	104	58.	6.9	3516.0	1		1655	204	0.	.0	3506.0
1		0020	5	1.	.0	3506.1	1		0840	105	57.	6.5	3515.9	1		1700	205	0.	.0	3506.0
1		0025	6	2.	.1	3506.3	1		0845	106	56.	6.1	3515.7	1		1705	206	0.	.0	3506.0
1		0030	7	3.	.1	3506.5	1		0850	107	56.	5.7	3515.6	1		1710	207	0.	.0	3506.0
1		0035	8	5.	.2	3506.7	1		0855	108	55.	5.4	3515.4	1		1715	208	0.	.0	3506.0
1		0040	9	6.	.2	3506.9	1		0900	109	55.	5.0	3515.3	1		1720	209	0.	.0	3506.0
1		0045	10	6.	.2	3507.0	1		0905	110	54.	4.6	3515.1	1		1725	210	0.	.0	3506.0
1		0050	11	6.	.2	3506.9	1		0910	111	54.	4.2	3515.0	1		1730	211	0.	.0	3506.0
1		0055	12	5.	.2	3506.8	1		0915	112	53.	3.9	3514.8	1		1735	212	0.	.0	3506.0
1		0100	13	4.	.2	3506.7	1		0920	113	53.	3.5	3514.7	1		1740	213	0.	.0	3506.0
1		0105	14	4.	.1	3506.6	1		0925	114	52.	3.1	3514.5	1		1745	214	0.	.0	3506.0
1		0110	15	3.	.1	3506.5	1		0930	115	52.	2.8	3514.4	1		1750	215	0.	.0	3506.0
1		0115	16	3.	.1	3506.5	1		0935	116	51.	2.4	3514.2	1		1755	216	0.	.0	3506.0
1		0120	17	4.	.1	3506.6	1		0940	117	51.	2.1	3514.1	1		1800	217	0.	.0	3506.0
1		0125	18	4.	.1	3506.6	1		0945	118	46.	1.7	3513.3	1		1805	218	0.	.0	3506.0
1		0130	19	5.	.2	3506.8	1		0950	119	39.	1.4	3512.1	1		1810	219	0.	.0	3506.0
1		0135	20	6.	.2	3507.0	1		0955	120	32.	1.2	3511.1	1		1815	220	0.	.0	3506.0
1		0140	21	8.	.3	3507.2	1		1000	121	27.	1.0	3510.2	1		1820	221	0.	.0	3506.0
1		0145	22	9.	.3	3507.4	1		1005	122	22.	.8	3509.5	1		1825	222	0.	.0	3506.0
1		0150	23	10.	.4	3507.6	1		1010	123	18.	.7	3508.9	1		1830	223	0.	.0	3506.0
1		0155	24	10.	.4	3507.6	1		1015	124	15.	.6	3508.4	1		1835	224	0.	.0	3506.0
1		0200	25	10.	.4	3507.5	1		1020	125	13.	.5	3508.0	1		1840	225	0.	.0	3506.0
1		0205	26	9.	.3	3507.4	1		1025	126	11.	.4	3507.7	1		1845	226	0.	.0	3506.0
1		0210	27	8.	.3	3507.3	1		1030	127	9.	.3	3507.4	1		1850	227	0.	.0	3506.0
1		0215	28	9.	.3	3507.4	1		1035	128	7.	.3	3507.2	1		1855	228	0.	.0	3506.0
1		0220	29	10.	.4	3507.6	1		1040	129	6.	.2	3507.0	1		1900	229	0.	.0	3506.0
1		0225	30	13.	.5	3508.0	1		1045	130	5.	.2	3506.8	1		1905	230	0.	.0	3506.0
1		0230	31	15.	.6	3508.3	1		1050	131	4.	.2	3506.7	1		1910	231	0.	.0	3506.0

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   1     0235  32      16.       .6  3508.5 *  1     1055 132       4.       .1  3506.6 *  1     1915 232       0.       .0  3506.0
   1     0240  33      16.       .6  3508.5 *  1     1100 133       3.       .1  3506.5 *  1     1920 233       0.       .0  3506.0
   1     0245  34      17.       .6  3508.7 *  1     1105 134       2.       .1  3506.4 *  1     1925 234       0.       .0  3506.0
   1     0250  35      18.       .7  3508.9 *  1     1110 135       2.       .1  3506.3 *  1     1930 235       0.       .0  3506.0
   1     0255  36      19.       .7  3508.9 *  1     1115 136       2.       .1  3506.3 *  1     1935 236       0.       .0  3506.0
   1     0300  37      19.       .7  3508.9 *  1     1120 137       1.       .1  3506.2 *  1     1940 237       0.       .0  3506.0
   1     0305  38      20.       .7  3509.1 *  1     1125 138       1.       .0  3506.2 *  1     1945 238       0.       .0  3506.0
   1     0310  39      25.       .9  3509.9 *  1     1130 139       1.       .0  3506.2 *  1     1950 239       0.       .0  3506.0
   1     0315  40      36.      1.4  3511.7 *  1     1135 140       1.       .0  3506.1 *  1     1955 240       0.       .0  3506.0
   1     0320  41      51.      2.2  3514.1 *  1     1140 141       1.       .0  3506.1 *  1     2000 241       0.       .0  3506.0
   1     0325  42      53.      3.8  3514.8 *  1     1145 142       1.       .0  3506.1 *  1     2005 242       0.       .0  3506.0
   1     0330  43      57.      6.4  3515.8 *  1     1150 143       0.       .0  3506.1 *  1     2010 243       0.       .0  3506.0
   1     0335  44      60.      9.6  3516.9 *  1     1155 144       0.       .0  3506.1 *  1     2015 244       0.       .0  3506.0
   1     0340  45      63.     12.7  3517.8 *  1     1200 145       0.       .0  3506.1 *  1     2020 245       0.       .0  3506.0
   1     0345  46      65.     15.2  3518.5 *  1     1205 146       0.       .0  3506.0 *  1     2025 246       0.       .0  3506.0
   1     0350  47      66.     17.0  3519.0 *  1     1210 147       0.       .0  3506.0 *  1     2030 247       0.       .0  3506.0
   1     0355  48      67.     18.3  3519.4 *  1     1215 148       0.       .0  3506.0 *  1     2035 248       0.       .0  3506.0
   1     0400  49      68.     19.2  3519.6 *  1     1220 149       0.       .0  3506.0 *  1     2040 249       0.       .0  3506.0
   1     0405  50      69.     19.9  3519.8 *  1     1225 150       0.       .0  3506.0 *  1     2045 250       0.       .0  3506.0
   1     0410  51      69.     20.3  3519.9 *  1     1230 151       0.       .0  3506.0 *  1     2050 251       0.       .0  3506.0
   1     0415  52      69.     20.5  3520.0 *  1     1235 152       0.       .0  3506.0 *  1     2055 252       0.       .0  3506.0
   1     0420  53      69.     20.5  3520.0 *  1     1240 153       0.       .0  3506.0 *  1     2100 253       0.       .0  3506.0
   1     0425  54      69.     20.6  3520.0 *  1     1245 154       0.       .0  3506.0 *  1     2105 254       0.       .0  3506.0
   1     0430  55      69.     20.7  3520.0 *  1     1250 155       0.       .0  3506.0 *  1     2110 255       0.       .0  3506.0
   1     0435  56      69.     21.0  3520.1 *  1     1255 156       0.       .0  3506.0 *  1     2115 256       0.       .0  3506.0
   1     0440  57      70.     21.4  3520.2 *  1     1300 157       0.       .0  3506.0 *  1     2120 257       0.       .0  3506.0
   1     0445  58      70.     21.9  3520.3 *  1     1305 158       0.       .0  3506.0 *  1     2125 258       0.       .0  3506.0
   1     0450  59      70.     22.3  3520.4 *  1     1310 159       0.       .0  3506.0 *  1     2130 259       0.       .0  3506.0
   1     0455  60      70.     22.8  3520.5 *  1     1315 160       0.       .0  3506.0 *  1     2135 260       0.       .0  3506.0
   1     0500  61      71.     23.1  3520.6 *  1     1320 161       0.       .0  3506.0 *  1     2140 261       0.       .0  3506.0
   1     0505  62      71.     23.4  3520.6 *  1     1325 162       0.       .0  3506.0 *  1     2145 262       0.       .0  3506.0
   1     0510  63      71.     23.4  3520.6 *  1     1330 163       0.       .0  3506.0 *  1     2150 263       0.       .0  3506.0
   1     0515  64      71.     23.3  3520.6 *  1     1335 164       0.       .0  3506.0 *  1     2155 264       0.       .0  3506.0
   1     0520  65      71.     23.1  3520.6 *  1     1340 165       0.       .0  3506.0 *  1     2200 265       0.       .0  3506.0
   1     0525  66      70.     22.8  3520.5 *  1     1345 166       0.       .0  3506.0 *  1     2205 266       0.       .0  3506.0
   1     0530  67      70.     22.5  3520.4 *  1     1350 167       0.       .0  3506.0 *  1     2210 267       0.       .0  3506.0
   1     0535  68      70.     22.1  3520.4 *  1     1355 168       0.       .0  3506.0 *  1     2215 268       0.       .0  3506.0
   1     0540  69      70.     21.8  3520.3 *  1     1400 169       0.       .0  3506.0 *  1     2220 269       0.       .0  3506.0
   1     0545  70      70.     21.4  3520.2 *  1     1405 170       0.       .0  3506.0 *  1     2225 270       0.       .0  3506.0
   1     0550  71      69.     21.0  3520.1 *  1     1410 171       0.       .0  3506.0 *  1     2230 271       0.       .0  3506.0
   1     0555  72      69.     20.6  3520.0 *  1     1415 172       0.       .0  3506.0 *  1     2235 272       0.       .0  3506.0
   1     0600  73      69.     20.2  3519.9 *  1     1420 173       0.       .0  3506.0 *  1     2240 273       0.       .0  3506.0
   1     0605  74      69.     19.8  3519.8 *  1     1425 174       0.       .0  3506.0 *  1     2245 274       0.       .0  3506.0
   1     0610  75      68.     19.4  3519.7 *  1     1430 175       0.       .0  3506.0 *  1     2250 275       0.       .0  3506.0
   1     0615  76      68.     19.0  3519.6 *  1     1435 176       0.       .0  3506.0 *  1     2255 276       0.       .0  3506.0
   1     0620  77      68.     18.5  3519.4 *  1     1440 177       0.       .0  3506.0 *  1     2300 277       0.       .0  3506.0
   1     0625  78      67.     18.1  3519.3 *  1     1445 178       0.       .0  3506.0 *  1     2305 278       0.       .0  3506.0
   1     0630  79      67.     17.6  3519.2 *  1     1450 179       0.       .0  3506.0 *  1     2310 279       0.       .0  3506.0
   1     0635  80      67.     17.2  3519.1 *  1     1455 180       0.       .0  3506.0 *  1     2315 280       0.       .0  3506.0
   1     0640  81      66.     16.7  3519.0 *  1     1500 181       0.       .0  3506.0 *  1     2320 281       0.       .0  3506.0
   1     0645  82      66.     16.3  3518.8 *  1     1505 182       0.       .0  3506.0 *  1     2325 282       0.       .0  3506.0
   1     0650  83      65.     15.8  3518.7 *  1     1510 183       0.       .0  3506.0 *  1     2330 283       0.       .0  3506.0
   1     0655  84      65.     15.4  3518.6 *  1     1515 184       0.       .0  3506.0 *  1     2335 284       0.       .0  3506.0
   1     0700  85      65.     14.9  3518.5 *  1     1520 185       0.       .0  3506.0 *  1     2340 285       0.       .0  3506.0
   1     0705  86      64.     14.5  3518.3 *  1     1525 186       0.       .0  3506.0 *  1     2345 286       0.       .0  3506.0
   1     0710  87      64.     14.0  3518.2 *  1     1530 187       0.       .0  3506.0 *  1     2350 287       0.       .0  3506.0
   1     0715  88      64.     13.6  3518.1 *  1     1535 188       0.       .0  3506.0 *  1     2355 288       0.       .0  3506.0
   1     0720  89      63.     13.2  3518.0 *  1     1540 189       0.       .0  3506.0 *  2     0000 289       0.       .0  3506.0
   1     0725  90      63.     12.7  3517.9 *  1     1545 190       0.       .0  3506.0 *  2     0005 290       0.       .0  3506.0
   1     0730  91      63.     12.3  3517.7 *  1     1550 191       0.       .0  3506.0 *  2     0010 291       0.       .0  3506.0
   1     0735  92      62.     11.9  3517.6 *  1     1555 192       0.       .0  3506.0 *  2     0015 292       0.       .0  3506.0
   1     0740  93      62.     11.4  3517.4 *  1     1600 193       0.       .0  3506.0 *  2     0020 293       0.       .0  3506.0
   1     0745  94      61.     11.0  3517.3 *  1     1605 194       0.       .0  3506.0 *  2     0025 294       0.       .0  3506.0
   1     0750  95      61.     10.6  3517.2 *  1     1610 195       0.       .0  3506.0 *  2     0030 295       0.       .0  3506.0
   1     0755  96      61.     10.2  3517.1 *  1     1615 196       0.       .0  3506.0 *  2     0035 296       0.       .0  3506.0
   1     0800  97      60.      9.8  3516.9 *  1     1620 197       0.       .0  3506.0 *  2     0040 297       0.       .0  3506.0
   1     0805  98      60.      9.3  3516.8 *  1     1625 198       0.       .0  3506.0 *  2     0045 298       0.       .0  3506.0
   1     0810  99      59.      8.9  3516.7 *  1     1630 199       0.       .0  3506.0 *  2     0050 299       0.       .0  3506.0
   1     0815 100      59.      8.5  3516.5 *  1     1635 200       0.       .0  3506.0 *  2     0055 300       0.       .0  3506.0
                                           *                                                 *
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  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                    6-HR        24-HR        72-HR     24.92-HR
+   (CFS)       (HR)
                          (CFS)
+      71.      5.17                 64.          19.          18.          18.
                         (INCHES)    .471         .562         .562         .562
                          (AC-FT)     32.          38.          38.          38.

  PEAK STORAGE  TIME                      MAXIMUM AVERAGE STORAGE
                                    6-HR        24-HR        72-HR     24.92-HR
+  (AC-FT)      (HR)
       23.      5.17                 15.           4.           4.           4.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                    6-HR        24-HR        72-HR     24.92-HR
+   (FEET)      (HR)
   3520.64      5.17              3518.35      3509.58      3509.45      3509.45

                        CUMULATIVE AREA =    1.27 SQ MI
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HYDROGRAPH AT STATION GPDB
PLAN 1, RATIO = .95

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	3506.0	1		0820	101	58.	6.9	3516.0	1		1640	201	0.	.0	3506.0
1		0005	2	0.	.0	3506.0	1		0825	102	57.	6.5	3515.9	1		1645	202	0.	.0	3506.0
1		0010	3	0.	.0	3506.0	1		0830	103	56.	6.1	3515.7	1		1650	203	0.	.0	3506.0
1		0015	4	0.	.0	3506.1	1		0835	104	56.	5.8	3515.6	1		1655	204	0.	.0	3506.0
1		0020	5	1.	.0	3506.1	1		0840	105	55.	5.4	3515.4	1		1700	205	0.	.0	3506.0
1		0025	6	2.	.1	3506.3	1		0845	106	55.	5.0	3515.3	1		1705	206	0.	.0	3506.0
1		0030	7	3.	.1	3506.5	1		0850	107	54.	4.6	3515.1	1		1710	207	0.	.0	3506.0
1		0035	8	4.	.2	3506.7	1		0855	108	54.	4.2	3515.0	1		1715	208	0.	.0	3506.0
1		0040	9	5.	.2	3506.9	1		0900	109	53.	3.9	3514.8	1		1720	209	0.	.0	3506.0
1		0045	10	6.	.2	3506.9	1		0905	110	53.	3.5	3514.7	1		1725	210	0.	.0	3506.0
1		0050	11	5.	.2	3506.8	1		0910	111	52.	3.2	3514.5	1		1730	211	0.	.0	3506.0
1		0055	12	5.	.2	3506.7	1		0915	112	52.	2.8	3514.4	1		1735	212	0.	.0	3506.0
1		0100	13	4.	.1	3506.6	1		0920	113	51.	2.4	3514.2	1		1740	213	0.	.0	3506.0
1		0105	14	3.	.1	3506.5	1		0925	114	51.	2.1	3514.1	1		1745	214	0.	.0	3506.0
1		0110	15	3.	.1	3506.5	1		0930	115	47.	1.8	3513.4	1		1750	215	0.	.0	3506.0
1		0115	16	3.	.1	3506.5	1		0935	116	39.	1.5	3512.1	1		1755	216	0.	.0	3506.0
1		0120	17	3.	.1	3506.5	1		0940	117	32.	1.2	3511.1	1		1800	217	0.	.0	3506.0
1		0125	18	4.	.1	3506.6	1		0945	118	27.	1.0	3510.2	1		1805	218	0.	.0	3506.0
1		0130	19	5.	.2	3506.7	1		0950	119	22.	.8	3509.5	1		1810	219	0.	.0	3506.0
1		0135	20	6.	.2	3506.9	1		0955	120	19.	.7	3508.9	1		1815	220	0.	.0	3506.0
1		0140	21	7.	.3	3507.2	1		1000	121	15.	.6	3508.4	1		1820	221	0.	.0	3506.0
1		0145	22	9.	.3	3507.3	1		1005	122	13.	.5	3508.0	1		1825	222	0.	.0	3506.0
1		0150	23	9.	.3	3507.5	1		1010	123	11.	.4	3507.7	1		1830	223	0.	.0	3506.0
1		0155	24	9.	.4	3507.5	1		1015	124	9.	.3	3507.4	1		1835	224	0.	.0	3506.0
1		0200	25	9.	.3	3507.4	1		1020	125	7.	.3	3507.2	1		1840	225	0.	.0	3506.0
1		0205	26	8.	.3	3507.3	1		1025	126	6.	.2	3507.0	1		1845	226	0.	.0	3506.0
1		0210	27	8.	.3	3507.2	1		1030	127	5.	.2	3506.8	1		1850	227	0.	.0	3506.0
1		0215	28	8.	.3	3507.3	1		1035	128	4.	.2	3506.7	1		1855	228	0.	.0	3506.0
1		0220	29	10.	.4	3507.5	1		1040	129	4.	.1	3506.6	1		1900	229	0.	.0	3506.0
1		0225	30	12.	.4	3507.9	1		1045	130	3.	.1	3506.5	1		1905	230	0.	.0	3506.0
1		0230	31	14.	.5	3508.2	1		1050	131	2.	.1	3506.4	1		1910	231	0.	.0	3506.0
1		0235	32	15.	.5	3508.3	1		1055	132	2.	.1	3506.3	1		1915	232	0.	.0	3506.0
1		0240	33	15.	.6	3508.4	1		1100	133	2.	.1	3506.3	1		1920	233	0.	.0	3506.0
1		0245	34	16.	.6	3508.5	1		1105	134	1.	.1	3506.2	1		1925	234	0.	.0	3506.0
1		0250	35	17.	.6	3508.7	1		1110	135	1.	.0	3506.2	1		1930	235	0.	.0	3506.0
1		0255	36	18.	.7	3508.8	1		1115	136	1.	.0	3506.2	1		1935	236	0.	.0	3506.0
1		0300	37	17.	.7	3508.8	1		1120	137	1.	.0	3506.1	1		1940	237	0.	.0	3506.0
1		0305	38	19.	.7	3509.0	1		1125	138	1.	.0	3506.1	1		1945	238	0.	.0	3506.0
1		0310	39	23.	.9	3509.7	1		1130	139	1.	.0	3506.1	1		1950	239	0.	.0	3506.0
1		0315	40	34.	1.3	3511.4	1		1135	140	0.	.0	3506.1	1		1955	240	0.	.0	3506.0
1		0320	41	51.	2.1	3514.1	1		1140	141	0.	.0	3506.1	1		2000	241	0.	.0	3506.0
1		0325	42	53.	3.6	3514.7	1		1145	142	0.	.0	3506.1	1		2005	242	0.	.0	3506.0
1		0330	43	56.	6.0	3515.7	1		1150	143	0.	.0	3506.0	1		2010	243	0.	.0	3506.0
1		0335	44	60.	9.1	3516.7	1		1155	144	0.	.0	3506.0	1		2015	244	0.	.0	3506.0
1		0340	45	62.	12.0	3517.6	1		1200	145	0.	.0	3506.0	1		2020	245	0.	.0	3506.0
1		0345	46	64.	14.3	3518.3	1		1205	146	0.	.0	3506.0	1		2025	246	0.	.0	3506.0
1		0350	47	66.	16.1	3518.8	1		1210	147	0.	.0	3506.0	1		2030	247	0.	.0	3506.0
1		0355	48	67.	17.4	3519.1	1		1215	148	0.	.0	3506.0	1		2035	248	0.	.0	3506.0
1		0400	49	67.	18.2	3519.4	1		1220	149	0.	.0	3506.0	1		2040	249	0.	.0	3506.0
1		0405	50	68.	18.8	3519.5	1		1225	150	0.	.0	3506.0	1		2045	250	0.	.0	3506.0
1		0410	51	68.	19.2	3519.6	1		1230	151	0.	.0	3506.0	1		2050	251	0.	.0	3506.0
1		0415	52	68.	19.3	3519.7	1		1235	152	0.	.0	3506.0	1		2055	252	0.	.0	3506.0
1		0420	53	68.	19.4	3519.7	1		1240	153	0.	.0	3506.0	1		2100	253	0.	.0	3506.0
1		0425	54	68.	19.4	3519.7	1		1245	154	0.	.0	3506.0	1		2105	254	0.	.0	3506.0
1		0430	55	68.	19.5	3519.7	1		1250	155	0.	.0	3506.0	1		2110	255	0.	.0	3506.0
1		0435	56	69.	19.8	3519.8	1		1255	156	0.	.0	3506.0	1		2115	256	0.	.0	3506.0
1		0440	57	69.	20.2	3519.9	1		1300	157	0.	.0	3506.0	1		2120	257	0.	.0	3506.0
1		0445	58	69.	20.6	3520.0	1		1305	158	0.	.0	3506.0	1		2125	258	0.	.0	3506.0
1		0450	59	69.	21.0	3520.1	1		1310	159	0.	.0	3506.0	1		2130	259	0.	.0	3506.0
1		0455	60	70.	21.4	3520.2	1		1315	160	0.	.0	3506.0	1		2135	260	0.	.0	3506.0
1		0500	61	70.	21.8	3520.3	1		1320	161	0.	.0	3506.0	1		2140	261	0.	.0	3506.0
1		0505	62	70.	22.0	3520.3	1		1325	162	0.	.0	3506.0	1		2145	262	0.	.0	3506.0
1		0510	63	70.	22.0	3520.3	1		1330	163	0.	.0	3506.0	1		2150	263	0.	.0	3506.0
1		0515	64	70.	21.9	3520.3	1		1335	164	0.	.0	3506.0	1		2155	264	0.	.0	3506.0
1		0520	65	70.	21.7	3520.2	1		1340	165	0.	.0	3506.0	1		2200	265	0.	.0	3506.0
1		0525	66	70.	21.4	3520.2	1		1345	166	0.	.0	3506.0	1		2205	266	0.	.0	3506.0
1		0530	67	69.	21.1	3520.1	1		1350	167	0.	.0	3506.0	1		2210	267	0.	.0	3506.0
1		0535	68	69.	20.7	3520.0	1		1355	168	0.	.0	3506.0	1		2215	268	0.	.0	3506.0
1		0540	69	69.	20.4	3519.9	1		1400	169	0.	.0	3506.0	1		2220	269	0.	.0	3506.0
1		0545	70	69.	20.0	3519.8	1		1405	170	0.	.0	3506.0	1		2225	270	0.	.0	3506.0
1		0550	71	68.	19.6	3519.7	1		1410	171	0.	.0	3506.0	1		2230	271	0.	.0	3506.0
1		0555	72	68.	19.2	3519.6	1		1415	172	0.	.0	3506.0	1		2235	272	0.	.0	3506.0
1		0600	73	68.	18.8	3519.5	1		1420	173	0.	.0	3506.0	1		2240	273	0.	.0	3506.0
1		0605	74	67.	18.4	3519.4	1		1425	174	0.	.0	3506.0	1		2245	274	0.	.0	3506.0
1		0610	75	67.	18.0	3519.3	1		1430	175	0.	.0	3506.0	1		2250	275	0.	.0	3506.0
1		0615	76	67.	17.6	3519.2	1		1435	176	0.	.0	3506.0	1		2255	276	0.	.0	3506.0
1		0620	77	67.	17.2	3519.1	1		1440	177	0.	.0	3506.0	1		2300	277	0.	.0	3506.0
1		0625	78	66.	16.7	3519.0	1		1445	178	0.	.0	3506.0	1		2305	278	0.	.0	3506.0
1		0630	79	66.	16.3	3518.8	1		1450	179	0.	.0	3506.0	1		2310	279	0.	.0	3506.0
1		0635	80	65.	15.8	3518.7	1		1455	180	0.	.0	3506.0	1		2315	280	0.	.0	3506.0

```
   1     0640  81      65.     15.4  3518.6 *  1     1500 181       0.       .0  3506.0 *  1     2320 281       0.       .0  3506.0
   1     0645  82      65.     14.9  3518.5 *  1     1505 182       0.       .0  3506.0 *  1     2325 282       0.       .0  3506.0
   1     0650  83      64.     14.5  3518.4 *  1     1510 183       0.       .0  3506.0 *  1     2330 283       0.       .0  3506.0
   1     0655  84      64.     14.1  3518.2 *  1     1515 184       0.       .0  3506.0 *  1     2335 284       0.       .0  3506.0
   1     0700  85      64.     13.6  3518.1 *  1     1520 185       0.       .0  3506.0 *  1     2340 285       0.       .0  3506.0
   1     0705  86      63.     13.2  3518.0 *  1     1525 186       0.       .0  3506.0 *  1     2345 286       0.       .0  3506.0
   1     0710  87      63.     12.7  3517.9 *  1     1530 187       0.       .0  3506.0 *  1     2350 287       0.       .0  3506.0
   1     0715  88      63.     12.3  3517.7 *  1     1535 188       0.       .0  3506.0 *  1     2355 288       0.       .0  3506.0
   1     0720  89      62.     11.9  3517.6 *  1     1540 189       0.       .0  3506.0 *  2     0000 289       0.       .0  3506.0
   1     0725  90      62.     11.5  3517.5 *  1     1545 190       0.       .0  3506.0 *  2     0005 290       0.       .0  3506.0
   1     0730  91      61.     11.0  3517.3 *  1     1550 191       0.       .0  3506.0 *  2     0010 291       0.       .0  3506.0
   1     0735  92      61.     10.6  3517.2 *  1     1555 192       0.       .0  3506.0 *  2     0015 292       0.       .0  3506.0
   1     0740  93      61.     10.2  3517.1 *  1     1600 193       0.       .0  3506.0 *  2     0020 293       0.       .0  3506.0
   1     0745  94      60.      9.8  3516.9 *  1     1605 194       0.       .0  3506.0 *  2     0025 294       0.       .0  3506.0
   1     0750  95      60.      9.4  3516.8 *  1     1610 195       0.       .0  3506.0 *  2     0030 295       0.       .0  3506.0
   1     0755  96      59.      8.9  3516.7 *  1     1615 196       0.       .0  3506.0 *  2     0035 296       0.       .0  3506.0
   1     0800  97      59.      8.5  3516.5 *  1     1620 197       0.       .0  3506.0 *  2     0040 297       0.       .0  3506.0
   1     0805  98      59.      8.1  3516.4 *  1     1625 198       0.       .0  3506.0 *  2     0045 298       0.       .0  3506.0
   1     0810  99      58.      7.7  3516.3 *  1     1630 199       0.       .0  3506.0 *  2     0050 299       0.       .0  3506.0
   1     0815 100      58.      7.3  3516.2 *  1     1635 200       0.       .0  3506.0 *  2     0055 300       0.       .0  3506.0
                                             *                                             *
 ********************************************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR        24-HR        72-HR     24.92-HR
+   (CFS)       (HR)
                        (CFS)
+      70.      5.17                  63.          18.          18.          18.
                          (INCHES)    .464         .537         .537         .537
                           (AC-FT)     31.          36.          36.          36.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                     6-HR        24-HR        72-HR     24.92-HR
+  (AC-FT)      (HR)
       22.      5.17                  14.           4.           3.           3.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR        24-HR        72-HR     24.92-HR
+   (FEET)      (HR)
   3520.32      5.17               3518.00      3509.40      3509.27      3509.27

                          CUMULATIVE AREA =    1.27 SQ MI

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


                                                                    RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN                    RATIO 1  RATIO 2  RATIO 3
                                                                 .99      .98      .95

 HYDROGRAPH AT
+                 COS12       .00     1   FLOW                    2.       2.       2.
                                           TIME                 3.58     3.58     3.58

 HYDROGRAPH AT
+              V31COS10       .02     1   FLOW                    7.       7.       6.
                                           TIME                 3.58     3.58     3.58

 HYDROGRAPH AT
+                     A       .32     1   FLOW                   54.      52.      47.
                                           TIME                 3.67     3.67     3.67

 HYDROGRAPH AT
+                  COS3       .02     1   FLOW                   12.      12.      11.
                                           TIME                 3.50     3.50     3.50

 HYDROGRAPH AT
+                  ST2A       .00     1   FLOW                    1.       1.       0.
                                           TIME                 3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST1       .01     1   FLOW                    8.       8.       8.
                                           TIME                 3.50     3.50     3.50

  6 COMBINED AT
+                   CP1       .37     1   FLOW                   73.      69.      64.
                                           TIME                 3.58     3.67     3.67

 ROUTED TO
+                  RCP1       .37     1   FLOW                   73.      69.      64.
                                           TIME                 3.67     3.67     3.67

 HYDROGRAPH AT
+              V31COS14       .01     1   FLOW                    5.       5.       5.
                                           TIME                 3.50     3.50     3.50

 HYDROGRAPH AT
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+                  COS2       .02     1   FLOW          11.      11.      10.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                   DC1       .01     1   FLOW           7.       7.       7.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  ST2B       .00     1   FLOW           1.       1.       1.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+              V27COS14       .00     1   FLOW           3.       2.       2.
                                          TIME         3.50     3.50     3.50

  4 COMBINED AT
+                  CP1A       .04     1   FLOW          21.      21.      20.
                                          TIME         3.50     3.50     3.50

 ROUTED TO
+                 RCP1A       .04     1   FLOW          19.      19.      18.
                                          TIME         3.50     3.50     3.58

 HYDROGRAPH AT
+                 COS11       .01     1   FLOW           7.       7.       7.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST2       .00     1   FLOW           4.       4.       4.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST3       .00     1   FLOW           2.       2.       2.
                                          TIME         3.50     3.50     3.50

  6 COMBINED AT
+                   CP2       .43     1   FLOW         106.     101.      95.
                                          TIME         3.58     3.58     3.58

 ROUTED TO
+                  RCP2       .43     1   FLOW         104.     100.      94.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                     M       .12     1   FLOW          26.      25.      23.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                  COS8       .01     1   FLOW           2.       2.       1.
                                          TIME         3.67     3.67     3.67

 HYDROGRAPH AT
+                  COS9       .00     1   FLOW           3.       3.       2.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+              V27COS10       .02     1   FLOW          13.      12.      12.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST4       .00     1   FLOW           3.       3.       3.
                                          TIME         3.50     3.50     3.50

  6 COMBINED AT
+                   CP3       .59     1   FLOW         148.     142.     133.
                                          TIME         3.58     3.58     3.58

 ROUTED TO
+                  RCP3       .59     1   FLOW         141.     135.     127.
                                          TIME         3.67     3.67     3.67

 HYDROGRAPH AT
+                  COS6       .01     1   FLOW           7.       6.       6.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  COS5       .01     1   FLOW           6.       6.       5.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                  COS7       .02     1   FLOW           8.       8.       8.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                     L       .15     1   FLOW          82.      80.      77.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                   ST5       .01     1   FLOW          12.      11.      11.
                                          TIME         3.50     3.50     3.50
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HYDROGRAPH AT							
+	ST14	.01	1	FLOW	9.	9.	9.
				TIME	3.50	3.50	3.50
7 COMBINED AT							
+	CP4	.79	1	FLOW	259.	251.	237.
				TIME	3.58	3.58	3.58
DIVERSION TO							
+	DVCP4	.79	1	FLOW	259.	251.	237.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	DVCP4	.79	1	FLOW	0.	0.	0.
				TIME	.00	.00	.00
ROUTED TO							
+	RCP4	.79	1	FLOW	0.	0.	0.
				TIME	.00	.00	.00
HYDROGRAPH AT							
+	K	.02	1	FLOW	14.	14.	13.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST17	.00	1	FLOW	2.	2.	2.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CP5	.82	1	FLOW	17.	16.	15.
				TIME	3.50	3.50	3.50
ROUTED TO							
+	RCP5	.82	1	FLOW	16.	15.	15.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	H	.02	1	FLOW	11.	11.	10.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST18	.01	1	FLOW	12.	11.	11.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	I	.02	1	FLOW	9.	9.	9.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST16	.00	1	FLOW	1.	1.	1.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST13	.01	1	FLOW	8.	8.	8.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	G	.03	1	FLOW	29.	28.	27.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	N	.00	1	FLOW	4.	4.	4.
				TIME	3.50	3.50	3.50
5 COMBINED AT							
+	CP6A	.06	1	FLOW	52.	51.	49.
				TIME	3.50	3.50	3.50
4 COMBINED AT							
+	CP6	.90	1	FLOW	91.	89.	85.
				TIME	3.50	3.50	3.50
ROUTED TO							
+	RCP6	.90	1	FLOW	88.	86.	83.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	O	.04	1	FLOW	29.	28.	27.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST19	.00	1	FLOW	4.	3.	3.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CP7	.94	1	FLOW	120.	118.	113.
				TIME	3.50	3.50	3.50
ROUTED TO							
+	RCP7	.94	1	FLOW	117.	115.	110.
				TIME	3.50	3.50	3.50

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 HYDROGRAPH AT
+                     P       .02     1   FLOW          18.      18.      17.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  ST20       .01     1   FLOW           7.       7.       7.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  ST12       .01     1   FLOW           8.       8.       8.
                                           TIME         3.50     3.50     3.50

  4 COMBINED AT
+                   CP8       .98     1   FLOW         151.     148.     143.
                                           TIME         3.50     3.50     3.50

 ROUTED TO
+                  RCP8       .98     1   FLOW         146.     142.     137.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                     E       .04     1   FLOW          42.      41.      40.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                     F       .04     1   FLOW          42.      41.      40.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  COS4       .07     1   FLOW          35.      34.      33.
                                           TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                   ST7       .01     1   FLOW           9.       9.       8.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST6       .00     1   FLOW           6.       6.       5.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                 DVCP4       .00     1   FLOW         259.     251.     237.
                                           TIME         3.58     3.58     3.58

  6 COMBINED AT
+                   CP9       .17     1   FLOW         380.     369.     351.
                                           TIME         3.58     3.58     3.58

 ROUTED TO
+                  RCP9       .17     1   FLOW         372.     360.     342.
                                           TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                   ST8       .00     1   FLOW           5.       5.       5.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  ST21       .00     1   FLOW           4.       4.       4.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  CP1A       .07     1   FLOW          36.      35.      33.
                                           TIME         3.58     3.58     3.58

  4 COMBINED AT
+                  CP10       .25     1   FLOW         413.     400.     380.
                                           TIME         3.58     3.58     3.58

 ROUTED TO
+                 RCP10       .25     1   FLOW         410.     397.     377.
                                           TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                  CP1B       .04     1   FLOW          20.      20.      19.
                                           TIME         3.50     3.50     3.50

  3 COMBINED AT
+                GPDBIN      1.27     1   FLOW         562.     545.     520.
                                           TIME         3.58     3.58     3.58

 ROUTED TO
+                  GPDB      1.27     1   FLOW          71.      71.      70.
                                           TIME         5.17     5.17     5.17

                                    ** PEAK STAGES IN FEET **
                                    1   STAGE     3520.84  3520.64  3520.32
                                           TIME         5.17     5.17     5.17

 ROUTED TO
+                 RGPDB      1.27     1   FLOW          71.      71.      70.
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                                        TIME         5.17     5.17     5.17

 HYDROGRAPH AT
+                    ST9       .00     1   FLOW          5.       5.       5.
                                        TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   CP1C       .05     1   FLOW         24.      23.      22.
                                        TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST10       .00     1   FLOW          4.       4.       4.
                                        TIME         3.50     3.50     3.50

  4 COMBINED AT
+                   CP11      1.32     1   FLOW         89.      88.      86.
                                        TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST11       .01     1   FLOW          6.       6.       6.
                                        TIME         3.50     3.50     3.50
1
                                        SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                            (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                              COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
              RCP1  MANE          .54     72.92    216.00       .30      5.00     72.60    220.00         .30


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5878E+01 EXCESS= .0000E+00 OUTFLOW= .5878E+01 BASIN STORAGE= .7989E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP1  MANE          .55     69.51    216.29       .29      5.00     69.43    220.00         .29


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5657E+01 EXCESS= .0000E+00 OUTFLOW= .5657E+01 BASIN STORAGE= .7942E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP1  MANE          .56     64.29    216.05       .27      5.00     64.24    220.00         .27


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5296E+01 EXCESS= .0000E+00 OUTFLOW= .5296E+01 BASIN STORAGE= .7823E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP1A  MANE         1.83     21.18    212.03       .62      5.00     19.42    210.00         .62


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1175E+01 EXCESS= .0000E+00 OUTFLOW= .1175E+01 BASIN STORAGE= .2207E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP1A  MANE         1.84     20.50    211.65       .61      5.00     18.85    210.00         .61


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1142E+01 EXCESS= .0000E+00 OUTFLOW= .1142E+01 BASIN STORAGE= .1928E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP1A  MANE         1.86     19.58    212.31       .58      5.00     18.11    215.00         .58


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1089E+01 EXCESS= .0000E+00 OUTFLOW= .1089E+01 BASIN STORAGE= .2205E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP2  MANE          .53    105.13    215.86       .35      5.00    104.21    215.00         .35


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .8086E+01 EXCESS= .0000E+00 OUTFLOW= .8086E+01 BASIN STORAGE= .8311E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP2  MANE          .53    100.96    215.43       .34      5.00    100.03    215.00         .34


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7806E+01 EXCESS= .0000E+00 OUTFLOW= .7806E+01 BASIN STORAGE= .8741E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP2  MANE          .54     94.45    215.79       .32      5.00     93.52    215.00         .32
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .7350E+01 EXCESS= .0000E+00 OUTFLOW= .7350E+01 BASIN STORAGE= .8530E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3	MANE	2.04	146.79	217.83	.35	5.00	140.81	220.00	.35	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1099E+02 EXCESS= .0000E+00 OUTFLOW= .1099E+02 BASIN STORAGE= .4174E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3	MANE	2.06	140.88	218.00	.34	5.00	135.17	220.00	.34	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1061E+02 EXCESS= .0000E+00 OUTFLOW= .1061E+02 BASIN STORAGE= .4014E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3	MANE	2.09	131.58	217.55	.32	5.00	127.07	220.00	.32	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9982E+01 EXCESS= .0000E+00 OUTFLOW= .9983E+01 BASIN STORAGE= .3477E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP4	MANE	.25	.00	389.75	.00	5.00	.00	390.00	.00	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3284E-08 EXCESS= .0000E+00 OUTFLOW= .3284E-08 BASIN STORAGE= .3098E-07 PERCENT ERROR=-943.5

FOR PLAN = 1 RATIO= .00

RCP4	MANE	.25	.00	264.75	.00	5.00	.00	265.00	.00	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1051E-06 EXCESS= .0000E+00 OUTFLOW= .1051E-06 BASIN STORAGE= .4169E-06 PERCENT ERROR=-396.7

FOR PLAN = 1 RATIO= .00

RCP4	MANE	.25	.00	324.75	.00	5.00	.00	325.00	.00	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2627E-07 EXCESS= .0000E+00 OUTFLOW= .2627E-07 BASIN STORAGE= .1474E-06 PERCENT ERROR=-561.0

FOR PLAN = 1 RATIO= .00

RCP5	MANE	.92	16.17	211.27	.02	5.00	15.76	210.00	.02	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8580E+00 EXCESS= .0000E+00 OUTFLOW= .8580E+00 BASIN STORAGE= .1019E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP5	MANE	.93	15.82	210.65	.02	5.00	15.40	210.00	.02	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8372E+00 EXCESS= .0000E+00 OUTFLOW= .8372E+00 BASIN STORAGE= .9331E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP5	MANE	.94	15.33	210.88	.02	5.00	14.83	210.00	.02	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8033E+00 EXCESS= .0000E+00 OUTFLOW= .8033E+00 BASIN STORAGE= .9091E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP6	MANE	.61	89.38	210.36	.10	5.00	88.09	210.00	.11	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5055E+01 EXCESS= .0000E+00 OUTFLOW= .5055E+01 BASIN STORAGE= .1017E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP6	MANE	.61	87.59	210.88	.10	5.00	86.19	210.00	.10	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4943E+01 EXCESS= .0000E+00 OUTFLOW= .4943E+01 BASIN STORAGE= .9608E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP6	MANE	.62	84.29	210.96	.10	5.00	83.06	210.00	.10	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4757E+01 EXCESS= .0000E+00 OUTFLOW= .4757E+01 BASIN STORAGE= .9745E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP7	MANE	.57	119.53	210.74	.14	5.00	117.24	210.00	.14	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6942E+01 EXCESS= .0000E+00 OUTFLOW= .6942E+01 BASIN STORAGE= .9966E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP7	MANE	.57	116.96	210.75	.13	5.00	114.70	210.00	.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6788E+01 EXCESS= .0000E+00 OUTFLOW= .6788E+01 BASIN STORAGE= .9192E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP7	MANE	.58	112.32	210.97	.13	5.00	110.48	210.00	.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6533E+01 EXCESS= .0000E+00 OUTFLOW= .6533E+01 BASIN STORAGE= .9725E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP8	MANE	.83	149.78	210.74	.17	5.00	145.72	210.00	.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8818E+01 EXCESS= .0000E+00 OUTFLOW= .8818E+01 BASIN STORAGE= .1708E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP8	MANE	.83	146.59	211.03	.17	5.00	142.46	210.00	.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8626E+01 EXCESS= .0000E+00 OUTFLOW= .8626E+01 BASIN STORAGE= .1526E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP8	MANE	.84	140.80	211.28	.16	5.00	137.17	210.00	.16

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8308E+01 EXCESS= .0000E+00 OUTFLOW= .8308E+01 BASIN STORAGE= .1430E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP9	MANE	1.30	375.21	216.52	2.86	5.00	372.32	215.00	2.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2649E+02 EXCESS= .0000E+00 OUTFLOW= .2650E+02 BASIN STORAGE= .3255E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP9	MANE	1.31	364.12	215.52	2.78	5.00	360.19	215.00	2.78

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2573E+02 EXCESS= .0000E+00 OUTFLOW= .2573E+02 BASIN STORAGE= .2958E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP9	MANE	1.33	346.35	215.59	2.65	5.00	342.13	215.00	2.65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2450E+02 EXCESS= .0000E+00 OUTFLOW= .2450E+02 BASIN STORAGE= .2874E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP10	MANE	.36	411.73	215.22	2.17	5.00	409.95	215.00	2.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2910E+02 EXCESS= .0000E+00 OUTFLOW= .2910E+02 BASIN STORAGE= .8125E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP10	MANE	.37	398.79	215.50	2.11	5.00	396.85	215.00	2.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2827E+02 EXCESS= .0000E+00 OUTFLOW= .2827E+02 BASIN STORAGE= .8452E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP10	MANE	.37	379.14	215.27	2.01	5.00	377.15	215.00	2.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2692E+02 EXCESS= .0000E+00 OUTFLOW= .2692E+02 BASIN STORAGE= .8451E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RGPDB	MANE	1.68	71.28	311.99	.58	5.00	71.28	310.00	.58

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3909E+02 EXCESS= .0000E+00 OUTFLOW= .3909E+02 BASIN STORAGE= .2443E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RGPDB	MANE	1.68	70.76	310.88	.56	5.00	70.76	310.00	.56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3803E+02 EXCESS= .0000E+00 OUTFLOW= .3803E+02 BASIN STORAGE= .2396E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RGPDB	MANE	1.69	69.94	311.80	.54	5.00	69.93	310.00	.54	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3630E+02 EXCESS= .0000E+00 OUTFLOW= .3630E+02 BASIN STORAGE= .2495E-03 PERCENT ERROR= .0

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

```
1****************************************                                  ****************************************
 *                                      *                                  *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                  *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                  *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                  *          609 SECOND STREET           *
 *                                      *                                  *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   05FEB20  TIME  08:30:29  *                                  *           (916) 756-1104             *
 *                                      *                                  *                                      *
 ****************************************                                  ****************************************

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


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

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

1                                                HEC-1 INPUT                                                PAGE  1

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

                        *DIAGRAM
 *** FREE ***
              1         ID          ************************************************
              2         ID                     GRAND PARK DETENTION BASIN
              3         ID          ************************************************
              4         ID
              5         ID    DEVELOPED CONDITION HYDROLOGIC MODEL
              6         ID    BY: VTN
              7         ID    DATE: FEBRUARY 2020
              8         ID    MODEL: GPDB-25.DAT
              9         ID    STORM EVENT: 25-YEAR
             10         ID
             11         ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
             12         ID
             13         ID                          AREA    DARF
             14         ID                          SQ. MI.
             15         ID                          0-0.5   0.990
             16         ID                          0.5-1   0.975
             17         ID                          1-2     0.950
             18         ID
             19         IT       5       0       0     300
             20         IN       5       0       0
             21         IO       5       0       0
             22         ID          0-0.5   0.5-1   1-2
             23         JR    PREC   0.990   0.975   0.950
                        *
             24         KK   COS12
             25         KM   COS (RR): PRESERVED RED ROCKS
             26         BA   .0040
             27         PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
             28         PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
             29         PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
             30         PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
             31         PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
             32         PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
             33         PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
             34         PC    .998    .999   1.00
             35         PB   1.99
             36         LS      0    85.2
             37         UD   0.100
                        *
             38         KKV31COS10
             39         KM   COS (RR): PRESERVED RED ROCKS
             40         BA   .0187
             41         PB    1.99
             42         LS      0    82.8
             43         UD   0.100
                        *
1                                                HEC-1 INPUT                                                PAGE  2

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

```
  44          KK       A
  45          KM   ER R: SINGLE FAMILY SPECIAL ESTATE
  46          BA   .3203
  47          PB    1.99
  48          LS       0    77.3
  49          UD   0.199
              *

  50          KK    COS3
  51          KM   COS DP: OPEN SPACE
  52          BA   .0218
  53          PB    1.99
  54          LS       0    87.0
  55          UD   0.091
              *

  56          KK    ST2A
  57          KM   PAVED STREET BASIN- ACCESS ROAD
  58          BA  0.0004
  59          PB    1.99
  60          LS       0    98.0
  61          UD   0.050
              *

  62          KK     ST1
  63          KM   PAVED STREET BASIN - LAKE MEAD
  64          BA   .0069
  65          PB    1.99
  66          LS       0    98.0
  67          UD   0.073
              *

  68          KK     CP1
  69          KM   COMBINE COS12, V31COS10, A, COS3, ST2A, AND ST1
  70          HC       6
              *

  71          KK    RCP1
  72          KM   ROUTE CP1 THROUGH ST3 IN STORM DRAIN TO CP2
  73          RD     881   0.091   0.013       0    DEEP       5       0
              *

  74          KKV31COS14
  75          KM   COS: OPEN SPACE
  76          BA   .0095
  77          PB    1.99
  78          LS       0    87.0
  79          UD   0.084
              *
1                                        HEC-1 INPUT                                          PAGE  3

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

  80          KK    COS2
  81          KM   COS (RR): PRESERVED RED ROCKS
  82          BA   .0222
  83          PB    1.99
  84          LS       0    85.9
  85          UD   0.100
              *

  86          KK     DC1
  87          KM   DC: DRAINAGE CORRIDOR
  88          BA   .0082
  89          PB    1.99
  90          LS       0    92.0
  91          UD   0.063
              *

  92          KK    ST2B
  93          KM   PAVED STREET BASIN- ACCESS ROAD
  94          BA   .0005
  95          PB    1.99
  96          LS       0    98.0
  97          UD   0.050
              *

  98          KKV27COS14
  99          KM   COS: OPEN SPACE
 100          BA   .0044
 101          PB    1.99
 102          LS       0    87.0
 103          UD   0.083
              *

 104          KK    CP1A
 105          KM   COMBINE CO2, DC1, ST2B, AND COS14
 106          HC       4
```

```
                *
 107            KK   RCP1A
 108            KM   ROUTE CP1A THROUGH ST2 IN STORM DRAIN TO CP2
 109            RD    1835   0.057   0.013       0    DEEP       5       0
                *
 110            KK   COS11
 111            KM   COS: OPEN SPACE
 112            BA   .0131
 113            PB    1.99
 114            LS       0    87.0
 115            UD   0.094
                *
1                                       HEC-1 INPUT                                          PAGE  4

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


 116            KK     ST2
 117            KM   PAVED STREET BASIN - RESERVOIR ACCESS
 118            BA   .0030
 119            PB    1.99
 120            LS       0    98.0
 121            UD   0.053
                *
 122            KK     ST3
 123            KM   PAVED STREET BASIN - LAKE MEAD
 124            BA   .0016
 125            PB    1.99
 126            LS       0    98.0
 127            UD   0.050
                *
 128            KK     CP2
 129            KM   COMBINE RCP1, V31COS14, RCP1A, COS11, ST2, AND ST3
 130            HC       6
                *
 131            KK    RCP2
 132            KM   ROUTE CP2 THROUGH ST4 IN STORM DRAIN TO CP3
 133            RD     967   0.098   0.013       0    DEEP       5       0
                *
 134            KK       M
 135            KM   ER R: SINGLE FAMILY SPECIAL ESTATE
 136            BA   .1211
 137            PB    1.99
 138            LS       0    78.3
 139            UD   0.146
                *
 140            KK    COS8
 141            KM   COS: OPEN SPACE
 142            BA   .0051
 143            PB    1.99
 144            LS       0    82.5
 145            UD   0.181
                *
 146            KK    COS9
 147            KM   COS: OPEN SPACE
 148            BA   .0045
 149            PB    1.99
 150            LS       0    87.0
 151            UD   0.080
                *
1                                       HEC-1 INPUT                                          PAGE  5

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


 152            KKV27COS10
 153            KM   COS: OPEN SPACE
 154            BA   .0231
 155            PB    1.99
 156            LS       0    87.0
 157            UD   0.096
                *
 158            KK     ST4
 159            KM   PAVED STREET BASIN - LAKE MEAD
 160            BA   .0027
 161            PB    1.99
 162            LS       0    98.0
 163            UD   0.050
                *
 164            KK     CP3
 165            KM   COMBINE RCP2, M, COS8, COS9, V27COS10, AND ST4
```

```
 166          HC       6
              *

 167          KK    RCP3
 168          KM   ROUTE CP3 THROUGH ST5 IN STORM DRAIN TO CP4
 169          RD    3202   0.052   0.013       0    DEEP       5       0
              *

 170          KK    COS6
 171          KM   COS: OPEN SPACE
 172          BA   .0120
 173          PB    1.93
 174          LS       0    87.0
 175          UD   0.084
              *

 176          KK    COS5
 177          KM   COS: OPEN SPACE
 178          BA   .0113
 179          PB    1.93
 180          LS       0    87.0
 181          UD   0.104
              *

 182          KK    COS7
 183          KM   COS: OPEN SPACE
 184          BA   .0155
 185          PB    1.92
 186          LS       0    87.9
 187          UD   0.131
              *
1                                        HEC-1 INPUT                                          PAGE  6

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


 188          KK       L
 189          KM   SFSD: TOWNHOMES
 190          BA   .1463
 191          PB    1.92
 192          LS       0    89.3
 193          UD   0.154
              *

 194          KK     ST5
 195          KM   PAVED STREET BASIN - LAKE MEAD
 196          BA   .0108
 197          PB    1.93
 198          LS       0    98.0
 199          UD   0.094
              *

 200          KK    ST14
 201          KM   PAVED STREET BASIN - PARK DRIFT
 202          BA   .0078
 203          PB    1.92
 204          LS       0    98.0
 205          UD   0.075
              *

 206          KK     CP4
 207          KM   COMBINE RCP3, COS6, COS5, COS7, L, ST5, AND ST14
 208          HC       7
              *

 209          KK   DVCP4
 210          KM   DIVERT FLOW FROM LAKE MEAD STORM DRAIN THROUGH COS4 TO CP9
 211          DT   DVCP4
 212          DI       0     500     553     750    1000    1250    1600
 213          DQ       0     500     553     553     553     553     553
              *

 214          KK    RCP4
 215          KM   ROUTE CP4 THROUGH 1/2 ST18 IN STORM DRAIN TO CP5
 216          RD     850   0.054   0.013       0    DEEP       5       0
              *

 217          KK       K
 218          KM   VC NR-MU: COMMERCIAL
 219          BA   .0187
 220          PB    1.92
 221          LS       0    90.6
 222          UD   0.072
              *
1                                        HEC-1 INPUT                                          PAGE  7

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


 223          KK    ST17
 224          KM   PAVED STREET BASIN
```

```
225          BA   .0019
226          PB    1.92
227          LS       0    98.0
228          UD   0.050
             *

229          KK     CP5
230          KM   COMBINE RCP4, K, AND ST17
231          HC       3
             *

232          KK    RCP5
233          KM   ROUTE CP5 THROUGH 1/2 ST18 IN STORM DRAIN TO CP6
234          RD     850   0.054   0.013       0    DEEP       5       0
             *

235          KK       H
236          KM   SFHD: TOWNHOMES
237          BA   .0162
238          PB    1.92
239          LS       0    89.1
240          UD   0.072
             *

241          KK    ST18
242          KM   PAVED STREET BASIN - LAKE MEAD
243          BA   .0097
244          PB    1.92
245          LS       0    98.0
246          UD   0.060
             *

247          KK       I
248          KM   SFHD: TOWNHOMES
249          BA   .0187
250          PB    1.92
251          LS       0    86.1
252          UD   0.087
             *

253          KK    ST16
254          KM   PAVED STREET BASIN
255          BA   .0012
256          PB    1.92
257          LS       0    98.0
258          UD   0.050
             *
```



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

259          KK    ST13
260          KM   PAVED STREET BASIN - SUNSET RUN
261          BA   .0072
262          PB    1.92
263          LS       0    98.0
264          UD   0.068
             *

265          KK       G
266          KM   SFHD: HIGH DENSITY
267          BA   .0305
268          PB    1.92
269          LS       0    94.9
270          UD   0.088
             *

271          KK       N
272          KM   SFHD: GENERAL PUBLIC
273          BA   .0045
274          PB    1.92
275          LS       0    93.9
276          UD   0.066
             *

277          KK    CP6A
278          KM   COMBINE I, ST16, ST13, G, AND N
279          HC       5
             *

280          KK     CP6
281          KM   COMBINE RCP5, H, ST18, AND CP6A
282          HC       4
             *

283          KK    RCP6
284          KM   ROUTE CP6 THROUGH 1/2 ST12 IN STORM DRAIN TO CP7
285          RD     900   0.061   0.013       0    DEEP       5       0
             *
```

```
          286          KK       O
          287          KM   SF3: HIGH DENSITY
          288          BA   .0371
          289          PB    1.87
          290          LS       0    93.1
          291          UD   0.097
                       *

          292          KK    ST19
          293          KM   PAVED STREET BASIN - HIGHLAND PRIDE
          294          BA   .0032
          295          PB    1.87
          296          LS       0    98.0
          297          UD   0.077
                       *
1                                        HEC-1 INPUT                                          PAGE  9

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


          298          KK     CP7
          299          KM   COMBINE RCP6, O, AND ST19
          300          HC       3
                       *

          301          KK    RCP7
          302          KM   ROUTE CP7 THROUGH 1/2 ST12 IN STORM DRAIN TO CP8
          303          RD     900   0.061   0.013       0    DEEP       5       0
                       *

          304          KK       P
          305          KM   SF3: HIGH DENSITY
          306          BA   .0214
          307          PB    1.87
          308          LS       0    93.3
          309          UD   0.073
                       *

          310          KK    ST20
          311          KM   PAVED STREET BASIN - CALICO BEND
          312          BA   .0062
          313          PB    1.87
          314          LS       0    98.0
          315          UD   0.070
                       *

          316          KK    ST12
          317          KM   PAVED STREET BASIN - SUNSET RUN
          318          BA   .0072
          319          PB    1.87
          320          LS       0    98.0
          321          UD   0.058
                       *

          322          KK     CP8
          323          KM   COMBINE CP7, P, ST20, AND ST12
          324          KM   FLOW INTO BASIN VIA NORTHERN INLET
          325          HC       4
                       *

          326          KK    RCP8
          327          KM   ROUTE CP8 THROUGH BASIN IN STORM DRAIN TO GPDBIN
          328          RD     996   0.025   0.013       0    DEEP       6       0
                       *

          329          KK       E
          330          KM   SF2: MEDIUM DENSITY
          331          BA   .0445
          332          PB    1.93
          333          LS       0    95.0
          334          UD   0.091
                       *
1                                        HEC-1 INPUT                                          PAGE 10

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


          335          KK       F
          336          KM   SF2: MEDIUM DENSITY
          337          BA   .0448
          338          PB    1.93
          339          LS       0    95.0
          340          UD   0.092
                       *

          341          KK    COS4
          342          KM   COS: OPEN SPACE
          343          BA   .0716
          344          PB    1.93
          345          LS       0    87.0
          346          UD   0.136
```

```
                *
  347           KK     ST7
  348           KM   PAVED STREET BASIN - PARK DRIFT
  349           BA   .0076
  350           PB    1.93
  351           LS       0    98.0
  352           UD   0.078
                *
  353           KK     ST6
  354           KM   PAVED STREET BASIN - PARK DRIFT
  355           BA   .0050
  356           PB    1.93
  357           LS       0    98.0
  358           UD   0.076
                *
  359           KK   DVCP4
  360           KM   RETRIEVE DVCP4
  361           DR   DVCP4
                *
  362           KK     CP9
  363           KM   COMBINE E, F, COS4, ST7, ST6, AND DVCP4
  364           HC       6
                *
  365           KK    RCP9
  366           KM   ROUTE CP9 THROUGH ST8 AND BASIN IN STORM DRAIN TO CP10
  367           RD    2651   0.055   0.013       0    DEEP       5       0
                *
  368           KK     ST8
  369           KM   PAVED STREET BASIN - FOX HILL
  370           BA   .0042
  371           PB    1.87
  372           LS       0    98.0
  373           UD   0.050
                *
1                                       HEC-1 INPUT                                             PAGE 11

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

  374           KK    ST21
  375           KM   PAVED STREET BASIN - GRAND PARK
  376           BA   .0036
  377           PB    1.87
  378           LS       0    98.0
  379           UD   0.064
                *
  380           KK    CP1A
  381           KM   COS (RP): REGIONAL PARK - OPEN SPACE
  382           BA   .0701
  383           PB    1.87
  384           LS       0    87.9
  385           UD   0.111
                *
  386           KK    CP10
  387           KM   COMBINE RCP9, ST8, ST21, AND CP1A
  388           KM   FLOW INTO BASIN VIA SOUTHERN INLET
  389           HC       4
                *
  390           KK   RCP10
  391           KM   ROUTE CP10 THROUGH BASIN IN STORM DRAIN TO GPDBIN
  392           RD     708   0.046   0.013       0    DEEP       6       0
                *
  393           KK    CP1B
  394           KM   COS (RP): REGIONAL PARK - OPEN SPACE
  395           BA   .0384
  396           PB    1.87
  397           LS       0    88.0
  398           UD   0.092
                *
  399           KK  GPDBIN
  400           KM   COMBINE RCP8, RCP10, AND CP1B
  401           KM   TOTAL FLOW INTO GRAND PARK DETENTION BASIN
  402           KO       1
  403           HC       3
                *
  404           KK    GPDB
  405           KM   VILLAGE 25 DETENTION BASIN (GRAND PARK DETENTION BASIN)
  406           KM   STORAGE VOLUME = 155.0 AC-FT AT 3534 STAGE
  407           KM   SEDIMENT VOLUME = 9.0 AC-FT (REMOVED FROM EACH STAGE)
```

```
            408          KM   OUTLET = 5'X5' RCB WITH 26" ORIFICE PLATE
            409          KM   100-YEAR DISCHARGE = 94 CFS
            410          KM   SPILLWAY LENGTH = 300 FT WITH 10:1 SIDE SLOPES
            411          KM   SPILLWAY HEIGHT = 3 FT
            412          KM   SPILLWAY CREST ELEVATION = 3532.0'
            413          KM   SPILLWAY TYPE = BROAD CRESTED TRAPEZOIDAL WEIR
            414          KM   PMF DISCHARGE = 4544 CFS
            415          KM   TOP OF EMBANKMENT ELEVATION = 3535.0'
1                                              HEC-1 INPUT                                                PAGE 12

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

            416          KM   STAGE/STORAGE/DISCHARGE CALCULATED BY: PLM OF VTN
            417          KO       1
            418          RS       1    STOR       0
            419          SV     0.0     1.9     6.8    13.2    20.6    29.3    39.9    55.0    75.4    97.3
            420          SV   108.9   120.9   133.3   146.0
            421          SE    3506    3514    3516    3518    3520    3522    3524    3526    3528    3530
            422          SE    3531    3532    3533    3534
            423          SQ       0    50.6    57.4    63.5    69.1    74.3    79.1    83.6    88.0    92.1
            424          SQ    94.1    96.0   921.2  2665.6
                         *

            425          KK   RGPDB
            426          KM   ROUTE GPDB THROUGH ST9 AND ST10 IN STORM DRAIN TO CP11
            427          RD    1972   0.039   0.013       0    DEEP       5       0
                         *

            428          KK     ST9
            429          KM   PAVED STREET BASIN - FOX HILL
            430          BA   .0046
            431          PB    1.87
            432          LS       0    98.0
            433          UD   0.059
                         *

            434          KK    CP1C
            435          KM   COS (RP): REGIONAL PARK - OPEN SPACE
            436          BA   .0451
            437          PB    1.87
            438          LS       0    88.0
            439          UD   0.096
                         *

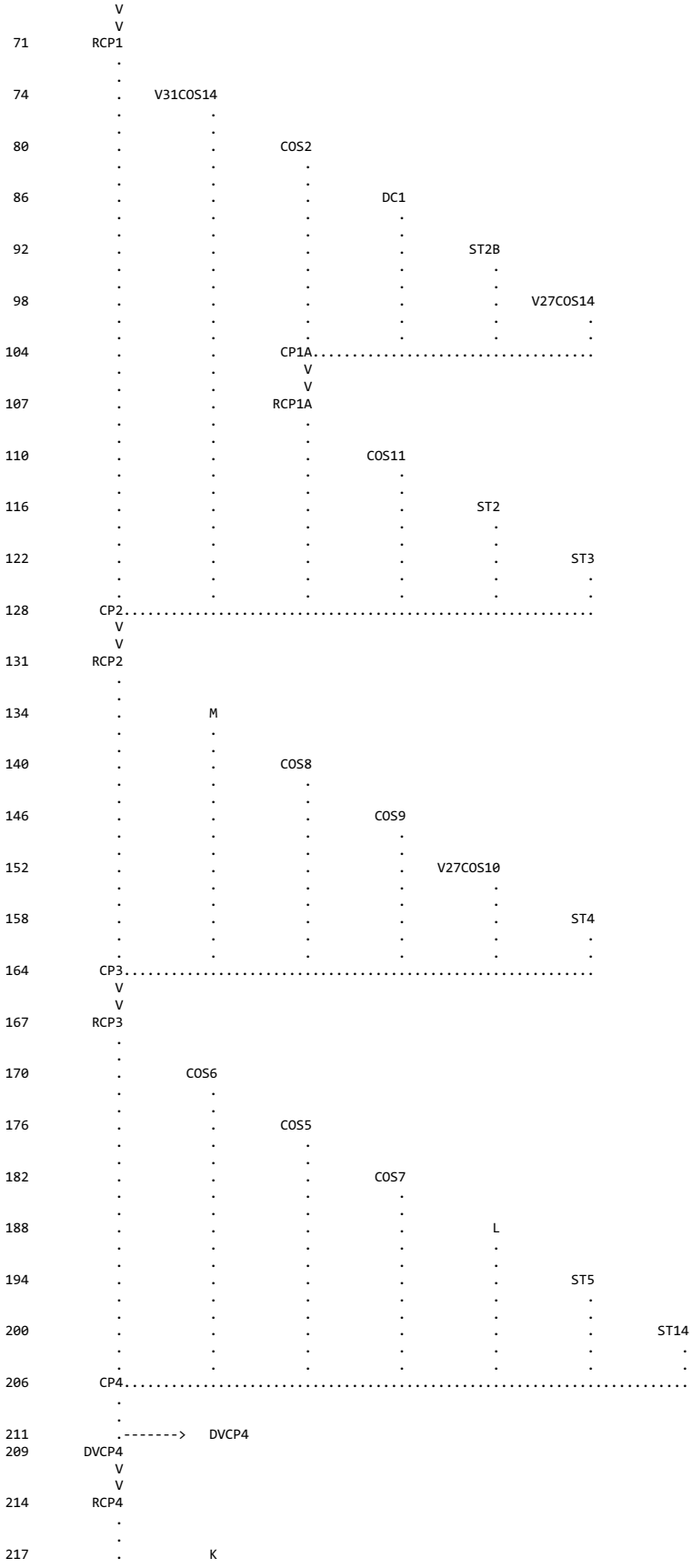
            440          KK    ST10
            441          KM   PAVED STREET BASIN - SKY VISTA
            442          BA   .0034
            443          PB    1.87
            444          LS       0    98.0
            445          UD   0.050
                         *

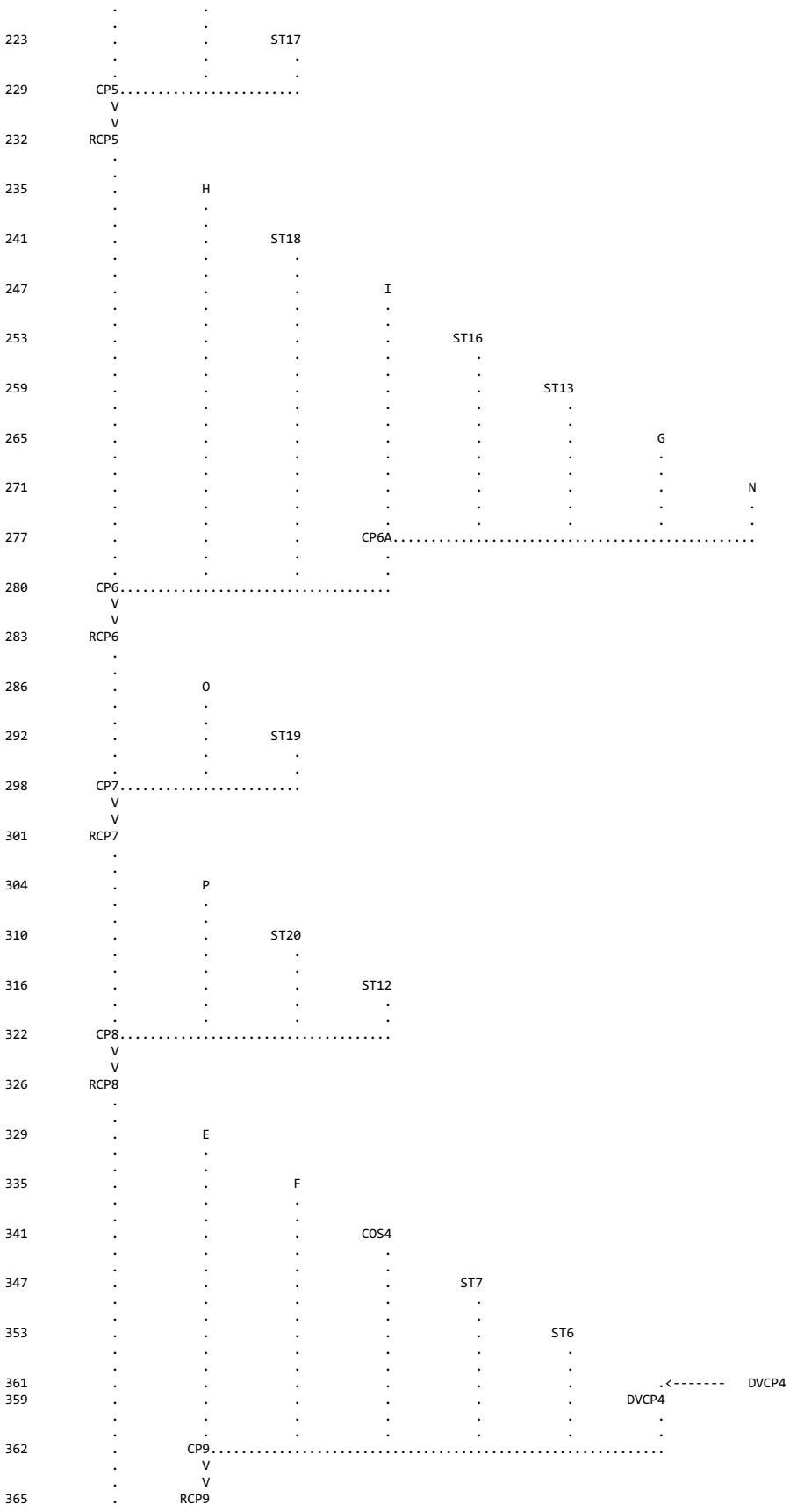
            446          KK    CP11
            447          KM   COMBINE RGPDB, ST9, CP1C, AND ST10
            448          HC       4
                         *

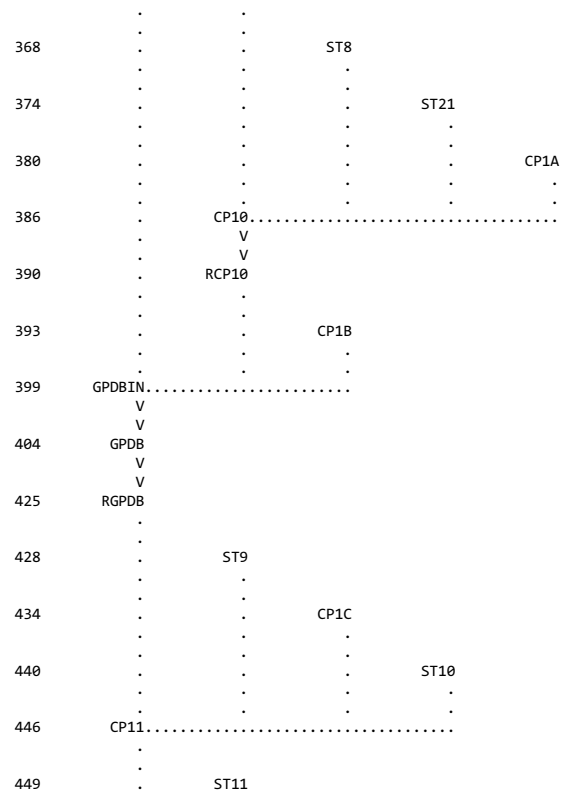
            449          KK    ST11
            450          KM   PAVED STREET BASIN - SUNSET RUN
            451          BA   .0052
            452          PB    1.87
            453          LS       0    98.0
            454          UD   0.054
                         *
            455          ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    24       COS12
                 .
                 .
    38           .    V31COS10
                 .           .
                 .           .
    44           .           .           A
                 .           .           .
                 .           .           .
    50           .           .           .       COS3
                 .           .           .          .
                 .           .           .          .
    56           .           .           .          .       ST2A
                 .           .           .          .          .
                 .           .           .          .          .
    62           .           .           .          .          .        ST1
                 .           .           .          .          .          .
                 .           .           .          .          .          .
    68         CP1...........................................................
```


RCP1
V31COS14
COS2
DC1
ST2B
V27COS14
CP1A
RCP1A
COS11
ST2
ST3
CP2
RCP2
M
COS8
COS9
V27COS10
ST4
CP3
RCP3
COS6
COS5
COS7
L
ST5
ST14
CP4
DVCP4
RCP4
K


223 ST17
229 CP5
232 RCP5
235 H
241 ST18
247 I
253 ST16
259 ST13
265 G
271 N
277 CP6A
280 CP6
283 RCP6
286 O
292 ST19
298 CP7
301 RCP7
304 P
310 ST20
316 ST12
322 CP8
326 RCP8
329 E
335 F
341 COS4
347 ST7
353 ST6
361 DVCP4
359 DVCP4
362 CP9
365 RCP9



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*************************************
 *                                   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998           *
 *            VERSION 4.1            *
 *                                   *
 *  RUN DATE   05FEB20  TIME  08:30:29   *
 *                                   *
 *************************************
```

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

****
GRAND PARK DETENTION BASIN
****

DEVELOPED CONDITION HYDROLOGIC MODEL
BY: VTN
DATE: FEBRUARY 2020
MODEL: GPDB-25.DAT
STORM EVENT: 25-YEAR

JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

AREA SQ. MI.	DARF
0-0.5	0.990
0.5-1	0.975
1-2	0.950

```
  21 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                                  0-0.5   0.5-1   1-2

     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
                  .99       .98       .95


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 399 KK    *    GPDBIN  *
           *            *
           **************

 402 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

 403 HC          HYDROGRAPH COMBINATION
                      ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                    ***

*********************************************************************************************************************************

                                        HYDROGRAPH AT STATION   GPDBIN
                                             SUM OF  3 HYDROGRAPHS
                                            PLAN 1,   RATIO =   .99

*********************************************************************************************************************************
                                 *                                 *                                 *
  DA MON HRMN  ORD      FLOW     *   DA MON HRMN  ORD      FLOW     *   DA MON HRMN  ORD      FLOW     *   DA MON HRMN  ORD      FLOW
                                 *                                 *                                 *
   1     0000    1        0.    *    1     0615   76        6.    *    1     1230  151        0.    *    1     1845  226        0.
   1     0005    2        0.    *    1     0620   77        4.    *    1     1235  152        0.    *    1     1850  227        0.
   1     0010    3        2.    *    1     0625   78        2.    *    1     1240  153        0.    *    1     1855  228        0.
   1     0015    4        6.    *    1     0630   79        1.    *    1     1245  154        0.    *    1     1900  229        0.
   1     0020    5       10.    *    1     0635   80        1.    *    1     1250  155        0.    *    1     1905  230        0.
   1     0025    6       16.    *    1     0640   81        0.    *    1     1255  156        0.    *    1     1910  231        0.
   1     0030    7       22.    *    1     0645   82        0.    *    1     1300  157        0.    *    1     1915  232        0.
   1     0035    8       22.    *    1     0650   83        0.    *    1     1305  158        0.    *    1     1920  233        0.
   1     0040    9       16.    *    1     0655   84        0.    *    1     1310  159        0.    *    1     1925  234        0.
   1     0045   10        8.    *    1     0700   85        0.    *    1     1315  160        0.    *    1     1930  235        0.
   1     0050   11        4.    *    1     0705   86        0.    *    1     1320  161        0.    *    1     1935  236        0.
   1     0055   12        1.    *    1     0710   87        0.    *    1     1325  162        0.    *    1     1940  237        0.
   1     0100   13        0.    *    1     0715   88        0.    *    1     1330  163        0.    *    1     1945  238        0.
   1     0105   14        1.    *    1     0720   89        0.    *    1     1335  164        0.    *    1     1950  239        0.
   1     0110   15        4.    *    1     0725   90        0.    *    1     1340  165        0.    *    1     1955  240        0.
   1     0115   16        7.    *    1     0730   91        0.    *    1     1345  166        0.    *    1     2000  241        0.
   1     0120   17        9.    *    1     0735   92        0.    *    1     1350  167        0.    *    1     2005  242        0.
   1     0125   18       12.    *    1     0740   93        0.    *    1     1355  168        0.    *    1     2010  243        0.
   1     0130   19       20.    *    1     0745   94        0.    *    1     1400  169        0.    *    1     2015  244        0.
   1     0135   20       26.    *    1     0750   95        0.    *    1     1405  170        0.    *    1     2020  245        0.
   1     0140   21       28.    *    1     0755   96        0.    *    1     1410  171        0.    *    1     2025  246        0.
   1     0145   22       28.    *    1     0800   97        0.    *    1     1415  172        0.    *    1     2030  247        0.
   1     0150   23       24.    *    1     0805   98        0.    *    1     1420  173        0.    *    1     2035  248        0.
   1     0155   24       17.    *    1     0810   99        0.    *    1     1425  174        0.    *    1     2040  249        0.
   1     0200   25       10.    *    1     0815  100        0.    *    1     1430  175        0.    *    1     2045  250        0.
   1     0205   26        8.    *    1     0820  101        0.    *    1     1435  176        0.    *    1     2050  251        0.
   1     0210   27       13.    *    1     0825  102        0.    *    1     1440  177        0.    *    1     2055  252        0.
   1     0215   28       27.    *    1     0830  103        0.    *    1     1445  178        0.    *    1     2100  253        0.
   1     0220   29       41.    *    1     0835  104        0.    *    1     1450  179        0.    *    1     2105  254        0.
   1     0225   30       46.    *    1     0840  105        0.    *    1     1455  180        0.    *    1     2110  255        0.
   1     0230   31       39.    *    1     0845  106        0.    *    1     1500  181        0.    *    1     2115  256        0.
   1     0235   32       30.    *    1     0850  107        0.    *    1     1505  182        0.    *    1     2120  257        0.
   1     0240   33       32.    *    1     0855  108        0.    *    1     1510  183        0.    *    1     2125  258        0.
   1     0245   34       41.    *    1     0900  109        0.    *    1     1515  184        0.    *    1     2130  259        0.
   1     0250   35       40.    *    1     0905  110        0.    *    1     1520  185        0.    *    1     2135  260        0.
   1     0255   36       31.    *    1     0910  111        0.    *    1     1525  186        0.    *    1     2140  261        0.
   1     0300   37       30.    *    1     0915  112        0.    *    1     1530  187        0.    *    1     2145  262        0.
   1     0305   38       57.    *    1     0920  113        0.    *    1     1535  188        0.    *    1     2150  263        0.
   1     0310   39      107.    *    1     0925  114        0.    *    1     1540  189        0.    *    1     2155  264        0.
   1     0315   40      190.    *    1     0930  115        0.    *    1     1545  190        0.    *    1     2200  265        0.
```

1	0320	41	351.	*	1	0935	116	0.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	551.	*	1	0940	117	0.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	781.	*	1	0945	118	0.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	835.	*	1	0950	119	0.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	710.	*	1	0955	120	0.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	582.	*	1	1000	121	0.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	446.	*	1	1005	122	0.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	328.	*	1	1010	123	0.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	263.	*	1	1015	124	0.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	213.	*	1	1020	125	0.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	159.	*	1	1025	126	0.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	123.	*	1	1030	127	0.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	109.	*	1	1035	128	0.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	112.	*	1	1040	129	0.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	145.	*	1	1045	130	0.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	185.	*	1	1050	131	0.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	196.	*	1	1055	132	0.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	188.	*	1	1100	133	0.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	195.	*	1	1105	134	0.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	192.	*	1	1110	135	0.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	162.	*	1	1115	136	0.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	126.	*	1	1120	137	0.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	92.	*	1	1125	138	0.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	67.	*	1	1130	139	0.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	49.	*	1	1135	140	0.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	38.	*	1	1140	141	0.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	31.	*	1	1145	142	0.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	25.	*	1	1150	143	0.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	19.	*	1	1155	144	0.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	19.	*	1	1200	145	0.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	20.	*	1	1205	146	0.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	18.	*	1	1210	147	0.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	16.	*	1	1215	148	0.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	13.	*	1	1220	149	0.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	10.	*	1	1225	150	0.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

****

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 835.	3.58	117.	29.	28.	28.
		(INCHES) .855	.857	.857	.857
		(AC-FT) 58.	58.	58.	58.

CUMULATIVE AREA = 1.27 SQ MI

****

HYDROGRAPH AT STATION GPDBIN
SUM OF 3 HYDROGRAPHS
PLAN 1, RATIO = .98

****

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
					*						*						*					
1		0000	1	0.	*	1		0615	76	6.	*	1		1230	151	0.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	4.	*	1		1235	152	0.	*	1		1850	227	0.
1		0010	3	2.	*	1		0625	78	2.	*	1		1240	153	0.	*	1		1855	228	0.
1		0015	4	6.	*	1		0630	79	1.	*	1		1245	154	0.	*	1		1900	229	0.
1		0020	5	9.	*	1		0635	80	1.	*	1		1250	155	0.	*	1		1905	230	0.
1		0025	6	15.	*	1		0640	81	0.	*	1		1255	156	0.	*	1		1910	231	0.
1		0030	7	21.	*	1		0645	82	0.	*	1		1300	157	0.	*	1		1915	232	0.
1		0035	8	21.	*	1		0650	83	0.	*	1		1305	158	0.	*	1		1920	233	0.
1		0040	9	15.	*	1		0655	84	0.	*	1		1310	159	0.	*	1		1925	234	0.
1		0045	10	8.	*	1		0700	85	0.	*	1		1315	160	0.	*	1		1930	235	0.
1		0050	11	3.	*	1		0705	86	0.	*	1		1320	161	0.	*	1		1935	236	0.
1		0055	12	1.	*	1		0710	87	0.	*	1		1325	162	0.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	0.	*	1		1330	163	0.	*	1		1945	238	0.
1		0105	14	1.	*	1		0720	89	0.	*	1		1335	164	0.	*	1		1950	239	0.
1		0110	15	4.	*	1		0725	90	0.	*	1		1340	165	0.	*	1		1955	240	0.
1		0115	16	7.	*	1		0730	91	0.	*	1		1345	166	0.	*	1		2000	241	0.
1		0120	17	8.	*	1		0735	92	0.	*	1		1350	167	0.	*	1		2005	242	0.
1		0125	18	12.	*	1		0740	93	0.	*	1		1355	168	0.	*	1		2010	243	0.
1		0130	19	19.	*	1		0745	94	0.	*	1		1400	169	0.	*	1		2015	244	0.
1		0135	20	25.	*	1		0750	95	0.	*	1		1405	170	0.	*	1		2020	245	0.
1		0140	21	27.	*	1		0755	96	0.	*	1		1410	171	0.	*	1		2025	246	0.
1		0145	22	27.	*	1		0800	97	0.	*	1		1415	172	0.	*	1		2030	247	0.
1		0150	23	23.	*	1		0805	98	0.	*	1		1420	173	0.	*	1		2035	248	0.
1		0155	24	16.	*	1		0810	99	0.	*	1		1425	174	0.	*	1		2040	249	0.
1		0200	25	10.	*	1		0815	100	0.	*	1		1430	175	0.	*	1		2045	250	0.
1		0205	26	7.	*	1		0820	101	0.	*	1		1435	176	0.	*	1		2050	251	0.
1		0210	27	12.	*	1		0825	102	0.	*	1		1440	177	0.	*	1		2055	252	0.
1		0215	28	26.	*	1		0830	103	0.	*	1		1445	178	0.	*	1		2100	253	0.
1		0220	29	40.	*	1		0835	104	0.	*	1		1450	179	0.	*	1		2105	254	0.
1		0225	30	45.	*	1		0840	105	0.	*	1		1455	180	0.	*	1		2110	255	0.
1		0230	31	38.	*	1		0845	106	0.	*	1		1500	181	0.	*	1		2115	256	0.
1		0235	32	29.	*	1		0850	107	0.	*	1		1505	182	0.	*	1		2120	257	0.

1	0240	33	31.	*	1	0855	108	0.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	40.	*	1	0900	109	0.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	39.	*	1	0905	110	0.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	30.	*	1	0910	111	0.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	29.	*	1	0915	112	0.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	56.	*	1	0920	113	0.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	104.	*	1	0925	114	0.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	184.	*	1	0930	115	0.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	341.	*	1	0935	116	0.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	536.	*	1	0940	117	0.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	761.	*	1	0945	118	0.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	815.	*	1	0950	119	0.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	693.	*	1	0955	120	0.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	567.	*	1	1000	121	0.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	435.	*	1	1005	122	0.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	320.	*	1	1010	123	0.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	257.	*	1	1015	124	0.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	208.	*	1	1020	125	0.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	156.	*	1	1025	126	0.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	120.	*	1	1030	127	0.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	106.	*	1	1035	128	0.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	110.	*	1	1040	129	0.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	142.	*	1	1045	130	0.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	181.	*	1	1050	131	0.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	192.	*	1	1055	132	0.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	184.	*	1	1100	133	0.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	191.	*	1	1105	134	0.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	188.	*	1	1110	135	0.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	159.	*	1	1115	136	0.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	123.	*	1	1120	137	0.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	91.	*	1	1125	138	0.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	66.	*	1	1130	139	0.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	48.	*	1	1135	140	0.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	38.	*	1	1140	141	0.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	31.	*	1	1145	142	0.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	24.	*	1	1150	143	0.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	19.	*	1	1155	144	0.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	19.	*	1	1200	145	0.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	20.	*	1	1205	146	0.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	18.	*	1	1210	147	0.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	16.	*	1	1215	148	0.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	13.	*	1	1220	149	0.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	10.	*	1	1225	150	0.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
	(CFS)				
+ 815.	3.58	114.	28.	27.	27.
	(INCHES)	.834	.835	.835	.835
	(AC-FT)	56.	56.	56.	56.

CUMULATIVE AREA = 1.27 SQ MI

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HYDROGRAPH AT STATION GPDBIN
SUM OF 3 HYDROGRAPHS
PLAN 1, RATIO = .95

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				*					*					*				
DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
					*						*						*					
1		0000	1	0.	*	1		0615	76	6.	*	1		1230	151	0.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	4.	*	1		1235	152	0.	*	1		1850	227	0.
1		0010	3	2.	*	1		0625	78	2.	*	1		1240	153	0.	*	1		1855	228	0.
1		0015	4	5.	*	1		0630	79	1.	*	1		1245	154	0.	*	1		1900	229	0.
1		0020	5	9.	*	1		0635	80	1.	*	1		1250	155	0.	*	1		1905	230	0.
1		0025	6	14.	*	1		0640	81	0.	*	1		1255	156	0.	*	1		1910	231	0.
1		0030	7	20.	*	1		0645	82	0.	*	1		1300	157	0.	*	1		1915	232	0.
1		0035	8	20.	*	1		0650	83	0.	*	1		1305	158	0.	*	1		1920	233	0.
1		0040	9	15.	*	1		0655	84	0.	*	1		1310	159	0.	*	1		1925	234	0.
1		0045	10	8.	*	1		0700	85	0.	*	1		1315	160	0.	*	1		1930	235	0.
1		0050	11	3.	*	1		0705	86	0.	*	1		1320	161	0.	*	1		1935	236	0.
1		0055	12	1.	*	1		0710	87	0.	*	1		1325	162	0.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	0.	*	1		1330	163	0.	*	1		1945	238	0.
1		0105	14	1.	*	1		0720	89	0.	*	1		1335	164	0.	*	1		1950	239	0.
1		0110	15	4.	*	1		0725	90	0.	*	1		1340	165	0.	*	1		1955	240	0.
1		0115	16	7.	*	1		0730	91	0.	*	1		1345	166	0.	*	1		2000	241	0.
1		0120	17	8.	*	1		0735	92	0.	*	1		1350	167	0.	*	1		2005	242	0.
1		0125	18	11.	*	1		0740	93	0.	*	1		1355	168	0.	*	1		2010	243	0.
1		0130	19	18.	*	1		0745	94	0.	*	1		1400	169	0.	*	1		2015	244	0.
1		0135	20	24.	*	1		0750	95	0.	*	1		1405	170	0.	*	1		2020	245	0.
1		0140	21	26.	*	1		0755	96	0.	*	1		1410	171	0.	*	1		2025	246	0.
1		0145	22	25.	*	1		0800	97	0.	*	1		1415	172	0.	*	1		2030	247	0.
1		0150	23	21.	*	1		0805	98	0.	*	1		1420	173	0.	*	1		2035	248	0.
1		0155	24	15.	*	1		0810	99	0.	*	1		1425	174	0.	*	1		2040	249	0.

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    1     0200   25        9.   *    1     0815  100        0.   *    1     1430  175        0.   *    1     2045  250        0.
    1     0205   26        7.   *    1     0820  101        0.   *    1     1435  176        0.   *    1     2050  251        0.
    1     0210   27       11.   *    1     0825  102        0.   *    1     1440  177        0.   *    1     2055  252        0.
    1     0215   28       24.   *    1     0830  103        0.   *    1     1445  178        0.   *    1     2100  253        0.
    1     0220   29       38.   *    1     0835  104        0.   *    1     1450  179        0.   *    1     2105  254        0.
    1     0225   30       42.   *    1     0840  105        0.   *    1     1455  180        0.   *    1     2110  255        0.
    1     0230   31       36.   *    1     0845  106        0.   *    1     1500  181        0.   *    1     2115  256        0.
    1     0235   32       27.   *    1     0850  107        0.   *    1     1505  182        0.   *    1     2120  257        0.
    1     0240   33       30.   *    1     0855  108        0.   *    1     1510  183        0.   *    1     2125  258        0.
    1     0245   34       38.   *    1     0900  109        0.   *    1     1515  184        0.   *    1     2130  259        0.
    1     0250   35       37.   *    1     0905  110        0.   *    1     1520  185        0.   *    1     2135  260        0.
    1     0255   36       29.   *    1     0910  111        0.   *    1     1525  186        0.   *    1     2140  261        0.
    1     0300   37       28.   *    1     0915  112        0.   *    1     1530  187        0.   *    1     2145  262        0.
    1     0305   38       53.   *    1     0920  113        0.   *    1     1535  188        0.   *    1     2150  263        0.
    1     0310   39       98.   *    1     0925  114        0.   *    1     1540  189        0.   *    1     2155  264        0.
    1     0315   40      175.   *    1     0930  115        0.   *    1     1545  190        0.   *    1     2200  265        0.
    1     0320   41      325.   *    1     0935  116        0.   *    1     1550  191        0.   *    1     2205  266        0.
    1     0325   42      511.   *    1     0940  117        0.   *    1     1555  192        0.   *    1     2210  267        0.
    1     0330   43      728.   *    1     0945  118        0.   *    1     1600  193        0.   *    1     2215  268        0.
    1     0335   44      781.   *    1     0950  119        0.   *    1     1605  194        0.   *    1     2220  269        0.
    1     0340   45      665.   *    1     0955  120        0.   *    1     1610  195        0.   *    1     2225  270        0.
    1     0345   46      544.   *    1     1000  121        0.   *    1     1615  196        0.   *    1     2230  271        0.
    1     0350   47      417.   *    1     1005  122        0.   *    1     1620  197        0.   *    1     2235  272        0.
    1     0355   48      307.   *    1     1010  123        0.   *    1     1625  198        0.   *    1     2240  273        0.
    1     0400   49      246.   *    1     1015  124        0.   *    1     1630  199        0.   *    1     2245  274        0.
    1     0405   50      200.   *    1     1020  125        0.   *    1     1635  200        0.   *    1     2250  275        0.
    1     0410   51      149.   *    1     1025  126        0.   *    1     1640  201        0.   *    1     2255  276        0.
    1     0415   52      115.   *    1     1030  127        0.   *    1     1645  202        0.   *    1     2300  277        0.
    1     0420   53      102.   *    1     1035  128        0.   *    1     1650  203        0.   *    1     2305  278        0.
    1     0425   54      106.   *    1     1040  129        0.   *    1     1655  204        0.   *    1     2310  279        0.
    1     0430   55      137.   *    1     1045  130        0.   *    1     1700  205        0.   *    1     2315  280        0.
    1     0435   56      175.   *    1     1050  131        0.   *    1     1705  206        0.   *    1     2320  281        0.
    1     0440   57      184.   *    1     1055  132        0.   *    1     1710  207        0.   *    1     2325  282        0.
    1     0445   58      177.   *    1     1100  133        0.   *    1     1715  208        0.   *    1     2330  283        0.
    1     0450   59      184.   *    1     1105  134        0.   *    1     1720  209        0.   *    1     2335  284        0.
    1     0455   60      181.   *    1     1110  135        0.   *    1     1725  210        0.   *    1     2340  285        0.
    1     0500   61      153.   *    1     1115  136        0.   *    1     1730  211        0.   *    1     2345  286        0.
    1     0505   62      119.   *    1     1120  137        0.   *    1     1735  212        0.   *    1     2350  287        0.
    1     0510   63       87.   *    1     1125  138        0.   *    1     1740  213        0.   *    1     2355  288        0.
    1     0515   64       63.   *    1     1130  139        0.   *    1     1745  214        0.   *    2     0000  289        0.
    1     0520   65       46.   *    1     1135  140        0.   *    1     1750  215        0.   *    2     0005  290        0.
    1     0525   66       36.   *    1     1140  141        0.   *    1     1755  216        0.   *    2     0010  291        0.
    1     0530   67       30.   *    1     1145  142        0.   *    1     1800  217        0.   *    2     0015  292        0.
    1     0535   68       23.   *    1     1150  143        0.   *    1     1805  218        0.   *    2     0020  293        0.
    1     0540   69       18.   *    1     1155  144        0.   *    1     1810  219        0.   *    2     0025  294        0.
    1     0545   70       18.   *    1     1200  145        0.   *    1     1815  220        0.   *    2     0030  295        0.
    1     0550   71       19.   *    1     1205  146        0.   *    1     1820  221        0.   *    2     0035  296        0.
    1     0555   72       17.   *    1     1210  147        0.   *    1     1825  222        0.   *    2     0040  297        0.
    1     0600   73       15.   *    1     1215  148        0.   *    1     1830  223        0.   *    2     0045  298        0.
    1     0605   74       13.   *    1     1220  149        0.   *    1     1835  224        0.   *    2     0050  299        0.
    1     0610   75        9.   *    1     1225  150        0.   *    1     1840  225        0.   *    2     0055  300        0.
                              *                                  *                                  *
 ********************************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR        24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                        (CFS)
+     781.      3.58                109.         27.         26.          26.
                       (INCHES)      .798        .800        .800         .800
                        (AC-FT)       54.         54.         54.          54.

                        CUMULATIVE AREA =    1.27 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  404 KK    *      GPDB  *
            *            *
            **************

  417 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           1  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

                HYDROGRAPH ROUTING DATA

  418 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        STOR  TYPE OF INITIAL CONDITION
                       RSVRIC         .00  INITIAL CONDITION
                            X         .00 WORKING R AND D COEFFICIENT

  419 SV            STORAGE          .0       1.9       6.8      13.2      20.6      29.3      39.9      55.0      75.4      97.3
                                   108.9     120.9     133.3     146.0
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421 SE          ELEVATION     3506.00   3514.00   3516.00   3518.00   3520.00   3522.00   3524.00   3526.00   3528.00   3530.00
                              3531.00   3532.00   3533.00   3534.00

423 SQ          DISCHARGE        0.        51.       57.       64.       69.       74.       79.       84.       88.       92.
                                94.        96.      921.     2666.

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HYDROGRAPH AT STATION GPDB
PLAN 1, RATIO = .99

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	3506.0	1		0820	101	70.	22.6	3520.5	1		1640	201	0.	.0	3506.0
1		0005	2	0.	.0	3506.0	1		0825	102	70.	22.1	3520.3	1		1645	202	0.	.0	3506.0
1		0010	3	0.	.0	3506.0	1		0830	103	70.	21.6	3520.2	1		1650	203	0.	.0	3506.0
1		0015	4	1.	.0	3506.1	1		0835	104	69.	21.2	3520.1	1		1655	204	0.	.0	3506.0
1		0020	5	2.	.1	3506.3	1		0840	105	69.	20.7	3520.0	1		1700	205	0.	.0	3506.0
1		0025	6	4.	.1	3506.6	1		0845	106	69.	20.2	3519.9	1		1705	206	0.	.0	3506.0
1		0030	7	6.	.2	3507.0	1		0850	107	68.	19.7	3519.8	1		1710	207	0.	.0	3506.0
1		0035	8	9.	.3	3507.4	1		0855	108	68.	19.3	3519.6	1		1715	208	0.	.0	3506.0
1		0040	9	11.	.4	3507.7	1		0900	109	68.	18.8	3519.5	1		1720	209	0.	.0	3506.0
1		0045	10	11.	.4	3507.7	1		0905	110	67.	18.3	3519.4	1		1725	210	0.	.0	3506.0
1		0050	11	10.	.4	3507.6	1		0910	111	67.	17.9	3519.3	1		1730	211	0.	.0	3506.0
1		0055	12	9.	.3	3507.4	1		0915	112	67.	17.4	3519.1	1		1735	212	0.	.0	3506.0
1		0100	13	7.	.3	3507.2	1		0920	113	66.	16.9	3519.0	1		1740	213	0.	.0	3506.0
1		0105	14	6.	.2	3507.0	1		0925	114	66.	16.5	3518.9	1		1745	214	0.	.0	3506.0
1		0110	15	6.	.2	3506.9	1		0930	115	66.	16.0	3518.8	1		1750	215	0.	.0	3506.0
1		0115	16	6.	.2	3506.9	1		0935	116	65.	15.6	3518.6	1		1755	216	0.	.0	3506.0
1		0120	17	6.	.2	3507.0	1		0940	117	65.	15.1	3518.5	1		1800	217	0.	.0	3506.0
1		0125	18	7.	.3	3507.1	1		0945	118	65.	14.7	3518.4	1		1805	218	0.	.0	3506.0
1		0130	19	8.	.3	3507.3	1		0950	119	64.	14.2	3518.3	1		1810	219	0.	.0	3506.0
1		0135	20	11.	.4	3507.7	1		0955	120	64.	13.8	3518.2	1		1815	220	0.	.0	3506.0
1		0140	21	14.	.5	3508.2	1		1000	121	64.	13.4	3518.0	1		1820	221	0.	.0	3506.0
1		0145	22	16.	.6	3508.5	1		1005	122	63.	12.9	3517.9	1		1825	222	0.	.0	3506.0
1		0150	23	18.	.7	3508.8	1		1010	123	63.	12.5	3517.8	1		1830	223	0.	.0	3506.0
1		0155	24	18.	.7	3508.9	1		1015	124	62.	12.1	3517.6	1		1835	224	0.	.0	3506.0
1		0200	25	17.	.6	3508.7	1		1020	125	62.	11.6	3517.5	1		1840	225	0.	.0	3506.0
1		0205	26	16.	.6	3508.5	1		1025	126	62.	11.2	3517.4	1		1845	226	0.	.0	3506.0
1		0210	27	15.	.6	3508.4	1		1030	127	61.	10.8	3517.2	1		1850	227	0.	.0	3506.0
1		0215	28	16.	.6	3508.5	1		1035	128	61.	10.4	3517.1	1		1855	228	0.	.0	3506.0
1		0220	29	19.	.7	3509.0	1		1040	129	60.	9.9	3517.0	1		1900	229	0.	.0	3506.0
1		0225	30	23.	.9	3509.6	1		1045	130	60.	9.5	3516.9	1		1905	230	0.	.0	3506.0
1		0230	31	26.	1.0	3510.2	1		1050	131	60.	9.1	3516.7	1		1910	231	0.	.0	3506.0
1		0235	32	28.	1.0	3510.4	1		1055	132	59.	8.7	3516.6	1		1915	232	0.	.0	3506.0
1		0240	33	28.	1.1	3510.5	1		1100	133	59.	8.3	3516.5	1		1920	233	0.	.0	3506.0
1		0245	34	30.	1.1	3510.7	1		1105	134	58.	7.9	3516.3	1		1925	234	0.	.0	3506.0
1		0250	35	32.	1.2	3511.0	1		1110	135	58.	7.5	3516.2	1		1930	235	0.	.0	3506.0
1		0255	36	32.	1.2	3511.1	1		1115	136	58.	7.1	3516.1	1		1935	236	0.	.0	3506.0
1		0300	37	32.	1.2	3511.1	1		1120	137	57.	6.7	3516.0	1		1940	237	0.	.0	3506.0
1		0305	38	34.	1.3	3511.4	1		1125	138	57.	6.3	3515.8	1		1945	238	0.	.0	3506.0
1		0310	39	42.	1.6	3512.7	1		1130	139	56.	5.9	3515.6	1		1950	239	0.	.0	3506.0
1		0315	40	51.	2.3	3514.2	1		1135	140	56.	5.5	3515.5	1		1955	240	0.	.0	3506.0
1		0320	41	53.	3.8	3514.8	1		1140	141	55.	5.2	3515.3	1		2000	241	0.	.0	3506.0
1		0325	42	57.	6.5	3515.9	1		1145	142	55.	4.8	3515.2	1		2005	242	0.	.0	3506.0
1		0330	43	61.	10.7	3517.2	1		1150	143	54.	4.4	3515.0	1		2010	243	0.	.0	3506.0
1		0335	44	65.	15.8	3518.7	1		1155	144	54.	4.0	3514.9	1		2015	244	0.	.0	3506.0
1		0340	45	69.	20.7	3520.0	1		1200	145	53.	3.7	3514.7	1		2020	245	0.	.0	3506.0
1		0345	46	72.	24.6	3520.9	1		1205	146	53.	3.3	3514.6	1		2025	246	0.	.0	3506.0
1		0350	47	73.	27.7	3521.6	1		1210	147	52.	2.9	3514.4	1		2030	247	0.	.0	3506.0
1		0355	48	75.	29.8	3522.1	1		1215	148	52.	2.6	3514.3	1		2035	248	0.	.0	3506.0
1		0400	49	75.	31.4	3522.4	1		1220	149	51.	2.2	3514.1	1		2040	249	0.	.0	3506.0
1		0405	50	76.	32.5	3522.6	1		1225	150	50.	1.9	3513.9	1		2045	250	0.	.0	3506.0
1		0410	51	76.	33.2	3522.7	1		1230	151	42.	1.6	3512.6	1		2050	251	0.	.0	3506.0
1		0415	52	76.	33.7	3522.8	1		1235	152	35.	1.3	3511.5	1		2055	252	0.	.0	3506.0
1		0420	53	76.	34.0	3522.9	1		1240	153	29.	1.1	3510.6	1		2100	253	0.	.0	3506.0
1		0425	54	77.	34.2	3522.9	1		1245	154	24.	.9	3509.8	1		2105	254	0.	.0	3506.0
1		0430	55	77.	34.5	3523.0	1		1250	155	20.	.8	3509.2	1		2110	255	0.	.0	3506.0
1		0435	56	77.	35.2	3523.1	1		1255	156	17.	.6	3508.6	1		2115	256	0.	.0	3506.0
1		0440	57	77.	35.9	3523.3	1		1300	157	14.	.5	3508.2	1		2120	257	0.	.0	3506.0
1		0445	58	78.	36.7	3523.4	1		1305	158	12.	.4	3507.8	1		2125	258	0.	.0	3506.0
1		0450	59	78.	37.5	3523.5	1		1310	159	10.	.4	3507.5	1		2130	259	0.	.0	3506.0
1		0455	60	78.	38.3	3523.7	1		1315	160	8.	.3	3507.3	1		2135	260	0.	.0	3506.0
1		0500	61	79.	39.0	3523.8	1		1320	161	7.	.2	3507.0	1		2140	261	0.	.0	3506.0
1		0505	62	79.	39.4	3523.9	1		1325	162	6.	.2	3506.9	1		2145	262	0.	.0	3506.0
1		0510	63	79.	39.6	3524.0	1		1330	163	5.	.2	3506.7	1		2150	263	0.	.0	3506.0
1		0515	64	79.	39.6	3524.0	1		1335	164	4.	.1	3506.6	1		2155	264	0.	.0	3506.0
1		0520	65	79.	39.5	3523.9	1		1340	165	3.	.1	3506.5	1		2200	265	0.	.0	3506.0
1		0525	66	79.	39.3	3523.9	1		1345	166	3.	.1	3506.4	1		2205	266	0.	.0	3506.0
1		0530	67	79.	39.0	3523.8	1		1350	167	2.	.1	3506.3	1		2210	267	0.	.0	3506.0
1		0535	68	79.	38.6	3523.8	1		1355	168	2.	.1	3506.3	1		2215	268	0.	.0	3506.0
1		0540	69	78.	38.2	3523.7	1		1400	169	2.	.1	3506.2	1		2220	269	0.	.0	3506.0
1		0545	70	78.	37.8	3523.6	1		1405	170	1.	.0	3506.2	1		2225	270	0.	.0	3506.0
1		0550	71	78.	37.4	3523.5	1		1410	171	1.	.0	3506.2	1		2230	271	0.	.0	3506.0
1		0555	72	78.	37.0	3523.5	1		1415	172	1.	.0	3506.1	1		2235	272	0.	.0	3506.0
1		0600	73	78.	36.6	3523.4	1		1420	173	1.	.0	3506.1	1		2240	273	0.	.0	3506.0

1	0605	74	77.	36.2	3523.3	*	1	1425	174	1.	.0	3506.1	*	1	2245	274	0.	.0	3506.0
1	0610	75	77.	35.7	3523.2	*	1	1430	175	1.	.0	3506.1	*	1	2250	275	0.	.0	3506.0
1	0615	76	77.	35.2	3523.1	*	1	1435	176	0.	.0	3506.1	*	1	2255	276	0.	.0	3506.0
1	0620	77	77.	34.7	3523.0	*	1	1440	177	0.	.0	3506.1	*	1	2300	277	0.	.0	3506.0
1	0625	78	77.	34.2	3522.9	*	1	1445	178	0.	.0	3506.0	*	1	2305	278	0.	.0	3506.0
1	0630	79	76.	33.7	3522.8	*	1	1450	179	0.	.0	3506.0	*	1	2310	279	0.	.0	3506.0
1	0635	80	76.	33.2	3522.7	*	1	1455	180	0.	.0	3506.0	*	1	2315	280	0.	.0	3506.0
1	0640	81	76.	32.7	3522.6	*	1	1500	181	0.	.0	3506.0	*	1	2320	281	0.	.0	3506.0
1	0645	82	76.	32.2	3522.5	*	1	1505	182	0.	.0	3506.0	*	1	2325	282	0.	.0	3506.0
1	0650	83	75.	31.6	3522.4	*	1	1510	183	0.	.0	3506.0	*	1	2330	283	0.	.0	3506.0
1	0655	84	75.	31.1	3522.3	*	1	1515	184	0.	.0	3506.0	*	1	2335	284	0.	.0	3506.0
1	0700	85	75.	30.6	3522.2	*	1	1520	185	0.	.0	3506.0	*	1	2340	285	0.	.0	3506.0
1	0705	86	75.	30.1	3522.1	*	1	1525	186	0.	.0	3506.0	*	1	2345	286	0.	.0	3506.0
1	0710	87	74.	29.6	3522.1	*	1	1530	187	0.	.0	3506.0	*	1	2350	287	0.	.0	3506.0
1	0715	88	74.	29.1	3521.9	*	1	1535	188	0.	.0	3506.0	*	1	2355	288	0.	.0	3506.0
1	0720	89	74.	28.5	3521.8	*	1	1540	189	0.	.0	3506.0	*	2	0000	289	0.	.0	3506.0
1	0725	90	74.	28.0	3521.7	*	1	1545	190	0.	.0	3506.0	*	2	0005	290	0.	.0	3506.0
1	0730	91	73.	27.5	3521.6	*	1	1550	191	0.	.0	3506.0	*	2	0010	291	0.	.0	3506.0
1	0735	92	73.	27.0	3521.5	*	1	1555	192	0.	.0	3506.0	*	2	0015	292	0.	.0	3506.0
1	0740	93	73.	26.5	3521.4	*	1	1600	193	0.	.0	3506.0	*	2	0020	293	0.	.0	3506.0
1	0745	94	72.	26.0	3521.2	*	1	1605	194	0.	.0	3506.0	*	2	0025	294	0.	.0	3506.0
1	0750	95	72.	25.5	3521.1	*	1	1610	195	0.	.0	3506.0	*	2	0030	295	0.	.0	3506.0
1	0755	96	72.	25.0	3521.0	*	1	1615	196	0.	.0	3506.0	*	2	0035	296	0.	.0	3506.0
1	0800	97	71.	24.5	3520.9	*	1	1620	197	0.	.0	3506.0	*	2	0040	297	0.	.0	3506.0
1	0805	98	71.	24.1	3520.8	*	1	1625	198	0.	.0	3506.0	*	2	0045	298	0.	.0	3506.0
1	0810	99	71.	23.6	3520.7	*	1	1630	199	0.	.0	3506.0	*	2	0050	299	0.	.0	3506.0
1	0815	100	71.	23.1	3520.6	*	1	1635	200	0.	.0	3506.0	*	2	0055	300	0.	.0	3506.0
						*							*						

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
	(CFS)				
+ 79.	5.25	74.	29.	28.	28.
	(INCHES)	.542	.857	.857	.857
	(AC-FT)	37.	58.	58.	58.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
40.	5.25	30.	9.	8.	8.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
3523.95	5.25	3521.90	3511.82	3511.61	3511.61

CUMULATIVE AREA = 1.27 SQ MI

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HYDROGRAPH AT STATION GPDB
PLAN 1, RATIO = .98

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
							*								*							
1		0000	1	0.	.0	3506.0	*	1		0820	101	70.	21.5	3520.2	*	1		1640	201	0.	.0	3506.0
1		0005	2	0.	.0	3506.0	*	1		0825	102	69.	21.0	3520.1	*	1		1645	202	0.	.0	3506.0
1		0010	3	0.	.0	3506.0	*	1		0830	103	69.	20.6	3520.0	*	1		1650	203	0.	.0	3506.0
1		0015	4	1.	.0	3506.1	*	1		0835	104	69.	20.1	3519.9	*	1		1655	204	0.	.0	3506.0
1		0020	5	2.	.1	3506.3	*	1		0840	105	68.	19.6	3519.7	*	1		1700	205	0.	.0	3506.0
1		0025	6	4.	.1	3506.6	*	1		0845	106	68.	19.1	3519.6	*	1		1705	206	0.	.0	3506.0
1		0030	7	6.	.2	3507.0	*	1		0850	107	68.	18.7	3519.5	*	1		1710	207	0.	.0	3506.0
1		0035	8	9.	.3	3507.4	*	1		0855	108	67.	18.2	3519.4	*	1		1715	208	0.	.0	3506.0
1		0040	9	10.	.4	3507.6	*	1		0900	109	67.	17.7	3519.2	*	1		1720	209	0.	.0	3506.0
1		0045	10	11.	.4	3507.7	*	1		0905	110	67.	17.3	3519.1	*	1		1725	210	0.	.0	3506.0
1		0050	11	10.	.4	3507.5	*	1		0910	111	66.	16.8	3519.0	*	1		1730	211	0.	.0	3506.0
1		0055	12	8.	.3	3507.3	*	1		0915	112	66.	16.4	3518.9	*	1		1735	212	0.	.0	3506.0
1		0100	13	7.	.3	3507.1	*	1		0920	113	66.	15.9	3518.7	*	1		1740	213	0.	.0	3506.0
1		0105	14	6.	.2	3507.0	*	1		0925	114	65.	15.5	3518.6	*	1		1745	214	0.	.0	3506.0
1		0110	15	6.	.2	3506.9	*	1		0930	115	65.	15.0	3518.5	*	1		1750	215	0.	.0	3506.0
1		0115	16	6.	.2	3506.9	*	1		0935	116	65.	14.6	3518.4	*	1		1755	216	0.	.0	3506.0
1		0120	17	6.	.2	3506.9	*	1		0940	117	64.	14.1	3518.3	*	1		1800	217	0.	.0	3506.0
1		0125	18	7.	.2	3507.0	*	1		0945	118	64.	13.7	3518.1	*	1		1805	218	0.	.0	3506.0
1		0130	19	8.	.3	3507.3	*	1		0950	119	64.	13.3	3518.0	*	1		1810	219	0.	.0	3506.0
1		0135	20	10.	.4	3507.7	*	1		0955	120	63.	12.8	3517.9	*	1		1815	220	0.	.0	3506.0
1		0140	21	13.	.5	3508.1	*	1		1000	121	63.	12.4	3517.7	*	1		1820	221	0.	.0	3506.0
1		0145	22	15.	.6	3508.4	*	1		1005	122	62.	12.0	3517.6	*	1		1825	222	0.	.0	3506.0
1		0150	23	17.	.6	3508.7	*	1		1010	123	62.	11.5	3517.5	*	1		1830	223	0.	.0	3506.0
1		0155	24	17.	.7	3508.8	*	1		1015	124	61.	11.1	3517.3	*	1		1835	224	0.	.0	3506.0
1		0200	25	17.	.6	3508.6	*	1		1020	125	61.	10.7	3517.2	*	1		1840	225	0.	.0	3506.0
1		0205	26	15.	.6	3508.4	*	1		1025	126	61.	10.3	3517.1	*	1		1845	226	0.	.0	3506.0
1		0210	27	14.	.5	3508.3	*	1		1030	127	60.	9.8	3517.0	*	1		1850	227	0.	.0	3506.0
1		0215	28	15.	.6	3508.4	*	1		1035	128	60.	9.4	3516.8	*	1		1855	228	0.	.0	3506.0
1		0220	29	18.	.7	3508.9	*	1		1040	129	60.	9.0	3516.7	*	1		1900	229	0.	.0	3506.0
1		0225	30	22.	.8	3509.5	*	1		1045	130	59.	8.6	3516.6	*	1		1905	230	0.	.0	3506.0
1		0230	31	25.	1.0	3510.0	*	1		1050	131	59.	8.2	3516.4	*	1		1910	231	0.	.0	3506.0

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   1     0235  32      27.      1.0  3510.2 *  1     1055 132      58.      7.8  3516.3 *  1     1915 232       0.       .0  3506.0
   1     0240  33      27.      1.0  3510.3 *  1     1100 133      58.      7.4  3516.2 *  1     1920 233       0.       .0  3506.0
   1     0245  34      29.      1.1  3510.5 *  1     1105 134      58.      7.0  3516.1 *  1     1925 234       0.       .0  3506.0
   1     0250  35      31.      1.1  3510.8 *  1     1110 135      57.      6.6  3515.9 *  1     1930 235       0.       .0  3506.0
   1     0255  36      31.      1.2  3510.9 *  1     1115 136      57.      6.2  3515.8 *  1     1935 236       0.       .0  3506.0
   1     0300  37      31.      1.2  3510.9 *  1     1120 137      56.      5.8  3515.6 *  1     1940 237       0.       .0  3506.0
   1     0305  38      33.      1.2  3511.2 *  1     1125 138      56.      5.4  3515.4 *  1     1945 238       0.       .0  3506.0
   1     0310  39      41.      1.5  3512.4 *  1     1130 139      55.      5.1  3515.3 *  1     1950 239       0.       .0  3506.0
   1     0315  40      51.      2.2  3514.1 *  1     1135 140      54.      4.7  3515.1 *  1     1955 240       0.       .0  3506.0
   1     0320  41      53.      3.7  3514.7 *  1     1140 141      54.      4.3  3515.0 *  1     2000 241       0.       .0  3506.0
   1     0325  42      57.      6.3  3515.8 *  1     1145 142      53.      3.9  3514.8 *  1     2005 242       0.       .0  3506.0
   1     0330  43      61.     10.4  3517.1 *  1     1150 143      53.      3.6  3514.7 *  1     2010 243       0.       .0  3506.0
   1     0335  44      65.     15.4  3518.6 *  1     1155 144      52.      3.2  3514.5 *  1     2015 244       0.       .0  3506.0
   1     0340  45      69.     20.1  3519.9 *  1     1200 145      52.      2.9  3514.4 *  1     2020 245       0.       .0  3506.0
   1     0345  46      71.     23.9  3520.8 *  1     1205 146      51.      2.5  3514.2 *  1     2025 246       0.       .0  3506.0
   1     0350  47      73.     26.9  3521.4 *  1     1210 147      51.      2.1  3514.1 *  1     2030 247       0.       .0  3506.0
   1     0355  48      74.     29.0  3521.9 *  1     1215 148      48.      1.8  3513.6 *  1     2035 248       0.       .0  3506.0
   1     0400  49      75.     30.5  3522.2 *  1     1220 149      40.      1.5  3512.3 *  1     2040 249       0.       .0  3506.0
   1     0405  50      75.     31.6  3522.4 *  1     1225 150      33.      1.2  3511.3 *  1     2045 250       0.       .0  3506.0
   1     0410  51      76.     32.3  3522.6 *  1     1230 151      28.      1.0  3510.4 *  1     2050 251       0.       .0  3506.0
   1     0415  52      76.     32.7  3522.6 *  1     1235 152      23.       .9  3509.6 *  1     2055 252       0.       .0  3506.0
   1     0420  53      76.     33.0  3522.7 *  1     1240 153      19.       .7  3509.0 *  1     2100 253       0.       .0  3506.0
   1     0425  54      76.     33.2  3522.7 *  1     1245 154      16.       .6  3508.5 *  1     2105 254       0.       .0  3506.0
   1     0430  55      76.     33.5  3522.8 *  1     1250 155      13.       .5  3508.1 *  1     2110 255       0.       .0  3506.0
   1     0435  56      76.     34.1  3522.9 *  1     1255 156      11.       .4  3507.7 *  1     2115 256       0.       .0  3506.0
   1     0440  57      77.     34.9  3523.1 *  1     1300 157       9.       .3  3507.5 *  1     2120 257       0.       .0  3506.0
   1     0445  58      77.     35.6  3523.2 *  1     1305 158       8.       .3  3507.2 *  1     2125 258       0.       .0  3506.0
   1     0450  59      78.     36.4  3523.3 *  1     1310 159       6.       .2  3507.0 *  1     2130 259       0.       .0  3506.0
   1     0455  60      78.     37.2  3523.5 *  1     1315 160       5.       .2  3506.8 *  1     2135 260       0.       .0  3506.0
   1     0500  61      78.     37.8  3523.6 *  1     1320 161       4.       .2  3506.7 *  1     2140 261       0.       .0  3506.0
   1     0505  62      78.     38.3  3523.7 *  1     1325 162       4.       .1  3506.6 *  1     2145 262       0.       .0  3506.0
   1     0510  63      78.     38.5  3523.7 *  1     1330 163       3.       .1  3506.5 *  1     2150 263       0.       .0  3506.0
   1     0515  64      78.     38.5  3523.7 *  1     1335 164       3.       .1  3506.4 *  1     2155 264       0.       .0  3506.0
   1     0520  65      78.     38.3  3523.7 *  1     1340 165       2.       .1  3506.3 *  1     2200 265       0.       .0  3506.0
   1     0525  66      78.     38.1  3523.7 *  1     1345 166       2.       .1  3506.3 *  1     2205 266       0.       .0  3506.0
   1     0530  67      78.     37.8  3523.6 *  1     1350 167       1.       .1  3506.2 *  1     2210 267       0.       .0  3506.0
   1     0535  68      78.     37.4  3523.5 *  1     1355 168       1.       .0  3506.2 *  1     2215 268       0.       .0  3506.0
   1     0540  69      78.     37.0  3523.5 *  1     1400 169       1.       .0  3506.2 *  1     2220 269       0.       .0  3506.0
   1     0545  70      78.     36.6  3523.4 *  1     1405 170       1.       .0  3506.1 *  1     2225 270       0.       .0  3506.0
   1     0550  71      77.     36.2  3523.3 *  1     1410 171       1.       .0  3506.1 *  1     2230 271       0.       .0  3506.0
   1     0555  72      77.     35.8  3523.2 *  1     1415 172       1.       .0  3506.1 *  1     2235 272       0.       .0  3506.0
   1     0600  73      77.     35.4  3523.1 *  1     1420 173       0.       .0  3506.1 *  1     2240 273       0.       .0  3506.0
   1     0605  74      77.     35.0  3523.1 *  1     1425 174       0.       .0  3506.1 *  1     2245 274       0.       .0  3506.0
   1     0610  75      77.     34.5  3523.0 *  1     1430 175       0.       .0  3506.1 *  1     2250 275       0.       .0  3506.0
   1     0615  76      76.     34.0  3522.9 *  1     1435 176       0.       .0  3506.0 *  1     2255 276       0.       .0  3506.0
   1     0620  77      76.     33.5  3522.8 *  1     1440 177       0.       .0  3506.0 *  1     2300 277       0.       .0  3506.0
   1     0625  78      76.     33.0  3522.7 *  1     1445 178       0.       .0  3506.0 *  1     2305 278       0.       .0  3506.0
   1     0630  79      76.     32.5  3522.6 *  1     1450 179       0.       .0  3506.0 *  1     2310 279       0.       .0  3506.0
   1     0635  80      76.     32.0  3522.5 *  1     1455 180       0.       .0  3506.0 *  1     2315 280       0.       .0  3506.0
   1     0640  81      75.     31.5  3522.4 *  1     1500 181       0.       .0  3506.0 *  1     2320 281       0.       .0  3506.0
   1     0645  82      75.     31.0  3522.3 *  1     1505 182       0.       .0  3506.0 *  1     2325 282       0.       .0  3506.0
   1     0650  83      75.     30.5  3522.2 *  1     1510 183       0.       .0  3506.0 *  1     2330 283       0.       .0  3506.0
   1     0655  84      75.     30.0  3522.1 *  1     1515 184       0.       .0  3506.0 *  1     2335 284       0.       .0  3506.0
   1     0700  85      74.     29.4  3522.0 *  1     1520 185       0.       .0  3506.0 *  1     2340 285       0.       .0  3506.0
   1     0705  86      74.     28.9  3521.9 *  1     1525 186       0.       .0  3506.0 *  1     2345 286       0.       .0  3506.0
   1     0710  87      74.     28.4  3521.8 *  1     1530 187       0.       .0  3506.0 *  1     2350 287       0.       .0  3506.0
   1     0715  88      73.     27.9  3521.7 *  1     1535 188       0.       .0  3506.0 *  1     2355 288       0.       .0  3506.0
   1     0720  89      73.     27.4  3521.6 *  1     1540 189       0.       .0  3506.0 *  2     0000 289       0.       .0  3506.0
   1     0725  90      73.     26.9  3521.4 *  1     1545 190       0.       .0  3506.0 *  2     0005 290       0.       .0  3506.0
   1     0730  91      73.     26.4  3521.3 *  1     1550 191       0.       .0  3506.0 *  2     0010 291       0.       .0  3506.0
   1     0735  92      72.     25.9  3521.2 *  1     1555 192       0.       .0  3506.0 *  2     0015 292       0.       .0  3506.0
   1     0740  93      72.     25.4  3521.1 *  1     1600 193       0.       .0  3506.0 *  2     0020 293       0.       .0  3506.0
   1     0745  94      72.     24.9  3521.0 *  1     1605 194       0.       .0  3506.0 *  2     0025 294       0.       .0  3506.0
   1     0750  95      71.     24.4  3520.9 *  1     1610 195       0.       .0  3506.0 *  2     0030 295       0.       .0  3506.0
   1     0755  96      71.     23.9  3520.8 *  1     1615 196       0.       .0  3506.0 *  2     0035 296       0.       .0  3506.0
   1     0800  97      71.     23.4  3520.7 *  1     1620 197       0.       .0  3506.0 *  2     0040 297       0.       .0  3506.0
   1     0805  98      71.     23.0  3520.5 *  1     1625 198       0.       .0  3506.0 *  2     0045 298       0.       .0  3506.0
   1     0810  99      70.     22.5  3520.4 *  1     1630 199       0.       .0  3506.0 *  2     0050 299       0.       .0  3506.0
   1     0815 100      70.     22.0  3520.3 *  1     1635 200       0.       .0  3506.0 *  2     0055 300       0.       .0  3506.0
                                             *                                            *

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  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR        72-HR     24.92-HR
+   (CFS)       (HR)
                        (CFS)
+      78.      5.17                 73.          28.          27.          27.
                          (INCHES)   .537         .835         .835         .835
                          (AC-FT)     36.          56.          56.          56.

  PEAK STORAGE  TIME                      MAXIMUM AVERAGE STORAGE
                                  6-HR        24-HR        72-HR     24.92-HR
+  (AC-FT)      (HR)
       38.      5.17                 28.           8.           8.           8.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                  6-HR        24-HR        72-HR     24.92-HR
+   (FEET)      (HR)
   3523.73      5.17              3521.67      3511.66      3511.45      3511.45

                          CUMULATIVE AREA =    1.27 SQ MI
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HYDROGRAPH AT STATION GPDB
PLAN 1, RATIO = .95

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	3506.0	1		0820	101	68.	19.7	3519.8	1		1640	201	0.	.0	3506.0
1		0005	2	0.	.0	3506.0	1		0825	102	68.	19.2	3519.6	1		1645	202	0.	.0	3506.0
1		0010	3	0.	.0	3506.0	1		0830	103	68.	18.8	3519.5	1		1650	203	0.	.0	3506.0
1		0015	4	1.	.0	3506.1	1		0835	104	67.	18.3	3519.4	1		1655	204	0.	.0	3506.0
1		0020	5	2.	.1	3506.3	1		0840	105	67.	17.8	3519.3	1		1700	205	0.	.0	3506.0
1		0025	6	3.	.1	3506.5	1		0845	106	67.	17.4	3519.1	1		1705	206	0.	.0	3506.0
1		0030	7	6.	.2	3506.9	1		0850	107	66.	16.9	3519.0	1		1710	207	0.	.0	3506.0
1		0035	8	8.	.3	3507.3	1		0855	108	66.	16.5	3518.9	1		1715	208	0.	.0	3506.0
1		0040	9	10.	.4	3507.5	1		0900	109	66.	16.0	3518.8	1		1720	209	0.	.0	3506.0
1		0045	10	10.	.4	3507.6	1		0905	110	65.	15.6	3518.6	1		1725	210	0.	.0	3506.0
1		0050	11	9.	.3	3507.4	1		0910	111	65.	15.1	3518.5	1		1730	211	0.	.0	3506.0
1		0055	12	8.	.3	3507.3	1		0915	112	65.	14.7	3518.4	1		1735	212	0.	.0	3506.0
1		0100	13	7.	.3	3507.1	1		0920	113	64.	14.2	3518.3	1		1740	213	0.	.0	3506.0
1		0105	14	6.	.2	3506.9	1		0925	114	64.	13.8	3518.2	1		1745	214	0.	.0	3506.0
1		0110	15	5.	.2	3506.8	1		0930	115	64.	13.4	3518.0	1		1750	215	0.	.0	3506.0
1		0115	16	5.	.2	3506.8	1		0935	116	63.	12.9	3517.9	1		1755	216	0.	.0	3506.0
1		0120	17	6.	.2	3506.9	1		0940	117	63.	12.5	3517.8	1		1800	217	0.	.0	3506.0
1		0125	18	6.	.2	3507.0	1		0945	118	62.	12.0	3517.6	1		1805	218	0.	.0	3506.0
1		0130	19	8.	.3	3507.2	1		0950	119	62.	11.6	3517.5	1		1810	219	0.	.0	3506.0
1		0135	20	10.	.4	3507.6	1		0955	120	62.	11.2	3517.4	1		1815	220	0.	.0	3506.0
1		0140	21	12.	.5	3507.9	1		1000	121	61.	10.8	3517.2	1		1820	221	0.	.0	3506.0
1		0145	22	14.	.5	3508.3	1		1005	122	61.	10.4	3517.1	1		1825	222	0.	.0	3506.0
1		0150	23	16.	.6	3508.5	1		1010	123	60.	9.9	3517.0	1		1830	223	0.	.0	3506.0
1		0155	24	16.	.6	3508.6	1		1015	124	60.	9.5	3516.9	1		1835	224	0.	.0	3506.0
1		0200	25	16.	.6	3508.5	1		1020	125	60.	9.1	3516.7	1		1840	225	0.	.0	3506.0
1		0205	26	14.	.5	3508.3	1		1025	126	59.	8.7	3516.6	1		1845	226	0.	.0	3506.0
1		0210	27	13.	.5	3508.1	1		1030	127	59.	8.3	3516.5	1		1850	227	0.	.0	3506.0
1		0215	28	14.	.5	3508.2	1		1035	128	58.	7.9	3516.3	1		1855	228	0.	.0	3506.0
1		0220	29	17.	.6	3508.7	1		1040	129	58.	7.5	3516.2	1		1900	229	0.	.0	3506.0
1		0225	30	21.	.8	3509.3	1		1045	130	58.	7.1	3516.1	1		1905	230	0.	.0	3506.0
1		0230	31	24.	.9	3509.8	1		1050	131	57.	6.7	3516.0	1		1910	231	0.	.0	3506.0
1		0235	32	25.	.9	3510.0	1		1055	132	57.	6.3	3515.8	1		1915	232	0.	.0	3506.0
1		0240	33	26.	1.0	3510.1	1		1100	133	56.	5.9	3515.6	1		1920	233	0.	.0	3506.0
1		0245	34	27.	1.0	3510.3	1		1105	134	56.	5.5	3515.5	1		1925	234	0.	.0	3506.0
1		0250	35	29.	1.1	3510.6	1		1110	135	55.	5.1	3515.3	1		1930	235	0.	.0	3506.0
1		0255	36	30.	1.1	3510.7	1		1115	136	55.	4.8	3515.2	1		1935	236	0.	.0	3506.0
1		0300	37	29.	1.1	3510.6	1		1120	137	54.	4.4	3515.0	1		1940	237	0.	.0	3506.0
1		0305	38	31.	1.2	3510.9	1		1125	138	54.	4.0	3514.9	1		1945	238	0.	.0	3506.0
1		0310	39	39.	1.5	3512.1	1		1130	139	53.	3.7	3514.7	1		1950	239	0.	.0	3506.0
1		0315	40	51.	2.1	3514.1	1		1135	140	53.	3.3	3514.6	1		1955	240	0.	.0	3506.0
1		0320	41	53.	3.4	3514.6	1		1140	141	52.	2.9	3514.4	1		2000	241	0.	.0	3506.0
1		0325	42	56.	6.0	3515.7	1		1145	142	52.	2.6	3514.3	1		2005	242	0.	.0	3506.0
1		0330	43	60.	9.8	3516.9	1		1150	143	51.	2.2	3514.1	1		2010	243	0.	.0	3506.0
1		0335	44	65.	14.6	3518.4	1		1155	144	50.	1.9	3513.9	1		2015	244	0.	.0	3506.0
1		0340	45	68.	19.1	3519.6	1		1200	145	42.	1.6	3512.6	1		2020	245	0.	.0	3506.0
1		0345	46	70.	22.8	3520.5	1		1205	146	35.	1.3	3511.5	1		2025	246	0.	.0	3506.0
1		0350	47	72.	25.6	3521.2	1		1210	147	29.	1.1	3510.5	1		2030	247	0.	.0	3506.0
1		0355	48	73.	27.6	3521.6	1		1215	148	24.	.9	3509.8	1		2035	248	0.	.0	3506.0
1		0400	49	74.	29.0	3521.9	1		1220	149	20.	.7	3509.1	1		2040	249	0.	.0	3506.0
1		0405	50	75.	30.0	3522.1	1		1225	150	17.	.6	3508.6	1		2045	250	0.	.0	3506.0
1		0410	51	75.	30.7	3522.3	1		1230	151	14.	.5	3508.2	1		2050	251	0.	.0	3506.0
1		0415	52	75.	31.1	3522.3	1		1235	152	11.	.4	3507.8	1		2055	252	0.	.0	3506.0
1		0420	53	75.	31.3	3522.4	1		1240	153	10.	.4	3507.5	1		2100	253	0.	.0	3506.0
1		0425	54	75.	31.5	3522.4	1		1245	154	8.	.3	3507.3	1		2105	254	0.	.0	3506.0
1		0430	55	75.	31.9	3522.5	1		1250	155	7.	.2	3507.0	1		2110	255	0.	.0	3506.0
1		0435	56	76.	32.4	3522.6	1		1255	156	5.	.2	3506.9	1		2115	256	0.	.0	3506.0
1		0440	57	76.	33.1	3522.7	1		1300	157	5.	.2	3506.7	1		2120	257	0.	.0	3506.0
1		0445	58	76.	33.8	3522.9	1		1305	158	4.	.1	3506.6	1		2125	258	0.	.0	3506.0
1		0450	59	77.	34.6	3523.0	1		1310	159	3.	.1	3506.5	1		2130	259	0.	.0	3506.0
1		0455	60	77.	35.3	3523.1	1		1315	160	3.	.1	3506.4	1		2135	260	0.	.0	3506.0
1		0500	61	77.	35.9	3523.2	1		1320	161	2.	.1	3506.3	1		2140	261	0.	.0	3506.0
1		0505	62	77.	36.3	3523.3	1		1325	162	2.	.1	3506.3	1		2145	262	0.	.0	3506.0
1		0510	63	78.	36.5	3523.4	1		1330	163	2.	.1	3506.2	1		2150	263	0.	.0	3506.0
1		0515	64	78.	36.5	3523.4	1		1335	164	1.	.0	3506.2	1		2155	264	0.	.0	3506.0
1		0520	65	77.	36.3	3523.3	1		1340	165	1.	.0	3506.2	1		2200	265	0.	.0	3506.0
1		0525	66	77.	36.1	3523.3	1		1345	166	1.	.0	3506.1	1		2205	266	0.	.0	3506.0
1		0530	67	77.	35.8	3523.2	1		1350	167	1.	.0	3506.1	1		2210	267	0.	.0	3506.0
1		0535	68	77.	35.4	3523.2	1		1355	168	1.	.0	3506.1	1		2215	268	0.	.0	3506.0
1		0540	69	77.	35.0	3523.1	1		1400	169	1.	.0	3506.1	1		2220	269	0.	.0	3506.0
1		0545	70	77.	34.6	3523.0	1		1405	170	0.	.0	3506.1	1		2225	270	0.	.0	3506.0
1		0550	71	77.	34.2	3522.9	1		1410	171	0.	.0	3506.1	1		2230	271	0.	.0	3506.0
1		0555	72	76.	33.8	3522.9	1		1415	172	0.	.0	3506.0	1		2235	272	0.	.0	3506.0
1		0600	73	76.	33.4	3522.8	1		1420	173	0.	.0	3506.0	1		2240	273	0.	.0	3506.0
1		0605	74	76.	33.0	3522.7	1		1425	174	0.	.0	3506.0	1		2245	274	0.	.0	3506.0
1		0610	75	76.	32.5	3522.6	1		1430	175	0.	.0	3506.0	1		2250	275	0.	.0	3506.0
1		0615	76	76.	32.1	3522.5	1		1435	176	0.	.0	3506.0	1		2255	276	0.	.0	3506.0
1		0620	77	75.	31.6	3522.4	1		1440	177	0.	.0	3506.0	1		2300	277	0.	.0	3506.0
1		0625	78	75.	31.1	3522.3	1		1445	178	0.	.0	3506.0	1		2305	278	0.	.0	3506.0
1		0630	79	75.	30.6	3522.2	1		1450	179	0.	.0	3506.0	1		2310	279	0.	.0	3506.0
1		0635	80	75.	30.1	3522.1	1		1455	180	0.	.0	3506.0	1		2315	280	0.	.0	3506.0

1	0640	81	74.	29.6	3522.0	*	1	1500	181	0.	.0	3506.0	*	1	2320	281	0.	.0	3506.0
1	0645	82	74.	29.0	3521.9	*	1	1505	182	0.	.0	3506.0	*	1	2325	282	0.	.0	3506.0
1	0650	83	74.	28.5	3521.8	*	1	1510	183	0.	.0	3506.0	*	1	2330	283	0.	.0	3506.0
1	0655	84	74.	28.0	3521.7	*	1	1515	184	0.	.0	3506.0	*	1	2335	284	0.	.0	3506.0
1	0700	85	73.	27.5	3521.6	*	1	1520	185	0.	.0	3506.0	*	1	2340	285	0.	.0	3506.0
1	0705	86	73.	27.0	3521.5	*	1	1525	186	0.	.0	3506.0	*	1	2345	286	0.	.0	3506.0
1	0710	87	73.	26.5	3521.4	*	1	1530	187	0.	.0	3506.0	*	1	2350	287	0.	.0	3506.0
1	0715	88	72.	26.0	3521.2	*	1	1535	188	0.	.0	3506.0	*	1	2355	288	0.	.0	3506.0
1	0720	89	72.	25.5	3521.1	*	1	1540	189	0.	.0	3506.0	*	2	0000	289	0.	.0	3506.0
1	0725	90	72.	25.0	3521.0	*	1	1545	190	0.	.0	3506.0	*	2	0005	290	0.	.0	3506.0
1	0730	91	71.	24.5	3520.9	*	1	1550	191	0.	.0	3506.0	*	2	0010	291	0.	.0	3506.0
1	0735	92	71.	24.0	3520.8	*	1	1555	192	0.	.0	3506.0	*	2	0015	292	0.	.0	3506.0
1	0740	93	71.	23.6	3520.7	*	1	1600	193	0.	.0	3506.0	*	2	0020	293	0.	.0	3506.0
1	0745	94	71.	23.1	3520.6	*	1	1605	194	0.	.0	3506.0	*	2	0025	294	0.	.0	3506.0
1	0750	95	70.	22.6	3520.5	*	1	1610	195	0.	.0	3506.0	*	2	0030	295	0.	.0	3506.0
1	0755	96	70.	22.1	3520.3	*	1	1615	196	0.	.0	3506.0	*	2	0035	296	0.	.0	3506.0
1	0800	97	70.	21.6	3520.2	*	1	1620	197	0.	.0	3506.0	*	2	0040	297	0.	.0	3506.0
1	0805	98	69.	21.1	3520.1	*	1	1625	198	0.	.0	3506.0	*	2	0045	298	0.	.0	3506.0
1	0810	99	69.	20.7	3520.0	*	1	1630	199	0.	.0	3506.0	*	2	0050	299	0.	.0	3506.0
1	0815	100	69.	20.2	3519.9	*	1	1635	200	0.	.0	3506.0	*	2	0055	300	0.	.0	3506.0
						*							*						

****

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
	(CFS)				
+ 78.	5.17	72.	27.	26.	26.
	(INCHES)	.530	.800	.800	.800
	(AC-FT)	36.	54.	54.	54.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
36.	5.17	27.	8.	7.	7.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
3523.36	5.17	3521.27	3511.38	3511.18	3511.18

CUMULATIVE AREA = 1.27 SQ MI

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

					RATIOS APPLIED TO PRECIPITATION		
OPERATION	STATION	AREA	PLAN		RATIO 1	RATIO 2	RATIO 3
					.99	.98	.95
HYDROGRAPH AT							
+	COS12	.00	1	FLOW	3.	3.	3.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	V31COS10	.02	1	FLOW	11.	11.	11.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	A	.32	1	FLOW	106.	102.	95.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	COS3	.02	1	FLOW	18.	18.	17.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST2A	.00	1	FLOW	1.	1.	1.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST1	.01	1	FLOW	10.	10.	10.
				TIME	3.50	3.50	3.50
6 COMBINED AT							
+	CP1	.37	1	FLOW	136.	131.	123.
				TIME	3.58	3.58	3.58
ROUTED TO							
+	RCP1	.37	1	FLOW	134.	129.	121.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	V31COS14	.01	1	FLOW	8.	8.	8.
				TIME	3.50	3.50	3.50

HYDROGRAPH AT

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+                  COS2       .02     1   FLOW          17.      16.      16.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   DC1       .01     1   FLOW          10.      10.      10.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  ST2B       .00     1   FLOW           1.       1.       1.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+               V27COS14      .00     1   FLOW           4.       4.       4.
                                          TIME         3.50     3.50     3.50

  4 COMBINED AT
+                  CP1A       .04     1   FLOW          32.      31.      30.
                                          TIME         3.50     3.50     3.50

 ROUTED TO
+                 RCP1A       .04     1   FLOW          29.      29.      27.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                 COS11       .01     1   FLOW          11.      11.      10.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST2       .00     1   FLOW           5.       5.       5.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST3       .00     1   FLOW           3.       3.       3.
                                          TIME         3.50     3.50     3.50

  6 COMBINED AT
+                   CP2       .43     1   FLOW         184.     178.     168.
                                          TIME         3.58     3.58     3.58

 ROUTED TO
+                  RCP2       .43     1   FLOW         182.     176.     166.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                     M       .12     1   FLOW          50.      48.      45.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                  COS8       .01     1   FLOW           3.       3.       2.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                  COS9       .00     1   FLOW           4.       4.       4.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+               V27COS10      .02     1   FLOW          19.      19.      18.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST4       .00     1   FLOW           4.       4.       4.
                                          TIME         3.50     3.50     3.50

  6 COMBINED AT
+                   CP3       .59     1   FLOW         258.     250.     236.
                                          TIME         3.58     3.58     3.58

 ROUTED TO
+                  RCP3       .59     1   FLOW         247.     239.     225.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                  COS6       .01     1   FLOW          10.      10.       9.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  COS5       .01     1   FLOW           9.       8.       8.
                                          TIME         3.50     3.58     3.58

 HYDROGRAPH AT
+                  COS7       .02     1   FLOW          12.      12.      11.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                     L       .15     1   FLOW         120.     117.     112.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                   ST5       .01     1   FLOW          15.      15.      14.
                                          TIME         3.50     3.50     3.50
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HYDROGRAPH AT							
+	ST14	.01	1	FLOW	11.	11.	11.
				TIME	3.50	3.50	3.50
7 COMBINED AT							
+	CP4	.79	1	FLOW	418.	406.	385.
				TIME	3.58	3.58	3.58
DIVERSION TO							
+	DVCP4	.79	1	FLOW	418.	406.	385.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	DVCP4	.79	1	FLOW	0.	0.	0.
				TIME	.00	.00	.00
ROUTED TO							
+	RCP4	.79	1	FLOW	0.	0.	0.
				TIME	.00	.00	.00
HYDROGRAPH AT							
+	K	.02	1	FLOW	20.	20.	19.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST17	.00	1	FLOW	3.	3.	3.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CP5	.82	1	FLOW	23.	23.	22.
				TIME	3.50	3.50	3.50
ROUTED TO							
+	RCP5	.82	1	FLOW	22.	22.	21.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	H	.02	1	FLOW	16.	16.	15.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST18	.01	1	FLOW	15.	15.	14.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	I	.02	1	FLOW	14.	14.	13.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST16	.00	1	FLOW	2.	2.	2.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST13	.01	1	FLOW	11.	11.	10.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	G	.03	1	FLOW	38.	37.	36.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	N	.00	1	FLOW	6.	6.	6.
				TIME	3.50	3.50	3.50
5 COMBINED AT							
+	CP6A	.06	1	FLOW	71.	69.	67.
				TIME	3.50	3.50	3.50
4 COMBINED AT							
+	CP6	.90	1	FLOW	124.	121.	117.
				TIME	3.50	3.50	3.50
ROUTED TO							
+	RCP6	.90	1	FLOW	121.	118.	114.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	O	.04	1	FLOW	40.	39.	38.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST19	.00	1	FLOW	4.	4.	4.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CP7	.94	1	FLOW	165.	161.	156.
				TIME	3.50	3.50	3.50
ROUTED TO							
+	RCP7	.94	1	FLOW	161.	158.	152.
				TIME	3.50	3.50	3.50

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 HYDROGRAPH AT
+                     P       .02     1   FLOW          25.      25.      24.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  ST20       .01     1   FLOW           9.       9.       9.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  ST12       .01     1   FLOW          11.      11.      10.
                                           TIME         3.50     3.50     3.50

  4 COMBINED AT
+                   CP8       .98     1   FLOW         206.     202.     195.
                                           TIME         3.50     3.50     3.50

 ROUTED TO
+                  RCP8       .98     1   FLOW         200.     196.     189.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                     E       .04     1   FLOW          55.      54.      53.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                     F       .04     1   FLOW          56.      55.      53.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  COS4       .07     1   FLOW          53.      52.      50.
                                           TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                   ST7       .01     1   FLOW          11.      11.      11.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST6       .00     1   FLOW           7.       7.       7.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                 DVCP4       .00     1   FLOW         418.     406.     385.
                                           TIME         3.58     3.58     3.58

  6 COMBINED AT
+                   CP9       .17     1   FLOW         583.     567.     541.
                                           TIME         3.58     3.58     3.58

 ROUTED TO
+                  RCP9       .17     1   FLOW         572.     557.     532.
                                           TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                   ST8       .00     1   FLOW           6.       6.       6.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  ST21       .00     1   FLOW           5.       5.       5.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  CP1A       .07     1   FLOW          53.      52.      50.
                                           TIME         3.58     3.58     3.58

  4 COMBINED AT
+                  CP10       .25     1   FLOW         632.     616.     589.
                                           TIME         3.58     3.58     3.58

 ROUTED TO
+                 RCP10       .25     1   FLOW         628.     612.     585.
                                           TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                  CP1B       .04     1   FLOW          31.      30.      29.
                                           TIME         3.50     3.50     3.50

  3 COMBINED AT
+                GPDBIN      1.27     1   FLOW         835.     815.     781.
                                           TIME         3.58     3.58     3.58

 ROUTED TO
+                  GPDB      1.27     1   FLOW          79.      78.      78.
                                           TIME         5.25     5.17     5.17

                                    ** PEAK STAGES IN FEET **
                                    1   STAGE     3523.95  3523.73  3523.36
                                           TIME         5.25     5.17     5.17

 ROUTED TO
+                 RGPDB      1.27     1   FLOW          79.      78.      78.
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                                    TIME         5.25     5.25     5.25

 HYDROGRAPH AT
+                    ST9       .00     1   FLOW          7.       7.       7.
                                    TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   CP1C       .05     1   FLOW         36.      35.      33.
                                    TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST10       .00     1   FLOW          5.       5.       5.
                                    TIME         3.50     3.50     3.50

  4 COMBINED AT
+                   CP11      1.32     1   FLOW        108.     106.     104.
                                    TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST11       .01     1   FLOW          8.       8.       8.
                                    TIME         3.50     3.50     3.50
1
                                    SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                        (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                              COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
              RCP1  MANE          .46    136.14    215.73       .51      5.00    133.85    215.00         .51


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1010E+02 EXCESS= .0000E+00 OUTFLOW= .1010E+02 BASIN STORAGE= .8113E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP1  MANE          .47    131.16    215.90       .49      5.00    128.94    215.00         .49


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9763E+01 EXCESS= .0000E+00 OUTFLOW= .9763E+01 BASIN STORAGE= .8230E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP1  MANE          .48    122.81    215.65       .46      5.00    120.65    215.00         .46


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9211E+01 EXCESS= .0000E+00 OUTFLOW= .9211E+01 BASIN STORAGE= .8257E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP1A  MANE         1.66     31.25    212.09       .93      5.00     29.18    210.00         .93


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1755E+01 EXCESS= .0000E+00 OUTFLOW= .1755E+01 BASIN STORAGE= .2425E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP1A  MANE         1.67     30.65    211.74       .91      5.00     28.59    210.00         .91


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1711E+01 EXCESS= .0000E+00 OUTFLOW= .1711E+01 BASIN STORAGE= .2133E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP1A  MANE         1.69     29.13    212.32       .87      5.00     27.17    210.00         .87


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1637E+01 EXCESS= .0000E+00 OUTFLOW= .1637E+01 BASIN STORAGE= .2433E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP2  MANE          .46    183.64    215.46       .58      5.00    182.09    215.00         .58


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1335E+02 EXCESS= .0000E+00 OUTFLOW= .1335E+02 BASIN STORAGE= .8454E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP2  MANE          .46    177.24    215.51       .56      5.00    175.77    215.00         .56


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1294E+02 EXCESS= .0000E+00 OUTFLOW= .1294E+02 BASIN STORAGE= .8274E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP2  MANE          .47    166.98    215.33       .53      5.00    165.83    215.00         .53
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1225E+02 EXCESS= .0000E+00 OUTFLOW= .1225E+02 BASIN STORAGE= .8530E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3 MANE 1.77 253.60 217.96 .58 5.00 247.31 215.00 .58

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1818E+02 EXCESS= .0000E+00 OUTFLOW= .1818E+02 BASIN STORAGE= .4063E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3 MANE 1.79 245.26 216.29 .56 5.00 238.82 215.00 .56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1761E+02 EXCESS= .0000E+00 OUTFLOW= .1761E+02 BASIN STORAGE= .3963E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3 MANE 1.81 232.72 217.63 .53 5.00 224.74 215.00 .53

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1668E+02 EXCESS= .0000E+00 OUTFLOW= .1668E+02 BASIN STORAGE= .4367E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP4 MANE .25 .00 154.75 .00 5.00 .00 155.00 .00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3284E-08 EXCESS= .0000E+00 OUTFLOW= .3284E-08 BASIN STORAGE= .3098E-07 PERCENT ERROR=-943.5

FOR PLAN = 1 RATIO= .00
RCP4 MANE .50 .00 580.50 .00 5.00 .00 580.00 .00

FOR PLAN = 1 RATIO= .00
RCP4 MANE .25 .00 244.75 .00 5.00 .00 245.00 .00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2627E-07 EXCESS= .0000E+00 OUTFLOW= .2627E-07 BASIN STORAGE= .1474E-06 PERCENT ERROR=-561.0

FOR PLAN = 1 RATIO= .00
RCP5 MANE .85 22.62 210.59 .03 5.00 22.11 210.00 .03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1217E+01 EXCESS= .0000E+00 OUTFLOW= .1217E+01 BASIN STORAGE= .1063E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP5 MANE .85 22.32 210.87 .03 5.00 21.69 210.00 .03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1190E+01 EXCESS= .0000E+00 OUTFLOW= .1190E+01 BASIN STORAGE= .9848E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP5 MANE .86 21.34 211.10 .03 5.00 20.84 210.00 .03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1144E+01 EXCESS= .0000E+00 OUTFLOW= .1144E+01 BASIN STORAGE= .9539E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP6 MANE .56 122.53 210.44 .15 5.00 120.65 210.00 .15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6993E+01 EXCESS= .0000E+00 OUTFLOW= .6993E+01 BASIN STORAGE= .9508E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP6 MANE .57 119.77 210.35 .14 5.00 118.19 210.00 .14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6846E+01 EXCESS= .0000E+00 OUTFLOW= .6846E+01 BASIN STORAGE= .1024E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP6 MANE .57 116.13 210.49 .14 5.00 114.19 210.00 .14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6601E+01 EXCESS= .0000E+00 OUTFLOW= .6601E+01 BASIN STORAGE= .1010E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP7 MANE .52 164.24 210.51 .19 5.00 161.40 210.00 .19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9629E+01 EXCESS= .0000E+00 OUTFLOW= .9629E+01 BASIN STORAGE= .9961E-04 PERCENT ERROR= .0

```
          FOR PLAN = 1  RATIO=  .00
              RCP7  MANE          .53    160.94    210.54       .19      5.00    158.11    210.00         .19


CONTINUITY SUMMARY (AC-FT) - INFLOW= .9426E+01 EXCESS= .0000E+00 OUTFLOW= .9426E+01 BASIN STORAGE= .1006E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP7  MANE          .53    154.88    210.76       .18      5.00    152.46    210.00         .18


CONTINUITY SUMMARY (AC-FT) - INFLOW= .9090E+01 EXCESS= .0000E+00 OUTFLOW= .9090E+01 BASIN STORAGE= .9392E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP8  MANE          .77    204.26    211.03       .23      5.00    199.67    210.00         .23


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1218E+02 EXCESS= .0000E+00 OUTFLOW= .1218E+02 BASIN STORAGE= .1468E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP8  MANE          .77    199.78    210.55       .23      5.00    195.70    210.00         .23


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1192E+02 EXCESS= .0000E+00 OUTFLOW= .1192E+02 BASIN STORAGE= .1570E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP8  MANE          .78    193.96    210.86       .22      5.00    189.08    210.00         .22


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1151E+02 EXCESS= .0000E+00 OUTFLOW= .1151E+02 BASIN STORAGE= .1421E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP9  MANE         1.17    576.09    215.68      4.34      5.00    571.62    215.00        4.34


CONTINUITY SUMMARY (AC-FT) - INFLOW= .4013E+02 EXCESS= .0000E+00 OUTFLOW= .4013E+02 BASIN STORAGE= .3296E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP9  MANE         1.18    561.83    215.98      4.22      5.00    557.34    215.00        4.23


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3907E+02 EXCESS= .0000E+00 OUTFLOW= .3907E+02 BASIN STORAGE= .2952E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP9  MANE         1.19    536.90    216.15      4.03      5.00    532.28    215.00        4.04


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3732E+02 EXCESS= .0000E+00 OUTFLOW= .3732E+02 BASIN STORAGE= .3342E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP10  MANE          .33    629.85    215.21      3.28      5.00    627.59    215.00        3.28


CONTINUITY SUMMARY (AC-FT) - INFLOW= .4399E+02 EXCESS= .0000E+00 OUTFLOW= .4399E+02 BASIN STORAGE= .8490E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP10  MANE          .33    614.46    215.24      3.20      5.00    611.94    215.00        3.20


CONTINUITY SUMMARY (AC-FT) - INFLOW= .4285E+02 EXCESS= .0000E+00 OUTFLOW= .4285E+02 BASIN STORAGE= .8326E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP10  MANE          .33    587.51    215.37      3.05      5.00    584.76    215.00        3.06


CONTINUITY SUMMARY (AC-FT) - INFLOW= .4095E+02 EXCESS= .0000E+00 OUTFLOW= .4095E+02 BASIN STORAGE= .8300E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RGPDB  MANE         1.63     78.98    312.27       .86      5.00     78.98    315.00         .86


CONTINUITY SUMMARY (AC-FT) - INFLOW= .5794E+02 EXCESS= .0000E+00 OUTFLOW= .5794E+02 BASIN STORAGE= .2481E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RGPDB  MANE         1.64     78.45    312.81       .84      5.00     78.44    315.00         .84


CONTINUITY SUMMARY (AC-FT) - INFLOW= .5650E+02 EXCESS= .0000E+00 OUTFLOW= .5650E+02 BASIN STORAGE= .2498E-03 PERCENT ERROR=    .0
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```
          FOR PLAN = 1  RATIO=  .00
             RGPDB  MANE          1.64     77.56    312.06       .80      5.00     77.55    315.00         .80


CONTINUITY SUMMARY (AC-FT) - INFLOW= .5411E+02 EXCESS= .0000E+00 OUTFLOW= .5411E+02 BASIN STORAGE= .2476E-03 PERCENT ERROR=    .0



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

```
1****************************************                                    ****************************************
 *                                      *                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                    *          609 SECOND STREET           *
 *                                      *                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   05FEB20  TIME  08:26:00  *                                    *           (916) 756-1104             *
 *                                      *                                    *                                      *
 ****************************************                                    ****************************************

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


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

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

1                                                HEC-1 INPUT                                                PAGE  1

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

                        *DIAGRAM
 *** FREE ***
              1         ID          ************************************************
              2         ID                      GRAND PARK DETENTION BASIN
              3         ID          ************************************************
              4         ID
              5         ID    DEVELOPED CONDITION HYDROLOGIC MODEL
              6         ID    BY: VTN
              7         ID    DATE: FEBRUARY 2020
              8         ID    MODEL: GPDB-100.DAT
              9         ID    STORM EVENT: 100-YEAR
             10         ID
             11         ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
             12         ID
             13         ID                          AREA    DARF
             14         ID                          SQ. MI.
             15         ID                          0-0.5   0.990
             16         ID                          0.5-1   0.975
             17         ID                          1-2     0.950
             18         ID
             19         IT       5       0       0     300
             20         IN       5       0       0
             21         IO       5       0       0
             22         ID          0-0.5   0.5-1   1-2
             23         JR    PREC   0.990   0.975   0.950
                        *
             24         KK   COS12
             25         KM   COS (RR): PRESERVED RED ROCKS
             26         BA   .0040
             27         PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
             28         PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
             29         PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
             30         PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
             31         PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
             32         PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
             33         PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
             34         PC    .998    .999   1.00
             35         PB    3.58
             36         LS       0    85.2
             37         UD   0.100
                        *
             38         KKV31COS10
             39         KM   COS (RR): PRESERVED RED ROCKS
             40         BA   .0187
             41         PB    3.58
             42         LS       0    82.8
             43         UD   0.100
                        *
1                                                HEC-1 INPUT                                                PAGE  2

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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```
 44          KK       A
 45          KM   ER R: SINGLE FAMILY SPECIAL ESTATE
 46          BA   .3203
 47          PB    3.58
 48          LS       0    77.3
 49          UD   0.199
             *

 50          KK    COS3
 51          KM   COS DP: OPEN SPACE
 52          BA   .0218
 53          PB    3.58
 54          LS       0    87.0
 55          UD   0.091
             *

 56          KK    ST2A
 57          KM   PAVED STREET BASIN- ACCESS ROAD
 58          BA  0.0004
 59          PB    3.58
 60          LS       0    98.0
 61          UD   0.050
             *

 62          KK     ST1
 63          KM   PAVED STREET BASIN - LAKE MEAD
 64          BA   .0069
 65          PB    3.58
 66          LS       0    98.0
 67          UD   0.073
             *

 68          KK     CP1
 69          KM   COMBINE COS12, V31COS10, A, COS3, ST2A, AND ST1
 70          HC       6
             *

 71          KK    RCP1
 72          KM   ROUTE CP1 THROUGH ST3 IN STORM DRAIN TO CP2
 73          RD     881   0.091   0.013       0    DEEP       5       0
             *

 74          KKV31COS14
 75          KM   COS: OPEN SPACE
 76          BA   .0095
 77          PB    3.58
 78          LS       0    87.0
 79          UD   0.084
             *
1                                        HEC-1 INPUT                                              PAGE  3

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

 80          KK    COS2
 81          KM   COS (RR): PRESERVED RED ROCKS
 82          BA   .0222
 83          PB    3.58
 84          LS       0    85.9
 85          UD   0.100
             *

 86          KK     DC1
 87          KM   DC: DRAINAGE CORRIDOR
 88          BA   .0082
 89          PB    3.58
 90          LS       0    92.0
 91          UD   0.063
             *

 92          KK    ST2B
 93          KM   PAVED STREET BASIN- ACCESS ROAD
 94          BA   .0005
 95          PB    3.58
 96          LS       0    98.0
 97          UD   0.050
             *

 98          KKV27COS14
 99          KM   COS: OPEN SPACE
100          BA   .0044
101          PB    3.58
102          LS       0    87.0
103          UD   0.083
             *

104          KK    CP1A
105          KM   COMBINE CO2, DC1, ST2B, AND COS14
106          HC       4
```

```
                *
 107            KK   RCP1A
 108            KM   ROUTE CP1A THROUGH ST2 IN STORM DRAIN TO CP2
 109            RD    1835   0.057   0.013       0    DEEP       5       0
                *
 110            KK   COS11
 111            KM   COS: OPEN SPACE
 112            BA   .0131
 113            PB    3.58
 114            LS       0    87.0
 115            UD   0.094
                *
1                                       HEC-1 INPUT                                          PAGE  4

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


 116            KK     ST2
 117            KM   PAVED STREET BASIN - RESERVOIR ACCESS
 118            BA   .0030
 119            PB    3.58
 120            LS       0    98.0
 121            UD   0.053
                *
 122            KK     ST3
 123            KM   PAVED STREET BASIN - LAKE MEAD
 124            BA   .0016
 125            PB    3.58
 126            LS       0    98.0
 127            UD   0.050
                *
 128            KK     CP2
 129            KM   COMBINE RCP1, V31COS14, RCP1A, COS11, ST2, AND ST3
 130            HC       6
                *
 131            KK    RCP2
 132            KM   ROUTE CP2 THROUGH ST4 IN STORM DRAIN TO CP3
 133            RD     967   0.098   0.013       0    DEEP       5       0
                *
 134            KK       M
 135            KM   ER R: SINGLE FAMILY SPECIAL ESTATE
 136            BA   .1211
 137            PB    3.58
 138            LS       0    78.3
 139            UD   0.146
                *
 140            KK    COS8
 141            KM   COS: OPEN SPACE
 142            BA   .0051
 143            PB    3.58
 144            LS       0    82.5
 145            UD   0.181
                *
 146            KK    COS9
 147            KM   COS: OPEN SPACE
 148            BA   .0045
 149            PB    3.58
 150            LS       0    87.0
 151            UD   0.080
                *
1                                       HEC-1 INPUT                                          PAGE  5

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


 152            KKV27COS10
 153            KM   COS: OPEN SPACE
 154            BA   .0231
 155            PB    3.58
 156            LS       0    87.0
 157            UD   0.096
                *
 158            KK     ST4
 159            KM   PAVED STREET BASIN - LAKE MEAD
 160            BA   .0027
 161            PB    3.58
 162            LS       0    98.0
 163            UD   0.050
                *
 164            KK     CP3
 165            KM   COMBINE RCP2, M, COS8, COS9, V27COS10, AND ST4
```

```
 166          HC       6
              *

 167          KK    RCP3
 168          KM   ROUTE CP3 THROUGH ST5 IN STORM DRAIN TO CP4
 169          RD    3202   0.052   0.013       0    DEEP       5       0
              *

 170          KK    COS6
 171          KM   COS: OPEN SPACE
 172          BA   .0120
 173          PB    3.52
 174          LS       0    87.0
 175          UD   0.084
              *

 176          KK    COS5
 177          KM   COS: OPEN SPACE
 178          BA   .0113
 179          PB    3.52
 180          LS       0    87.0
 181          UD   0.104
              *

 182          KK    COS7
 183          KM   COS: OPEN SPACE
 184          BA   .0155
 185          PB    3.51
 186          LS       0    87.9
 187          UD   0.131
              *
1                                        HEC-1 INPUT                                          PAGE  6

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


 188          KK       L
 189          KM   SFSD: TOWNHOMES
 190          BA   .1463
 191          PB    3.51
 192          LS       0    89.3
 193          UD   0.154
              *

 194          KK     ST5
 195          KM   PAVED STREET BASIN - LAKE MEAD
 196          BA   .0108
 197          PB    3.52
 198          LS       0    98.0
 199          UD   0.094
              *

 200          KK    ST14
 201          KM   PAVED STREET BASIN - PARK DRIFT
 202          BA   .0078
 203          PB    3.51
 204          LS       0    98.0
 205          UD   0.075
              *

 206          KK     CP4
 207          KM   COMBINE RCP3, COS6, COS5, COS7, L, ST5, AND ST14
 208          HC       7
              *

 209          KK   DVCP4
 210          KM   DIVERT FLOW FROM LAKE MEAD STORM DRAIN THROUGH COS4 TO CP9
 211          DT   DVCP4
 212          DI       0     500     553     750    1000    1250    1600
 213          DQ       0     500     553     553     553     553     553
              *

 214          KK    RCP4
 215          KM   ROUTE CP4 THROUGH 1/2 ST18 IN STORM DRAIN TO CP5
 216          RD     850   0.054   0.013       0    DEEP       5       0
              *

 217          KK       K
 218          KM   VC NR-MU: COMMERCIAL
 219          BA   .0187
 220          PB    3.51
 221          LS       0    90.6
 222          UD   0.072
              *
1                                        HEC-1 INPUT                                          PAGE  7

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


 223          KK    ST17
 224          KM   PAVED STREET BASIN
```

```
225          BA   .0019
226          PB    3.51
227          LS       0    98.0
228          UD   0.050
             *

229          KK     CP5
230          KM   COMBINE RCP4, K, AND ST17
231          HC       3
             *

232          KK    RCP5
233          KM   ROUTE CP5 THROUGH 1/2 ST18 IN STORM DRAIN TO CP6
234          RD     850   0.054   0.013       0    DEEP       5       0
             *

235          KK       H
236          KM   SFHD: TOWNHOMES
237          BA   .0162
238          PB    3.51
239          LS       0    89.1
240          UD   0.072
             *

241          KK    ST18
242          KM   PAVED STREET BASIN - LAKE MEAD
243          BA   .0097
244          PB    3.51
245          LS       0    98.0
246          UD   0.060
             *

247          KK       I
248          KM   SFHD: TOWNHOMES
249          BA   .0187
250          PB    3.51
251          LS       0    86.1
252          UD   0.087
             *

253          KK    ST16
254          KM   PAVED STREET BASIN
255          BA   .0012
256          PB    3.51
257          LS       0    98.0
258          UD   0.050
             *
```



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

259          KK    ST13
260          KM   PAVED STREET BASIN - SUNSET RUN
261          BA   .0072
262          PB    3.51
263          LS       0    98.0
264          UD   0.068
             *

265          KK       G
266          KM   SFHD: HIGH DENSITY
267          BA   .0305
268          PB    3.51
269          LS       0    94.9
270          UD   0.088
             *

271          KK       N
272          KM   SFHD: GENERAL PUBLIC
273          BA   .0045
274          PB    3.51
275          LS       0    93.9
276          UD   0.066
             *

277          KK    CP6A
278          KM   COMBINE I, ST16, ST13, G, AND N
279          HC       5
             *

280          KK     CP6
281          KM   COMBINE RCP5, H, ST18, AND CP6A
282          HC       4
             *

283          KK    RCP6
284          KM   ROUTE CP6 THROUGH 1/2 ST12 IN STORM DRAIN TO CP7
285          RD     900   0.061   0.013       0    DEEP       5       0
             *
```

```
 286          KK       O
 287          KM   SF3: HIGH DENSITY
 288          BA   .0371
 289          PB    3.46
 290          LS       0    93.1
 291          UD   0.097
                   *

 292          KK    ST19
 293          KM   PAVED STREET BASIN - HIGHLAND PRIDE
 294          BA   .0032
 295          PB    3.46
 296          LS       0    98.0
 297          UD   0.077
                   *
1                                      HEC-1 INPUT                                          PAGE  9

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


 298          KK     CP7
 299          KM   COMBINE RCP6, O, AND ST19
 300          HC       3
                   *

 301          KK    RCP7
 302          KM   ROUTE CP7 THROUGH 1/2 ST12 IN STORM DRAIN TO CP8
 303          RD     900   0.061   0.013       0    DEEP       5       0
                   *

 304          KK       P
 305          KM   SF3: HIGH DENSITY
 306          BA   .0214
 307          PB    3.46
 308          LS       0    93.3
 309          UD   0.073
                   *

 310          KK    ST20
 311          KM   PAVED STREET BASIN - CALICO BEND
 312          BA   .0062
 313          PB    3.46
 314          LS       0    98.0
 315          UD   0.070
                   *

 316          KK    ST12
 317          KM   PAVED STREET BASIN - SUNSET RUN
 318          BA   .0072
 319          PB    3.46
 320          LS       0    98.0
 321          UD   0.058
                   *

 322          KK     CP8
 323          KM   COMBINE CP7, P, ST20, AND ST12
 324          KM   FLOW INTO BASIN VIA NORTHERN INLET
 325          HC       4
                   *

 326          KK    RCP8
 327          KM   ROUTE CP8 THROUGH BASIN IN STORM DRAIN TO GPDBIN
 328          RD     996   0.025   0.013       0    DEEP       6       0
                   *

 329          KK       E
 330          KM   SF2: MEDIUM DENSITY
 331          BA   .0445
 332          PB    3.52
 333          LS       0    95.0
 334          UD   0.091
                   *
1                                      HEC-1 INPUT                                          PAGE 10

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


 335          KK       F
 336          KM   SF2: MEDIUM DENSITY
 337          BA   .0448
 338          PB    3.52
 339          LS       0    95.0
 340          UD   0.092
                   *

 341          KK    COS4
 342          KM   COS: OPEN SPACE
 343          BA   .0716
 344          PB    3.52
 345          LS       0    87.0
 346          UD   0.136
```

```
                *
347             KK     ST7
348             KM   PAVED STREET BASIN - PARK DRIFT
349             BA   .0076
350             PB    3.52
351             LS       0    98.0
352             UD   0.078
                *
353             KK     ST6
354             KM   PAVED STREET BASIN - PARK DRIFT
355             BA   .0050
356             PB    3.52
357             LS       0    98.0
358             UD   0.076
                *
359             KK   DVCP4
360             KM   RETRIEVE DVCP4
361             DR   DVCP4
                *
362             KK     CP9
363             KM   COMBINE E, F, COS4, ST7, ST6, AND DVCP4
364             HC       6
                *
365             KK    RCP9
366             KM   ROUTE CP9 THROUGH ST8 AND BASIN IN STORM DRAIN TO CP10
367             RD    2651   0.055   0.013       0    DEEP       5       0
                *
368             KK     ST8
369             KM   PAVED STREET BASIN - FOX HILL
370             BA   .0042
371             PB    3.46
372             LS       0    98.0
373             UD   0.050
                *
1                                       HEC-1 INPUT                                             PAGE 11

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

374             KK    ST21
375             KM   PAVED STREET BASIN - GRAND PARK
376             BA   .0036
377             PB    3.46
378             LS       0    98.0
379             UD   0.064
                *
380             KK    CP1A
381             KM   COS (RP): REGIONAL PARK - OPEN SPACE
382             BA   .0701
383             PB    3.46
384             LS       0    87.9
385             UD   0.111
                *
386             KK    CP10
387             KM   COMBINE RCP9, ST8, ST21, AND CP1A
388             KM   FLOW INTO BASIN VIA SOUTHERN INLET
389             HC       4
                *
390             KK   RCP10
391             KM   ROUTE CP10 THROUGH BASIN IN STORM DRAIN TO GPDBIN
392             RD     708   0.046   0.013       0    DEEP       6       0
                *
393             KK    CP1B
394             KM   COS (RP): REGIONAL PARK - OPEN SPACE
395             BA   .0384
396             PB    3.46
397             LS       0    88.0
398             UD   0.092
                *
399             KK  GPDBIN
400             KM   COMBINE RCP8, RCP10, AND CP1B
401             KM   TOTAL FLOW INTO GRAND PARK DETENTION BASIN
402             KO       1
403             HC       3
                *
404             KK    GPDB
405             KM   VILLAGE 25 DETENTION BASIN (GRAND PARK DETENTION BASIN)
406             KM   STORAGE VOLUME = 155.0 AC-FT AT 3534 STAGE
407             KM   SEDIMENT VOLUME = 9.0 AC-FT (REMOVED FROM EACH STAGE)
```

```
            408          KM   OUTLET = 5'X5' RCB WITH 26" ORIFICE PLATE
            409          KM   100-YEAR DISCHARGE = 94 CFS
            410          KM   SPILLWAY LENGTH = 300 FT WITH 10:1 SIDE SLOPES
            411          KM   SPILLWAY HEIGHT = 3 FT
            412          KM   SPILLWAY CREST ELEVATION = 3532.0'
            413          KM   SPILLWAY TYPE = BROAD CRESTED TRAPEZOIDAL WEIR
            414          KM   PMF DISCHARGE = 4544 CFS
            415          KM   TOP OF EMBANKMENT ELEVATION = 3535.0'
1                                              HEC-1 INPUT                                                PAGE 12

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

            416          KM   STAGE/STORAGE/DISCHARGE CALCULATED BY: PLM OF VTN
            417          KO       1
            418          RS       1    STOR       0
            419          SV     0.0     1.9     6.8    13.2    20.6    29.3    39.9    55.0    75.4    97.3
            420          SV   108.9   120.9   133.3   146.0
            421          SE    3506    3514    3516    3518    3520    3522    3524    3526    3528    3530
            422          SE    3531    3532    3533    3534
            423          SQ       0    50.6    57.4    63.5    69.1    74.3    79.1    83.6    88.0    92.1
            424          SQ    94.1    96.0   921.2  2665.6
                         *

            425          KK   RGPDB
            426          KM   ROUTE GPDB THROUGH ST9 AND ST10 IN STORM DRAIN TO CP11
            427          RD    1972   0.039   0.013       0    DEEP       5       0
                         *

            428          KK     ST9
            429          KM   PAVED STREET BASIN - FOX HILL
            430          BA   .0046
            431          PB    3.46
            432          LS       0    98.0
            433          UD   0.059
                         *

            434          KK    CP1C
            435          KM   COS (RP): REGIONAL PARK - OPEN SPACE
            436          BA   .0451
            437          PB    3.46
            438          LS       0    88.0
            439          UD   0.096
                         *

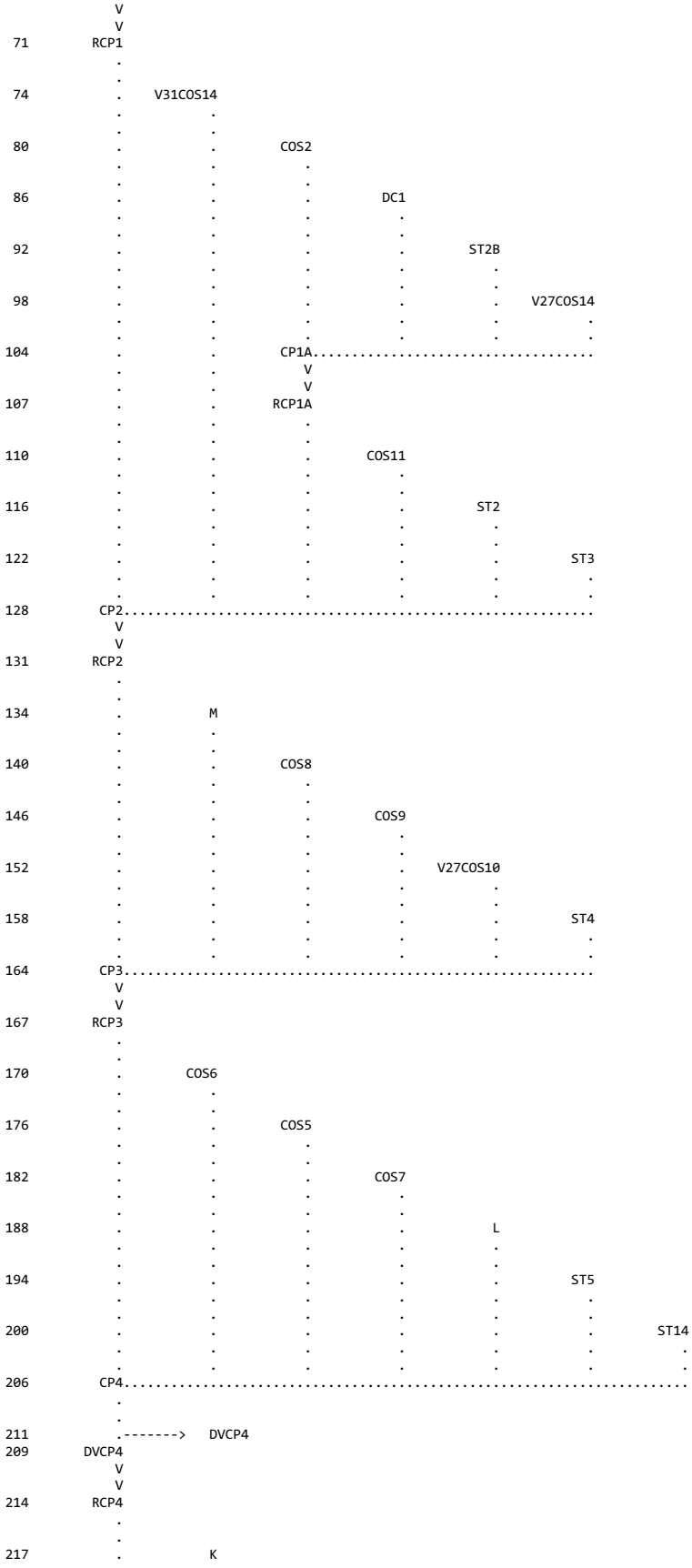
            440          KK    ST10
            441          KM   PAVED STREET BASIN - SKY VISTA
            442          BA   .0034
            443          PB    3.46
            444          LS       0    98.0
            445          UD   0.050
                         *

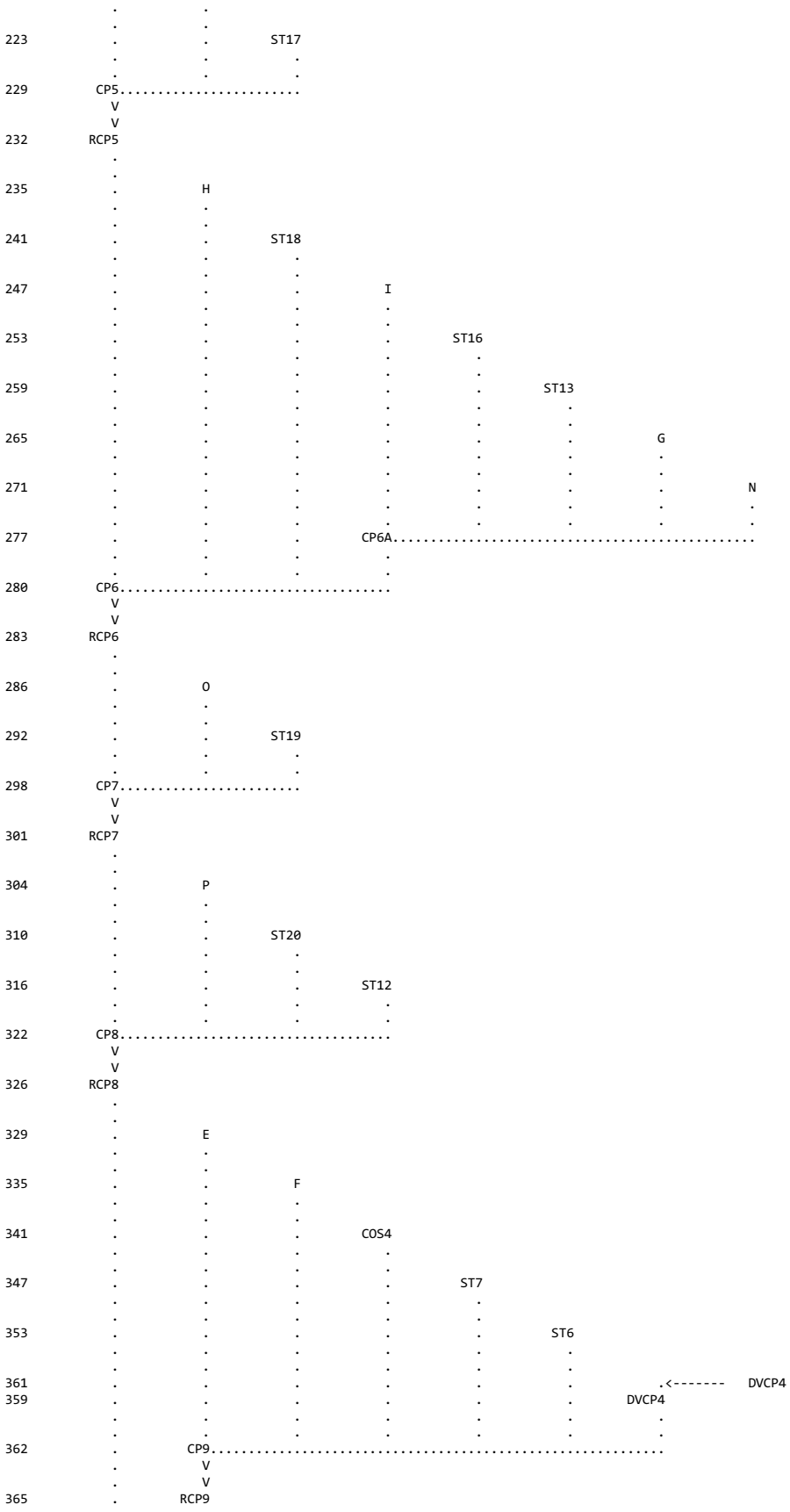
            446          KK    CP11
            447          KM   COMBINE RGPDB, ST9, CP1C, AND ST10
            448          HC       4
                         *

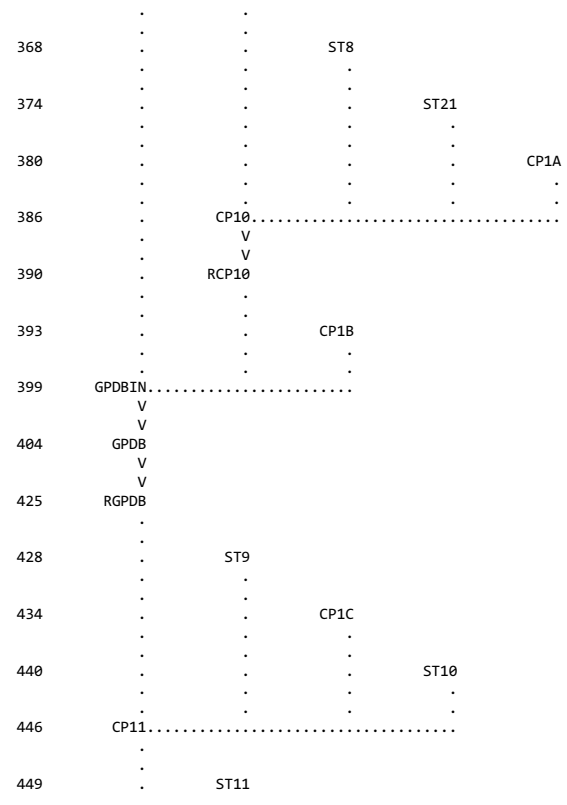
            449          KK    ST11
            450          KM   PAVED STREET BASIN - SUNSET RUN
            451          BA   .0052
            452          PB    3.46
            453          LS       0    98.0
            454          UD   0.054
                         *
            455          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

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

    24       COS12
                 .
                 .
    38           .    V31COS10
                 .           .
                 .           .
    44           .           .           A
                 .           .           .
                 .           .           .
    50           .           .           .       COS3
                 .           .           .          .
                 .           .           .          .
    56           .           .           .          .       ST2A
                 .           .           .          .          .
                 .           .           .          .          .
    62           .           .           .          .          .        ST1
                 .           .           .          .          .          .
                 .           .           .          .          .          .
    68         CP1...........................................................
```


RCP1
V31COS14
COS2
DC1
ST2B
V27COS14
CP1A
RCP1A
COS11
ST2
ST3
CP2
RCP2
M
COS8
COS9
V27COS10
ST4
CP3
RCP3
COS6
COS5
COS7
L
ST5
ST14
CP4
DVCP4
RCP4
K


223 ST17
229 CP5
232 RCP5
235 H
241 ST18
247 I
253 ST16
259 ST13
265 G
271 N
277 CP6A
280 CP6
283 RCP6
286 O
292 ST19
298 CP7
301 RCP7
304 P
310 ST20
316 ST12
322 CP8
326 RCP8
329 E
335 F
341 COS4
347 ST7
353 ST6
361 DVCP4
359 DVCP4
362 CP9
365 RCP9



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998               *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   05FEB20  TIME  08:26:00   *
 *                                       *
 *****************************************
```

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

****
GRAND PARK DETENTION BASIN
****

DEVELOPED CONDITION HYDROLOGIC MODEL
BY: VTN
DATE: FEBRUARY 2020
MODEL: GPDB-100.DAT
STORM EVENT: 100-YEAR

JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

AREA SQ. MI.	DARF
0-0.5	0.990
0.5-1	0.975
1-2	0.950

```
  21 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                                  0-0.5   0.5-1   1-2

     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
                .99       .98       .95


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 399 KK    *    GPDBIN  *
           *            *
           **************

 402 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

 403 HC          HYDROGRAPH COMBINATION
                      ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                    ***

*********************************************************************************************************************************

                                        HYDROGRAPH AT STATION   GPDBIN
                                             SUM OF  3 HYDROGRAPHS
                                            PLAN 1,   RATIO =   .99

*********************************************************************************************************************************
                                 *                                *                                *                                *
  DA MON HRMN  ORD      FLOW    *   DA MON HRMN  ORD      FLOW    *   DA MON HRMN  ORD      FLOW    *   DA MON HRMN  ORD      FLOW
                                 *                                *                                *                                *
   1     0000    1        0.    *    1     0615   76       13.    *    1     1230  151        0.    *    1     1845  226        0.
   1     0005    2        1.    *    1     0620   77        8.    *    1     1235  152        0.    *    1     1850  227        0.
   1     0010    3       15.    *    1     0625   78        4.    *    1     1240  153        0.    *    1     1855  228        0.
   1     0015    4       31.    *    1     0630   79        2.    *    1     1245  154        0.    *    1     1900  229        0.
   1     0020    5       45.    *    1     0635   80        1.    *    1     1250  155        0.    *    1     1905  230        0.
   1     0025    6       65.    *    1     0640   81        1.    *    1     1255  156        0.    *    1     1910  231        0.
   1     0030    7       87.    *    1     0645   82        0.    *    1     1300  157        0.    *    1     1915  232        0.
   1     0035    8       87.    *    1     0650   83        0.    *    1     1305  158        0.    *    1     1920  233        0.
   1     0040    9       63.    *    1     0655   84        0.    *    1     1310  159        0.    *    1     1925  234        0.
   1     0045   10       35.    *    1     0700   85        0.    *    1     1315  160        0.    *    1     1930  235        0.
   1     0050   11       16.    *    1     0705   86        0.    *    1     1320  161        0.    *    1     1935  236        0.
   1     0055   12        7.    *    1     0710   87        0.    *    1     1325  162        0.    *    1     1940  237        0.
   1     0100   13        3.    *    1     0715   88        0.    *    1     1330  163        0.    *    1     1945  238        0.
   1     0105   14        5.    *    1     0720   89        0.    *    1     1335  164        0.    *    1     1950  239        0.
   1     0110   15       19.    *    1     0725   90        0.    *    1     1340  165        0.    *    1     1955  240        0.
   1     0115   16       30.    *    1     0730   91        0.    *    1     1345  166        0.    *    1     2000  241        0.
   1     0120   17       35.    *    1     0735   92        0.    *    1     1350  167        0.    *    1     2005  242        0.
   1     0125   18       50.    *    1     0740   93        0.    *    1     1355  168        0.    *    1     2010  243        0.
   1     0130   19       79.    *    1     0745   94        0.    *    1     1400  169        0.    *    1     2015  244        0.
   1     0135   20      101.    *    1     0750   95        0.    *    1     1405  170        0.    *    1     2020  245        0.
   1     0140   21      106.    *    1     0755   96        0.    *    1     1410  171        0.    *    1     2025  246        0.
   1     0145   22      102.    *    1     0800   97        0.    *    1     1415  172        0.    *    1     2030  247        0.
   1     0150   23       85.    *    1     0805   98        0.    *    1     1420  173        0.    *    1     2035  248        0.
   1     0155   24       60.    *    1     0810   99        0.    *    1     1425  174        0.    *    1     2040  249        0.
   1     0200   25       38.    *    1     0815  100        0.    *    1     1430  175        0.    *    1     2045  250        0.
   1     0205   26       30.    *    1     0820  101        0.    *    1     1435  176        0.    *    1     2050  251        0.
   1     0210   27       46.    *    1     0825  102        0.    *    1     1440  177        0.    *    1     2055  252        0.
   1     0215   28       93.    *    1     0830  103        0.    *    1     1445  178        0.    *    1     2100  253        0.
   1     0220   29      139.    *    1     0835  104        0.    *    1     1450  179        0.    *    1     2105  254        0.
   1     0225   30      153.    *    1     0840  105        0.    *    1     1455  180        0.    *    1     2110  255        0.
   1     0230   31      130.    *    1     0845  106        0.    *    1     1500  181        0.    *    1     2115  256        0.
   1     0235   32      102.    *    1     0850  107        0.    *    1     1505  182        0.    *    1     2120  257        0.
   1     0240   33      111.    *    1     0855  108        0.    *    1     1510  183        0.    *    1     2125  258        0.
   1     0245   34      137.    *    1     0900  109        0.    *    1     1515  184        0.    *    1     2130  259        0.
   1     0250   35      131.    *    1     0905  110        0.    *    1     1520  185        0.    *    1     2135  260        0.
   1     0255   36      102.    *    1     0910  111        0.    *    1     1525  186        0.    *    1     2140  261        0.
   1     0300   37      101.    *    1     0915  112        0.    *    1     1530  187        0.    *    1     2145  262        0.
   1     0305   38      183.    *    1     0920  113        0.    *    1     1535  188        0.    *    1     2150  263        0.
   1     0310   39      323.    *    1     0925  114        0.    *    1     1540  189        0.    *    1     2155  264        0.
   1     0315   40      550.    *    1     0930  115        0.    *    1     1545  190        0.    *    1     2200  265        0.
```

1	0320	41	967.	*	1	0935	116	0.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	1428.	*	1	0940	117	0.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	1932.	*	1	0945	118	0.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	2031.	*	1	0950	119	0.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1729.	*	1	0955	120	0.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	1418.	*	1	1000	121	0.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1090.	*	1	1005	122	0.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	806.	*	1	1010	123	0.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	624.	*	1	1015	124	0.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	489.	*	1	1020	125	0.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	360.	*	1	1025	126	0.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	276.	*	1	1030	127	0.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	244.	*	1	1035	128	0.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	251.	*	1	1040	129	0.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	324.	*	1	1045	130	0.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	410.	*	1	1050	131	0.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	429.	*	1	1055	132	0.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	410.	*	1	1100	133	0.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	427.	*	1	1105	134	0.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	417.	*	1	1110	135	0.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	350.	*	1	1115	136	0.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	270.	*	1	1120	137	0.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	197.	*	1	1125	138	0.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	142.	*	1	1130	139	0.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	103.	*	1	1135	140	0.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	82.	*	1	1140	141	0.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	67.	*	1	1145	142	0.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	52.	*	1	1150	143	0.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	41.	*	1	1155	144	0.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	42.	*	1	1200	145	0.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	43.	*	1	1205	146	0.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	38.	*	1	1210	147	0.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	34.	*	1	1215	148	0.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	28.	*	1	1220	149	0.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	20.	*	1	1225	150	0.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

****

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 2031.	3.58	292.	73.	71.	71.
		(INCHES) 2.143	2.148	2.148	2.148
		(AC-FT) 145.	145.	145.	145.

CUMULATIVE AREA = 1.27 SQ MI

****

HYDROGRAPH AT STATION GPDBIN
SUM OF 3 HYDROGRAPHS
PLAN 1, RATIO = .98

****

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
					*						*						*					
1		0000	1	0.	*	1		0615	76	13.	*	1		1230	151	0.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	8.	*	1		1235	152	0.	*	1		1850	227	0.
1		0010	3	14.	*	1		0625	78	4.	*	1		1240	153	0.	*	1		1855	228	0.
1		0015	4	30.	*	1		0630	79	2.	*	1		1245	154	0.	*	1		1900	229	0.
1		0020	5	43.	*	1		0635	80	1.	*	1		1250	155	0.	*	1		1905	230	0.
1		0025	6	63.	*	1		0640	81	1.	*	1		1255	156	0.	*	1		1910	231	0.
1		0030	7	84.	*	1		0645	82	0.	*	1		1300	157	0.	*	1		1915	232	0.
1		0035	8	84.	*	1		0650	83	0.	*	1		1305	158	0.	*	1		1920	233	0.
1		0040	9	61.	*	1		0655	84	0.	*	1		1310	159	0.	*	1		1925	234	0.
1		0045	10	34.	*	1		0700	85	0.	*	1		1315	160	0.	*	1		1930	235	0.
1		0050	11	15.	*	1		0705	86	0.	*	1		1320	161	0.	*	1		1935	236	0.
1		0055	12	7.	*	1		0710	87	0.	*	1		1325	162	0.	*	1		1940	237	0.
1		0100	13	3.	*	1		0715	88	0.	*	1		1330	163	0.	*	1		1945	238	0.
1		0105	14	5.	*	1		0720	89	0.	*	1		1335	164	0.	*	1		1950	239	0.
1		0110	15	19.	*	1		0725	90	0.	*	1		1340	165	0.	*	1		1955	240	0.
1		0115	16	29.	*	1		0730	91	0.	*	1		1345	166	0.	*	1		2000	241	0.
1		0120	17	34.	*	1		0735	92	0.	*	1		1350	167	0.	*	1		2005	242	0.
1		0125	18	48.	*	1		0740	93	0.	*	1		1355	168	0.	*	1		2010	243	0.
1		0130	19	77.	*	1		0745	94	0.	*	1		1400	169	0.	*	1		2015	244	0.
1		0135	20	98.	*	1		0750	95	0.	*	1		1405	170	0.	*	1		2020	245	0.
1		0140	21	103.	*	1		0755	96	0.	*	1		1410	171	0.	*	1		2025	246	0.
1		0145	22	99.	*	1		0800	97	0.	*	1		1415	172	0.	*	1		2030	247	0.
1		0150	23	82.	*	1		0805	98	0.	*	1		1420	173	0.	*	1		2035	248	0.
1		0155	24	58.	*	1		0810	99	0.	*	1		1425	174	0.	*	1		2040	249	0.
1		0200	25	37.	*	1		0815	100	0.	*	1		1430	175	0.	*	1		2045	250	0.
1		0205	26	28.	*	1		0820	101	0.	*	1		1435	176	0.	*	1		2050	251	0.
1		0210	27	44.	*	1		0825	102	0.	*	1		1440	177	0.	*	1		2055	252	0.
1		0215	28	90.	*	1		0830	103	0.	*	1		1445	178	0.	*	1		2100	253	0.
1		0220	29	135.	*	1		0835	104	0.	*	1		1450	179	0.	*	1		2105	254	0.
1		0225	30	149.	*	1		0840	105	0.	*	1		1455	180	0.	*	1		2110	255	0.
1		0230	31	127.	*	1		0845	106	0.	*	1		1500	181	0.	*	1		2115	256	0.
1		0235	32	99.	*	1		0850	107	0.	*	1		1505	182	0.	*	1		2120	257	0.

1	0240	33	108.	*	1	0855	108	0.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	133.	*	1	0900	109	0.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	128.	*	1	0905	110	0.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	100.	*	1	0910	111	0.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	99.	*	1	0915	112	0.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	178.	*	1	0920	113	0.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	315.	*	1	0925	114	0.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	538.	*	1	0930	115	0.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	945.	*	1	0935	116	0.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	1398.	*	1	0940	117	0.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	1891.	*	1	0945	118	0.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	1988.	*	1	0950	119	0.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1694.	*	1	0955	120	0.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	1390.	*	1	1000	121	0.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1069.	*	1	1005	122	0.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	788.	*	1	1010	123	0.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	611.	*	1	1015	124	0.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	479.	*	1	1020	125	0.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	353.	*	1	1025	126	0.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	271.	*	1	1030	127	0.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	239.	*	1	1035	128	0.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	246.	*	1	1040	129	0.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	318.	*	1	1045	130	0.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	402.	*	1	1050	131	0.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	421.	*	1	1055	132	0.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	403.	*	1	1100	133	0.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	419.	*	1	1105	134	0.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	409.	*	1	1110	135	0.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	343.	*	1	1115	136	0.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	265.	*	1	1120	137	0.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	194.	*	1	1125	138	0.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	140.	*	1	1130	139	0.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	101.	*	1	1135	140	0.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	81.	*	1	1140	141	0.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	66.	*	1	1145	142	0.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	51.	*	1	1150	143	0.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	41.	*	1	1155	144	0.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	41.	*	1	1200	145	0.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	43.	*	1	1205	146	0.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	38.	*	1	1210	147	0.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	33.	*	1	1215	148	0.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	28.	*	1	1220	149	0.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	20.	*	1	1225	150	0.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 1988.	3.58	286.	72.	69.	69.
		(INCHES) 2.097	2.102	2.102	2.102
		(AC-FT) 142.	142.	142.	142.

CUMULATIVE AREA = 1.27 SQ MI

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HYDROGRAPH AT STATION GPDBIN
SUM OF 3 HYDROGRAPHS
PLAN 1, RATIO = .95

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	12.	*	1		1230	151	0.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	7.	*	1		1235	152	0.	*	1		1850	227	0.
1		0010	3	13.	*	1		0625	78	4.	*	1		1240	153	0.	*	1		1855	228	0.
1		0015	4	28.	*	1		0630	79	2.	*	1		1245	154	0.	*	1		1900	229	0.
1		0020	5	41.	*	1		0635	80	1.	*	1		1250	155	0.	*	1		1905	230	0.
1		0025	6	59.	*	1		0640	81	1.	*	1		1255	156	0.	*	1		1910	231	0.
1		0030	7	79.	*	1		0645	82	0.	*	1		1300	157	0.	*	1		1915	232	0.
1		0035	8	79.	*	1		0650	83	0.	*	1		1305	158	0.	*	1		1920	233	0.
1		0040	9	57.	*	1		0655	84	0.	*	1		1310	159	0.	*	1		1925	234	0.
1		0045	10	32.	*	1		0700	85	0.	*	1		1315	160	0.	*	1		1930	235	0.
1		0050	11	14.	*	1		0705	86	0.	*	1		1320	161	0.	*	1		1935	236	0.
1		0055	12	6.	*	1		0710	87	0.	*	1		1325	162	0.	*	1		1940	237	0.
1		0100	13	3.	*	1		0715	88	0.	*	1		1330	163	0.	*	1		1945	238	0.
1		0105	14	5.	*	1		0720	89	0.	*	1		1335	164	0.	*	1		1950	239	0.
1		0110	15	18.	*	1		0725	90	0.	*	1		1340	165	0.	*	1		1955	240	0.
1		0115	16	27.	*	1		0730	91	0.	*	1		1345	166	0.	*	1		2000	241	0.
1		0120	17	32.	*	1		0735	92	0.	*	1		1350	167	0.	*	1		2005	242	0.
1		0125	18	46.	*	1		0740	93	0.	*	1		1355	168	0.	*	1		2010	243	0.
1		0130	19	73.	*	1		0745	94	0.	*	1		1400	169	0.	*	1		2015	244	0.
1		0135	20	93.	*	1		0750	95	0.	*	1		1405	170	0.	*	1		2020	245	0.
1		0140	21	98.	*	1		0755	96	0.	*	1		1410	171	0.	*	1		2025	246	0.
1		0145	22	94.	*	1		0800	97	0.	*	1		1415	172	0.	*	1		2030	247	0.
1		0150	23	78.	*	1		0805	98	0.	*	1		1420	173	0.	*	1		2035	248	0.
1		0155	24	54.	*	1		0810	99	0.	*	1		1425	174	0.	*	1		2040	249	0.

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    1     0200   25       35.   *    1     0815  100        0.   *    1     1430  175        0.   *    1     2045  250        0.
    1     0205   26       27.   *    1     0820  101        0.   *    1     1435  176        0.   *    1     2050  251        0.
    1     0210   27       42.   *    1     0825  102        0.   *    1     1440  177        0.   *    1     2055  252        0.
    1     0215   28       86.   *    1     0830  103        0.   *    1     1445  178        0.   *    1     2100  253        0.
    1     0220   29      128.   *    1     0835  104        0.   *    1     1450  179        0.   *    1     2105  254        0.
    1     0225   30      141.   *    1     0840  105        0.   *    1     1455  180        0.   *    1     2110  255        0.
    1     0230   31      121.   *    1     0845  106        0.   *    1     1500  181        0.   *    1     2115  256        0.
    1     0235   32       94.   *    1     0850  107        0.   *    1     1505  182        0.   *    1     2120  257        0.
    1     0240   33      103.   *    1     0855  108        0.   *    1     1510  183        0.   *    1     2125  258        0.
    1     0245   34      127.   *    1     0900  109        0.   *    1     1515  184        0.   *    1     2130  259        0.
    1     0250   35      122.   *    1     0905  110        0.   *    1     1520  185        0.   *    1     2135  260        0.
    1     0255   36       95.   *    1     0910  111        0.   *    1     1525  186        0.   *    1     2140  261        0.
    1     0300   37       94.   *    1     0915  112        0.   *    1     1530  187        0.   *    1     2145  262        0.
    1     0305   38      171.   *    1     0920  113        0.   *    1     1535  188        0.   *    1     2150  263        0.
    1     0310   39      302.   *    1     0925  114        0.   *    1     1540  189        0.   *    1     2155  264        0.
    1     0315   40      515.   *    1     0930  115        0.   *    1     1545  190        0.   *    1     2200  265        0.
    1     0320   41      909.   *    1     0935  116        0.   *    1     1550  191        0.   *    1     2205  266        0.
    1     0325   42     1348.   *    1     0940  117        0.   *    1     1555  192        0.   *    1     2210  267        0.
    1     0330   43     1823.   *    1     0945  118        0.   *    1     1600  193        0.   *    1     2215  268        0.
    1     0335   44     1916.   *    1     0950  119        0.   *    1     1605  194        0.   *    1     2220  269        0.
    1     0340   45     1633.   *    1     0955  120        0.   *    1     1610  195        0.   *    1     2225  270        0.
    1     0345   46     1342.   *    1     1000  121        0.   *    1     1615  196        0.   *    1     2230  271        0.
    1     0350   47     1035.   *    1     1005  122        0.   *    1     1620  197        0.   *    1     2235  272        0.
    1     0355   48      758.   *    1     1010  123        0.   *    1     1625  198        0.   *    1     2240  273        0.
    1     0400   49      589.   *    1     1015  124        0.   *    1     1630  199        0.   *    1     2245  274        0.
    1     0405   50      463.   *    1     1020  125        0.   *    1     1635  200        0.   *    1     2250  275        0.
    1     0410   51      342.   *    1     1025  126        0.   *    1     1640  201        0.   *    1     2255  276        0.
    1     0415   52      263.   *    1     1030  127        0.   *    1     1645  202        0.   *    1     2300  277        0.
    1     0420   53      231.   *    1     1035  128        0.   *    1     1650  203        0.   *    1     2305  278        0.
    1     0425   54      238.   *    1     1040  129        0.   *    1     1655  204        0.   *    1     2310  279        0.
    1     0430   55      308.   *    1     1045  130        0.   *    1     1700  205        0.   *    1     2315  280        0.
    1     0435   56      389.   *    1     1050  131        0.   *    1     1705  206        0.   *    1     2320  281        0.
    1     0440   57      408.   *    1     1055  132        0.   *    1     1710  207        0.   *    1     2325  282        0.
    1     0445   58      390.   *    1     1100  133        0.   *    1     1715  208        0.   *    1     2330  283        0.
    1     0450   59      406.   *    1     1105  134        0.   *    1     1720  209        0.   *    1     2335  284        0.
    1     0455   60      396.   *    1     1110  135        0.   *    1     1725  210        0.   *    1     2340  285        0.
    1     0500   61      333.   *    1     1115  136        0.   *    1     1730  211        0.   *    1     2345  286        0.
    1     0505   62      257.   *    1     1120  137        0.   *    1     1735  212        0.   *    1     2350  287        0.
    1     0510   63      188.   *    1     1125  138        0.   *    1     1740  213        0.   *    1     2355  288        0.
    1     0515   64      135.   *    1     1130  139        0.   *    1     1745  214        0.   *    2     0000  289        0.
    1     0520   65       98.   *    1     1135  140        0.   *    1     1750  215        0.   *    2     0005  290        0.
    1     0525   66       78.   *    1     1140  141        0.   *    1     1755  216        0.   *    2     0010  291        0.
    1     0530   67       64.   *    1     1145  142        0.   *    1     1800  217        0.   *    2     0015  292        0.
    1     0535   68       49.   *    1     1150  143        0.   *    1     1805  218        0.   *    2     0020  293        0.
    1     0540   69       39.   *    1     1155  144        0.   *    1     1810  219        0.   *    2     0025  294        0.
    1     0545   70       40.   *    1     1200  145        0.   *    1     1815  220        0.   *    2     0030  295        0.
    1     0550   71       41.   *    1     1205  146        0.   *    1     1820  221        0.   *    2     0035  296        0.
    1     0555   72       37.   *    1     1210  147        0.   *    1     1825  222        0.   *    2     0040  297        0.
    1     0600   73       32.   *    1     1215  148        0.   *    1     1830  223        0.   *    2     0045  298        0.
    1     0605   74       27.   *    1     1220  149        0.   *    1     1835  224        0.   *    2     0050  299        0.
    1     0610   75       19.   *    1     1225  150        0.   *    1     1840  225        0.   *    2     0055  300        0.
                               *                                 *                                 *
 ********************************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR        24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                      (CFS)
+    1916.      3.58                276.         69.         67.         67.
                     (INCHES)     2.020       2.025       2.025       2.025
                      (AC-FT)     137.        137.        137.        137.

                     CUMULATIVE AREA =    1.27 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
  404 KK   *      GPDB  *
           *            *
           **************

  417 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          1  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

  418 RS          STORAGE ROUTING
                       NSTPS          1  NUMBER OF SUBREACHES
                        ITYP       STOR  TYPE OF INITIAL CONDITION
                      RSVRIC        .00  INITIAL CONDITION
                           X        .00 WORKING R AND D COEFFICIENT

  419 SV            STORAGE         .0       1.9       6.8      13.2      20.6      29.3      39.9      55.0      75.4      97.3
                                  108.9     120.9     133.3     146.0
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421 SE          ELEVATION     3506.00   3514.00   3516.00   3518.00   3520.00   3522.00   3524.00   3526.00   3528.00   3530.00
                              3531.00   3532.00   3533.00   3534.00

423 SQ          DISCHARGE        0.        51.       57.       64.       69.       74.       79.       84.       88.       92.
                                94.        96.      921.     2666.

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HYDROGRAPH AT STATION GPDB
PLAN 1, RATIO = .99

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	3506.0	1		0820	101	92.	96.1	3529.9	1		1640	201	78.	37.1	3523.5
1		0005	2	0.	.0	3506.0	1		0825	102	92.	95.4	3529.8	1		1645	202	78.	36.6	3523.4
1		0010	3	1.	.1	3506.2	1		0830	103	92.	94.8	3529.8	1		1650	203	77.	36.0	3523.3
1		0015	4	5.	.2	3506.8	1		0835	104	92.	94.2	3529.7	1		1655	204	77.	35.5	3523.2
1		0020	5	11.	.4	3507.7	1		0840	105	91.	93.5	3529.7	1		1700	205	77.	35.0	3523.1
1		0025	6	18.	.7	3508.9	1		0845	106	91.	92.9	3529.6	1		1705	206	77.	34.5	3523.0
1		0030	7	28.	1.0	3510.4	1		0850	107	91.	92.3	3529.5	1		1710	207	76.	33.9	3522.9
1		0035	8	38.	1.4	3512.0	1		0855	108	91.	91.6	3529.5	1		1715	208	76.	33.4	3522.8
1		0040	9	44.	1.7	3513.0	1		0900	109	91.	91.0	3529.4	1		1720	209	76.	32.9	3522.7
1		0045	10	45.	1.7	3513.1	1		0905	110	91.	90.4	3529.4	1		1725	210	76.	32.4	3522.6
1		0050	11	42.	1.6	3512.6	1		0910	111	91.	89.8	3529.3	1		1730	211	75.	31.8	3522.5
1		0055	12	37.	1.4	3511.8	1		0915	112	91.	89.1	3529.3	1		1735	212	75.	31.3	3522.4
1		0100	13	31.	1.2	3510.9	1		0920	113	90.	88.5	3529.2	1		1740	213	75.	30.8	3522.3
1		0105	14	27.	1.0	3510.2	1		0925	114	90.	87.9	3529.1	1		1745	214	75.	30.3	3522.2
1		0110	15	24.	.9	3509.8	1		0930	115	90.	87.3	3529.1	1		1750	215	75.	29.8	3522.1
1		0115	16	24.	.9	3509.8	1		0935	116	90.	86.7	3529.0	1		1755	216	74.	29.3	3522.0
1		0120	17	26.	1.0	3510.1	1		0940	117	90.	86.0	3529.0	1		1800	217	74.	28.7	3521.9
1		0125	18	28.	1.1	3510.5	1		0945	118	90.	85.4	3528.9	1		1805	218	74.	28.2	3521.8
1		0130	19	35.	1.3	3511.5	1		0950	119	90.	84.8	3528.9	1		1810	219	73.	27.7	3521.6
1		0135	20	44.	1.6	3512.9	1		0955	120	90.	84.2	3528.8	1		1815	220	73.	27.2	3521.5
1		0140	21	51.	2.0	3514.1	1		1000	121	90.	83.6	3528.7	1		1820	221	73.	26.7	3521.4
1		0145	22	51.	2.4	3514.2	1		1005	122	89.	82.9	3528.7	1		1825	222	72.	26.2	3521.3
1		0150	23	52.	2.7	3514.3	1		1010	123	89.	82.3	3528.6	1		1830	223	72.	25.7	3521.2
1		0155	24	52.	2.8	3514.4	1		1015	124	89.	81.7	3528.6	1		1835	224	72.	25.2	3521.1
1		0200	25	52.	2.8	3514.4	1		1020	125	89.	81.1	3528.5	1		1840	225	72.	24.7	3521.0
1		0205	26	52.	2.7	3514.3	1		1025	126	89.	80.5	3528.5	1		1845	226	71.	24.2	3520.8
1		0210	27	52.	2.6	3514.3	1		1030	127	89.	79.9	3528.4	1		1850	227	71.	23.8	3520.7
1		0215	28	52.	2.7	3514.3	1		1035	128	89.	79.3	3528.4	1		1855	228	71.	23.3	3520.6
1		0220	29	52.	3.2	3514.5	1		1040	129	89.	78.7	3528.3	1		1900	229	70.	22.8	3520.5
1		0225	30	53.	3.8	3514.8	1		1045	130	88.	78.0	3528.2	1		1905	230	70.	22.3	3520.4
1		0230	31	54.	4.4	3515.0	1		1050	131	88.	77.4	3528.2	1		1910	231	70.	21.8	3520.3
1		0235	32	55.	4.8	3515.2	1		1055	132	88.	76.8	3528.1	1		1915	232	70.	21.3	3520.2
1		0240	33	55.	5.2	3515.3	1		1100	133	88.	76.2	3528.1	1		1920	233	69.	20.9	3520.1
1		0245	34	56.	5.6	3515.5	1		1105	134	88.	75.6	3528.0	1		1925	234	69.	20.4	3519.9
1		0250	35	57.	6.2	3515.7	1		1110	135	88.	75.0	3528.0	1		1930	235	69.	19.9	3519.8
1		0255	36	57.	6.6	3515.9	1		1115	136	88.	74.4	3527.9	1		1935	236	68.	19.4	3519.7
1		0300	37	57.	6.9	3516.0	1		1120	137	88.	73.8	3527.8	1		1940	237	68.	19.0	3519.6
1		0305	38	58.	7.5	3516.2	1		1125	138	88.	73.2	3527.8	1		1945	238	68.	18.5	3519.4
1		0310	39	59.	8.8	3516.6	1		1130	139	87.	72.6	3527.7	1		1950	239	67.	18.0	3519.3
1		0315	40	62.	11.4	3517.4	1		1135	140	87.	72.0	3527.7	1		1955	240	67.	17.6	3519.2
1		0320	41	66.	16.2	3518.8	1		1140	141	87.	71.4	3527.6	1		2000	241	66.	17.1	3519.1
1		0325	42	71.	24.0	3520.8	1		1145	142	87.	70.8	3527.5	1		2005	242	66.	16.7	3518.9
1		0330	43	77.	35.0	3523.1	1		1150	143	87.	70.2	3527.5	1		2010	243	66.	16.2	3518.8
1		0335	44	82.	48.1	3525.1	1		1155	144	87.	69.6	3527.4	1		2015	244	65.	15.8	3518.7
1		0340	45	85.	60.5	3526.5	1		1200	145	87.	69.0	3527.4	1		2020	245	65.	15.3	3518.6
1		0345	46	87.	70.8	3527.5	1		1205	146	86.	68.4	3527.3	1		2025	246	65.	14.9	3518.4
1		0350	47	89.	78.8	3528.3	1		1210	147	86.	67.8	3527.3	1		2030	247	64.	14.4	3518.3
1		0355	48	90.	84.7	3528.8	1		1215	148	86.	67.2	3527.2	1		2035	248	64.	14.0	3518.2
1		0400	49	91.	89.0	3529.2	1		1220	149	86.	66.6	3527.1	1		2040	249	64.	13.5	3518.1
1		0405	50	91.	92.2	3529.5	1		1225	150	86.	66.0	3527.1	1		2045	250	63.	13.1	3518.0
1		0410	51	92.	94.5	3529.7	1		1230	151	86.	65.4	3527.0	1		2050	251	63.	12.7	3517.8
1		0415	52	92.	96.1	3529.9	1		1235	152	86.	64.8	3527.0	1		2055	252	63.	12.2	3517.7
1		0420	53	92.	97.2	3530.0	1		1240	153	86.	64.3	3526.9	1		2100	253	62.	11.8	3517.6
1		0425	54	92.	98.3	3530.1	1		1245	154	85.	63.7	3526.8	1		2105	254	62.	11.4	3517.4
1		0430	55	93.	99.6	3530.2	1		1250	155	85.	63.1	3526.8	1		2110	255	61.	10.9	3517.3
1		0435	56	93.	101.5	3530.4	1		1255	156	85.	62.5	3526.7	1		2115	256	61.	10.5	3517.2
1		0440	57	93.	103.8	3530.6	1		1300	157	85.	61.9	3526.7	1		2120	257	61.	10.1	3517.0
1		0445	58	94.	106.0	3530.8	1		1305	158	85.	61.3	3526.6	1		2125	258	60.	9.7	3516.9
1		0450	59	94.	108.3	3530.9	1		1310	159	85.	60.7	3526.6	1		2130	259	60.	9.3	3516.8
1		0455	60	94.	110.5	3531.1	1		1315	160	85.	60.1	3526.5	1		2135	260	59.	8.9	3516.6
1		0500	61	95.	112.5	3531.3	1		1320	161	85.	59.6	3526.4	1		2140	261	59.	8.5	3516.5
1		0505	62	95.	114.0	3531.4	1		1325	162	84.	59.0	3526.4	1		2145	262	59.	8.1	3516.4
1		0510	63	95.	114.9	3531.5	1		1330	163	84.	58.4	3526.3	1		2150	263	58.	7.7	3516.3
1		0515	64	95.	115.5	3531.5	1		1335	164	84.	57.8	3526.3	1		2155	264	58.	7.3	3516.1
1		0520	65	95.	115.6	3531.6	1		1340	165	84.	57.2	3526.2	1		2200	265	57.	6.9	3516.0
1		0525	66	95.	115.6	3531.6	1		1345	166	84.	56.7	3526.2	1		2205	266	57.	6.5	3515.9
1		0530	67	95.	115.5	3531.5	1		1350	167	84.	56.1	3526.1	1		2210	267	56.	6.1	3515.7
1		0535	68	95.	115.2	3531.5	1		1355	168	84.	55.5	3526.0	1		2215	268	56.	5.7	3515.5
1		0540	69	95.	114.9	3531.5	1		1400	169	84.	54.9	3526.0	1		2220	269	55.	5.3	3515.4
1		0545	70	95.	114.5	3531.5	1		1405	170	83.	54.4	3525.9	1		2225	270	55.	4.9	3515.2
1		0550	71	95.	114.2	3531.4	1		1410	171	83.	53.8	3525.8	1		2230	271	54.	4.5	3515.1
1		0555	72	95.	113.8	3531.4	1		1415	172	83.	53.2	3525.8	1		2235	272	54.	4.2	3514.9
1		0600	73	95.	113.4	3531.4	1		1420	173	83.	52.6	3525.7	1		2240	273	53.	3.8	3514.8

1	0605	74	95.	113.0	3531.3	*	1	1425	174	83.	52.1	3525.6	*	1	2245	274	53.	3.4	3514.6
1	0610	75	95.	112.5	3531.3	*	1	1430	175	83.	51.5	3525.5	*	1	2250	275	52.	3.1	3514.5
1	0615	76	95.	111.9	3531.3	*	1	1435	176	82.	50.9	3525.5	*	1	2255	276	52.	2.7	3514.3
1	0620	77	94.	111.4	3531.2	*	1	1440	177	82.	50.4	3525.4	*	1	2300	277	51.	2.4	3514.2
1	0625	78	94.	110.8	3531.2	*	1	1445	178	82.	49.8	3525.3	*	1	2305	278	51.	2.0	3514.0
1	0630	79	94.	110.1	3531.1	*	1	1450	179	82.	49.2	3525.2	*	1	2310	279	45.	1.7	3513.1
1	0635	80	94.	109.5	3531.0	*	1	1455	180	82.	48.7	3525.2	*	1	2315	280	37.	1.4	3511.9
1	0640	81	94.	108.9	3531.0	*	1	1500	181	82.	48.1	3525.1	*	1	2320	281	31.	1.2	3510.9
1	0645	82	94.	108.2	3530.9	*	1	1505	182	81.	47.5	3525.0	*	1	2325	282	26.	1.0	3510.1
1	0650	83	94.	107.6	3530.9	*	1	1510	183	81.	47.0	3524.9	*	1	2330	283	22.	.8	3509.4
1	0655	84	94.	106.9	3530.8	*	1	1515	184	81.	46.4	3524.9	*	1	2335	284	18.	.7	3508.8
1	0700	85	94.	106.3	3530.8	*	1	1520	185	81.	45.9	3524.8	*	1	2340	285	15.	.6	3508.4
1	0705	86	94.	105.6	3530.7	*	1	1525	186	81.	45.3	3524.7	*	1	2345	286	12.	.5	3508.0
1	0710	87	93.	105.0	3530.7	*	1	1530	187	81.	44.8	3524.6	*	1	2350	287	10.	.4	3507.6
1	0715	88	93.	104.3	3530.6	*	1	1535	188	80.	44.2	3524.6	*	1	2355	288	9.	.3	3507.4
1	0720	89	93.	103.7	3530.6	*	1	1540	189	80.	43.7	3524.5	*	2	0000	289	7.	.3	3507.1
1	0725	90	93.	103.1	3530.5	*	1	1545	190	80.	43.1	3524.4	*	2	0005	290	6.	.2	3506.9
1	0730	91	93.	102.4	3530.4	*	1	1550	191	80.	42.5	3524.4	*	2	0010	291	5.	.2	3506.8
1	0735	92	93.	101.8	3530.4	*	1	1555	192	80.	42.0	3524.3	*	2	0015	292	4.	.2	3506.6
1	0740	93	93.	101.1	3530.3	*	1	1600	193	80.	41.5	3524.2	*	2	0020	293	3.	.1	3506.5
1	0745	94	93.	100.5	3530.3	*	1	1605	194	79.	40.9	3524.1	*	2	0025	294	3.	.1	3506.4
1	0750	95	93.	99.9	3530.2	*	1	1610	195	79.	40.4	3524.1	*	2	0030	295	2.	.1	3506.4
1	0755	96	92.	99.2	3530.2	*	1	1615	196	79.	39.8	3524.0	*	2	0035	296	2.	.1	3506.3
1	0800	97	92.	98.6	3530.1	*	1	1620	197	79.	39.3	3523.9	*	2	0040	297	2.	.1	3506.3
1	0805	98	92.	98.0	3530.1	*	1	1625	198	79.	38.7	3523.8	*	2	0045	298	1.	.1	3506.2
1	0810	99	92.	97.3	3530.0	*	1	1630	199	78.	38.2	3523.7	*	2	0050	299	1.	.0	3506.2
1	0815	100	92.	96.7	3529.9	*	1	1635	200	78.	37.6	3523.6	*	2	0055	300	1.	.0	3506.1
						*							*						

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 95.	5.33	93.	73.	71.	71.
		(INCHES) .680	2.146	2.148	2.148
		(AC-FT) 46.	145.	145.	145.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
116.	5.33	102.	49.	47.	47.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
3531.56	5.33	3530.36	3522.87	3522.26	3522.26

CUMULATIVE AREA = 1.27 SQ MI

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HYDROGRAPH AT STATION GPDB
PLAN 1, RATIO = .98

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	3506.0	1		0820	101	91.	93.3	3529.6	1		1640	201	77.	34.8	3523.0
1		0005	2	0.	.0	3506.0	1		0825	102	91.	92.6	3529.6	1		1645	202	77.	34.2	3522.9
1		0010	3	1.	.0	3506.2	1		0830	103	91.	92.0	3529.5	1		1650	203	76.	33.7	3522.8
1		0015	4	5.	.2	3506.8	1		0835	104	91.	91.4	3529.5	1		1655	204	76.	33.2	3522.7
1		0020	5	10.	.4	3507.6	1		0840	105	91.	90.8	3529.4	1		1700	205	76.	32.7	3522.6
1		0025	6	17.	.7	3508.7	1		0845	106	91.	90.1	3529.3	1		1705	206	76.	32.1	3522.5
1		0030	7	27.	1.0	3510.2	1		0850	107	91.	89.5	3529.3	1		1710	207	75.	31.6	3522.4
1		0035	8	37.	1.4	3511.8	1		0855	108	91.	88.9	3529.2	1		1715	208	75.	31.1	3522.3
1		0040	9	43.	1.6	3512.7	1		0900	109	90.	88.3	3529.2	1		1720	209	75.	30.6	3522.2
1		0045	10	43.	1.6	3512.9	1		0905	110	90.	87.6	3529.1	1		1725	210	75.	30.1	3522.1
1		0050	11	40.	1.5	3512.4	1		0910	111	90.	87.0	3529.1	1		1730	211	74.	29.6	3522.0
1		0055	12	35.	1.3	3511.6	1		0915	112	90.	86.4	3529.0	1		1735	212	74.	29.0	3521.9
1		0100	13	30.	1.1	3510.8	1		0920	113	90.	85.8	3528.9	1		1740	213	74.	28.5	3521.8
1		0105	14	26.	1.0	3510.1	1		0925	114	90.	85.2	3528.9	1		1745	214	74.	28.0	3521.7
1		0110	15	23.	.9	3509.7	1		0930	115	90.	84.5	3528.8	1		1750	215	73.	27.5	3521.6
1		0115	16	23.	.9	3509.7	1		0935	116	90.	83.9	3528.8	1		1755	216	73.	27.0	3521.5
1		0120	17	25.	.9	3509.9	1		0940	117	89.	83.3	3528.7	1		1800	217	73.	26.5	3521.4
1		0125	18	28.	1.0	3510.4	1		0945	118	89.	82.7	3528.7	1		1805	218	72.	26.0	3521.2
1		0130	19	33.	1.3	3511.3	1		0950	119	89.	82.1	3528.6	1		1810	219	72.	25.5	3521.1
1		0135	20	43.	1.6	3512.7	1		0955	120	89.	81.5	3528.6	1		1815	220	72.	25.0	3521.0
1		0140	21	51.	2.0	3514.0	1		1000	121	89.	80.8	3528.5	1		1820	221	71.	24.5	3520.9
1		0145	22	51.	2.3	3514.2	1		1005	122	89.	80.2	3528.4	1		1825	222	71.	24.0	3520.8
1		0150	23	52.	2.6	3514.3	1		1010	123	89.	79.6	3528.4	1		1830	223	71.	23.6	3520.7
1		0155	24	52.	2.7	3514.3	1		1015	124	89.	79.0	3528.3	1		1835	224	71.	23.1	3520.6
1		0200	25	52.	2.7	3514.3	1		1020	125	89.	78.4	3528.3	1		1840	225	70.	22.6	3520.5
1		0205	26	52.	2.6	3514.3	1		1025	126	88.	77.8	3528.2	1		1845	226	70.	22.1	3520.3
1		0210	27	51.	2.4	3514.2	1		1030	127	88.	77.2	3528.2	1		1850	227	70.	21.6	3520.2
1		0215	28	52.	2.6	3514.3	1		1035	128	88.	76.6	3528.1	1		1855	228	69.	21.1	3520.1
1		0220	29	52.	3.0	3514.4	1		1040	129	88.	76.0	3528.1	1		1900	229	69.	20.7	3520.0
1		0225	30	53.	3.6	3514.7	1		1045	130	88.	75.4	3528.0	1		1905	230	69.	20.2	3519.9
1		0230	31	54.	4.2	3514.9	1		1050	131	88.	74.8	3527.9	1		1910	231	68.	19.7	3519.8

1	0235	32	54.	4.6	3515.1	*	1	1055	132	88.	74.2	3527.9	*	1	1915	232	68.	19.2	3519.6
1	0240	33	55.	4.9	3515.2	*	1	1100	133	88.	73.5	3527.8	*	1	1920	233	68.	18.8	3519.5
1	0245	34	55.	5.4	3515.4	*	1	1105	134	87.	72.9	3527.8	*	1	1925	234	67.	18.3	3519.4
1	0250	35	56.	5.9	3515.6	*	1	1110	135	87.	72.3	3527.7	*	1	1930	235	67.	17.8	3519.3
1	0255	36	57.	6.3	3515.8	*	1	1115	136	87.	71.7	3527.6	*	1	1935	236	67.	17.4	3519.1
1	0300	37	57.	6.6	3515.9	*	1	1120	137	87.	71.1	3527.6	*	1	1940	237	66.	16.9	3519.0
1	0305	38	58.	7.1	3516.1	*	1	1125	138	87.	70.5	3527.5	*	1	1945	238	66.	16.5	3518.9
1	0310	39	59.	8.4	3516.5	*	1	1130	139	87.	69.9	3527.5	*	1	1950	239	66.	16.0	3518.8
1	0315	40	61.	10.9	3517.3	*	1	1135	140	87.	69.3	3527.4	*	1	1955	240	65.	15.6	3518.6
1	0320	41	65.	15.6	3518.6	*	1	1140	141	87.	68.8	3527.3	*	1	2000	241	65.	15.1	3518.5
1	0325	42	71.	23.2	3520.6	*	1	1145	142	86.	68.2	3527.3	*	1	2005	242	65.	14.7	3518.4
1	0330	43	76.	34.0	3522.9	*	1	1150	143	86.	67.6	3527.2	*	1	2010	243	64.	14.2	3518.3
1	0335	44	81.	46.8	3524.9	*	1	1155	144	86.	67.0	3527.2	*	1	2015	244	64.	13.8	3518.2
1	0340	45	84.	58.9	3526.4	*	1	1200	145	86.	66.4	3527.1	*	1	2020	245	64.	13.4	3518.0
1	0345	46	87.	69.0	3527.4	*	1	1205	146	86.	65.8	3527.1	*	1	2025	246	63.	12.9	3517.9
1	0350	47	88.	76.8	3528.1	*	1	1210	147	86.	65.2	3527.0	*	1	2030	247	63.	12.5	3517.8
1	0355	48	89.	82.6	3528.7	*	1	1215	148	86.	64.6	3526.9	*	1	2035	248	62.	12.0	3517.6
1	0400	49	90.	86.8	3529.0	*	1	1220	149	86.	64.0	3526.9	*	1	2040	249	62.	11.6	3517.5
1	0405	50	91.	90.0	3529.3	*	1	1225	150	85.	63.4	3526.8	*	1	2045	250	62.	11.2	3517.4
1	0410	51	91.	92.2	3529.5	*	1	1230	151	85.	62.8	3526.8	*	1	2050	251	61.	10.8	3517.2
1	0415	52	91.	93.7	3529.7	*	1	1235	152	85.	62.2	3526.7	*	1	2055	252	61.	10.4	3517.1
1	0420	53	92.	94.8	3529.8	*	1	1240	153	85.	61.7	3526.7	*	1	2100	253	60.	9.9	3517.0
1	0425	54	92.	95.9	3529.9	*	1	1245	154	85.	61.1	3526.6	*	1	2105	254	60.	9.5	3516.9
1	0430	55	92.	97.2	3530.0	*	1	1250	155	85.	60.5	3526.5	*	1	2110	255	60.	9.1	3516.7
1	0435	56	92.	99.0	3530.1	*	1	1255	156	85.	59.9	3526.5	*	1	2115	256	59.	8.7	3516.6
1	0440	57	93.	101.2	3530.3	*	1	1300	157	85.	59.3	3526.4	*	1	2120	257	59.	8.3	3516.5
1	0445	58	93.	103.4	3530.5	*	1	1305	158	84.	58.7	3526.4	*	1	2125	258	58.	7.9	3516.3
1	0450	59	94.	105.6	3530.7	*	1	1310	159	84.	58.2	3526.3	*	1	2130	259	58.	7.5	3516.2
1	0455	60	94.	107.8	3530.9	*	1	1315	160	84.	57.6	3526.3	*	1	2135	260	58.	7.1	3516.1
1	0500	61	94.	109.8	3531.1	*	1	1320	161	84.	57.0	3526.2	*	1	2140	261	57.	6.7	3516.0
1	0505	62	94.	111.2	3531.2	*	1	1325	162	84.	56.4	3526.1	*	1	2145	262	57.	6.3	3515.8
1	0510	63	95.	112.1	3531.3	*	1	1330	163	84.	55.8	3526.1	*	1	2150	263	56.	5.9	3515.6
1	0515	64	95.	112.6	3531.3	*	1	1335	164	84.	55.3	3526.0	*	1	2155	264	56.	5.5	3515.5
1	0520	65	95.	112.8	3531.3	*	1	1340	165	84.	54.7	3526.0	*	1	2200	265	55.	5.1	3515.3
1	0525	66	95.	112.8	3531.3	*	1	1345	166	83.	54.1	3525.9	*	1	2205	266	55.	4.8	3515.2
1	0530	67	95.	112.6	3531.3	*	1	1350	167	83.	53.5	3525.8	*	1	2210	267	54.	4.4	3515.0
1	0535	68	95.	112.4	3531.3	*	1	1355	168	83.	53.0	3525.7	*	1	2215	268	54.	4.0	3514.9
1	0540	69	95.	112.1	3531.3	*	1	1400	169	83.	52.4	3525.7	*	1	2220	269	53.	3.7	3514.7
1	0545	70	95.	111.7	3531.2	*	1	1405	170	83.	51.8	3525.6	*	1	2225	270	53.	3.3	3514.6
1	0550	71	94.	111.3	3531.2	*	1	1410	171	82.	51.3	3525.5	*	1	2230	271	52.	2.9	3514.4
1	0555	72	94.	110.9	3531.2	*	1	1415	172	82.	50.7	3525.4	*	1	2235	272	52.	2.6	3514.3
1	0600	73	94.	110.5	3531.1	*	1	1420	173	82.	50.1	3525.4	*	1	2240	273	51.	2.2	3514.1
1	0605	74	94.	110.1	3531.1	*	1	1425	174	82.	49.6	3525.3	*	1	2245	274	50.	1.9	3513.9
1	0610	75	94.	109.6	3531.1	*	1	1430	175	82.	49.0	3525.2	*	1	2250	275	42.	1.6	3512.6
1	0615	76	94.	109.1	3531.0	*	1	1435	176	82.	48.4	3525.1	*	1	2255	276	35.	1.3	3511.5
1	0620	77	94.	108.5	3531.0	*	1	1440	177	81.	47.9	3525.1	*	1	2300	277	29.	1.1	3510.5
1	0625	78	94.	107.9	3530.9	*	1	1445	178	81.	47.3	3525.0	*	1	2305	278	24.	.9	3509.8
1	0630	79	94.	107.3	3530.9	*	1	1450	179	81.	46.8	3524.9	*	1	2310	279	20.	.7	3509.1
1	0635	80	94.	106.6	3530.8	*	1	1455	180	81.	46.2	3524.8	*	1	2315	280	17.	.6	3508.6
1	0640	81	94.	106.0	3530.8	*	1	1500	181	81.	45.6	3524.8	*	1	2320	281	14.	.5	3508.2
1	0645	82	93.	105.4	3530.7	*	1	1505	182	81.	45.1	3524.7	*	1	2325	282	11.	.4	3507.8
1	0650	83	93.	104.7	3530.6	*	1	1510	183	80.	44.5	3524.6	*	1	2330	283	10.	.4	3507.5
1	0655	84	93.	104.1	3530.6	*	1	1515	184	80.	44.0	3524.5	*	1	2335	284	8.	.3	3507.3
1	0700	85	93.	103.4	3530.5	*	1	1520	185	80.	43.4	3524.5	*	1	2340	285	7.	.2	3507.0
1	0705	86	93.	102.8	3530.5	*	1	1525	186	80.	42.9	3524.4	*	1	2345	286	5.	.2	3506.9
1	0710	87	93.	102.2	3530.4	*	1	1530	187	80.	42.3	3524.3	*	1	2350	287	5.	.2	3506.7
1	0715	88	93.	101.5	3530.4	*	1	1535	188	80.	41.8	3524.2	*	1	2355	288	4.	.1	3506.6
1	0720	89	93.	100.9	3530.3	*	1	1540	189	79.	41.2	3524.2	*	2	0000	289	3.	.1	3506.5
1	0725	90	93.	100.2	3530.3	*	1	1545	190	79.	40.7	3524.1	*	2	0005	290	3.	.1	3506.4
1	0730	91	92.	99.6	3530.2	*	1	1550	191	79.	40.1	3524.0	*	2	0010	291	2.	.1	3506.3
1	0735	92	92.	99.0	3530.1	*	1	1555	192	79.	39.6	3523.9	*	2	0015	292	2.	.1	3506.3
1	0740	93	92.	98.3	3530.1	*	1	1600	193	79.	39.0	3523.8	*	2	0020	293	2.	.1	3506.2
1	0745	94	92.	97.7	3530.0	*	1	1605	194	78.	38.5	3523.7	*	2	0025	294	1.	.0	3506.2
1	0750	95	92.	97.1	3530.0	*	1	1610	195	78.	38.0	3523.6	*	2	0030	295	1.	.0	3506.2
1	0755	96	92.	96.4	3529.9	*	1	1615	196	78.	37.4	3523.5	*	2	0035	296	1.	.0	3506.1
1	0800	97	92.	95.8	3529.9	*	1	1620	197	78.	36.9	3523.4	*	2	0040	297	1.	.0	3506.1
1	0805	98	92.	95.2	3529.8	*	1	1625	198	77.	36.4	3523.3	*	2	0045	298	1.	.0	3506.1
1	0810	99	92.	94.5	3529.7	*	1	1630	199	77.	35.8	3523.2	*	2	0050	299	1.	.0	3506.1
1	0815	100	91.	93.9	3529.7	*	1	1635	200	77.	35.3	3523.1	*	2	0055	300	0.	.0	3506.1
						*							*						

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
	(CFS)				
+ 95.	5.33	92.	72.	69.	69.
	(INCHES)	.677	2.101	2.102	2.102
	(AC-FT)	46.	142.	142.	142.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
113.	5.33	99.	47.	45.	45.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
3531.33	5.33	3530.12	3522.45	3521.85	3521.85

CUMULATIVE AREA = 1.27 SQ MI

HYDROGRAPH AT STATION GPDB
PLAN 1, RATIO = .95

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	3506.0	1		0820	101	90.	88.7	3529.2	1		1640	201	75.	30.9	3522.3
1		0005	2	0.	.0	3506.0	1		0825	102	90.	88.0	3529.2	1		1645	202	75.	30.4	3522.2
1		0010	3	1.	.0	3506.2	1		0830	103	90.	87.4	3529.1	1		1650	203	75.	29.9	3522.1
1		0015	4	5.	.2	3506.7	1		0835	104	90.	86.8	3529.0	1		1655	204	74.	29.4	3522.0
1		0020	5	10.	.4	3507.5	1		0840	105	90.	86.2	3529.0	1		1700	205	74.	28.9	3521.9
1		0025	6	16.	.6	3508.6	1		0845	106	90.	85.5	3528.9	1		1705	206	74.	28.3	3521.8
1		0030	7	25.	.9	3510.0	1		0850	107	90.	84.9	3528.9	1		1710	207	73.	27.8	3521.7
1		0035	8	34.	1.3	3511.4	1		0855	108	90.	84.3	3528.8	1		1715	208	73.	27.3	3521.5
1		0040	9	40.	1.5	3512.3	1		0900	109	90.	83.7	3528.8	1		1720	209	73.	26.8	3521.4
1		0045	10	41.	1.5	3512.4	1		0905	110	89.	83.1	3528.7	1		1725	210	73.	26.3	3521.3
1		0050	11	38.	1.4	3512.0	1		0910	111	89.	82.5	3528.6	1		1730	211	72.	25.8	3521.2
1		0055	12	33.	1.2	3511.2	1		0915	112	89.	81.8	3528.6	1		1735	212	72.	25.3	3521.1
1		0100	13	28.	1.1	3510.5	1		0920	113	89.	81.2	3528.5	1		1740	213	72.	24.8	3521.0
1		0105	14	24.	.9	3509.8	1		0925	114	89.	80.6	3528.5	1		1745	214	71.	24.3	3520.9
1		0110	15	22.	.8	3509.5	1		0930	115	89.	80.0	3528.4	1		1750	215	71.	23.9	3520.7
1		0115	16	22.	.8	3509.5	1		0935	116	89.	79.4	3528.4	1		1755	216	71.	23.4	3520.6
1		0120	17	23.	.9	3509.7	1		0940	117	89.	78.8	3528.3	1		1800	217	70.	22.9	3520.5
1		0125	18	26.	1.0	3510.1	1		0945	118	89.	78.2	3528.3	1		1805	218	70.	22.4	3520.4
1		0130	19	32.	1.2	3511.0	1		0950	119	88.	77.6	3528.2	1		1810	219	70.	21.9	3520.3
1		0135	20	40.	1.5	3512.4	1		0955	120	88.	77.0	3528.1	1		1815	220	70.	21.4	3520.2
1		0140	21	50.	1.9	3513.8	1		1000	121	88.	76.3	3528.1	1		1820	221	69.	21.0	3520.1
1		0145	22	51.	2.2	3514.1	1		1005	122	88.	75.7	3528.0	1		1825	222	69.	20.5	3520.0
1		0150	23	51.	2.4	3514.2	1		1010	123	88.	75.1	3528.0	1		1830	223	69.	20.0	3519.8
1		0155	24	51.	2.5	3514.3	1		1015	124	88.	74.5	3527.9	1		1835	224	68.	19.5	3519.7
1		0200	25	51.	2.5	3514.2	1		1020	125	88.	73.9	3527.9	1		1840	225	68.	19.1	3519.6
1		0205	26	51.	2.3	3514.2	1		1025	126	88.	73.3	3527.8	1		1845	226	68.	18.6	3519.5
1		0210	27	51.	2.2	3514.1	1		1030	127	87.	72.7	3527.7	1		1850	227	67.	18.1	3519.3
1		0215	28	51.	2.3	3514.2	1		1035	128	87.	72.1	3527.7	1		1855	228	67.	17.7	3519.2
1		0220	29	52.	2.7	3514.3	1		1040	129	87.	71.5	3527.6	1		1900	229	67.	17.2	3519.1
1		0225	30	52.	3.3	3514.6	1		1045	130	87.	70.9	3527.6	1		1905	230	66.	16.8	3519.0
1		0230	31	53.	3.8	3514.8	1		1050	131	87.	70.3	3527.5	1		1910	231	66.	16.3	3518.8
1		0235	32	54.	4.2	3514.9	1		1055	132	87.	69.7	3527.4	1		1915	232	66.	15.9	3518.7
1		0240	33	54.	4.5	3515.0	1		1100	133	87.	69.1	3527.4	1		1920	233	65.	15.4	3518.6
1		0245	34	55.	4.9	3515.2	1		1105	134	87.	68.5	3527.3	1		1925	234	65.	15.0	3518.5
1		0250	35	55.	5.4	3515.4	1		1110	135	86.	67.9	3527.3	1		1930	235	64.	14.5	3518.4
1		0255	36	56.	5.7	3515.6	1		1115	136	86.	67.3	3527.2	1		1935	236	64.	14.1	3518.2
1		0300	37	56.	6.0	3515.7	1		1120	137	86.	66.7	3527.2	1		1940	237	64.	13.6	3518.1
1		0305	38	57.	6.5	3515.9	1		1125	138	86.	66.2	3527.1	1		1945	238	63.	13.2	3518.0
1		0310	39	58.	7.7	3516.3	1		1130	139	86.	65.6	3527.0	1		1950	239	63.	12.8	3517.9
1		0315	40	61.	10.1	3517.0	1		1135	140	86.	65.0	3527.0	1		1955	240	63.	12.3	3517.7
1		0320	41	65.	14.6	3518.4	1		1140	141	86.	64.4	3526.9	1		2000	241	62.	11.9	3517.6
1		0325	42	70.	21.9	3520.3	1		1145	142	85.	63.8	3526.9	1		2005	242	62.	11.5	3517.5
1		0330	43	76.	32.3	3522.6	1		1150	143	85.	63.2	3526.8	1		2010	243	61.	11.0	3517.3
1		0335	44	81.	44.7	3524.6	1		1155	144	85.	62.6	3526.7	1		2015	244	61.	10.6	3517.2
1		0340	45	84.	56.3	3526.1	1		1200	145	85.	62.0	3526.7	1		2020	245	61.	10.2	3517.1
1		0345	46	86.	66.0	3527.1	1		1205	146	85.	61.4	3526.6	1		2025	246	60.	9.8	3516.9
1		0350	47	88.	73.6	3527.8	1		1210	147	85.	60.9	3526.6	1		2030	247	60.	9.4	3516.8
1		0355	48	89.	79.2	3528.3	1		1215	148	85.	60.3	3526.5	1		2035	248	59.	9.0	3516.7
1		0400	49	89.	83.2	3528.7	1		1220	149	85.	59.7	3526.5	1		2040	249	59.	8.5	3516.5
1		0405	50	90.	86.2	3529.0	1		1225	150	84.	59.1	3526.4	1		2045	250	59.	8.1	3516.4
1		0410	51	90.	88.3	3529.2	1		1230	151	84.	58.5	3526.3	1		2050	251	58.	7.7	3516.3
1		0415	52	91.	89.8	3529.3	1		1235	152	84.	57.9	3526.3	1		2055	252	58.	7.3	3516.2
1		0420	53	91.	90.9	3529.4	1		1240	153	84.	57.4	3526.2	1		2100	253	58.	6.9	3516.0
1		0425	54	91.	91.9	3529.5	1		1245	154	84.	56.8	3526.2	1		2105	254	57.	6.5	3515.9
1		0430	55	91.	93.1	3529.6	1		1250	155	84.	56.2	3526.1	1		2110	255	57.	6.2	3515.7
1		0435	56	92.	94.9	3529.8	1		1255	156	84.	55.6	3526.1	1		2115	256	56.	5.8	3515.6
1		0440	57	92.	97.0	3530.0	1		1300	157	84.	55.1	3526.0	1		2120	257	55.	5.4	3515.4
1		0445	58	92.	99.1	3530.2	1		1305	158	83.	54.5	3525.9	1		2125	258	55.	5.0	3515.3
1		0450	59	93.	101.2	3530.3	1		1310	159	83.	53.9	3525.9	1		2130	259	54.	4.6	3515.1
1		0455	60	93.	103.3	3530.5	1		1315	160	83.	53.3	3525.8	1		2135	260	54.	4.3	3515.0
1		0500	61	93.	105.2	3530.7	1		1320	161	83.	52.8	3525.7	1		2140	261	53.	3.9	3514.8
1		0505	62	94.	106.6	3530.8	1		1325	162	83.	52.2	3525.6	1		2145	262	53.	3.5	3514.7
1		0510	63	94.	107.5	3530.9	1		1330	163	83.	51.6	3525.6	1		2150	263	52.	3.2	3514.5
1		0515	64	94.	107.9	3530.9	1		1335	164	82.	51.1	3525.5	1		2155	264	52.	2.8	3514.4
1		0520	65	94.	108.1	3530.9	1		1340	165	82.	50.5	3525.4	1		2200	265	51.	2.4	3514.2
1		0525	66	94.	108.1	3530.9	1		1345	166	82.	49.9	3525.3	1		2205	266	51.	2.1	3514.1
1		0530	67	94.	107.9	3530.9	1		1350	167	82.	49.4	3525.3	1		2210	267	47.	1.8	3513.4
1		0535	68	94.	107.6	3530.9	1		1355	168	82.	48.8	3525.2	1		2215	268	39.	1.5	3512.1
1		0540	69	94.	107.3	3530.9	1		1400	169	82.	48.2	3525.1	1		2220	269	32.	1.2	3511.1
1		0545	70	94.	106.9	3530.8	1		1405	170	81.	47.7	3525.0	1		2225	270	27.	1.0	3510.3
1		0550	71	94.	106.6	3530.8	1		1410	171	81.	47.1	3525.0	1		2230	271	22.	.8	3509.5
1		0555	72	94.	106.2	3530.8	1		1415	172	81.	46.5	3524.9	1		2235	272	19.	.7	3508.9
1		0600	73	94.	105.8	3530.7	1		1420	173	81.	46.0	3524.8	1		2240	273	16.	.6	3508.5
1		0605	74	93.	105.3	3530.7	1		1425	174	81.	45.4	3524.7	1		2245	274	13.	.5	3508.0
1		0610	75	93.	104.9	3530.7	1		1430	175	81.	44.9	3524.7	1		2250	275	11.	.4	3507.7
1		0615	76	93.	104.3	3530.6	1		1435	176	80.	44.3	3524.6	1		2255	276	9.	.3	3507.4
1		0620	77	93.	103.7	3530.6	1		1440	177	80.	43.8	3524.5	1		2300	277	7.	.3	3507.2
1		0625	78	93.	103.1	3530.5	1		1445	178	80.	43.2	3524.4	1		2305	278	6.	.2	3507.0
1		0630	79	93.	102.5	3530.5	1		1450	179	80.	42.7	3524.4	1		2310	279	5.	.2	3506.8
1		0635	80	93.	101.9	3530.4	1		1455	180	80.	42.1	3524.3	1		2315	280	4.	.2	3506.7

1	0640	81	93.	101.3	3530.3	*	1	1500	181	80.	41.6	3524.2	*	1	2320	281	4.	.1	3506.6
1	0645	82	93.	100.6	3530.3	*	1	1505	182	79.	41.0	3524.1	*	1	2325	282	3.	.1	3506.5
1	0650	83	93.	100.0	3530.2	*	1	1510	183	79.	40.5	3524.1	*	1	2330	283	2.	.1	3506.4
1	0655	84	92.	99.4	3530.2	*	1	1515	184	79.	39.9	3524.0	*	1	2335	284	2.	.1	3506.3
1	0700	85	92.	98.7	3530.1	*	1	1520	185	79.	39.4	3523.9	*	1	2340	285	2.	.1	3506.3
1	0705	86	92.	98.1	3530.1	*	1	1525	186	79.	38.8	3523.8	*	1	2345	286	1.	.1	3506.2
1	0710	87	92.	97.5	3530.0	*	1	1530	187	78.	38.3	3523.7	*	1	2350	287	1.	.0	3506.2
1	0715	88	92.	96.8	3530.0	*	1	1535	188	78.	37.8	3523.6	*	1	2355	288	1.	.0	3506.2
1	0720	89	92.	96.2	3529.9	*	1	1540	189	78.	37.2	3523.5	*	2	0000	289	1.	.0	3506.1
1	0725	90	92.	95.6	3529.8	*	1	1545	190	78.	36.7	3523.4	*	2	0005	290	1.	.0	3506.1
1	0730	91	92.	94.9	3529.8	*	1	1550	191	77.	36.2	3523.3	*	2	0010	291	1.	.0	3506.1
1	0735	92	92.	94.3	3529.7	*	1	1555	192	77.	35.6	3523.2	*	2	0015	292	0.	.0	3506.1
1	0740	93	91.	93.7	3529.7	*	1	1600	193	77.	35.1	3523.1	*	2	0020	293	0.	.0	3506.1
1	0745	94	91.	93.0	3529.6	*	1	1605	194	77.	34.6	3523.0	*	2	0025	294	0.	.0	3506.1
1	0750	95	91.	92.4	3529.6	*	1	1610	195	76.	34.0	3522.9	*	2	0030	295	0.	.0	3506.0
1	0755	96	91.	91.8	3529.5	*	1	1615	196	76.	33.5	3522.8	*	2	0035	296	0.	.0	3506.0
1	0800	97	91.	91.2	3529.4	*	1	1620	197	76.	33.0	3522.7	*	2	0040	297	0.	.0	3506.0
1	0805	98	91.	90.5	3529.4	*	1	1625	198	76.	32.5	3522.6	*	2	0045	298	0.	.0	3506.0
1	0810	99	91.	89.9	3529.3	*	1	1630	199	75.	31.9	3522.5	*	2	0050	299	0.	.0	3506.0
1	0815	100	91.	89.3	3529.3	*	1	1635	200	75.	31.4	3522.4	*	2	0055	300	0.	.0	3506.0
						*							*						

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
	(CFS)				
+ 94.	5.33	92.	69.	67.	67.
	(INCHES)	.671	2.025	2.025	2.025
	(AC-FT)	45.	137.	137.	137.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
108.	5.33	94.	44.	42.	42.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
3530.93	5.33	3529.72	3521.74	3521.17	3521.17

CUMULATIVE AREA = 1.27 SQ MI

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

					RATIOS APPLIED TO PRECIPITATION		
OPERATION	STATION	AREA	PLAN		RATIO 1	RATIO 2	RATIO 3
					.99	.98	.95
HYDROGRAPH AT							
+	COS12	.00	1	FLOW	7.	7.	7.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	V31COS10	.02	1	FLOW	32.	31.	30.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	A	.32	1	FLOW	362.	352.	336.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	COS3	.02	1	FLOW	45.	44.	42.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST2A	.00	1	FLOW	1.	1.	1.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST1	.01	1	FLOW	19.	19.	18.
				TIME	3.50	3.50	3.50
6 COMBINED AT							
+	CP1	.37	1	FLOW	449.	437.	418.
				TIME	3.58	3.58	3.58
ROUTED TO							
+	RCP1	.37	1	FLOW	445.	433.	414.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	V31COS14	.01	1	FLOW	20.	20.	19.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							

+	COS2	.02	1	FLOW	42.	42.	40.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	DC1	.01	1	FLOW	21.	21.	20.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST2B	.00	1	FLOW	1.	1.	1.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	V27COS14	.00	1	FLOW	9.	9.	9.
				TIME	3.50	3.50	3.50
4 COMBINED AT							
+	CP1A	.04	1	FLOW	75.	73.	71.
				TIME	3.50	3.50	3.50
ROUTED TO							
+	RCP1A	.04	1	FLOW	71.	69.	67.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	COS11	.01	1	FLOW	27.	26.	25.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST2	.00	1	FLOW	9.	9.	9.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST3	.00	1	FLOW	5.	5.	5.
				TIME	3.50	3.50	3.50
6 COMBINED AT							
+	CP2	.43	1	FLOW	559.	545.	522.
				TIME	3.58	3.58	3.58
ROUTED TO							
+	RCP2	.43	1	FLOW	555.	542.	518.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	M	.12	1	FLOW	164.	160.	153.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	COS8	.01	1	FLOW	7.	7.	7.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	COS9	.00	1	FLOW	10.	9.	9.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	V27COS10	.02	1	FLOW	47.	46.	44.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST4	.00	1	FLOW	8.	8.	8.
				TIME	3.50	3.50	3.50
6 COMBINED AT							
+	CP3	.59	1	FLOW	782.	763.	730.
				TIME	3.58	3.58	3.58
ROUTED TO							
+	RCP3	.59	1	FLOW	764.	745.	710.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	COS6	.01	1	FLOW	25.	24.	23.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	COS5	.01	1	FLOW	22.	21.	20.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	COS7	.02	1	FLOW	29.	29.	28.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	L	.15	1	FLOW	280.	274.	265.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	ST5	.01	1	FLOW	28.	27.	26.
				TIME	3.50	3.50	3.50

HYDROGRAPH AT							
+	ST14	.01	1	FLOW	21.	21.	20.
				TIME	3.50	3.50	3.50
7 COMBINED AT							
+	CP4	.79	1	FLOW	1155.	1128.	1081.
				TIME	3.58	3.58	3.58
DIVERSION TO							
+	DVCP4	.79	1	FLOW	553.	553.	553.
				TIME	3.42	3.42	3.42
HYDROGRAPH AT							
+	DVCP4	.79	1	FLOW	602.	575.	528.
				TIME	3.58	3.58	3.58
ROUTED TO							
+	RCP4	.79	1	FLOW	593.	566.	519.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	K	.02	1	FLOW	45.	44.	42.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST17	.00	1	FLOW	6.	5.	5.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CP5	.82	1	FLOW	629.	602.	554.
				TIME	3.58	3.58	3.58
ROUTED TO							
+	RCP5	.82	1	FLOW	621.	593.	546.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	H	.02	1	FLOW	37.	36.	35.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST18	.01	1	FLOW	28.	27.	26.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	I	.02	1	FLOW	37.	36.	35.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST16	.00	1	FLOW	4.	3.	3.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST13	.01	1	FLOW	20.	20.	19.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	G	.03	1	FLOW	76.	74.	72.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	N	.00	1	FLOW	12.	12.	11.
				TIME	3.50	3.50	3.50
5 COMBINED AT							
+	CP6A	.06	1	FLOW	148.	145.	141.
				TIME	3.50	3.50	3.50
4 COMBINED AT							
+	CP6	.90	1	FLOW	786.	756.	704.
				TIME	3.58	3.58	3.58
ROUTED TO							
+	RCP6	.90	1	FLOW	780.	750.	698.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	O	.04	1	FLOW	85.	83.	81.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST19	.00	1	FLOW	8.	8.	8.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CP7	.94	1	FLOW	863.	831.	778.
				TIME	3.58	3.58	3.58
ROUTED TO							
+	RCP7	.94	1	FLOW	856.	825.	771.
				TIME	3.58	3.58	3.58

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 HYDROGRAPH AT
+                     P       .02     1   FLOW          53.      52.      51.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  ST20       .01     1   FLOW          17.      17.      16.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  ST12       .01     1   FLOW          20.      20.      19.
                                           TIME         3.50     3.50     3.50

  4 COMBINED AT
+                   CP8       .98     1   FLOW         921.     888.     833.
                                           TIME         3.58     3.58     3.58

 ROUTED TO
+                  RCP8       .98     1   FLOW         912.     879.     825.
                                           TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                     E       .04     1   FLOW         110.     108.     105.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                     F       .04     1   FLOW         110.     109.     105.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  COS4       .07     1   FLOW         132.     129.     124.
                                           TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                   ST7       .01     1   FLOW          20.      20.      20.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST6       .00     1   FLOW          14.      13.      13.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                 DVCP4       .00     1   FLOW         553.     553.     553.
                                           TIME         3.42     3.42     3.42

  6 COMBINED AT
+                   CP9       .17     1   FLOW         928.     921.     910.
                                           TIME         3.50     3.50     3.50

 ROUTED TO
+                  RCP9       .17     1   FLOW         913.     906.     896.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST8       .00     1   FLOW          12.      12.      12.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  ST21       .00     1   FLOW          10.      10.      10.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  CP1A       .07     1   FLOW         131.     128.     124.
                                           TIME         3.50     3.50     3.50

  4 COMBINED AT
+                  CP10       .25     1   FLOW        1066.    1056.    1041.
                                           TIME         3.50     3.50     3.50

 ROUTED TO
+                 RCP10       .25     1   FLOW        1059.    1050.    1034.
                                           TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  CP1B       .04     1   FLOW          77.      76.      73.
                                           TIME         3.50     3.50     3.50

  3 COMBINED AT
+                GPDBIN      1.27     1   FLOW        2031.    1988.    1916.
                                           TIME         3.58     3.58     3.58

 ROUTED TO
+                  GPDB      1.27     1   FLOW          95.      95.      94.
                                           TIME         5.33     5.33     5.33

                                    ** PEAK STAGES IN FEET **
                                    1   STAGE     3531.56  3531.33  3530.93
                                           TIME         5.33     5.33     5.33

 ROUTED TO
+                 RGPDB      1.27     1   FLOW          95.      95.      94.
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                                    TIME         5.42     5.42     5.42

 HYDROGRAPH AT
+                    ST9       .00     1   FLOW          13.      13.      12.
                                    TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   CP1C       .05     1   FLOW          90.      88.      85.
                                    TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST10       .00     1   FLOW          10.      10.       9.
                                    TIME         3.50     3.50     3.50

  4 COMBINED AT
+                   CP11      1.32     1   FLOW         188.     185.     181.
                                    TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                   ST11       .01     1   FLOW          15.      15.      14.
                                    TIME         3.50     3.50     3.50
1
                                    SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                        (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                              COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
              RCP1  MANE          .34    448.16    215.52      1.59      5.00    444.53    215.00        1.59


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3153E+02 EXCESS= .0000E+00 OUTFLOW= .3153E+02 BASIN STORAGE= .7944E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP1  MANE          .35    436.43    215.56      1.55      5.00    432.93    215.00        1.55


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3071E+02 EXCESS= .0000E+00 OUTFLOW= .3071E+02 BASIN STORAGE= .7751E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP1  MANE          .35    417.12    215.56      1.48      5.00    413.63    215.00        1.48


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2936E+02 EXCESS= .0000E+00 OUTFLOW= .2936E+02 BASIN STORAGE= .8087E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP1A  MANE         1.34     74.00    211.43      2.29      5.00     70.68    210.00        2.29


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4303E+01 EXCESS= .0000E+00 OUTFLOW= .4303E+01 BASIN STORAGE= .2090E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP1A  MANE         1.34     72.16    211.15      2.24      5.00     69.16    210.00        2.24


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4211E+01 EXCESS= .0000E+00 OUTFLOW= .4211E+01 BASIN STORAGE= .2347E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP1A  MANE         1.36     69.80    211.63      2.16      5.00     66.69    210.00        2.16


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4059E+01 EXCESS= .0000E+00 OUTFLOW= .4059E+01 BASIN STORAGE= .2056E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP2  MANE          .35    558.05    215.37      1.70      5.00    555.48    215.00        1.70


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3935E+02 EXCESS= .0000E+00 OUTFLOW= .3935E+02 BASIN STORAGE= .8320E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP2  MANE          .35    544.29    215.31      1.66      5.00    541.84    215.00        1.66


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3836E+02 EXCESS= .0000E+00 OUTFLOW= .3836E+02 BASIN STORAGE= .8497E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP2  MANE          .35    520.17    215.20      1.58      5.00    518.40    215.00        1.59
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .3673E+02 EXCESS= .0000E+00 OUTFLOW= .3673E+02 BASIN STORAGE= .8650E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3	MANE	1.34	777.02	216.32	1.70	5.00	764.03	215.00	1.70

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5364E+02 EXCESS= .0000E+00 OUTFLOW= .5365E+02 BASIN STORAGE= .3971E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3	MANE	1.35	757.93	216.31	1.66	5.00	744.82	215.00	1.66

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5231E+02 EXCESS= .0000E+00 OUTFLOW= .5231E+02 BASIN STORAGE= .3962E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP3	MANE	1.37	722.94	215.95	1.59	5.00	710.37	215.00	1.59

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5007E+02 EXCESS= .0000E+00 OUTFLOW= .5008E+02 BASIN STORAGE= .4343E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP4	MANE	.38	597.58	215.50	.34	5.00	592.52	215.00	.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1458E+02 EXCESS= .0000E+00 OUTFLOW= .1458E+02 BASIN STORAGE= .1014E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP4	MANE	.38	571.83	215.30	.32	5.00	566.17	215.00	.33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1372E+02 EXCESS= .0000E+00 OUTFLOW= .1372E+02 BASIN STORAGE= .9407E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP4	MANE	.39	524.50	215.27	.29	5.00	519.41	215.00	.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1226E+02 EXCESS= .0000E+00 OUTFLOW= .1226E+02 BASIN STORAGE= .1667E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP5	MANE	.37	626.88	215.36	.40	5.00	620.67	215.00	.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1746E+02 EXCESS= .0000E+00 OUTFLOW= .1746E+02 BASIN STORAGE= .9795E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP5	MANE	.38	598.43	215.48	.38	5.00	593.20	215.00	.38

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1654E+02 EXCESS= .0000E+00 OUTFLOW= .1654E+02 BASIN STORAGE= .9593E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP5	MANE	.38	552.33	215.39	.34	5.00	546.14	215.00	.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1498E+02 EXCESS= .0000E+00 OUTFLOW= .1498E+02 BASIN STORAGE= .9625E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP6	MANE	.36	783.03	215.24	.63	5.00	779.93	215.00	.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3014E+02 EXCESS= .0000E+00 OUTFLOW= .3014E+02 BASIN STORAGE= .9799E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP6	MANE	.36	752.50	215.21	.60	5.00	749.63	215.00	.60

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2898E+02 EXCESS= .0000E+00 OUTFLOW= .2898E+02 BASIN STORAGE= .9881E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP6	MANE	.37	700.88	215.42	.56	5.00	698.32	215.00	.56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2704E+02 EXCESS= .0000E+00 OUTFLOW= .2704E+02 BASIN STORAGE= .9694E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP7	MANE	.35	858.66	215.16	.72	5.00	856.16	215.00	.72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3602E+02 EXCESS= .0000E+00 OUTFLOW= .3602E+02 BASIN STORAGE= .9827E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP7	MANE	.35	826.89	215.43	.69	5.00	824.84	215.00	.69	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3475E+02 EXCESS= .0000E+00 OUTFLOW= .3475E+02 BASIN STORAGE= .9262E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP7	MANE	.36	773.24	215.14	.65	5.00	771.15	215.00	.65	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3263E+02 EXCESS= .0000E+00 OUTFLOW= .3263E+02 BASIN STORAGE= .9571E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP8	MANE	.53	915.51	215.41	.79	5.00	911.69	215.00	.80	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4143E+02 EXCESS= .0000E+00 OUTFLOW= .4143E+02 BASIN STORAGE= .1445E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP8	MANE	.53	881.90	215.22	.77	5.00	878.98	215.00	.77	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4006E+02 EXCESS= .0000E+00 OUTFLOW= .4006E+02 BASIN STORAGE= .1517E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP8	MANE	.54	828.27	215.47	.72	5.00	824.53	215.00	.73	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3778E+02 EXCESS= .0000E+00 OUTFLOW= .3778E+02 BASIN STORAGE= .1535E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP9	MANE	1.04	925.06	211.86	9.69	5.00	913.16	210.00	9.70	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8970E+02 EXCESS= .0000E+00 OUTFLOW= .8970E+02 BASIN STORAGE= .2863E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP9	MANE	1.05	919.86	211.20	9.54	5.00	906.43	210.00	9.54	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8823E+02 EXCESS= .0000E+00 OUTFLOW= .8824E+02 BASIN STORAGE= .2974E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP9	MANE	1.05	907.39	211.84	9.27	5.00	895.87	210.00	9.28	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8578E+02 EXCESS= .0000E+00 OUTFLOW= .8579E+02 BASIN STORAGE= .3402E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP10	MANE	.29	1065.74	210.42	7.40	5.00	1059.14	210.00	7.41	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9928E+02 EXCESS= .0000E+00 OUTFLOW= .9928E+02 BASIN STORAGE= .8400E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP10	MANE	.29	1055.88	210.33	7.28	5.00	1049.65	210.00	7.28	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9762E+02 EXCESS= .0000E+00 OUTFLOW= .9762E+02 BASIN STORAGE= .8343E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP10	MANE	.29	1040.61	210.54	7.07	5.00	1033.98	210.00	7.08	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9484E+02 EXCESS= .0000E+00 OUTFLOW= .9484E+02 BASIN STORAGE= .8323E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RGPDB	MANE	1.56	95.17	321.46	2.15	5.00	95.17	325.00	2.15	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1453E+03 EXCESS= .0000E+00 OUTFLOW= .1453E+03 BASIN STORAGE= .7739E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RGPDB	MANE	1.56	94.72	321.84	2.10	5.00	94.72	325.00	2.10	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1422E+03 EXCESS= .0000E+00 OUTFLOW= .1422E+03 BASIN STORAGE= .4351E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RGPDB	MANE	1.57	93.96	322.49	2.02	5.00	93.96	325.00	2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1370E+03 EXCESS= .0000E+00 OUTFLOW= .1370E+03 BASIN STORAGE= .1587E-02 PERCENT ERROR= .0

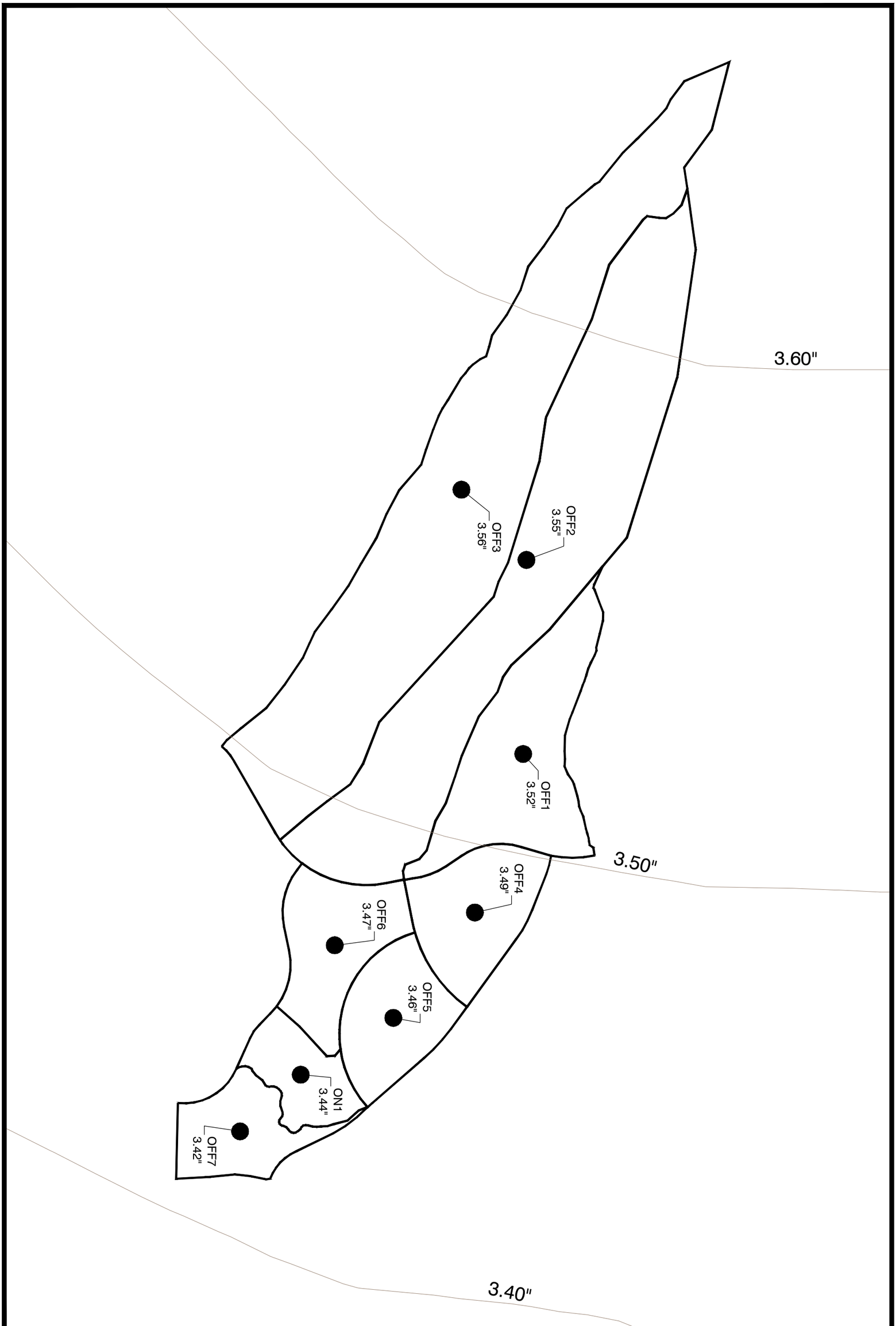
*** NORMAL END OF HEC-1 ***

B.2

INTERIM CONDITION

B.2.1

Precipitation Map and Calculations



2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

SUMMERLIN WEST
GRAND PARK DETENTION BASIN
INTERIM #2 - 100-YEAR PRECIPITATION MAP

W.O.#:	**7809-GPDB**
DATE:	**JAN 2020**
BY:	**PLM**
SCALE:	**1"=1000'**
SHEET	OF

H:\7809-GP Basin\Drainage\TDS\2_Outflow-Basin\3_ADD1\B_Hydrology\Interim Condition\Rainfall_depth_2006MPU.dwg;paulm; Jan 15, 2020 - 3:30pm

CURVE NUMBER CALCULATIONS

DEVELOPMENT: **Grand Park Detention Basin - Interim**
W.O. # **7809-GPDB** **CALCULATED BY:** **PLM**

	Precip. (in) Distance. (ft)	**Precip. (in)** Distance. (ft)	**Precip. (in)** Distance. (ft)	**Precip. (in)**
Interim #2 Condition - 100-Year				
Basin	**3.40**	**3.50**	**3.60**	**Design**
OFF1		1129	4859	**3.52**
OFF2		3308	2717	**3.55**
OFF3		3833	2183	**3.56**
OFF4	4418	770		**3.49**
OFF5	3059	2166		**3.46**
OFF6	3550	1563		**3.47**
OFF7	1152	3955		**3.42**
ON1	2030	3103		**3.44**

B.2.2

Curve Number Calculation

CURVE NUMBERS FOR SOILS - W.O. #7809

Soil # 112 Arizo very gravelly loamy sand, flooded, 0 to 4 percent slopes								
Soil	Percent	Group	Existing$_1$	Impervious$_2$	Residential$_3$ (6,000 Ft^2 or Less)	Residential$_4$ (7,000 Ft^2)	Residential$_5$ (10,000 Ft^2)	Open Space$_6$ (Poor Condition)
Arizo	100%	A	63	98	80	76	61	68
Total	**100%**		**63**	**98**	**80**	**76**	**61**	**68**

Soil # 152 Cave gravelly fine sandy loam, 0 to 4 percent slopes								
Soil	Percent	Group	Existing$_1$	Impervious$_2$	Residential$_3$ (6,000 Ft^2 or Less)	Residential$_4$ (7,000 Ft^2)	Residential$_5$ (10,000 Ft^2)	Open Space$_6$ (Poor Condition)
Cave	100%	D	88	98	92	91	87	89
Total	**100%**		**88**	**98**	**92**	**91**	**87**	**89**

Soil # 155 Cave gravelly fine sandy loam, 4 to 15 percent slopes								
Soil	Percent	Group	Existing$_1$	Impervious$_2$	Residential$_3$ (6,000 Ft^2 or Less)	Residential$_4$ (7,000 Ft^2)	Residential$_5$ (10,000 Ft^2)	Open Space$_6$ (Poor Condition)
Cave	100%	D	88	98	92	91	87	89
Total	**100%**		**88**	**98**	**92**	**91**	**87**	**89**

Soil # 156 Vace - Wechech association								
Soil	Percent	Group	Existing$_1$	Impervious$_2$	Residential$_3$ (6,000 Ft^2 or Less)	Residential$_4$ (7,000 Ft^2)	Residential$_5$ (10,000 Ft^2)	Open Space$_6$ (Poor Condition)
Vace and Similar	45%	D	88	98	92	91	87	89
Wechech and Similar	25%	D	88	98	92	91	87	89
Wechech, steep, and similar	15%	D	88	98	92	91	87	89
Weiser	8%	B	77	98	87	84	75	79
Irongold	4%	D	88	98	92	91	87	89
Commski	2%	B	77	98	87	84	75	79
Threelakes	1%	A	63	98	80	76	61	68
Total	**100%**		**87**	**98**	**92**	**91**	**86**	**88**

Soil # 191 Dalian very cobbly fine sandy loam, 2 to 8 percent slopes								
Soil	Percent	Group	Existing$_1$	Impervious$_2$	Residential$_3$ (6,000 Ft^2 or Less)	Residential$_4$ (7,000 Ft^2)	Residential$_5$ (10,000 Ft^2)	Open Space$_6$ (Poor Condition)
Dalian	100%	A	63	98	80	76	61	68
Total	**100%**		**63**	**98**	**80**	**76**	**61**	**68**

Soil # 502 Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes								
Soil	Percent	Group	Existing$_1$	Impervious$_2$	Residential$_3$ (6,000 Ft^2 or Less)	Residential$_4$ (7,000 Ft^2)	Residential$_5$ (10,000 Ft^2)	Open Space$_6$ (Poor Condition)
Canutio	55%	A	63	98	80	76	61	68
Cave	40%	D	88	98	92	91	87	89
Arizo	5%	A	63	98	80	76	61	68
Total	**100%**		**73**	**98**	**85**	**82**	**72**	**77**

Soil # 640 Rock outcrop, sand stone								
Soil	Percent	Group	Existing$_1$	Impervious$_2$	Residential$_3$ (6,000 Ft^2 or Less)	Residential$_4$ (7,000 Ft^2)	Residential$_5$ (10,000 Ft^2)	Open Space$_6$ (Poor Condition)

Rock outcrop	90%	D	88	98	92	91	87	89
Moentria	5%	D	88	98	92	91	87	89
Nupper	5%	D	88	98	92	91	87	89
Total	**100%**		**88**	**98**	**92**	**91**	**87**	**89**

Soil # 731 Purob-Irongold association								
Soil	Percent	Group	Existing$_1$	Impervious$_2$	Residential$_{3\ (6,000\ Ft^2\ or\ Less)}$	Residential$_{4\ (7,000\ Ft^2)}$	Residential$_{5\ (10,000\ Ft^2)}$	Open Space$_{6\ (Poor\ Condition)}$
Purob	60%	D	88	98	92	91	87	89
Irongold	25%	D	88	98	92	91	87	89
Typic torriorthents	5%	A	63	98	80	76	61	68
Arizo	3%	A	63	98	80	76	61	68
Purob	3%	D	88	98	92	91	87	89
Typic haplocalcids	2%	B	77	98	87	84	75	79
Xeric haplocambids	1%	A	63	98	80	76	61	68
Aridic calcixerolls	1%	A	63	98	80	76	61	68
Total	**100%**		**86**	**98**	**91**	**90**	**85**	**87**

1-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 4 of 4
* Desert Shrub in Poor Hydrologic Condition
2-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page1 of 4
* Streets and Roads
3-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A
* Townhouses / 6,000 sq ft lots or less **(SF/SFA 7-10 UNITS per ACRE)**
4-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A
* 7,000 sq ft lots **(SF/SFA 5-7 UNITS per ACRE)**
5-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602A
* 10,000 sq ft lots **(SF LOW 3-5 UNITS Per ACRE)**
6-Referenced Clark County's Hydrologic Criteria and Drainage Design Manual Table 602 page 1 of 4
* Open spaces in poor condition (grass cover < 50%)

CURVE NUMBER CALCULATIONS

DEVELOPMENT: Grand Park Detention Basin - Interim
W.O. # 7809-GPDB **CALCULATED BY:** PLM

Curve Number calculations for basins

Basin	Cover Type	112	152	155	156	191	502	640	731	CN Value
Interim #2 Condition										
OFF1	1	0.0%	0.0%	34.6%	2.0%	27.1%	30.0%	0.0%	6.3%	77
OFF2	1	0.0%	0.0%	0.0%	3.0%	3.0%	3.0%	0.0%	91.0%	85
OFF3	1	6.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	90.0%	85
OFF4	1	0.0%	0.0%	35.2%	4.3%	0.0%	60.5%	0.0%	0.0%	79
OFF5	1	0.0%	0.0%	7.8%	20.4%	0.0%	71.8%	0.0%	0.0%	77
OFF6	1	0.0%	0.0%	0.0%	84.5%	0.0%	1.8%	0.0%	13.7%	87
OFF7	1	0.0%	0.0%	0.0%	99.6%	0.0%	0.4%	0.0%	0.0%	87
ON1	9	0.0%	0.0%	0.0%	97.0%	0.0%	3.0%	0.0%	0.0%	88

B.2.3

Travel Time Calculation

TRAVEL TIME CALCULATIONS

DEVELOPMENT: Grand Park Detention Basin - Interim

W.O. # 7809-GPDB **CALCULATED BY:** PLM

$$Velocity = CS^{1/2}$$

C1 applies to the first 500 feet of travel distance
C2 applies to the remaining travel distance

Non Urbanized:		Urbanized:	
C1=14.8	C2=29.4	C1=20.2	C2=30.6

					First 500 feet		Remaining Travel Distance	
Basin	**Length** (ft)	**High Elev** (ft)	**Low Elev** (ft)	**Slope** (ft/ft)	**C1**	**V1** (fps)	**C2**	**V2** (fps)
Interim #2 Condition								
OFF1	3215	4030.0	3756.0	0.085	14.8	4.3	29.4	8.6
OFF2	8000	4345.0	3710.0	0.079	14.8	4.2	29.4	8.3
OFF3	10367	4560.0	3695.0	0.083	14.8	4.3	29.4	8.5
OFF4	1940	3780.0	3655.0	0.064	14.8	3.8	29.4	7.5
OFF5	1905	3685.0	3555.0	0.068	14.8	3.9	29.4	7.7
OFF6	1900	3685.0	3600.0	0.045	14.8	3.1	29.4	6.2
OFF7	2200	3530.0	3450.0	0.036	14.8	2.8	29.4	5.6
ON1	850	3540.0	3505.0	0.041	20.2	4.1	30.6	6.2

B.2.4

Standard Form 4

STANDARD FORM 4

DEVELOPMENT: Grand Park Detention Basin - Interim

W.O. # 7809-GPDB **CALCULATED BY:** PLM

V1 applies to the first 500 feet of travel distance
V2 applies to the remaining travel distance

Non-Urbanized:		Urbanized	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132C_n - 0.39 \qquad T_c = T_i + T_t$$

SUB-BASIN DATA					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG. (1)	Cn	K (2)	AREA Ac. (3)	AREA Mi^2	LENGTH Ft (4)	SLOPE % (5)	Ti Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	V1 fps (9a)	V2 fps (9b)	Tt Min. (10)	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
Interim #2 Condition																	
OFF1	77	0.6208	77.77	0.1215	385	10.4	7.75	3215	8.5	4.3	8.6	7.20	3600	30.00	14.95	0.150	
OFF2	85	0.7313	202.52	0.3164	500	9.7	6.96	8000	7.9	4.2	8.3	17.09	8500	57.22	24.05	0.240	
OFF3	85	0.7280	242.36	0.3787	500	9.7	7.02	10367	8.3	4.3	8.5	21.31	10867	70.37	28.33	0.283	
OFF4	79	0.6512	43.01	0.0672	150	13.5	4.15	1940	6.4	3.8	7.5	5.43	2090	21.61	9.59	0.096	min Tlag = 0.100
OFF5	77	0.6267	38.55	0.0602	150	27.1	3.47	1905	6.8	3.9	7.7	5.20	2055	21.42	8.68	0.087	min Tlag = 0.100
OFF6	87	0.7533	43.38	0.0678	180	14.6	3.43	1900	4.5	3.1	6.2	6.41	2080	21.56	9.84	0.098	min Tlag = 0.100
OFF7	87	0.7577	31.40	0.0491	25	18.0	1.18	2200	3.6	2.8	5.6	8.01	2225	22.36	9.18	0.092	min Tlag = 0.100
ON1	88	0.7672	24.96	0.0390	280	16.4	3.94	850	4.1	4.1	6.2	2.97	1130	16.28	6.92	0.069	
															Tc Min (URB)= 5 min		
															Tc Min (NON-URB)= 10 min		

B.2.5

HEC-1 Models

B.2.5.1 GPDB-INT2.out - 100-Year Interim #2 Condition

```
1****************************************                                    ****************************************
 *                                      *                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                    *          609 SECOND STREET           *
 *                                      *                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   05FEB20  TIME  08:27:14  *                                    *           (916) 756-1104             *
 *                                      *                                    *                                      *
 ****************************************                                    ****************************************

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


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

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

1                                                HEC-1 INPUT                                                PAGE  1

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

                        *DIAGRAM
 *** FREE ***
              1         ID           ************************************************
              2         ID                 GRAND PARK DETENTION BASIN PROJECT
              3         ID           ************************************************
              4         ID
              5         ID    GRAND PARK DETENTION BASIN - INTERIM #2 CONDITION
              6         ID    BY: VTN
              7         ID    DATE: FEBRUARY 2020
              8         ID    MODEL: GPDB-INT2.DAT
              9         ID
             10         ID   JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
             11         ID
             12         ID                         AREA    DARF
             13         ID                         SQ. MI.
             14         ID                         0-0.5   0.99
             15         ID                         0.5-1   0.975
             16         ID                         1-2     0.95
             17         ID
             18         ID   JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
             19         ID
             20         ID   100-YEAR,  6-HOUR STORM,  SDN3
             21         ID
             22         IT       5       0       0     300
             23         IO       5       0       0
             24         IN       5       0       0
             25         ID         0-0.5    0.5-1   1-2
             26         JR    PREC    0.99   0.975    0.95
                        *

             27         KK    OFF2
             28         KM   OFFSITE EXISTING UNDEVELOPED BASIN
             29         BA  0.3164
             30         PB    3.55
             31         PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
             32         PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
             33         PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
             34         PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
             35         PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
             36         PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
             37         PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
             38         PC   0.998   0.999       1
             39         LS       0      85
             40         UD   0.240
                        *

             41         KK    OFF3
             42         KM   OFFSITE EXISTING UNDEVELOPED BASIN
             43         BA  0.3787
             44         PB    3.56
             45         LS       0      85
             46         UD   0.283
                        *
```

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

  47          KK     CP1
  48          KM   COMBINE OFF2 & OFF3
  49          HC       2
              *

  50          KK    RCP1
  51          KM   ROUTE CP1 THROUGH STORM DRAIN TO CP5
  52          RD    2651   0.055   0.013       0    DEEP       5       0
              *

  53          KK    OFF6
  54          KM   OFFSITE EXISTING UNDEVELOPED BASIN
  55          BA  0.0678
  56          PB    3.47
  57          LS       0      87
  58          UD   0.100
              *

  59          KK     CP5
  60          KM   COMBINE RCP1 & OFF6 FOR FLOW INTO BASIN FROM SOUTH
  61          HC       2
              *

  62          KK    OFF1
  63          KM   OFFSITE EXISTING UNDEVELOPED BASIN
  64          BA  0.1215
  65          PB    3.52
  66          LS       0      77
  67          UD   0.150
              *

  68          KK   ROFF1
  69          KM   ROUTE OFF1 THROUGH STORM DRAIN TO CP2
  70          RD    1700   0.054   0.013       0    DEEP       5       0
              *

  71          KK    OFF4
  72          KM   OFFSITE EXISTING UNDEVELOPED BASIN
  73          BA  0.0672
  74          PB    3.49
  75          LS       0      79
  76          UD   0.100
              *

  77          KK     CP2
  78          KM   COMBINE OFF1 & OFF4
  79          HC       2
              *
```



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

  80          KK    RCP2
  81          KM   ROUTE CP2 THROUGH STORM DRAIN TO CP3
  82          RD    1800   0.061   0.013       0    DEEP       5       0
              *

  83          KK    OFF5
  84          KM   OFFSITE EXISTING UNDEVELOPED BASIN
  85          BA  0.0602
  86          PB    3.46
  87          LS       0      77
  88          UD   0.100
              *

  89          KK     CP3
  90          KM   COMBINE RCP2 & OFF5 FOR FLOW INTO BASIN FROM NORTH
  91          HC       2
              *

  92          KK     ON1
  93          KM   ONSITE OPEN SPACE COVER TYPE BASIN
  94          BA  0.0390
  95          PB    3.44
  96          LS       0      88
  97          UD   0.069
              *

  98          KK     CP4
  99          KM   COMBINE CP5, CP3, & ON1 FOR TOTAL FLOW IN BASIN
 100          HC       3
              *

 101          KK    GPDB
 102          KM   VILLAGE 25 DETENTION BASIN (GRAND PARK DETENTION BASIN)
```

```
            103          KM   STORAGE VOLUME = 155.0 AC-FT AT 3534 STAGE
            104          KM   SEDIMENT VOLUME = 9.0 AC-FT (REMOVED FROM EACH STAGE)
            105          KM   OUTLET = 5'X5' RCB WITH 26" ORIFICE PLATE
            106          KM   100-YEAR DISCHARGE = 94 CFS
            107          KM   SPILLWAY LENGTH = 300 FT WITH 10:1 SIDE SLOPES
            108          KM   SPILLWAY HEIGHT = 3 FT
            109          KM   SPILLWAY CREST ELEVATION = 3532.0'
            110          KM   SPILLWAY TYPE = BROAD CRESTED TRAPEZOIDAL WEIR
            111          KM   PMF DISCHARGE = 4544 CFS
            112          KM   TOP OF EMBANKMENT ELEVATION = 3535.0'
            113          KM   STAGE/STORAGE/DISCHARGE CALCULATED BY: PLM OF VTN
            114          KO       1
            115          RS       1    STOR       0
            116          SV     0.0     1.9     6.8    13.2    20.6    29.3    39.9    55.0    75.4    97.3
            117          SV   108.9   120.9   133.3   146.0
            118          SE    3506    3514    3516    3518    3520    3522    3524    3526    3528    3530
            119          SE    3531    3532    3533    3534
            120          SQ       0    50.6    57.4    63.5    69.1    74.3    79.1    83.6    88.0    92.1
            121          SQ    94.1    96.0   921.2  2665.6
                         *
1                                                HEC-1 INPUT                                              PAGE  4

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


            122          KK    OFF7
            123          KM   OFFSITE EXISTING UNDEVELOPED BASIN
            124          BA  0.0491
            125          PB    3.42
            126          LS       0      87
            127          UD   0.100
                         *

            128          KK     CP6
            129          KM   COMBINE GPDB & OFF7 FOR FLOW AT SKY VISTA & STREET J
            130          HC       2
                         *
            131          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    27        OFF2
                 .
                 .
    41           .        OFF3
                 .           .
                 .           .
    47         CP1............
                 V
                 V
    50        RCP1
                 .
                 .
    53           .        OFF6
                 .           .
                 .           .
    59         CP5............
                 .
                 .
    62           .        OFF1
                 .           V
                 .           V
    68           .       ROFF1
                 .           .
                 .           .
    71           .           .        OFF4
                 .           .           .
                 .           .           .
    77           .         CP2............
                 .           V
                 .           V
    80           .        RCP2
                 .           .
                 .           .
    83           .           .        OFF5
                 .           .           .
                 .           .           .
    89           .         CP3............
                 .           .
                 .           .
    92           .           .         ON1
                 .           .           .
                 .           .           .
    98         CP4.......................
                 V
                 V
   101        GPDB
```

```
              .
              .
  122         .        OFF7
              .          .
              .          .
  128       CP6.............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************                                    ****************************************
 *                                      *                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                    *          609 SECOND STREET           *
 *                                      *                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   05FEB20  TIME  08:27:14  *                                    *           (916) 756-1104             *
 *                                      *                                    *                                      *
 ****************************************                                    ****************************************
```

****
GRAND PARK DETENTION BASIN PROJECT
****

GRAND PARK DETENTION BASIN - INTERIM #2 CONDITION
BY: VTN
DATE: FEBRUARY 2020
MODEL: GPDB-INT2.DAT

JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

AREA SQ. MI.	DARF
0-0.5	0.99
0.5-1	0.975
1-2	0.95

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

100-YEAR, 6-HOUR STORM, SDN3

```
  23 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                               0-0.5    0.5-1   1-2

     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
                     .99       .98       .95
```

*** ***

```
            **************
            *            *
 101 KK     *      GPDB  *
            *            *
            **************

 114 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           1  PRINT CONTROL
```

```
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

115 RS          STORAGE ROUTING
                     NSTPS           1  NUMBER OF SUBREACHES
                      ITYP        STOR  TYPE OF INITIAL CONDITION
                    RSVRIC         .00  INITIAL CONDITION
                         X         .00 WORKING R AND D COEFFICIENT

116 SV            STORAGE          .0       1.9       6.8      13.2      20.6      29.3      39.9      55.0      75.4      97.3
                                 108.9     120.9     133.3     146.0

118 SE          ELEVATION     3506.00   3514.00   3516.00   3518.00   3520.00   3522.00   3524.00   3526.00   3528.00   3530.00
                              3531.00   3532.00   3533.00   3534.00

120 SQ          DISCHARGE          0.       51.       57.       64.       69.       74.       79.       84.       88.       92.
                                  94.       96.      921.     2666.

                                                      ***
```

****

HYDROGRAPH AT STATION GPDB
PLAN 1, RATIO = .99

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	3506.0	1		0820	101	86.	65.4	3527.0	1		1640	201	63.	12.7	3517.8
1		0005	2	0.	.0	3506.0	1		0825	102	86.	64.8	3527.0	1		1645	202	63.	12.2	3517.7
1		0010	3	0.	.0	3506.0	1		0830	103	86.	64.2	3526.9	1		1650	203	62.	11.8	3517.6
1		0015	4	0.	.0	3506.0	1		0835	104	85.	63.7	3526.8	1		1655	204	62.	11.4	3517.4
1		0020	5	0.	.0	3506.0	1		0840	105	85.	63.1	3526.8	1		1700	205	61.	10.9	3517.3
1		0025	6	0.	.0	3506.0	1		0845	106	85.	62.5	3526.7	1		1705	206	61.	10.5	3517.2
1		0030	7	1.	.0	3506.1	1		0850	107	85.	61.9	3526.7	1		1710	207	61.	10.1	3517.0
1		0035	8	1.	.0	3506.2	1		0855	108	85.	61.3	3526.6	1		1715	208	60.	9.7	3516.9
1		0040	9	2.	.1	3506.3	1		0900	109	85.	60.7	3526.6	1		1720	209	60.	9.3	3516.8
1		0045	10	3.	.1	3506.5	1		0905	110	85.	60.1	3526.5	1		1725	210	59.	8.9	3516.6
1		0050	11	3.	.1	3506.5	1		0910	111	85.	59.6	3526.4	1		1730	211	59.	8.5	3516.5
1		0055	12	4.	.1	3506.6	1		0915	112	84.	59.0	3526.4	1		1735	212	59.	8.1	3516.4
1		0100	13	4.	.1	3506.6	1		0920	113	84.	58.4	3526.3	1		1740	213	58.	7.6	3516.3
1		0105	14	4.	.1	3506.6	1		0925	114	84.	57.8	3526.3	1		1745	214	58.	7.2	3516.1
1		0110	15	4.	.1	3506.6	1		0930	115	84.	57.2	3526.2	1		1750	215	57.	6.9	3516.0
1		0115	16	4.	.1	3506.6	1		0935	116	84.	56.7	3526.2	1		1755	216	57.	6.5	3515.9
1		0120	17	4.	.2	3506.7	1		0940	117	84.	56.1	3526.1	1		1800	217	56.	6.1	3515.7
1		0125	18	5.	.2	3506.8	1		0945	118	84.	55.5	3526.0	1		1805	218	56.	5.7	3515.5
1		0130	19	7.	.3	3507.1	1		0950	119	84.	54.9	3526.0	1		1810	219	55.	5.3	3515.4
1		0135	20	10.	.4	3507.6	1		0955	120	83.	54.4	3525.9	1		1815	220	55.	4.9	3515.2
1		0140	21	14.	.5	3508.2	1		1000	121	83.	53.8	3525.8	1		1820	221	54.	4.5	3515.1
1		0145	22	18.	.7	3508.8	1		1005	122	83.	53.2	3525.8	1		1825	222	54.	4.2	3514.9
1		0150	23	22.	.8	3509.5	1		1010	123	83.	52.6	3525.7	1		1830	223	53.	3.8	3514.8
1		0155	24	26.	1.0	3510.0	1		1015	124	83.	52.1	3525.6	1		1835	224	53.	3.4	3514.6
1		0200	25	28.	1.0	3510.4	1		1020	125	83.	51.5	3525.5	1		1840	225	52.	3.1	3514.5
1		0205	26	28.	1.1	3510.5	1		1025	126	82.	50.9	3525.5	1		1845	226	52.	2.7	3514.3
1		0210	27	28.	1.1	3510.5	1		1030	127	82.	50.4	3525.4	1		1850	227	51.	2.4	3514.2
1		0215	28	29.	1.1	3510.6	1		1035	128	82.	49.8	3525.3	1		1855	228	51.	2.0	3514.0
1		0220	29	32.	1.2	3511.1	1		1040	129	82.	49.2	3525.2	1		1900	229	45.	1.7	3513.1
1		0225	30	37.	1.4	3511.8	1		1045	130	82.	48.7	3525.2	1		1905	230	37.	1.4	3511.9
1		0230	31	43.	1.6	3512.7	1		1050	131	82.	48.1	3525.1	1		1910	231	31.	1.2	3510.9
1		0235	32	48.	1.8	3513.5	1		1055	132	81.	47.5	3525.0	1		1915	232	26.	1.0	3510.1
1		0240	33	51.	2.0	3514.0	1		1100	133	81.	47.0	3524.9	1		1920	233	21.	.8	3509.4
1		0245	34	51.	2.1	3514.1	1		1105	134	81.	46.4	3524.9	1		1925	234	18.	.7	3508.8
1		0250	35	51.	2.3	3514.2	1		1110	135	81.	45.9	3524.8	1		1930	235	15.	.6	3508.4
1		0255	36	51.	2.5	3514.2	1		1115	136	81.	45.3	3524.7	1		1935	236	12.	.5	3508.0
1		0300	37	52.	2.7	3514.3	1		1120	137	81.	44.8	3524.6	1		1940	237	10.	.4	3507.6
1		0305	38	52.	2.9	3514.4	1		1125	138	80.	44.2	3524.6	1		1945	238	9.	.3	3507.4
1		0310	39	53.	3.4	3514.6	1		1130	139	80.	43.6	3524.5	1		1950	239	7.	.3	3507.1
1		0315	40	54.	4.4	3515.0	1		1135	140	80.	43.1	3524.4	1		1955	240	6.	.2	3506.9
1		0320	41	57.	6.5	3515.9	1		1140	141	80.	42.5	3524.4	1		2000	241	5.	.2	3506.8
1		0325	42	61.	10.2	3517.1	1		1145	142	80.	42.0	3524.3	1		2005	242	4.	.2	3506.6
1		0330	43	66.	16.0	3518.8	1		1150	143	80.	41.4	3524.2	1		2010	243	3.	.1	3506.5
1		0335	44	71.	23.7	3520.7	1		1155	144	79.	40.9	3524.1	1		2015	244	3.	.1	3506.4
1		0340	45	76.	32.2	3522.5	1		1200	145	79.	40.4	3524.1	1		2020	245	2.	.1	3506.4
1		0345	46	79.	40.4	3524.1	1		1205	146	79.	39.8	3524.0	1		2025	246	2.	.1	3506.3
1		0350	47	81.	47.7	3525.0	1		1210	147	79.	39.3	3523.9	1		2030	247	2.	.1	3506.3
1		0355	48	83.	53.6	3525.8	1		1215	148	79.	38.7	3523.8	1		2035	248	1.	.1	3506.2
1		0400	49	84.	58.3	3526.3	1		1220	149	78.	38.2	3523.7	1		2040	249	1.	.0	3506.2
1		0405	50	85.	61.9	3526.7	1		1225	150	78.	37.6	3523.6	1		2045	250	1.	.0	3506.1
1		0410	51	86.	64.7	3526.9	1		1230	151	78.	37.1	3523.5	1		2050	251	1.	.0	3506.1
1		0415	52	86.	66.7	3527.1	1		1235	152	78.	36.6	3523.4	1		2055	252	1.	.0	3506.1
1		0420	53	86.	68.2	3527.3	1		1240	153	77.	36.0	3523.3	1		2100	253	1.	.0	3506.1
1		0425	54	87.	69.4	3527.4	1		1245	154	77.	35.5	3523.2	1		2105	254	0.	.0	3506.1
1		0430	55	87.	70.5	3527.5	1		1250	155	77.	35.0	3523.1	1		2110	255	0.	.0	3506.1
1		0435	56	87.	71.8	3527.7	1		1255	156	77.	34.4	3523.0	1		2115	256	0.	.0	3506.0
1		0440	57	88.	73.3	3527.8	1		1300	157	76.	33.9	3522.9	1		2120	257	0.	.0	3506.0
1		0445	58	88.	74.9	3528.0	1		1305	158	76.	33.4	3522.8	1		2125	258	0.	.0	3506.0
1		0450	59	88.	76.6	3528.1	1		1310	159	76.	32.9	3522.7	1		2130	259	0.	.0	3506.0
1		0455	60	89.	78.3	3528.3	1		1315	160	76.	32.3	3522.6	1		2135	260	0.	.0	3506.0

1	0500	61	89.	79.9	3528.4	*	1	1320	161	75.	31.8	3522.5	*	1	2140	261	0.	.0	3506.0
1	0505	62	89.	81.2	3528.5	*	1	1325	162	75.	31.3	3522.4	*	1	2145	262	0.	.0	3506.0
1	0510	63	89.	82.2	3528.6	*	1	1330	163	75.	30.8	3522.3	*	1	2150	263	0.	.0	3506.0
1	0515	64	89.	82.8	3528.7	*	1	1335	164	75.	30.3	3522.2	*	1	2155	264	0.	.0	3506.0
1	0520	65	89.	83.2	3528.7	*	1	1340	165	75.	29.8	3522.1	*	1	2200	265	0.	.0	3506.0
1	0525	66	89.	83.4	3528.7	*	1	1345	166	74.	29.3	3522.0	*	1	2205	266	0.	.0	3506.0
1	0530	67	89.	83.3	3528.7	*	1	1350	167	74.	28.7	3521.9	*	1	2210	267	0.	.0	3506.0
1	0535	68	89.	83.2	3528.7	*	1	1355	168	74.	28.2	3521.8	*	1	2215	268	0.	.0	3506.0
1	0540	69	89.	82.9	3528.7	*	1	1400	169	73.	27.7	3521.6	*	1	2220	269	0.	.0	3506.0
1	0545	70	89.	82.6	3528.7	*	1	1405	170	73.	27.2	3521.5	*	1	2225	270	0.	.0	3506.0
1	0550	71	89.	82.3	3528.6	*	1	1410	171	73.	26.7	3521.4	*	1	2230	271	0.	.0	3506.0
1	0555	72	89.	82.0	3528.6	*	1	1415	172	72.	26.2	3521.3	*	1	2235	272	0.	.0	3506.0
1	0600	73	89.	81.6	3528.6	*	1	1420	173	72.	25.7	3521.2	*	1	2240	273	0.	.0	3506.0
1	0605	74	89.	81.2	3528.5	*	1	1425	174	72.	25.2	3521.1	*	1	2245	274	0.	.0	3506.0
1	0610	75	89.	80.7	3528.5	*	1	1430	175	72.	24.7	3520.9	*	1	2250	275	0.	.0	3506.0
1	0615	76	89.	80.2	3528.4	*	1	1435	176	71.	24.2	3520.8	*	1	2255	276	0.	.0	3506.0
1	0620	77	89.	79.7	3528.4	*	1	1440	177	71.	23.7	3520.7	*	1	2300	277	0.	.0	3506.0
1	0625	78	89.	79.2	3528.3	*	1	1445	178	71.	23.3	3520.6	*	1	2305	278	0.	.0	3506.0
1	0630	79	89.	78.6	3528.3	*	1	1450	179	70.	22.8	3520.5	*	1	2310	279	0.	.0	3506.0
1	0635	80	88.	78.0	3528.2	*	1	1455	180	70.	22.3	3520.4	*	1	2315	280	0.	.0	3506.0
1	0640	81	88.	77.4	3528.2	*	1	1500	181	70.	21.8	3520.3	*	1	2320	281	0.	.0	3506.0
1	0645	82	88.	76.8	3528.1	*	1	1505	182	70.	21.3	3520.2	*	1	2325	282	0.	.0	3506.0
1	0650	83	88.	76.2	3528.1	*	1	1510	183	69.	20.9	3520.1	*	1	2330	283	0.	.0	3506.0
1	0655	84	88.	75.6	3528.0	*	1	1515	184	69.	20.4	3519.9	*	1	2335	284	0.	.0	3506.0
1	0700	85	88.	75.0	3528.0	*	1	1520	185	69.	19.9	3519.8	*	1	2340	285	0.	.0	3506.0
1	0705	86	88.	74.4	3527.9	*	1	1525	186	68.	19.4	3519.7	*	1	2345	286	0.	.0	3506.0
1	0710	87	88.	73.8	3527.8	*	1	1530	187	68.	19.0	3519.6	*	1	2350	287	0.	.0	3506.0
1	0715	88	88.	73.2	3527.8	*	1	1535	188	68.	18.5	3519.4	*	1	2355	288	0.	.0	3506.0
1	0720	89	87.	72.6	3527.7	*	1	1540	189	67.	18.0	3519.3	*	2	0000	289	0.	.0	3506.0
1	0725	90	87.	72.0	3527.7	*	1	1545	190	67.	17.6	3519.2	*	2	0005	290	0.	.0	3506.0
1	0730	91	87.	71.4	3527.6	*	1	1550	191	66.	17.1	3519.1	*	2	0010	291	0.	.0	3506.0
1	0735	92	87.	70.8	3527.5	*	1	1555	192	66.	16.7	3518.9	*	2	0015	292	0.	.0	3506.0
1	0740	93	87.	70.2	3527.5	*	1	1600	193	66.	16.2	3518.8	*	2	0020	293	0.	.0	3506.0
1	0745	94	87.	69.6	3527.4	*	1	1605	194	65.	15.8	3518.7	*	2	0025	294	0.	.0	3506.0
1	0750	95	87.	69.0	3527.4	*	1	1610	195	65.	15.3	3518.6	*	2	0030	295	0.	.0	3506.0
1	0755	96	86.	68.4	3527.3	*	1	1615	196	65.	14.9	3518.4	*	2	0035	296	0.	.0	3506.0
1	0800	97	86.	67.8	3527.3	*	1	1620	197	64.	14.4	3518.3	*	2	0040	297	0.	.0	3506.0
1	0805	98	86.	67.2	3527.2	*	1	1625	198	64.	14.0	3518.2	*	2	0045	298	0.	.0	3506.0
1	0810	99	86.	66.6	3527.1	*	1	1630	199	64.	13.5	3518.1	*	2	0050	299	0.	.0	3506.0
1	0815	100	86.	66.0	3527.1	*	1	1635	200	63.	13.1	3518.0	*	2	0055	300	0.	.0	3506.0
						*							*						

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
	(CFS)				
+ 89.	5.42	87.	54.	52.	52.
	(INCHES)	.769	1.905	1.905	1.905
	(AC-FT)	43.	107.	107.	107.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
83.	5.42	71.	28.	27.	27.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
3528.73	5.42	3527.53	3517.91	3517.47	3517.47

CUMULATIVE AREA = 1.05 SQ MI

HYDROGRAPH AT STATION GPDB
PLAN 1, RATIO = .98

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE		DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE		DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1	0000		1	0.	.0	3506.0	*	1	0820		101	85.	63.3	3526.8	*	1	1640		201	61.	11.1	3517.3
1	0005		2	0.	.0	3506.0	*	1	0825		102	85.	62.7	3526.8	*	1	1645		202	61.	10.7	3517.2
1	0010		3	0.	.0	3506.0	*	1	0830		103	85.	62.1	3526.7	*	1	1650		203	61.	10.2	3517.1
1	0015		4	0.	.0	3506.0	*	1	0835		104	85.	61.5	3526.6	*	1	1655		204	60.	9.8	3516.9
1	0020		5	0.	.0	3506.0	*	1	0840		105	85.	60.9	3526.6	*	1	1700		205	60.	9.4	3516.8
1	0025		6	0.	.0	3506.0	*	1	0845		106	85.	60.3	3526.5	*	1	1705		206	59.	9.0	3516.7
1	0030		7	1.	.0	3506.1	*	1	0850		107	85.	59.8	3526.5	*	1	1710		207	59.	8.6	3516.6
1	0035		8	1.	.0	3506.2	*	1	0855		108	84.	59.2	3526.4	*	1	1715		208	59.	8.2	3516.4
1	0040		9	2.	.1	3506.3	*	1	0900		109	84.	58.6	3526.4	*	1	1720		209	58.	7.8	3516.3
1	0045		10	3.	.1	3506.4	*	1	0905		110	84.	58.0	3526.3	*	1	1725		210	58.	7.4	3516.2
1	0050		11	3.	.1	3506.5	*	1	0910		111	84.	57.4	3526.2	*	1	1730		211	58.	7.0	3516.1
1	0055		12	3.	.1	3506.5	*	1	0915		112	84.	56.9	3526.2	*	1	1735		212	57.	6.6	3515.9
1	0100		13	3.	.1	3506.5	*	1	0920		113	84.	56.3	3526.1	*	1	1740		213	57.	6.2	3515.8
1	0105		14	3.	.1	3506.5	*	1	0925		114	84.	55.7	3526.1	*	1	1745		214	56.	5.8	3515.6
1	0110		15	3.	.1	3506.5	*	1	0930		115	84.	55.1	3526.0	*	1	1750		215	55.	5.4	3515.4
1	0115		16	3.	.1	3506.5	*	1	0935		116	83.	54.5	3525.9	*	1	1755		216	55.	5.0	3515.3
1	0120		17	4.	.1	3506.6	*	1	0940		117	83.	54.0	3525.9	*	1	1800		217	54.	4.7	3515.1
1	0125		18	5.	.2	3506.8	*	1	0945		118	83.	53.4	3525.8	*	1	1805		218	54.	4.3	3515.0

1	0130	19	7.	.3	3507.1	*	1	0950	119	83.	52.8	3525.7	*	1	1810	219	53.	3.9	3514.8
1	0135	20	9.	.4	3507.5	*	1	0955	120	83.	52.3	3525.6	*	1	1815	220	53.	3.6	3514.7
1	0140	21	13.	.5	3508.0	*	1	1000	121	83.	51.7	3525.6	*	1	1820	221	52.	3.2	3514.5
1	0145	22	17.	.6	3508.7	*	1	1005	122	82.	51.1	3525.5	*	1	1825	222	52.	2.8	3514.4
1	0150	23	21.	.8	3509.3	*	1	1010	123	82.	50.5	3525.4	*	1	1830	223	51.	2.5	3514.2
1	0155	24	24.	.9	3509.8	*	1	1015	124	82.	50.0	3525.3	*	1	1835	224	51.	2.1	3514.1
1	0200	25	26.	1.0	3510.1	*	1	1020	125	82.	49.4	3525.3	*	1	1840	225	48.	1.8	3513.5
1	0205	26	27.	1.0	3510.2	*	1	1025	126	82.	48.9	3525.2	*	1	1845	226	40.	1.5	3512.3
1	0210	27	27.	1.0	3510.2	*	1	1030	127	82.	48.3	3525.1	*	1	1850	227	33.	1.2	3511.2
1	0215	28	28.	1.0	3510.4	*	1	1035	128	81.	47.7	3525.0	*	1	1855	228	27.	1.0	3510.3
1	0220	29	30.	1.1	3510.8	*	1	1040	129	81.	47.2	3525.0	*	1	1900	229	23.	.9	3509.6
1	0225	30	35.	1.3	3511.6	*	1	1045	130	81.	46.6	3524.9	*	1	1905	230	19.	.7	3509.0
1	0230	31	41.	1.5	3512.4	*	1	1050	131	81.	46.1	3524.8	*	1	1910	231	16.	.6	3508.5
1	0235	32	46.	1.7	3513.2	*	1	1055	132	81.	45.5	3524.7	*	1	1915	232	13.	.5	3508.1
1	0240	33	50.	1.9	3513.9	*	1	1100	133	81.	44.9	3524.7	*	1	1920	233	11.	.4	3507.7
1	0245	34	51.	2.0	3514.1	*	1	1105	134	80.	44.4	3524.6	*	1	1925	234	9.	.3	3507.4
1	0250	35	51.	2.2	3514.1	*	1	1110	135	80.	43.8	3524.5	*	1	1930	235	8.	.3	3507.2
1	0255	36	51.	2.4	3514.2	*	1	1115	136	80.	43.3	3524.4	*	1	1935	236	6.	.2	3507.0
1	0300	37	51.	2.5	3514.3	*	1	1120	137	80.	42.7	3524.4	*	1	1940	237	5.	.2	3506.8
1	0305	38	52.	2.7	3514.3	*	1	1125	138	80.	42.2	3524.3	*	1	1945	238	4.	.2	3506.7
1	0310	39	52.	3.2	3514.5	*	1	1130	139	80.	41.6	3524.2	*	1	1950	239	4.	.1	3506.6
1	0315	40	54.	4.2	3514.9	*	1	1135	140	79.	41.1	3524.2	*	1	1955	240	3.	.1	3506.5
1	0320	41	57.	6.2	3515.8	*	1	1140	141	79.	40.5	3524.1	*	1	2000	241	3.	.1	3506.4
1	0325	42	60.	9.8	3516.9	*	1	1145	142	79.	40.0	3524.0	*	1	2005	242	2.	.1	3506.3
1	0330	43	65.	15.4	3518.6	*	1	1150	143	79.	39.4	3523.9	*	1	2010	243	2.	.1	3506.3
1	0335	44	71.	23.0	3520.5	*	1	1155	144	79.	38.9	3523.8	*	1	2015	244	1.	.1	3506.2
1	0340	45	75.	31.2	3522.4	*	1	1200	145	78.	38.4	3523.7	*	1	2020	245	1.	.0	3506.2
1	0345	46	79.	39.3	3523.9	*	1	1205	146	78.	37.8	3523.6	*	1	2025	246	1.	.0	3506.2
1	0350	47	81.	46.4	3524.9	*	1	1210	147	78.	37.3	3523.5	*	1	2030	247	1.	.0	3506.1
1	0355	48	83.	52.2	3525.6	*	1	1215	148	78.	36.8	3523.4	*	1	2035	248	1.	.0	3506.1
1	0400	49	84.	56.7	3526.2	*	1	1220	149	77.	36.2	3523.3	*	1	2040	249	1.	.0	3506.1
1	0405	50	85.	60.3	3526.5	*	1	1225	150	77.	35.7	3523.2	*	1	2045	250	0.	.0	3506.1
1	0410	51	85.	63.0	3526.8	*	1	1230	151	77.	35.2	3523.1	*	1	2050	251	0.	.0	3506.1
1	0415	52	86.	64.9	3527.0	*	1	1235	152	77.	34.6	3523.0	*	1	2055	252	0.	.0	3506.1
1	0420	53	86.	66.4	3527.1	*	1	1240	153	76.	34.1	3522.9	*	1	2100	253	0.	.0	3506.0
1	0425	54	86.	67.6	3527.2	*	1	1245	154	76.	33.6	3522.8	*	1	2105	254	0.	.0	3506.0
1	0430	55	87.	68.7	3527.3	*	1	1250	155	76.	33.0	3522.7	*	1	2110	255	0.	.0	3506.0
1	0435	56	87.	69.9	3527.5	*	1	1255	156	76.	32.5	3522.6	*	1	2115	256	0.	.0	3506.0
1	0440	57	87.	71.4	3527.6	*	1	1300	157	76.	32.0	3522.5	*	1	2120	257	0.	.0	3506.0
1	0445	58	87.	73.0	3527.8	*	1	1305	158	75.	31.5	3522.4	*	1	2125	258	0.	.0	3506.0
1	0450	59	88.	74.6	3527.9	*	1	1310	159	75.	31.0	3522.3	*	1	2130	259	0.	.0	3506.0
1	0455	60	88.	76.2	3528.1	*	1	1315	160	75.	30.5	3522.2	*	1	2135	260	0.	.0	3506.0
1	0500	61	88.	77.8	3528.2	*	1	1320	161	75.	29.9	3522.1	*	1	2140	261	0.	.0	3506.0
1	0505	62	89.	79.0	3528.3	*	1	1325	162	74.	29.4	3522.0	*	1	2145	262	0.	.0	3506.0
1	0510	63	89.	80.0	3528.4	*	1	1330	163	74.	28.9	3521.9	*	1	2150	263	0.	.0	3506.0
1	0515	64	89.	80.7	3528.5	*	1	1335	164	74.	28.4	3521.8	*	1	2155	264	0.	.0	3506.0
1	0520	65	89.	81.0	3528.5	*	1	1340	165	73.	27.9	3521.7	*	1	2200	265	0.	.0	3506.0
1	0525	66	89.	81.2	3528.5	*	1	1345	166	73.	27.4	3521.6	*	1	2205	266	0.	.0	3506.0
1	0530	67	89.	81.1	3528.5	*	1	1350	167	73.	26.9	3521.4	*	1	2210	267	0.	.0	3506.0
1	0535	68	89.	81.0	3528.5	*	1	1355	168	73.	26.4	3521.3	*	1	2215	268	0.	.0	3506.0
1	0540	69	89.	80.7	3528.5	*	1	1400	169	72.	25.9	3521.2	*	1	2220	269	0.	.0	3506.0
1	0545	70	89.	80.4	3528.5	*	1	1405	170	72.	25.4	3521.1	*	1	2225	270	0.	.0	3506.0
1	0550	71	89.	80.1	3528.4	*	1	1410	171	72.	24.9	3521.0	*	1	2230	271	0.	.0	3506.0
1	0555	72	89.	79.7	3528.4	*	1	1415	172	71.	24.4	3520.9	*	1	2235	272	0.	.0	3506.0
1	0600	73	89.	79.3	3528.4	*	1	1420	173	71.	23.9	3520.8	*	1	2240	273	0.	.0	3506.0
1	0605	74	89.	78.9	3528.3	*	1	1425	174	71.	23.4	3520.6	*	1	2245	274	0.	.0	3506.0
1	0610	75	89.	78.5	3528.3	*	1	1430	175	70.	22.9	3520.5	*	1	2250	275	0.	.0	3506.0
1	0615	76	88.	78.0	3528.2	*	1	1435	176	70.	22.5	3520.4	*	1	2255	276	0.	.0	3506.0
1	0620	77	88.	77.5	3528.2	*	1	1440	177	70.	22.0	3520.3	*	1	2300	277	0.	.0	3506.0
1	0625	78	88.	76.9	3528.1	*	1	1445	178	70.	21.5	3520.2	*	1	2305	278	0.	.0	3506.0
1	0630	79	88.	76.4	3528.1	*	1	1450	179	69.	21.0	3520.1	*	1	2310	279	0.	.0	3506.0
1	0635	80	88.	75.8	3528.0	*	1	1455	180	69.	20.5	3520.0	*	1	2315	280	0.	.0	3506.0
1	0640	81	88.	75.2	3528.0	*	1	1500	181	69.	20.1	3519.9	*	1	2320	281	0.	.0	3506.0
1	0645	82	88.	74.6	3527.9	*	1	1505	182	68.	19.6	3519.7	*	1	2325	282	0.	.0	3506.0
1	0650	83	88.	74.0	3527.9	*	1	1510	183	68.	19.1	3519.6	*	1	2330	283	0.	.0	3506.0
1	0655	84	88.	73.4	3527.8	*	1	1515	184	68.	18.7	3519.5	*	1	2335	284	0.	.0	3506.0
1	0700	85	87.	72.8	3527.7	*	1	1520	185	67.	18.2	3519.3	*	1	2340	285	0.	.0	3506.0
1	0705	86	87.	72.2	3527.7	*	1	1525	186	67.	17.7	3519.2	*	1	2345	286	0.	.0	3506.0
1	0710	87	87.	71.6	3527.6	*	1	1530	187	67.	17.3	3519.1	*	1	2350	287	0.	.0	3506.0
1	0715	88	87.	71.0	3527.6	*	1	1535	188	66.	16.8	3519.0	*	1	2355	288	0.	.0	3506.0
1	0720	89	87.	70.4	3527.5	*	1	1540	189	66.	16.4	3518.9	*	2	0000	289	0.	.0	3506.0
1	0725	90	87.	69.8	3527.4	*	1	1545	190	66.	15.9	3518.7	*	2	0005	290	0.	.0	3506.0
1	0730	91	87.	69.2	3527.4	*	1	1550	191	65.	15.5	3518.6	*	2	0010	291	0.	.0	3506.0
1	0735	92	87.	68.6	3527.3	*	1	1555	192	65.	15.0	3518.5	*	2	0015	292	0.	.0	3506.0
1	0740	93	86.	68.0	3527.3	*	1	1600	193	65.	14.6	3518.4	*	2	0020	293	0.	.0	3506.0
1	0745	94	86.	67.4	3527.2	*	1	1605	194	64.	14.1	3518.2	*	2	0025	294	0.	.0	3506.0
1	0750	95	86.	66.8	3527.2	*	1	1610	195	64.	13.7	3518.1	*	2	0030	295	0.	.0	3506.0
1	0755	96	86.	66.2	3527.1	*	1	1615	196	64.	13.2	3518.0	*	2	0035	296	0.	.0	3506.0
1	0800	97	86.	65.6	3527.0	*	1	1620	197	63.	12.8	3517.9	*	2	0040	297	0.	.0	3506.0
1	0805	98	86.	65.0	3527.0	*	1	1625	198	63.	12.4	3517.7	*	2	0045	298	0.	.0	3506.0
1	0810	99	86.	64.4	3526.9	*	1	1630	199	62.	11.9	3517.6	*	2	0050	299	0.	.0	3506.0
1	0815	100	86.	63.9	3526.9	*	1	1635	200	62.	11.5	3517.5	*	2	0055	300	0.	.0	3506.0
						*							*						

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
(CFS)	(HR)				
		(CFS)			
89.	5.42	87.	53.	51.	51.
		(INCHES) .765	1.861	1.861	1.861

(AC-FT)	43.	104.	104.	104.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
81.	5.42	69.	27.	26.	26.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
3528.53	5.42	3527.32	3517.59	3517.16	3517.16

CUMULATIVE AREA = 1.05 SQ MI

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HYDROGRAPH AT STATION GPDB
PLAN 1, RATIO = .95

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	3506.0	1		0820	101	85.	59.7	3526.5	1		1640	201	59.	8.6	3516.5
1		0005	2	0.	.0	3506.0	1		0825	102	84.	59.1	3526.4	1		1645	202	59.	8.1	3516.4
1		0010	3	0.	.0	3506.0	1		0830	103	84.	58.5	3526.3	1		1650	203	58.	7.7	3516.3
1		0015	4	0.	.0	3506.0	1		0835	104	84.	58.0	3526.3	1		1655	204	58.	7.3	3516.2
1		0020	5	0.	.0	3506.0	1		0840	105	84.	57.4	3526.2	1		1700	205	58.	6.9	3516.0
1		0025	6	0.	.0	3506.0	1		0845	106	84.	56.8	3526.2	1		1705	206	57.	6.5	3515.9
1		0030	7	0.	.0	3506.1	1		0850	107	84.	56.2	3526.1	1		1710	207	57.	6.2	3515.7
1		0035	8	1.	.0	3506.2	1		0855	108	84.	55.6	3526.1	1		1715	208	56.	5.8	3515.6
1		0040	9	2.	.1	3506.2	1		0900	109	84.	55.1	3526.0	1		1720	209	55.	5.4	3515.4
1		0045	10	2.	.1	3506.3	1		0905	110	83.	54.5	3525.9	1		1725	210	55.	5.0	3515.3
1		0050	11	2.	.1	3506.4	1		0910	111	83.	53.9	3525.9	1		1730	211	54.	4.6	3515.1
1		0055	12	3.	.1	3506.4	1		0915	112	83.	53.3	3525.8	1		1735	212	54.	4.3	3515.0
1		0100	13	3.	.1	3506.4	1		0920	113	83.	52.8	3525.7	1		1740	213	53.	3.9	3514.8
1		0105	14	3.	.1	3506.4	1		0925	114	83.	52.2	3525.6	1		1745	214	53.	3.5	3514.7
1		0110	15	3.	.1	3506.4	1		0930	115	83.	51.6	3525.6	1		1750	215	52.	3.2	3514.5
1		0115	16	3.	.1	3506.5	1		0935	116	82.	51.1	3525.5	1		1755	216	52.	2.8	3514.4
1		0120	17	3.	.1	3506.5	1		0940	117	82.	50.5	3525.4	1		1800	217	51.	2.4	3514.2
1		0125	18	4.	.2	3506.7	1		0945	118	82.	49.9	3525.3	1		1805	218	51.	2.1	3514.1
1		0130	19	6.	.2	3506.9	1		0950	119	82.	49.4	3525.3	1		1810	219	47.	1.8	3513.4
1		0135	20	8.	.3	3507.3	1		0955	120	82.	48.8	3525.2	1		1815	220	39.	1.5	3512.2
1		0140	21	12.	.4	3507.8	1		1000	121	82.	48.2	3525.1	1		1820	221	32.	1.2	3511.1
1		0145	22	15.	.6	3508.4	1		1005	122	81.	47.7	3525.0	1		1825	222	27.	1.0	3510.3
1		0150	23	19.	.7	3509.0	1		1010	123	81.	47.1	3525.0	1		1830	223	22.	.8	3509.5
1		0155	24	22.	.8	3509.5	1		1015	124	81.	46.6	3524.9	1		1835	224	19.	.7	3509.0
1		0200	25	24.	.9	3509.8	1		1020	125	81.	46.0	3524.8	1		1840	225	16.	.6	3508.5
1		0205	26	24.	.9	3509.9	1		1025	126	81.	45.4	3524.7	1		1845	226	13.	.5	3508.0
1		0210	27	25.	.9	3509.9	1		1030	127	81.	44.9	3524.7	1		1850	227	11.	.4	3507.7
1		0215	28	25.	1.0	3510.0	1		1035	128	80.	44.3	3524.6	1		1855	228	9.	.3	3507.4
1		0220	29	28.	1.1	3510.4	1		1040	129	80.	43.8	3524.5	1		1900	229	7.	.3	3507.2
1		0225	30	33.	1.2	3511.1	1		1045	130	80.	43.2	3524.4	1		1905	230	6.	.2	3507.0
1		0230	31	38.	1.4	3512.0	1		1050	131	80.	42.7	3524.4	1		1910	231	5.	.2	3506.8
1		0235	32	42.	1.6	3512.7	1		1055	132	80.	42.1	3524.3	1		1915	232	4.	.2	3506.7
1		0240	33	46.	1.7	3513.3	1		1100	133	80.	41.6	3524.2	1		1920	233	4.	.1	3506.6
1		0245	34	50.	1.9	3514.0	1		1105	134	79.	41.0	3524.1	1		1925	234	3.	.1	3506.5
1		0250	35	51.	2.0	3514.1	1		1110	135	79.	40.5	3524.1	1		1930	235	2.	.1	3506.4
1		0255	36	51.	2.2	3514.1	1		1115	136	79.	39.9	3524.0	1		1935	236	2.	.1	3506.3
1		0300	37	51.	2.3	3514.2	1		1120	137	79.	39.4	3523.9	1		1940	237	2.	.1	3506.3
1		0305	38	51.	2.5	3514.2	1		1125	138	79.	38.8	3523.8	1		1945	238	1.	.1	3506.2
1		0310	39	52.	2.9	3514.4	1		1130	139	78.	38.3	3523.7	1		1950	239	1.	.0	3506.2
1		0315	40	53.	3.8	3514.8	1		1135	140	78.	37.8	3523.6	1		1955	240	1.	.0	3506.2
1		0320	41	56.	5.7	3515.6	1		1140	141	78.	37.2	3523.5	1		2000	241	1.	.0	3506.1
1		0325	42	60.	9.1	3516.7	1		1145	142	78.	36.7	3523.4	1		2005	242	1.	.0	3506.1
1		0330	43	64.	14.5	3518.4	1		1150	143	77.	36.2	3523.3	1		2010	243	1.	.0	3506.1
1		0335	44	70.	21.7	3520.3	1		1155	144	77.	35.6	3523.2	1		2015	244	0.	.0	3506.1
1		0340	45	74.	29.7	3522.1	1		1200	145	77.	35.1	3523.1	1		2020	245	0.	.0	3506.1
1		0345	46	78.	37.4	3523.5	1		1205	146	77.	34.6	3523.0	1		2025	246	0.	.0	3506.1
1		0350	47	80.	44.2	3524.6	1		1210	147	76.	34.0	3522.9	1		2030	247	0.	.0	3506.0
1		0355	48	82.	49.8	3525.3	1		1215	148	76.	33.5	3522.8	1		2035	248	0.	.0	3506.0
1		0400	49	83.	54.2	3525.9	1		1220	149	76.	33.0	3522.7	1		2040	249	0.	.0	3506.0
1		0405	50	84.	57.6	3526.3	1		1225	150	76.	32.5	3522.6	1		2045	250	0.	.0	3506.0
1		0410	51	85.	60.1	3526.5	1		1230	151	75.	31.9	3522.5	1		2050	251	0.	.0	3506.0
1		0415	52	85.	62.0	3526.7	1		1235	152	75.	31.4	3522.4	1		2055	252	0.	.0	3506.0
1		0420	53	85.	63.4	3526.8	1		1240	153	75.	30.9	3522.3	1		2100	253	0.	.0	3506.0
1		0425	54	86.	64.5	3526.9	1		1245	154	75.	30.4	3522.2	1		2105	254	0.	.0	3506.0
1		0430	55	86.	65.6	3527.0	1		1250	155	75.	29.9	3522.1	1		2110	255	0.	.0	3506.0
1		0435	56	86.	66.8	3527.2	1		1255	156	74.	29.4	3522.0	1		2115	256	0.	.0	3506.0
1		0440	57	86.	68.2	3527.3	1		1300	157	74.	28.9	3521.9	1		2120	257	0.	.0	3506.0
1		0445	58	87.	69.7	3527.4	1		1305	158	74.	28.4	3521.8	1		2125	258	0.	.0	3506.0
1		0450	59	87.	71.2	3527.6	1		1310	159	73.	27.8	3521.7	1		2130	259	0.	.0	3506.0
1		0455	60	87.	72.8	3527.7	1		1315	160	73.	27.3	3521.5	1		2135	260	0.	.0	3506.0
1		0500	61	88.	74.3	3527.9	1		1320	161	73.	26.8	3521.4	1		2140	261	0.	.0	3506.0
1		0505	62	88.	75.5	3528.0	1		1325	162	73.	26.3	3521.3	1		2145	262	0.	.0	3506.0
1		0510	63	88.	76.4	3528.1	1		1330	163	72.	25.8	3521.2	1		2150	263	0.	.0	3506.0
1		0515	64	88.	77.1	3528.2	1		1335	164	72.	25.3	3521.1	1		2155	264	0.	.0	3506.0
1		0520	65	88.	77.4	3528.2	1		1340	165	72.	24.8	3521.0	1		2200	265	0.	.0	3506.0
1		0525	66	88.	77.5	3528.2	1		1345	166	71.	24.4	3520.9	1		2205	266	0.	.0	3506.0
1		0530	67	88.	77.5	3528.2	1		1350	167	71.	23.9	3520.8	1		2210	267	0.	.0	3506.0

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   1     0535  68      88.     77.3  3528.2 *  1     1355 168      71.     23.4  3520.6 *  1     2215 268       0.       .0  3506.0
   1     0540  69      88.     77.0  3528.1 *  1     1400 169      70.     22.9  3520.5 *  1     2220 269       0.       .0  3506.0
   1     0545  70      88.     76.7  3528.1 *  1     1405 170      70.     22.4  3520.4 *  1     2225 270       0.       .0  3506.0
   1     0550  71      88.     76.4  3528.1 *  1     1410 171      70.     21.9  3520.3 *  1     2230 271       0.       .0  3506.0
   1     0555  72      88.     76.0  3528.1 *  1     1415 172      70.     21.4  3520.2 *  1     2235 272       0.       .0  3506.0
   1     0600  73      88.     75.6  3528.0 *  1     1420 173      69.     21.0  3520.1 *  1     2240 273       0.       .0  3506.0
   1     0605  74      88.     75.2  3528.0 *  1     1425 174      69.     20.5  3520.0 *  1     2245 274       0.       .0  3506.0
   1     0610  75      88.     74.8  3527.9 *  1     1430 175      69.     20.0  3519.8 *  1     2250 275       0.       .0  3506.0
   1     0615  76      88.     74.3  3527.9 *  1     1435 176      68.     19.5  3519.7 *  1     2255 276       0.       .0  3506.0
   1     0620  77      88.     73.8  3527.8 *  1     1440 177      68.     19.1  3519.6 *  1     2300 277       0.       .0  3506.0
   1     0625  78      88.     73.2  3527.8 *  1     1445 178      68.     18.6  3519.5 *  1     2305 278       0.       .0  3506.0
   1     0630  79      87.     72.7  3527.7 *  1     1450 179      67.     18.1  3519.3 *  1     2310 279       0.       .0  3506.0
   1     0635  80      87.     72.1  3527.7 *  1     1455 180      67.     17.7  3519.2 *  1     2315 280       0.       .0  3506.0
   1     0640  81      87.     71.5  3527.6 *  1     1500 181      67.     17.2  3519.1 *  1     2320 281       0.       .0  3506.0
   1     0645  82      87.     70.9  3527.6 *  1     1505 182      66.     16.8  3519.0 *  1     2325 282       0.       .0  3506.0
   1     0650  83      87.     70.3  3527.5 *  1     1510 183      66.     16.3  3518.8 *  1     2330 283       0.       .0  3506.0
   1     0655  84      87.     69.7  3527.4 *  1     1515 184      66.     15.9  3518.7 *  1     2335 284       0.       .0  3506.0
   1     0700  85      87.     69.1  3527.4 *  1     1520 185      65.     15.4  3518.6 *  1     2340 285       0.       .0  3506.0
   1     0705  86      87.     68.5  3527.3 *  1     1525 186      65.     15.0  3518.5 *  1     2345 286       0.       .0  3506.0
   1     0710  87      86.     67.9  3527.3 *  1     1530 187      64.     14.5  3518.4 *  1     2350 287       0.       .0  3506.0
   1     0715  88      86.     67.3  3527.2 *  1     1535 188      64.     14.1  3518.2 *  1     2355 288       0.       .0  3506.0
   1     0720  89      86.     66.8  3527.2 *  1     1540 189      64.     13.6  3518.1 *  2     0000 289       0.       .0  3506.0
   1     0725  90      86.     66.2  3527.1 *  1     1545 190      63.     13.2  3518.0 *  2     0005 290       0.       .0  3506.0
   1     0730  91      86.     65.6  3527.0 *  1     1550 191      63.     12.8  3517.9 *  2     0010 291       0.       .0  3506.0
   1     0735  92      86.     65.0  3527.0 *  1     1555 192      63.     12.3  3517.7 *  2     0015 292       0.       .0  3506.0
   1     0740  93      86.     64.4  3526.9 *  1     1600 193      62.     11.9  3517.6 *  2     0020 293       0.       .0  3506.0
   1     0745  94      85.     63.8  3526.9 *  1     1605 194      62.     11.5  3517.5 *  2     0025 294       0.       .0  3506.0
   1     0750  95      85.     63.2  3526.8 *  1     1610 195      61.     11.0  3517.3 *  2     0030 295       0.       .0  3506.0
   1     0755  96      85.     62.6  3526.7 *  1     1615 196      61.     10.6  3517.2 *  2     0035 296       0.       .0  3506.0
   1     0800  97      85.     62.0  3526.7 *  1     1620 197      61.     10.2  3517.1 *  2     0040 297       0.       .0  3506.0
   1     0805  98      85.     61.4  3526.6 *  1     1625 198      60.      9.8  3516.9 *  2     0045 298       0.       .0  3506.0
   1     0810  99      85.     60.9  3526.6 *  1     1630 199      60.      9.4  3516.8 *  2     0050 299       0.       .0  3506.0
   1     0815 100      85.     60.3  3526.5 *  1     1635 200      59.      9.0  3516.7 *  2     0055 300       0.       .0  3506.0
                                             *                                              *
 ********************************************************************************************************************************************

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR        72-HR      24.92-HR
+   (CFS)       (HR)
                     (CFS)
+      88.      5.42                  86.          50.          49.          49.
                     (INCHES)      .759        1.787        1.787        1.787
                      (AC-FT)       43.         100.         100.         100.

 PEAK STORAGE   TIME                       MAXIMUM AVERAGE STORAGE
                                  6-HR        24-HR        72-HR      24.92-HR
+  (AC-FT)      (HR)
       78.      5.42                  65.          25.          24.          24.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                  6-HR        24-HR        72-HR      24.92-HR
+   (FEET)      (HR)
   3528.19      5.42               3526.97      3517.06      3516.65      3516.65

                        CUMULATIVE AREA =    1.05 SQ MI

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


                                                                          RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN           RATIO 1  RATIO 2  RATIO 3
                                                       .99      .98      .95

 HYDROGRAPH AT
+                  OFF2       .32     1   FLOW         452.     442.     426.
                                           TIME         3.67     3.67     3.67

 HYDROGRAPH AT
+                  OFF3       .38     1   FLOW         499.     488.     470.
                                           TIME         3.75     3.75     3.75

   2 COMBINED AT
+                   CP1       .70     1   FLOW         951.     930.     895.
                                           TIME         3.67     3.67     3.67

 ROUTED TO
+                  RCP1       .70     1   FLOW         932.     911.     876.
                                           TIME         3.67     3.67     3.67

 HYDROGRAPH AT
+                  OFF6       .07     1   FLOW         129.     126.     122.
                                           TIME         3.50     3.50     3.50

   2 COMBINED AT
+                   CP5       .76     1   FLOW        1014.     992.     954.
                                           TIME         3.67     3.67     3.67
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 HYDROGRAPH AT
+                   OFF1       .12     1   FLOW         150.     145.     139.
                                           TIME         3.58     3.58     3.58

 ROUTED TO
+                  ROFF1       .12     1   FLOW         145.     141.     134.
                                           TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                   OFF4       .07     1   FLOW          95.      92.      88.
                                           TIME         3.50     3.50     3.50

  2 COMBINED AT
+                    CP2       .19     1   FLOW         237.     231.     220.
                                           TIME         3.58     3.58     3.58

 ROUTED TO
+                   RCP2       .19     1   FLOW         233.     226.     216.
                                           TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                   OFF5       .06     1   FLOW          76.      74.      71.
                                           TIME         3.50     3.50     3.50

  2 COMBINED AT
+                    CP3       .25     1   FLOW         308.     299.     286.
                                           TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                    ON1       .04     1   FLOW          85.      83.      81.
                                           TIME         3.50     3.50     3.50

  3 COMBINED AT
+                    CP4      1.05     1   FLOW        1312.    1282.    1233.
                                           TIME         3.67     3.67     3.67

 ROUTED TO
+                   GPDB      1.05     1   FLOW          89.      89.      88.
                                           TIME         5.42     5.42     5.42

                                         ** PEAK STAGES IN FEET **
                                         1   STAGE     3528.73  3528.53  3528.19
                                             TIME         5.42     5.42     5.42

 HYDROGRAPH AT
+                   OFF7       .05     1   FLOW          91.      90.      86.
                                           TIME         3.50     3.50     3.50

  2 COMBINED AT
+                    CP6      1.10     1   FLOW         157.     155.     151.
                                           TIME         3.58     3.58     3.58
1
                                             SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                 (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                     PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
              RCP1  MANE         1.04    947.63    220.93      2.03      5.00    931.66    220.00        2.03


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7540E+02 EXCESS= .0000E+00 OUTFLOW= .7540E+02 BASIN STORAGE= .2822E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP1  MANE         1.04    928.37    221.13      1.99      5.00    910.72    220.00        1.99


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7367E+02 EXCESS= .0000E+00 OUTFLOW= .7367E+02 BASIN STORAGE= .3073E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP1  MANE         1.05    893.45    221.15      1.91      5.00    876.13    220.00        1.91


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7082E+02 EXCESS= .0000E+00 OUTFLOW= .7082E+02 BASIN STORAGE= .2917E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             ROFF1  MANE         1.06    148.19    215.89      1.42      5.00    144.94    215.00        1.42


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9196E+01 EXCESS= .0000E+00 OUTFLOW= .9196E+01 BASIN STORAGE= .2019E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             ROFF1  MANE         1.07    144.27    216.31      1.38      5.00    140.82    215.00        1.38
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8944E+01 EXCESS= .0000E+00 OUTFLOW= .8944E+01 BASIN STORAGE= .2090E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

ROFF1	MANE	1.08	136.77	216.71	1.32	5.00	134.17	215.00	1.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8525E+01 EXCESS= .0000E+00 OUTFLOW= .8526E+01 BASIN STORAGE= .1931E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP2	MANE	.96	235.16	215.68	1.46	5.00	232.51	215.00	1.46

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1469E+02 EXCESS= .0000E+00 OUTFLOW= .1469E+02 BASIN STORAGE= .2033E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP2	MANE	.97	228.30	216.19	1.42	5.00	226.31	215.00	1.42

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1430E+02 EXCESS= .0000E+00 OUTFLOW= .1430E+02 BASIN STORAGE= .2012E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP2	MANE	.98	218.67	215.79	1.36	5.00	215.84	215.00	1.36

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1364E+02 EXCESS= .0000E+00 OUTFLOW= .1364E+02 BASIN STORAGE= .2022E-03 PERCENT ERROR= .0

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

B.3

INTERIM PMF CONDITION

B.3.5 HEC-1

B.3.5.1 GPDB-PMF.out - Interim PMF Condition

```
1****************************************                                    ****************************************
 *                                      *                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                    *          609 SECOND STREET           *
 *                                      *                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   05FEB20  TIME  08:27:43  *                                    *           (916) 756-1104             *
 *                                      *                                    *                                      *
 ****************************************                                    ****************************************

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


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

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

1                                                  HEC-1 INPUT                                                  PAGE  1

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

                        *DIAGRAM
 *** FREE ***
              1         ID           ************************************************
              2         ID                 GRAND PARK DETENTION BASIN PROJECT
              3         ID           ************************************************
              4         ID
              5         ID    GRAND PARK DETENTION BASIN - PROBABLY MAXIMUM FLOOD
              6         ID    BY: VTN
              7         ID    DATE: FEBRUARY 2020
              8         ID    MODEL: GPDB-PMF.DAT
              9         ID
             10         ID    PMF STORM DISTRIBUTIONS
             11         ID    INTERIM PMF CONDITIONS
             12         ID    WITH GRAND PARK BASIN INTERIM SUBBASIN
             13         ID
             14         ID
             15         IT       5       0       0     300
             16         IO       5       0       0
                        *  USE 15 MINUTE INPUT INTERVAL
             17         IN      15       0       0
                        *

             18         KK    PMF1
             19         BA  0.4687
                        * PMF CONDITIONS
             20         PB   13.80
             21         PC   0.000   0.005   0.011   0.016   0.022   0.034   0.047   0.060   0.072   0.638
             22         PC   0.754   0.804   0.841   0.868   0.895   0.922   0.949   0.958   0.967   0.976
             23         PC   0.986   0.989   0.993   0.996   1.000
             24         LS       0   84.81
             25         UD   0.299
             26         KO       1
                        *

             27         KK    GPDB
             28         KM   VILLAGE 25 DETENTION BASIN (GRAND PARK DETENTION BASIN)
             29         KM   STORAGE VOLUME = 155.0 AC-FT AT 3534 STAGE
             30         KM   SEDIMENT VOLUME = 9.0 AC-FT (REMOVED FROM EACH STAGE)
             31         KM   OUTLET = 5'X5' RCB WITH 26" ORIFICE PLATE
             32         KM   100-YEAR DISCHARGE = 94 CFS
             33         KM   SPILLWAY LENGTH = 300 FT WITH 10:1 SIDE SLOPES
             34         KM   SPILLWAY HEIGHT = 3 FT
             35         KM   SPILLWAY CREST ELEVATION = 3532.0'
             36         KM   SPILLWAY TYPE = BROAD CRESTED TRAPEZOIDAL WEIR
             37         KM   PMF DISCHARGE = 4544 CFS
             38         KM   TOP OF EMBANKMENT ELEVATION = 3535.0'
             39         KM   STAGE/STORAGE/DISCHARGE CALCULATED BY: PLM OF VTN
             40         KO       1
             41         RS       1    STOR       0
             42         SV       0   120.9   133.3   146.0   158.6
             43         SE    3506    3532    3533    3534    3535
             44         SQ       0     0.1   921.2  2665.6  5007.2
             45         ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE (V) ROUTING (---->) DIVERSION OR PUMP FLOW

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

```
 18        PMF1
              V
              V
 27        GPDB
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************                                    *****************************************
*                                       *                                    *                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                    *    U.S. ARMY CORPS OF ENGINEERS       *
*              JUN   1998               *                                    *    HYDROLOGIC ENGINEERING CENTER      *
*            VERSION 4.1                *                                    *          609 SECOND STREET            *
*                                       *                                    *       DAVIS, CALIFORNIA 95616         *
*  RUN DATE   05FEB20  TIME  08:27:43   *                                    *           (916) 756-1104              *
*                                       *                                    *                                       *
*****************************************                                    *****************************************
```

****
GRAND PARK DETENTION BASIN PROJECT
****

GRAND PARK DETENTION BASIN - PROBABLY MAXIMUM FLOOD
BY: VTN
DATE: FEBRUARY 2020
MODEL: GPDB-PMF.DAT

PMF STORM DISTRIBUTIONS
INTERIM PMF CONDITIONS
WITH GRAND PARK BASIN INTERIM SUBBASIN

```
  16 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
```

*** ***

```
            **************
            *            *
  18 KK     *      PMF1  *
            *            *
            **************

  26 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           1  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

              SUBBASIN RUNOFF DATA

  19 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .47  SUBBASIN AREA

                 PRECIPITATION DATA
```

```
 20 PB               STORM       13.80  BASIN TOTAL PRECIPITATION

 21 PI            INCREMENTAL PRECIPITATION PATTERN
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .19       .19       .19       .04       .04       .04
                     .02       .02       .02       .01       .01       .01       .01       .01       .01       .01
                     .01       .01       .01       .01       .01       .01       .01       .01       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00

 24 LS          SCS LOSS RATE
                     STRTL        .36  INITIAL ABSTRACTION
                    CRVNBR      84.81  CURVE NUMBER
                     RTIMP        .00  PERCENT IMPERVIOUS AREA

 25 UD          SCS DIMENSIONLESS UNITGRAPH
                      TLAG        .30  LAG

                                                  ***

                                               UNIT HYDROGRAPH
                                            20 END-OF-PERIOD ORDINATES
             93.      302.      571.      665.      609.      475.      301.      201.      138.       92.
             62.       41.       28.       19.       13.        8.        6.        4.        2.        1.

*****************************************************************************************************************************************

                                              HYDROGRAPH AT STATION     PMF1

*****************************************************************************************************************************************
                                                                                *
      DA MON HRMN  ORD    RAIN    LOSS  EXCESS     COMP Q       *       DA MON HRMN  ORD    RAIN    LOSS  EXCESS     COMP Q
                                                                                *
       1     0000    1     .00     .00     .00         0.       *        1     1230  151     .00     .00     .00         0.
       1     0005    2     .02     .02     .00         0.       *        1     1235  152     .00     .00     .00         0.
       1     0010    3     .02     .02     .00         0.       *        1     1240  153     .00     .00     .00         0.
       1     0015    4     .02     .02     .00         0.       *        1     1245  154     .00     .00     .00         0.
       1     0020    5     .03     .03     .00         0.       *        1     1250  155     .00     .00     .00         0.
       1     0025    6     .03     .03     .00         0.       *        1     1255  156     .00     .00     .00         0.
       1     0030    7     .03     .03     .00         0.       *        1     1300  157     .00     .00     .00         0.
       1     0035    8     .02     .02     .00         0.       *        1     1305  158     .00     .00     .00         0.
       1     0040    9     .02     .02     .00         0.       *        1     1310  159     .00     .00     .00         0.
       1     0045   10     .02     .02     .00         0.       *        1     1315  160     .00     .00     .00         0.
       1     0050   11     .03     .03     .00         0.       *        1     1320  161     .00     .00     .00         0.
       1     0055   12     .03     .03     .00         0.       *        1     1325  162     .00     .00     .00         0.
       1     0100   13     .03     .03     .00         0.       *        1     1330  163     .00     .00     .00         0.
       1     0105   14     .06     .06     .00         0.       *        1     1335  164     .00     .00     .00         0.
       1     0110   15     .06     .05     .00         0.       *        1     1340  165     .00     .00     .00         0.
       1     0115   16     .06     .05     .00         1.       *        1     1345  166     .00     .00     .00         0.
       1     0120   17     .06     .05     .01         3.       *        1     1350  167     .00     .00     .00         0.
       1     0125   18     .06     .05     .01         7.       *        1     1355  168     .00     .00     .00         0.
       1     0130   19     .06     .05     .01        14.       *        1     1400  169     .00     .00     .00         0.
       1     0135   20     .06     .04     .02        22.       *        1     1405  170     .00     .00     .00         0.
       1     0140   21     .06     .04     .02        30.       *        1     1410  171     .00     .00     .00         0.
       1     0145   22     .06     .04     .02        39.       *        1     1415  172     .00     .00     .00         0.
       1     0150   23     .06     .03     .02        48.       *        1     1420  173     .00     .00     .00         0.
       1     0155   24     .06     .03     .02        56.       *        1     1425  174     .00     .00     .00         0.
       1     0200   25     .06     .03     .02        63.       *        1     1430  175     .00     .00     .00         0.
       1     0205   26    2.60     .68    1.92       247.       *        1     1435  176     .00     .00     .00         0.
       1     0210   27    2.60     .22    2.39       867.       *        1     1440  177     .00     .00     .00         0.
       1     0215   28    2.60     .11    2.50      2105.       *        1     1445  178     .00     .00     .00         0.
       1     0220   29     .53     .02     .52      3483.       *        1     1450  179     .00     .00     .00         0.
       1     0225   30     .53     .01     .52      4415.       *        1     1455  180     .00     .00     .00         0.
       1     0230   31     .53     .01     .52      4544.       *        1     1500  181     .00     .00     .00         0.
       1     0235   32     .23     .01     .22      4062.       *        1     1505  182     .00     .00     .00         0.
       1     0240   33     .23     .00     .23      3344.       *        1     1510  183     .00     .00     .00         0.
       1     0245   34     .23     .00     .23      2626.       *        1     1515  184     .00     .00     .00         0.
       1     0250   35     .17     .00     .17      2091.       *        1     1520  185     .00     .00     .00         0.
       1     0255   36     .17     .00     .17      1673.       *        1     1525  186     .00     .00     .00         0.
       1     0300   37     .17     .00     .17      1346.       *        1     1530  187     .00     .00     .00         0.
       1     0305   38     .12     .00     .12      1111.       *        1     1535  188     .00     .00     .00         0.
       1     0310   39     .12     .00     .12       933.       *        1     1540  189     .00     .00     .00         0.
       1     0315   40     .12     .00     .12       793.       *        1     1545  190     .00     .00     .00         0.
       1     0320   41     .12     .00     .12       688.       *        1     1550  191     .00     .00     .00         0.
       1     0325   42     .12     .00     .12       611.       *        1     1555  192     .00     .00     .00         0.
       1     0330   43     .12     .00     .12       556.       *        1     1600  193     .00     .00     .00         0.
       1     0335   44     .12     .00     .12       519.       *        1     1605  194     .00     .00     .00         0.
       1     0340   45     .12     .00     .12       492.       *        1     1610  195     .00     .00     .00         0.
       1     0345   46     .12     .00     .12       472.       *        1     1615  196     .00     .00     .00         0.
       1     0350   47     .12     .00     .12       460.       *        1     1620  197     .00     .00     .00         0.
       1     0355   48     .12     .00     .12       453.       *        1     1625  198     .00     .00     .00         0.
       1     0400   49     .12     .00     .12       449.       *        1     1630  199     .00     .00     .00         0.
       1     0405   50     .04     .00     .04       439.       *        1     1635  200     .00     .00     .00         0.
       1     0410   51     .04     .00     .04       413.       *        1     1640  201     .00     .00     .00         0.
       1     0415   52     .04     .00     .04       366.       *        1     1645  202     .00     .00     .00         0.
       1     0420   53     .04     .00     .04       311.       *        1     1650  203     .00     .00     .00         0.
       1     0425   54     .04     .00     .04       262.       *        1     1655  204     .00     .00     .00         0.
       1     0430   55     .04     .00     .04       223.       *        1     1700  205     .00     .00     .00         0.
       1     0435   56     .04     .00     .04       198.       *        1     1705  206     .00     .00     .00         0.
```

1	0440	57	.04	.00	.04	182.	*	1	1710	207	.00	.00	.00	0.
1	0445	58	.04	.00	.04	171.	*	1	1715	208	.00	.00	.00	0.
1	0450	59	.05	.00	.05	163.	*	1	1720	209	.00	.00	.00	0.
1	0455	60	.05	.00	.05	160.	*	1	1725	210	.00	.00	.00	0.
1	0500	61	.05	.00	.05	159.	*	1	1730	211	.00	.00	.00	0.
1	0505	62	.01	.00	.01	157.	*	1	1735	212	.00	.00	.00	0.
1	0510	63	.01	.00	.01	149.	*	1	1740	213	.00	.00	.00	0.
1	0515	64	.01	.00	.01	132.	*	1	1745	214	.00	.00	.00	0.
1	0520	65	.02	.00	.02	112.	*	1	1750	215	.00	.00	.00	0.
1	0525	66	.02	.00	.02	94.	*	1	1755	216	.00	.00	.00	0.
1	0530	67	.02	.00	.02	82.	*	1	1800	217	.00	.00	.00	0.
1	0535	68	.01	.00	.01	75.	*	1	1805	218	.00	.00	.00	0.
1	0540	69	.01	.00	.01	70.	*	1	1810	219	.00	.00	.00	0.
1	0545	70	.01	.00	.01	66.	*	1	1815	220	.00	.00	.00	0.
1	0550	71	.02	.00	.02	62.	*	1	1820	221	.00	.00	.00	0.
1	0555	72	.02	.00	.02	59.	*	1	1825	222	.00	.00	.00	0.
1	0600	73	.02	.00	.02	59.	*	1	1830	223	.00	.00	.00	0.
1	0605	74	.00	.00	.00	59.	*	1	1835	224	.00	.00	.00	0.
1	0610	75	.00	.00	.00	55.	*	1	1840	225	.00	.00	.00	0.
1	0615	76	.00	.00	.00	46.	*	1	1845	226	.00	.00	.00	0.
1	0620	77	.00	.00	.00	34.	*	1	1850	227	.00	.00	.00	0.
1	0625	78	.00	.00	.00	24.	*	1	1855	228	.00	.00	.00	0.
1	0630	79	.00	.00	.00	16.	*	1	1900	229	.00	.00	.00	0.
1	0635	80	.00	.00	.00	11.	*	1	1905	230	.00	.00	.00	0.
1	0640	81	.00	.00	.00	7.	*	1	1910	231	.00	.00	.00	0.
1	0645	82	.00	.00	.00	5.	*	1	1915	232	.00	.00	.00	0.
1	0650	83	.00	.00	.00	3.	*	1	1920	233	.00	.00	.00	0.
1	0655	84	.00	.00	.00	2.	*	1	1925	234	.00	.00	.00	0.
1	0700	85	.00	.00	.00	1.	*	1	1930	235	.00	.00	.00	0.
1	0705	86	.00	.00	.00	1.	*	1	1935	236	.00	.00	.00	0.
1	0710	87	.00	.00	.00	1.	*	1	1940	237	.00	.00	.00	0.
1	0715	88	.00	.00	.00	0.	*	1	1945	238	.00	.00	.00	0.
1	0720	89	.00	.00	.00	0.	*	1	1950	239	.00	.00	.00	0.
1	0725	90	.00	.00	.00	0.	*	1	1955	240	.00	.00	.00	0.
1	0730	91	.00	.00	.00	0.	*	1	2000	241	.00	.00	.00	0.
1	0735	92	.00	.00	.00	0.	*	1	2005	242	.00	.00	.00	0.
1	0740	93	.00	.00	.00	0.	*	1	2010	243	.00	.00	.00	0.
1	0745	94	.00	.00	.00	0.	*	1	2015	244	.00	.00	.00	0.
1	0750	95	.00	.00	.00	0.	*	1	2020	245	.00	.00	.00	0.
1	0755	96	.00	.00	.00	0.	*	1	2025	246	.00	.00	.00	0.
1	0800	97	.00	.00	.00	0.	*	1	2030	247	.00	.00	.00	0.
1	0805	98	.00	.00	.00	0.	*	1	2035	248	.00	.00	.00	0.
1	0810	99	.00	.00	.00	0.	*	1	2040	249	.00	.00	.00	0.
1	0815	100	.00	.00	.00	0.	*	1	2045	250	.00	.00	.00	0.
1	0820	101	.00	.00	.00	0.	*	1	2050	251	.00	.00	.00	0.
1	0825	102	.00	.00	.00	0.	*	1	2055	252	.00	.00	.00	0.
1	0830	103	.00	.00	.00	0.	*	1	2100	253	.00	.00	.00	0.
1	0835	104	.00	.00	.00	0.	*	1	2105	254	.00	.00	.00	0.
1	0840	105	.00	.00	.00	0.	*	1	2110	255	.00	.00	.00	0.
1	0845	106	.00	.00	.00	0.	*	1	2115	256	.00	.00	.00	0.
1	0850	107	.00	.00	.00	0.	*	1	2120	257	.00	.00	.00	0.
1	0855	108	.00	.00	.00	0.	*	1	2125	258	.00	.00	.00	0.
1	0900	109	.00	.00	.00	0.	*	1	2130	259	.00	.00	.00	0.
1	0905	110	.00	.00	.00	0.	*	1	2135	260	.00	.00	.00	0.
1	0910	111	.00	.00	.00	0.	*	1	2140	261	.00	.00	.00	0.
1	0915	112	.00	.00	.00	0.	*	1	2145	262	.00	.00	.00	0.
1	0920	113	.00	.00	.00	0.	*	1	2150	263	.00	.00	.00	0.
1	0925	114	.00	.00	.00	0.	*	1	2155	264	.00	.00	.00	0.
1	0930	115	.00	.00	.00	0.	*	1	2200	265	.00	.00	.00	0.
1	0935	116	.00	.00	.00	0.	*	1	2205	266	.00	.00	.00	0.
1	0940	117	.00	.00	.00	0.	*	1	2210	267	.00	.00	.00	0.
1	0945	118	.00	.00	.00	0.	*	1	2215	268	.00	.00	.00	0.
1	0950	119	.00	.00	.00	0.	*	1	2220	269	.00	.00	.00	0.
1	0955	120	.00	.00	.00	0.	*	1	2225	270	.00	.00	.00	0.
1	1000	121	.00	.00	.00	0.	*	1	2230	271	.00	.00	.00	0.
1	1005	122	.00	.00	.00	0.	*	1	2235	272	.00	.00	.00	0.
1	1010	123	.00	.00	.00	0.	*	1	2240	273	.00	.00	.00	0.
1	1015	124	.00	.00	.00	0.	*	1	2245	274	.00	.00	.00	0.
1	1020	125	.00	.00	.00	0.	*	1	2250	275	.00	.00	.00	0.
1	1025	126	.00	.00	.00	0.	*	1	2255	276	.00	.00	.00	0.
1	1030	127	.00	.00	.00	0.	*	1	2300	277	.00	.00	.00	0.
1	1035	128	.00	.00	.00	0.	*	1	2305	278	.00	.00	.00	0.
1	1040	129	.00	.00	.00	0.	*	1	2310	279	.00	.00	.00	0.
1	1045	130	.00	.00	.00	0.	*	1	2315	280	.00	.00	.00	0.
1	1050	131	.00	.00	.00	0.	*	1	2320	281	.00	.00	.00	0.
1	1055	132	.00	.00	.00	0.	*	1	2325	282	.00	.00	.00	0.
1	1100	133	.00	.00	.00	0.	*	1	2330	283	.00	.00	.00	0.
1	1105	134	.00	.00	.00	0.	*	1	2335	284	.00	.00	.00	0.
1	1110	135	.00	.00	.00	0.	*	1	2340	285	.00	.00	.00	0.
1	1115	136	.00	.00	.00	0.	*	1	2345	286	.00	.00	.00	0.
1	1120	137	.00	.00	.00	0.	*	1	2350	287	.00	.00	.00	0.
1	1125	138	.00	.00	.00	0.	*	1	2355	288	.00	.00	.00	0.
1	1130	139	.00	.00	.00	0.	*	2	0000	289	.00	.00	.00	0.
1	1135	140	.00	.00	.00	0.	*	2	0005	290	.00	.00	.00	0.
1	1140	141	.00	.00	.00	0.	*	2	0010	291	.00	.00	.00	0.
1	1145	142	.00	.00	.00	0.	*	2	0015	292	.00	.00	.00	0.
1	1150	143	.00	.00	.00	0.	*	2	0020	293	.00	.00	.00	0.
1	1155	144	.00	.00	.00	0.	*	2	0025	294	.00	.00	.00	0.
1	1200	145	.00	.00	.00	0.	*	2	0030	295	.00	.00	.00	0.
1	1205	146	.00	.00	.00	0.	*	2	0035	296	.00	.00	.00	0.
1	1210	147	.00	.00	.00	0.	*	2	0040	297	.00	.00	.00	0.

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        1     1215  148     .00     .00     .00         0.       *        2     0045  298     .00     .00     .00         0.
        1     1220  149     .00     .00     .00         0.       *        2     0050  299     .00     .00     .00         0.
        1     1225  150     .00     .00     .00         0.       *        2     0055  300     .00     .00     .00         0.
                                                                 *
 ********************************************************************************************************************************

     TOTAL RAINFALL =   13.80, TOTAL LOSS =    1.94, TOTAL EXCESS =   11.86

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                    (CFS)
+    4544.      2.50                598.        149.        144.         144.
                (INCHES)    11.861      11.861      11.861       11.861
                 (AC-FT)      296.        297.        297.         297.

                 CUMULATIVE AREA =     .47 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
   27 KK   *      GPDB  *
           *            *
           **************

   40 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           1  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

   41 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        STOR  TYPE OF INITIAL CONDITION
                       RSVRIC        .00  INITIAL CONDITION
                            X        .00 WORKING R AND D COEFFICIENT

   42 SV            STORAGE          .0     120.9     133.3     146.0     158.6

   43 SE          ELEVATION     3506.00   3532.00   3533.00   3534.00   3535.00

   44 SQ          DISCHARGE          0.        0.      921.     2666.     5007.

                                                        ***

 ********************************************************************************************************************************

                                          HYDROGRAPH AT STATION     GPDB

 ********************************************************************************************************************************
                                        *                                                 *
  DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE * DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE * DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE
                                        *                                                 *
    1     0000   1       0.       .0  3506.0 *  1     0820 101       0.    120.9  3532.0 *  1     1640 201       0.    120.8  3532.0
    1     0005   2       0.       .0  3506.0 *  1     0825 102       0.    120.9  3532.0 *  1     1645 202       0.    120.8  3532.0
    1     0010   3       0.       .0  3506.0 *  1     0830 103       0.    120.9  3532.0 *  1     1650 203       0.    120.8  3532.0
    1     0015   4       0.       .0  3506.0 *  1     0835 104       0.    120.9  3532.0 *  1     1655 204       0.    120.8  3532.0
    1     0020   5       0.       .0  3506.0 *  1     0840 105       0.    120.9  3532.0 *  1     1700 205       0.    120.8  3532.0
    1     0025   6       0.       .0  3506.0 *  1     0845 106       0.    120.9  3532.0 *  1     1705 206       0.    120.8  3532.0
    1     0030   7       0.       .0  3506.0 *  1     0850 107       0.    120.9  3532.0 *  1     1710 207       0.    120.8  3532.0
    1     0035   8       0.       .0  3506.0 *  1     0855 108       0.    120.9  3532.0 *  1     1715 208       0.    120.8  3532.0
    1     0040   9       0.       .0  3506.0 *  1     0900 109       0.    120.9  3532.0 *  1     1720 209       0.    120.8  3532.0
    1     0045  10       0.       .0  3506.0 *  1     0905 110       0.    120.9  3532.0 *  1     1725 210       0.    120.8  3532.0
    1     0050  11       0.       .0  3506.0 *  1     0910 111       0.    120.9  3532.0 *  1     1730 211       0.    120.8  3532.0
    1     0055  12       0.       .0  3506.0 *  1     0915 112       0.    120.9  3532.0 *  1     1735 212       0.    120.8  3532.0
    1     0100  13       0.       .0  3506.0 *  1     0920 113       0.    120.9  3532.0 *  1     1740 213       0.    120.8  3532.0
    1     0105  14       0.       .0  3506.0 *  1     0925 114       0.    120.9  3532.0 *  1     1745 214       0.    120.8  3532.0
    1     0110  15       0.       .0  3506.0 *  1     0930 115       0.    120.9  3532.0 *  1     1750 215       0.    120.8  3532.0
    1     0115  16       0.       .0  3506.0 *  1     0935 116       0.    120.9  3532.0 *  1     1755 216       0.    120.8  3532.0
    1     0120  17       0.       .0  3506.0 *  1     0940 117       0.    120.9  3532.0 *  1     1800 217       0.    120.8  3532.0
    1     0125  18       0.       .1  3506.0 *  1     0945 118       0.    120.9  3532.0 *  1     1805 218       0.    120.8  3532.0
    1     0130  19       0.       .1  3506.0 *  1     0950 119       0.    120.9  3532.0 *  1     1810 219       0.    120.8  3532.0
    1     0135  20       0.       .3  3506.1 *  1     0955 120       0.    120.9  3532.0 *  1     1815 220       0.    120.8  3532.0
    1     0140  21       0.       .4  3506.1 *  1     1000 121       0.    120.9  3532.0 *  1     1820 221       0.    120.8  3532.0
    1     0145  22       0.       .7  3506.1 *  1     1005 122       0.    120.9  3532.0 *  1     1825 222       0.    120.8  3532.0
    1     0150  23       0.      1.0  3506.2 *  1     1010 123       0.    120.9  3532.0 *  1     1830 223       0.    120.8  3532.0
    1     0155  24       0.      1.3  3506.3 *  1     1015 124       0.    120.9  3532.0 *  1     1835 224       0.    120.8  3532.0
    1     0200  25       0.      1.7  3506.4 *  1     1020 125       0.    120.9  3532.0 *  1     1840 225       0.    120.8  3532.0
    1     0205  26       0.      2.8  3506.6 *  1     1025 126       0.    120.9  3532.0 *  1     1845 226       0.    120.8  3532.0
    1     0210  27       0.      6.6  3507.4 *  1     1030 127       0.    120.9  3532.0 *  1     1850 227       0.    120.8  3532.0
    1     0215  28       0.     16.9  3509.6 *  1     1035 128       0.    120.9  3532.0 *  1     1855 228       0.    120.8  3532.0
    1     0220  29       0.     36.1  3513.8 *  1     1040 129       0.    120.9  3532.0 *  1     1900 229       0.    120.8  3532.0
    1     0225  30       0.     63.3  3519.6 *  1     1045 130       0.    120.9  3532.0 *  1     1905 230       0.    120.8  3532.0
    1     0230  31       0.     94.2  3526.3 *  1     1050 131       0.    120.9  3532.0 *  1     1910 231       0.    120.8  3532.0
    1     0235  32     172.    123.2  3532.2 *  1     1055 132       0.    120.9  3532.0 *  1     1915 232       0.    120.8  3532.0
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1	0240	33	2008.	141.2	3533.6	*	1	1100	133	0.	120.9	3532.0	*	1	1920	233	0.	120.8	3532.0
1	0245	34	2635.	145.8	3534.0	*	1	1105	134	0.	120.9	3532.0	*	1	1925	234	0.	120.8	3532.0
1	0250	35	2457.	144.5	3533.9	*	1	1110	135	0.	120.9	3532.0	*	1	1930	235	0.	120.8	3532.0
1	0255	36	2088.	141.8	3533.7	*	1	1115	136	0.	120.9	3532.0	*	1	1935	236	0.	120.8	3532.0
1	0300	37	1716.	139.1	3533.5	*	1	1120	137	0.	120.9	3532.0	*	1	1940	237	0.	120.8	3532.0
1	0305	38	1403.	136.8	3533.3	*	1	1125	138	0.	120.9	3532.0	*	1	1945	238	0.	120.8	3532.0
1	0310	39	1159.	135.0	3533.1	*	1	1130	139	0.	120.9	3532.0	*	1	1950	239	0.	120.8	3532.0
1	0315	40	969.	133.6	3533.0	*	1	1135	140	0.	120.9	3532.0	*	1	1955	240	0.	120.8	3532.0
1	0320	41	858.	132.5	3532.9	*	1	1140	141	0.	120.9	3532.0	*	1	2000	241	0.	120.8	3532.0
1	0325	42	773.	131.3	3532.8	*	1	1145	142	0.	120.9	3532.0	*	1	2005	242	0.	120.8	3532.0
1	0330	43	696.	130.3	3532.8	*	1	1150	143	0.	120.9	3532.0	*	1	2010	243	0.	120.8	3532.0
1	0335	44	631.	129.4	3532.7	*	1	1155	144	0.	120.9	3532.0	*	1	2015	244	0.	120.8	3532.0
1	0340	45	580.	128.7	3532.6	*	1	1200	145	0.	120.9	3532.0	*	1	2020	245	0.	120.8	3532.0
1	0345	46	540.	128.2	3532.6	*	1	1205	146	0.	120.9	3532.0	*	1	2025	246	0.	120.8	3532.0
1	0350	47	510.	127.8	3532.6	*	1	1210	147	0.	120.9	3532.0	*	1	2030	247	0.	120.8	3532.0
1	0355	48	488.	127.5	3532.5	*	1	1215	148	0.	120.9	3532.0	*	1	2035	248	0.	120.8	3532.0
1	0400	49	473.	127.3	3532.5	*	1	1220	149	0.	120.9	3532.0	*	1	2040	249	0.	120.8	3532.0
1	0405	50	461.	127.1	3532.5	*	1	1225	150	0.	120.9	3532.0	*	1	2045	250	0.	120.8	3532.0
1	0410	51	447.	126.9	3532.5	*	1	1230	151	0.	120.9	3532.0	*	1	2050	251	0.	120.8	3532.0
1	0415	52	424.	126.6	3532.5	*	1	1235	152	0.	120.9	3532.0	*	1	2055	252	0.	120.8	3532.0
1	0420	53	389.	126.1	3532.4	*	1	1240	153	0.	120.9	3532.0	*	1	2100	253	0.	120.8	3532.0
1	0425	54	347.	125.6	3532.4	*	1	1245	154	0.	120.9	3532.0	*	1	2105	254	0.	120.8	3532.0
1	0430	55	304.	125.0	3532.3	*	1	1250	155	0.	120.9	3532.0	*	1	2110	255	0.	120.8	3532.0
1	0435	56	266.	124.5	3532.3	*	1	1255	156	0.	120.9	3532.0	*	1	2115	256	0.	120.8	3532.0
1	0440	57	235.	124.1	3532.3	*	1	1300	157	0.	120.9	3532.0	*	1	2120	257	0.	120.8	3532.0
1	0445	58	211.	123.7	3532.2	*	1	1305	158	0.	120.9	3532.0	*	1	2125	258	0.	120.8	3532.0
1	0450	59	193.	123.5	3532.2	*	1	1310	159	0.	120.9	3532.0	*	1	2130	259	0.	120.8	3532.0
1	0455	60	180.	123.3	3532.2	*	1	1315	160	0.	120.9	3532.0	*	1	2135	260	0.	120.8	3532.0
1	0500	61	172.	123.2	3532.2	*	1	1320	161	0.	120.9	3532.0	*	1	2140	261	0.	120.8	3532.0
1	0505	62	166.	123.1	3532.2	*	1	1325	162	0.	120.9	3532.0	*	1	2145	262	0.	120.8	3532.0
1	0510	63	161.	123.1	3532.2	*	1	1330	163	0.	120.9	3532.0	*	1	2150	263	0.	120.8	3532.0
1	0515	64	152.	122.9	3532.2	*	1	1335	164	0.	120.9	3532.0	*	1	2155	264	0.	120.8	3532.0
1	0520	65	140.	122.8	3532.2	*	1	1340	165	0.	120.9	3532.0	*	1	2200	265	0.	120.8	3532.0
1	0525	66	125.	122.6	3532.1	*	1	1345	166	0.	120.9	3532.0	*	1	2205	266	0.	120.8	3532.0
1	0530	67	110.	122.4	3532.1	*	1	1350	167	0.	120.8	3532.0	*	1	2210	267	0.	120.8	3532.0
1	0535	68	97.	122.2	3532.1	*	1	1355	168	0.	120.8	3532.0	*	1	2215	268	0.	120.8	3532.0
1	0540	69	87.	122.1	3532.1	*	1	1400	169	0.	120.8	3532.0	*	1	2220	269	0.	120.8	3532.0
1	0545	70	79.	122.0	3532.1	*	1	1405	170	0.	120.8	3532.0	*	1	2225	270	0.	120.8	3532.0
1	0550	71	73.	121.9	3532.1	*	1	1410	171	0.	120.8	3532.0	*	1	2230	271	0.	120.8	3532.0
1	0555	72	68.	121.8	3532.1	*	1	1415	172	0.	120.8	3532.0	*	1	2235	272	0.	120.8	3532.0
1	0600	73	64.	121.8	3532.1	*	1	1420	173	0.	120.8	3532.0	*	1	2240	273	0.	120.8	3532.0
1	0605	74	62.	121.7	3532.1	*	1	1425	174	0.	120.8	3532.0	*	1	2245	274	0.	120.8	3532.0
1	0610	75	60.	121.7	3532.1	*	1	1430	175	0.	120.8	3532.0	*	1	2250	275	0.	120.8	3532.0
1	0615	76	56.	121.7	3532.1	*	1	1435	176	0.	120.8	3532.0	*	1	2255	276	0.	120.8	3532.0
1	0620	77	50.	121.6	3532.1	*	1	1440	177	0.	120.8	3532.0	*	1	2300	277	0.	120.8	3532.0
1	0625	78	41.	121.5	3532.0	*	1	1445	178	0.	120.8	3532.0	*	1	2305	278	0.	120.8	3532.0
1	0630	79	33.	121.3	3532.0	*	1	1450	179	0.	120.8	3532.0	*	1	2310	279	0.	120.8	3532.0
1	0635	80	25.	121.2	3532.0	*	1	1455	180	0.	120.8	3532.0	*	1	2315	280	0.	120.8	3532.0
1	0640	81	18.	121.1	3532.0	*	1	1500	181	0.	120.8	3532.0	*	1	2320	281	0.	120.8	3532.0
1	0645	82	13.	121.1	3532.0	*	1	1505	182	0.	120.8	3532.0	*	1	2325	282	0.	120.8	3532.0
1	0650	83	9.	121.0	3532.0	*	1	1510	183	0.	120.8	3532.0	*	1	2330	283	0.	120.8	3532.0
1	0655	84	7.	121.0	3532.0	*	1	1515	184	0.	120.8	3532.0	*	1	2335	284	0.	120.8	3532.0
1	0700	85	5.	121.0	3532.0	*	1	1520	185	0.	120.8	3532.0	*	1	2340	285	0.	120.8	3532.0
1	0705	86	3.	120.9	3532.0	*	1	1525	186	0.	120.8	3532.0	*	1	2345	286	0.	120.8	3532.0
1	0710	87	2.	120.9	3532.0	*	1	1530	187	0.	120.8	3532.0	*	1	2350	287	0.	120.8	3532.0
1	0715	88	2.	120.9	3532.0	*	1	1535	188	0.	120.8	3532.0	*	1	2355	288	0.	120.8	3532.0
1	0720	89	1.	120.9	3532.0	*	1	1540	189	0.	120.8	3532.0	*	2	0000	289	0.	120.8	3532.0
1	0725	90	1.	120.9	3532.0	*	1	1545	190	0.	120.8	3532.0	*	2	0005	290	0.	120.8	3532.0
1	0730	91	0.	120.9	3532.0	*	1	1550	191	0.	120.8	3532.0	*	2	0010	291	0.	120.8	3532.0
1	0735	92	0.	120.9	3532.0	*	1	1555	192	0.	120.8	3532.0	*	2	0015	292	0.	120.8	3532.0
1	0740	93	0.	120.9	3532.0	*	1	1600	193	0.	120.8	3532.0	*	2	0020	293	0.	120.8	3532.0
1	0745	94	0.	120.9	3532.0	*	1	1605	194	0.	120.8	3532.0	*	2	0025	294	0.	120.8	3532.0
1	0750	95	0.	120.9	3532.0	*	1	1610	195	0.	120.8	3532.0	*	2	0030	295	0.	120.8	3532.0
1	0755	96	0.	120.9	3532.0	*	1	1615	196	0.	120.8	3532.0	*	2	0035	296	0.	120.8	3532.0
1	0800	97	0.	120.9	3532.0	*	1	1620	197	0.	120.8	3532.0	*	2	0040	297	0.	120.8	3532.0
1	0805	98	0.	120.9	3532.0	*	1	1625	198	0.	120.8	3532.0	*	2	0045	298	0.	120.8	3532.0
1	0810	99	0.	120.9	3532.0	*	1	1630	199	0.	120.8	3532.0	*	2	0050	299	0.	120.8	3532.0
1	0815	100	0.	120.9	3532.0	*	1	1635	200	0.	120.8	3532.0	*	2	0055	300	0.	120.8	3532.0

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2635.	2.75		354.	89.	85.	85.
		(INCHES)	7.025	7.030	7.030	7.030
		(AC-FT)	176.	176.	176.	176.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
146.	2.75	125.	114.	110.	110.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
3533.98	2.75	3532.33	3530.49	3529.59	3529.59

CUMULATIVE AREA = .47 SQ MI

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
	HYDROGRAPH AT									
+		PMF1	4544.	2.50	598.	149.	144.	.47		
	ROUTED TO									
+		GPDB	2635.	2.75	354.	89.	85.	.47		
+									3533.98	2.75

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

APPENDIX C

HYDRAULIC CALCULATIONS

C.1

FLOWMASTER NORMAL DEPTH CALCULATIONS

C.1.1

Developed/Ultimate Condition Stubs

Stub/Lateral Summary Table - 100-Year Peak Flow								
ID	**Street**	**Inflow**	**RCP**	**Velocity**	**Developed/Ultimate**	**Q100**	**Interim**	**Q100**
		Facility	**(in)**	**(fps)**	**Basin/CP**	**(cfs)**	**Basin/CP**	**(cfs)**
1	Lake Mead	North	5'x5'	22.68	DVCP4 to CP5	**575**	OFF1	150
2	Lake Mead	North	30"	22.60	ST14	**21**	Capped	n/a
3	Lake Mead	North	42"	30.86	K	**45**	Capped	n/a
4	Lake Mead	North	24"	n/a	Nuisance	n/a	Capped	n/a
5	Lake Mead	North	24"	15.28	ST17	**6**	Capped	n/a
6	Lake Mead	North	24"	n/a	Nuisance	n/a	Capped	n/a
7	Lake Mead	North	24"	n/a	Nuisance	n/a	Capped	n/a
9	Lake Mead	North	24"	n/a	Nuisance	n/a	Capped	n/a
10	Lake Mead	North	24"	n/a	Nuisance	n/a	Capped	n/a
11	Lake Mead	North	42"	29.05	H	37	OFF4	**95**
12	Sunset Run (Street Q)	North	54"	28.18	CP6A	**148**	Capped	n/a
13	Sunset Run (Street Q)	North	24"	n/a	Nuisance	n/a	Capped	n/a
14	Sunset Run (Street Q)	North	24"	n/a	Nuisance	n/a	Capped	n/a
15	Sunset Run (Street Q)	North	48"	28.55	O	**85**	Capped	n/a
16	Sunset Run (Street Q)	North	24"	n/a	Nuisance	n/a	Capped	n/a
17	Sunset Run (Street Q)	North	24"	16.05	ST19	**8**	Capped	n/a
18	Sunset Run (Street Q)	North	24"	n/a	Nuisance	n/a	Capped	n/a
19	Sunset Run (Street Q)	North	30"	16.67	ST20	**17**	Capped	n/a
20	Sunset Run (Street Q)	North	48"	31.38	P	53	OFF5	**76**
21	Fox Hill	South	7'x7'	16.04	CP9 - prorate (ST6,ST7,F)	786	CP1	**930**
22	Fox Hill	South	30"	26.42	ST6	**14**	Capped	n/a
23	Fox Hill	South	54"	35.04	ST7, F	**130**	Capped	n/a
24	Fox Hill	South	24"	n/a	Nuisance	n/a	Capped	n/a
25	Fox Hill	South	24"	n/a	Nuisance	n/a	Capped	n/a
26	Fox Hill	South	24"	n/a	Nuisance	n/a	Capped	n/a
27	Fox Hill	South	24"	n/a	Nuisance	n/a	Capped	n/a
28	Fox Hill	South	30"	29.36	15% CP1A	**20**	Capped	n/a
29	Fox Hill	South	24"	n/a	Nuisance	n/a	Capped	n/a
30	Fox Hill	South	24"	n/a	Nuisance	n/a	Capped	n/a
31	Inside Park	South	36"	30.52	29% CP1A	38	OFF6b,c,d,e	**56**
32	Inside Park	South	48"	33.82	56% CP1A	**73**	OFF6a	72
33	Fox Hill	South	36"	13.15	ST21	**10**	Capped	n/a

*Worst case bold flows have been used to size

Worksheet for 2 - ST14 - 21-cfs - 30"

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.15300	ft/ft
Diameter	2.50	ft
Discharge	21.00	ft³/s

Results

Normal Depth	0.61	ft
Flow Area	0.93	ft²
Wetted Perimeter	2.59	ft
Hydraulic Radius	0.36	ft
Top Width	2.15	ft
Critical Depth	1.56	ft
Percent Full	24.4	%
Critical Slope	0.00519	ft/ft
Velocity	22.60	ft/s
Velocity Head	7.94	ft
Specific Energy	8.55	ft
Froude Number	6.06	
Maximum Discharge	172.58	ft³/s
Discharge Full	160.43	ft³/s
Slope Full	0.00262	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	24.43	%
Downstream Velocity	Infinity	ft/s

Worksheet for 2 - ST14 - 21-cfs - 30"

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.61	ft
Critical Depth	1.56	ft
Channel Slope	0.15300	ft/ft
Critical Slope	0.00519	ft/ft

Cross Section for 2 - ST14 - 21-cfs - 30"

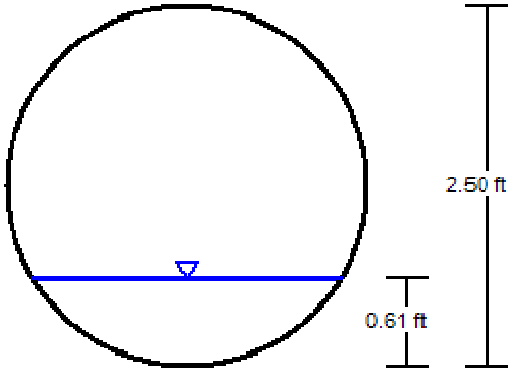
Project Description

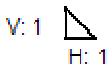
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.15300	ft/ft
Normal Depth	0.61	ft
Diameter	2.50	ft
Discharge	21.00	ft³/s

Cross Section Image





Worksheet for 3 - K - 45-cfs - 42"

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.21870	ft/ft
Diameter	3.50	ft
Discharge	45.00	ft^3/s

Results

Normal Depth	0.73	ft
Flow Area	1.46	ft^2
Wetted Perimeter	3.32	ft
Hydraulic Radius	0.44	ft
Top Width	2.85	ft
Critical Depth	2.09	ft
Percent Full	20.9	%
Critical Slope	0.00448	ft/ft
Velocity	30.86	ft/s
Velocity Head	14.80	ft
Specific Energy	15.53	ft
Froude Number	7.60	
Maximum Discharge	506.10	ft^3/s
Discharge Full	470.48	ft^3/s
Slope Full	0.00200	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	20.89	%
Downstream Velocity	Infinity	ft/s

Worksheet for 3 - K - 45-cfs - 42"

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.73	ft
Critical Depth	2.09	ft
Channel Slope	0.21870	ft/ft
Critical Slope	0.00448	ft/ft

Cross Section for 3 - K - 45-cfs - 42"

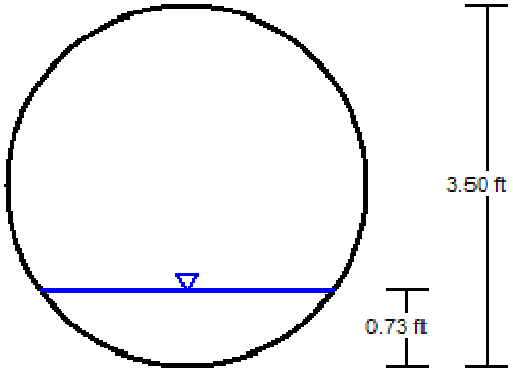
Project Description

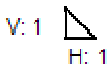
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.21870	ft/ft
Normal Depth	0.73	ft
Diameter	3.50	ft
Discharge	45.00	ft³/s

Cross Section Image





Worksheet for 5 - ST17 - 6-cfs - 24" XX

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.13270	ft/ft
Diameter	2.00	ft
Discharge	6.00	ft³/s

Results

Normal Depth	0.37	ft
Flow Area	0.39	ft²
Wetted Perimeter	1.77	ft
Hydraulic Radius	0.22	ft
Top Width	1.55	ft
Critical Depth	0.87	ft
Percent Full	18.3	%
Critical Slope	0.00464	ft/ft
Velocity	15.28	ft/s
Velocity Head	3.63	ft
Specific Energy	3.99	ft
Froude Number	5.34	
Maximum Discharge	88.64	ft³/s
Discharge Full	82.40	ft³/s
Slope Full	0.00070	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	18.26	%
Downstream Velocity	Infinity	ft/s

Worksheet for 5 - ST17 - 6-cfs - 24" XX

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.37	ft
Critical Depth	0.87	ft
Channel Slope	0.13270	ft/ft
Critical Slope	0.00464	ft/ft

Cross Section for 5 - ST17 - 6-cfs - 24" XX

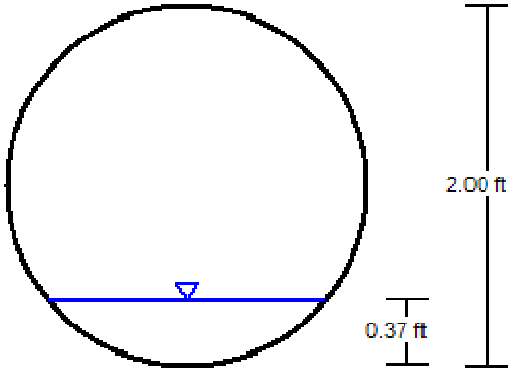
Project Description

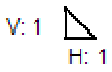
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.13270	ft/ft
Normal Depth	0.37	ft
Diameter	2.00	ft
Discharge	6.00	ft³/s

Cross Section Image





Worksheet for 11 - H - 37-cfs - 42" (INT)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.21670	ft/ft
Diameter	3.50	ft
Discharge	37.00	ft³/s

Results

Normal Depth	0.67	ft
Flow Area	1.27	ft²
Wetted Perimeter	3.16	ft
Hydraulic Radius	0.40	ft
Top Width	2.75	ft
Critical Depth	1.89	ft
Percent Full	19.0	%
Critical Slope	0.00420	ft/ft
Velocity	29.05	ft/s
Velocity Head	13.11	ft
Specific Energy	13.78	ft
Froude Number	7.52	
Maximum Discharge	503.78	ft³/s
Discharge Full	468.32	ft³/s
Slope Full	0.00135	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	19.01	%
Downstream Velocity	Infinity	ft/s

Worksheet for 11 - H - 37-cfs - 42" (INT)

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.67	ft
Critical Depth	1.89	ft
Channel Slope	0.21670	ft/ft
Critical Slope	0.00420	ft/ft

Cross Section for 11 - H - 37-cfs - 42" (INT)

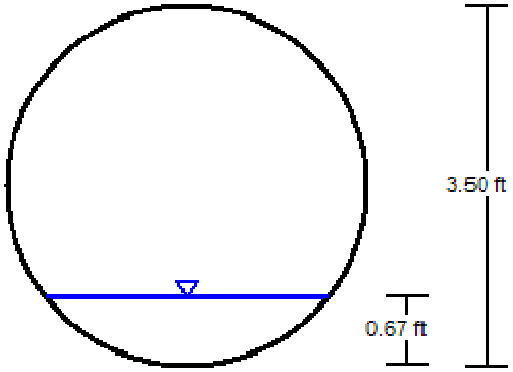
Project Description

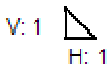
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.21670	ft/ft
Normal Depth	0.67	ft
Diameter	3.50	ft
Discharge	37.00	ft³/s

Cross Section Image





Worksheet for 12 - CP6A - 148-cfs - 54" XX

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.07000	ft/ft
Diameter	4.50	ft
Discharge	148.00	ft³/s

Results

Normal Depth	1.64	ft
Flow Area	5.25	ft²
Wetted Perimeter	5.84	ft
Hydraulic Radius	0.90	ft
Top Width	4.33	ft
Critical Depth	3.57	ft
Percent Full	36.5	%
Critical Slope	0.00602	ft/ft
Velocity	28.18	ft/s
Velocity Head	12.34	ft
Specific Energy	13.98	ft
Froude Number	4.51	
Maximum Discharge	559.64	ft³/s
Discharge Full	520.26	ft³/s
Slope Full	0.00566	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	36.50	%
Downstream Velocity	Infinity	ft/s

Worksheet for 12 - CP6A - 148-cfs - 54" XX

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.64	ft
Critical Depth	3.57	ft
Channel Slope	0.07000	ft/ft
Critical Slope	0.00602	ft/ft

Cross Section for 12 - CP6A - 148-cfs - 54" XX

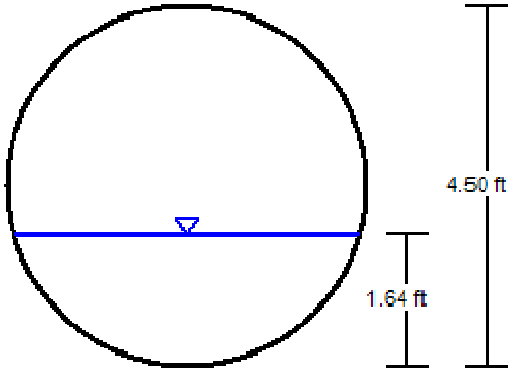
Project Description

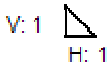
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.07000	ft/ft
Normal Depth	1.64	ft
Diameter	4.50	ft
Discharge	148.00	ft³/s

Cross Section Image





Worksheet for 15 - O - 85-cfs - 48"

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.10890	ft/ft
Diameter	4.00	ft
Discharge	85.00	ft^3/s

Results

Normal Depth	1.15	ft
Flow Area	2.98	ft^2
Wetted Perimeter	4.52	ft
Hydraulic Radius	0.66	ft
Top Width	3.62	ft
Critical Depth	2.79	ft
Percent Full	28.7	%
Critical Slope	0.00502	ft/ft
Velocity	28.55	ft/s
Velocity Head	12.67	ft
Specific Energy	13.82	ft
Froude Number	5.55	
Maximum Discharge	509.88	ft^3/s
Discharge Full	474.00	ft^3/s
Slope Full	0.00350	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	28.67	%
Downstream Velocity	Infinity	ft/s

Worksheet for 15 - O - 85-cfs - 48"

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.15	ft
Critical Depth	2.79	ft
Channel Slope	0.10890	ft/ft
Critical Slope	0.00502	ft/ft

Cross Section for 15 - O - 85-cfs - 48"

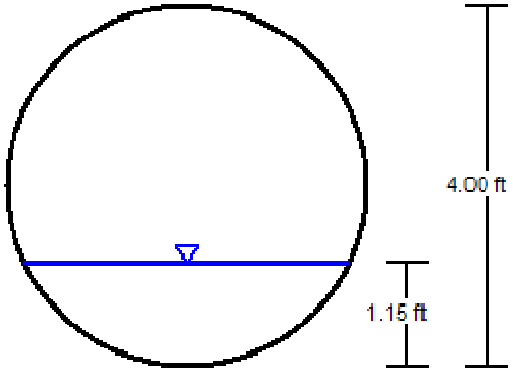
Project Description

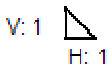
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.10890	ft/ft
Normal Depth	1.15	ft
Diameter	4.00	ft
Discharge	85.00	ft³/s

Cross Section Image





Worksheet for 17 - ST19 - 8-cfs - 24"

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.12000	ft/ft
Diameter	2.00	ft
Discharge	8.00	ft^3/s

Results

Normal Depth	0.43	ft
Flow Area	0.50	ft^2
Wetted Perimeter	1.93	ft
Hydraulic Radius	0.26	ft
Top Width	1.65	ft
Critical Depth	1.01	ft
Percent Full	21.6	%
Critical Slope	0.00489	ft/ft
Velocity	16.05	ft/s
Velocity Head	4.00	ft
Specific Energy	4.44	ft
Froude Number	5.14	
Maximum Discharge	84.29	ft^3/s
Discharge Full	78.36	ft^3/s
Slope Full	0.00125	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	21.57	%
Downstream Velocity	Infinity	ft/s

Worksheet for 17 - ST19 - 8-cfs - 24"

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.43	ft
Critical Depth	1.01	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.00489	ft/ft

Cross Section for 17 - ST19 - 8-cfs - 24"

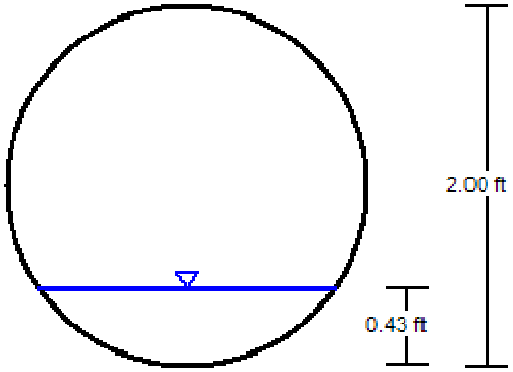
Project Description

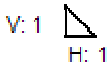
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.12000	ft/ft
Normal Depth	0.43	ft
Diameter	2.00	ft
Discharge	8.00	ft³/s

Cross Section Image





Worksheet for 19 - ST20 - 17-cfs - 30"

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.07710	ft/ft
Diameter	2.50	ft
Discharge	17.00	ft³/s

Results

Normal Depth	0.65	ft
Flow Area	1.02	ft²
Wetted Perimeter	2.68	ft
Hydraulic Radius	0.38	ft
Top Width	2.20	ft
Critical Depth	1.39	ft
Percent Full	26.1	%
Critical Slope	0.00478	ft/ft
Velocity	16.67	ft/s
Velocity Head	4.32	ft
Specific Energy	4.97	ft
Froude Number	4.31	
Maximum Discharge	122.51	ft³/s
Discharge Full	113.89	ft³/s
Slope Full	0.00172	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	26.11	%
Downstream Velocity	Infinity	ft/s

Worksheet for 19 - ST20 - 17-cfs - 30"

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.65	ft
Critical Depth	1.39	ft
Channel Slope	0.07710	ft/ft
Critical Slope	0.00478	ft/ft

Cross Section for 19 - ST20 - 17-cfs - 30"

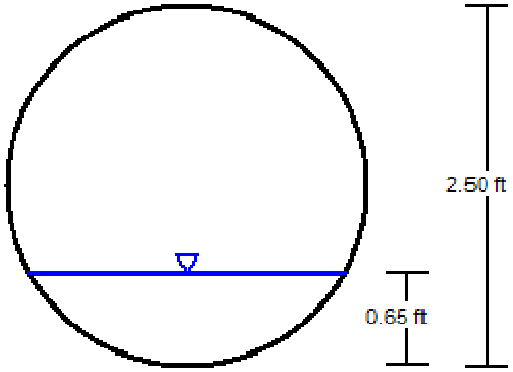
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.07710	ft/ft
Normal Depth	0.65	ft
Diameter	2.50	ft
Discharge	17.00	ft³/s

Cross Section Image



V: 1
H: 1

Worksheet for 20 - P - 53-cfs - 48" (INT)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.20900	ft/ft
Diameter	4.00	ft
Discharge	53.00	ft³/s

Results

Normal Depth	0.77	ft
Flow Area	1.69	ft²
Wetted Perimeter	3.63	ft
Hydraulic Radius	0.47	ft
Top Width	3.15	ft
Critical Depth	2.19	ft
Percent Full	19.2	%
Critical Slope	0.00404	ft/ft
Velocity	31.38	ft/s
Velocity Head	15.30	ft
Specific Energy	16.07	ft
Froude Number	7.56	
Maximum Discharge	706.36	ft³/s
Discharge Full	656.65	ft³/s
Slope Full	0.00136	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	19.21	%
Downstream Velocity	Infinity	ft/s

Worksheet for 20 - P - 53-cfs - 48" (INT)

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.77	ft
Critical Depth	2.19	ft
Channel Slope	0.20900	ft/ft
Critical Slope	0.00404	ft/ft

Cross Section for 20 - P - 53-cfs - 48" (INT)

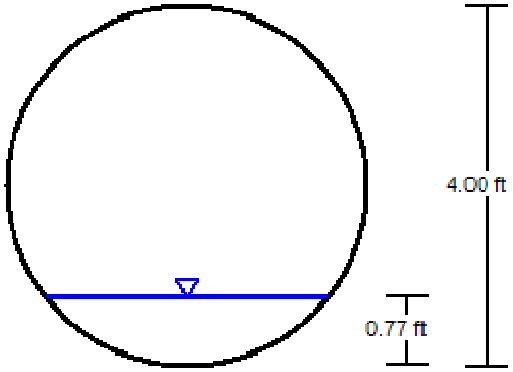
Project Description

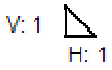
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.20900	ft/ft
Normal Depth	0.77	ft
Diameter	4.00	ft
Discharge	53.00	ft³/s

Cross Section Image





Worksheet for 22 - ST6 - 14-cfs - 30"

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.33330	ft/ft
Diameter	2.50	ft
Discharge	14.00	ft³/s

Results

Normal Depth	0.41	ft
Flow Area	0.53	ft²
Wetted Perimeter	2.09	ft
Hydraulic Radius	0.25	ft
Top Width	1.86	ft
Critical Depth	1.26	ft
Percent Full	16.5	%
Critical Slope	0.00454	ft/ft
Velocity	26.42	ft/s
Velocity Head	10.85	ft
Specific Energy	11.26	ft
Froude Number	8.72	
Maximum Discharge	254.71	ft³/s
Discharge Full	236.79	ft³/s
Slope Full	0.00117	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	16.50	%
Downstream Velocity	Infinity	ft/s

Worksheet for 22 - ST6 - 14-cfs - 30"

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.41	ft
Critical Depth	1.26	ft
Channel Slope	0.33330	ft/ft
Critical Slope	0.00454	ft/ft

Cross Section for 22 - ST6 - 14-cfs - 30"

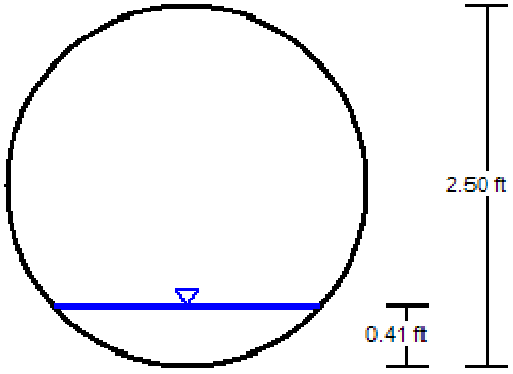
Project Description

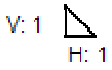
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.33330	ft/ft
Normal Depth	0.41	ft
Diameter	2.50	ft
Discharge	14.00	ft³/s

Cross Section Image





Worksheet for 23 - ST7/F - 130-cfs - 54"

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.33330	ft/ft
Diameter	4.50	ft
Discharge	130.00	ft³/s

Results

Normal Depth	1.03	ft
Flow Area	2.74	ft²
Wetted Perimeter	4.49	ft
Hydraulic Radius	0.61	ft
Top Width	3.78	ft
Critical Depth	3.36	ft
Percent Full	22.8	%
Critical Slope	0.00533	ft/ft
Velocity	47.48	ft/s
Velocity Head	35.04	ft
Specific Energy	36.07	ft
Froude Number	9.84	
Maximum Discharge	1221.18	ft³/s
Discharge Full	1135.24	ft³/s
Slope Full	0.00437	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	22.85	%
Downstream Velocity	Infinity	ft/s

Worksheet for 23 - ST7/F - 130-cfs - 54"

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.03	ft
Critical Depth	3.36	ft
Channel Slope	0.33330	ft/ft
Critical Slope	0.00533	ft/ft

Cross Section for 23 - ST7/F - 130-cfs - 54"

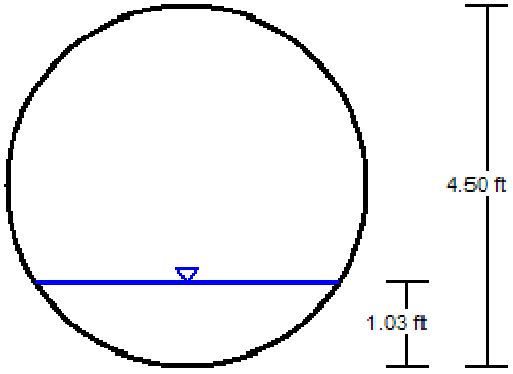
Project Description

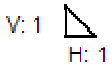
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.33330	ft/ft
Normal Depth	1.03	ft
Diameter	4.50	ft
Discharge	130.00	ft³/s

Cross Section Image





Worksheet for 28 - 15% CP1A - 20-cfs - 30"

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.33330	ft/ft
Diameter	2.50	ft
Discharge	20.00	ft³/s

Results

Normal Depth	0.49	ft
Flow Area	0.68	ft²
Wetted Perimeter	2.30	ft
Hydraulic Radius	0.30	ft
Top Width	1.99	ft
Critical Depth	1.52	ft
Percent Full	19.6	%
Critical Slope	0.00508	ft/ft
Velocity	29.36	ft/s
Velocity Head	13.39	ft
Specific Energy	13.88	ft
Froude Number	8.84	
Maximum Discharge	254.71	ft³/s
Discharge Full	236.79	ft³/s
Slope Full	0.00238	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	19.65	%
Downstream Velocity	Infinity	ft/s

Worksheet for 28 - 15% CP1A - 20-cfs - 30"

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.49	ft
Critical Depth	1.52	ft
Channel Slope	0.33330	ft/ft
Critical Slope	0.00508	ft/ft

Cross Section for 28 - 15% CP1A - 20-cfs - 30"

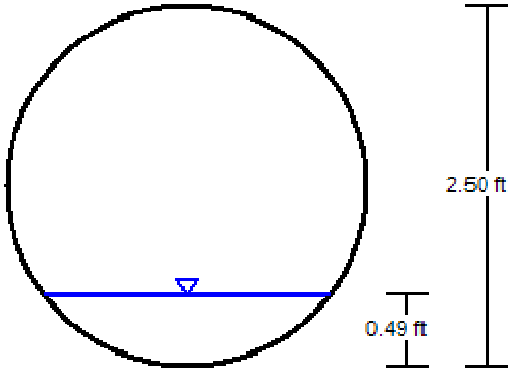
Project Description

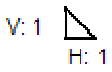
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.33330	ft/ft
Normal Depth	0.49	ft
Diameter	2.50	ft
Discharge	20.00	ft³/s

Cross Section Image





Worksheet for 31 - 29% CP1A - 38-cfs - 36"

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.16980	ft/ft
Diameter	3.00	ft
Discharge	56.00	ft³/s

Results

Normal Depth	0.92	ft
Flow Area	1.83	ft²
Wetted Perimeter	3.52	ft
Hydraulic Radius	0.52	ft
Top Width	2.77	ft
Critical Depth	2.43	ft
Percent Full	30.6	%
Critical Slope	0.00722	ft/ft
Velocity	30.52	ft/s
Velocity Head	14.48	ft
Specific Energy	15.39	ft
Froude Number	6.61	
Maximum Discharge	295.63	ft³/s
Discharge Full	274.83	ft³/s
Slope Full	0.00705	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	30.62	%
Downstream Velocity	Infinity	ft/s

Worksheet for 31 - 29% CP1A - 38-cfs - 36"

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.92	ft
Critical Depth	2.43	ft
Channel Slope	0.16980	ft/ft
Critical Slope	0.00722	ft/ft

Cross Section for 31 - 29% CP1A - 38-cfs - 36"

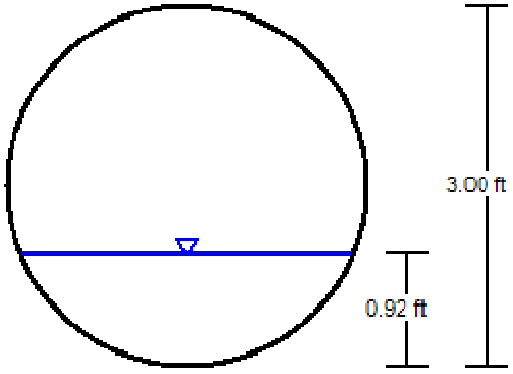
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.16980	ft/ft
Normal Depth	0.92	ft
Diameter	3.00	ft
Discharge	56.00	ft³/s

Cross Section Image



V: 1
H: 1

Worksheet for 32 - 56% CP1A - 73-cfs - 48"

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.19810	ft/ft
Diameter	4.00	ft
Discharge	73.00	ft³/s

Results

Normal Depth	0.91	ft
Flow Area	2.16	ft²
Wetted Perimeter	3.98	ft
Hydraulic Radius	0.54	ft
Top Width	3.36	ft
Critical Depth	2.58	ft
Percent Full	22.8	%
Critical Slope	0.00459	ft/ft
Velocity	33.82	ft/s
Velocity Head	17.77	ft
Specific Energy	18.68	ft
Froude Number	7.43	
Maximum Discharge	687.70	ft³/s
Discharge Full	639.30	ft³/s
Slope Full	0.00258	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	22.82	%
Downstream Velocity	Infinity	ft/s

Worksheet for 32 - 56% CP1A - 73-cfs - 48"

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.91	ft
Critical Depth	2.58	ft
Channel Slope	0.19810	ft/ft
Critical Slope	0.00459	ft/ft

Cross Section for 32 - 56% CP1A - 73-cfs - 48"

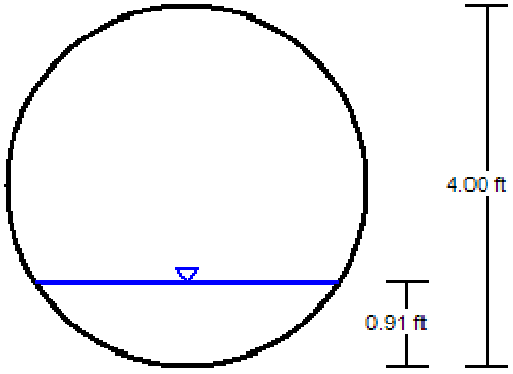
Project Description

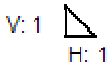
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.19810	ft/ft
Normal Depth	0.91	ft
Diameter	4.00	ft
Discharge	73.00	ft³/s

Cross Section Image





Worksheet for 33 - ST21 - 10-cfs - 36"

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.06490	ft/ft
Diameter	3.00	ft
Discharge	10.00	ft³/s

Results

Normal Depth	0.49	ft
Flow Area	0.76	ft²
Wetted Perimeter	2.51	ft
Hydraulic Radius	0.30	ft
Top Width	2.23	ft
Critical Depth	1.00	ft
Percent Full	16.5	%
Critical Slope	0.00391	ft/ft
Velocity	13.15	ft/s
Velocity Head	2.69	ft
Specific Energy	3.18	ft
Froude Number	3.96	
Maximum Discharge	182.77	ft³/s
Discharge Full	169.91	ft³/s
Slope Full	0.00022	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	16.46	%
Downstream Velocity	Infinity	ft/s

Worksheet for 33 - ST21 - 10-cfs - 36"

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.49	ft
Critical Depth	1.00	ft
Channel Slope	0.06490	ft/ft
Critical Slope	0.00391	ft/ft

Cross Section for 33 - ST21 - 10-cfs - 36"

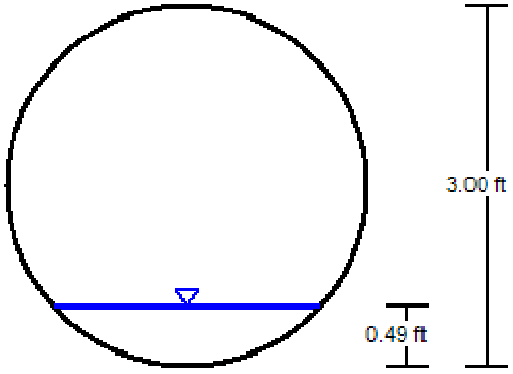
Project Description

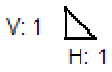
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.06490	ft/ft
Normal Depth	0.49	ft
Diameter	3.00	ft
Discharge	10.00	ft³/s

Cross Section Image





C.1.2

Interim #2 Detention Basin West Channel

Worksheet for Interim #2 (from inflow study OFF6a) - West Berm-

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.042	
Channel Slope	0.04700	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	5.00	ft
Discharge	72.00	ft³/s

Results

Normal Depth	1.22	ft
Flow Area	10.61	ft²
Wetted Perimeter	12.74	ft
Hydraulic Radius	0.83	ft
Top Width	12.34	ft
Critical Depth	1.40	ft
Critical Slope	0.02721	ft/ft
Velocity	6.79	ft/s
Velocity Head	0.72	ft
Specific Energy	1.94	ft
Froude Number	1.29	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	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	1.22	ft
Critical Depth	1.40	ft
Channel Slope	0.04700	ft/ft

Worksheet for Interim #2 (from inflow study OFF6a) - West Berm-

GVF Output Data

Critical Slope	0.02721	ft/ft

Cross Section for Interim #2 (from inflow study OFF6a) - West Berm-

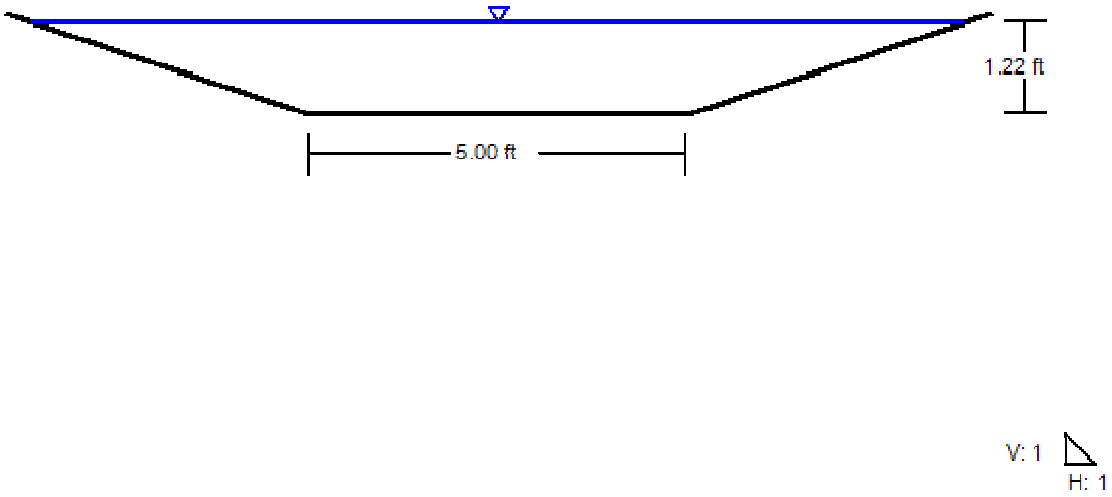
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.042	
Channel Slope	0.04700	ft/ft
Normal Depth	1.22	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	5.00	ft
Discharge	72.00	ft³/s

Cross Section Image



C.2

WATER SURFACE PRESSURE GRADIENT (WSPG)

C.2.1

Detention Basin Outlet - 0.013 Roughness

GPDB-OUTLET-13

```
T1 GRAND PARK DETENTION BASIN - ADD1
T2 FILE NAME: GPDB-OUTLET-13
T3 MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCTURE
SO   1000.00 3424.80   1                        3429.82
R    1017.89 3425.70   1      .013                              .00     .00  1
JX   1017.8913425.71   1  2   .013   81.00          3425.71          90.00       .00
R    1025.55 3426.025  1      .013                              .000  17.11  1
R    1094.15 3429.30   1      .013                              .000 -18.00  1
R    1201.85 3434.57   1      .013                            -5.000    .00  1
R    1401.85 3448.45   1      .023                              .000    .00  1
R    1690.41 3468.46   1      .013                              .000    .00  1
R    1826.09 3472.18   1      .013                            -3.800    .00  1
R    1832.31 3472.35   1      .013                              .000    .00  1
JX   1832.32 3472.351  3  4   .013  378.00          472.351           .00       .00
R    1832.33 3472.352  3      .013                              .00   22.00  1
R    1840.30 3472.43   3      .013                              .00     .00  1
R    1887.00 3474.34   3      .013                            66.90     .00  1
R    1909.92 3475.24   3      .013                              .00     .00  1
R    1950.65 3476.83   3      .013                              .00     .00  1
R    2516.97 3495.80   3      .013                           -49.00     .00  1
R    2632.49 3498.72   3      .013                            68.90     .00  1
R    2912.62 3503.20   3      .013                              .00  -23.92  1
R    2951.65 3503.98   3      .013                              .00  -45.00  1
R    3045.50 3505.86   3      .013                              .00     .00  1
SH   3045.50 3505.86   3                        3529.99
CD   1  3   0    .000   5.000    6.000  .000  .000   .00
CD   2  4   1    .000   3.500     .000  .000  .000   .00
CD   3  3   0    .000   5.000    5.000  .000  .000   .00
CD   4  4   1    .000   5.000     .000  .000  .000   .00
Q            94.00    .0
```

GRAND PARK DETENTION BASIN - ADD1
FILE NAME: GPDB-OUTLET-13
MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	3424.800	3.910	3428.710	553.00	23.57	8.63	3437.34	.00	5.00	6.00	5.000	6.000	.00	0 .0
17.890	.0503					.0199	.36	3.91	2.10	2.81	.013	.00	.00	BOX
1017.890	3425.700	4.083	3429.783	553.00	22.57	7.91	3437.69	.00	5.00	6.00	5.000	6.000	.00	0 .0
JUNCT STR 10.2500						.0281	.00	4.08	1.97		.013	.00	.00	BOX
1017.891	3425.710	2.784	3428.494	472.00	28.26	12.40	3440.89	.00	5.00	6.00	5.000	6.000	.00	0 .0
7.659	.0411					.0374	.29	2.78	2.98	2.69	.013	.00	.00	BOX
1025.550	3426.025	2.787	3428.812	472.00	28.23	12.37	3441.18	.00	5.00	6.00	5.000	6.000	.00	0 .0
68.600	.0477					.0354	2.43	2.79	2.98	2.54	.013	.00	.00	BOX
1094.150	3429.300	2.902	3432.202	472.00	27.11	11.41	3443.62	.11	5.00	6.00	5.000	6.000	.00	0 .0
34.019	.0489					.0322	1.10	3.01	2.80	2.52	.013	.00	.00	BOX
1128.169	3430.965	2.988	3433.953	472.00	26.33	10.76	3444.71	.10	5.00	6.00	5.000	6.000	.00	0 .0
42.029	.0489					.0291	1.22	3.09	2.68	2.52	.013	.00	.00	BOX
1170.198	3433.021	3.134	3436.155	472.00	25.10	9.78	3445.94	.10	5.00	6.00	5.000	6.000	.00	0 .0
31.652	.0489					.0257	.81	3.23	2.50	2.52	.013	.00	.00	BOX
1201.850	3434.570	3.287	3437.857	472.00	23.93	8.89	3446.75	.00	5.00	6.00	5.000	6.000	.00	0 .0
48.688	.0694					.0782	3.81	3.29	2.33	3.39	.023	.00	.00	BOX
1250.538	3437.949	3.194	3441.143	472.00	24.63	9.42	3450.56	.00	5.00	6.00	5.000	6.000	.00	0 .0
45.911	.0694					.0867	3.98	3.19	2.43	3.39	.023	.00	.00	BOX

GRAND PARK DETENTION BASIN - ADD1
FILE NAME: GPDB-OUTLET-13
MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1296.450	3441.135	3.046	3444.181	472.00	25.83	10.36	3454.54	.00	5.00	6.00	5.000	6.000	.00	0 .0
30.836	.0694					.0984	3.03	3.05	2.61	3.39	.023	.00	.00	BOX
1327.285	3443.275	2.904	3446.179	472.00	27.09	11.40	3457.57	.00	5.00	6.00	5.000	6.000	.00	0 .0
23.692	.0694					.1118	2.65	2.90	2.80	3.39	.023	.00	.00	BOX
1350.978	3444.919	2.769	3447.688	472.00	28.41	12.53	3460.22	.00	5.00	6.00	5.000	6.000	.00	0 .0
19.489	.0694					.1271	2.48	2.77	3.01	3.39	.023	.00	.00	BOX
1370.466	3446.272	2.640	3448.912	472.00	29.80	13.79	3462.70	.00	5.00	6.00	5.000	6.000	.00	0 .0
16.696	.0694					.1446	2.41	2.64	3.23	3.39	.023	.00	.00	BOX
1387.162	3447.431	2.517	3449.948	472.00	31.25	15.17	3465.11	.00	5.00	6.00	5.000	6.000	.00	0 .0
14.688	.0694					.1647	2.42	2.52	3.47	3.39	.023	.00	.00	BOX
1401.850	3448.450	2.400	3450.850	472.00	32.78	16.68	3467.53	.00	5.00	6.00	5.000	6.000	.00	0 .0
82.939	.0693					.0526	4.37	2.40	3.73	2.22	.013	.00	.00	BOX
1484.789	3454.201	2.516	3456.717	472.00	31.27	15.18	3471.90	.00	5.00	6.00	5.000	6.000	.00	0 .0
54.501	.0693					.0463	2.52	2.52	3.47	2.22	.013	.00	.00	BOX
1539.290	3457.980	2.639	3460.619	472.00	29.81	13.80	3474.42	.00	5.00	6.00	5.000	6.000	.00	0 .0

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   39.263    .0693                                        .0407     1.60     2.64    3.23    2.22    .013       .00   .00  BOX
         |         |        |         |         |              |        |        |       |       |       |        |     |    |
 1578.553  3460.703    2.767  3463.470    472.00   28.43   12.55  3476.02     .00    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
   29.950    .0693                                        .0358     1.07     2.77    3.01    2.22    .013       .00   .00  BOX
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Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:50:23

GRAND PARK DETENTION BASIN - ADD1

FILE NAME: GPDB-OUTLET-13

MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

```
         | 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
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*******|*******
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1608.503  3462.780    2.902  3465.682    472.00   27.10   11.41  3477.09     .00    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
   23.647    .0693                                        .0315      .74     2.90    2.80    2.22    .013       .00   .00  BOX
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1632.150  3464.420    3.044  3467.464    472.00   25.84   10.37  3477.83     .00    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
   19.084    .0693                                        .0277      .53     3.04    2.61    2.22    .013       .00   .00  BOX
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1651.234  3465.743    3.193  3468.936    472.00   24.64    9.43  3478.36     .00    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
   15.617    .0693                                        .0244      .38     3.19    2.43    2.22    .013       .00   .00  BOX
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1666.851  3466.826    3.348  3470.175    472.00   23.49    8.57  3478.75     .00    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
   12.886    .0693                                        .0216      .28     3.35    2.26    2.22    .013       .00   .00  BOX
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1679.738  3467.720    3.512  3471.232    472.00   22.40    7.79  3479.02     .00    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
   10.672    .0693                                        .0190      .20     3.51    2.11    2.22    .013       .00   .00  BOX
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1690.410  3468.460    3.683  3472.144    472.00   21.36    7.08  3479.23     .04    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
   28.810    .0274                                        .0172      .50     3.72    1.96    3.13    .013       .00   .00  BOX
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1719.220  3469.250    3.793  3473.043    472.00   20.74    6.68  3479.72     .04    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
   35.690    .0274                                        .0156      .56     3.83    1.88    3.13    .013       .00   .00  BOX
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1754.910  3470.229    3.978  3474.207    472.00   19.77    6.07  3480.28     .04    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
   26.262    .0274                                        .0138      .36     4.01    1.75    3.13    .013       .00   .00  BOX
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1781.172  3470.948    4.172  3475.121    472.00   18.85    5.52  3480.64     .03    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
   19.606    .0274                                        .0122      .24     4.20    1.63    3.13    .013       .00   .00  BOX
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Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:50:23

GRAND PARK DETENTION BASIN - ADD1

FILE NAME: GPDB-OUTLET-13

MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

```
         | 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
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*******|*******
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1800.778  3471.486    4.376  3475.862    472.00   17.98    5.02  3480.88     .03    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
   14.614    .0274                                        .0108      .16     4.41    1.51    3.13    .013       .00   .00  BOX
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1815.392  3471.887    4.589  3476.476    472.00   17.14    4.56  3481.04     .03    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
   10.698    .0274                                        .0096      .10     4.62    1.41    3.13    .013       .00   .00  BOX
                    -------------------- WARNING - Flow depth near top of box conduit --------------------
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1826.090  3472.180    4.813  3476.993    472.00   16.34    4.15  3481.14     .00    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
    6.220    .0274                                        .0108      .07     4.81    1.31    3.13    .013       .00   .00  BOX
                    -------------------- WARNING - Flow depth near top of box conduit --------------------
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1832.310  3472.350    5.000  3477.350    472.00   15.73    3.84  3481.19     .00    5.00    6.00    5.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
JUNCT STR   .0988                                        .0008      .00    5.00    1.24            .013       .00   .00  BOX
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1832.320  3472.351    8.623  3480.974     94.00    3.76     .22  3481.19     .00    2.22    5.00    5.000    5.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
     .010    .0976                                        .0008      .00     8.62     .30     .76    .013       .00   .00  BOX
         |         |        |         |         |              |        |       |        |        |       |       |       |
 1832.330  3472.352    8.649  3481.001     94.00    3.76     .22  3481.22     .00    2.22    5.00    5.000    5.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-      -|-     -|-     -|-
    7.970    .0098                                        .0008      .01     8.65     .30    1.66    .013       .00   .00  BOX
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1840.300	3472.430	8.589	3481.019	94.00	3.76	.22	3481.24	.00	2.22	5.00	5.000	5.000	.00	0 .0
46.700	.0409					.0008	.04	.00	.30	1.01	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:50:23

GRAND PARK DETENTION BASIN - ADD1

FILE NAME: GPDB-OUTLET-13

MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1887.000	3474.340	6.765	3481.105	94.00	3.76	.22	3481.32	.00	2.22	5.00	5.000	5.000	.00	0 .0
22.920	.0393					.0008	.02	6.76	.30	1.03	.013	.00	.00	BOX
1909.920	3475.240	5.894	3481.134	94.00	3.76	.22	3481.35	.00	2.22	5.00	5.000	5.000	.00	0 .0
23.557	.0390					.0008	.02	5.89	.30	1.03	.013	.00	.00	BOX
1933.477	3476.160	5.000	3481.160	94.00	3.76	.22	3481.38	.00	2.22	5.00	5.000	5.000	.00	0 .0
5.478	.0390					.0005	.00	5.00	.30	1.03	.013	.00	.00	BOX
1938.955	3476.374	4.766	3481.140	94.00	3.94	.24	3481.38	.00	2.22	5.00	5.000	5.000	.00	0 .0
5.149	.0390					.0006	.00	4.77	.32	1.03	.013	.00	.00	BOX

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

1944.104	3476.574	4.545	3481.119	94.00	4.14	.27	3481.38	.00	2.22	5.00	5.000	5.000	.00	0 .0
4.828	.0390					.0007	.00	4.54	.34	1.03	.013	.00	.00	BOX

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

1948.932	3476.763	4.333	3481.096	94.00	4.34	.29	3481.39	.00	2.22	5.00	5.000	5.000	.00	0 .0
1.718	.0390					.0008	.00	4.33	.37	1.03	.013	.00	.00	BOX
1950.650	3476.830	4.257	3481.087	94.00	4.42	.30	3481.39	.00	2.22	5.00	5.000	5.000	.00	0 .0
5.143	.0335					.0008	.00	4.26	.38	1.08	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:50:23

GRAND PARK DETENTION BASIN - ADD1

FILE NAME: GPDB-OUTLET-13

MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1955.793	3477.002	4.059	3481.061	94.00	4.63	.33	3481.39	.01	2.22	5.00	5.000	5.000	.00	0 .0
1.710	.0335					.0009	.00	4.06	.41	1.08	.013	.00	.00	BOX
1957.503	3477.060	3.993	3481.053	94.00	4.71	.34	3481.40	.01	2.22	5.00	5.000	5.000	.00	0 .0
HYDRAULIC JUMP														
1957.503	3477.060	1.083	3478.143	94.00	17.36	4.68	3482.82	.07	2.22	5.00	5.000	5.000	.00	0 .0
294.650	.0335					.0335	9.87	1.15	2.94	1.08	.013	.00	.00	BOX
2252.153	3486.929	1.083	3488.012	94.00	17.36	4.68	3492.69	.07	2.22	5.00	5.000	5.000	.00	0 .0
170.544	.0335					.0317	5.41	1.15	2.94	1.08	.013	.00	.00	BOX
2422.697	3492.642	1.126	3493.768	94.00	16.70	4.33	3498.10	.07	2.22	5.00	5.000	5.000	.00	0 .0
61.404	.0335					.0280	1.72	1.19	2.77	1.08	.013	.00	.00	BOX
2484.101	3494.699	1.181	3495.880	94.00	15.92	3.94	3499.82	.06	2.22	5.00	5.000	5.000	.00	0 .0
32.869	.0335					.0244	.80	1.24	2.58	1.08	.013	.00	.00	BOX
2516.970	3495.800	1.238	3497.038	94.00	15.18	3.58	3500.62	.37	2.22	5.00	5.000	5.000	.00	0 .0
44.890	.0253					.0219	.98	1.61	2.40	1.19	.013	.00	.00	BOX
2561.860	3496.935	1.271	3498.206	94.00	14.79	3.40	3501.60	.35	2.22	5.00	5.000	5.000	.00	0 .0
44.061	.0253					.0197	.87	1.62	2.31	1.19	.013	.00	.00	BOX

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 2605.922  3498.048    1.333  3499.382     94.00   14.10    3.09  3502.47     .32    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
   26.568    .0253                                .0172      .46     1.65    2.15    1.19    .013       .00   .00  BOX

                                Program Package Serial Number: 1513
                                              WATER SURFACE PROFILE LISTING                    Date: 2- 5-2020  Time:10:50:23
                           GRAND PARK DETENTION BASIN - ADD1
                             FILE NAME: GPDB-OUTLET-13
                               MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT
 ********************************************************************************************************************** ********
          | 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
 *********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|***** |*******
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 2632.490  3498.720    1.398  3500.118     94.00   13.44    2.81  3502.92     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
   96.219    .0160                                .0160     1.54     1.40    2.00    1.40    .013       .00   .00  BOX
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 2728.709  3500.259    1.398  3501.657     94.00   13.44    2.81  3504.46     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
  183.911    .0160                                .0164     3.02     1.40    2.00    1.40    .013       .00   .00  BOX
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 2912.620  3503.200    1.372  3504.572     94.00   13.70    2.92  3507.49     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
   39.030    .0200                                .0161      .63     1.37    2.06    1.29    .013       .00   .00  BOX
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 2951.650  3503.980    1.422  3505.402     94.00   13.22    2.71  3508.12     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
   13.052    .0200                                .0149      .19     1.42    1.95    1.29    .013       .00   .00  BOX
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 2964.702  3504.242    1.447  3505.688     94.00   12.99    2.62  3508.31     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
   26.073    .0200                                .0136      .35     1.45    1.90    1.29    .013       .00   .00  BOX
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 2990.775  3504.764    1.517  3506.281     94.00   12.39    2.38  3508.66     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
   17.501    .0200                                .0119      .21     1.52    1.77    1.29    .013       .00   .00  BOX
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3008.276  3505.115    1.591  3506.706     94.00   11.81    2.17  3508.87     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
   12.375    .0200                                .0104      .13     1.59    1.65    1.29    .013       .00   .00  BOX
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3020.651  3505.362    1.669  3507.031     94.00   11.26    1.97  3509.00     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
    8.923    .0200                                .0091      .08     1.67    1.54    1.29    .013       .00   .00  BOX
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3029.574  3505.541    1.751  3507.292     94.00   10.74    1.79  3509.08     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
    6.409    .0200                                .0080      .05     1.75    1.43    1.29    .013       .00   .00  BOX

                                Program Package Serial Number: 1513
                                              WATER SURFACE PROFILE LISTING                    Date: 2- 5-2020  Time:10:50:23
                           GRAND PARK DETENTION BASIN - ADD1
                             FILE NAME: GPDB-OUTLET-13
                               MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT
 ********************************************************************************************************************** ********
          | 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
 *********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|***** |*******
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3035.983  3505.669    1.836  3507.505     94.00   10.24    1.63  3509.13     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
    4.473    .0200                                .0070      .03     1.84    1.33    1.29    .013       .00   .00  BOX
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3040.456  3505.759    1.926  3507.685     94.00    9.76    1.48  3509.16     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
    2.915    .0200                                .0061      .02     1.93    1.24    1.29    .013       .00   .00  BOX
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3043.371  3505.817    2.020  3507.837     94.00    9.31    1.35  3509.18     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
    1.619    .0200                                .0054      .01     2.02    1.15    1.29    .013       .00   .00  BOX
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3044.990  3505.850    2.118  3507.968     94.00    8.88    1.22  3509.19     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
     .510    .0200                                .0047      .00     2.12    1.07    1.29    .013       .00   .00  BOX
          |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3045.500  3505.860    2.223  3508.083     94.00    8.46    1.11  3509.19     .00    2.22     5.00    5.000    5.000   .00   0   .0
      -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-     |-
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C.2.2

Detention Basin Outlet - 0.015 Roughness

GPDB-OUTLET-15

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T1 GRAND PARK DETENTION BASIN - ADD1
T2 FILE NAME: GPDB-OUTLET-15
T3 MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCTURE
SO   1000.00 3424.80   1                        3429.82
R    1017.89 3425.70   1      .015                              .00     .00  1
JX   1017.8913425.71   1  2   .015   81.00          3425.71          90.00       .00
R    1025.55 3426.025  1      .015                              .000  17.11  1
R    1094.15 3429.30   1      .015                              .000 -18.00  1
R    1201.85 3434.57   1      .015                            -5.000    .00  1
R    1401.85 3448.45   1      .023                              .000    .00  1
R    1690.41 3468.46   1      .015                              .000    .00  1
R    1826.09 3472.18   1      .015                            -3.800    .00  1
R    1832.31 3472.35   1      .015                              .000    .00  1
JX   1832.32 3472.351  3  4   .015  378.00          472.351           .00       .00
R    1832.33 3472.352  3      .015                              .00   22.00  1
R    1840.30 3472.43   3      .015                              .00     .00  1
R    1887.00 3474.34   3      .015                            66.90     .00  1
R    1909.92 3475.24   3      .015                              .00     .00  1
R    1950.65 3476.83   3      .015                              .00     .00  1
R    2516.97 3495.80   3      .015                           -49.00     .00  1
R    2632.49 3498.72   3      .015                            68.90     .00  1
R    2912.62 3503.20   3      .015                              .00  -23.92  1
R    2951.65 3503.98   3      .015                              .00  -45.00  1
R    3045.50 3505.86   3      .015                              .00     .00  1
SH   3045.50 3505.86   3                        3529.99
CD   1  3   0    .000   5.000    6.000  .000  .000   .00
CD   2  4   1    .000   3.500     .000  .000  .000   .00
CD   3  3   0    .000   5.000    5.000  .000  .000   .00
CD   4  4   1    .000   5.000     .000  .000  .000   .00
Q            94.00    .0
```

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:50:38

GRAND PARK DETENTION BASIN - ADD1

FILE NAME: GPDB-OUTLET-15

MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	3424.800	4.208	3429.008	553.00	21.90	7.45	3436.46	.00	5.00	6.00	5.000	6.000	.00	0 .0
1.693	.0503					.0230	.04	4.21	1.88	3.12	.015	.00	.00	BOX
1001.693	3424.885	4.226	3429.112	553.00	21.81	7.38	3436.50	.00	5.00	6.00	5.000	6.000	.00	0 .0
16.197	.0503					.0216	.35	4.23	1.87	3.12	.015	.00	.00	BOX
1017.890	3425.700	4.433	3430.133	553.00	20.79	6.71	3436.85	.00	5.00	6.00	5.000	6.000	.00	0 .0
JUNCT STR 10.2500						.0313	.00	4.43	1.74		.015	.00	.00	BOX
1017.891	3425.710	2.960	3428.670	472.00	26.57	10.96	3439.63	.00	5.00	6.00	5.000	6.000	.00	0 .0
7.659	.0411					.0423	.32	2.96	2.72	2.99	.015	.00	.00	BOX
1025.550	3426.025	2.959	3428.984	472.00	26.59	10.98	3439.96	.00	5.00	6.00	5.000	6.000	.00	0 .0
68.600	.0477					.0410	2.81	2.96	2.72	2.83	.015	.00	.00	BOX
1094.150	3429.300	3.034	3432.334	472.00	25.93	10.44	3442.77	.10	5.00	6.00	5.000	6.000	.00	0 .0
61.453	.0489					.0375	2.31	3.14	2.62	2.80	.015	.00	.00	BOX
1155.603	3432.307	3.162	3435.469	472.00	24.88	9.61	3445.08	.09	5.00	6.00	5.000	6.000	.00	0 .0
46.247	.0489					.0334	1.54	3.26	2.47	2.80	.015	.00	.00	BOX
1201.850	3434.570	3.316	3437.887	472.00	23.72	8.74	3446.62	.00	5.00	6.00	5.000	6.000	.00	0 .0
31.954	.0694					.0747	2.39	3.32	2.30	3.39	.023	.00	.00	BOX
1233.804	3436.788	3.278	3440.065	472.00	24.00	8.95	3449.01	.00	5.00	6.00	5.000	6.000	.00	0 .0
64.147	.0694					.0810	5.19	3.28	2.34	3.39	.023	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:50:38

GRAND PARK DETENTION BASIN - ADD1

FILE NAME: GPDB-OUTLET-15

MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1297.951	3441.240	3.125	3444.365	472.00	25.17	9.84	3454.20	.00	5.00	6.00	5.000	6.000	.00	0 .0
37.300	.0694					.0919	3.43	3.12	2.51	3.39	.023	.00	.00	BOX
1335.252	3443.828	2.980	3446.808	472.00	26.40	10.82	3457.63	.00	5.00	6.00	5.000	6.000	.00	0 .0
27.006	.0694					.1043	2.82	2.98	2.70	3.39	.023	.00	.00	BOX
1362.257	3445.702	2.841	3448.543	472.00	27.69	11.91	3460.45	.00	5.00	6.00	5.000	6.000	.00	0 .0
21.517	.0694					.1186	2.55	2.84	2.90	3.39	.023	.00	.00	BOX
1383.774	3447.196	2.709	3449.904	472.00	29.04	13.10	3463.00	.00	5.00	6.00	5.000	6.000	.00	0 .0
18.076	.0694					.1349	2.44	2.71	3.11	3.39	.023	.00	.00	BOX
1401.850	3448.450	2.583	3451.032	472.00	30.46	14.41	3465.44	.00	5.00	6.00	5.000	6.000	.00	0 .0
52.642	.0693					.0594	3.13	2.58	3.34	2.46	.015	.00	.00	BOX
1454.493	3452.100	2.636	3454.736	472.00	29.85	13.83	3468.57	.00	5.00	6.00	5.000	6.000	.00	0 .0
75.074	.0693					.0543	4.08	2.64	3.24	2.46	.015	.00	.00	BOX
1529.566	3457.306	2.764	3460.071	472.00	28.46	12.58	3472.65	.00	5.00	6.00	5.000	6.000	.00	0 .0
46.723	.0693					.0478	2.23	2.76	3.02	2.46	.015	.00	.00	BOX
1576.289	3460.546	2.899	3463.446	472.00	27.13	11.43	3474.88	.00	5.00	6.00	5.000	6.000	.00	0 .0

32.882	.0693					.0420	1.38	2.90	2.81	2.46	.015	.00	.00	BOX					
1609.171	3462.827	3.041	3465.867	472.00	25.87	10.39	3476.26	.00	5.00	6.00	5.000	6.000	.00	0	.0				
24.647	.0693					.0370	.91	3.04	2.61	2.46	.015	.00	.00	BOX					

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:50:38

GRAND PARK DETENTION BASIN - ADD1

FILE NAME: GPDB-OUTLET-15

MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1633.817	3464.536	3.189	3467.725	472.00	24.67	9.45	3477.17	.00	5.00	6.00	5.000	6.000	.00	0 .0
19.162	.0693				.0326	.63	3.19	2.43	2.46	.015	.00	.00	BOX	
1652.979	3465.865	3.345	3469.209	472.00	23.52	8.59	3477.80	.00	5.00	6.00	5.000	6.000	.00	0 .0
15.232	.0693				.0288	.44	3.34	2.27	2.46	.015	.00	.00	BOX	
1668.211	3466.921	3.508	3470.428	472.00	22.43	7.81	3478.24	.00	5.00	6.00	5.000	6.000	.00	0 .0
12.264	.0693				.0254	.31	3.51	2.11	2.46	.015	.00	.00	BOX	
1680.475	3467.771	3.679	3471.450	472.00	21.38	7.10	3478.55	.00	5.00	6.00	5.000	6.000	.00	0 .0
9.935	.0693				.0225	.22	3.68	1.96	2.46	.015	.00	.00	BOX	
1690.410	3468.460	3.859	3472.318	472.00	20.39	6.45	3478.77	.04	5.00	6.00	5.000	6.000	.00	0 .0
41.717	.0274				.0202	.84	3.90	1.83	3.49	.015	.00	.00	BOX	
1732.127	3469.604	3.998	3473.602	472.00	19.68	6.01	3479.61	.04	5.00	6.00	5.000	6.000	.00	0 .0
37.807	.0274				.0181	.69	4.03	1.73	3.49	.015	.00	.00	BOX	
1769.934	3470.640	4.193	3474.833	472.00	18.76	5.46	3480.30	.03	5.00	6.00	5.000	6.000	.00	0 .0
25.689	.0274				.0160	.41	4.23	1.61	3.49	.015	.00	.00	BOX	
1795.623	3471.344	4.398	3475.742	472.00	17.89	4.97	3480.71	.03	5.00	6.00	5.000	6.000	.00	0 .0
17.950	.0274				.0142	.26	4.43	1.50	3.49	.015	.00	.00	BOX	
1813.572	3471.837	4.613	3476.449	472.00	17.05	4.52	3480.97	.03	5.00	6.00	5.000	6.000	.00	0 .0
12.518	.0274				.0126	.16	4.64	1.40	3.49	.015	.00	.00	BOX	

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

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:50:38

GRAND PARK DETENTION BASIN - ADD1

FILE NAME: GPDB-OUTLET-15

MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1826.090	3472.180	4.838	3477.018	472.00	16.26	4.11	3481.12	.00	5.00	6.00	5.000	6.000	.00	0 .0
6.220	.0274				.0143	.09	4.84	1.30	3.49	.015	.00	.00	BOX	

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

1832.310	3472.350	5.000	3477.350	472.00	15.73	3.84	3481.19	.00	5.00	6.00	5.000	6.000	.00	0	.0				
JUNCT STR	.0988					.0011	.00	5.00	1.24		.015	.00	.00	BOX					
1832.320	3472.351	8.624	3480.975	94.00	3.76	.22	3481.19	.00	2.22	5.00	5.000	5.000	.00	0	.0				
.010	.0976					.0011	.00	8.62	.30	.83	.015	.00	.00	BOX					
1832.330	3472.352	8.650	3481.002	94.00	3.76	.22	3481.22	.00	2.22	5.00	5.000	5.000	.00	0	.0				
7.970	.0098					.0011	.01	8.65	.30	1.84	.015	.00	.00	BOX					
1840.300	3472.430	8.592	3481.022	94.00	3.76	.22	3481.24	.00	2.22	5.00	5.000	5.000	.00	0	.0				
46.700	.0409					.0011	.05	.00	.30	1.12	.015	.00	.00	BOX					
1887.000	3474.340	6.780	3481.121	94.00	3.76	.22	3481.34	.00	2.22	5.00	5.000	5.000	.00	0	.0				
22.920	.0393					.0011	.02	6.78	.30	1.13	.015	.00	.00	BOX					

1909.920	3475.240	5.916	3481.156	94.00	3.76	.22	3481.38	.00	2.22	5.00	5.000	5.000	.00	0 .0
24.300	.0390					.0011	.03	5.92	.30	1.13	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:50:38

GRAND PARK DETENTION BASIN - ADD1

FILE NAME: GPDB-OUTLET-15

MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1934.220	3476.189	5.000	3481.189	94.00	3.76	.22	3481.41	.00	2.22	5.00	5.000	5.000	.00	0 .0
5.506	.0390					.0007	.00	5.00	.30	1.13	.015	.00	.00	BOX
1939.726	3476.404	4.766	3481.170	94.00	3.94	.24	3481.41	.00	2.22	5.00	5.000	5.000	.00	0 .0
5.178	.0390					.0008	.00	4.77	.32	1.13	.015	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												
1944.904	3476.606	4.545	3481.150	94.00	4.14	.27	3481.42	.00	2.22	5.00	5.000	5.000	.00	0 .0
4.859	.0390					.0009	.00	4.54	.34	1.13	.015	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												
1949.763	3476.795	4.333	3481.128	94.00	4.34	.29	3481.42	.00	2.22	5.00	5.000	5.000	.00	0 .0
.887	.0390					.0010	.00	4.33	.37	1.13	.015	.00	.00	BOX
1950.650	3476.830	4.294	3481.124	94.00	4.38	.30	3481.42	.00	2.22	5.00	5.000	5.000	.00	0 .0
5.254	.0335					.0011	.01	4.30	.37	1.19	.015	.00	.00	BOX
1955.904	3477.006	4.094	3481.100	94.00	4.59	.33	3481.43	.00	2.22	5.00	5.000	5.000	.00	0 .0
4.896	.0335					.0012	.01	4.10	.40	1.19	.015	.00	.00	BOX
1960.801	3477.170	3.904	3481.074	94.00	4.82	.36	3481.43	.01	2.22	5.00	5.000	5.000	.00	0 .0
4.335	.0335					.0013	.01	3.91	.43	1.19	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:50:38

GRAND PARK DETENTION BASIN - ADD1

FILE NAME: GPDB-OUTLET-15

MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1965.136	3477.315	3.729	3481.045	94.00	5.04	.39	3481.44	.01	2.22	5.00	5.000	5.000	.00	0 .0
HYDRAULIC JUMP														
1965.136	3477.315	1.195	3478.510	94.00	15.74	3.84	3482.36	.06	2.22	5.00	5.000	5.000	.00	0 .0
325.332	.0335					.0335	10.90	1.25	2.54	1.19	.015	.00	.00	BOX
2290.467	3488.213	1.195	3489.408	94.00	15.74	3.84	3493.25	.06	2.22	5.00	5.000	5.000	.00	0 .0
135.027	.0335					.0323	4.36	1.25	2.54	1.19	.015	.00	.00	BOX
2425.494	3492.736	1.226	3493.962	94.00	15.34	3.65	3497.61	.06	2.22	5.00	5.000	5.000	.00	0 .0
62.034	.0335					.0291	1.81	1.28	2.44	1.19	.015	.00	.00	BOX
2487.528	3494.814	1.286	3496.100	94.00	14.62	3.32	3499.42	.05	2.22	5.00	5.000	5.000	.00	0 .0
29.442	.0335					.0254	.75	1.34	2.27	1.19	.015	.00	.00	BOX
2516.970	3495.800	1.348	3497.148	94.00	13.94	3.02	3500.17	.31	2.22	5.00	5.000	5.000	.00	0 .0
63.590	.0253					.0223	1.42	1.66	2.12	1.32	.015	.00	.00	BOX
2580.560	3497.407	1.406	3498.813	94.00	13.37	2.78	3501.59	.29	2.22	5.00	5.000	5.000	.00	0 .0
32.560	.0253					.0196	.64	1.70	1.99	1.32	.015	.00	.00	BOX
2613.119	3498.230	1.475	3499.705	94.00	12.75	2.52	3502.23	.26	2.22	5.00	5.000	5.000	.00	0 .0
19.371	.0253					.0171	.33	1.74	1.85	1.32	.015	.00	.00	BOX

2632.490	3498.720	1.547	3500.267	94.00	12.15	2.29	3502.56	.00	2.22	5.00	5.000	5.000	.00	0	.0			
25.612	.0160				.0160	.41	1.55	1.72	1.55	.015	.00	.00	BOX					

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:50:38

GRAND PARK DETENTION BASIN - ADD1

FILE NAME: GPDB-OUTLET-15

MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
2658.102	3499.130	1.547	3500.676	94.00	12.15	2.29	3502.97	.00	2.22	5.00	5.000	5.000	.00	0 .0
130.911	.0160				.0161	2.10	1.55	1.72	1.55	.015	.00	.00	BOX	
2789.013	3501.223	1.543	3502.766	94.00	12.19	2.31	3505.07	.00	2.22	5.00	5.000	5.000	.00	0 .0
123.607	.0160				.0173	2.14	1.54	1.73	1.55	.015	.00	.00	BOX	
2912.620	3503.200	1.471	3504.671	94.00	12.78	2.54	3507.21	.00	2.22	5.00	5.000	5.000	.00	0 .0
39.030	.0200				.0178	.70	1.47	1.86	1.43	.015	.00	.00	BOX	
2951.649	3503.980	1.506	3505.486	94.00	12.48	2.42	3507.91	.00	2.22	5.00	5.000	5.000	.00	0 .0
8.959	.0200				.0171	.15	1.51	1.79	1.43	.015	.00	.00	BOX	
2960.609	3504.159	1.517	3505.677	94.00	12.39	2.38	3508.06	.00	2.22	5.00	5.000	5.000	.00	0 .0
33.864	.0200				.0158	.54	1.52	1.77	1.43	.015	.00	.00	BOX	
2994.473	3504.838	1.591	3506.429	94.00	11.81	2.17	3508.60	.00	2.22	5.00	5.000	5.000	.00	0 .0
19.250	.0200				.0138	.27	1.59	1.65	1.43	.015	.00	.00	BOX	
3013.723	3505.223	1.669	3506.893	94.00	11.26	1.97	3508.86	.00	2.22	5.00	5.000	5.000	.00	0 .0
12.315	.0200				.0121	.15	1.67	1.54	1.43	.015	.00	.00	BOX	
3026.038	3505.470	1.751	3507.221	94.00	10.74	1.79	3509.01	.00	2.22	5.00	5.000	5.000	.00	0 .0
8.203	.0200				.0106	.09	1.75	1.43	1.43	.015	.00	.00	BOX	
3034.241	3505.635	1.836	3507.470	94.00	10.24	1.63	3509.10	.00	2.22	5.00	5.000	5.000	.00	0 .0
5.436	.0200				.0093	.05	1.84	1.33	1.43	.015	.00	.00	BOX	

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:50:38

GRAND PARK DETENTION BASIN - ADD1

FILE NAME: GPDB-OUTLET-15

MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
3039.676	3505.743	1.926	3507.669	94.00	9.76	1.48	3509.15	.00	2.22	5.00	5.000	5.000	.00	0 .0
3.413	.0200				.0081	.03	1.93	1.24	1.43	.015	.00	.00	BOX	
3043.089	3505.812	2.020	3507.831	94.00	9.31	1.35	3509.18	.00	2.22	5.00	5.000	5.000	.00	0 .0
1.843	.0200				.0072	.01	2.02	1.15	1.43	.015	.00	.00	BOX	
3044.932	3505.849	2.118	3507.967	94.00	8.88	1.22	3509.19	.00	2.22	5.00	5.000	5.000	.00	0 .0
.568	.0200				.0063	.00	2.12	1.07	1.43	.015	.00	.00	BOX	
3045.500	3505.860	2.223	3508.083	94.00	8.46	1.11	3509.19	.00	2.22	5.00	5.000	5.000	.00	0 .0

C.2.3

Detention Basin Inlet – North - 0.013 Roughness

GPDB-IN-NORTH-13

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T1 GRAND PARK DETENTION BASIN NORTH MAINLINE INLET
T2 FILE NAME: GPDB-IN-NORTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY IMPACT
T3 LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN
SO   1000.00 3507.36   5      .013
R    1668.87 3523.41   5      .013                                  0.00    0.00  0
R    1670.70 3523.46   5      .013                                -34.95    0.00  0
R    1725.87 3524.60   5      .013                                  0.00    0.00  0
R    1727.71 3524.64   5      .013                                -35.14    0.00  0
R    1837.69 3527.49   5      .013                                  0.00    0.00  0
R    1906.08 3529.06   5      .013                                  0.00    0.00  0
JX   1906.08 3529.06   5 24   .013   12.00          3529.56         -90.0
R    1960.38 3530.31   5      .013                                  0.00    0.00  0
TS   1969.52 3530.52   5      .013                                  0.00    0.00  0
R    1974.52 3530.64   5      .023                                  0.00    0.00  0
R    2036.52 3532.07   5      .023                                  0.00    0.00  0
JX   2036.52 3532.07   5 48   .023   49.00          3532.51         -45.0
R    2051.62 3532.41   5      .023                                  0.00    0.00  0
R    2196.62 3541.84   5      .023
TS   2201.62 3542.16   1      .023                                  0.00    0.00  0
R    2601.62 3568.16   1      .023                                  0.00    0.00  0
R    2646.14 3571.05   1      .023                                  0.00    0.00  0
JX   2646.14 3571.05   1 24   .023    7.00          3571.55         -90.0
R    2697.81 3574.41   1      .023                                  0.00    0.00  0
JX   2697.81 3574.41   1 24   .023    0.01          3574.91          90.0
R    2794.89 3580.72   1      .023                                  0.00    0.00  0
JX   2794.89 3580.72   1 48   .023   72.00          3581.22         -90.0
R    2801.60 3581.16   1      .023                                  0.00    0.00  0
R    2862.65 3585.13   1      .023                                  0.00   -6.76  0
R    3078.77 3599.18   1      .023                                  0.00   -6.26  0
R    3112.58 3601.38   1      .023                                  0.00    0.00  0
JX   3112.58 3601.38   1 24 24.023    0.01     0.01 3601.88 3601.88  90.0-90.0
R    3243.76 3609.90   1      .023                                  0.00    0.00  0
R    3378.75 3618.68   1      .013                                  0.00  -14.30  0
R    3535.15 3624.39   1      .013                                -39.58    0.00  0
JX   3535.15 3624.39   1 54   .013  132.00          3625.23          45.0
R    3573.06 3625.77   1      .013                                 -9.59    0.00  0
R    3584.85 3626.20   1      .013                                  0.00    0.00  0
R    3585.83 3626.24   1      .013                                -22.46    0.00  0
R    3598.03 3626.68   1      .013                                  0.44    0.00  0
JX   3598.03 3626.68   1 24 24.013    0.01     0.01 3627.20 3627.20  56.0-90.0
R    3621.62 3627.54   1      .013                                  0.85    0.00  0
R    3645.10 3628.40   1      .013                                  0.85    0.00  0
JX   3645.10 3628.40   1 48   .013   27.00          3628.59          45.0
TS   3650.10 3628.58   2      .013
R    3770.21 3632.97   2      .013                                  4.52    0.00  0
R    3873.45 3641.02   2      .013                                  3.73    0.00  0
TS   3878.45 3641.41   3      .013
R    4059.24 3655.51   3      .023                                  6.72    0.00  0
JX   4059.24 3655.51   3 24 24.023    0.01     0.01 3656.01 3656.01  90.0-90.0
R    4265.53 3671.61   3      .023                                  7.46    0.00  0
R    4364.59 3677.71   3      .013                                  3.55    0.00  0
R    4534.20 3682.12   3      .013                                  6.14    0.00  0
JX   4534.20 3682.12   3 42   .013    4.00          3682.62          90.0
R    4575.70 3683.20   3      .013                                  1.50    0.00  0
JX   4575.70 3683.20   3 24   .013    0.01          3683.70         -90.0
R    4617.16 3684.28   3      .013                                  1.50    0.00  0
JX   4617.16 3684.28   3 42   .013   27.00          3684.78          90.0
R    4650.71 3685.14   3      .013                                  1.21    0.00  0
TS   4655.71 3685.41   4      .013
R    4811.87 3693.82   4      .013                                  0.00    0.00  0
R    4986.87 3705.50   4      .013                                  0.00    0.00  0
R    5132.97 3709.93   4      .013                                  0.00    0.00  0
JX   5132.97 3709.93   4 30   .013   19.00          3710.43          45.0
R    5146.18 3710.33   4      .013                                  0.00    0.00  0
R    5147.26 3710.36   4      .013                                 24.75    0.00  0
R    5247.67 3717.80   4      .013                                  0.00    0.00  0
SH   5247.67 3717.80   4
CD   1  3   0    .00    7.00     6.00  0.00  0.00
CD   2  3   0    .00    7.00     5.00  0.00  0.00
CD   3  3   0    .00    6.00     5.00  0.00  0.00
CD   4  3   0    .00    5.00     5.00  0.00  0.00
CD   5  3   0    .00    7.00     7.00  0.00  0.00
CD  24  4   1    .00    2.00      .00  0.00  0.00
CD  30  4   1    .00    2.50      .00  0.00  0.00
CD  36  4   1    .00    3.00      .00  0.00  0.00
CD  42  4   1    .00    3.50      .00  0.00  0.00
CD  48  4   1    .00    4.00      .00  0.00  0.00
CD  54  4   1    .00    4.50      .00  0.00  0.00
CD  60  4   1    .00    5.00      .00  0.00  0.00
Q           567.00   .0
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Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-23-2020 Time: 8:34: 2

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY

IM LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1000.000	3507.360	4.693	3512.053	916.08	27.89	12.08	3524.13	.00	7.00	7.00	7.000	7.000	.00	0 .0
21.156	.0240					.0235	.50	4.69	2.27	4.66	.013	.00	.00	BOX
1021.156	3507.868	4.695	3512.563	916.08	27.87	12.07	3524.63	.00	7.00	7.00	7.000	7.000	.00	0 .0
474.507	.0240					.0222	10.52	4.69	2.27	4.66	.013	.00	.00	BOX
1495.662	3519.254	4.924	3524.178	916.08	26.58	10.97	3535.15	.00	7.00	7.00	7.000	7.000	.00	0 .0
173.208	.0240					.0196	3.40	4.92	2.11	4.66	.013	.00	.00	BOX
1668.870	3523.410	5.164	3528.574	916.08	25.34	9.97	3538.55	7.00	7.00	7.00	7.000	7.000	.00	0 .0
1.830	.0273					.0184	.03	7.00	1.97	4.43	.013	.00	.00	BOX
1670.700	3523.460	5.170	3528.630	916.08	25.32	9.95	3538.58	.00	7.00	7.00	7.000	7.000	.00	0 .0
55.170	.0207					.0182	1.00	5.17	1.96	4.94	.013	.00	.00	BOX
1725.870	3524.600	5.219	3529.819	916.08	25.08	9.76	3539.58	7.00	7.00	7.00	7.000	7.000	.00	0 .0
1.840	.0216					.0179	.03	7.00	1.93	4.85	.013	.00	.00	BOX
1727.710	3524.640	5.221	3529.861	916.08	25.07	9.76	3539.62	.00	7.00	7.00	7.000	7.000	.00	0 .0
56.702	.0259					.0171	.97	5.22	1.93	4.52	.013	.00	.00	BOX
1784.412	3526.109	5.417	3531.527	916.08	24.16	9.06	3540.59	.00	7.00	7.00	7.000	7.000	.00	0 .0
53.278	.0259					.0154	.82	5.42	1.83	4.52	.013	.00	.00	BOX
1837.690	3527.490	5.682	3533.172	916.08	23.03	8.24	3541.41	.00	7.00	7.00	7.000	7.000	.00	0 .0
24.841	.0230					.0141	.35	5.68	1.70	4.74	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-23-2020 Time: 8:34: 2

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY

IM LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1862.531	3528.060	5.803	3533.863	916.08	22.55	7.90	3541.76	.00	7.00	7.00	7.000	7.000	.00	0 .0
43.549	.0230					.0130	.57	5.80	1.65	4.74	.013	.00	.00	BOX
1906.080	3529.060	6.086	3535.146	916.08	21.50	7.18	3542.33	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0127	.00	6.09	1.54		.013	.00	.00	BOX
1906.080	3529.060	5.824	3534.884	904.08	22.18	7.64	3542.52	.00	7.00	7.00	7.000	7.000	.00	0 .0
21.259	.0230					.0129	.27	5.82	1.62	4.69	.013	.00	.00	BOX
1927.339	3529.550	5.965	3535.514	904.08	21.65	7.28	3542.79	.00	7.00	7.00	7.000	7.000	.00	0 .0
33.041	.0230					.0118	.39	5.96	1.56	4.69	.013	.00	.00	BOX
1960.380	3530.310	6.256	3536.566	904.08	20.65	6.62	3543.18	.00	7.00	7.00	7.000	7.000	.00	0 .0
TRANS STR	.0230					.0109	.10	6.26	1.45		.013	.00	.00	BOX
1969.520	3530.520	6.342	3536.862	904.08	20.37	6.44	3543.30	.00	7.00	7.00	7.000	7.000	.00	0 .0
5.000	.0240					.0339	.17	6.34	1.43	7.00	.023	.00	.00	BOX

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

1974.520	3530.640	6.294	3536.934	904.08	20.52	6.54	3543.47	.00	7.00	7.00	7.000	7.000	.00	0 .0
12.422	.0231					.0351	.44	6.29	1.44	7.00	.023	.00	.00	BOX
1986.942	3530.927	6.163	3537.089	904.08	20.96	6.82	3543.91	.00	7.00	7.00	7.000	7.000	.00	0 .0

25.880	.0231					.0383	.99	6.16	1.49	7.00	.023	.00	.00	BOX					

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-23-2020 Time: 8:34: 2

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY

IM LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
2012.822	3531.523	5.876	3537.399	904.08	21.98	7.50	3544.90	.00	7.00	7.00	7.000	7.000	.00	0 .0
23.698	.0231					.0432	1.02	5.88	1.60	7.00	.023	.00	.00	BOX
2036.520	3532.070	5.603	3537.673	904.08	23.05	8.25	3545.92	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0526	.00	5.60	1.72		.023	.00	.00	BOX
2036.520	3532.070	4.833	3536.904	855.08	25.27	9.92	3546.82	.00	7.00	7.00	7.000	7.000	.00	0 .0
15.100	.0225					.0626	.95	4.83	2.03	7.00	.023	.00	.00	BOX
2051.620	3532.410	4.653	3537.063	855.08	26.26	10.70	3547.77	.00	7.00	7.00	7.000	7.000	.00	0 .0
145.000	.0650					.0673	9.76	4.65	2.15	4.67	.023	.00	.00	BOX
2196.620	3541.840	4.564	3546.404	855.08	26.77	11.12	3557.53	.00	7.00	7.00	7.000	7.000	.00	0 .0
TRANS STR	.0640					.0670	.33	4.56	2.21		.023	.00	.00	BOX
2201.620	3542.160	5.548	3547.708	855.08	25.69	10.24	3557.95	.00	7.00	6.00	7.000	6.000	.00	0 .0
215.113	.0650					.0650	13.98	5.55	1.92	5.55	.023	.00	.00	BOX
2416.733	3556.142	5.548	3561.691	855.08	25.69	10.24	3571.94	.00	7.00	6.00	7.000	6.000	.00	0 .0
184.887	.0650					.0629	11.63	5.55	1.92	5.55	.023	.00	.00	BOX
2601.620	3568.160	5.701	3573.861	855.08	25.00	9.70	3583.56	.00	7.00	6.00	7.000	6.000	.00	0 .0
44.520	.0649					.0595	2.65	5.70	1.85	5.55	.023	.00	.00	BOX
2646.140	3571.050	5.806	3576.856	855.08	24.55	9.36	3586.21	.00	7.00	6.00	7.000	6.000	.00	0 .0
JUNCT STR	.0000					.0594	.00	5.81	1.80		.023	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-23-2020 Time: 8:34: 2

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY

IM LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
2646.140	3571.050	5.671	3576.721	848.08	24.92	9.65	3586.37	.00	7.00	6.00	7.000	6.000	.00	0 .0
51.670	.0650					.0588	3.04	5.67	1.84	5.51	.023	.00	.00	BOX
2697.810	3574.410	5.812	3580.222	848.07	24.32	9.18	3589.41	.00	7.00	6.00	7.000	6.000	.00	0 .0
13.790	.0650					.0564	.78	5.81	1.78	5.51	.023	.00	.00	BOX
2711.600	3575.306	5.868	3581.174	848.07	24.09	9.01	3590.18	.00	7.00	6.00	7.000	6.000	.00	0 .0
43.177	.0650					.0527	2.27	5.87	1.75	5.51	.023	.00	.00	BOX
2754.777	3578.113	6.154	3584.267	848.07	22.97	8.19	3592.46	.00	7.00	6.00	7.000	6.000	.00	0 .0
24.530	.0650					.0469	1.15	6.15	1.63	5.51	.023	.00	.00	BOX
2779.307	3579.707	6.454	3586.161	848.07	21.90	7.45	3593.61	.00	7.00	6.00	7.000	6.000	.00	0 .0
15.583	.0650					.0418	.65	6.45	1.52	5.51	.023	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												
2794.890	3580.720	6.769	3587.489	848.07	20.88	6.77	3594.26	.00	7.00	6.00	7.000	6.000	.00	0 .0
JUNCT STR	.0000					.0523	.00	6.77	1.41		.023	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												
2794.890	3580.720	5.121	3585.841	776.07	25.26	9.90	3595.75	.00	7.00	6.00	7.000	6.000	.00	0 .0

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    6.710    .0656                                        .0653      .44     5.12    1.97    5.11    .023       .00   .00  BOX

                                Program Package Serial Number: 1513
                                                WATER SURFACE PROFILE LISTING                    Date: 1-23-2020  Time: 8:34: 2
                            GRAND PARK DETENTION BASIN NORTH MAINLINE INLET
                              FILE NAME: GPDB-IN-NORTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY
                            IM  LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN
 ********************************************************************************************************************** ********
         | 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
 ********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|******|*******
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 2801.600  3581.160    5.121  3586.281    776.07   25.26    9.90  3596.19     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   61.050    .0650                                        .0655     4.00     5.12    1.97    5.13    .023       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 2862.650  3585.130    5.112  3590.242    776.07   25.30    9.94  3600.18     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   85.317    .0650                                        .0661     5.64     5.11    1.97    5.13    .023       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 2947.967  3590.676    5.079  3595.755    776.07   25.47   10.07  3605.83     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
  130.803    .0650                                        .0709     9.27     5.08    1.99    5.13    .023       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3078.770  3599.180    4.843  3604.022    776.07   26.71   11.08  3615.10     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   33.810    .0651                                        .0774     2.62     4.84    2.14    5.13    .023       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3112.580  3601.380    4.730  3606.110    776.05   27.34   11.61  3617.72     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   42.415    .0649                                        .0841     3.57     4.73    2.22    5.13    .023       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3154.996  3604.135    4.538  3608.672    776.05   28.50   12.62  3621.29     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   35.925    .0649                                        .0942     3.38     4.54    2.36    5.13    .023       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3190.920  3606.468    4.327  3610.794    776.05   29.90   13.88  3624.67     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   28.663    .0649                                        .1063     3.05     4.33    2.53    5.13    .023       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3219.583  3608.330    4.125  3612.455    776.05   31.35   15.27  3627.72     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   24.177    .0649                                        .1201     2.90     4.13    2.72    5.13    .023       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3243.760  3609.900    3.933  3613.833    776.05   32.88   16.79  3630.63     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   34.979    .0650                                        .0391     1.37     3.93    2.92    3.29    .013       .00   .00  BOX

                                Program Package Serial Number: 1513
                                                WATER SURFACE PROFILE LISTING                    Date: 1-23-2020  Time: 8:34: 2
                            GRAND PARK DETENTION BASIN NORTH MAINLINE INLET
                              FILE NAME: GPDB-IN-NORTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY
                            IM  LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN
 ********************************************************************************************************************** ********
         | 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
 ********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|******|*******
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3278.740  3612.175    4.060  3616.235    776.05   31.86   15.76  3631.99     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   41.624    .0650                                        .0354     1.47     4.06    2.79    3.29    .013       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3320.364  3614.882    4.258  3619.141    776.05   30.37   14.33  3633.47     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   32.471    .0650                                        .0313     1.02     4.26    2.59    3.29    .013       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3352.835  3616.994    4.466  3621.460    776.05   28.96   13.02  3634.48     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   25.915    .0650                                        .0278      .72     4.47    2.42    3.29    .013       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3378.750  3618.680    4.684  3623.364    776.05   27.61   11.84  3635.20     .63    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   66.412    .0365                                        .0247     1.64     5.31    2.25    4.10    .013       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3445.162  3621.104    4.893  3625.998    776.05   26.43   10.85  3636.85     .58    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   51.774    .0365                                        .0221     1.14     5.47    2.11    4.10    .013       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3496.936  3622.995    5.132  3628.126    776.05   25.20    9.86  3637.99     .52    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
   38.214    .0365                                        .0196      .75     5.65    1.96    4.10    .013       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3535.150  3624.390    5.382  3629.772    776.05   24.03    8.97  3638.74     .00    7.00     6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-    -|
 JUNCT STR   .0000                                        .0271      .00    5.86    1.83             .013       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 3535.150  3624.390    3.579  3627.969    644.05   29.99   13.97  3641.94     .74    7.00     6.00    7.000    6.000   .00   0   .0
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 4059.240  3655.510    4.814  3660.323    617.01   25.63   10.20  3670.53     .06    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
   93.472    .0780                                  .0854     7.98     4.88    2.06    4.89    .023       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4152.711  3662.805    4.618  3667.423    617.01   26.72   11.09  3678.51     .07    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
   51.514    .0780                                  .0954     4.91     4.69    2.19    4.89    .023       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4204.225  3666.825    4.403  3671.228    617.01   28.03   12.20  3683.43     .08    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
   34.591    .0780                                  .1074     3.71     4.48    2.35    4.89    .023       .00   .00  BOX
 FILE: GPDB-IN-NORTH-13.WSW                W S P G W - CIVILDESIGN Version 14.05                                        PAGE    9
                            Program Package Serial Number: 1513
                                                WATER SURFACE PROFILE LISTING                    Date: 1-23-2020  Time: 8:34: 2
                          GRAND PARK DETENTION BASIN NORTH MAINLINE INLET
                            FILE NAME: GPDB-IN-NORTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY
                          IM  LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN
 ********************************************************************************************************************** ********
         | 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
 ********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****  |*******
         |         |        |         |         |       |       |         |       |        |        |       |       |       |
 4238.816  3669.525    4.198  3673.723    617.01   29.40   13.42  3687.14     .08    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
   26.713    .0780                                  .1210     3.23     4.28    2.53    4.89    .023       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4265.530  3671.610    4.003  3675.612    617.01   30.83   14.76  3690.37     .09    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
   20.861    .0616                                  .0401      .84     4.09    2.72    3.41    .013       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4286.391  3672.895    4.074  3676.969    617.01   30.29   14.24  3691.21     .09    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
   44.519    .0616                                  .0370     1.65     4.16    2.64    3.41    .013       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4330.910  3675.636    4.273  3679.909    617.01   28.88   12.95  3692.86     .08    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
   33.680    .0616                                  .0328     1.11     4.35    2.46    3.41    .013       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4364.590  3677.710    4.482  3682.192    617.01   27.53   11.77  3693.96     .07    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
   40.836    .0260                                  .0313     1.28     4.56    2.29    4.81    .013       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4405.426  3678.772    4.432  3683.204    617.01   27.84   12.04  3695.24     .08    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
  128.774    .0260                                  .0337     4.35     4.51    2.33    4.81    .013       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4534.200  3682.120    4.226  3686.346    617.01   29.20   13.24  3699.59     .00    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
 JUNCT STR   .0000                                  .0362      .00    4.31    2.50            .013       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4534.200  3682.120    4.161  3686.281    613.01   29.46   13.48  3699.76     .09    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
   41.500    .0260                                  .0376     1.56     4.25    2.55    4.78    .013       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4575.700  3683.200    4.076  3687.276    613.00   30.08   14.05  3701.32     .09    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
   41.460    .0261                                  .0398     1.65     4.16    2.63    4.78    .013       .00   .00  BOX
 FILE: GPDB-IN-NORTH-13.WSW                W S P G W - CIVILDESIGN Version 14.05                                        PAGE   10
                            Program Package Serial Number: 1513
                                                WATER SURFACE PROFILE LISTING                    Date: 1-23-2020  Time: 8:34: 2
                          GRAND PARK DETENTION BASIN NORTH MAINLINE INLET
                            FILE NAME: GPDB-IN-NORTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY
                          IM  LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN
 ********************************************************************************************************************** ********
         | 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
 ********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****  |*******
         |         |        |         |         |       |       |         |       |        |        |       |       |       |
 4617.160  3684.280    3.984  3688.264    613.00   30.78   14.71  3702.97     .00    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
 JUNCT STR   .0000                                  .0447      .00    4.08    2.72            .013       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4617.160  3684.280    3.595  3687.875    586.00   32.60   16.50  3704.38     .10    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
   33.550    .0256                                  .0502     1.68     3.70    3.03    4.64    .013       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4650.710  3685.140    3.499  3688.639    586.00   33.50   17.42  3706.06     .00    6.00     5.00    6.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
 TRANS STR   .0540                                  .0519      .26    3.50    3.16            .013       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4655.710  3685.410    3.499  3688.909    586.00   33.49   17.42  3706.33     .00    5.00     5.00    5.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
  156.160    .0539                                  .0510     7.96     3.50    3.16    3.45    .013       .00   .00  BOX
         |         |        |        |        |        |        |        |       |       |       |       |       |      |
 4811.870  3693.820    3.551  3697.371    586.00   33.01   16.92  3714.29     .00    5.00     5.00    5.000    5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-      -|-     -|-     -|-     |-
   50.378    .0667                                  .0481     2.42     3.55    3.09    3.17    .013       .00   .00  BOX
```

4862.249	3697.183	3.667	3700.850	586.00	31.96	15.86	3716.71	.00	5.00	5.00	5.000	5.000	.00	0 .0
54.249	.0667					.0435	2.36	3.67	2.94	3.17	.013	.00	.00	BOX
4916.497	3700.803	3.846	3704.649	586.00	30.47	14.42	3719.07	.00	5.00	5.00	5.000	5.000	.00	0 .0
39.814	.0667					.0385	1.53	3.85	2.74	3.17	.013	.00	.00	BOX
4956.312	3703.460	4.034	3707.494	586.00	29.06	13.11	3720.60	.00	5.00	5.00	5.000	5.000	.00	0 .0
30.559	.0667					.0342	1.04	4.03	2.55	3.17	.013	.00	.00	BOX
4986.870	3705.500	4.231	3709.730	586.00	27.70	11.92	3721.65	.00	5.00	5.00	5.000	5.000	.00	0 .0
146.100	.0303					.0329	4.81	4.23	2.37	4.33	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-23-2020 Time: 8:34: 2

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY

IM LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
5132.970	3709.930	4.151	3714.081	586.00	28.24	12.38	3726.46	.00	5.00	5.00	5.000	5.000	.00	0 .0
JUNCT STR	.0000					.0359	.00	4.15	2.44		.013	.00	.00	BOX
5132.970	3709.930	3.854	3713.783	567.00	29.43	13.45	3727.23	.00	5.00	5.00	5.000	5.000	.00	0 .0
13.210	.0303					.0383	.51	3.85	2.64	4.22	.013	.00	.00	BOX
5146.180	3710.330	3.836	3714.166	567.00	29.56	13.57	3727.74	5.00	5.00	5.00	5.000	5.000	.00	0 .0
1.080	.0278					.0385	.04	5.00	2.66	4.37	.013	.00	.00	BOX
5147.260	3710.360	3.834	3714.194	567.00	29.58	13.59	3727.78	.00	5.00	5.00	5.000	5.000	.00	0 .0
16.707	.0741					.0373	.62	3.83	2.66	2.97	.013	.00	.00	BOX
5163.966	3711.598	3.939	3715.537	567.00	28.79	12.87	3728.41	.00	5.00	5.00	5.000	5.000	.00	0 .0
24.362	.0741					.0340	.83	3.94	2.56	2.97	.013	.00	.00	BOX
5188.329	3713.403	4.131	3717.534	567.00	27.45	11.70	3729.23	.00	5.00	5.00	5.000	5.000	.00	0 .0
19.611	.0741					.0301	.59	4.13	2.38	2.97	.013	.00	.00	BOX
5207.940	3714.856	4.333	3719.189	567.00	26.17	10.64	3729.82	.00	5.00	5.00	5.000	5.000	.00	0 .0
15.963	.0741					.0268	.43	4.33	2.22	2.97	.013	.00	.00	BOX
5223.903	3716.039	4.545	3720.583	567.00	24.95	9.67	3730.25	.00	5.00	5.00	5.000	5.000	.00	0 .0
13.065	.0741					.0238	.31	4.54	2.06	2.97	.013	.00	.00	BOX

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

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-23-2020 Time: 8:34: 2

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY

IM LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
5236.968	3717.007	4.766	3721.773	567.00	23.79	8.79	3730.56	.00	5.00	5.00	5.000	5.000	.00	0 .0
10.702	.0741					.0258	.28	4.77	1.92	2.97	.013	.00	.00	BOX

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

5247.670	3717.800	5.000	3722.800	567.00	22.68	7.99	3730.79	.00	5.00	5.00	5.000	5.000	.00	0 .0

C.2.4

Detention Basin Inlet – North - 0.015 Roughness

GPDB-IN-NORTH-15

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T1 GRAND PARK DETENTION BASIN NORTH MAINLINE INLET
T2 FILE NAME: GPDB-IN-NORTH-15.WSW - MANNINGS=0.015 MODEL TO TEST HGL IMPACT
T3 LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN
SO   1000.00 3507.36   5      .015
R    1668.87 3523.41   5      .015                                  0.00    0.00  0
R    1670.70 3523.46   5      .015                                -34.95    0.00  0
R    1725.87 3524.60   5      .015                                  0.00    0.00  0
R    1727.71 3524.64   5      .015                                -35.14    0.00  0
R    1837.69 3527.49   5      .015                                  0.00    0.00  0
R    1906.08 3529.06   5      .015                                  0.00    0.00  0
JX   1906.08 3529.06   5 24   .015   12.00          3529.56         -90.0
R    1960.38 3530.31   5      .015                                  0.00    0.00  0
TS   1969.52 3530.52   5      .015                                  0.00    0.00  0
R    1974.52 3530.64   5      .023                                  0.00    0.00  0
R    2036.52 3532.07   5      .023                                  0.00    0.00  0
JX   2036.52 3532.07   5 48   .023   49.00          3532.51         -45.0
R    2051.62 3532.41   5      .023                                  0.00    0.00  0
R    2196.62 3541.84   5      .023
TS   2201.62 3542.16   1      .023                                  0.00    0.00  0
R    2601.62 3568.16   1      .023                                  0.00    0.00  0
R    2646.14 3571.05   1      .023                                  0.00    0.00  0
JX   2646.14 3571.05   1 24   .023    7.00          3571.55         -90.0
R    2697.81 3574.41   1      .023                                  0.00    0.00  0
JX   2697.81 3574.41   1 24   .023    0.01          3574.91          90.0
R    2794.89 3580.72   1      .023                                  0.00    0.00  0
JX   2794.89 3580.72   1 48   .023   72.00          3581.22         -90.0
R    2801.60 3581.16   1      .023                                  0.00    0.00  0
R    2862.65 3585.13   1      .023                                  0.00   -6.76  0
R    3078.77 3599.18   1      .023                                  0.00   -6.26  0
R    3112.58 3601.38   1      .023                                  0.00    0.00  0
JX   3112.58 3601.38   1 24 24.023    0.01     0.01 3601.88 3601.88  90.0-90.0
R    3243.76 3609.90   1      .023                                  0.00    0.00  0
R    3378.75 3618.68   1      .015                                  0.00  -14.30  0
R    3535.15 3624.39   1      .015                                -39.58    0.00  0
JX   3535.15 3624.39   1 54   .015  132.00          3625.23          45.0
R    3573.06 3625.77   1      .015                                 -9.59    0.00  0
R    3584.85 3626.20   1      .015                                  0.00    0.00  0
R    3585.83 3626.24   1      .015                                -22.46    0.00  0
R    3598.03 3626.68   1      .015                                  0.44    0.00  0
JX   3598.03 3626.68   1 24 24.015    0.01     0.01 3627.20 3627.20  56.0-90.0
R    3621.62 3627.54   1      .015                                  0.85    0.00  0
R    3645.10 3628.40   1      .015                                  0.85    0.00  0
JX   3645.10 3628.40   1 48   .015   27.00          3628.59          45.0
TS   3650.10 3628.58   2      .015
R    3770.21 3632.97   2      .015                                  4.52    0.00  0
R    3873.45 3641.02   2      .015                                  3.73    0.00  0
TS   3878.45 3641.41   3      .015
R    4059.24 3655.51   3      .023                                  6.72    0.00  0
JX   4059.24 3655.51   3 24 24.023    0.01     0.01 3656.01 3656.01  90.0-90.0
R    4265.53 3671.61   3      .023                                  7.46    0.00  0
R    4364.59 3677.71   3      .015                                  3.55    0.00  0
R    4534.20 3682.12   3      .015                                  6.14    0.00  0
JX   4534.20 3682.12   3 42   .015    4.00          3682.62          90.0
R    4575.70 3683.20   3      .015                                  1.50    0.00  0
JX   4575.70 3683.20   3 24   .015    0.01          3683.70         -90.0
R    4617.16 3684.28   3      .015                                  1.50    0.00  0
JX   4617.16 3684.28   3 42   .015   27.00          3684.78          90.0
R    4650.71 3685.14   3      .015                                  1.21    0.00  0
TS   4655.71 3685.41   4      .015
R    4811.87 3693.82   4      .015                                  0.00    0.00  0
R    4986.87 3705.50   4      .015                                  0.00    0.00  0
R    5132.97 3709.93   4      .015                                  0.00    0.00  0
JX   5132.97 3709.93   4 30   .015   19.00          3710.43          45.0
R    5146.18 3710.33   4      .015                                  0.00    0.00  0
R    5147.26 3710.36   4      .015                                 24.75    0.00  0
R    5247.67 3717.80   4      .015                                  0.00    0.00  0
SH   5247.67 3717.80   4
CD   1  3   0    .00    7.00     6.00  0.00  0.00
CD   2  3   0    .00    7.00     5.00  0.00  0.00
CD   3  3   0    .00    6.00     5.00  0.00  0.00
CD   4  3   0    .00    5.00     5.00  0.00  0.00
CD   5  3   0    .00    7.00     7.00  0.00  0.00
CD  24  4   1    .00    2.00      .00  0.00  0.00
CD  30  4   1    .00    2.50      .00  0.00  0.00
CD  36  4   1    .00    3.00      .00  0.00  0.00
CD  42  4   1    .00    3.50      .00  0.00  0.00
CD  48  4   1    .00    4.00      .00  0.00  0.00
CD  54  4   1    .00    4.50      .00  0.00  0.00
CD  60  4   1    .00    5.00      .00  0.00  0.00
Q           567.00   .0
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Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-23-2020 Time: 8:36:11

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15.WSW - MANNINGS=0.015 MODEL TO TEST HGL IMPAC

T LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1000.000	3507.360	5.219	3512.579	916.08	25.08	9.77	3522.34	.00	7.00	7.00	7.000	7.000	.00	0 .0
342.779	.0240					.0237	8.11	5.22	1.93	5.21	.015	.00	.00	BOX
1342.779	3515.585	5.260	3520.845	916.08	24.88	9.61	3530.46	.00	7.00	7.00	7.000	7.000	.00	0 .0
326.091	.0240					.0221	7.21	5.26	1.91	5.21	.015	.00	.00	BOX
1668.870	3523.410	5.517	3528.927	916.08	23.72	8.74	3537.67	7.00	7.00	7.00	7.000	7.000	.00	0 .0
1.830	.0273					.0208	.04	7.00	1.78	4.95	.015	.00	.00	BOX
1670.700	3523.460	5.522	3528.982	916.08	23.70	8.72	3537.70	.00	7.00	7.00	7.000	7.000	.00	0 .0
55.170	.0207					.0207	1.14	5.52	1.78	5.53	.015	.00	.00	BOX
1725.870	3524.600	5.519	3530.119	916.08	23.71	8.73	3538.85	7.00	7.00	7.00	7.000	7.000	.00	0 .0
1.840	.0216					.0208	.04	7.00	1.78	5.43	.015	.00	.00	BOX
1727.710	3524.640	5.519	3530.159	916.08	23.71	8.73	3538.89	.00	7.00	7.00	7.000	7.000	.00	0 .0
44.467	.0259					.0202	.90	5.52	1.78	5.06	.015	.00	.00	BOX
1772.177	3525.792	5.642	3531.435	916.08	23.19	8.35	3539.79	.00	7.00	7.00	7.000	7.000	.00	0 .0
65.513	.0259					.0185	1.21	5.64	1.72	5.06	.015	.00	.00	BOX
1837.690	3527.490	5.918	3533.408	916.08	22.11	7.59	3541.00	.00	7.00	7.00	7.000	7.000	.00	0 .0
10.762	.0230					.0173	.19	5.92	1.60	5.30	.015	.00	.00	BOX
1848.452	3527.737	5.957	3533.694	916.08	21.97	7.49	3541.19	.00	7.00	7.00	7.000	7.000	.00	0 .0
57.628	.0230					.0162	.93	5.96	1.59	5.30	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-23-2020 Time: 8:36:11

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15.WSW - MANNINGS=0.015 MODEL TO TEST HGL IMPAC

T LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1906.080	3529.060	6.248	3535.308	916.08	20.95	6.81	3542.12	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0159	.00	6.25	1.48		.015	.00	.00	BOX
1906.080	3529.060	5.964	3535.024	904.08	21.66	7.28	3542.31	.00	7.00	7.00	7.000	7.000	.00	0 .0
5.500	.0230					.0166	.09	5.96	1.56	5.24	.015	.00	.00	BOX
1911.580	3529.187	5.988	3535.175	904.08	21.57	7.22	3542.40	.00	7.00	7.00	7.000	7.000	.00	0 .0
48.800	.0230					.0156	.76	5.99	1.55	5.24	.015	.00	.00	BOX
1960.380	3530.310	6.281	3536.591	904.08	20.56	6.57	3543.16	.00	7.00	7.00	7.000	7.000	.00	0 .0
TRANS STR	.0230					.0145	.13	6.28	1.45		.015	.00	.00	BOX
1969.520	3530.520	6.342	3536.862	904.08	20.37	6.44	3543.30	.00	7.00	7.00	7.000	7.000	.00	0 .0
5.000	.0240					.0339	.17	6.34	1.43	7.00	.023	.00	.00	BOX

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

1974.520	3530.640	6.294	3536.934	904.08	20.52	6.54	3543.47	.00	7.00	7.00	7.000	7.000	.00	0 .0
12.422	.0231					.0351	.44	6.29	1.44	7.00	.023	.00	.00	BOX
1986.942	3530.927	6.163	3537.089	904.08	20.96	6.82	3543.91	.00	7.00	7.00	7.000	7.000	.00	0 .0
25.880	.0231					.0383	.99	6.16	1.49	7.00	.023	.00	.00	BOX
2012.822	3531.523	5.876	3537.399	904.08	21.98	7.50	3544.90	.00	7.00	7.00	7.000	7.000	.00	0 .0

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
23.698	.0231					.0432	1.02	5.88	1.60	7.00	.023	.00	.00	BOX
2036.520	3532.070	5.603	3537.673	904.08	23.05	8.25	3545.92	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0526	.00	5.60	1.72		.023	.00	.00	BOX
2036.520	3532.070	4.833	3536.904	855.08	25.27	9.92	3546.82	.00	7.00	7.00	7.000	7.000	.00	0 .0
15.100	.0225					.0626	.95	4.83	2.03	7.00	.023	.00	.00	BOX
2051.620	3532.410	4.653	3537.063	855.08	26.26	10.70	3547.77	.00	7.00	7.00	7.000	7.000	.00	0 .0
145.000	.0650					.0673	9.76	4.65	2.15	4.67	.023	.00	.00	BOX
2196.620	3541.840	4.564	3546.404	855.08	26.77	11.12	3557.53	.00	7.00	7.00	7.000	7.000	.00	0 .0
TRANS STR	.0640					.0670	.33	4.56	2.21		.023	.00	.00	BOX
2201.620	3542.160	5.548	3547.708	855.08	25.69	10.24	3557.95	.00	7.00	6.00	7.000	6.000	.00	0 .0
215.120	.0650					.0650	13.98	5.55	1.92	5.55	.023	.00	.00	BOX
2416.740	3556.143	5.548	3561.691	855.08	25.69	10.24	3571.94	.00	7.00	6.00	7.000	6.000	.00	0 .0
184.880	.0650					.0629	11.63	5.55	1.92	5.55	.023	.00	.00	BOX
2601.620	3568.160	5.702	3573.862	855.08	24.99	9.70	3583.56	.00	7.00	6.00	7.000	6.000	.00	0 .0
44.520	.0649					.0594	2.65	5.70	1.84	5.55	.023	.00	.00	BOX
2646.140	3571.050	5.807	3576.857	855.08	24.54	9.35	3586.21	.00	7.00	6.00	7.000	6.000	.00	0 .0
JUNCT STR	.0000					.0593	.00	5.81	1.79		.023	.00	.00	BOX
2646.140	3571.050	5.672	3576.722	848.08	24.92	9.64	3586.36	.00	7.00	6.00	7.000	6.000	.00	0 .0
51.670	.0650					.0588	3.04	5.67	1.84	5.51	.023	.00	.00	BOX

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
2697.810	3574.410	5.814	3580.224	848.07	24.31	9.18	3589.40	.00	7.00	6.00	7.000	6.000	.00	0 .0
16.235	.0650					.0562	.91	5.81	1.78	5.51	.023	.00	.00	BOX
2714.045	3575.465	5.882	3581.347	848.07	24.03	8.97	3590.31	.00	7.00	6.00	7.000	6.000	.00	0 .0
41.700	.0650					.0523	2.18	5.88	1.75	5.51	.023	.00	.00	BOX
2755.745	3578.176	6.169	3584.345	848.07	22.91	8.15	3592.50	.00	7.00	6.00	7.000	6.000	.00	0 .0
23.906	.0650					.0466	1.11	6.17	1.63	5.51	.023	.00	.00	BOX
2779.652	3579.729	6.471	3586.200	848.07	21.84	7.41	3593.61	.00	7.00	6.00	7.000	6.000	.00	0 .0
15.238	.0650					.0415	.63	6.47	1.51	5.51	.023	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												
2794.890	3580.720	6.786	3587.506	848.07	20.83	6.74	3594.24	.00	7.00	6.00	7.000	6.000	.00	0 .0
JUNCT STR	.0000					.0521	.00	6.79	1.41		.023	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												
2794.890	3580.720	5.129	3585.849	776.07	25.22	9.88	3595.72	.00	7.00	6.00	7.000	6.000	.00	0 .0
6.710	.0656					.0650	.44	5.13	1.96	5.11	.023	.00	.00	BOX
2801.600	3581.160	5.130	3586.290	776.07	25.21	9.87	3596.16	.00	7.00	6.00	7.000	6.000	.00	0 .0

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
61.050	.0650					.0650	3.97	5.13	1.96	5.13	.023	.00	.00	BOX
2862.650	3585.130	5.131	3590.260	776.07	25.21	9.87	3600.13	.00	7.00	6.00	7.000	6.000	.00	0 .0
34.579	.0650					.0650	2.25	5.13	1.96	5.13	.023	.00	.00	BOX
2897.229	3587.378	5.131	3592.509	776.07	25.21	9.87	3602.38	.00	7.00	6.00	7.000	6.000	.00	0 .0
181.542	.0650					.0683	12.40	5.13	1.96	5.13	.023	.00	.00	BOX
3078.770	3599.180	4.937	3604.117	776.07	26.20	10.66	3614.78	.00	7.00	6.00	7.000	6.000	.00	0 .0
33.810	.0651					.0731	2.47	4.94	2.08	5.13	.023	.00	.00	BOX
3112.580	3601.380	4.857	3606.237	776.05	26.63	11.01	3617.25	.00	7.00	6.00	7.000	6.000	.00	0 .0
57.767	.0649					.0789	4.56	4.86	2.13	5.13	.023	.00	.00	BOX
3170.347	3605.132	4.647	3609.779	776.05	27.83	12.03	3621.81	.00	7.00	6.00	7.000	6.000	.00	0 .0
41.606	.0649					.0887	3.69	4.65	2.28	5.13	.023	.00	.00	BOX
3211.953	3607.834	4.431	3612.265	776.05	29.19	13.23	3625.50	.00	7.00	6.00	7.000	6.000	.00	0 .0
31.807	.0649					.1001	3.18	4.43	2.44	5.13	.023	.00	.00	BOX
3243.760	3609.900	4.225	3614.125	776.05	30.62	14.55	3628.68	.00	7.00	6.00	7.000	6.000	.00	0 .0
.976	.0650					.0451	.04	4.22	2.62	3.67	.015	.00	.00	BOX
3244.736	3609.963	4.228	3614.191	776.05	30.59	14.53	3628.73	.00	7.00	6.00	7.000	6.000	.00	0 .0
49.437	.0650					.0425	2.10	4.23	2.62	3.67	.015	.00	.00	BOX
3294.173	3613.179	4.434	3617.613	776.05	29.17	13.21	3630.83	.00	7.00	6.00	7.000	6.000	.00	0 .0
35.948	.0650					.0376	1.35	4.43	2.44	3.67	.015	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
3330.122	3615.517	4.650	3620.167	776.05	27.81	12.01	3632.18	.00	7.00	6.00	7.000	6.000	.00	0 .0
27.323	.0650					.0334	.91	4.65	2.27	3.67	.015	.00	.00	BOX
3357.444	3617.294	4.877	3622.171	776.05	26.52	10.92	3633.09	.00	7.00	6.00	7.000	6.000	.00	0 .0
21.306	.0650					.0296	.63	4.88	2.12	3.67	.015	.00	.00	BOX
3378.750	3618.680	5.115	3623.795	776.05	25.28	9.93	3633.72	.53	7.00	6.00	7.000	6.000	.00	0 .0
59.033	.0365					.0264	1.56	5.64	1.97	4.59	.015	.00	.00	BOX
3437.783	3620.835	5.340	3626.176	776.05	24.22	9.11	3635.28	.48	7.00	6.00	7.000	6.000	.00	0 .0
44.089	.0365					.0236	1.04	5.82	1.85	4.59	.015	.00	.00	BOX
3481.872	3622.445	5.601	3628.046	776.05	23.09	8.28	3636.33	.44	7.00	6.00	7.000	6.000	.00	0 .0
30.949	.0365					.0210	.65	6.04	1.72	4.59	.015	.00	.00	BOX
3512.821	3623.575	5.874	3629.449	776.05	22.02	7.53	3636.98	.40	7.00	6.00	7.000	6.000	.00	0 .0
22.329	.0365					.0187	.42	6.27	1.60	4.59	.015	.00	.00	BOX
3535.150	3624.390	6.161	3630.551	776.05	20.99	6.84	3637.39	.00	7.00	6.00	7.000	6.000	.00	0 .0
JUNCT STR	.0000					.0278	.00	6.52	1.49		.015	.00	.00	BOX
3535.150	3624.390	3.909	3628.299	644.05	27.46	11.71	3640.01	.62	7.00	6.00	7.000	6.000	.00	0 .0

| | | |

4059.240	3655.510	4.865	3660.375	617.01	25.36	9.99	3670.37	.06	6.00	5.00	6.000	5.000	.00	0	.0				
30.200	.0780					.0792	2.39	4.93	2.03	4.89	.023	.00	.00	BOX					
4089.440	3657.867	4.854	3662.721	617.01	25.42	10.04	3672.76	.06	6.00	5.00	6.000	5.000	.00	0	.0				
123.306	.0780					.0844	10.40	4.92	2.03	4.89	.023	.00	.00	BOX					
4212.746	3667.490	4.628	3672.118	617.01	26.67	11.04	3683.16	.07	6.00	5.00	6.000	5.000	.00	0	.0				
52.784	.0780					.0949	5.01	4.70	2.18	4.89	.023	.00	.00	BOX					

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-23-2020 Time: 8:36:11

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15.WSW - MANNINGS=0.015 MODEL TO TEST HGL IMPAC

T LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4265.530	3671.610	4.412	3676.023	617.01	27.97	12.14	3688.17	.08	6.00	5.00	6.000	5.000	.00	0	.0				
10.068	.0616					.0422	.43	4.49	2.35	3.81	.015	.00	.00	BOX					
4275.599	3672.230	4.456	3676.686	617.01	27.69	11.91	3688.59	.07	6.00	5.00	6.000	5.000	.00	0	.0				
38.979	.0616					.0394	1.54	4.53	2.31	3.81	.015	.00	.00	BOX					
4314.577	3674.630	4.674	3679.304	617.01	26.40	10.83	3690.13	.07	6.00	5.00	6.000	5.000	.00	0	.0				
28.466	.0616					.0350	1.00	4.74	2.15	3.81	.015	.00	.00	BOX					
4343.043	3676.383	4.902	3681.285	617.01	25.17	9.84	3691.13	.06	6.00	5.00	6.000	5.000	.00	0	.0				
21.546	.0616					.0312	.67	4.96	2.00	3.81	.015	.00	.00	BOX					
4364.590	3677.710	5.141	3682.851	617.01	24.00	8.95	3691.80	.06	6.00	5.00	6.000	5.000	.00	0	.0				
66.663	.0260					.0301	2.01	5.20	1.87	5.40	.015	.00	.00	BOX					
4431.253	3679.443	5.035	3684.479	617.01	24.51	9.33	3693.80	.06	6.00	5.00	6.000	5.000	.00	0	.0				
102.947	.0260					.0328	3.38	5.09	1.92	5.40	.015	.00	.00	BOX					
4534.200	3682.120	4.801	3686.921	617.01	25.70	10.26	3697.18	.00	6.00	5.00	6.000	5.000	.00	0	.0				
JUNCT STR	.0000					.0352	.00	4.87	2.07		.015	.00	.00	BOX					
4534.200	3682.120	4.721	3686.841	613.01	25.97	10.47	3697.31	.07	6.00	5.00	6.000	5.000	.00	0	.0				
41.500	.0260					.0369	1.53	4.79	2.11	5.37	.015	.00	.00	BOX					
4575.700	3683.200	4.596	3687.796	613.00	26.68	11.05	3698.85	.07	6.00	5.00	6.000	5.000	.00	0	.0				
41.460	.0261					.0397	1.64	4.67	2.19	5.37	.015	.00	.00	BOX					

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-23-2020 Time: 8:36:11

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15.WSW - MANNINGS=0.015 MODEL TO TEST HGL IMPAC

T LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4617.160	3684.280	4.456	3688.736	613.00	27.51	11.75	3700.49	.00	6.00	5.00	6.000	5.000	.00	0	.0				
JUNCT STR	.0000					.0452	.00	4.53	2.30		.015	.00	.00	BOX					
4617.160	3684.280	3.999	3688.279	586.00	29.31	13.34	3701.62	.08	6.00	5.00	6.000	5.000	.00	0	.0				
33.550	.0256					.0517	1.73	4.08	2.58	5.21	.015	.00	.00	BOX					
4650.710	3685.140	3.854	3688.994	586.00	30.41	14.36	3703.35	.00	6.00	5.00	6.000	5.000	.00	0	.0				
TRANS STR	.0540					.0541	.27	3.85	2.73		.015	.00	.00	BOX					
4655.710	3685.410	3.853	3689.263	586.00	30.42	14.37	3703.63	.00	5.00	5.00	5.000	5.000	.00	0	.0				
156.160	.0539					.0543	8.48	3.85	2.73	3.86	.015	.00	.00	BOX					
4811.870	3693.820	3.842	3697.662	586.00	30.50	14.45	3712.11	.00	5.00	5.00	5.000	5.000	.00	0	.0				
61.229	.0667					.0521	3.19	3.84	2.74	3.55	.015	.00	.00	BOX					

4873.099	3697.906	3.989	3701.896	586.00	29.38	13.40	3715.30	.00	5.00	5.00	5.000	5.000	.00	0 .0
51.338	.0667					.0468	2.40	3.99	2.59	3.55	.015	.00	.00	BOX
4924.438	3701.333	4.184	3705.517	586.00	28.01	12.19	3717.70	.00	5.00	5.00	5.000	5.000	.00	0 .0
35.858	.0667					.0415	1.49	4.18	2.41	3.55	.015	.00	.00	BOX
4960.296	3703.726	4.388	3708.114	586.00	26.71	11.08	3719.19	.00	5.00	5.00	5.000	5.000	.00	0 .0
26.574	.0667					.0369	.98	4.39	2.25	3.55	.015	.00	.00	BOX
4986.870	3705.500	4.602	3710.102	586.00	25.47	10.07	3720.17	.00	5.00	5.00	5.000	5.000	.00	0 .0
40.324	.0303					.0353	1.42	4.60	2.09	4.86	.015	.00	.00	BOX

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

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-23-2020 Time: 8:36:11

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15.WSW - MANNINGS=0.015 MODEL TO TEST HGL IMPAC

T LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
5027.194	3706.723	4.544	3711.267	586.00	25.79	10.33	3721.60	.00	5.00	5.00	5.000	5.000	.00	0 .0
105.776	.0303					.0381	4.03	4.54	2.13	4.86	.015	.00	.00	BOX

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

5132.970	3709.930	4.333	3714.262	586.00	27.05	11.36	3725.62	.00	5.00	5.00	5.000	5.000	.00	0 .0
JUNCT STR	.0000					.0430	.00	4.33	2.29		.015	.00	.00	BOX
5132.970	3709.930	4.016	3713.946	567.00	28.24	12.38	3726.33	.00	5.00	5.00	5.000	5.000	.00	0 .0
13.210	.0303					.0462	.61	4.02	2.48	4.74	.015	.00	.00	BOX
5146.180	3710.330	3.975	3714.305	567.00	28.53	12.64	3726.94	5.00	5.00	5.00	5.000	5.000	.00	0 .0
1.080	.0278					.0469	.05	5.00	2.52	4.90	.015	.00	.00	BOX
5147.260	3710.360	3.971	3714.331	567.00	28.56	12.67	3727.00	.00	5.00	5.00	5.000	5.000	.00	0 .0
27.552	.0741					.0447	1.23	3.97	2.53	3.32	.015	.00	.00	BOX
5174.812	3712.401	4.131	3716.533	567.00	27.45	11.70	3728.23	.00	5.00	5.00	5.000	5.000	.00	0 .0
25.380	.0741					.0401	1.02	4.13	2.38	3.32	.015	.00	.00	BOX
5200.192	3714.282	4.333	3718.615	567.00	26.17	10.64	3729.25	.00	5.00	5.00	5.000	5.000	.00	0 .0
19.647	.0741					.0356	.70	4.33	2.22	3.32	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-23-2020 Time: 8:36:11

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15.WSW - MANNINGS=0.015 MODEL TO TEST HGL IMPAC

T LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
5219.839	3715.738	4.545	3720.282	567.00	24.95	9.67	3729.95	.00	5.00	5.00	5.000	5.000	.00	0 .0
15.495	.0741					.0317	.49	4.54	2.06	3.32	.015	.00	.00	BOX

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

5235.334	3716.886	4.766	3721.652	567.00	23.79	8.79	3730.44	.00	5.00	5.00	5.000	5.000	.00	0 .0
12.336	.0741					.0344	.42	4.77	1.92	3.32	.015	.00	.00	BOX

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

5247.670	3717.800	5.000	3722.800	567.00	22.68	7.99	3730.79	.00	5.00	5.00	5.000	5.000	.00	0 .0

C.2.5

Detention Basin Inlet – North – Grate Tailwater

GPDB-IN-NORTH-GRATE

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T1 GRAND PARK DETENTION BASIN NORTH MAINLINE INLET
T2 FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE ASSUMED
T3 LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN
SO   1000.00 3507.36   6      .015
R    1001.00 3507.39   6      .015                                  0.00    0.00  0
WE   1001.00 3507.39   5      .500
R    1668.87 3523.41   5      .015                                  0.00    0.00  0
R    1670.70 3523.46   5      .015                                -34.95    0.00  0
R    1725.87 3524.60   5      .015                                  0.00    0.00  0
R    1727.71 3524.64   5      .015                                -35.14    0.00  0
R    1837.69 3527.49   5      .015                                  0.00    0.00  0
R    1906.08 3529.06   5      .015                                  0.00    0.00  0
JX   1906.08 3529.06   5 24   .015   12.00          3529.56         -90.0
R    1960.38 3530.31   5      .015                                  0.00    0.00  0
TS   1969.52 3530.52   5      .015                                  0.00    0.00  0
R    1974.52 3530.64   5      .023                                  0.00    0.00  0
R    2036.52 3532.07   5      .023                                  0.00    0.00  0
JX   2036.52 3532.07   5 48   .023   49.00          3532.51         -45.0
R    2051.62 3532.41   5      .023                                  0.00    0.00  0
R    2196.62 3541.84   5      .023
TS   2201.62 3542.16   1      .023                                  0.00    0.00  0
R    2601.62 3568.16   1      .023                                  0.00    0.00  0
R    2646.14 3571.05   1      .023                                  0.00    0.00  0
JX   2646.14 3571.05   1 24   .023    7.00          3571.55         -90.0
R    2697.81 3574.41   1      .023                                  0.00    0.00  0
JX   2697.81 3574.41   1 24   .023    0.01          3574.91          90.0
R    2794.89 3580.72   1      .023                                  0.00    0.00  0
JX   2794.89 3580.72   1 48   .023   72.00          3581.22         -90.0
R    2801.60 3581.16   1      .023                                  0.00    0.00  0
R    2862.65 3585.13   1      .023                                  0.00   -6.76  0
R    3078.77 3599.18   1      .023                                  0.00   -6.26  0
R    3112.58 3601.38   1      .023                                  0.00    0.00  0
JX   3112.58 3601.38   1 24 24.023    0.01     0.01 3601.88 3601.88  90.0-90.0
R    3243.76 3609.90   1      .023                                  0.00    0.00  0
R    3378.75 3618.68   1      .015                                  0.00  -14.30  0
R    3535.15 3624.39   1      .015                                -39.58    0.00  0
JX   3535.15 3624.39   1 54   .015  132.00          3625.23          45.0
R    3573.06 3625.77   1      .015                                 -9.59    0.00  0
R    3584.85 3626.20   1      .015                                  0.00    0.00  0
R    3585.83 3626.24   1      .015                                -22.46    0.00  0
R    3598.03 3626.68   1      .015                                  0.44    0.00  0
JX   3598.03 3626.68   1 24 24.015    0.01     0.01 3627.20 3627.20  56.0-90.0
R    3621.62 3627.54   1      .015                                  0.85    0.00  0
R    3645.10 3628.40   1      .015                                  0.85    0.00  0
JX   3645.10 3628.40   1 48   .015   27.00          3628.59          45.0
TS   3650.10 3628.58   2      .015
R    3770.21 3632.97   2      .015                                  4.52    0.00  0
R    3873.45 3641.02   2      .015                                  3.73    0.00  0
TS   3878.45 3641.41   3      .015
R    4059.24 3655.51   3      .023                                  6.72    0.00  0
JX   4059.24 3655.51   3 24 24.023    0.01     0.01 3656.01 3656.01  90.0-90.0
R    4265.53 3671.61   3      .023                                  7.46    0.00  0
R    4364.59 3677.71   3      .015                                  3.55    0.00  0
R    4534.20 3682.12   3      .015                                  6.14    0.00  0
JX   4534.20 3682.12   3 42   .015    4.00          3682.62          90.0
R    4575.70 3683.20   3      .015                                  1.50    0.00  0
JX   4575.70 3683.20   3 24   .015    0.01          3683.70         -90.0
R    4617.16 3684.28   3      .015                                  1.50    0.00  0
JX   4617.16 3684.28   3 42   .015   27.00          3684.78          90.0
R    4650.71 3685.14   3      .015                                  1.21    0.00  0
TS   4655.71 3685.41   4      .015
R    4811.87 3693.82   4      .015                                  0.00    0.00  0
R    4986.87 3705.50   4      .015                                  0.00    0.00  0
R    5132.97 3709.93   4      .015                                  0.00    0.00  0
JX   5132.97 3709.93   4 30   .015   19.00          3710.43          45.0
R    5146.18 3710.33   4      .015                                  0.00    0.00  0
R    5147.26 3710.36   4      .015                                 24.75    0.00  0
R    5247.67 3717.80   4      .015                                  0.00    0.00  0
SH   5247.67 3717.80   4
CD   1  3   0    .00    7.00     6.00  0.00  0.00
CD   2  3   0    .00    7.00     5.00  0.00  0.00
CD   3  3   0    .00    6.00     5.00  0.00  0.00
CD   4  3   0    .00    5.00     5.00  0.00  0.00
CD   5  3   0    .00    7.00     7.00  0.00  0.00
CD   6  3   0    .00    6.00     5.37  0.00  0.00
CD  24  4   1    .00    2.00      .00  0.00  0.00
CD  30  4   1    .00    2.50      .00  0.00  0.00
CD  36  4   1    .00    3.00      .00  0.00  0.00
CD  42  4   1    .00    3.50      .00  0.00  0.00
CD  48  4   1    .00    4.00      .00  0.00  0.00
CD  54  4   1    .00    4.50      .00  0.00  0.00
CD  60  4   1    .00    5.00      .00  0.00  0.00
Q           567.00   .0
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Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 6-2020 Time: 3: 3:37

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	3507.360	6.000	3513.360	916.08	28.43	12.55	3525.91	.00	6.00	5.37	6.000	5.370	.00	0 .0
1.000	.0298					.0518	.05	6.00	2.05	6.00	.015	.00	.00	BOX
1001.000	3507.390	6.022	3513.412	916.08	28.43	12.55	3525.96	.00	6.00	5.37	6.000	5.370	.00	0 .0
WALL	ENTRANCE													
1001.000	3507.390	16.710	3524.100	916.08	18.70	5.43	3529.53	.00	7.00	7.00	7.000	7.000	.00	0 .0
667.870	.0240					.0169	11.28	16.71	1.25	5.21	.015	.00	.00	BOX
1668.870	3523.410	11.968	3535.378	916.08	18.70	5.43	3540.81	.00	7.00	7.00	7.000	7.000	.00	0 .0
1.830	.0273					.0169	.03	.00	1.25	4.95	.015	.00	.00	BOX
1670.700	3523.460	12.626	3536.086	916.08	18.70	5.43	3541.51	.00	7.00	7.00	7.000	7.000	.00	0 .0
55.170	.0207					.0169	.93	12.63	1.25	5.53	.015	.00	.00	BOX
1725.870	3524.600	12.417	3537.017	916.08	18.70	5.43	3542.44	.00	7.00	7.00	7.000	7.000	.00	0 .0
1.840	.0216					.0169	.03	.00	1.25	5.43	.015	.00	.00	BOX
1727.710	3524.640	13.087	3537.727	916.08	18.70	5.43	3543.15	.00	7.00	7.00	7.000	7.000	.00	0 .0
109.980	.0259					.0169	1.86	13.09	1.25	5.06	.015	.00	.00	BOX
1837.690	3527.490	12.094	3539.584	916.08	18.70	5.43	3545.01	.00	7.00	7.00	7.000	7.000	.00	0 .0
68.390	.0230					.0169	1.15	12.09	1.25	5.30	.015	.00	.00	BOX
1906.080	3529.060	11.679	3540.739	916.08	18.70	5.43	3546.17	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0164	.00	11.68	1.25		.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 6-2020 Time: 3: 3:37

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1906.080	3529.060	11.961	3541.021	904.08	18.45	5.29	3546.31	.00	7.00	7.00	7.000	7.000	.00	0 .0
54.300	.0230					.0164	.89	11.96	1.23	5.24	.015	.00	.00	BOX
1960.380	3530.310	11.605	3541.915	904.08	18.45	5.29	3547.20	.00	7.00	7.00	7.000	7.000	.00	0 .0
TRANS STR	.0230					.0164	.15	11.60	1.23		.015	.00	.00	BOX
1969.520	3530.520	11.545	3542.065	904.08	18.45	5.29	3547.35	.00	7.00	7.00	7.000	7.000	.00	0 .0
5.000	.0240					.0387	.19	11.54	1.23	7.00	.023	.00	.00	BOX
1974.520	3530.640	11.618	3542.258	904.08	18.45	5.29	3547.54	.00	7.00	7.00	7.000	7.000	.00	0 .0
62.000	.0231					.0387	2.40	11.62	1.23	7.00	.023	.00	.00	BOX
2036.520	3532.070	12.586	3544.656	904.08	18.45	5.29	3549.94	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0346	.00	12.59	1.23		.023	.00	.00	BOX
2036.520	3532.070	13.615	3545.685	855.08	17.45	4.73	3550.41	.00	7.00	7.00	7.000	7.000	.00	0 .0
15.100	.0225					.0346	.52	13.62	1.16	7.00	.023	.00	.00	BOX
2051.620	3532.410	13.798	3546.208	855.08	17.45	4.73	3550.94	.00	7.00	7.00	7.000	7.000	.00	0 .0
124.575	.0650					.0346	4.31	13.80	1.16	4.67	.023	.00	.00	BOX
2176.195	3540.512	10.002	3550.514	855.08	17.45	4.73	3555.24	.00	7.00	7.00	7.000	.00	0 .0

HYDRAULIC JUMP

2176.195	3540.512	4.574	3545.085	855.08	26.71	11.08	3556.16	.00	7.00	7.00	7.000	7.000	.00	0	.0
20.425	.0650					.0688	1.41	4.57	2.20	4.67	.023	.00	.00	BOX	

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 6-2020 Time: 3: 3:37

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
2196.620	3541.840	4.564	3546.404	855.08	26.77	11.12	3557.53	.00	7.00	7.00	7.000	7.000	.00	0	.0
TRANS STR	.0640					.0670	.33	4.56	2.21		.023	.00	.00	BOX	
2201.620	3542.160	5.548	3547.708	855.08	25.69	10.24	3557.95	.00	7.00	6.00	7.000	6.000	.00	0	.0
215.120	.0650					.0650	13.98	5.55	1.92	5.55	.023	.00	.00	BOX	
2416.740	3556.143	5.548	3561.691	855.08	25.69	10.24	3571.94	.00	7.00	6.00	7.000	6.000	.00	0	.0
184.880	.0650					.0629	11.63	5.55	1.92	5.55	.023	.00	.00	BOX	
2601.620	3568.160	5.702	3573.862	855.08	24.99	9.70	3583.56	.00	7.00	6.00	7.000	6.000	.00	0	.0
44.520	.0649					.0594	2.65	5.70	1.84	5.55	.023	.00	.00	BOX	
2646.140	3571.050	5.807	3576.857	855.08	24.54	9.35	3586.21	.00	7.00	6.00	7.000	6.000	.00	0	.0
JUNCT STR	.0000					.0593	.00	5.81	1.79		.023	.00	.00	BOX	
2646.140	3571.050	5.672	3576.722	848.08	24.92	9.64	3586.36	.00	7.00	6.00	7.000	6.000	.00	0	.0
51.670	.0650					.0588	3.04	5.67	1.84	5.51	.023	.00	.00	BOX	
2697.810	3574.410	5.814	3580.224	848.07	24.31	9.18	3589.40	.00	7.00	6.00	7.000	6.000	.00	0	.0
16.235	.0650					.0562	.91	5.81	1.78	5.51	.023	.00	.00	BOX	
2714.045	3575.465	5.882	3581.347	848.07	24.03	8.97	3590.31	.00	7.00	6.00	7.000	6.000	.00	0	.0
41.700	.0650					.0523	2.18	5.88	1.75	5.51	.023	.00	.00	BOX	
2755.745	3578.176	6.169	3584.345	848.07	22.91	8.15	3592.50	.00	7.00	6.00	7.000	6.000	.00	0	.0
23.906	.0650					.0466	1.11	6.17	1.63	5.51	.023	.00	.00	BOX	

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 6-2020 Time: 3: 3:37

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
2779.652	3579.729	6.471	3586.200	848.07	21.84	7.41	3593.61	.00	7.00	6.00	7.000	6.000	.00	0	.0
15.238	.0650					.0415	.63	6.47	1.51	5.51	.023	.00	.00	BOX	

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

2794.890	3580.720	6.786	3587.506	848.07	20.83	6.74	3594.24	.00	7.00	6.00	7.000	6.000	.00	0	.0
JUNCT STR	.0000					.0521	.00	6.79	1.41		.023	.00	.00	BOX	

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

2794.890	3580.720	5.129	3585.849	776.07	25.22	9.88	3595.72	.00	7.00	6.00	7.000	6.000	.00	0	.0
6.710	.0656					.0650	.44	5.13	1.96	5.11	.023	.00	.00	BOX	
2801.600	3581.160	5.130	3586.290	776.07	25.21	9.87	3596.16	.00	7.00	6.00	7.000	6.000	.00	0	.0
61.050	.0650					.0650	3.97	5.13	1.96	5.13	.023	.00	.00	BOX	
2862.650	3585.130	5.131	3590.260	776.07	25.21	9.87	3600.13	.00	7.00	6.00	7.000	6.000	.00	0	.0
34.579	.0650					.0650	2.25	5.13	1.96	5.13	.023	.00	.00	BOX	
2897.229	3587.378	5.131	3592.509	776.07	25.21	9.87	3602.38	.00	7.00	6.00	7.000	6.000	.00	0	.0
181.542	.0650					.0683	12.40	5.13	1.96	5.13	.023	.00	.00	BOX	

3078.770	3599.180	4.937	3604.117	776.07	26.20	10.66	3614.78	.00	7.00	6.00	7.000	6.000	.00	0 .0
33.810	.0651					.0731	2.47	4.94	2.08	5.13	.023	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 6-2020 Time: 3: 3:37

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
3112.580	3601.380	4.857	3606.237	776.05	26.63	11.01	3617.25	.00	7.00	6.00	7.000	6.000	.00	0 .0
57.767	.0649					.0789	4.56	4.86	2.13	5.13	.023	.00	.00	BOX
3170.347	3605.132	4.647	3609.779	776.05	27.83	12.03	3621.81	.00	7.00	6.00	7.000	6.000	.00	0 .0
41.606	.0649					.0887	3.69	4.65	2.28	5.13	.023	.00	.00	BOX
3211.953	3607.834	4.431	3612.265	776.05	29.19	13.23	3625.50	.00	7.00	6.00	7.000	6.000	.00	0 .0
31.807	.0649					.1001	3.18	4.43	2.44	5.13	.023	.00	.00	BOX
3243.760	3609.900	4.225	3614.125	776.05	30.62	14.55	3628.68	.00	7.00	6.00	7.000	6.000	.00	0 .0
.976	.0650					.0451	.04	4.22	2.62	3.67	.015	.00	.00	BOX
3244.736	3609.963	4.228	3614.191	776.05	30.59	14.53	3628.73	.00	7.00	6.00	7.000	6.000	.00	0 .0
49.437	.0650					.0425	2.10	4.23	2.62	3.67	.015	.00	.00	BOX
3294.173	3613.179	4.434	3617.613	776.05	29.17	13.21	3630.83	.00	7.00	6.00	7.000	6.000	.00	0 .0
35.948	.0650					.0376	1.35	4.43	2.44	3.67	.015	.00	.00	BOX
3330.122	3615.517	4.650	3620.167	776.05	27.81	12.01	3632.18	.00	7.00	6.00	7.000	6.000	.00	0 .0
27.323	.0650					.0334	.91	4.65	2.27	3.67	.015	.00	.00	BOX
3357.444	3617.294	4.877	3622.171	776.05	26.52	10.92	3633.09	.00	7.00	6.00	7.000	6.000	.00	0 .0
21.306	.0650					.0296	.63	4.88	2.12	3.67	.015	.00	.00	BOX
3378.750	3618.680	5.115	3623.795	776.05	25.28	9.93	3633.72	.53	7.00	6.00	7.000	6.000	.00	0 .0
59.033	.0365					.0264	1.56	5.64	1.97	4.59	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 6-2020 Time: 3: 3:37

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
3437.783	3620.835	5.340	3626.176	776.05	24.22	9.11	3635.28	.48	7.00	6.00	7.000	6.000	.00	0 .0
44.089	.0365					.0236	1.04	5.82	1.85	4.59	.015	.00	.00	BOX
3481.872	3622.445	5.601	3628.046	776.05	23.09	8.28	3636.33	.44	7.00	6.00	7.000	6.000	.00	0 .0
30.949	.0365					.0210	.65	6.04	1.72	4.59	.015	.00	.00	BOX
3512.821	3623.575	5.874	3629.449	776.05	22.02	7.53	3636.98	.40	7.00	6.00	7.000	6.000	.00	0 .0
22.329	.0365					.0187	.42	6.27	1.60	4.59	.015	.00	.00	BOX
3535.150	3624.390	6.161	3630.551	776.05	20.99	6.84	3637.39	.00	7.00	6.00	7.000	6.000	.00	0 .0
JUNCT STR	.0000					.0278	.00	6.52	1.49		.015	.00	.00	BOX
3535.150	3624.390	3.909	3628.299	644.05	27.46	11.71	3640.01	.62	7.00	6.00	7.000	6.000	.00	0 .0
37.910	.0364					.0381	1.44	4.53	2.45	3.97	.015	.00	.00	BOX
3573.060	3625.770	3.897	3629.667	644.05	27.55	11.78	3641.45	.00	7.00	6.00	7.000	6.000	.00	0 .0
11.790	.0365					.0383	.45	3.90	2.46	3.97	.015	.00	.00	BOX
3584.850	3626.200	3.892	3630.092	644.05	27.58	11.81	3641.90	7.00	7.00	6.00	7.000	6.000	.00	0 .0

.980	.0409					.0384	.04	7.00	2.46	3.80	.015	.00	.00	BOX		
3585.830	3626.240	3.892	3630.132	644.05	27.58	11.81	3641.94	.09	7.00	6.00	7.000	6.000	.00	0	.0	
12.200	.0361					.0385	.47	3.98	2.46	3.99	.015	.00	.00	BOX		
3598.030	3626.680	3.886	3630.566	644.03	27.62	11.85	3642.41	.09	7.00	6.00	7.000	6.000	.00	0	.0	
23.590	.0365					.0387	.91	3.98	2.47	3.97	.015	.00	.00	BOX		

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 6-2020 Time: 3: 3:37

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
3621.620	3627.540	3.876	3631.416	644.03	27.70	11.91	3643.33	.09	7.00	6.00	7.000	6.000	.00	0 .0
23.480	.0366					.0389	.91	3.97	2.48	3.96	.015	.00	.00	BOX
3645.100	3628.400	3.865	3632.265	644.03	27.77	11.98	3644.24	.00	7.00	6.00	7.000	6.000	.00	0 .0
JUNCT STR	.0000					.0426	.00	3.86	2.49		.015	.00	.00	BOX
3645.100	3628.400	3.506	3631.906	617.03	29.33	13.36	3645.26	.00	6.90	6.00	7.000	6.000	.00	0 .0
TRANS STR	.0360					.0456	.23	3.51	2.76		.015	.00	.00	BOX
3650.100	3628.580	4.321	3632.901	617.03	28.56	12.67	3645.57	.08	7.00	5.00	7.000	5.000	.00	0 .0
36.585	.0365					.0460	1.68	4.40	2.42	4.70	.015	.00	.00	BOX
3686.685	3629.917	4.252	3634.169	617.03	29.03	13.08	3647.25	.09	7.00	5.00	7.000	5.000	.00	0 .0
83.525	.0365					.0498	4.16	4.34	2.48	4.70	.015	.00	.00	BOX
3770.210	3632.970	4.054	3637.023	617.03	30.44	14.39	3651.41	.09	7.00	5.00	7.000	5.000	.00	0 .0
27.910	.0780					.0508	1.42	4.14	2.66	3.48	.015	.00	.00	BOX
3798.120	3635.146	4.185	3639.331	617.03	29.49	13.50	3652.83	.09	7.00	5.00	7.000	5.000	.00	0 .0
32.036	.0780					.0460	1.47	4.27	2.54	3.48	.015	.00	.00	BOX
3830.156	3637.644	4.389	3642.033	617.03	28.12	12.28	3654.31	.08	7.00	5.00	7.000	5.000	.00	0 .0
24.317	.0780					.0409	.99	4.47	2.37	3.48	.015	.00	.00	BOX
3854.474	3639.540	4.603	3644.144	617.03	26.81	11.16	3655.30	.07	7.00	5.00	7.000	5.000	.00	0 .0
18.976	.0780					.0364	.69	4.67	2.20	3.48	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 6-2020 Time: 3: 3:37

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
3873.450	3641.020	4.828	3645.848	617.03	25.56	10.14	3655.99	.00	7.00	5.00	7.000	5.000	.00	0 .0
TRANS STR	.0780					.0337	.17	4.83	2.05		.015	.00	.00	BOX
3878.450	3641.410	4.890	3646.300	617.03	25.24	9.89	3656.19	.06	6.00	5.00	6.000	5.000	.00	0 .0
25.480	.0780					.0780	1.99	4.95	2.01	4.89	.023	.00	.00	BOX
3903.930	3643.397	4.890	3648.287	617.03	25.24	9.89	3658.18	.06	6.00	5.00	6.000	5.000	.00	0 .0
155.310	.0780					.0785	12.19	4.95	2.01	4.89	.023	.00	.00	BOX
4059.240	3655.510	4.865	3660.375	617.01	25.36	9.99	3670.37	.06	6.00	5.00	6.000	5.000	.00	0 .0
30.200	.0780					.0792	2.39	4.93	2.03	4.89	.023	.00	.00	BOX
4089.440	3657.867	4.854	3662.721	617.01	25.42	10.04	3672.76	.06	6.00	5.00	6.000	5.000	.00	0 .0
123.306	.0780					.0844	10.40	4.92	2.03	4.89	.023	.00	.00	BOX
4212.746	3667.490	4.628	3672.118	617.01	26.67	11.04	3683.16	.07	6.00	5.00	6.000	5.000	.00	0 .0

52.784	.0780					.0949	5.01	4.70	2.18	4.89	.023	.00	.00	BOX					
4265.530	3671.610	4.412	3676.023	617.01	27.97	12.14	3688.17	.08	6.00	5.00	6.000	5.000	.00	0	.0				
10.068	.0616					.0422	.43	4.49	2.35	3.81	.015	.00	.00	BOX					
4275.599	3672.230	4.456	3676.686	617.01	27.69	11.91	3688.59	.07	6.00	5.00	6.000	5.000	.00	0	.0				
38.979	.0616					.0394	1.54	4.53	2.31	3.81	.015	.00	.00	BOX					
4314.577	3674.630	4.674	3679.304	617.01	26.40	10.83	3690.13	.07	6.00	5.00	6.000	5.000	.00	0	.0				
28.466	.0616					.0350	1.00	4.74	2.15	3.81	.015	.00	.00	BOX					

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 6-2020 Time: 3: 3:37

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
4343.043	3676.383	4.902	3681.285	617.01	25.17	9.84	3691.13	.06	6.00	5.00	6.000	5.000	.00	0 .0
21.546	.0616					.0312	.67	4.96	2.00	3.81	.015	.00	.00	BOX
4364.590	3677.710	5.141	3682.851	617.01	24.00	8.95	3691.80	.06	6.00	5.00	6.000	5.000	.00	0 .0
66.663	.0260					.0301	2.01	5.20	1.87	5.40	.015	.00	.00	BOX
4431.253	3679.443	5.035	3684.479	617.01	24.51	9.33	3693.80	.06	6.00	5.00	6.000	5.000	.00	0 .0
102.947	.0260					.0328	3.38	5.09	1.92	5.40	.015	.00	.00	BOX
4534.200	3682.120	4.801	3686.921	617.01	25.70	10.26	3697.18	.00	6.00	5.00	6.000	5.000	.00	0 .0
JUNCT STR	.0000					.0352	.00	4.87	2.07		.015	.00	.00	BOX
4534.200	3682.120	4.721	3686.841	613.01	25.97	10.47	3697.31	.07	6.00	5.00	6.000	5.000	.00	0 .0
41.500	.0260					.0369	1.53	4.79	2.11	5.37	.015	.00	.00	BOX
4575.700	3683.200	4.596	3687.796	613.00	26.68	11.05	3698.85	.07	6.00	5.00	6.000	5.000	.00	0 .0
41.460	.0261					.0397	1.64	4.67	2.19	5.37	.015	.00	.00	BOX
4617.160	3684.280	4.456	3688.736	613.00	27.51	11.75	3700.49	.00	6.00	5.00	6.000	5.000	.00	0 .0
JUNCT STR	.0000					.0452	.00	4.53	2.30		.015	.00	.00	BOX
4617.160	3684.280	3.999	3688.279	586.00	29.31	13.34	3701.62	.08	6.00	5.00	6.000	5.000	.00	0 .0
33.550	.0256					.0517	1.73	4.08	2.58	5.21	.015	.00	.00	BOX
4650.710	3685.140	3.854	3688.994	586.00	30.41	14.36	3703.35	.00	6.00	5.00	6.000	5.000	.00	0 .0
TRANS STR	.0540					.0541	.27	3.85	2.73		.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 6-2020 Time: 3: 3:37

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
4655.710	3685.410	3.853	3689.263	586.00	30.42	14.37	3703.63	.00	5.00	5.00	5.000	5.000	.00	0 .0
156.160	.0539					.0543	8.48	3.85	2.73	3.86	.015	.00	.00	BOX
4811.870	3693.820	3.842	3697.662	586.00	30.50	14.45	3712.11	.00	5.00	5.00	5.000	5.000	.00	0 .0
61.229	.0667					.0521	3.19	3.84	2.74	3.55	.015	.00	.00	BOX
4873.099	3697.906	3.989	3701.896	586.00	29.38	13.40	3715.30	.00	5.00	5.00	5.000	5.000	.00	0 .0
51.338	.0667					.0468	2.40	3.99	2.59	3.55	.015	.00	.00	BOX
4924.438	3701.333	4.184	3705.517	586.00	28.01	12.19	3717.70	.00	5.00	5.00	5.000	5.000	.00	0 .0
35.858	.0667					.0415	1.49	4.18	2.41	3.55	.015	.00	.00	BOX

4960.296	3703.726	4.388	3708.114	586.00	26.71	11.08	3719.19	.00	5.00	5.00	5.000	5.000	.00	0	.0				
26.574	.0667					.0369	.98	4.39	2.25	3.55	.015	.00	.00	BOX					
4986.870	3705.500	4.602	3710.102	586.00	25.47	10.07	3720.17	.00	5.00	5.00	5.000	5.000	.00	0	.0				
40.324	.0303					.0353	1.42	4.60	2.09	4.86	.015	.00	.00	BOX					

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

5027.194	3706.723	4.544	3711.267	586.00	25.79	10.33	3721.60	.00	5.00	5.00	5.000	5.000	.00	0	.0				
105.776	.0303					.0381	4.03	4.54	2.13	4.86	.015	.00	.00	BOX					

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

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 6-2020 Time: 3: 3:37

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
5132.970	3709.930	4.333	3714.262	586.00	27.05	11.36	3725.62	.00	5.00	5.00	5.000	5.000	.00	0 .0
JUNCT STR	.0000					.0430	.00	4.33	2.29		.015	.00	.00	BOX
5132.970	3709.930	4.016	3713.946	567.00	28.24	12.38	3726.33	.00	5.00	5.00	5.000	5.000	.00	0 .0
13.210	.0303					.0462	.61	4.02	2.48	4.74	.015	.00	.00	BOX
5146.180	3710.330	3.975	3714.305	567.00	28.53	12.64	3726.94	5.00	5.00	5.00	5.000	5.000	.00	0 .0
1.080	.0278					.0469	.05	5.00	2.52	4.90	.015	.00	.00	BOX
5147.260	3710.360	3.971	3714.331	567.00	28.56	12.67	3727.00	.00	5.00	5.00	5.000	5.000	.00	0 .0
27.552	.0741					.0447	1.23	3.97	2.53	3.32	.015	.00	.00	BOX
5174.812	3712.401	4.131	3716.533	567.00	27.45	11.70	3728.23	.00	5.00	5.00	5.000	5.000	.00	0 .0
25.380	.0741					.0401	1.02	4.13	2.38	3.32	.015	.00	.00	BOX
5200.192	3714.282	4.333	3718.615	567.00	26.17	10.64	3729.25	.00	5.00	5.00	5.000	5.000	.00	0 .0
19.647	.0741					.0356	.70	4.33	2.22	3.32	.015	.00	.00	BOX
5219.839	3715.738	4.545	3720.282	567.00	24.95	9.67	3729.95	.00	5.00	5.00	5.000	5.000	.00	0 .0
15.495	.0741					.0317	.49	4.54	2.06	3.32	.015	.00	.00	BOX

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

5235.334	3716.886	4.766	3721.652	567.00	23.79	8.79	3730.44	.00	5.00	5.00	5.000	5.000	.00	0	.0				
12.336	.0741					.0344	.42	4.77	1.92	3.32	.015	.00	.00	BOX					

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

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 6-2020 Time: 3: 3:37

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
5247.670	3717.800	5.000	3722.800	567.00	22.68	7.99	3730.79	.00	5.00	5.00	5.000	5.000	.00	0 .0

C.2.6

Detention Basin Inlet – North – 100-yr Tailwater

GPDB-IN-NORTH-TW

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T1 GRAND PARK DETENTION BASIN NORTH MAINLINE INLET
T2 FILE NAME: GPDB-IN-NORTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWATER
T3 LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN
SO   1000.00 3507.36   5                          3530.93
R    1668.87 3523.41   5      .015                                  0.00    0.00  0
R    1670.70 3523.46   5      .015                                -34.95    0.00  0
R    1725.87 3524.60   5      .015                                  0.00    0.00  0
R    1727.71 3524.64   5      .015                                -35.14    0.00  0
R    1837.69 3527.49   5      .015                                  0.00    0.00  0
R    1906.08 3529.06   5      .015                                  0.00    0.00  0
JX   1906.08 3529.06   5 24   .015   12.00          3529.56         -90.0
R    1960.38 3530.31   5      .015                                  0.00    0.00  0
TS   1969.52 3530.52   5      .015                                  0.00    0.00  0
R    1974.52 3530.64   5      .023                                  0.00    0.00  0
R    2036.52 3532.07   5      .023                                  0.00    0.00  0
JX   2036.52 3532.07   5 48   .023   49.00          3532.51         -45.0
R    2051.62 3532.41   5      .023                                  0.00    0.00  0
R    2196.62 3541.84   5      .023
TS   2201.62 3542.16   1      .023                                  0.00    0.00  0
R    2601.62 3568.16   1      .023                                  0.00    0.00  0
R    2646.14 3571.05   1      .023                                  0.00    0.00  0
JX   2646.14 3571.05   1 24   .023    7.00          3571.55         -90.0
R    2697.81 3574.41   1      .023                                  0.00    0.00  0
JX   2697.81 3574.41   1 24   .023    0.01          3574.91          90.0
R    2794.89 3580.72   1      .023                                  0.00    0.00  0
JX   2794.89 3580.72   1 48   .023   72.00          3581.22         -90.0
R    2801.60 3581.16   1      .023                                  0.00    0.00  0
R    2862.65 3585.13   1      .023                                  0.00   -6.76  0
R    3078.77 3599.18   1      .023                                  0.00   -6.26  0
R    3112.58 3601.38   1      .023                                  0.00    0.00  0
JX   3112.58 3601.38   1 24 24.023    0.01     0.01 3601.88 3601.88  90.0-90.0
R    3243.76 3609.90   1      .023                                  0.00    0.00  0
R    3378.75 3618.68   1      .015                                  0.00  -14.30  0
R    3535.15 3624.39   1      .015                                -39.58    0.00  0
JX   3535.15 3624.39   1 54   .015  132.00          3625.23          45.0
R    3573.06 3625.77   1      .015                                 -9.59    0.00  0
R    3584.85 3626.20   1      .015                                  0.00    0.00  0
R    3585.83 3626.24   1      .015                                -22.46    0.00  0
R    3598.03 3626.68   1      .015                                  0.44    0.00  0
JX   3598.03 3626.68   1 24 24.015    0.01     0.01 3627.20 3627.20  56.0-90.0
R    3621.62 3627.54   1      .015                                  0.85    0.00  0
R    3645.10 3628.40   1      .015                                  0.85    0.00  0
JX   3645.10 3628.40   1 48   .015   27.00          3628.59          45.0
TS   3650.10 3628.58   2      .015
R    3770.21 3632.97   2      .015                                  4.52    0.00  0
R    3873.45 3641.02   2      .015                                  3.73    0.00  0
TS   3878.45 3641.41   3      .015
R    4059.24 3655.51   3      .023                                  6.72    0.00  0
JX   4059.24 3655.51   3 24 24.023    0.01     0.01 3656.01 3656.01  90.0-90.0
R    4265.53 3671.61   3      .023                                  7.46    0.00  0
R    4364.59 3677.71   3      .015                                  3.55    0.00  0
R    4534.20 3682.12   3      .015                                  6.14    0.00  0
JX   4534.20 3682.12   3 42   .015    4.00          3682.62          90.0
R    4575.70 3683.20   3      .015                                  1.50    0.00  0
JX   4575.70 3683.20   3 24   .015    0.01          3683.70         -90.0
R    4617.16 3684.28   3      .015                                  1.50    0.00  0
JX   4617.16 3684.28   3 42   .015   27.00          3684.78          90.0
R    4650.71 3685.14   3      .015                                  1.21    0.00  0
TS   4655.71 3685.41   4      .015
R    4811.87 3693.82   4      .015                                  0.00    0.00  0
R    4986.87 3705.50   4      .015                                  0.00    0.00  0
R    5132.97 3709.93   4      .015                                  0.00    0.00  0
JX   5132.97 3709.93   4 30   .015   19.00          3710.43          45.0
R    5146.18 3710.33   4      .015                                  0.00    0.00  0
R    5147.26 3710.36   4      .015                                 24.75    0.00  0
R    5247.67 3717.80   4      .015                                  0.00    0.00  0
SH   5247.67 3717.80   4
CD   1  3   0    .00    7.00     6.00  0.00  0.00
CD   2  3   0    .00    7.00     5.00  0.00  0.00
CD   3  3   0    .00    6.00     5.00  0.00  0.00
CD   4  3   0    .00    5.00     5.00  0.00  0.00
CD   5  3   0    .00    7.00     7.00  0.00  0.00
CD  24  4   1    .00    2.00      .00  0.00  0.00
CD  30  4   1    .00    2.50      .00  0.00  0.00
CD  36  4   1    .00    3.00      .00  0.00  0.00
CD  42  4   1    .00    3.50      .00  0.00  0.00
CD  48  4   1    .00    4.00      .00  0.00  0.00
CD  54  4   1    .00    4.50      .00  0.00  0.00
CD  60  4   1    .00    5.00      .00  0.00  0.00
Q           567.00   .0
```

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:39: 4

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT

ER LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1000.000	3507.360	23.570	3530.930	916.08	18.70	5.43	3536.36	.00	7.00	7.00	7.000	7.000	.00	0 .0
668.870	.0240					.0169	11.30	23.57	1.25	5.21	.015	.00	.00	BOX
1668.870	3523.410	18.816	3542.226	916.08	18.70	5.43	3547.65	.00	7.00	7.00	7.000	7.000	.00	0 .0
1.830	.0273					.0169	.03	.00	1.25	4.95	.015	.00	.00	BOX
1670.700	3523.460	19.473	3542.933	916.08	18.70	5.43	3548.36	.00	7.00	7.00	7.000	7.000	.00	0 .0
55.170	.0207					.0169	.93	19.47	1.25	5.53	.015	.00	.00	BOX
1725.870	3524.600	19.264	3543.865	916.08	18.70	5.43	3549.29	.00	7.00	7.00	7.000	7.000	.00	0 .0
1.840	.0216					.0169	.03	.00	1.25	5.43	.015	.00	.00	BOX
1727.710	3524.640	19.934	3544.574	916.08	18.70	5.43	3550.00	.00	7.00	7.00	7.000	7.000	.00	0 .0
109.980	.0259					.0169	1.86	19.93	1.25	5.06	.015	.00	.00	BOX
1837.690	3527.490	18.941	3546.431	916.08	18.70	5.43	3551.86	.00	7.00	7.00	7.000	7.000	.00	0 .0
68.390	.0230					.0169	1.15	18.94	1.25	5.30	.015	.00	.00	BOX
1906.080	3529.060	18.526	3547.586	916.08	18.70	5.43	3553.01	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0164	.00	18.53	1.25		.015	.00	.00	BOX
1906.080	3529.060	18.809	3547.869	904.08	18.45	5.29	3553.15	.00	7.00	7.00	7.000	7.000	.00	0 .0
54.300	.0230					.0164	.89	18.81	1.23	5.24	.015	.00	.00	BOX
1960.380	3530.310	18.452	3548.762	904.08	18.45	5.29	3554.05	.00	7.00	7.00	7.000	7.000	.00	0 .0
TRANS STR	.0230					.0164	.15	18.45	1.23		.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:39: 4

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT

ER LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1969.520	3530.520	18.392	3548.912	904.08	18.45	5.29	3554.20	.00	7.00	7.00	7.000	7.000	.00	0 .0
5.000	.0240					.0387	.19	18.39	1.23	7.00	.023	.00	.00	BOX
1974.520	3530.640	18.466	3549.105	904.08	18.45	5.29	3554.39	.00	7.00	7.00	7.000	7.000	.00	0 .0
62.000	.0231					.0387	2.40	18.47	1.23	7.00	.023	.00	.00	BOX
2036.520	3532.070	19.433	3551.503	904.08	18.45	5.29	3556.79	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0346	.00	19.43	1.23		.023	.00	.00	BOX
2036.520	3532.070	20.462	3552.532	855.08	17.45	4.73	3557.26	.00	7.00	7.00	7.000	7.000	.00	0 .0
15.100	.0225					.0346	.52	20.46	1.16	7.00	.023	.00	.00	BOX
2051.620	3532.410	20.645	3553.055	855.08	17.45	4.73	3557.78	.00	7.00	7.00	7.000	7.000	.00	0 .0
145.000	.0650					.0346	5.02	20.64	1.16	4.67	.023	.00	.00	BOX
2196.620	3541.840	16.231	3558.071	855.08	17.45	4.73	3562.80	.00	7.00	7.00	7.000	7.000	.00	0 .0
TRANS STR	.0640					.0346	.17	16.23	1.16		.023	.00	.00	BOX
2201.620	3542.160	14.762	3556.922	855.08	20.36	6.44	3563.36	.00	7.00	6.00	7.000	6.000	.00	0 .0
400.000	.0650					.0524	20.96	14.76	1.36	5.55	.023	.00	.00	BOX
2601.620	3568.160	9.718	3577.877	855.08	20.36	6.44	3584.31	.00	7.00	6.00	7.000	6.000	.00	0 .0

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   44.520    .0649                                        .0524     2.33     9.72    1.36    5.55    .023       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 2646.140  3571.050    9.160  3580.210    855.08   20.36    6.44  3586.65     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
JUNCT STR   .0000                                        .0515      .00    9.16    1.36            .023       .00   .00  BOX
 FILE: GPDB-IN-NORTH-15-TW.WSW              W S P G W - CIVILDESIGN Version 14.05                                    PAGE    3
                              Program Package Serial Number: 1513
                                              WATER SURFACE PROFILE LISTING                    Date: 2- 5-2020  Time:10:39: 4
                           GRAND PARK DETENTION BASIN NORTH MAINLINE INLET
                             FILE NAME: GPDB-IN-NORTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT
                           ER  LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN
 ********************************************************************************************************************** ********
         | 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
 ********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*******|*******
         |         |        |         |         |                  |         |       |        |        |       |       |       |
 2646.140  3571.050    9.370  3580.420    848.08   20.19    6.33  3586.75     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
   51.670    .0650                                        .0515     2.66     9.37    1.34    5.51    .023       .00   .00  BOX
JUNCT STR   .0000                                        .0515      .00    8.67    1.34            .023       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 2697.810  3574.410    8.673  3583.083    848.07   20.19    6.33  3589.41     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
   97.080    .0650                                        .0515     5.00     8.67    1.34    5.51    .023       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 2794.890  3580.720    7.366  3588.085    848.07   20.19    6.33  3594.42     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
JUNCT STR   .0000                                        .0432      .00    7.37    1.34            .023       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 2794.890  3580.720    9.424  3590.144    776.07   18.48    5.30  3595.45     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
    6.710    .0656                                        .0432      .29     9.42    1.23    5.11    .023       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 2801.600  3581.160    9.274  3590.434    776.07   18.48    5.30  3595.74     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
    1.479    .0650                                        .0432      .06     9.27    1.23    5.13    .023       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 2803.079  3581.256    9.244  3590.500    776.07   18.48    5.30  3595.80     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
HYDRAULIC JUMP
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 2803.079  3581.256    5.130  3586.386    776.07   25.21    9.87  3596.26     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
   59.571    .0650                                        .0650     3.87     5.13    1.96    5.13    .023       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 2862.650  3585.130    5.131  3590.260    776.07   25.21    9.87  3600.13     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
   34.579    .0650                                        .0650     2.25     5.13    1.96    5.13    .023       .00   .00  BOX
 FILE: GPDB-IN-NORTH-15-TW.WSW              W S P G W - CIVILDESIGN Version 14.05                                    PAGE    4
                              Program Package Serial Number: 1513
                                              WATER SURFACE PROFILE LISTING                    Date: 2- 5-2020  Time:10:39: 4
                           GRAND PARK DETENTION BASIN NORTH MAINLINE INLET
                             FILE NAME: GPDB-IN-NORTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT
                           ER  LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN
 ********************************************************************************************************************** ********
         | 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
 ********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*******|*******
         |         |        |         |         |                  |         |       |        |        |       |       |       |
 2897.229  3587.378    5.131  3592.509    776.07   25.21    9.87  3602.38     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
  181.542    .0650                                        .0683    12.40     5.13    1.96    5.13    .023       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 3078.770  3599.180    4.937  3604.117    776.07   26.20   10.66  3614.78     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
   33.810    .0651                                        .0731     2.47     4.94    2.08    5.13    .023       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 3112.580  3601.380    4.857  3606.237    776.05   26.63   11.01  3617.25     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
   57.767    .0649                                        .0789     4.56     4.86    2.13    5.13    .023       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 3170.347  3605.132    4.647  3609.779    776.05   27.83   12.03  3621.81     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
   41.606    .0649                                        .0887     3.69     4.65    2.28    5.13    .023       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 3211.953  3607.834    4.431  3612.265    776.05   29.19   13.23  3625.50     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
   31.807    .0649                                        .1001     3.18     4.43    2.44    5.13    .023       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 3243.760  3609.900    4.225  3614.125    776.05   30.62   14.55  3628.68     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
    .976    .0650                                        .0451      .04     4.22    2.62    3.67    .015       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
 3244.736  3609.963    4.228  3614.191    776.05   30.59   14.53  3628.73     .00    7.00    6.00    7.000    6.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-     -|-     -|-     -|-     -|-
   49.437    .0650                                        .0425     2.10     4.23    2.62    3.67    .015       .00   .00  BOX
         |         |         |         |         |          |        |        |       |       |       |       |       |     |
```

3294.173	3613.179	4.434	3617.613	776.05	29.17	13.21	3630.83	.00	7.00	6.00	7.000	6.000	.00	0	.0				
35.948	.0650					.0376	1.35	4.43	2.44	3.67	.015	.00	.00	BOX					
3330.122	3615.517	4.650	3620.167	776.05	27.81	12.01	3632.18	.00	7.00	6.00	7.000	6.000	.00	0	.0				
27.323	.0650					.0334	.91	4.65	2.27	3.67	.015	.00	.00	BOX					

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:39: 4

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT

ER LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
3357.444	3617.294	4.877	3622.171	776.05	26.52	10.92	3633.09	.00	7.00	6.00	7.000	6.000	.00	0	.0				
21.306	.0650					.0296	.63	4.88	2.12	3.67	.015	.00	.00	BOX					
3378.750	3618.680	5.115	3623.795	776.05	25.28	9.93	3633.72	.53	7.00	6.00	7.000	6.000	.00	0	.0				
59.033	.0365					.0264	1.56	5.64	1.97	4.59	.015	.00	.00	BOX					
3437.783	3620.835	5.340	3626.176	776.05	24.22	9.11	3635.28	.48	7.00	6.00	7.000	6.000	.00	0	.0				
44.089	.0365					.0236	1.04	5.82	1.85	4.59	.015	.00	.00	BOX					
3481.872	3622.445	5.601	3628.046	776.05	23.09	8.28	3636.33	.44	7.00	6.00	7.000	6.000	.00	0	.0				
30.949	.0365					.0210	.65	6.04	1.72	4.59	.015	.00	.00	BOX					
3512.821	3623.575	5.874	3629.449	776.05	22.02	7.53	3636.98	.40	7.00	6.00	7.000	6.000	.00	0	.0				
22.329	.0365					.0187	.42	6.27	1.60	4.59	.015	.00	.00	BOX					
3535.150	3624.390	6.161	3630.551	776.05	20.99	6.84	3637.39	.00	7.00	6.00	7.000	6.000	.00	0	.0				
JUNCT STR	.0000					.0278	.00	6.52	1.49		.015	.00	.00	BOX					
3535.150	3624.390	3.909	3628.299	644.05	27.46	11.71	3640.01	.62	7.00	6.00	7.000	6.000	.00	0	.0				
37.910	.0364					.0381	1.44	4.53	2.45	3.97	.015	.00	.00	BOX					
3573.060	3625.770	3.897	3629.667	644.05	27.55	11.78	3641.45	.00	7.00	6.00	7.000	6.000	.00	0	.0				
11.790	.0365					.0383	.45	3.90	2.46	3.97	.015	.00	.00	BOX					
3584.850	3626.200	3.892	3630.092	644.05	27.58	11.81	3641.90	7.00	7.00	6.00	7.000	6.000	.00	0	.0				
.980	.0409					.0384	.04	7.00	2.46	3.80	.015	.00	.00	BOX					

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:39: 4

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT

ER LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
3585.830	3626.240	3.892	3630.132	644.05	27.58	11.81	3641.94	.09	7.00	6.00	7.000	6.000	.00	0	.0				
12.200	.0361					.0385	.47	3.98	2.46	3.99	.015	.00	.00	BOX					
3598.030	3626.680	3.886	3630.566	644.03	27.62	11.85	3642.41	.09	7.00	6.00	7.000	6.000	.00	0	.0				
23.590	.0365					.0387	.91	3.98	2.47	3.97	.015	.00	.00	BOX					
3621.620	3627.540	3.876	3631.416	644.03	27.70	11.91	3643.33	.09	7.00	6.00	7.000	6.000	.00	0	.0				
23.480	.0366					.0389	.91	3.97	2.48	3.96	.015	.00	.00	BOX					
3645.100	3628.400	3.865	3632.265	644.03	27.77	11.98	3644.24	.00	7.00	6.00	7.000	6.000	.00	0	.0				
JUNCT STR	.0000					.0426	.00	3.86	2.49		.015	.00	.00	BOX					
3645.100	3628.400	3.506	3631.906	617.03	29.33	13.36	3645.26	.00	6.90	6.00	7.000	6.000	.00	0	.0				
TRANS STR	.0360					.0456	.23	3.51	2.76		.015	.00	.00	BOX					
3650.100	3628.580	4.321	3632.901	617.03	28.56	12.67	3645.57	.08	7.00	5.00	7.000	5.000	.00	0	.0				
36.585	.0365					.0460	1.68	4.40	2.42	4.70	.015	.00	.00	BOX					

3686.685	3629.917	4.252	3634.169	617.03	29.03	13.08	3647.25	.09	7.00	5.00	7.000	5.000	.00	0 .0
83.525	.0365					.0498	4.16	4.34	2.48	4.70	.015	.00	.00	BOX
3770.210	3632.970	4.054	3637.023	617.03	30.44	14.39	3651.41	.09	7.00	5.00	7.000	5.000	.00	0 .0
27.910	.0780					.0508	1.42	4.14	2.66	3.48	.015	.00	.00	BOX
3798.120	3635.146	4.185	3639.331	617.03	29.49	13.50	3652.83	.09	7.00	5.00	7.000	5.000	.00	0 .0
32.036	.0780					.0460	1.47	4.27	2.54	3.48	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:39: 4

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT

ER LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
3830.156	3637.644	4.389	3642.033	617.03	28.12	12.28	3654.31	.08	7.00	5.00	7.000	5.000	.00	0 .0
24.317	.0780					.0409	.99	4.47	2.37	3.48	.015	.00	.00	BOX
3854.474	3639.540	4.603	3644.144	617.03	26.81	11.16	3655.30	.07	7.00	5.00	7.000	5.000	.00	0 .0
18.976	.0780					.0364	.69	4.67	2.20	3.48	.015	.00	.00	BOX
3873.450	3641.020	4.828	3645.848	617.03	25.56	10.14	3655.99	.00	7.00	5.00	7.000	5.000	.00	0 .0
TRANS STR	.0780					.0337	.17	4.83	2.05		.015	.00	.00	BOX
3878.450	3641.410	4.890	3646.300	617.03	25.24	9.89	3656.19	.06	6.00	5.00	6.000	5.000	.00	0 .0
25.480	.0780					.0780	1.99	4.95	2.01	4.89	.023	.00	.00	BOX
3903.930	3643.397	4.890	3648.287	617.03	25.24	9.89	3658.18	.06	6.00	5.00	6.000	5.000	.00	0 .0
155.310	.0780					.0785	12.19	4.95	2.01	4.89	.023	.00	.00	BOX
4059.240	3655.510	4.865	3660.375	617.01	25.36	9.99	3670.37	.06	6.00	5.00	6.000	5.000	.00	0 .0
30.200	.0780					.0792	2.39	4.93	2.03	4.89	.023	.00	.00	BOX
4089.440	3657.867	4.854	3662.721	617.01	25.42	10.04	3672.76	.06	6.00	5.00	6.000	5.000	.00	0 .0
123.306	.0780					.0844	10.40	4.92	2.03	4.89	.023	.00	.00	BOX
4212.746	3667.490	4.628	3672.118	617.01	26.67	11.04	3683.16	.07	6.00	5.00	6.000	5.000	.00	0 .0
52.784	.0780					.0949	5.01	4.70	2.18	4.89	.023	.00	.00	BOX
4265.530	3671.610	4.412	3676.023	617.01	27.97	12.14	3688.17	.08	6.00	5.00	6.000	5.000	.00	0 .0
10.068	.0616					.0422	.43	4.49	2.35	3.81	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 5-2020 Time:10:39: 4

GRAND PARK DETENTION BASIN NORTH MAINLINE INLET

FILE NAME: GPDB-IN-NORTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT

ER LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4275.599	3672.230	4.456	3676.686	617.01	27.69	11.91	3688.59	.07	6.00	5.00	6.000	5.000	.00	0 .0
38.979	.0616					.0394	1.54	4.53	2.31	3.81	.015	.00	.00	BOX
4314.577	3674.630	4.674	3679.304	617.01	26.40	10.83	3690.13	.07	6.00	5.00	6.000	5.000	.00	0 .0
28.466	.0616					.0350	1.00	4.74	2.15	3.81	.015	.00	.00	BOX
4343.043	3676.383	4.902	3681.285	617.01	25.17	9.84	3691.13	.06	6.00	5.00	6.000	5.000	.00	0 .0
21.546	.0616					.0312	.67	4.96	2.00	3.81	.015	.00	.00	BOX
4364.590	3677.710	5.141	3682.851	617.01	24.00	8.95	3691.80	.06	6.00	5.00	6.000	5.000	.00	0 .0
66.663	.0260					.0301	2.01	5.20	1.87	5.40	.015	.00	.00	BOX
4431.253	3679.443	5.035	3684.479	617.01	24.51	9.33	3693.80	.06	6.00	5.00	6.000	5.000	.00	0 .0

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  102.947    .0260                                        .0328     3.38     5.09    1.92    5.40    .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 4534.200  3682.120    4.801  3686.921    617.01   25.70   10.26  3697.18     .00    6.00     5.00    6.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
JUNCT STR   .0000                                        .0352      .00    4.87    2.07            .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 4534.200  3682.120    4.721  3686.841    613.01   25.97   10.47  3697.31     .07    6.00     5.00    6.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
   41.500    .0260                                        .0369     1.53     4.79    2.11    5.37    .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 4575.700  3683.200    4.596  3687.796    613.00   26.68   11.05  3698.85     .07    6.00     5.00    6.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
   41.460    .0261                                        .0397     1.64     4.67    2.19    5.37    .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 4617.160  3684.280    4.456  3688.736    613.00   27.51   11.75  3700.49     .00    6.00     5.00    6.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
JUNCT STR   .0000                                        .0452      .00    4.53    2.30            .015       .00   .00  BOX
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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
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****  |*******
        |         |        |         |         |         |       |         |       |        |        |       |       |        |
 4617.160  3684.280    3.999  3688.279    586.00   29.31   13.34  3701.62     .08    6.00     5.00    6.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
   33.550    .0256                                        .0517     1.73     4.08    2.58    5.21    .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 4650.710  3685.140    3.854  3688.994    586.00   30.41   14.36  3703.35     .00    6.00     5.00    6.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
TRANS STR   .0540                                        .0541      .27    3.85    2.73            .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 4655.710  3685.410    3.853  3689.263    586.00   30.42   14.37  3703.63     .00    5.00     5.00    5.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
   156.160    .0539                                        .0543     8.48     3.85    2.73    3.86    .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 4811.870  3693.820    3.842  3697.662    586.00   30.50   14.45  3712.11     .00    5.00     5.00    5.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
   61.229    .0667                                        .0521     3.19     3.84    2.74    3.55    .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 4873.099  3697.906    3.989  3701.896    586.00   29.38   13.40  3715.30     .00    5.00     5.00    5.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
   51.338    .0667                                        .0468     2.40     3.99    2.59    3.55    .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 4924.438  3701.333    4.184  3705.517    586.00   28.01   12.19  3717.70     .00    5.00     5.00    5.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
   35.858    .0667                                        .0415     1.49     4.18    2.41    3.55    .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 4960.296  3703.726    4.388  3708.114    586.00   26.71   11.08  3719.19     .00    5.00     5.00    5.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
   26.574    .0667                                        .0369      .98     4.39    2.25    3.55    .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 4986.870  3705.500    4.602  3710.102    586.00   25.47   10.07  3720.17     .00    5.00     5.00    5.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
   40.324    .0303                                        .0353     1.42     4.60    2.09    4.86    .015       .00   .00  BOX
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WARNING - Flow depth near top of box conduit


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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
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****  |*******
        |         |        |         |         |         |       |         |       |        |        |       |       |        |
 5027.194  3706.723    4.544  3711.267    586.00   25.79   10.33  3721.60     .00    5.00     5.00    5.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
   105.776    .0303                                        .0381     4.03     4.54    2.13    4.86    .015       .00   .00  BOX
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WARNING - Flow depth near top of box conduit

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        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 5132.970  3709.930    4.333  3714.262    586.00   27.05   11.36  3725.62     .00    5.00     5.00    5.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
JUNCT STR   .0000                                        .0430      .00    4.33    2.29            .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 5132.970  3709.930    4.016  3713.946    567.00   28.24   12.38  3726.33     .00    5.00     5.00    5.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
   13.210    .0303                                        .0462      .61     4.02    2.48    4.74    .015       .00   .00  BOX
        |        |        |        |        |        |        |        |        |        |        |        |        |        |
 5146.180  3710.330    3.975  3714.305    567.00   28.53   12.64  3726.94    5.00    5.00     5.00    5.000    5.000   .00   0   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-    |-
    1.080    .0278                                        .0469      .05     5.00    2.52    4.90    .015       .00   .00  BOX
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         |         |        |         |         |               |         |       |        |        |       |       |      |
 5147.260  3710.360    3.971  3714.331    567.00   28.56   12.67  3727.00     .00    5.00     5.00    5.000   5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
   27.552    .0741                                  .0447     1.23     3.97    2.53    3.32    .015       .00   .00  BOX
         |         |        |         |         |               |         |       |        |        |       |       |      |
 5174.812  3712.401    4.131  3716.533    567.00   27.45   11.70  3728.23     .00    5.00     5.00    5.000   5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
   25.380    .0741                                  .0401     1.02     4.13    2.38    3.32    .015       .00   .00  BOX
         |         |        |         |         |               |         |       |        |        |       |       |      |
 5200.192  3714.282    4.333  3718.615    567.00   26.17   10.64  3729.25     .00    5.00     5.00    5.000   5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
   19.647    .0741                                  .0356      .70     4.33    2.22    3.32    .015       .00   .00  BOX
         |         |        |         |         |               |         |       |        |        |       |       |      |
 5219.839  3715.738    4.545  3720.282    567.00   24.95    9.67  3729.95     .00    5.00     5.00    5.000   5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
   15.495    .0741                                  .0317      .49     4.54    2.06    3.32    .015       .00   .00  BOX
                     -------------------- WARNING - Flow depth near top of box conduit --------------------
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                    Program Package Serial Number: 1513
                                  WATER SURFACE PROFILE LISTING                  Date: 2- 5-2020  Time:10:39: 4
                  GRAND PARK DETENTION BASIN NORTH MAINLINE INLET
                    FILE NAME: GPDB-IN-NORTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT
                  ER  LAKE MEAD TO SUNSET RUN INTO GRAND PARK DETENTION BASIN
 ************************************************************************************************************************ ********
         | 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
 *********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|***** |*******
         |         |        |         |         |               |         |       |        |        |       |       |      |
 5235.334  3716.886    4.766  3721.652    567.00   23.79    8.79  3730.44     .00    5.00     5.00    5.000   5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
   12.336    .0741                                  .0344      .42     4.77    1.92    3.32    .015       .00   .00  BOX
                     -------------------- WARNING - Flow depth near top of box conduit --------------------
         |         |        |         |         |               |         |       |        |        |       |       |      |
 5247.670  3717.800    5.000  3722.800    567.00   22.68    7.99  3730.79     .00    5.00     5.00    5.000   5.000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
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C.2.7

Detention Basin Inlet – South – 0.013 Roughness

GPDB-IN-SOUTH-13

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T1 GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
T2 FILE NAME: GPDB-IN-SOUTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY IMPACT
T3 PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN
SO    969.41 3507.21   4      .013
TS   1000.00 3507.36   3      .013
JX   1000.00 3507.36   3  1   .013  850.00          3507.36
WX   1000.00 3507.36   5
R    1100.01 3509.17   5      .013                                    0.00    0.00  0
R    1583.14 3534.22   5      .023                                 -157.21    0.00  0
R    1707.84 3540.69   5      .023                                    0.00    0.00  0
JX   1707.84 3540.69   5 48   .023   72.00          3541.19          45.0
R    2366.94 3574.87   5      .023                                    0.00    0.00  0
JX   2366.94 3574.87   5 36   .023   38.00          3575.37          45.0
R    2487.93 3581.14   5      .023                                    0.00    0.00  0
JX   2487.93 3581.14   5 36   .023    9.00          3581.64         -45.0
R    2647.25 3589.41   5      .023                                   53.06    0.00  0
R    2652.25 3589.67   5      .023                                    0.00    0.00  0
JX   2652.25 3589.67   5 24 24.023    0.01     0.01 3590.17 3590.17  63.6-57.9
R    2868.40 3600.89   5      .023                                 -15.18    0.00  0
JX   2868.40 3600.89   5 30   .023   19.00          3601.39          75.2
R    3107.77 3613.29   5      .023                                 -16.93    0.00  0
R    3127.23 3614.46   5      .023                                    0.00    0.00  0
JX   3127.23 3614.46   5 24 24.023    0.01     0.01 3614.96 3614.96  40.4-68.8
R    3384.76 3629.91   5      .023                                    0.00    0.00  0
R    3694.97 3648.52   5      .023                                   22.51    0.00  0
JX   3694.97 3648.52   5 24 24.023    0.01     0.01 3649.02 3649.02  51.7-72.9
R    4070.86 3671.07   5      .023                                   27.27    0.00  0
R    4152.84 3675.99   5      .013                                    0.00    0.00  0
JX   4152.84 3675.99   5 30 54.013   14.00   128.00 3676.49 3676.49  60.7-60.7
R    4163.33 3676.62   5      .013                                    0.00    0.00  0
R    4164.23 3676.67   5      .013                                 -20.63    0.00  0
R    4275.73 3683.22   5      .013                                    0.00    0.00  0
R    4280.73 3683.51   5      .013
R    4290.73 3684.10   5      .013                                    0.00    0.00  0
SH   4290.73 3684.10   5
CD   1  3   0    .00    7.00     6.00  0.00  0.00
CD   2  3   0    .00    7.00     5.00  0.00  0.00
CD   3  3   0    .00    7.00    15.75  0.00  0.00
CD   4  3   0    .00    7.00    75.00  0.00  0.00
CD   5  3   0    .00    7.00     7.00  0.00  0.00
CD  24  4   1    .00    2.00      .00  0.00  0.00
CD  30  4   1    .00    2.50      .00  0.00  0.00
CD  36  4   1    .00    3.00      .00  0.00  0.00
CD  42  4   1    .00    3.50      .00  0.00  0.00
CD  48  4   1    .00    4.00      .00  0.00  0.00
CD  54  4   1    .00    4.50      .00  0.00  0.00
CD  60  4   2    .00    5.00      .00  0.00  0.00
Q           786.000   .0
```

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 0:47

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY
IM PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
969.410	3507.210	.935	3508.145	1916.06	27.33	11.60	3519.74	.00	2.73	75.00	7.000	75.000	.00	0 .0
TRANS STR	.0049					.0374	1.14	.93	4.98		.013	.00	.00	BOX
1000.000	3507.360	5.009	3512.369	1916.06	24.29	9.16	3521.53	.00	7.00	15.75	7.000	15.750	.00	0 .0
JUNCT STR	.0000					.0175	.00	5.01	1.91		.013	.00	.00	BOX
1000.000	3507.360	2.465	3509.825	1066.06	27.45	11.70	3521.53	.00	5.22	15.75	7.000	15.750	.00	0 .0
WALL	EXIT													
1000.000	3507.360	6.022	3513.382	1066.06	25.29	9.93	3523.31	.00	7.00	7.00	7.000	7.000	.00	0 .0
100.010	.0181					.0168	1.68	6.02	1.82	5.87	.013	.00	.00	BOX
1100.010	3509.170	6.081	3515.250	1066.06	25.05	9.74	3524.99	.77	7.00	7.00	7.000	7.000	.00	0 .0
277.991	.0518					.0518	14.41	6.86	1.79	6.08	.023	.00	.00	BOX
1378.001	3523.583	6.081	3529.664	1066.06	25.05	9.74	3539.41	.77	7.00	7.00	7.000	7.000	.00	0 .0
205.139	.0518					.0498	10.23	6.86	1.79	6.08	.023	.00	.00	BOX
1583.140	3534.220	6.281	3540.500	1066.06	24.25	9.13	3549.63	.00	7.00	7.00	7.000	7.000	.00	0 .0
31.760	.0519					.0471	1.50	6.28	1.71	6.08	.023	.00	.00	BOX
1614.901	3535.868	6.363	3542.230	1066.06	23.94	8.90	3551.13	.00	7.00	7.00	7.000	7.000	.00	0 .0
61.344	.0519					.0438	2.68	6.36	1.67	6.08	.023	.00	.00	BOX

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

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 0:47

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY
IM PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1676.245	3539.051	6.673	3545.724	1066.06	22.82	8.09	3553.81	.00	7.00	7.00	7.000	7.000	.00	0 .0
31.595	.0519					.0475	1.50	6.67	1.56	6.08	.023	.00	.00	BOX

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

1707.840	3540.690	7.000	3547.690	1066.06	21.76	7.35	3555.04	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0468	.00	7.00	1.45		.023	.00	.00	BOX
1707.840	3540.690	8.734	3549.424	994.06	20.29	6.39	3555.81	.00	7.00	7.00	7.000	7.000	.00	0 .0
17.845	.0519					.0468	.83	8.73	1.35	5.75	.023	.00	.00	BOX
1725.685	3541.615	8.642	3550.257	994.06	20.29	6.39	3556.65	.00	7.00	7.00	7.000	7.000	.00	0 .0
HYDRAULIC JUMP														
1725.685	3541.615	5.749	3547.364	994.06	24.70	9.48	3556.84	.00	7.00	7.00	7.000	7.000	.00	0 .0
367.644	.0519					.0519	19.07	5.75	1.82	5.75	.023	.00	.00	BOX
2093.328	3560.681	5.749	3566.430	994.06	24.70	9.48	3575.91	.00	7.00	7.00	7.000	7.000	.00	0 .0
200.704	.0519					.0497	9.97	5.75	1.82	5.75	.023	.00	.00	BOX
2294.032	3571.089	5.955	3577.044	994.06	23.85	8.83	3585.87	.00	7.00	7.00	7.000	7.000	.00	0 .0
72.908	.0519					.0448	3.27	5.95	1.72	5.75	.023	.00	.00	BOX
2366.940	3574.870	6.246	3581.116	994.06	22.74	8.03	3589.14	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0467	.00	6.25	1.60		.023	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2366.940	3574.870	5.599	3580.469	956.06	24.39	9.24	3589.71	.00	7.00	7.00	7.000	7.000	.00	0 .0
120.990	.0518					.0504	6.09	5.60	1.82	5.57	.023	.00	.00	BOX
2487.930	3581.140	5.679	3586.819	956.06	24.05	8.98	3595.80	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0507	.00	6.41	1.78		.023	.00	.00	BOX
2487.930	3581.140	5.529	3586.669	947.06	24.47	9.30	3595.97	.76	7.00	7.00	7.000	7.000	.00	0 .0
125.237	.0519					.0519	6.50	6.29	1.83	5.53	.023	.00	.00	BOX
2613.167	3587.641	5.529	3593.170	947.06	24.47	9.30	3602.47	.76	7.00	7.00	7.000	7.000	.00	0 .0
34.083	.0519					.0519	1.77	6.29	1.83	5.53	.023	.00	.00	BOX
2647.250	3589.410	5.529	3594.939	947.06	24.47	9.30	3604.24	.00	7.00	7.00	7.000	7.000	.00	0 .0
5.000	.0520					.0519	.26	5.53	1.83	5.53	.023	.00	.00	BOX
2652.250	3589.670	5.529	3595.199	947.04	24.47	9.30	3604.50	.16	7.00	7.00	7.000	7.000	.00	0 .0
18.700	.0519					.0519	.97	5.69	1.83	5.53	.023	.00	.00	BOX
2670.950	3590.641	5.529	3596.169	947.04	24.47	9.30	3605.47	.16	7.00	7.00	7.000	7.000	.00	0 .0
197.450	.0519					.0495	9.77	5.69	1.83	5.53	.023	.00	.00	BOX
2868.400	3600.890	5.748	3606.638	947.04	23.54	8.60	3615.24	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0497	.00	5.90	1.73		.023	.00	.00	BOX
2868.400	3600.890	5.425	3606.315	928.04	24.44	9.27	3615.59	.16	7.00	7.00	7.000	7.000	.00	0 .0
95.698	.0518					.0527	5.05	5.59	1.85	5.45	.023	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2964.098	3605.847	5.388	3611.236	928.04	24.60	9.40	3620.64	.16	7.00	7.00	7.000	7.000	.00	0 .0
143.672	.0518					.0566	8.13	5.55	1.87	5.45	.023	.00	.00	BOX
3107.770	3613.290	5.138	3618.428	928.04	25.80	10.34	3628.77	.00	7.00	7.00	7.000	7.000	.00	0 .0
19.460	.0601					.0600	1.17	5.14	2.01	5.13	.023	.00	.00	BOX
3127.230	3614.460	5.138	3619.598	928.02	25.80	10.34	3629.94	.00	7.00	7.00	7.000	7.000	.00	0 .0
257.530	.0600					.0600	15.45	5.14	2.01	5.14	.023	.00	.00	BOX
3384.760	3629.910	5.138	3635.048	928.02	25.80	10.34	3645.39	.18	7.00	7.00	7.000	7.000	.00	0 .0
169.851	.0600					.0600	10.19	5.32	2.01	5.14	.023	.00	.00	BOX
3554.611	3640.100	5.138	3645.238	928.02	25.80	10.34	3655.58	.18	7.00	7.00	7.000	7.000	.00	0 .0
140.359	.0600					.0600	8.42	5.32	2.01	5.14	.023	.00	.00	BOX
3694.970	3648.520	5.138	3653.658	928.00	25.80	10.34	3664.00	.18	7.00	7.00	7.000	7.000	.00	0 .0
88.505	.0600					.0600	5.31	5.32	2.01	5.14	.023	.00	.00	BOX
3783.475	3653.830	5.138	3658.968	928.00	25.80	10.34	3669.30	.18	7.00	7.00	7.000	7.000	.00	0 .0
204.878	.0600					.0632	12.96	5.32	2.01	5.14	.023	.00	.00	BOX
3988.353	3666.120	4.935	3671.056	928.00	26.86	11.20	3682.26	.20	7.00	7.00	7.000	7.000	.00	0 .0
82.508	.0600					.0708	5.84	5.13	2.13	5.14	.023	.00	.00	BOX

4070.860	3671.070	4.706	3675.776	928.00	28.17	12.32	3688.10	.00	7.00	7.00	7.000	7.000	.00	0 .0
21.953	.0600					.0227	.50	4.71	2.29	3.32	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 0:47

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY
IM PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4092.813	3672.387	4.915	3677.302	928.00	26.97	11.30	3688.60	.00	7.00	7.00	7.000	7.000	.00	0 .0
19.786	.0600					.0202	.40	4.92	2.14	3.32	.013	.00	.00	BOX
4112.599	3673.575	5.155	3678.730	928.00	25.72	10.27	3689.00	.00	7.00	7.00	7.000	7.000	.00	0 .0
16.206	.0600					.0179	.29	5.15	2.00	3.32	.013	.00	.00	BOX
4128.805	3674.548	5.407	3679.954	928.00	24.52	9.34	3689.29	.00	7.00	7.00	7.000	7.000	.00	0 .0
13.257	.0600					.0159	.21	5.41	1.86	3.32	.013	.00	.00	BOX
4142.062	3675.343	5.670	3681.014	928.00	23.38	8.49	3689.50	.00	7.00	7.00	7.000	7.000	.00	0 .0
10.778	.0600					.0141	.15	5.67	1.73	3.32	.013	.00	.00	BOX
4152.840	3675.990	5.947	3681.937	928.00	22.29	7.72	3689.65	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0203	.00	5.95	1.61		.013	.00	.00	BOX
4152.840	3675.990	3.941	3679.931	786.00	28.49	12.61	3692.54	.00	7.00	7.00	7.000	7.000	.00	0 .0
10.490	.0601					.0267	.28	3.94	2.53	2.93	.013	.00	.00	BOX
4163.330	3676.620	4.007	3680.627	786.00	28.02	12.19	3692.82	7.00	7.00	7.00	7.000	7.000	.00	0 .0
.900	.0553					.0261	.02	7.00	2.47	3.02	.013	.00	.00	BOX
4164.229	3676.670	4.012	3680.682	786.00	27.99	12.16	3692.84	.00	7.00	7.00	7.000	7.000	.00	0 .0
8.962	.0587					.0255	.23	4.01	2.46	2.96	.013	.00	.00	BOX
4173.192	3677.197	4.073	3681.269	786.00	27.57	11.80	3693.07	.00	7.00	7.00	7.000	7.000	.00	0 .0
24.854	.0587					.0236	.59	4.07	2.41	2.96	.013	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 0:47

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY
IM PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4198.045	3678.656	4.271	3682.928	786.00	26.29	10.73	3693.66	.00	7.00	7.00	7.000	7.000	.00	0 .0
20.225	.0587					.0208	.42	4.27	2.24	2.96	.013	.00	.00	BOX
4218.271	3679.844	4.480	3684.324	786.00	25.06	9.75	3694.08	.00	7.00	7.00	7.000	7.000	.00	0 .0
16.564	.0587					.0184	.30	4.48	2.09	2.96	.013	.00	.00	BOX
4234.834	3680.818	4.699	3685.516	786.00	23.90	8.87	3694.38	.00	7.00	7.00	7.000	7.000	.00	0 .0
13.586	.0587					.0163	.22	4.70	1.94	2.96	.013	.00	.00	BOX
4248.421	3681.616	4.928	3686.544	786.00	22.79	8.06	3694.61	.00	7.00	7.00	7.000	7.000	.00	0 .0
11.108	.0587					.0144	.16	4.93	1.81	2.96	.013	.00	.00	BOX
4259.529	3682.268	5.168	3687.437	786.00	21.73	7.33	3694.77	.00	7.00	7.00	7.000	7.000	.00	0 .0
9.006	.0587					.0128	.12	5.17	1.68	2.96	.013	.00	.00	BOX
4268.536	3682.797	5.421	3688.218	786.00	20.71	6.66	3694.88	.00	7.00	7.00	7.000	7.000	.00	0 .0
7.194	.0587					.0113	.08	5.42	1.57	2.96	.013	.00	.00	BOX
4275.730	3683.220	5.685	3688.905	786.00	19.75	6.06	3694.96	.00	7.00	7.00	7.000	.00	0 .0

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    5.000    .0580                                      .0101      .05     5.69    1.46    2.97    .013       .00   .00  BOX
         |        |        |        |        |              |        |       |       |       |       |        |     |
  4280.730  3683.510    5.923  3689.433    786.00   18.96    5.58  3695.01     .00    7.00    7.00    7.000    7.000   .00   0   .0
        -|-      -|-      -|-      -|-      -|-      -|-     -|-     -|-      -|-     -|-     -|-     -|-     -|-     -|-     -|-
    2.358    .0590                                      .0093      .02     5.92    1.37    2.95    .013       .00   .00  BOX
         |        |        |        |        |              |        |       |       |       |       |        |     |
  4283.088  3683.649    6.067  3689.716    786.00   18.51    5.32  3695.04     .00    7.00    7.00    7.000    7.000   .00   0   .0
        -|-      -|-      -|-      -|-      -|-      -|-     -|-     -|-      -|-     -|-     -|-     -|-     -|-     -|-     -|-
    3.716    .0590                                      .0086      .03     6.07    1.32    2.95    .013       .00   .00  BOX
 FILE: GPDB-IN-SOUTH-13.WSW                 W S P G W - CIVILDESIGN Version 14.05                                  PAGE    7
                              Program Package Serial Number: 1513
                                            WATER SURFACE PROFILE LISTING                 Date: 2- 7-2020  Time:11: 0:47
                          GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
                            FILE NAME: GPDB-IN-SOUTH-13.WSW - MANNINGS=0.013 MODEL TO TEST VELOCITY
                           IM  PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN
 ********************************************************************************************************************** ********
          | 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
 *********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|***** |*******
          |         |        |         |         |               |         |       |        |        |       |       |      |
  4286.804  3683.868    6.363  3690.231    786.00   17.65    4.84  3695.07     .00    7.00    7.00    7.000    7.000   .00   0   .0
        -|-      -|-      -|-      -|-      -|-      -|-     -|-     -|-      -|-     -|-     -|-     -|-     -|-     -|-     -|-
    2.511    .0590                                      .0076      .02     6.36    1.23    2.95    .013       .00   .00  BOX
                        -------------------- WARNING - Flow depth near top of box conduit --------------------
         |        |        |        |        |              |        |       |       |       |       |        |     |
  4289.315  3684.017    6.673  3690.690    786.00   16.83    4.40  3695.09     .00    7.00    7.00    7.000    7.000   .00   0   .0
        -|-      -|-      -|-      -|-      -|-      -|-     -|-     -|-      -|-     -|-     -|-     -|-     -|-     -|-     -|-
    1.415    .0590                                      .0068      .01     6.67    1.15    2.95    .013       .00   .00  BOX
                        -------------------- WARNING - Flow depth near top of box conduit --------------------
         |        |        |        |        |              |        |       |       |       |       |        |     |
  4290.730  3684.100    7.000  3691.100    786.00   16.04    4.00  3695.10     .00    7.00    7.00    7.000    7.000   .00   0   .0
        -|-      -|-      -|-      -|-      -|-      -|-     -|-     -|-      -|-     -|-     -|-     -|-     -|-     -|-     -|-
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C.2.8

Detention Basin Inlet – South – 0.015 Roughness

GPDB-IN-SOUTH-15

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T1 GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
T2 FILE NAME: GPDB-IN-SOUTH-15.WSW - MANNINGS=0.015 MODEL TO TEST HGL IMPACT
T3 PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN
SO    969.41 3507.21   4      .015
TS   1000.00 3507.36   3      .015
JX   1000.00 3507.36   3  1   .015  850.00          3507.36
WX   1000.00 3507.36   5
R    1100.01 3509.17   5      .015                                  0.00    0.00  0
R    1583.14 3534.22   5      .023                                -157.21    0.00  0
R    1707.84 3540.69   5      .023                                  0.00    0.00  0
JX   1707.84 3540.69   5 48   .023   72.00          3541.19          45.0
R    2366.94 3574.87   5      .023                                  0.00    0.00  0
JX   2366.94 3574.87   5 36   .023   38.00          3575.37          45.0
R    2487.93 3581.14   5      .023                                  0.00    0.00  0
JX   2487.93 3581.14   5 36   .023    9.00          3581.64         -45.0
R    2647.25 3589.41   5      .023                                 53.06    0.00  0
R    2652.25 3589.67   5      .023                                  0.00    0.00  0
JX   2652.25 3589.67   5 24 24.023    0.01     0.01 3590.17 3590.17  63.6-57.9
R    2868.40 3600.89   5      .023                                -15.18    0.00  0
JX   2868.40 3600.89   5 30   .023   19.00          3601.39          75.2
R    3107.77 3613.29   5      .023                                -16.93    0.00  0
R    3127.23 3614.46   5      .023                                  0.00    0.00  0
JX   3127.23 3614.46   5 24 24.023    0.01     0.01 3614.96 3614.96  40.4-68.8
R    3384.76 3629.91   5      .023                                  0.00    0.00  0
R    3694.97 3648.52   5      .023                                 22.51    0.00  0
JX   3694.97 3648.52   5 24 24.023    0.01     0.01 3649.02 3649.02  51.7-72.9
R    4070.86 3671.07   5      .023                                 27.27    0.00  0
R    4152.84 3675.99   5      .015                                  0.00    0.00  0
JX   4152.84 3675.99   5 30 54.015   14.00   128.00 3676.49 3676.49  60.7-60.7
R    4163.33 3676.62   5      .015                                  0.00    0.00  0
R    4164.23 3676.67   5      .015                                -20.63    0.00  0
R    4275.73 3683.22   5      .015                                  0.00    0.00  0
R    4280.73 3683.51   5      .015
R    4290.73 3684.10   5      .015                                  0.00    0.00  0
SH   4290.73 3684.10   5
CD   1  3   0    .00    7.00     6.00  0.00  0.00
CD   2  3   0    .00    7.00     5.00  0.00  0.00
CD   3  3   0    .00    7.00    15.75  0.00  0.00
CD   4  3   0    .00    7.00    75.00  0.00  0.00
CD   5  3   0    .00    7.00     7.00  0.00  0.00
CD  24  4   1    .00    2.00      .00  0.00  0.00
CD  30  4   1    .00    2.50      .00  0.00  0.00
CD  36  4   1    .00    3.00      .00  0.00  0.00
CD  42  4   1    .00    3.50      .00  0.00  0.00
CD  48  4   1    .00    4.00      .00  0.00  0.00
CD  54  4   1    .00    4.50      .00  0.00  0.00
CD  60  4   2    .00    5.00      .00  0.00  0.00
Q           786.000   .0
```

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 9:27

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-15.WSW - MANNINGS=0.015 MODEL TO TEST HGL IMPAC
T PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
969.410	3507.210	.968	3508.178	1916.06	26.40	10.82	3519.00	.00	2.73	75.00	7.000	75.000	.00	0 .0
TRANS STR	.0049					.0444	1.36	.97	4.73		.015	.00	.00	BOX
1000.000	3507.360	5.230	3512.590	1916.06	23.26	8.40	3520.99	.00	7.00	15.75	7.000	15.750	.00	0 .0
JUNCT STR	.0000					.0213	.00	5.23	1.79		.015	.00	.00	BOX
1000.000	3507.360	2.531	3509.892	1066.06	26.74	11.10	3520.99	.00	5.22	15.75	7.000	15.750	.00	0 .0
WALL	EXIT													
1000.000	3507.360	6.238	3513.598	1066.06	24.41	9.25	3522.85	.00	7.00	7.00	7.000	7.000	.00	0 .0
100.010	.0181					.0214	2.14	6.24	1.72	6.59	.015	.00	.00	BOX
1100.010	3509.170	6.081	3515.250	1066.06	25.05	9.74	3524.99	.77	7.00	7.00	7.000	7.000	.00	0 .0
277.991	.0518					.0518	14.41	6.86	1.79	6.08	.023	.00	.00	BOX
1378.001	3523.583	6.081	3529.664	1066.06	25.05	9.74	3539.41	.77	7.00	7.00	7.000	7.000	.00	0 .0
205.139	.0518					.0498	10.23	6.86	1.79	6.08	.023	.00	.00	BOX
1583.140	3534.220	6.281	3540.500	1066.06	24.25	9.13	3549.63	.00	7.00	7.00	7.000	7.000	.00	0 .0
31.760	.0519					.0471	1.50	6.28	1.71	6.08	.023	.00	.00	BOX
1614.901	3535.868	6.363	3542.230	1066.06	23.94	8.90	3551.13	.00	7.00	7.00	7.000	7.000	.00	0 .0
61.344	.0519					.0438	2.68	6.36	1.67	6.08	.023	.00	.00	BOX

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

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 9:27

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-15.WSW - MANNINGS=0.015 MODEL TO TEST HGL IMPAC
T PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1676.245	3539.051	6.673	3545.724	1066.06	22.82	8.09	3553.81	.00	7.00	7.00	7.000	7.000	.00	0 .0
31.595	.0519					.0475	1.50	6.67	1.56	6.08	.023	.00	.00	BOX

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

1707.840	3540.690	7.000	3547.690	1066.06	21.76	7.35	3555.04	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0468	.00	7.00	1.45		.023	.00	.00	BOX
1707.840	3540.690	8.734	3549.424	994.06	20.29	6.39	3555.81	.00	7.00	7.00	7.000	7.000	.00	0 .0
17.845	.0519					.0468	.83	8.73	1.35	5.75	.023	.00	.00	BOX
1725.685	3541.615	8.642	3550.257	994.06	20.29	6.39	3556.65	.00	7.00	7.00	7.000	7.000	.00	0 .0
HYDRAULIC JUMP														
1725.685	3541.615	5.749	3547.364	994.06	24.70	9.48	3556.84	.00	7.00	7.00	7.000	7.000	.00	0 .0
367.644	.0519					.0519	19.07	5.75	1.82	5.75	.023	.00	.00	BOX
2093.328	3560.681	5.749	3566.430	994.06	24.70	9.48	3575.91	.00	7.00	7.00	7.000	7.000	.00	0 .0
200.704	.0519					.0497	9.97	5.75	1.82	5.75	.023	.00	.00	BOX
2294.032	3571.089	5.955	3577.044	994.06	23.85	8.83	3585.87	.00	7.00	7.00	7.000	7.000	.00	0 .0
72.908	.0519					.0448	3.27	5.95	1.72	5.75	.023	.00	.00	BOX
2366.940	3574.870	6.246	3581.116	994.06	22.74	8.03	3589.14	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0467	.00	6.25	1.60		.023	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2366.940	3574.870	5.599	3580.469	956.06	24.39	9.24	3589.71	.00	7.00	7.00	7.000	7.000	.00	0 .0
120.990	.0518					.0504	6.09	5.60	1.82	5.57	.023	.00	.00	BOX
2487.930	3581.140	5.679	3586.819	956.06	24.05	8.98	3595.80	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0507	.00	6.41	1.78		.023	.00	.00	BOX
2487.930	3581.140	5.529	3586.669	947.06	24.47	9.30	3595.97	.76	7.00	7.00	7.000	7.000	.00	0 .0
125.237	.0519					.0519	6.50	6.29	1.83	5.53	.023	.00	.00	BOX
2613.167	3587.641	5.529	3593.170	947.06	24.47	9.30	3602.47	.76	7.00	7.00	7.000	7.000	.00	0 .0
34.083	.0519					.0519	1.77	6.29	1.83	5.53	.023	.00	.00	BOX
2647.250	3589.410	5.529	3594.939	947.06	24.47	9.30	3604.24	.00	7.00	7.00	7.000	7.000	.00	0 .0
5.000	.0520					.0519	.26	5.53	1.83	5.53	.023	.00	.00	BOX
2652.250	3589.670	5.529	3595.199	947.04	24.47	9.30	3604.50	.16	7.00	7.00	7.000	7.000	.00	0 .0
18.700	.0519					.0519	.97	5.69	1.83	5.53	.023	.00	.00	BOX
2670.950	3590.641	5.529	3596.169	947.04	24.47	9.30	3605.47	.16	7.00	7.00	7.000	7.000	.00	0 .0
197.450	.0519					.0495	9.77	5.69	1.83	5.53	.023	.00	.00	BOX
2868.400	3600.890	5.748	3606.638	947.04	23.54	8.60	3615.24	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0497	.00	5.90	1.73		.023	.00	.00	BOX
2868.400	3600.890	5.425	3606.315	928.04	24.44	9.27	3615.59	.16	7.00	7.00	7.000	7.000	.00	0 .0
95.698	.0518					.0527	5.05	5.59	1.85	5.45	.023	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2964.098	3605.847	5.388	3611.236	928.04	24.60	9.40	3620.64	.16	7.00	7.00	7.000	7.000	.00	0 .0
143.672	.0518					.0566	8.13	5.55	1.87	5.45	.023	.00	.00	BOX
3107.770	3613.290	5.138	3618.428	928.04	25.80	10.34	3628.77	.00	7.00	7.00	7.000	7.000	.00	0 .0
19.460	.0601					.0600	1.17	5.14	2.01	5.13	.023	.00	.00	BOX
3127.230	3614.460	5.138	3619.598	928.02	25.80	10.34	3629.94	.00	7.00	7.00	7.000	7.000	.00	0 .0
257.530	.0600					.0600	15.45	5.14	2.01	5.14	.023	.00	.00	BOX
3384.760	3629.910	5.138	3635.048	928.02	25.80	10.34	3645.39	.18	7.00	7.00	7.000	7.000	.00	0 .0
169.851	.0600					.0600	10.19	5.32	2.01	5.14	.023	.00	.00	BOX
3554.611	3640.100	5.138	3645.238	928.02	25.80	10.34	3655.58	.18	7.00	7.00	7.000	7.000	.00	0 .0
140.359	.0600					.0600	8.42	5.32	2.01	5.14	.023	.00	.00	BOX
3694.970	3648.520	5.138	3653.658	928.00	25.80	10.34	3664.00	.18	7.00	7.00	7.000	7.000	.00	0 .0
174.567	.0600					.0600	10.48	5.32	2.01	5.14	.023	.00	.00	BOX
3869.537	3658.992	5.136	3664.128	928.00	25.81	10.35	3674.48	.18	7.00	7.00	7.000	7.000	.00	0 .0
201.323	.0600					.0639	12.87	5.32	2.01	5.14	.023	.00	.00	BOX
4070.860	3671.070	4.897	3675.967	928.00	27.07	11.38	3687.35	.00	7.00	7.00	7.000	7.000	.00	0 .0
4.164	.0600					.0286	.12	4.90	2.16	3.70	.015	.00	.00	BOX

4075.024	3671.320	4.933	3676.253	928.00	26.87	11.22	3687.47	.00	7.00	7.00	7.000	7.000	.00	0 .0
23.370	.0600					.0267	.62	4.93	2.13	3.70	.015	.00	.00	BOX

Program Package Serial Number: 1513

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GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-15.WSW - MANNINGS=0.015 MODEL TO TEST HGL IMPAC
T PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4098.395	3672.723	5.174	3677.897	928.00	25.62	10.20	3688.09	.00	7.00	7.00	7.000	7.000	.00	0 .0
18.544	.0600					.0236	.44	5.17	1.99	3.70	.015	.00	.00	BOX
4116.938	3673.836	5.426	3679.262	928.00	24.43	9.27	3688.53	.00	7.00	7.00	7.000	7.000	.00	0 .0
14.797	.0600					.0210	.31	5.43	1.85	3.70	.015	.00	.00	BOX
4131.736	3674.724	5.691	3680.415	928.00	23.29	8.43	3688.84	.00	7.00	7.00	7.000	7.000	.00	0 .0
11.791	.0600					.0186	.22	5.69	1.72	3.70	.015	.00	.00	BOX
4143.527	3675.431	5.969	3681.400	928.00	22.21	7.66	3689.06	.00	7.00	7.00	7.000	7.000	.00	0 .0
9.313	.0600					.0165	.15	5.97	1.60	3.70	.015	.00	.00	BOX
4152.840	3675.990	6.260	3682.250	928.00	21.18	6.96	3689.21	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0244	.00	6.26	1.49		.015	.00	.00	BOX
4152.840	3675.990	4.072	3680.062	786.00	27.58	11.81	3691.87	.00	7.00	7.00	7.000	7.000	.00	0 .0
10.490	.0601					.0327	.34	4.07	2.41	3.26	.015	.00	.00	BOX
4163.330	3676.620	4.133	3680.753	786.00	27.17	11.46	3692.22	7.00	7.00	7.00	7.000	7.000	.00	0 .0
.900	.0553					.0320	.03	7.00	2.36	3.36	.015	.00	.00	BOX
4164.230	3676.670	4.137	3680.807	786.00	27.14	11.44	3692.25	.00	7.00	7.00	7.000	7.000	.00	0 .0
24.412	.0587					.0305	.74	4.14	2.35	3.29	.015	.00	.00	BOX
4188.642	3678.104	4.300	3682.404	786.00	26.11	10.59	3692.99	.00	7.00	7.00	7.000	7.000	.00	0 .0
23.894	.0587					.0272	.65	4.30	2.22	3.29	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 9:27

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-15.WSW - MANNINGS=0.015 MODEL TO TEST HGL IMPAC
T PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4212.536	3679.508	4.510	3684.018	786.00	24.90	9.63	3693.64	.00	7.00	7.00	7.000	7.000	.00	0 .0
18.897	.0587					.0241	.46	4.51	2.07	3.29	.015	.00	.00	BOX
4231.433	3680.618	4.730	3685.348	786.00	23.74	8.75	3694.10	.00	7.00	7.00	7.000	7.000	.00	0 .0
15.085	.0587					.0213	.32	4.73	1.92	3.29	.015	.00	.00	BOX
4246.518	3681.504	4.961	3686.465	786.00	22.63	7.95	3694.42	.00	7.00	7.00	7.000	7.000	.00	0 .0
12.065	.0587					.0189	.23	4.96	1.79	3.29	.015	.00	.00	BOX
4258.583	3682.213	5.203	3687.416	786.00	21.58	7.23	3694.65	.00	7.00	7.00	7.000	7.000	.00	0 .0
9.602	.0587					.0167	.16	5.20	1.67	3.29	.015	.00	.00	BOX
4268.185	3682.777	5.457	3688.234	786.00	20.58	6.57	3694.81	.00	7.00	7.00	7.000	7.000	.00	0 .0
7.545	.0587					.0148	.11	5.46	1.55	3.29	.015	.00	.00	BOX
4275.730	3683.220	5.723	3688.943	786.00	19.62	5.98	3694.92	.00	7.00	7.00	7.000	7.000	.00	0 .0
5.000	.0580					.0133	.07	5.72	1.45	3.30	.015	.00	.00	BOX
4280.730	3683.510	5.954	3689.464	786.00	18.86	5.52	3694.99	.00	7.00	7.00	7.000	.00	0 .0

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
	1.944	.0590				.0123	.02	5.95	1.36	3.28	.015	.00	.00	BOX
4282.674	3683.625	6.067	3689.691	786.00	18.51	5.32	3695.01	.00	7.00	7.00	7.000	7.000	.00	0 .0
	3.937	.0590				.0114	.04	6.07	1.32	3.28	.015	.00	.00	BOX
4286.611	3683.857	6.363	3690.220	786.00	17.65	4.84	3695.06	.00	7.00	7.00	7.000	7.000	.00	0 .0
	2.640	.0590				.0101	.03	6.36	1.23	3.28	.015	.00	.00	BOX

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

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4289.251	3684.013	6.673	3690.686	786.00	16.83	4.40	3695.08	.00	7.00	7.00	7.000	7.000	.00	0 .0
	1.479	.0590				.0090	.01	6.67	1.15	3.28	.015	.00	.00	BOX

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

4290.730	3684.100	7.000	3691.100	786.00	16.04	4.00	3695.10	.00	7.00	7.00	7.000	7.000	.00	0 .0

C.2.9

Detention Basin Inlet – South – Grate Tailwater

GPDB-IN-SOUTH-GRATE

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T1 GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
T2 FILE NAME: GPDB-IN-SOUTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE ASSUMED
T3 PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN
SO    969.41 3507.21   4
TS   1000.00 3507.36   3      .015
JX   1000.00 3507.36   3  1   .015  850.00          3507.36
WX   1000.00 3507.36   6
R    1001.00 3507.39   6      .015                                  0.00    0.00  0
WE   1001.00 3507.39   5      .500
R    1100.01 3509.17   5      .015                                  0.00    0.00  0
R    1583.14 3534.22   5      .023                                -157.21    0.00  0
R    1707.84 3540.69   5      .023                                  0.00    0.00  0
JX   1707.84 3540.69   5 48   .023   72.00          3541.19          45.0
R    2366.94 3574.87   5      .023                                  0.00    0.00  0
JX   2366.94 3574.87   5 36   .023   38.00          3575.37          45.0
R    2487.93 3581.14   5      .023                                  0.00    0.00  0
JX   2487.93 3581.14   5 36   .023    9.00          3581.64         -45.0
R    2647.25 3589.41   5      .023                                 53.06    0.00  0
R    2652.25 3589.67   5      .023                                  0.00    0.00  0
JX   2652.25 3589.67   5 24 24.023    0.01     0.01 3590.17 3590.17  63.6-57.9
R    2868.40 3600.89   5      .023                                -15.18    0.00  0
JX   2868.40 3600.89   5 30   .023   19.00          3601.39          75.2
R    3107.77 3613.29   5      .023                                -16.93    0.00  0
R    3127.23 3614.46   5      .023                                  0.00    0.00  0
JX   3127.23 3614.46   5 24 24.023    0.01     0.01 3614.96 3614.96  40.4-68.8
R    3384.76 3629.91   5      .023                                  0.00    0.00  0
R    3694.97 3648.52   5      .023                                 22.51    0.00  0
JX   3694.97 3648.52   5 24 24.023    0.01     0.01 3649.02 3649.02  51.7-72.9
R    4070.86 3671.07   5      .023                                 27.27    0.00  0
R    4152.84 3675.99   5      .015                                  0.00    0.00  0
JX   4152.84 3675.99   5 30 54.015   14.00   128.00 3676.49 3676.49  60.7-60.7
R    4163.33 3676.62   5      .015                                  0.00    0.00  0
R    4164.23 3676.67   5      .015                                -20.63    0.00  0
R    4275.73 3683.22   5      .015                                  0.00    0.00  0
R    4280.73 3683.51   5      .015
R    4290.73 3684.10   5      .015                                  0.00    0.00  0
SH   4290.73 3684.10   5
CD   1  3   0    .00    7.00     6.00  0.00  0.00
CD   2  3   0    .00    7.00     5.00  0.00  0.00
CD   3  3   0    .00    7.00    15.75  0.00  0.00
CD   4  3   0    .00    7.00    75.00  0.00  0.00
CD   5  3   0    .00    7.00     7.00  0.00  0.00
CD   6  3   0    .00    6.00     5.37  0.00  0.00
CD  24  4   1    .00    2.00      .00  0.00  0.00
CD  30  4   1    .00    2.50      .00  0.00  0.00
CD  36  4   1    .00    3.00      .00  0.00  0.00
CD  42  4   1    .00    3.50      .00  0.00  0.00
CD  48  4   1    .00    4.00      .00  0.00  0.00
CD  54  4   1    .00    4.50      .00  0.00  0.00
CD  60  4   2    .00    5.00      .00  0.00  0.00
Q           786.000   .0
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Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 9:47

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY

FILE NAME: GPDB-IN-SOUTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
969.410	3507.210	.767	3507.977	1916.06	33.32	17.24	3525.22	.00	2.73	75.00	7.000	75.000	.00	0 .0
TRANS STR	.0049					.0996	3.05	.77	6.71		.015	.00	.00	BOX
1000.000	3507.360	3.643	3511.003	1916.06	33.39	17.31	3528.32	.00	7.00	15.75	7.000	15.750	.00	0 .0
JUNCT STR	.0000					.0516	.00	3.64	3.08		.015	.00	.00	BOX
1000.000	3507.360	1.933	3509.293	1066.06	35.01	19.03	3528.32	.00	5.22	15.75	7.000	15.750	.00	0 .0
WALL	EXIT													
1000.000	3507.360	6.000	3513.360	1066.06	33.09	17.00	3530.36	.00	6.00	5.37	6.000	5.370	.00	0 .0
1.000	.0298					.0701	.07	6.00	2.38	6.00	.015	.00	.00	BOX
1001.000	3507.390	6.040	3513.430	1066.06	33.09	17.00	3530.43	.00	6.00	5.37	6.000	5.370	.00	0 .0
WALL	ENTRANCE													
1001.000	3507.390	20.514	3527.904	1066.06	21.76	7.35	3535.25	.00	7.00	7.00	7.000	7.000	.00	0 .0
99.010	.0180					.0229	2.26	20.51	1.45	6.60	.015	.00	.00	BOX
1100.010	3509.170	20.998	3530.168	1066.06	21.76	7.35	3537.52	.00	7.00	7.00	7.000	7.000	.00	0 .0
483.130	.0518					.0538	25.98	.00	1.45	6.08	.023	.00	.00	BOX
1583.140	3534.220	23.869	3558.089	1066.06	21.76	7.35	3565.44	.00	7.00	7.00	7.000	7.000	.00	0 .0
124.700	.0519					.0538	6.71	23.87	1.45	6.08	.023	.00	.00	BOX
1707.840	3540.690	24.104	3564.794	1066.06	21.76	7.35	3572.14	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0468	.00	24.10	1.45		.023	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 9:47

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY

FILE NAME: GPDB-IN-SOUTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE

A PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1707.840	3540.690	25.838	3566.528	994.06	20.29	6.39	3572.92	.00	7.00	7.00	7.000	7.000	.00	0 .0
659.100	.0519					.0468	30.81	25.84	1.35	5.75	.023	.00	.00	BOX
2366.940	3574.870	22.472	3597.342	994.06	20.29	6.39	3603.73	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0432	.00	22.47	1.35		.023	.00	.00	BOX
2366.940	3574.870	23.339	3598.209	956.06	19.51	5.91	3604.12	.00	7.00	7.00	7.000	7.000	.00	0 .0
120.990	.0518					.0432	5.23	23.34	1.30	5.57	.023	.00	.00	BOX
2487.930	3581.140	22.301	3603.441	956.06	19.51	5.91	3609.35	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0424	.00	.00	1.30		.023	.00	.00	BOX
2487.930	3581.140	22.518	3603.657	947.06	19.33	5.80	3609.46	.00	7.00	7.00	7.000	7.000	.00	0 .0
159.320	.0519					.0424	6.76	.00	1.29	5.53	.023	.00	.00	BOX
2647.250	3589.410	21.899	3611.309	947.06	19.33	5.80	3617.11	.00	7.00	7.00	7.000	7.000	.00	0 .0
5.000	.0520					.0424	.21	21.90	1.29	5.53	.023	.00	.00	BOX
JUNCT STR	.0000					.0424	.00	21.85	1.29		.023	.00	.00	BOX
2652.250	3589.670	21.852	3611.522	947.04	19.33	5.80	3617.32	.00	7.00	7.00	7.000	7.000	.00	0 .0
216.150	.0519					.0424	9.17	.00	1.29	5.53	.023	.00	.00	BOX
2868.400	3600.890	20.280	3621.170	947.04	19.33	5.80	3626.97	.00	7.00	7.00	7.000	7.000	.00	0 .0

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2868.400	3600.890	20.729	3621.619	928.04	18.94	5.57	3627.19	.00	7.00	7.00	7.000	7.000	.00	0 .0
239.370	.0518					.0407	9.75	.00	1.26	5.45	.023	.00	.00	BOX
3107.770	3613.290	18.566	3631.856	928.04	18.94	5.57	3637.43	.00	7.00	7.00	7.000	7.000	.00	0 .0
19.460	.0601					.0407	.79	18.57	1.26	5.13	.023	.00	.00	BOX
JUNCT STR	.0000					.0407	.00	18.19	1.26		.023	.00	.00	BOX
3127.230	3614.460	18.190	3632.650	928.02	18.94	5.57	3638.22	.00	7.00	7.00	7.000	7.000	.00	0 .0
257.530	.0600					.0407	10.49	18.19	1.26	5.14	.023	.00	.00	BOX
3384.760	3629.910	13.233	3643.143	928.02	18.94	5.57	3648.71	.00	7.00	7.00	7.000	7.000	.00	0 .0
218.398	.0600					.0407	8.90	.00	1.26	5.14	.023	.00	.00	BOX
3603.158	3643.012	9.418	3652.429	928.02	18.94	5.57	3658.00	.00	7.00	7.00	7.000	7.000	.00	0 .0
HYDRAULIC JUMP														
3603.158	3643.012	5.138	3648.150	928.02	25.80	10.34	3658.49	.18	7.00	7.00	7.000	7.000	.00	0 .0
91.812	.0600					.0600	5.51	5.32	2.01	5.14	.023	.00	.00	BOX
3694.970	3648.520	5.138	3653.658	928.00	25.80	10.34	3664.00	.18	7.00	7.00	7.000	7.000	.00	0 .0
174.567	.0600					.0600	10.48	5.32	2.01	5.14	.023	.00	.00	BOX
3869.537	3658.992	5.136	3664.128	928.00	25.81	10.35	3674.48	.18	7.00	7.00	7.000	7.000	.00	0 .0
201.323	.0600					.0639	12.87	5.32	2.01	5.14	.023	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4070.860	3671.070	4.897	3675.967	928.00	27.07	11.38	3687.35	.00	7.00	7.00	7.000	7.000	.00	0 .0
4.164	.0600					.0286	.12	4.90	2.16	3.70	.015	.00	.00	BOX
4075.024	3671.320	4.933	3676.253	928.00	26.87	11.22	3687.47	.00	7.00	7.00	7.000	7.000	.00	0 .0
23.370	.0600					.0267	.62	4.93	2.13	3.70	.015	.00	.00	BOX
4098.395	3672.723	5.174	3677.897	928.00	25.62	10.20	3688.09	.00	7.00	7.00	7.000	7.000	.00	0 .0
18.544	.0600					.0236	.44	5.17	1.99	3.70	.015	.00	.00	BOX
4116.938	3673.836	5.426	3679.262	928.00	24.43	9.27	3688.53	.00	7.00	7.00	7.000	7.000	.00	0 .0
14.797	.0600					.0210	.31	5.43	1.85	3.70	.015	.00	.00	BOX
4131.736	3674.724	5.691	3680.415	928.00	23.29	8.43	3688.84	.00	7.00	7.00	7.000	7.000	.00	0 .0
11.791	.0600					.0186	.22	5.69	1.72	3.70	.015	.00	.00	BOX
4143.527	3675.431	5.969	3681.400	928.00	22.21	7.66	3689.06	.00	7.00	7.00	7.000	7.000	.00	0 .0
9.313	.0600					.0165	.15	5.97	1.60	3.70	.015	.00	.00	BOX
4152.840	3675.990	6.260	3682.250	928.00	21.18	6.96	3689.21	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0244	.00	6.26	1.49		.015	.00	.00	BOX
4152.840	3675.990	4.072	3680.062	786.00	27.58	11.81	3691.87	.00	7.00	7.00	7.000	7.000	.00	0 .0
10.490	.0601					.0327	.34	4.07	2.41	3.26	.015	.00	.00	BOX

4163.330	3676.620	4.133	3680.753	786.00	27.17	11.46	3692.22	7.00	7.00	7.00	7.000	7.000	.00	0 .0
.900	.0553					.0320	.03	7.00	2.36	3.36	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 9:47

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE
A PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4164.230	3676.670	4.137	3680.807	786.00	27.14	11.44	3692.25	.00	7.00	7.00	7.000	7.000	.00	0 .0
24.412	.0587					.0305	.74	4.14	2.35	3.29	.015	.00	.00	BOX
4188.642	3678.104	4.300	3682.404	786.00	26.11	10.59	3692.99	.00	7.00	7.00	7.000	7.000	.00	0 .0
23.894	.0587					.0272	.65	4.30	2.22	3.29	.015	.00	.00	BOX
4212.536	3679.508	4.510	3684.018	786.00	24.90	9.63	3693.64	.00	7.00	7.00	7.000	7.000	.00	0 .0
18.897	.0587					.0241	.46	4.51	2.07	3.29	.015	.00	.00	BOX
4231.433	3680.618	4.730	3685.348	786.00	23.74	8.75	3694.10	.00	7.00	7.00	7.000	7.000	.00	0 .0
15.085	.0587					.0213	.32	4.73	1.92	3.29	.015	.00	.00	BOX
4246.518	3681.504	4.961	3686.465	786.00	22.63	7.95	3694.42	.00	7.00	7.00	7.000	7.000	.00	0 .0
12.065	.0587					.0189	.23	4.96	1.79	3.29	.015	.00	.00	BOX
4258.583	3682.213	5.203	3687.416	786.00	21.58	7.23	3694.65	.00	7.00	7.00	7.000	7.000	.00	0 .0
9.602	.0587					.0167	.16	5.20	1.67	3.29	.015	.00	.00	BOX
4268.185	3682.777	5.457	3688.234	786.00	20.58	6.57	3694.81	.00	7.00	7.00	7.000	7.000	.00	0 .0
7.545	.0587					.0148	.11	5.46	1.55	3.29	.015	.00	.00	BOX
4275.730	3683.220	5.723	3688.943	786.00	19.62	5.98	3694.92	.00	7.00	7.00	7.000	7.000	.00	0 .0
5.000	.0580					.0133	.07	5.72	1.45	3.30	.015	.00	.00	BOX
4280.730	3683.510	5.954	3689.464	786.00	18.86	5.52	3694.99	.00	7.00	7.00	7.000	7.000	.00	0 .0
1.944	.0590					.0123	.02	5.95	1.36	3.28	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 9:47

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-15-GRATE.WSW - MANNINGS=0.015 WITH OUTLET GRATE
A PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4282.674	3683.625	6.067	3689.691	786.00	18.51	5.32	3695.01	.00	7.00	7.00	7.000	7.000	.00	0 .0
3.937	.0590					.0114	.04	6.07	1.32	3.28	.015	.00	.00	BOX
4286.611	3683.857	6.363	3690.220	786.00	17.65	4.84	3695.06	.00	7.00	7.00	7.000	7.000	.00	0 .0
2.640	.0590					.0101	.03	6.36	1.23	3.28	.015	.00	.00	BOX

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

4289.251	3684.013	6.673	3690.686	786.00	16.83	4.40	3695.08	.00	7.00	7.00	7.000	7.000	.00	0 .0
1.479	.0590					.0090	.01	6.67	1.15	3.28	.015	.00	.00	BOX

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

4290.730	3684.100	7.000	3691.100	786.00	16.04	4.00	3695.10	.00	7.00	7.00	7.000	7.000	.00	0 .0

C.2.10

Detention Basin Inlet – South – 100-yr Tailwater

GPDB-IN-SOUTH-TW

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T1 GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
T2 FILE NAME: GPDB-IN-SOUTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWATER
T3 PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN
SO    969.41 3507.21   4                          3530.93
TS   1000.00 3507.36   3      .015
JX   1000.00 3507.36   3  1   .015  850.00          3507.36
WX   1000.00 3507.36   5
R    1100.01 3509.17   5      .015                                  0.00    0.00  0
R    1583.14 3534.22   5      .023                                -157.21    0.00  0
R    1707.84 3540.69   5      .023                                  0.00    0.00  0
JX   1707.84 3540.69   5 48   .023   72.00          3541.19          45.0
R    2366.94 3574.87   5      .023                                  0.00    0.00  0
JX   2366.94 3574.87   5 36   .023   38.00          3575.37          45.0
R    2487.93 3581.14   5      .023                                  0.00    0.00  0
JX   2487.93 3581.14   5 36   .023    9.00          3581.64         -45.0
R    2647.25 3589.41   5      .023                                 53.06    0.00  0
R    2652.25 3589.67   5      .023                                  0.00    0.00  0
JX   2652.25 3589.67   5 24 24.023    0.01     0.01 3590.17 3590.17  63.6-57.9
R    2868.40 3600.89   5      .023                                -15.18    0.00  0
JX   2868.40 3600.89   5 30   .023   19.00          3601.39          75.2
R    3107.77 3613.29   5      .023                                -16.93    0.00  0
R    3127.23 3614.46   5      .023                                  0.00    0.00  0
JX   3127.23 3614.46   5 24 24.023    0.01     0.01 3614.96 3614.96  40.4-68.8
R    3384.76 3629.91   5      .023                                  0.00    0.00  0
R    3694.97 3648.52   5      .023                                 22.51    0.00  0
JX   3694.97 3648.52   5 24 24.023    0.01     0.01 3649.02 3649.02  51.7-72.9
R    4070.86 3671.07   5      .023                                 27.27    0.00  0
R    4152.84 3675.99   5      .015                                  0.00    0.00  0
JX   4152.84 3675.99   5 30 54.015   14.00   128.00 3676.49 3676.49  60.7-60.7
R    4163.33 3676.62   5      .015                                  0.00    0.00  0
R    4164.23 3676.67   5      .015                                -20.63    0.00  0
R    4275.73 3683.22   5      .015                                  0.00    0.00  0
R    4280.73 3683.51   5      .015
R    4290.73 3684.10   5      .015                                  0.00    0.00  0
SH   4290.73 3684.10   5
CD   1  3   0    .00    7.00     6.00  0.00  0.00
CD   2  3   0    .00    7.00     5.00  0.00  0.00
CD   3  3   0    .00    7.00    15.75  0.00  0.00
CD   4  3   0    .00    7.00    75.00  0.00  0.00
CD   5  3   0    .00    7.00     7.00  0.00  0.00
CD  24  4   1    .00    2.00      .00  0.00  0.00
CD  30  4   1    .00    2.50      .00  0.00  0.00
CD  36  4   1    .00    3.00      .00  0.00  0.00
CD  42  4   1    .00    3.50      .00  0.00  0.00
CD  48  4   1    .00    4.00      .00  0.00  0.00
CD  54  4   1    .00    4.50      .00  0.00  0.00
CD  60  4   2    .00    5.00      .00  0.00  0.00
Q           786.000   .0
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Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 9:37

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT
ER PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
969.410	3507.210	23.720	3530.930	1916.06	3.65	.21	3531.14	.00	2.73	75.00	7.000	75.000	.00	0 .0
TRANS STR	.0049					.0003	.01	23.72	.24		.015	.00	.00	BOX
1000.000	3507.360	21.477	3528.837	1916.06	17.38	4.69	3533.53	.00	7.00	15.75	7.000	15.750	.00	0 .0
JUNCT STR	.0000					.0029	.00	21.48	1.16		.015	.00	.00	BOX
1000.000	3507.360	24.715	3532.075	1066.06	9.67	1.45	3533.53	.00	5.22	15.75	7.000	15.750	.00	0 .0
WALL	EXIT													
1000.000	3507.360	24.716	3532.076	1066.06	21.76	7.35	3539.43	.00	7.00	7.00	7.000	7.000	.00	0 .0
100.010	.0181					.0229	2.29	24.72	1.45	6.59	.015	.00	.00	BOX
1100.010	3509.170	25.193	3534.363	1066.06	21.76	7.35	3541.71	.00	7.00	7.00	7.000	7.000	.00	0 .0
483.130	.0518					.0538	25.98	.00	1.45	6.08	.023	.00	.00	BOX
1583.140	3534.220	28.064	3562.284	1066.06	21.76	7.35	3569.63	.00	7.00	7.00	7.000	7.000	.00	0 .0
124.700	.0519					.0538	6.71	28.06	1.45	6.08	.023	.00	.00	BOX
1707.840	3540.690	28.299	3568.989	1066.06	21.76	7.35	3576.34	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0468	.00	28.30	1.45		.023	.00	.00	BOX
1707.840	3540.690	30.033	3570.723	994.06	20.29	6.39	3577.11	.00	7.00	7.00	7.000	7.000	.00	0 .0
659.100	.0519					.0468	30.81	30.03	1.35	5.75	.023	.00	.00	BOX
2366.940	3574.870	26.667	3601.537	994.06	20.29	6.39	3607.93	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0432	.00	26.67	1.35		.023	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 9:37

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT
ER PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
2366.940	3574.870	27.534	3602.404	956.06	19.51	5.91	3608.32	.00	7.00	7.00	7.000	7.000	.00	0 .0
120.990	.0518					.0432	5.23	27.53	1.30	5.57	.023	.00	.00	BOX
2487.930	3581.140	26.496	3607.636	956.06	19.51	5.91	3613.55	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0424	.00	.00	1.30		.023	.00	.00	BOX
2487.930	3581.140	26.713	3607.853	947.06	19.33	5.80	3613.65	.00	7.00	7.00	7.000	7.000	.00	0 .0
159.320	.0519					.0424	6.76	.00	1.29	5.53	.023	.00	.00	BOX
2647.250	3589.410	26.094	3615.504	947.06	19.33	5.80	3621.30	.00	7.00	7.00	7.000	7.000	.00	0 .0
5.000	.0520					.0424	.21	26.09	1.29	5.53	.023	.00	.00	BOX
JUNCT STR	.0000					.0424	.00	26.05	1.29		.023	.00	.00	BOX
2652.250	3589.670	26.047	3615.717	947.04	19.33	5.80	3621.52	.00	7.00	7.00	7.000	7.000	.00	0 .0
216.150	.0519					.0424	9.17	.00	1.29	5.53	.023	.00	.00	BOX
2868.400	3600.890	24.475	3625.365	947.04	19.33	5.80	3631.17	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0407	.00	.00	1.29		.023	.00	.00	BOX
2868.400	3600.890	24.924	3625.814	928.04	18.94	5.57	3631.38	.00	7.00	7.00	7.000	7.000	.00	0 .0
239.370	.0518					.0407	9.75	.00	1.26	5.45	.023	.00	.00	BOX
3107.770	3613.290	22.761	3636.051	928.04	18.94	5.57	3641.62	.00	7.00	7.00	7.000	7.000	.00	0 .0

19.460	.0601					.0407	.79	22.76	1.26	5.13	.023	.00	.00	BOX					

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 9:37

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT
ER PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
JUNCT STR	.0000					.0407	.00	22.38	1.26		.023	.00	.00	BOX
3127.230	3614.460	22.385	3636.845	928.02	18.94	5.57	3642.41	.00	7.00	7.00	7.000	7.000	.00	0 .0
257.530	.0600					.0407	10.49	22.38	1.26	5.14	.023	.00	.00	BOX
3384.760	3629.910	17.428	3647.338	928.02	18.94	5.57	3652.91	.00	7.00	7.00	7.000	7.000	.00	0 .0
310.210	.0600					.0407	12.64	.00	1.26	5.14	.023	.00	.00	BOX
JUNCT STR	.0000					.0407	.00	12.02	1.26		.023	.00	.00	BOX
3694.970	3648.520	12.016	3660.536	928.00	18.94	5.57	3666.11	.00	7.00	7.00	7.000	7.000	.00	0 .0
148.920	.0600					.0407	6.07	.00	1.26	5.14	.023	.00	.00	BOX
3843.890	3657.454	9.423	3666.877	928.00	18.94	5.57	3672.45	.00	7.00	7.00	7.000	7.000	.00	0 .0
HYDRAULIC JUMP														
3843.890	3657.454	5.136	3662.590	928.00	25.81	10.35	3672.94	.18	7.00	7.00	7.000	7.000	.00	0 .0
25.647	.0600					.0601	1.54	5.32	2.01	5.14	.023	.00	.00	BOX
3869.537	3658.992	5.136	3664.128	928.00	25.81	10.35	3674.48	.18	7.00	7.00	7.000	7.000	.00	0 .0
201.323	.0600					.0639	12.87	5.32	2.01	5.14	.023	.00	.00	BOX
4070.860	3671.070	4.897	3675.967	928.00	27.07	11.38	3687.35	.00	7.00	7.00	7.000	7.000	.00	0 .0
4.164	.0600					.0286	.12	4.90	2.16	3.70	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 2- 7-2020 Time:11: 9:37

GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
FILE NAME: GPDB-IN-SOUTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT
ER PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
4075.024	3671.320	4.933	3676.253	928.00	26.87	11.22	3687.47	.00	7.00	7.00	7.000	7.000	.00	0 .0
23.370	.0600					.0267	.62	4.93	2.13	3.70	.015	.00	.00	BOX
4098.395	3672.723	5.174	3677.897	928.00	25.62	10.20	3688.09	.00	7.00	7.00	7.000	7.000	.00	0 .0
18.544	.0600					.0236	.44	5.17	1.99	3.70	.015	.00	.00	BOX
4116.938	3673.836	5.426	3679.262	928.00	24.43	9.27	3688.53	.00	7.00	7.00	7.000	7.000	.00	0 .0
14.797	.0600					.0210	.31	5.43	1.85	3.70	.015	.00	.00	BOX
4131.736	3674.724	5.691	3680.415	928.00	23.29	8.43	3688.84	.00	7.00	7.00	7.000	7.000	.00	0 .0
11.791	.0600					.0186	.22	5.69	1.72	3.70	.015	.00	.00	BOX
4143.527	3675.431	5.969	3681.400	928.00	22.21	7.66	3689.06	.00	7.00	7.00	7.000	7.000	.00	0 .0
9.313	.0600					.0165	.15	5.97	1.60	3.70	.015	.00	.00	BOX
4152.840	3675.990	6.260	3682.250	928.00	21.18	6.96	3689.21	.00	7.00	7.00	7.000	7.000	.00	0 .0
JUNCT STR	.0000					.0244	.00	6.26	1.49		.015	.00	.00	BOX
4152.840	3675.990	4.072	3680.062	786.00	27.58	11.81	3691.87	.00	7.00	7.00	7.000	7.000	.00	0 .0
10.490	.0601					.0327	.34	4.07	2.41	3.26	.015	.00	.00	BOX
4163.330	3676.620	4.133	3680.753	786.00	27.17	11.46	3692.22	7.00	7.00	7.00	7.000	7.000	.00	0 .0
.900	.0553					.0320	.03	7.00	2.36	3.36	.015	.00	.00	BOX
4164.230	3676.670	4.137	3680.807	786.00	27.14	11.44	3692.25	.00	7.00	7.00	7.000	.00	0 .0	

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   24.412    .0587                                        .0305      .74     4.14    2.35    3.29    .015       .00   .00  BOX
↟ FILE: GPDB-IN-SOUTH-15-TW.WSW              W S P G W - CIVILDESIGN Version 14.05                                    PAGE    5
                              Program Package Serial Number: 1513
                                            WATER SURFACE PROFILE LISTING                  Date: 2- 7-2020  Time:11: 9:37
                          GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
                            FILE NAME: GPDB-IN-SOUTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT
                          ER  PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN
 ********************************************************************************************************************** ********
         | 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
 *********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|******|*******
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 4188.642  3678.104    4.300  3682.404    786.00   26.11   10.59  3692.99     .00    7.00     7.00    7.000    7.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-      -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    23.894    .0587                                        .0272      .65     4.30    2.22    3.29    .015       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 4212.536  3679.508    4.510  3684.018    786.00   24.90    9.63  3693.64     .00    7.00     7.00    7.000    7.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-      -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    18.897    .0587                                        .0241      .46     4.51    2.07    3.29    .015       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 4231.433  3680.618    4.730  3685.348    786.00   23.74    8.75  3694.10     .00    7.00     7.00    7.000    7.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-      -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    15.085    .0587                                        .0213      .32     4.73    1.92    3.29    .015       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 4246.518  3681.504    4.961  3686.465    786.00   22.63    7.95  3694.42     .00    7.00     7.00    7.000    7.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-      -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    12.065    .0587                                        .0189      .23     4.96    1.79    3.29    .015       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 4258.583  3682.213    5.203  3687.416    786.00   21.58    7.23  3694.65     .00    7.00     7.00    7.000    7.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-      -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
     9.602    .0587                                        .0167      .16     5.20    1.67    3.29    .015       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 4268.185  3682.777    5.457  3688.234    786.00   20.58    6.57  3694.81     .00    7.00     7.00    7.000    7.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-      -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    7.545    .0587                                        .0148      .11     5.46    1.55    3.29    .015       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 4275.730  3683.220    5.723  3688.943    786.00   19.62    5.98  3694.92     .00    7.00     7.00    7.000    7.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-      -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    5.000    .0580                                        .0133      .07     5.72    1.45    3.30    .015       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 4280.730  3683.510    5.954  3689.464    786.00   18.86    5.52  3694.99     .00    7.00     7.00    7.000    7.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-      -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    1.944    .0590                                        .0123      .02     5.95    1.36    3.28    .015       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 4282.674  3683.625    6.067  3689.691    786.00   18.51    5.32  3695.01     .00    7.00     7.00    7.000    7.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-      -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    3.937    .0590                                        .0114      .04     6.07    1.32    3.28    .015       .00   .00  BOX
↟ FILE: GPDB-IN-SOUTH-15-TW.WSW              W S P G W - CIVILDESIGN Version 14.05                                    PAGE    6
                              Program Package Serial Number: 1513
                                            WATER SURFACE PROFILE LISTING                  Date: 2- 7-2020  Time:11: 9:37
                          GRAND PARK DETENTION BASIN SOUTH INLET WITH NORTH ADDED AT INLET FACILITY
                            FILE NAME: GPDB-IN-SOUTH-15-TW.WSW - MANNINGS=0.015 WITH PEAK DB TAILWAT
                          ER  PARK DRIFT TRAIL TO FOX HILL AND INTO GRAND PARK DETENTION BASIN
 ********************************************************************************************************************** ********
         | 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
 *********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|******|*******
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 4286.611  3683.857    6.363  3690.220    786.00   17.65    4.84  3695.06     .00    7.00     7.00    7.000    7.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-      -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    2.640    .0590                                        .0101      .03     6.36    1.23    3.28    .015       .00   .00  BOX
                        -------------------- WARNING - Flow depth near top of box conduit --------------------
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 4289.251  3684.013    6.673  3690.686    786.00   16.83    4.40  3695.08     .00    7.00     7.00    7.000    7.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-      -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    1.479    .0590                                        .0090      .01     6.67    1.15    3.28    .015       .00   .00  BOX
                        -------------------- WARNING - Flow depth near top of box conduit --------------------
         |         |        |         |         |       |       |         |       |        |        |       |       |      |
 4290.730  3684.100    7.000  3691.100    786.00   16.04    4.00  3695.10     .00    7.00     7.00    7.000    7.000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-      -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
↟
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C.3

HY8 CULVERT HEADWATER ANALYSIS

C.3.1 Detention Basin Low Flow Outlet
C.3.2 Interim Condition Stubs

HY-8 Report – Basin 26” Orifice Outlet

Headwater Elevation (ft)	Total Discharge (cfs)	26 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3505.88	0.00	0.00	0.00	1
3506.68	3.00	3.00	0.00	1
3507.05	6.00	6.00	0.00	1
3507.39	9.00	9.00	0.00	1
3507.69	12.00	12.00	0.00	1
3507.97	15.00	15.00	0.00	1
3508.27	18.00	18.00	0.00	1
3508.61	21.00	21.00	0.00	1
3508.99	24.00	24.00	0.00	1
3509.42	27.00	27.00	0.00	1
3509.92	30.00	30.00	0.00	1
3535.00	93.57	93.57	0.00	Overtopping

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 30 cfs

Maximum Flow: 30 cfs

Table 1 - Summary of Culvert Flows at Crossing: GPDB Outlet

Rating Curve Plot for Crossing: GPDB Outlet

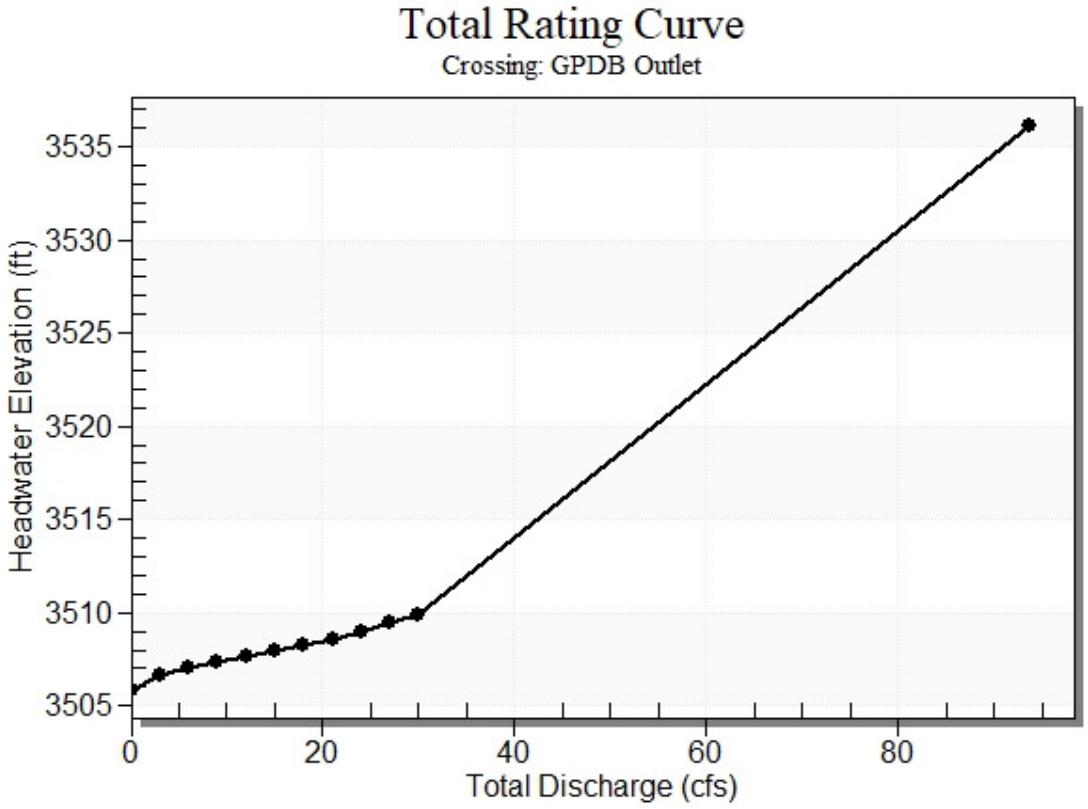

Table 2 - Culvert Summary Table: 26

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	3505.88	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
3.00	3.00	3506.68	0.798	0.0*	1-S2n	0.419	0.586	0.419	0.155	5.798	3.880
6.00	6.00	3507.05	1.170	0.0*	1-S2n	0.594	0.840	0.594	0.237	7.061	5.056
9.00	9.00	3507.39	1.511	0.0*	1-S2n	0.734	1.045	0.762	0.306	7.519	5.887
12.00	12.00	3507.69	1.806	0.0*	1-S2n	0.857	1.209	0.857	0.366	8.539	6.550
15.00	15.00	3507.97	2.091	0.203	1-S2n	0.972	1.362	1.007	0.422	8.639	7.106
18.00	18.00	3508.27	2.391	0.662	5-S2n	1.080	1.494	1.123	0.474	9.033	7.590
21.00	21.00	3508.61	2.725	1.170	5-S2n	1.187	1.617	1.232	0.524	9.397	8.019
24.00	24.00	3508.99	3.107	1.944	5-S2n	1.293	1.724	1.343	0.571	9.695	8.406
27.00	27.00	3509.42	3.544	2.494	5-S2n	1.403	1.817	1.457	0.616	9.945	8.761
30.00	30.00	3509.92	4.039	3.097	5-S2n	1.519	1.896	1.577	0.660	10.154	9.088

* Full Flow Headwater elevation is below inlet invert.

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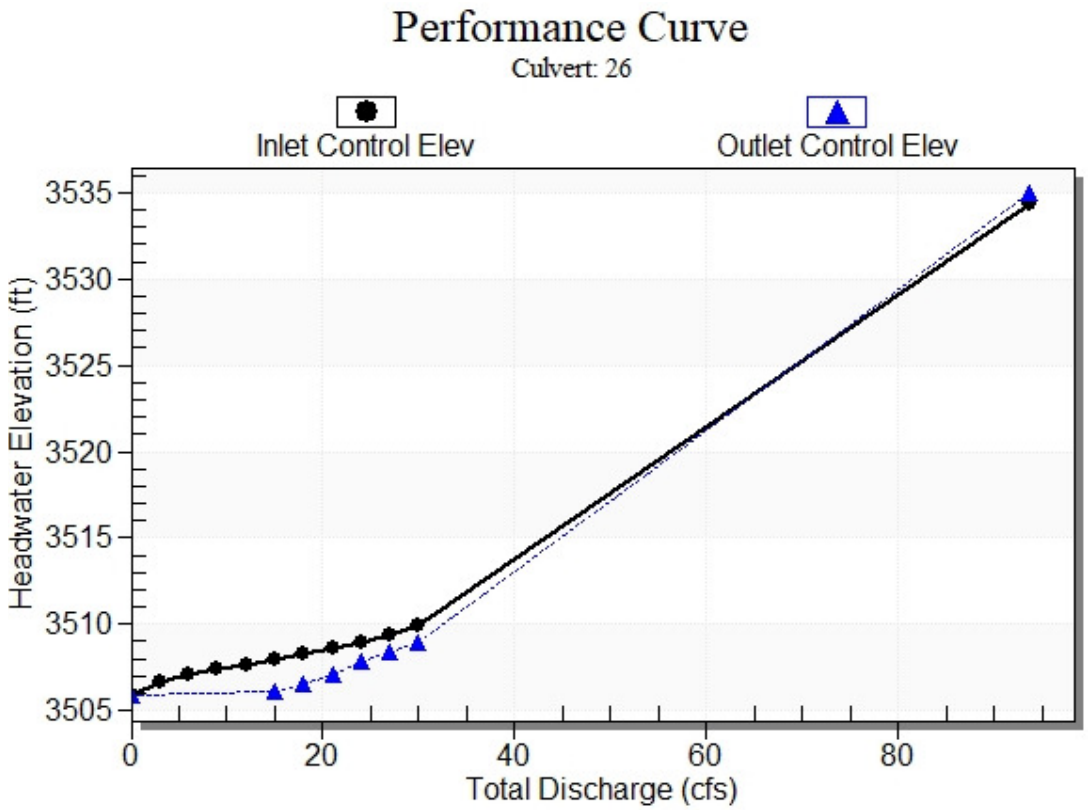
Straight Culvert

Inlet Elevation (invert): 3505.88 ft, Outlet Elevation (invert): 3503.98 ft

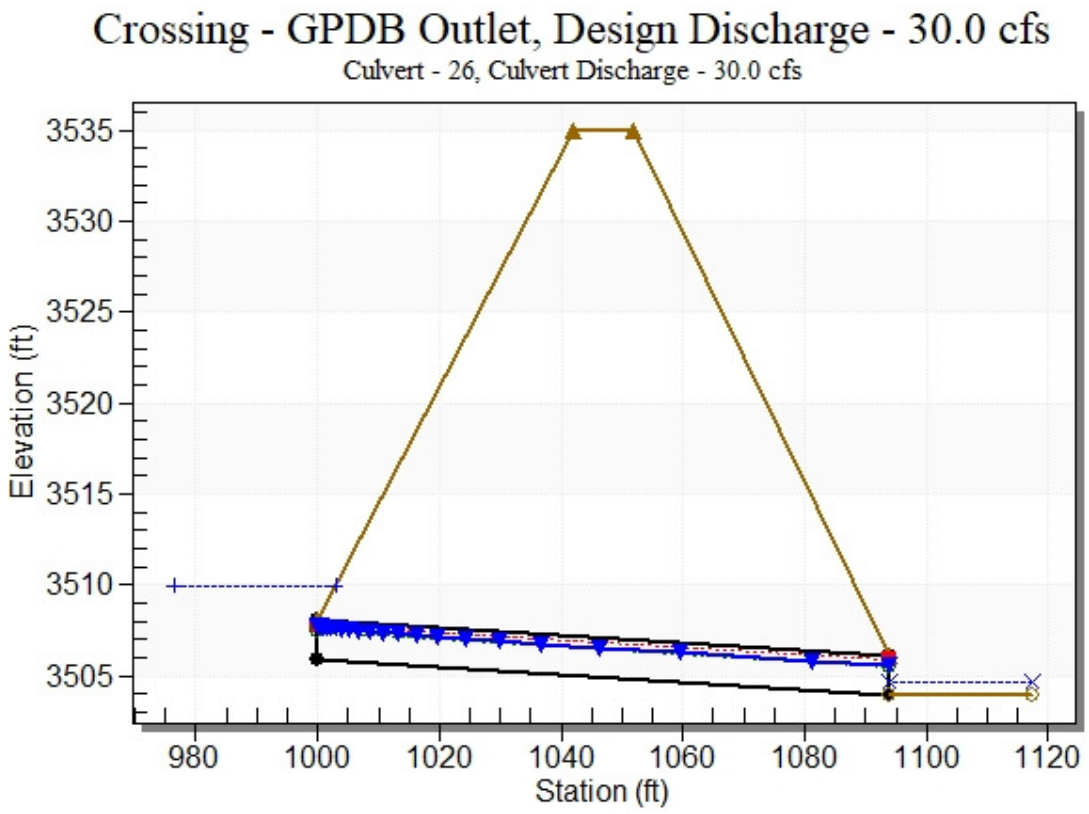
Culvert Length: 93.87 ft, Culvert Slope: 0.0202

****

Culvert Performance Curve Plot: 26



Water Surface Profile Plot for Culvert: 26



Site Data - 26

Site Data Option: Culvert Invert Data

Inlet Station: 1000.00 ft

Inlet Elevation: 3505.88 ft

Outlet Station: 1093.85 ft

Outlet Elevation: 3503.98 ft

Number of Barrels: 1

Culvert Data Summary - 26

Barrel Shape: Circular

Barrel Diameter: 2.17 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0150

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: GPDB Outlet)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	3503.98	0.00	0.00	0.00	0.00
3.00	3504.13	0.15	3.88	0.19	1.74
6.00	3504.22	0.24	5.06	0.30	1.83
9.00	3504.29	0.31	5.89	0.38	1.88
12.00	3504.35	0.37	6.55	0.46	1.91
15.00	3504.40	0.42	7.11	0.53	1.93
18.00	3504.45	0.47	7.59	0.59	1.94
21.00	3504.50	0.52	8.02	0.65	1.95
24.00	3504.55	0.57	8.41	0.71	1.96
27.00	3504.60	0.62	8.76	0.77	1.97
30.00	3504.64	0.66	9.09	0.82	1.97

Tailwater Channel Data - GPDB Outlet

Tailwater Channel Option: Rectangular Channel

Bottom Width: 5.00 ft

Channel Slope: 0.0200

Channel Manning's n: 0.0150

Channel Invert Elevation: 3503.98 ft

Roadway Data for Crossing: GPDB Outlet

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 3535.00 ft

Roadway Surface: Paved

Roadway Top Width: 10.00 ft

HY-8 Report: Facility 1

Headwater Elevation (ft)	Total Discharge (cfs)	5'x5' RCB Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3717.80	0.00	0.00	0.00	1
3718.84	15.00	15.00	0.00	1
3719.46	30.00	30.00	0.00	1
3719.97	45.00	45.00	0.00	1
3720.43	60.00	60.00	0.00	1
3720.87	75.00	75.00	0.00	1
3721.28	90.00	90.00	0.00	1
3721.67	105.00	105.00	0.00	1
3722.04	120.00	120.00	0.00	1
3722.41	135.00	135.00	0.00	1
3722.78	150.00	150.00	0.00	1
3731.33	389.08	389.08	0.00	Overtopping

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 150 cfs

Maximum Flow: 150 cfs

Table 1 - Summary of Culvert Flows at Crossing: 1 - Lake Mead

Rating Curve Plot for Crossing: 1 - Lake Mead

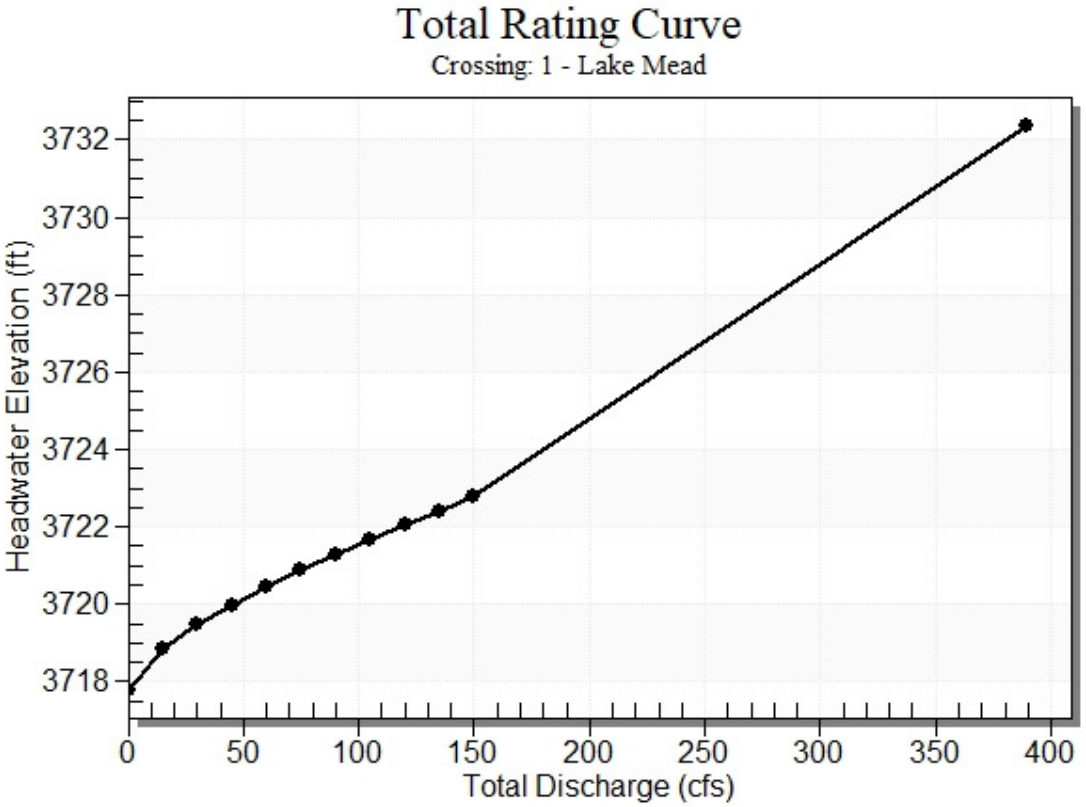


Table 2 - Culvert Summary Table: 5'x5' RCB

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	3717.80	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
15.00	15.00	3718.84	1.043	0.0*	1-S2n	0.271	0.654	0.271	0.370	11.089	8.108
30.00	30.00	3719.46	1.655	0.0*	1-S2n	0.419	1.038	0.419	0.577	14.305	10.405
45.00	45.00	3719.97	2.169	0.0*	1-S2n	0.545	1.360	0.577	0.752	15.591	11.967
60.00	60.00	3720.43	2.633	0.0*	1-S2n	0.659	1.648	0.699	0.911	17.171	13.174
75.00	75.00	3720.87	3.069	0.0*	1-S2n	0.764	1.912	0.828	1.059	18.111	14.161
90.00	90.00	3721.28	3.477	0.0*	1-S2n	0.862	2.159	0.949	1.200	18.966	14.995
105.00	105.00	3721.67	3.865	0.0*	1-S2n	0.956	2.393	1.067	1.336	19.684	15.722
120.00	120.00	3722.04	4.240	0.0*	1-S2n	1.048	2.615	1.182	1.467	20.306	16.364
135.00	135.00	3722.41	4.608	0.0*	1-S2n	1.136	2.829	1.296	1.594	20.831	16.938
150.00	150.00	3722.78	4.976	0.0*	1-S2n	1.221	3.035	1.409	1.719	21.290	17.456

* Full Flow Headwater elevation is below inlet invert.

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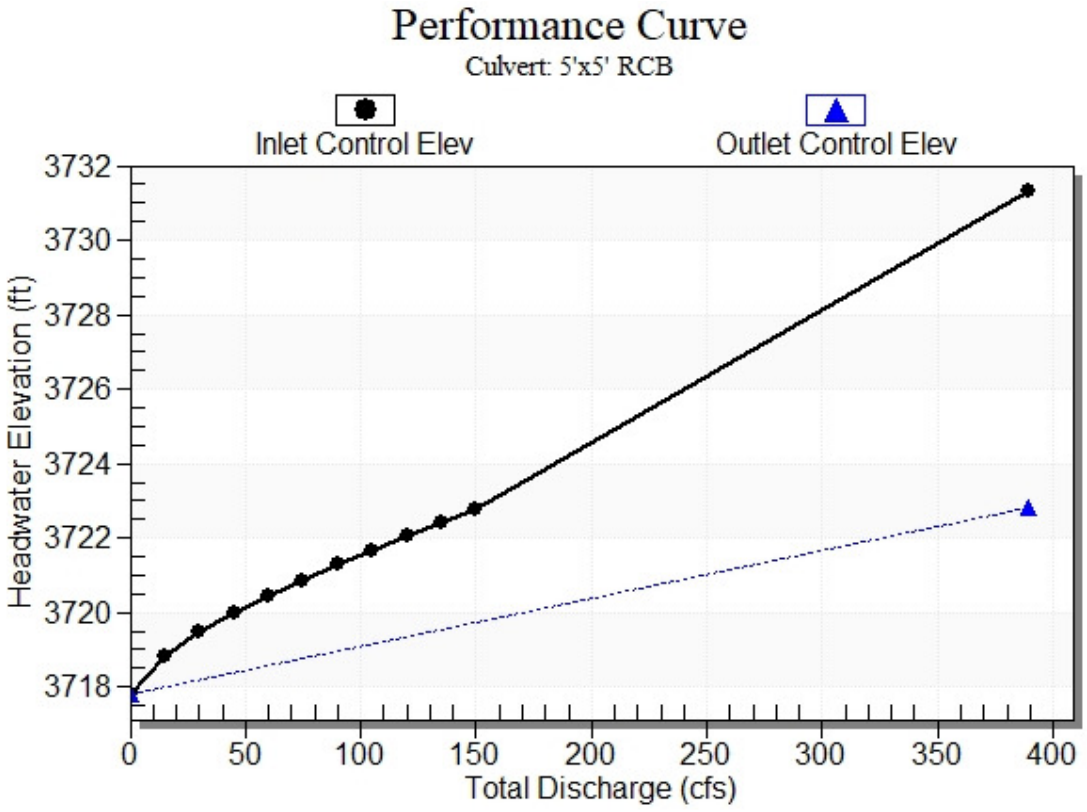
Straight Culvert

Inlet Elevation (invert): 3717.80 ft, Outlet Elevation (invert): 3710.34 ft

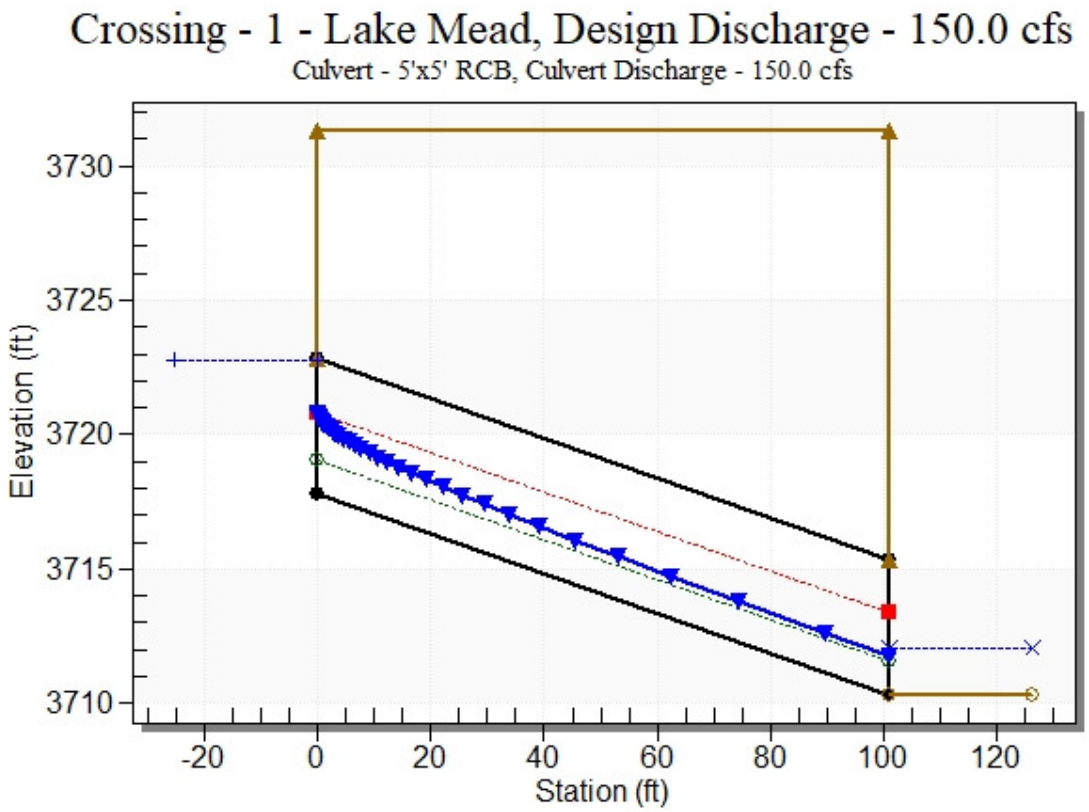
Culvert Length: 101.23 ft, Culvert Slope: 0.0739

****

Culvert Performance Curve Plot: 5'x5' RCB



Water Surface Profile Plot for Culvert: 5'x5' RCB



Site Data - 5'x5' RCB

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 3717.80 ft

Outlet Station: 100.95 ft

Outlet Elevation: 3710.34 ft

Number of Barrels: 1

Culvert Data Summary - 5'x5' RCB

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0150

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: 1 - Lake Mead)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	3710.34	0.00	0.00	0.00	0.00
15.00	3710.71	0.37	8.11	0.70	2.35
30.00	3710.92	0.58	10.40	1.09	2.41
45.00	3711.09	0.75	11.97	1.42	2.43
60.00	3711.25	0.91	13.17	1.72	2.43
75.00	3711.40	1.06	14.16	2.00	2.42
90.00	3711.54	1.20	15.00	2.27	2.41
105.00	3711.68	1.34	15.72	2.53	2.40
120.00	3711.81	1.47	16.36	2.77	2.38
135.00	3711.93	1.59	16.94	3.01	2.36
150.00	3712.06	1.72	17.46	3.25	2.35

Tailwater Channel Data - 1 - Lake Mead

Tailwater Channel Option: Rectangular Channel

Bottom Width: 5.00 ft

Channel Slope: 0.0303

Channel Manning's n: 0.0150

Channel Invert Elevation: 3710.34 ft

Roadway Data for Crossing: 1 - Lake Mead

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 3731.33 ft

Roadway Surface: Paved

Roadway Top Width: 100.95 ft

HY-8 Report: Facility 11

Headwater Elevation (ft)	Total Discharge (cfs)	42 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3640.03	0.00	0.00	0.00	1
3641.20	9.50	9.50	0.00	1
3641.73	19.00	19.00	0.00	1
3642.22	28.50	28.50	0.00	1
3642.64	38.00	38.00	0.00	1
3643.02	47.50	47.50	0.00	1
3643.40	57.00	57.00	0.00	1
3643.81	66.50	66.50	0.00	1
3644.27	76.00	76.00	0.00	1
3644.79	85.50	85.50	0.00	1
3645.37	95.00	95.00	0.00	1
3648.00	128.86	128.86	0.00	Overtopping

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 95 cfs

Maximum Flow: 95 cfs

Table 1 - Summary of Culvert Flows at Crossing: 11 - Sunset Run
Rating Curve Plot for Crossing: 11 - Sunset Run

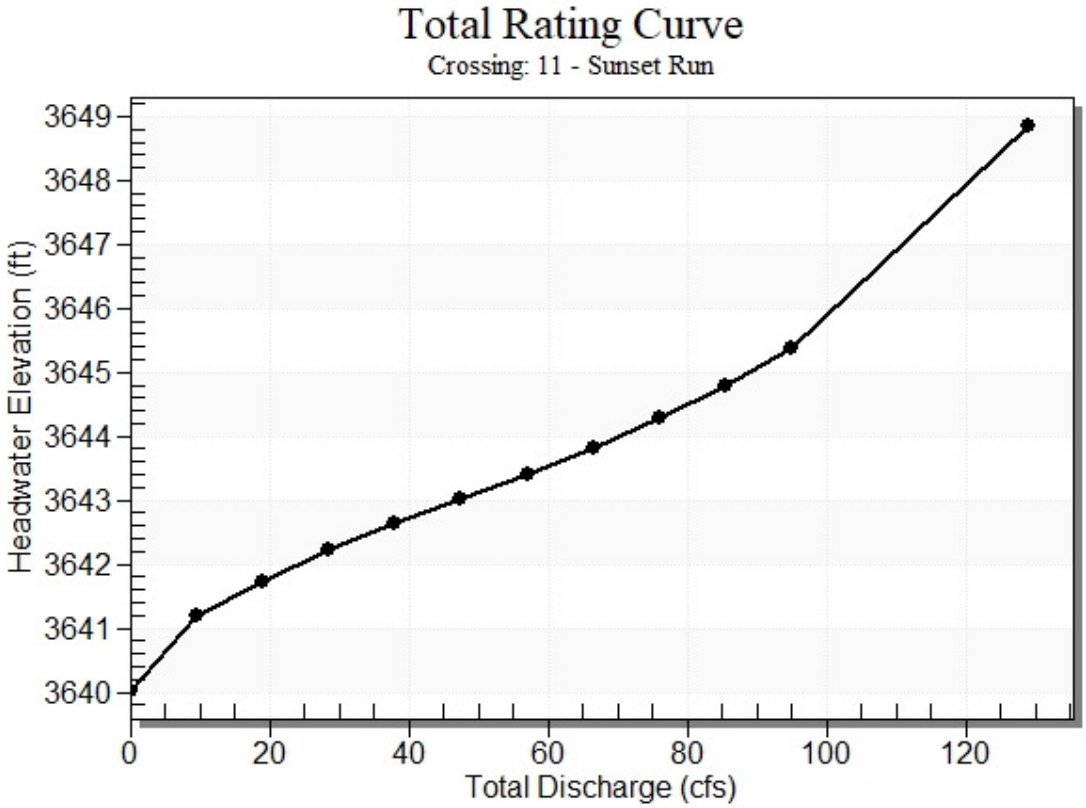


Table 2 - Culvert Summary Table: 42

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	3640.03	0.000	0.030	0-NF	0.000	0.000	3.500	3.500	0.000	0.000
9.50	9.50	3641.20	1.196	0.044	1-JS1f	0.439	0.929	3.500	3.500	0.987	0.000
19.00	19.00	3641.73	1.728	0.112	1-JS1f	0.615	1.329	3.500	3.500	1.975	0.000
28.50	28.50	3642.22	2.221	0.225	1-S2n	0.751	1.648	0.879	3.500	14.519	0.000
38.00	38.00	3642.64	2.639	0.383	1-S2n	0.868	1.909	1.041	3.500	15.271	0.000
47.50	47.50	3643.02	3.021	0.586	1-S2n	0.974	2.148	1.190	3.500	15.890	0.000
57.00	57.00	3643.40	3.404	0.834	1-S2n	1.070	2.362	1.332	3.500	16.376	0.000
66.50	66.50	3643.81	3.815	1.127	5-S2n	1.160	2.553	1.465	3.500	16.840	0.000
76.00	76.00	3644.27	4.271	1.466	5-S2n	1.245	2.725	1.592	3.500	17.255	0.000
85.50	85.50	3644.79	4.787	1.849	5-S2n	1.327	2.877	1.713	3.500	17.664	0.000
95.00	95.00	3645.37	5.369	2.278	5-S2n	1.405	3.008	1.830	3.500	18.063	0.000

****

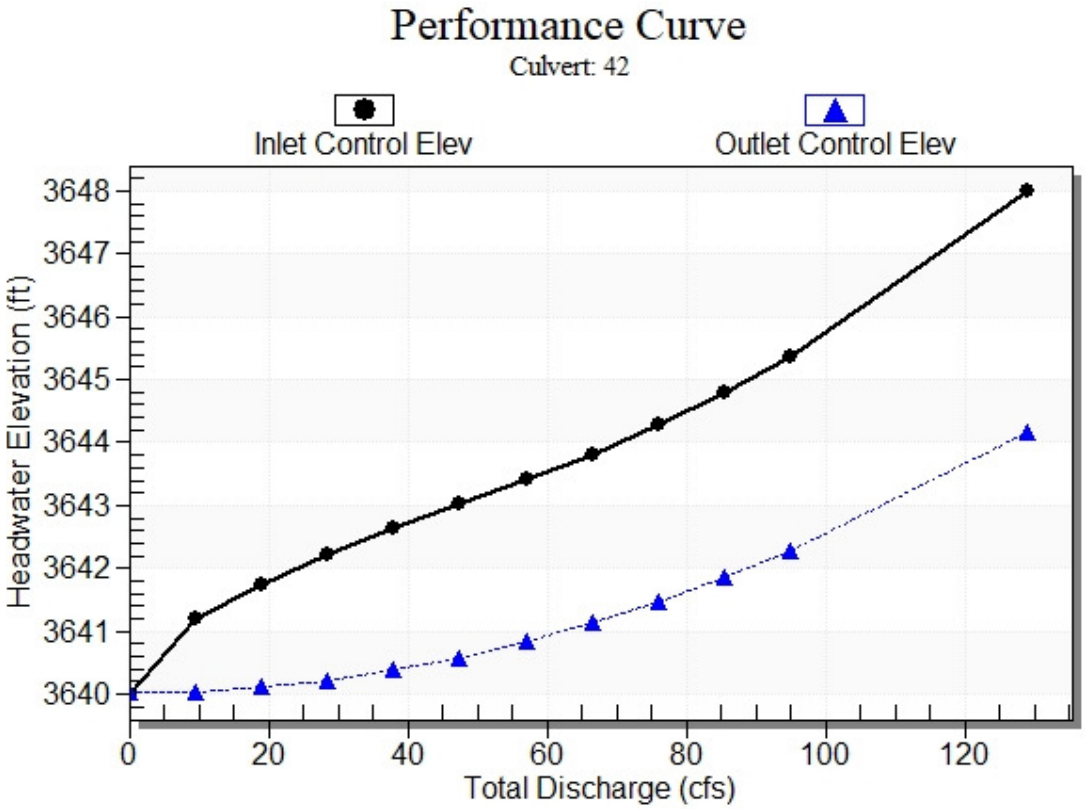
Straight Culvert

Inlet Elevation (invert): 3640.00 ft, Outlet Elevation (invert): 3636.53 ft

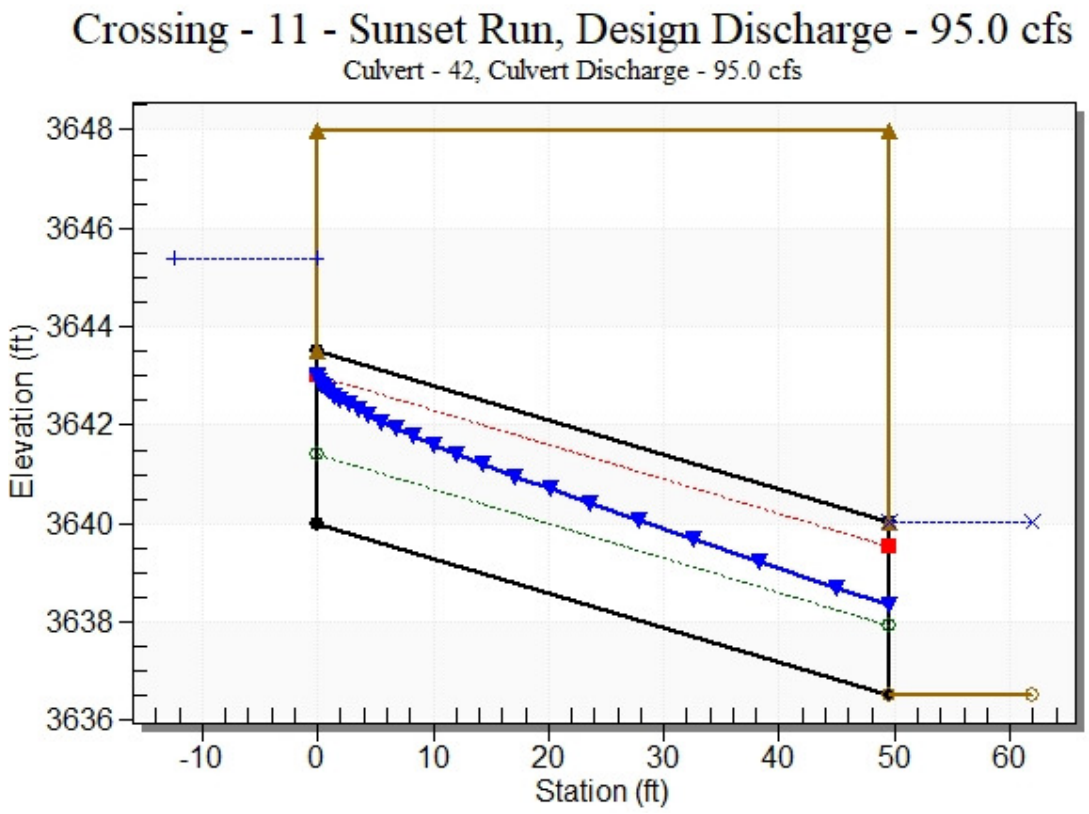
Culvert Length: 49.63 ft, Culvert Slope: 0.0701

****

Culvert Performance Curve Plot: 42



Water Surface Profile Plot for Culvert: 42



Site Data - 42

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 3640.00 ft

Outlet Station: 49.51 ft

Outlet Elevation: 3636.53 ft

Number of Barrels: 1

Culvert Data Summary - 42

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: 11 - Sunset Run)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
0.00	3640.03	3.50
9.50	3640.03	3.50
19.00	3640.03	3.50
28.50	3640.03	3.50
38.00	3640.03	3.50
47.50	3640.03	3.50
57.00	3640.03	3.50
66.50	3640.03	3.50
76.00	3640.03	3.50
85.50	3640.03	3.50
95.00	3640.03	3.50

Tailwater Channel Data - 11 - Sunset Run

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 3640.03 ft

Roadway Data for Crossing: 11 - Sunset Run

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 3648.00 ft

Roadway Surface: Paved

Roadway Top Width: 49.51 ft

HY-8 Report: Facility 20

Headwater Elevation (ft)	Total Discharge (cfs)	48 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3544.00	0.00	0.00	0.00	1
3545.03	7.60	7.60	0.00	1
3545.48	15.20	15.20	0.00	1
3545.84	22.80	22.80	0.00	1
3546.17	30.40	30.40	0.00	1
3546.49	38.00	38.00	0.00	1
3546.78	45.60	45.60	0.00	1
3547.04	53.20	53.20	0.00	1
3547.29	60.80	60.80	0.00	1
3547.54	68.40	68.40	0.00	1
3547.79	76.00	76.00	0.00	1
3549.00	108.44	108.44	0.00	Overtopping

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 76 cfs

Maximum Flow: 76 cfs

Table 1 - Summary of Culvert Flows at Crossing: 20 - Calico Bend

Rating Curve Plot for Crossing: 20 - Calico Bend

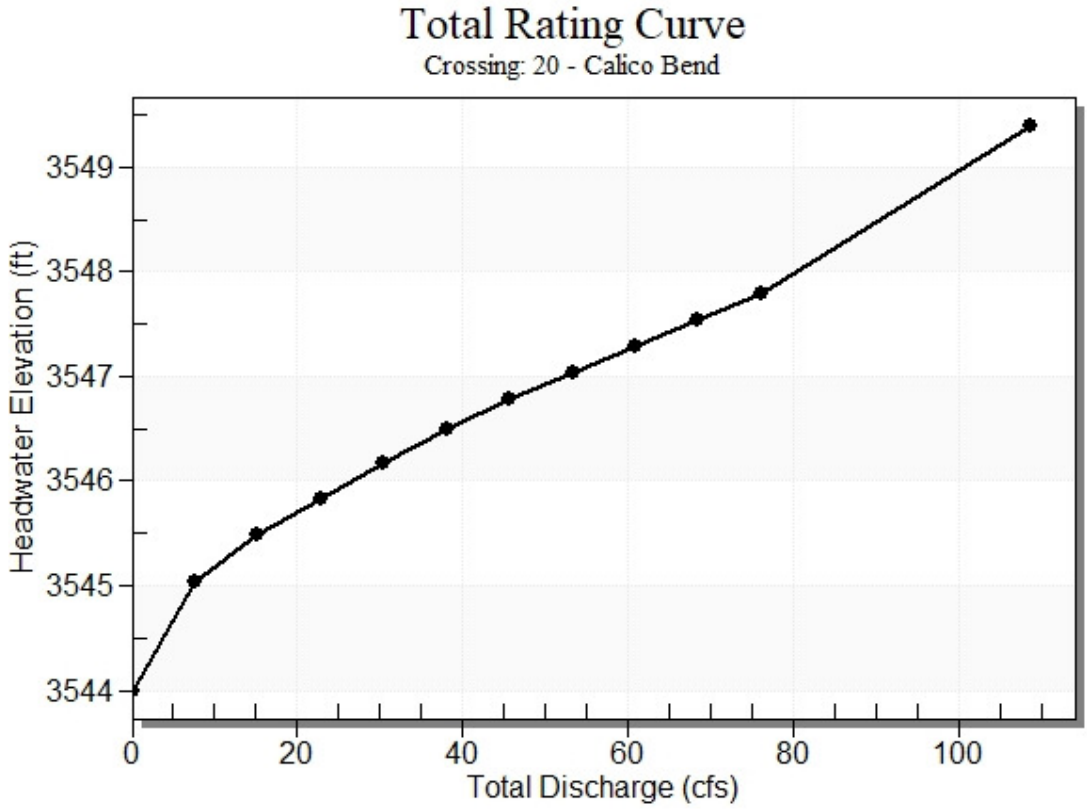


Table 2 - Culvert Summary Table: 48

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	3544.00	0.000	0.000	0-NF	0.000	0.000	4.000	4.000	0.000	0.000
7.60	7.60	3545.03	1.031	0.0*	1-JS1f	0.394	0.798	4.000	4.000	0.605	0.000
15.20	15.20	3545.48	1.481	0.0*	1-JS1f	0.549	1.139	4.000	4.000	1.210	0.000
22.80	22.80	3545.84	1.836	0.0*	1-JS1f	0.670	1.405	4.000	4.000	1.814	0.000
30.40	30.40	3546.17	2.169	0.0*	1-JS1f	0.772	1.633	4.000	4.000	2.419	0.000
38.00	38.00	3546.49	2.488	0.0*	1-S2n	0.863	1.838	0.955	4.000	15.935	0.000
45.60	45.60	3546.78	2.775	0.0*	1-S2n	0.946	2.021	1.060	4.000	16.516	0.000
53.20	53.20	3547.04	3.040	0.0*	1-S2n	1.023	2.189	1.158	4.000	17.009	0.000
60.80	60.80	3547.29	3.293	0.0*	1-S2n	1.094	2.348	1.251	4.000	17.472	0.000
68.40	68.40	3547.54	3.540	0.0*	1-S2n	1.163	2.495	1.342	4.000	17.843	0.000
76.00	76.00	3547.79	3.790	0.0*	1-S2n	1.229	2.637	1.431	4.000	18.172	0.000

* Full Flow Headwater elevation is below inlet invert.

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Straight Culvert

Inlet Elevation (invert): 3544.00 ft, Outlet Elevation (invert): 3538.76 ft

Culvert Length: 87.48 ft, Culvert Slope: 0.0600

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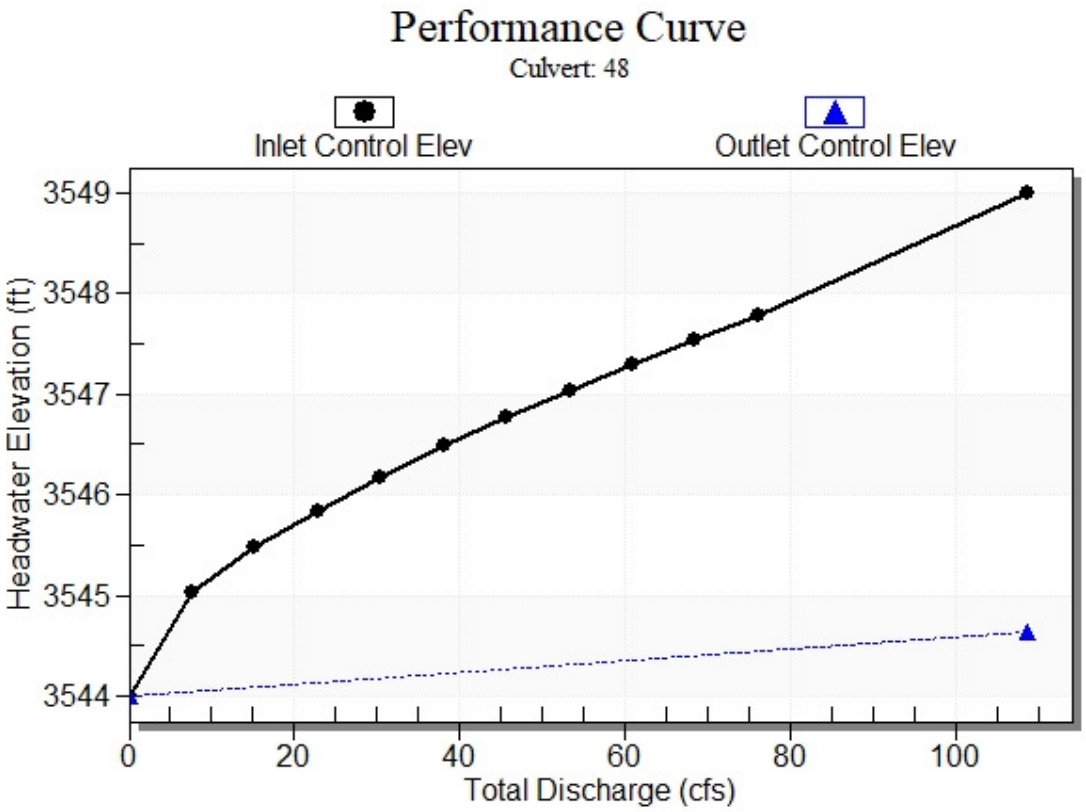
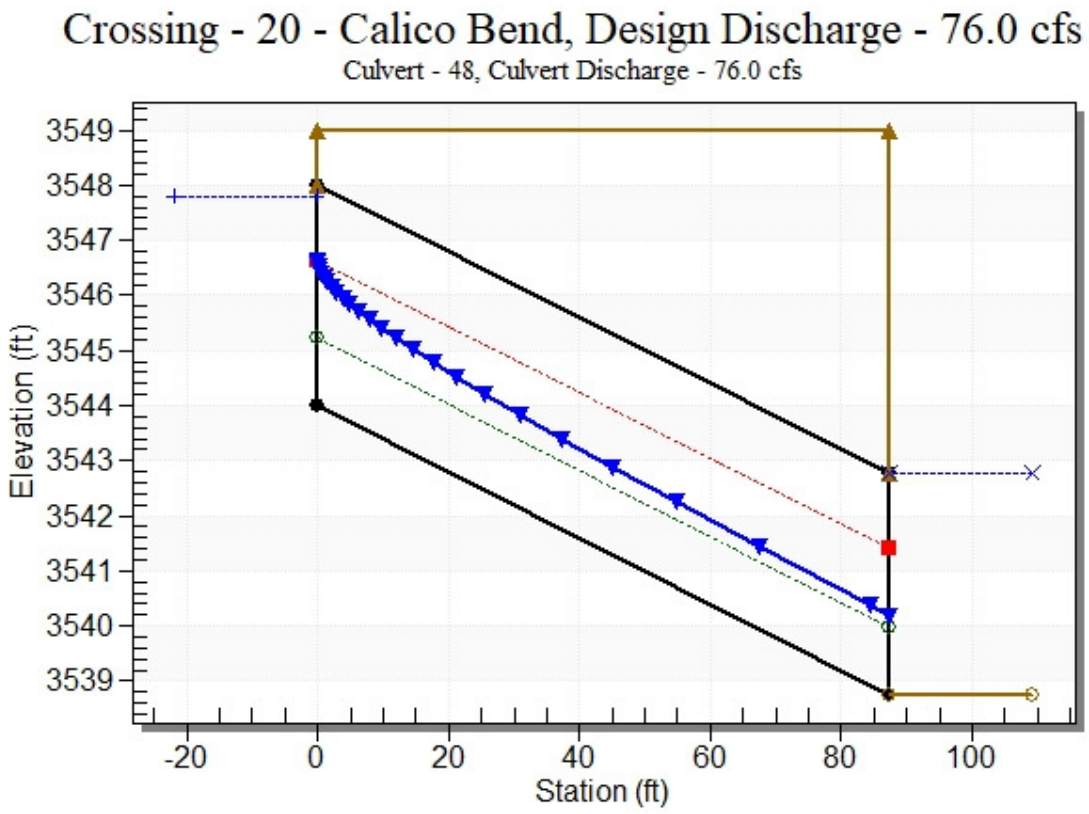
Culvert Performance Curve Plot: 48



Water Surface Profile Plot for Culvert: 48



Site Data - 48

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 3544.00 ft

Outlet Station: 87.32 ft

Outlet Elevation: 3538.76 ft

Number of Barrels: 1

Culvert Data Summary - 48

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: 20 - Calico Bend)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
0.00	3542.76	4.00
7.60	3542.76	4.00
15.20	3542.76	4.00
22.80	3542.76	4.00
30.40	3542.76	4.00
38.00	3542.76	4.00
45.60	3542.76	4.00
53.20	3542.76	4.00
60.80	3542.76	4.00
68.40	3542.76	4.00
76.00	3542.76	4.00

Tailwater Channel Data - 20 - Calico Bend

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 3542.76 ft

Roadway Data for Crossing: 20 - Calico Bend

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 3549.00 ft

Roadway Surface: Paved

Roadway Top Width: 87.32 ft

HY-8 Report: Facility 21

Headwater Elevation (ft)	Total Discharge (cfs)	7'x7' RCB Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3684.10	0.00	0.00	0.00	1
3686.95	93.00	93.00	0.00	1
3688.65	186.00	186.00	0.00	1
3690.10	279.00	279.00	0.00	1
3691.48	372.00	372.00	0.00	1
3692.93	465.00	465.00	0.00	1
3694.57	558.00	558.00	0.00	1
3696.46	651.00	651.00	0.00	1
3698.64	744.00	744.00	0.00	1
3701.14	837.00	837.00	0.00	1
3703.97	930.00	930.00	0.00	1
3707.56	1030.11	1030.11	0.00	Overtopping

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 930 cfs

Maximum Flow: 930 cfs

Table 1 - Summary of Culvert Flows at Crossing: 21 - Fox Hill

Rating Curve Plot for Crossing: 21 - Fox Hill

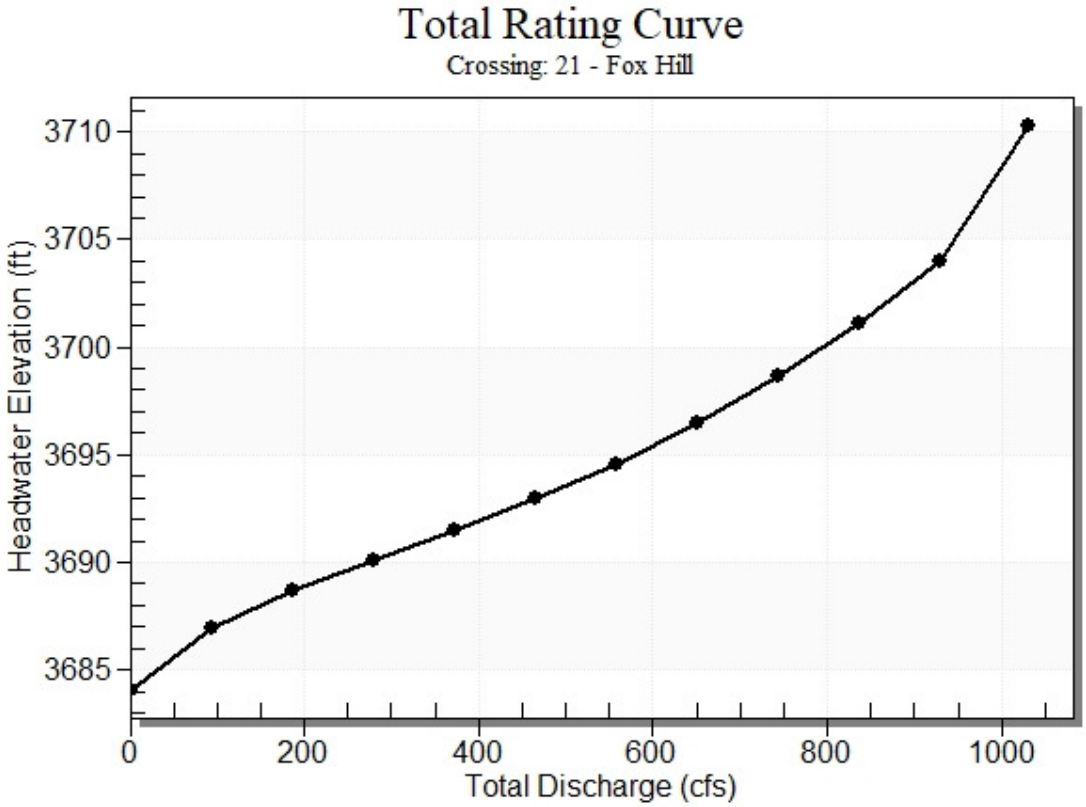


Table 2 - Culvert Summary Table: 7'x7' RCB

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	3684.10	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
93.00	93.00	3686.95	2.854	0.0*	1-S2n	0.737	1.763	0.787	0.753	16.878	17.640
186.00	186.00	3688.65	4.552	0.0*	1-S2n	1.162	2.799	1.300	1.187	20.447	22.389
279.00	279.00	3690.10	6.000	0.0*	1-S2n	1.529	3.668	1.786	1.561	22.319	25.536
372.00	372.00	3691.48	7.380	0.0*	5-S2n	1.867	4.443	2.247	1.904	23.648	27.907
465.00	465.00	3692.93	8.835	0.353	5-S2n	2.185	5.156	2.693	2.228	24.663	29.809
558.00	558.00	3694.57	10.471	2.774	5-S2n	2.490	5.822	3.125	2.539	25.508	31.394
651.00	651.00	3696.46	12.359	4.466	5-S2n	2.785	6.452	3.546	2.840	26.228	32.748
744.00	744.00	3698.64	14.543	6.328	5-S2n	3.073	7.000	3.957	3.133	26.864	33.926
837.00	837.00	3701.14	17.044	8.129	5-S2n	3.354	7.000	4.348	3.420	27.502	34.966
930.00	930.00	3703.97	19.869	10.141	5-S2n	3.631	7.000	4.710	3.701	28.206	35.893

* Full Flow Headwater elevation is below inlet invert.

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Straight Culvert

Inlet Elevation (invert): 3684.10 ft, Outlet Elevation (invert): 3676.65 ft

Culvert Length: 127.17 ft, Culvert Slope: 0.0587

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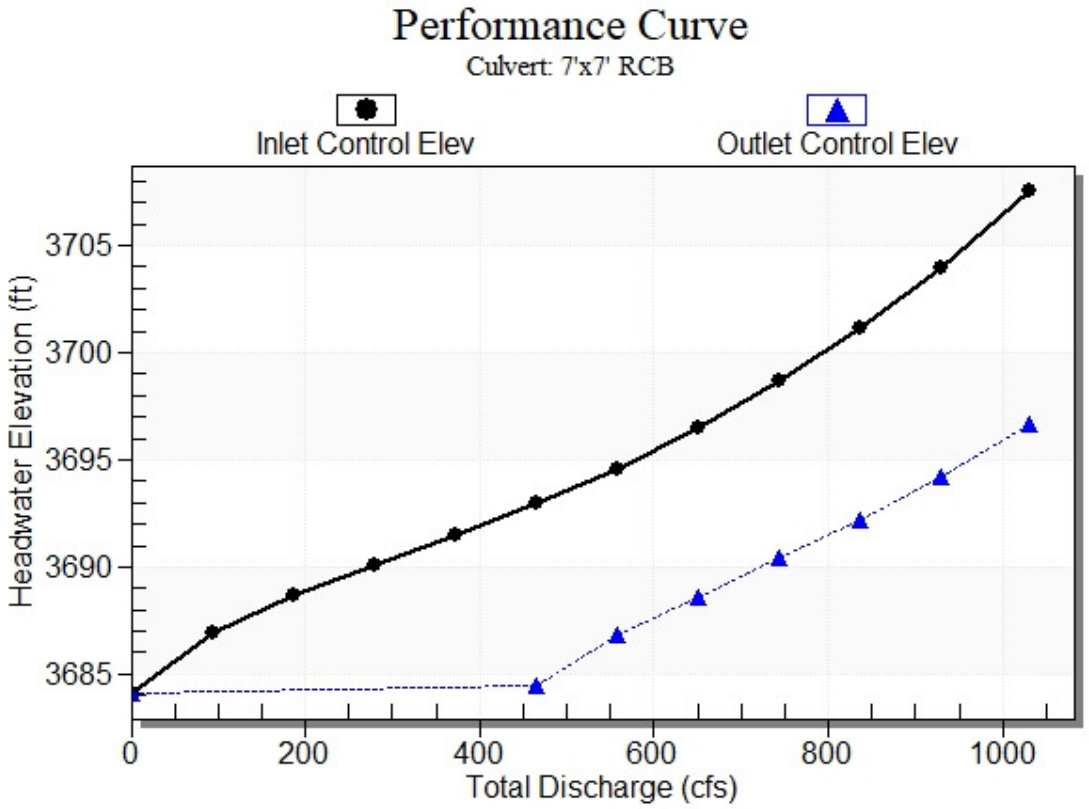
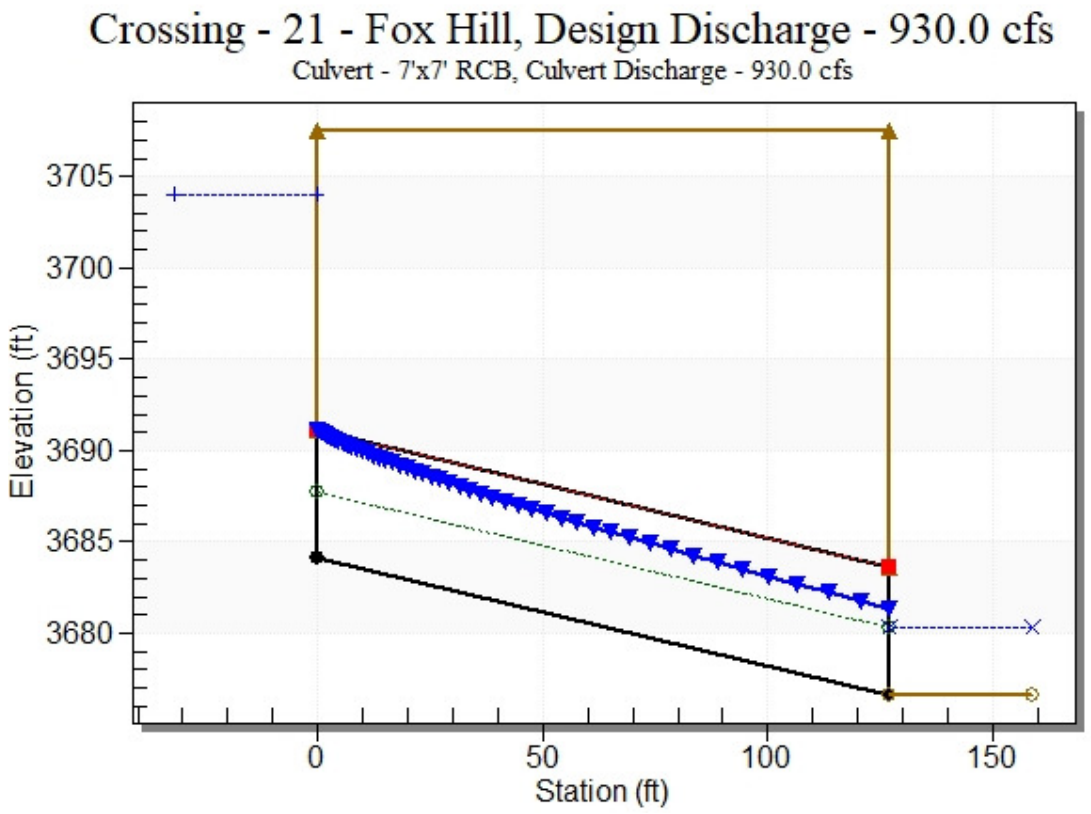
Culvert Performance Curve Plot: 7'x7' RCB



Water Surface Profile Plot for Culvert: 7'x7' RCB



Site Data - 7'x7' RCB

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 3684.10 ft

Outlet Station: 126.95 ft

Outlet Elevation: 3676.65 ft

Number of Barrels: 1

Culvert Data Summary - 7'x7' RCB

Barrel Shape: Concrete Box

Barrel Span: 7.00 ft

Barrel Rise: 7.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0150

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: 21 - Fox Hill)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	3676.65	0.00	0.00	0.00	0.00
93.00	3677.40	0.75	17.64	2.82	3.58
186.00	3677.84	1.19	22.39	4.44	3.62
279.00	3678.21	1.56	25.54	5.84	3.60
372.00	3678.55	1.90	27.91	7.13	3.56
465.00	3678.88	2.23	29.81	8.34	3.52
558.00	3679.19	2.54	31.39	9.51	3.47
651.00	3679.49	2.84	32.75	10.63	3.42
744.00	3679.78	3.13	33.93	11.73	3.38
837.00	3680.07	3.42	34.97	12.80	3.33
930.00	3680.35	3.70	35.89	13.86	3.29

Tailwater Channel Data - 21 - Fox Hill

Tailwater Channel Option: Rectangular Channel

Bottom Width: 7.00 ft

Channel Slope: 0.0600

Channel Manning's n: 0.0150

Channel Invert Elevation: 3676.65 ft

Roadway Data for Crossing: 21 - Fox Hill

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 3707.56 ft

Roadway Surface: Paved

Roadway Top Width: 126.95 ft

HY-8 Report – Facility 31

Headwater Elevation (ft)	Total Discharge (cfs)	36 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3590.00	0.00	0.00	0.00	1
3590.88	5.60	5.60	0.00	1
3591.27	11.20	11.20	0.00	1
3591.59	16.80	16.80	0.00	1
3591.93	22.40	22.40	0.00	1
3592.22	28.00	28.00	0.00	1
3592.50	33.60	33.60	0.00	1
3592.79	39.20	39.20	0.00	1
3593.10	44.80	44.80	0.00	1
3593.43	50.40	50.40	0.00	1
3593.80	56.00	56.00	0.00	1
3599.00	106.13	106.13	0.00	Overtopping

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 56 cfs

Maximum Flow: 56 cfs

Table 1 - Summary of Culvert Flows at Crossing: 31 - Park 1

Rating Curve Plot for Crossing: 31 - Park 1

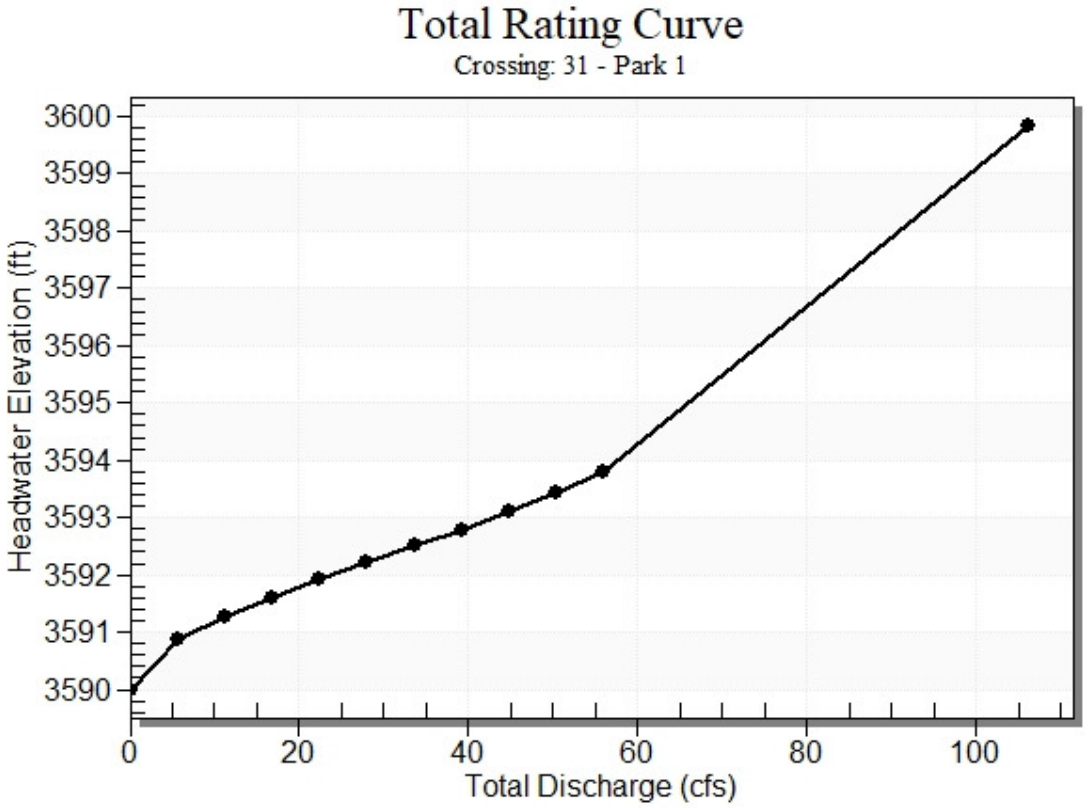


Table 2 - Culvert Summary Table: 36

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	3590.00	0.000	0.000	0-NF	0.000	0.000	3.000	6.260	0.000	0.000
5.60	5.60	3590.88	0.881	0.0*	1-JS1f	0.286	0.739	3.000	6.260	0.792	0.000
11.20	11.20	3591.27	1.265	0.0*	1-JS1f	0.401	1.055	3.000	6.260	1.584	0.000
16.80	16.80	3591.59	1.594	0.0*	1-S2n	0.488	1.309	0.488	6.260	21.707	0.000
22.40	22.40	3591.93	1.927	0.0*	1-S2n	0.563	1.522	0.597	6.260	21.598	0.000
28.00	28.00	3592.22	2.223	0.0*	1-S2n	0.629	1.708	0.629	6.260	25.093	0.000
33.60	33.60	3592.50	2.505	0.0*	1-S2n	0.689	1.879	0.689	6.260	26.407	0.000
39.20	39.20	3592.79	2.791	0.0*	1-S2n	0.744	2.033	0.799	6.260	25.073	0.000
44.80	44.80	3593.10	3.095	0.0*	5-S2n	0.797	2.178	0.863	6.260	25.681	0.000
50.40	50.40	3593.43	3.429	0.0*	5-S2n	0.847	2.307	0.919	6.260	26.494	0.000
56.00	56.00	3593.80	3.800	0.0*	5-S2n	0.893	2.424	0.974	6.260	27.166	0.000

* Full Flow Headwater elevation is below inlet invert.

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Straight Culvert

Inlet Elevation (invert): 3590.00 ft, Outlet Elevation (invert): 3571.08 ft

Culvert Length: 112.99 ft, Culvert Slope: 0.1699

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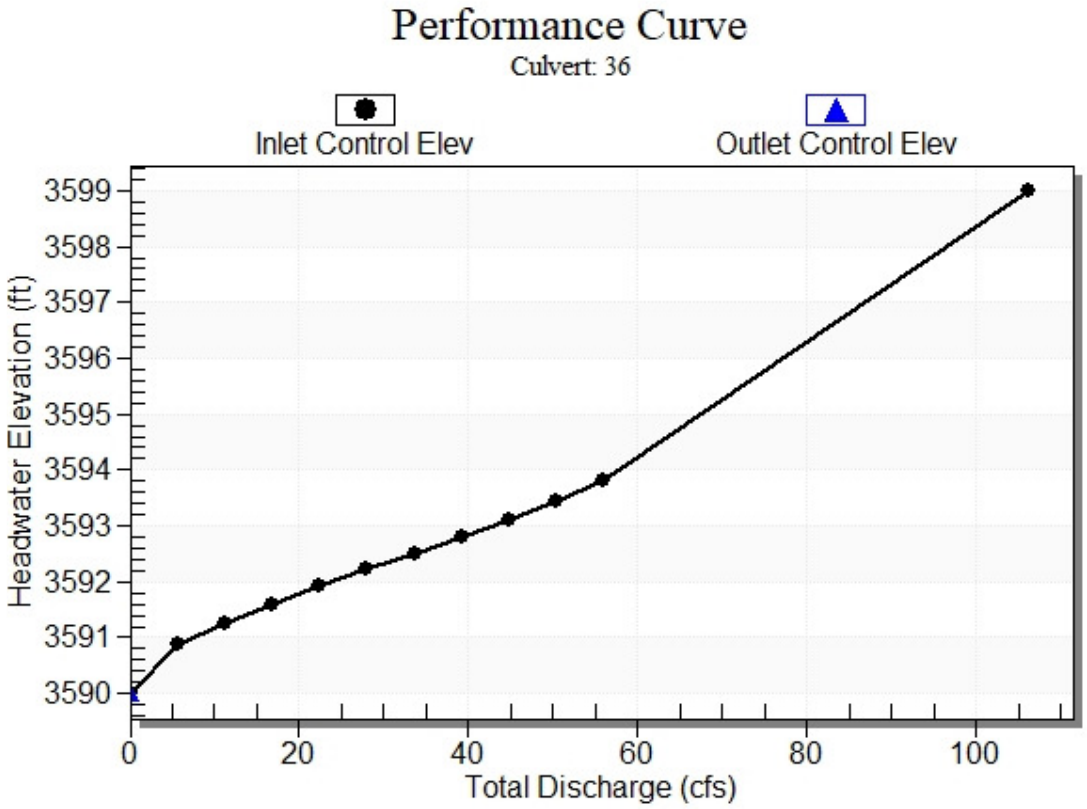
Culvert Performance Curve Plot: 36



HY-8 Report: Facility 31

Headwater Elevation (ft)	Total Discharge (cfs)	42 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3590.00	0.00	0.00	0.00	1
3590.87	5.60	5.60	0.00	1
3591.25	11.20	11.20	0.00	1
3591.55	16.80	16.80	0.00	1
3591.82	22.40	22.40	0.00	1
3592.10	28.00	28.00	0.00	1
3592.36	33.60	33.60	0.00	1
3592.59	39.20	39.20	0.00	1
3592.82	44.80	44.80	0.00	1
3593.04	50.40	50.40	0.00	1
3593.27	56.00	56.00	0.00	1
3599.00	140.57	140.57	0.00	Overtopping

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 56 cfs

Maximum Flow: 56 cfs

Table 1 - Summary of Culvert Flows at Crossing: 31 - Park 1

Rating Curve Plot for Crossing: 31 - Park 1

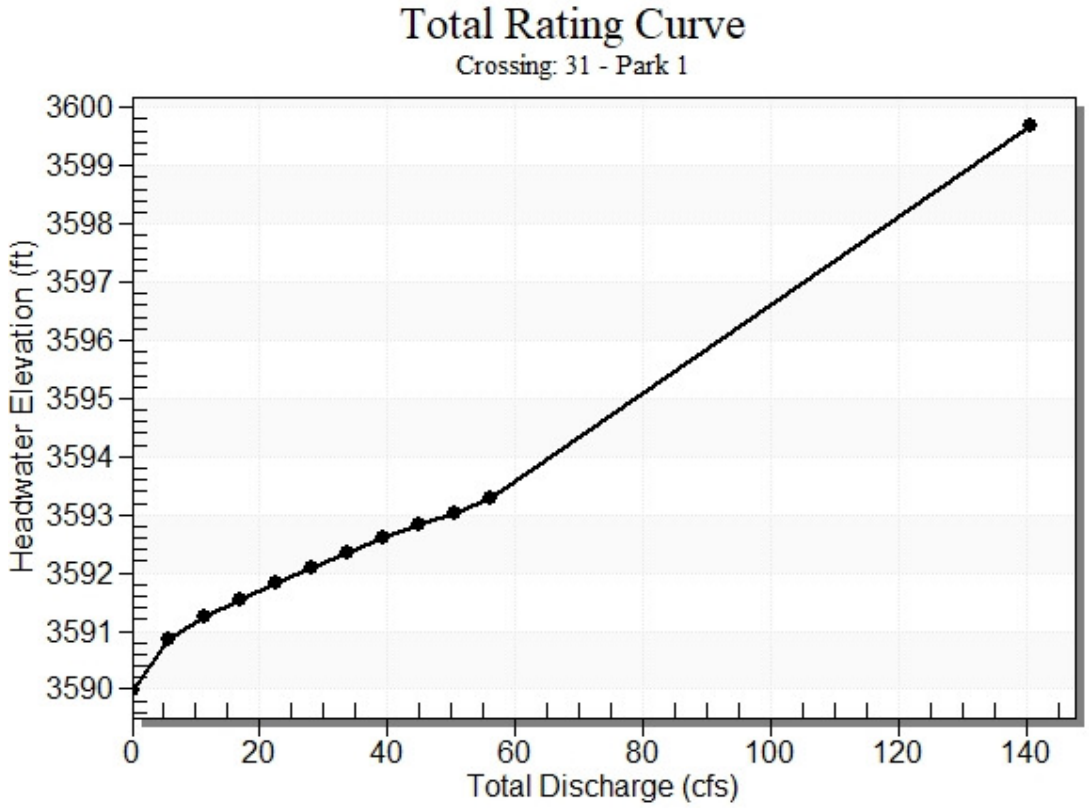


Table 2 - Culvert Summary Table: 42

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	3590.00	0.000	0.000	0-NF	0.000	0.000	3.500	6.250	0.000	0.000
5.60	5.60	3590.87	0.868	0.0*	1-JS1f	0.295	0.705	3.500	6.250	0.582	0.000
11.20	11.20	3591.25	1.248	0.0*	1-JS1f	0.412	1.012	3.500	6.250	1.164	0.000
16.80	16.80	3591.55	1.547	0.0*	1-JS1f	0.502	1.248	3.500	6.250	1.746	0.000
22.40	22.40	3591.82	1.818	0.0*	1-JS1f	0.578	1.448	3.500	6.250	2.328	0.000
28.00	28.00	3592.10	2.101	0.0*	1-S2n	0.645	1.632	0.645	6.250	22.158	0.000
33.60	33.60	3592.36	2.356	0.0*	1-S2n	0.706	1.794	0.750	6.250	21.469	0.000
39.20	39.20	3592.59	2.591	0.0*	1-S2n	0.762	1.944	0.823	6.250	21.923	0.000
44.80	44.80	3592.82	2.817	0.0*	1-S2n	0.816	2.085	0.882	6.250	22.711	0.000
50.40	50.40	3593.04	3.040	0.0*	1-S2n	0.865	2.215	0.945	6.250	23.237	0.000
56.00	56.00	3593.27	3.267	0.0*	1-S2n	0.913	2.341	1.000	6.250	23.833	0.000

* Full Flow Headwater elevation is below inlet invert.

****

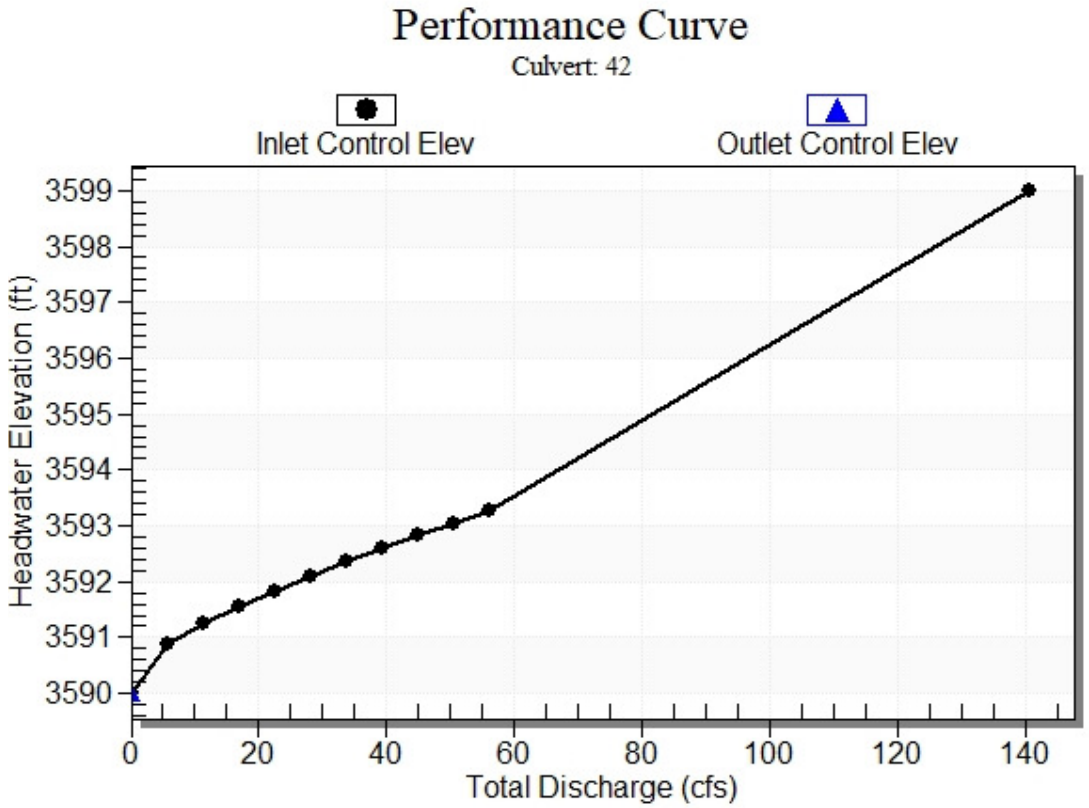
Straight Culvert

Inlet Elevation (invert): 3590.00 ft, Outlet Elevation (invert): 3576.05 ft

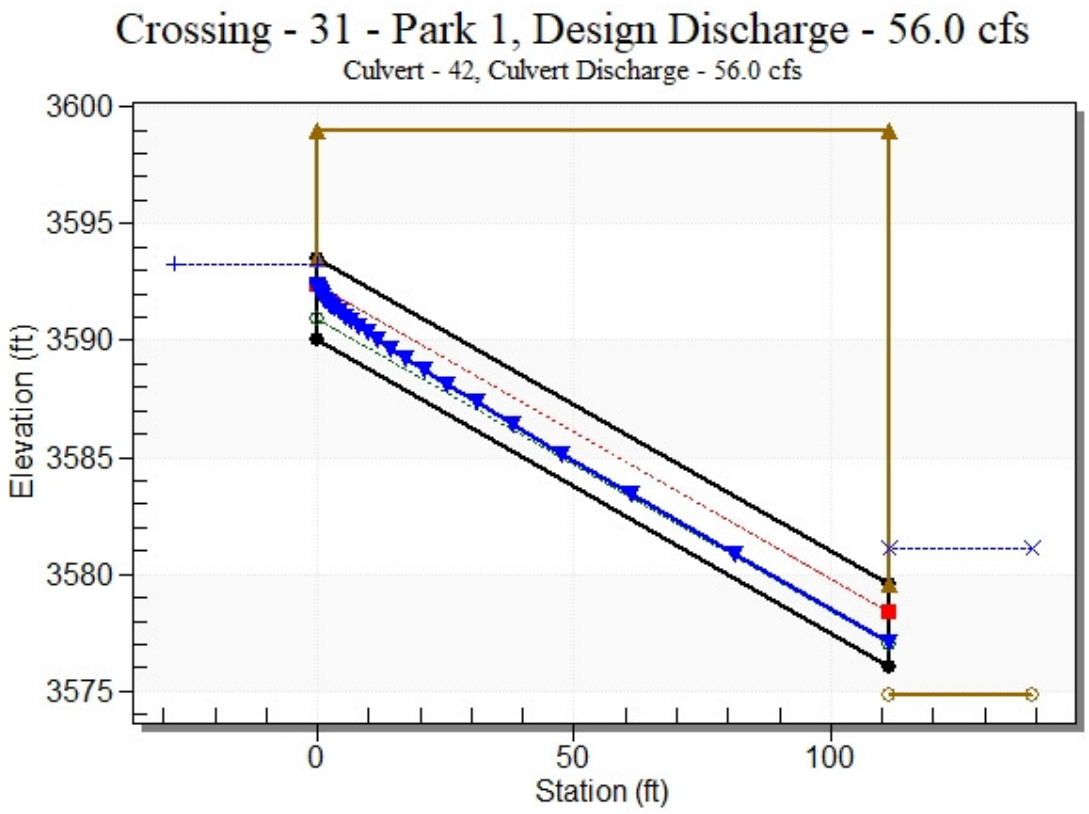
Culvert Length: 112.26 ft, Culvert Slope: 0.1252

****

Culvert Performance Curve Plot: 42



Water Surface Profile Plot for Culvert: 42



Site Data - 42

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 3590.00 ft

Outlet Station: 111.39 ft

Outlet Elevation: 3576.05 ft

Number of Barrels: 1

Culvert Data Summary - 42

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: 31 - Park 1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
0.00	3581.12	6.25
5.60	3581.12	6.25
11.20	3581.12	6.25
16.80	3581.12	6.25
22.40	3581.12	6.25
28.00	3581.12	6.25
33.60	3581.12	6.25
39.20	3581.12	6.25
44.80	3581.12	6.25
50.40	3581.12	6.25
56.00	3581.12	6.25

Tailwater Channel Data - 31 - Park 1

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 3581.12 ft

Roadway Data for Crossing: 31 - Park 1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 3599.00 ft

Roadway Surface: Paved

Roadway Top Width: 111.39 ft

HY-8 Report: Facility 32

Headwater Elevation (ft)	Total Discharge (cfs)	48 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3561.46	0.00	0.00	0.00	1
3562.38	7.20	7.20	0.00	1
3562.77	14.40	14.40	0.00	1
3563.09	21.60	21.60	0.00	1
3563.36	28.80	28.80	0.00	1
3563.64	36.00	36.00	0.00	1
3563.92	43.20	43.20	0.00	1
3564.17	50.40	50.40	0.00	1
3564.42	57.60	57.60	0.00	1
3564.65	64.80	64.80	0.00	1
3564.89	72.00	72.00	0.00	1
3569.00	159.90	159.90	0.00	Overtopping

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 72 cfs

Maximum Flow: 72 cfs

Table 1 - Summary of Culvert Flows at Crossing: 32 - Park 2

Rating Curve Plot for Crossing: 32 - Park 2

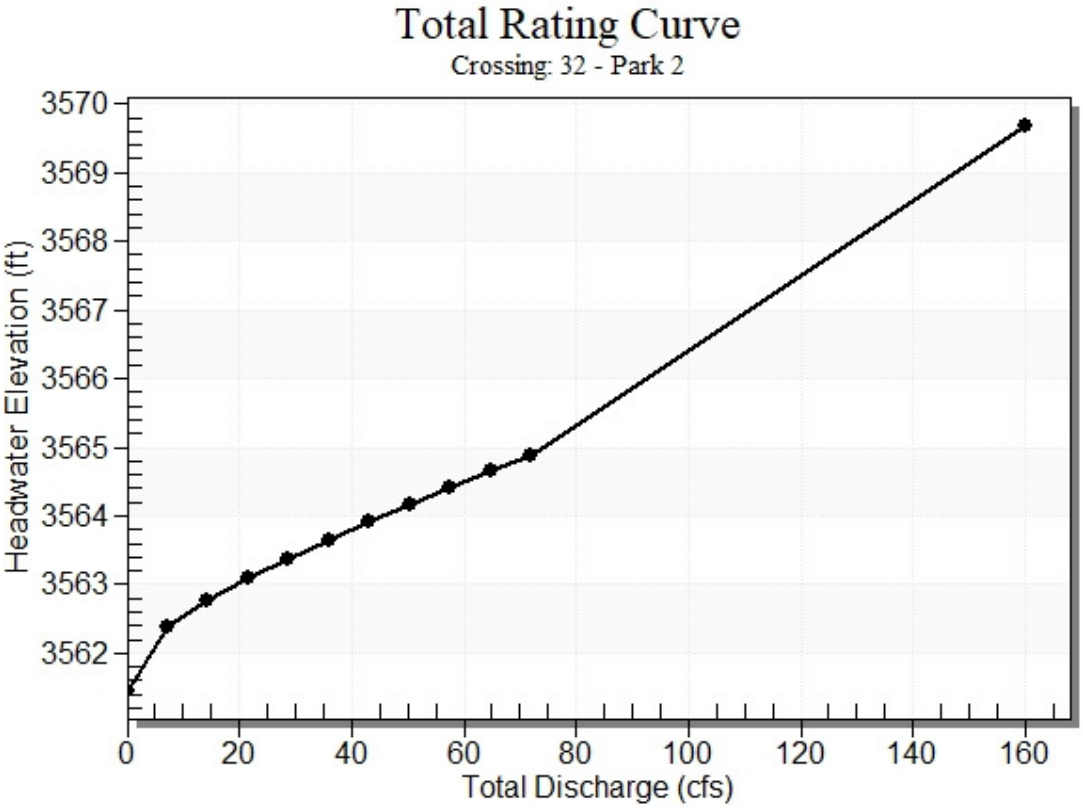


Table 2 - Culvert Summary Table: 48

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	3561.46	0.000	0.000	0-NF	0.000	0.000	4.000	8.730	0.000	0.000
7.20	7.20	3562.38	0.917	0.0*	1-JS1f	0.297	0.776	4.000	8.730	0.573	0.000
14.40	14.40	3562.77	1.314	0.0*	1-JS1f	0.415	1.108	4.000	8.730	1.146	0.000
21.60	21.60	3563.09	1.627	0.0*	1-JS1f	0.503	1.366	4.000	8.730	1.719	0.000
28.80	28.80	3563.36	1.896	0.0*	1-JS1f	0.577	1.587	4.000	8.730	2.292	0.000
36.00	36.00	3563.64	2.176	0.0*	1-JS1f	0.644	1.786	4.000	8.730	2.865	0.000
43.20	43.20	3563.92	2.456	0.0*	1-JS1f	0.705	1.965	4.000	8.730	3.438	0.000
50.40	50.40	3564.17	2.713	0.0*	1-JS1f	0.760	2.126	4.000	8.730	4.011	0.000
57.60	57.60	3564.42	2.956	0.0*	1-JS1f	0.813	2.280	4.000	8.730	4.584	0.000
64.80	64.80	3564.65	3.192	0.0*	1-JS1f	0.861	2.426	4.000	8.730	5.157	0.000
72.00	72.00	3564.89	3.427	0.0*	1-JS1f	0.908	2.561	4.000	8.730	5.730	0.000

* Full Flow Headwater elevation is below inlet invert.

****

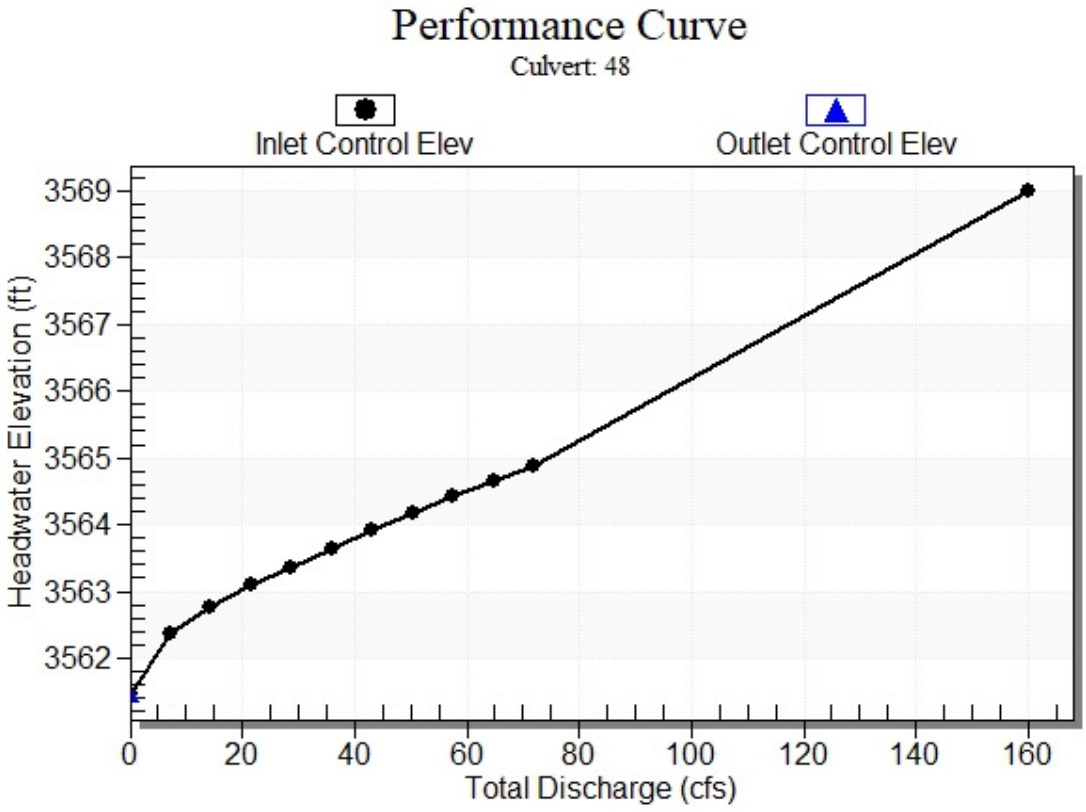
Straight Culvert

Inlet Elevation (invert): 3561.46 ft, Outlet Elevation (invert): 3541.87 ft

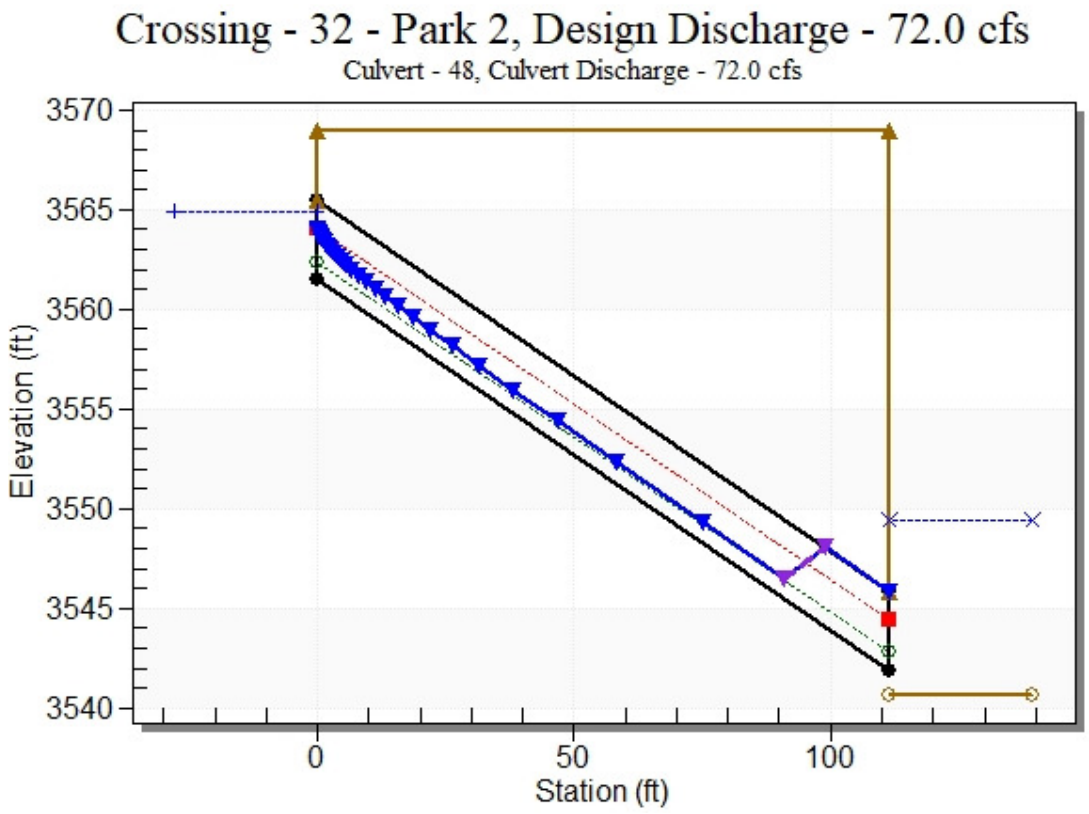
Culvert Length: 113.11 ft, Culvert Slope: 0.1759

****

Culvert Performance Curve Plot: 48



Water Surface Profile Plot for Culvert: 48



Site Data - 48

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 3561.46 ft

Outlet Station: 111.40 ft

Outlet Elevation: 3541.87 ft

Number of Barrels: 1

Culvert Data Summary - 48

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: 32 - Park 2)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
0.00	3549.42	8.73
7.20	3549.42	8.73
14.40	3549.42	8.73
21.60	3549.42	8.73
28.80	3549.42	8.73
36.00	3549.42	8.73
43.20	3549.42	8.73
50.40	3549.42	8.73
57.60	3549.42	8.73
64.80	3549.42	8.73
72.00	3549.42	8.73

Tailwater Channel Data - 32 - Park 2

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 3549.42 ft

Roadway Data for Crossing: 32 - Park 2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 3569.00 ft

Roadway Surface: Paved

Roadway Top Width: 111.40 ft

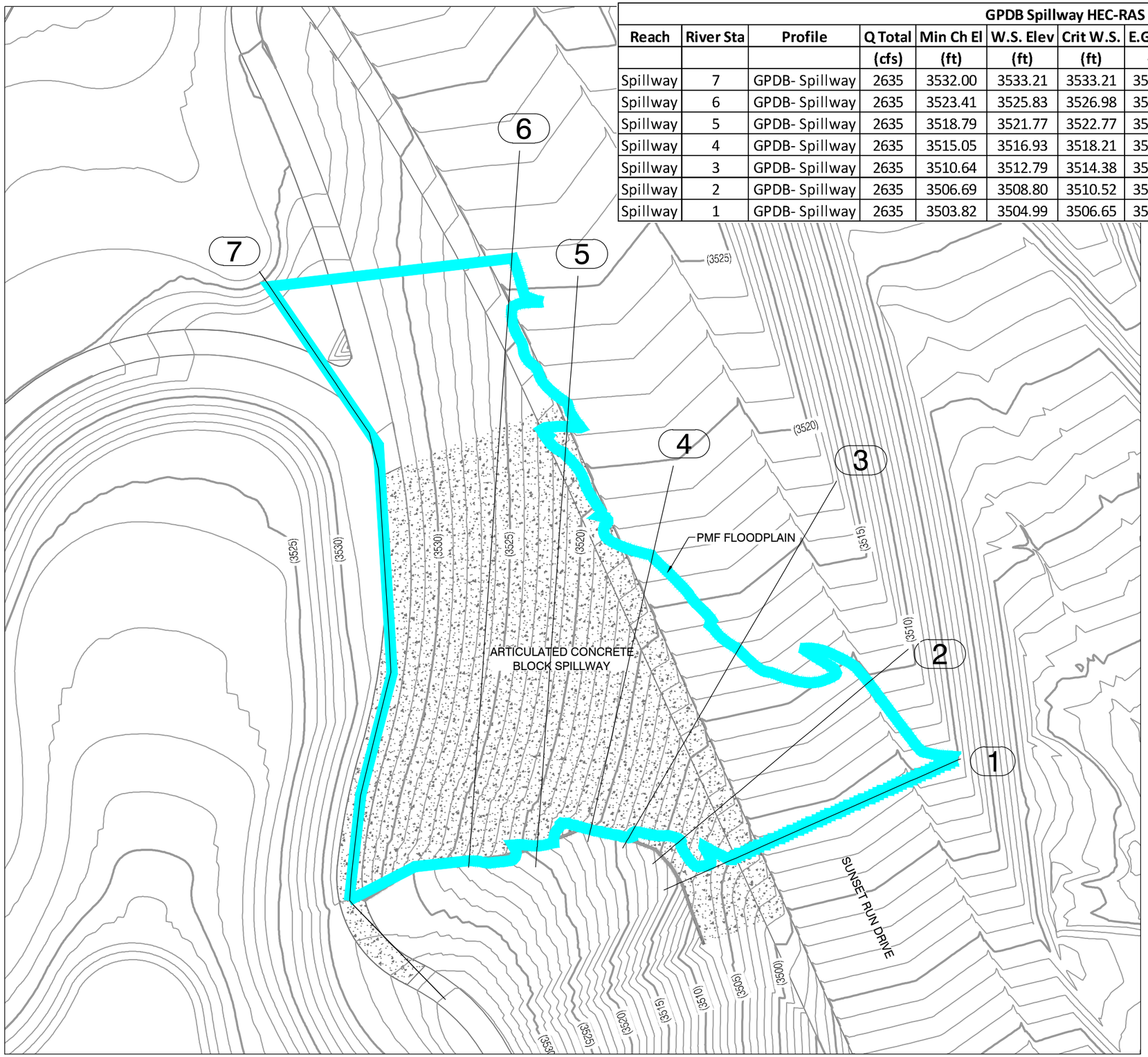
C.4

HEC-RAS RIVER ANALYSIS SYSTEM

C.4.1 PMF Spillway Analysis

GPDB Spillway HEC-RAS Summary

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Spillway	7	GPDB- Spillway	2635	3532.00	3533.21	3533.21	3533.80	0.002	6.23	426.56	363.48	1.00
Spillway	6	GPDB- Spillway	2635	3523.41	3525.83	3526.98	3532.78	0.199	19.95	127.15	170.28	4.00
Spillway	5	GPDB- Spillway	2635	3518.79	3521.77	3522.77	3526.61	0.154	17.67	149.40	196.31	3.52
Spillway	4	GPDB- Spillway	2635	3515.05	3516.93	3518.21	3522.86	0.117	18.94	135.92	134.40	3.23
Spillway	3	GPDB- Spillway	2635	3510.64	3512.79	3514.38	3520.51	0.066	15.97	131.60	104.66	2.50
Spillway	2	GPDB- Spillway	2635	3506.69	3508.80	3510.52	3518.05	0.089	16.68	113.53	115.86	2.82
Spillway	1	GPDB- Spillway	2635	3503.82	3504.99	3506.65	3515.57	0.089	8.26	104.11	120.23	2.36



GRAPHIC SCALE

50 0 25 50 100

1" = 50'

NORTH

GRAND PARK DETENTION BASIN
SPILLWAY HEC-RAS EXHIBIT

W.O.#: 7809-GPDB
DATE: FEB-2020
BY: PLM
SCALE: 1"=50'
SHEET OF

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7809-GP Basin\Drainage\TDS\2_Outflow-Basin\3_ADD1\C_Hydraulics\C.4_HEC-RAS XXXX\GPDB-RBR\GPDB-SPILLWAY-HECRAS.dwg;paulm; Feb 11, 2020 - 1:15pm

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: HEC-RAS model from Autodesk® River and Flood Analysis Module 2019
Project File : GPDB-SPILLWAY-HECRAS.prj
Run Date and Time: 2/11/2020 12:50:40 PM

Project in English units

PLAN DATA

Plan Title: Current model
Plan File : H:\7809-GP Basin\Drainage\TDS\2_Outflow-Basin\3_ADD1\C_Hydraulics\C.4_HEC-RAS XXXX\GPDB-RBR\GPDB-SPILLWAY-HECRAS.P01

Geometry Title: Base Conditions Geometry
Geometry File : H:\7809-GP Basin\Drainage\TDS\2_Outflow-Basin\3_ADD1\C_Hydraulics\C.4_HEC-RAS XXXX\GPDB-RBR\GPDB-SPILLWAY-HECRAS.G01

Flow Title : 1 Flow Profiles
Flow File : H:\7809-GP Basin\Drainage\TDS\2_Outflow-Basin\3_ADD1\C_Hydraulics\C.4_HEC-RAS XXXX\GPDB-RBR\GPDB-SPILLWAY-HECRAS.F01

Plan Summary Information:
Number of: Cross Sections = 7 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: 1 Flow Profiles
Flow File : H:\7809-GP Basin\Drainage\TDS\2_Outflow-Basin\3_ADD1\C_Hydraulics\C.4_HEC-RAS XXXX\GPDB-RBR\GPDB-SPILLWAY-HECRAS.F01

Flow Data (cfs)

River	Reach	RS	GPDB- Spillway
GPDB	Spillway	7	2635

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
GPDB	Spillway	GPDB- Spillway	Known WS = 3534	Normal S = 0.133673

GEOMETRY DATA

Geometry Title: Base Conditions Geometry
Geometry File : H:\7809-GP Basin\Drainage\TDS\2_Outflow-Basin\3_ADD1\C_Hydraulics\C.4_HEC-RAS XXXX\GPDB-RBR\GPDB-SPILLWAY-HECRAS.G01

CROSS SECTION

RIVER: GPDB
REACH: Spillway RS: 7

INPUT
Description:
Station Elevation Data   num=   30
     Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
       0   3536   .92 3535.98   8.24   3534   16.24   3532   35.27   3532
   49.12   3532   65.34   3532   65.66   3532   77.29   3532   92.89   3532
  110.67   3532   120.2   3532 149.83   3532 168.31   3532 185.98   3532
   207.8   3532 217.32   3532 246.52   3532 268.43   3532 283.19   3532
  308.28   3532   318.7   3532 320.09   3532 321.82   3532 333.09   3532
   347.5   3532 360.46   3532 363.02 3532.19 376.33 3533.32 384.45 3534.04

Manning's n Values   num=   3
     Sta   n Val   Sta   n Val   Sta   n Val
       0   .013   16.24   .013 363.02   .013

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
         16.24 363.02   46.94   52.85   61.43   .1   .3

CROSS SECTION

RIVER: GPDB
REACH: Spillway   RS: 6

INPUT
Description:
Station Elevation Data   num=   30
     Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
       0 3528.28   11.59 3527.71   27.66 3526.93   40.88 3526.27   48.46 3525.9
   58.44 3525.4   68.23 3524.9   70.99 3524.62   72.14 3525.08   76.09 3525.62
   95.62 3525.02 107.71 3525.1 129.91 3525.38 150.64 3525.74 169.06 3526.09
  192.94 3526.36 215.66 3526.47   239.1 3526.39 247.19 3526.28 273.39 3525.85
  288.89 3525.39 301.45 3524.95 307.93 3524.43 329.21 3523.96 334.43 3523.78
   338.5 3523.41 338.61 3523.72 339.19 3525.83 339.52 3527.35 342.41 3527.61

Manning's n Values   num=   3
     Sta   n Val   Sta   n Val   Sta   n Val
       0   .016   72.14   .028 338.61   .013

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
         72.14 338.61   32.01   31.73   33.37   .1   .3

CROSS SECTION

RIVER: GPDB
REACH: Spillway   RS: 5

INPUT
Description:
Station Elevation Data   num=   30
     Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
       0 3525.23   13.65 3524.57   24.83 3523.97   40.26 3523.08   52.49 3522.37
   67.09 3521.54   70.06 3521.23   71.29 3521.67   75.48 3522.17   79.51 3522.01
   96.46 3521.3 113.45 3521.44 127.75 3521.57 140.78 3521.62 153.67 3521.64
  167.92 3521.59 179.15 3521.53 189.77 3521.37 204.48 3521.14 217.19 3520.91
  232.63 3520.4 246.67 3519.94 256.07 3519.38 257.65 3519.06 271.81 3518.79
  271.84 3518.79   272.5 3522.34 272.69 3523.28 272.92 3524.39 282.43 3525.41

Manning's n Values   num=   3
     Sta   n Val   Sta   n Val   Sta   n Val
       0   .016   71.29   .028 271.81   .013

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
         71.29 271.81   31.35   27.02   26.84   .1   .3

CROSS SECTION

RIVER: GPDB
REACH: Spillway   RS: 4

INPUT
Description:
Station Elevation Data   num=   30
     Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev   Sta   Elev
       0 3519.79   8.7 3519.24   10.17 3519.15   21.61 3518.42   27.35 3518.03
   36.36 3517.42   53 3516.28   59.6 3515.8   61.94 3515.49   62.91 3515.93
   66.22 3516.43   69.91 3516.24   80.93 3515.68   90.34 3515.72   99.84 3515.79
  111.28 3515.88 118.98 3515.93 126.11 3515.98 133.07 3516.02 143.94 3515.96
  148.62 3515.9 166.04 3515.7 172.26 3515.63 177.51 3515.05 177.65 3515.02
  178.24 3518.31 178.36 3519.1 178.51 3520.05 178.73 3521.48 183.88 3521.93

Manning's n Values   num=   3
     Sta   n Val   Sta   n Val   Sta   n Val
       0   .016   62.91   .028 177.51   .013

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
         62.91 177.51   31.43   22.45   18.71   .1   .3

CROSS SECTION

RIVER: GPDB
REACH: Spillway RS: 3

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3517.34	2.44	3517.9	5.95	3517.7	29.41	3516.28	31.87	3515.47
32.48	3515.42	32.58	3514.94	34.32	3515.03	49.14	3514.62	49.14	3514.61
78.47	3513.69	86.05	3513.21	95.93	3512.56	126.25	3510.51	129.27	3510.18
129.45	3510.64	132.43	3511.2	138.19	3510.96	144.69	3510.69	146.26	3510.77
161.43	3511.4	169.2	3511.66	175.5	3511.88	181.74	3512.11	191.68	3512.45
196.04	3512.38	197.1	3512.44	197.43	3514.6	198.12	3518.83	202.6	3519.33

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	129.45	.028	197.1	.013

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
129.45	197.1	33.07	25.37	18.95	.1	.3

CROSS SECTION

RIVER: GPDB
REACH: Spillway RS: 2

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3510.74	.2	3510.73	10.43	3510.27	11.74	3510.21	22.76	3509.72
25.44	3508.45	26.92	3508.58	60.46	3508.37	67.42	3508.2	105.84	3506.41
107.31	3506.21	107.92	3506.69	109.99	3507.33	112	3507.31	116.24	3507.28
120.38	3507.25	124.15	3507.5	126.35	3507.65	130.06	3507.91	134.43	3508.25
137.88	3508.53	139.87	3508.69	143.44	3508.98	145.69	3509.17	149.86	3509.53
152.95	3509.8	153.21	3511.55	153.67	3514.58	153.95	3516.43	159.09	3517.27

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	107.92	.028	152.95	.013

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
107.92	152.95	26.64	25.33	18.66	.1	.3

Left Levee Station= 64.22 Elevation= 3508.34

CROSS SECTION

RIVER: GPDB
REACH: Spillway RS: 1

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	3504.57	1.12	3504.94	13.72	3504.7	14.85	3504.68	23.12	3504.52
26.31	3503.4	27.12	3503.5	47.16	3503.92	63.12	3504.25	81.51	3503.9
103.79	3503.42	104.86	3503.82	108.15	3504.55	112.2	3504.64	113.12	3504.65
117.12	3504.74	119.4	3504.91	122.43	3505.19	123.46	3505.26	126.77	3505.65
130.22	3506.07	134.68	3506.65	138.24	3506.98	141.85	3507.32	145.24	3507.66
145.37	3508.6	146.01	3513.08	146.25	3514.7	149.74	3515.39	154.73	3516.37

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	104.86	.028	145.24	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
104.86	145.24	.1	.3

Left Levee Station= 63.05 Elevation= 3504.27

SUMMARY OF MANNING'S N VALUES

River:GPDB

Reach	River Sta.	n1	n2	n3
Spillway	7	.013	.013	.013
Spillway	6	.016	.028	.013
Spillway	5	.016	.028	.013
Spillway	4	.016	.028	.013
Spillway	3	.016	.028	.013
Spillway	2	.016	.028	.013
Spillway	1	.016	.028	.013

SUMMARY OF REACH LENGTHS

River: GPDB

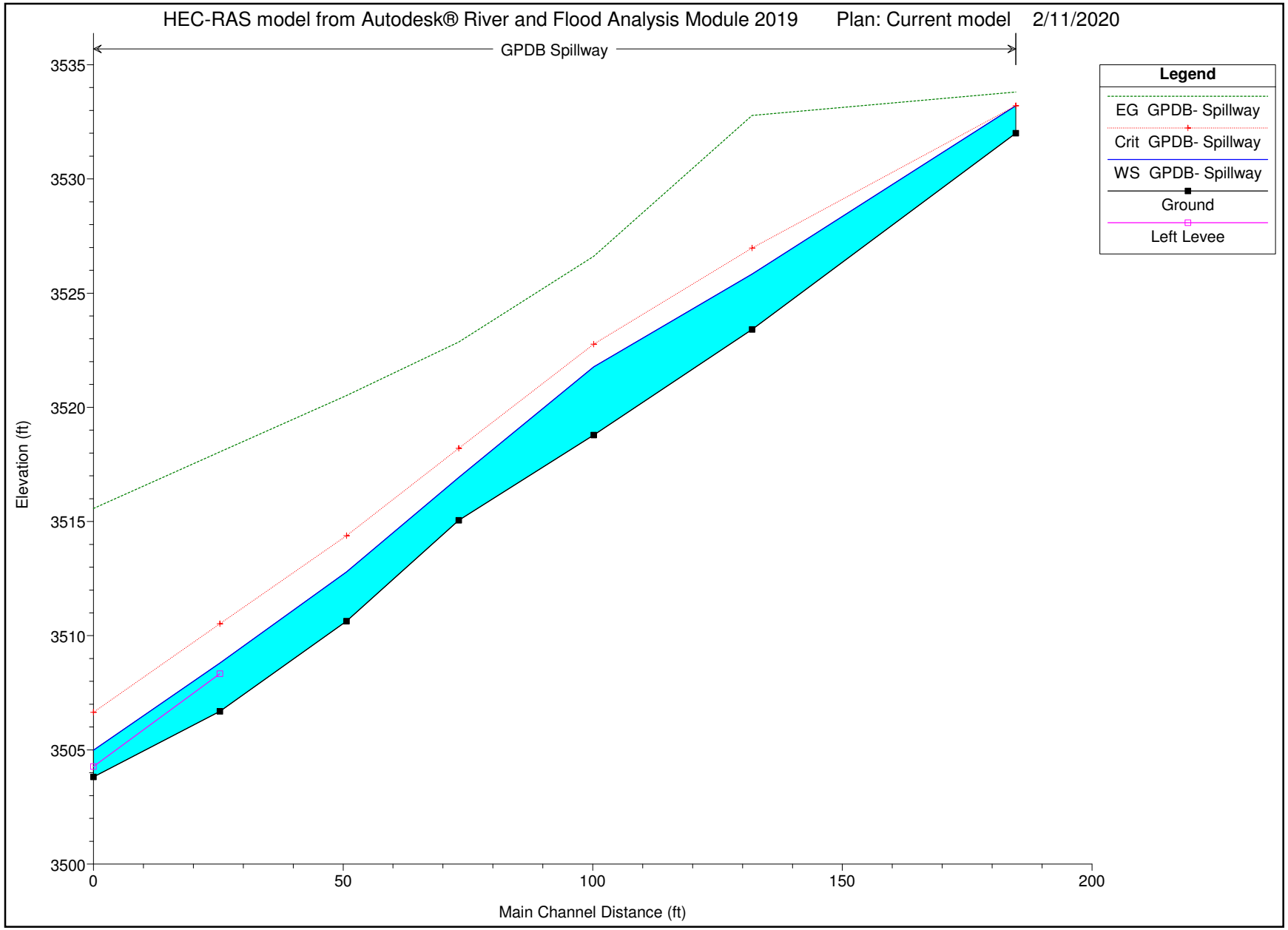
Reach	River Sta.	Left	Channel	Right
Spillway	7	46.94	52.85	61.43
Spillway	6	32.01	31.73	33.37
Spillway	5	31.35	27.02	26.84
Spillway	4	31.43	22.45	18.71
Spillway	3	33.07	25.37	18.95
Spillway	2	26.64	25.33	18.66
Spillway	1			

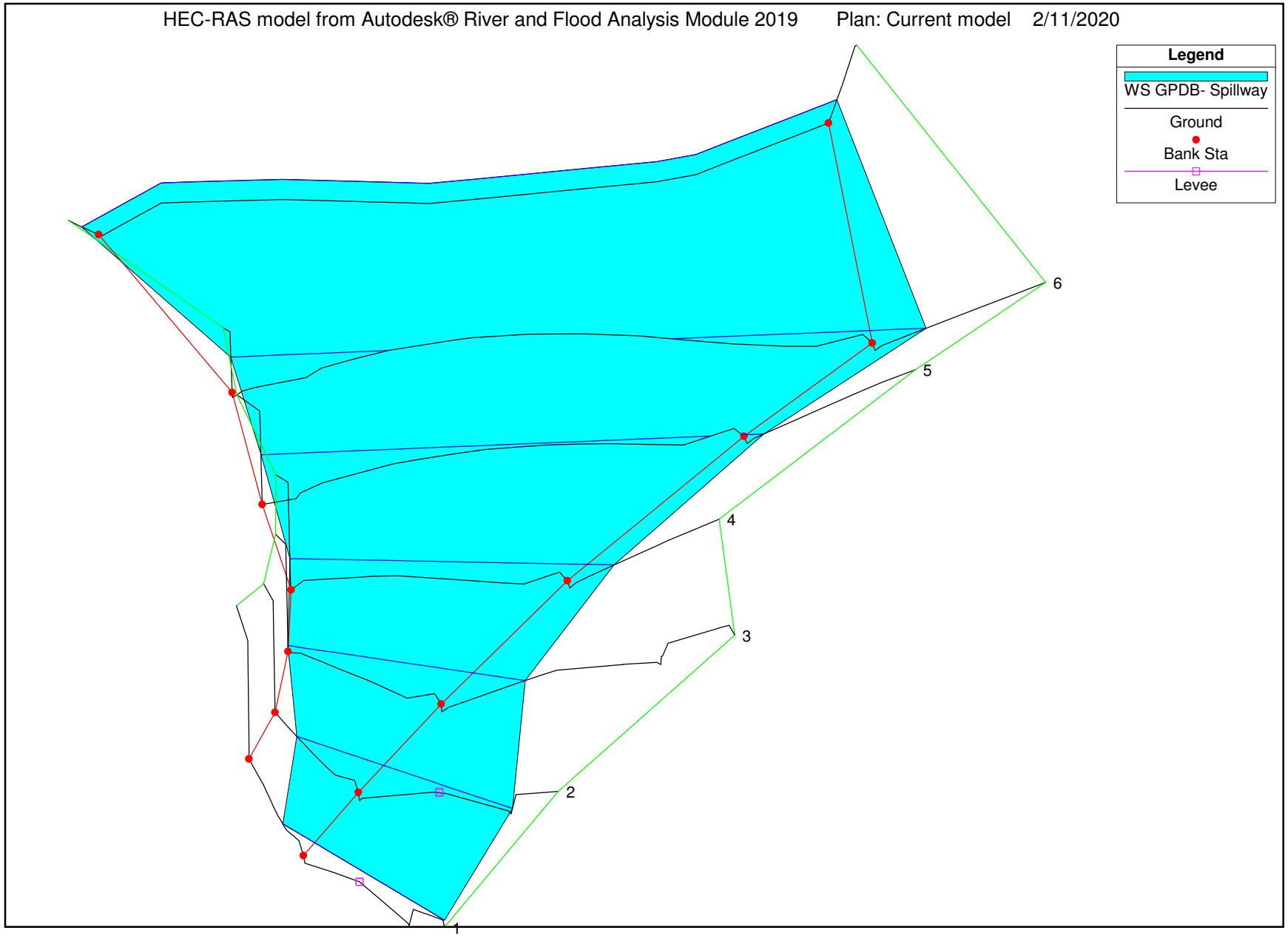
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: GPDB

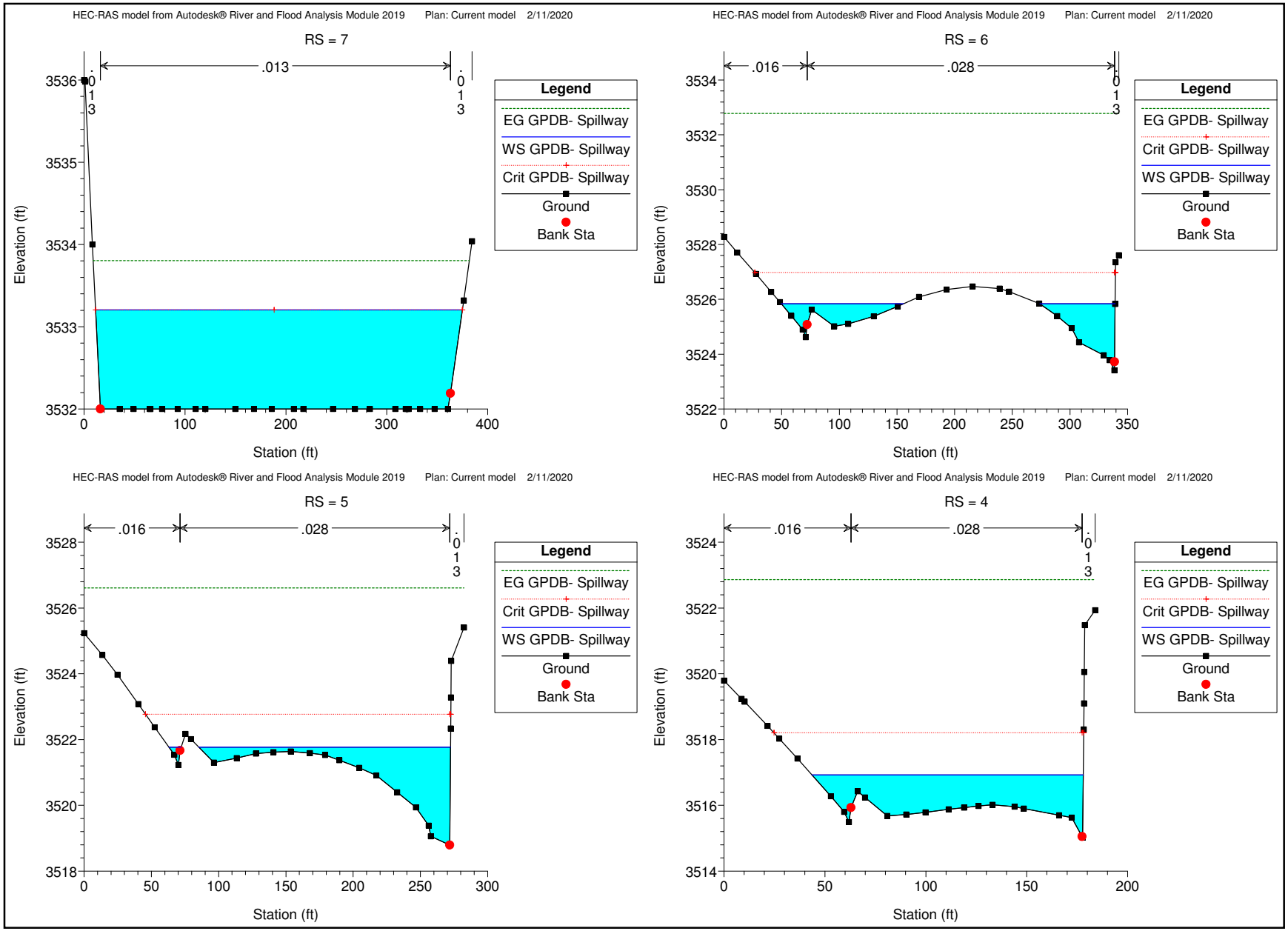
Reach	River Sta.	Contr.	Expan.
Spillway	7	.1	.3
Spillway	6	.1	.3
Spillway	5	.1	.3
Spillway	4	.1	.3
Spillway	3	.1	.3
Spillway	2	.1	.3
Spillway	1	.1	.3

HEC-RAS Plan: Current mode River: GPDB Reach: Spillway Profile: GPDB- Spillway

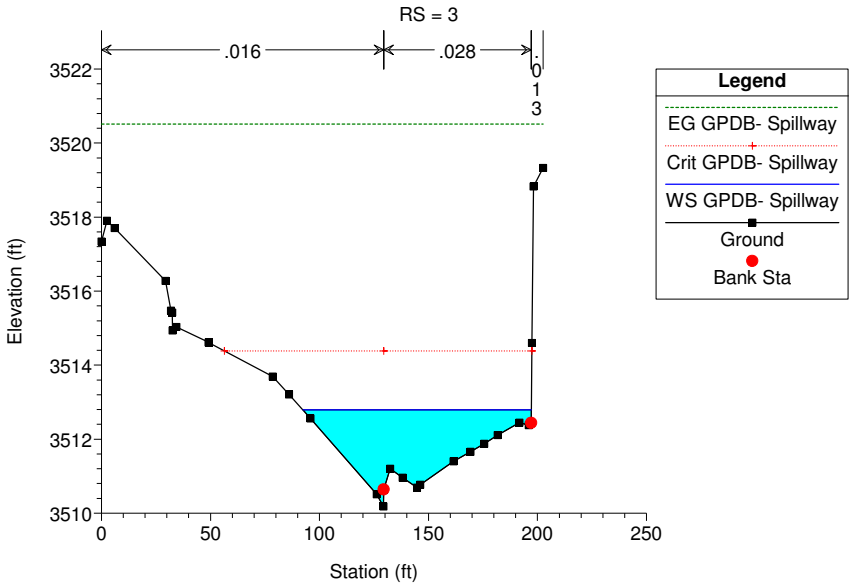
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Spillway	7	GPDB- Spillway	2635.00	3532.00	3533.21	3533.21	3533.80	0.002321	6.23	426.56	363.48	1.00
Spillway	6	GPDB- Spillway	2635.00	3523.41	3525.83	3526.98	3532.78	0.199402	19.95	127.15	170.28	4.00
Spillway	5	GPDB- Spillway	2635.00	3518.79	3521.77	3522.77	3526.61	0.154173	17.67	149.40	196.31	3.52
Spillway	4	GPDB- Spillway	2635.00	3515.05	3516.93	3518.21	3522.86	0.116642	18.94	135.92	134.40	3.23
Spillway	3	GPDB- Spillway	2635.00	3510.64	3512.79	3514.38	3520.51	0.066493	15.97	131.60	104.66	2.50
Spillway	2	GPDB- Spillway	2635.00	3506.69	3508.80	3510.52	3518.05	0.088636	16.68	113.53	115.86	2.82
Spillway	1	GPDB- Spillway	2635.00	3503.82	3504.99	3506.65	3515.57	0.089039	8.26	104.11	120.23	2.36


HEC-RAS model from Autodesk® River and Flood Analysis Module 2019
Plan: Current model
2/11/2020
GPDB Spillway
Legend
EG GPDB- Spillway
Crit GPDB- Spillway
WS GPDB- Spillway
Ground
Left Levee
Elevation (ft)
3535
3530
3525
3520
3515
3510
3505
3500
0
50
100
150
200
Main Channel Distance (ft)

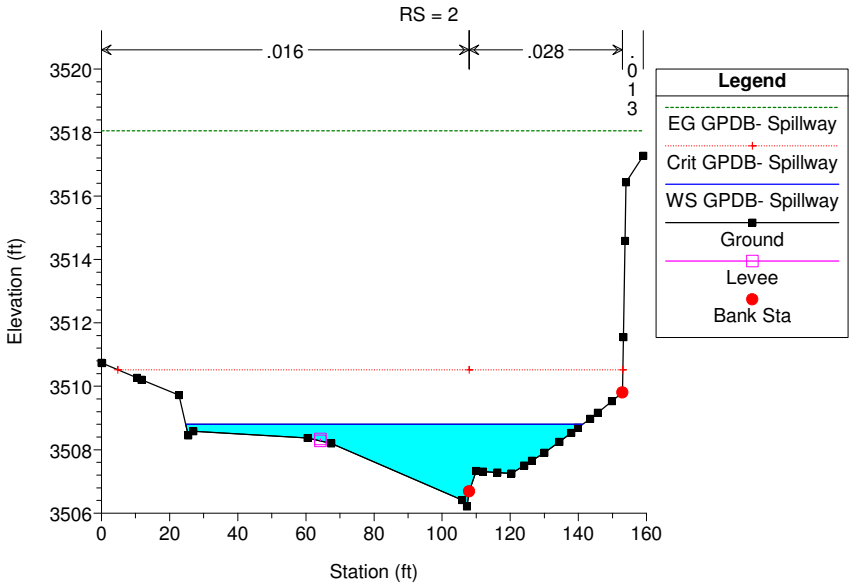

HEC-RAS model from Autodesk® River and Flood Analysis Module 2019
Plan: Current model
2/11/2020
Legend
WS GPDB- Spillway
Ground
Bank Sta
Levee
6
5
4
3
2
1


HEC-RAS model from Autodesk® River and Flood Analysis Module 2019 Plan: Current model 2/11/2020
RS = 7
.013
.013
Elevation (ft)
Station (ft)
Legend
EG GPDB- Spillway
WS GPDB- Spillway
Crit GPDB- Spillway
Ground
Bank Sta
HEC-RAS model from Autodesk® River and Flood Analysis Module 2019 Plan: Current model 2/11/2020
RS = 6
.016
.028
.013
Elevation (ft)
Station (ft)
Legend
EG GPDB- Spillway
Crit GPDB- Spillway
WS GPDB- Spillway
Ground
Bank Sta
HEC-RAS model from Autodesk® River and Flood Analysis Module 2019 Plan: Current model 2/11/2020
RS = 5
.016
.028
.013
Elevation (ft)
Station (ft)
Legend
EG GPDB- Spillway
Crit GPDB- Spillway
WS GPDB- Spillway
Ground
Bank Sta
HEC-RAS model from Autodesk® River and Flood Analysis Module 2019 Plan: Current model 2/11/2020
RS = 4
.016
.028
.013
Elevation (ft)
Station (ft)
Legend
EG GPDB- Spillway
Crit GPDB- Spillway
WS GPDB- Spillway
Ground
Bank Sta

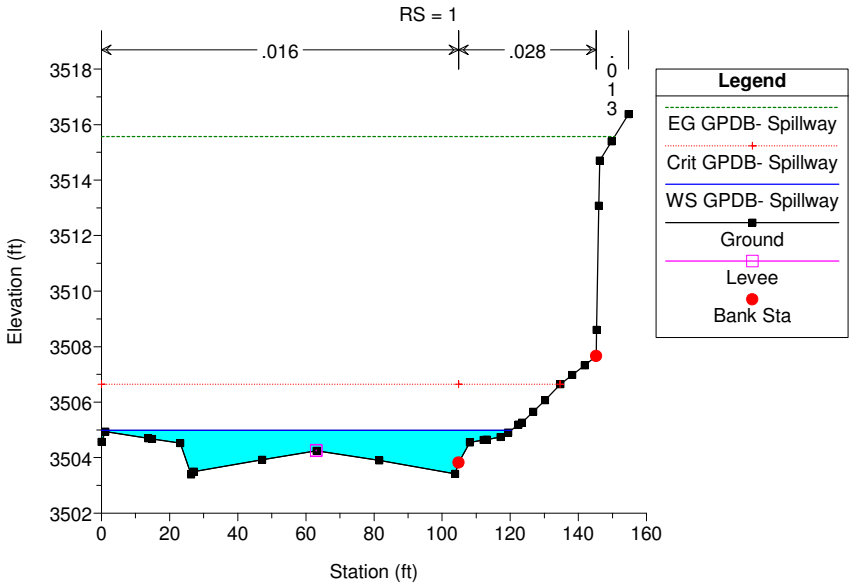
HEC-RAS model from Autodesk® River and Flood Analysis Module 2019 Plan: Current model 2/11/2020



HEC-RAS model from Autodesk® River and Flood Analysis Module 2019 Plan: Current model 2/11/2020



HEC-RAS model from Autodesk® River and Flood Analysis Module 2019 Plan: Current model 2/11/2020



C.5

DETENTION BASIN OUTLET FLOW SUMMARY

Grand Park Detention Basin
STAGE/OUTFLOW

26	inch RCP

HY-8 INLET CONTROL RESULTS
For D ≤ 1.5 Culvert Height
Refer to HY-8 Report

	STAGE	Q
	3506.53	2
Interpolated	**3507**	**6**
	3507.49	10
Interpolated	**3508**	**15**
	3508.49	20
Interpolated	**3509**	**24**
	3509.42	27

CE EQUATION VARIABLES
For D > 1.5 Culvert Height

Cd=	0.65	
A=	3.69	sqft
g=	32.2	ft/s/s
Hcentroid=	1.083333	ft

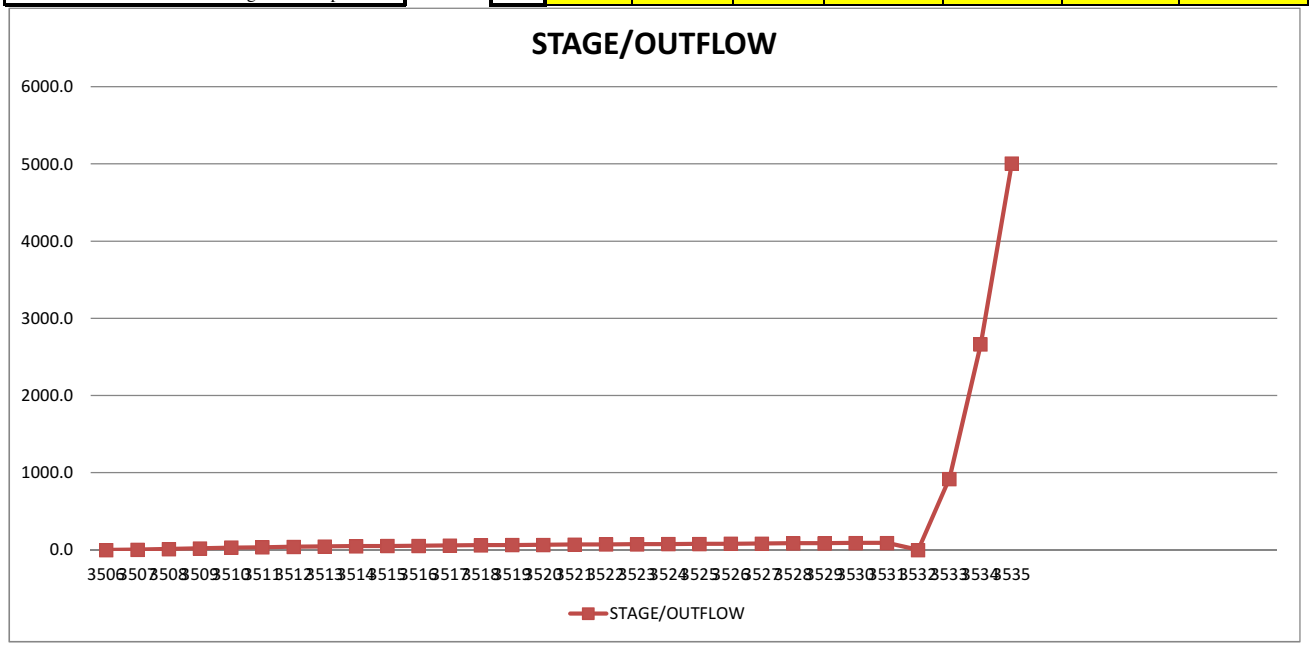
$$Q = CLH^{1.5}$$

$$Q = CBH^{1.5} + C(H * SS_L + H * SS_R)(H/2)^{1.5}$$

B: bottom width, Lss: left side slope, Rss: right side slope, H: height, L: weir length

BROAD CRESTED WEIR SPILLWAY
Trapezoidal sectIon with 300-ft bottom width and a 10:1 left and 10:1 right side slope.

	STAGE (ft)	D ABOVE OUTLET (ft)	H ABOVE WIER (ft)	HY-8 OUTFLOW (cfs)	ORIFICE OUTFLOW (cfs)	SPILLWAY OUTFLOW (cfs)	TOTAL OUTFLOW (cfs)
BASED ON HY-8	**3506**	0		0.0			**0.0**
	3507	1		5.9			**5.9**
	3508	2		15.1			**15.1**
	3509	3		23.8			**23.8**
BASED ON ORIFACE EQUATION	**3510**	4			32.8		**32.8**
	3511	5			38.1		**38.1**
	3512	6			42.6		**42.6**
	3513	7			46.8		**46.8**
	3514	8			50.6		**50.6**
	3515	9			54.1		**54.1**
	3516	10			57.4		**57.4**
	3517	11			60.6		**60.6**
	3518	12			63.5		**63.5**
	3519	13			66.4		**66.4**
	3520	14			69.1		**69.1**
	3521	15			71.7		**71.7**
	3522	16			74.3		**74.3**
	3523	17			76.7		**76.7**
	3524	18			79.1		**79.1**
	3525	19			81.4		**81.4**
	3526	20			83.6		**83.6**
	3527	21			85.8		**85.8**
	3528	22			88.0		**88.0**
	3529	23			90.0		**90.0**
	3530	24			92.1		**92.1**
	3531	25			94.1		**94.1**
SPILLWAY	**3532**	26	0		96.0	0.0	**0.0**
	3533	27	1			921.2	**921.2**
	3534	28	2			2665.6	**2665.6**
	3535	29	3			5007.2	**5007.2**



C.7

WATER QUALITY CAPTURE VOLUME SIZING

C.7.1 Figure 1207B from HCDDM
C.7.2 Percent Impervious Calculation

FIGURE 1207B - CALCULATIONS FOR SIZING WATER QUALITY CAPTURE VOLUME (WQCV) IN REGIONAL DETENTION BASINS

CALCULATIONS

Watershed	Alta/DB5
Facility	Grand Park Detention Basin
Facility Size	167 acre-feet

Step 1

Watershed Developable Land WQCV

(1)	Watershed Area =	**1.33**	Sq. Miles
(2)	Planned % Impervious =	**40.3%**	

Maximized Detention Volume (inches)

(5)	C=	0.281	
(6)	P_6 =	0.370	inches
(7)	a =	1.299	
(8)	P_0 =	0.135	inches
(9)	Maximized WQCV =	9.6	acre-feet

Adjusted Detention Volume (inches)

(10)	Adjustment Factor	0.85	
	$WQCV_{WatershedA}$	**9.0**	acre-feet

Feasability

Feasable (Y/N) **yes**

No MPU basins due to the Summerline West Planning Area redifining basins upstream of detention basin. Watershed basins are the same as tributary area.

Detention Basin Tributary Area WQCV

(3)	Tributary Area =	**1.33**	Sq. Miles
(4)	Planned % Impervious =	**40.3%**	

Maximized Detention Volume (inches)

(5)	C=	0.281	
(6)	P_6 =	0.370	inches
(7)	a =	1.299	
(8)	P_0 =	0.135	inches
(9)	Maximized WQCV =	9.6	acre-feet

Adjusted Detention Volume (inches)

(10)	Adjustment Factor	0.85	
	$WQCV_{TribA}$	**9.0**	acre-feet

Feasability

Feasable (Y/N) **yes**

Individual basins from Grand Park Detention Basin technical drainage study used.

Step 2

Tributary Area Developable Land WQCV

(11)	Developable Vacant Land Area	**1.33**	Sq. Miles
(12)	Planned % Impervious =	**40.3%**	

Maximized Detention Volume (inches)

(5)	C=	0.281	
(6)	P_6 =	0.370	inches
(7)	a =	1.299	
(8)	P_0 =	0.135	inches
(9)	Maximized WQCV =	9.6	acre-feet

Adjusted Detention Volume (inches)

(10)	Adjustment Factor	0.85	
	$WQCV_{VacantA}$	**9.0**	acre-feet

Comment Here…

Notes:

(1) *Tributary Area Determined From MPU*

(2) *Percent Impervious for Planned Development Conditions for Watershed Area from MPU*

(3) *Tributary Area Determined From MPU*

(4) *Percent Impervious for Planned Development Conditions for Tributary Area from MPU*

(5) *C = Runoff Coefficient per Equation I from CCRFCD HDDCM Figure 1207A*

(6) *P_6 = Event Average Rainfall Depth => Use* ***0.37 inches*** *per Equation II from CCRFCD HDDCM Figure 1207A*

(7) *a = Constant for Event Maximization, drain time 24 hours => Use* ***1.299*** *per Equation II from CCRFCD HDDCM Figure 1207A*

(8) *P_0 = Maximized Detention Volume per Equation II from CCRFCD HDDCM Figure 1207A*

(9) *Maximized Water Quality Capture Volume (acre-ft) = Watershed Area x 640 x P_0 / 12*

(10) *Tributary Area Adjustment Factor based on Table on CCRFCD HDDCM Figure 1207A. No Interpolation of values applied.*

(11) *Developable Vacant Land Excludes Area Outside the Ultimate Development Boundary*

(12) *Percent Impervious for Planned Development Conditions for Developable Vacant Land Area from MPU*

Curve Number calculations for basins			
Subbasin	**Area**	**Cover Type**	**% imperv.**
DEVELOPED CONDITION ONSITE			
V27-M (ER R)	77.48	8	**25%**
		8	
		8	
V27-COS-8 (COS)	3.25	9	**5%**
		9	
		9	
V27-COS-9 (COS)	2.89	9	**5%**
V27-COS-10 (COS)	14.78	9	**5%**
V27-COS-11 (COS)	8.36	9	**5%**
V27-COS-14 (COS)	2.8	9	**5%**
V31-A (ER R)	204.97	8	**25%**
		8	
		8	
V31-COS-2 (COS RR)	14.22	9	**5%**
		9	
V31-COS-3 (COS DP)	13.92	9	**5%**
V31-COS-10 (COS RR)	11.99	9	**5%**
		9	
V31-COS-12 (COS RR)	2.57	9	**5%**
		9	
V31-COS-14 (COS)	6.10	9	**5%**
V31-DC-1 (DC)	5.28	12	**72%**
V27-COS-4 (COS)	45.82	9	**5%**
		9	
V27-COS-5 (COS)	7.21	9	**5%**
V27-COS-6 (COS)	7.65	9	**5%**
V30A-E (SF2)	28.50	11	**85%**
V30A-F (SF2)	28.69	11	**85%**
V27-H (SFSD)	10.39	5	**69%**
		5	
V27-I (SFSD)	11.97	5	**69%**
		5	
V27-K (VC NR-MU)	11.99	4/11	**78.5%**
		4/11	
		4/11	
V27-L (SFSD)	93.61	5	**69%**
		5	
		5	
		5	
		5	

Curve Number calculations for basins			
Subbasin	**Area**	**Cover Type**	**% imperv.**
DEVELOPED CONDITION ONSITE			
V27-COS-7 (COS)	9.94	9 9	**5%**
V25-CP1A (OS-NF RP)	44.86	9 9	**5%**
V25-CP1B (OS-NF RP)	24.57	9	**5%**
V25-CP1C (OS-NF RP)	28.88	9	**5%**
V25-O (SF3)	23.76	11 11 11	**85%**
V25-P (SF3)	13.69	11 11	**85%**
V27-N (EC)	2.90	11 11	**85%**
V27-G (SF3)	19.51	11 11	**85%**
ST1	4.42	2	**100%**
ST2	1.90	2	**100%**
ST2A	0.23	2	**100%**
ST2B	0.32	2	**100%**
ST3	1.05	2	**100%**
ST4	1.70	2	**100%**
ST5	6.89	2	**100%**
ST6	3.19	2	**100%**
ST7	4.89	2	**100%**
ST8	2.68	2	**100%**
ST9	2.96	2	**100%**
ST10	2.20	2	**100%**
ST11	3.34	2	**100%**
ST12	4.63	2	**100%**
ST13	4.59	2	**100%**
ST14	5.00	2	**100%**
ST16	0.81	2	**100%**
ST17	0.67	2	**100%**
ST18	6.22	2	**100%**
ST19	2.03	2	**100%**
ST20	3.97	2	**100%**
ST21	2.31	2	**100%**
Total	**848.5**		**40.3%**

C.8

FHYA HEC-14 7.4.2 OUTLET WEIR

Outlet Weir Energy Dissipater

DEVELOPMENT: Grand Park Detention Basin - Combined Inlets
WORK ORDER #: 7809-GPDB
CALCULATED BY: PLM
DATE: Jan-20

WEIR FLOW CALCULATIONS **FHYA HEC-14 Section 7.4.2**

Q=	1916	cfs		
D=	7	ft		
Culvert B=	75	ft	Weir B=	75 ft
y_1=	0.82	ft	Weir y_1=	0.821 ft

Step 1. Find the depth of flow, y1, velocity, and Froude number at the beginning of the horizontal runout section.

V_1=	31.12	fps
Fr_1=	6.05	

$$Fr_1 = \frac{V_1}{\sqrt{g y_1}}$$

Step 2. Find critical depth, yc, using Equation 7.1.

y_c=	2.73	ft

$$y_c = \left(\frac{q^2}{g}\right)^{1/3} \qquad q = Q/B$$

Step 3. Find the weir height (Equation 7.27) and location (Equations 7.27 and

h_w=	2.64	ft
y_2=	6.63	ft
L_w=	33.1	ft
Fb=	8.00	ft

$$h_w = (0.0331 {Fr_1}^2 + 0.4385 Fr_1 - 0.6534) y_1$$

$$y_2 = \frac{y_1}{2}\left(\sqrt{1 + 8 {Fr_1}^2} - 1\right) \qquad L_w = 5 y_2$$

$$Fb_{sub} = y_2 + \frac{1}{2} + \frac{V^2}{2g}$$ Rounded Up

Step 4. Solve the energy equation (Equation 7.29) iteratively for the depth downstream from the weir.

y_3=	1.38	ft
	Goal Seek	
V_3=	18.56	fps
Fr_3=	2.8	

Super Critical

$$h_w + y_c + \frac{\left(\frac{Q}{B y_c}\right)^2}{2g} = y_3 + \frac{\left(\frac{Q}{B y_3}\right)^2}{2g}$$

Step 5. Compute the outlet depth (Equation 7.30) and velocity (Equation 7.31). Evaluate if energy dissipation is sufficient.

y_0=	1.74	ft
V_0=	14.7	fps

$$y_0 = 1.23 y_3 + \alpha$$

$$V_0 = \frac{Q}{B y_0}$$

C.9

CCRFCD HCDDM STANDARD FORM 6

C.9.1

Developed/Ultimate Condition

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3714.26	3710.43	3.83	1.56	2.5	2.028	3714.260	0.28	3714.54

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 2 on North Inlet
DESCRIPTION: 30" RCP - 21-cfs

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+10.50	2.5	3710.43	3712.03	10.50	4.91	0.00492	21.0	15.24	4.28	0.28	0.00261	0.00261	0.03						0.03	3714.57	3714.29	Yes	3714.81	3714.81	3714.53
2	Stub 2	10+10.50	10+10.50	2.5	3712.03	3712.03	0.0	4.91	0.00492	21.0	N/A	4.28	0.28	0.00261	0.00261	0.00				0.14		0.14	3714.96	3714.67				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.284	0.142

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 2	3731.11	16.44	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3688.74	3684.77	3.97	2.09	3.5	2.796	3688.740	0.34	3689.08

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 3 on North Inlet
DESCRIPTION: 42" RCP - 45-cfs

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+16.00	3.5	3684.77	3688.26	16.00	9.62	0.00492	45.0	21.81	4.68	0.34	0.00200	0.00200	0.03						0.03	3689.11	3688.77	Yes	3692.10	3692.10	3691.76
2	Stub 3	10+16.00	10+16.00	3.5	3688.26	3688.26	0.0	9.62	0.00492	45.0	N/A	4.68	0.34	0.00200	0.00200	0.00				0.17		0.17	3692.27	3691.93				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.340	0.170

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 3	3704.3	12.37	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3687.80	3683.69	4.11	0.07	2.0	1.033	3687.800	0.00	3687.80

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 4 on North Inlet
DESCRIPTION: 24" RCP - Nuisance

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+47.00	2	3683.69	3693.00	47.00	3.14	0.00492	0.0	19.81	0.00	0.00	0.00000	0.00000	0.00						0.00	3687.80	3687.80	Yes	3695.00	3695.00	3695.00
2	Stub 4	10+47.00	10+47.00	2	3693.00	3693.00	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00				0.00		0.00	3695.00	3695.00				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.000	0.000

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 4	3702.83	7.83	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3686.92	3682.61	4.31	0.87	2.0	1.433	3686.920	0.06	3686.98

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 5 on North Inlet
DESCRIPTION: 24" RCP - 6-cfs

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+45.53	2	3682.61	3688.65	45.53	3.14	0.00492	6.0	13.27	1.91	0.06	0.00070	0.00070	0.03						0.03	3687.01	3686.95	Yes	3690.71	3690.71	3690.65
2	Stub 5	10+45.53	10+45.53	2	3688.65	3688.65	0.0	3.14	0.00492	6.0	N/A	1.91	0.06	0.00070	0.00070	0.00				0.03		0.03	3690.73	3690.68				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.057	0.028

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 5	3703.07	12.39	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3660.38	3656.02	4.36	0.07	2.0	1.033	3660.380	0.00	3660.38

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 6 on North Inlet
DESCRIPTION: 24" RCP - Nuisance

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+16.00	2	3656.02	3661.35	16.00	3.14	0.00492	0.0	33.31	0.00	0.00	0.00000	0.00000	0.00						0.00	3660.38	3660.38	Yes	3663.35	3663.35	3663.35
2	Stub 6	10+16.00	10+16.00	2	3661.35	3661.35	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00				0.00		0.00	3663.35	3663.35				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.000	0.000

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 6	3676.13	12.78	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3660.38	3656.02	4.36	0.07	2.0	1.033	3660.380	0.00	3660.38

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 7 on North Inlet
DESCRIPTION: 24" RCP - Nuisance

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+53.60	2	3656.02	3663.52	53.60	3.14	0.00492	0.0	13.99	0.00	0.00	0.00000	0.00000	0.00						0.00	3660.38	3660.38	Yes	3665.52	3665.52	3665.52
2	Stub 7	10+53.60	10+53.60	2	3663.52	3663.52	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00				0.00		0.00	3665.52	3665.52				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.000	0.000

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 7	3675.58	10.06	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3630.57	3627.22	3.35	0.07	2.0	1.033	3630.570	0.00	3630.57

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 9 on North Inlet
DESCRIPTION: 24" RCP - Nuisance

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+18.70	2	3627.22	3633.46	18.70	3.14	0.00492	0.0	33.37	0.00	0.00	0.00000	0.00000	0.00						0.00	3630.57	3630.57	Yes	3635.46	3635.46	3635.46
2	Stub 9	10+18.70	10+18.70	2	3633.46	3633.46	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00				0.00		0.00	3635.46	3635.46				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.000	0.000

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 9	3647.61	12.15	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3630.57	3627.22	3.35	0.07	2.0	1.033	3630.570	0.00	3630.57

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 10 on North Inlet
DESCRIPTION: 24" RCP - Nuisance

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+47.00	2	3627.22	3634.27	47.00	3.14	0.00492	0.0	15.00	0.00	0.00	0.00000	0.00000	0.00						0.00	3630.57	3630.57	Yes	3636.27	3636.27	3636.27
2	Stub 10	10+47.00	10+47.00	2	3634.27	3634.27	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00				0.00		0.00	3636.27	3636.27				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.000	0.000

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 10	3646.45	10.18	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3632.27	3628.50	3.77	1.89	3.5	2.694	3632.270	0.23	3632.50

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 11 on North Inlet
DESCRIPTION: 42" RCP - 37-cfs

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+37.06	3.5	3628.50	3636.53	37.06	9.62	0.00492	37.0	21.67	3.85	0.23	0.00135	0.00135	0.05						0.05	3632.55	3632.32	Yes	3640.26	3640.26	3640.03
2	MH	10+37.06	10+37.06	3.5	3636.53	3636.53	0.0	9.62	0.00492	37.0	N/A	3.85	0.23	0.00135	0.00135	0.00		0.09				0.09	3640.35	3640.12	Yes	3640.26	3640.35	3640.12
3	PIPE	10+37.06	10+86.57	3.5	3636.53	3640.00	49.5	9.62	0.00492	37.0	7.01	3.85	0.23	0.00135	0.00135	0.07						0.07	3640.41	3640.19	Yes	3643.73	3643.73	3643.73
4	Stub 11	10+86.57	10+86.57	3.5	3640.00	3640.00	0.0	9.62	0.00492	37.0	N/A	3.85	0.23	0.00135	0.00135	0.00				0.11		0.11	3643.84	3643.61				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2	45	0.39	0.230	0.088												
3																
4														0.5	0.230	0.115

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
MH	3649.44	9.32	Yes
PIPE			
Stub 11	3649.44	5.83	Yes

Note: future FG elevation assumed over interim stub.

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3630.55	3625.07	5.48	3.57	4.5	4.035	3630.550	1.34	3631.89

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 12 on North Inlet
DESCRIPTION: 54" RCP - 148-cfs

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+89.45	4.5	3625.07	3631.34	89.45	15.90	0.00492	148.0	7.01	9.31	1.34	0.00566	0.00566	0.51						0.51	3632.40	3631.06	Yes	3637.18	3637.18	3635.84
2	MH	10+89.45	10+89.45	4.5	3631.34	3631.34	0.0	15.90	0.00492	148.0	N/A	9.31	1.34	0.00566	0.00566	0.00		0.41				0.41	3637.60	3636.25	Yes	3637.18	3637.60	3636.25
3	PIPE	10+89.45	12+50.26	4.5	3631.34	3635.36	160.8	15.90	0.00492	148.0	2.50	9.31	1.34	0.00566	0.00566	0.91						0.91	3638.51	3637.16	Yes	3641.20	3641.20	3641.20
4	Stub 12	12+50.26	12+50.26	4.5	3635.36	3635.36	0.0	15.90	0.00492	148.0	N/A	9.31	1.34	0.00566	0.00566	0.00						0.00	3641.20	3639.86				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2	39	0.31	1.345	0.414												
3																
4														0.5	1.345	0.672

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
MH	3648.25	12.00	Yes
PIPE			
Stub 12	3652.23	12.37	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3606.24	3601.87	4.37	0.04	2.0	1.022	3606.240	0.00	3606.24

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 13 on North Inlet
DESCRIPTION: 24" RCP - Nuisance

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+22.00	2	3601.87	3609.21	22.00	3.14	0.00492	0.0	33.36	0.00	0.00	0.00000	0.00000	0.00						0.00	3606.24	3606.24	Yes	3611.21	3611.21	3611.21
2	Stub 13	10+22.00	10+22.00	2	3609.21	3609.21	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00				0.00		0.00	3611.21	3611.21				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.000	0.000

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 13	3629.37	18.16	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3606.24	3601.87	4.37	0.04	2.0	1.022	3606.240	0.00	3606.24

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 14 on North Inlet
DESCRIPTION: 24" RCP - Nuisance

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+54.50	2	3601.87	3620.04	54.50	3.14	0.00492	0.0	33.34	0.00	0.00	0.00000	0.00000	0.00						0.00	3606.24	3606.24	Yes	3622.04	3622.04	3622.04
2	Stub 14	10+54.50	10+54.50	2	3620.04	3620.04	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00				0.00		0.00	3622.04	3622.04				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.000	0.000

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 14	3629.08	7.04	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3587.51	3581.22	6.29	2.79	4.0	3.397	3587.510	0.71	3588.22

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 15 on North Inlet
DESCRIPTION: 48" RCP - 85-cfs

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+87.50	4	3581.22	3590.75	87.50	12.57	0.00492	85.0	10.89	6.76	0.71	0.00350	0.00350	0.31						0.31	3588.53	3587.82	Yes	3595.46	3595.46	3594.75
2	Stub 15	10+87.50	10+87.50	4	3590.75	3590.75	0.0	12.57	0.00492	85.0	N/A	6.76	0.71	0.00350	0.00350	0.00				0.36		0.36	3595.82	3595.11				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.710	0.355

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 15	3602.42	7.31	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3580.22	3574.91	5.31	0.04	2.0	1.022	3580.220	0.00	3580.22

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 16 on North Inlet
DESCRIPTION: 24" RCP - Nuisance

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+17.00	2	3574.91	3580.58	17.00	3.14	0.00492	0.0	33.35	0.00	0.00	0.00000	0.00000	0.00						0.00	3580.22	3580.22	Yes	3582.58	3582.58	3582.58
2	Stub 16	10+17.00	10+17.00	2	3580.58	3580.58	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00				0.00		0.00	3582.58	3582.58				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.000	0.000

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 16	3597.78	15.20	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3576.86	3571.56	5.30	1.01	2.0	1.503	3576.860	0.10	3576.96

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 17 on North Inlet
DESCRIPTION: 24" RCP - 8-cfs

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+66.50	2	3571.56	3579.54	66.50	3.14	0.00492	8.0	12.00	2.55	0.10	0.00125	0.00125	0.08						0.08	3577.04	3576.94	Yes	3581.64	3581.64	3581.54
2	Stub 17	10+66.50	10+66.50	2	3579.54	3579.54	0.0	3.14	0.00492	8.0	N/A	2.55	0.10	0.00125	0.00125	0.00				0.05		0.05	3581.69	3581.59				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.101	0.050

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 17	3595.93	14.34	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3535.31	3530.81	4.50	0.04	2.0	1.022	3535.310	0.00	3535.31

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 18 on North Inlet
DESCRIPTION: 24" RCP - Nuisance

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+16.50	2	3530.81	3536.31	16.50	3.14	0.00492	0.0	33.33	0.00	0.00	0.00000	0.00000	0.00						0.00	3535.31	3535.31	Yes	3538.31	3538.31	3538.31
2	Stub 18	10+16.50	10+16.50	2	3536.31	3536.31	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00				0.00		0.00	3538.31	3538.31				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.000	0.000

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 18	3549.58	11.27	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3535.31	3529.56	5.75	1.39	2.5	1.947	3535.310	0.19	3535.50

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 19 on North Inlet
DESCRIPTION: 30" RCP - 17-cfs

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+67.00	2.5	3529.56	3536.46	67.00	4.91	0.00492	17.0	10.30	3.46	0.19	0.00171	0.00171	0.11						0.11	3535.61	3535.42	Yes	3539.15	3539.15	3538.96
2	Stub 19	10+67.00	10+67.00	2.5	3536.46	3536.46	0.0	4.91	0.00492	17.0	N/A	3.46	0.19	0.00171	0.00171	0.00				0.09		0.09	3539.24	3539.05				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.186	0.093

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 19	3548.89	9.84	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3537.67	3532.51	5.16	2.19	4.0	3.093	3537.670	0.28	3537.95

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 20 on North Inlet
DESCRIPTION: 48" RCP - 53-cfs

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+29.93	4	3532.51	3538.76	29.93	12.57	0.00492	53.0	20.88	4.22	0.28	0.00136	0.00136	0.04						0.04	3537.99	3537.71	Yes	3543.04	3543.04	3542.76
2	MH	10+29.93	10+29.93	4	3538.76	3538.76	0.0	12.57	0.00492	53.0	N/A	4.22	0.28	0.00136	0.00136	0.00		0.11				0.11	3543.14	3542.87	Yes	3543.04	3543.14	3542.87
3	PIPE	10+29.93	11+17.25	4	3538.76	3544.00	87.3	12.57	0.00492	53.0	6.00	4.22	0.28	0.00136	0.00136	0.12						0.12	3543.26	3542.99	Yes	3548.28	3548.28	3548.28
4	Stub 20	11+17.25	11+17.25	4	3544.00	3544.00	0.0	12.57	0.00492	53.0	N/A	4.22	0.28	0.00136	0.00136	0.00				0.14		0.14	3548.41	3548.14				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2	45	0.39	0.276	0.106												
3																
4														0.5	0.276	0.138

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
MH	3553.81	10.94	Yes
PIPE			
Stub 20	3553.81	5.67	Yes

Note: future FG elevation assumed over interim stub.

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3682.27	3676.49	5.78	1.26	2.5	1.880	3682.270	0.13	3682.40

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 22 on South Inlet
DESCRIPTION: 30" RCP - 14-cfs

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+10.00	2.5	3676.49	3679.82	10.00	4.91	0.00492	14.0	33.30	2.85	0.13	0.00116	0.00116	0.01						0.01	3682.41	3682.28	Yes	3682.45	3682.45	3682.32
2	Stub 22	10+10.00	10+10.00	2.5	3679.82	3679.82	0.0	4.91	0.00492	14.0	N/A	2.85	0.13	0.00116	0.00116	0.00						0.00	3682.45	3682.32				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2																

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 22	3707.27	24.95	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3682.27	3676.49	5.78	3.36	4.5	3.928	3682.270	1.04	3683.31

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 23 on South Inlet
DESCRIPTION: 54" RCP - 130-cfs

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+10.00	4.5	3676.49	3679.82	10.00	15.90	0.00492	130.0	33.30	8.17	1.04	0.00437	0.00437	0.04						0.04	3683.35	3682.31	Yes	3685.36	3685.36	3684.32
2	Stub 23	10+10.00	10+10.00	4.5	3679.82	3679.82	0.0	15.90	0.00492	130.0	N/A	8.17	1.04	0.00437	0.00437	0.00						0.00	3685.36	3684.32				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2																

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 23	3707.21	22.89	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3653.66	3649.00	4.66	0.07	2.0	1.033	3653.660	0.00	3653.66

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 24 on South Inlet
DESCRIPTION: 24" RCP - Nuisance

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+08.50	2	3649.00	3651.84	8.50	3.14	0.00492	0.0	33.41	0.00	0.00	0.00000	0.00000	0.00						0.00	3653.66	3653.66	Yes	3653.84	3653.84	3653.84
2	Stub 24	10+08.50	10+08.50	2	3651.84	3651.84	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00				0.00		0.00	3653.84	3653.84				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.000	0.000

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 24	3676.4	22.56	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3653.66	3649.00	4.66	0.07	2.0	1.033	3653.660	0.00	3653.66

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 25 on South Inlet
DESCRIPTION: 24" RCP - Nuisance

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+29.00	2	3649.00	3658.67	29.00	3.14	0.00492	0.0	33.34	0.00	0.00	0.00000	0.00000	0.00						0.00	3653.66	3653.66	Yes	3660.67	3660.67	3660.67
2	Stub 25	10+29.00	10+29.00	2	3658.67	3658.67	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00						0.00	3660.67	3660.67				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2																

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 25	3676.72	16.05	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3619.60	3614.97	4.63	0.07	2.0	1.033	3619.600	0.00	3619.60

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 26 on South Inlet
DESCRIPTION: 24" RCP - Nuisance

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+09.50	2	3614.97	3618.13	9.50	3.14	0.00492	0.0	33.26	0.00	0.00	0.00000	0.00000	0.00						0.00	3619.60	3619.60	Yes	3620.13	3620.13	3620.13
2	Stub 26	10+09.50	10+09.50	2	3618.13	3618.13	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00						0.00	3620.13	3620.13				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2																

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 26	3644.7	24.57	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3619.60	3614.97	4.63	0.07	2.0	1.033	3619.600	0.00	3619.60

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 27 on South Inlet
DESCRIPTION: 24" RCP - Nuisance

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+29.50	2	3614.97	3624.80	29.50	3.14	0.00492	0.0	33.32	0.00	0.00	0.00000	0.00000	0.00						0.00	3619.60	3619.60	Yes	3626.80	3626.80	3626.80
2	Stub 27	10+29.50	10+29.50	2	3624.80	3624.80	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00						0.00	3626.80	3626.80				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2																

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 27	3644.82	18.02	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3600.43	3599.41	1.02	1.52	2.5	2.009	3601.419	0.26	3601.68

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 28 on South Inlet
DESCRIPTION: 30" RCP - 20-cfs

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+43.00	2.5	3599.41	3613.75	43.00	4.91	0.00492	20.0	33.35	4.07	0.26	0.00237	0.00237	0.10						0.10	3601.78	3601.52	Yes	3616.51	3616.51	3616.25
2	Stub 28	10+43.00	10+43.00	2.5	3613.75	3613.75	0.0	4.91	0.00492	20.0	N/A	4.07	0.26	0.00237	0.00237	0.00						0.00	3616.51	3616.25				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2																

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 28	3627.14	10.89	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3584.22	3580.21	4.01	0.07	2.0	1.033	3584.220	0.00	3584.22

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 29 on South Inlet
DESCRIPTION: 24" RCP - Nusiance

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+07.50	2	3580.21	3582.71	7.50	3.14	0.00492	0.0	33.33	0.00	0.00	0.00000	0.00000	0.00						0.00	3584.22	3584.22	Yes	3584.71	3584.71	3584.71
2	Stub 29	10+07.50	10+07.50	2	3582.71	3582.71	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00				0.00		0.00	3584.71	3584.71				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.000	0.000

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 29	3599.76	15.05	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3584.22	3580.21	4.01	0.07	2.0	1.033	3584.220	0.00	3584.22

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 30 on South Inlet
DESCRIPTION: 24" RCP - Nusiance

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+32.50	2	3580.21	3591.04	32.50	3.14	0.00492	0.0	33.32	0.00	0.00	0.00000	0.00000	0.00						0.00	3584.22	3584.22	Yes	3593.04	3593.04	3593.04
2	Stub 30	10+32.50	10+32.50	2	3591.04	3591.04	0.0	3.14	0.00492	0.0	N/A	0.00	0.00	0.00000	0.00000	0.00				0.00		0.00	3593.04	3593.04				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.000	0.000

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 30	3600.43	7.39	Yes

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3581.12	3576.05	5.07	1.91	3.5	2.707	3581.120	0.24	3581.36

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 31 on South Inlet
DESCRIPTION: 42" RCP - 38-cfs

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	11+12.08	3.5	3576.05	3590.00	112.08	9.62	0.00492	38.0	12.45	3.95	0.24	0.00142	0.00142	0.16						0.16	3581.52	3581.28	Yes	3593.74	3593.74	3593.50
2	Stub 31	11+12.08	11+12.08	3.5	3590.00	3590.00	0.0	9.62	0.00492	38.0	N/A	3.95	0.24	0.00142	0.00142	0.00				0.12		0.12	3593.86	3593.62				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.242	0.121

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 31	3600.00	6.38	Yes

Note: future FG assumed for interim stub.

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3549.42	3541.87	7.55	2.58	4.0	3.292	3549.420	0.52	3549.94

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 32 on South Inlet
DESCRIPTION: 48" RCP - 73-cfs

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	11+12.08	4	3541.87	3561.46	112.08	12.57	0.00492	73.0	17.48	5.81	0.52	0.00258	0.00258	0.29						0.29	3550.23	3549.71	Yes	3565.98	3565.98	3565.46
2	Stub 32	11+12.08	11+12.08	4	3561.46	3561.46	0.0	12.57	0.00492	73.0	N/A	5.81	0.52	0.00258	0.00258	0.00				0.26		0.26	3566.25	3565.72				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.524	0.262

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 32	3571.46	5.74	Yes

Note: future FG assumed for interim stub.

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3583.32	3580.32	3.00	1.00	3.0	2.000	3583.320	0.03	3583.35

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 33 on South Inlet
DESCRIPTION: 36" RCP - 10-cfs

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	11+29.01	3	3580.32	3581.61	129.01	7.07	0.00492	10.0	1.00	1.41	0.03	0.00022	0.00022	0.03						0.03	3583.38	3583.35	Yes	3584.64	3584.64	3584.61
2	Stub 33	11+29.01	11+29.01	3	3581.61	3581.61	0.0	7.07	0.00492	10.0	N/A	1.41	0.03	0.00022	0.00022	0.00				0.02		0.02	3584.66	3584.63				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.031	0.016

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 33	3595.13	10.50	Yes

C.9.2

Interim Condition

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3632.27	3628.50	3.77	3.01	3.5	3.254	3632.270	1.51	3633.78

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 11 on North Inlet
DESCRIPTION: 42" RCP - 95-cfs

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+37.06	3.5	3628.50	3636.53	37.06	9.62	0.00492	95.0	21.67	9.87	1.51	0.00890	0.00890	0.33						0.33	3634.11	3632.60	Yes	3641.54	3641.54	3640.03
2	MH	10+37.06	10+37.06	3.5	3636.53	3636.53	0.0	9.62	0.00492	95.0	N/A	9.87	1.51	0.00890	0.00890	0.00		0.58				0.58	3642.13	3640.61	Yes	3641.54	3642.13	3640.61
3	PIPE	10+37.06	10+86.57	3.5	3636.53	3640.00	49.5	9.62	0.00492	95.0	7.01	9.87	1.51	0.00890	0.00890	0.44						0.44	3642.57	3641.05	Yes	3645.01	3645.01	3645.01
4	Stub 11	10+86.57	10+86.57	3.5	3640.00	3640.00	0.0	9.62	0.00492	95.0	N/A	9.87	1.51	0.00890	0.00890	0.00				0.76		0.76	3645.77	3644.26				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2	45	0.39	1.514	0.583												
3																
4														0.5	1.514	0.757

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
MH	3649.44	8.83	Yes
PIPE			
Stub 11	3649.44	5.18	Yes

Note: future FG elevation assumed over interim stub.

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3537.67	3532.51	5.16	2.64	4.0	3.319	3537.670	0.57	3538.24

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 20 on North Inlet
DESCRIPTION: 48" RCP - 76-cfs

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+29.93	4	3532.51	3538.76	29.93	12.57	0.00492	76.0	20.88	6.05	0.57	0.00280	0.00280	0.08						0.08	3538.32	3537.75	Yes	3543.33	3543.33	3542.76
2	MH	10+29.93	10+29.93	4	3538.76	3538.76	0.0	12.57	0.00492	76.0	N/A	6.05	0.57	0.00280	0.00280	0.00		0.22				0.22	3543.55	3542.98	Yes	3543.33	3543.55	3542.98
3	PIPE	10+29.93	11+17.25	4	3538.76	3544.00	87.3	12.57	0.00492	76.0	6.00	6.05	0.57	0.00280	0.00280	0.24						0.24	3543.79	3543.22	Yes	3548.57	3548.57	3548.57
4	Stub 20	11+17.25	11+17.25	4	3544.00	3544.00	0.0	12.57	0.00492	76.0	N/A	6.05	0.57	0.00280	0.00280	0.00				0.28		0.28	3548.85	3548.28				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2	45	0.39	0.568	0.219												
3																
4														0.5	0.568	0.284

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
MH	3553.81	10.83	Yes
PIPE			
Stub 20	3553.81	5.53	Yes

Note: future FG elevation assumed over interim stub.

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3581.12	3576.05	5.07	2.34	3.5	2.921	3581.120	0.53	3581.65

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 31 on South Inlet
DESCRIPTION: 42" RCP - 56-cfs

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	11+12.08	3.5	3576.05	3590.00	112.08	9.62	0.00492	56.0	12.45	5.82	0.53	0.00309	0.00309	0.35						0.35	3581.99	3581.47	Yes	3594.03	3594.03	3593.50
2	Stub 31	11+12.08	11+12.08	3.5	3590.00	3590.00	0.0	9.62	0.00492	56.0	N/A	5.82	0.53	0.00309	0.00309	0.00				0.26		0.26	3594.29	3593.76				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.526	0.263

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 31	3600.00	6.24	Yes

Note: future FG assumed for interim stub.

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3549.42	3541.87	7.55	2.57	4.0	3.283	3549.420	0.51	3549.93

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: GPDB Inlet Pipe
CALCULATED BY: PLM **WO#** 7809-GPDB
STORM DRAIN SEGMENT: Stub 32 on South Inlet
DESCRIPTION: 48" RCP - 72-cfs

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq, ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	11+12.08	4	3541.87	3561.46	112.08	12.57	0.00492	72.0	17.48	5.73	0.51	0.00251	0.00251	0.28						0.28	3550.21	3549.70	Yes	3565.97	3565.97	3565.46
2	Stub 32	11+12.08	11+12.08	4	3561.46	3561.46	0.0	12.57	0.00492	72.0	N/A	5.73	0.51	0.00251	0.00251	0.00				0.25		0.25	3566.22	3565.71				

Manholes/Transition Losses

	Straight Through Manhole				Junction Manhole					Bend Losses				Inlet Losses		
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Bend Angle	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.510	0.255

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
Stub 32	3571.46	5.75	Yes

Note: future FG assumed for interim stub.

C.10

RIPRAP SIZING CALCULATIONS

C.10.1 Riprap Apron for Weir Structure
C10.2 Channel Riprap

Grand Park Detention Basin - Inflow Pipes

RCB Culvert Outlet Apron Calculations

Based on procedures outlined in the CCRFCD HCDDM, Section 707.4

FACILITY NAME	FACILITY SIZE	Q100 DESIGN @ FACILITY	W Total	H	D Outlet	V Outlet	Fr	Fr Check	Q/WH1.5	Q/WH1.5 Check	Yt	Yn	Ha	D50 min (For Q/WH1.5<4)	D50 min (For Q/WH1.5>4)	D50 min	D50 Design	Allowable D/S Velocity	At	Θ	L Calculated	Lmin	Lmax	Ldesign	Notes
	Forumula Note		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
	Units		(ft)	(ft)	(ft)	(fps)					(ft)	(ft)	(ft)	(ft)	(ft)	(in)	(in)	(ft/s)	(sqft)	(deg)	(ft)	(ft)	(ft)	(ft)	
Inflow	75-ft Weir Structure	1916	75	7	1.74	14.70	1.96	OK	1.38	OK	3.21	2.22	4.61	0.24	1.05	2.9	**12**	**5**	383.20	1	14.2	21	70	**21**	

1 Total width of all RCB cells
2 Height of RCB
3 Depth of flow at RCB outlet from HY-8 Culvert Summary Table - Outlet Depth
4 Velocity at RCB outlet from HY-8 Culvert Summary Table - Outlet Velocity
5 Froude Number at outlet (V/sqrt(32.2*D))
6 Check if Fr < 2.5
7 Froude Parameter from CCRFCD HCDDM 707.4 (Q/W*H^1.5)
8 Froude parameter check < 14
9 Tailwater Depth from HY-8 Culvert Summary Table - Tailwater Depth
10 Normal Depth from HY-8 Culvert Summary Table - Normal Depth
11 Adjusted H for supercritical flows from CCRFCD HCDDM 707.4.2 Ha = 0.5*(H+Yn)
12 Minimum D50 for Q/WH1.5 < 4 from CCRFCD HCDDM 707.4.2 D50 = (0.014*(Q/W*Ha^1.5)*H^2)) / (Yt)
13 Minimum D50 for Q/WH1.5 >4 from CCRFCD HCDDM 7.0.4.2 D50 = ((0.0019*(Q/W*Ha^1.5)^2.5)*Ha)/((Yt/Ha)^2)
14 Chose Minimum D50 based on if Q/WH1.5 is less than or greater than 4
15 D50 for design
16 Allowable velocity at end of riprap apron
17 Flow area at end or riprap apron from CCRFCD HCDDM 707.4.3 At=Q/V
18 Expansion angle of water jet downstream of culvert
19 Minimum Apron Length from CCRFCD HCDDM 707.4.3 L=(1/(2*tan Θ))*(At/Yt-W)
20 Minimum Apron Length = 3*H
21 Maximum Apron Length = 10*H
22 Design Apron Length

*** Values taken from HEC-RAS**

3 Outlet Depth taken from HEC-RAS Six XS Bridge Table BR-DS W.S.E.
4 Outlet Velocity taken from HEC-RAS Six XS Bridge Table BR-DS Velocity.
9 Tailwater Depth taken from HEC-RAS Standard Table 1 Tailwater Cross Section Normal Depth
10 Normal Depth calculated by FlowMaster Normal Depth Cross Section of culvert facility

RIP-RAP CALCULATIONS

DEVELOPMENT Grand Park Detention Basin
Work Order # 7809-GPDB **CALCULATED BY** PLM

EQUATIONS

$$V = \frac{3(d_{50})^{0.5}(S_s - 1)}{S^{0.17}} \qquad n = 0.0395(D_{50})^{1/6}$$

Where : V = Velocity, in fps; d_{50} = Mean Rock Size, in feet; S = Channel Slope; & S_s = Specific Gravity

NOTES: Equations are referenced from section 705.4.5 and 705.4.6 of the CCRFCD HC&DDM
Minimum rip rap size utilized is D_{50} = 0.5 ft

Section	Q_{100} (cfs)	Max. Velocity (fps)	Slope (ft/ft)	Specific Gravity	D_{50} (ft)	n-value
West Channel - Interim #2	72	6.79	0.047	2.65	0.7	0.037
West Channel - Interim #2	72	6.79	0.047	2.65	1.4	0.042

C.11

FREEBOARD CALCULATIONS

FREEBOARD CALCULATIONS

DEVELOPMENT Grand Park Detention Basin
W.O. # 7809-GPDB **CALCULATED BY** PLM

EQUATIONS*

$$Fb_{sup} = 1 + 0.025 * V * D^{1/3}$$

$$Fb_{sub} = \frac{1}{2} + \frac{V^2}{2g}$$

Where :Fb=Freeboard, sup=Super-critical, sub=Sub-critical, V = Velocity, D = Depth and g = 32.2

NOTES: Equations are referenced from pages 769 and 773 of the CCRFCD HC&DDM
Minimum Freeboard is 1 ft.

Section / Description	Super/Sub critical flow	Channel Velocity (fps)	Flow Depth (ft)	Freeboard Required (ft)	Min. Channel Depth (ft)
Interim #2 - West Berm	SUPER	6.79	1.22	1.18	2.40

C.12

WSPG ANGLE POINT LOSS

WSPG STORM DRAIN MODEL ANGLE POINT LOSS

Development: Grand Park Detention Basin - Outlet

W.O. # 7809-GPDB **Calculated By:** PLM **Date:** Jan-20

$$H_L = K_m\left(\frac{{V_2}^2}{2g}\right)$$

*Headloss eqution referenced from Equation 806 of Section 804.2.2.4 of the CCRFCD HCDDM

*Km values referenced from Figure 815 of the CCRFCD HCDDM

0 Program Package Serial Number: 1513 Date: 1-16-2020 Time: 7: 3:18 File:GPDB-OUTLET-15.WSW										
GRAND PARK DETENTION BASIN - ADD1										
FILE NAME: GPDB-OUTLET-15										
MODEL REF. FROM SKY VISTA (DS5187) AND EXTENDED TO BASIN OUTLET STRUCT										
Station	**Invert**	**Water**	**Height**	**Width**	**Angle Point**	**Velocity**	**Km**	**H_L**	**H_L total**	**Final Water Elevation**
			(ft)	(ft)	(degrees)	(fps)		(ft)	(ft)	
1000.00	3424.80	3429.01	5	6		21.90	n/a	n/a	0	3429.01
1001.69	3424.89	3429.11	5	6		21.81	n/a	n/a	0	3429.11
1017.89	3425.70	3430.13	5	6		20.79	n/a	n/a	0	3430.13
1017.89	3425.71	3428.67	5	6		26.57	n/a	n/a	0	3428.67
1025.55	3426.03	3428.98	5	6	17	26.59	0.10	1.10	1.10	3430.08
1094.15	3429.30	3432.33	5	6	18	25.93	0.10	1.04	2.14	3434.48
1155.60	3432.31	3435.47	5	6		24.88	n/a	n/a	2.14	3437.61
1201.85	3434.57	3437.89	5	6		23.72	n/a	n/a	2.14	3440.03
1233.80	3436.79	3440.07	5	6		24.00	n/a	n/a	2.14	3442.21
1297.95	3441.24	3444.37	5	6		25.17	n/a	n/a	2.14	3446.51
1335.25	3443.83	3446.81	5	6		26.40	n/a	n/a	2.14	3448.95
1362.26	3445.70	3448.54	5	6		27.69	n/a	n/a	2.14	3450.68
1383.77	3447.20	3449.90	5	6		29.04	n/a	n/a	2.14	3452.05
1401.85	3448.45	3451.03	5	6		30.46	n/a	n/a	2.14	3453.17
1454.49	3452.10	3454.74	5	6		29.85	n/a	n/a	2.14	3456.88
1529.57	3457.31	3460.07	5	6		28.46	n/a	n/a	2.14	3462.21
1576.29	3460.55	3463.45	5	6		27.13	n/a	n/a	2.14	3465.59
1609.17	3462.83	3465.87	5	6		25.87	n/a	n/a	2.14	3468.01
1633.82	3464.54	3467.73	5	6		24.67	n/a	n/a	2.14	3469.87
1652.98	3465.87	3469.21	5	6		23.52	n/a	n/a	2.14	3471.35
1668.21	3466.92	3470.43	5	6		22.43	n/a	n/a	2.14	3472.57
1680.48	3467.77	3471.45	5	6		21.38	n/a	n/a	2.14	3473.59
1690.41	3468.46	3472.32	5	6		20.39	n/a	n/a	2.14	3474.46
1732.13	3469.60	3473.60	5	6		19.68	n/a	n/a	2.14	3475.74
1769.93	3470.64	3474.83	5	6		18.76	n/a	n/a	2.14	3476.97
1795.62	3471.34	3475.74	5	6		17.89	n/a	n/a	2.14	3477.88
1813.57	3471.84	3476.45	5	6		17.05	n/a	n/a	2.14	3478.59
1826.09	3472.18	3477.02	5	6		16.26	n/a	n/a	2.14	3479.16
1832.31	3472.35	3477.35	5	6		15.73	n/a	n/a	2.14	3479.49
1832.32	3472.35	3480.98	5	5	22	3.76	0.13	0.03	2.17	3483.14
1832.33	3472.35	3481.00	5	5		3.76	n/a	n/a	2.17	3483.17
1840.30	3472.43	3481.02	5	5		3.76	n/a	n/a	2.17	3483.19
1887.00	3474.34	3481.12	5	5		3.76	n/a	n/a	2.17	3483.29
1909.92	3475.24	3481.16	5	5		3.76	n/a	n/a	2.17	3483.33
1934.22	3476.19	3481.19	5	5		3.76	n/a	n/a	2.17	3483.36
1939.73	3476.40	3481.17	5	5		3.94	n/a	n/a	2.17	3483.34
1944.90	3476.61	3481.15	5	5		4.14	n/a	n/a	2.17	3483.32
1949.76	3476.80	3481.13	5	5		4.34	n/a	n/a	2.17	3483.30
1950.65	3476.83	3481.12	5	5		4.38	n/a	n/a	2.17	3483.29
1955.90	3477.01	3481.10	5	5		4.59	n/a	n/a	2.17	3483.27
1960.80	3477.17	3481.07	5	5		4.82	n/a	n/a	2.17	3483.24
1965.14	3477.32	3481.05	5	5		5.04	n/a	n/a	2.17	3483.21
1965.14	3477.32	3478.51	5	5		15.74	n/a	n/a	2.17	3480.68

2290.47	3488.21	3489.41	5	5		15.74	n/a	n/a	2.17	3491.58
2425.49	3492.74	3493.96	5	5		15.34	n/a	n/a	2.17	3496.13
2487.53	3494.81	3496.10	5	5		14.62	n/a	n/a	2.17	3498.27
2516.97	3495.80	3497.15	5	5		13.94	n/a	n/a	2.17	3499.32
2580.56	3497.41	3498.81	5	5		13.37	n/a	n/a	2.17	3500.98
2613.12	3498.23	3499.71	5	5		12.75	n/a	n/a	2.17	3501.87
2632.49	3498.72	3500.27	5	5		12.15	n/a	n/a	2.17	3502.44
2658.10	3499.13	3500.68	5	5		12.15	n/a	n/a	2.17	3502.85
2789.01	3501.22	3502.77	5	5		12.19	n/a	n/a	2.17	3504.94
2912.62	3503.20	3504.67	5	5	24	12.78	0.15	0.38	2.55	3507.22
2951.65	3503.98	3505.49	5	5	45	12.48	0.39	0.94	3.49	3508.98
2960.61	3504.16	3505.68	5	5		12.39	n/a	n/a	3.49	3509.17
2994.47	3504.84	3506.43	5	5		11.81	n/a	n/a	3.49	3509.92
3013.72	3505.22	3506.89	5	5		11.26	n/a	n/a	3.49	3510.39
3026.04	3505.47	3507.22	5	5		10.74	n/a	n/a	3.49	3510.72
3034.24	3505.64	3507.47	5	5		10.24	n/a	n/a	3.49	3510.96
3039.68	3505.74	3507.67	5	5		9.76	n/a	n/a	3.49	3511.16
3043.09	3505.81	3507.83	5	5		9.31	n/a	n/a	3.49	3511.33
3044.93	3505.85	3507.97	5	5		8.88	n/a	n/a	3.49	3511.46
3045.50	3505.86	3508.08	5	5		8.46	n/a	n/a	3.49	3511.58

APPENDIX D

REFERENCE MATERIAL

D.1

VILLAGE 25 – ZONING/PLANNING DOCUMENTS

PARCEL MAP - VILLAGE 25

BEING ALL OF LOT 4 AS SHOWN ON THAT CERTAIN PARCEL MAP IN FILE 123 , PAGE 36, LOCATED WITHIN SECTIONS 15 THRU 17, 20 THRU 22, 27 THRU 29, 32 AND 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AND SECTION 4, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

OWNER'S CERTIFICATE AND DEDICATION

THE HOWARD HUGHES COMPANY, LLC, A DELAWARE LIMITED LIABILITY COMPANY, DOES HEREBY CERTIFY THAT IT IS THE OWNER OF THE LAND SUBDIVIDED WITHIN THE BOUNDARY SHOWN HEREON, AND DOES HEREBY CONSENT TO THE PREPARATION AND RECORDATION OF THIS PARCEL MAP, AND HAVE CAUSED THE LANDS TO BE SURVEYED AND PLATTED INTO PARCELS AND DOES HEREBY OFFER AND DEDICATE TO THE CITY OF LAS VEGAS, ITS SUCCESSORS AND ASSIGNS, ALL PUBLIC STREETS (EXCEPT PRIVATE STREETS) AND OTHER RIGHTS-OF-WAY AND PLACES AS INDICATED AND OUTLINED HEREON, FOR THE USE OF THE PUBLIC, AND DO HEREBY GRANT TO THE CITY OF LAS VEGAS, ITS SUCCESSORS AND ASSIGNS, EASEMENTS, AS INDICATED AND OUTLINED HEREON, FOR THE USE OF THE PUBLIC.

FURTHER, THE UNDERSIGNED OWNER HEREBY GRANTS AND CONVEYS TO THE CITY OF LAS VEGAS AND TO ITS SUCCESSORS AND ASSIGNS A FIVE-FOOT WIDE EASEMENT ADJACENT TO ALL PROPERTY LINES WHERE LOTS OR PARCELS ABUT PUBLIC STREETS FOR THE PURPOSES OF PUBLIC PEDESTRIAN ACCESS TO SIDEWALKS, PLACING PUBLIC FIRE HYDRANTS, PUBLIC STREETLIGHTS, TRAFFIC SIGNALS, CONDUITS, TRAFFIC SIGNALS AND APPURTENANCES; AND AN ADDITIONAL EASEMENT OF UP TO TWO FEET IN RADIUS FROM EACH FIRE HYDRANT, STREETLIGHT, CONDUIT, TRAFFIC SIGNAL AND APPURTENANCE, TO EXTEND BEYOND THE FIVE-FOOT EASEMENT IF NECESSARY, TOGETHER WITH THE RIGHT OF INGRESS TO AND EGRESS FROM THESE EASEMENTS.

HOWARD HUGHES COMPANY, LLC, A DELAWARE LIMITED LIABILITY COMPANY, BY:

KEVIN T. ORROCK - VICE PRESIDENT — DATE 3/11/2019

ACKNOWLEDGMENT

STATE OF NEVADA }
COUNTY OF CLARK } SS

THIS INSTRUMENT WAS ACKNOWLEDGED BEFORE ME ON March 11, 2019

BY Kevin T. Orrock AS Vice President
OF HOWARD HUGHES COMPANY, LLC, A DELAWARE LIMITED LIABILITY COMPANY.

Rebecca Misty Abasta
Rebecca Misty Abasta
NOTARY PUBLIC IN AND FOR
SAID COUNTY AND STATE

MY APPOINTMENT EXPIRES 12/10/2020

REBECCA MISTY ABASTA
NOTARY PUBLIC - STATE OF NEVADA
My Commission Expires: 12-10-2020
Certificate No: 17-4216-1

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

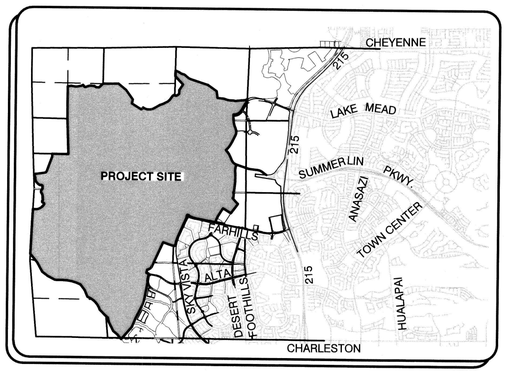
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.



VICINITY MAP

NOT TO SCALE

CITY SURVEYOR'S CERTIFICATE

I, ALAN R. RIEKKI, CITY SURVEYOR OF THE CITY OF LAS VEGAS, DO HEREBY CERTIFY THAT I HAVE EXAMINED THIS PARCEL MAP AND AM SATISFIED THAT IT IS TECHNICALLY CORRECT.

Randy W. Mrowicki

RANDY W. MROWICKI PLS 11441 — 03-APRIL-2019
FOR: ALAN R. RIEKKI — DATE
CITY OF LAS VEGAS SURVEYOR
NEVADA LICENSE NUMBER 12469

CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS NEVADA

LEGAL DESCRIPTION

BEING LOT 4 OF THAT CERTAIN PARCEL MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA IN FILE 123, PAGE 36, LOCATED WITHIN SECTIONS 15 THRU 17, 20 THRU 22, 27 THRU 29, 32 AND 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AND SECTION 4, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

CONTAINING 4,176.26 ACRES, MORE OR LESS, AS DETERMINED BY COMPUTER METHODS.

REFERENCE MAPS

PARCEL MAP FILE 91, PAGE 28
PARCEL MAP FILE 122, PAGE 22
PARCEL MAP FILE 123, PAGE 08
PARCEL MAP FILE 123, PAGE 36
FINAL MAP BOOK 120, PAGE 17
FINAL MAP BOOK 130, PAGE 56

SURVEYOR'S CERTIFICATE

I, RAYMOND A. JOHNSON, A PROFESSIONAL LAND SURVEYOR LICENSED IN THE STATE OF NEVADA, AS AN AGENT OF VTN NEVADA CERTIFY THAT:

1. THIS PLAT REPRESENTS THE RESULTS OF A SURVEY CONDUCTED UNDER MY DIRECT SUPERVISION AT THE INSTANCE OF THE HOWARD HUGHES COMPANY, LLC, A DELAWARE LIMITED LIABILITY COMPANY.

2. LANDS SURVEYED LIE WITHIN SECTIONS 15, 21, 22 AND 27, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AND THE SURVEY WAS COMPLETED ON 08/01/2018.

3. THIS PLAT COMPLIES WITH THE APPLICABLE STATE STATUTES AND ANY LOCAL ORDINANCES IN EFFECT ON THE DATE THAT THE GOVERNING BODY GAVE ITS FINAL APPROVAL.

4. THE MONUMENTS DEPICTED ON THE PLAT ARE OF THE CHARACTER SHOWN, AND OCCUPY THE POSITIONS INDICATED AND ARE OF SUFFICIENT NUMBER AND DURABILITY.

RAYMOND A. JOHNSON, PLS
PROFESSIONAL LAND SURVEYOR
NEVADA LICENSE NO. 18983

PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
RAYMOND A. JOHNSON
EXP. 06-30-19
18983

03/07/2019

CERTIFICATE OF DIRECTOR OF PLANNING

I CERTIFY THAT THIS PARCEL MAP WAS APPROVED AND THE PARCELS HEREIN WERE ACCEPTED FOR DEDICATION BY THE DIRECTOR OF PLANNING ON THE 2nd DAY OF APRIL, 2019.

Robert Summerfield

ROBERT SUMMERFIELD, AICP
DIRECTOR OF PLANNING
CITY OF LAS VEGAS

LAS VEGAS WATER DISTRICT NOTE

SEPARATE AND INDEPENDENT WATER SERVICE FOR EACH PARCEL HAS BEEN ESTABLISHED THROUGH, AND IS GOVERNED AND LIMITED BY, THE APPROVED CIVIL IMPROVEMENT PLANS FOR SUCH A PARCEL.

COUNTY RECORDER'S NOTE

ANY SUBSEQUENT CHANGES TO THIS MAP SHOULD BE EXAMINED AND MAY BE DETERMINED BY REFERENCE TO THE COUNTY RECORDER'S CUMULATIVE MAP INDEX N.R.S. 278.5695.

PMP-74780

vtn

CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA, 89146-5148
(702) 873-7550 FAX (702) 362-2597

PARCEL MAP - VILLAGE 25
FOR
THE HOWARD HUGHES COMPANY, INC.
BEING ALL OF LOT 4 AS SHOWN ON THAT CERTAIN PARCEL MAP IN FILE 123 , PAGE 36, LOCATED WITHIN SECTIONS 15 THRU 17, 20 THRU 22, 27 THRU 29, 32 AND 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AND SECTION 4, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

FILE: G:\7809\MAPPING\	W.O.# 7809	DATE: 08/2018	SHEET	OF
Parcel Map\VILLAGE 25\	DRN. BY: WLB	REV:	1	11
7809-PM-VIL25	CKD. BY: TJ			

NO. 01906
FILED AT THE REQUEST OF
VTN
DATED 4/4/19 AT 11:48 AM
FILE 124 PAGE 0051
OF PARCEL MAPS
OFFICIAL RECORDS
BOOK NO. 20190404
CLARK COUNTY, NEVADA RECORDS
DEBBIE CONWAY - RECORDER
FEE $ 132 DEPUTY COJ

S89°29'35"W 2,668.41' N89°28'26"E 2,669.79' N88°29'51"E 5,376.39' S89°06'03"E 5,462.84' N88°22'22"E 5,259.94' S89°18'09"E 1,361.59' S89°20'32"E 1,364.23'

T20S 7 | 8 / 18 | 17 R59E — FOUND BLM BRASS CAP "1987"

T20S 1/4 S8 | S17 R59E — FOUND BLM BRASS CAP "1987"

T20S 8 | 9 / 17 | 16 R59E — FOUND BLM BRASS CAP "1987"

T20S 9 | 10 / 16 | 15 R59E — FOUND 3-1/4" ALUMINUM CAP STAMPED "PLS 11174" PER PARCEL MAP FILE 91, PAGE 28

T20S 10 | 11 / 15 | 14 R59E — FOUND 1-1/2" ALUMINUM CAP STAMPED "PLS 2050" PER RECORD OF SURVEY FILE 88, PAGE 8

T20S 11 | 12 / 14 | 13 R59E — FOUND ALUMINUM CAP STAMPED "PLS 5571"

T20S 1/4 S12 | S13 R59E — FOUND BRASS CAP IN CONCRETE STAMPED "PLS 78973"

2,515.80' S00°02'34"W 2,631.42' S01°50'22"E 2,632.01' S01°45'30"E 2,631.68' S02°02'53"E 2,633.34' S03°00'13"E 2,171.91' N02°38'28"E

S00°02'19"E 2,575.98' N00°02'19"W 2,635.27' N02°06'48"W 2,628.52' S02°06'25"E 2,626.03' N02°32'02"W 2,626.03' N02°31'29"W 2,627.28' N00°52'05"E 2,638.48' N00°52'45"E 2,636.74'

N89°12'58"W 2,672.18' S89°12'59"E 2,627.73' N89°13'51"E 5,360.76'

T20S 1/4 S18 | S17 R59E — FOUND BLM BRASS CAP "1987"

T20S C1/4 S17 R59E — FOUND 3-1/4" ALUMINUM CAP STAMPED "PLS 11174" PER PARCEL MAP FILE 91, PAGE 28

T20S 1/4 S17 | S16 R59E — FOUND 3-1/4" ALUMINUM CAP STAMPED "PLS 11174" PER PARCEL MAP FILE 91, PAGE 28

T20S 1/4 S16 | S15 R59E — FOUND 3-1/4" ALUMINUM CAP STAMPED "PLS 11174" PER PARCEL MAP FILE 91, PAGE 28

S89°04'33"E 2,589.58' S89°08'22"E 2,586.03' N89°56'59"E 5,345.53' N89°49'01"E 5,370.48'

T20S 18 | 17 / 19 | 20 R59E — FOUND BLM BRASS CAP "1987"

T20S 1/4 S17 | S20 R59E — FOUND 3-1/4" ALUMINUM CAP STAMPED "PLS 11174" PER PARCEL MAP FILE 91, PAGE 28

T20S 17 | 16 / 20 | 21 R59E — FOUND BLM BRASS CAP "1987"

T20S 16 | 15 / 21 | 22 R59E — FOUND NEVADA POWER COMPANY BRASS CAP "PLS 6199"

T20S 15 | 14 / 22 | 23 R59E — FOUND 3" BRASS CAP STAMPED "PLS 6199" PER PARCEL MAP FILE 118, PAGE 100

5,279.67' 5,307.67' 5,311.80' N01°43'02"W N01°09'32"E N02°10'13"E

FOUND BLM BRASS CAP "1987" — T20S 1/4 S19 | S20 R59E

N89°11'16"W 2,605.65' S89°10'20"E 2,604.84'

T20S C1/4 S20 R59E — FOUND BLM BRASS CAP "1987"

T20S 1/4 S20 | S21 R59E — FOUND BLM BRASS CAP "1987"

LOT 2
518.75 ACRES

LOT 1
15.03 ACRES

LOT 3
3,642.47 ACRES

LOT 2
PM 123-36

LOT 1
PM 123-36

LOT 3
PM 123-36

SECTION 17 SECTION 16 SECTION 15 SECTION 14 SECTION 20 SECTION 21 SECTION 22 SECTION 23 SECTION 27 SECTION 29 SECTION 28 SECTION 26 SECTION 32 SECTION 33 SECTION 34

NOT A PART NOT A PART N.A.P.

GRAPHIC SCALE
1000 0 500 1000 2000 4000
(IN FEET)
1 inch = 1000 ft.

NORTH

FOUND BLM BRASS CAP "1987" — T20S 19 | 20 / 30 | 29 R59E

S89°15'37"E 2,608.19' S89°15'00"E 2,624.26' S89°44'05"E 5,271.95' S89°51'25"E 5,247.68'

T20S 1/4 S20 | S29 R59E — FOUND BLM BRASS CAP "1987"

T20S 20 | 21 / 29 | 28 R59E — FOUND BLM BRASS CAP "1987"

T20S 21 | 22 / 28 | 27 R59E — FOUND 3-1/4" ALUMINUM CAP STAMPED "PLS 11174" PER PARCEL MAP FILE 91, PAGE 28

T20S 22 | 23 / 27 | 26 R59E — FOUND BLM BRASS CAP "1987"

5,249.45' 5,277.14' 5,332.19' N03°00'13"E N01°26'53"E N00°22'56"W

FOUND BLM BRASS CAP "1987" — T20S 1/4 S30 | S29 R59E

N01°49'31"E

FOUND BLM BRASS CAP "1987" — T20S 29 | 28 / 32 | 33 R59E

T20S 27 | 26 / 34 | 35 R59E

N00°23'27"E

S89°23'57"E 5,324.36' N89°25'37"W 5,306.00' N89°15'10"W 5,345.12'

FOUND BLM BRASS CAP "1987" — T20S 30 | 29 / 31 | 32 R59E

2,847.59' 2,836.56' N05°06'10"W N05°14'46"W 5,590.23' N05°38'06"W

T20S 1/4 S32 | S33 R59E — FOUND BLM BRASS CAP "1987"

2,846.19' 2,836.11' N05°05'46"W N05°14'14"W

FOUND BLM BRASS CAP "1987" — T20S T21S S32 | S33 / S4 R59E

FOUND BLM BRASS CAP "1987" 0.25' SOUTH OF SECTION LINE CLOSING CORNER — T20S T21S 1/4 S33 | S4 R59E

FOUND BLM BRASS CAP "1987" — T20S T21S 1/4 S33 / S4 R59E

FOUND BLM BRASS CAP "1987" — T20S T21S S33 / S4 | S3 R59E

FOUND BLM BRASS CAP "1987" — T20-21S S33 | S34 / S3 R59E

TOWNSHIP 20 SOUTH
TOWNSHIP 21 SOUTH

S89°51'21"W 2,668.32' 550.18' S89°26'34"W 2,668.29' 533.40'

LEGEND

- BOUNDARY LINE
- LOT LINE
- ADJOINER PROPERTY LINE
- STREET CENTER LINE
- SECTION LINE
- QUARTER SECTION LINE
- FOUND MONUMENT AS DESCRIBED
- N.A.P. NOT A PART

SURVEY ANALYSIS

SCALE: 1"=1000'

FILE: G\7809\MAPPING\	W.O.# 7809	DATE: 08/2018	SHEET	OF
Parcel Map\VILLAGE 25\	DRN. BY: WLB	REV:	2	11
7809-PM-VIL25	CKD. BY: TJ			

PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
RAYMOND A. JOHNSON
EXP. 06-30-19
No. 18983
03/18/2019

124-0051

FOR CONTINUATION SEE SHEET 4

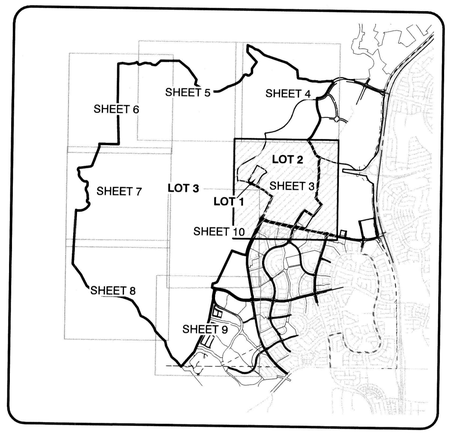
LOT 3
3,642.47 ACRES

LOT 1
15.03 ACRES

LOT 2
518.75 ACRES

LOT 2
PM 123-36
NOT A PART

LOT 1
PM 123-36
NOT A PART



SHEET INDEX
NOT TO SCALE

NORTH

GRAPHIC SCALE
300 0 150 300 600 1200
(IN FEET)
1 inch = 300 ft.

LEGEND
- BOUNDARY LINE
- LOT LINE
- ADJOINER PROPERTY LINE
- STREET CENTER LINE
- SECTION LINE
- EASEMENT LINE
- FOUND MONUMENT AS DESCRIBED
- SET TYPE III MONUMENT - REBAR & ALUMINUM CAP STAMPED "VTN PLS 18983"
- (#) EASEMENT REFERENCE SYMBOL - SEE SHEET11 FOR DESCRIPTIONS
- (1) PUBLIC RIGHT-OF-WAY GRANTED PER DOCUMENT NUMBER 20140922:04156
- (2) PUBLIC RIGHT-OF-WAY GRANTED PER DOCUMENT NUMBER 19971218:01041

FAR HILLS AVENUE
SKY VISTA DRIVE
FOX HILL DRIVE
DESERT FOOTHILLS DRIVE

LOS ALTOS PHASE 2
BOOK 149 OF PLATS, PAGE 70
NOT A PART

PARCEL Z - ALLEGRA PHASE 2
BOOK 149 OF PLATS, PAGE 75
NOT A PART

PARCEL AA - PHASE 2
BOOK 147 OF PLATS, PAGE 12
NOT A PART

PARCEL BB - PHASE 2
BOOK 150 OF PLATS, PAGE 37
NOT A PART

PARCEL 2
PARCEL MAP
FILE 91, PAGE 28
NOT A PART

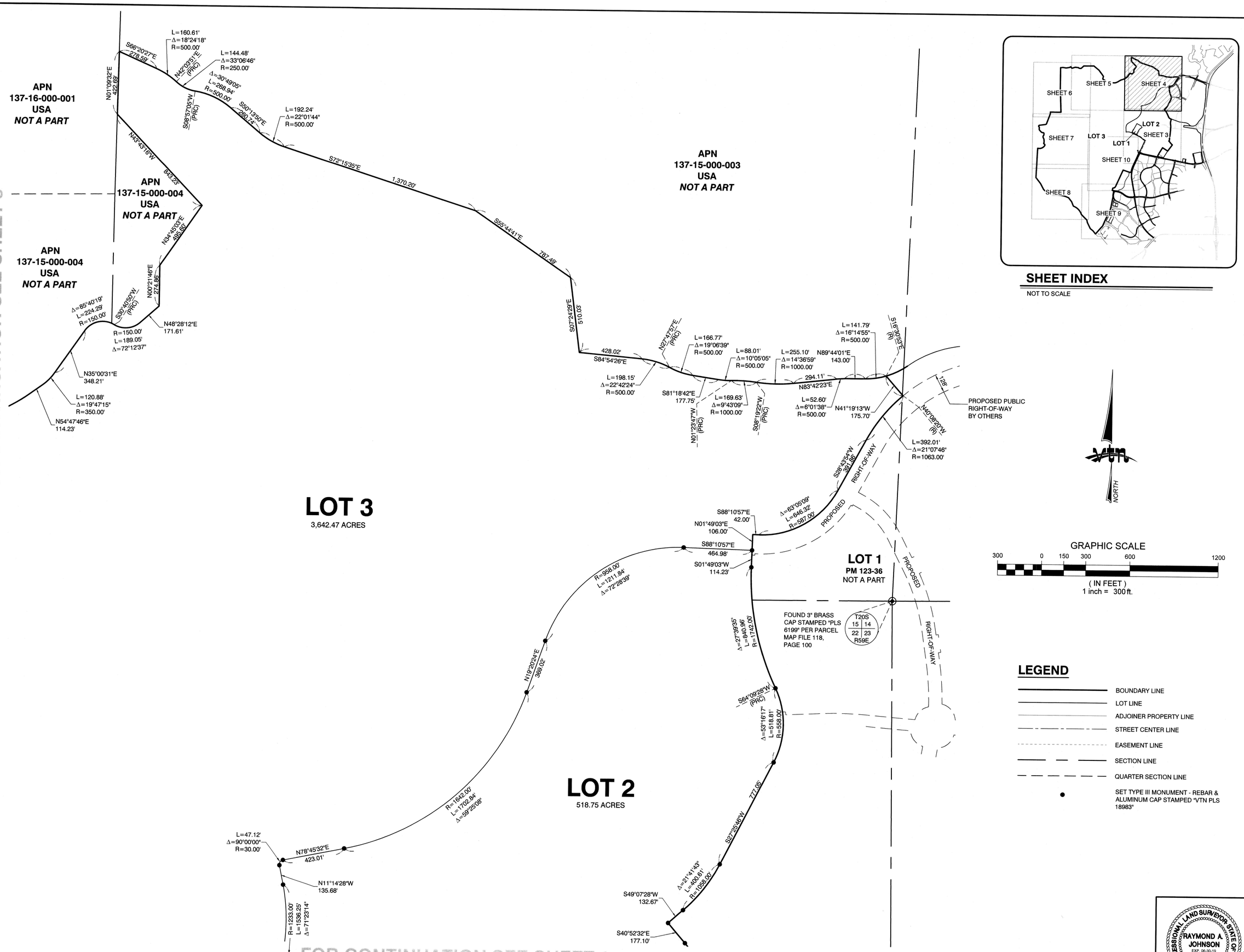
PARCEL 2 PARCEL MAP FILE 91, PAGE 28 *NOT A PART*

FOR CONTINUATION SEE SHEET 10

vtn	FILE: G\7809\MAPPING\	W.O.# 7809	DATE: 08/2018	SHEET	OF
	Parcel Map\VILLAGE 25\	DRN. BY: WLB	REV:	3	11
	7809-PM-VIL25	CKD. BY: TJ			

PROFESSIONAL LAND SURVEYOR, STATE OF NEVADA
RAYMOND A. JOHNSON
EXP. 06-30-19
No. 18983
03/18/2019

124-0051



SHEET INDEX

NOT TO SCALE

LEGEND

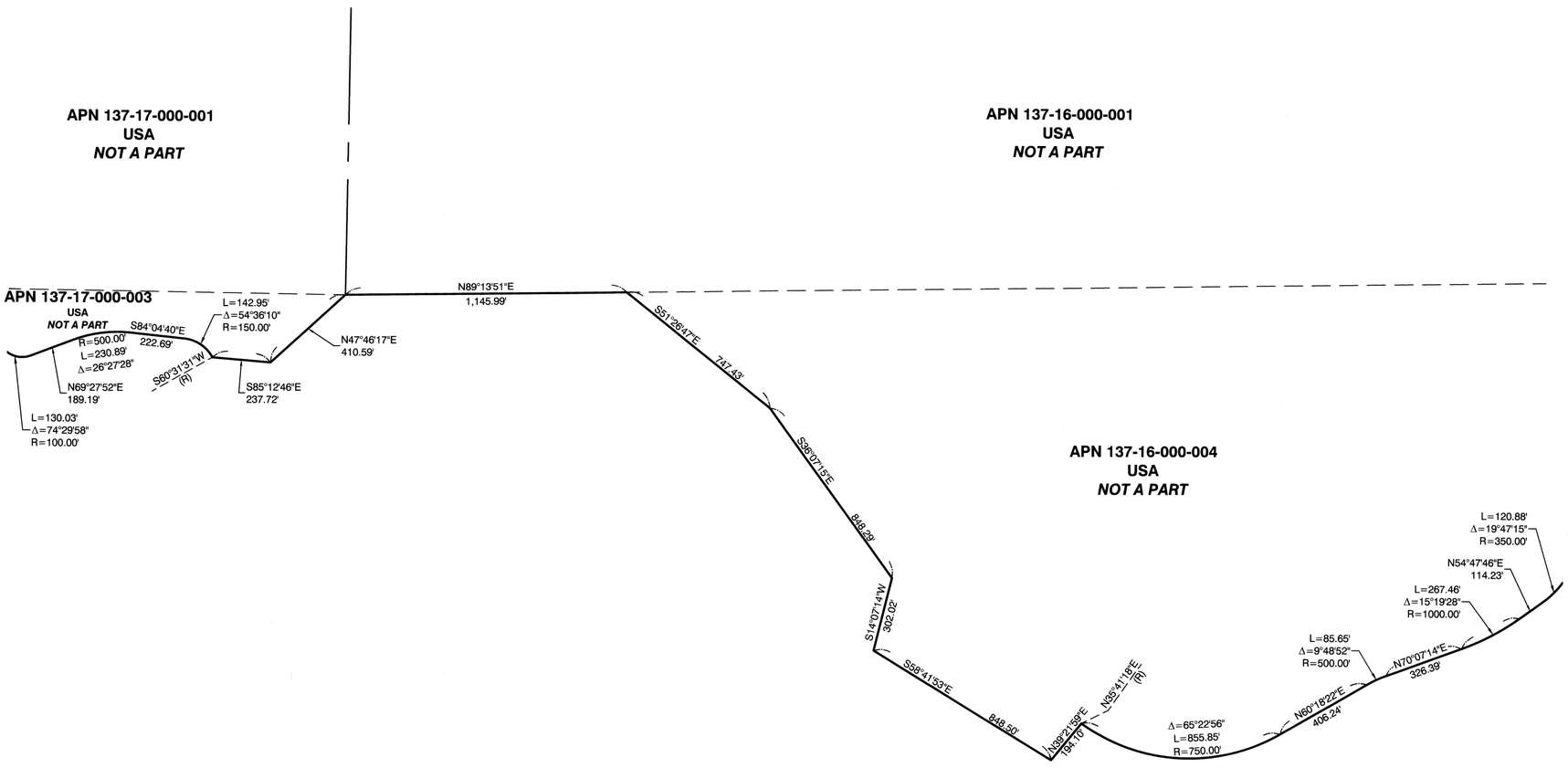
- BOUNDARY LINE
- LOT LINE
- ADJOINER PROPERTY LINE
- STREET CENTER LINE
- EASEMENT LINE
- SECTION LINE
- QUARTER SECTION LINE
- SET TYPE III MONUMENT - REBAR & ALUMINUM CAP STAMPED "VTN PLS 18983"

FILE: G\7809\MAPPING\	W.O.# 7809	DATE: 08/2018	SHEET	OF
Parcel Map\VILLAGE 25\	DRN. BY: WLB	REV:	4	11
7809-PM-VIL25	CKD. BY: TJ			

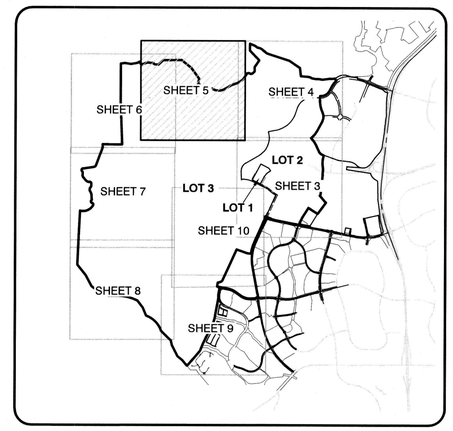
PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
RAYMOND A JOHNSON
EXP. 06-30-19
18983
03/13/2019

124-0051

FOR CONTINUATION SEE SHEET 6



FOR CONTINUATION SEE SHEET 4



SHEET INDEX

NOT TO SCALE

GRAPHIC SCALE

150 0 75 150 300 600

(IN FEET)
1 inch = 150 ft.

LOT 3

3,642.47 ACRES

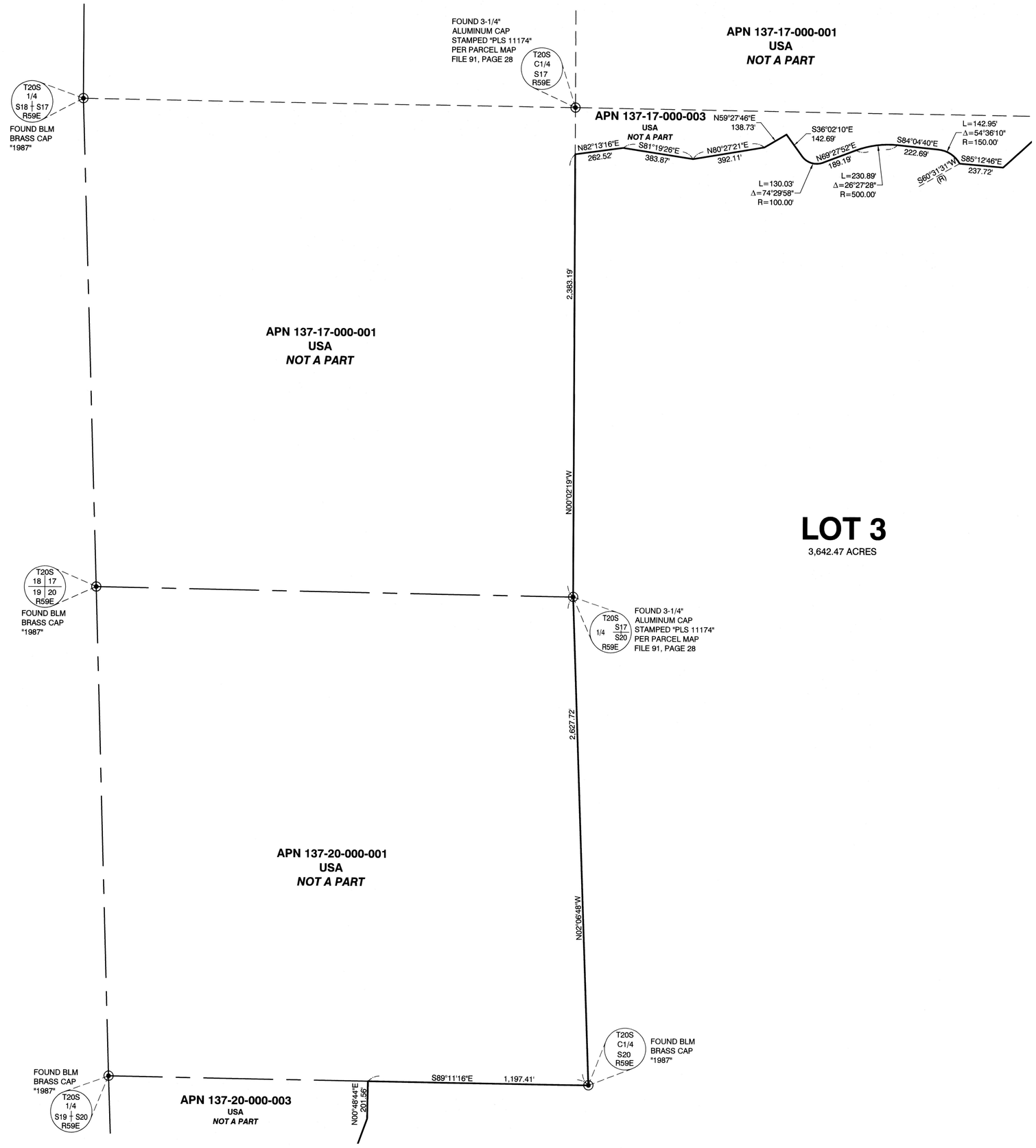
LEGEND

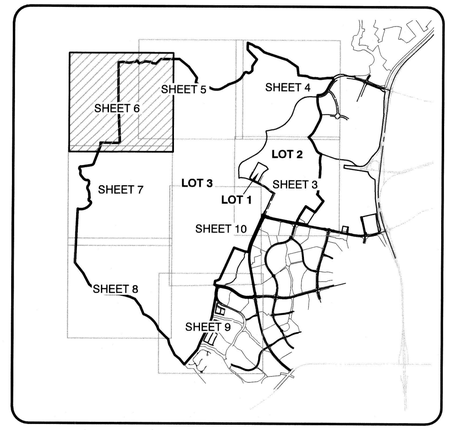
- BOUNDARY LINE
- LOT LINE
- ADJOINER PROPERTY LINE
- STREET CENTER LINE
- EASEMENT LINE
- SECTION LINE
- QUARTER SECTION LINE
- FOUND MONUMENT AS DESCRIBED

FILE: G\7809\MAPPING\	W.O.# 7809	DATE: 08/2018	SHEET	OF
Parcel Map\VILLAGE 25\	DRN. BY: WLB	REV:	5	11
7809-PM-VIL25	CKD. BY: TJ			

PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
RAYMOND A JOHNSON
EXP. 06-30-19
18983
03/19/2019

124-0051





SHEET INDEX

NOT TO SCALE

NORTH

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

LEGEND

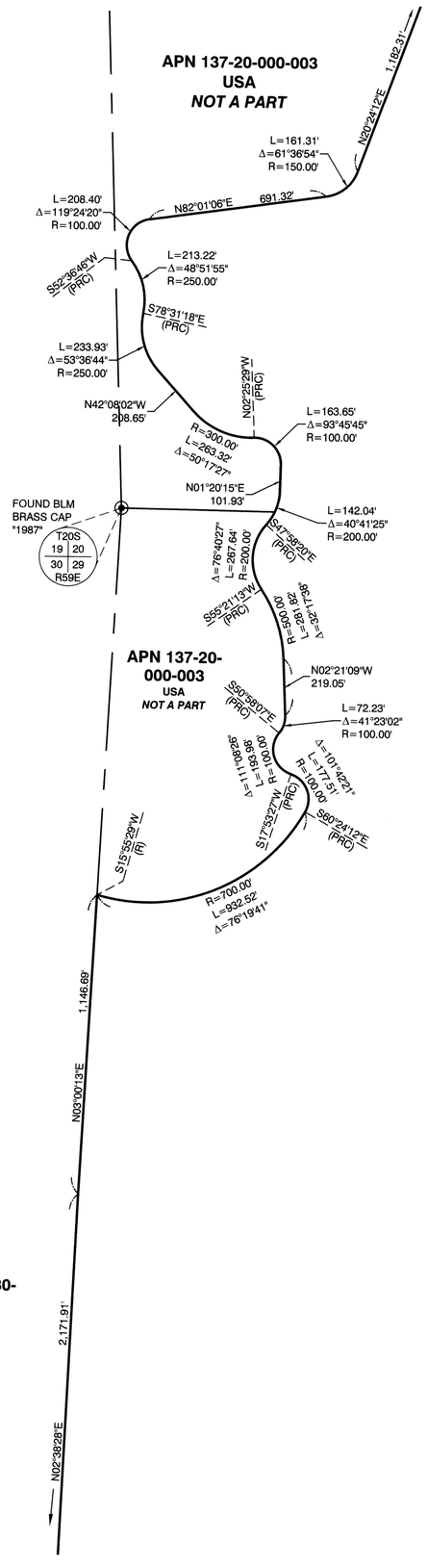
- BOUNDARY LINE
- LOT LINE
- ADJOINER PROPERTY LINE
- STREET CENTER LINE
- SECTION LINE
- QUARTER SECTION LINE
- EASEMENT LINE

FILE: G\7809\MAPPING\	W.O.# 7809	DATE: 08/2018	SHEET	OF
Parcel Map\VILLAGE 25\	DRN. BY: WLB	REV:	6	11
7809-PM-VIL25	CKD. BY: TJ			

PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
RAYMOND A. JOHNSON
EXP. 06-30-19
No. 18983
03/18/2019

124-0051

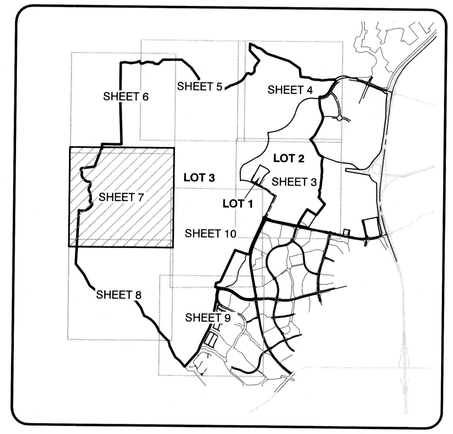
FOR CONTINUATION SEE SHEET 6



FOR CONTINUATION SEE SHEET 8

LOT 3

3,642.47 ACRES



SHEET INDEX

NOT TO SCALE

NORTH

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

LEGEND

- BOUNDARY LINE
- LOT LINE
- ADJOINER PROPERTY LINE
- STREET CENTER LINE
- SECTION LINE
- QUARTER SECTION LINE

FILE: G\7809\MAPPING\	W.O.# 7809	DATE: 08/2018	SHEET	OF
Parcel Map\VILLAGE 25\	DRN. BY: WLB	REV:	7	11
7809-PM-VIL25	CKD. BY: TJ			

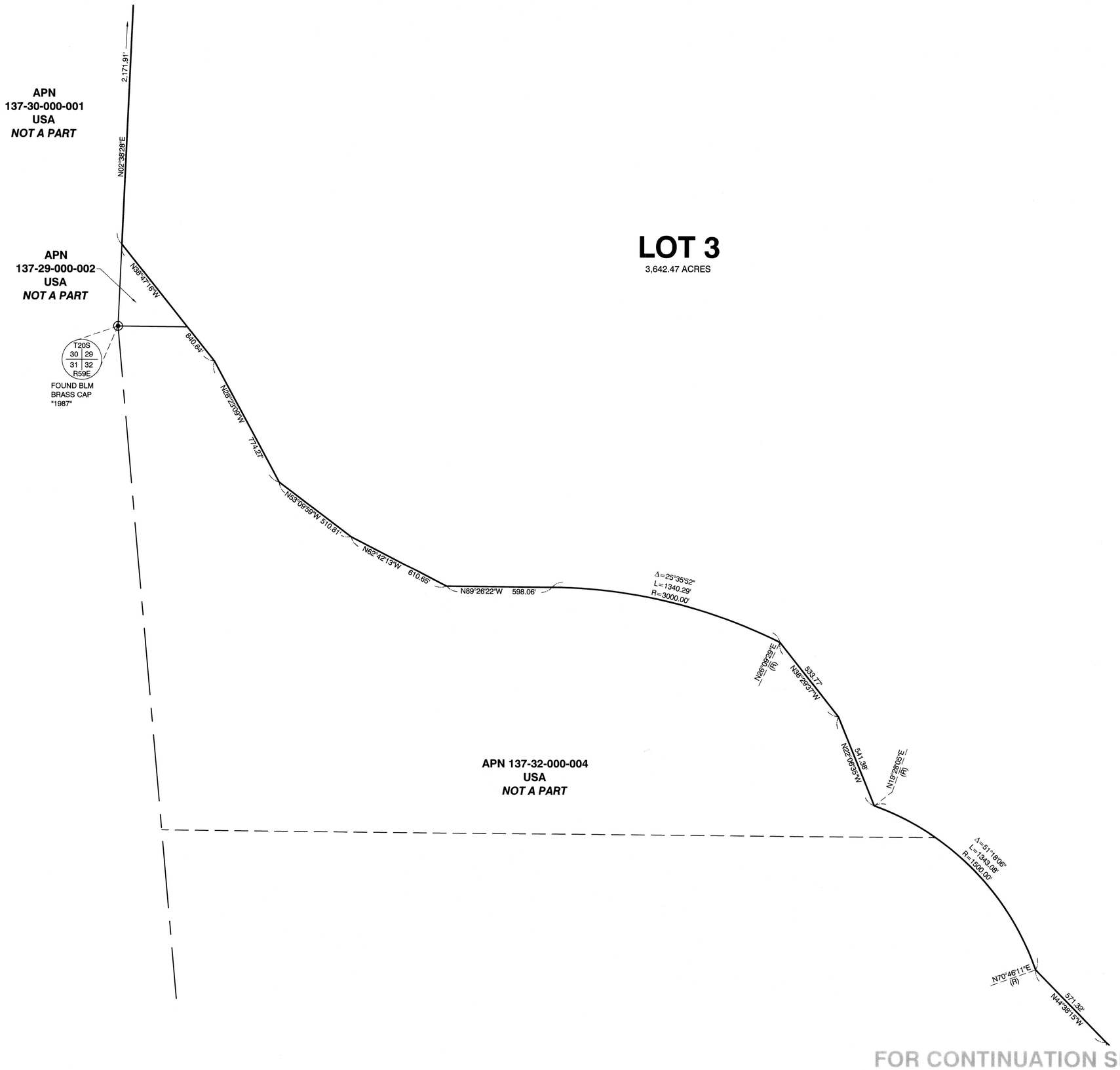
RAYMOND A. JOHNSON
EXP. 06-30-19
No. 18983
PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
03/18/2019

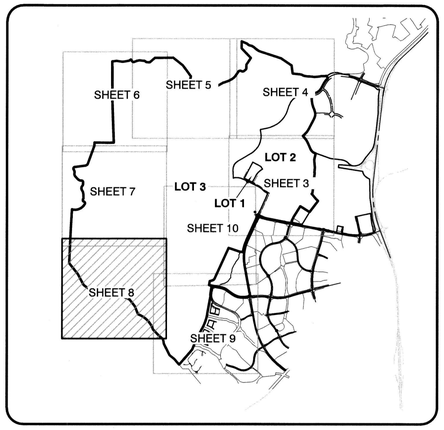
124-0051

FOR CONTINUATION SEE SHEET 7

LOT 3

3,642.47 ACRES





SHEET INDEX

NOT TO SCALE

NORTH

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

LEGEND

- BOUNDARY LINE
- LOT LINE
- ADJOINER PROPERTY LINE
- STREET CENTER LINE
- SECTION LINE
- QUARTER SECTION LINE

FOR CONTINUATION SEE SHEET 9

FILE: G\7809\MAPPING\	W.O.# 7809	DATE: 08/2018	SHEET	OF
Parcel Map\VILLAGE 25\	DRN. BY: WLB	REV:	8	11
7809-PM-VIL25	CKD. BY: TJ			

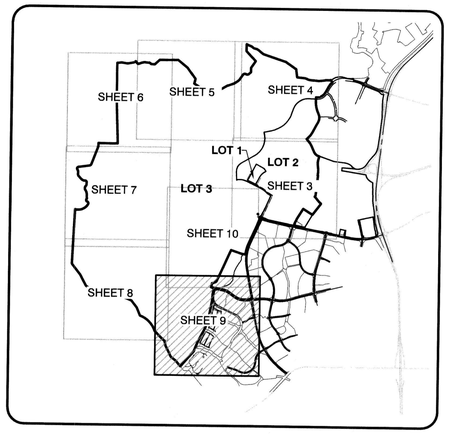
PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
RAYMOND A JOHNSON
EXP. 06-30-19
No. 18983
03/18/2019

124-0051

FOR CONTINUATION SEE SHEET 10

FOR CONTINUATION SEE SHEET 8

LOT 3
3,642.47 ACRES



SHEET INDEX
NOT TO SCALE

S74°22'48"W 153.43'
S10°25'31"W 249.37'
S79°34'29"E 146.54'
(11)
LOT 3
PM 123-36
NOT A PART
S10°25'31"W 76.00'
L=47.12'
Δ=90°00'00"
R=30.00'
(1) ALTA DRIVE
S10°25'31"W 354.70'
Δ=18°53'24"
L=226.50'
R=687.00'
S81°31'48"W (R)
SUMMERLIN VILLAGE 24
BOOK 154 OF PLATS,
PAGE 83
NOT A PART
1,094.88'
S10°25'31"W
CROSSBRIDGE DRIVE
SUMMERLIN VILLAGE 24 -
BIXBY CREEK UNIT 4
BOOK 156 OF PLATS,
PAGE 82
NOT A PART
Δ=18°53'09"
L=988.86'
R=3000.00'
LOT J
BOOK 152 OF PLATS,
PAGE 41
NOT A PART
N60°41'20"W (PRC)
Δ=8°24'12"
L=1393.92'
R=9500.00'
LOT 1
BOOK 152 OF PLATS,
PAGE 41
NOT A PART
S89°05'32"E (R)
1,231.39'
S40°46'53"W
LOTS F/G/H
BOOK 152 OF PLATS,
PAGE 41
NOT A PART
N48°12'11"W 305.69'
N12°13'05"W 198.88'
N26°48'50"W 768.07'
N51°22'45"W 387.27'
N39°47'24"W 450.61'
(2) (4) (12) (13) (14)
APN
164-32-101-004
USA
NOT A PART
APN
164-04-101-001
USA
NOT A PART
T20S T21S S32 S33 S4 R59E
FOUND BLM BRASS CAP "1987"
T20S T21S 1/4 S33 S4 R59E
FOUND BLM BRASS CAP "1987" 0.25' SOUTH OF SECTION LINE CLOSING CORNER

NORTH

GRAPHIC SCALE
300 0 150 300 600 1200
(IN FEET)
1 inch = 300 ft.

LEGEND

- BOUNDARY LINE
- ADJOINER PROPERTY LINE
- STREET CENTER LINE
- SECTION LINE
- (#) EASEMENT REFERENCE SYMBOL - SEE SHEET 11 FOR DESCRIPTIONS
- (1) PUBLIC RIGHT-OF-WAY GRANTED PER DOCUMENT NUMBER 20171107:01324

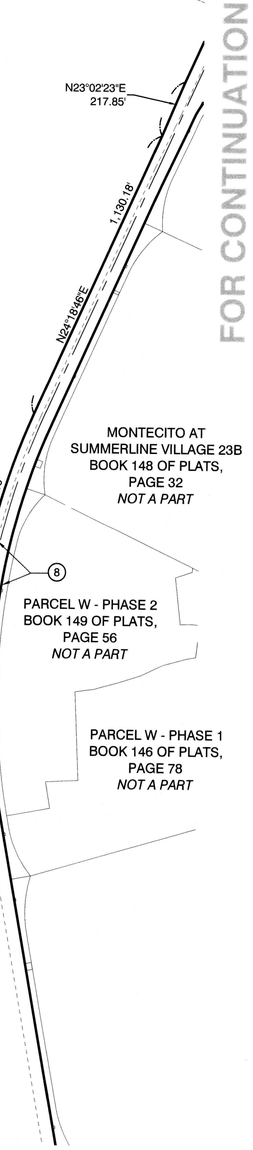
vtm	FILE: G\7809\MAPPING\	W.O.# 7809	DATE: 08/2018	SHEET	OF
	Parcel Map\VILLAGE 25	DRN. BY: WLB	REV:	9	11
	7809-PM-VIL25	CKD. BY: TJ			

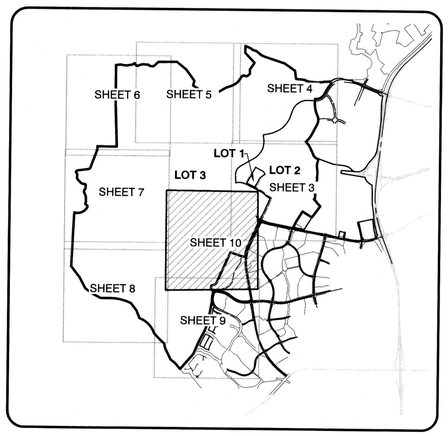
PROFESSIONAL LAND SURVEYOR, STATE OF NEVADA
RAYMOND A. JOHNSON
EXP. 06-30-19
18983
03/18/2019

124-0051

LOT 3

3,642.47 ACRES





SHEET INDEX

NOT TO SCALE

NORTH

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

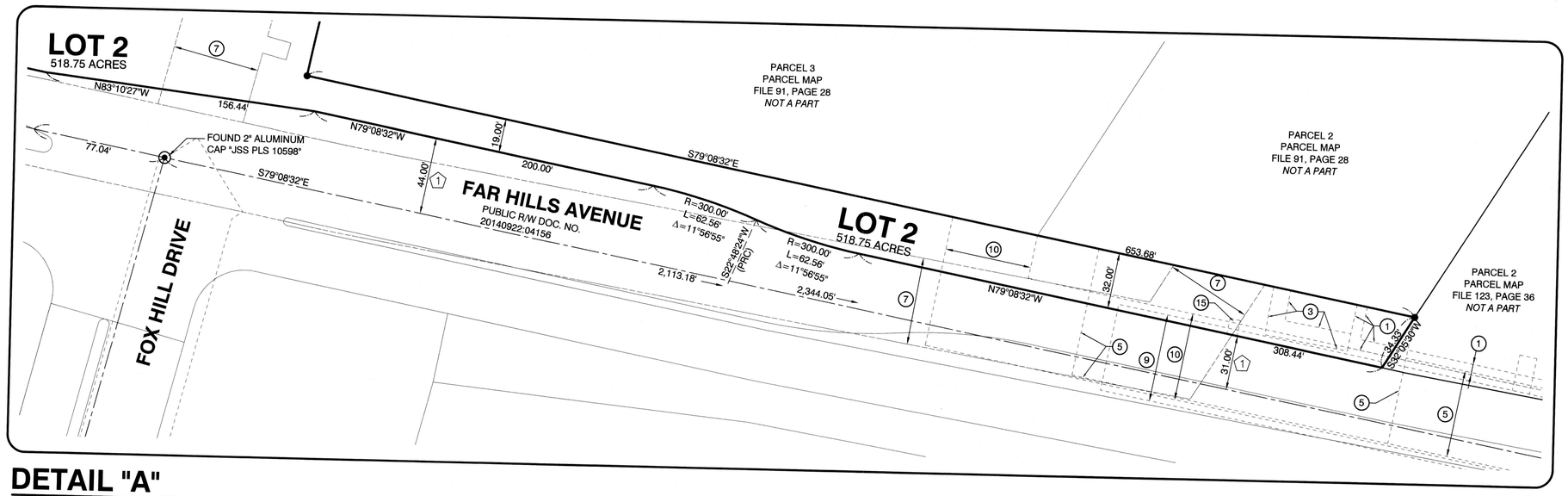
LEGEND

- BOUNDARY LINE
- LOT LINE
- ADJOINER PROPERTY LINE
- STREET CENTER LINE
- SECTION LINE
- QUARTER SECTION LINE
- (#) EASEMENT REFERENCE SYMBOL - SEE SHEET 11 FOR DESCRIPTIONS

FILE: G\7809\MAPPING\	W.O.# 7809	DATE: 08/2018	SHEET	OF
PARCEL MAP\VILLAGE 25\	DRN. BY: WLB	REV:	10	11
7809-PM-VIL25	CKD. BY: TJ			

PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
RAYMOND A JOHNSON
EXP. 06-30-19
18983
03/18/2019

124-0051



DETAIL "A"

NOT TO SCALE

DETAIL "B"

NOT TO SCALE

DETAIL "C"

NOT TO SCALE

DETAIL "D"

NOT TO SCALE

EASEMENT REFERENCE LEGEND

1. 6' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20020919:0001856.
2. 10' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20030404:0000086.
3. 10' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20040802:0004556.
4. 10' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20060427:0004171.
5. 50' WIDE LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20010417:0001977.
6. 50' WIDE LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20020117:0001522.
7. 50' WIDE LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20040220:0001664.
8. 50' WIDE LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20040506:0001223.
9. 50' WIDE LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20070529:0001401
10. 50' WIDE PUBLIC ACCESS EASEMENT GRANTED TO THE CITY OF LAS VEGAS PER FILE 91, PAGE 28 OF PARCEL MAPS.
11. DRAINAGE EASEMENT GRANTED TO CLARK COUNTY PER OR: 19960402:0001120.
12. 10' COMMUNICATIONS EASEMENT GRANTED TO CENTRAL TELEPHONE COMPANY PER OR: 20030326:0000792.
13. 10' COMMUNICATIONS EASEMENT GRANTED TO CENTRAL TELEPHONE COMPANY PER OR: 20060201:0002208.
14. 10' COMMUNICATIONS EASEMENT GRANTED TO CENTRAL TELEPHONE COMPANY PER OR: 20060804:0004986.
15. LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20131022:0002145.
16. LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20140619:0003353.
17. SEWER EASEMENT GRANTED TO CITY OF LAS VEGAS PER OR: 20140922:0004152.
18. DRAINAGE EASEMENT GRANTED TO CITY OF LAS VEGAS PER OR: 20140922:0004154.
19. LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20171116:0001224.
20. LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20171116:0001221.
21. LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20171116:0001220.
22. LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20171116:0001223.
23. LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20171113:0002029.
24. LAS VEGAS VALLEY WATER DISTRICT EASEMENT GRANTED PER OR: 20171116:0001222.

LEGEND

- BOUNDARY LINE
- LOT LINE
- ADJOINER PROPERTY LINE
- STREET CENTER LINE
- EASEMENT LINE
- SET TYPE III MONUMENT - REBAR & ALUMINUM CAP STAMPED "VTN PLS 18983"
- FOUND MONUMENT AS DESCRIBED
- (#) EASEMENT REFERENCE SYMBOL - SEE THIS SHEET FOR DESCRIPTIONS
- (1) PUBLIC RIGHT-OF-WAY GRANTED PER DOCUMENT NUMBER 20140922:04156
- (R) RADIAL
- (PRC) POINT OF REVERSE CURVE

NORTH

FILE: G\7809\MAPPING\	W.O.# 7809	DATE: 08/2018	SHEET	OF
PARCEL MAP\VILLAGE 25\	DRN. BY: WLB	REV:	11	11
7809-PM-VIL25	CKD. BY: TJ			

PROFESSIONAL LAND SURVEYOR, STATE OF NEVADA
RAYMOND A. JOHNSON
EXP. 06-30-19
18983
03/18/2019

124-0051

City of Las Vegas

AGENDA MEMO - PLANNING

PLANNING COMMISSION MEETING DATE: JANUARY 8, 2019
DEPARTMENT: PLANNING
ITEM DESCRIPTION: APPLICANT/OWNER: THE HOWARD HUGHES COMPANY, LLC

** STAFF RECOMMENDATION(S) **

CASE NUMBER	*RECOMMENDATION*	*REQUIRED FOR APPROVAL*
MDR-75107	Staff recommends APPROVAL, subject to conditions:	

** NOTIFICATION **

NEIGHBORHOOD ASSOCIATIONS NOTIFIED 19

NOTICES MAILED 689

PROTESTS 0

APPROVALS 0

SS

**** CONDITIONS ****

MDR-75107 CONDITIONS

Planning

1. A Parcel Map, such as PMP-74780, shall be recorded prior to public notification of a Tentative Map corresponding to the area of the proposed Village 25.

2. Conformance with the Summerlin Village 25 Development Plan, date stamped 11/15/18, except as amended by conditions herein.

3. All development shall be in conformance with the Summerlin Development Standards and this Development Plan.

4. All City Code requirements and design standards of all City Departments must be satisfied, except as modified herein.

Public Works

5. Prior to or concurrent with development of each parcel/village, appropriate right of way dedications, street improvements, drainage plan/study submittals, drainage improvements, sanitary sewer collection system extensions and traffic impact analyses including traffic mitigation plans along with signal participation schedules and pedestrian circulation plans may be required by the Department of Public Works. Provide appropriate easements for all public facilities (sewer, drainage, sidewalk, traffic signal, streetlighting, etc.) as required by the Department of Public Works. Comply with such requirements when imposed and/or when compliance is indicated.

6. Provide a minimum of two lanes of paved legal access from an existing paved public street to each individual development area prior to occupancy of any buildings within each development area.

7. Development of this site shall substantially conform to Summerlin Improvement Standards. Approval of deviations to the Summerlin Improvement Standards may be approved through the approval of a Master Tentative Map. Street lighting shall be per Standard Drawing #300.S3. Public parking shall meet the approval of the City Traffic Engineer.

8. All landscaping within public rights of way or common areas shall be maintained by the Master Developer or his designee. A License Agreement shall be obtained prior to installation of any private improvements or landscaping within public rights of way. All installed landscaping, whether in public rights-of-way or within common area properties, shall be situated and maintained so as to not create sight visibility obstructions for vehicular traffic at all development access drives and all adjacent, abutting street intersections.

9. Submit a revised Summerlin Wastewater Collection System Master Plan acceptable to the Sanitary Sewer Planning Section of the Department of Public Works. The Wastewater Master Plan must be approved prior to the submittal of a Tentative Map unless otherwise allowed by the City Engineer.

10. A Village Master Traffic Impact Analysis must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits or the submittal of any construction drawings, whichever may occur first. Comply with the recommendations of the approved Traffic Impact Analysis prior to occupancy of the site. Phased compliance will be allowed if recommended by the approved Traffic Impact Analysis. No recommendation of the approved Traffic Impact Analysis, nor compliance therewith, shall be deemed to modify or eliminate any condition of approval imposed by the Planning Commission or the City Council on the development of this site.

11. A Village Master Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to submittal of any construction drawings or the issuance of any building or grading permits, or the recordation of Final Maps, whichever may occur first. Provide and improve all drainage ways recommended in the approved drainage study update.

12. The approval of all Public Works related improvements shown on this Master Development Review is in concept only. Cross Sections provided may be used in construction provided that their uses in roadway designs are acceptable to the Department of Public Works. Specific design and construction details relating to size, type and/or alignment of improvements, including but not limited to street, sewer and drainage improvements, shall be resolved prior to approval of the construction plans by the City. No deviations from adopted Summerlin and/or City Standards shall be allowed unless specific written approval for such is received from the City Engineer prior to the recordation of a Final Map or the approval of subdivision related construction plans, whichever may occur first. We reserve the right to impose additional conditions of approval for each individual development site when such plans are known. We anticipate the need for additional conditions concurrent with approval of the Master Tentative Map(s) and/or Village Map(s) for this site.

** STAFF REPORT **

PROJECT DESCRIPTION

As required by the Summerlin Development Standards, a Development Plan Review is requested to establish land uses and densities related to a large parcel of land within Summerlin West (Summerlin Village 25), generally located at the northwest corner of Far Hills Avenue and Fox Hill Drive.

ISSUES

- Summerlin Development Standards Section V requires City Council approval of a plan for development of each village identifying the location and size of interior development parcels, uses and density ranges, community facilities and other amenities that will direct future development of the village.
- The Master Developer reviewed and approved the submitted Development Plan on 11/15/18.
- Prior to notification of a tentative map over this site, a parcel map, such as PMP-74780, shall be recorded that delineates the village boundaries.

DETAILS OF DEVELOPMENT PLAN

Development Parcel	Land Use Designation	Max. Density (unit/acre)	Gross Area (acres)	Max. Residential Units*
A	SF3	10	23.71	237
B	SF2	6	21.74	130
C	SF2	6	29.34	176
D	SF3	10	30.73	307
E	SF3	10	19.92	199
F	SF3	10	12.67	126
G	MF3	40	15.33	613
H	SF2	6	14.34	86
I	SF2	6	15.56	93
J	SF2	6	19.92	119
K	SF2	6	25.13	150
L	SF2	6	16.06	96
M	SF2	6	14.45	86
N	SF2	6	13.45	80
O	SF3	10	24.80	248
P	SF3	10	13.69	136

Development Parcel	Land Use Designation	Max. Density (unit/acre)	Gross Area (acres)	Max. Residential Units*
ES-1	SF2/NF	6	12.62	75
HS-1	SF3/NF	10	71.73	717
COS-1	COS	--	3.66	--
COS-2	COS	--	1.86	--
COS-3	COS	--	3.18	--
COS-4	COS	--	6.44	--
CP-1	COS/NF	--	103.47	--
P-U	NF	--	17.58	--
NP-1	COS	--	3.61	--
TOTAL			**534.99**	**3,674**

*For each developer parcel, fractions on the maximum number of dwelling units are rounded down to the whole unit.

ANALYSIS

The designation of this site as Village 25 was reestablished by the General Development Plan (MDR-72841) for the undeveloped portions of Summerlin West on 05/16/18. A Parcel Map (PMP-74780) has been submitted that defines the legal boundary of Village 25. This map must be recorded prior to notification for a tentative map for Village 25. Village 22 and future Village 27 are located to the north, Villages 21 and 22 lie to the east, Village 23B and future Village 29 lie to the south, and future Villages 29 and 30 lie to the west.

Per Section V of the Summerlin Development Standards, a Development Plan is required for each village which identifies general location and size of development parcels, establishes uses and density ranges for each parcel, locates community facilities, amenities and open space, establishes major pedestrian pathways and classifies roadways in the vehicular circulation system. The development plan includes the following:

1. A narrative that briefly describes the project, restates previous actions on the property, provides information about all planned phases of the village, and provides information regarding amenities, services and open space not indicated on the land use plan; and
2. A land use plan showing all development parcels in the village, along with their respective land uses, densities and acreages; and pedestrian and vehicular circulation systems.

The Master Developer has submitted the above materials and provided staff with a letter of approval from the Summerlin Design Review Committee.

Development standards for this village are determined by the Summerlin Development Standards through the authority of the Summerlin West Development Agreement. Development of streets and other offsite improvements are subject to the Summerlin Improvement Standards. Deviations to such standards may be submitted for review by the city as part of the village tentative map. No deviations are proposed at this time.

Up to 3,674 residential dwelling units are proposed within two main residential dwelling categories: Single Family Detached and Multi-Family. About 83 percent of allowable units per the Master Developer's maximum density criteria are classified as single family. The maximum number of units allowed within Summerlin West per the development agreement is 30,000. About one-third of these units have already been built or proposed.

Of the commercial land use categories described by the Summerlin Development Standards, Neighborhood Focus (NF) is represented within Village 25. The NF category allows commercial facilities designed for use primarily by neighborhood residents such as convenience retail stores and offices, and can include day care centers, elementary schools, houses of worship, playgrounds, playing fields and other recreational facilities such as clubhouses. The development plan is appropriately notated for the type of residential units planned for each parcel. Neighborhood Focus parcels are provided for an elementary school (ES-1) and a middle school and high school (HS-1); however, if these schools are not built, the Development Plan calls for single family residential (SF2 and SF3) uses on these parcels, similar to other villages in Summerlin West.

Village 25 is centrally located within Summerlin West; as such, it is intended to provide public amenities and services for the larger community. The predominant feature of Village 25 is a 94.86-acre park. The Development Plan shows multiple designations (COS/NF) for the park to indicate that it could accommodate both recreational and commercial uses on the same parcel. At this time the commercial uses are not yet defined, but the Development Plan narrative states that these could include both commercially operated recreational activities and retail establishments. These uses may or may not be ancillary to the park use. Currently, the Summerlin Development Standards do not specifically address standards for mixed use development. The Master Developer will have the option to request a future review of the standards to create a new land use designation for mixed use and specify standards for mixed use development or to modify the Development Plan to specify the types of uses allowed within a multiple use parcel. The proposed open space area will contain a regional water detention basin, recreation center, playing fields and walking trails. A trail system will link the residential neighborhoods in the south portion of the village to the park.

The village will contain a network of major streets connecting both the parcels within the village and Village 25 to the surrounding villages. The primary east-west vehicular connector to Village 25 is Summerlin Parkway, which forks into two arterials (Sky Vista Drive and Street "Q") serving neighborhood traffic. Fox Hill Drive will remain a neighborhood collector for most of the single family pods and would form the park perimeter. Lake Mead Boulevard will feature a multi-use trail along the northern and western boundary of the village. Public Works will evaluate the street sections and placement of major streets during review of the tentative map. Some street types may require deviations from the Summerlin Improvement Standards in order to satisfy the needs of the Master Developer to accommodate the residents of the village.

A Development Notice and Impact Assessment (DINA) is not required to accompany this request, as "projects of significant impact" that are located on property subject to a Development Agreement effective prior June 8, 1999 (such as Summerlin West) are exempt from the requirements of LVMC 19.16.010(E), which otherwise would require a DINA for such projects.

FINDINGS (MDR-75107)

The proposed Development Plan meets the criteria required by the Summerlin Development Standards and Summerlin West General Development Plan and has been approved by the Master Developer. A traffic study will be required to assess the impact of vehicular traffic in this area, and a sewer study will be required prior to submittal of a tentative map in order to verify that adequate service can be provided. The development is organized around a regional park facility; adequate bicycle and pedestrian connections and amenities are provided to facilitate transportation to and from the park. Single family uses are appropriately clustered and adequately buffered from more intense uses. Staff therefore recommends approval, subject to conditions.

BACKGROUND INFORMATION

Related Relevant City Actions by P&D, Fire, Bldg., etc.	
01/27/97	The City Council approved a Development Agreement (DA-0001-96) for the development of the Summerlin Planned Community west of the 215 Beltway between Charleston Boulevard and Cheyenne Avenue. The Planning Commission and staff recommended approval. The agreement was adopted as Ordinance 4069 on 02/24/97 and was recorded 11/21/97. This document included the General Development Plan for Summerlin West.
	The City Council approved a Rezoning (Z-0119-96) from N-U (Non-Urban) to P-C (Planned Community) on 8,318 acres along the west side of Clark County 215, between Charleston Boulevard and Lake Mead Boulevard. The Planning Commission and staff recommended approval.
09/15/04	The City Council approved a revised Summerlin Development Standards document (DIR-3934), which is still in effect.
05/16/18	The City Council approved a proposed revision (MDR-72841) to the General Development Plan for the undeveloped portions of Summerlin West on 5,054.53 acres at the northwest corner of Far Hills Avenue and Clark County 215. The Planning Commission and staff recommended approval.
07/18/18	The City Council approved a required two-year review (DIR-73621) of the Development Agreement for Summerlin West.
10/16/18	A three lot Parcel Map (PMP-74780) on 4,176.26 acres at the northwest corner of Far Hills Avenue and Fox Hill Drive was submitted for staff technical review. The map has not yet recorded.

Most Recent Change of Ownership	
12/18/97	A deed was recorded for a change in ownership.

Related Building Permits/Business Licenses
There are no related building permits or business licenses pertaining to the subject site.

Pre-Application Meeting	
11/06/18	A pre-application meeting was held with the applicant to discuss submittal requirements for a Summerlin Development Plan Review.

Neighborhood Meeting
A neighborhood meeting was not required, nor was one held.

Field Check	
11/29/18	The site is undeveloped and contains desert vegetation.

Details of Application Request	
Site Area	
Gross Acres	534.99

Surrounding Property	***Existing Land Use Per Title 19.12***	***Planned or Special Land Use Designation***	***Existing Zoning District***
Subject Property	Undeveloped	SF1 (Single Family Detached – 3.5 Units per Acre)	P-C (Planned Community)
		SF2 (Single Family Detached – 6.0 Units per Acre)	
		SF3 (Single Family Detached – 10 Units per Acre)	
		COS (Community Open Space)	
North	Undeveloped	VC (Village Center)	P-C (Planned Community)
		ER (Estate Residential)	
		SF1 (Single Family Detached – 3.5 Units per Acre)	
South (Village 23B)	Single Family, Detached	SF3 (Single Family Detached – 10 Units per Acre)	P-C (Planned Community)
South	Undeveloped	VC (Village Center)	
		SF1 (Single Family Detached – 3.5 Units per Acre)	
		SFZL (Single Family Zero Lot Line)	

Surrounding Property	***Existing Land Use Per Title 19.12***	***Planned or Special Land Use Designation***	***Existing Zoning District***
East (Village 22)	Utility Installation, Other Than Listed	Multiple	P-C (Planned Community)
West	Undeveloped	VC (Village Center)	P-C (Planned Community)
		SF1 (Single Family Detached – 3.5 Units per Acre)	
		SFZL (Single Family Zero Lot Line)	

Master and Neighborhood Plan Areas	***Compliance***
Summerlin West Development Agreement	Y
Special Area and Overlay Districts	***Compliance***
P-C (Planned Community) District	Y
Other Plans or Special Requirements	***Compliance***
Trails (per Development Plan)	Y
Las Vegas Redevelopment Plan Area	N/A
Interlocal Agreement	N/A
Project of Significant Impact (Development Impact Notification Assessment)	N/A
Project of Regional Significance	N/A

DEVELOPMENT STANDARDS

Each individual development is reviewed by the Summerlin Residential Design Review Committee prior to submittal to the City of Las Vegas for review. There may be more restrictive standards for a specific development than required by the Summerlin Development Standards.

(SF2) Single Family Detached	*Required/Allowed*
Min. Lot Size	N/A
Min. Lot Width	N/A
Max. Density	6.0 du/gross acre
Min. Setbacks • Front • Side • Corner • Rear	 18 Feet* 5 Feet N/A 15 Feet
Max. Lot Coverage	N/A
Max. Building Height	38 Feet

*The front yard building setback, exclusive of the garage, may be 10 feet, and may be reduced to 6 feet from the back of sidewalk if the sidewalk is detached from the curb by at least 4 feet. Side entry garages may have a 10-foot front yard setback, and may be reduced to 6 feet from the back of sidewalk if the sidewalk is detached from the curb by at least 4 feet.

(SF3) Single Family Detached	*Required/Allowed*
Min. Lot Size	N/A
Min. Lot Width	N/A
Max. Density	10 du/gross acre
Min. Setbacks • Front • Side • Corner • Rear	 18 Feet* 5 Feet 15 Feet 15 Feet
Max. Lot Coverage	N/A
Max. Building Height	45 Feet

*The front yard building setback, exclusive of the garage, may be 10 feet, and may be reduced to 6 feet from the back of sidewalk if the sidewalk is detached from the curb by at least 4 feet. Side entry garages may have a 10-foot front yard setback, and may be reduced to 6 feet from the back of sidewalk if the sidewalk is detached from the curb by at least 4 feet.

(MF3) High Density Multi-Family	*Required/Allowed*
Min. Lot Size	N/A
Min. Lot Width	N/A
Max. Density	40 du/gross acre
Min. Setbacks	25 feet from the exterior property lines of the development
Min. Distance Between Buildings	10 Feet
Max. Lot Coverage	N/A
Max. Building Height	N/A

Garage door setbacks may be either 5 feet or less or 18 feet or greater from the back of sidewalk, or back of curb, if no sidewalk exists.

D.2

GRAND PARK DETENTION BASIN

(DS5163)

D.2.1 Grading Plans

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

APN:
CITY OF LAS VEGAS
STATE OF NEVADA

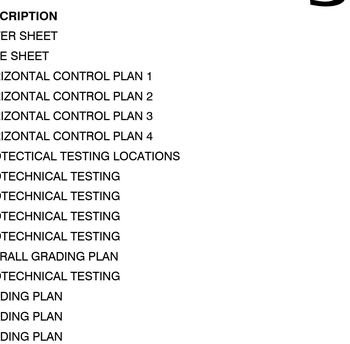
DEVELOPED BY:

HOWARD HUGHES COMPANY, LLC

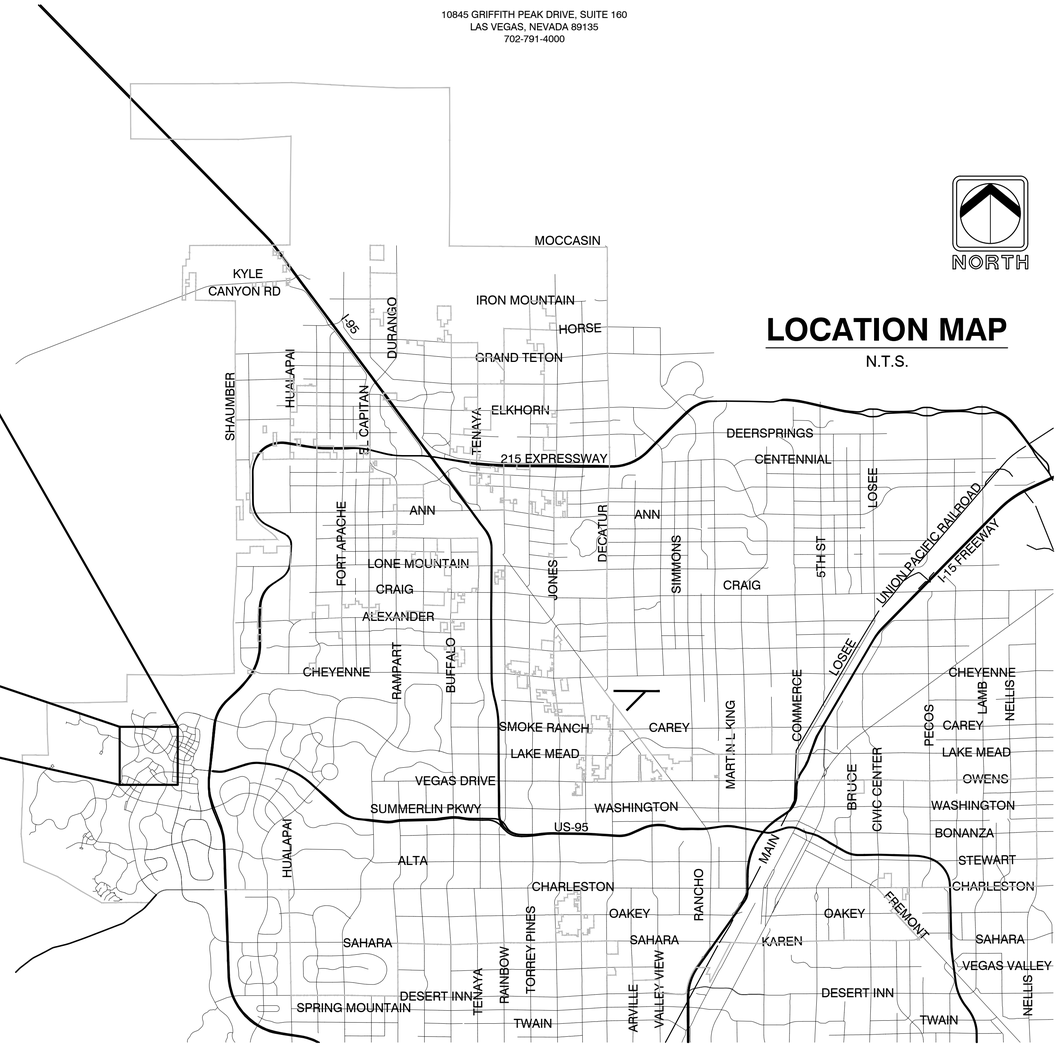
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

SHEET INDEX

SHEET #	SHEET	DESCRIPTION
1	CV	COVER SHEET
2	NT	NOTE SHEET
3	HC1	HORIZONTAL CONTROL PLAN 1
4	HC2	HORIZONTAL CONTROL PLAN 2
5	HC3	HORIZONTAL CONTROL PLAN 3
6	HC4	HORIZONTAL CONTROL PLAN 4
7	GT1	GEOTECTICAL TESTING LOCATIONS
8	GT2	GEOTECHNICAL TESTING
9	GT3	GEOTECHNICAL TESTING
10	GT4	GEOTECHNICAL TESTING
11	GT5	GEOTECHNICAL TESTING
12	GR1	OVERALL GRADING PLAN
13	GR2	GEOTECHNICAL TESTING
14	GR3	GRADING PLAN
15	GR4	GRADING PLAN
16	GR5	GRADING PLAN
17	GR6	GRADING CONTROL DATA TABLES
18	XS1	CROSS-SECTION PLAN VIEW
19	XS2	BASIN CROSS SECTION XS1
20	XS3	BASIN CROSS SECTION XS2 & XS3
21	XS4	BASIN CROSS SECTION XS4 & XS5
22	XS5	BASIN CROSS SECTION XS6 & XS7
23	XS6	BASIN CROSS SECTION XS8
24	DT1	DETAIL SHEET
25	DT2	DETAIL SHEET
26	DT3	DETAIL SHEET
27	DT4	DETAIL SHEET
28	SD1	STORM DRAIN PLAN AND PROFILE 1
29	SD2	STORM DRAIN PLAN AND PROFILE 2
30	SD3	STORM DRAIN PLAN AND PROFILE 3
31	SD4	STORM DRAIN PLAN AND PROFILE 4
32	SD5	STORM DRAIN PLAN AND PROFILE 5
33	SD6	STORM DRAIN PLAN AND PROFILE 6
34	SD7	STORM DRAIN PLAN AND PROFILE 7
35	SD8	STORM DRAIN PLAN AND PROFILE 8



KEY MAP
N.T.S



LOCATION MAP
N.T.S.

NORTH

OWNER
HOWARD HUGHES COMPANY, LLC
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

DEVELOPER
HOWARD HUGHES COMPANY, LLC
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

ENGINEERING FIRM
VTN
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550
FAX (702) 362-2597

FIRE DEPARTMENT APPROVAL

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

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

THESE PLANS AND THE DESIGN CRITERIA CONTAINED WITHIN THESE PLANS ARE BASED UPON THE INFORMATION PRESENTLY KNOWN BY THE ENGINEER. ALL CONSTRUCTION SHALL BE IN CONFORMANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL STATUTES, LAWS, CODES, REGULATIONS AND ORDINANCES, INCLUDING BUT NOT LIMITED TO THE FEDERAL FAIR HOUSING AMENDMENTS ACT, AMERICANS WITH DISABILITIES ACT, THE ARCHITECTURAL BARRIERS ACT AND ANY APPLICABLE UNIFORM STANDARDS, SPECIFICATIONS OR DRAWINGS. THE PERSON OR ENTITY PERFORMING THE CONSTRUCTION SHALL BE SOLELY RESPONSIBLE TO MAKE SURE CONSTRUCTION IS IN CONFORMANCE WITH ALL LOCAL, STATE AND FEDERAL STATUES, LAWS, CODES, REGULATIONS, STANDARDS, GUIDELINES AND ORDINANCES AND FURTHER, IS IN CONFORMANCE WITH ANY APPLICABLE DESIGN CRITERIA, INCLUDING BUT NOT LIMITED TO SOILS REPORTS, TRAFFIC STUDIES, GEOTECHNICAL REPORTS, ARCHITECTURAL PLANS AND SPECIFICATIONS, DRAINAGE PLANS OR STUDIES AND ANY OTHER CRITERIA, STANDARDS OR REQUIREMENTS LISTED IN THE PLANS OR THE GENERAL NOTES RELATED TO THESE PLANS OR PROVIDED BY ANYONE IN REFERENCE TO THIS PROJECT.

APPROVALS

CITY ENGINEER ALLEN PAVELKA, P.E. # 9029

APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

PLANNING DEPARTMENT, CITY OF LAS VEGAS DATE

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK DATE

"THE AFFIXED CENTURY LINK NEVADA APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS."

NV ENERGY DATE

NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NVENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

COX COMMUNICATIONS LAS VEGAS, INC. DATE

SOUTHWEST GAS CORPORATION DATE

LAS VEGAS FIRE & RESCUE DATE

LAS VEGAS VALLEY WATER DISTRICT

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO:--- FIRST APPROVED DATE: _____.

LVVWD APPROVED FIRE FLOW 1,500 GPM / ONSITE N/A GPM

SHEETS: CV, NT, MUTSS, MUTSD, MUTW, MUTEX, DT1, UT1-UT14

KEVIN T. ORROCK, VICE PRESIDENT DATE

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

VTN
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

COVER SHEET

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM — FEB '19
DESIGNED BY: PLM — FEB '19
CHECKED BY: BR
PROJECT NO: 7809-GPDB
SCALE: HORIZ N/A, VERT N/A

PROFESSIONAL ENGINEER — BRIAN TROY RUIZ — EXP: 12/31/21 — CIVIL — No. 15961 — STATE OF NEVADA
02/11/2020

SHEET
CV
1 OF 35 SHEETS

DRAWING NO.

H:\7809-GP Basin\Sheet Set\DWG\7809-GPDB-BASIN-CV.dwg;12/27/2019 11:45 AM;paulm

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLICWORKS CONSTRUCTION OFFSITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA". LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA". LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".

2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCE'S WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THERE WITH.

3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.

4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.

5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.

6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.

7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.

8. AC PAVEMENT TO BE ONE-HALF INCH (½") ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.

9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.

10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.

11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.

12. 12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY: ---, PROJECT NO. ---, DATED ---, APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLAN.

13. EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.

14. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. STATUTE NO. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.

15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

16. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.

17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.

18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.

19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.

20. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC, THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.

21. AFTER HAUNCHING AND PRIOR TO BACKFILL OPERATIONS WHICH WOULD COVER SANITARY SEWER AND STORM DRAIN FACILITIES, CONTRACTOR IS REQUIRED TO SCHEDULE CLV OPEN-TRENCH UTILITY SURVEY INSPECTION FOR DETERMINATION OF FINAL LOCATION COORDINATES. FACILITIES TO BE LOCATED BY CLV SHALL INCLUDE AT A MINIMUM THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES AND TRANSITION STRUCTURES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXIT THE PUBLIC RIGHT-OF-WAY, SEWER AND STORM DRAIN MAIN ALIGNMENT, INCLUDING DEFLECTION POINTS.

22. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST EDITION.

23. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

REVISED 06/04/2018

CITY OF LAS VEGAS STREETLIGHT NOTES:

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION (USS), AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" (USD), LATEST REVISION.

2. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS, ETC., LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE TRAFFIC AND CITY ENGINEER. ANY DEVIATION FROM THE PLAN LOCATION WILL REQUIRE COMPLIANCE WITH SECTION 623 OF THE USS.

3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION IN ACCORDANCE WITH SECTION 623 G.03.01 OF THE USS.

4. ALL EMPTY CONDUIT SHALL HAVE AT LEAST ONE GREEN NO. #8 AWG WIRE INSTALLED AS TRACER WIRE IN ACCORDANCE WITH SECTION 623 G.02.01 OF THE USS PRIOR TO BACKFILLING AND FINAL INSPECTION.

5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE IN COMPLIANCE WITH USD NO. 320A WHEN POLE IS INSTALLED BEHIND SIDEWALK, AND SHALL AT NO TIME COMPLETELY ENCLOSE THE STREET LIGHTING POLE.

6. AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE TRAFFIC ENGINEERING DIVISION PRIOR TO ANY PRE-FINAL INSPECTION. THE AS-BUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.

7. SERVICE POINTS SHALL BE COORDINATED WITH NV ENERGY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICEPOINTS SHALL BE SHOWN ON THE PLANS.

8. WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREETLIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED BEFORE STREETLIGHT BASES ARE INSTALLED. AT NO EXPENSE TO THE CITY OF LAS VEGAS.

9. THE CONTRACTOR SHALL FURNISH COMPLETE CONDUIT, WIRE, ETC. FROM SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON THE PLANS.

REVISED JUNE 28, 2016 (LD VERSION)

ABBREVIATIONS

FF	FINISH FLOOR	PT	POINT OF TANGENCY	O/C	OFFSET CROWN
FG	FINISH GRADE	PRC	POINT OF REVERSE CURVATURE	BC	BACK OF CURB
FL	FLOW LINE	PCC	POINT OF COMPOUND CURVATURE	BCR	BEGIN CURB RETURN
TC	TOP OF CURB	BVC	BEGIN VERTICAL CURVE	BCL	BACK OF CURB LENGTH
TRC	TOP OF ROLL CURB	MVC	MID-POINT OF VERTICAL CURVE	TF	TOP OF FOOTING
EOP	EDGE OF ASPHALT PAVEMENT	EVC	END VERTICAL CURVE	GB	GRADE BREAK
FUT.	FUTURE	PRVC	POINT OF REVERSE VERTICAL CURVE	PC	POINT OF CURVATURE
EX.	EXISTING	R/W	RIGHT-OF-WAY	TPW	TOP OF PLANTER WALL
VG	VALLEY GUTTER	DI	DROP INLET	TRW	TOP OF RETAINMENT WALL
NG	NATURAL GROUND	BFE	BASE FLOOD ELEVATION	TOP	TOP OF CHANNEL/SCARP
H.P.	HIGH POINT	CCUSD	CLARK COUNTY UNIFORM STANDARD DRAWINGS	TOE	TOE OF CHANNEL/SCARP
L.P.	LOW POINT	SW	SIDEWALK	TOB	TOP OF BOX
SSMH	SEWER MANHOLE	TSW	TOP OF SIDEWALK	PP	POWER POLE
WTR	WATER LINE	INT.	INTERSECTION	TRANS.	TRANSITION
SD	STORM DRAIN	D.G.	DESIGN GRADE	RET.	RETAINMENT
RCP	REINFORCED CONCRETE PIPE	C/L	CENTER LINE		

DEVIATION FROM CITY OF LAS VEGAS STANDARDS

- NONE

CITY OF LAS VEGAS FIRE DEPARTMENT NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE LAS VEGAS FIRE AND RESCUE ADOPTED FIRE CODE ORDINANCE #6325 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS.

2. ONLY FIRE HYDRANTS THAT ARE ON THE LAS VEGAS VALEY WATER DISTRICTS - APPROVED PRODUCTS LIST ARE ALLOWED TO BE INSTALLED.

3. A PERMIT IS REQUIRED FROM LAS VEGAS FIRE AND RESCUE FOR THE INSTALLATION OF ON-SITE WATER LINES AND FIRE HYDRANTS. THE PERMIT AND CONTRACTORS MATERIAL TEST CERTIFICATE FOR UNDERGROUND PIPING FORM SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK. [IFC § 105.7.12]

4. ON ANY RESIDENTIAL OR COMMERCIAL INSTALLATIONS, FIRE HYDRANTS SHALL BE INSTALLED AND FIRE APPARATUS ACCESS ROADS SHALL BE MAINTAINED BEFORE COMMENCEMENT OF ANY COMBUSTIBLE CONSTRUCTION. ALL FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER AND SHALL BE CAPABLE OF DELIVERING THE REQUIRED FIRE FLOW. [IFC § 3310, § 3312]

5. TO IDENTIFY THE FIRE HYDRANT LOCATIONS, THE CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTERLINE OF THE STREET ADJACENT TO THE FIRE HYDRANTS. [IFC § 507.5.7.3]

6. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH VERIFICATIONS OF ALL FIRE HYDRANTS AND FIRE LINES, SHALL BE CONDUCTED BEFORE COVERING THE LINES. CENTER LOADING IS ACCEPTABLE FOR THE HYDRO TESTS WITH PRIOR FIRE PREVENTION APPROVAL. [IFC § 106.3]

7. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. [IFC § 507.2.1, NFPA 24]

8. PAINTING OF CURBS, FIRE HYDRANTS, PADS, PROTECTION OF FIRE HYDRANTS FROM PHYSICAL DAMAGE, AND ALL OTHER WORK NECESSARY PER PLANS SHALL BE COMPLETED BEFORE APPROVAL BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION. **IFC 507**

9. PRIVATE HYDRANTS SHALL BE PAINTED RED. [IFC § 507.5.7.1]

10. PRIOR TO THE FINAL OCCUPANCY, A FIRE FLOW TEST SHALL BE WITNESSED BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION TO VERIFY AVAILABILITY OF THE REQUIRED FIRE FLOW. [IFC § 507]

11. FIRE HYDRANT SPACING SHALL BE AS FOLLOWS: [IFC § C102]

    • RESIDENTIAL – 500 FT UNSPRINKLERED; 600 FT SPRINKLERED.
    • COMMERCIAL – 300 FT UNSPRINKLERED; 400 FT SPRINKLERED.

12. WHERE THE WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF THE STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT A MAXIMUM OF 1000 FT SPACING, TO PROVIDE FOR TRANSPORTATION HAZARDS. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS OR HAVE FOUR (4) OR MORE TRAFFIC LANES AND HAVE A TRAFFIC COUNT OF MORE THAN 30,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FT ON AN ALTERNATING BASIS. [IFC § C102.8]

13. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN THE RADIUS OF A CUL-DE-SAC OR WITHIN 20 FT OF THE PERIMETER OF THE RADIUS OF THE CUL-DE-SAC.

14. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FT OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREETLIGHT OR ANY OTHER OBSTRUCTION. [IFC § C102.12]

15. A MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE-TWO FAMILY DWELLING SHALL NOT EXCEED 300 FT, AS MEASURED BY AN APPROVED ROUTE. [IFC § C102.4]

16. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A FIRE DEPARTMENT CONNECTION (FDC) SHALL NOT EXCEED 100 FT, AS MEASURED BY AN APPROVED ROUTE. [IFC § C102.7]

17. THE MAXIMUM DISTANCE FROM A HYDRANT TO THE END OF A DEAD-END STREET SHALL NOT EXCEED 200 FT. [IFC § C102.6]

18. TWO (2) SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE IS 4 OR MORE FIRE HYDRANTS/SPRINKLER LEAD-INS ARE INSTALLED ON A SINGLE SYSTEM. SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 2 FIRE HYDRANTS CAN BE OUT OF SERVICE DUE TO A BREAK IN A WATER MAIN. [IFC § C104]

19. ALL FIRE APPARATUS ACCESS ROADS SHALL BE PAVED TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES, AND SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF THE FIRE APPARATUS. [IFC § 503.2.3]

20. THE GRADIENT FOR THE FIRE APPARATUS ACCESS ROADS SHALL NOT EXCEED 12%. ANGLES OF APPROACH AND ANGLES OF DEPARTURE SHALL NOT EXCEED 8% FOR 25 FT PRIOR TO OR AFTER THE GRADE CHANGE. ADJACENT TO THE STRUCTURES GRADIENT SHALL NOT EXCEED 6%. [IFC § 503.2.7, § 503.2.8]

21. THE TURNING RADIUS OF THE FIRE APPARATUS ACCESS ROADS SHALL BE NO LESS THAN 52 FT OUTSIDE AND 28 FT INSIDE TURNING RADIUS. IFC § 503.2.4]

22. VERTICAL CLEARANCE OF ALL FIRE APPARATUS ACCESS ROADS SHALL NOT BE LESS THAN 13FT 6 INS. [IFC § 503.2.1]

23. FIRE DEPARTMENT ACCESS ROADS SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 40 FT FLOW LINE TO FLOW LINE WITH PARALLEL PARKING PERMITTED ON BOTH SIDES, NOT LESS THAN 32 FT WIDE, FLOW-LINE TO FLOW-LINE, WHERE PARKING IS PERMITTED ONLY ON ONE SIDE OF THE FIRE APPARATUS ACCESS ROAD, NOT LESS THAN 24 FT WIDE, FLOW-LINE TO FLOW-LINE, WHERE NO PARKING IS PERMITTED ON EITHER SIDE. FIRE LANES THROUGH PARKING LOTS SHALL BE NOT LESS THAN 24 FT. [IFC § 503.2.1.1]

24. A FIRE APPARATUS ACCESS ROAD SHALL BE REQUIRED WHEN ANY PORTION OF AN EXTERIOR WALL OF THE FIRST STORY IS LOCATED MORE THAN 150 FT FROM A FIRE DEPARTMENT VEHICLE ACCESS. THIS DISTANCE COULD BE INCREASED TO 250 FT IF THE BUILDING IS SPRINKLERED. [IFC § 503.1.1

25. APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 100 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS OR WITH A SINGLE POINT OF ACCESS IN EXCESS OF 600 FT. COMMERCIAL AND INDUSTRIAL DEVELOPMENTS WHERE BUILDINGS EXCEED 2 STORIES OR 30 FEET IN HEIGHT, OR EXCEEDING 62,000 SQUARE FEET IN AREA. [IFC § 503.1.2]

26. ALL DEAD-END FIRE APPARATUS ROADS AND/OR FIRE LANES, PUBLIC OR PRIVATE, IN EXCESS OF 150 FT IN LENGTH SHALL BE PROVIDED WITH AN APPROVED TURN AROUND HAVING A MINIMUM DIAMETER OF 81 FT. [IFC § 503.2.5]

27. ALL FIRE APPARATUS ACCESS ROADS SHALL BE MARKED BY PLACING APPROVED SIGNS AT THE START OF THE DESIGNATED FIRE LANE, ONE SIGN AT THE END OF THE FIRE LANE AND WITH SIGNS AT INTERVALS OF 100 FT ALONG THE DESIGNATED FIRE LANES. SIGNS TO BE PLACED ON BOTH SIDES OF AN ACCESS ROADWAY IF NEEDED TO PREVENT PARKING ON EITHER SIDE. SIGNS TO BE INSTALLED NO HIGHER THAN 10 FT OR LESS THAN 6 FT FROM THE ROADWAY LEVEL. THE CURB ALONG OR ON THE PAVEMENT OR CEMENT (IF NO CURB IS PROVIDED) SHALL BE PAINTED WITH A RED WEATHER RESISTANT PAINT IN ADDITION TO THE SIGNS. [IFC § 503.3]

28. ELECTRICALLY CONTROLLED ACCESS GATES SHALL BE PROVIDED WITH AN APPROVED EMERGENCY VEHICLE DETECTOR/RECEIVER SYSTEM. SAID SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH THE IFC § 503.6 AND IFC APPENDIX M.

EFFECTIVE DATE: MARCH 1st, 2016

CITY OF LAS VEGAS TRAFFIC NOTES

1. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.

2. THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.

3. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.

4. WHEN A DESIGNATED "SUGGESTED ROUTE TO SCHOOL" IS ENCROACHED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF IDENTIFIES A NEED FOR CHILDREN'S TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.

5. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.

6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. ALL NEW TRAFFIC SIGNS SHALL UTILIZE TYPE XI RETROREFLECTIVE SHEETING IN ACCORDANCE WITH CGAUSS 627 AND 716 AND SHALL HAVE AN ANTI-GRAFFITI PROTECTIVE OVERLAY FILM THAT IS A MATCHING COMPONENT TO, AND OF THE SAME MANUFACTURER AS THE RETROREFLECTIVE SHEETING TO WHICH IT IS APPLIED. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARDS.

7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5') FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREET LIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.

8. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HERE UNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.

9. STREET SIGNS AND STOP SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.

10. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO INSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK AREA. THE CONTRACTOR SHALL HAVE A CERTIFIED ATSSA TRAFFIC CONTROL TECHNICIAN OR IMSA WORK ZONE SAFETY SPECIALIST SET UP, MAINTAIN AND/OR REMOVE ALL TRAFFIC CONTROL DEVICES IN THE CITY OF LAS VEGAS RIGHT OF WAY.

11. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE EXPEDITED TO COMPLETION SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.

12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING CITIZENS AREA TRANSIT (C.A.T.) IF THE CONSTRUCTION INTERRUPTS OR RELOCATES A BUS STOP OR HAS AN ADVERSE EFFECT ON BUS SERVICE ON THAT STREET TO ARRANGE FOR TEMPORARY RELOCATION OF STOP.

13. GUARDS SHALL BE OBTAINED BY CONTACTING THE METROPOLITAN POLICE DEPARTMENT SPECIAL EVENTS UNIT (PHONE # 828-3442) WHO WILL PROVIDE OFFICERS PROPERLY TRAINED IN TRAFFIC CONTROL. FEES FOR THE USE OF THESE OFFICERS SHALL BE SET BY METRO AND WILL BE PAID BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL ARRANGEMENTS WITH METRO.

14. ANY WORK WITHIN 300' OF A SIGNALIZED INTERSECTION WILL BE NIGHT WORK, UNLESS DIRECTED BY THE CITY OF LAS VEGAS TRAFFIC ENGINEER.

15. THE CONTRACTOR SHALL CONTACT THE TRAFFIC ENGINEERING DIVISION (TRANSPORTATION SECTION) THROUGH THE PROJECT'S OFFSITE INSPECTOR PRIOR TO INITIATING PAVING TO RECEIVE DIRECTION FOR ANY PERMANENT OR TEMPORARY MODIFICATIONS TO THE APPROVED DRAWINGS REGARDING FINAL PAVEMENT TRANSITIONS, MARKINGS AND SIGNING THAT ARE REQUIRED TO MATCH ADJACENT ROADWAY SEGMENTS. THE CONTRACTOR SHALL PROVIDE A DRAWING FOR APPROVAL BY THE TRAFFIC ENGINEERING DIVISION DEPICTING ANY ADJUSTMENTS TO THE FINAL PAVEMENT MARKINGS AND SIGNAGE, WHICH MAY INCLUDE OMITTING, ADDING OR MODIFYING PAVEMENT MARKINGS AND TRAFFIC CONTROL SIGNS SUCH THAT ADEQUATE TRANSITIONS AND LANE TERMINATIONS BETWEEN ADJACENT ROADWAY SEGMENTS ARE CONSTRUCTED.

REVISED 7/3/13

LAS VEGAS VALLEY WATER DISTRICT STANDARD NOTES

LVVWD PROJECT #----

(REVISED 01/09/2017)

1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN APPROVED FOR CONSTRUCTION BY THE LVVWD. FOLLOWING WATER PLAN APPROVAL, NOTICE SHALL BE GIVEN TO THE LVVWD COMMUNICATION SUPPORT CENTER (258-7171) TWO (2) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. FOR FUTURE INSPECTIONS, NOTICE MUST BE GIVEN BY 2:00 P.M. THE BUSINESS DAY PRIOR TO THE REQUESTED LVVWD INSPECTION. **WHEN REQUESTING INSPECTIONS, PLEASE REFER TO THE PROJECT # IDENTIFIED ABOVE.**
2. ALL WORK SHALL CONFORM TO LVVWD STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS, AND TO THE **2010** EDITION OF THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS). **THE LATEST EDITION OF UDACS SHALL SUPERSEDE ANY CONFLICTS CONTAINED IN THE APPROVED DRAWINGS AND/OR SPECIFICATIONS.**
3. ALL WORK, EXCEPT AS MODIFIED BY THESE PLANS OR BY NOTE 2 ABOVE, SHALL BE DONE IN ACCORDANCE WITH THE MOST RECENT DRAFT OR EDITION OF THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENT, CLARK COUNTY AREA.
4. A SINGLE PIPE MATERIAL SHALL BE USED THROUGHOUT THE PROJECT UNLESS OTHERWISE APPROVED BY THE LVVWD.
5. ALL SERVICE LATERALS TWO (2) INCHES IN DIAMETER AND SMALLER SHALL BE TYPE K COPPER TUBING WITH LVVWD APPROVED SERVICE SADDLES.
6. ALL WATER METER BOXES SHALL BE LOCATED OUTSIDE OF DRIVEWAY AREAS.
7. ALL VALVES SHALL BE LOCATED OUTSIDE OF DRIVEWAYS, VALLEY AND CURB GUTTERS.
8. ALL WATER AND STORM DRAIN OR SANITARY SEWER CROSSINGS SHALL CONFORM TO SECTION 2.22 OF THE **2010** EDITION OF THE UDACS.
9. ALL WATER FACILITIES SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED, AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LVVWD DISTRIBUTION SYSTEM.
10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES AND SMALLER FROM LVVWD CENTRAL STORES. TELEPHONE 258-3152 OR 258-3802, TWO (2) WORKING DAYS PRIOR TO METER PICKUP.
11. ANY INTERRUPTION OF SERVICE MUST BE PERFORMED IN ACCORDANCE WITH UDACS SECTION 3.14.01, AND APPROVED BY THE LVVWD INSPECTION DIVISION PRIOR TO SHUTDOWN. PROPER WRITTEN NOTIFICATION MUST BE GIVEN TO ALL AFFECTED CUSTOMERS.
12. ALL WATER FACILITY CONSTRUCTION MATERIALS USED MUST BE AS LISTED ON THE LVVWD PRE-APPROVED MATERIALS AND MANUFACTURER'S LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.
13. TELEPHONE "CALL BEFORE YOU DIG" AT "811" OR 1-800-227-2600.
14. THE INSTALLATION OF LAS VEGAS VALLEY WATER DISTRICT (LVVWD) MUNICIPAL WATER FACILITIES WITHIN ALL STREETS IS ASSUMED TO BE IN COMPLIANCE WITH THE UNIFORM STANDARDS, INCLUDING THE PLACEMENT OF ASPHALT PAVING STREET SURFACES. ANY REPAIR WORK DONE BY THE LVVWD TO THE MUNICIPAL WATER FACILITIES WILL INCLUDE THE PLACEMENT OF AN APPROPRIATELY SIZED ASPHALT REPAIR PATCH ON THE STREET SURFACE.

    ANY DECORATIVE PAVING SURFACE WITHIN THE STREET IS THE RESPONSIBILITY OF THE OWNERS ASSOCIATION, OR THE INDIVIDUAL PROPERTY OWNERS IF NO OWNER'S ASSOCIATION IS IN EXISTENCE, OR THE AGENCY HAVING JURISDICTION. DECORATIVE SURFACE MATERIALS PLACED WITHIN THE TEN FOOT EASEMENT ABUTTING A PUBLIC OR PRIVATE STREET, IF DISTURBED BY THE LVVWD DURING THE REPAIR OR OPERATION OF ITS FACILITIES, WILL BE REPLACED BY LVVWD WITH AN APPROPRIATELY SIZED PLAIN FINISH CONCRETE PATCH. THE LVVWD WILL NOT RESTORE

GRAPHIC SCALE
60 0 30 60 120
1" = 60'

NORTH

GEOTECHNICAL TESTING ALIGNMENT No.1
SEE SHEET GT2

GEOTECHNICAL TESTING ALIGNMENT No.2
SEE SHEET GT3

GEOTECHNICAL TESTING ALIGNMENT No.3
SEE SHEET GT4

GEOTECHNICAL TESTING ALIGNMENT No.4
SEE SHEET GT5

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16

FOX HILL DRIVE (PUBLIC)

CALICO BEND DRIVE (PUBLIC)

SUNSET RUN DRIVE (PUBLIC)

APN: 13722301001
PARCEL ____
SUMMERLIN WEST VILLAGE 25-UNIT
PER FINAL MAP
BOOK _____
PAGE _____

APN: 13723101002
PARCEL ____
SUMMERLIN WEST VILLAGE 25-UNIT
PER FINAL MAP
BOOK _____
PAGE _____

APN: 13723101002
PARCEL ____
SUMMERLIN WEST VILLAGE 25-UNIT
PER FINAL MAP
BOOK _____
PAGE _____

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702) 791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GEOTECTICAL TESTING LOCATIONS
PLAN VIEW

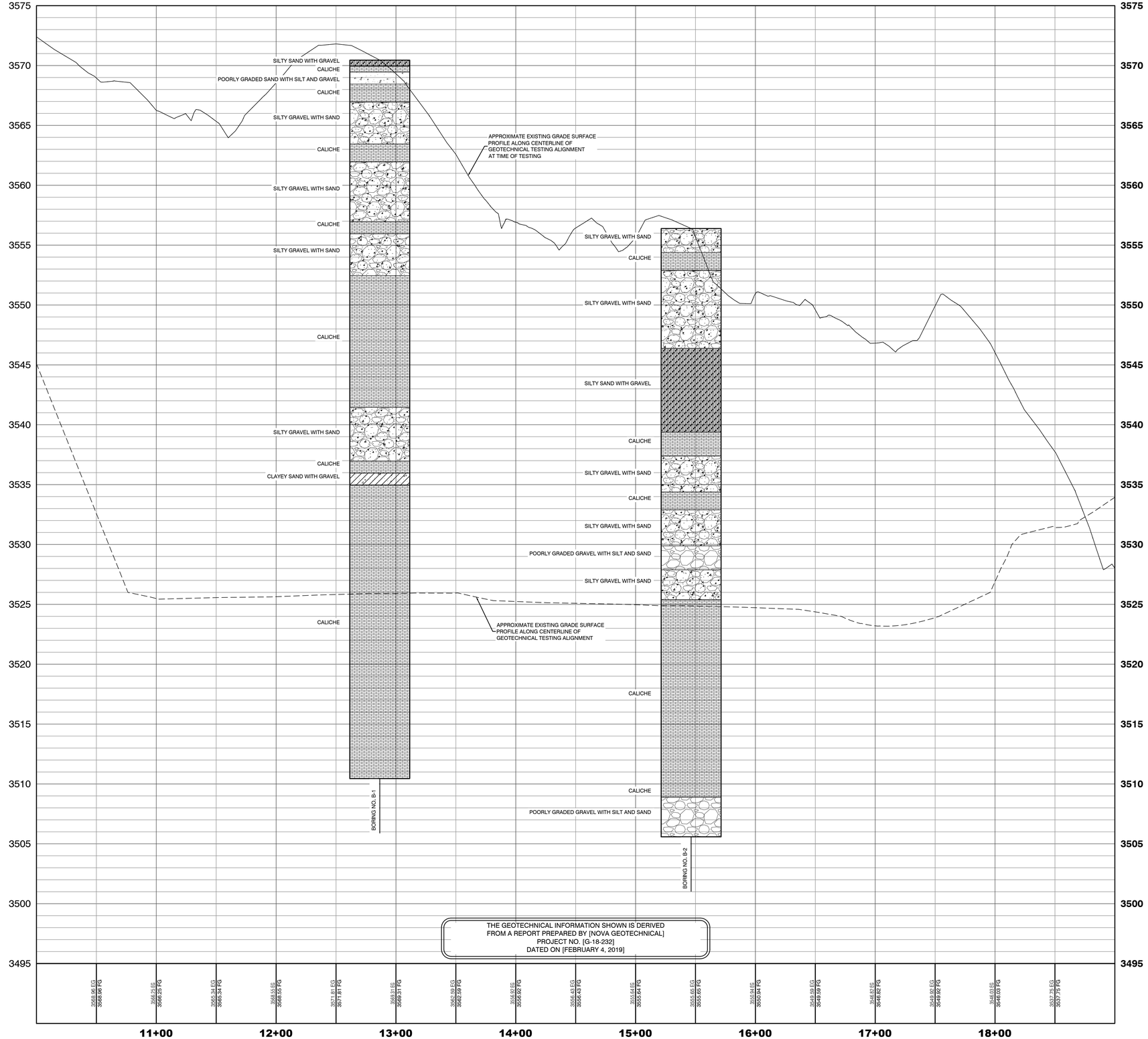
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM — FEB 19'
DESIGNED BY: PLM — FEB 19'
CHECKED BY: BR — —
PROJECT NO: 7809-GPDB
SCALE: 1"=60' HORZ. N/A VERT.

PROFESSIONAL ENGINEER — STATE OF NEVADA — No. 15967
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
02/11/2020

SHEET
GT1
7 OF 35 SHEETS
DRAWING NO.

H:\7809-GP Basin\Sheet Set\DWG\7809-GPDB-BASIN.7809-GPDB-BASIN-GT.dwg2/10/2020 3:10 PMplaulm



GEOTECHNICAL TESTING PROFILE ALIGNMENT NO. 1

PROFILE SCALES:
HORIZ. = 1"=40'
VERT. = 1"=4'

NORTH

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GEOTECHNICAL TESTING ALIGNMENT NO. 2 PROFILE

SUMMERLIN WEST VILLAGE 25 GRAND PARK DETENTION BASIN DETENTION BASIN PLANS

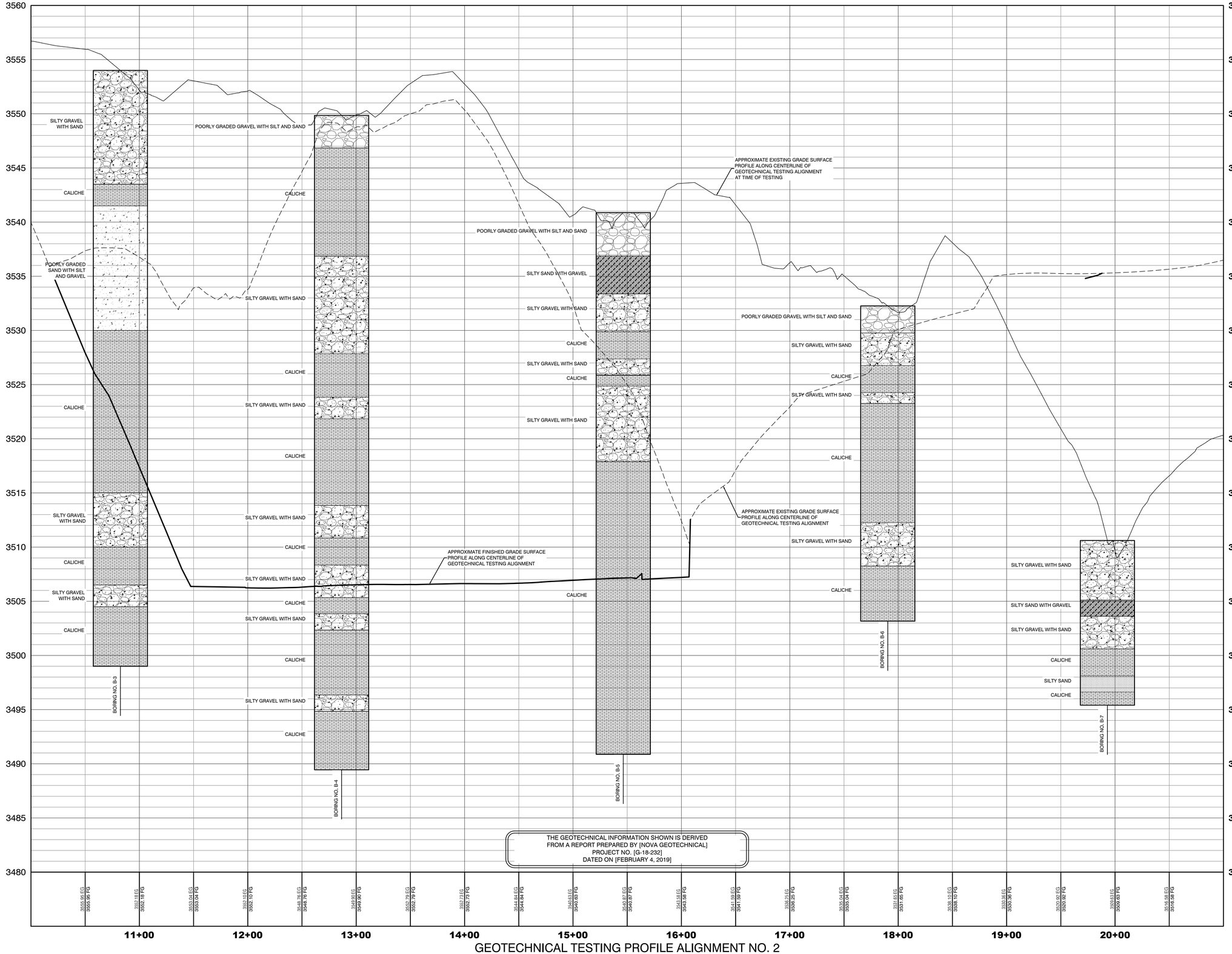
DRAWN BY: PLM — FEB '19
DESIGNED BY: PLM — FEB '19
CHECKED BY: BR — ---
PROJECT NO: 7809-GPDB
SCALE: HORIZ. 1"=40' VERT. 1"=4'

PROFESSIONAL ENGINEER — STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
No. 15967
02/11/2020

SHEET
GT2
8 OF 35 SHEETS

DRAWING NO.

H:\7809-GP Basin\Sheet Set\DWG\7809-GPDB-BASIN-GT.dwg,2/10/2020 3:10 PM,paulm



THE GEOTECHNICAL INFORMATION SHOWN IS DERIVED FROM A REPORT PREPARED BY [NOVA GEOTECHNICAL] PROJECT NO. [G-18-232] DATED ON [FEBRUARY 4, 2019]

GEOTECHNICAL TESTING PROFILE ALIGNMENT NO. 2

PROFILE SCALES:
HORIZ. = 1"=40'
VERT. = 1"=4'

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GEOTECHNICAL TESTING ALIGNMENT NO. 2 PROFILE

SUMMERLIN WEST VILLAGE 25 GRAND PARK DETENTION BASIN DETENTION BASIN PLANS

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	HORIZ.
PLM FEB 19'	PLM FEB 19'	BR ----	1"=40'	VERT. 1"=4'

PROJECT NO: 7809-GPDB

PROFESSIONAL ENGINEER — BRIAN TROY RUIZ — EXP: 12/31/21 — CIVIL — No. 15971 — STATE OF NEVADA

02/11/2020

SHEET
GT3
9 OF **35** SHEETS

DRAWING NO.

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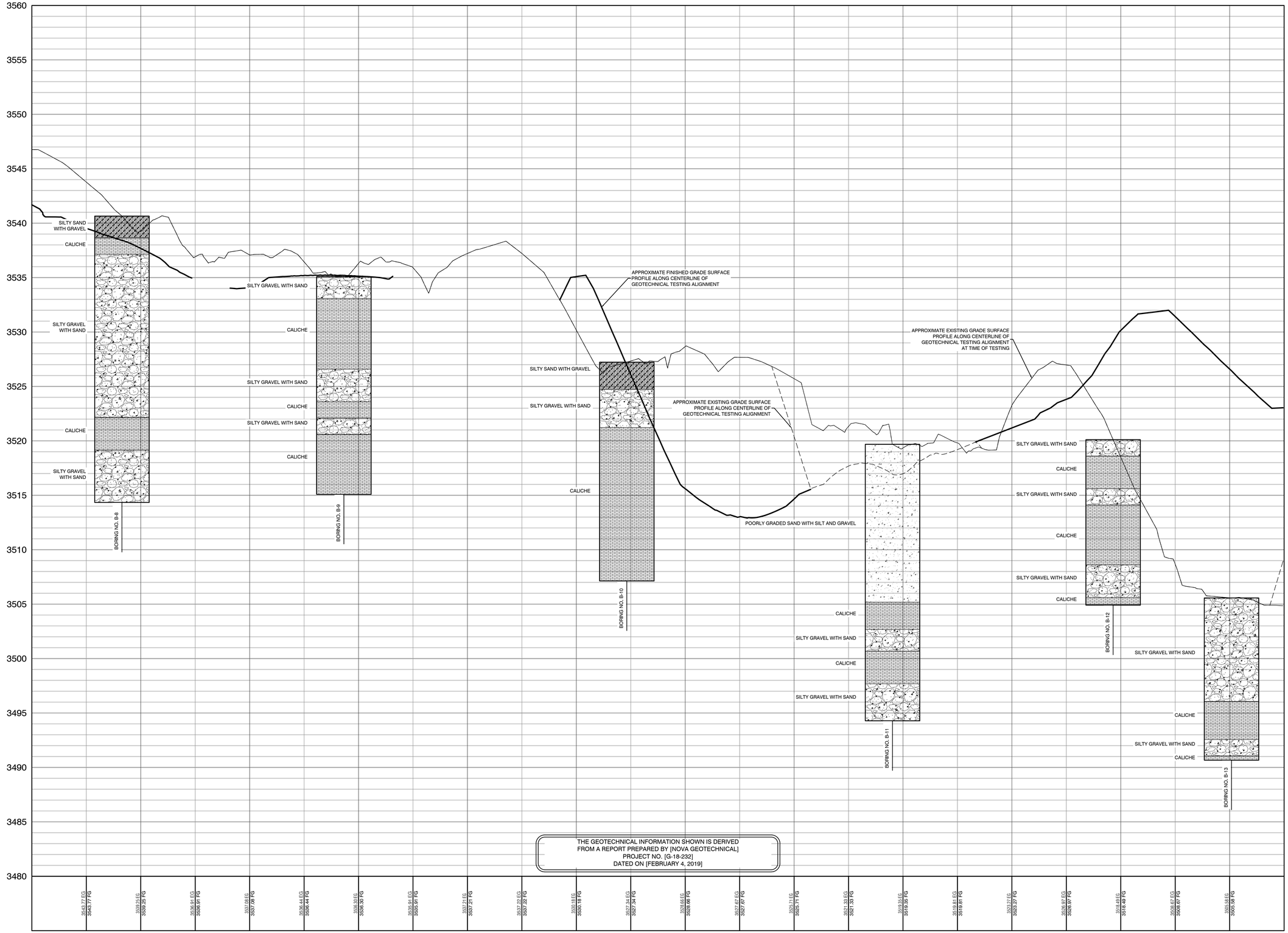

GEOTECHNICAL TESTING PROFILE ALIGNMENT NO. 3

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
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10845 GRIFFITH PEAK DRIVE, SUITE 160
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702-791-4000

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GEOTECHNICAL TESTING
ALIGNMENT NO. 3 PROFILE

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:
PLM	PLM	BR	7909.GPDB

FEB 19'
FEB 19'

SCALE: HORIZ. 1"=40' VERT. 1"=4'

PROFESSIONAL ENGINEER
STATE OF NEVADA
No. 15961
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
02/11/2020

SHEET
GT4
10 OF 35 SHEETS

DRAWING NO.

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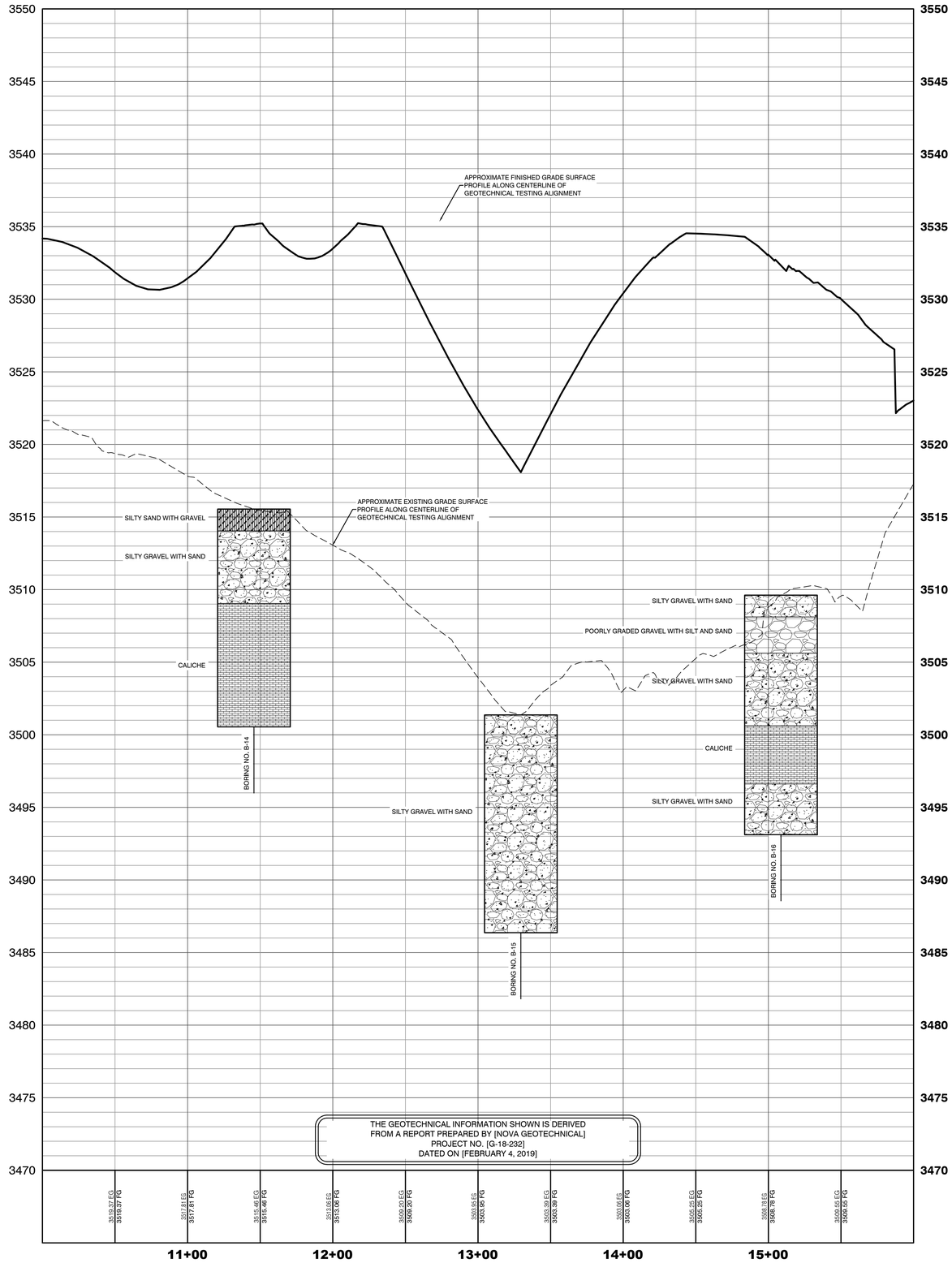

GEOTECHNICAL TESTING PROFILE ALIGNMENT NO. 4

PROFILE SCALES:
HORIZ. = N/A
VERT. = N/A

NORTH

REV	DATE	BY	REVISION

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702-791-4000

CITY OF LAS VEGAS

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GEOTECHNICAL TESTING ALIGNMENT NO. 4 PROFILE

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM — FEB 19
DESIGNED BY: PLM — FEB 19
CHECKED BY: BR — ---
PROJECT NO: 7909-GPDB
SCALE: HORIZ N/A, VERT N/A

PROFESSIONAL ENGINEER — BRIAN TROY RUIZ — EXP: 12/31/21 — CIVIL — No. 15967 — STATE OF NEVADA

02/11/2020

SHEET
GT5
11 OF 35 SHEETS

DRAWING NO.

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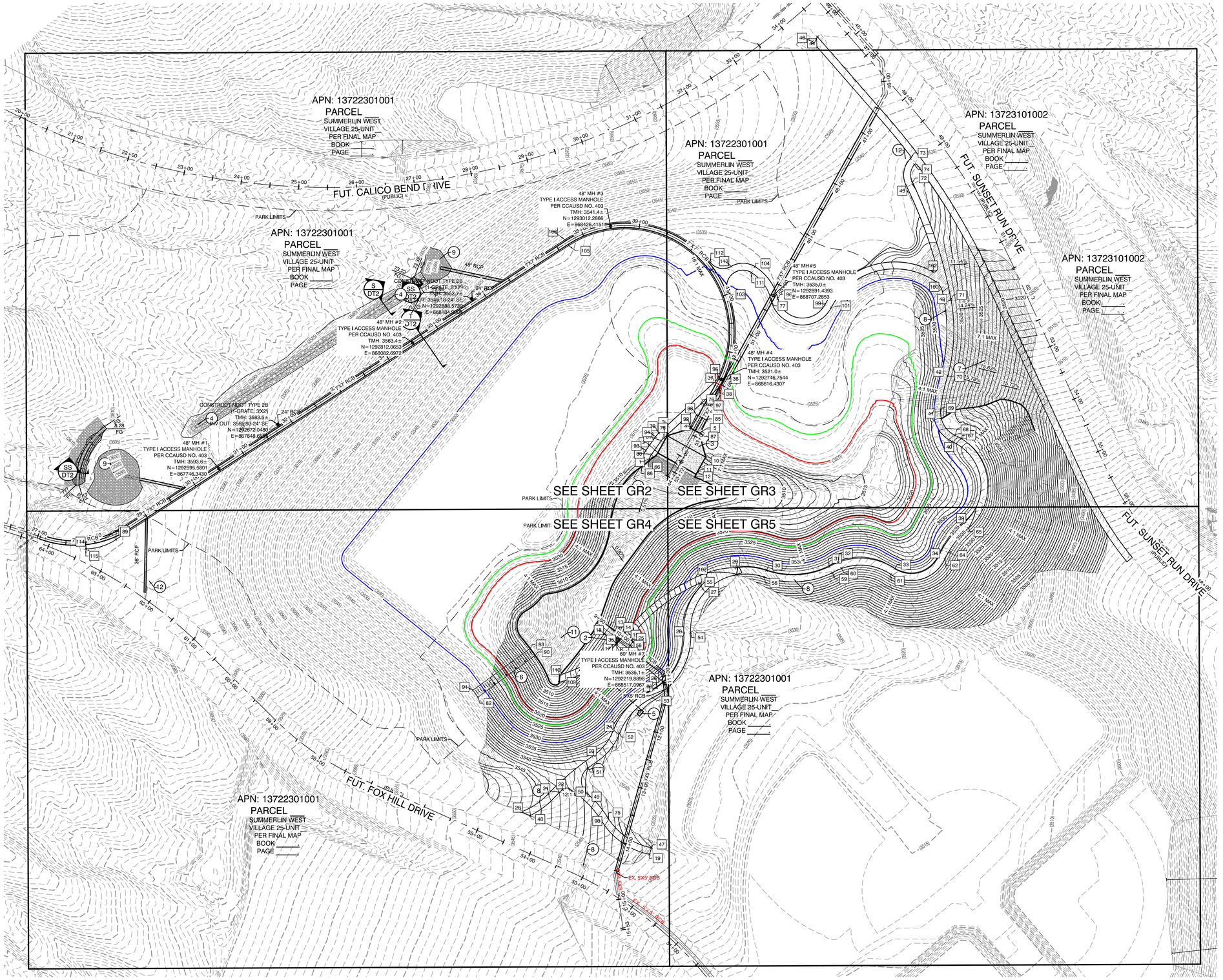

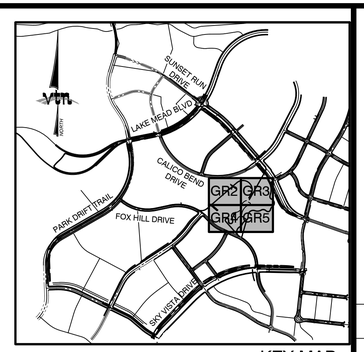

KEY MAP
N.T.S

GRAPHIC SCALE
80 0 40 80 160
1" = 80'

NORTH

CONSTRUCTION NOTES

1. TRASH RACK OUTLET STRUCTURE DETAILS D,E,F,G/DT1
2. STORM WATER QUALITY STRUCTURE DETAILS D,E,F,G/DT1
3. ENERGY DISSIPATION INLET STRUCTURE DETAILS I,K/DT2
4. RIPRAP, D50=1.5-FT, THK=3-FT
5. FLOOD CONTROL MONITORING STATION DETAIL SHEET DT4
6. CONCRETE DEPTH GAGE DETAIL O/DT2
7. EMERGENCY SPILLWAY DETAIL H/DT1
8. BASIN ACCESS ROAD DETAIL C/DT2
9. GROUTED RIPRAP, D50=12", THK=24" (MIN 6", MAX 18")
10. PROPOSED 3' VALLEY GUTTER PER DETAIL ON SHEET DT2
11. CONSTRUCT SEDIMENT DEPTH GAUGE PER DETAIL P/DT2
12. CONSTRUCT FLOOD WARNING SIGN PER DETAIL X,Y,Z/DT5

WATER SURFACE ELEVATION NOTES

- 10-YEAR at 3520.32
- 25-YEAR at 3523.36
- 100-YEAR at 3530.93

SEE SHEET "GR6" FOR DESIGN & CURVE DATA TABLE

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL. WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:

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

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702-791-4000

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REV	DATE	BY	REVISION

OVERALL GRADING PLAN

SUMMERLIN WEST VILLAGE 25 GRAND PARK DETENTION BASIN DETENTION BASIN PLANS

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ
PLM	PLM	BR	7809-GPDB	N/A	VERT: N/A

PROFESSIONAL ENGINEER
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
STATE OF NEVADA

02/11/2020

SHEET
GR1
12 OF 35 SHEETS

DRAWING NO.

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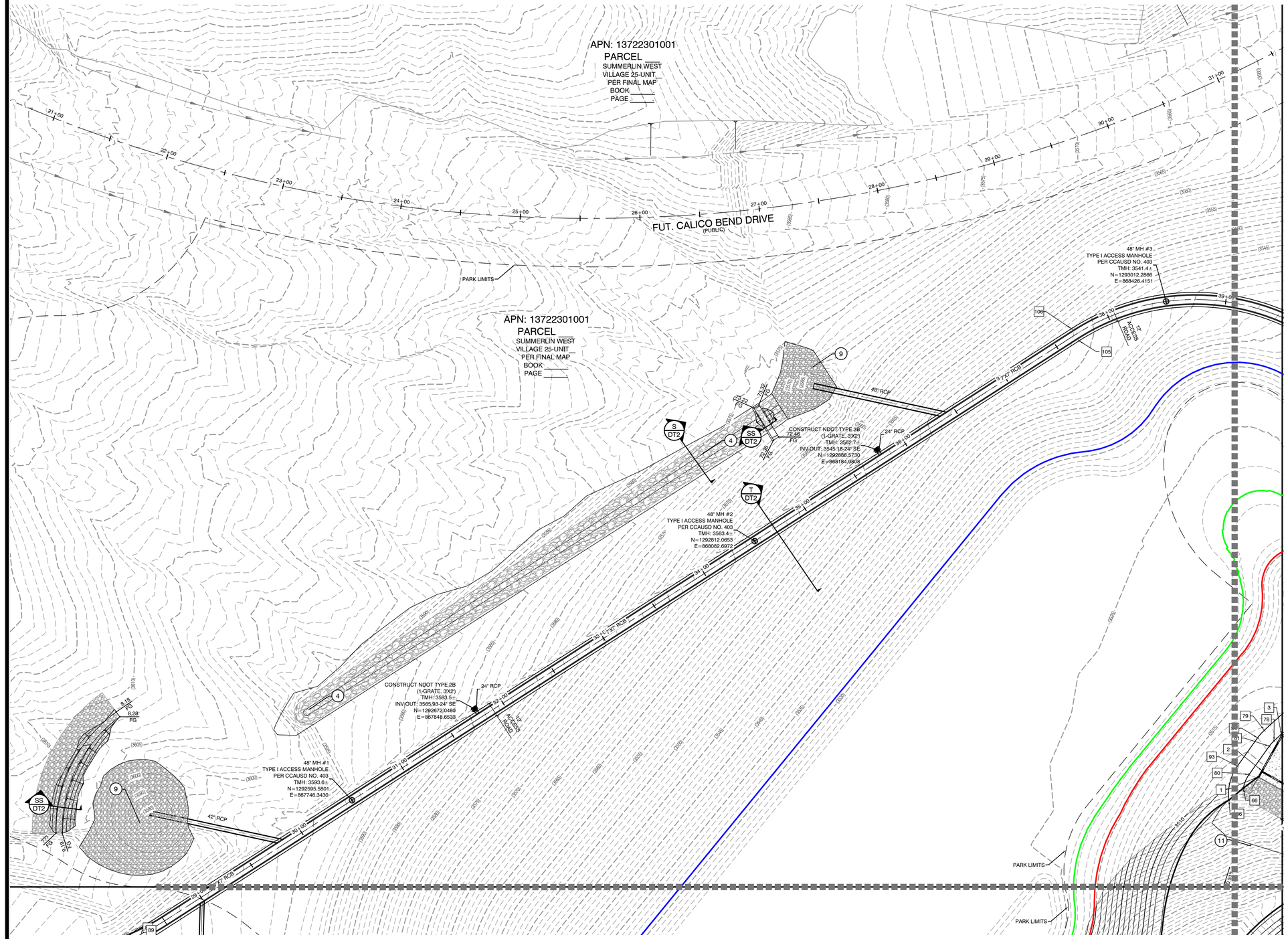

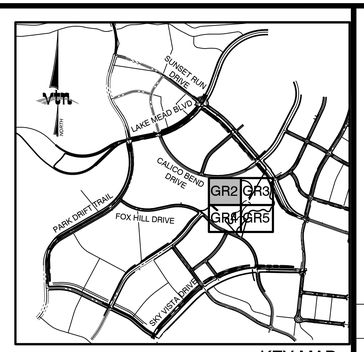

KEY MAP
N.T.S

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

NORTH

CONSTRUCTION NOTES

3. ENERGY DISSIPATION INLET STRUCTURE DETAILS I,K/DT2
4. RIPRAP, D50=1.5-FT, THK=3-FT
9. GROUTED RIPRAP, D50=12", THK=24" (MIN 6", MAX 18")
10. PROPOSED 3' VALLEY GUTTER PER DETAIL ON SHEET DT2
11. CONSTRUCT SEDIMENT DEPTH GAUGE PER DETAIL P/DT2

WATER SURFACE ELEVATION NOTES

10-YEAR at 3520.32
25-YEAR at 3523.36
100-YEAR at 3530.93

SEE SHEET "GR6" FOR DESIGN & CURVE DATA TABLE

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

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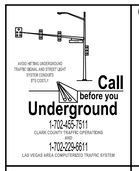

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REV	DATE	BY	REVISION

GEOTECHNICAL TESTING
PLAN VIEW

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: ---
DESIGNED BY: ---
CHECKED BY: BR
PROJECT NO: 7809.GPDB
SCALE: N/A (HORIZ.) N/A (VERT.)

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

02/11/2020

SHEET
GR2
13 OF 35 SHEETS

DRAWING NO.

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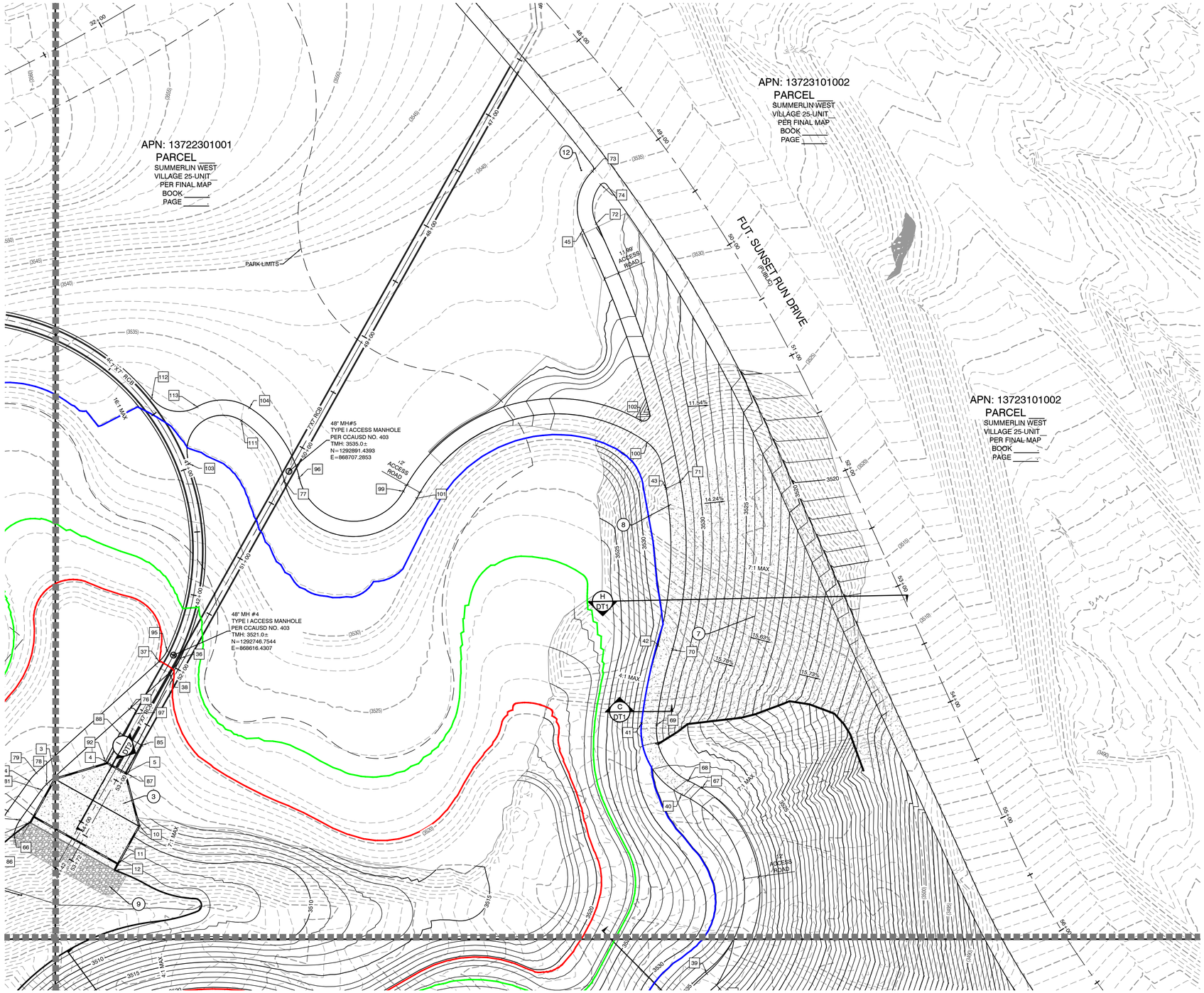

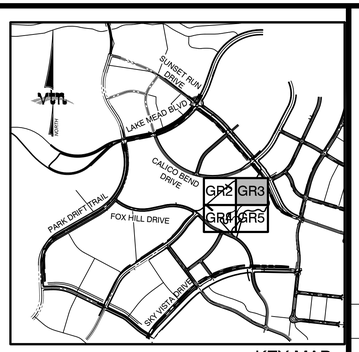

KEY MAP
N.T.S

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

NORTH

CONSTRUCTION NOTES

(3) ENERGY DISSIPATION INLET STRUCTURE DETAILS I,K/DT2
(4) RIPRAP, D50=1.5-FT, THK=3-FT
(7) EMERGENCY SPILLWAY DETAIL H/DT1
(8) BASIN ACCESS ROAD DETAIL C/DT2
(9) GROUTED RIPRAP, D50=12", THK=24" (MIN 6", MAX 18")
(12) CONSTRUCT FLOOD WARNING SIGN PER DETAIL X,Y,Z/DT5

WATER SURFACE ELEVATION NOTES

10-YEAR at 3520.32
25-YEAR at 3523.36
100-YEAR at 3530.93

SEE SHEET "GR6" FOR DESIGN & CURVE DATA TABLE

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

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REV	DATE	BY	REVISION

GRADING PLAN

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: ---
DESIGNED BY: ---
CHECKED BY: BR
PROJECT NO: 7809.GPDB
SCALE: HORIZ. N/A VERT. N/A

PROFESSIONAL ENGINEER
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
STATE OF NEVADA

02/11/2020

SHEET
GR3
14 OF 35 SHEETS

DRAWING NO.

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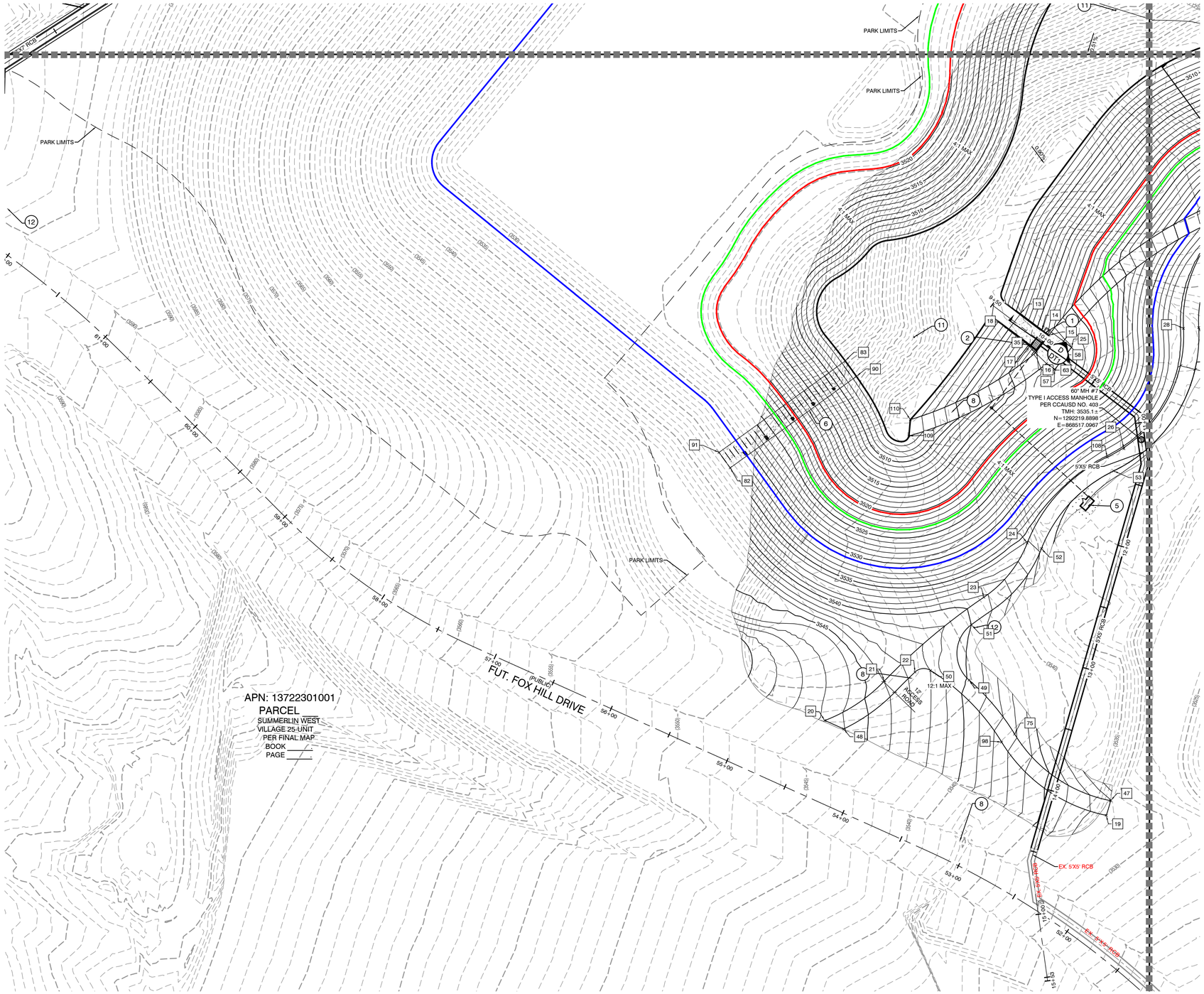
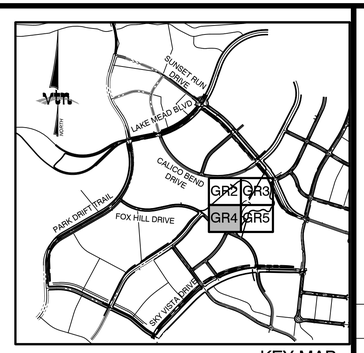
SEE SHEET GR2 FOR CONTINUATION



SEE SHEET GR5 FOR CONTINUATION



KEY MAP
N.T.S

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

NORTH

CONSTRUCTION NOTES

1. TRASH RACK OUTLET STRUCTURE DETAILS D,E,F,G/DT1
2. STORM WATER QUALITY STRUCTURE DETAILS D,E,F,G/DT1
5. FLOOD CONTROL MONITORING STATION DETAIL SHEET DT4
6. CONCRETE DEPTH GAGE DETAIL O/DT2
8. BASIN ACCESS ROAD DETAIL C/DT2
9. GROUTED RIPRAP, D50=12", THK=24" (MIN 6", MAX 18")
10. PROPOSED 3' VALLEY GUTTER PER DETAIL ON SHEET DT2
11. CONSTRUCT SEDIMENT DEPTH GAUGE PER DETAIL P/DT2
12. CONSTRUCT FLOOD WARNING SIGN PER DETAIL X,Y,Z/DT5

WATER SURFACE ELEVATION NOTES

- 10-YEAR at 3520.32
- 25-YEAR at 3523.36
- 100-YEAR at 3530.93

SEE SHEET "GR6" FOR DESIGN & CURVE DATA TABLE

UTILITY CROSSING NOTE:

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GRADING PLAN

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY:	---	SCALE:	HORIZ. N/A
DESIGNED BY:	---		VERT. N/A
CHECKED BY:	---		
BR			
PROJECT NO:			
7809.GPDB			

PROFESSIONAL ENGINEER
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
STATE OF NEVADA

02/11/2020

SHEET
GR4
15 OF 35 SHEETS

DRAWING NO.

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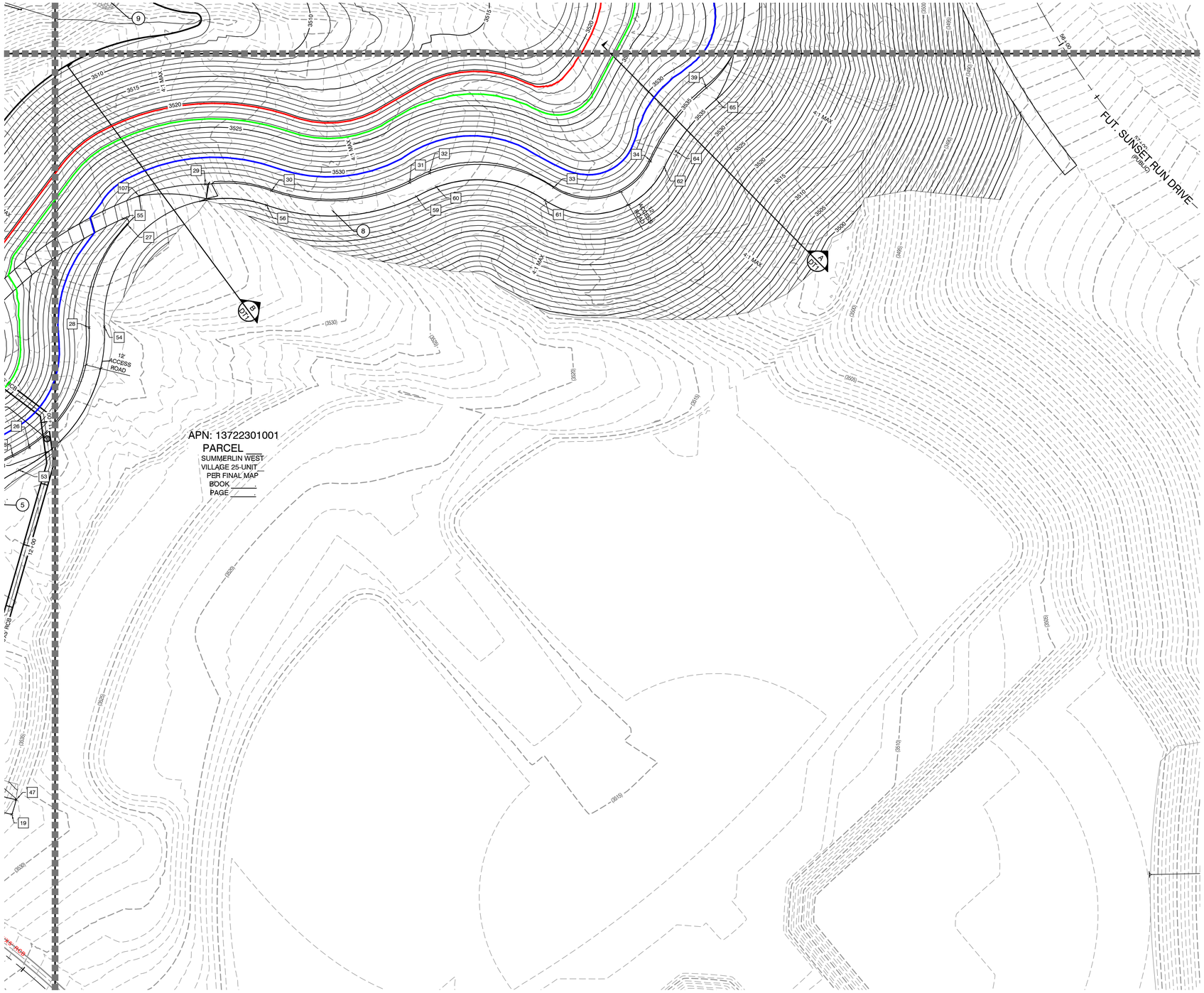
SEE SHEET GR3 FOR CONTINUATION

SEE SHEET GR4 FOR CONTINUATION



Point Table				
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2	3507.04	1292619.80	868507.09	GB / HINGE PT
3	3512.39	1292649.86	868522.80	GB / HINGE PT
4	3542.80	1292662.41	868564.19	GB / HINGE PT
5	3517.71	1292654.04	868579.09	GB / HINGE PT
10	3511.00	1292612.21	868589.84	GB / HINGE PT
11	3507.62	1292582.23	868572.01	GB / HINGE PT
12	3507.20	1292577.38	868570.44	GB / HINGE PT
13	3511.01	1292319.08	868422.04	GB / HINGE PT
14	3516.12	1292306.42	868438.79	GB / HINGE PT
15	3517.53	1292302.20	868444.38	GB / HINGE PT
16	3517.21	1292289.44	868434.73	GB / HINGE PT
17	3515.28	1292293.66	868429.14	GB / HINGE PT
18	3510.08	1292306.32	868412.39	GB / HINGE PT
19	3532.73	1291924.28	868489.46	GB / HINGE PT
20	3546.81	1291998.96	868267.99	GB / HINGE PT
21	3543.97	1292030.05	868314.90	GB / HINGE PT
22	3542.38	1292037.04	868338.95	GB / HINGE PT
23	3539.22	1292095.94	868393.16	GB / HINGE PT
24	3536.09	1292138.55	868427.28	GB / HINGE PT

Point Table				
Point #	Elevation	Northing	Easting	Description
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26	3535.22	1292212.81	868503.36	GB / HINGE PT
27	3535.20	1292388.41	868580.55	GB / HINGE PT
28	3535.24	1292307.45	868550.24	GB / HINGE PT
29	3534.76	1292420.31	868641.78	GB / HINGE PT
30	3535.24	1292415.19	868693.70	GB / HINGE PT
31	3535.22	1292421.49	868802.56	GB / HINGE PT
32	3535.19	1292429.00	868818.13	GB / HINGE PT
33	3535.24	1292417.67	868915.73	GB / HINGE PT
34	3535.24	1292438.71	868992.01	GB / HINGE PT
35	3517.17	1292288.18	868433.78	GB / HINGE PT
36	3538.58	1292744.37	868621.95	GB / HINGE PT
37	3539.44	1292741.71	868605.08	GB / HINGE PT
38	3539.04	1292732.82	868613.14	GB / HINGE PT
39	3535.24	1292496.13	869036.02	GB / HINGE PT
40	3531.87	1292637.07	869016.25	GB / HINGE PT
41	3531.26	1292693.08	868984.70	GB / HINGE PT
42	3531.26	1292754.64	868997.67	GB / HINGE PT
43	3534.76	1292877.96	869004.05	GB / HINGE PT
44	3550.86	1293338.97	868786.19	GB / HINGE PT

Point Table				
Point #	Elevation	Northing	Easting	Description
45	3527.23	1293081.05	868938.48	GB / HINGE PT
46	3551.30	1293331.11	868777.12	GB / HINGE PT
47	3532.10	1291935.83	868492.89	GB / HINGE PT
48	3546.04	1291992.29	868282.82	GB / HINGE PT
49	3539.91	1292030.67	868381.52	GB / HINGE PT
50	3542.00	1292038.29	868351.11	GB / HINGE PT
51	3540.00	1292074.26	868383.29	GB / HINGE PT
52	3535.85	1292134.17	868438.45	GB / HINGE PT
53	3535.00	1292195.34	868495.34	GB / HINGE PT
54	3535.00	1292308.09	868562.22	GB / HINGE PT
55	3533.46	1292393.25	868577.19	GB / HINGE PT
56	3535.00	1292403.86	868689.74	GB / HINGE PT
57	3517.55	1292274.98	868448.87	GB / HINGE PT
58	3517.83	1292297.44	868455.82	GB / HINGE PT
59	3535.00	1292410.69	868807.77	GB / HINGE PT
60	3535.02	1292418.19	868823.34	GB / HINGE PT
61	3535.00	1292407.73	868909.00	GB / HINGE PT
62	3535.00	1292433.63	869002.88	GB / HINGE PT
63	3517.38	1292279.81	868442.49	GB / HINGE PT
64	3534.48	1292446.32	869012.03	GB / HINGE PT

Point Table				
Point #	Elevation	Northing	Easting	Description
65	3535.00	1292486.95	869043.75	GB / HINGE PT
66	3520.91	1292605.78	868490.99	GB / HINGE PT
67	3533.01	1292642.58	869032.54	GB / HINGE PT
68	3532.10	1292647.89	869021.43	GB / HINGE PT
69	3531.50	1292691.84	868996.64	GB / HINGE PT
70	3531.50	1292751.23	869009.18	GB / HINGE PT
71	3535.13	1292883.24	869015.30	GB / HINGE PT
72	3525.40	1293086.48	868949.19	GB / HINGE PT
73	3528.44	1293127.66	868946.24	GB / HINGE PT
74	3526.67	1293117.15	868952.72	GB / HINGE PT
75	3537.17	1291988.21	868417.36	GP / HINGE PT
76	3539.89	1292704.29	868581.70	GP / HINGE PT
77	3532.82	1292883.73	868703.69	GP / HINGE PT
78	3515.73	1292645.19	868516.57	GP / HINGE PT
79	3536.95	1292654.08	868508.51	GP / HINGE PT
80	3531.88	1292617.13	868495.76	GP / HINGE PT
81	3525.25	1292640.72	868512.59	GP / HINGE PT
82	3556.54	1292197.71	868193.54	GP / HINGE PT
83	3506.39	1292281.85	868284.03	GP / HINGE PT
84	3607.26	1292483.34	867561.08	GP / HINGE PT

Point Table				
Point #	Elevation	Northing	Easting	Description
85	3542.37	1292675.66	868591.64	GP / HINGE PT
86	3507.00	1292595.68	868478.89	GP / HINGE PT
87	3519.73	1292653.34	868580.33	GP / HINGE PT
88	3542.88	1292685.46	868574.18	GP / HINGE PT
89	3606.49	1292473.31	867567.66	GP / HINGE PT
90	3506.37	1292269.70	868292.81	GP / HINGE PT
91	3559.44	1292209.85	868184.74	GP / HINGE PT
92	3545.61	1292663.14	868562.88	GP / HINGE PT
93	3545.05	1292624.10	868485.99	GP / HINGE PT
94	3535.95	1292647.69	868502.83	GP / HINGE PT
95	3539.45	1292750.12	868611.40	GP / HINGE PT
96	3531.31	1292886.39	868715.39	GP / HINGE PT
97	3539.55	1292700.71	868586.39	GP / HINGE PT
98	3537.41	1291981.95	868407.13	GP / HINGE PT
99	3523.27	1292875.75	868797.28	GB / RR
100	3535.13	1292914.11	868989.17	GB / RR
101	3522.36	1292870.19	868807.92	GB / RR
102	3535.24	1292931.59	868983.85	GB / RR
103	3538.28	1292897.52	868628.91	GB / RR
104	3522.69	1292941.49	868676.26	GB / RR

Point Table				
Point #	Elevation	Northing	Easting	Description
105	3571.83	1292979.40	868353.77	GB / RR
106	3573.30	1292989.49	868347.27	GB / RR
107	3535.00	1292411.16	868589.48	GP / HINGE PT
108	3535.24	1292206.16	868490.16	GP / HINGE PT
109	0.00	1292222.81	868334.12	GP / HINGE PT
110	3506.02	1292235.68	868335.32	GP / HINGE PT
111	3526.38	1292931.32	868669.89	GB / RR
112	3534.05	1292948.89	868599.26	GB / RR
113	3527.73	1292942.23	868635.04	GB / RR
114	3609.65	1292469.42	867515.76	GB / RR
115	3609.05	1292457.42	867515.85	GB / RR

CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	TANGENT
C1	101.53'	118°17'46"	209.63'	169.97'
C2	1000.00'	1°16'21"	22.21'	11.10'
C4	102.00'	29°44'33"	52.95'	27.09'
C6	89.54'	35°53'42"	56.10'	29.00'
C8	101.98'	64°30'46"	114.82'	64.36'
C10	95.00'	111°35'23"	185.02'	139.76'
C12	154.90'	43°47'38"	118.39'	62.26'
C14	75.00'	60°01'11"	78.57'	43.32'
C16	50.00'	105°55'19"	92.43'	66.26'
C18	75.00'	37°22'54"	48.93'	25.37'
C20	90.00'	120°11'16"	188.79'	156.48'
C22	43.96'	70°02'57"	53.75'	30.81'
C23	301.82'	11°32'28"	60.80'	30.50'
C24	300.16'	24°48'08"	129.93'	66.00'
C25	780.80'	14°20'25"	195.42'	98.22'
C26	350.45'	20°10'55"	123.44'	62.37'
C27	32.69'	78°55'33"	45.02'	26.91'
C28	113.53'	118°17'46"	234.41'	190.06'
C29	988.00'	1°16'21"	21.94'	10.97'
C31	90.00'	29°44'33"	46.72'	23.90'

CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	TANGENT
C33	101.54'	35°53'01"	63.59'	32.88'
C35	89.98'	64°30'46"	101.31'	56.79'
C37	107.00'	111°35'23"	208.39'	157.42'
C39	142.90'	43°47'38"	109.22'	57.44'
C41	87.00'	60°01'11"	91.14'	50.25'
C43	38.00'	105°55'19"	70.25'	50.36'
C45	87.00'	37°22'54"	56.76'	29.43'
C47	78.00'	120°11'16"	163.62'	135.61'
C49	55.96'	70°06'39"	68.48'	39.27'
C50	313.82'	11°30'22"	63.02'	31.62'
C51	288.16'	24°44'41"	124.45'	63.21'
C52	768.80'	14°20'44"	192.49'	96.75'
C53	338.45'	20°28'54"	120.99'	61.15'
C54	44.69'	81°26'27"	63.52'	38.46'
C55	28.00'	115°37'39"	56.51'	44.49'
C56	28.00'	122°42'47"	59.97'	51.26'
C57	56.18'	33°32'56"	32.90'	16.94'
C58	43.96'	61°40'29"	47.32'	26.24'
C59	70.34'	15°25'03"	18.93'	9.52'
C60	44.86'	74°37'06"	58.42'	34.18'

CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	TANGENT
C61	109.46'	28°11'27"	53.86'	27.49'
C62	45.04'	82°08'30"	64.57'	39.25'
C63	170.04'	18°38'38"	55.33'	27.91'
C64	182.46'	18°54'48"	60.23'	30.39'
C65	57.07'	81°39'40"	81.34'	49.31'
C66	97.46'	28°07'08"	47.83'	24.41'
C67	32.86'	74°37'06"	42.79'	25.04'
C68	58.34'	15°25'03"	15.70'	7.90'
C69	32.38'	61°01'55"	34.49'	19.08'
C70	44.18'	33°32'56"	25.87'	13.32'
C71	40.00'	129°16'49"	90.25'	84.38'
C72	40.00'	109°28'09"	76.42'	56.57'

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702-791-4000

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GRADING CONTROL DATA TABLES

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM
DESIGNED BY: PLM
CHECKED BY: BR
PROJECT NO: 7809.GPDB
FEB 19
FEB 19

SCALE: HORIZ. N/A VERT. N/A

PROFESSIONAL ENGINEER REGISTERED
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
STATE OF NEVADA

02/11/2020

SHEET
GR6
17 OF 35 SHEETS

DRAWING NO.

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APN: 13722301001
PARCEL
SUMMERLIN WEST
VILLAGE 25-UNIT
PER FINAL MAP
BOOK
PAGE

FUT. CALICO BEND DRIVE
(PUBLIC)

APN: 13723101002
PARCEL
SUMMERLIN WEST
VILLAGE 25-UNIT
PER FINAL MAP
BOOK
PAGE

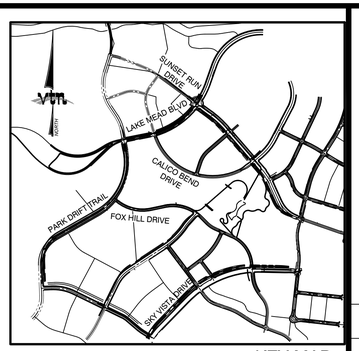
FUT. SUNSET RUN DRIVE
(PUBLIC)

APN: 13722301001
PARCEL
SUMMERLIN WEST
VILLAGE 25-UNIT
PER FINAL MAP
BOOK
PAGE

APN: 13723101002
PARCEL
SUMMERLIN WEST
VILLAGE 25-UNIT
PER FINAL MAP
BOOK
PAGE

APN: 13722301001
PARCEL
SUMMERLIN WEST
VILLAGE 25-UNIT
PER FINAL MAP
BOOK
PAGE

FUT. FOX HILL DRIVE
(PUBLIC)



KEY MAP
N.T.S

NORTH

GRAPHIC SCALE
80 0 40 80 160
1" = 80'

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

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AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

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CALL BEFORE YOU DO OVERHEAD
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CROSS-SECTION PLAN VIEW

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM — FEB 19'
DESIGNED BY: PLM — FEB 19'
CHECKED BY: BR — ---
PROJECT NO: 7609-GPDB
SCALE: 1"=80' HORIZ. N/A VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
No. 15967
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL

02/11/2020

SHEET
XS1
18 OF 35 SHEETS

DRAWING NO.

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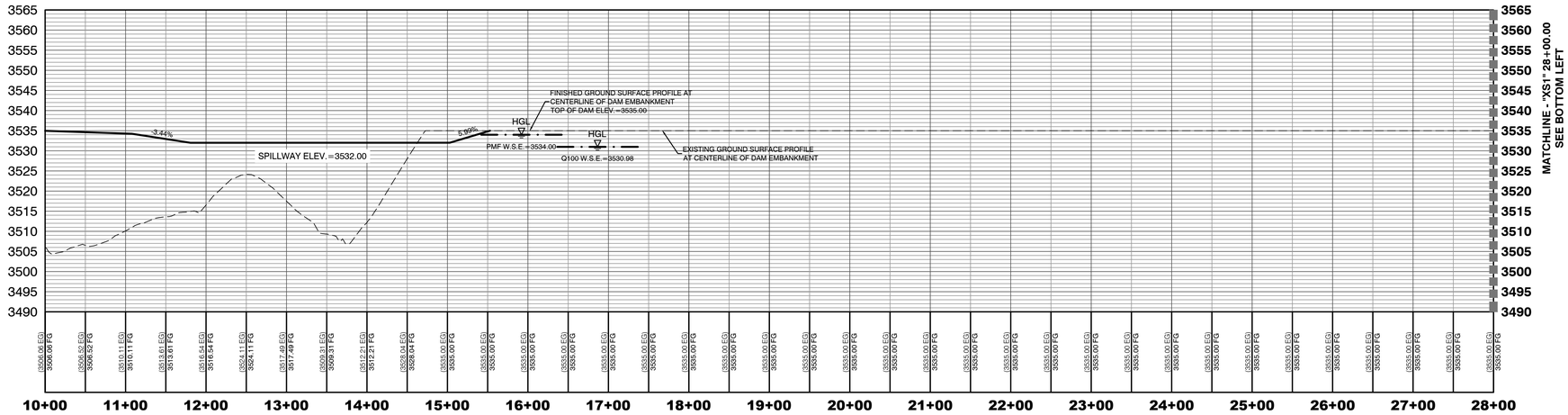
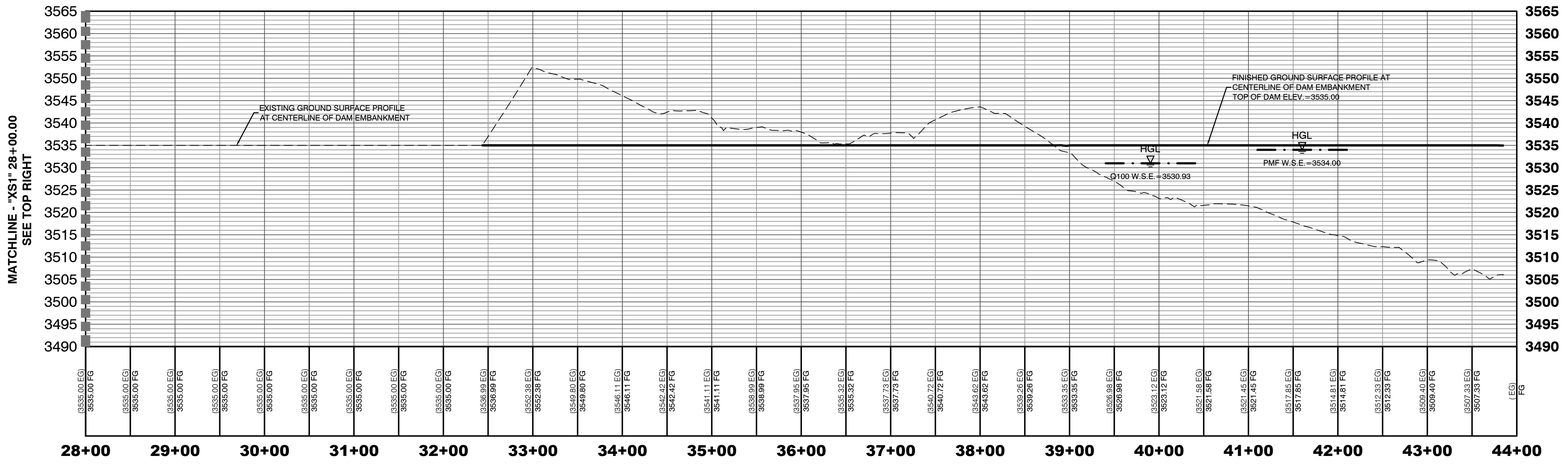


DAM EMBANKMENT CENTERLINE PROFILE (ALIGNMENT "XS1")



DAM EMBANKMENT CENTERLINE PROFILE (ALIGNMENT "XS1")

GRAPHIC SCALE

80 0 40 80 160

1" = 80'

UTILITY CROSSING NOTE:

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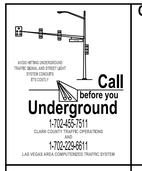

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AND
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BASIN CROSS SECTION XS1

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM — FEB 19'
DESIGNED BY: PLM — FEB 19'
CHECKED BY: BR — ----
PROJECT NO: 7809.GPDB
SCALE: HORIZ. 1"=80' VERT. 1"=16'

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BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

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SHEET
XS2
19 OF 35 SHEETS

DRAWING NO.

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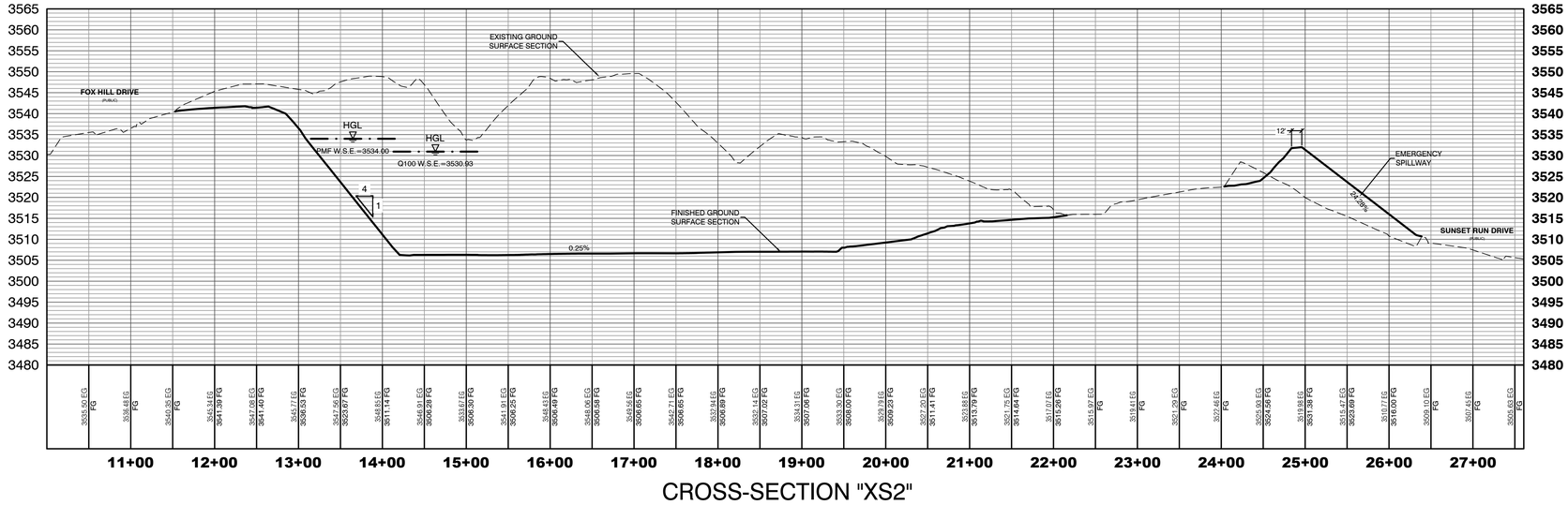
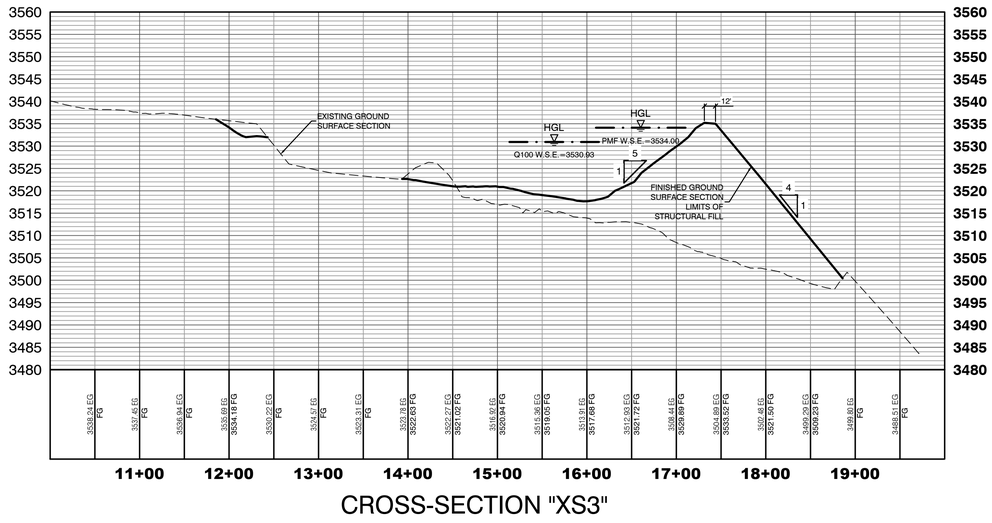


CROSS-SECTION "XS2"



CROSS-SECTION "XS3"

GRAPHIC SCALE

80 0 40 80 160

1" = 80'

UTILITY CROSSING NOTE:

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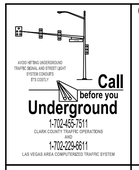

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BASIN CROSS SECTION XS2 & XS3

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM — FEB 19'
DESIGNED BY: PLM — FEB 19'
CHECKED BY: BR — ----
PROJECT NO: 7809.GPDB
SCALE: HORIZ. 1"=80' VERT. 1"=16'

PROFESSIONAL ENGINEER — STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

02/11/2020

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XS3
20 OF **35** SHEETS

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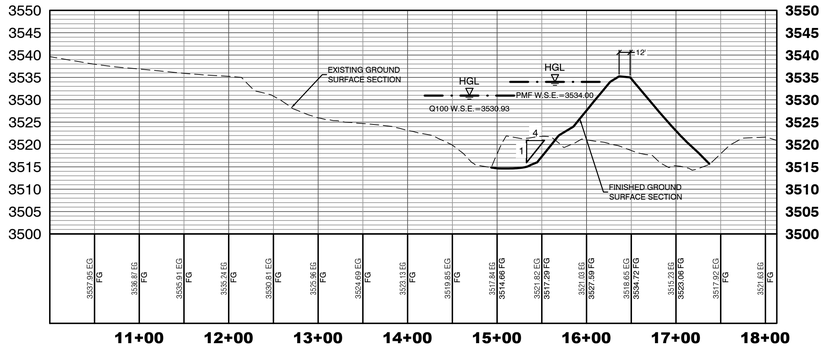
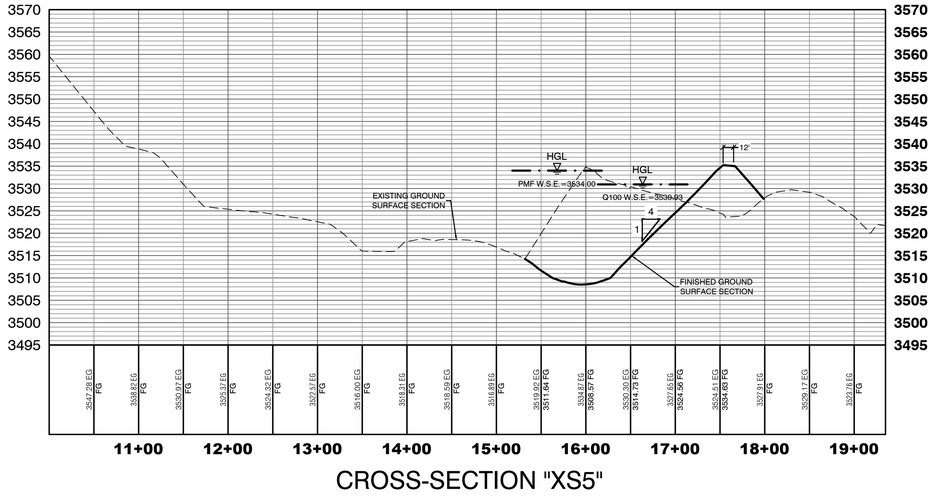


CROSS-SECTION "XS4"



CROSS-SECTION "XS5"

GRAPHIC SCALE

80 0 40 80 160

1" = 80'

UTILITY CROSSING NOTE:

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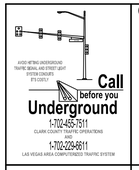

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BASIN CROSS SECTION XS4 & XS5

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM	FEB 19		HORIZ. 1"=80'
DESIGNED BY: PLM	FEB 19		VERT. 1"=16'
CHECKED BY: BR			SCALE:
PROJECT NO: 7809.GPDB			

02/11/2020

SHEET
XS4
21 OF **35** SHEETS

DRAWING NO.

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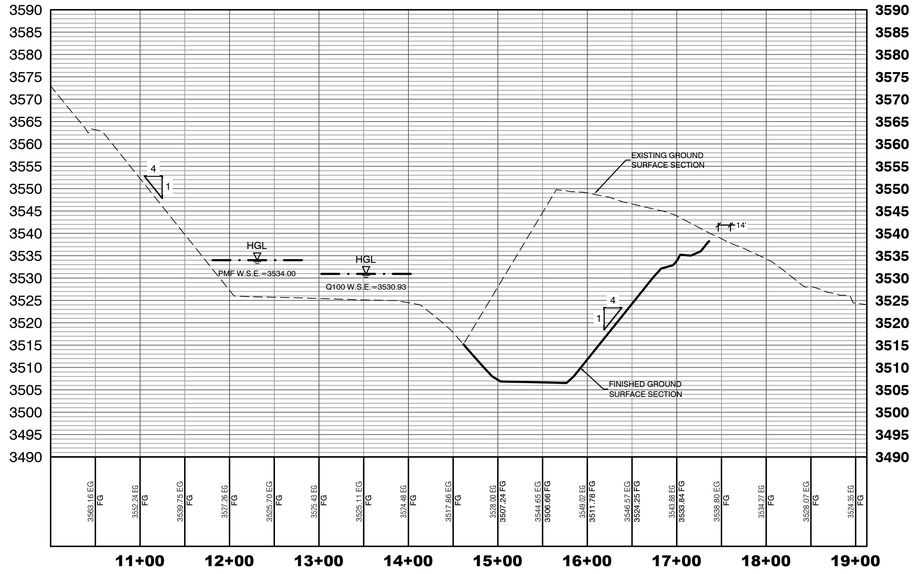
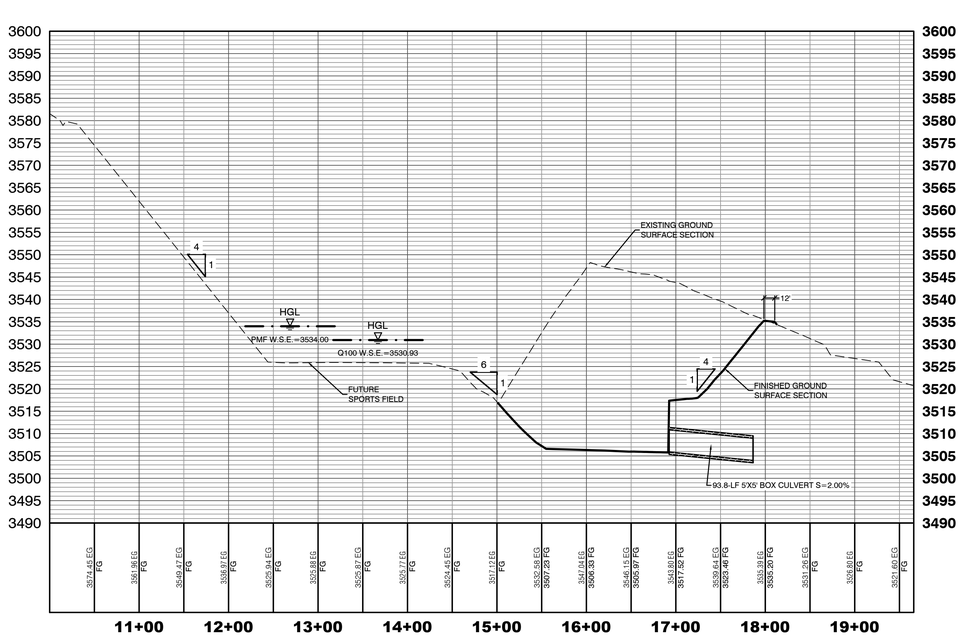


CROSS-SECTION "XS6"



CROSS-SECTION "XS7"

GRAPHIC SCALE

80 0 40 80 160

1" = 80'

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL. WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:

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

Call before you Dig

Avoid cutting underground utility lines. It's costly.

CALL 811 OR 1-800-227-2600 AND 1-702-455-6000 CLARK COUNTY TRAFFIC OPERATIONS

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

BASIN CROSS SECTION XS6 & XS7

SUMMERLIN WEST VILLAGE 25 GRAND PARK DETENTION BASIN DETENTION BASIN PLANS

DRAWN BY: PLM	FEB '19	SCALE:	HORIZ 1"=80'
DESIGNED BY: PLM	FEB '19		VERT 1"=16'
CHECKED BY: BR			
PROJECT NO: 7809.GPDB			

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15961

02/11/2020

SHEET
XS5
22 OF 35 SHEETS

DRAWING NO.

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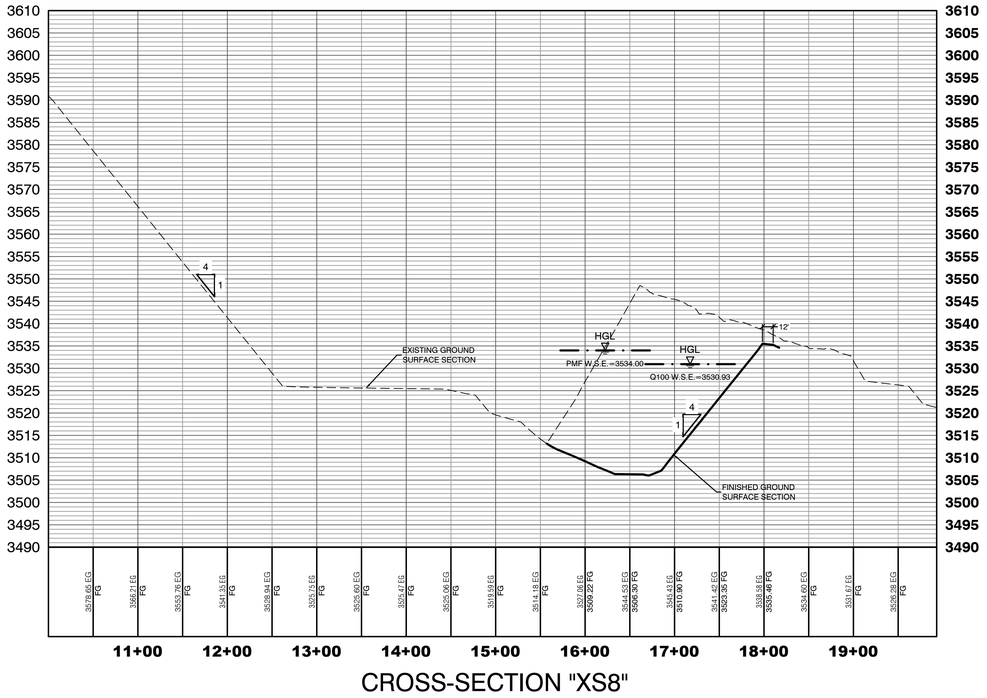

CROSS-SECTION "XS8"

GRAPHIC SCALE

80 0 40 80 160

1" = 80'

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:

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REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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BASIN CROSS SECTION XS8

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
PLM	PLM	BR	7809.GPDB	HORIZ. 1"=80' VERT. 1"=16'
FEB '19	FEB '19	----		

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

02/11/2020

SHEET
XS6
23 OF **35** SHEETS

DRAWING NO.

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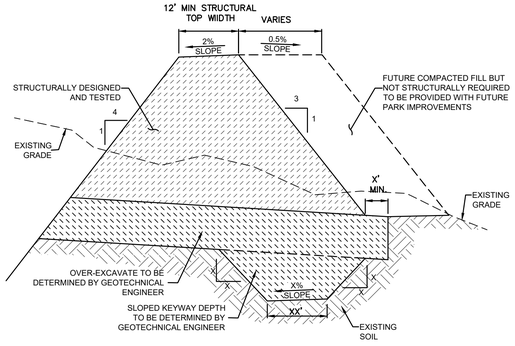
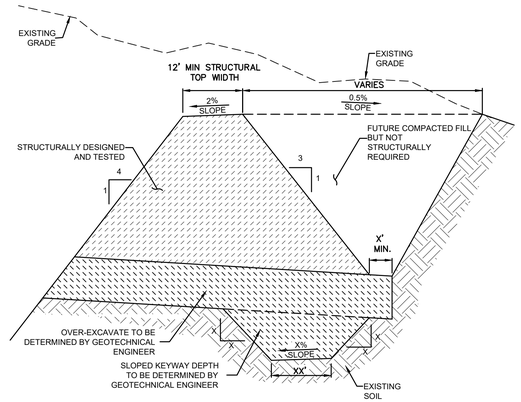
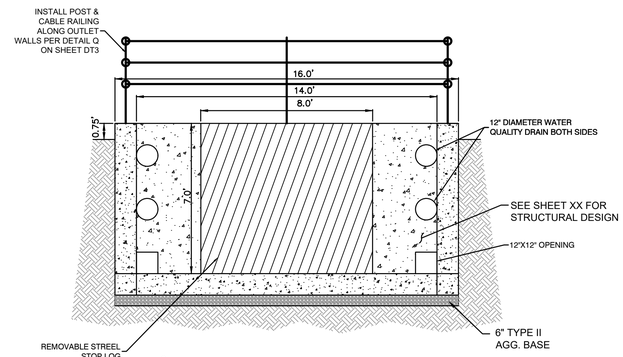


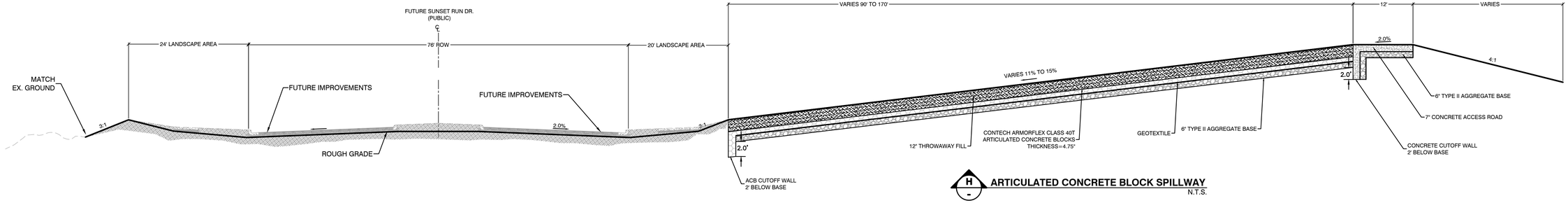
A **STRUCTURAL DAM SECTION ABOVE EXISTING GRADE**
N.T.S.



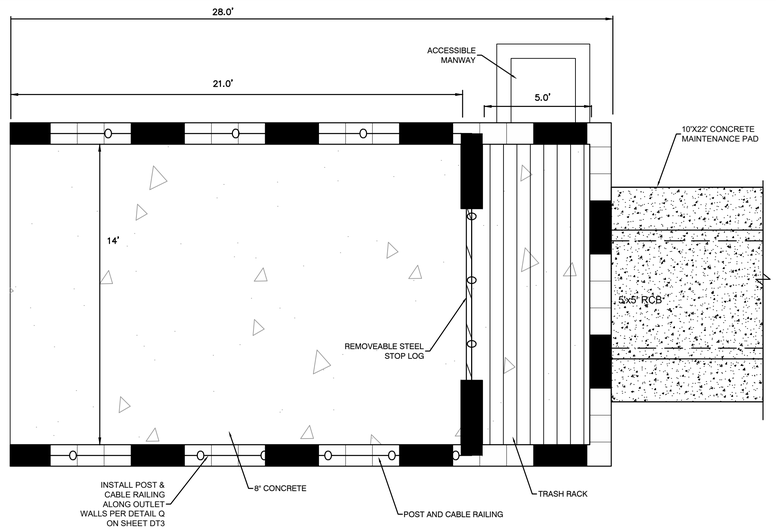
B **STRUCTURAL DAM SECTION BELOW EXISTING GRADE**
N.T.S.



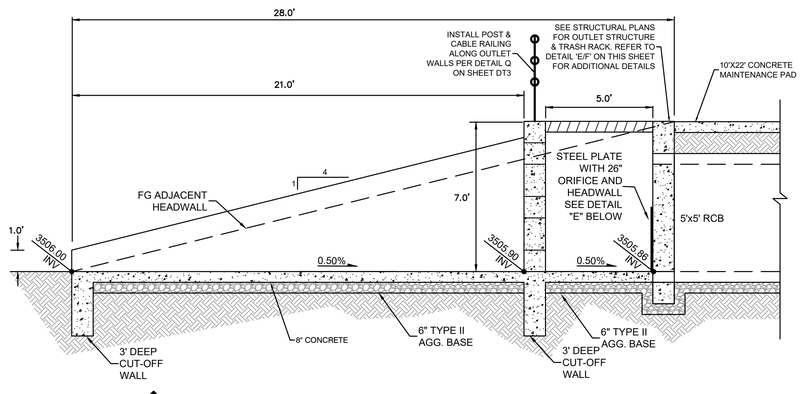
F **SWQ STEEL GATE HEADWALL SECTION**
N.T.S.



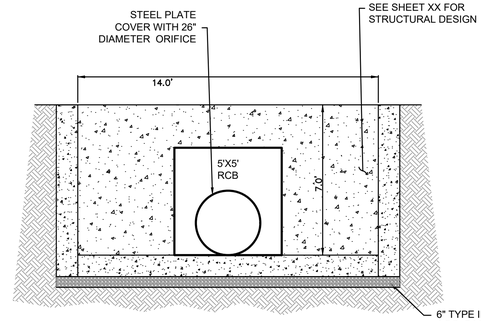
H **ARTICULATED CONCRETE BLOCK SPILLWAY**
N.T.S.



G **SWQ STRUCTURE AND 5'X5' RCB TRASH RACK PLAN**
N.T.S.



D **SWQ STRUCTURE AND 5'X5' RCB TRASH RACK ELEVATION**
N.T.S.



E **5'X5' RCB OUTLET HEADWALL SECTION**
N.T.S.

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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DETAIL SHEET

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	HORIZ.
PLM FEB 19'	PLM FEB 19'	BR	N/A	VERT. N/A

PROJECT NO: 7909.GPDB

PROFESSIONAL ENGINEER — STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15961

02/11/2020

SHEET
DT1
24 OF **35** SHEETS

DRAWING NO.

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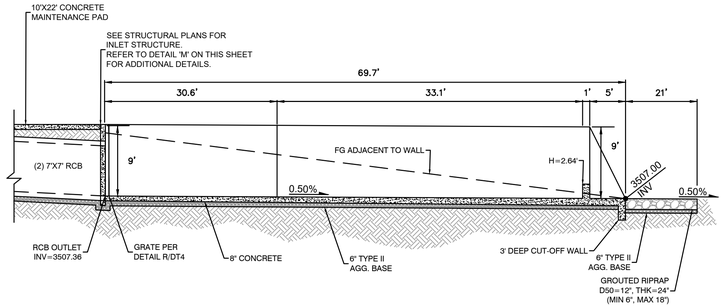
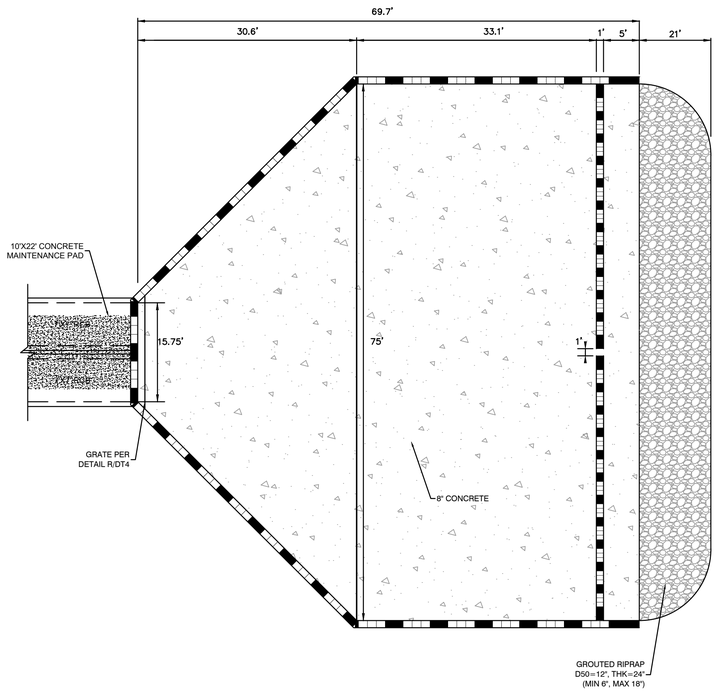
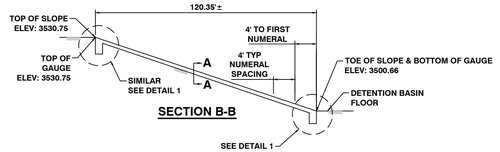


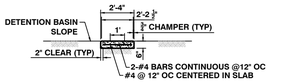
I - **(2) 7'X7' RCB INLET WEIR ENERGY DISSIPATION STRUCTURE ELEVATION**
N.T.S.



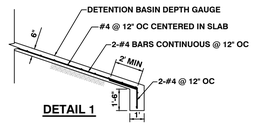
K - **(2) 7'X7' RCB INLET WEIR ENERGY DISSIPATION STRUCTURE PLAN**
N.T.S.



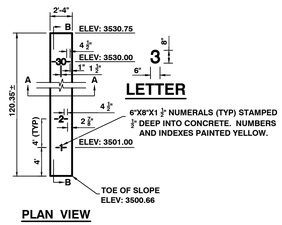
SECTION B-B



SECTION A-A

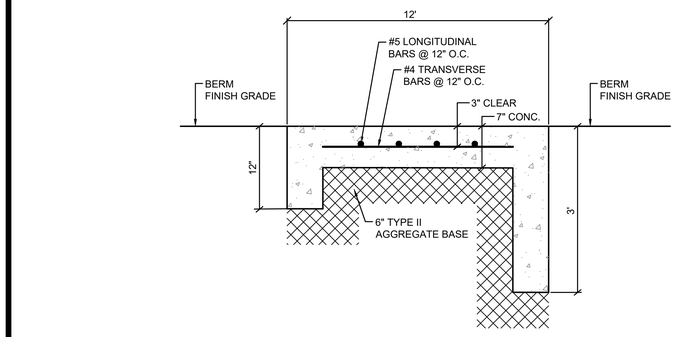


DETAIL 1

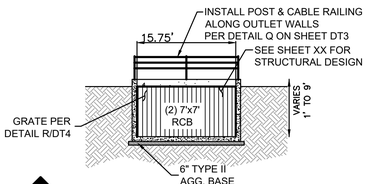


PLAN VIEW

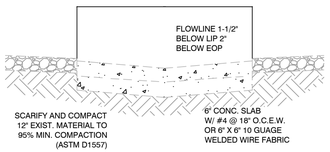
O - **CONCRETE EMBANKMENT DEPTH GAUGE**
N.T.S.



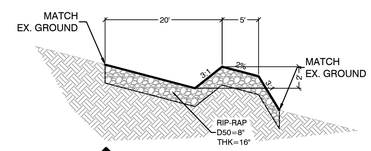
C - **CONCRETE ACCESS ROAD DETAIL**
N.T.S.



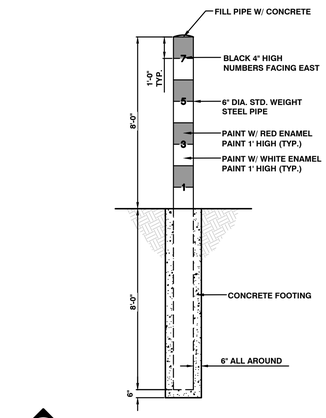
M - **(2) 7'x7' RCB OUTLET HEADWALL SECTION**
N.T.S.



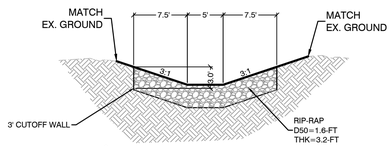
36" WIDE VALLEY GUTTER
NTS



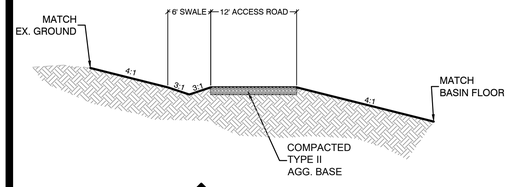
SS - **SEDIMENT BERM**
N.T.S.



P - **SEDIMENT DEPTH GAUGE DETAIL**
N.T.S.



S - **CHANNEL SECTION**
N.T.S.



T - **ACCESS ROAD SECTION**
N.T.S.

REVISION | BY | DATE | REV

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

DETAIL SHEET

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM	FEB 19'	SCALE:	HORIZ. N/A
DESIGNED BY: PLM	FEB 19'		VERT. N/A
CHECKED BY: BR	---		
PROJECT NO: 7809.GPDB	---		

PROFESSIONAL ENGINEER
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
STATE OF NEVADA

02/11/2020

SHEET
DT2
25 OF 35 SHEETS

DRAWING NO.

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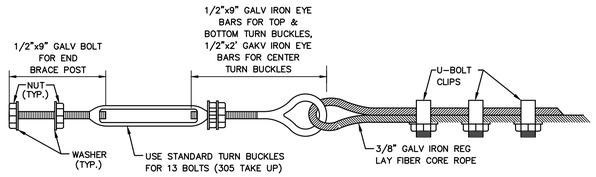
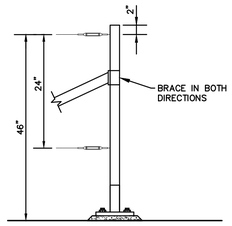
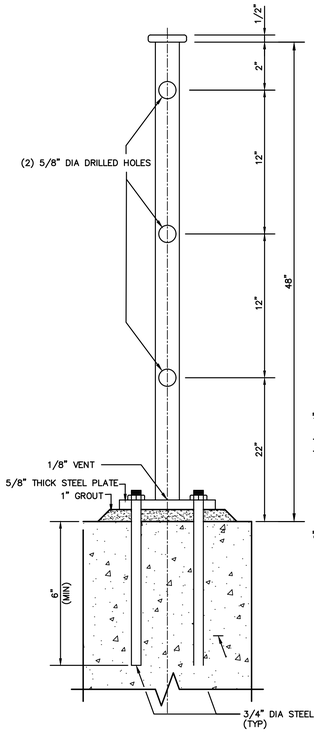


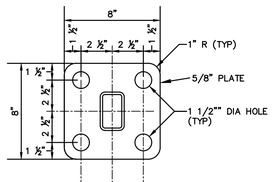
Q1 - TURN BUCKLE N.T.S.

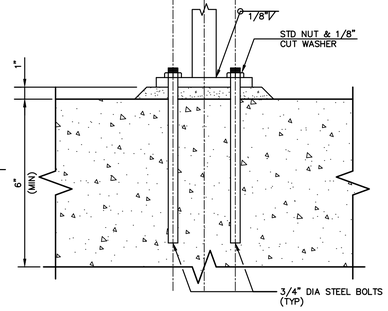


Q2 - ANGLE POST N.T.S.

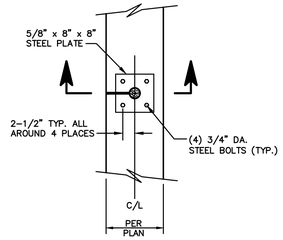


NOTE:
ALL METAL PARTS OF THE HANDRAIL SHOULD BE GALVANIZED STEEL

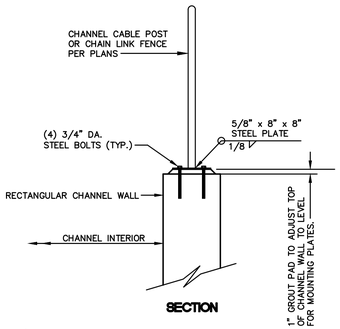




Q3 - POST MOUNTING N.T.S.



PLAN VIEW



SECTION

Q4 - WALL POST & FENCE MOUNTING DETAIL N.T.S.

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

DETAIL SHEET

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM	FEB 19'	SCALE:	HORIZ. N/A
DESIGNED BY: PLM	FEB 19'		VERT. N/A
CHECKED BY: BR	----		
PROJECT NO: 7809-GPDB			

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

02/11/2020

SHEET
DT3
26 OF **35** SHEETS

DRAWING NO.

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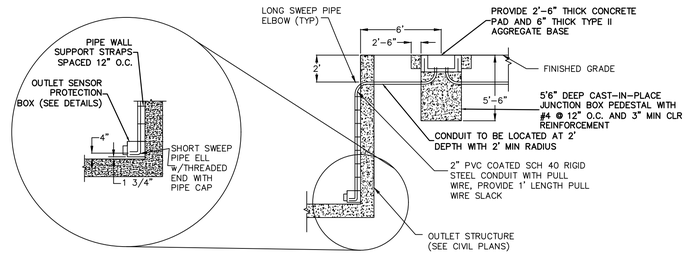
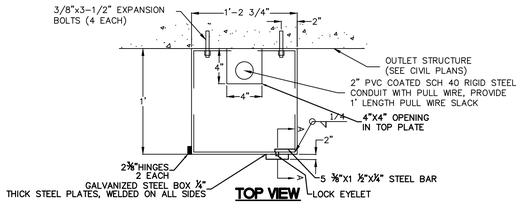


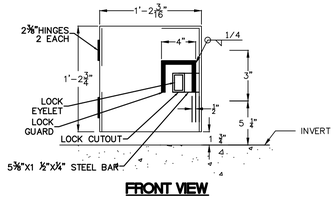
SIDE VIEW

NOTES:

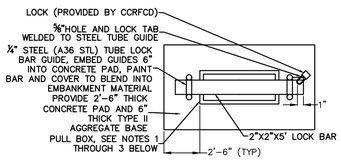
1. GROUT AROUND ALL PIPE OPENINGS.



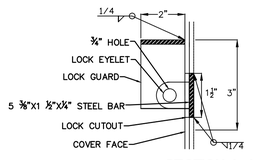
TOP VIEW



FRONT VIEW



PULL BOX



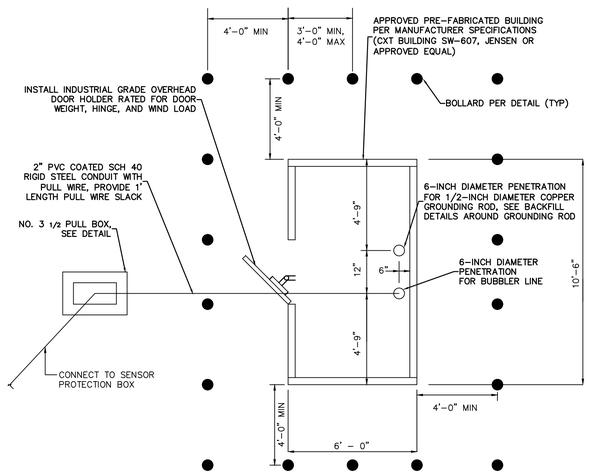
SECTION A-A

NOTES:

1. INSTALL STANDARD NO. 3 ½ PULL BOX PER USDCCA STD DWG NO. 705. PROVIDE CAST IRON COVER.
2. PULL BOXES TO BE PLACED AT INTERVALS NOT TO EXCEED 100 FEET BETWEEN GAUGING VAULT AND OUTLET STRUCTURE.
3. PULL BOX LID TO BE STAMPED "IRRIGATION".

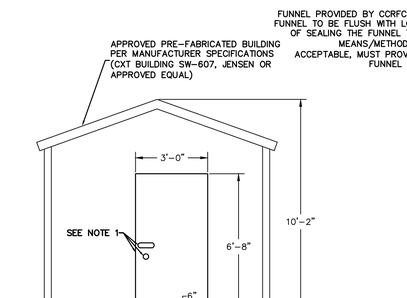
OUTLET STRUCTURE SENSOR PROTECTION BOX

N.T.S.



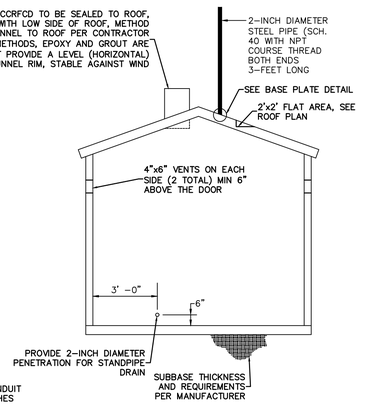
FLOOD CONTROL MONITORING STATION

N.T.S.



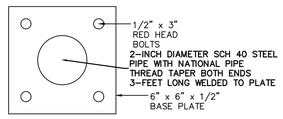
FRONT OF BUILDING

N.T.S.



BACK OF BUILDING

N.T.S.

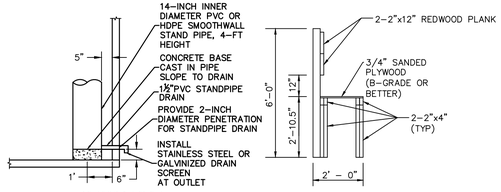


BASE PLATE DETAIL

N.T.S.

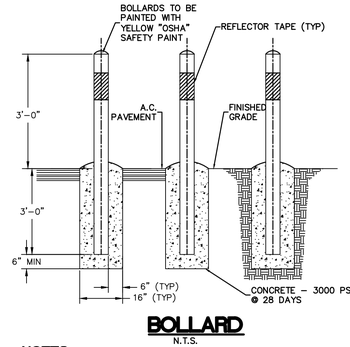
NOTES:

1. INSTALL DEAD BOLT, DOOR STROP, DOOR SWEEP, AND LOCKSET PER PRE-FABRICATED BUILDING MANUFACTURER SPECIFICATIONS OR APPROVED EQUAL.



STAND PIPE

SECTION B-B

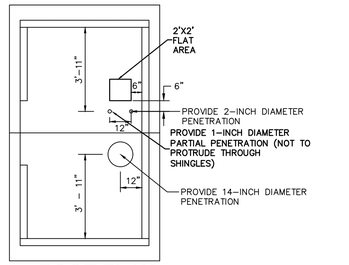


BOLLARD

N.T.S.

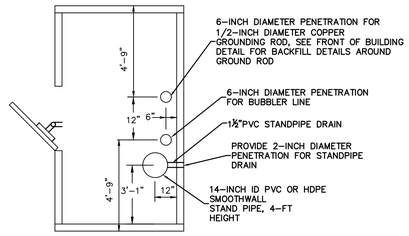
NOTES:

1. BOLLARD TO BE 4" SCH 40 STEEL PIPE, 6'-0" LONG AND FILLED WITH CONCRETE.
2. PLACE 6" WIDE, YELLOW CLASS 4 REFLECTIVE TAPE (PER STANDARD SPECIFICATIONS, SECTION 716), 4" DOWN FROM TOP, FOR FULL DIAMETER ON ALL BOLLARDS.



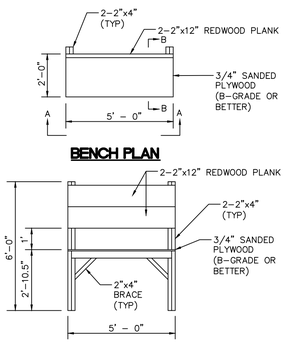
ROOF PLAN

N.T.S.



FLOOR PLAN

N.T.S.



BENCH PLAN

SECTION A-A

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

DETAIL SHEET

SUMMERLIN WEST VILLAGE 25 GRAND PARK DETENTION BASIN DETENTION BASIN PLANS

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	HORIZ.
PLM	PLM	BR	N/A	VERT.
FEB 19'	FEB 19'	---	N/A	

PROJECT NO: 7809.GPDB

PROFESSIONAL ENGINEER — STATE OF NEVADA — BRIAN TROY RUIZ — EXP: 12/31/21 — CIVIL — No. 15961

02/11/2020

SHEET
DT4
27 OF **35** SHEETS

DRAWING NO.

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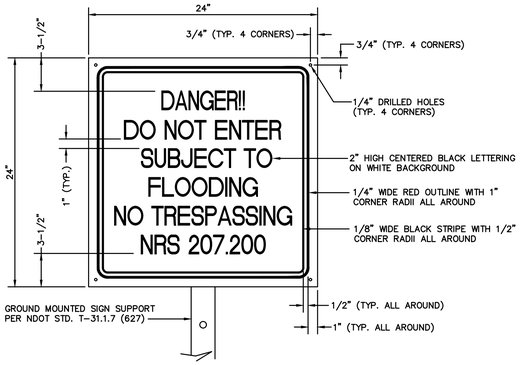
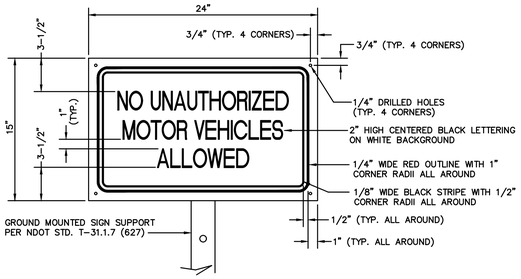


TYPE "A"

NOTE:
1. DIMENSIONS FOR SPANISH SIGN ARE SIMILAR TO ENGLISH VERSION.

TYPE "A" (SPANISH)

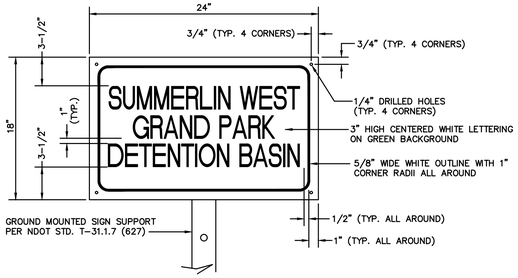


TYPE "B"

NOTE:
1. DIMENSIONS FOR SPANISH SIGN ARE SIMILAR TO ENGLISH VERSION.

TYPE "B" (SPANISH)

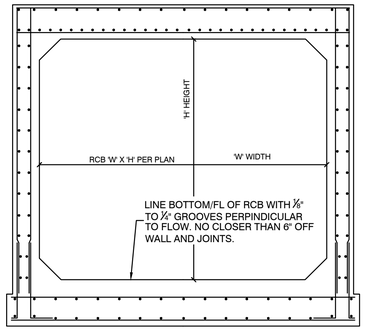
X **FLOOD WARNING SIGN DETAILS**
N.T.S.



SUMMERLIN WEST GRAND PARK DETENTION BASIN

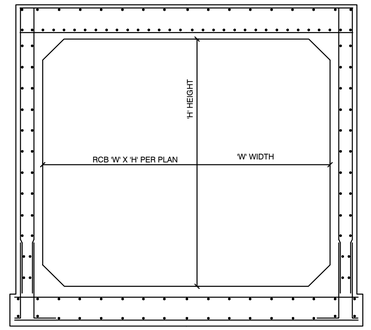
Y **DETENTION BASIN IDENTIFICATION SIGN DETAILS**
N.T.S.

Z **WARNING SIGN - DETENTION BASIN DETAIL**
N.T.S.



(ALL REINFORCEMENT JOINTS TO BE BY MANUFACTURER)

V **RCB ADDITIONAL BASE CONCRETE - 5" CLR**
N.T.S. (NOT INTENDED FOR CONSTRUCTION PURPOSES)



(ALL REINFORCEMENT JOINTS TO BE BY MANUFACTURER)

W **RCB ADDITIONAL BASE CONCRETE - 3" CLR**
N.T.S. (NOT INTENDED FOR CONSTRUCTION PURPOSES)

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
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DETAIL SHEET

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM	FEB 19'	SCALE:	HORIZ. N/A
DESIGNED BY: PLM	FEB 19'		VERT. N/A
CHECKED BY: BR	---		
PROJECT NO: 7809.GPDB			

PROFESSIONAL ENGINEER REGISTERED
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
STATE OF NEVADA

02/11/2020

SHEET
DT5
28 OF **35** SHEETS

DRAWING NO.

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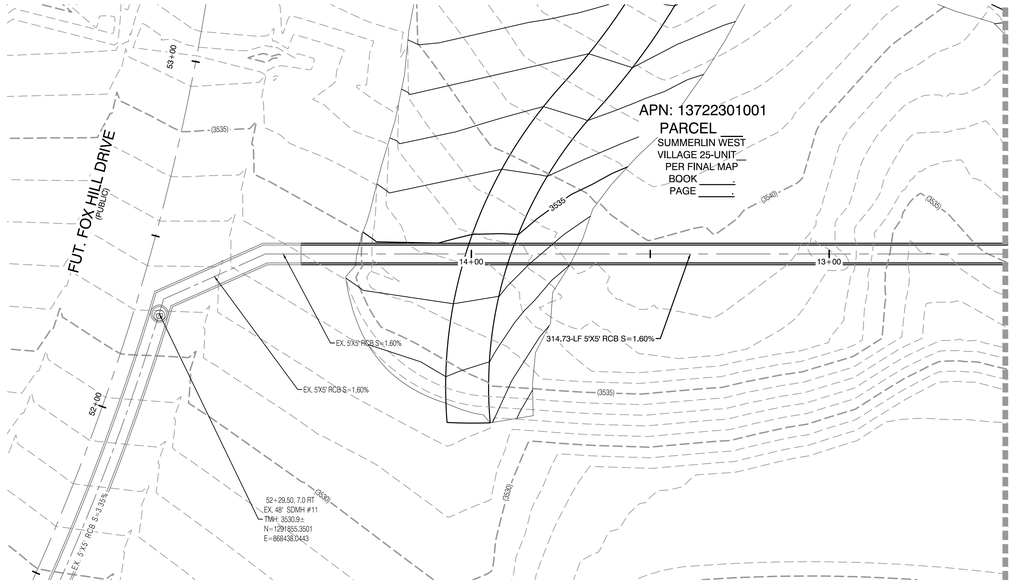
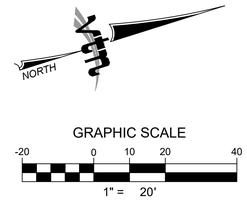
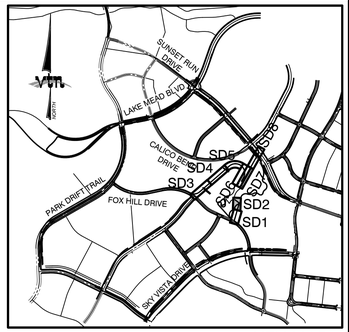




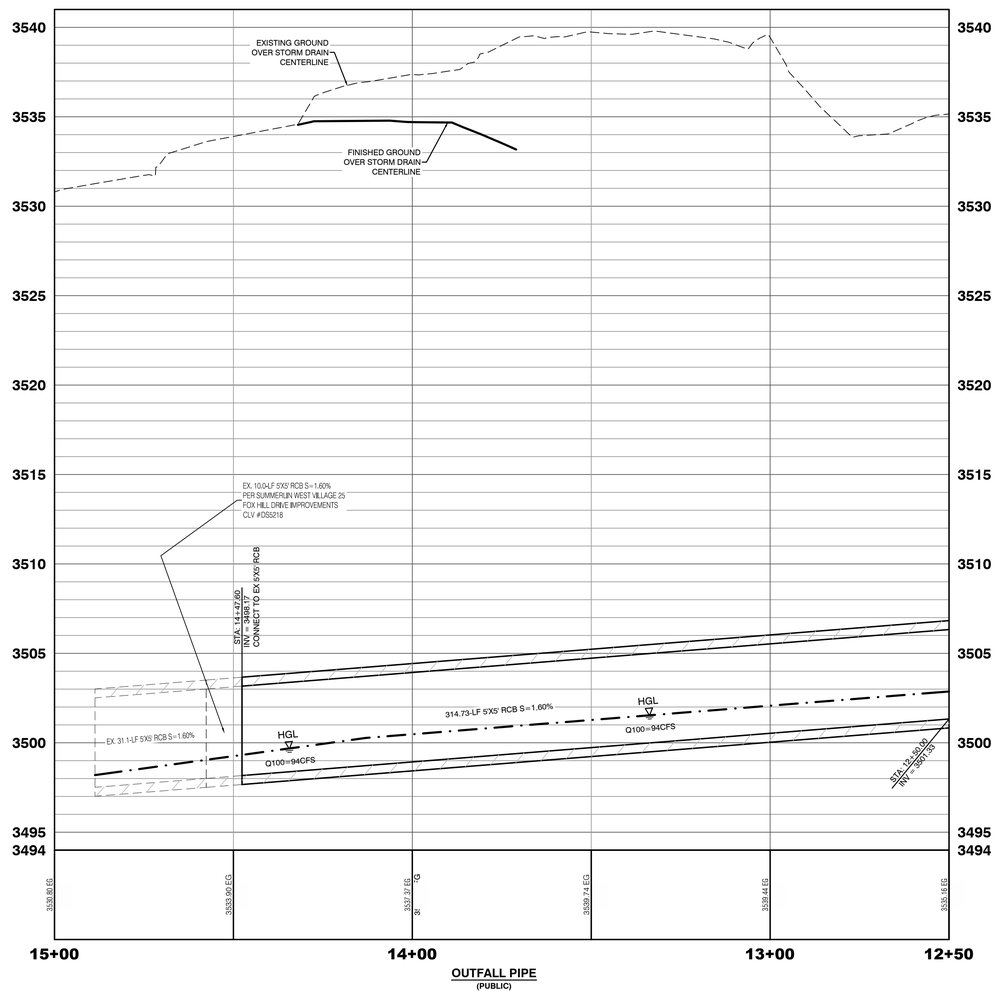
GRAPHIC SCALE

-20 0 10 20 40

1" = 20'



KEY MAP
N.T.S



PROFILE SCALES:

HORIZ. = 1"=40'
VERT.= 1"=4'

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO 'GROUND' DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

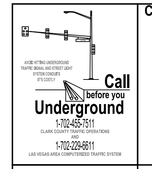
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:

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



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REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
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STORM DRAIN PLAN AND PROFILE 1
42" RCP OUTFALL PIPE

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:
PLM	PLM	BR	7809-GPDB
FEB '19	FEB '19	---	SCALE: HORIZ. 1"=40' VERT. 1"=4'

BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
STATE OF NEVADA
PROFESSIONAL ENGINEER

02/11/2020

SHEET
SD1
28 OF **35** SHEETS

DRAWING NO.

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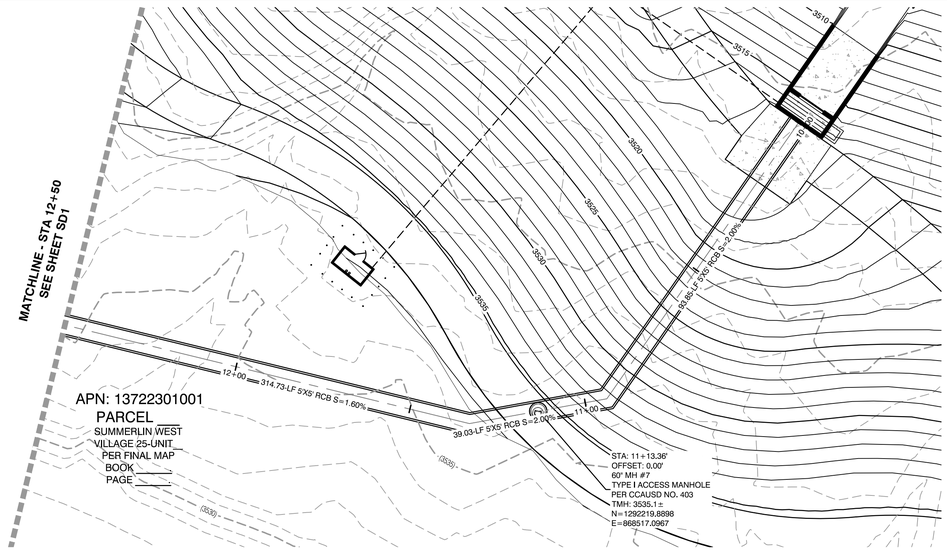
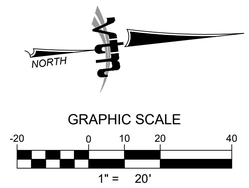
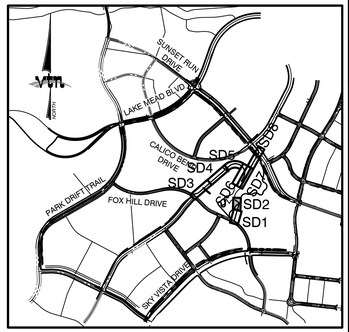


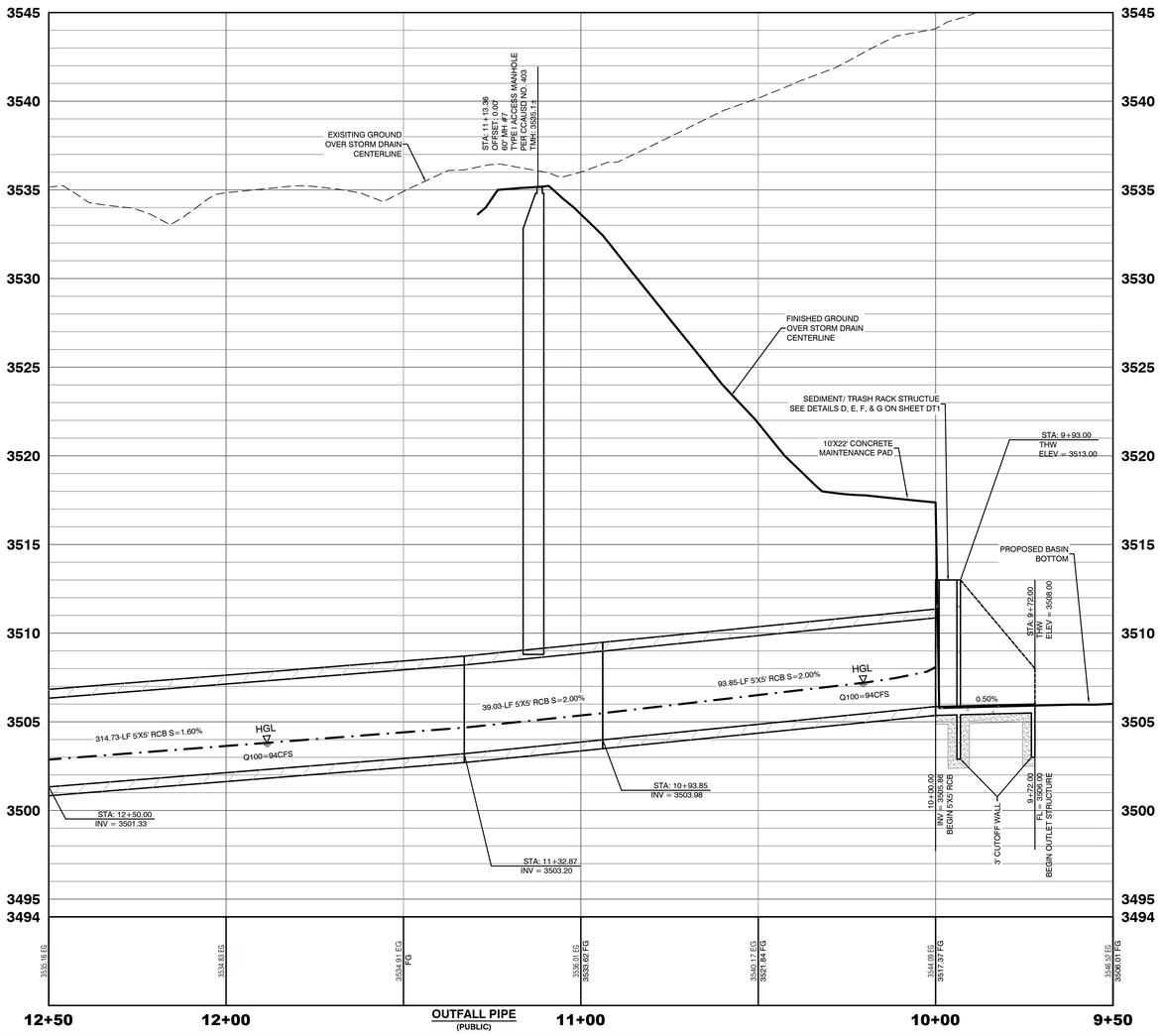




KEY MAP
N.T.S

PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'



STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
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SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2009)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:

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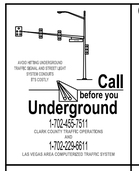

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REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
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STORM DRAIN PLAN AND PROFILE 2

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	
PLM	PLM	BR	1"=20'	HORIZ.
FEB '19	FEB '19	---	1"=4'	VERT.

PROJECT NO: 7809-GPDB

02/11/2020

SHEET
SD2
29 OF 35 SHEETS

DRAWING NO.

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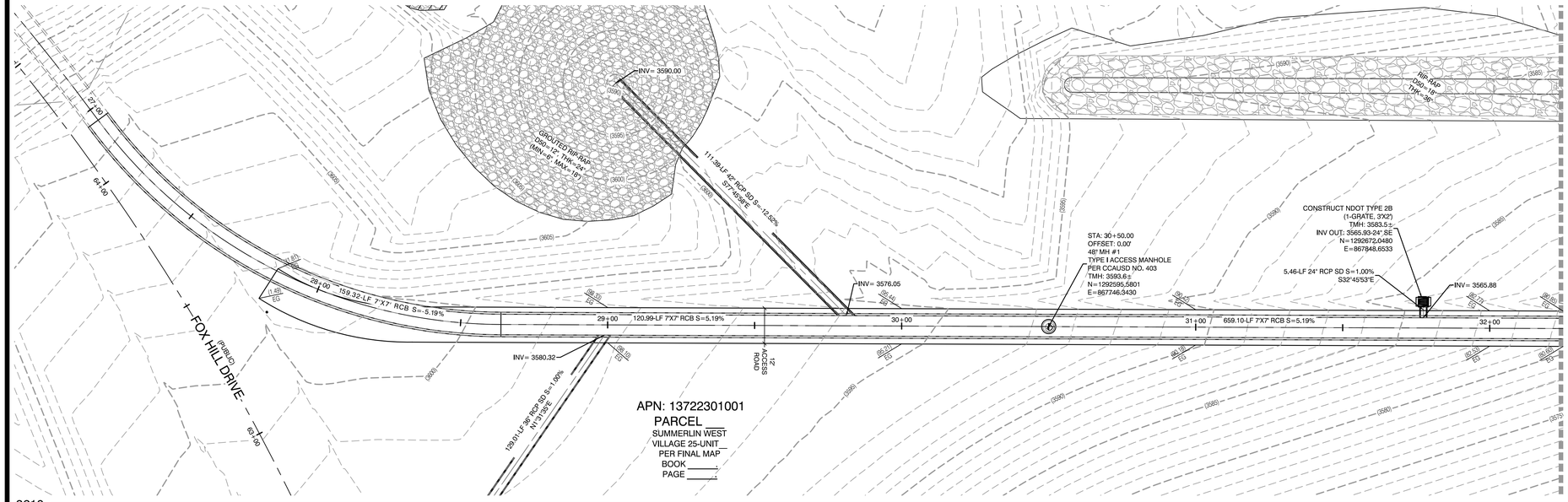
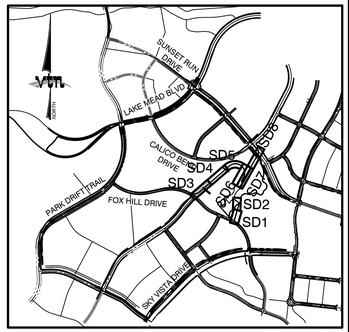
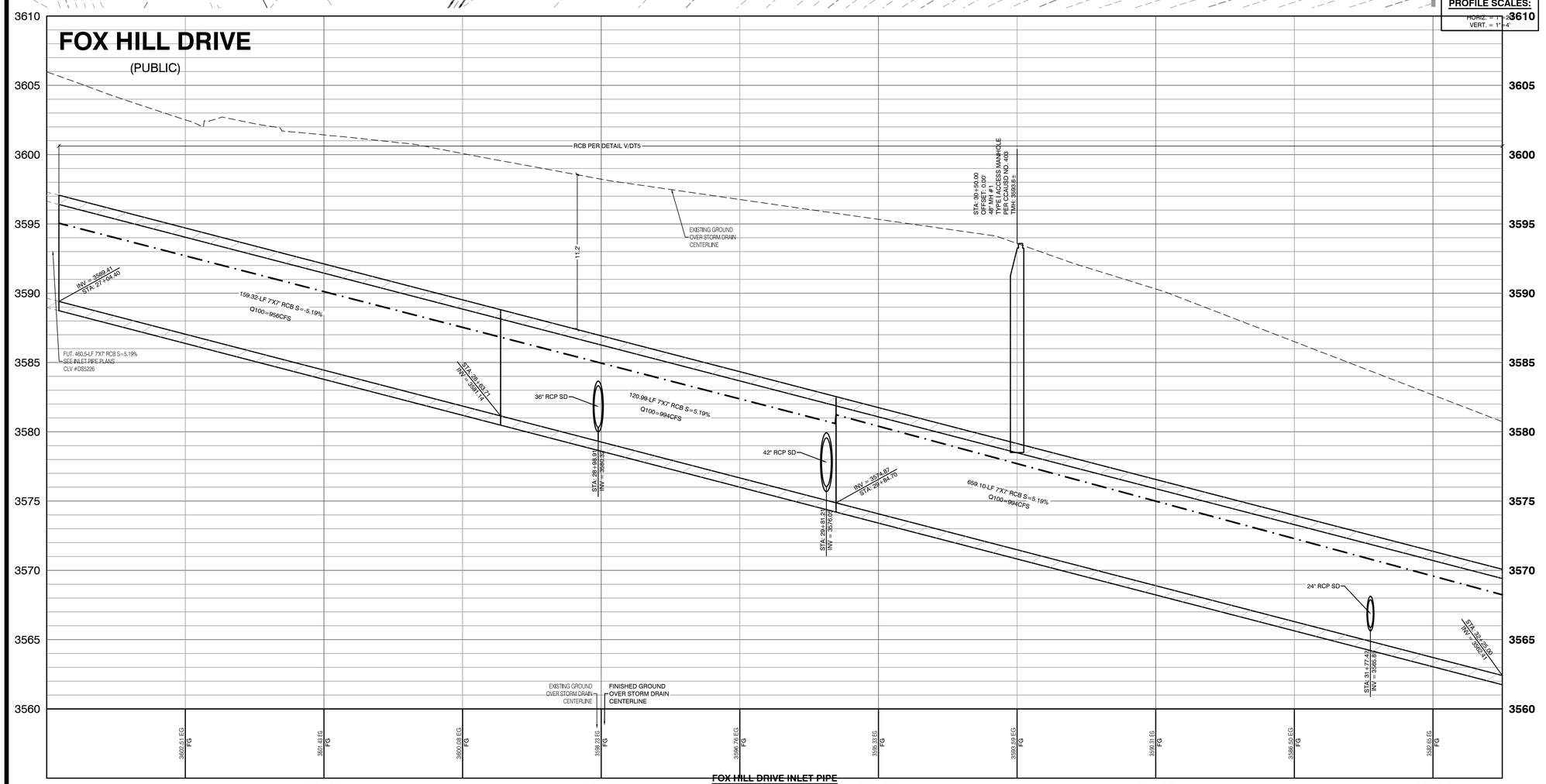




KEY MAP
N.T.S

GRAPHIC SCALE
-20 0 10 20 40
1" = 20'

PROFILE SCALES:
HORIZ. = 1" = 20'
VERT. = 1" = 4'



FOX HILL DRIVE INLET PIPE
(PUBLIC)

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
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2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL. WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

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REV	DATE	BY	REVISION

STORM DRAIN PLAN AND PROFILE 3

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM — FEB '19
DESIGNED BY: PLM — FEB '19
CHECKED BY: BR — ---
PROJECT NO: 7809-GPDB
SCALE: HORIZ 1"=20' VERT 1"=4'

PROFESSIONAL ENGINEER
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
STATE OF NEVADA

02/11/2020

SHEET
SD3
30 OF 35 SHEETS

DRAWING NO.

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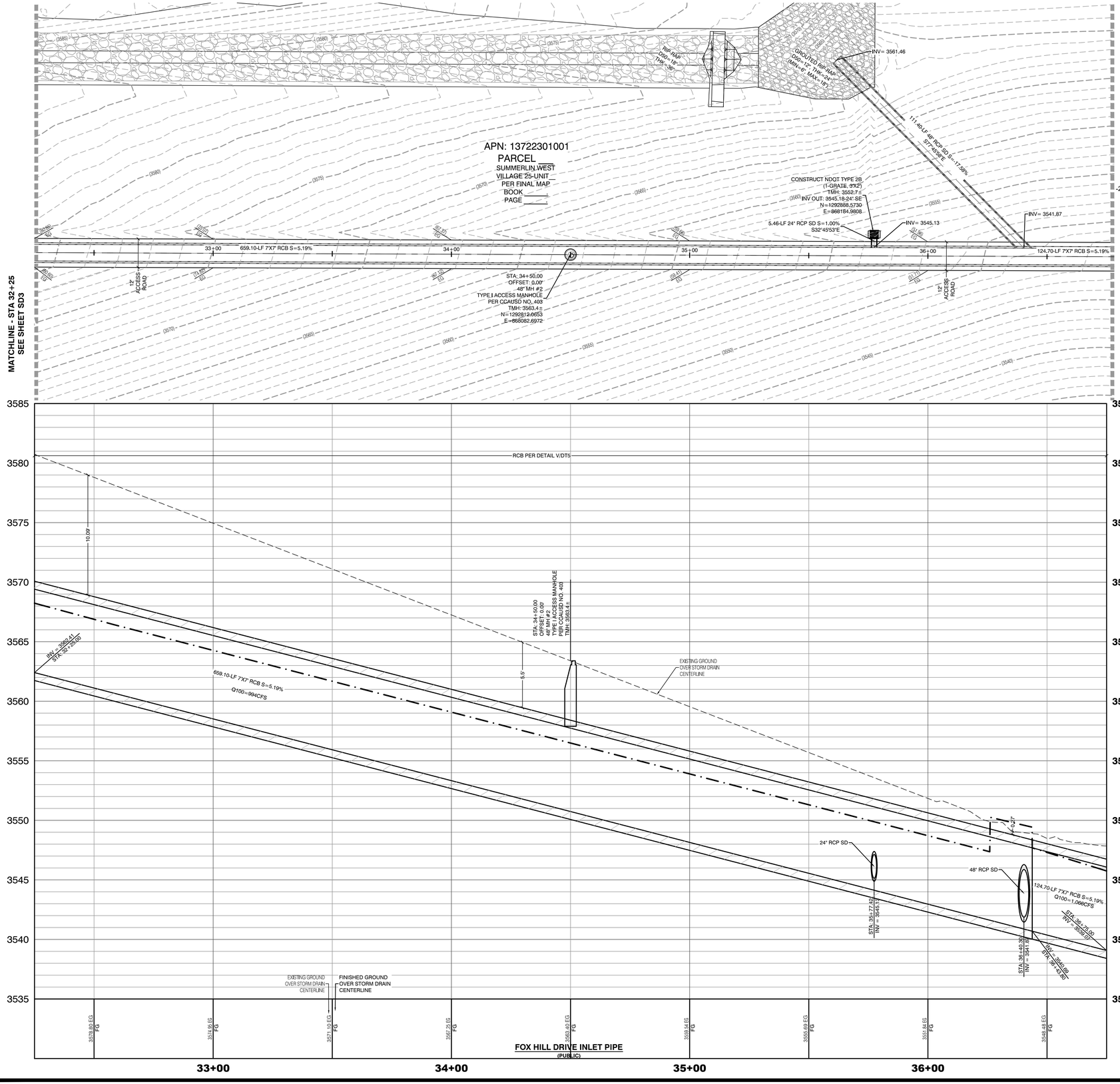

GRAPHIC SCALE

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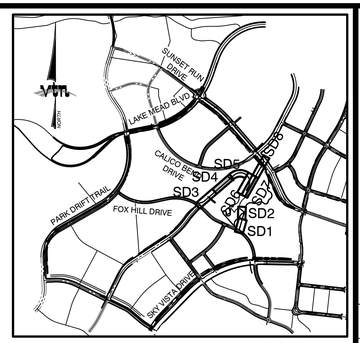
1" = 20'



KEY MAP
N.T.S

PROFILE SCALES:

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VERT. = 1"=4'

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

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T21S,R59E,S03

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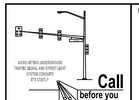

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STORM DRAIN PLAN AND PROFILE 4

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	HORIZ. / VERT.
PLM FEB '19	PLM FEB '19	BR ----	1"=20' / 1"=4'	

PROJECT NO: 7809-GPDB

BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
STATE OF NEVADA
No. 15967
PROFESSIONAL ENGINEER

02/11/2020

SHEET
SD4
31 OF 35 SHEETS

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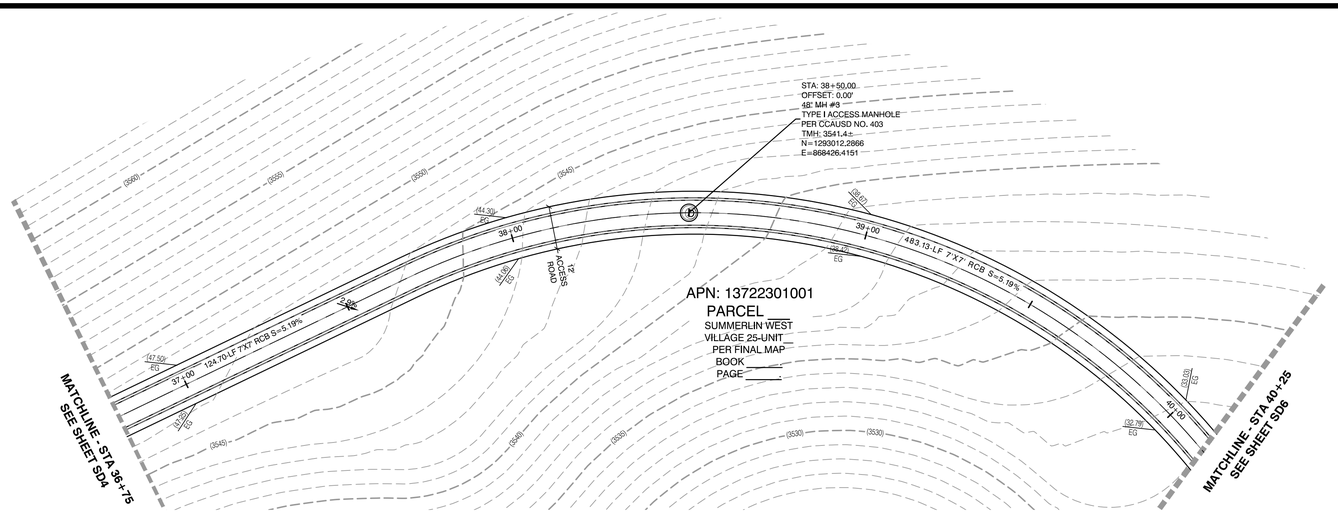

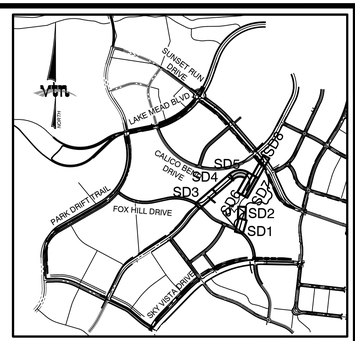

KEY MAP
N.T.S

PROFILE SCALES:

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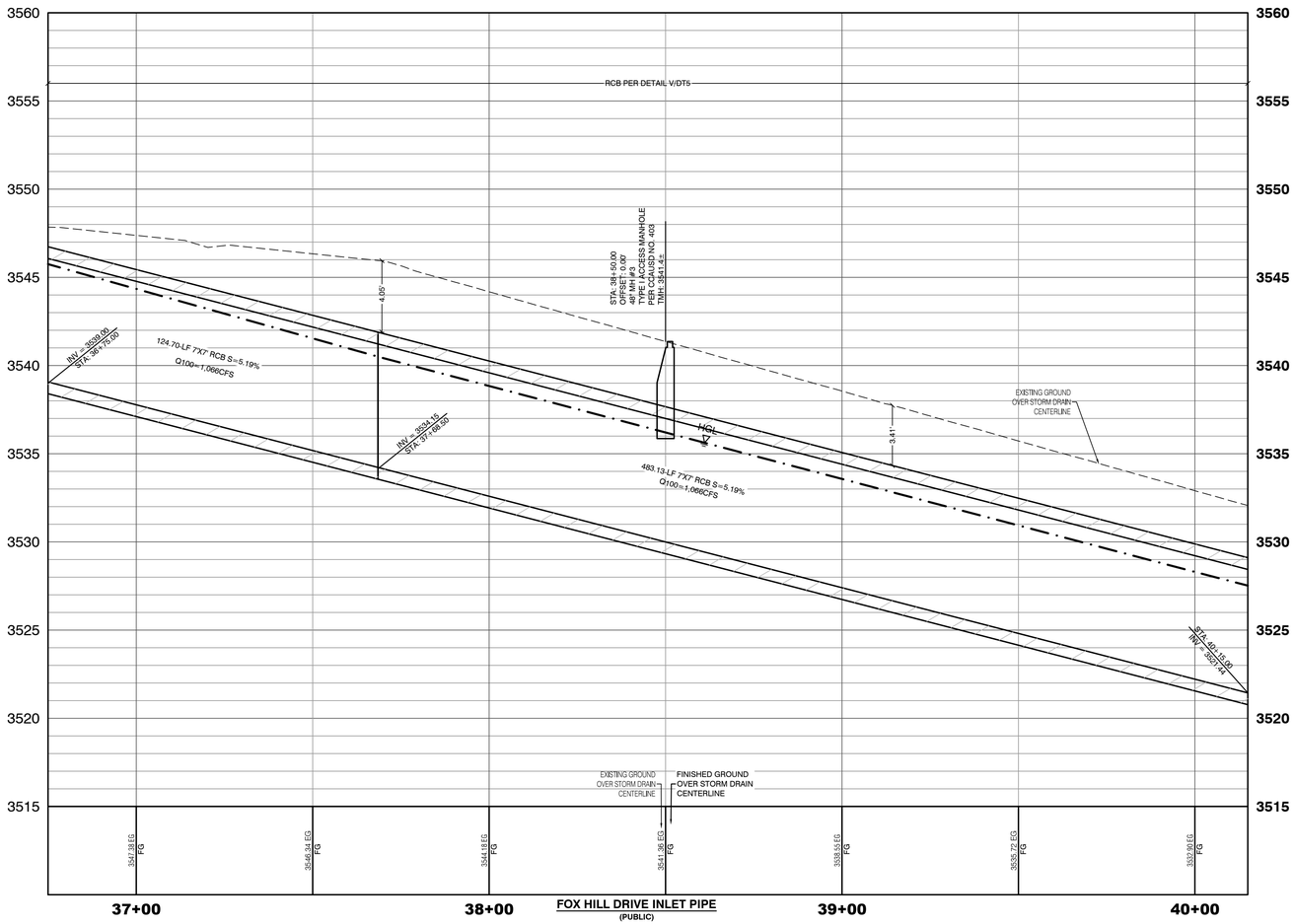
VERT. = 1"=4'



FOX HILL DRIVE INLET PIPE
(PUBLIC)

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DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

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BENCHMARK

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REV	DATE	BY	REVISION

STORM DRAIN PLAN AND PROFILE 5

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM	FEB '19	SCALE:	1"=20'	HORIZ.	
DESIGNED BY: PLM	FEB '19		1"=4'	VERT.	
CHECKED BY: BR	----				
PROJECT NO: 7809-GPDB	----				

PROFESSIONAL ENGINEER
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
STATE OF NEVADA

02/11/2020

SHEET
SD5
32 OF **35** SHEETS

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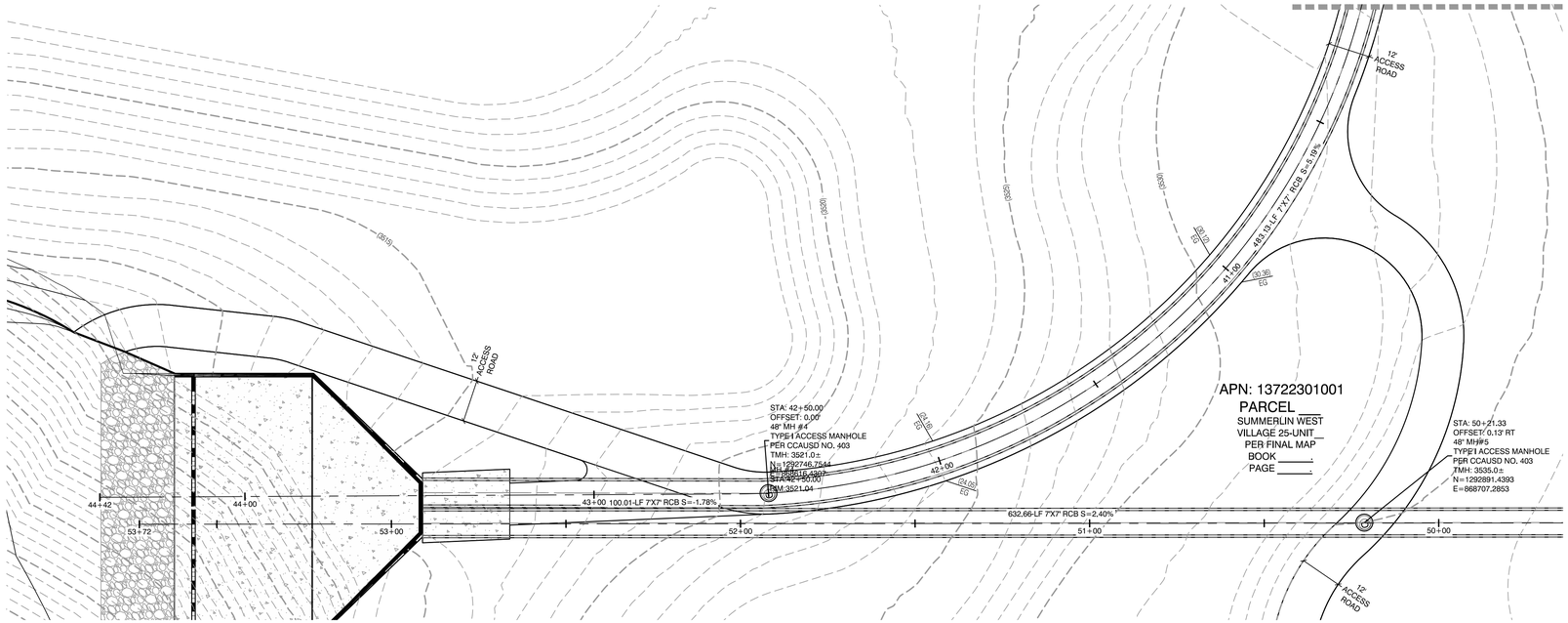
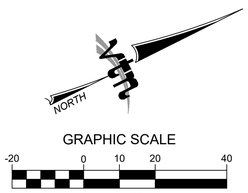
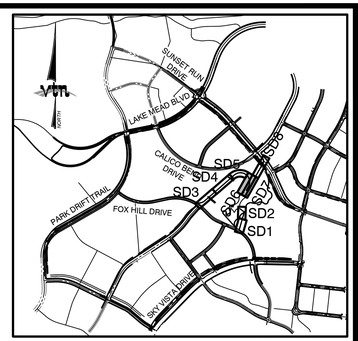
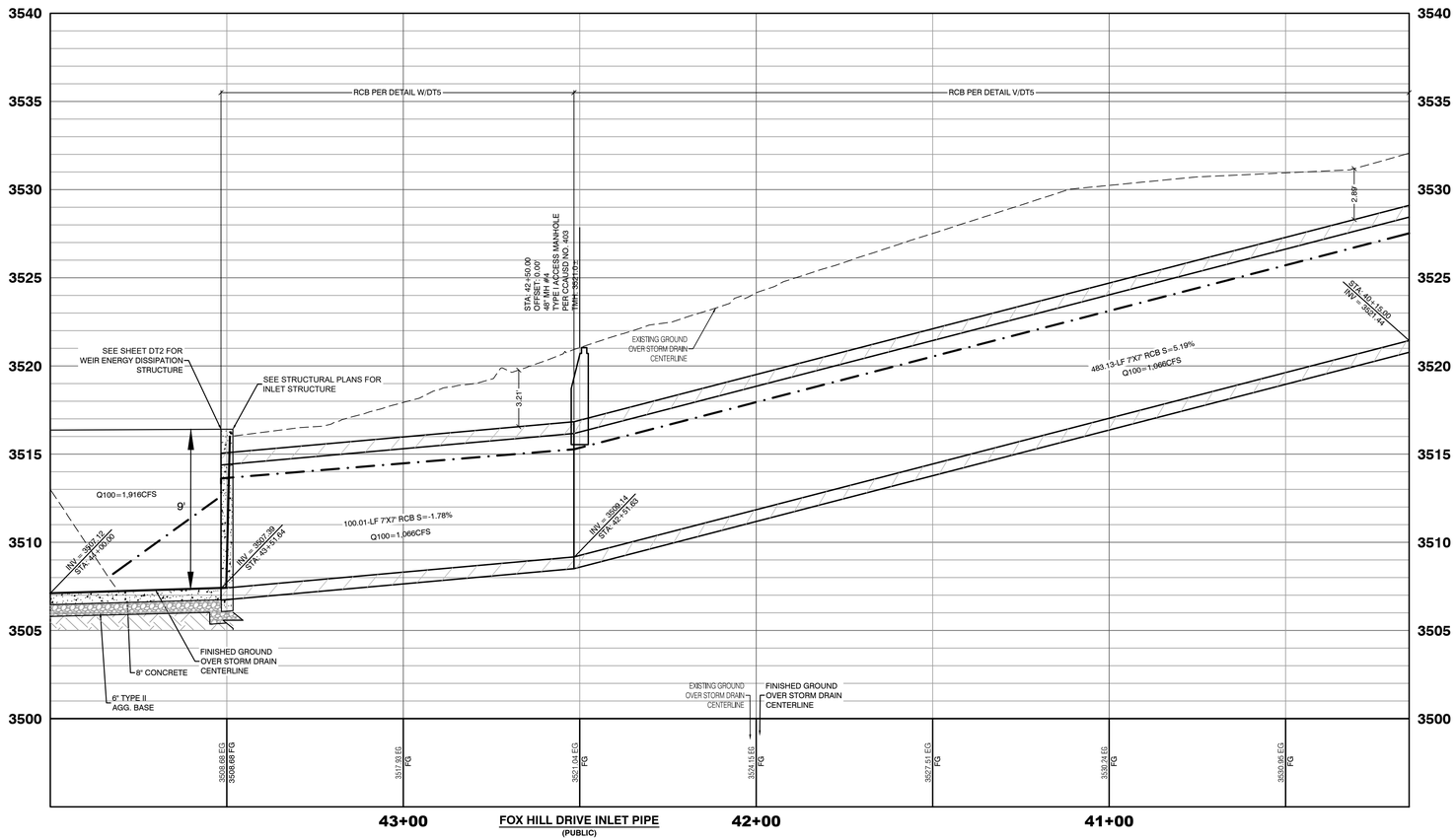






KEY MAP
N.T.S



PROFILE SCALES:

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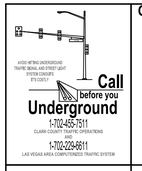

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STORM DRAIN PLAN AND PROFILE 6

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM — FEB '19
DESIGNED BY: PLM — FEB '19
CHECKED BY: BR — ---
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PROFESSIONAL ENGINEER — STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
02/11/2020

SHEET
SD6
33 OF 35 SHEETS

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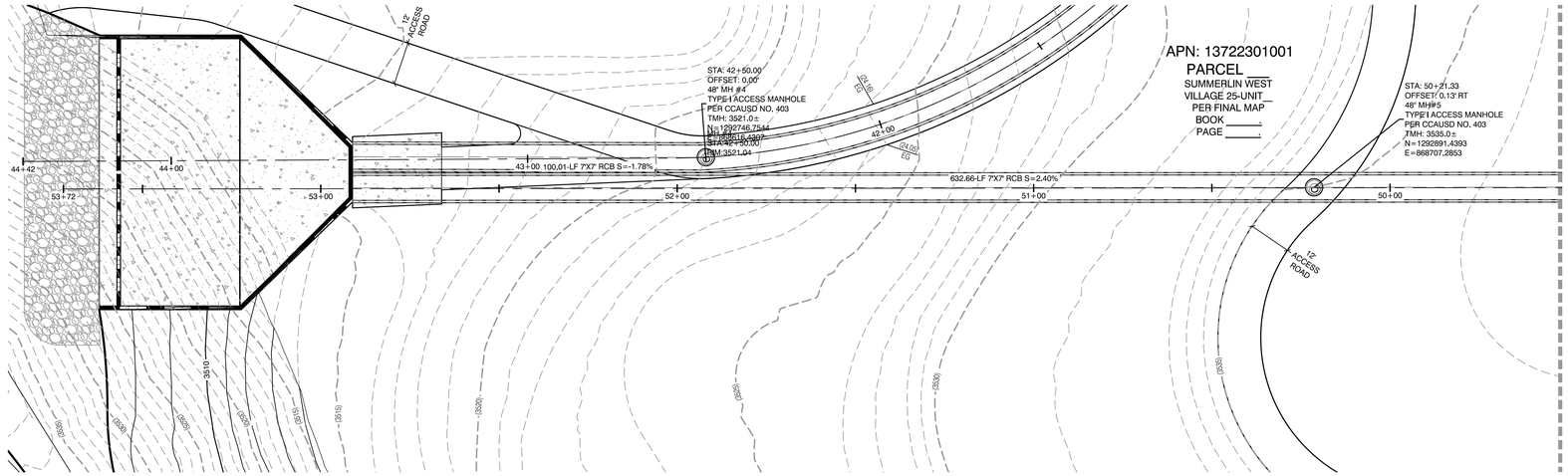


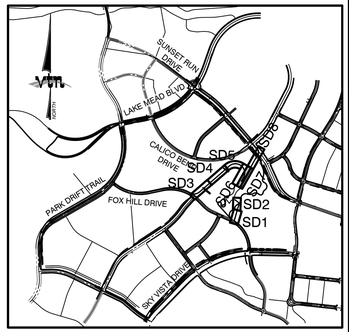
MATCHLINE - STA 49+50
SEE SHEET SD8

NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'



KEY MAP
N.T.S

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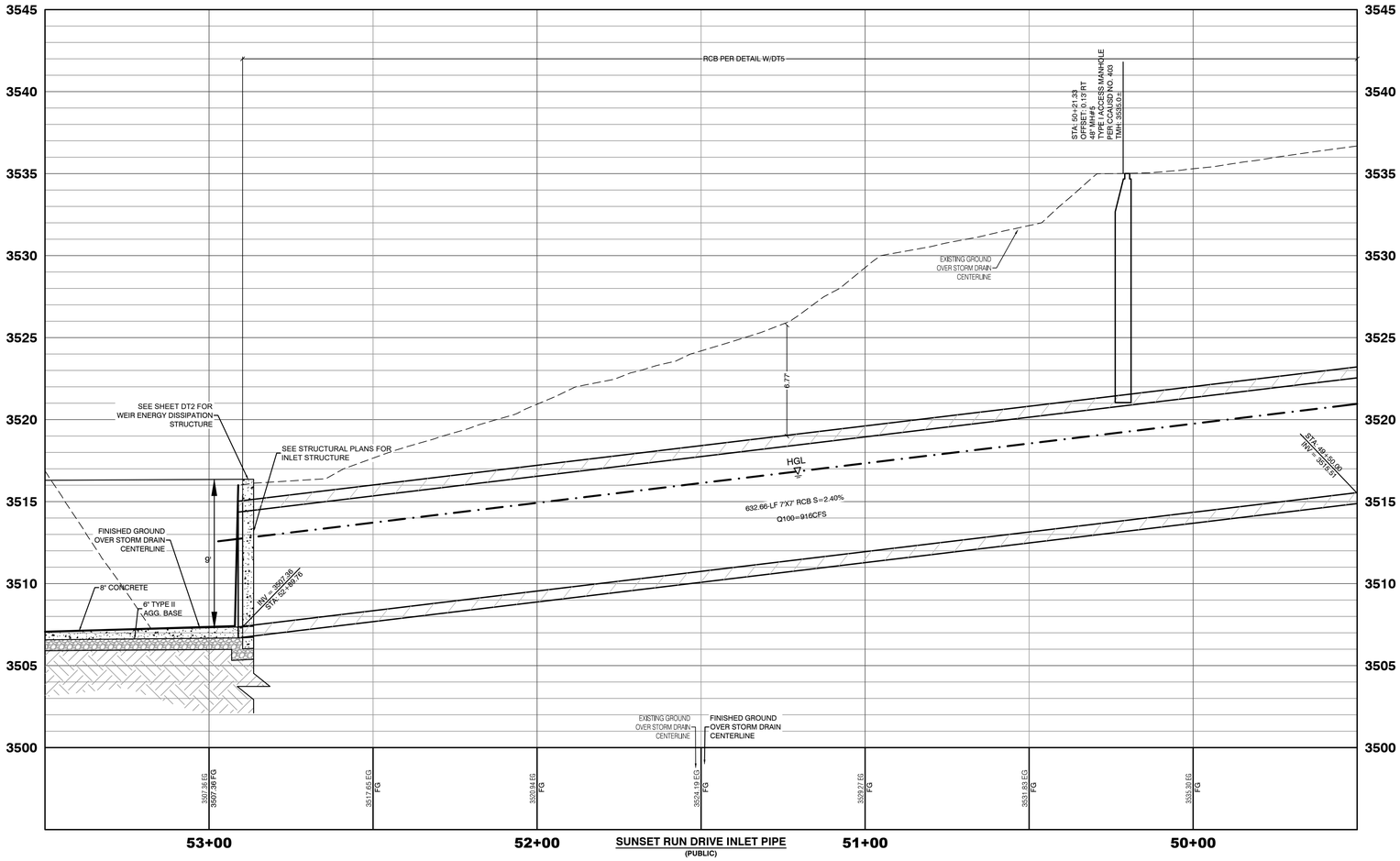
CLARK COUNTY TRAFFIC OPERATIONS

PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'



SUNSET RUN DRIVE INLET PIPE
(PUBLIC)

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

STORM DRAIN PLAN AND PROFILE 7

SUMMERLIN WEST VILLAGE 25 GRAND PARK DETENTION BASIN DETENTION BASIN PLANS

DRAWN BY: PLM — FEB 19
DESIGNED BY: PLM — FEB 19
CHECKED BY: BR
PROJECT NO: 7809-GPDB
SCALE: HORIZ 1"=20' VERT. 1"=4"

PROFESSIONAL ENGINEER — BRIAN TROY RUIZ — EXP: 12/31/21 — CIVIL — No. 15967 — STATE OF NEVADA

02/11/2020

SHEET
SD7
34 OF 35 SHEETS

DRAWING NO.

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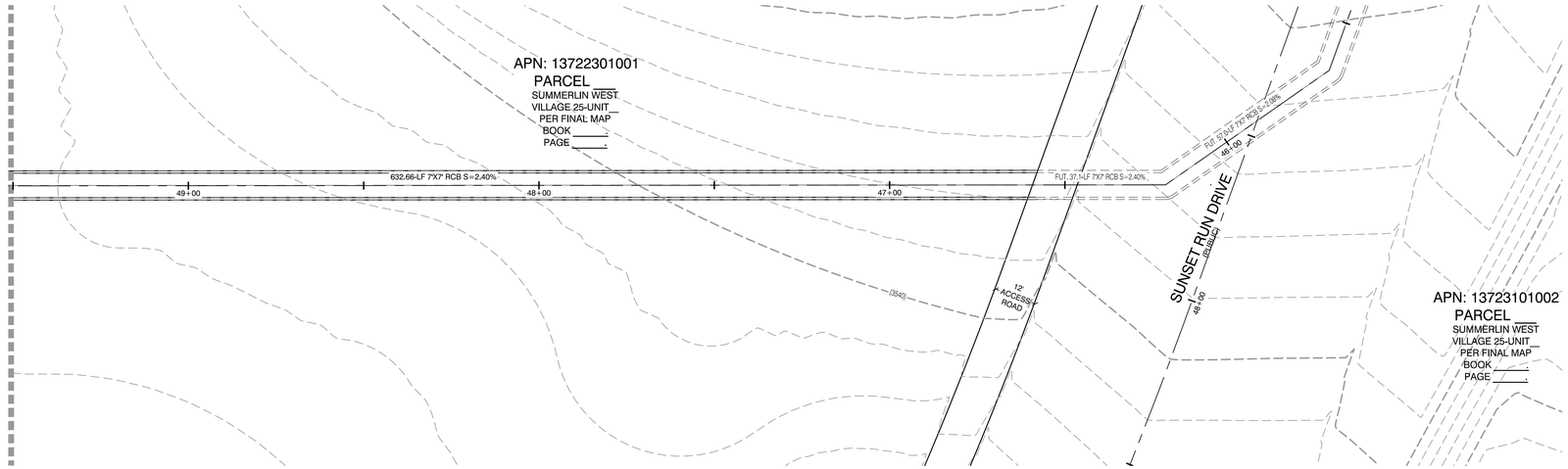
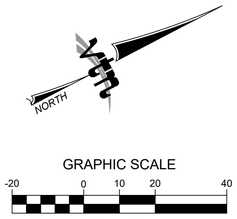
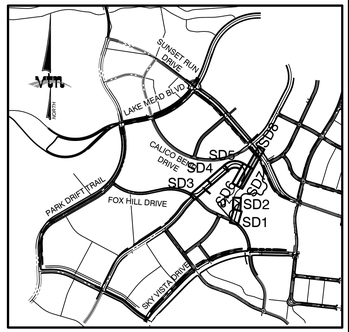
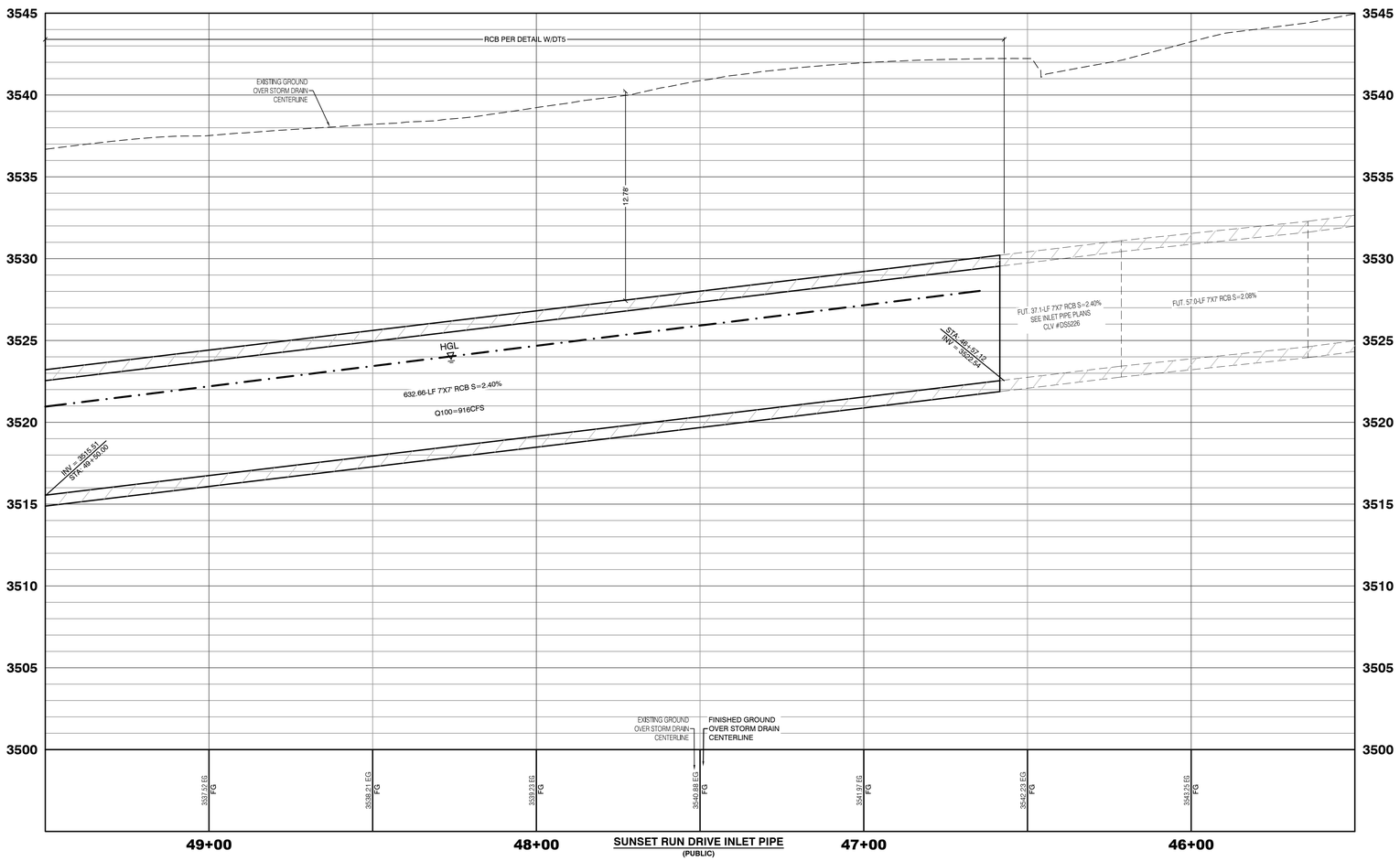






KEY MAP
N.T.S

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2009)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

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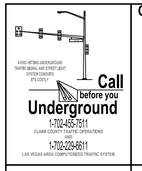

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REV	DATE	BY	REVISION

STORM DRAIN PLAN AND PROFILE 8

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
DETENTION BASIN PLANS

DRAWN BY: PLM	FEB '19	SCALE:	HORIZ. 1"=20'
DESIGNED BY: PLM	FEB '19		VERT. 1"=4'
CHECKED BY: BR	---		
PROJECT NO: 7809-GPDB			

02/11/2020

SHEET
SD8
35 OF **35** SHEETS

DRAWING NO.

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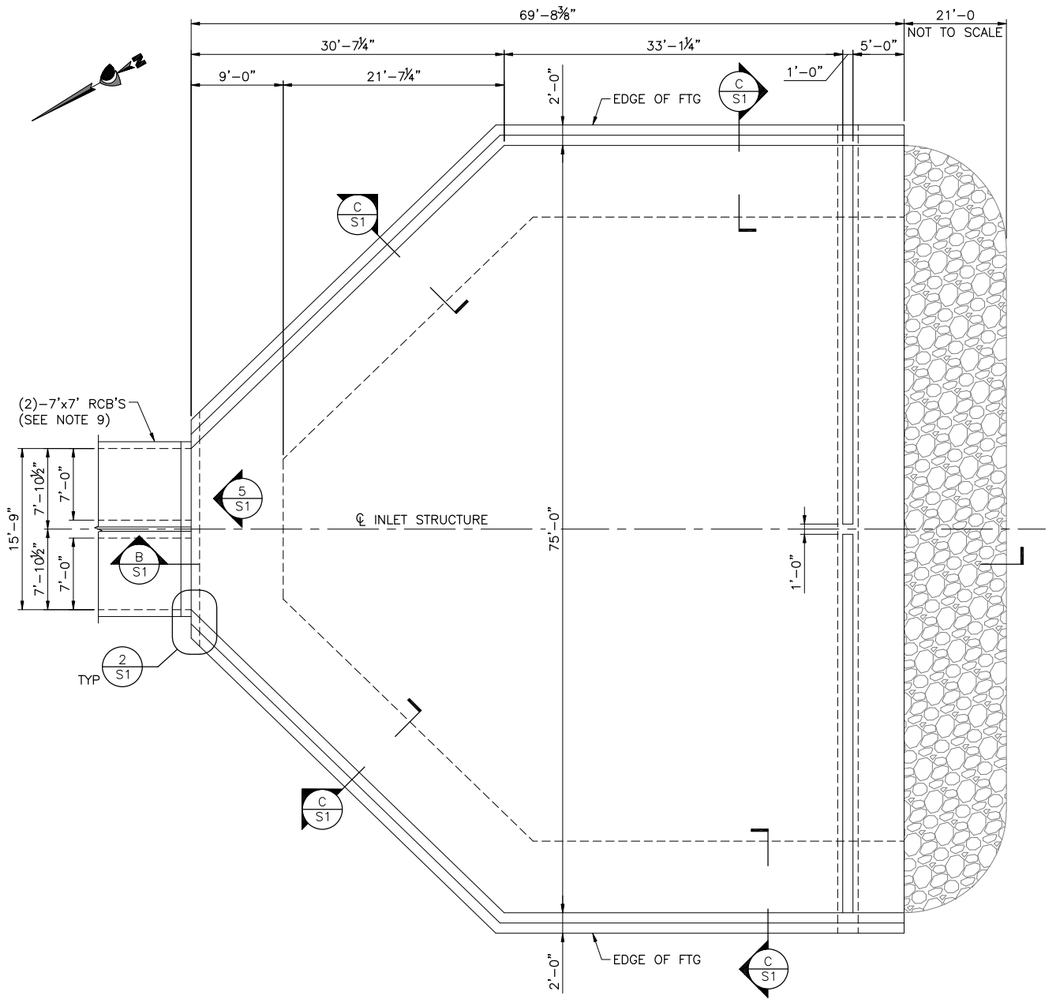
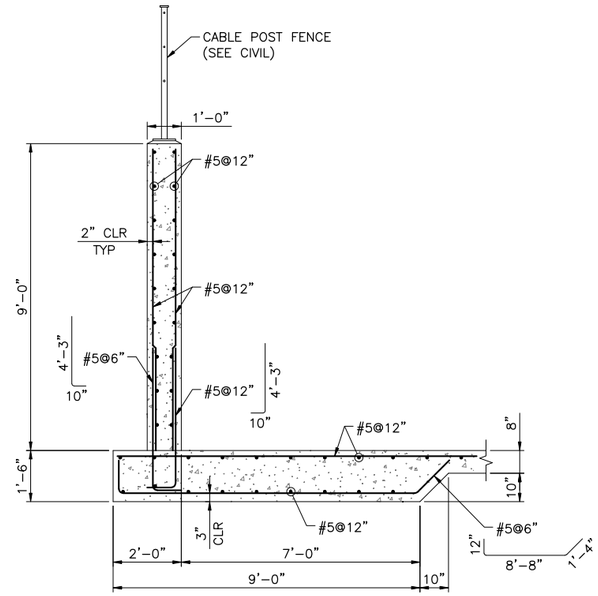


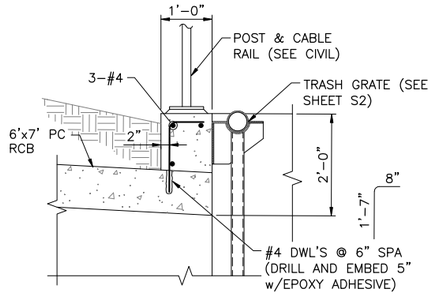
INLET STRUCTURE PLAN — A S1



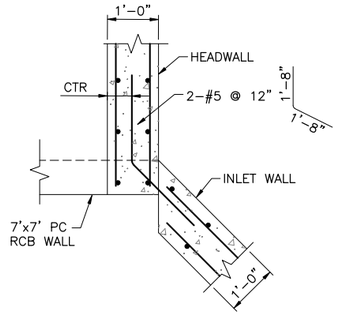
SECTION — C S1
SCALE: 1/4"=1'

NOTES:

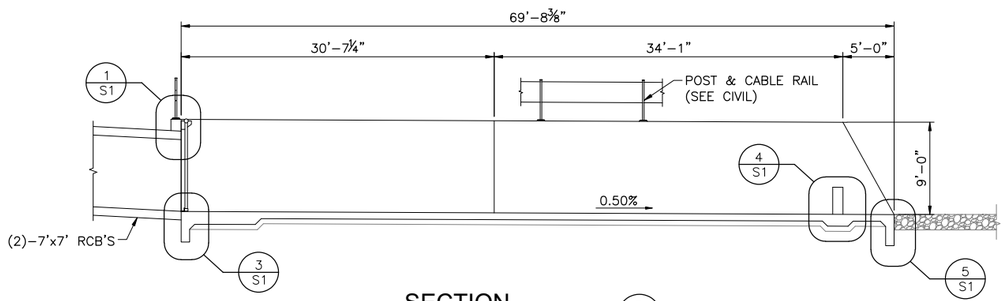
1. PORTLAND CEMENT SHALL CONFORM TO A.S.T.M. C 150-18, TYPE V. AGGREGATE SHALL CONFORM TO A.S.T.M. C 33-18.
2. ALL STRUCTURAL CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS.
3. ALL REINFORCING STEEL SHALL BE ASTM DESIGNATION A615 GRADE 60.
4. COVERAGE FOR REINFORCING BARS, EXCEPT WHERE OTHERWISE SHOWN, SHALL BE: 3" FOR CONCRETE PLACED AGAINST EARTH; 2" FOR OTHERS.
5. USE 3/4" CHAMFER ON ALL EXPOSED CORNERS.
6. ALL REINFORCING BAR LAP SPLICES SHALL CONFORM TO ACI 318.
7. PROVIDE #5 x 1'-3" DOWELS AT 18" O.C. ALONG THE BOTTOM SLAB AND OUTSIDE WALLS OF THE PRECAST RCB'S. DRILL AND EPOXY WITH 5" EMBED.
8. PROVIDE 'SIMPSON SET-XP' EPOXY ADHESIVE OR ENGINEER APPROVED EQUAL.
9. FILL THE OPEN SPACE BETWEEN THE PRECAST RCB'S WITH NON-SHRINK GROUT FOR A MINIMUM LENGTH OF 2' AND FULL HEIGHT. GROUT SHALL MEET THE REQUIREMENTS OF ASTM C1107.



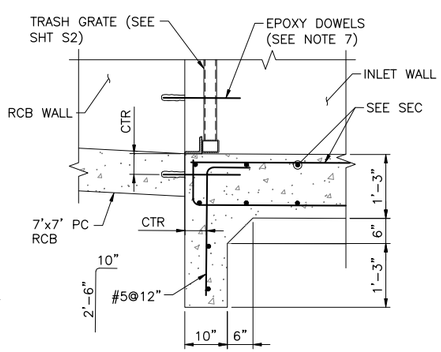
DETAIL — 1 S1
NTS



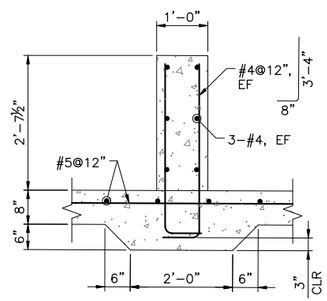
DETAIL — 2 S1
NTS



SECTION — B S1



DETAIL — 3 S1
NTS



DETAIL — 4 S1
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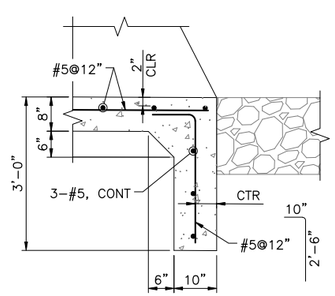

DETAIL — 5 S1
NTS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
CITY OF LAS VEGAS
10845 GRIFFITH PEAK DR.
LAS VEGAS, NV 89135
702/791-4000
PREPARED BY
2785 S. RAINBOW BLVD
LAS VEGAS, NV 89146
PHONE: (702) 685-5945
CA Group, Inc
CAVIOLA ANSON

REV | DATE | BY | REVISION

STRUCTURAL DETAILS
INLET STRUCTURE

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN

DRAWN BY: CW ####
DESIGNED BY: CW ####
CHECKED BY: AM ####
PROJECT NO: # ####
SCALE: N/A HORIZ. N/A VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
CHRISTOPHER A. WUNSCH
EXP. 6/30/20
CIVIL
No. 18349
02/11/2020

SHEET
S1
36 OF 39 SHEETS

DRAWING NO.
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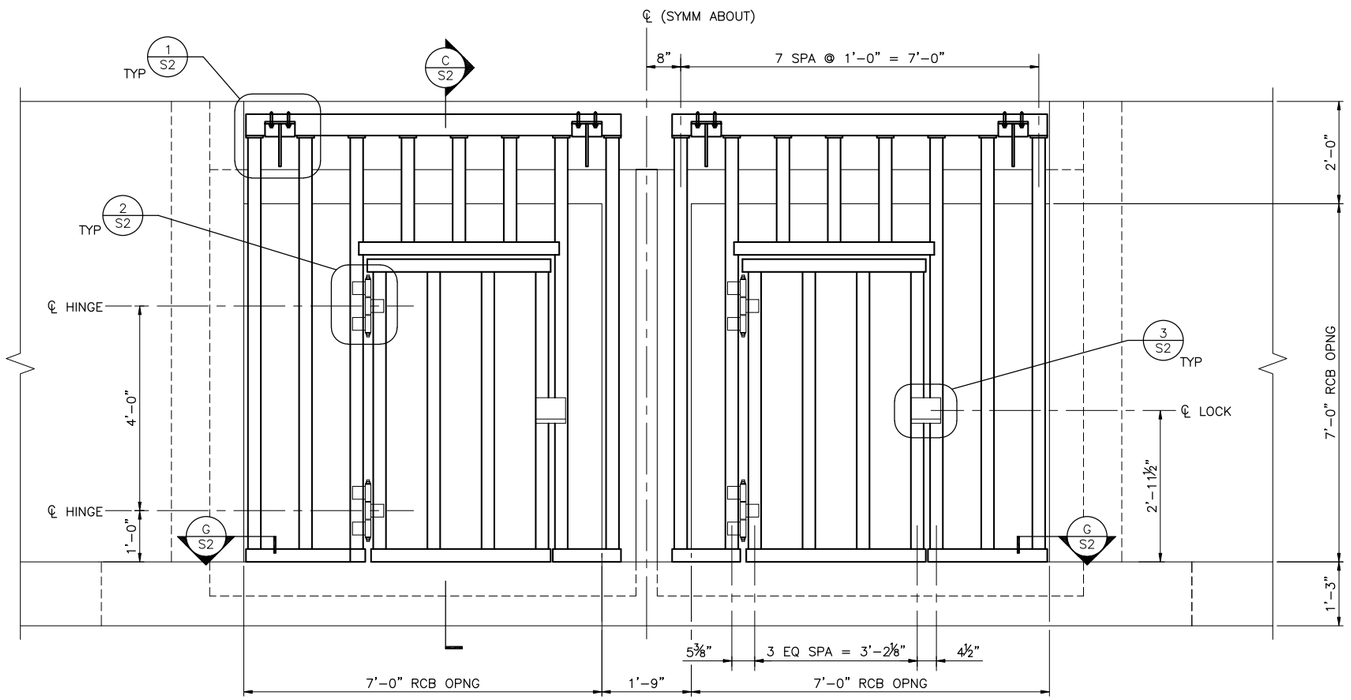
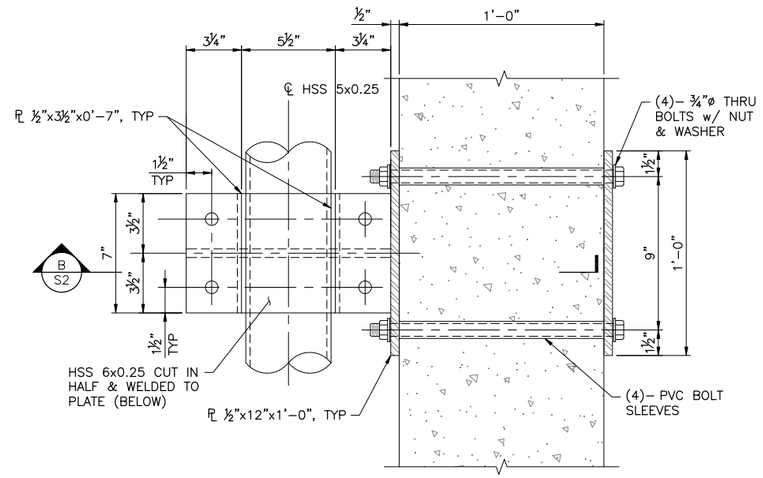
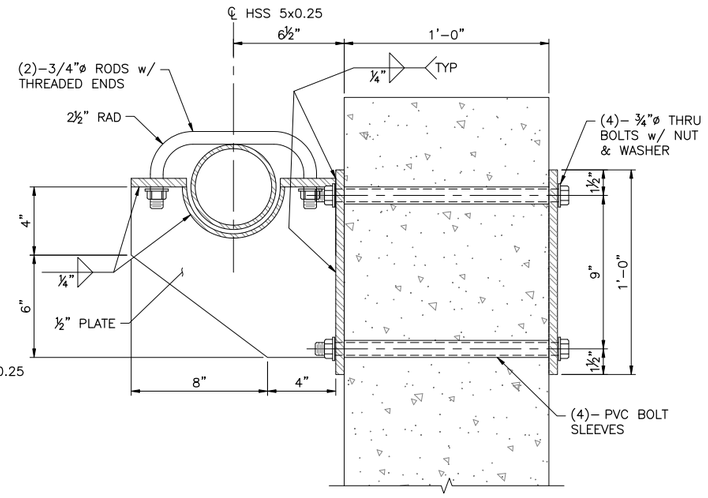


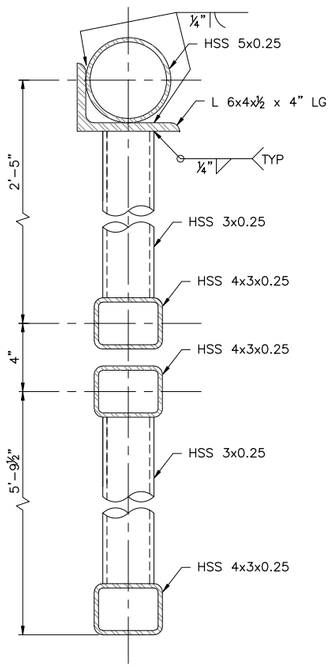
ELEVATION — A S2



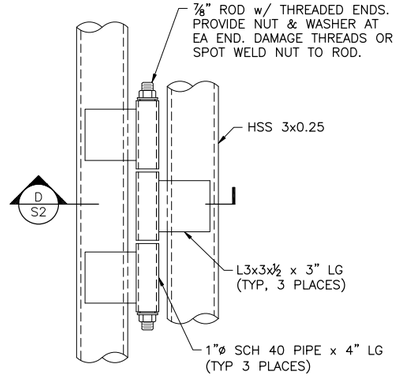
DETAIL — 1 S2



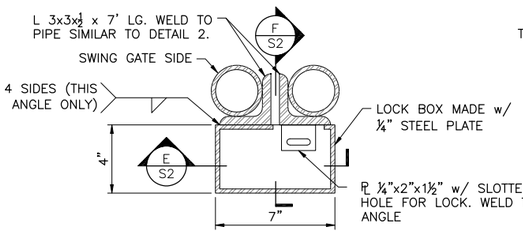
SECTION — B S2



SECTION — C S2



DETAIL — 2 S2



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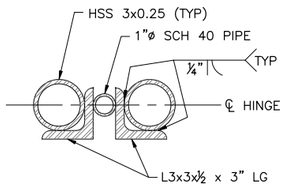

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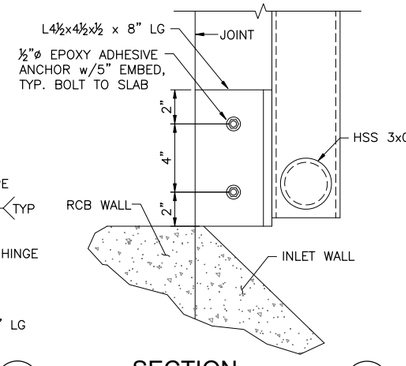

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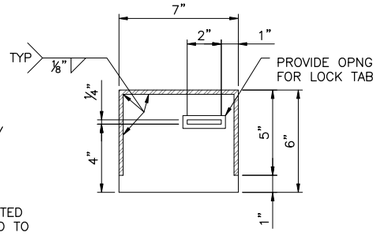

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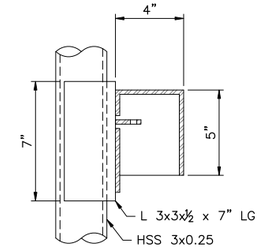


SECTION — F S2

NOTES:

1. PROVIDE SHOP DRAWINGS PRIOR TO FABRICATION.
2. ALL EXPOSED METAL AND METAL PARTS SHALL BE GALVANIZED. GALVANIZING DAMAGED BY FABRICATION SHALL RECEIVE TWO COATS OF ZINC RICH PAINT (GALVANOX OR EQUAL).
3. ALL MISCELLANEOUS STEEL SHALL CONFORM TO ASTM A36 UNLESS NOTED OTHERWISE. ALL HOLLOW STRUCTURAL SECTIONS (HSS) SHALL BE ASTM A500 GRADE B.
4. PROVIDE 'SIMPSON SET–XP' EPOXY ADHESIVE OR ENGINEER APPROVED EQUAL.

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 150
LAS VEGAS, NV 89135
702.791-4000

CITY OF LAS VEGAS

PREPARED BY
CA Group, Inc
CAVIOLA ANSON
2785 S. RAINBOW BLVD
LAS VEGAS, NV 89146
PHONE: (702) 685–5945

STRUCTURAL DETAILS
INLET STRUCTURE

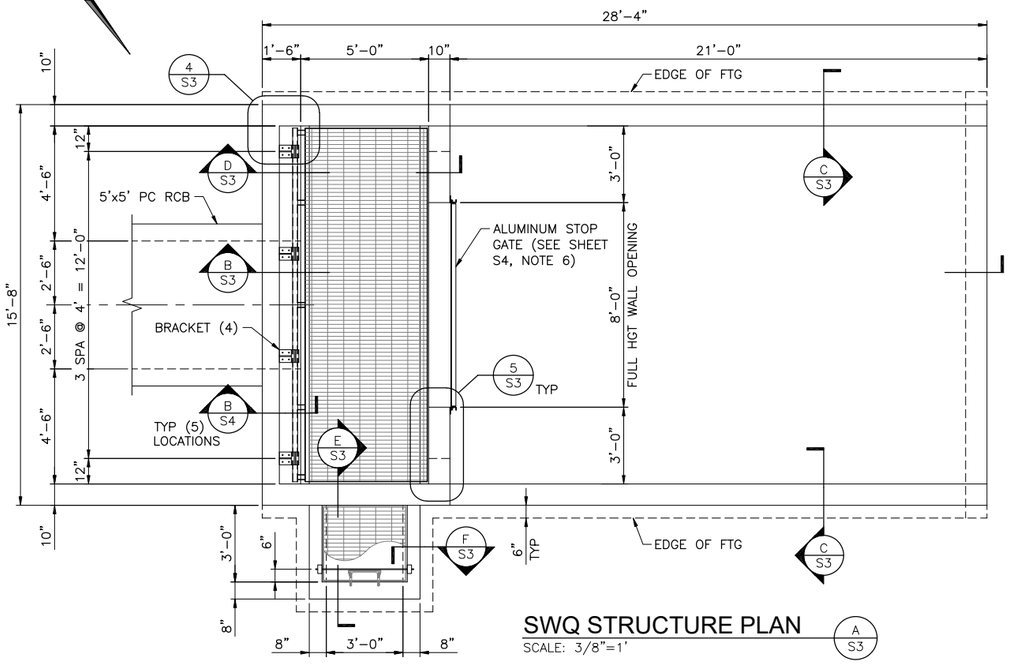
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN

DRAWN BY: CW
DESIGNED BY: CW
CHECKED BY: JM
PROJECT NO: #
SCALE: N/A HORIZ. N/A VERT.

PROFESSIONAL ENGINEER – STATE OF NEVADA
CHRISTOPHER A. WUNSCH
EXP. 6/30/20
CIVIL
No. 18349
02/11/2020

SHEET
S2
37 OF **39** SHEETS
DRAWING NO.
--

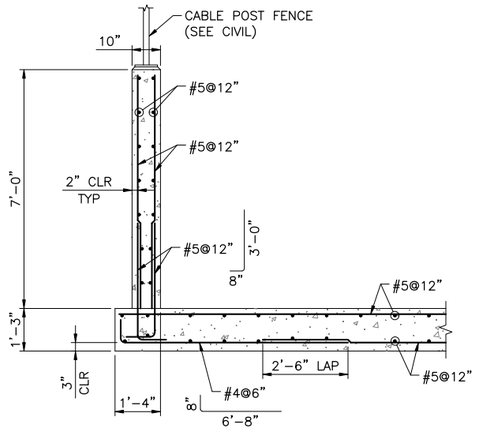
H:\0165 Grand Park Detention Basin (sub to VTN)\CAD\S1.dwg, 2/7/2020 11:37 AM, Chris Wunsch



SWQ STRUCTURE PLAN

SCALE: 3/8"=1'

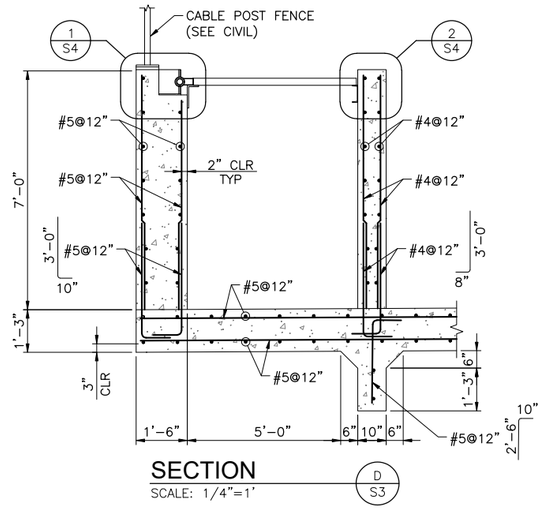
A S3



SECTION

SCALE: 1/4"=1'

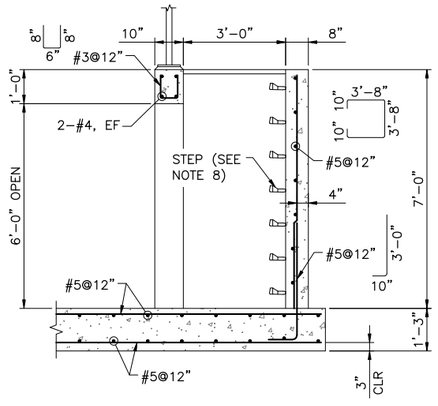
C S3



SECTION

SCALE: 1/4"=1'

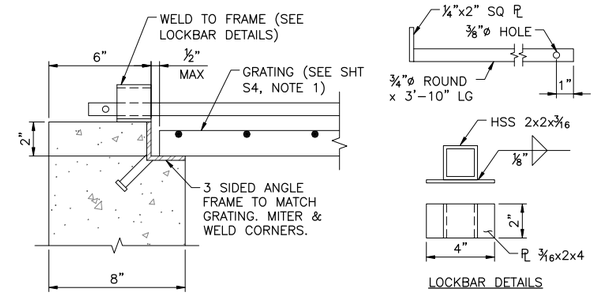
D S3



SECTION

SCALE: 1/4"=1'

E S3

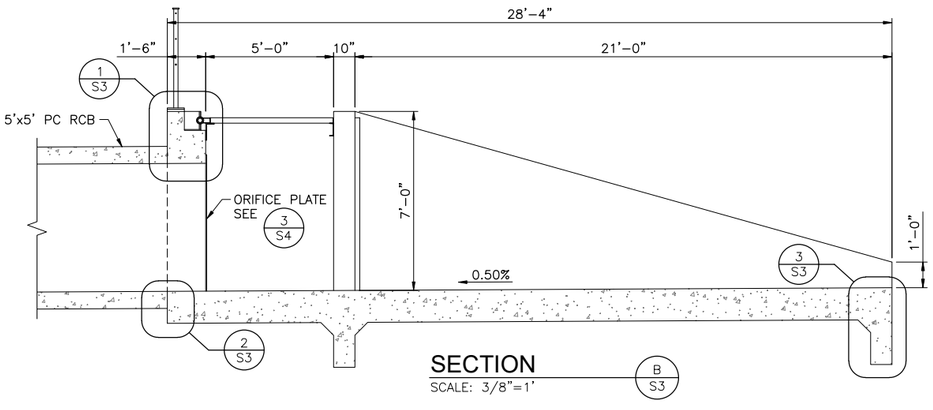


LOCKBAR DETAILS

SECTION

NTS

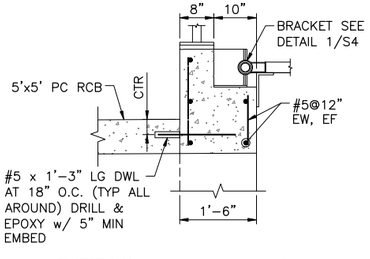
F S3



SECTION

SCALE: 3/8"=1'

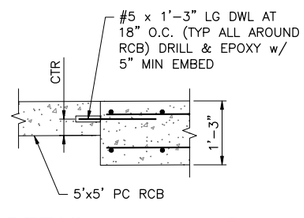
B S3



DETAIL

NTS

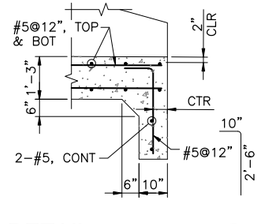
1 S3



DETAIL

NTS

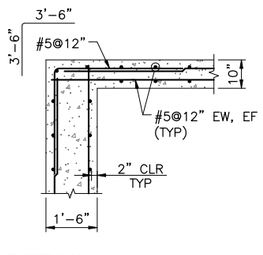
2 S3



DETAIL

NTS

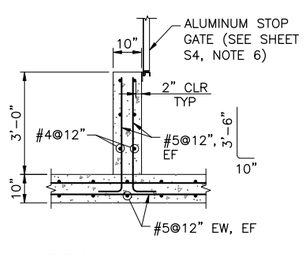
3 S3



DETAIL

NTS

4 S3



DETAIL

NTS

5 S3

NOTES:

1. PORTLAND CEMENT SHALL CONFORM TO A.S.T.M. C 150–18, TYPE V. AGGREGATE SHALL CONFORM TO A.S.T.M. C 33–18.
2. ALL STRUCTURAL CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS.
3. ALL REINFORCING STEEL SHALL BE ASTM DESIGNATION A615 GRADE 60.
4. COVERAGE FOR REINFORCING BARS, EXCEPT WHERE OTHERWISE SHOWN, SHALL BE: 3" FOR CONCRETE PLACED AGAINST EARTH; 2" FOR OTHERS.
5. USE 3/4" CHAMFER ON ALL EXPOSED CORNERS.
6. ALL REINFORCING BAR LAP SPLICES SHALL CONFORM TO ACI 318.
7. PROVIDE 'SIMPSON SET–XP' EPOXY ADHESIVE OR ENGINEER APPROVED EQUAL.
8. MANHOLE STEPS PER CCUSD DRAWING NO. 410.

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10-80 GRIFFITH PEAK DRIVE, SUITE 100
LAS VEGAS, NV 89135
702/791-4000

PREPARED BY

CA Group, Inc
CAVIOLA ANSON
2785 S. RAINBOW BLVD
LAS VEGAS, NV 89146
PHONE: (702) 685-5945

STRUCTURAL DETAILS
SWQ STRUCTURE

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ.	VERT.
CW	CW	JM	#	N/A	N/A	

PROFESSIONAL ENGINEER – STATE OF NEVADA
CHRISTOPHER A. WUNSCH
EXP. 6/30/20
CIVIL
No. 18349
02/11/2020

SHEET
S3
38 OF 39 SHEETS

DRAWING NO.
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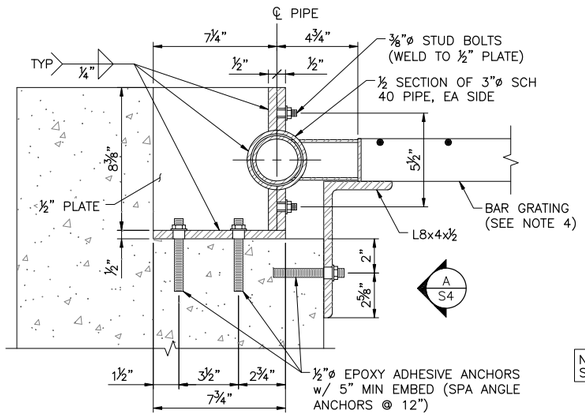
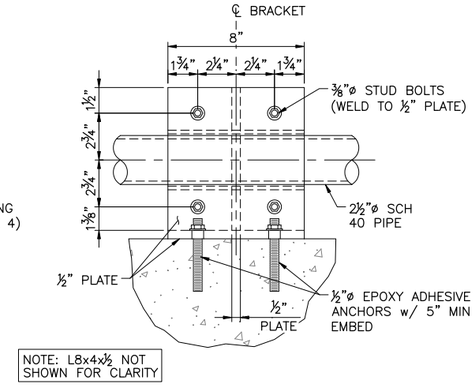
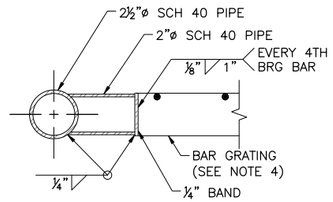
H:\0160 Grand Park Detention Basin (was by HYA CAD)\S1.dwg 2/7/2020 11:31 AM Chris Wunsch



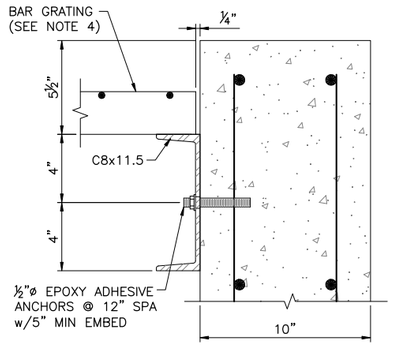
DETAIL
NTS — 1 / S4



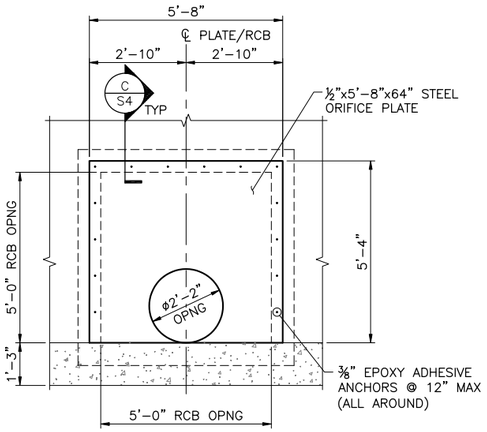
ELEVATION
NTS — A / S4



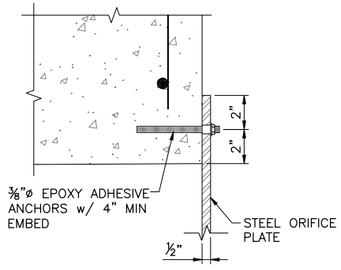
SECTION
SCALE: 1/4"=1' — B / S4



DETAIL
NTS — 2 / S4



DETAIL
NTS — 3 / S4



SECTION
NTS — C / S4

NOTES:

1. PROVIDE SHOP DRAWINGS PRIOR TO FABRICATION.
2. ALL EXPOSED METAL AND METAL PARTS SHALL BE GALVANIZED. GALVANIZING DAMAGED BY FABRICATION SHALL RECEIVE TWO COATS OF ZINC RICH PAINT (GALVANOX OR EQUAL).
3. ALL MISCELLANEOUS STEEL SHALL CONFORM TO ASTM A36 UNLESS NOTED OTHERWISE. ALL HOLLOW STRUCTURAL SECTIONS (HSS) SHALL BE ASTM A500 GRADE B.
4. PROVIDE GALVANIZED STEEL BAR GRATING PANELS WITH 2½"x⅜₁₆" BEARING BARS AT 1⅜₁₆" O.C. AND WELDED CROSS BARS AT 4" O.C.
5. PROVIDE 'SIMPSON SET–XP' EPOXY ADHESIVE OR ENGINEER APPROVED EQUAL.
6. PROVIDE AN EXTERIOR WALL MOUNTED ALUMINUM STOP GATE (MANUFACTURED BY WHIPPS, WATERMAN, OR APPROVED EQUIVALENT) WITH THE FOLLOWING SPECIFICATIONS:
   - THE FRAME SHALL BE OF EXTRUDED ALUMINUM (ALLOY 6061–T6) WITH SIDE AND INVERT SEALS THAT LIMIT LEAKAGE FOR THE STOP GATE TO 0.10 GALLONS PER MINUTE PER LINEAR FOOT OF WETTED PERIMETER.
   - THE SLIDE SHALL BE MINIMUM ¼" THICKNESS ALUMINUM PLATE (ALLOY 6061–T6), REINFORCED WITH STIFFENERS AS REQUIRED TO LIMIT DEFLECTION TO NO MORE THAN 1/360 OF ITS WIDTH AT THE DESIGN HEAD.
   - ALL ASSEMBLY AND ANCHOR BOLTS SHALL BE TYPE 304 STAINLESS STEEL AND SHALL BE PROVIDED BY THE GATE MANUFACTURER.
   - THE STOP GATE MANUFACTURER SHALL PROVIDE SHOP DRAWINGS AND DESIGN CALCULATIONS OF THE PROPOSED INSTALLATION FOR REVIEW BY THE ENGINEER.

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10140 GRIFFITH PEAK DRIVE, SUITE 150
LAS VEGAS, NV 89135
702-791-4000

CITY OF LAS VEGAS

PREPARED BY
CA Group, Inc
CAVIOLA ANSON
2785 S. RAINBOW BLVD
LAS VEGAS, NV 89146
PHONE: (702) 685–5945

STRUCTURAL DETAILS SWQ STRUCTURE

SUMMERLIN WEST VILLAGE 25 GRAND PARK DETENTION BASIN

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	
CW	CW	JM	#	NA	HORIZ.
####	####	####		NA	VERT.

PROFESSIONAL ENGINEER – STATE OF NEVADA
CHRISTOPHER WUNSCH
EXP. 6/30/20
CIVIL
No. 18145

02/11/2020

SHEET
S4
39 OF **39** SHEETS

DRAWING NO.
--

H:\0185 Grand Park Detention Basin (sub to VTN)\CADD\S1.dwg 2/7/2020 11:31 AM Chris Wunsch

D.3

GCW – SKY VISTA IMPROVEMENTS

(DS5187)

D.3.1 Cover and Text
D.3.2 WSPG Models
D.3.3 Grading Plan

2nd RESPONSE TO COMMENTS FOR THE TECHNICAL DRAINAGE STUDY FOR VILLAGE 25 SKY VISTA DRIVE IMPROVEMENTS (REDPOINT DRIVE TO KETTLE RIDGE DRIVE)

62025-206

December 2019

Prepared for:

The Howard Hughes Company, LLC
10845 Griffith Peak Drive, Suite 160
Las Vegas, Nevada 89135
Phone: (702) 791-4300

GCW 50 YEARS
ENGINEERS \ SURVEYORS 1969-2019

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Village 25 Sky Vista Drive Improvements (Redpoint Dr to Kettle Ridge Dr) Date: December 2019

Location of Development: a) Descriptive (Cross Streets) North/South: Fox Hill Drive

East/West: Sky Vista Drive

b) Section: 22 Township: 20 S Range: 59 E

c) APN : 137-22-101-001

Name of Owner: The Howard Hughes Company, LLC

Telephone No.: 702-791-4300 Fax No.: 702-791-4385 E-Mail Address: chris.anderson@howardhughes.com

Address: 10845 Griffith Peak Drive, Suite 160, Las Vegas, Nevada 89135

Contact Person-Name: Steve Jones **Telephone No.:** (702) 804-2130

* **E-Mail Address:** sjones@gcwengineering.com **Fax No.:** (702) 804-2299

Firm: GCW, Inc.

Address: 1555 South Rainbow Blvd, Las Vegas, Nevada 89135

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	x	Building Permit		

1. Total Owned Land Area: At Site: +/- 1,800 Acres Being Developed/Disturbed: +/- 7 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.): Road Improvement
5. Approximate upstream land area which drains to the subject site: +/- 100 Acres
6. Has the site drainage been evaluated in the past? ☒ **YES** ☐ **NO** If yes, please identify documentation: Master Conceptual Drainage Study fro SUmmerlin West VIllage 25
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: The runoff drains into the existing 6'X5' RCB at Kettle Ridge Dr and Sky Vista Dr
8. Briefly describe your proposed schedule for the subject project: ASAP

PROFESSIONAL ENGINEER STATE OF NEVADA
STEPHEN M. JONES
EXP. 6-30-21
CIVIL
No. 19638

Engineer's Seal 12/26/2019

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

***New Required Field**

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

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

Hydraulics

WSPG has been used to model the proposed storm drain in this project. Below described the details for hydraulic models:

- SkyV_GP_13.WSW; The storm drain has been modeled from the intersection of Sky Vista and Kettle Ridge to the Grand Park Detention Basin Outlet (in Fox Hill). Note that 0.013 is used for Manning's N. This model has been mainly used to check the velocity in the storm drain.
- SkyV_GP_15.WSW; This model is similar to the previous model, the only difference is using of 0.015 as Manning's N for the storm drain. This model is mainly used to check water surface elevation.
- SkyV_13.WSW; In this model, the storm drain has been modeled from the intersection of Sky Vista and Kettle Ridge, to Foxtail Pass Way.
- In addition to these models, previously submitted WSPG models have been updated for storm drain laterals.

Note that for areas that velocity is greater than 25 fps, 1-inch sacrificial concrete has been proposed. For a 200 ft stretch of the 6'X5' RCB (starting at Station ~451+80), a corrugated wall face with 1-inch formed pattern on both sides of the RCB along with 3-inch of sacrificial concrete with a tined flow line on the bottom of the channel will be provided. A combined Manning's n of 0.023 for the 200-ft stretch of the box was calculated using 0.020 for the tined sacrificial concrete bottom and 0.026 (equivalent to n value of d_{50} 1-inch riprap) for the side 1-inch deep patterns. Typical sections of the high velocity mitigation is shown on Sheet DT4 and applicable labeling has been provided on the profile sheets. Super elevation has also been checked at channel bends, per the Manual (equation 748). As a result, super-elevation water surface increase has been added to WSPG results and shown as the HGL on the improvement plans.

Note that since the added storm drain is part of the outfall for the Grand Park Detention Basin, the entire system to the Grand Park Detention Basin outlet has been modeled for a comprehensive model to show no potential adverse tailwater impacts to the basin's outlet. Although the system is capped at the Fox Hill intersection to be extended upstream by a separate project, referenced plans from the upstream Fox Hill (Sky Vista to Grand Park) improvements used in WSPG modeling has been included in the appendix. The headworks HGL in the storm drain model approaches critical depth with a normal depth below critical depth due to the supercritical flow regime in the RCB. Therefore, the proposed design does not force outlet control on the Grand Park Detention Basin outlet, and considered an acceptable design.

Note that at the intersection of Sky Vista and Kettle Ridge (concentration point CPT) the flow is 641 cfs, however, the design flow at this location was 627 cfs. That has happened mainly due to the current land plan change in Parcel K, L and DC-1, where DC-1 that drains south to Sandstone has reduced in size and the K has grown that drains to the DB outfall alignment. Since the flow increase is minor (about 2%) from the design flow, we have considered this to be acceptable.

Please refer to the appendix for hydraulic calculations.

WSPG Models referenced and extended to the outlet structure of the GPDB.

SkyV_GP_13.WSW

```
T1 Sky Vista Drive Improvements Phase II (62025-206)                                                    0
T2 SD from GPDB to Kettle Ridge

SO   1000.0003424.800  1                          3429.820
R    1017.8903425.700  1      .013                                  .000    .000 1
JX   1017.8913425.710  1  2   .013   81.00          3425.710         90.000      .000
R    1025.5503426.025  1      .013                                  .000  17.110 1
R    1094.1503429.300  1      .013                                  .000 -18.000 1
R    1201.8503434.570  1      .013                                -5.000    .000 1
R    1401.8503448.450  1      .023                                  .000    .000 1
R    1690.4103468.460  1      .013                                  .000    .000 1
R    1826.0903472.180  1      .013                                -3.800    .000 1
R    1832.3103472.350  1      .013                                  .000    .000 1
JX   1832.3203472.351  3  4   .013  378.00          472.351           .000      .000
R    1832.3303472.352  3      .013                                  .000  22.000 1
R    1840.3003472.430  3      .013                                  .000    .000 1
R    1887.0003474.340  3      .013                                66.900    .000 1
R    1909.9203475.240  3      .013                                  .000    .000 1
R    1950.6503476.830  3      .013                                  .000    .000 1
R    2516.9703495.800  3      .013                               -49.000    .000 1
R    2632.4903498.720  3      .013                                68.900    .000 1
SH   2632.4903498.720  3                          3498.720
CD   1  3   0    .000   5.000    6.000  .000  .000   .00
CD   2  4   1    .000   3.500     .000  .000  .000   .00
CD   3  3   0    .000   5.000    5.000  .000  .000   .00
CD   4  4   1    .000   5.000     .000  .000  .000   .00
Q           182.000   .0
```

FILE: SkyV_GP_13.WSW W S P G W - EDIT LISTING - Version 14.10 Date:12-20-2019 Time: 9:14:22

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	3	0	.000	5.000	6.000	.000	.000	.00										
CD	2	4	1		3.500														
CD	3	3	0	.000	5.000	5.000	.000	.000	.00										
CD	4	4	1		5.000														

W S P G W PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

Sky Vista Drive Improvements Phase II (62025-206)

HEADING LINE NO 2 IS -

SD from GPDB to Kettle Ridge

HEADING LINE NO 3 IS -

W S P G W PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.000	3424.800	1	3429.820

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1017.890	3425.700	1	.013	.000	.000	.000	1

ELEMENT NO 3 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1017.891	3425.710	1	2	0	.013	81.000	.000	3425.710	.000	90.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1025.550	3426.025	1	.013	.000	.000	17.110	1

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1094.150	3429.300	1	.013	.000	.000	-18.000	1

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1201.850	3434.570	1	.013	1234.151	-5.000	.000	1

ELEMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1401.850	3448.450	1	.023	.000	.000	.000	1

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1690.410	3468.460	1	.013	.000	.000	.000	1

ELEMENT NO 9 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1826.090	3472.180	1	.013	2045.760	-3.800	.000	1

ELEMENT NO 10 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1832.310	3472.350	1	.013	.000	.000	.000	1

ELEMENT NO 11 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1832.320	3472.351	3	4	0	.013	378.000	.000	472.351	.000	.000	.000

RADIUS	ANGLE
.000	.000

W S P G W PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 12 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1832.330	3472.352	3	.013	.000	.000	22.000	1

ELEMENT NO 13 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1840.300	3472.430	3	.013	.000	.000	.000	1

ELEMENT NO 14 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1887.000	3474.340	3	.013	39.996	66.900	.000	1

ELEMENT NO 15 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1909.920	3475.240	3	.013	.000	.000	.000	1

ELEMENT NO 16 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1950.650	3476.830	3	.013	.000	.000	.000	1

ELEMENT NO 17 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2516.970	3495.800	3	.013	662.199	-49.000	.000	1

ELEMENT NO 18 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2632.490	3498.720	3	.013	96.064	68.900	.000	1

ELEMENT NO 19 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	2632.490	3498.720	3	3498.720

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	3424.800	4.256	3429.056	641.00	25.10	9.78	3438.84	.00	5.00	6.00	5.000	6.000	.00	0 .0
17.890	.0503					.0217	.39	4.26	2.14	3.13	.013	.00	.00	BOX
1017.890	3425.700	4.408	3430.108	641.00	24.23	9.12	3439.23	.00	5.00	6.00	5.000	6.000	.00	0 .0
JUNCT STR 10.2500						.0288	.00	4.41	2.03		.013	.00	.00	BOX
1017.891	3425.710	3.182	3428.892	560.00	29.33	13.36	3442.25	.00	5.00	6.00	5.000	6.000	.00	0 .0
7.659	.0411					.0368	.28	3.18	2.90	3.05	.013	.00	.00	BOX
1025.550	3426.025	3.186	3429.211	560.00	29.29	13.32	3442.53	.00	5.00	6.00	5.000	6.000	.00	0 .0
68.600	.0477					.0350	2.40	3.19	2.89	2.89	.013	.00	.00	BOX
1094.150	3429.300	3.314	3432.614	560.00	28.17	12.32	3444.93	.12	5.00	6.00	5.000	6.000	.00	0 .0
25.335	.0489					.0323	.82	3.43	2.73	2.86	.013	.00	.00	BOX
1119.485	3430.540	3.381	3433.921	560.00	27.60	11.83	3445.75	.12	5.00	6.00	5.000	6.000	.00	0 .0
47.077	.0489					.0296	1.39	3.50	2.65	2.86	.013	.00	.00	BOX
1166.562	3432.843	3.546	3436.389	560.00	26.32	10.76	3447.15	.10	5.00	6.00	5.000	6.000	.00	0 .0
35.288	.0489					.0261	.92	3.65	2.46	2.86	.013	.00	.00	BOX
1201.850	3434.570	3.719	3438.289	560.00	25.09	9.78	3448.07	.00	5.00	6.00	5.000	6.000	.00	0 .0
28.393	.0694					.0783	2.22	3.72	2.29	3.87	.023	.00	.00	BOX
1230.243	3436.541	3.661	3440.202	560.00	25.49	10.09	3450.29	.00	5.00	6.00	5.000	6.000	.00	0 .0
53.077	.0694					.0852	4.52	3.66	2.35	3.87	.023	.00	.00	BOX

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1283.320	3440.224	3.491	3443.715	560.00	26.74	11.10	3454.81	.00	5.00	6.00	5.000	6.000	.00	0 .0
34.942	.0694					.0965	3.37	3.49	2.52	3.87	.023	.00	.00	BOX
1318.261	3442.649	3.328	3445.978	560.00	28.04	12.21	3458.19	.00	5.00	6.00	5.000	6.000	.00	0 .0
26.640	.0694					.1094	2.91	3.33	2.71	3.87	.023	.00	.00	BOX
1344.901	3444.498	3.174	3447.671	560.00	29.41	13.43	3461.10	.00	5.00	6.00	5.000	6.000	.00	0 .0
21.838	.0694					.1241	2.71	3.17	2.91	3.87	.023	.00	.00	BOX
1366.739	3446.013	3.026	3449.039	560.00	30.84	14.77	3463.81	.00	5.00	6.00	5.000	6.000	.00	0 .0
18.682	.0694					.1409	2.63	3.03	3.12	3.87	.023	.00	.00	BOX
1385.421	3447.310	2.885	3450.195	560.00	32.35	16.25	3466.45	.00	5.00	6.00	5.000	6.000	.00	0 .0
16.429	.0694					.1601	2.63	2.89	3.36	3.87	.023	.00	.00	BOX
1401.850	3448.450	2.751	3451.201	560.00	33.93	17.88	3469.08	.00	5.00	6.00	5.000	6.000	.00	0 .0
44.954	.0693					.0528	2.37	2.75	3.61	2.52	.013	.00	.00	BOX
1446.804	3451.568	2.815	3454.383	560.00	33.15	17.07	3471.45	.00	5.00	6.00	5.000	6.000	.00	0 .0
66.504	.0693					.0481	3.20	2.82	3.48	2.52	.013	.00	.00	BOX

1513.308	3456.179	2.953	3459.132	560.00	31.61	15.52	3474.65	.00	5.00	6.00	5.000	6.000	.00	0	.0
46.880	.0693					.0423	1.98	2.95	3.24	2.52	.013	.00	.00	BOX	
1560.188	3459.430	3.097	3462.527	560.00	30.14	14.11	3476.63	.00	5.00	6.00	5.000	6.000	.00	0	.0
35.296	.0693					.0373	1.32	3.10	3.02	2.52	.013	.00	.00	BOX	

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:12 20 2019 Time: 9:14:24

Sky Vista Drive Improvements Phase II (62025-206)

SD from GPDB to Kettle Ridge

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1595.483	3461.877	3.248	3465.125	560.00	28.74	12.82	3477.95	.00	5.00	6.00	5.000	6.000	.00	0	.0
27.626	.0693					.0329	.91	3.25	2.81	2.52	.013	.00	.00	BOX	
1623.110	3463.793	3.406	3467.200	560.00	27.40	11.66	3478.86	.00	5.00	6.00	5.000	6.000	.00	0	.0
22.157	.0693					.0290	.64	3.41	2.62	2.52	.013	.00	.00	BOX	
1645.267	3465.330	3.573	3468.902	560.00	26.12	10.60	3479.50	.00	5.00	6.00	5.000	6.000	.00	0	.0
18.048	.0693					.0256	.46	3.57	2.44	2.52	.013	.00	.00	BOX	
1663.315	3466.581	3.747	3470.328	560.00	24.91	9.63	3479.96	.00	5.00	6.00	5.000	6.000	.00	0	.0
14.839	.0693					.0226	.34	3.75	2.27	2.52	.013	.00	.00	BOX	
1678.154	3467.610	3.930	3471.540	560.00	23.75	8.76	3480.30	.00	5.00	6.00	5.000	6.000	.00	0	.0
12.256	.0693					.0200	.25	3.93	2.11	2.52	.013	.00	.00	BOX	
1690.410	3468.460	4.122	3472.582	560.00	22.64	7.96	3480.54	.05	5.00	6.00	5.000	6.000	.00	0	.0
40.726	.0274					.0180	.73	4.17	1.97	3.56	.013	.00	.00	BOX	
1731.136	3469.577	4.264	3473.841	560.00	21.89	7.44	3481.28	.04	5.00	6.00	5.000	6.000	.00	0	.0
41.945	.0274					.0163	.68	4.31	1.87	3.56	.013	.00	.00	BOX	
1773.081	3470.727	4.472	3475.199	560.00	20.87	6.76	3481.96	.04	5.00	6.00	5.000	6.000	.00	0	.0
30.474	.0274					.0144	.44	4.51	1.74	3.56	.013	.00	.00	BOX	
1803.555	3471.562	4.691	3476.253	560.00	19.90	6.15	3482.40	.04	5.00	6.00	5.000	6.000	.00	0	.0
22.535	.0274					.0128	.29	4.73	1.62	3.56	.013	.00	.00	BOX	

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

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:12-20-2019 Time: 9:14:24

Sky Vista Drive Improvements Phase II (62025-206)

SD from GPDB to Kettle Ridge

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1826.090	3472.180	4.920	3477.100	560.00	18.97	5.59	3482.69	.00	5.00	6.00	5.000	6.000	.00	0	.0
6.220	.0274					.0148	.09	4.92	1.51	3.57	.013	.00	.00	BOX	

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

1832.310	3472.350	5.000	3477.350	560.00	18.67	5.41	3482.76	.00	5.00	6.00	5.000	6.000	.00	0	.0
JUNCT STR	.0988					.0030	.00	5.00	1.47		.013	.00	.00	BOX	
1832.320	3472.351	9.587	3481.938	182.00	7.28	.82	3482.76	.00	3.45	5.00	5.000	5.000	.00	0	.0
.010	.0976					.0030	.00	9.59	.57	1.18	.013	.00	.00	BOX	
1832.330	3472.352	9.687	3482.039	182.00	7.28	.82	3482.86	.00	3.45	5.00	5.000	5.000	.00	0	.0
7.970	.0098					.0030	.02	9.69	.57	2.71	.013	.00	.00	BOX	
1840.300	3472.430	9.674	3482.104	182.00	7.28	.82	3482.93	.00	3.45	5.00	5.000	5.000	.00	0	.0
46.700	.0409					.0030	.14	.00	.57	1.60	.013	.00	.00	BOX	

1887.000	3474.340	8.088	3482.428	182.00	7.28	.82	3483.25	.00	3.45	5.00	5.000	5.000	.00	0 .0
22.920	.0393					.0030	.07	8.09	.57	1.62	.013	.00	.00	BOX
1909.920	3475.240	7.298	3482.538	182.00	7.28	.82	3483.36	.00	3.45	5.00	5.000	5.000	.00	0 .0
38.752	.0390					.0030	.12	7.30	.57	1.63	.013	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1948.672	3476.753	5.940	3482.693	182.00	7.28	.82	3483.52	.00	3.45	5.00	5.000	5.000	.00	0 .0
HYDRAULIC JUMP														
1948.672	3476.753	1.716	3478.469	182.00	21.21	6.98	3485.45	.00	3.45	5.00	5.000	5.000	.00	0 .0
1.978	.0390					.0336	.07	1.72	2.85	1.63	.013	.00	.00	BOX
1950.650	3476.830	1.719	3478.549	182.00	21.18	6.96	3485.51	.11	3.45	5.00	5.000	5.000	.00	0 .0
101.841	.0335					.0335	3.41	1.82	2.85	1.72	.013	.00	.00	BOX
2052.490	3480.241	1.719	3481.960	182.00	21.18	6.96	3488.92	.11	3.45	5.00	5.000	5.000	.00	0 .0
263.722	.0335					.0318	8.38	1.82	2.85	1.72	.013	.00	.00	BOX
2316.212	3489.075	1.787	3490.862	182.00	20.37	6.44	3497.31	.10	3.45	5.00	5.000	5.000	.00	0 .0
94.137	.0335					.0282	2.65	1.88	2.69	1.72	.013	.00	.00	BOX
2410.350	3492.229	1.874	3494.103	182.00	19.42	5.86	3499.96	.09	3.45	5.00	5.000	5.000	.00	0 .0
50.263	.0335					.0247	1.24	1.96	2.50	1.72	.013	.00	.00	BOX
2460.613	3493.912	1.966	3495.878	182.00	18.52	5.33	3501.20	.08	3.45	5.00	5.000	5.000	.00	0 .0
32.873	.0335					.0217	.71	2.05	2.33	1.72	.013	.00	.00	BOX
2493.485	3495.013	2.062	3497.075	182.00	17.66	4.84	3501.92	.07	3.45	5.00	5.000	5.000	.00	0 .0
23.485	.0335					.0190	.45	2.13	2.17	1.72	.013	.00	.00	BOX
2516.970	3495.800	2.162	3497.962	182.00	16.84	4.40	3502.36	.46	3.45	5.00	5.000	5.000	.00	0 .0
29.103	.0253					.0169	.49	2.62	2.02	1.90	.013	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2546.073	3496.536	2.247	3498.783	182.00	16.20	4.07	3502.86	.42	3.45	5.00	5.000	5.000	.00	0 .0
25.539	.0253					.0151	.38	2.67	1.90	1.90	.013	.00	.00	BOX
2571.611	3497.181	2.357	3499.538	182.00	15.44	3.70	3503.24	.39	3.45	5.00	5.000	5.000	.00	0 .0
18.442	.0253					.0133	.24	2.74	1.77	1.90	.013	.00	.00	BOX
2590.053	3497.647	2.472	3500.119	182.00	14.72	3.37	3503.49	.35	3.45	5.00	5.000	5.000	.00	0 .0
13.630	.0253					.0117	.16	2.82	1.65	1.90	.013	.00	.00	BOX
2603.683	3497.992	2.593	3500.584	182.00	14.04	3.06	3503.65	.32	3.45	5.00	5.000	5.000	.00	0 .0
10.119	.0253					.0103	.10	2.91	1.54	1.90	.013	.00	.00	BOX
2613.802	3498.248	2.719	3500.967	182.00	13.39	2.78	3503.75	.29	3.45	5.00	5.000	5.000	.00	0 .0
7.418	.0253					.0091	.07	3.01	1.43	1.90	.013	.00	.00	BOX

2621.220	3498.435	2.852	3501.287	182.00	12.76	2.53	3503.82	.26	3.45	5.00	5.000	5.000	.00	0	.0		
5.253	.0253					.0080	.04	3.12	1.33	1.90	.013	.00	.00	BOX			
2626.473	3498.568	2.991	3501.559	182.00	12.17	2.30	3503.86	.24	3.45	5.00	5.000	5.000	.00	0	.0		
3.462	.0253					.0071	.02	3.23	1.24	1.90	.013	.00	.00	BOX			
2629.935	3498.655	3.137	3501.792	182.00	11.60	2.09	3503.88	.22	3.45	5.00	5.000	5.000	.00	0	.0		
1.939	.0253					.0062	.01	3.35	1.15	1.90	.013	.00	.00	BOX			
2631.875	3498.704	3.290	3501.995	182.00	11.06	1.90	3503.90	.20	3.45	5.00	5.000	5.000	.00	0	.0		
.615	.0253					.0055	.00	3.49	1.07	1.90	.013	.00	.00	BOX			

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2632.490	3498.720	3.452	3502.172	182.00	10.54	1.73	3503.90	.18	3.45	5.00	5.000	5.000	.00	0	.0		

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T1 Sky Vista Drive Improvements Phase II (62025-206)                                                0
T2 SD from GPDB to Kettle Ridge

SO   1000.0003424.800  1                          3429.820
R    1017.8903425.700  1      .015                                  .000    .000 1
JX   1017.8913425.710  1  2   .015   81.00          3425.710         90.000      .000
R    1025.5503426.025  1      .015                                  .000  17.110 1
R    1094.1503429.300  1      .015                                  .000 -18.000 1
R    1201.8503434.570  1      .015                                 -5.000    .000 1
R    1401.8503448.450  1      .023                                  .000    .000 1
R    1690.4103468.460  1      .015                                  .000    .000 1
R    1826.0903472.180  1      .015                                 -3.800    .000 1
R    1832.3103472.350  1      .015                                  .000    .000 1
JX   1832.3203472.351  3  4   .015  378.00          472.351           .000      .000
R    1832.3303472.352  3      .015                                  .000  22.000 1
R    1840.3003472.430  3      .015                                  .000    .000 1
R    1887.0003474.340  3      .015                                 66.900    .000 1
R    1909.9203475.240  3      .015                                  .000    .000 1
R    1950.6503476.830  3      .015                                  .000    .000 1
R    2516.9703495.800  3      .015                                -49.000    .000 1
R    2632.4903498.720  3      .015                                 68.900    .000 1
SH   2632.4903498.720  3                          3498.720
CD   1  3   0    .000   5.000    6.000  .000  .000   .00
CD   2  4   1    .000   3.500     .000  .000  .000   .00
CD   3  3   0    .000   5.000    5.000  .000  .000   .00
CD   4  4   1    .000   5.000     .000  .000  .000   .00
Q           182.000   .0
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FILE: SkyV_GP_15.WSW W S P G W - EDIT LISTING - Version 14.10 Date:12-20-2019 Time:10:17:34

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	3	0	.000	5.000	6.000	.000	.000	.00										
CD	2	4	1		3.500														
CD	3	3	0	.000	5.000	5.000	.000	.000	.00										
CD	4	4	1		5.000														

W S P G W PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

Sky Vista Drive Improvements Phase II (62025-206)

HEADING LINE NO 2 IS -

SD from GPDB to Kettle Ridge

HEADING LINE NO 3 IS -

W S P G W PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.000	3424.800	1	3429.820

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1017.890	3425.700	1	.015	.000	.000	.000	1

ELEMENT NO 3 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1017.891	3425.710	1	2	0	.015	81.000	.000	3425.710	.000	90.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1025.550	3426.025	1	.015	.000	.000	17.110	1

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1094.150	3429.300	1	.015	.000	.000	-18.000	1

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1201.850	3434.570	1	.015	1234.151	-5.000	.000	1

ELEMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1401.850	3448.450	1	.023	.000	.000	.000	1

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1690.410	3468.460	1	.015	.000	.000	.000	1

ELEMENT NO 9 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1826.090	3472.180	1	.015	2045.760	-3.800	.000	1

ELEMENT NO 10 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1832.310	3472.350	1	.015	.000	.000	.000	1

ELEMENT NO 11 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1832.320	3472.351	3	4	0	.015	378.000	.000	472.351	.000	.000	.000

RADIUS	ANGLE
.000	.000

W S P G W PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 12 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1832.330	3472.352	3	.015	.000	.000	22.000	1

ELEMENT NO 13 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1840.300	3472.430	3	.015	.000	.000	.000	1

ELEMENT NO 14 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1887.000	3474.340	3	.015	39.996	66.900	.000	1

ELEMENT NO 15 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1909.920	3475.240	3	.015	.000	.000	.000	1

ELEMENT NO 16 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1950.650	3476.830	3	.015	.000	.000	.000	1

ELEMENT NO 17 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2516.970	3495.800	3	.015	662.199	-49.000	.000	1

ELEMENT NO 18 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2632.490	3498.720	3	.015	96.064	68.900	.000	1

ELEMENT NO 19 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	2632.490	3498.720	3	3498.720

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	3424.800	4.572	3429.372	641.00	23.37	8.48	3437.85	.00	5.00	6.00	5.000	6.000	.00	0 .0
17.890	.0503					.0240	.43	4.57	1.93	3.49	.015	.00	.00	BOX
		WARNING - Flow depth near top of box conduit												
1017.890	3425.700	4.761	3430.460	641.00	22.44	7.82	3438.28	.00	5.00	6.00	5.000	6.000	.00	0 .0
JUNCT STR 10.2500						.0323	.00	4.76	1.81		.015	.00	.00	BOX
		WARNING - Flow depth near top of box conduit												
1017.891	3425.710	3.380	3429.090	560.00	27.61	11.84	3440.93	.00	5.00	6.00	5.000	6.000	.00	0 .0
7.659	.0411					.0419	.32	3.38	2.65	3.40	.015	.00	.00	BOX
1025.550	3426.025	3.379	3429.404	560.00	27.62	11.85	3441.25	.00	5.00	6.00	5.000	6.000	.00	0 .0
68.600	.0477					.0406	2.79	3.38	2.65	3.22	.015	.00	.00	BOX
1094.150	3429.300	3.464	3432.764	560.00	26.94	11.27	3444.04	.11	5.00	6.00	5.000	6.000	.00	0 .0
56.274	.0489					.0376	2.11	3.57	2.55	3.19	.015	.00	.00	BOX
1150.424	3432.054	3.587	3435.641	560.00	26.02	10.51	3446.15	.10	5.00	6.00	5.000	6.000	.00	0 .0
51.426	.0489					.0338	1.74	3.69	2.42	3.19	.015	.00	.00	BOX
1201.850	3434.570	3.762	3438.333	560.00	24.81	9.56	3447.89	.00	5.00	6.00	5.000	6.000	.00	0 .0
11.019	.0694					.0748	.82	3.76	2.25	3.87	.023	.00	.00	BOX

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1212.869	3435.335	3.748	3439.083	560.00	24.90	9.63	3448.71	.00	5.00	6.00	5.000	6.000	.00	0 .0
73.180	.0694					.0802	5.87	3.75	2.27	3.87	.023	.00	.00	BOX
1286.049	3440.414	3.573	3443.987	560.00	26.12	10.59	3454.58	.00	5.00	6.00	5.000	6.000	.00	0 .0
41.748	.0694					.0908	3.79	3.57	2.43	3.87	.023	.00	.00	BOX
1327.797	3443.311	3.407	3446.718	560.00	27.39	11.65	3458.37	.00	5.00	6.00	5.000	6.000	.00	0 .0
30.061	.0694					.1029	3.09	3.41	2.62	3.87	.023	.00	.00	BOX
1357.858	3445.397	3.249	3448.646	560.00	28.73	12.82	3461.46	.00	5.00	6.00	5.000	6.000	.00	0 .0
23.910	.0694					.1167	2.79	3.25	2.81	3.87	.023	.00	.00	BOX
1381.768	3447.056	3.097	3450.154	560.00	30.13	14.10	3464.25	.00	5.00	6.00	5.000	6.000	.00	0 .0
20.082	.0694					.1324	2.66	3.10	3.02	3.87	.023	.00	.00	BOX
1401.850	3448.450	2.953	3451.403	560.00	31.60	15.51	3466.91	.00	5.00	6.00	5.000	6.000	.00	0 .0
96.309	.0693					.0564	5.43	2.95	3.24	2.80	.015	.00	.00	BOX
1498.159	3455.129	3.095	3458.224	560.00	30.15	14.12	3472.34	.00	5.00	6.00	5.000	6.000	.00	0 .0
57.709	.0693					.0497	2.87	3.10	3.02	2.80	.015	.00	.00	BOX
1555.868	3459.130	3.246	3462.377	560.00	28.75	12.84	3475.21	.00	5.00	6.00	5.000	6.000	.00	0 .0
39.540	.0693					.0438	1.73	3.25	2.81	2.80	.015	.00	.00	BOX
1595.408	3461.872	3.405	3465.277	560.00	27.41	11.67	3476.95	.00	5.00	6.00	5.000	6.000	.00	0 .0

```
   29.179    .0693                                    .0387     1.13     3.40    2.62    2.80    .015       .00   .00  BOX
```


Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:12-20-2019 Time:10:17:37

Sky Vista Drive Improvements Phase II (62025-206)
SD from GPDB to Kettle Ridge

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia. FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1624.587	3463.896	3.571	3467.467	560.00	26.14	10.61	3478.07	.00	5.00	6.00	5.000	6.000	.00	0 .0
22.456	.0693					.0342	.77	3.57	2.44	2.80	.015	.00	.00	BOX
1647.044	3465.453	3.745	3469.198	560.00	24.92	9.64	3478.84	.00	5.00	6.00	5.000	6.000	.00	0 .0
17.722	.0693					.0302	.54	3.75	2.27	2.80	.015	.00	.00	BOX
1664.766	3466.682	3.928	3470.610	560.00	23.76	8.77	3479.38	.00	5.00	6.00	5.000	6.000	.00	0 .0
14.193	.0693					.0267	.38	3.93	2.11	2.80	.015	.00	.00	BOX
1678.959	3467.666	4.120	3471.786	560.00	22.66	7.97	3479.76	.00	5.00	6.00	5.000	6.000	.00	0 .0
11.451	.0693					.0236	.27	4.12	1.97	2.80	.015	.00	.00	BOX
1690.410	3468.460	4.321	3472.781	560.00	21.60	7.25	3480.03	.04	5.00	6.00	5.000	6.000	.00	0 .0
58.521	.0274					.0212	1.24	4.36	1.83	3.98	.015	.00	.00	BOX
1748.931	3470.064	4.489	3474.554	560.00	20.79	6.71	3481.27	.04	5.00	6.00	5.000	6.000	.00	0 .0
46.429	.0274					.0190	.88	4.53	1.73	3.98	.015	.00	.00	BOX
1795.360	3471.337	4.709	3476.046	560.00	19.82	6.10	3482.15	.04	5.00	6.00	5.000	6.000	.00	0 .0
30.730	.0274					.0168	.52	4.74	1.61	3.98	.015	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												
1826.090	3472.180	4.938	3477.118	560.00	18.90	5.55	3482.66	.00	5.00	6.00	5.000	6.000	.00	0 .0
6.220	.0274					.0197	.12	4.94	1.50	3.98	.015	.00	.00	BOX
		---------- WARNING - Flow depth near top of box conduit ----------												

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:12-20-2019 Time:10:17:37

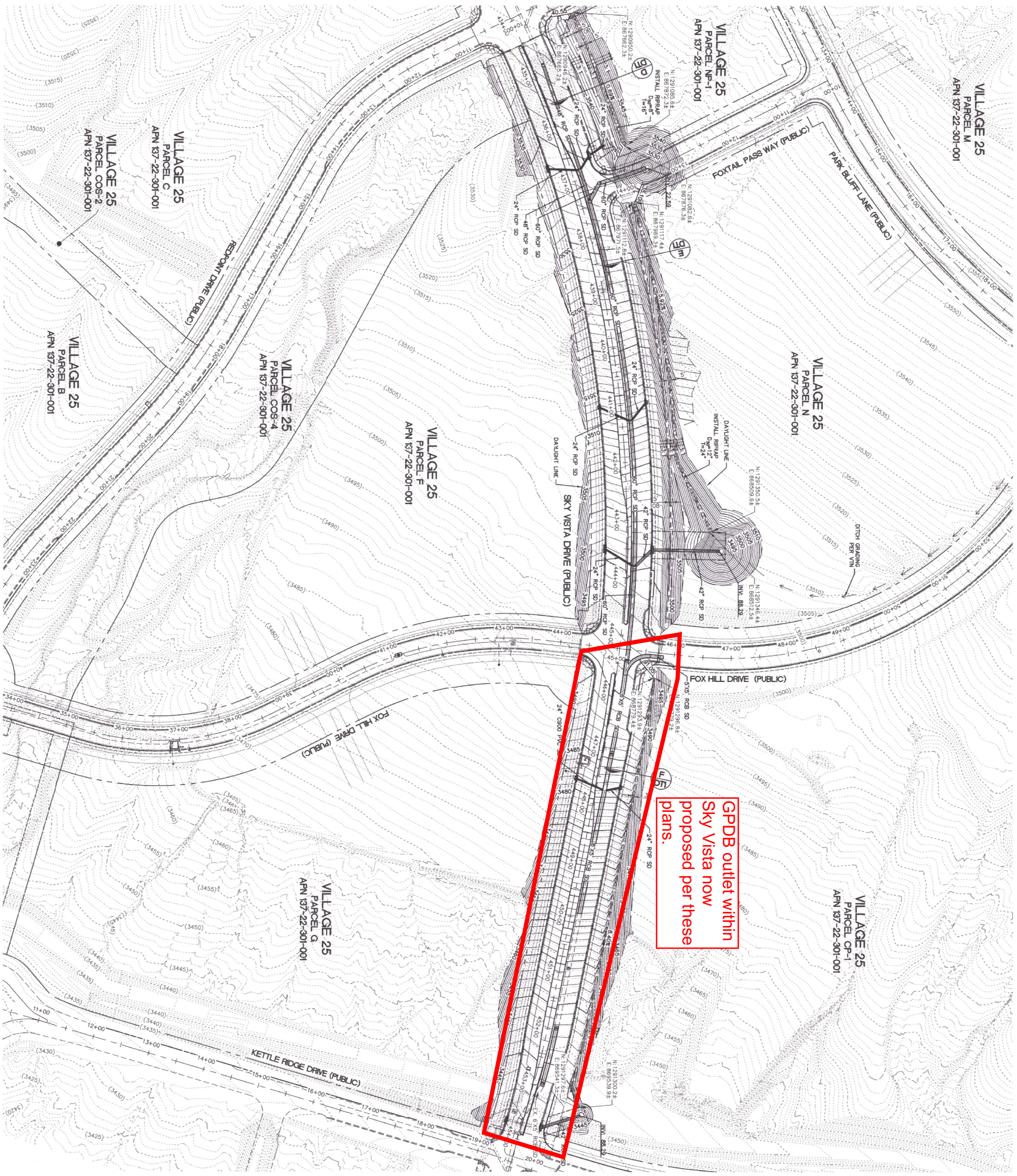
Sky Vista Drive Improvements Phase II (62025-206)
SD from GPDB to Kettle Ridge

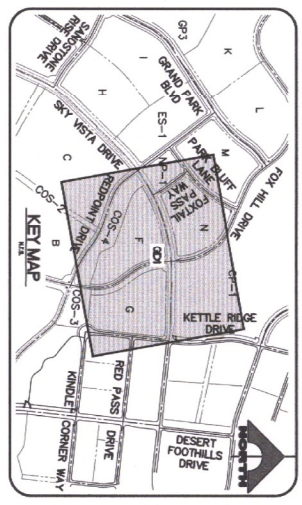
Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1832.310	3472.350	5.000	3477.350	560.00	18.67	5.41	3482.76	.00	5.00	6.00	5.000	6.000	.00	0 .0
JUNCT STR	.0988					.0040	.00	5.00	1.47		.015	.00	.00	BOX
1832.320	3472.351	9.587	3481.938	182.00	7.28	.82	3482.76	.00	3.45	5.00	5.000	5.000	.00	0 .0
.010	.0976					.0040	.00	9.59	.57	1.30	.015	.00	.00	BOX
1832.330	3472.352	9.687	3482.039	182.00	7.28	.82	3482.86	.00	3.45	5.00	5.000	5.000	.00	0 .0
7.970	.0098					.0040	.03	9.69	.57	3.02	.015	.00	.00	BOX
1840.300	3472.430	9.682	3482.112	182.00	7.28	.82	3482.93	.00	3.45	5.00	5.000	5.000	.00	0 .0
46.700	.0409					.0040	.19	.00	.57	1.77	.015	.00	.00	BOX
1887.000	3474.340	8.142	3482.482	182.00	7.28	.82	3483.31	.00	3.45	5.00	5.000	5.000	.00	0 .0
22.920	.0393					.0040	.09	8.14	.57	1.80	.015	.00	.00	BOX
1909.920	3475.240	7.375	3482.615	182.00	7.28	.82	3483.44	.00	3.45	5.00	5.000	5.000	.00	0 .0
40.730	.0390					.0040	.16	7.38	.57	1.80	.015	.00	.00	BOX
1950.650	3476.830	5.990	3482.820	182.00	7.28	.82	3483.64	.00	3.45	5.00	5.000	5.000	.00	0 .0
15.892	.0335					.0040	.06	.00	.57	1.91	.015	.00	.00	BOX
1966.542	3477.362	5.535	3482.898	182.00	7.28	.82	3483.72	.00	3.45	5.00	5.000	5.000	.00	0 .0

HYDRAULIC JUMP

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1966.542	3477.362	1.906	3479.268	182.00	19.10	5.67	3484.93	.09	3.45	5.00	5.000	5.000	.00	0 .0
204.138	.0335					.0335	6.84	1.99	2.44	1.91	.015	.00	.00	BOX
2170.680	3484.201	1.906	3486.106	182.00	19.10	5.67	3491.77	.09	3.45	5.00	5.000	5.000	.00	0 .0
205.367	.0335					.0319	6.55	1.99	2.44	1.91	.015	.00	.00	BOX
2376.047	3491.080	1.975	3493.055	182.00	18.43	5.27	3498.33	.08	3.45	5.00	5.000	5.000	.00	0 .0
76.341	.0335					.0285	2.17	2.06	2.31	1.91	.015	.00	.00	BOX
2452.388	3493.637	2.072	3495.709	182.00	17.57	4.79	3500.50	.07	3.45	5.00	5.000	5.000	.00	0 .0
39.412	.0335					.0250	.99	2.14	2.15	1.91	.015	.00	.00	BOX
2491.800	3494.957	2.173	3497.130	182.00	16.75	4.36	3501.49	.07	3.45	5.00	5.000	5.000	.00	0 .0
25.170	.0335					.0220	.55	2.24	2.00	1.91	.015	.00	.00	BOX
2516.970	3495.800	2.279	3498.079	182.00	15.97	3.96	3502.04	.41	3.45	5.00	5.000	5.000	.00	0 .0
32.159	.0253					.0197	.63	2.69	1.86	2.11	.015	.00	.00	BOX
2549.129	3496.613	2.357	3498.970	182.00	15.44	3.70	3502.67	.39	3.45	5.00	5.000	5.000	.00	0 .0
29.073	.0253					.0177	.51	2.74	1.77	2.11	.015	.00	.00	BOX
2578.202	3497.348	2.472	3499.820	182.00	14.72	3.37	3503.19	.35	3.45	5.00	5.000	5.000	.00	0 .0
19.048	.0253					.0155	.30	2.82	1.65	2.11	.015	.00	.00	BOX
2597.250	3497.829	2.593	3500.422	182.00	14.04	3.06	3503.48	.32	3.45	5.00	5.000	5.000	.00	0 .0
13.098	.0253					.0137	.18	2.91	1.54	2.11	.015	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2610.348	3498.160	2.719	3500.880	182.00	13.39	2.78	3503.66	.29	3.45	5.00	5.000	5.000	.00	0 .0
9.107	.0253					.0121	.11	3.01	1.43	2.11	.015	.00	.00	BOX
2619.455	3498.391	2.852	3501.243	182.00	12.76	2.53	3503.77	.26	3.45	5.00	5.000	5.000	.00	0 .0
6.207	.0253					.0107	.07	3.12	1.33	2.11	.015	.00	.00	BOX
2625.662	3498.548	2.991	3501.539	182.00	12.17	2.30	3503.84	.24	3.45	5.00	5.000	5.000	.00	0 .0
3.973	.0253					.0094	.04	3.23	1.24	2.11	.015	.00	.00	BOX
2629.635	3498.648	3.137	3501.785	182.00	11.60	2.09	3503.88	.22	3.45	5.00	5.000	5.000	.00	0 .0
2.176	.0253					.0083	.02	3.35	1.15	2.11	.015	.00	.00	BOX
2631.812	3498.703	3.290	3501.993	182.00	11.06	1.90	3503.89	.20	3.45	5.00	5.000	5.000	.00	0 .0
.678	.0253					.0074	.00	3.49	1.07	2.11	.015	.00	.00	BOX
2632.490	3498.720	3.452	3502.172	182.00	10.54	1.73	3503.90	.18	3.45	5.00	5.000	5.000	.00	0 .0





NORTH

SCALE: 1" = 80'

80' 0' 40' 80' 160'

OFF-SITE FLOOD CONTROL NOTE

ALL OFF-SITE INTERIM FLOOD CONTROL FACILITIES SUCH AS, BUT NOT LIMITED TO, BERMS/DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND ARE TO BE PRIVATELY MAINTAINED BY THE HOWARD HUGHES COMPANY.

BASIS OF BEARING AND COORDINATES

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983, SAID MERIDIAN BEING CONCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)
ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 800,000.00 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DESIGNED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO GROUND DISTANCES IN THE PROJECT AREA.
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

BM#	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. 7LV09340W6	FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. TSOS:R59E:S34	3316.31 (FEET)	1,011.422 (METERS)

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Cal 811
or
1-800-227-2600

FAST
Call before you UnderGround
1-702-432-6300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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

L#: LXX-XXXXX-XXXX
CLV#: 107XXXXX

THE HOWARD HUGHES COMPANY. LLC

VILLAGE 25 SKY VISTA DRIVE IMPROVEMENTS
(REDPOINT DRIVE TO KETTLE RIDGE DRIVE)

GRADING PLAN 1

DRAWING GD1
10 OF 32 SHTS

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\PROJECTS\600\62025-206\DWG\PRODUCTION\62025-206C04_GD1.DWG
ALEXANDER SANTIAGO

PROJECT NO. 62025-206
DESIGN: LG/MF
DRAWN: AS
CHECK: LG/MF
PLOT DATE: 12-26-19
PLOT TIME: 11:22:53

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP

PROFESSIONAL ENGINEER STATE OF NEVADA
STEPHEN M. JONES
Exp. 06/30/2021
CIVIL
No. 19636

DATE: 12/26/2019

90% REVIEW - NOT FOR CONSTRUCTION

D.4

GCW – FOX HILL IMPROVEMENTS

(DS5218)

D.3.1 Cover and Text
D.3.2 Grading Plan

1st RESPONSE TO COMMENTS FOR THE TECHNICAL DRAINAGE STUDY FOR VILLAGE 25 FOX HILL DRIVE IMPROVEMENTS (SKY VISTA DRIVE TO GRAND PARK BOULEVARD)

62025-210

January 2020

Prepared for:

The Howard Hughes Company, LLC
10845 Griffith Peak Drive, Suite 160
Las Vegas, NV 89135
Phone: (702) 791-4300

GCW 50 YEARS ENGINEERS \ SURVEYORS 1969-2019

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Village 25 Fox Hill Drive Improvements (Sky Vista Drive to Grand Park Blvd) Date: January 2020

Location of Development: a) Descriptive (Cross Streets) North/South: Fox Hill Drive

East/West: Sky Vista Drive

b) Section: 22 Township: 20S Range: 59E

c) APN : 137-22-101-001

Name of Owner: Howard Hughes Company, LLC

Telephone No.: 702.791.4300 Fax No.: 702.791.4385 E-Mail Address: chris.anderson@howardhughes.com

Address: 10845 Griffith Peak Drive, Suite 160, Las Vegas Nevada 89135

Contact Person-Name: Steve Jones **Telephone No.:** 702.804.2000

* **E-Mail Address:** sjones@gcwengineering.com **Fax No.:** 702.804.2299

Firm: GCW

Address: 1555 South Rainbow Boulevard Las Vegas, Nevada 89146

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: +/- 497.59 acres Being Developed/Disturbed: +/- 5.00 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.): Roadway Improvements
5. Approximate upstream land area which drains to the subject site: +/- 100 acres
6. Has the site drainage been evaluated in the past? ☒ **YES** ☐ **NO** If yes, please identify documentation: Master Conceptual Drainage Study for Summerlin West Village 25
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Sky Vista Drive Intersection
8. Briefly describe your proposed schedule for the subject project: The Client intends to start construction as soon as practical. Any expediting of this process is appreciated.

PROFESSIONAL ENGINEER-STATE OF NEVADA
STEPHEN M. JONES
EXP. 6-30-21
CIVIL
No. 19638
1/2/2020

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.

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

62025-210

Subject: **1st Response to Comments for the Technical Drainage Study for Village 25 Fox Hill Drive Improvements (Sky Vista Drive to Grand Park Boulevard)**

This report addresses City of Las Vegas (CLV) review comments dated December 13, 2018 (included in Appendix A) and design changes which include the construction of the Grand Park Detention Basin Outfall pipe improvements with the Fox Hill Drive roadway improvements. The Fox Hill Drive plan set will now include the construction of the portion of Grand Park Detention Basin outfall pipe that is aligned within Fox Hill Drive since the Grand Park Detention Basin is undergoing design changes and could potentially hold up the progress of the Fox Hill Drive. Note that, after consultation with Peter Jackson at CLV, the City agrees that if Howard Hughes wants to be able to get approval on Fox Hill prior to approval of the Update #2 to the Summerlin West MPU and the Grand Park DB, that utilization of the below flow rates is the best/safest course of action. The proposed outfall pipe has been modelled in WSPG (Included in Appendix B) and the resulting HGL has been plotted on the revised plans.

Table 1: Grand Park Detention Basin Flow Rates.

	Currently Approved Summerlin West MPU (Referenced from Addendum #1 to Update #1 for Summerlin West MPU)
GPDB Inflow (cfs)	1,785
GPDB Outflow (cfs)	182

Additional revisions to the plan set include a second ditch (Ditch 2) at the upstream side of the proposed roadway improvements, additional nuisance inlets, and resizing of the inlets near Sky Vista Drive. Ditch 2 will direct runoff from ^FOX1 toward the Grand Park Detention Basin instead of down Fox Hill Drive as shown in the previous submittal. This revision will reflect the Ultimate Condition drainage patterns more accurately since ^FOX1 will discharge into the Grand Park Detention Basin Inflow pipe in the future.

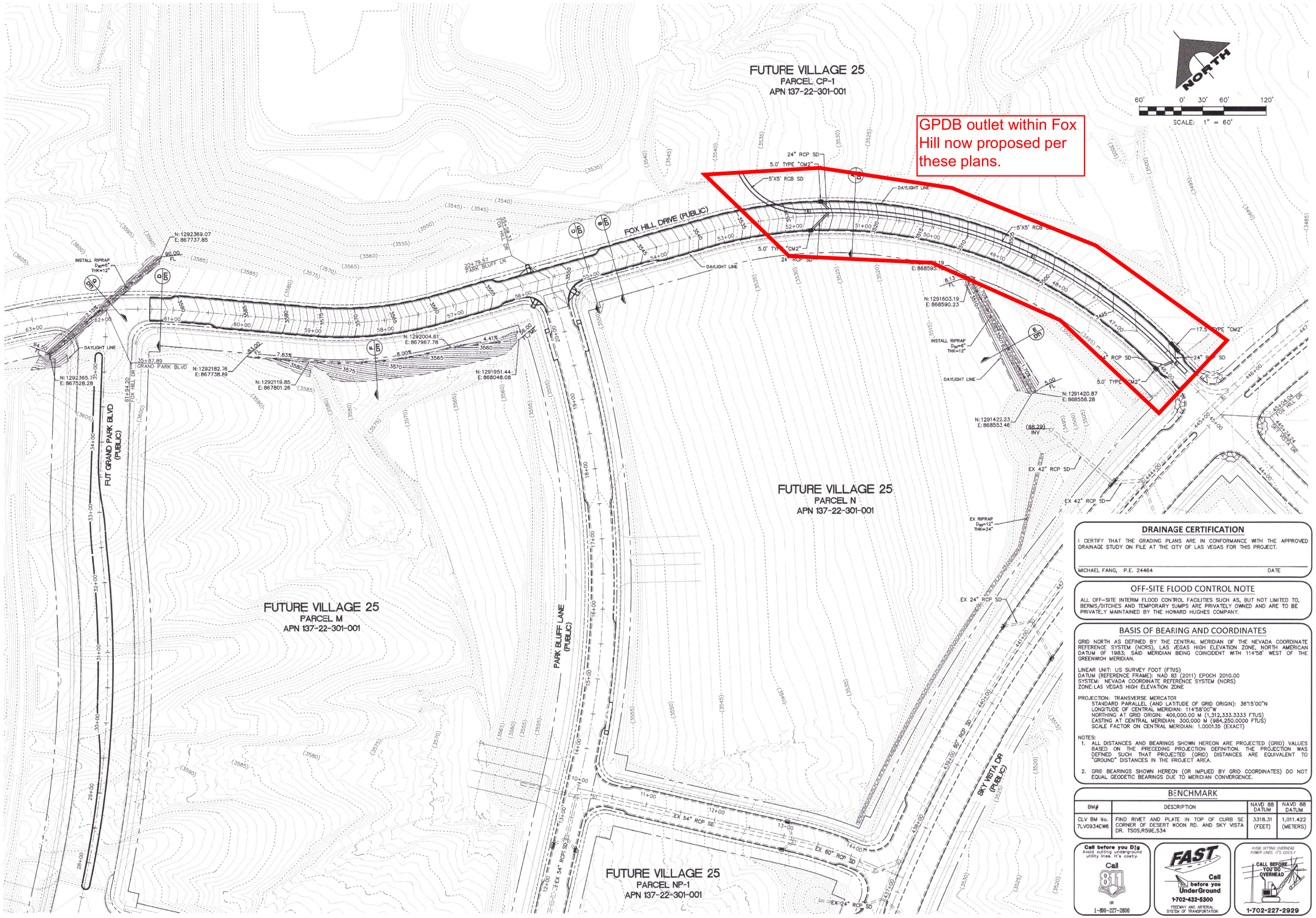
Comment 1:

The subject drainage study is premised on the existence of the Grand Park Detention Basin Outfall Facility (APDF 0123) in Fox Hill Drive.

The subject drainage study will not be approved prior to the approval of the Technical Drainage Study for Summerlin West Grand Park Detention Basin.

Response:

The infrastructure proposed as part of the Grand Park Detention Basin Outfall Facility will be constructed with this project. The flow rates from the most recently approved Summerlin West MPU study have been adopted for the purposes of this study. Through coordination with the client, it is expected that the future revisions to the Grand Park Detention Basin Outfall and Summerlin West MPU are projected to reduce the flow rates; therefore, the infrastructure constructed with Fox Hill Drive should accommodate the lower flow rates. Therefore, this drainage study and the Fox Hill Drive improvements can be approved and constructed independently from the Grand Park Deten-



DRAINAGE CERTIFICATION

I CERTIFY THAT THE GRADING PLANS ARE IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

MICHAEL FANG, P.E. 24464 DATE

OFF-SITE FLOOD CONTROL NOTE

ALL OFF-SITE INTERIM FLOOD CONTROL FACILITIES SUCH AS, BUT NOT LIMITED TO, BERMS/DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND ARE TO BE PRIVATE.Y MAINTAINED BY THE HOWARD HUGHES COMPANY.

BASIS OF BEARING AND COORDINATES

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)
ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

BM#	DESCRIPTION	NAVD 88 DATUM	NAVD 88 DATUM
CLV BM No. 7LV0934CW6	FIND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T5OS,R59E,S34	3318.31 (FEET)	1,011.422 (METERS)

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811 OR 1-800-227-2600

FAST Call before you UnderGround 1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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

L#: LXX-XXXXX-XXXX | CLV#: XXXXXXXX

ENGINEER - STATE OF NEVADA
MICHAEL FANG
Exp. 06/30/2020
No. 24464
PROFESSIONAL
DATE: 01/03/2020

REV	DATE	DESCRIPTION	DATE AGEN APP	DATE GOW APP

FOR AGENCY REVIEW - NOT FOR CONSTRUCTION

PROJECT NO. 62025-210
DESIGN: APM
DRAWN: APM
CHECK: MF/LG
PLOT DATE: 01-03-20
PLOT TIME: 10:13:37

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gowengineering.com

T:\PROJECTS\62025-210\DWG\PRODUCTION\62025-210_GD1.DWG

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 25 FOX HILL DRIVE IMPROVEMENTS
(SKY VISTA DRIVE TO GRAND PARK BLVD.)

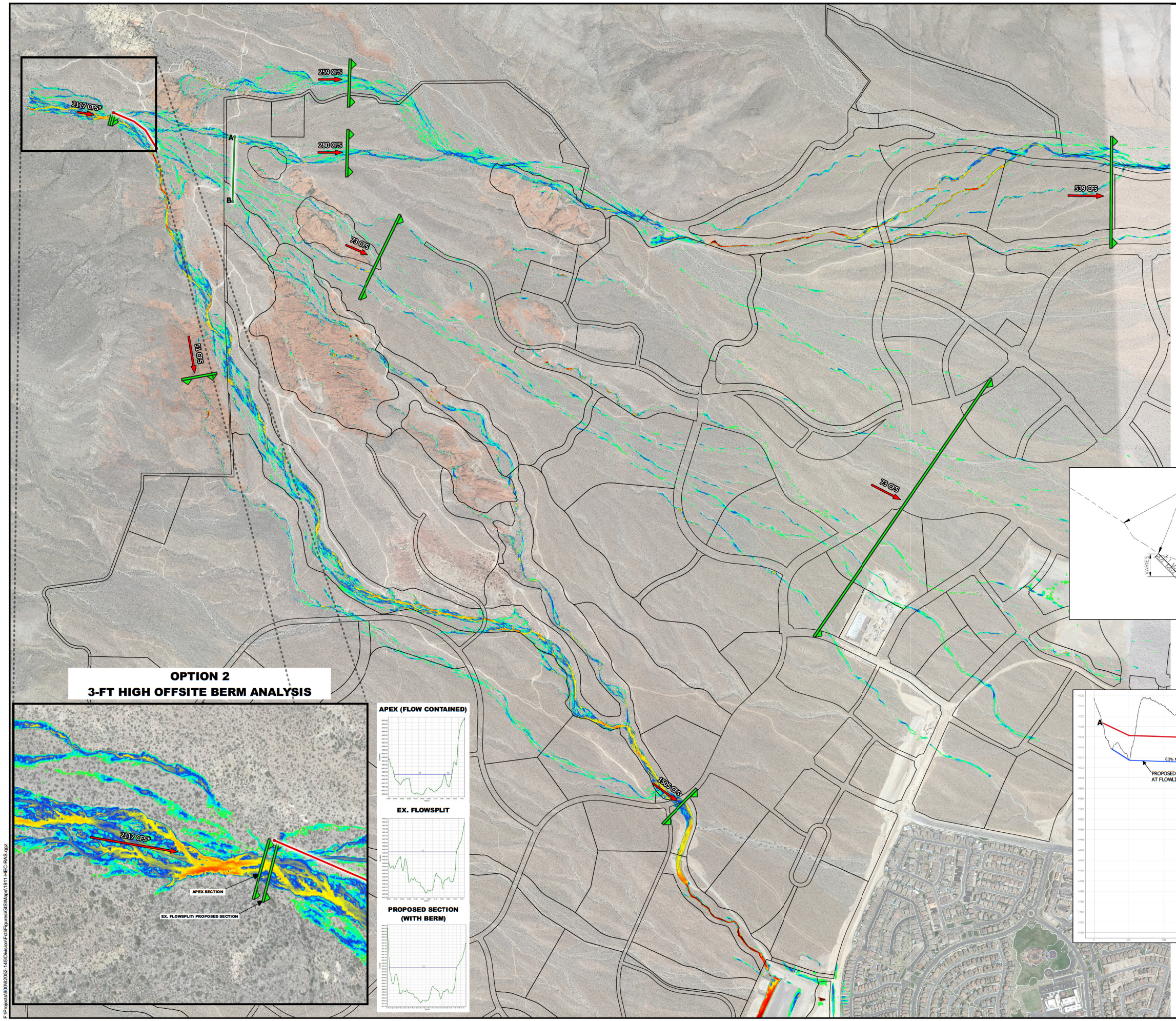
GRADING PLAN 1

DRAWING
GD1
8 OF 19 SHTS

D.5

GCW – 2D HEC-RAS WOTUS 4 AND 5 FLOW SPLIT AND BERM ANALYSIS

D.5.1 2D HEC-RAS Exhibit



LEGEND

DEPTH (FT)
- 0 TO 0.5
- 0.5 TO 1
- 1 TO 2
- 2 TO 3
- 3 TO 4
- 4 TO 5
- 5+
- SECTION
- FLOW RATE THROUGH SECTION
- OPTION 1 FACILITY
- OPTION 2 FACILITY

NORTH

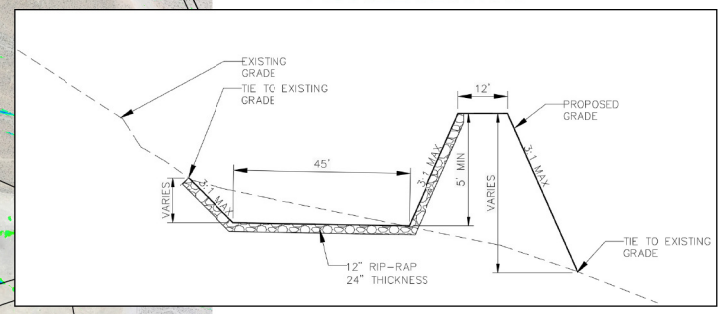
0 300 600 900 1200 ft

2D HECRAS MODEL PARAMETERS

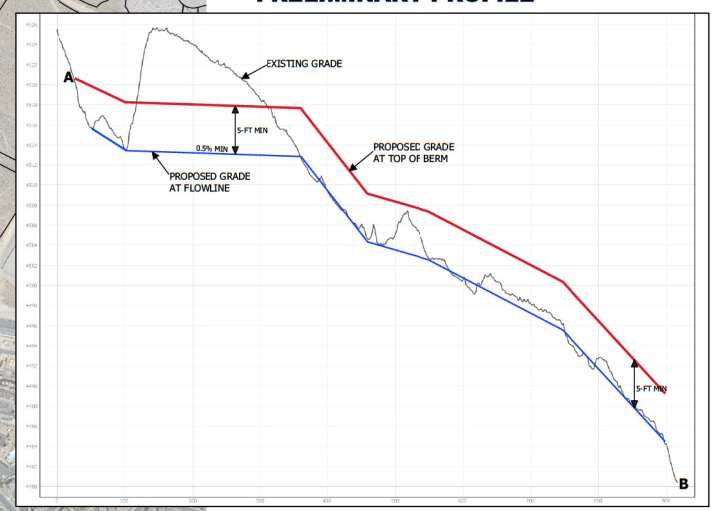
CELL SIZE: 30-FT TO 50-FT
TIME STEP: VARIABLE (0.16 SECOND MINIMUM)
EQUATION SET: FULL MOMENTUM
MANNING'S: 0.035

*REFERENCED FROM THE 2019 UPDATE #2 TO SUMMERLIN WEST PLANNING AREA

OPTION 1 - VILLAGE 31 BOUNDARY CHANNEL TYPICAL SECTION



OPTION 1 - VILLAGE 31 BOUNDARY CHANNEL PRELIMINARY PROFILE



OPTION 2 3-FT HIGH OFFSITE BERM ANALYSIS

THE EVALUATION AND DESIGN SHOWN ARE PRLIMINARY AND ARE NOT FOR CONSTRUCTION.

F:\Projects\600\62002-145\Division\Cad\Figures\GIS\Maps\1911-HEC-RAS.qgz

REV	DATE	DESCRIPTION	AGSN. APP	DATE	GCW APP	DATE

PROJECT NO. 62052-145
DESIGN: NB
DRAWN: NB
CHECK:
PLOT DATE: APRIL 2019
PLOT TIME:

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

SUMMERLIN DEVELOPMENT, LLC

SUMMERLIN WEST WOTUS PLANNING

2D HECRAS WOTUS 4 AND 5 FLOW SPLIT AND BERM ANALYSIS

DRAWING
EXH
SHEET 1 OF 1

D.6

HYDRAULIC DESIGN SERIES 5

D.6.1 Hydraulic Design of Highway Culverts
D.6.2 Page 3.11
D.6.3 Page 3.22
D.6.4 Page 5.3

January 2012
Publication No. FHWA-NHI-12-029

Hydraulic Design Series Number 5

HYDRAULIC DESIGN OF HIGHWAY CULVERTS

Third Edition

NATIONAL HIGHWAY INSTITUTE
Training Solutions for Transportation Excellence

U.S. Department of Transportation
Federal Highway Administration

Figure 3.8 depicts the energy grade line and the hydraulic grade line for full flow in a culvert barrel. The energy grade line represents the total energy at any point along the culvert barrel. HW_o is the depth from the inlet invert to the energy grade line. The hydraulic grade line is the depth to which water would rise in vertical tubes connected to the sides of the culvert barrel. In full flow, the energy grade line and the hydraulic grade line are parallel straight lines separated by the velocity head except in the vicinity of the inlet where the flow passes through a contraction.

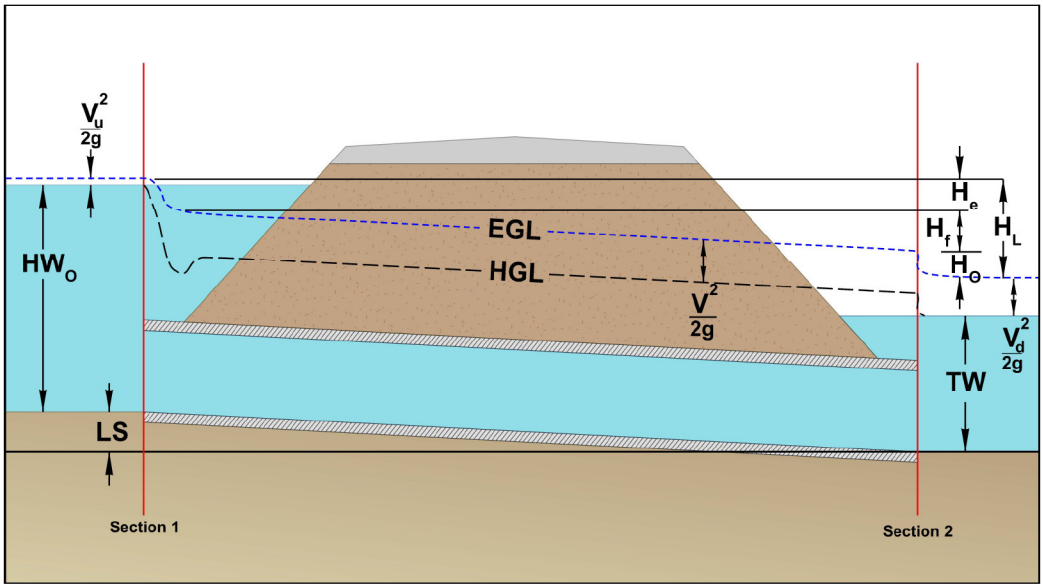


Figure 3.8. Full flow energy and hydraulic grade lines.

The headwater and tailwater conditions as well as the entrance, friction, and exit losses are also shown in Figure 3.8. Equating the total energy at sections 1 and 2, upstream and downstream of the culvert barrel in Figure 3.8, the following relationship results:

$$HW_o + LS + \frac{V_u^2}{2g} = TW + \frac{V_d^2}{2g} + H_L \qquad (3.6a)$$

HW_o	=	Headwater depth above the entrance invert in outlet control, ft (m)
V_u	=	Approach velocity, ft/s (m/s)
TW	=	Tailwater depth above the outlet invert, ft (m)
V_d	=	Downstream velocity, ft/s (m/s)
H_L	=	Sum of all losses including entrance (H_e), friction (H_f), exit (H_o) and other losses, (H_b), (H_i), ft (m)
LS	=	Drop through the culvert, ft (m)

In most instances, the approach velocity is low, and the approach velocity head is neglected. However, it can be considered to be a part of the available headwater and used to convey the flow through the culvert.

Likewise, the velocity downstream of the culvert (V_d) is usually neglected. When both approach and downstream velocities are neglected, Equation 3.6a becomes:

$$HW_o = TW + H_L - LS \qquad (3.6b)$$

3.3 CULVERT DESIGN USING NOMOGRAPHS

The manual culvert design method using nomographs provides a convenient and organized procedure for designing culverts and for checking software solutions (Section 3.5). While it is possible to follow the manual design method without an understanding of culvert hydraulics, this is not recommended. The result could be an inadequate and possibly unsafe structure. This section provides an overview of culvert design with nomographs. Step by Step design procedures are provided in Design Guideline 1 in the Appendices.

3.3.1 Culvert Design Form

The Culvert Design Form, shown in Figure 3.17, has been formulated to guide the user through the design process. Summary blocks are provided at the top of the form for the project description, and the designer's identification. Summaries of hydrologic data of the form are also included. At the top right is a small sketch of the culvert with blanks for inserting important dimensions and elevations.

The central portion of the design form contains lines for inserting the trial culvert description and calculating the inlet control and outlet control headwater elevations. Space is provided at the lower center for comments and at the lower right for a description of the culvert barrel selected. This form provides adequate documentation for roadway culverts where the site assessments (Section 2.3) do not indicate any unusual conditions.

The first step in the design process is to summarize hydrology data (Section 2.1) and site data (Section 2.2) for the culvert at the top of the Culvert Design Form. This information will have been collected or calculated prior to performing the actual culvert design. The next step is to select a preliminary culvert material, shape, size, and entrance type. The user then enters the design flow rate and proceeds with the inlet control calculations.

3.3.2 Inlet Control

The inlet control calculations determine the headwater elevation required to pass the design flow through the selected culvert configuration in inlet control. The approach velocity head is assumed to be zero for the manual method. If the approach velocity needs to be considered (irrigation structure or AOP design), a software solution should be used (see Section 3.5).

The inlet control nomographs of Appendix C are used to determine the design headwater depth under inlet control (HW_i). If HW_i is greater than the allowable headwater (HW_a) other configurations should be evaluated or an inlet depression can be considered.

An inlet depression is constructing the inlet invert below the streambed while maintaining the outlet invert on the streambed. Essentially, this amounts to rotating the culvert about the outlet invert. While this can allow a given culvert configuration to meet the allowable headwater, this rotation may increase sediment deposition potential both in the barrel and in the sump area created at the entrance, and perhaps more importantly, too much rotation can change the culvert to outlet control.

is added to the calculated energy grade line at the inlet to define the upstream energy grade line. Deducting the approach velocity head from the upstream energy grade line results in the upstream water surface elevation (hydraulic grade line).

With minor modifications, the culvert design procedures of this publication are adequate for the design of low head installations. In the usual case of outlet control, the entrance, friction, and exit losses can be obtained from the outlet control nomographs in Appendix C. If the downstream velocity is significant compared with the barrel velocity, the losses should be calculated using Equations (3.4e) instead of the outlet control nomograph. Use of Equation (3.4e) will reduce the exit losses.

It is also advantageous to consider approach and downstream velocities in the design of low head installations. Equation (3.6a) should be used instead of Equation (3.6b) to calculate headwater depth (HW_o) in outlet control. In inlet control, the approach velocity head should be considered to be a part of the available headwater when using the inlet control nomographs.

The HY-8 software can be used to size these structures, but currently does not include conservation of approach velocity. These structures can also be designed using the procedures in HEC-14, Section 4.2, which uses transition losses rather than entrance and exit losses. A similar approach can be applied using HEC-RAS.

Sag culverts, called "inverted siphons," are often used to convey irrigation waters under roadways (Figure 5.2). This type of culvert offers the advantage of providing adequate vertical clearance for the pipe under the roadway pavement and subgrade. A possible disadvantage of a sag culvert is clogging due to sediment. The design is not recommended for use on streams. Sag culverts require the use of bends and inclusion of their related energy losses. Losses due to bends are covered in the next section.

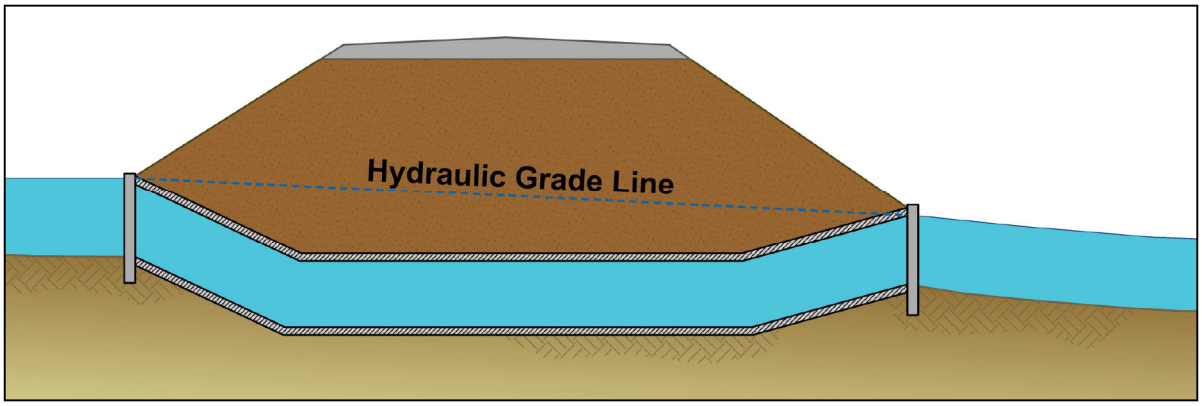


Figure 5.2. Sag culvert.

5.2.3 Bends

A straight culvert alignment is desirable to avoid clogging, increased construction costs, and reduced hydraulic efficiency. However, site conditions may dictate a change of alignment, either in plan or in profile. A change of alignment in profile is generally referred to as a "broken back" culvert and is discussed in Section 5.7. Horizontal bends may also be used to avoid obstacles (e.g. utilities) or realign the flow (Figure 5.3). When considering a nonlinear culvert alignment, particular attention should be given to erosion, sedimentation, and debris control.

D.7

SUMMERLIN WEST PLANNING AREA MASTER PLAN UPDATE – UPDATE #3 MASS GRADING – V21 & V25

(DS4926)

D.7.1 Approval Letter
D.7.2 Mass Grading Plans

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: November 27, 2019
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: **Summerlin West Planning Area Master Plan Update Update #3 Mass Grading – V21 & V25**		**COPIES TO:** VTN Nevada
Cross Streets:	West of I-215 between Lake Mead Boulevard and Charleston Boulevard		The Howard Hughes Corporation
File Number:	F:\Depot\DSMemos\DS4926K.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-22-000-017		CCRFCD
Zoning Action:			CCPW
FEMA Flood Zone	YES	NO **X**	
Proposed Storm Drain	YES **X**	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	10/9/2017 & 10/25/2017	11/8/2017	Not Approved	$400.00	490518: $400
2nd Submittal	12/6/2017	12/20/2017 & 1/10/2018	Not Approved	$400.00	492005: $400
3rd Submittal	2/27/2018	3/24/2018	Not Approved	$400.00	493739: $400
4th Submittal & Supplement	4/23/2018 & 5/22/2018	5/22/2018	See Comments Below	$400.00	495223: $400
CCPW & CCRFCD	7/30/2018	7/30/2018	Concurrence Recv'd	N/C	N/C
5th Submittal	1/3/2019 (Paid on 1/7/2019)	1/30/2019	Not Approved	$100.00	502286: $100
6th Submittal	2/19/2019	3/13/2019	Conditional Approval	$400.00	503267: $400
CCPW & CCRFCD	4/15/2019	4/17/2019	Concurrence Recv'd	N/C	N/C
7th Submittal	10/28/2019		Under Review	$400	
8th Submittal – Mass Grading	11/19/201 & 11/27/2019	11/25/2019	Conditionally Approved	$100	
			TOTAL FEES (LDDRS):	**$2,600.00**	**----**

REMARKS: 8th Submittal is for Mass Grading ONLY within V21 and V25.

7th Submittal: Update #2 is under review.

5th & 6th Submittals: Update #1 & Addendum #1 to address Land Use Changes in the Summerlin West Planning Area

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

X	is approved subject to conformance to all City standards and the following conditions:
	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.

Note that the Clark County Regional Flood Control District (District) has begun efforts to update the *Hydrologic Criteria and Drainage Design Manual* (HCDDM) and is requesting participation from the engineering community. The District is collecting comments and suggestions on errors, clarifications, or changes needed to the current Manual and/or content and usability enhancements to be incorporated into the updated Manual. Additional information on procedures and deadline to provide feedback and comments are available online at (http://www.ccrfcd.org/hcddmupdate.html).

1. Flood Control supports the Mass Grading concept with the understanding that these are interim improvements and are the responsibility of the Master Developer. Mass Grading shall not place any fill material in the proposed embankment area of the detention basin. This exclusion area is delineated on the plans and a Note has been added to the Grading Plans. **State Dam Safety Permit approval is required prior to any other detention basin work.**
2. The approval of this drainage study update is for the issuance of a mass grading permit for future streets, conceptual development, detention basin excavation and temporary construction access only.
3. Howard Hughes Company (Summerlin) is solely responsible for the maintenance and erosion control of the interim facilities based upon the Mass Grading.
4. Revise the drainage note on the Grading Plans to reference DS4926K instead of DS4926H. See Sheets GR1, GR2, GR3 and DT1.

The previous comments to the overall *Summerlin West Planning Area* (SWPA) Master Plan Update, Update #1 approval are noted below. These conditions will affect the Development Phasing.

5. The proposed revision of the overall *Summerlin West Planning Area* (SWPA) will have impact to the various existing downstream regional facilities. All impacted downstream facilities must be modified and substantially completed prior to the onsite development of upstream Villages.

   With the exception of ***Summerlin West Villages 21 and 22***, no occupancy permits will be issued to the remaining villages prior to the pertinent downstream facility modifications being completed.

6. The *Study* states that ***Detention Basin 5*** (**DB5**) needs additional capacity to accommodate the increased flows from the proposed SWPA revision. An update to the **DB5** technical drainage study must be submitted and approved prior to any upstream Villages development with the exception of Villages 21 and 22.

7. The *Study* states that a portion of the existing *Beltway Channel* between *Far Hills Avenue* and *Summerlin Parkway* requires modification with heightened stem walls. An update to the Western Beltway Channel modification must be submitted and approved prior to any upstream Villages development with the exception of Villages 21 and 22.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section.* Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

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
WSP/AYS/PBJ

T/R/S: T21S/R69E/22
AREA K-22

SHEET INDEX		
SHEET #	SHEET	DESCRIPTION
1	CV	COVER SHEET
2	NT	GENERAL NOTES SHEET
3	GR1	GRADING & DRAINAGE PLAN AREA 1
4	GR2	GRADING & DRAINAGE PLAN AREA 2
5	GR3	GRADING & DRAINAGE PLAN AREA 3
6	DT1	DETAILS

SUMMERLIN WEST VILLAGE 21 & 25
MASS GRADING & DRAINAGE PLAN

GRAND PARK DETENTION BASIN & SUMMERLIN PKWY EXTENSION

APN: 137-26-112-001

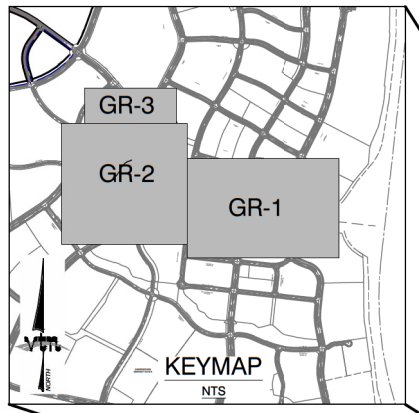
CITY OF LAS VEGAS

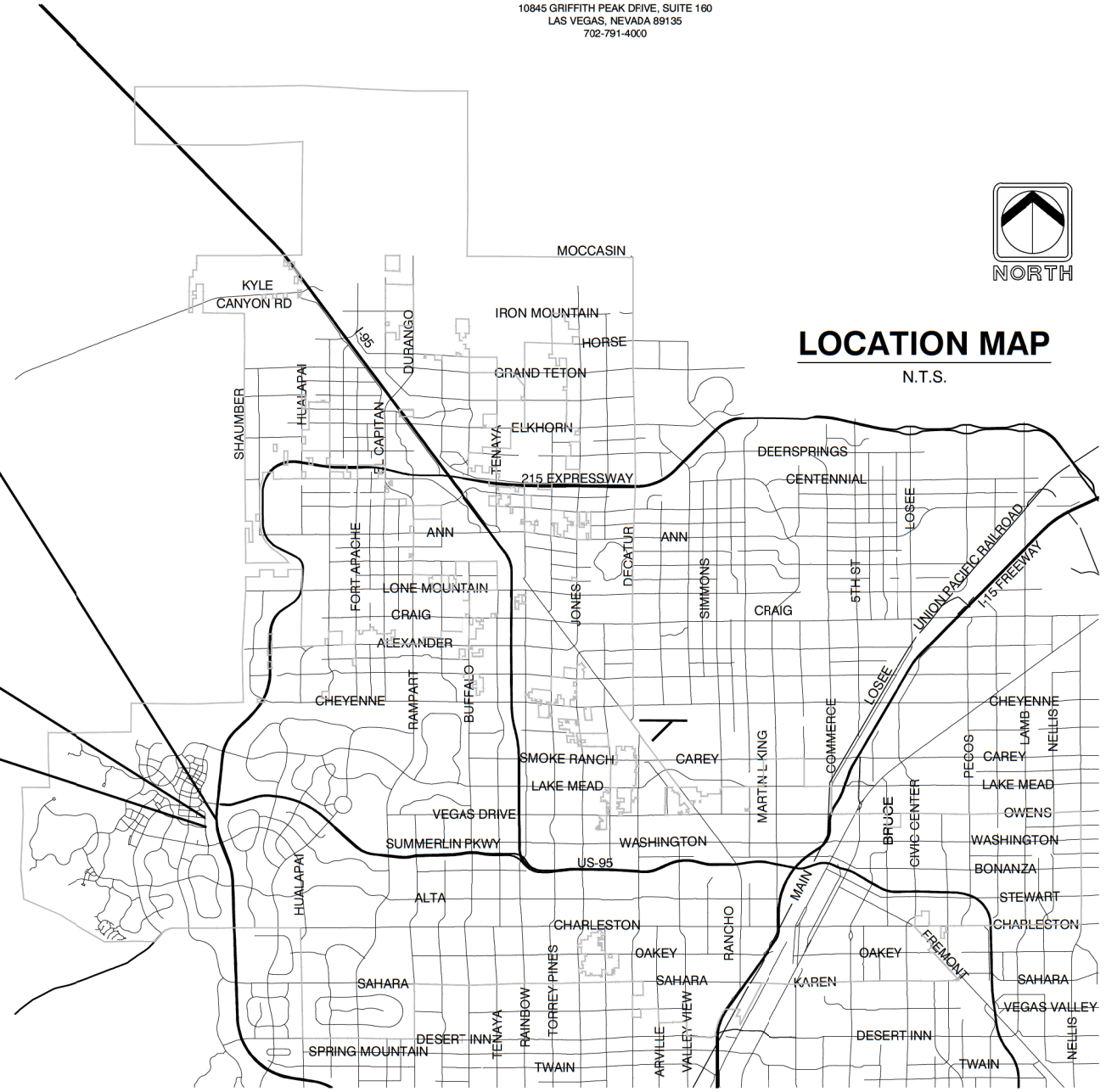
STATE OF NEVADA

DEVELOPED BY:

HOWARD HUGHES COMPANY, LLC - A DELAWARE LIMITED LIABILTY COMPANY

10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000





OWNER
HOWARD HUGHES COMPANY, LLC - A DELAWARE LIMITED LIABILTY COMPANY SUMMERLIN WEST VILLAGE 21 & 25 10845 GRIFFITH PEAK DRIVE, SUITE 160 LAS VEGAS, NEVADA 89135 702-791-4000
DEVELOPER
HOWARD HUGHES COMPANY, LLC - A DELAWARE LIMITED LIABILTY COMPANY SUMMERLIN WEST VILLAGE 21 & 25 10845 GRIFFITH PEAK DRIVE, SUITE 160 LAS VEGAS, NEVADA 89135 702-791-4000
ENGINEERING FIRM
VTN 2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH. (702) 873-7550 FAX (702) 362-2597

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

THESE PLANS AND THE DESIGN CRITERIA CONTAINED WITHIN THESE PLANS ARE BASED UPON THE INFORMATION PRESENTLY KNOWN BY THE ENGINEER. ALL CONSTRUCTION SHALL BE IN CONFORMANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL STATUTES, LAWS, CODES, REGULATIONS AND ORDINANCES, INCLUDING BUT NOT LIMITED TO THE FEDERAL FAIR HOUSING AMENDMENTS ACT, AMERICANS WITH DISABILITIES ACT, THE ARCHITECTURAL BARRIERS ACT AND ANY APPLICABLE UNIFORM STANDARDS, SPECIFICATIONS OR DRAWINGS. THE PERSON CR ENTITY PERFORMING THE CONSTRUCTION SHALL BE SOLELY RESPONSIBLE TO MAKE SURE CONSTRUCTION IS IN CONFORMANCE WITH ALL LOCAL, STATE AND FEDERAL STATUES, LAWS, CODES, REGULATIONS, STANDARDS, GUIDELINES AND ORDINANCES AND FURTHER, IS IN CONFORMANCE WITH ANY APPLICABLE DESIGN CRITERIA, INCLUDING BUT NOT LIMITED TO SOILS REPORTS, TRAFFIC STUDIES, GEOTECHNICAL REPORTS, ARCHITECTURAL PLANS AND SPECIFICATIONS, DRAINAGE PLANS OR STUDIES AND ANY OTHER CRITERIA, STANDARDS OR REQUIREMENTS LISTED IN THE PLANS OR THE GENERAL NOTES RELATED TO THESE PLANS OR PROVIDED BY ANYONE IN REFERENCE TO THIS PROJECT.

APPROVALS

CITY ENGINEER ROSA CORTEZ, P.E. # 17505

APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

PLANNING DEPARTMENT, CITY OF LAS VEGAS DATE

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

KEVIN T. ORROCK, VICE PRESIDENT DATE

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC - A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

COVER SHEET

SUMMERLIN WEST VILLAGE 21 & 25
MASS GRADING & DRAINAGE PLAN

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:
JDH 11/04/2019	JDH 11/04/2019	FLM 11/04/2019	1" = 100' HORIZ. N/A VERT.

PROJECT NO: 7809.GP2B

PROFESSIONAL ENGINEER
RAUL M. MONTENEGRO
No. 21721
STATE OF NEVADA
PRELIMINARY

SHEET
CV
1 OF 6 SHEETS

DRAWING NO.

01-22-2020 - UNAPPROVED – ISSUE FOR BID SET – NOT FOR CONSTRUCTION

H:\7809.GP Basin\Engineering Drawings\Surfaces\Proposed\Basin Volume\2019-10-10 - Cut Fill GP2B & Summerlin Pkwy\7809-GP2B-MASS GRADING PLAN & DRAINAGE.dwg 1/23/2020 1:44 PM jjohn

CITY OF LAS VEGAS FIRE DEPARTMENT NOTES

1. ALL WORK SHALL BE DORE IN STRICT ACCORDANCE WITH THE LAS VEGAS FIRE AND RESCUE ADOPTED FIRE CODE ORDINANCE #6631 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS.
2. ONLY FIRE HYDRANTS THAT ARE ON THE LAS VEGAS VALEY WATER DISTRICT'S - APPROVED PRODUCTS LIST ARE ALLOWED TO BE INSTALLED.
3. A PERMIT IS REQUIRED FROM LAS VEGAS FIRE AND RESCUE FOR THE INSTALLATION OF ON-SITE WATER LINES AND FIRE HYDRANTS. THE PERMIT AND CONTRACTORS MATERIAL TEST CERTIFICATE FOR UNDERGROUND PIPING FORM SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK. [IFC § 105.6.15]
4. ON ANY RESIDENTIAL OR COMMERCIAL INSTALLATIONS, FIRE HYDRANTS SHALL BE INSTALLED AND FIRE APPARATUS ACCESS ROADS SHALL BE MAINTAINED BEFORE COMMENCEMENT OF ANY COMBUSTIBLE CONSTRUCTION. ALL FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER AND SHALL BE CAPABLE OF DELIVERING THE REQUIRED FIRE FLOW. [IFC § 3310, § 3312]
5. TO IDENTIFY THE FIRE HYDRANT LOCATIONS, THE CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTERLINE OF THE STREET ADJACENT TO THE FIRE HYDRANTS. [IFC § 507.5.7.3]
6. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH VEEIFICATIONS OF ALL FIRE HYDRANTS AND FIRE LINES, SHALL BE CONDUCTED BEFORE COVERING THE LINES. CENTER LOADING IS ACCEPTABLE FOR THE HYDRO TES'S WITH PRIOR FIRE PREVENTION APPROVAL. [IFC § 106.3]
7. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. [IFC § 507.2.1, NFPA 24]
8. PAINTING OF CURBS, FIR: HYDRANTS, PADS, PROTECTION OF FIRE HYDRANTS FROM PHYSICAL DAMAGE, AND ALL OTHER WORK NECESSARY PER PLANS SHALL BE COMPLETED BEFORE APPROVAL BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION. [IFC § 507]
9. PRIVATE HYDRANTS SHALL BE PAINTED RED. [IFC § 507.5.7.1]
10. PRIOR TO THE FINAL OCCUPANCY, A FIRE FLOW TEST SHALL BE WITNESSED BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION TO VERIFY AVAILABILITY OF THE REQUIRED FIRE FLOW. [IFC § 507]
11. FIRE HYDRANT SPACING SHALL BE AS FOLLOWS: [IFC § C102]

    RESIDENTIAL - 500 FT UNSPRINKLERED; 600 FT SPRINKLERED.
    COMMERCIAL - 300 FT UNSPRINKLERED; 400 FT SPRINKLERED.
12. WHERE THE WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF THE STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT A MAXIMUM OF 1000 FT SPACING, TO PROVIDE FOR TRANSPORTATION HAZARDS. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS OR HAVE FOUR (4) OR MORE TRAFFIC LANES AND HAVE A TRAFFIC COUNT OF MORE THAN 30,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FT ON AN ALTERNATING BASIS [IFC § C102.8]
13. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN THE RADIUS OF A CUL-DE-SAC OR WITHIN 20 FT OF THE PERIMETER OF THE RADIUS OF THE CUL-DE-SAC.
14. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FT OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREETLIGHT OR ANY OTHER OBSTRUCTION. [IFC § C102.10]
15. A MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE-TWO FAMILY DWELLING SHALL NOT EXCEED 300 FT, AS MEASURED BY AN APPROVED ROUTE. [IFC § C102.4]
16. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A FIRE DEPARTMENT CONNECTION (FDC) SHALL NOT EXCEED 100 FT, AS MEASURED BY AN APPROVED ROUTE. [IFC § C102.7]
17. THE MAXIMUM DISTANCE FROM A HYDRANT TO THE END OF A DEAD-END STREET SHALL NOT EXCEED 200 FT. [IFC § C102.6]
18. TWO (2) SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE IS 4 OR MORE FIRE HYDRANTS/SPRINKLER LEAD-INS ARE INSTALLED ON A SINGLE SYSTEM. FOR SYSTEMS REQUIRED TO HAVE TWO (2) SOURCES OF WATER SUPPLY, SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 3 FIRE HYDRANTS AND/OR FIRE SPRINKLER LEAD-INS CAN BE OUT OF SERVICE DUE TO A SERVICE INTERRUPTION. FOR SYSTEMS PERMITTED TO HAVE ONE SOURCE OF WATER SUPPLY, SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 3 FIRE HYDRANTS AND/OR FIRE SPRINKLER LEAD-INS CAN BE OUT OF SERVICE DUE TO A SERVICE INTERRUPTION. [IFC § C104]
19. ALL FIRE APPARATUS ACCESS ROADS SHALL BE PAVED TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES, AND SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF THE FIRE APPARATUS. [IFC § 503.2.3]
20. THE GRADIENT FOR THE FIRE APPARATUS ACCESS ROADS SHALL NOT EXCEED 12%. ANGLES OF APPROACH AND ANGLES OF DEPARTURE SHALL NOT EXCEED 6% FOR 25 FT PRIOR TO OR AFTER THE GRADE CHANGE. ADJACENT TO THE STRUCTURES GRADIENT SHALL NOT EXCEED 6%. [IFC § 503.2.7, § 503.2.8]
21. THE TURNING RADIUS OF THE FIRE APPARATUS ACCESS ROADS SHALL BE NO LESS THAN 52 FT OUTSIDE AND 28 FT INSIDE TURNING RADIUS. [IFC § 503.2.4]
22. VERTICAL CLEARANCE OF ALL FIRE APPARATUS ACCESS ROADS SHALL NOT BE LESS THAN 13FT 6 INS. [IFC § 503.2.1]
23. FIRE DEPARTMENT ACCESS ROADS SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 33 FT WITH PARKING ON BOTH SIDES MEASURED TO FACE OF CURB. NOT LESS THAN 28 FT WIDE WITH PARKING RESTRICTED TO ONE SIDE MEASURED TO FACE OF CURB. NOT LESS THAN 24 FT WIDE WITH NO PARKING ON EITHER SIDE MEASURED TO FACE OF CURB. FIRE LANES THROUGH PARKING LOTS SHALL BE NOT LESS THAN 24 FT. [IFC § 503.2.1.1]
24. A FIRE APPARATUS ACCESS ROAD SHALL BE REQUIRED WHENANY PORTION OF AN EXTERIOR WALL OF THE FIRST STORY IS LOCATED MORE THAN 150 FT FROM A FIRE DEPARTMENT VEHICLE ACCESS. THIS DISTANCE COULD BE INCREASED TO 250 FT IF THE BUILDING IS SPRINKLERED. [IFC § 503.1.1]
25. APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 200 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS. COMMERCIAL AND INDUSTRIAL DEVELOPMENTS WHERE BUILDINGS EXCEED 2 STORIES OR 30 FEET IN HEIGHT, OR EXCEEDING 62,000 SQUARE FEET IN AREA. [IFC § 503.1.2]
26. ALL DEAD-END FIRE APPARATUS ROADS AND/OR FIRE LANES, PUBLIC OR PRIVATE, IN EXCESS OF 150 FT IN LENGTH SHALL BE PROVIDED WITH AN APPROVED TURN AROUND HAVING A MINIMUM DIAMETER OF 81 FT. [IFC § 503.2.5]
27. ALL FIRE APPARATUS ACCESS ROADS SHALL BE MARKED BY PLACING APPROVED SIGNS AT THE START OF THE DESIGNATED FIRE LANE, ONE SIGN AT THE END OF THE FIRE LANE AND WITH SIGNS AT INTERVALS OF 100 FT ALONG THE DESIGNATED FIRE LANES. SIGNS TO BE PLACED ON BOTH SIDES OF AN ACCESS ROADWAY IF NEEDED TO PREVENT PARKING ON EITHER SIDE. SIGNS TO BE INSTALLED NO HIGHER THAN 10 FT OR LESS THAN 6 FT FROM THE ROADWAY LEVEL. THE CURB ALONG OR ON THE PAVEMENT OR CEMENT (IF NO CURB IS PROVIDED) SHALL BE PAINTED WITH A RED WEATHER RESISTANT PAINT IN ADDITION TO THE SIGNS. [IFC § 503.3]
28. ELECTRICALLY CONTROLLED ACCESS GATES SHALL BE PROVIDED WITH AN APPROVED EMERGENCY VEHICLE DETECTOR/RECEIVER SYSTEM. IFC § 503.6

    EFFECTIVE DATE: FEBRUARY 4th, 2019

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLICWORKS CONSTRUCTION OFFSITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".
2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCES WHICH MAY AFFECT HIS OPERATIONS DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THERE WITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR
4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.
8. AC PAVEMENT TO BE ONE-HALF INCH (½") ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.
9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.
10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.
11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.
12. 12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY: ---, PROJECT NO. ---, DATED ---, APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLAN.
13. EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN. OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.
14. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. STATUTE NO. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

16. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.
17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.
18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT "HEY ARE SHOWN ON THE PLANS.
19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.
20. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC, THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.
21. AFTER HAUNCHING AND PRIOR TO BACKFILL OPERATIONS WHICH WOULD COVER SANITARY SEWER AND STORM DRAIN FACILITIES, CONTRACTOR IS REQUIRED TO SCHEDULE CLV OPEN-TRENCH UTILITY SURVEY INSPECTION FOR DETERMINATION OF FINAL LOCATION COORDINATES. FACILITIES TO BE LOCATED BY CLV SHALL INCLUDE AT A MINIMUM THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES AND TRANSITION STRUCTURES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXIT THE PUBLIC RIGHT-OF-WAY. SEWER AND STORM DRAIN MAIN ALIGNMENT, INCLUDING DEFLECTION POINTS.
22. CCTV VIDEO INSPECTION IS RECUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST EDITION.
23. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

REVISED 06/04/2018

CITY OF LAS VEGAS GRADING NOTES

1. IN THE EVENT THAT ANY UNFORESEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BE IMMEDIATELY NOTIFIED FOR DIRECTION.
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF-SITE WORK, SO AS TO GENERATE THE DESIRED SUBGRADE, FINISH GRADES AND SLOPES SHOWN.
3. CONTRACTOR SHALL TAKE FULL RESPONSIBILITY FOR ALL EXCAVATION. ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.
4. THE CONTRACTOR IS WARNED THAT AN EARTHWORK BALANCE WAS NOT NECESSARILY THE INTENT OF THIS PROJECT. ANY ADDITIONAL MATERIAL REQUIRED OR LEFT OVER MATERIAL FOLLOWING EARTHWORK OPERATIONS BECOMES THE RESPONSIBILITY OF THE CONTRACTOR.
5. THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED PERMIT.
6. CONTRACTOR SHALL GRADE TO THE LINES AND ELEVATIONS SHOWN ON THE PLANS WITHIN THE FOLLOWING HORIZONTAL AND VERTICAL TOLERANCES AND DEGREES OF COMPACTION, IN THE AREAS INDICATED:

	HORIZONTAL	VERTICAL	COMPACTION
A.PAVEMENT AREA SUBGRADE	0.1'+	+0.0'to-0.1'	SEE SOILS REPORT
B.ENGINEERED FILL	0.5'+	+0.1'to-0.1'	SEE SOILS REPORT

   REPORT COMPACTION TESTING WILL BE PERFORMED BY THE OWNER OR HIS REPRESENTATIVE.
7. ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED.
8. THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL OR DUST CONTROL IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.
9. THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT-OF-WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOIL, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM THE PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.
10. IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, THE OWNER AGREES TO PROVIDE AND INSTALL SUCH ITEM AT HIS OWN EXPENSE AND AT THE DIRECTION OF THE CITY ENGINEER. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

REVISED 04/15/10

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCH-MARK: D368 (REVISED 2008) NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN. T21S,R59E,S03

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

LEGEND

DESCRIPTION	PROPOSED	EXISTING	FUTURE
CONTOUR (5' INTERVAL)	2450	(2450)	(2450)
CONTOUR (1' INTERVAL)			
EDGE OF PAVEMENT			
SAW CUT			
RETAINING WALL			
SCREEN WALL			
RIGHT OF WAY			
CENTER LINE			
BACK OF CURB			
LIP OF GUTTER			
FACE OF CURB			
SIDEWALK			
UNIT BOUNDARY LINE			
UNIT BOUNDARY / ROW			
PROPERTY LINE			
SLOPE AND FLOW DIRECTION	1.00%	(1.00%)	(1.00%)
SCARP AREA			
MATCHLINE			
SIDEWALK RAMP			
SIGHT VISIBILITY ZONES			
PAVED ROAD			
PAVEMENT REMOVAL			
STREET LIGHT			
WATER UNDER 18"			
WATER 18" & OVER			
SANITARY SEWER UNDER 18"			
SANITARY SEWER 18" & OVER			
STORM SEWER			
FIRE HYDRANT			
SANITARY SEWER MAN HOLE			
CLEAN OUT			
STORM DRAIN MAN HOLE			

ABBREVIATIONS

FF	FINISH FLOOR	PT	POINT OF TANGENCY	O/C	OFFSET CROWN
FG	FINISH GRADE	PRC	POINT OF REVERSE CURVATURE	BC	BACK OF CURB
FL	FLOW LINE	PCC	POINT OF COMPOUND CURVATURE	BCR	BEGIN CURB RETURN
TC	TOP OF CURB	BVC	BEGIN VERTICAL CURVE	BCL	BACK OF CURB LENGTH
TRC	TOP OF ROLL CURB	MVC	MID-POINT OF VERTICAL CURVE	TF	TOP OF FOOTING
EOP	EDGE OF ASPHALT PAVEMENT	EVC	END VERTICAL CURVE	GB	GRADE BREAK
FUT.	FUTURE	PRVC	POINT OF REVERSE VERTICAL CURVE	PC	POINT OF CURVATURE
EX.	EXISTING	R/W	RIGHT-OF-WAY	TPW	TOP OF PLANTER WALL
VG	VALLEY GUTTER	DI	DROP INLET	TRW	TOP OF RETAINMENT WALL
NG	NATURAL GROUND	BFE	BASE FLOOD ELEVATION	TOP	TOP OF CHANNEL/SCARP
H.P	HIGH POINT	CCUSD	CLARK COUNTY UNIFORM STANDARD DRAWINGS	TOE	TOE OF CHANNEL/SCARP
L.P.	LOW POINT	SW	SIDEWALK	TOB	TOP OF BOX
SSMH	SEWER MANHOLE	TSW	TOP OF SIDEWALK	PP	POWER POLE
WTR	WATER LINE	INT.	INTERSECTION	TRANS.	TRANSITION
SD	STORM DRAIN	D.G.	DESIGN GRADE	RET.	RETAINMENT
RCP	REINFORCED CONCRETE PIPE	C/L	CENTER LINE		

DEVIATION FROM CITY OF LAS VEGAS STANDARDS

- NONE

ESTIMATE OF QUANTITIES

ESTIMATED GRADING/SD/ROAD IMP. QUANTITIES	PUBLIC
EARTHWORKS CUT	914,127 CY
EARTHWORKS FILL	1,021,308 CY
EARTHWORKS TOTAL (FILL)	107,181 CY

LAS VEGAS VALLEY CONSTRUCTION SITE BEST MANAGEMENT PRACTICES NOTES:

1. THE OWNER, SITE DEVELOPER, CONTRACTOR, AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO, OR ACCUMULATED IN, THE PUBLIC RIGHTS OF WAY OF THE CITY OF LAS VEGAS AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.
2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN THE CITY OF LAS VEGAS AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BMP GUIDANCE MANUAL.
3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY; REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION II.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPS WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMPS SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 180
LAS VEGAS, NEVADA 89135
702) 791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5149
PH.: (702) 873-7550 FAX: (702) 362-2697 WEB: WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GENERAL NOTES SHEET

SUMMERLIN WEST VILLAGE 21 & 25
MASS GRADING & DRAINAGE PLAN

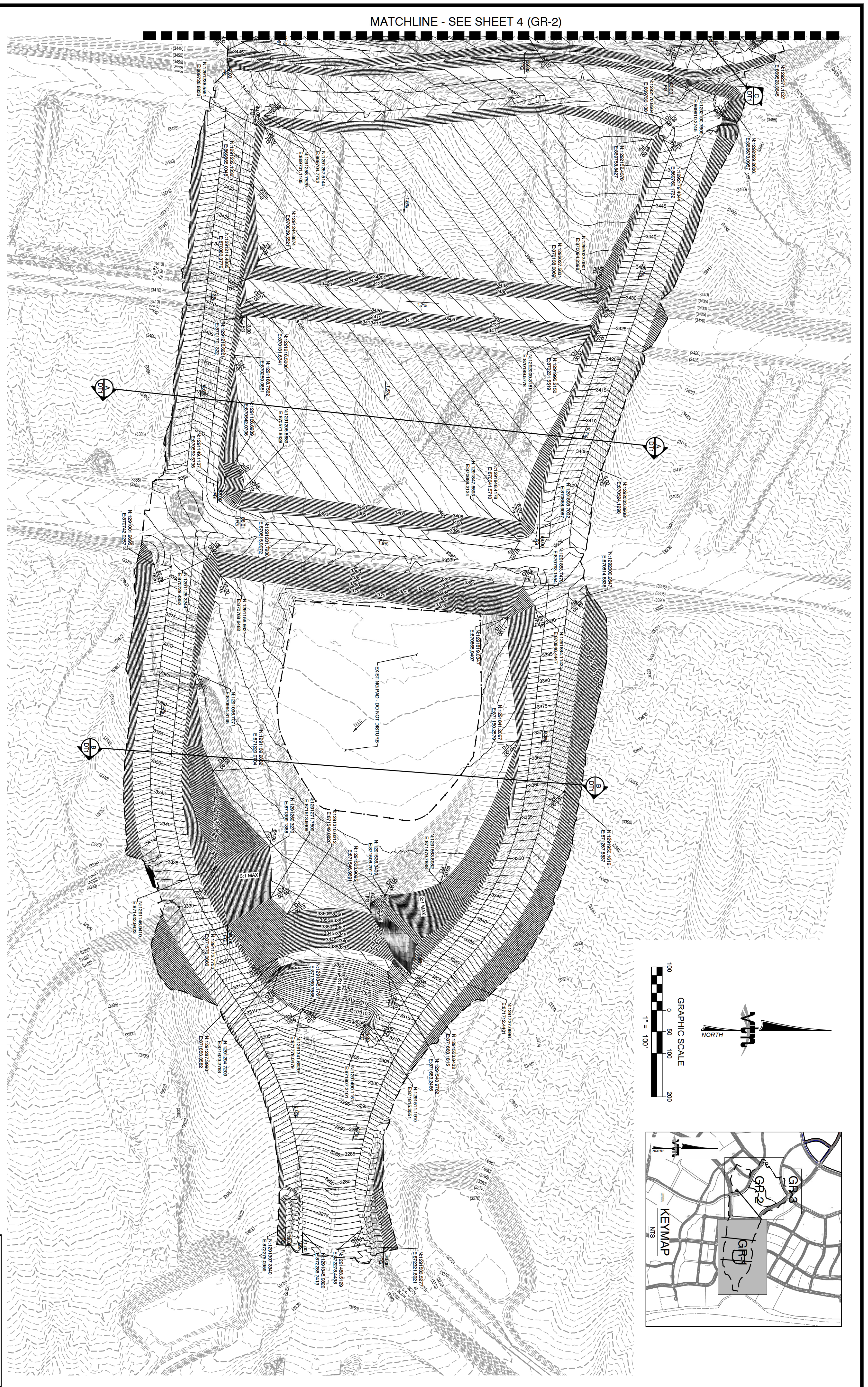
01-22-2020 - UNAPPROVED – ISSUE FOR BID SET – NOT FOR CONSTRUCTION

DRAWN BY:	DESIGNED BY:	CHECKED BY:		SCALE:
JDH 11/04/2019	JDH 11/04/2019	PLM 11/04/2019	PROJECT NO. 7809.GP3B	1" = 100' HORIZ. N/A VERT.

PRELIMINARY
PROFESSIONAL ENGINEER STATE OF NEVADA
PAUL L. MORRISON
No. 25983
11/21
CIVIL

SHEET
NT
2 OF 6 SHEETS
DRAWING NO.

H:\7809.GP Basin\Engineering Drawings\Surfaces\Proposed\Basin Volume\2019.10.10 - Cut-Fill GP3B & Summerlin Pkwy\7809.GP3B MASS GRADING PLAN & DRAINAGE.dwg 1/29/2020 1:44 PM jjonh



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GRADING & DRAINAGE PLAN
AREA 1

SUMMERLIN WEST VILLAGE 21 & 25
MASS GRADING & DRAINAGE PLAN

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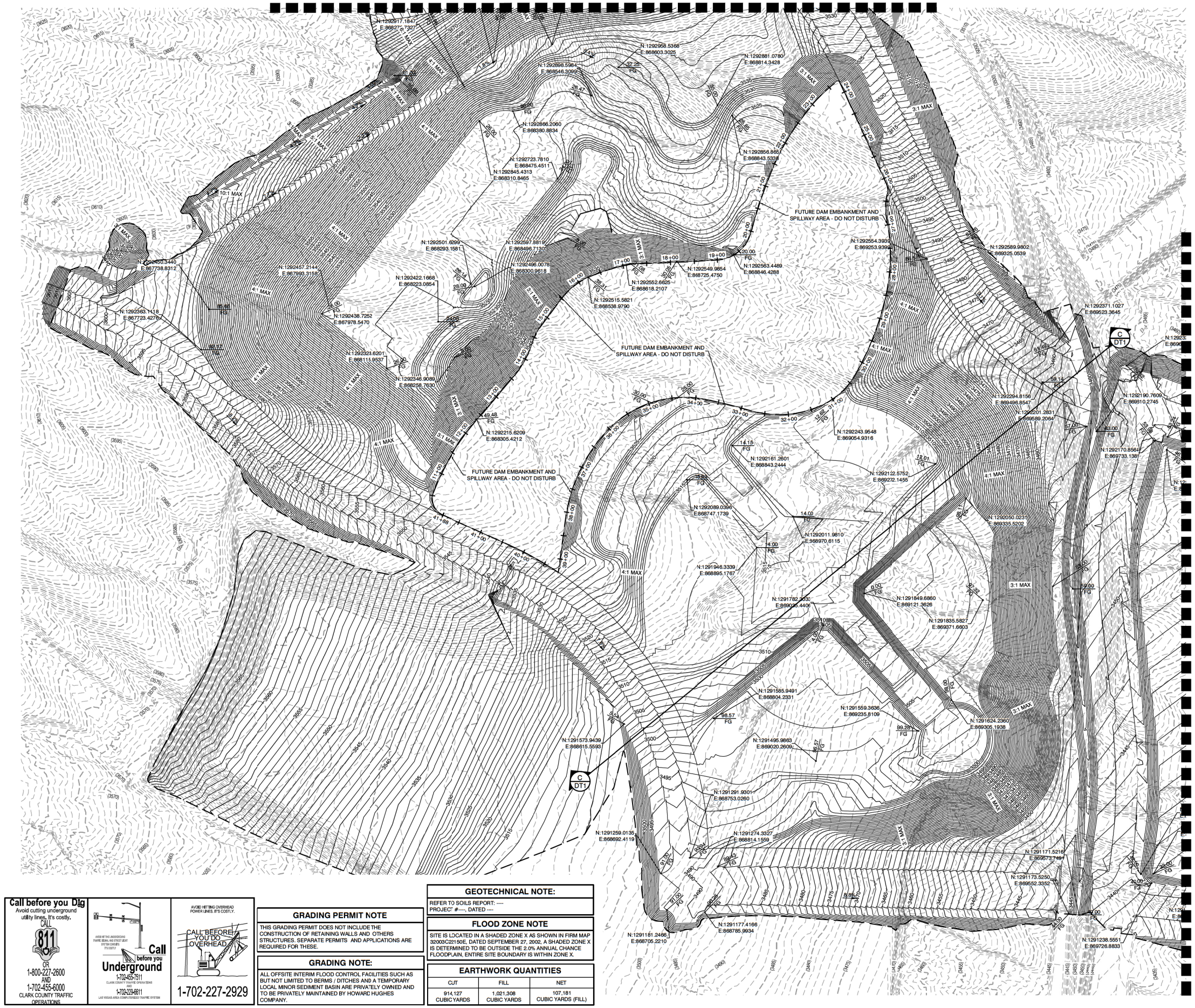

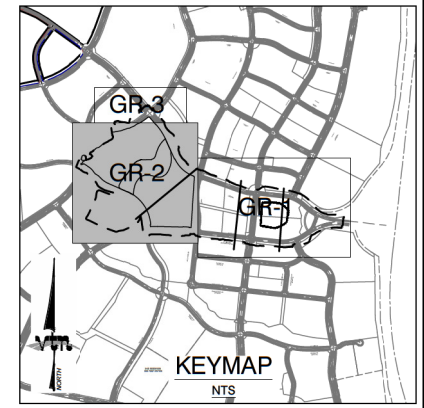

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EARTHWORK QUANTITIES

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GRADING & DRAINAGE PLAN AREA 2

SUMMERLIN WEST VILLAGE 21 & 25 MASS GRADING & DRAINAGE PLAN

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DESIGNED BY: JDH	11/04/2019
CHECKED BY: FLM	11/04/2019
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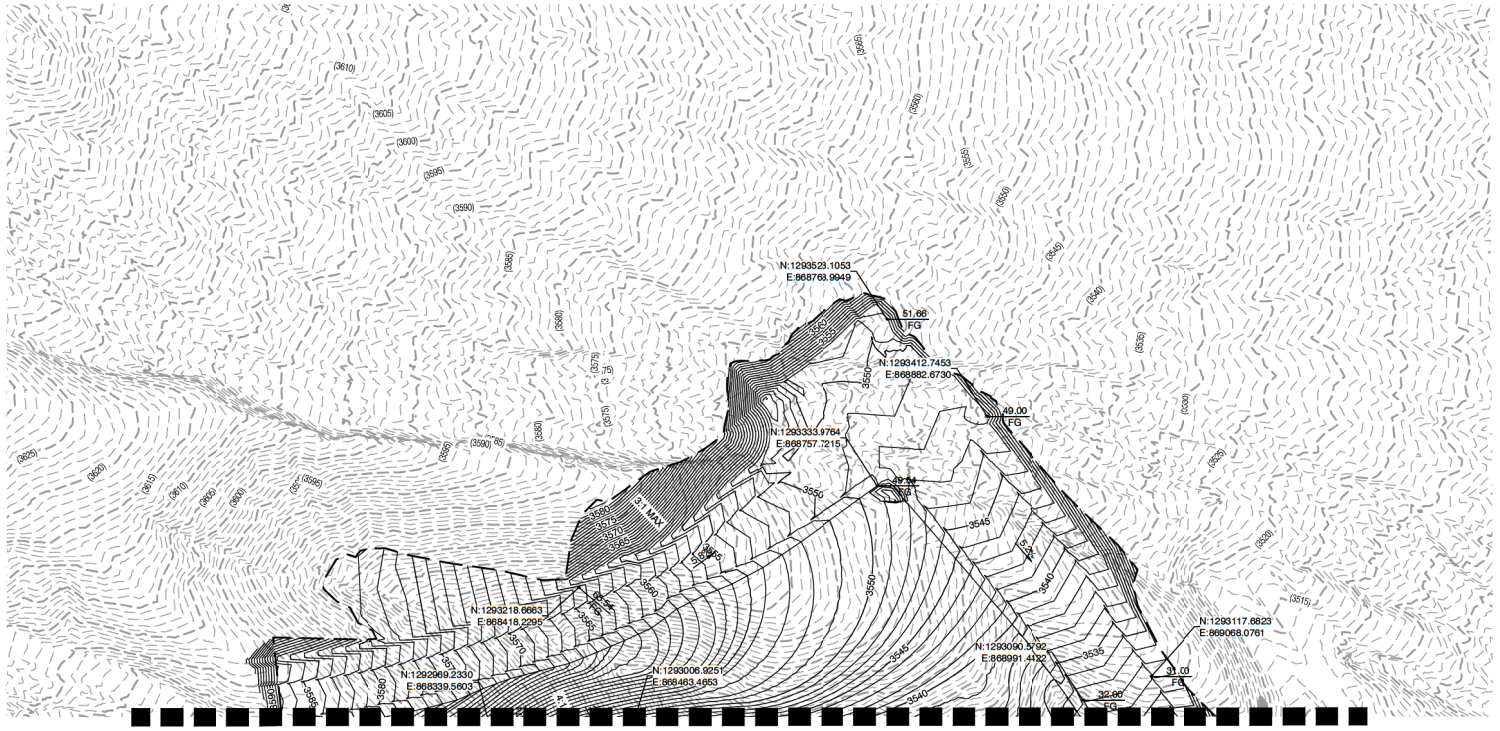
01-22-2020



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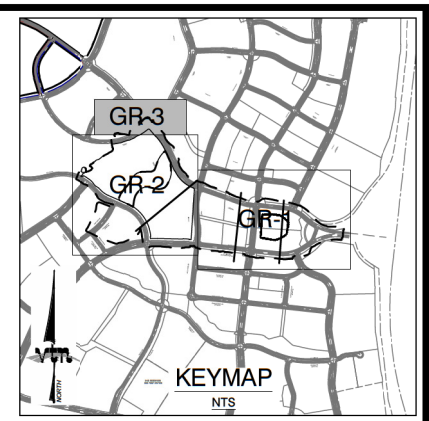

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PROFESSIONAL ENGINEER — PRELIMINARY — RANDALL MARTIN — 12/31/21 — CIVIL — STATE OF NEVADA — NO. 25960

SHEET
GR3
5 OF 6 SHEETS
DRAWING NO.

DRAWN BY: JDH 11/04/2019
DESIGNED BY: JDH 11/04/2019
CHECKED BY: TLM 11/04/2019
PROJECT NO: 7809-GP5B
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GRADING & DRAINAGE PLAN
AREA 3

SUMMERLIN WEST VILLAGE 21 & 25
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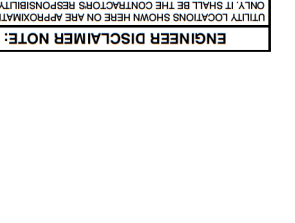

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JSH	11/04/2019
DESIGNED BY:	DATE:
JSH	11/04/2019
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SHEET **DT1** OF **6** SHEETS

DETAILS

SUMMERLIN WEST VILLAGE 21 & 25
MASS GRADING & DRAINAGE PLAN

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D.8

SLUG AND PULSATING FLOW IN HIGH GRADIENT CHANNEL

BY: ***JAMES C.Y. GUO, PHD, P.E.***

Guo, James C.Y. "Roll Waves in High Gradient Channel", *Journal of IWRA Water International, Vol 24, No. 1, March 1999*

SLUG AND PULSATING FLOW IN HIGH GRADIENT CHANNEL

a revision of the paper published on
Journal of IWRA Water International, Vol 24, No. 1, March 1999.

By James C.Y. Guo, PhD., P.E.
Department of Civil Engineering, University of Colorado at Denver, Denver, Colorado 80204. E-mail: James.Guo@cudenver.edu.

INTRODUCTION

Supercritical flow occurs in steep channels. A small perturbation in a supercritical flow may be dampened out or amplified to roll waves, depending on the stability of the flow. When the channel is shallow and steep, the surface velocity of the flow may become less than its wave speed. Consequently, the uniform flow as predicted by Manning's equation breaks into a train of traveling waves or pulses as a response to the temporary force balance among gravitational force, skin friction, and internal turbulent stress. Roll waves in a pulsating flow exhibit similar characteristics to moving oblique jumps. They are the result of transition from a wall boundary layer flow to a turbulent state of flow [1]. After a pulsating flow is developed in a steep channel, roll waves progress downstream and eventually break and form hydraulic bores or shock waves with rough tumbling heads and smooth tails.

Design of high gradient channel is challenging because the interchange between flow depth and velocity head is sensitive to channel shape, curvature, and slope. Often the design velocity in a concrete flood control channel can be as high as 20 to 30 feet/second which is equivalent to velocity head of 6 to 14 ft. One of major concerns in the design of high gradient channel is to make sure that the selected channel cross section can sufficiently accommodate the increase of flow depth due to roll waves. Escoffier and Boyd [2] demonstrated that the ratio of the velocity of the flow to its wave celerity, i.e. Froude number, divides the open channel flow regime into subcritical and supercritical flows. And, the ratio of incremental flow velocity to incremental wave celerity divides the supercritical open channel flow regime into uniform and pulsating flows. Vedernikov's number [3][4] was also developed to identify the existence of pulsating flow in high gradient channels [5].

Roll waves in a pulsating flow are formed through a continuous growth of disturbances. The complex structure of roll waves consists of a series of bores separated by smooth variable water depth [6]. The heights of roll waves are random and temporal. Several studies [7][8] applied normal probability distribution to describe laboratory and field data of roll waves. However, they are not adequately to relate roll waves to channel shape and slope. Thorsky and Haggman [9] indicated that the channel cross section can have a decisive influence on the generation of roll waves, and channel shapes with no roll waves can be achieved. However such an important design guideline has not been adequately addressed. In 1995, the Corps of Engineers [10] summarized their flood control channel experience in the Los Angeles area and published design curves using Vedernikov's number developed for rectangular channels as a criterion to identify the pulsating flows in trapezoidal channels. Although these design criteria and curves are useful in alerting the existence of roll waves, none of them provides the needy information of roll wave height for channel designs. Secondly, further derivations of Vedernikov's number for trapezoidal channels are necessary.

This paper presents revised Vedernikov's number for trapezoidal channels. A new design chart is presented as an improvement to the current practice. Further, roll waves in this paper are modeled as a moving hydraulic jump. As a result, the height of roll waves can be estimated by design flow, channel shape, slope, and roughness. Design examples demonstrate that the height of roll waves predicted by the moving hydraulic jump is similar to that by the wave frequency distributions. The ratio of flow depth to channel width is identified as an important factor to reduce or eliminate roll waves on a steep slope. Although roll waves can be accommodated by additional freeboard, the optimal channel shapes in terms of the least flow area are often to be those that sustain a supercritical uniform flow, not a pulsating flow.

CRITERIA OF INSTABILITY OF CHANNEL FLOWS

Studies of roll waves were performed primarily in connection with the mechanism of instability of uniform flow on a steep slope. Vedernikov number is often used as a criterion to identify if the uniform flow is stable. Vedernikov number is defined as:

$$Nv = m(1 - R\frac{dP}{dA})F \tag{1}$$

in which m = 2/3 when Manning's equation is used or ½ when Chezy's equation is used, R = hydraulic radius, P = wetted perimeter, F = Froude number, and A = flow area. To be a stable uniform flow, Nv shall be less than or equal to 1. To apply Eq 1 to a trapezoidal channel, the parameters can be derived as:

$$R = \frac{A}{P} = \frac{y(b + zy)}{b + 2ky} \tag{2}$$

$$k = \sqrt{1 + z^2} \tag{3}$$

$$\frac{dP}{dA} = \frac{2k}{b + 2zy} \tag{4}$$

in which y = flow depth, b= channel bottom width, and z = channel side slope. Normalizing Eq's 2 through 4 by the channel bottom width and then substituting Eq's 2,3 and 4 into Eq 1 yields:

$$F \le \frac{3}{2}\left[\frac{(1 + 2kY^*)(1 + 2zY^*)}{1 + 2zY^* + 2kzY^{*2}}\right] \tag{5}$$

$$Y^* = \frac{y}{b} \tag{6}$$

Eq 5 is the limiting Froude number for having stable uniform flows in high gradient trapezoidal channels. When z =0, it reduces to

$$F \le \frac{3}{2}(2Y^* + 1) \tag{7}$$

Eq 7 agrees with the straight line on Plate B-7 of Corpse of Engineers' Hydraulic Design of Flood Control Channels [10] when the channel side slope is zero. But it was also found that Eq 7 was misused to produce similar design curves for trapezoidal channels. Figure 1 presents the revised limiting Froude numbers for channels with z = 0.0, 0.5, 1.0, 2.0 and 3.0. These curves separate the supercritical flow regime into stable uniform flows with Froude numbers equal to or less than the limiting Froude number and pulsating flows with Froude numbers greater than the limiting Froude number. In general, deep and narrow channels tend to carry stable uniform flow and shallow and wide channels tend to carry pulsating flows. When the flow Froude number <1.5, a supercritical uniform flow can be sustained in trapezoidal channels, and when the flow Froude number >3.0, roll waves in pulsating flows are expected.

Care has to be taken when designing a steep channel. Selections of y/b ratio, channel slope, and roughness shall follow the above criteria to avoid roll waves. Otherwise mitigation has to be provided, including additional freeboard or rougher linings.

HEIGHTS OF ROLL WAVES

Development of roll waves is a continuous amplification of a small perturbation [6]. Block [7] recommended the required distances for the growth of roll waves to various stages. For the purpose of design, this complicated process can be approximated by the model of positive surges which have an advancing front with the profile similar to a moving hydraulic jump. When the height of the surge is small, the surge appears undular like an undular jump. When the height is increasing, the undulation will eventually disappear and the

surge will have a sharp and steep front. The moving hydraulic jump was investigated by Liggett [5] to solve the gradually varied flow equation, and achieved the same criteria of instability as Vedernikov's number. This conclusion further confirms the dynamic similarity between moving hydraulic jumps and roll waves.

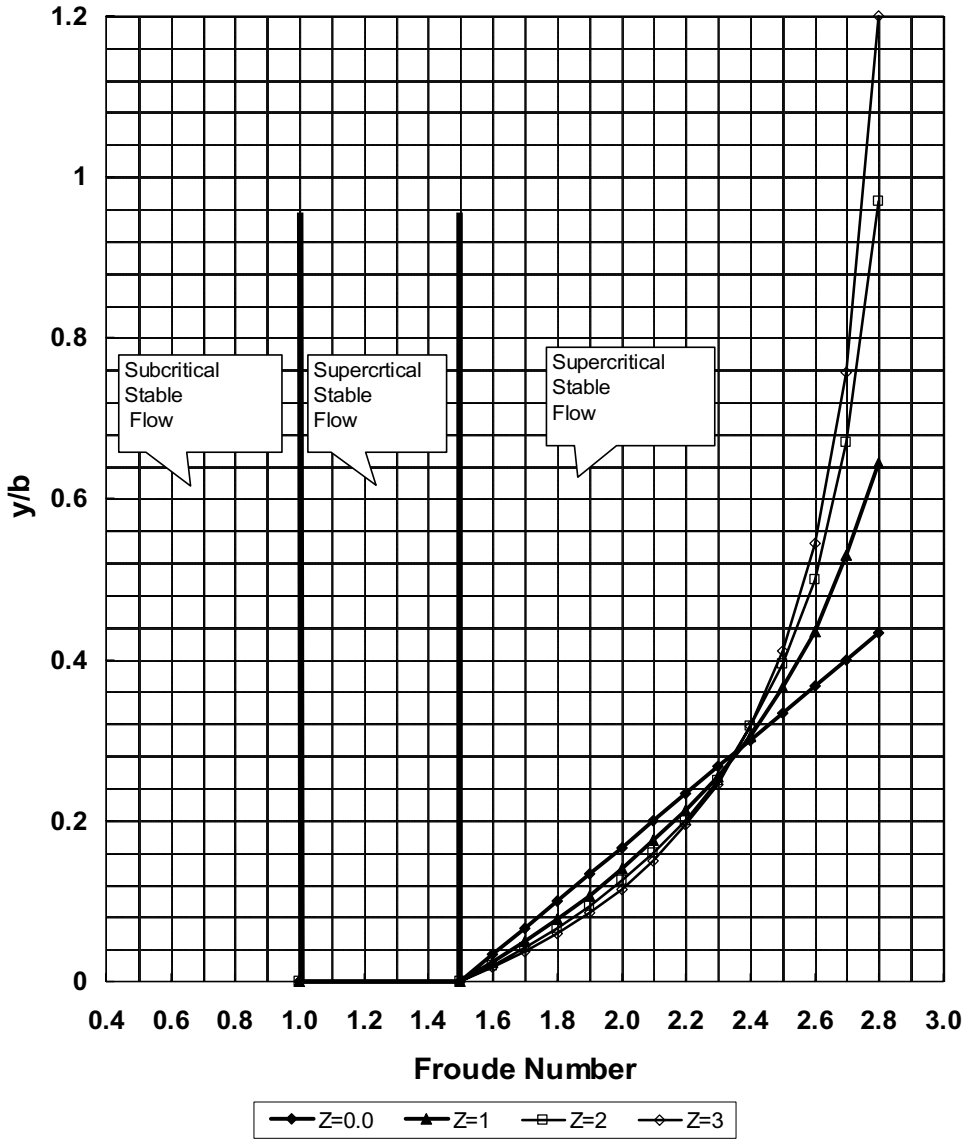

Figure 1 Regimes for Open Channel Flows

In this study, the roll wave front is considered as a positive surge. The unsteady flow pattern can be converted to its steady pattern by a coordinate system moving with the bore velocity. As illustrated in Figure 2, the continuity principle is:

$$(V_2 - V_w) A_2 = (V_1 - V_w) A_1 \quad (8)$$

Re-arranging Eq 8 yields:

$$V_2 = \frac{(V_1 - V_w)A_1 + V_w A_2}{A_2} \tag{9}$$

And the momentum principle is:

$$(V_w - V_2)(V_2 - V_1) = (\overline{y_2} - \frac{A_1}{A_2}\overline{y_1})g \tag{10}$$

in which V_w = wave velocity, V = flow velocity, A = flow area, g = gravitational acceleration, and $\overline{y}$ = distance to the centroid of the flow area, approximated by 0.5y.

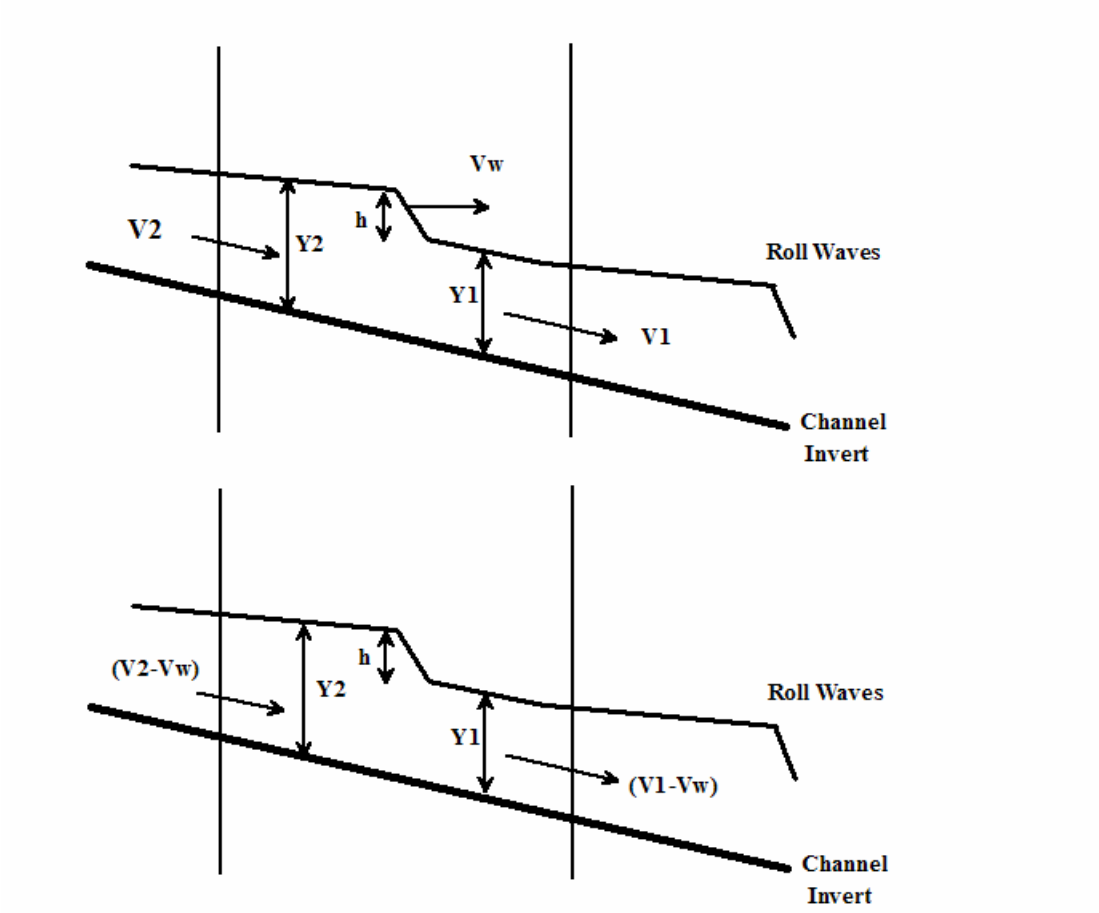

Figure 2 Illustration of Moving Hydraulic Jump

The subscript 2 denotes the design condition including roll waves, and the subscript 1 represents the limiting condition defined by Vedernikov number. Solving Eq's 8, 9, and 10 simultaneously yields

$$V_w = V_1 + \sqrt{\frac{(A_2\overline{y_2} - A_1\overline{y_1})g}{A_1(1 - A_1/A_2)}} \tag{11}$$

Let the height of roll waves be the difference between flow depths as

$$h = y_2 - y_1 \tag{12}$$

$C=V_w - V_2$ (13)

in which h = roll wave height, and C = wave celerity. In a high gradient channel, the water surface in a cross section is fluctuating due to cross waves [8]. Considering that the roll waves near the center of the channel section is similar to that in a rectangular channel, the representative height of roll waves can be derived by simplifying Eq's 8 and 9 for rectangular channel. Details can be found elsewhere [1]. Canceling the wave velocity in Eq's 8 and 9, the height of roll waves is derived as:

$$h = \frac{C^2}{g}\left(\frac{2y_1}{y_1 + y_2}\right)\left(\frac{V_2}{C} - \frac{V_1}{C}\right) = \frac{C^2}{g}\left(\frac{2y_1}{y_1 + y_2}\right)(F_2 - F_1) \tag{14}$$

Eq 14 is only applicable if $F_2>F_1$. Otherwise h=0.

$$F_1 = \frac{V_1}{C} \tag{15}$$

$$F_2 = \frac{V_2}{C} \tag{16}$$

In practice, F_2 is the Froude number for the design discharge and F_1 is the limiting Froude number determined by Vedernikov's number. When the height of roll waves is small compared with the depth of flow, i.e. $y_1 \approx y_2$, Eq 14 is reduced to

$$h = \frac{C^2}{g}\left(\frac{V_1}{C} - \frac{V_2}{C}\right) = \frac{(V_w - V_2)^2}{g}(F_1 - F_2) \tag{17}$$

Eq 17 agrees with Chow's two-dimensional surge model [1] and can provide an estimated wave height of the spectrum of roll waves. To apply the above procedure to the design of a high gradient channel, the design condition, at first, shall be evaluated by Eq 5 or Figure 1. If the design condition exceeds the limiting condition, a pulsating flow is expected. The height of roll waves can be estimated by Eq 17 for the freeboard design.

DESIGN EXAMPLES

Like oblique jumps, roll waves are formed through a successive amplification. Methods derived to quantify heights of roll waves, while recognizing the uncertainty and scarcity of data, are to provide estimates from a statistical point of view [7]. For instance, the example of a 9.8-ft wide rectangular concrete channel was used by French [11] to illustrate how to use the wave frequency distributions to estimate the height of roll waves. The maximum height of roll waves in this channel is estimated to be 1.8 ft when the discharge is 320 cfs on a 10% slope. The same example is employed to test the moving hydraulic jump model by the following procedures:

(1) Check the Stability of the Design Flow
The uniform flow for the example has a depth of 1.0 ft. Since the design Froude number is 5.66 which is greater than the limiting Froude number of 1.8 determined by Eq 7 or Figure 1, roll waves are expected.

(2) Calculation of the Height of Roll Waves
2.1 Guess the height of roll waves, h in Eq 12. Solve for y_2 and V_2 by Eq 12 and Eq 9 respectively. Solve for V_w by Eq 11 and C by Eq 13. Calculate the height of roll waves by Eq 17.
2.2 Revise the value of h based on the calculated value and repeat Steps 2.1 and 2.2 until the convergence is achieved between the guessed and calculated height of roll waves.

This procedure leads to a prediction of roll waves of 1.73 feet for the aforementioned case, which is comparable to the method of wave frequency distributions.

Further, a sensitivity investigation on roll waves was also tested for a discharge of 5000 cfs on a 3.0% concrete slope. Channel shapes considered are the combinations among bottom widths of 10-, 15-, and 20-ft, and side slopes of 0, 1, 2, and 3 ft/ft. As shown in Table 1, the wider the channel is, the lower the roll waves are. The steeper the side slope is, the higher the roll waves are. And, the shallower the channel is, the higher the roll waves are. Therefore, there exists a tradeoff between channel width and depth when roll waves are taken into account. Under the consideration of roll waves, the minimal flow area is achieved by a 15-ft rectangular channel for this case. In fact, a 15-ft rectangular channel is the one that sustains a supercritical uniform flow without roll waves. Similar conclusions were also observed for many other cases.

Channel Width b ft	Side Slope z ft/ft	Limiting Froude Number	Uniform Flow Depth y/b	Design Flow Froude Number	Roll Wave Height h ft	Wave Speed fps	Water Flow Depth ft	Water Flow Area sq ft
10	0	5.03	1.175	2.19	0.00	62.02	11.76	117.60
10	1	2.81	0.665	3.66	3.32	65.45	9.97	199.10
10	2	2.82	0.564	3.83	3.01	61.04	8.65	236.15
10	3	2.86	0.510	3.84	2.57	56.87	7.67	253.19
15	0	3.00	0.500	2.86	0.00	60.05	7.51	112.65
15	1	2.51	0.369	3.73	3.95	65.03	9.48	232.04
15	2	2.61	0.328	3.84	3.26	60.31	8.18	256.74
15	3	2.71	0.304	3.83	2.72	56.28	7.29	268.55
20	0	2.36	0.287	3.21	3.90	64.03	9.63	192.60
20	1	2.26	0.237	3.76	4.22	63.67	8.97	259.79
20	2	2.42	0.219	3.83	3.42	59.26	7.79	277.17
20	3	2.54	0.206	3.82	2.84	55.50	6.96	284.77
25	0	2.07	0.190	3.40	4.73	63.45	9.49	237.25
25	1	2.09	0.167	3.78	4.27	61.86	8.45	282.76
25	2	2.25	0.158	3.82	3.49	57.99	7.43	296.02
25	3	2.39	0.151	3.81	2.92	54.60	6.69	301.19

Table 1 Case Study for Channel Geometries for Stable Supercritical Flow

CONCLUSION

To design a high gradient channel, the design condition must be evaluated by Vedermikov's number as a stability criterion. In this study, Vedernikov's number was expanded from rectangular channels to trapezoidal channels. The widely used design curves recommended by the Corps of Engineers for flood channel designs was revised to identify the existence of pulsating flow in high gradient channels. When Froude number is less than 1.5, flows in trapezoidal channels are stable, and when Froude number is greater than 3.0, roll waves are expected in high gradient trapezoidal channels. Figure 1 is produced to determine the stability of flow when Froude number is between 1.5 and 3.0. When a design condition exceeds the limiting condition, the increased flow depth due to roll waves shall be accommodated by the additional freeboard.

Roll waves in pulsating flows are further modeled by a moving hydraulic jump. Design procedures developed in this paper provide estimations of wave height in the same magnitude as solutions obtained from the wave frequency distributions. However, the frequency distributions were only developed for three ranges of Froude number between 3.45 to 5.60. The moving hydraulic jump model developed in this study provides estimations of roll wave heights as Froude number is greater than 1.50.

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D.9

CONTECH ARMORTECH
ARTICULATED CONCRETE BLOCK
SIZING CALCULATIONS

Factor of Safety
Hydraulic Analysis

These calculations are an application of the Moment Stability Analysis technique presented in Julien (2010) and as illustrated in the NCMA Manual (2010), listed in the References.
The factor of safety method is used in the selection of block sizes for ACB's for revetments or bed armor.
The following assumes that hydraulic testing has been performed for the block system to quantify a critical shear stress; the use of Manning's equation conservatively assumes normal depth and critical velocity.

References
1. Julien, Pierre Y. (2010) "Erosion and Sedimentation", 2nd Edition, Cambridge University Press

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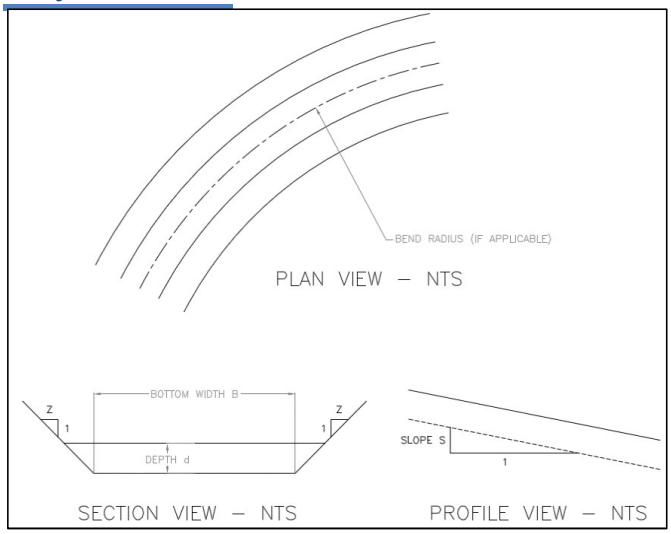
5. ASTM D 7276 & D7277 Testing and Analysis Compliant

Factor of Safety
Hydraulic Analysis

Project Data



Channel Bottom Width, B	300	ft
Bed Slope, S_o	0.150	ft/ft
Friction Slope, S	0.150	ft/ft
Left Side Slope, Z_L	10	(_H:1V)
Right Side Slope, Z_R	10	(_H:1V)
Bend Radius, r	0	ft
Depth of Flow d	0.56	ft

The Depth of Flow is varied iteratively to obtain a given volumetric flow rate.

Top Surface Width ,T	311.18	ft

Other Constants		
Unit Weight of Water, γ	62.4	pcf
Unit Wt. of Concrete, Dry-Cast	130	pcf
Sp. Gr. Of Concrete, S_c	2.083	--
Gravitational Constant, g	32.2	ft/s^2

Calculated Channel Geometry Factors

Flow Area, A	170.78	ft^2
Wetted Perimeter, P	311.23	ft
Hydraulic Radius = R_H = A/P =	0.55	ft
Bend Coefficient, K_b	1	--
Froude Number, Fr	3.64	--
Flow Type	Supercritical	

Volumetric Flow Rate, Q: 2635.00 cfs

The Volumetric Flow Rate is determined using Manning's equation:

$$Q = 1.486 / (n * A * R^{2/3} * S^{1/2})$$

Velocity, V: 15.43 ft/sec

		sin	cos	tan
Largest Side Slope Angle, θ_1	5.711 °	0.100	0.995	0.100
Bed Slope Angle, θ_0	8.531 °	0.148	0.989	0.150

ArmorFlex Block parameters

Class	40-T
SF	4.54

ϑ_1	0.198	ft	A_B	1.1
ϑ_2	0.725	ft	C_L	0.00834
ϑ_3	0.396	ft	Weight	58.1 lbs
ϑ_4	0.725	ft	Width	1.292 ft
ϑ_5	0.646		τ_c	25.0 psf
ϑ_6	0.646		ΔZ	0.0 in
ϑ_7	0.971		n	0.025 --
ϑ_8	0.971			

ARMORTEC
Erosion Control Solutions

Factor of Safety
Hydraulic Analysis

Detailed Calculations REFERENCE

Flow Area, $A = A_L + A_B + A_R$

$A_L = ½ * d^2 * Z_L =$	1.56	ft^2
$A_B = B * d =$	167.65	ft^2
$A_R = ½ * d^2 * Z_R =$	1.56	ft^2
$A =$	170.78	ft^2

Wetted Perimeter, $P = P_L + P_B + P_R$

$P_L = d * (Z_L^2 + 1)^{0.5} =$	5.62	ft
$P_B = B =$	300	ft
$P_R = d * (Z_R^2 + 1)^{0.5} =$	5.62	ft
$P =$	311.23	ft

Volumetric Flow Rate, Q

$Q = 1.486 / n * A * R_H^{2/3} * S^{1/2} =$	2635.00	cfs	(Ref. 3 Eqn. 2.1)

Compute Factor of Safety Parameters

Submerged Weight, W_s	$W_s = W * ((S_c - 1) / S_c) =$	30.22	lb	(Ref. 2 Eqn 4.13a)
Applied Shear Stress, τ_o	$\tau_o = \gamma * d * S_o =$	5.23	psf	(Ref. 3 Eqn. 2.4)

Bend Coefficient Calculation

X = r/B = (Constrained to between 1.984 and 10)	1.984	--	
Calculated $K_b = 2.38-0.206(X)+0.0073(X)^2 =$	2.00	--	(Ref. 3 Eqn. 3.7)
Constrained K_b: $1.05 \le K_b \le 2 \rightarrow$	1.00		

(If no bend radius is present, $K_b = 1$)

(Design Shear Stress)	$\tau_o = K_b \gamma y \sin(\tan^{-1} S_o) =$	5.17	lbs/ft^2	(Ref. 3 Eqn 3.1 & 3.6)

Calculate Cox Parameters

	$\beta = \cos^{-1}((b/2)/\vartheta_8) =$	48.31	°	
$\sin\beta =$ 0.747	$\cos\beta =$	0.665		
	$W_{SX} = W_S * \sin\theta_0$	4.48	lb	(Ref. 4. Eqn. 7.1)
	$\theta_2 = \tan^{-1}(\tan\theta_1 * \cos\theta_0)$	5.648	°	(Ref. 4. Eqn. 7.3)
	$W_{SY} = W_S * \cos\theta_0 * \cos\theta_2$	29.74	lb	(Ref. 4. Eqn. 7.2)
	$W_{SZ} = W_S * \cos\theta_0 * \sin\theta_2$	2.94	lb	(Ref. 4. Eqn. 7.4)
	Applied $F_D = \tau_0 * A_B =$	5.80	lbs	(Ref. 4. Eqn. 7.10)
	Applied $F_L = 0.5 * C_{BL} * \rho * A_B * V^2 =$	2.16	lbs	(Ref. 4. Eqn. 7.11)
	$F_L' = F_D' = 0.5 \Delta Z b \rho V_{des}^2 =$	0.00	lbs	(Ref. 4. Eqn. 7.12)

$SF_M = (\vartheta_7 * W_{SY}) / [(\vartheta_1 * (W_{SX} * \sin\beta + W_{SZ} * \cos\beta)) + (\vartheta_3 * (F_D + F_D') * \sin\beta) + (\vartheta_8 * (F_L + F_L'))] =$

5.94 (Ref. 4. Eqn. 7.18)

$SF_P = (\vartheta_2 * W_{SY}) / [(\vartheta_1 * W_{SX}) + (\vartheta_3 * (F_D + F_D')) + (\vartheta_4 * (F_L + F_L'))] =$

4.54 (Ref. 4. Eqn. 7.20)

$SF_O = (\vartheta_5 * W_{SY}) / [(\vartheta_1 * W_{SZ}) + (\vartheta_6 * (F_L + F_L'))] =$

9.72 (Ref. 4. Eqn. 7.22)

$SF_{BED} = (\vartheta_2 * W_S * \cos\theta_0) / [(\vartheta_1 * (W_S * \sin\theta_0)) + (\vartheta_3 * (F_D + F_D')) + (\vartheta_4 * (F_L + F_L'))] =$

4.56 (Ref. 4. Eqn. 7.28)

Factor of Safety
Hydraulic Analysis

Parameters for Factor of Safety Calculations													
Block Class	Block Area	ϑ_1	ϑ_2	ϑ_3	ϑ_4	ϑ_5	ϑ_6	ϑ_7	ϑ_8	τ_c / 0°	Width	Weight	Lift Coeff. C_L
	(SF)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(psf)	(ft)	(lbs)	
30-S	0.68	0.198	0.542	0.396	0.542	0.483	0.483	0.726	0.726	5.180	0.967	32.89	0.11045
40	1.23	0.198	0.725	0.396	0.725	0.646	0.646	0.971	0.971	11.200	1.292	59.02	0.04563
40-L	1.93	0.198	0.725	0.396	0.725	0.983	0.983	1.222	1.222	19.460	1.967	97.18	0.02455
40-T	1.12	0.198	0.725	0.396	0.725	0.646	0.646	0.971	0.971	25.022	1.292	58.12	0.00834
45	1.49	0.198	0.725	0.396	0.725	0.646	0.646	0.971	0.971	13.530	1.292	71.25	0.04563
45-L	2.31	0.198	0.725	0.396	0.725	0.983	0.983	1.222	1.222	21.860	1.967	109.15	0.02455
45-S	0.83	0.198	0.542	0.396	0.542	0.483	0.483	0.726	0.726	6.170	0.967	39.20	0.11045
50	1.23	0.250	0.725	0.500	0.725	0.646	0.646	0.971	0.971	13.610	1.292	76.29	0.04563
50-L	1.93	0.250	0.725	0.500	0.725	0.983	0.983	1.222	1.222	22.050	1.967	116.02	0.02455
50-S	0.68	0.250	0.542	0.500	0.542	0.483	0.483	0.726	0.726	6.130	0.967	42.03	0.11045
50-T	1.12	0.250	0.725	0.500	0.725	0.646	0.646	0.971	0.971	30.500	1.292	75.39	0.00834
55	1.49	0.250	0.725	0.500	0.725	0.646	0.646	0.971	0.971	16.290	1.292	91.37	0.04563
55-L	2.31	0.250	0.725	0.500	0.725	0.983	0.983	1.222	1.222	26.280	1.967	138.29	0.02455
55-S	0.83	0.250	0.542	0.500	0.542	0.483	0.483	0.726	0.726	7.330	0.967	50.25	0.11045
60	1.23	0.313	0.725	0.625	0.725	0.646	0.646	0.971	0.971	15.490	1.292	93.17	0.04563
60-T	1.12	0.313	0.725	0.625	0.725	0.646	0.646	0.971	0.971	35.200	1.292	93.42	0.00834
70	1.23	0.354	0.725	0.708	0.725	0.646	0.646	0.971	0.971	17.730	1.292	113.90	0.04563
70-L	1.93	0.354	0.725	0.708	0.725	0.983	0.983	1.222	1.222	29.520	1.967	174.46	0.02455
70-T	1.12	0.354	0.725	0.708	0.725	0.646	0.646	0.971	0.971	38.500	1.292	108.96	0.00834
75	1.49	0.313	0.725	0.625	0.725	0.646	0.646	0.971	0.971	18.620	1.292	112.02	0.04563
85	1.49	0.354	0.725	0.708	0.725	0.646	0.646	0.971	0.971	21.100	1.292	135.60	0.04563
85-L	2.31	0.354	0.725	0.708	0.725	0.983	0.983	1.222	1.222	35.060	1.967	207.23	0.02455

	A_B	ϑ_1	ϑ_2	ϑ_3	ϑ_4	ϑ_5	ϑ_6	ϑ_7	ϑ_8	τ_c / 0°	Width	Weight	Lift Coeff. C_L
40-T	1.121	0.198	0.725	0.396	0.725	0.646	0.646	0.971	0.971	25.022	1.292	58.120	0.00834

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

APN: 137-22-301-001
APN: 137-21-801-001
CITY OF LAS VEGAS
STATE OF NEVADA

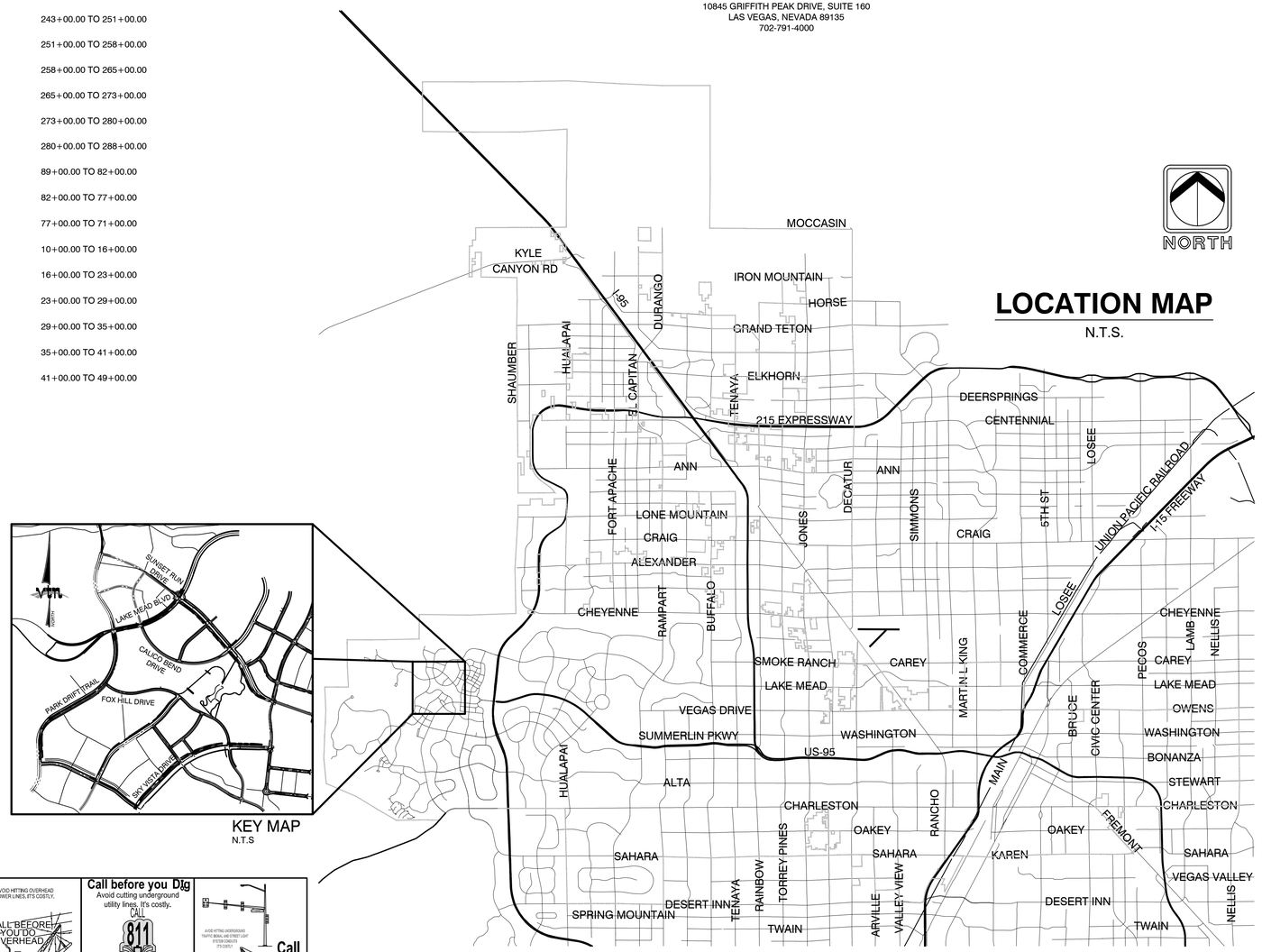
DEVELOPED BY:

HOWARD HUGHES COMPANY, LLC

10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

SHEET INDEX

SHEET #	SHEET	DESCRIPTION	STATIONS
1	CV	COVER SHEET	
2	NT	NOTE SHEET	
3	HC1	HORIZONTAL CONTROL PLAN 1	
4	HC2	HORIZONTAL CONTROL PLAN 2	
5	HC3	HORIZONTAL CONTROL PLAN 3	
6	HC4	HORIZONTAL CONTROL PLAN 4	
7	HC5	HORIZONTAL CONTROL PLAN 5	
8	MGRD1	MASTER GRADING PLAN 1	
9	MGRD2	MASTER GRADING PLAN 2	
10	MGRD3	MASTER GRADING PLAN 3	
11	MGRD4	MASTER GRADING PLAN 4	
12	DT1	DETAIL SHEET 1	
13	DT2	DETAIL SHEET 2	
14	PP1	STREET PROFILE 1 FOX HILL DRIVE	81+50.00 TO 75+00.00
15	PP2	STREET PROFILE 2 FOX HILL DRIVE	75+00.00 TO 69+00.00
16	PP3	STREET PROFILE 3 FOX HILL DRIVE	69+00.00 TO 64+00.00
17	PP4	STREET PROFILE 4 CALICO BEND DRIVE	10+00.00 TO 17+00.00
18	PP5	STREET PROFILE 5 CALICO BEND DRIVE	17+00.00 TO 25+50.00
19	PP6	STREET PROFILE 6 CALICO BEND DRIVE	25+50.00 TO 35+00.00
20	PP7	STREET PROFILE 7 PARK DRIFT TRAIL	235+00.00 TO 243+00.00
21	PP8	STREET PROFILE 8 PARK DRIFT TRAIL	243+00.00 TO 251+00.00
22	PP9	STREET PROFILE 9 PARK DRIFT TRAIL	251+00.00 TO 258+00.00
23	PP10	STREET PROFILE 10 PARK DRIFT TRAIL	258+00.00 TO 265+00.00
24	PP11	STREET PROFILE 11 PARK DRIFT TRAIL	265+00.00 TO 273+00.00
25	PP12	STREET PROFILE 12 PARK DRIFT TRAIL	273+00.00 TO 280+00.00
26	PP13	STREET PROFILE 13 PARK DRIFT TRAIL	280+00.00 TO 288+00.00
27	PP14	STREET PROFILE 14 LAKE MEAD BLVD	89+00.00 TO 82+00.00
28	PP15	STREET PROFILE 15 LAKE MEAD BLVD	82+00.00 TO 77+00.00
29	PP16	STREET PROFILE 16 LAKE MEAD BLVD	77+00.00 TO 71+00.00
30	PP17	STREET PROFILE 17 SUNSET RUN DRIVE	10+00.00 TO 16+00.00
31	PP18	STREET PROFILE 18 SUNSET RUN DRIVE	16+00.00 TO 23+00.00
32	PP19	STREET PROFILE 19 SUNSET RUN DRIVE	23+00.00 TO 29+00.00
33	PP20	STREET PROFILE 20 SUNSET RUN DRIVE	29+00.00 TO 35+00.00
34	PP21	STREET PROFILE 21 SUNSET RUN DRIVE	35+00.00 TO 41+00.00
35	PP22	STREET PROFILE 22 SUNSET RUN DRIVE	41+00.00 TO 49+00.00
36	PP23	LATERAL PROFILE 1 FOX HILL DRIVE	
37	PP24	LATERAL PROFILE 2 FOX HILL DRIVE	
38	PP25	LATERAL PROFILE 3 FOX HILL DRIVE	
39	PP26	LATERAL PROFILE 5 LAKE MEAD BLVD	
40	PP27	LATERAL PROFILE 6 LAKE MEAD BLVD	
41	PP28	LATERAL PROFILE 7 LAKE MEAD BLVD	
42	PP29	LATERAL PROFILE 8 SUNSET RUN DRIVE	
43	PP30	LATERAL PROFILE 9 SUNSET RUN DRIVE	
44	PP31	LATERAL PROFILE 10 SUNSET RUN DRIVE	
45	PP32	LATERAL PROFILE 11 SUNSET RUN DRIVE	
46	PP33	LATERAL PROFILE 12 SUNSET RUN DRIVE	



LOCATION MAP

N.T.S.

NORTH

KEY MAP
N.T.S

OWNER
HOWARD HUGHES COMPANY, LLC
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

DEVELOPER
HOWARD HUGHES COMPANY, LLC
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

ENGINEERING FIRM
VTN
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
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FAX (702) 362-2597

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AND
1-702-229-6511
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):38°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

APPROVALS

CITY ENGINEER ROSA CORTEZ, P.E. # 17505

APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

CHRIS KNIGHT, DIRECTOR OF BUILDING & SAFETY DATE

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK DATE

"THE AFFIXED CENTURY LINK NEVADA APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS."

NV ENERGY DATE

NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NVENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

COX COMMUNICATIONS LAS VEGAS, INC. DATE

SOUTHWEST GAS CORPORATION DATE

KEVIN T. ORROCK, VICE PRESIDENT DATE

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY

REV | DATE | BY | REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

COVER SHEET

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — JAN 2019
DESIGNED BY: DMO — JAN 2019
CHECKED BY: BR — 08/02/2019
PROJECT NO: 7809
SCALE: HORIZ. 1" = 40' VERT. 1" = 8'

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
No. 15967
EXP: 12/31/21
CIVIL
2/18/2020

SHEET
CV
1 OF 46 SHEETS

DRAWING NO.

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CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLICWORKS CONSTRUCTION OFFSITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".

2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCE'S WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THERE WITH.

3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE. AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.

4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.

5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.

6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.

7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.

8. AC PAVEMENT TO BE ONE-HALF INCH (½") ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.

9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.

10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.

11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.

12. 12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY: ----, PROJECT NO. ----, DATED ----, APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLAN.

13. EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.

14. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. STATUTE NO. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.

15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

16. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.

17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.

18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.

19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.

20. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC, THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.

21. SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S) SHALL BE PROVIDED TO THE CITY AND APPROVED PRIOR TO ACCEPTANCE OF FACILITY VIDEO INSPECTION. THE MAP(S) SHALL INCLUDE THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES AND TRANSITION STRUCTURES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXIT THE PUBLIC RIGHT-OF-WAY, AND STORM DRAIN MAIN ALIGNMENT, INCLUDING DEFLECTION POINTS. THE LOCATION SHALL BE DESCRIBED BY COORDINATES WHICH SHALL BE BASED ON THE OFFICIAL HORIZONTAL AND VERTICAL CONTROL NETWORKS OF THE CITY OF LAS VEGAS. FINAL LOCATION MAPS MUST BE SEALED AND CERTIFIED BY A NEVADA PROFESSIONAL LAND SURVEYOR TO HAVE POSITIONAL CERTAINTIES OF ± 0.09 METERS (± 0.3 FEET) HORIZONTALLY AND VERTICALLY. A SEPARATE ELECTRONIC COMMA DELIMITED FILE FOR THE SANITARY SEWER AND STORM DRAIN COORDINATES SHALL ALSO ACCOMPANY THE SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S).

22. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST EDITION.

23. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

REVISED 06/04/2018

CITY OF LAS VEGAS GRADING NOTES

1. IN THE EVENT THAT ANY UNFORESEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BE IMMEDIATELY NOTIFIED FOR DIRECTION.

2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF-SITE WORK, SO AS TO GENERATE THE DESIRED SUBGRADE, FINISH GRADES AND SLOPES SHOWN.

3. CONTRACTOR SHALL TAKE FULL RESPONSIBILITY FOR ALL EXCAVATION. ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.

4. THE CONTRACTOR IS WARNED THAT AN EARTHWORK BALANCE WAS NOT NECESSARILY THE INTENT OF THIS PROJECT. ANY ADDITIONAL MATERIAL REQUIRED OR LEFTOVER MATERIAL FOLLOWING EARTHWORK OPERATIONS BECOMES THE RESPONSIBILITY OF THE CONTRACTOR.

5. THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED PERMIT.

6. CONTRACTOR SHALL GRADE TO THE LINES AND ELEVATIONS SHOWN ON THE PLANS WITHIN THE FOLLOWING HORIZONTAL AND VERTICAL TOLERANCES AND DEGREES OF COMPACTION, IN THE AREAS INDICATED:

	HORIZONTAL	VERTICAL	COMPACTION
A.PAVEMENT AREA SUBGRADE	0.1'+	+0.0to-0.1'	SEE SOILS REPORT
B.ENGINEERED FILL	0.5'+	+0.1to-0.1'	SEE SOILS REPORT

REPORT COMPACTION TESTING WILL BE PERFORMED BY THE OWNER OR HIS REPRESENTATIVE.

7. ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED.

8. THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL OR DUST CONTROL IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.

9. THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT-OF-WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOIL, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM THE PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.

10. IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, THE OWNER AGREES TO PROVIDE AND INSTALL SUCH ITEM AT HIS OWN EXPENSE AND AT THE DIRECTION OF THE CITY ENGINEER. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

REVISED 04/15/10

CITY OF LAS VEGAS TRAFFIC NOTES

1. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.

2. THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.

3. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.

4. WHEN A DESIGNATED "SUGGESTED ROUTE TO SCHOOL" IS ENCROACHED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF IDENTIFIES A NEED FOR STUDENTS TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.

5. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.

6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. ALL NEW TRAFFIC SIGNS SHALL UTILIZE TYPE XI RETROREFLECTIVE SHEETING IN ACCORDANCE WITH CCAUSS 627 AND 716 AND SHALL HAVE AN ANTI-GRAFFITI PROTECTIVE OVERLAY FILM THAT IS A MATCHING COMPONENT TO, AND OF THE SAME MANUFACTURER AS THE RETROREFLECTIVE SHEETING TO WHICH IT IS APPLIED. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARDS.

7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5') FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREET LIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.

8. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HERE UNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.

9. STREET SIGNS AND STOP SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.

10. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO INSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK AREA. THE CONTRACTOR SHALL HAVE A CERTIFIED ATSSA TRAFFIC CONTROL TECHNICIAN OR IMSA WORK ZONE SAFETY SPECIALIST SET UP, MAINTAIN AND/OR REMOVE ALL TRAFFIC CONTROL DEVICES IN THE CITY OF LAS VEGAS RIGHT OF WAY.

11. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE EXPEDITED TO COMPLETION SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.

12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING CITIZENS AREA TRANSIT (C.A.T.) IF THE CONSTRUCTION INTERRUPTS OR RELOCATES A BUS STOP OR HAS AN ADVERSE EFFECT ON BUS SERVICE ON THAT STREET TO ARRANGE FOR TEMPORARY RELOCATION OF STOP.

13. GUARDS SHALL BE OBTAINED BY CONTACTING THE METROPOLITAN POLICE DEPARTMENT SPECIAL EVENTS UNIT (PHONE # 828-3442) WHO WILL PROVIDE OFFICERS PROPERLY TRAINED IN TRAFFIC CONTROL. FEES FOR THE USE OF THESE OFFICERS SHALL BE SET BY METRO AND WILL BE PAID BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL ARRANGEMENTS WITH METRO.

14. ANY WORK WITHIN 300' OF A SIGNALIZED INTERSECTION WILL BE NIGHT WORK, UNLESS DIRECTED BY THE CITY OF LAS VEGAS TRAFFIC ENGINEER.

15. THE CONTRACTOR SHALL CONTACT THE TRAFFIC ENGINEERING DIVISION (TRANSPORTATION SECTION) THROUGH THE PROJECT'S OFFSITE INSPECTOR PRIOR TO INITIATING PAVING TO RECEIVE DIRECTION FOR ANY PERMANENT OR TEMPORARY MODIFICATIONS TO THE APPROVED DRAWINGS REGARDING FINAL PAVEMENT TRANSITIONS, MARKINGS AND SIGNING THAT ARE REQUIRED TO MATCH ADJACENT ROADWAY SEGMENTS. THE CONTRACTOR SHALL PROVIDE A DRAWING FOR APPROVAL BY THE TRAFFIC ENGINEERING DIVISION DEPICTING ANY ADJUSTMENTS TO THE FINAL PAVEMENT MARKINGS AND SIGNAGE, WHICH MAY INCLUDE OMITTING, ADDING OR MODIFYING PAVEMENT MARKINGS AND TRAFFIC CONTROL SIGNS SUCH THAT ADEQUATE TRANSITIONS AND LANE TERMINATIONS BETWEEN ADJACENT ROADWAY SEGMENTS ARE CONSTRUCTED.

REVISED 7/3/13

ABBREVIATIONS

FF	FINISH FLOOR	DI	DROP INLET
FG	FINISH GRADE	BFE	BASE FLOOD ELEVATION
FL	FLOW LINE	CCUSD	CLARK COUNTY UNIFORM STANDARD DRAWINGS
TC	TOP OF CURB	SW	SIDEWALK
TRC	TOP OF ROLL CURB	TSW	TOP OF SIDEWALK
EOP	EDGE OF ASPHALT PAVEMENT	INT.	INTERSECTION
FUT.	FUTURE	D.G.	DESIGN GRADE
EX.	EXISTING	C/L	CENTER LINE
VG	VALLEY GUTTER	O/C	OFFSET CROWN
NG	NATURAL GROUND	BC	BACK OF CURB
H.P.	HIGH POINT	BCR	BEGIN CURB RETURN
L.P.	LOW POINT	BCL	BACK OF CURB LENGTH
SSMH	SEWER MANHOLE	TF	TOP OF FOOTING
WTR	WATER LINE	GB	GRADE BREAK
SD	STORM DRAIN	PC	POINT OF CURVATURE
RCP	REINFORCED CONCRETE PIPE	TPW	TOP OF PLANTER WALL
PT	POINT OF TANGENCY	TRW	TOP OF RETAINMENT WALL
PRC	POINT OF REVERSE CURVATURE	TOP	TOP OF CHANNEL/SCARP
PCC	POINT OF COMPOUND CURVATURE	TOE	TOE OF CHANNEL/SCARP
BVC	BEGIN VERTICAL CURVE	TOB	TOP OF BOX
MVC	MID-POINT OF VERTICAL CURVE	PP	POWER POLE
EVC	END VERTICAL CURVE	TRANS.	TRANSITION
PRVC	POINT OF REVERSE VERTICAL CURVE	RET.	RETAINMENT
R/W	RIGHT-OF-WAY		

LEGEND

DESCRIPTION	PROPOSED	EXISTING	FUTURE
CONTOUR (5' INTERVAL)	2450	(2450)	(2450)
CONTOUR (1' INTERVAL)			
EDGE OF PAVEMENT			
SAW CUT			
RETAINING WALL			
SCREEN WALL			
RIGHT OF WAY			
CENTER LINE			
BACK OF CURB			
LIP OF GUTTER			
FACE OF CURB			
SIDEWALK			
UNIT BOUNDARY LINE			
UNIT BOUNDARY / ROW			
PROPERTY LINE			
SLOPE AND FLOW DIRECTION	1.00%	(1.00%)	(1.00%)
SCARP AREA			
MATCHLINE			
SIDEWALK RAMP			
SIGHT VISIBILITY ZONES			
PAVED ROAD			
PAVEMENT REMOVAL			
WATER UNDER 18"			
WATER 18" & OVER			
SANITARY SEWER UNDER 18"			
SANITARY SEWER 18" & OVER			
STORM SEWER			
FIRE HYDRANT			
SANITARY SEWER MAN HOLE			
CLEAN OUT			
STORM DRAIN MAN HOLE			

ESTIMATE OF QUANTITIES

ESTIMATED GRADING QUANTITIES	PUBLIC
24" RCP STORM DRAIN	510 LF
30" RCP STORM DRAIN	150 LF
42" RCP STORM DRAIN	102 LF
48" RCP STORM DRAIN	174 LF
54" RCP STORM DRAIN	258 LF
5'X5' RCB STORM DRAIN	637 LF
5'X6' RCB STORM DRAIN	777 LF
5'X7' RCB STORM DRAIN	223 LF
6'X7' RCB STORM DRAIN	1,453 LF
7'X7' RCB STORM DRAIN	2,207 LF
48" STORM DRAIN MANHOLE	19 EA
60" STORM DRAIN MANHOLE	3 EA
RCP STORM DRAIN PLUG	25 EA
RIP-RAP D50=8"	2,517 CY
RIP-RAP D50=12"	206 CY
RIP-RAP GROUTED D50=12"	2,016 CY
EARTHWORKS CUT	428,175 CY
EARTHWORKS FILL	155,239 CY
EARTHWORKS TOTAL (CUT)	272,937 CY

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

NOTE SHEET

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	
RC	DMO	BR	7809	N/A	HORIZ.
MAR 2019	MAR 2019	08/30/2019		N/A	VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

2/18/2020

SHEET
NT
2 OF 46 SHEETS

DRAWING NO.

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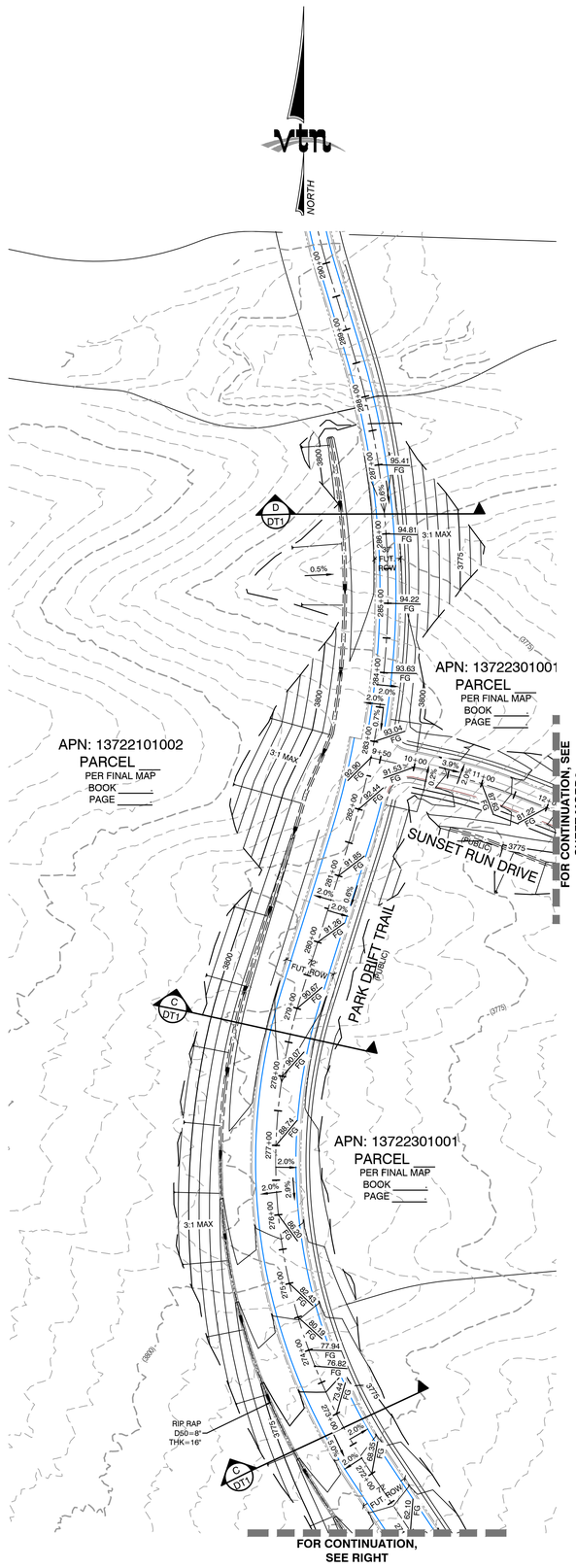

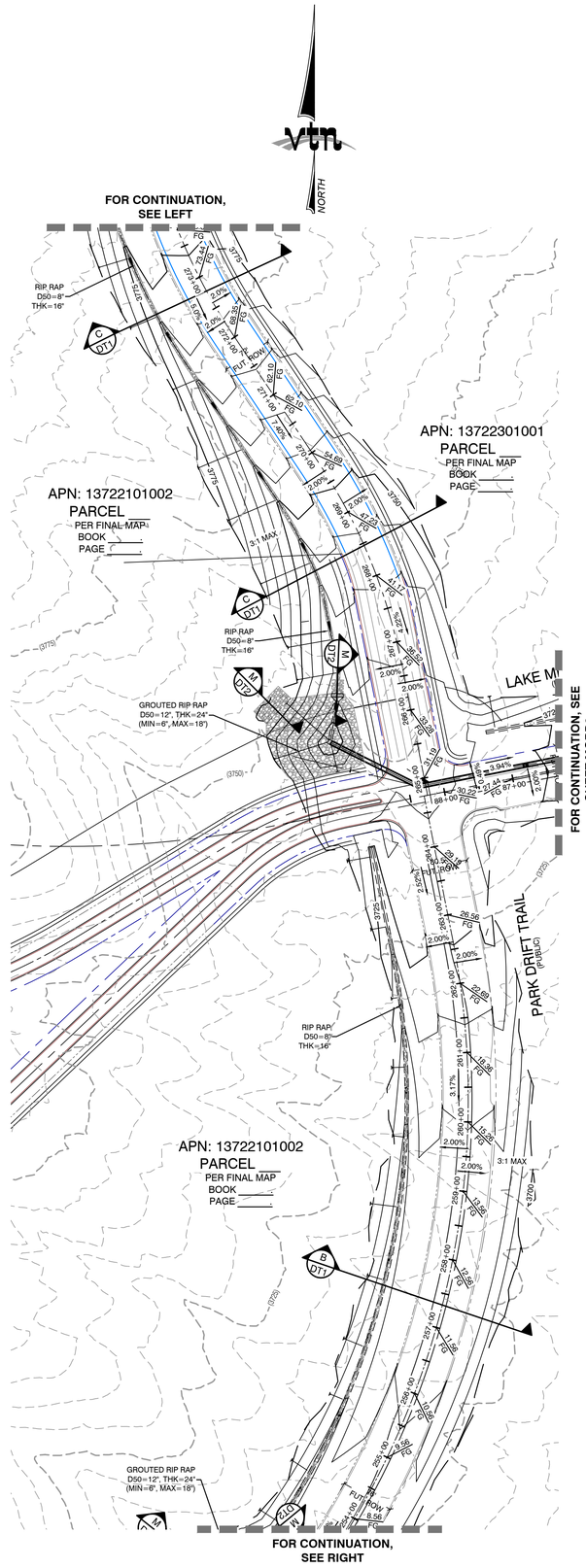

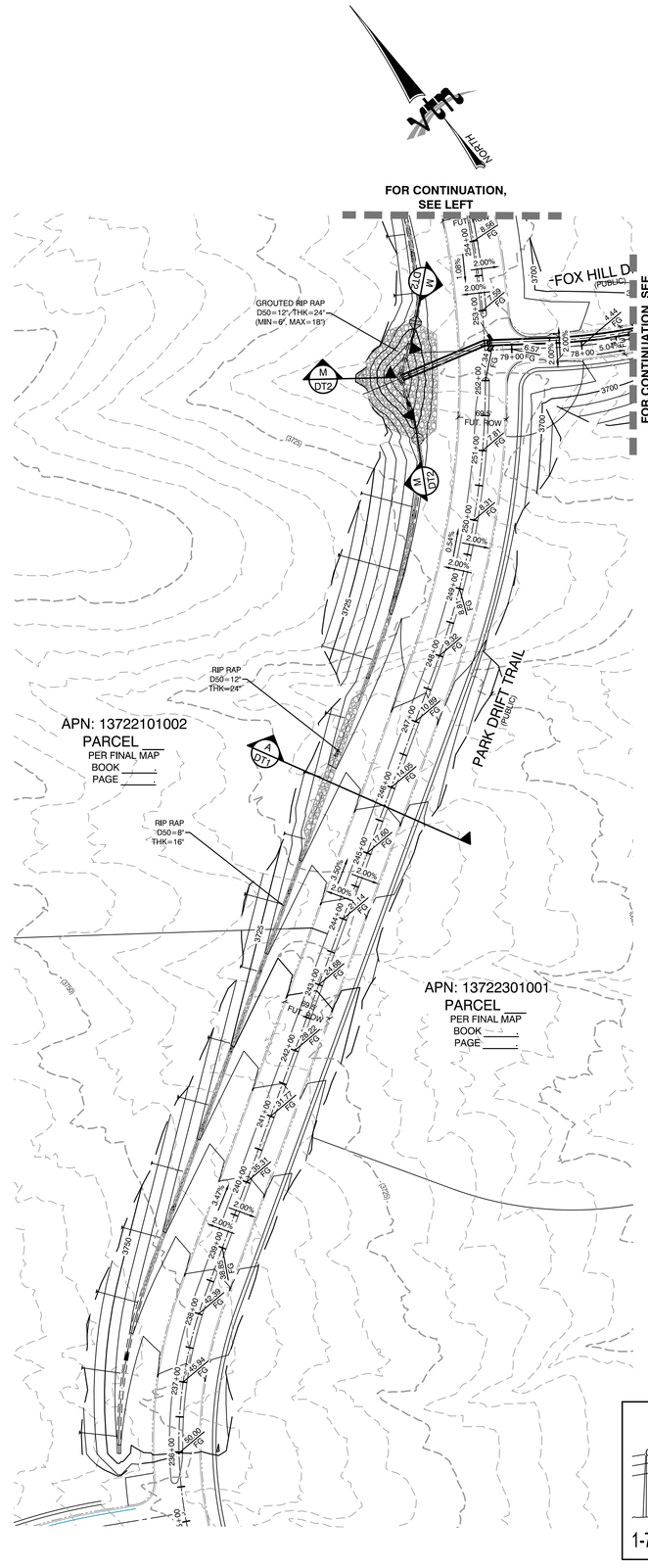

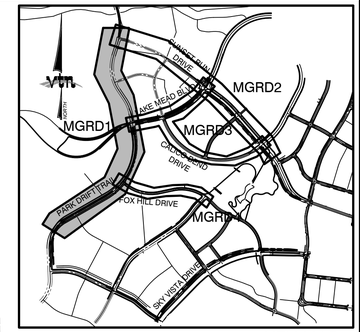

KEY MAP
N.T.S

GRAPHIC SCALE

100 0 50 100 200

1" = 100'

GRADING PERMIT NOTE

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GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: ----
PROJECT #----, DATED ----

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BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°10'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

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BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #----

BRIAN T. RUIZ , P.E. No. 15967 DATE

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REV	DATE	BY	REVISION

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A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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MASTER GRADING PLAN 1

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: KTC	AUG 2019	SCALE:	HORIZ 1" = 100'
DESIGNED BY: DMO	MAR 2019		VERT N/A
CHECKED BY: BR	08/20/2019	PROJECT NO: 7809	

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

2/18/2020

SHEET
MGRD1
8 OF **46** SHEETS

DRAWING NO.

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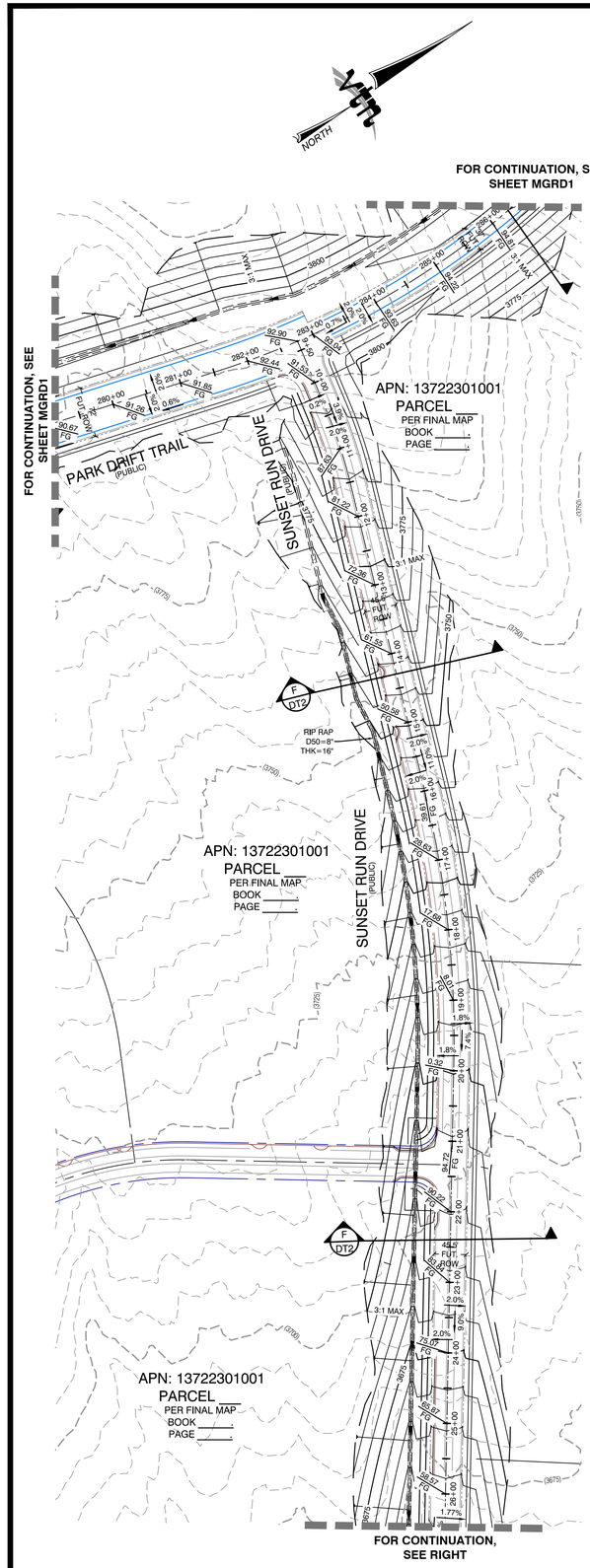

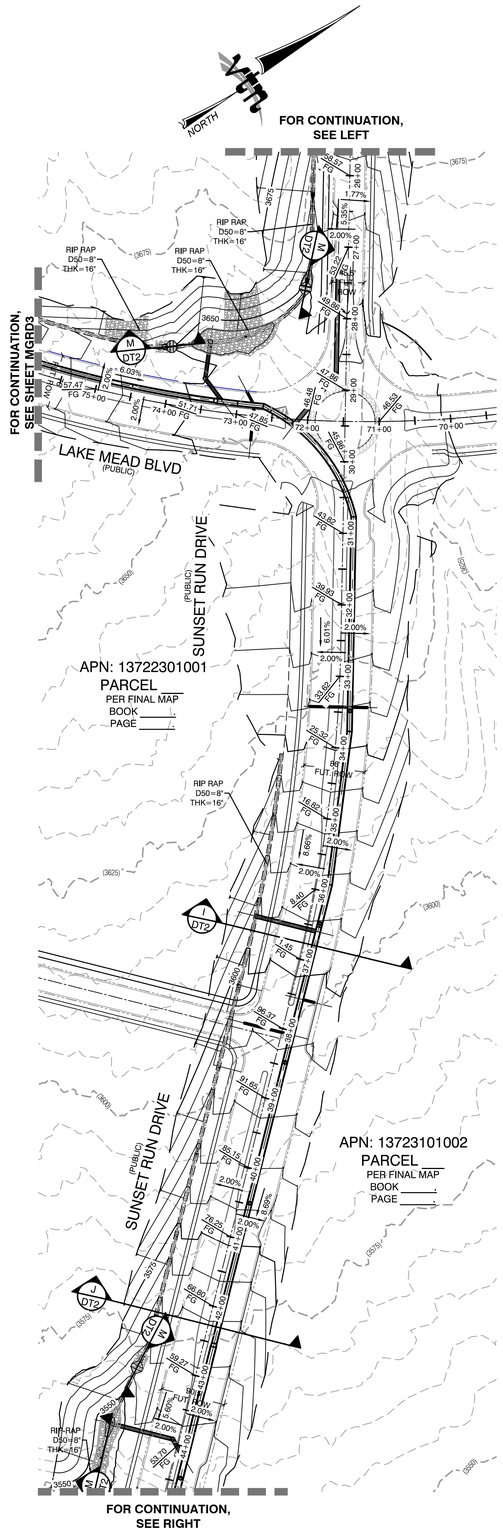

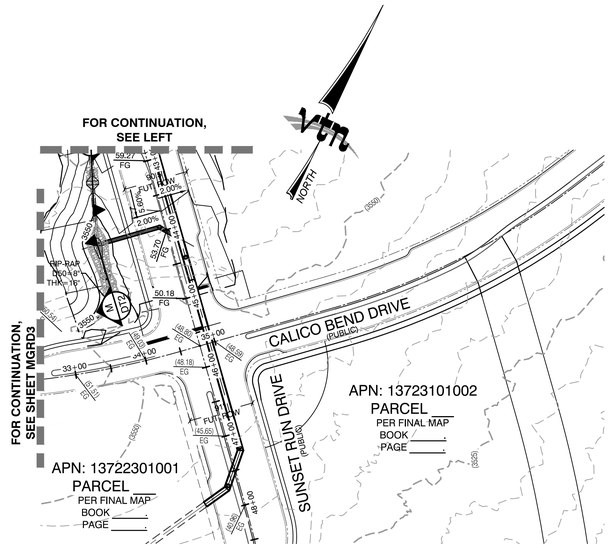

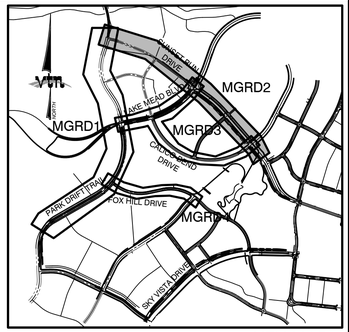

KEY MAP
N.T.S

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100 0 50 100 200
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PROJECT #-----, DATED ----

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
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T21S,R59E,S03

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BRIAN T. RUIZ , P.E. No. 15967 DATE

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REV	DATE	BY	REVISION

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10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

MASTER GRADING PLAN 2

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: KTC	AUG 2019	SCALE:	1"= 100'
DESIGNED BY: DMO	MAR 2019	HORIZ	
CHECKED BY: BR	08/20/2019	VERT:	N/A
PROJECT NO: 7809			

2/18/2020

SHEET
MGRD2
9 OF **46** SHEETS

DRAWING NO.

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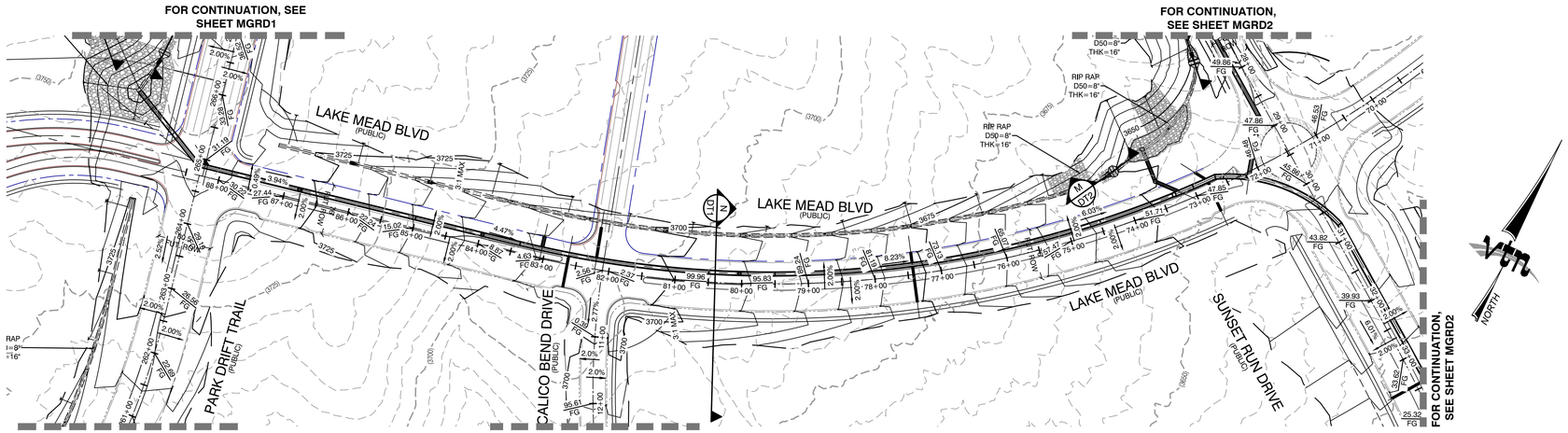
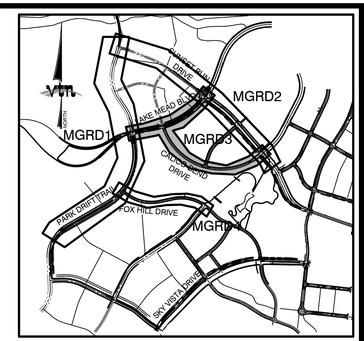
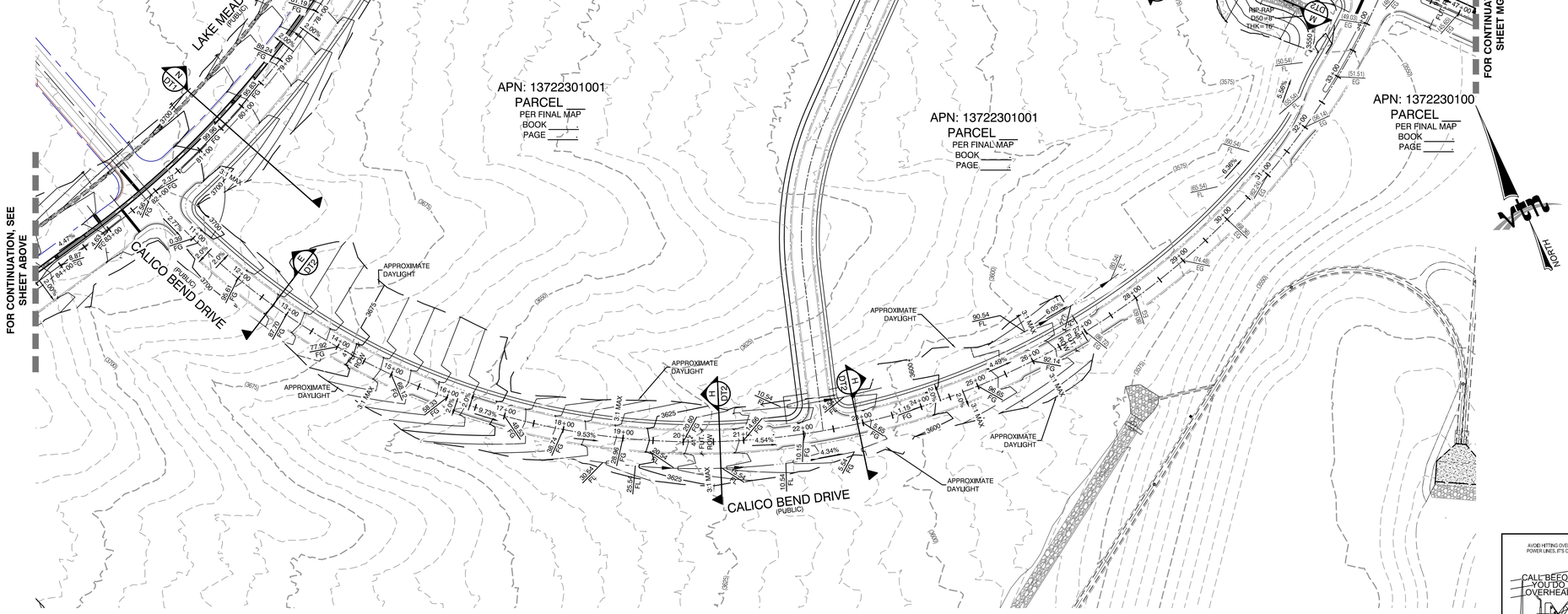




KEY MAP
N.T.S



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A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

MASTER GRADING PLAN 3

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:
KTC	DMO	BR	7809
AUG 2019	MAR 2019	08/02/2019	SCALE: 1"=100' HORIZ. N/A VERT.

BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
PROFESSIONAL ENGINEER - STATE OF NEVADA
2/18/2020

SHEET
MGRD3
10 OF **46** SHEETS

DRAWING NO.

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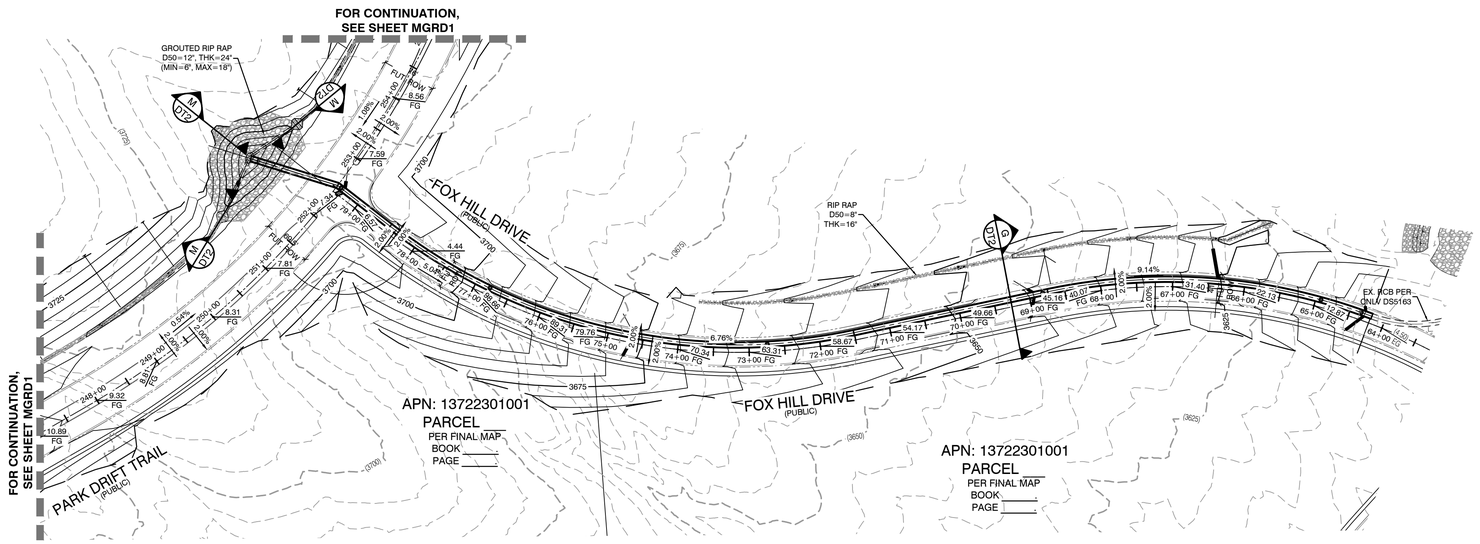

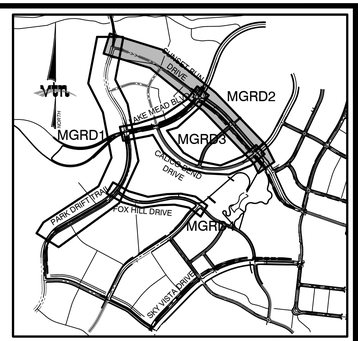

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LINEAR UNIT: US SURVEY FOOT (FTUS)

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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

MASTER GRADING PLAN 4

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: KTC	AUG 2019	SCALE:	1"= 100' HORIZ N/A VERT.
DESIGNED BY: DMO	MAR 2019		
CHECKED BY: BR	08/02/2019		
PROJECT NO: 7809			

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EXP: 12/31/21
CIVIL
No. 15967
STATE OF NEVADA
PROFESSIONAL ENGINEER

2/18/2020

SHEET
MGRD4
11 OF **46** SHEETS

DRAWING NO.

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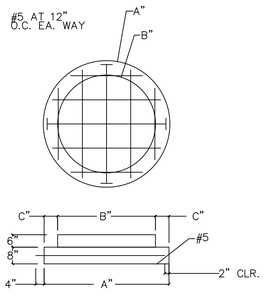

DIA	A	B	C
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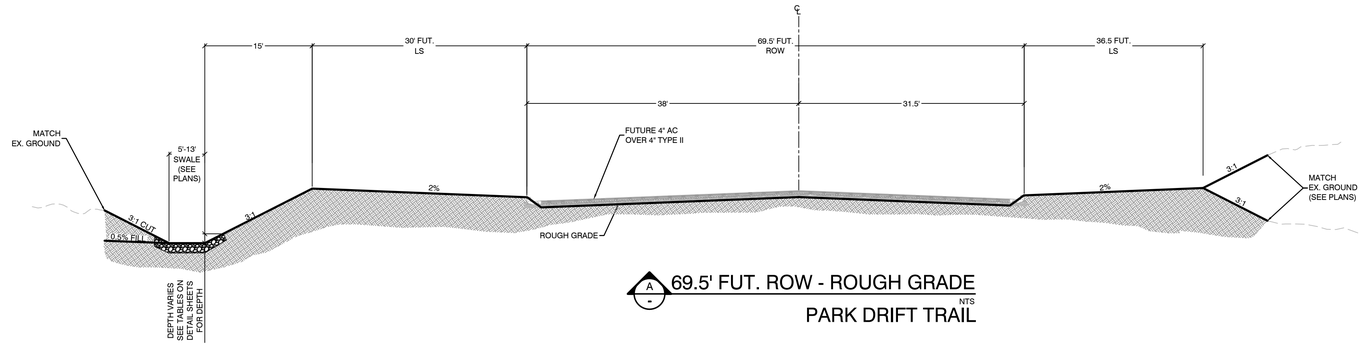
30	38	29	4.5
36	45	35	5.0
42	52	41	5.5
48	60	47	6.5
54	66	53	6.5

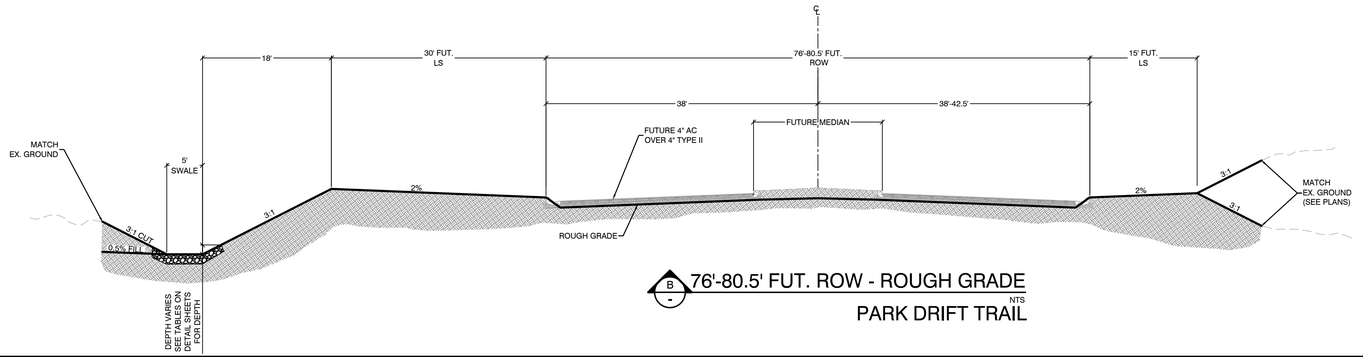
RCP CAP
NTS



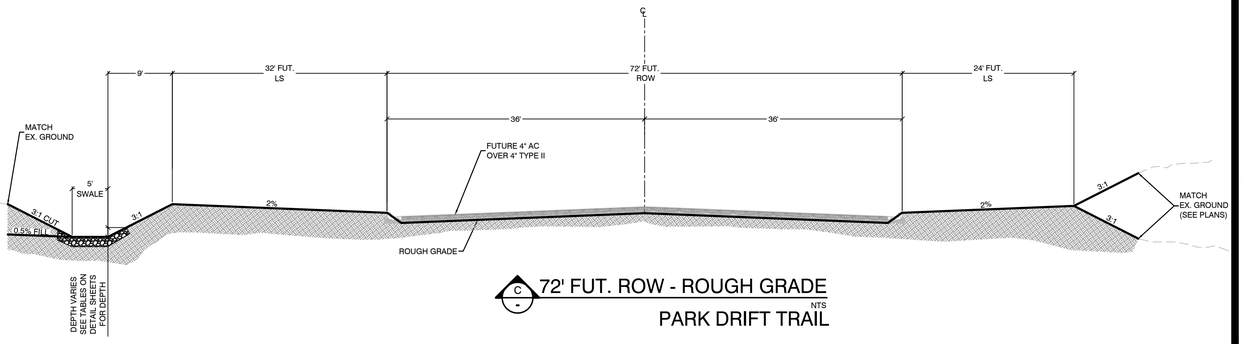
A 69.5' FUT. ROW - ROUGH GRADE
NTS
PARK DRIFT TRAIL

PARK DRIFT TRAIL RIP RAP TABLE

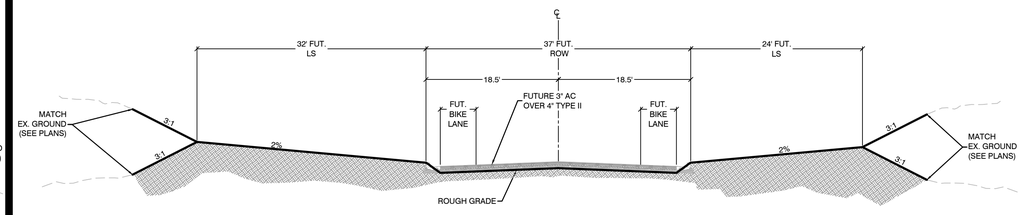
STATION RANGE	RIP RAP D50 (INCHES)	RIP RAP THICKNESS (INCHES)	DEPTH (FT)
236+00 to 238+00	UNLINED	UNLINED	1.5
238+00 to 245+00	8	16	2.5
245+00 to 247+00	12	24	3.5
247+00 to 251+00	8	16	6.0
253+00 to 259+00	8	16	5.0
259+00 to 263+00	8	16	2.0
263+00 to 264+00	UNLINED	UNLINED	2.5
266+00 to 272+00	8	16	2.5
272+00 to 277+00	8	16	2.5
277+00 to 288+00	UNLINED	UNLINED	2.5



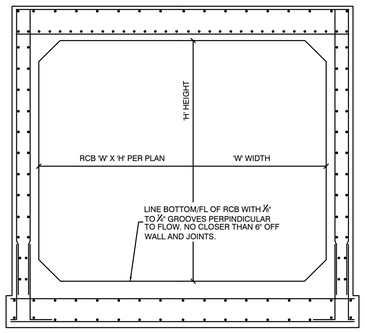
B 76'-80.5' FUT. ROW - ROUGH GRADE
NTS
PARK DRIFT TRAIL



C 72' FUT. ROW - ROUGH GRADE
NTS
PARK DRIFT TRAIL

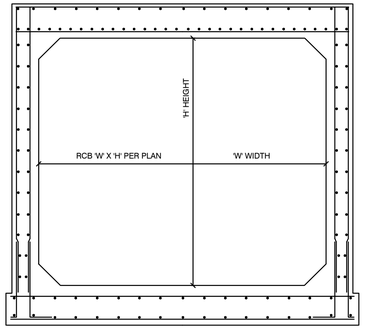


D 37' FUT. ROW - ROUGH GRADE
NTS
PARK DRIFT TRAIL



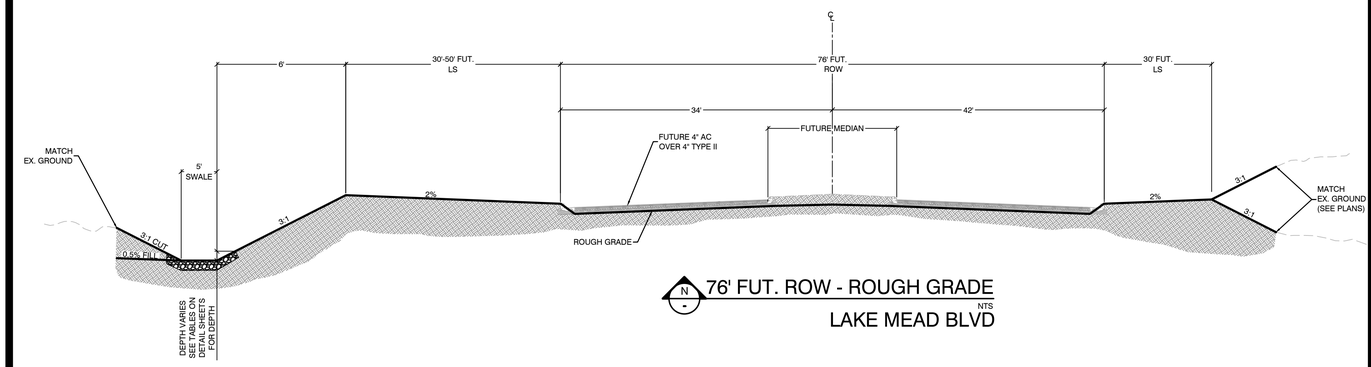
(ALL REINFORCEMENT JOINTS TO BE BY MANUFACTURER)

K **RCB ADDITIONAL BASE CONCRETE - 5" CLR**
N.T.S. (NOT INTENDED FOR CONSTRUCTION PURPOSES)



(ALL REINFORCEMENT JOINTS TO BE BY MANUFACTURER)

L **RCB ADDITIONAL BASE CONCRETE - 3" CLR**
N.T.S. (NOT INTENDED FOR CONSTRUCTION PURPOSES)



N 76' FUT. ROW - ROUGH GRADE
NTS
LAKE MEAD BLVD

REV | DATE | BY | REVISION

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LAS VEGAS, NEVADA 89135
702-791-4000

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LAS VEGAS, NEVADA 89146-5148
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DETAIL SHEET 1

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — JAN 2019
DESIGNED BY: DMO — JAN 2019
CHECKED BY: BR — 08/20/2019
PROJECT NO: 7809
SCALE: HORIZ N/A, VERT N/A

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
2/18/2020

SHEET
DT1
12 OF **46** SHEETS

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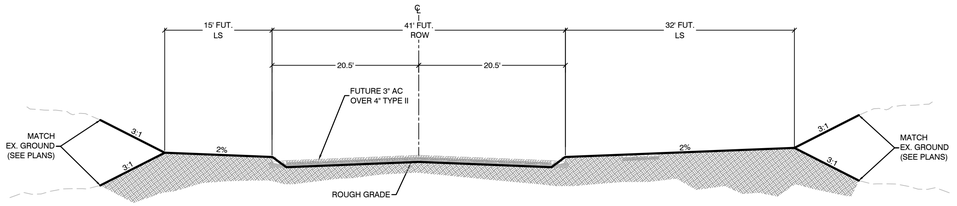
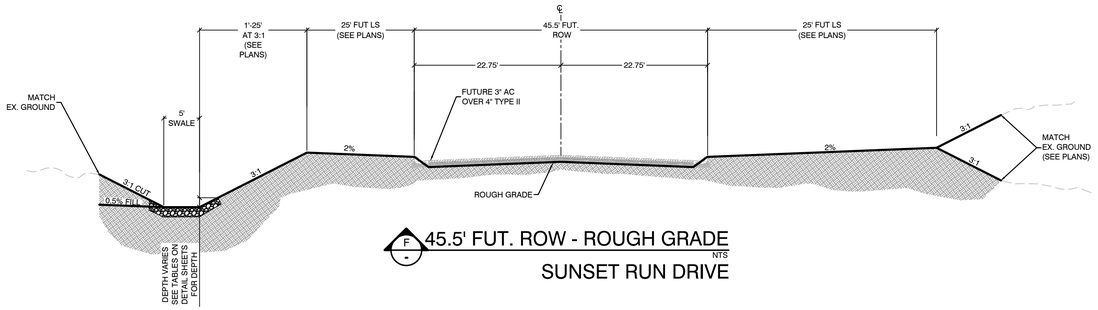


E
NTS

41' FUT. ROW - ROUGH GRADE
CALICO BEND DRIVE



F
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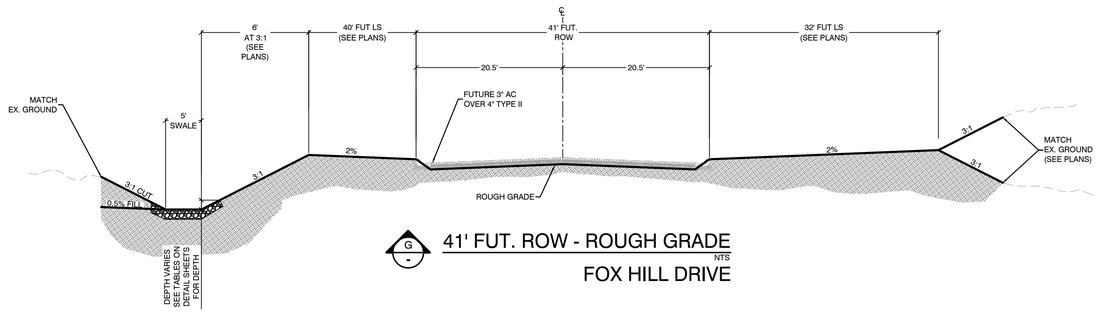
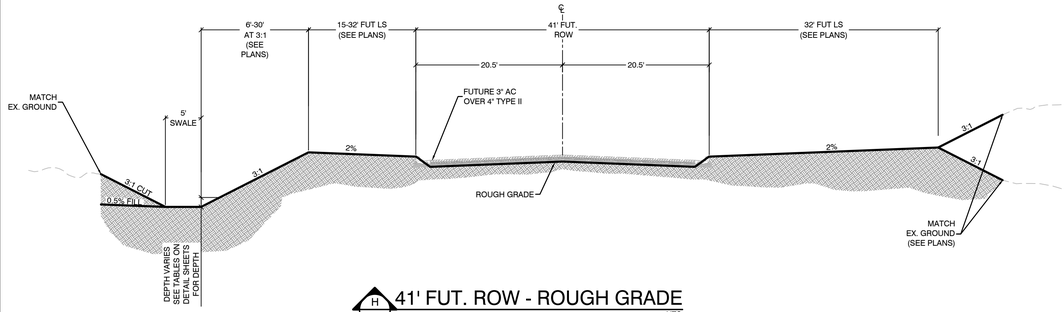
45.5' FUT. ROW - ROUGH GRADE
SUNSET RUN DRIVE



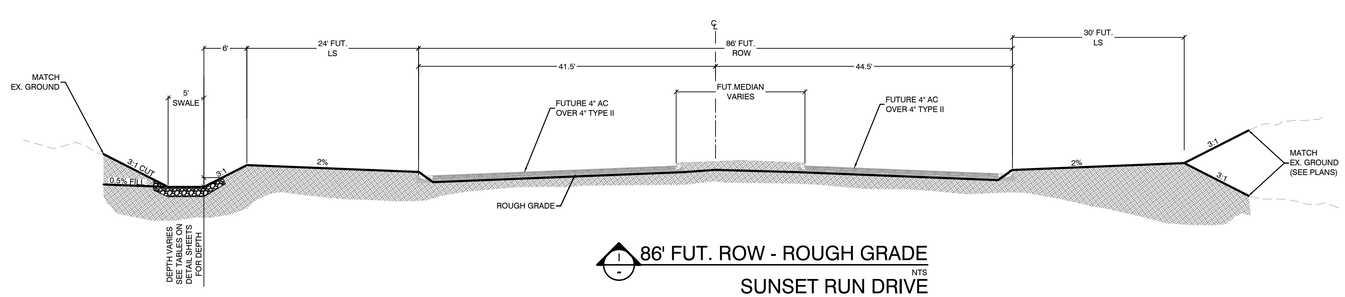
G
NTS

41' FUT. ROW - ROUGH GRADE
FOX HILL DRIVE



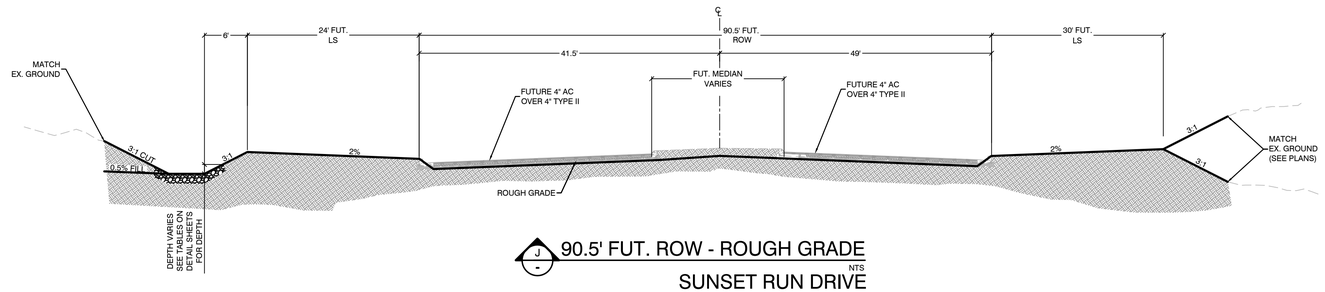
H
NTS

41' FUT. ROW - ROUGH GRADE
CALICO BEND DRIVE



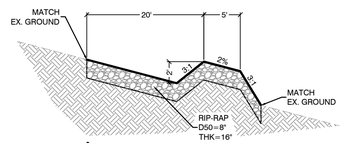
I
NTS

86' FUT. ROW - ROUGH GRADE
SUNSET RUN DRIVE



J
NTS

90.5' FUT. ROW - ROUGH GRADE
SUNSET RUN DRIVE



M
N.T.S.

SEDIMENT BERM

SUNSET RUN DRIVE RIP RAP TABLE

STATION RANGE	RIP RAP D50 (INCHES)	RIP RAP THICKNESS (INCHES)	DEPTH (FT)
11+00 to 13+00	UNLINED	UNLINED	1.5
13+00 to 28+00	8	16	2.0
31+00 to 34+00	UNLINED	UNLINED	1.5
34+00 to 44+00	8	16	2.0

FOX HILL RIP RAP TABLE

STATION RANGE	RIP RAP D50 (INCHES)	RIP RAP THICKNESS (INCHES)	DEPTH (FT)
66+50 to 67+50	UNLINED	UNLINED	2.0
67+50 to 73+00	8	16	2.0
73+00 to 74+00	UNLINED	UNLINED	1.5

LAKE MEAD RIP RAP TABLE

STATION RANGE	RIP RAP D50 (INCHES)	RIP RAP THICKNESS (INCHES)	DEPTH (FT)
73+00 to 84+00	8	16	2.0
84+00 to 87+00	UNLINED	UNLINED	1.5

REV	DATE	BY	REVISION

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DETAIL SHEET 2

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — APR 2019
DESIGNED BY: DMO — APR 2019
CHECKED BY: BR — 08/02/2019
PROJECT NO: 7809
SCALE: HORIZ. N/A, VERT. N/A

PROFESSIONAL ENGINEER — STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
2/18/2020

SHEET
DT2
13 OF 46 SHEETS

DRAWING NO.

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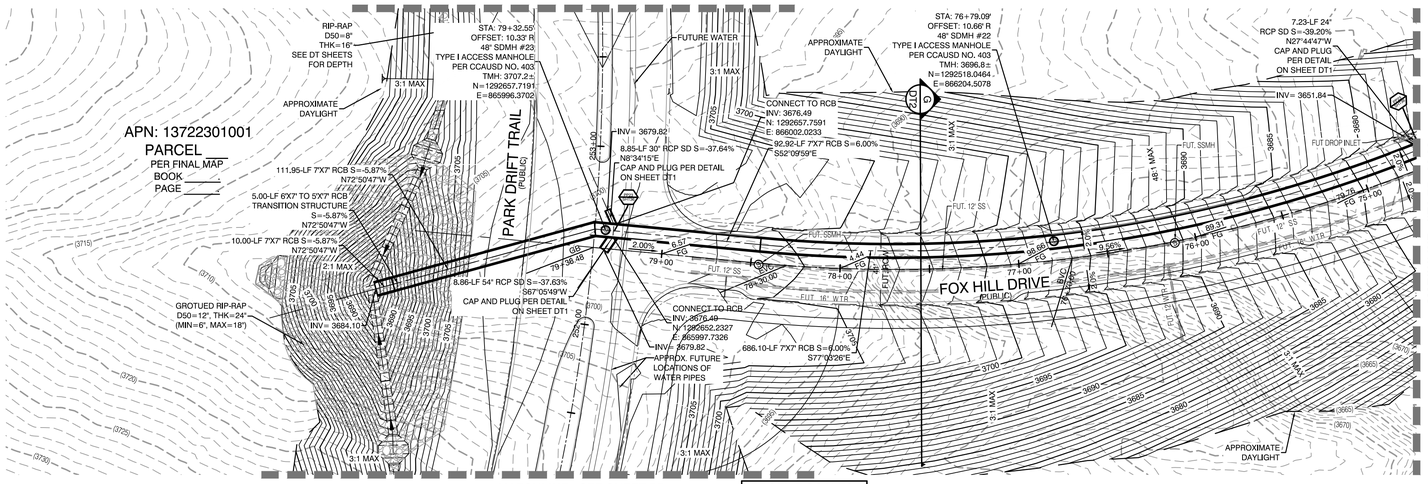
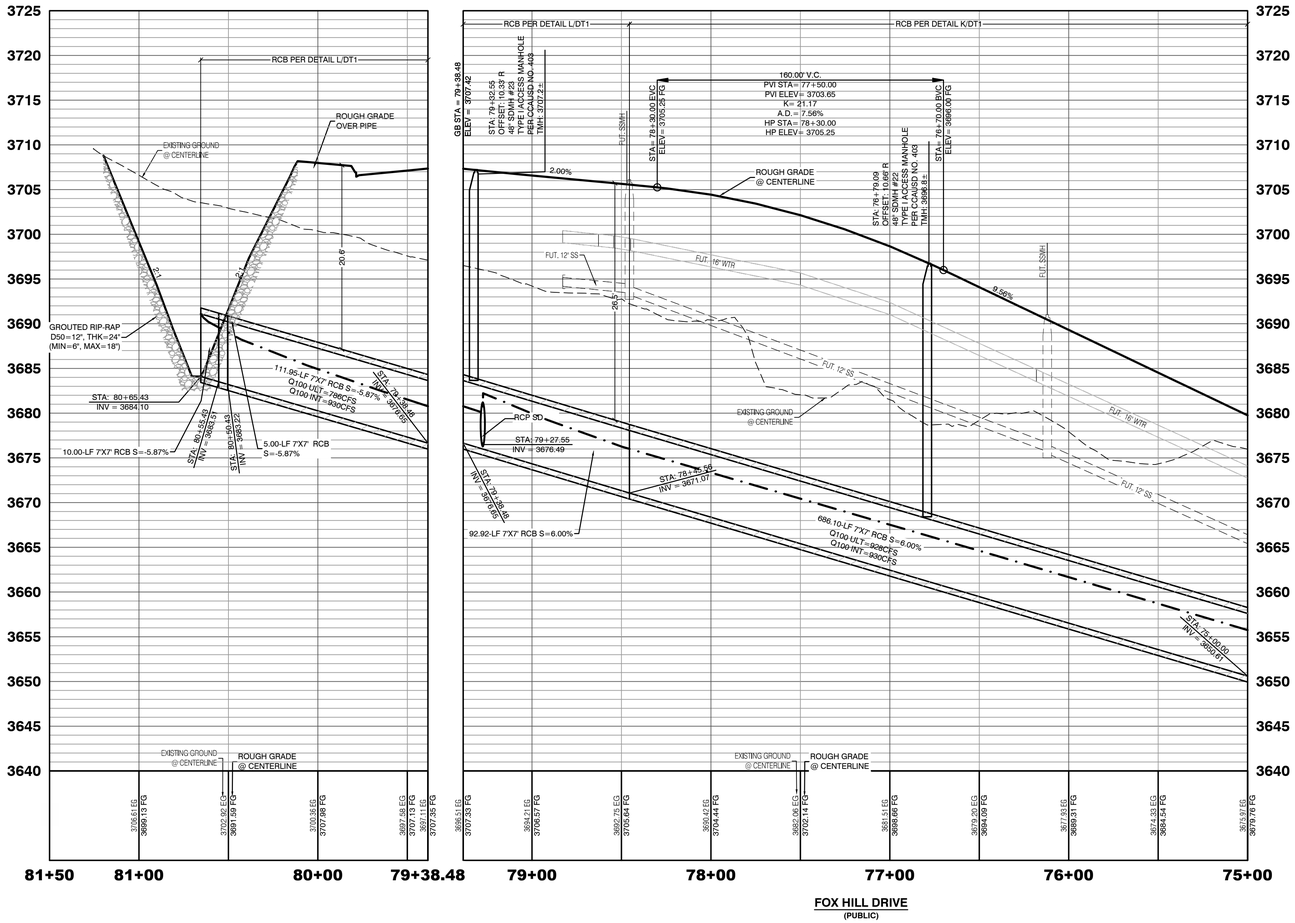
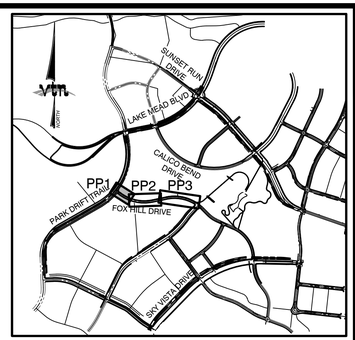


PROFILE SCALES:

HORIZ. = 1" =40'
VERT. = 1" = 8'





KEY MAP
N.T.S

NORTH

GRAPHIC SCALE

40 0 20 40 80

1" = 40'

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:

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

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REV	DATE	BY	REVISION

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702-791-4000

CITY OF LAS VEGAS

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STREET PROFILE 1
FOX HILL DRIVE
81+50.00 TO 75+00.00

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC	MAR 2019	SCALE:	HORIZ: 1" = 40' VERT: 1" = 8'
DESIGNED BY: DMO	MAR 2019		
CHECKED BY: BR	08/02/2019		
PROJECT NO: 7809			

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

2/18/2020

SHEET
PP1
14 OF **46** SHEETS

DRAWING NO.

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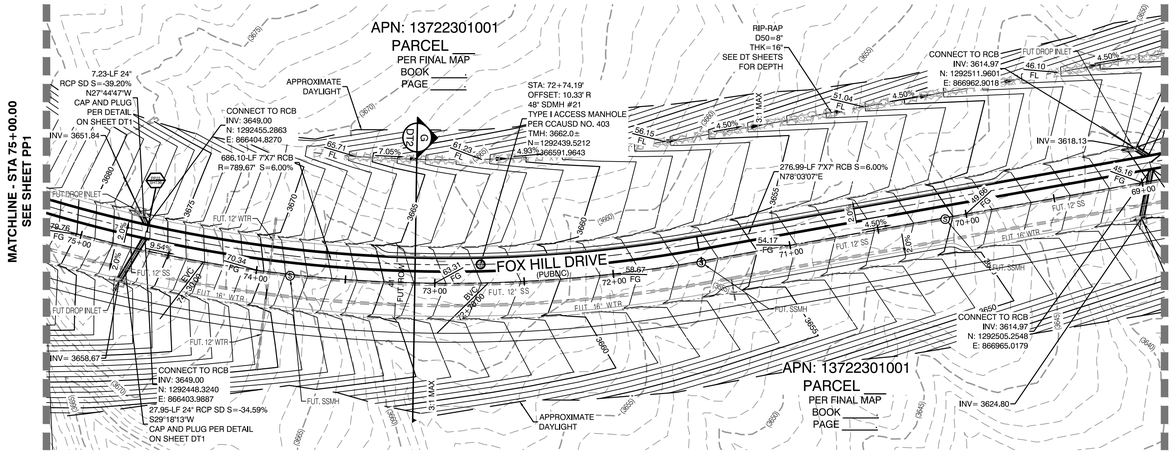
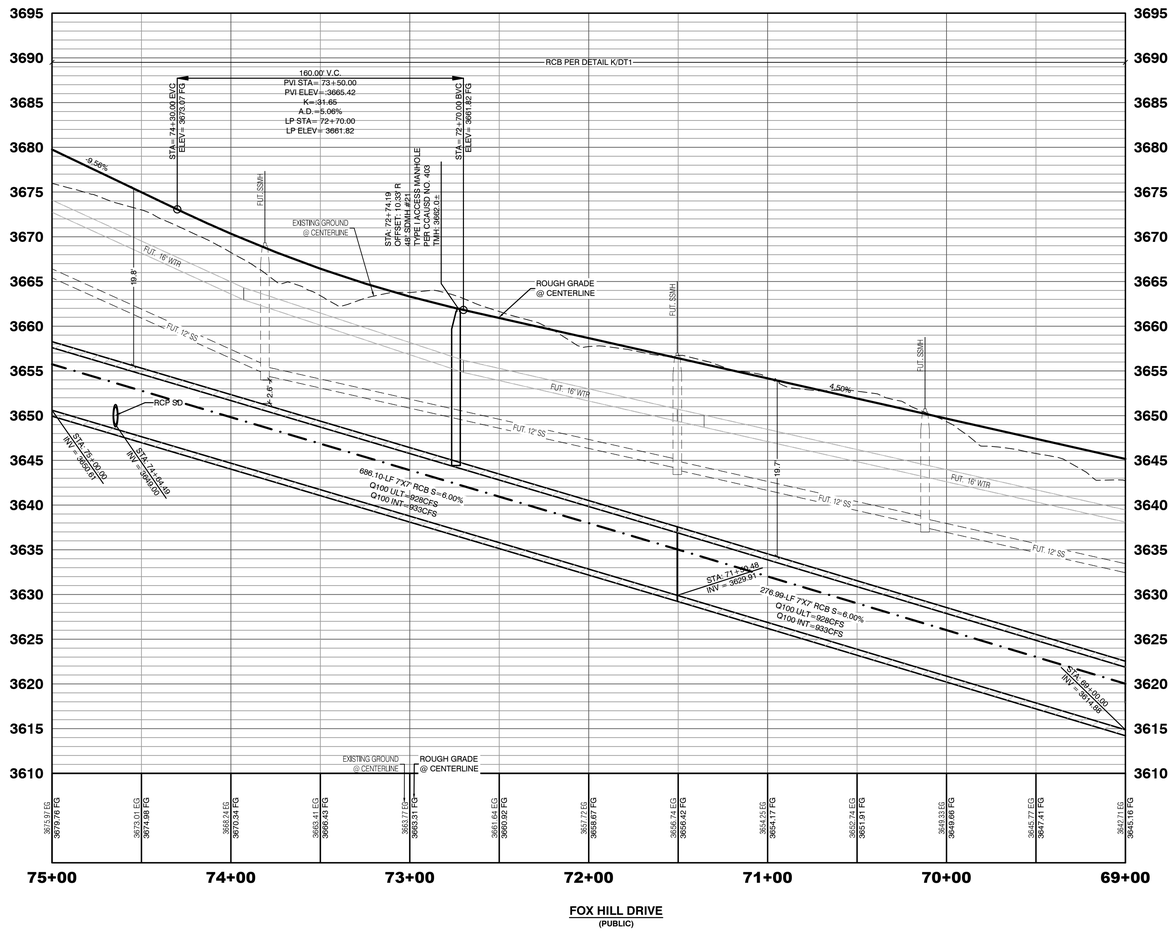
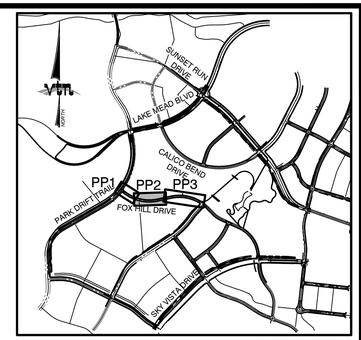


PROFILE SCALES:

HORIZ. = 1" = 40'
VERT. = 1" = 8'



FOX HILL DRIVE
(PUBLIC)



KEY MAP
N.T.S

GRAPHIC SCALE

40 0 20 40 80

1" = 40'

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
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LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
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SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
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PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
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FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

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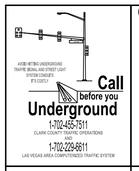

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CITY OF LAS VEGAS

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REV	DATE	BY	REVISION

STREET PROFILE 2
FOX HILL DRIVE
75+00.00 TO 69+00.00
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — MAR 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
PROJECT NO: 7809
SCALE: HORIZ 1" = 40' VERT. 1" = 8'

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

2/18/2020

SHEET
PP2
15 OF **46** SHEETS

DRAWING NO.

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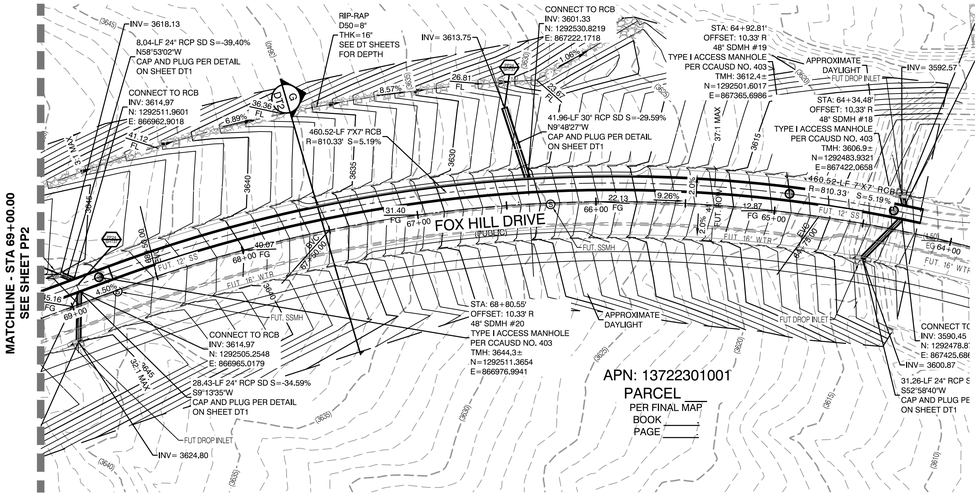
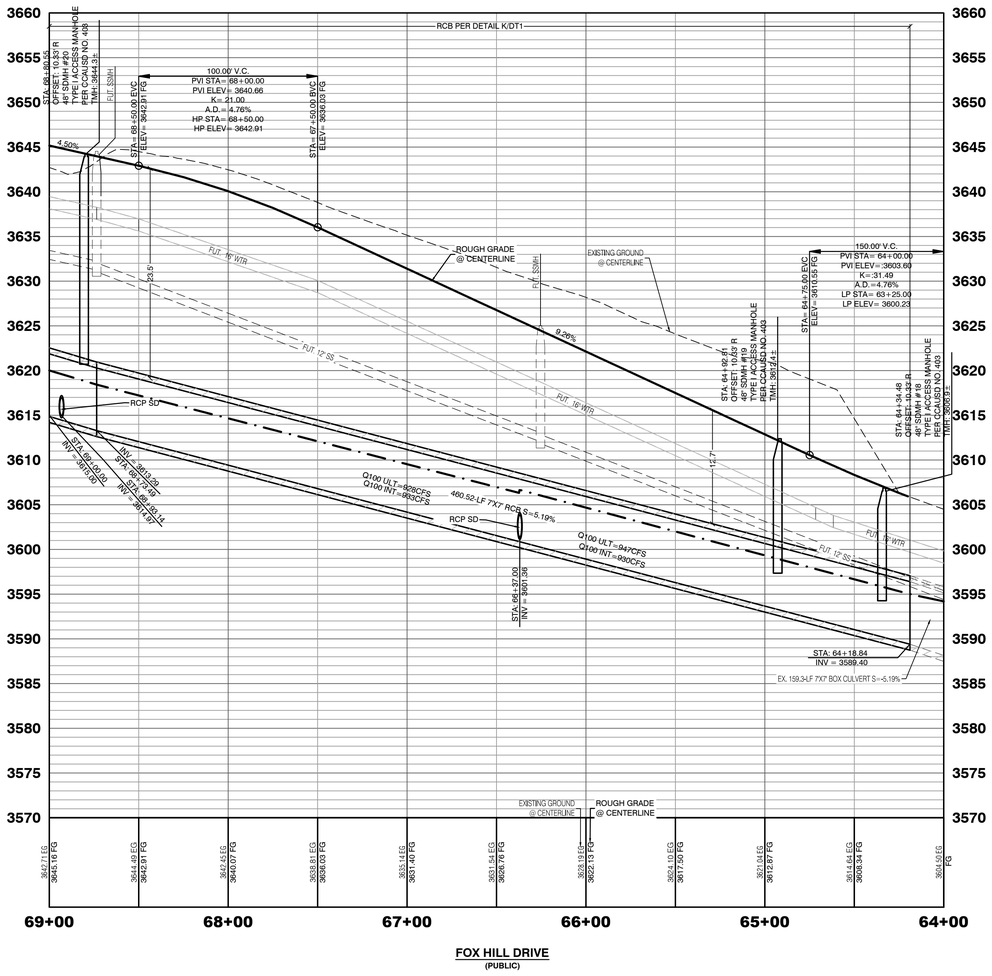
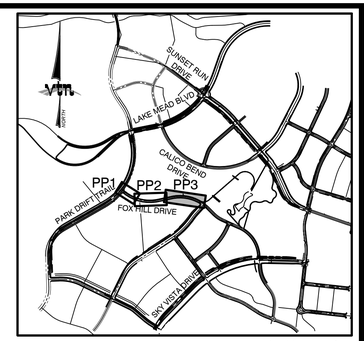


PROFILE SCALES:

HORIZ. = 1" = 40'
VERT. = 1" = 8'





KEY MAP
N.T.S

GRAPHIC SCALE

40 0 20 40 80

1" = 40'

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:

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

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LAS VEGAS, NEVADA 89135
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CITY OF LAS VEGAS

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STREET PROFILE 3
FOX HILL DRIVE
69+00.00 TO 64+00.00

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — MAR 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
SCALE: HORIZ. 1" = 40' VERT. 1" = 8'
PROJECT NO: 7809

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
No. 15967
EXP: 12/31/21
CIVIL
2/18/2020

SHEET
PP3
16 OF 46 SHEETS

DRAWING NO.

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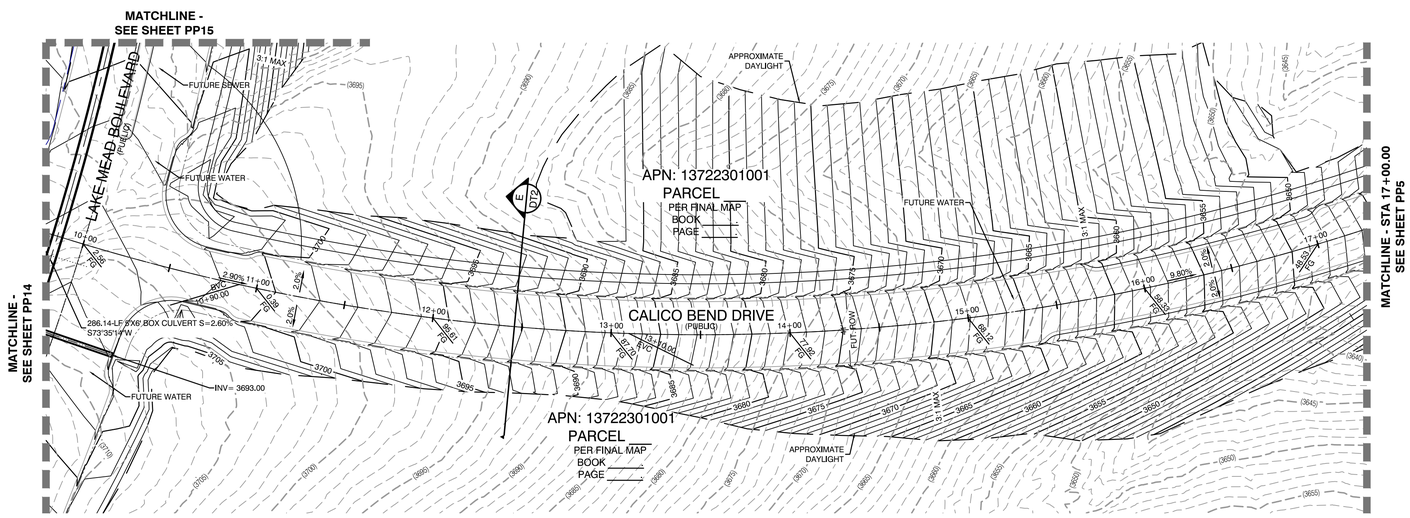
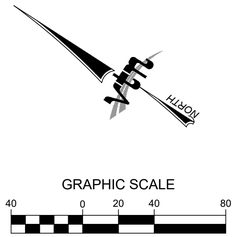
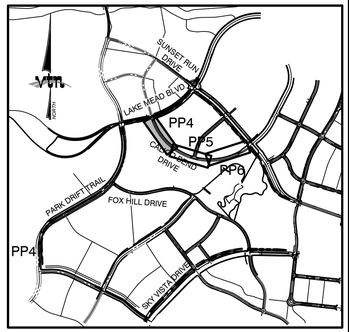




GRAPHIC SCALE

40 0 20 40 80

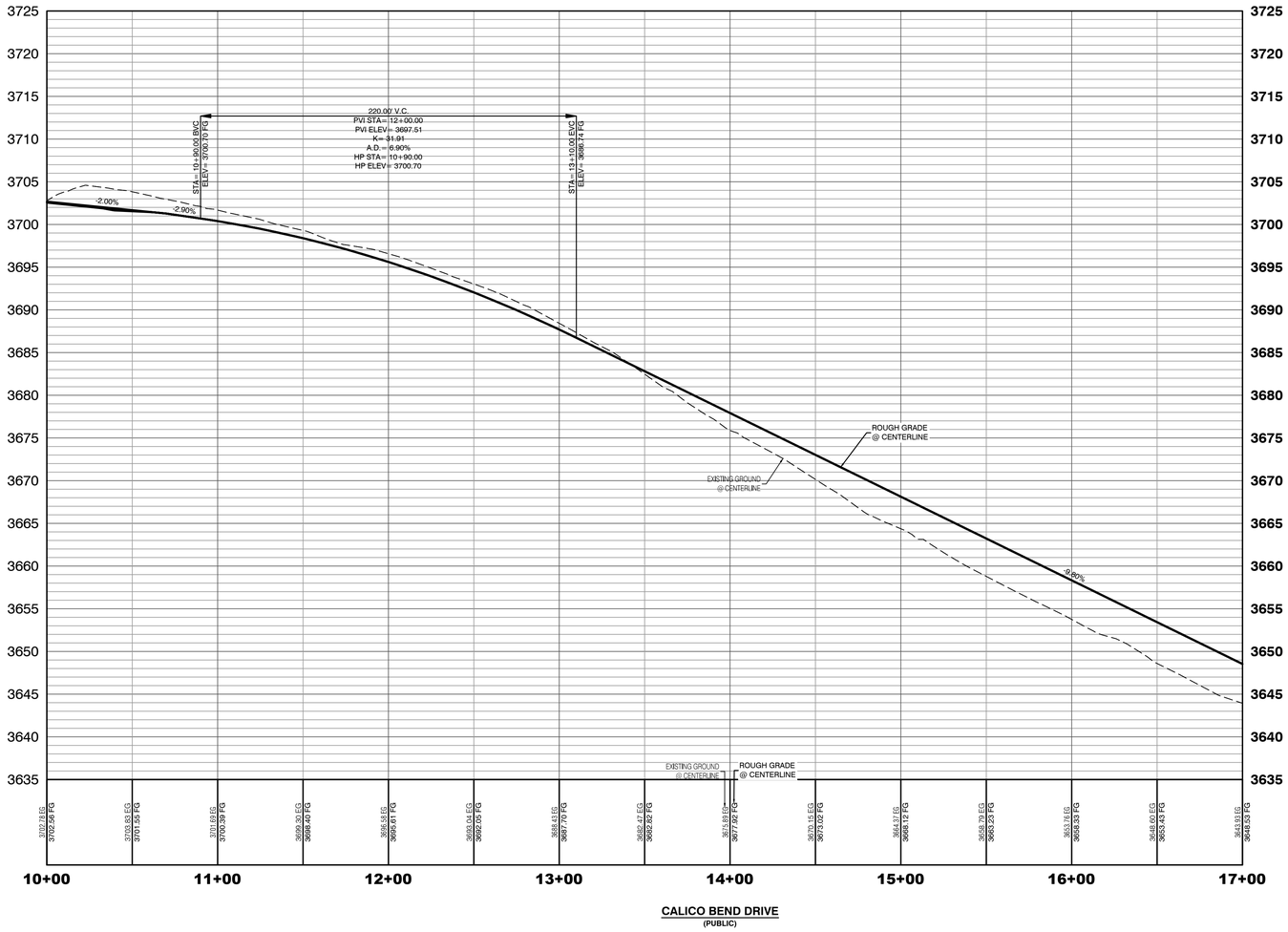
1" = 40'



KEY MAP
N.T.S

PROFILE SCALES:

HORIZ. = 1" = 40'
VERT. = 1" = 8'



CALICO BEND DRIVE
(PUBLIC)

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
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SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

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BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

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T21S,R59E,S03

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CITY OF LAS VEGAS

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REV	DATE	BY	REVISION

STREET PROFILE 4
CALICO BEND DRIVE
10+00.00 TO 17+00.00

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — MAR 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/20/2019
PROJECT NO: 7809
SCALE: HORIZ 1" = 40' VERT 1" = 8'

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

2/18/2020

SHEET
PP4
17 OF **46** SHEETS

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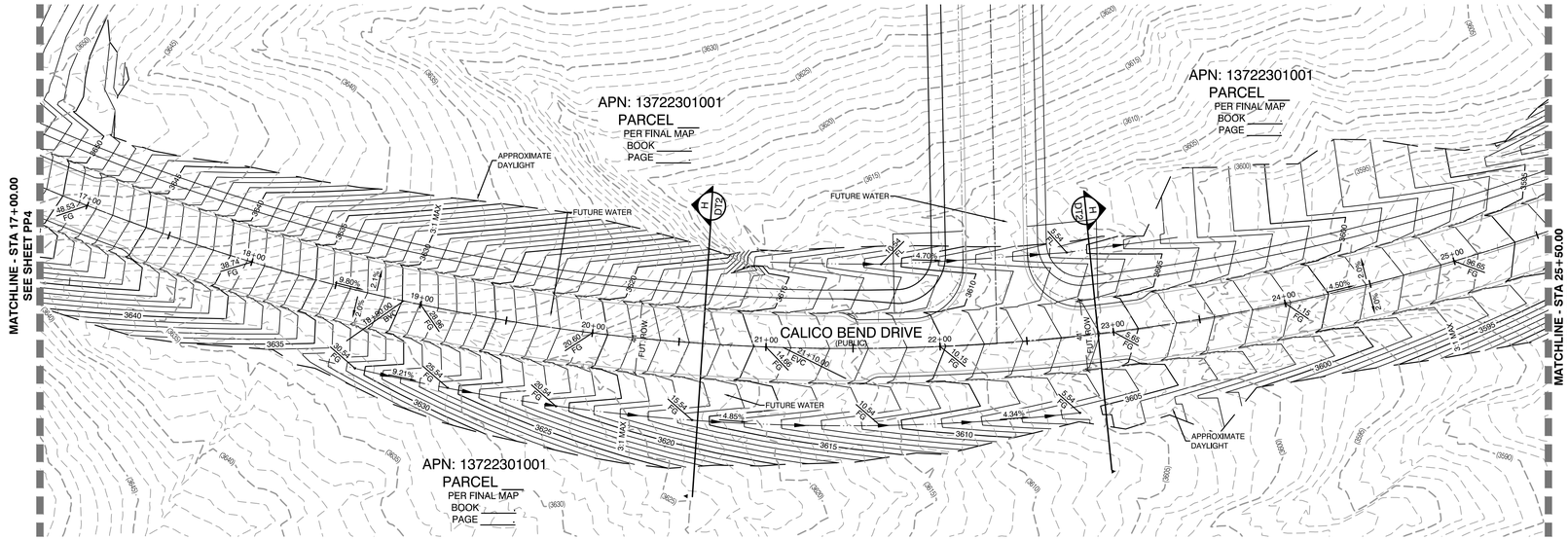
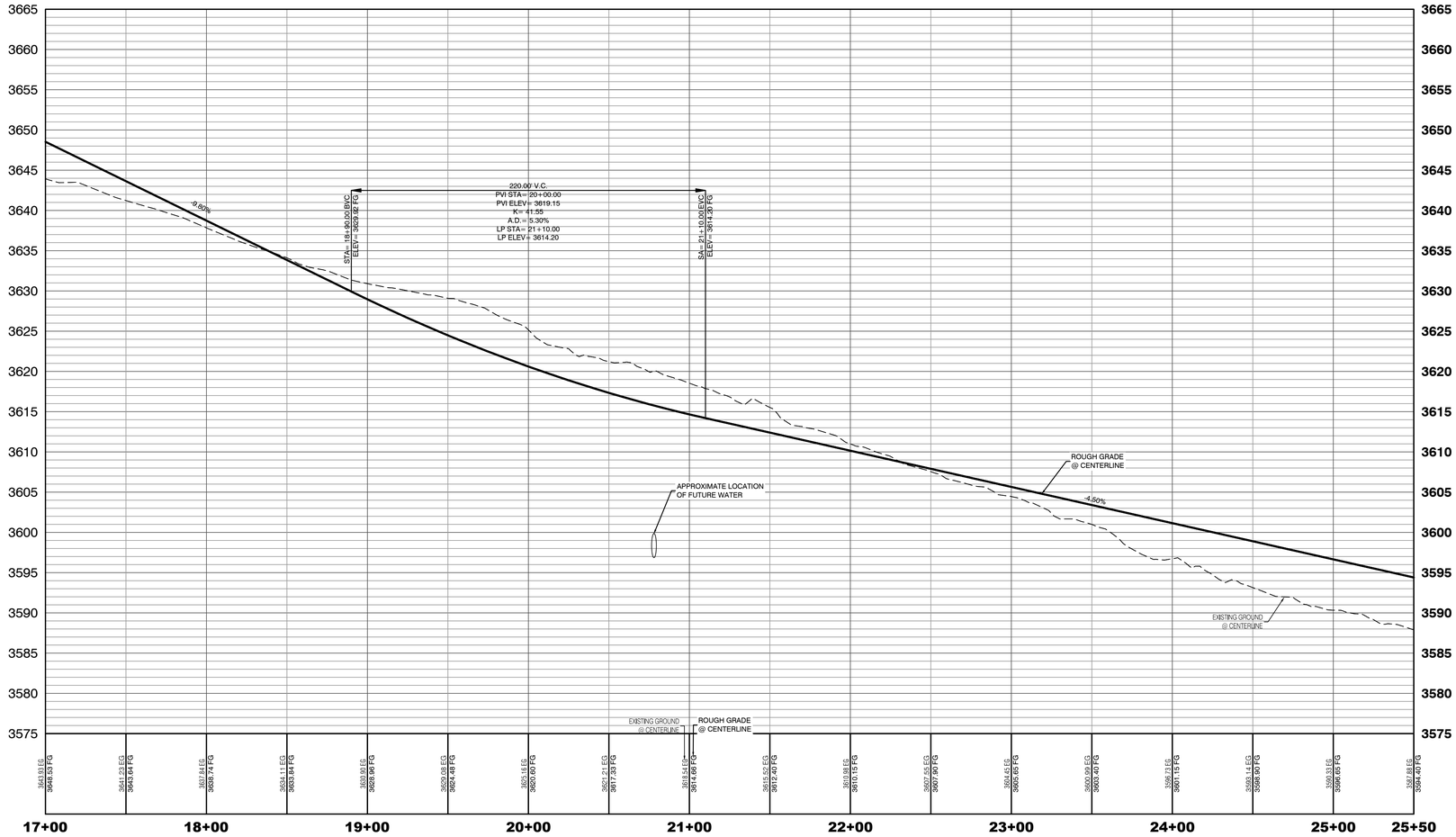
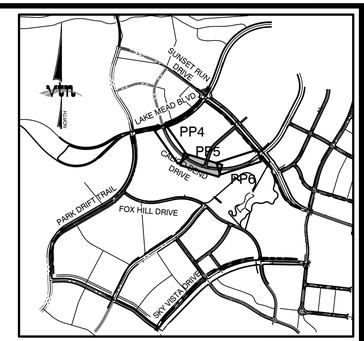


PROFILE SCALES:

HORIZ. = 1" = 40'
VERT. = 1" = 8'





KEY MAP
N.T.S

NORTH

GRAPHIC SCALE

40 0 20 40 80

1" = 40'

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
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PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008) NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN. T21S,R59E,S03

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REV	DATE	BY	REVISION

STREET PROFILE 5
CALICO BEND DRIVE
17+00.00 TO 25+50.00
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — MAR 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
SCALE: 1" = 40' HORIZ. / 1" = 8' VERT.
PROJECT NO: 7809

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15961

2/18/2020

SHEET
PP5
18 OF **46** SHEETS

DRAWING NO.

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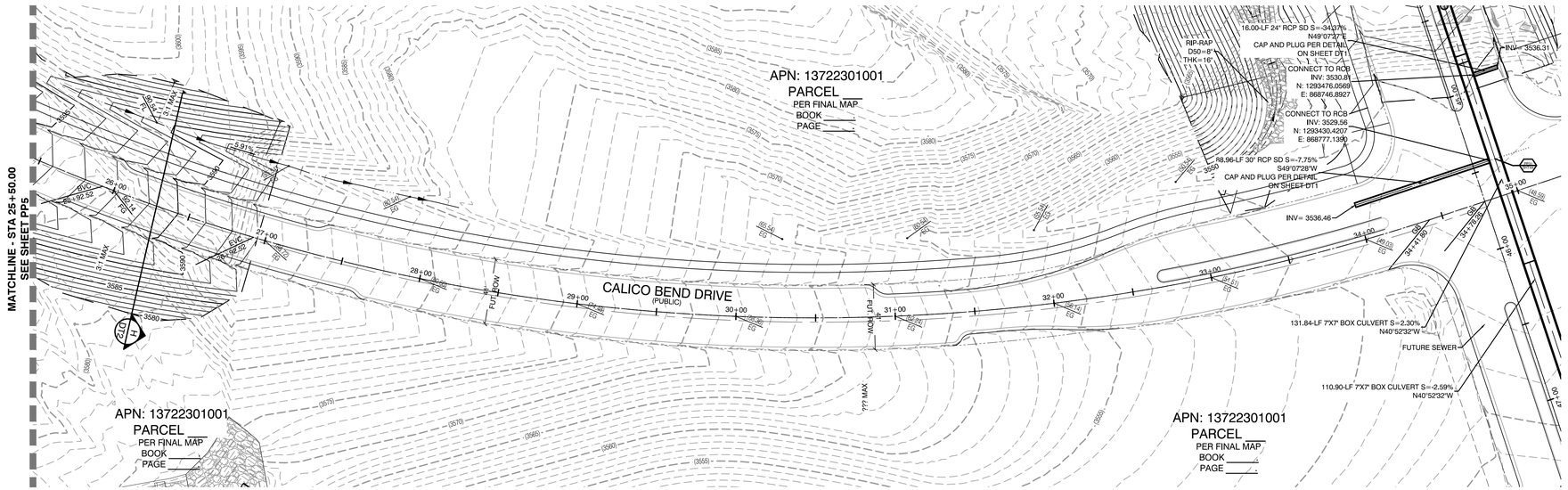
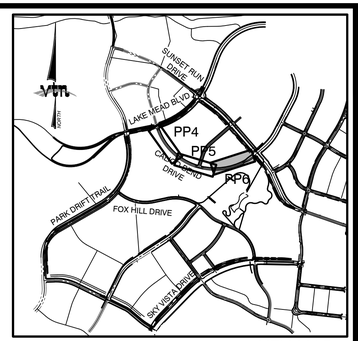


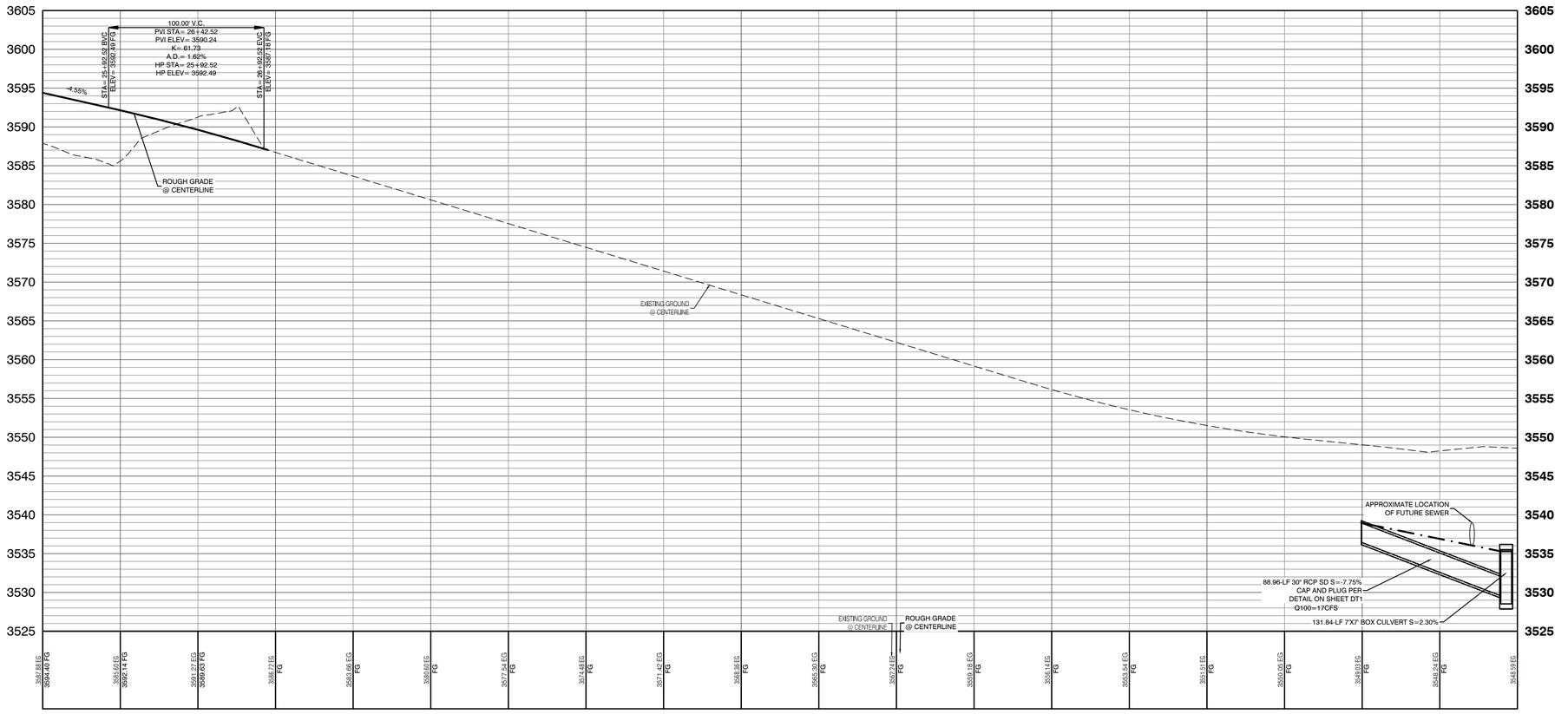


KEY MAP
N.T.S

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

NORTH

PROFILE SCALES:
HORIZ. = 1" = 40'
VERT. = 1" = 8'



CALICO BEND DRIVE
(PUBLIC)

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
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BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

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CITY OF LAS VEGAS

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STREET PROFILE 6
CALICO BEND DRIVE
25+50.00 TO 35+00.00

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — MAR 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
PROJECT NO: 7809
SCALE: HORIZ 1" = 40' VERT. 1" = 8'

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
2/18/2020

SHEET
PP6
19 OF **46** SHEETS

DRAWING NO.

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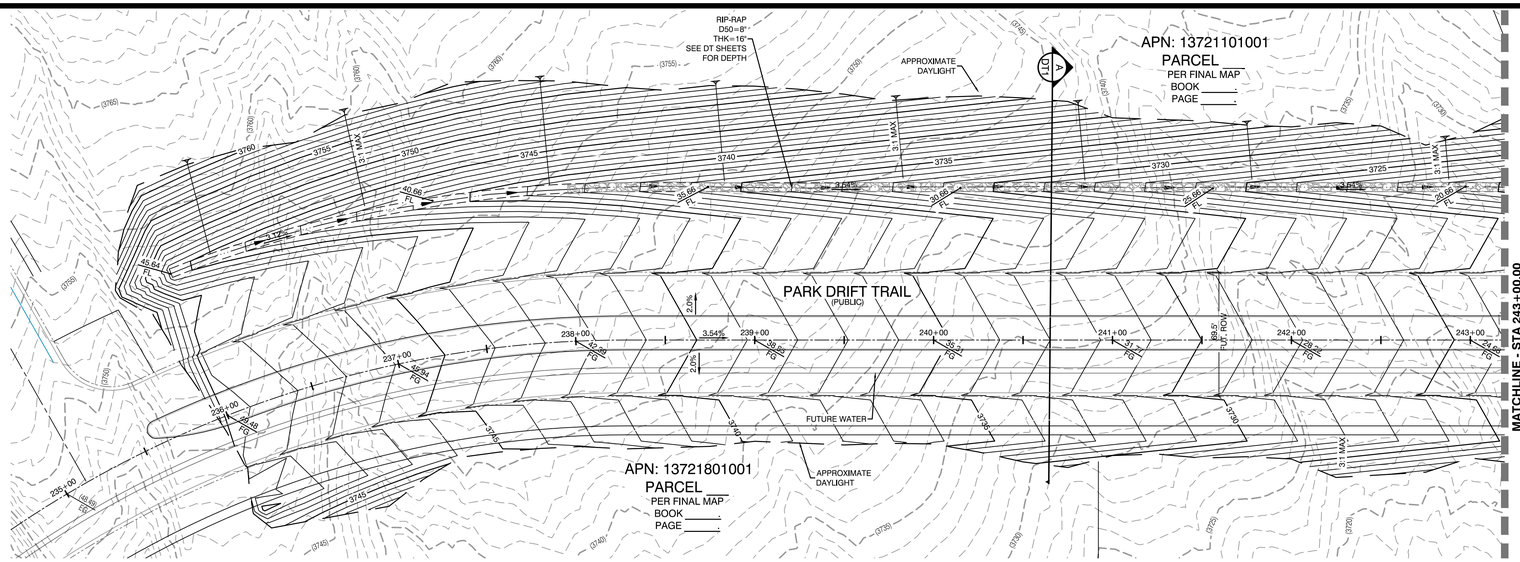
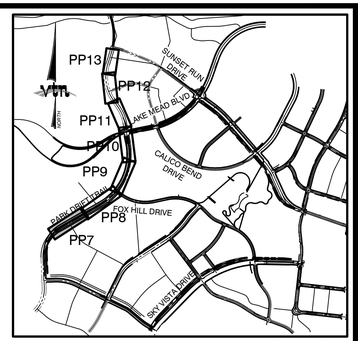


GRAPHIC SCALE

40 0 20 40 80

1" = 40'



KEY MAP
N.T.S

PROFILE SCALES:

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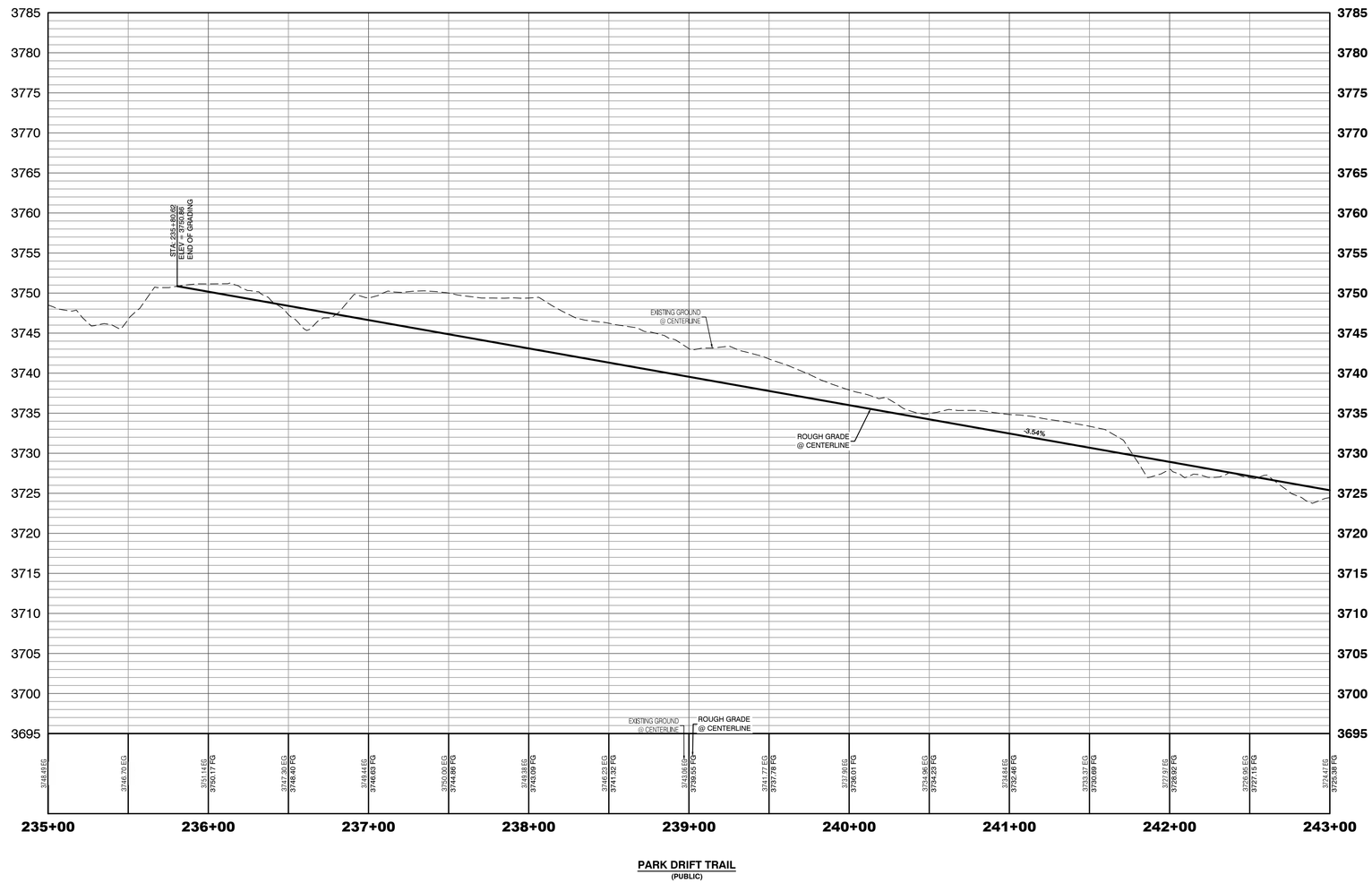
VERT. = 1" = 8'



PARK DRIFT TRAIL
(PUBLIC)

BASIS OF BEARING

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

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AND
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OR
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AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
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A DELAWARE LIMITED LIABILITY COMPANY
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LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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REV	DATE	BY	REVISION

STREET PROFILE 7
PARK DRIFT TRAIL
235+00.00 TO 243+00.00
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — MAR 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
SCALE: 1" = 40' HORIZ. 1" = 8' VERT.
PROJECT NO: 7809

PROFESSIONAL ENGINEER — STATE OF NEVADA — BRIAN TROY RUIZ — No. 15967 — EXP: 12/31/21 — CIVIL

2/18/2020

SHEET
PP7
20 OF **46** SHEETS

DRAWING NO.

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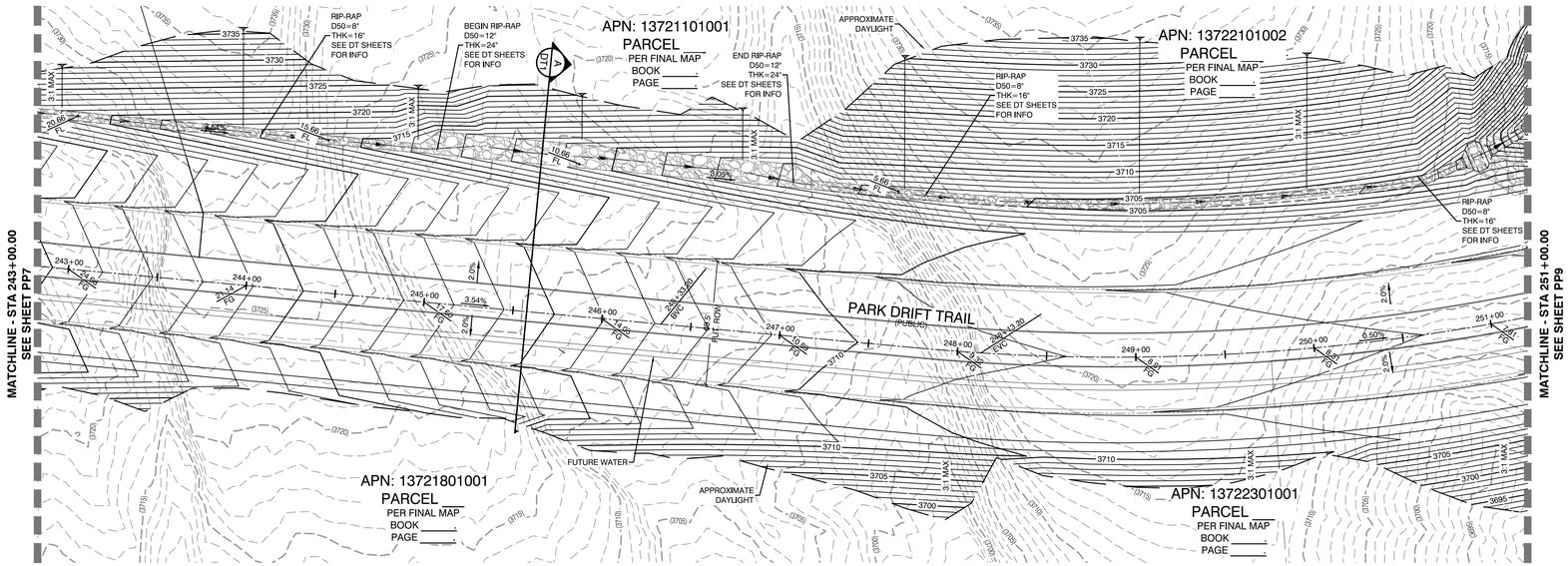

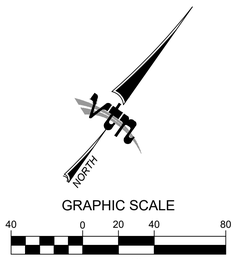

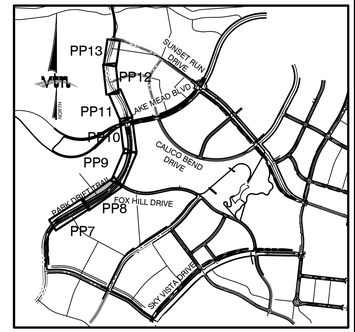

PROFILE SCALES:
HORIZ. = 1" = 40'
VERT. = 1" = 8'

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
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2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

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REV	DATE	BY	REVISION

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LAS VEGAS, NEVADA 89135
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CITY OF LAS VEGAS

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STREET PROFILE 8
PARK DRIFT TRAIL
243+00.00 TO 251+00.00

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:
RC MAR 2019	DMO MAR 2019	BR 08/02/2019	1" = 40' HORIZ. 1" = 8' VERT.

PROJECT NO: 7809

PROFESSIONAL ENGINEER — STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
2/18/2020

SHEET
PP8
21 OF 46 SHEETS

DRAWING NO.

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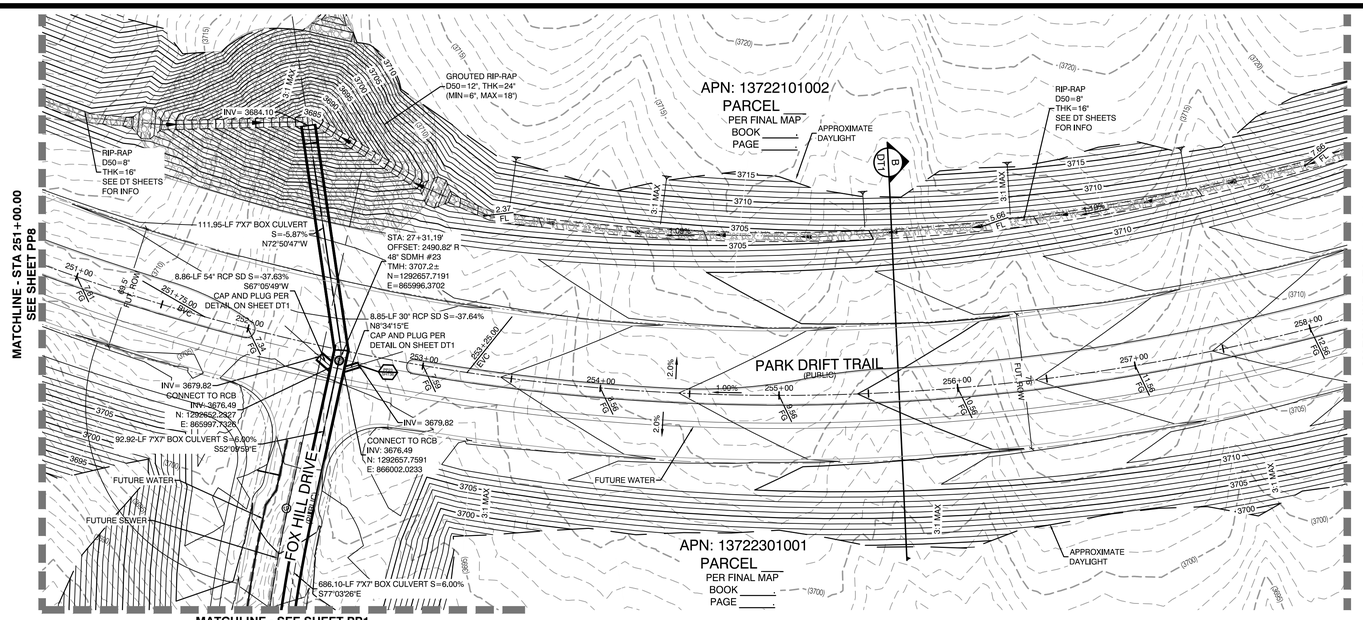
MATCHLINE - STA 251+00.00
SEE SHEET PP8
MATCHLINE - STA 258+00.00
SEE SHEET PP10
MATCHLINE - SEE SHEET PP1
GROUTED RIP-RAP
D50=12", THK=24"
(MIN=6", MAX=18")
RIP-RAP
D50=8"
THK=16"
SEE DT SHEETS
FOR INFO
INV= 3684.10
111.95-LF 7'X7' BOX CULVERT
S=-5.87%
N72°50'47"W
8.86-LF 54" RCP SD S=-37.63%
S67°05'49"W
CAP AND PLUG PER
DETAIL ON SHEET DT1
STA: 27+31.19'
OFFSET: 2490.82' R
48" SDMH #23
TMH: 3707.2±
N=1292657.7191
E=865996.3702
8.85-LF 30" RCP SD S=-37.64%
N8°34'15"E
CAP AND PLUG PER
DETAIL ON SHEET DT1
INV= 3679.82
CONNECT TO RCB
INV= 3676.49
N: 1292657.7591
E: 866002.0233
92.92-LF 7'X7' BOX CULVERT S=-6.00%
S52°09'59"E
INV= 3679.82
CONNECT TO RCB
INV= 3676.49
N: 1292662.2827
E: 865997.7326
FUTURE WATER
FUTURE SEWER
FOX HILL DRIVE
686.10-LF 7'X7' BOX CULVERT S=-6.00%
S77°03'26"E
APN: 13722101002
PARCEL ___
PER FINAL MAP
BOOK ____;
PAGE ____;
APPROXIMATE
DAYLIGHT
LOT 8
APN: 13722301001
PARCEL ___
PER FINAL MAP
BOOK ____;
PAGE ____;
APPROXIMATE
DAYLIGHT
PARK DRIFT TRAIL
(PUBLIC)
FUT. R/W
FUTURE WATER
3:1 MAX
2.37' FL
5.66' FL
3.68' FL
2.68' FL
2.58' FL
2.48' FL
2.38' FL
2.28' FL
2.18' FL
2.08' FL
1.98' FL
1.88' FL
1.78' FL
1.68' FL
1.58' FL
1.48' FL
1.38' FL
1.28' FL
1.18' FL
1.08' FL
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0.68' FL
0.58' FL
0.48' FL
0.38' FL
0.28' FL
0.18' FL
0.08' FL
-0.02' FL
-0.12' FL
-0.22' FL
-0.32' FL
-0.42' FL
-0.52' FL
-0.62' FL
-0.72' FL
-0.82' FL
-0.92' FL
-1.02' FL
-1.12' FL
-1.22' FL
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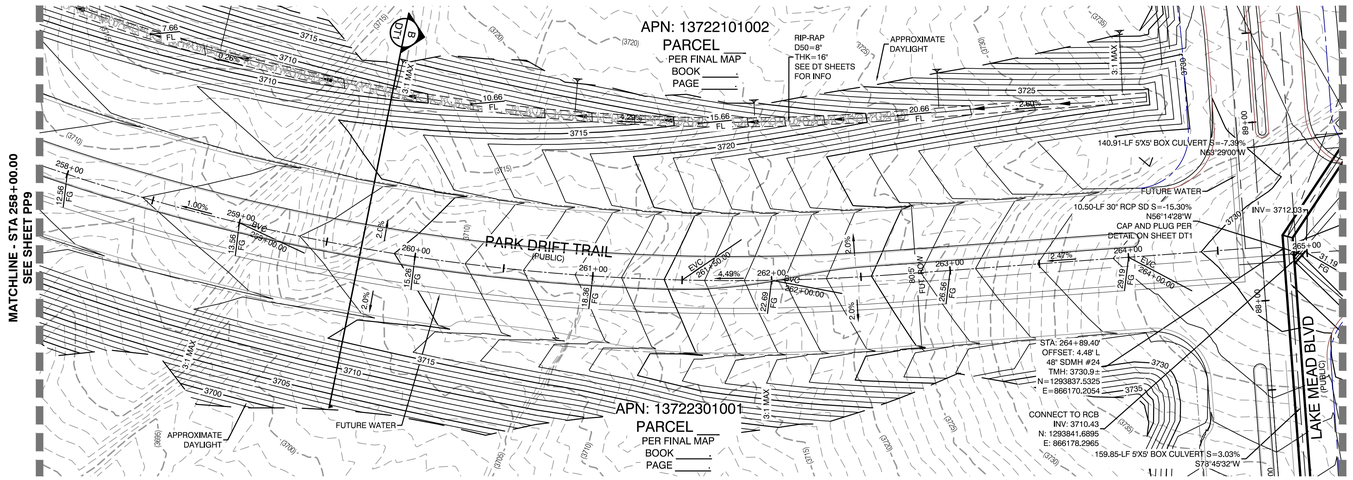
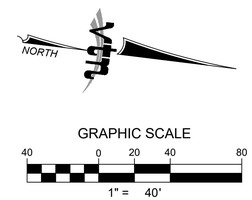
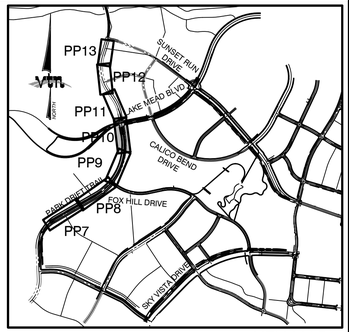
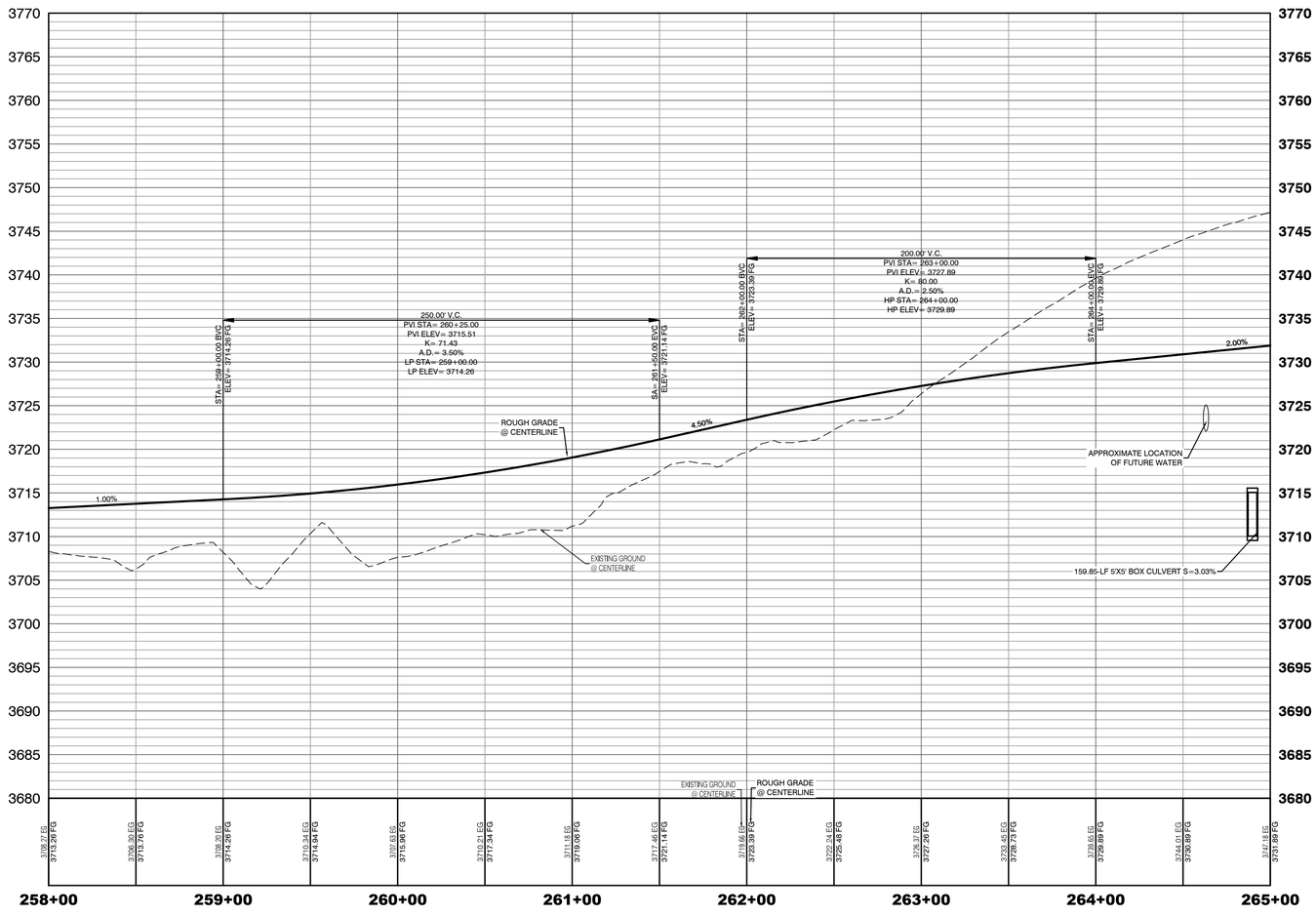
-1.82' FL
-1.92' FL







KEY MAP
N.T.S



PARK DRIFT TRAIL
(PUBLIC)

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
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SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
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BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS. IT'S COSTLY.
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AND
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OR
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CITY OF LAS VEGAS

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REV	DATE	BY	REVISION

STREET PROFILE 10
PARK DRIFT TRAIL
258+00.00 TO 265+00.00
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — MAR 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
SCALE: 1" = 40' HORIZ. 1" = 8' VERT.
PROJECT NO: 7809

BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
STATE OF NEVADA
No. 15961
PROFESSIONAL ENGINEER
2/18/2020

SHEET
PP10
23 OF **46** SHEETS

DRAWING NO.

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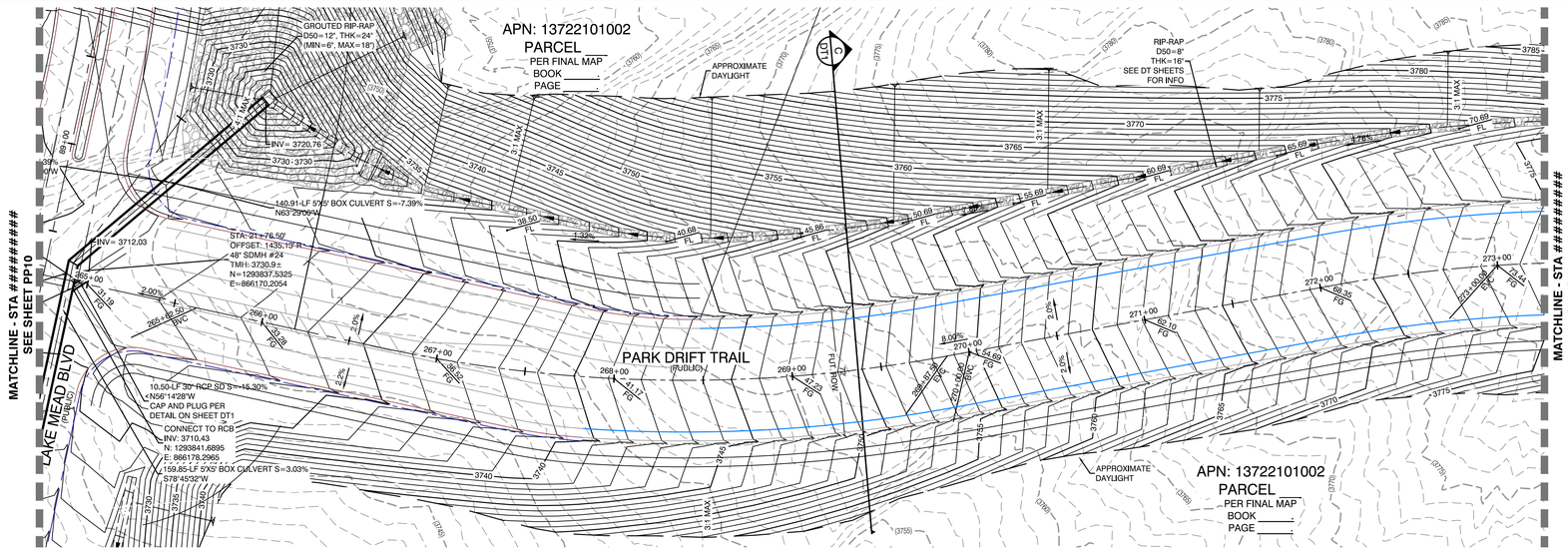
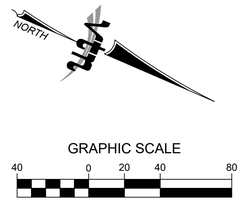
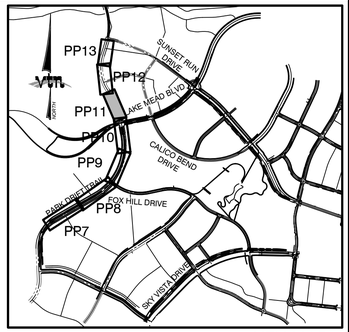
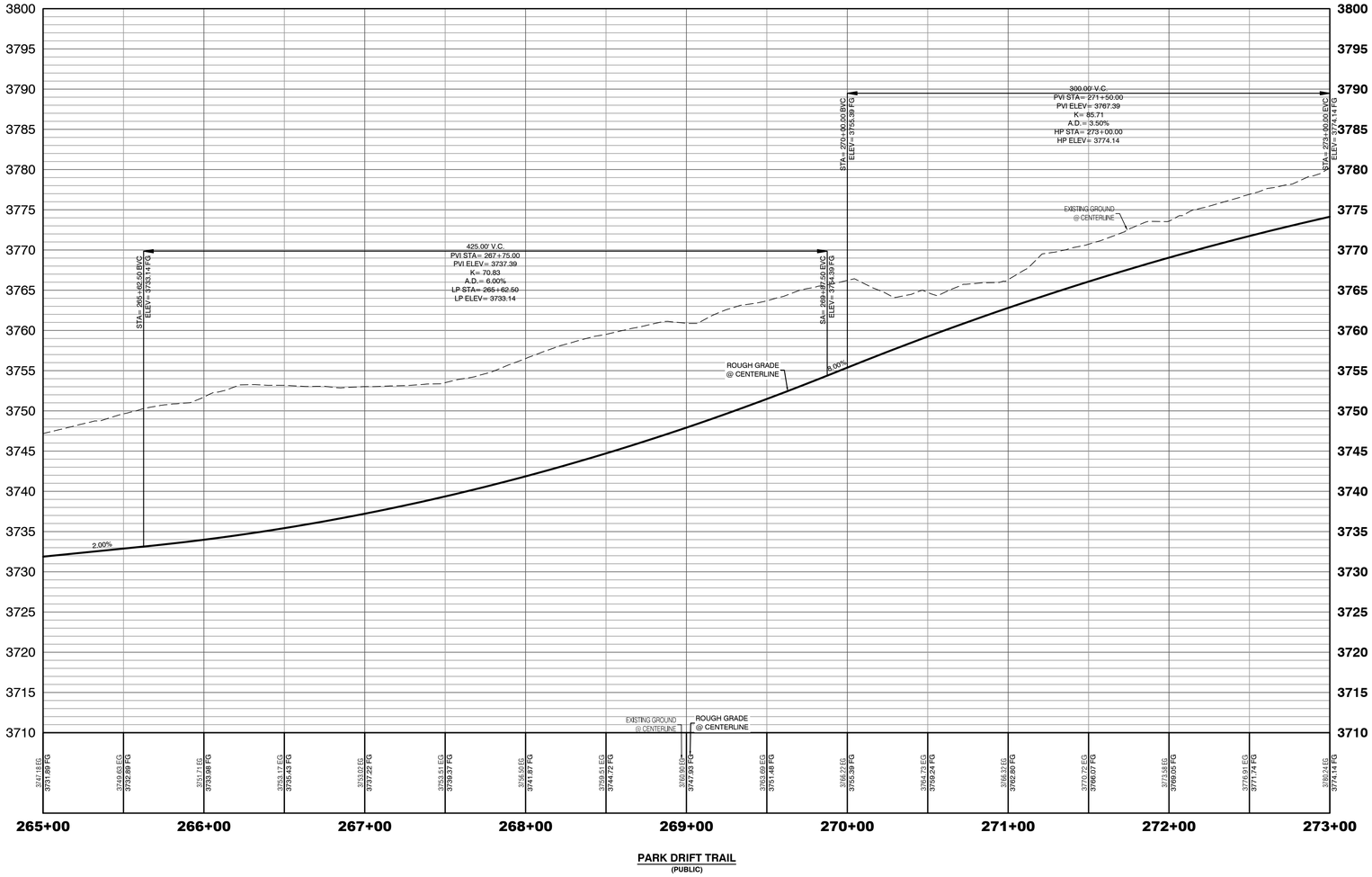






KEY MAP
N.T.S

PROFILE SCALES:
HORIZ. = 1" = 40'
VERT. = 1" = 8'



BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
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BENCHMARK

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T21S,R59E,S03

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CITY OF LAS VEGAS

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REV	DATE	BY	REVISION

STREET PROFILE 11
PARK DRIFT TRAIL
265+00.00 TO 273+00.00
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — MAR 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
PROJECT NO: 7809
SCALE: HORIZ. 1" = 40' VERT. 1" = 8'

2/18/2020

SHEET
PP11
24 OF **46** SHEETS

DRAWING NO.

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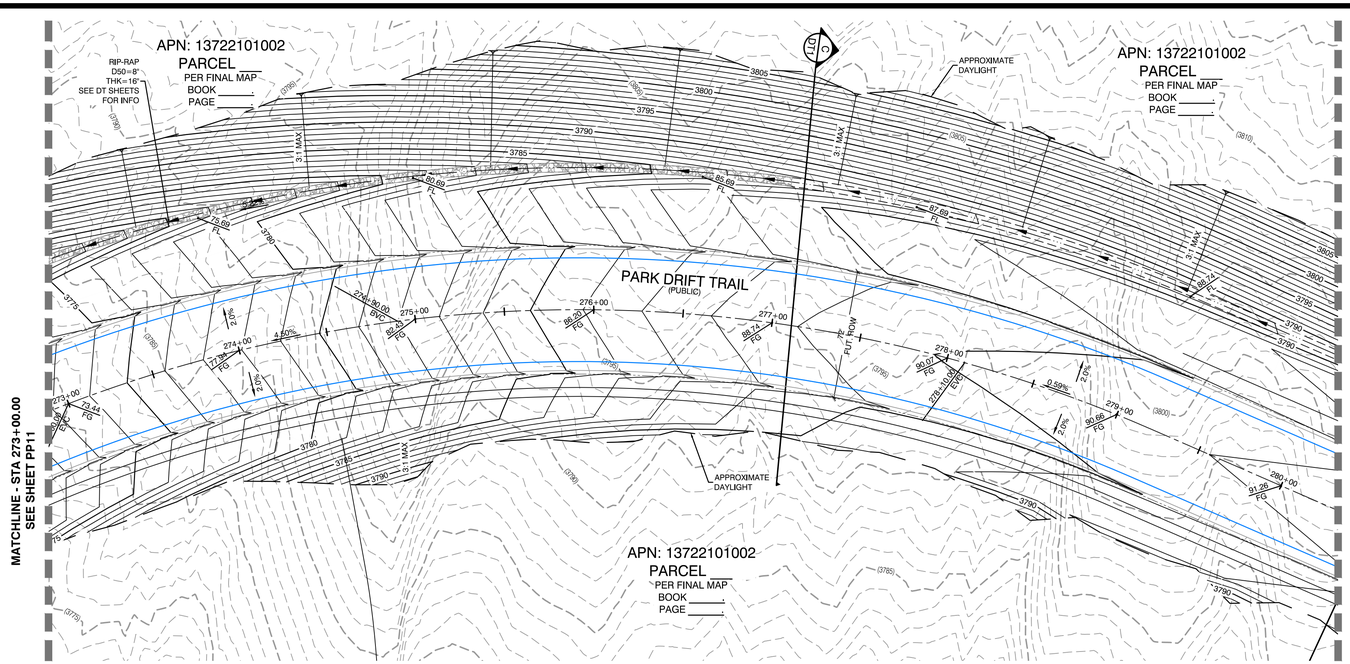
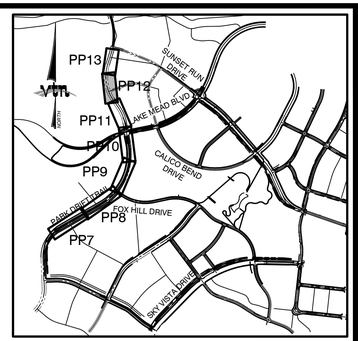


GRAPHIC SCALE

40 0 20 40 80

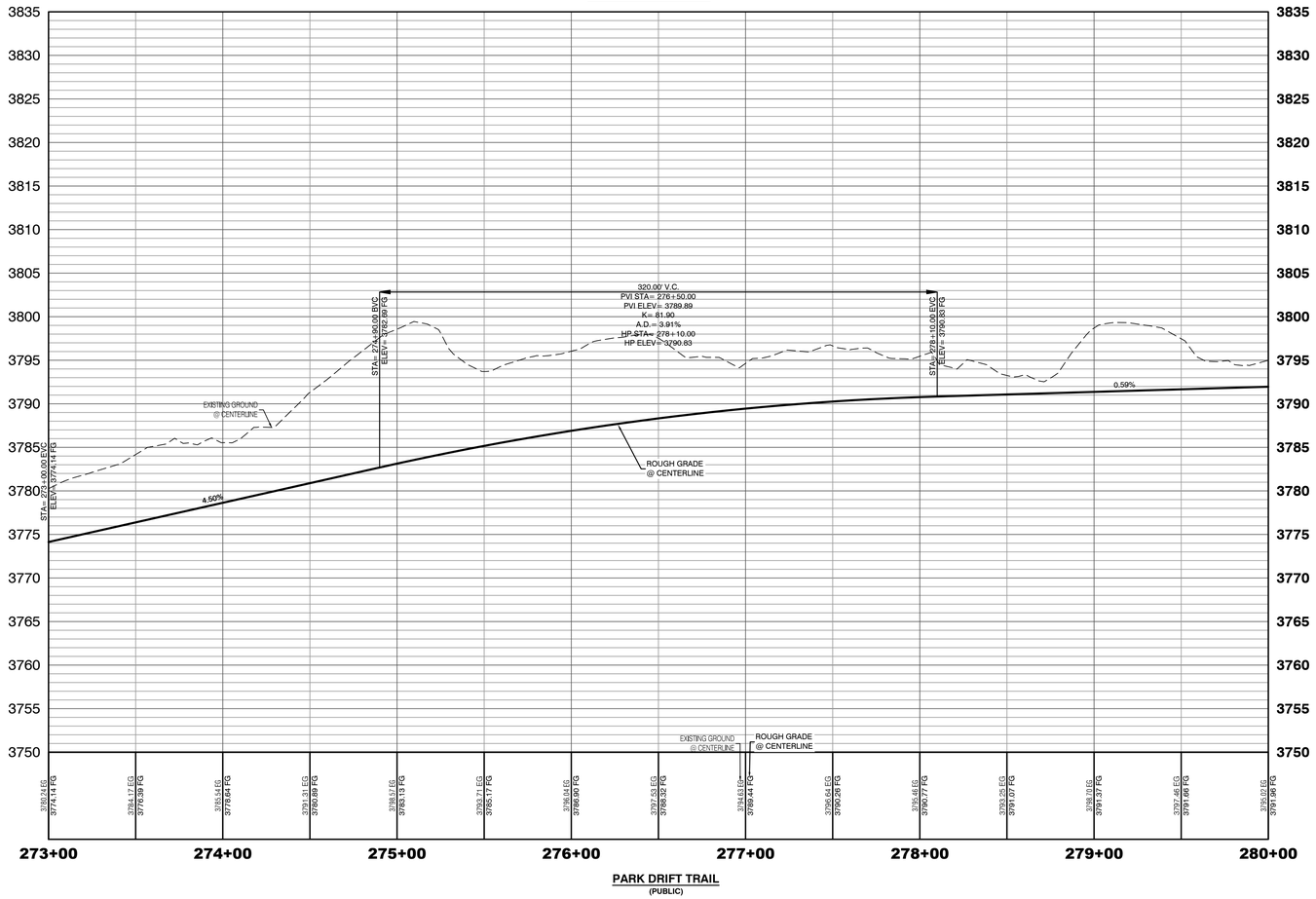
1" = 40'



KEY MAP
N.T.S

PROFILE SCALES:

HORIZ. = 1" = 40'
VERT. = 1" = 8'



BASIS OF BEARING

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LINEAR UNIT: US SURVEY FOOT (FTUS)

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PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

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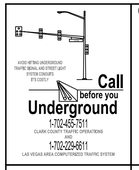
T21S,R59E,S03



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CLARK COUNTY TRAFFIC OPERATIONS

REV	DATE	BY	REVISION

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LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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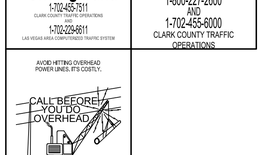
STREET PROFILE 12
PARK DRIFT TRAIL
273+00.00 TO 280+00.00
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — MAR 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
SCALE: 1" = 40' HORIZ. 1" = 8' VERT.
PROJECT NO: 7809



2/18/2020

SHEET
PP12
25 OF **46** SHEETS

DRAWING NO.

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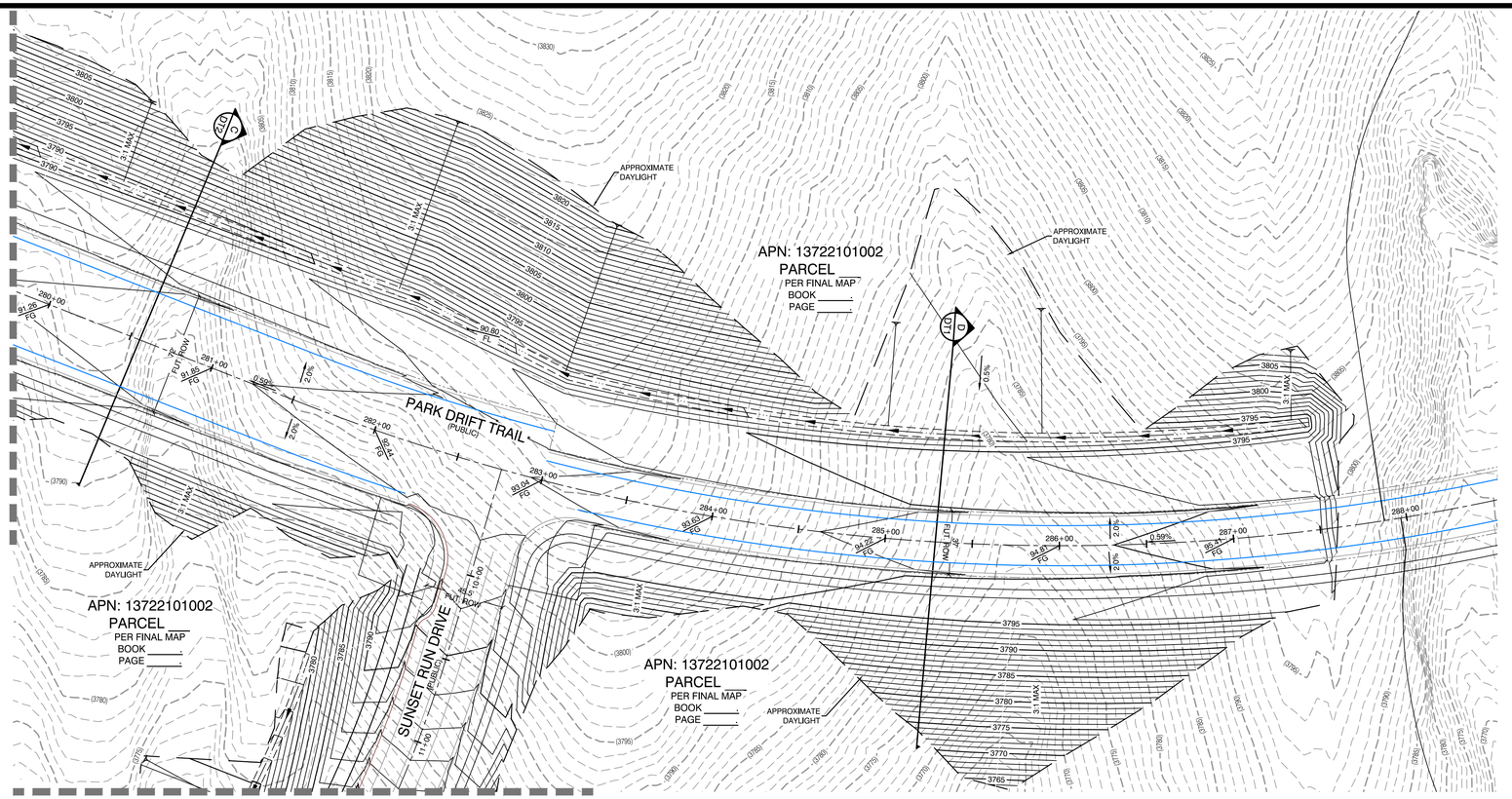
MATCHLINE - STA 280+00.00
SEE SHEET PP12
APPROXIMATE DAYLIGHT
APN: 13722101002
PARCEL
PER FINAL MAP
BOOK ____:
PAGE ____:
PARK DRIFT TRAIL
(PUBLIC)
SUNSET RUN DRIVE
(PUBLIC)
PUE TYP.
45.15' P.U.E.
11.00'
2.0%
0.59%
3:1 MAX
280+00
281+00
282+00
283+00
284+00
285+00
286+00
287+00
288+00
90.80 TG
91.46 FG
91.86 FG
92.44 FG
92.84 FG
93.65 FG
94.21 FG
94.61 FG
95.01 FG
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98.61 FG
99.01 FG
99.41 FG
99.81 FG
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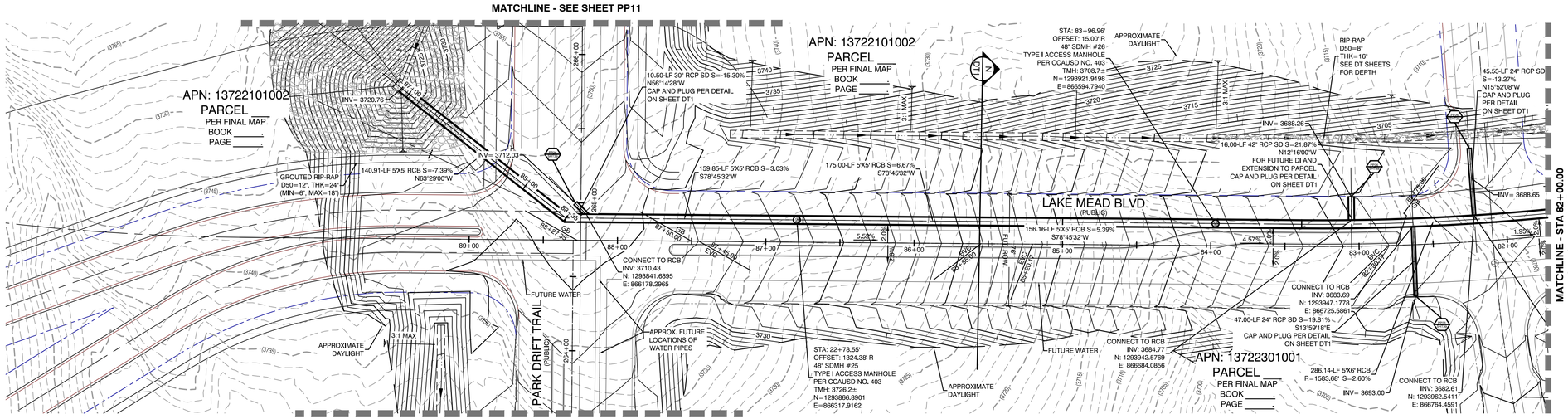
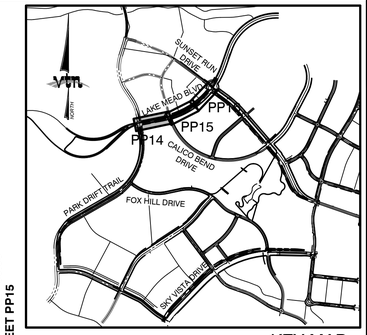
101.81 FG





KEY MAP
N.T.S

NORTH

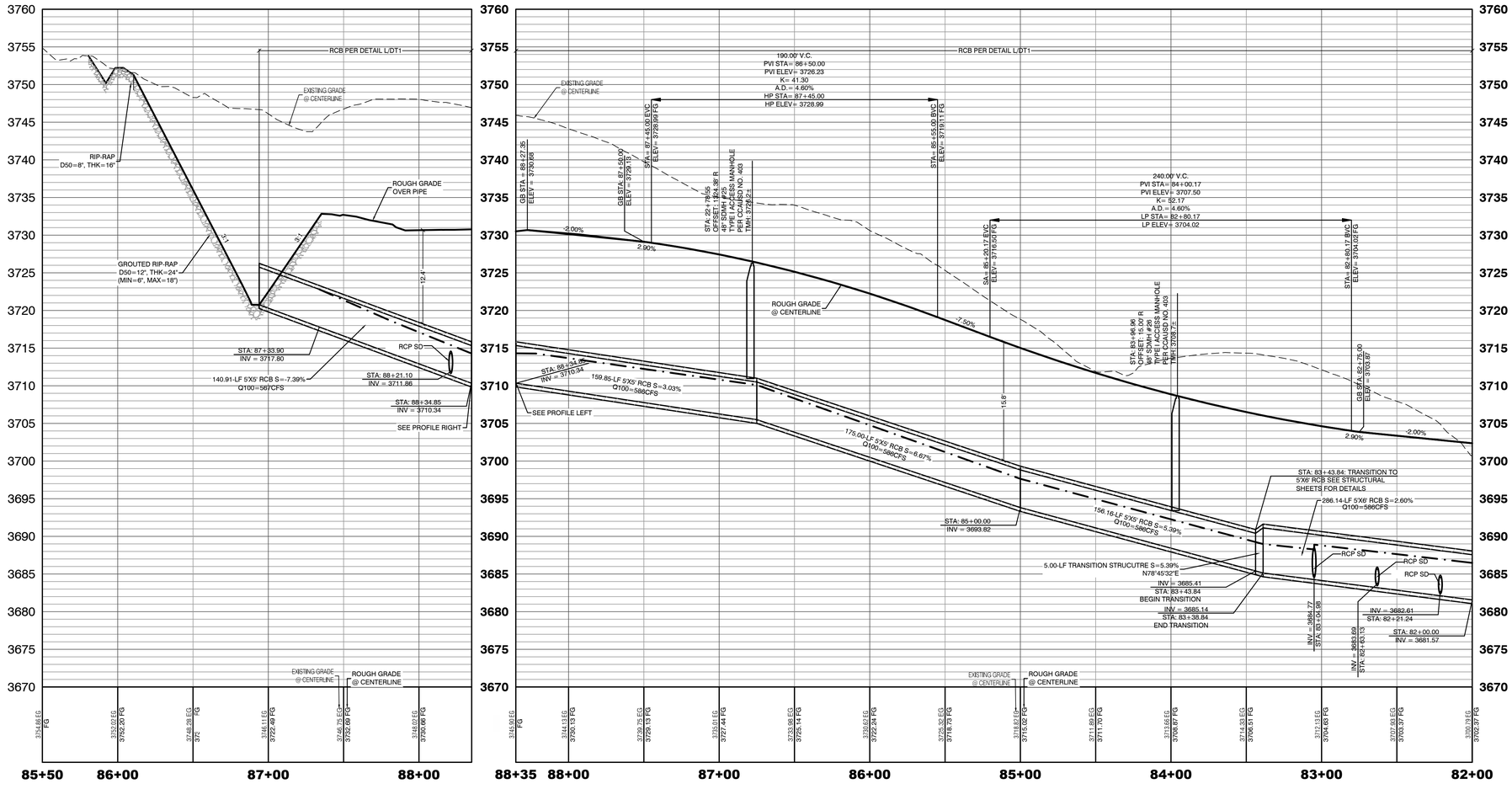
GRAPHIC SCALE

40 0 20 40 80

1" = 40'

PROFILE SCALES:

HORIZ. = 1" = 40'
VERT. = 1" = 8'



STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE. NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 450,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008) NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN. T21S,R59E,S03

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CITY OF LAS VEGAS

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STREET PROFILE 14
LAKE MEAD BLVD
89+00.00 TO 82+00.00
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
RC	DMO	BR	7809	HORIZ. 1" = 40' VERT. 1" = 8'
MAR 2019	MAR 2019	08/02/2019		

PROFESSIONAL ENGINEER – STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
2/18/2020

SHEET
PP14
27 OF 46 SHEETS

DRAWING NO.

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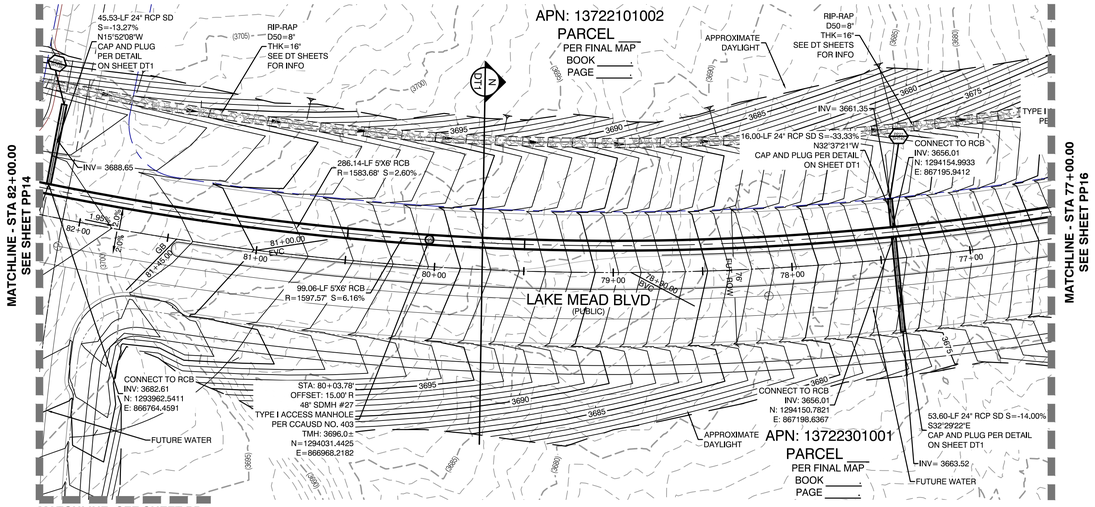
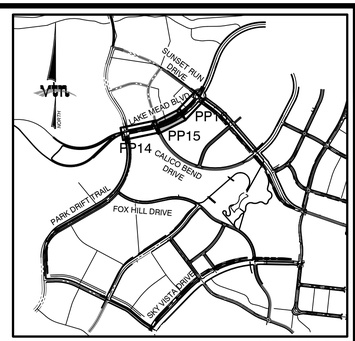




KEY MAP
N.T.S

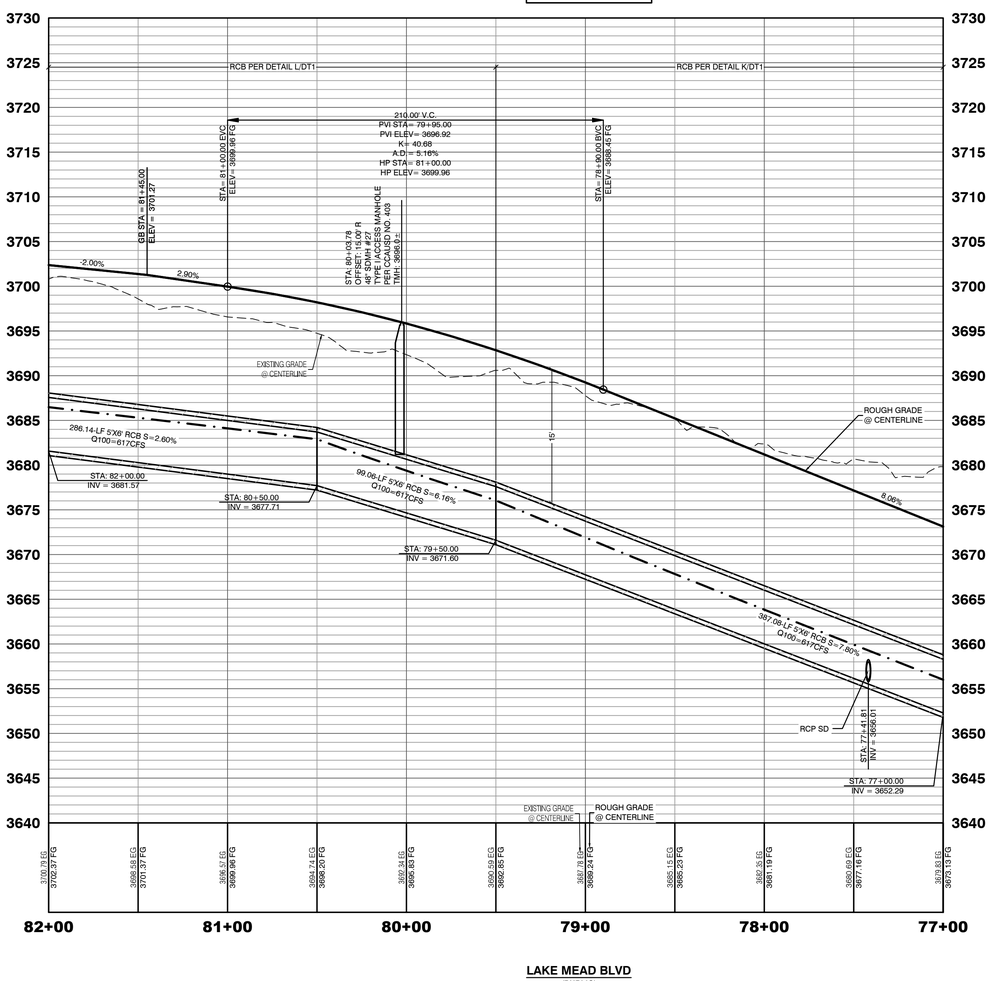
GRAPHIC SCALE

40 0 20 40 80

1" = 40'

PROFILE SCALES:

HORIZ. = 1" = 40'
VERT. = 1" = 8'



LAKE MEAD BLVD
(PUBLIC)

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE. NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
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SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

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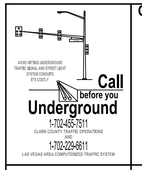
BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03



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REV	DATE	BY	REVISION

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CITY OF LAS VEGAS

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STREET PROFILE 15
LAKE MEAD BLVD
82+00.00 TO 77+00.00
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:
RC MAR 2019	DMO MAR 2019	BR 08/02/2019	1" = 40' HORIZ. 1" = 8' VERT.

PROJECT NO:
7809

PROFESSIONAL ENGINEER — STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
2/18/2020

SHEET
PP15
28 OF **46** SHEETS

DRAWING NO.

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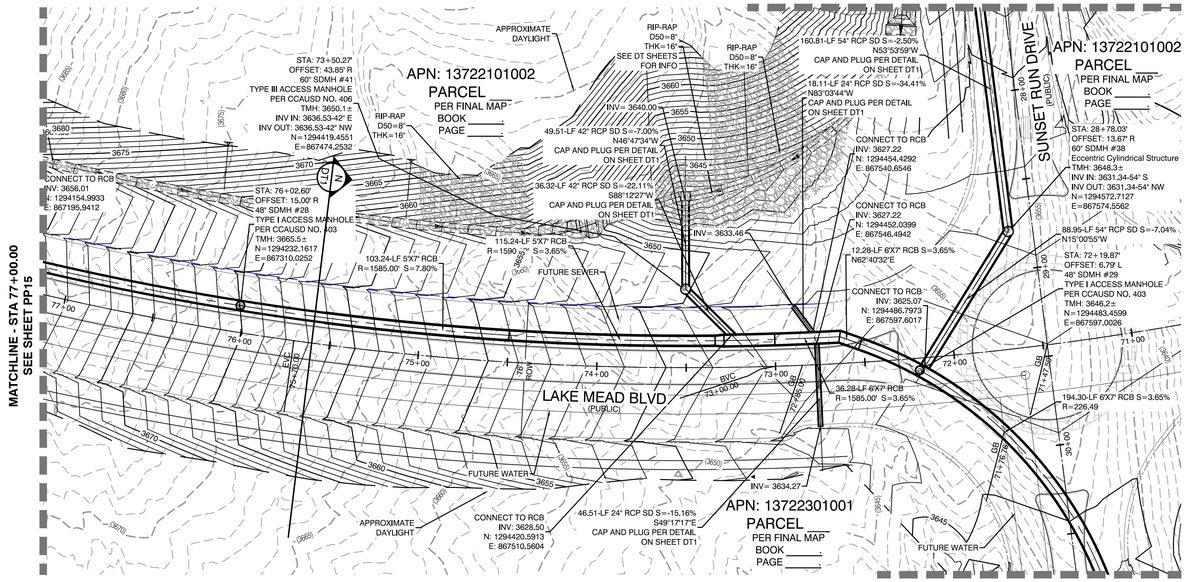


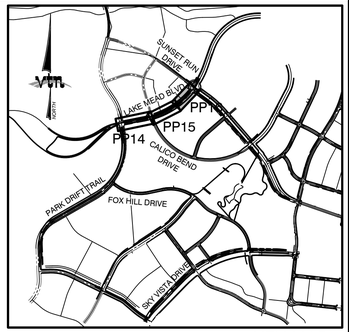
PROFILE SCALES:

HORIZ. = 1" = 40'
VERT. = 1" = 8'

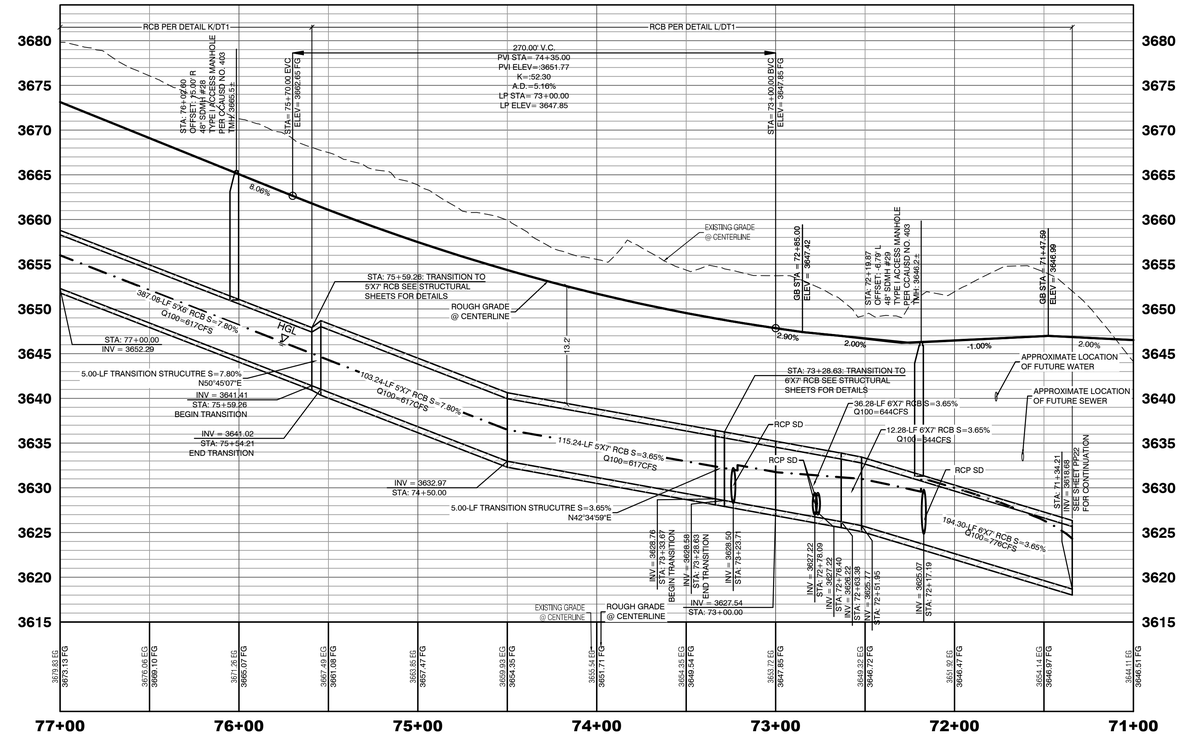
GRAPHIC SCALE

40 0 20 40 80

1" = 40'



KEY MAP
N.T.S



LAKE MEAD BLVD
(PUBLIC)

STORM DRAIN MANHOLE NOTE:

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BASIS OF BEARING

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

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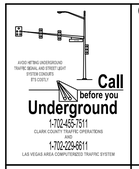

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REV	DATE	BY	REVISION

STREET PROFILE 16
LAKE MEAD BLVD
77+00.00 TO 71+00.00
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — MAR 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
PROJECT NO: 7809
SCALE: HORIZ 1" = 40' VERT 1" = 8'

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15997
2/18/2020

SHEET
PP16
29 OF **46** SHEETS

DRAWING NO.

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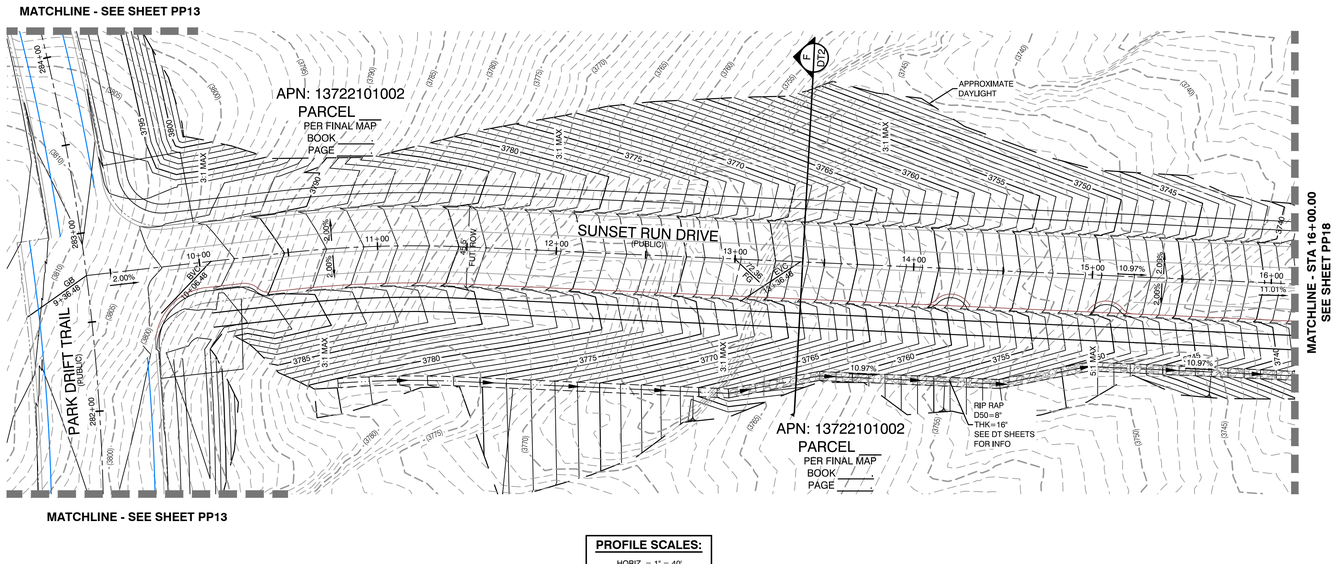

PROFILE SCALES:

HORIZ. = 1" = 40'
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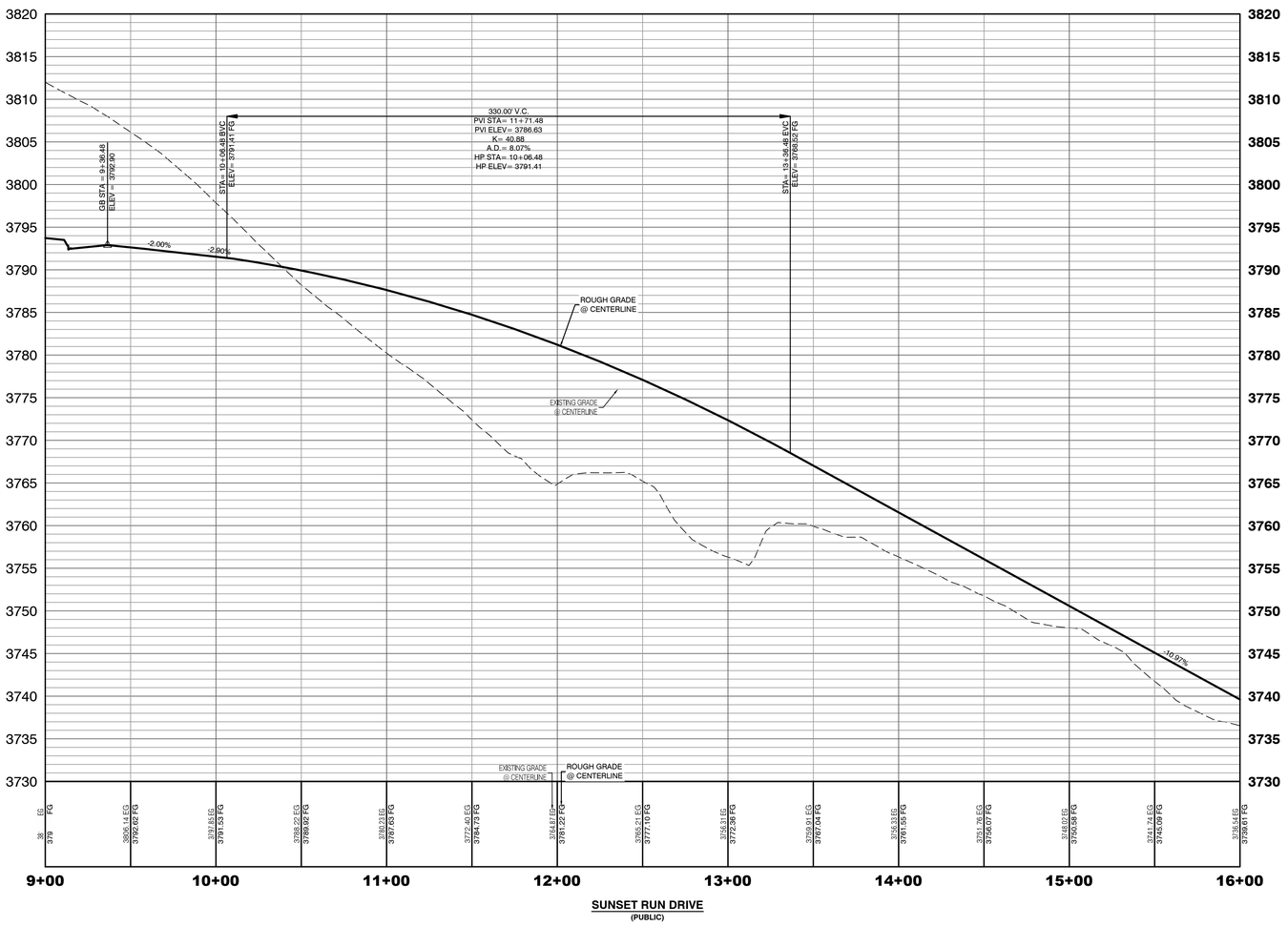

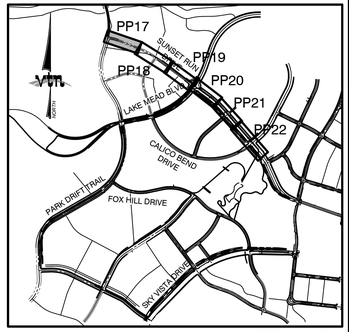

KEY MAP
N.T.S

NORTH

GRAPHIC SCALE

40 0 20 40 80

1" = 40'

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
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NOTES:
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CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
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T21S,R59E,S03

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OR
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AND
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CLARK COUNTY TRAFFIC OPERATIONS

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CALL BEFORE YOU DIG OVERHEAD
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REV	DATE	BY	REVISION

STREET PROFILE 17
SUNSET RUN DRIVE
10+00.00 TO 16+00.00

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — MAR 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
PROJECT NO: 7809
SCALE: HORIZ. 1" = 40' VERT. 1" = 8'

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
2/18/2020

SHEET
PP17
30 OF 46 SHEETS

DRAWING NO.

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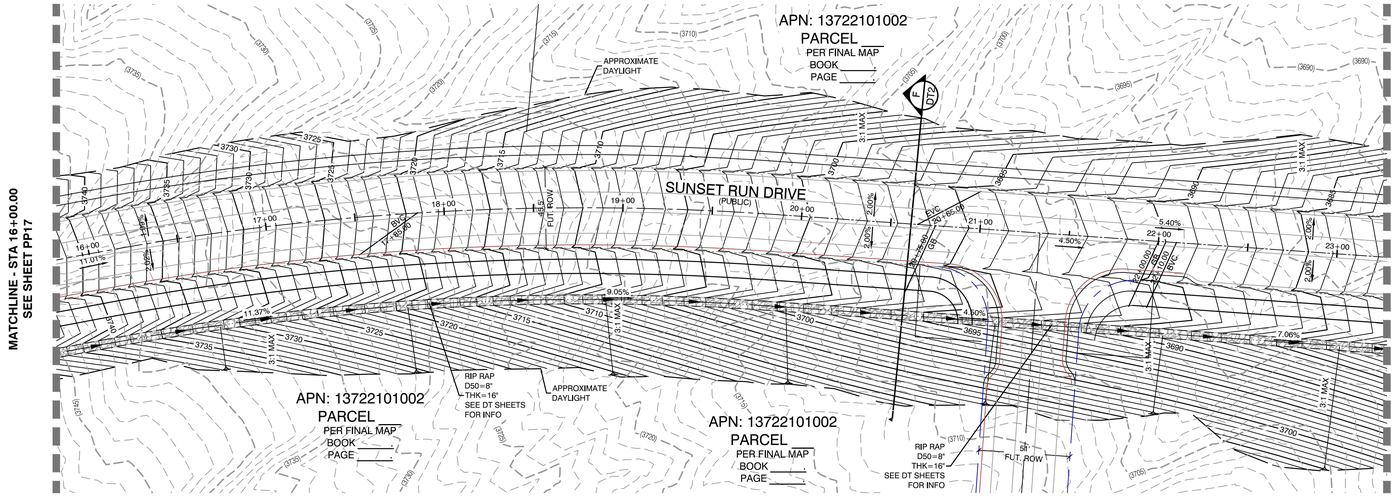
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PARCEL
PER FINAL MAP
BOOK
PAGE
APPROXIMATE DAYLIGHT
SUNSET RUN DRIVE
(PUBLIC)
MATCHLINE - STA 16+00.00
SEE SHEET PP17
MATCHLINE - STA 23+00.00
SEE SHEET PP19
APN: 13722101002
PARCEL
PER FINAL MAP
BOOK
PAGE
RIP RAP
D50=8"
THK=16"
SEE DT SHEETS
FOR INFO
APPROXIMATE DAYLIGHT
APN: 13722101002
PARCEL
PER FINAL MAP
BOOK
PAGE
RIP RAP
D50=8"
THK=16"
SEE DT SHEETS
FOR INFO
58'
FUT. ROW
58'
FUT. ROW
11.37%
9.05%
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5.40%
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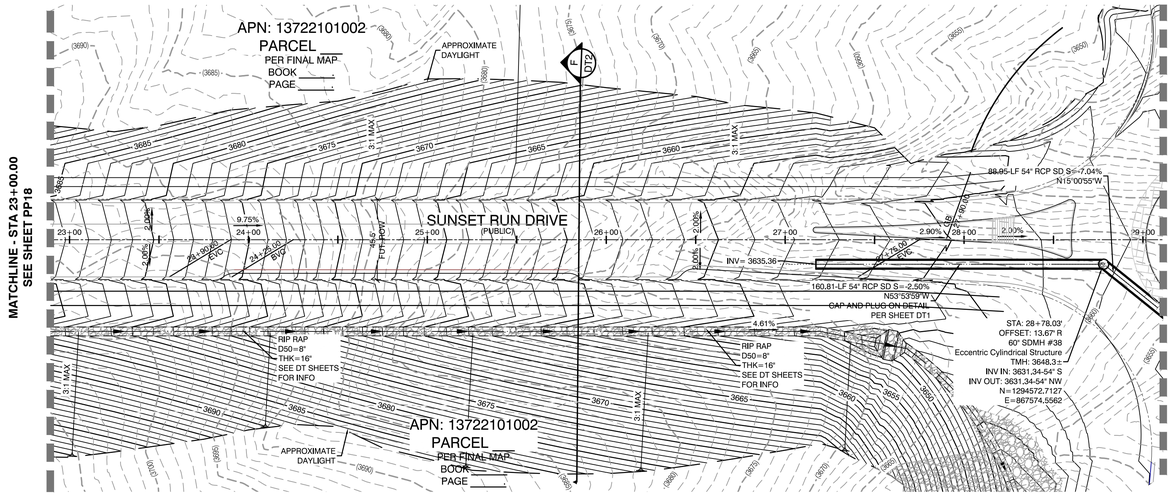
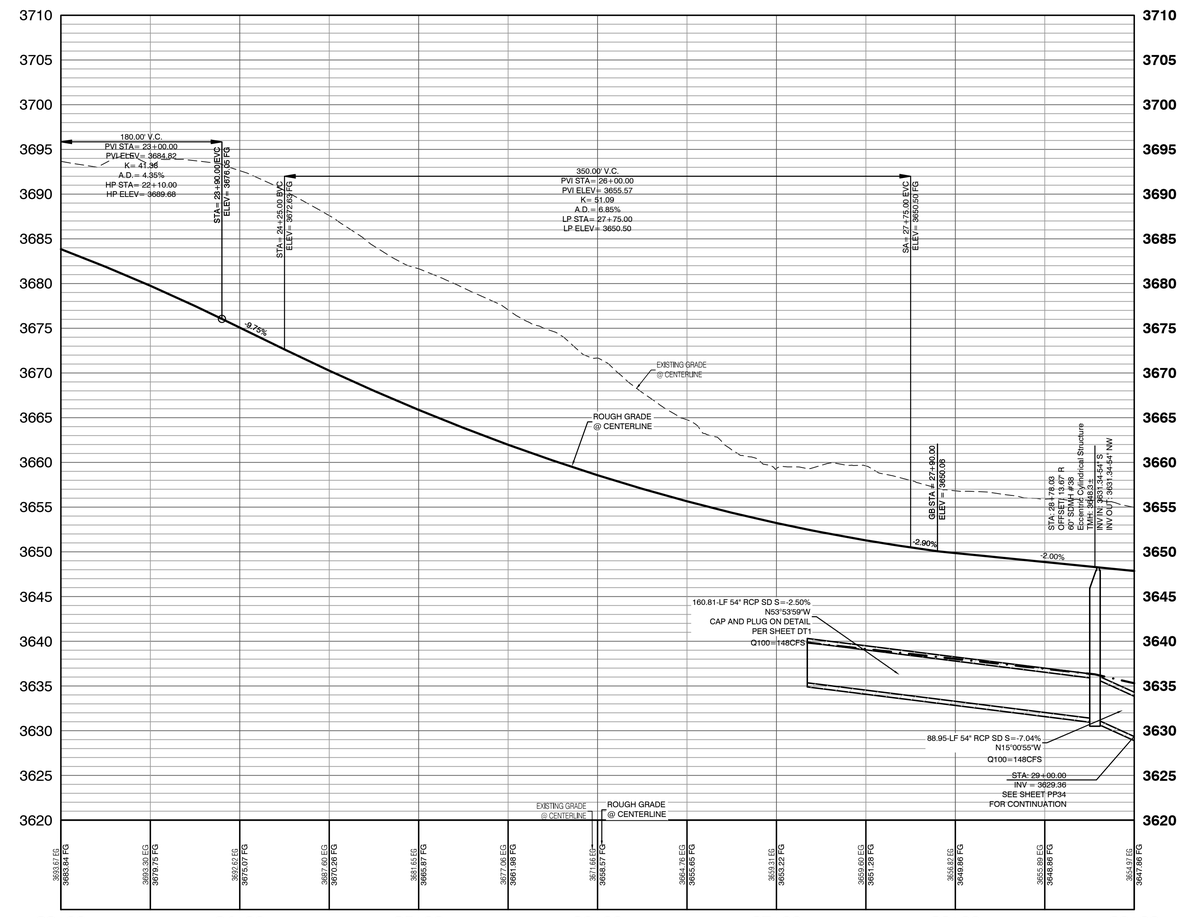
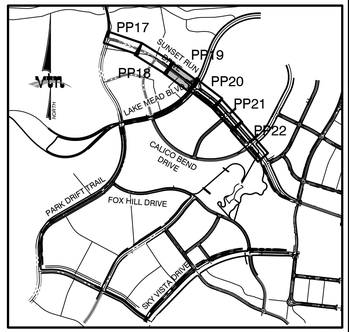
3



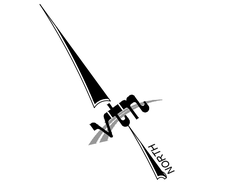
PROFILE SCALES:

HORIZ. = 1" = 40'
VERT. = 1" = 8'





KEY MAP
N.T.S



GRAPHIC SCALE

40 0 20 40 80

1" = 40'

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BASIS OF BEARING

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

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SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

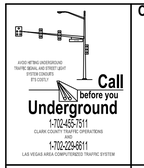
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03



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STREET PROFILE 19
SUNSET RUN DRIVE
23+00.00 TO 29+00.00

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC	MAR 2019	SCALE:	HORIZ. 1" = 40'
DESIGNED BY: DMO	MAR 2019		VERT. 1" = 8'
CHECKED BY: BR	08/02/2019	PROJECT NO: 7809	

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

2/18/2020

SHEET
PP19
32 OF **46** SHEETS

DRAWING NO.

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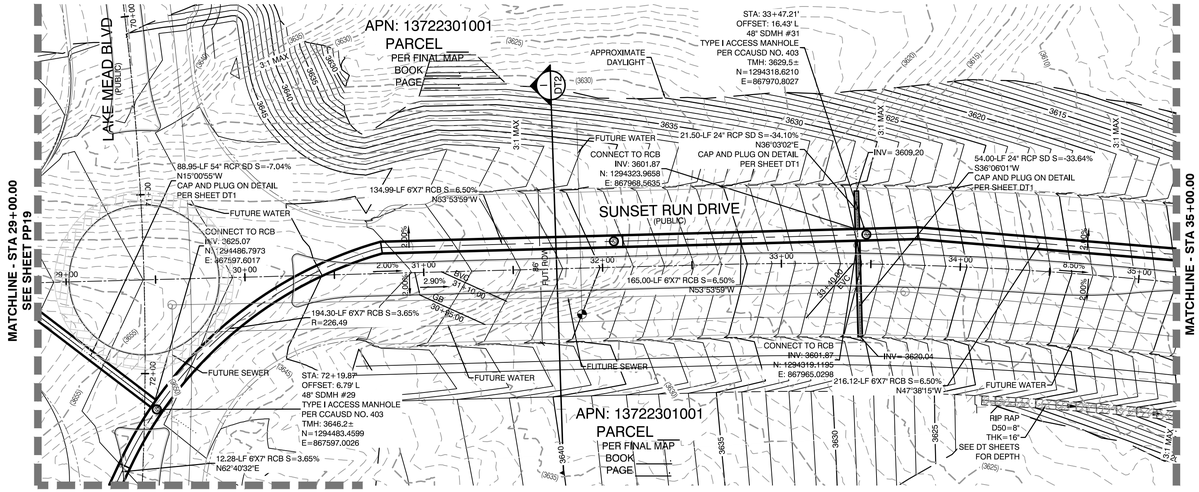
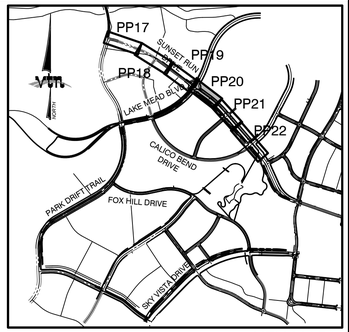


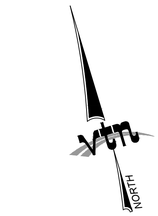
SEE SHEET PP16 FOR CONTINUATION

PROFILE SCALES:

HORIZ. = 1" = 40'
VERT. = 1" = 8'



KEY MAP
N.T.S



GRAPHIC SCALE

40 0 20 40 80

1" = 40'

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE. NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
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SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
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BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
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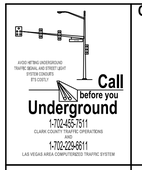
T21S,R59E,S03



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STREET PROFILE 20
SUNSET RUN DRIVE
29+00.00 TO 35+00.00

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
RC MAR 2019	DMO MAR 2019	BR 08/02/2019	7809	HORIZ. 1" = 40' VERT. 1" = 8'

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
No. 15967
2/18/2020

SHEET
PP20
33 OF **46** SHEETS

DRAWING NO.

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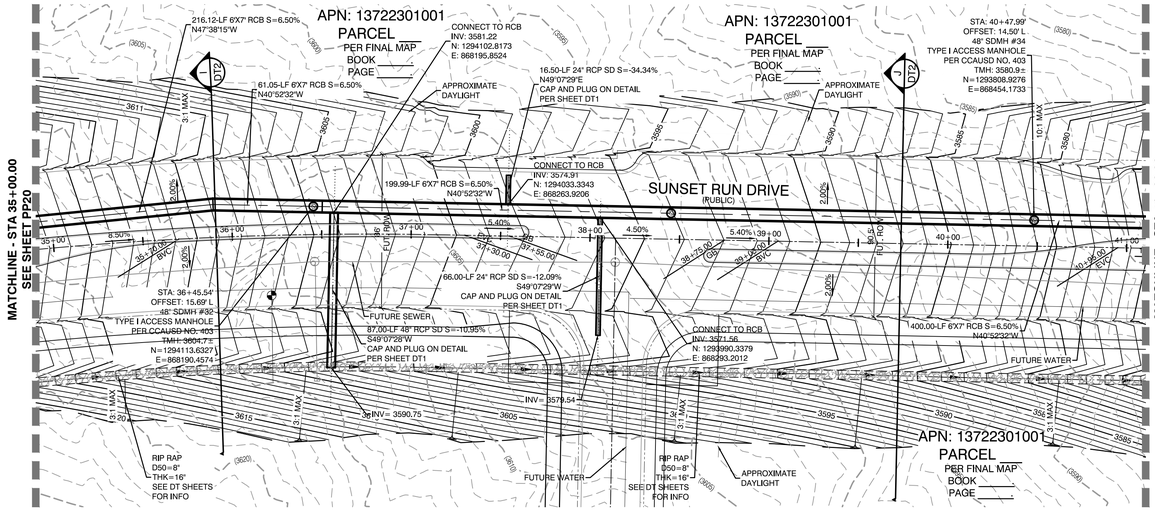
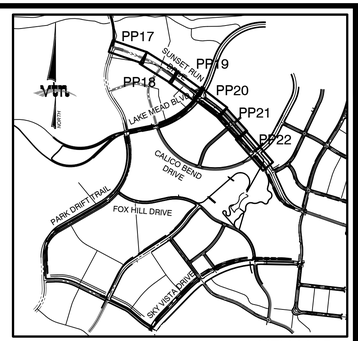




KEY MAP
N.T.S

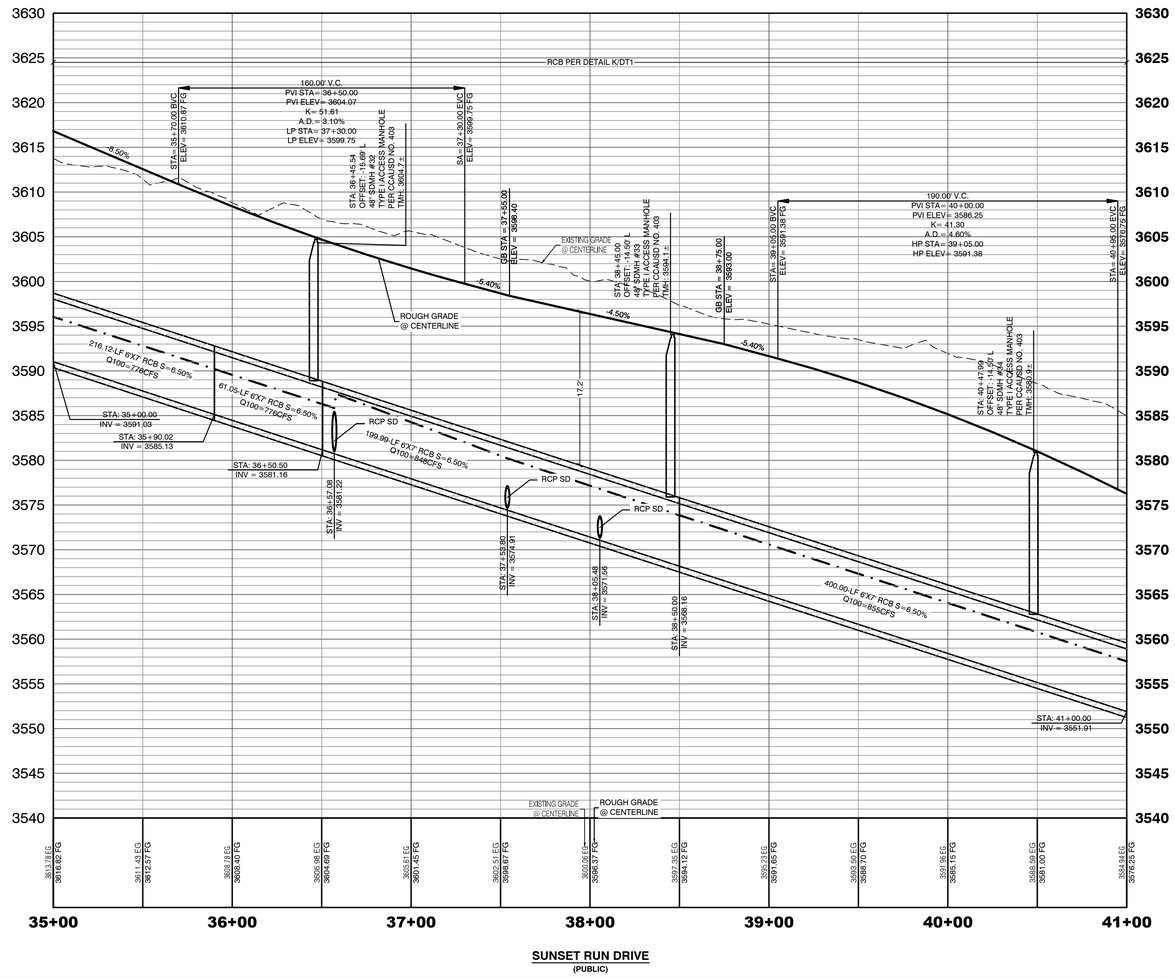
GRAPHIC SCALE

40 0 20 40 80

1" = 40'

PROFILE SCALES:

HORIZ. = 1" = 40'
VERT. = 1" = 8'



SUNSET RUN DRIVE
(PUBLIC)

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

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FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN. T21S,R59E,S03

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REV	DATE	BY	REVISION

STREET PROFILE 21
SUNSET RUN DRIVE
35+00.00 TO 41+00.00
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC — MAR 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
PROJECT NO: 7809
SCALE: 1" = 40' HORIZ. 1" = 8' VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

2/18/2020

SHEET
PP21
34 OF **46** SHEETS

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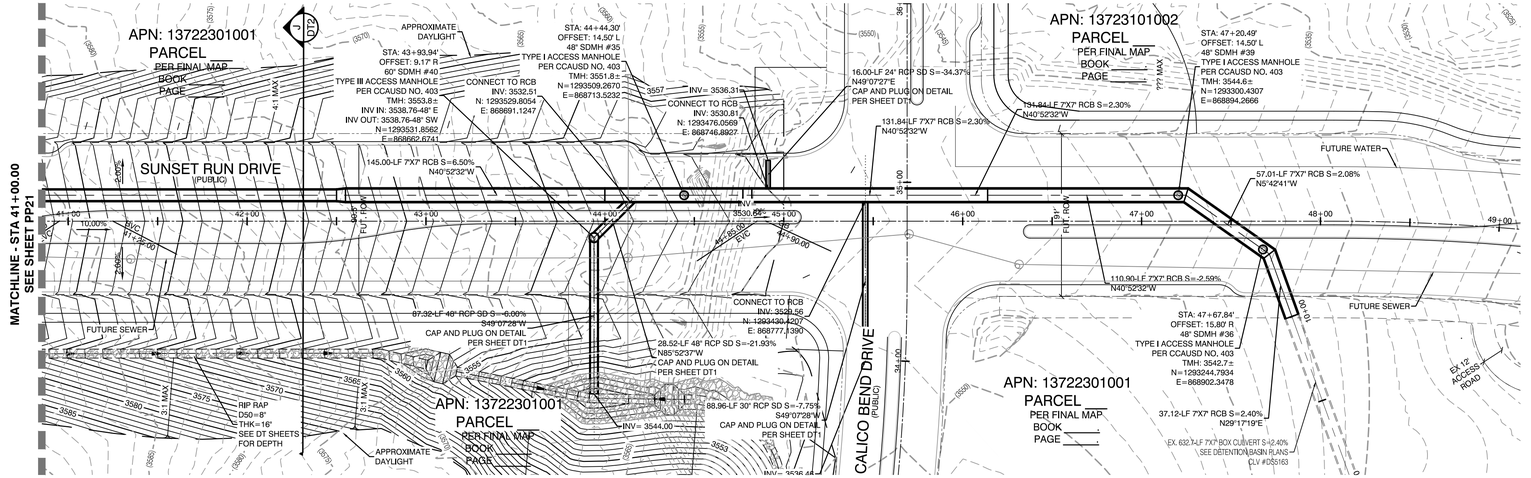

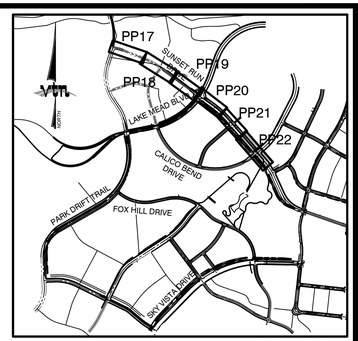

KEY MAP
N.T.S

PROFILE SCALES:
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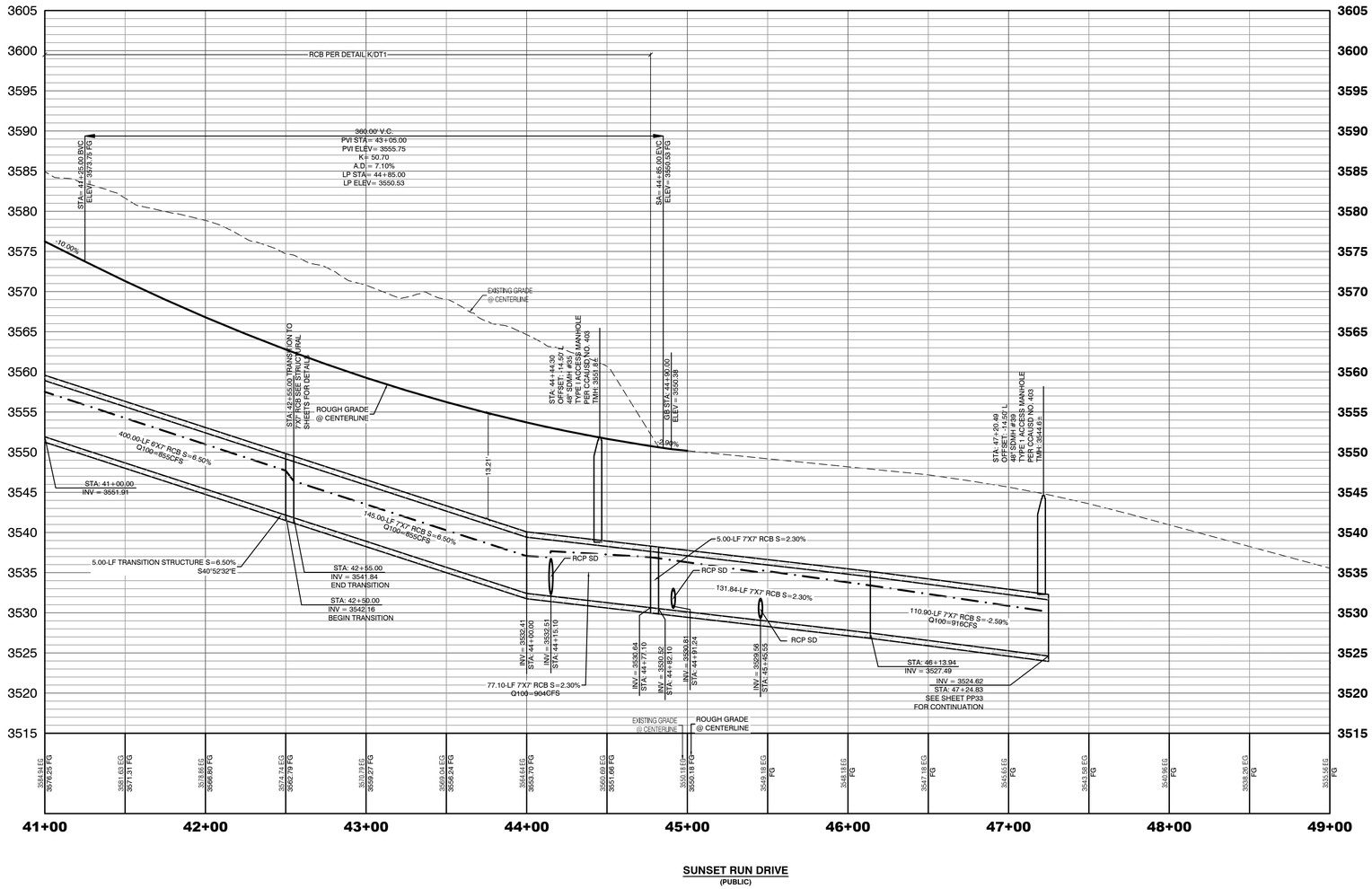
VERT. = 1" = 8'



SUNSET RUN DRIVE
(PUBLIC)

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

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LINEAR UNIT: US SURVEY FOOT (FTUS)

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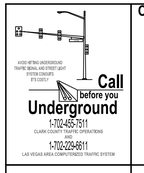

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STREET PROFILE 22
SUNSET RUN DRIVE
41+00.00 TO 49+00.00
SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: RC	MAR 2019	SCALE:	HORIZ 1" = 40' VERT 1" = 8'
DESIGNED BY: DMO	MAR 2019		
CHECKED BY: BR	08/20/2019	PROJECT NO:	7809

PROFESSIONAL ENGINEER - STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

2/18/2020

SHEET
PP22
35 OF **46** SHEETS

DRAWING NO.

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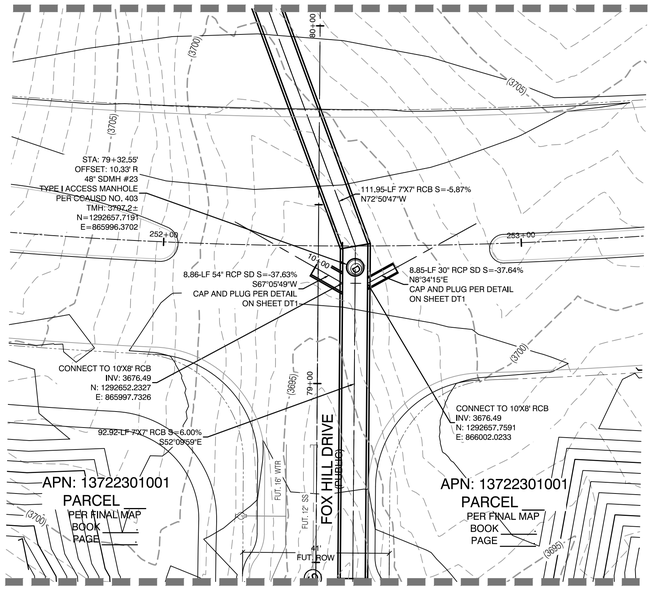
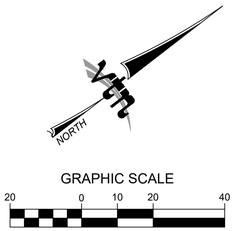
SEE SHEET PP1
FOR CONTINUATION



SEE SHEET PP1
FOR CONTINUATION

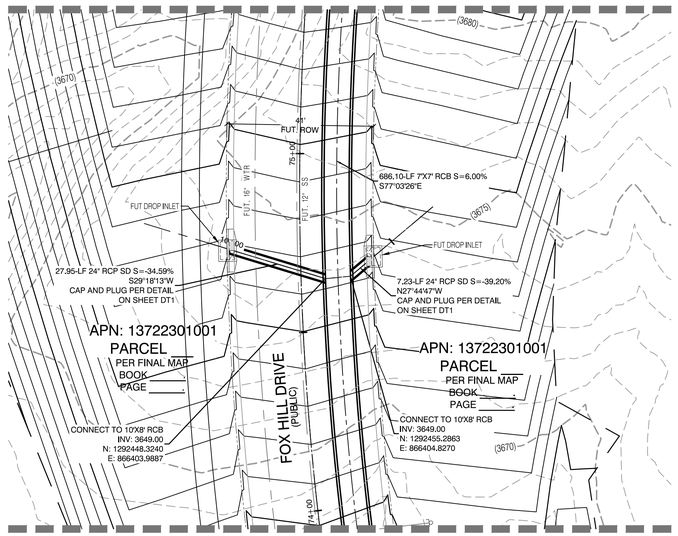


GRAPHIC SCALE

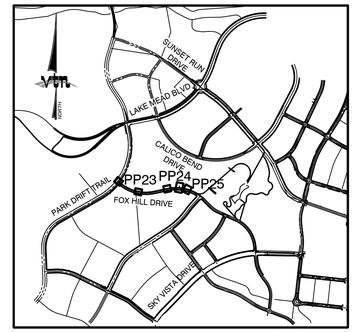
20 0 10 20 40

1" = 20'

SEE SHEET PP1
FOR CONTINUATION



SEE SHEET PP2
FOR CONTINUATION



KEY MAP
N.T.S

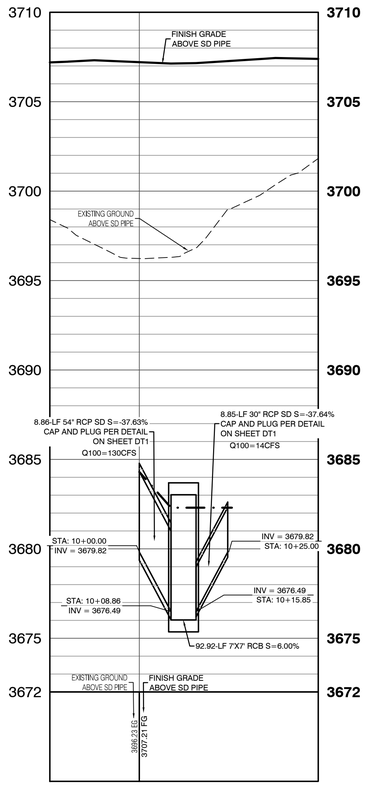
GRAPHIC SCALE

20 0 10 20 40

1" = 20'

PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'



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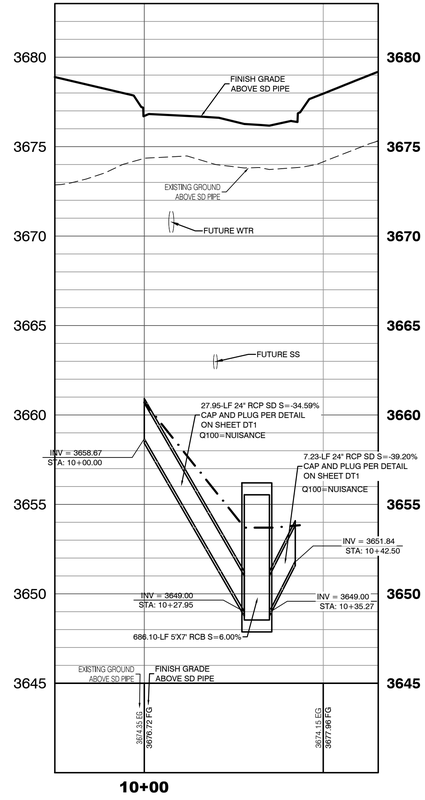
HORIZ. = 1"=20'
VERT. = 1"=4'



BASIS OF BEARING

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LINEAR UNIT: US SURVEY FOOT (FTUS)

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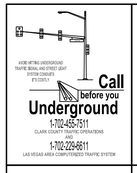
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

ENGINEER DISCLAIMER NOTE:

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



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LATERAL PROFILE 1
FOX HILL DRIVE

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: KTC — AUG 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
SCALE: HORIZ. 1"=20' VERT. 1"=4"
PROJECT NO: 7809

BRIAN TROY RUIZ
PROFESSIONAL ENGINEER — STATE OF NEVADA — No. 15967
EXP: 12/31/21
CIVIL
2/18/2020

SHEET
PP23
36 OF **46** SHEETS

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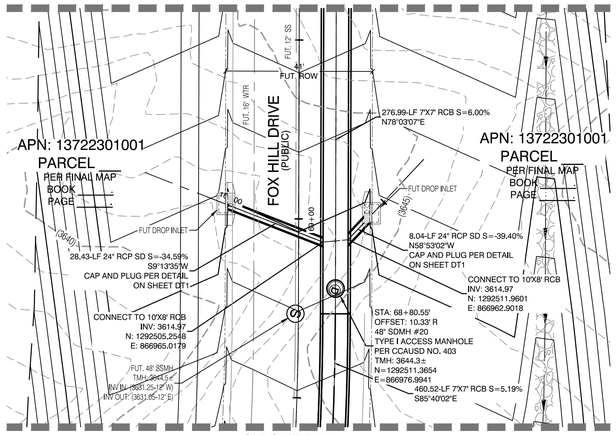
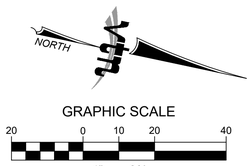
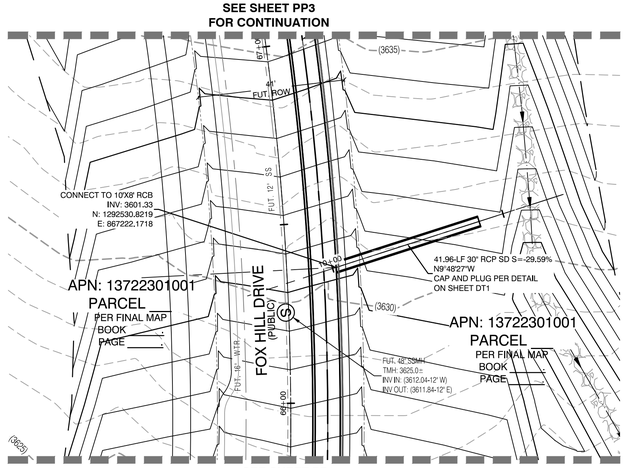
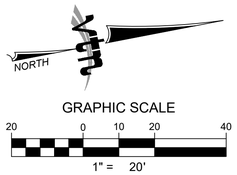
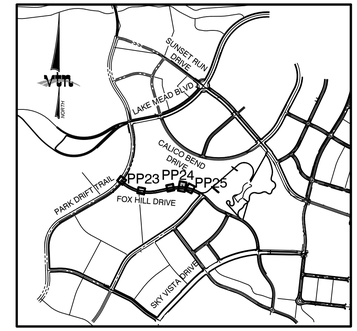




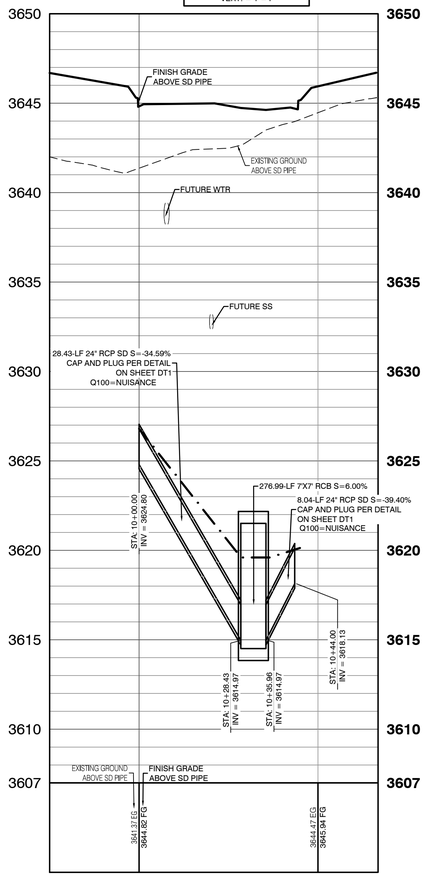






KEY MAP
N.T.S

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



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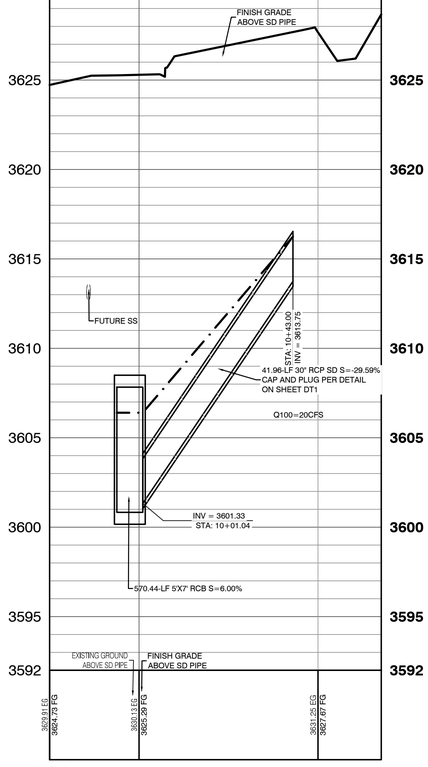

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
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2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

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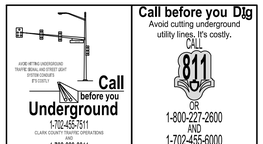

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REV	DATE	BY	REVISION

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A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
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LATERAL PROFILE 2
FOX HILL DRIVE

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: KTC	AUG 2019	SCALE:	HORIZ. 1"=20' VERT. 1"=4'
DESIGNED BY: DMO	MAR 2019		
CHECKED BY: BR	08/02/2019		
PROJECT NO: 7809			

PROFESSIONAL ENGINEER — STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
2/18/2020

SHEET
PP24
37 OF **46** SHEETS

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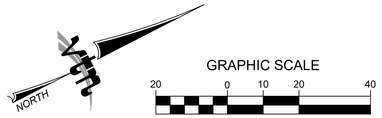
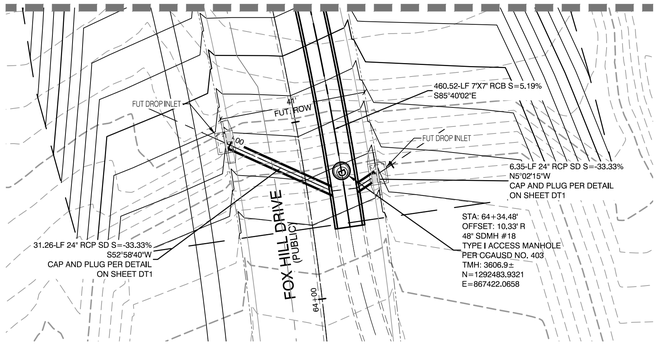


GRAPHIC SCALE

20 0 10 20 40

1" = 20'

SEE SHEET PP3
FOR CONTINUATION



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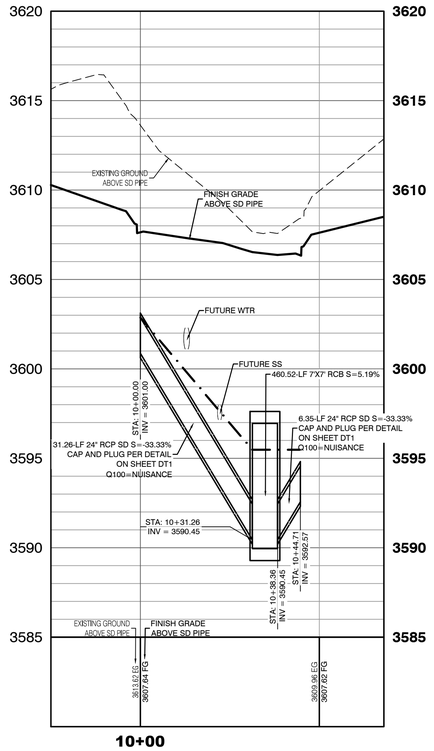

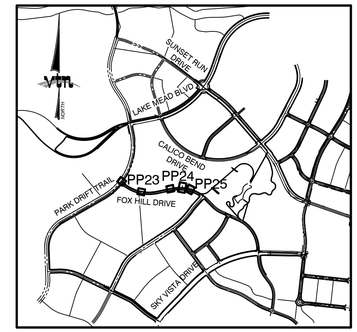

KEY MAP
N.T.S

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

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LINEAR UNIT: US SURVEY FOOT (FTUS)

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T21S,R59E,S03

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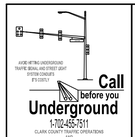

REV	DATE	BY	REVISION

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LATERAL PROFILE 3
FOX HILL DRIVE

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: KTC — AUG 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
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SCALE: HORIZ 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

2/18/2020

SHEET
PP25
38 OF **46** SHEETS

DRAWING NO.

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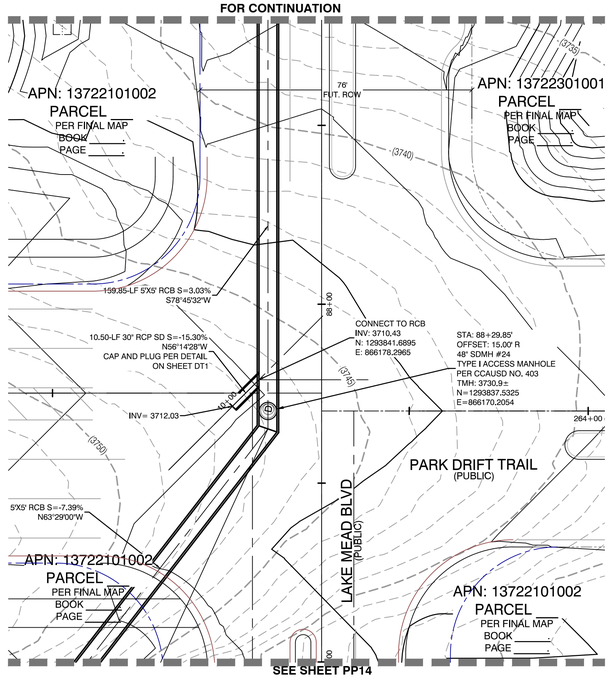

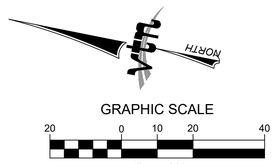

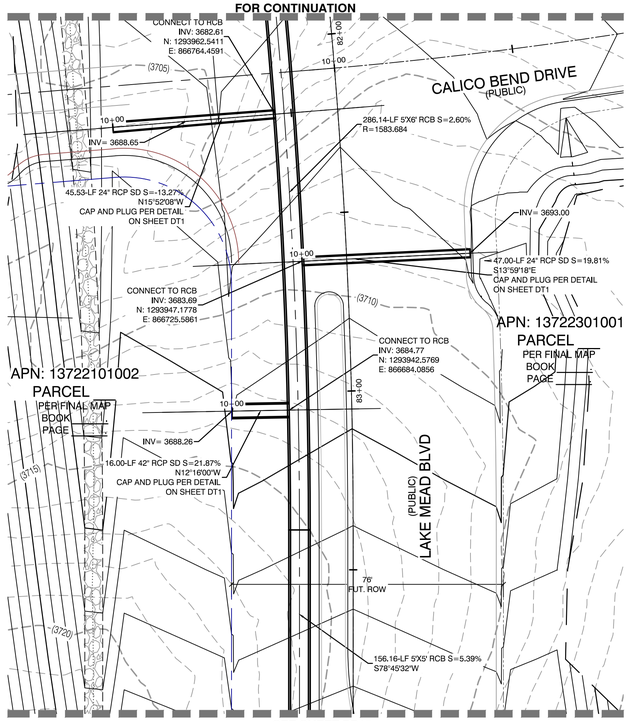

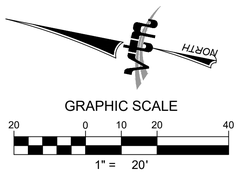

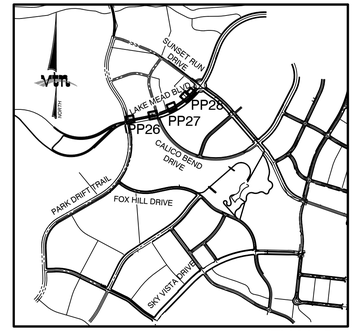

KEY MAP
N.T.S

PROFILE SCALES:

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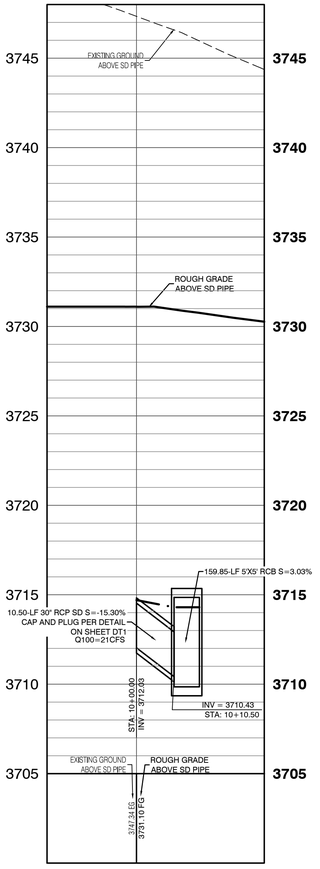

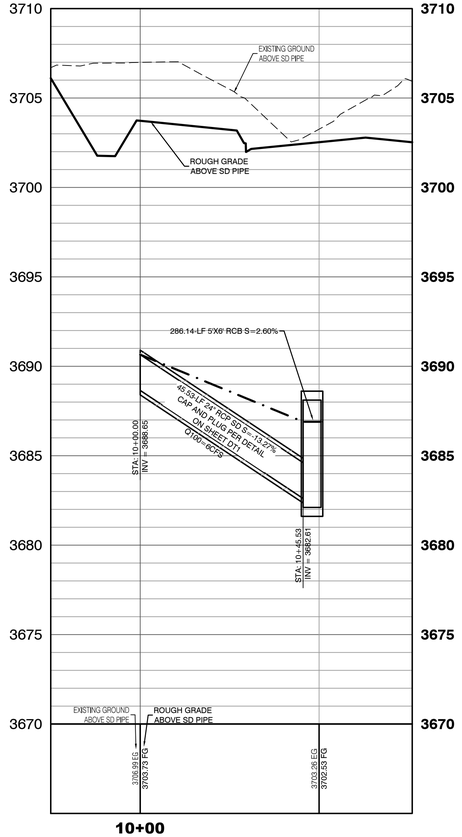

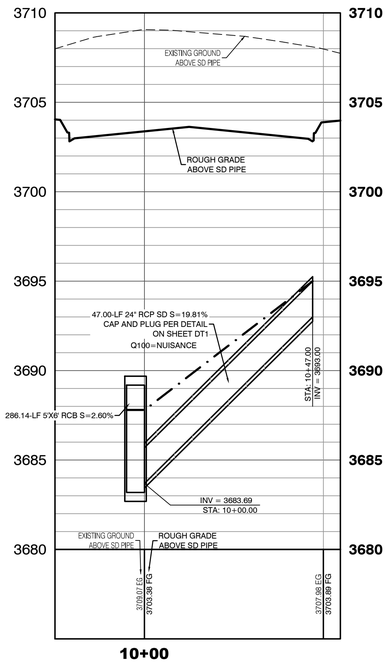

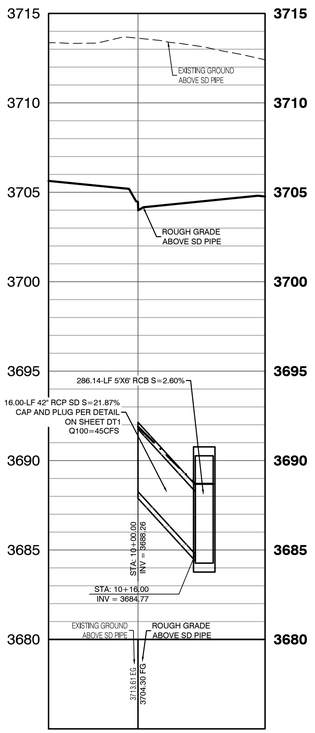

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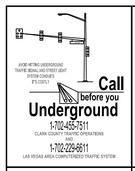

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CITY OF LAS VEGAS

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REV	DATE	BY	REVISION

LATERAL PROFILE 5
LAKE MEAD BLVD

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: KTC — AUG 2019
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PROFESSIONAL ENGINEER — STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
No. 15967
2/18/2020

SHEET
PP26
39 OF **46** SHEETS

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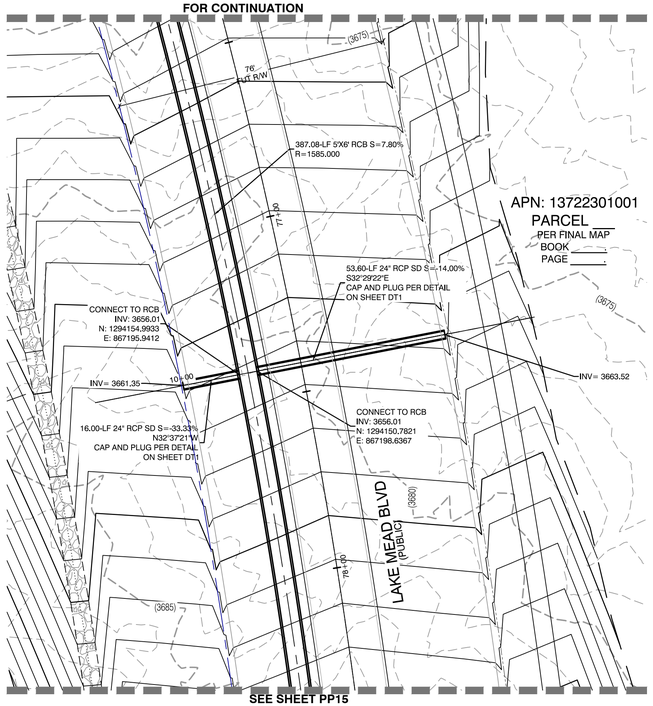
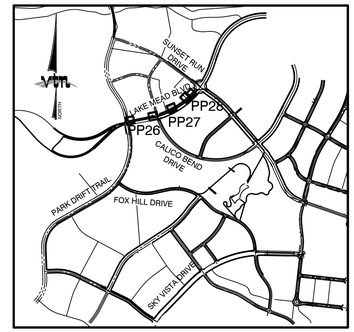


SEE SHEET PP15
FOR CONTINUATION

GRAPHIC SCALE

20 0 10 20 40

1" = 20'



KEY MAP
N.T.S

PROFILE SCALES:

HORIZ. = 1"=20'
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BASIS OF BEARING

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2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

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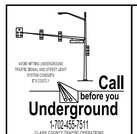

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REV	DATE	BY	REVISION

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10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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LATERAL PROFILE 6
LAKE MEAD BLVD

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: KTC	AUG 2019	SCALE:	HORIZ 1"=20'
DESIGNED BY: DMO	MAR 2019		VERT 1"=4'
CHECKED BY: BR	08/20/2019		
PROJECT NO: 7809			

2/18/2020

SHEET
PP27
40 OF **46** SHEETS

DRAWING NO.

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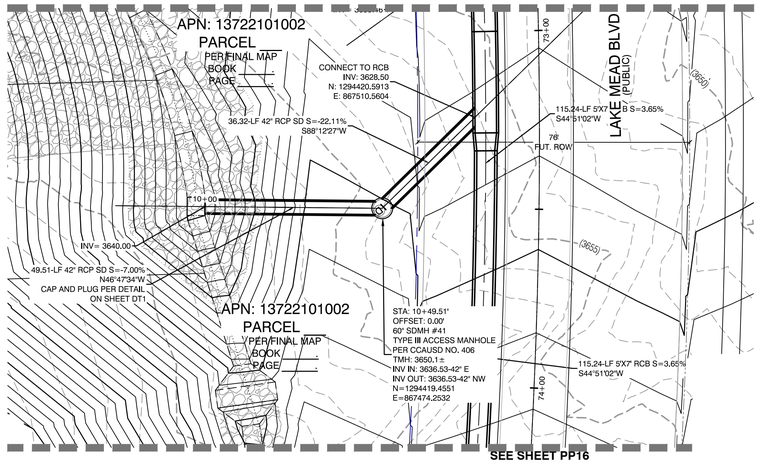
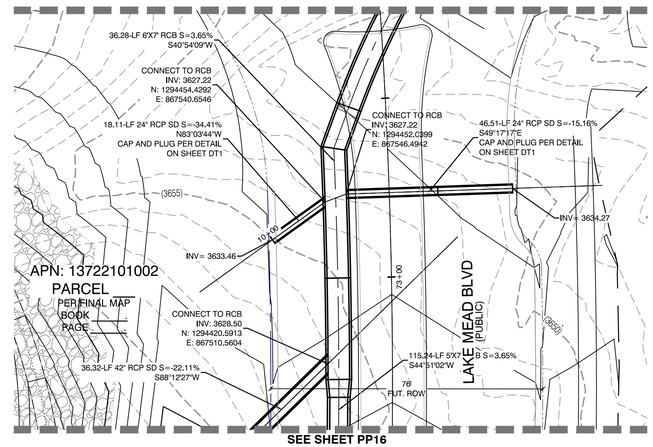
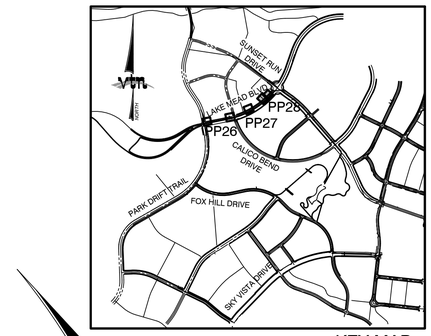
GRAPHIC SCALE

20 0 10 20 40

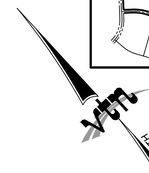
1" = 20'







KEY MAP
N.T.S



GRAPHIC SCALE

20 0 10 20 40

1" = 20'

PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'

PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
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BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
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T21S,R59E,S03

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REV	DATE	BY	REVISION

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10845 GRIFFITH PEAK DRIVE, SUITE 160
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702-791-4000

CITY OF LAS VEGAS

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LATERAL PROFILE 7
LAKE MEAD BLVD

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: KTC	AUG 2019	SCALE:	HORZ: 1"=20'
DESIGNED BY: DMO	MAR 2019		VERT: N/A
CHECKED BY: BR	08/02/2019		
PROJECT NO: 7809			

2/18/2020

SHEET
PP28
41 OF **46** SHEETS

DRAWING NO.

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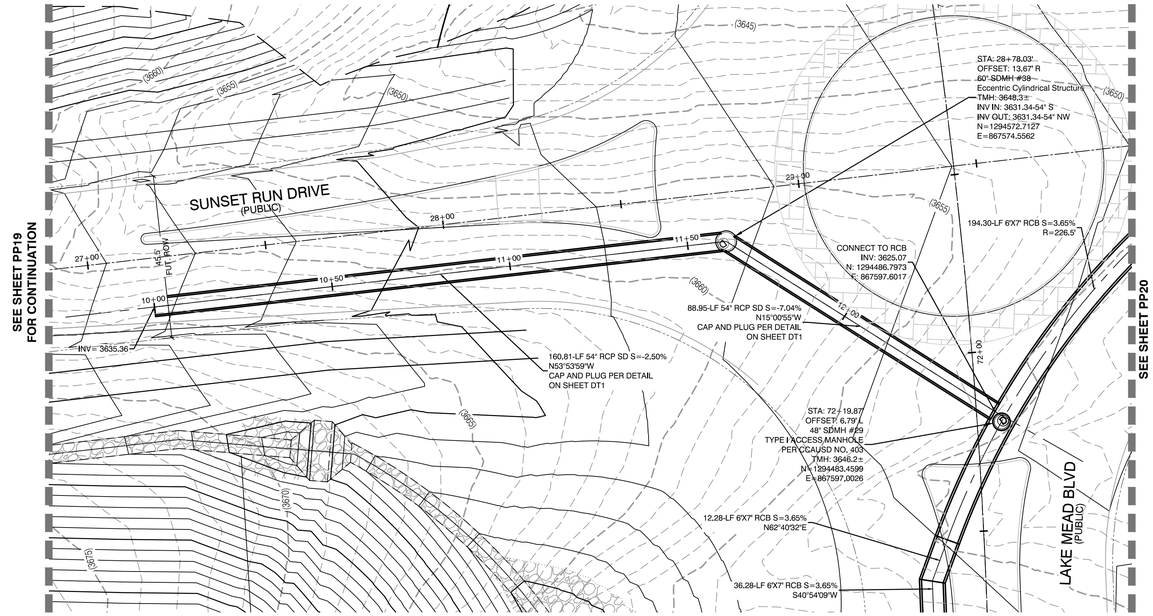

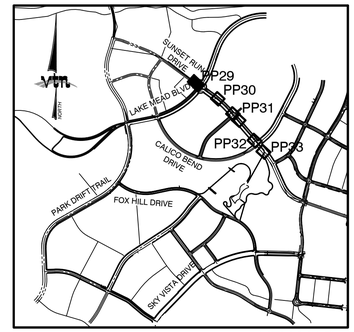

KEY MAP
N.T.S

GRAPHIC SCALE

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1" = 20'

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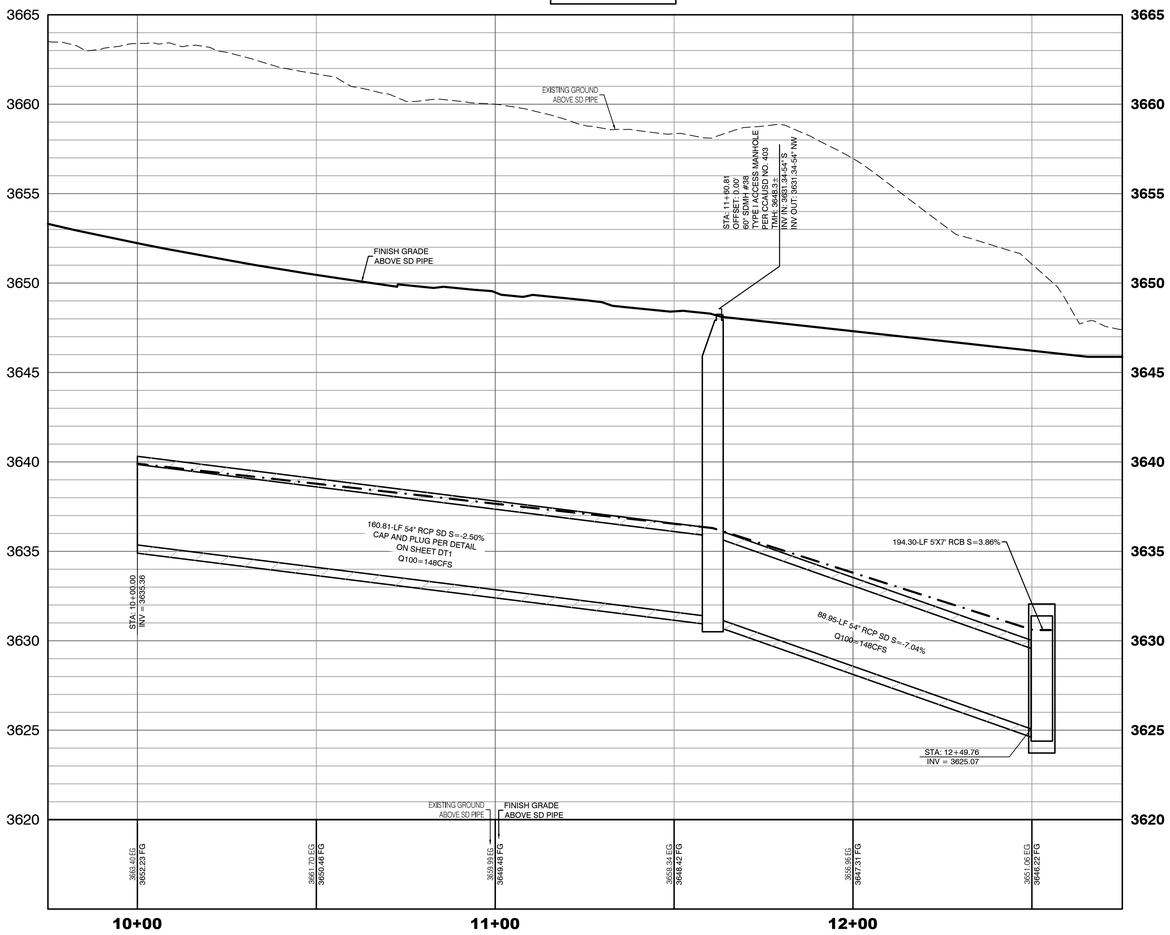

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

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REV	DATE	BY	REVISION

LATERAL PROFILE 8 SUNSET RUN DRIVE

SUMMERLIN WEST VILLAGE 25 GRAND PARK DETENTION BASIN INLET PIPE

DRAWN BY: KTC — AUG 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
PROJECT NO: 7809
SCALE: HORIZ 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

2/18/2020

SHEET
PP29
42 OF **46** SHEETS

DRAWING NO.

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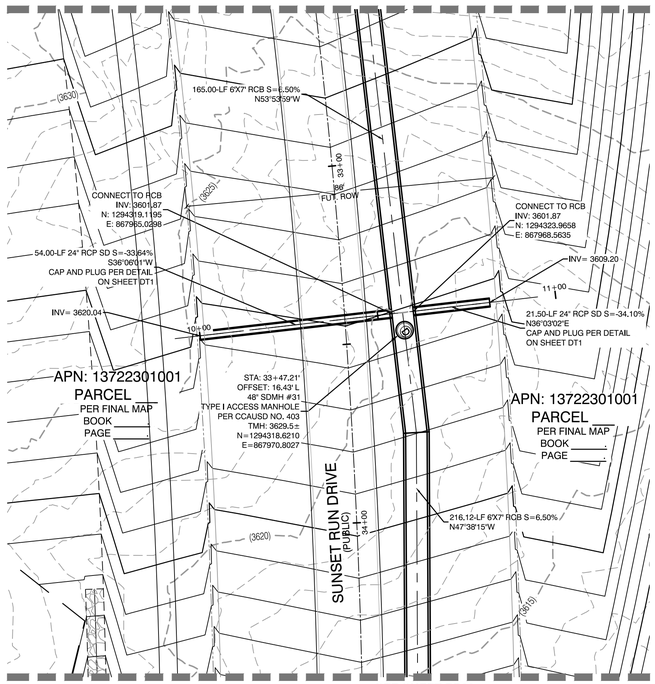
SEE SHEET PP20
FOR CONTINUATION



SEE SHEET PP20
FOR CONTINUATION

PROFILE SCALES:

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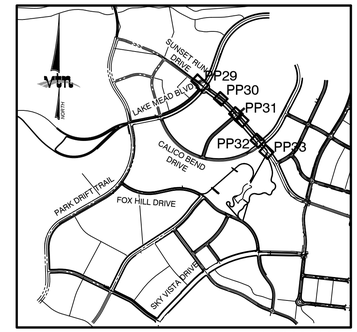

KEY MAP
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BASIS OF BEARING

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REV	DATE	BY	REVISION

LATERAL PROFILE 9
SUNSET RUN DRIVE

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: KTC — AUG 2019
DESIGNED BY: DMO — MAR 2019
CHECKED BY: BR — 08/02/2019
SCALE: HORZ. 1"=20' VERT. 1"=4"
PROJECT NO: 7809

2/18/2020

SHEET
PP30
43 OF **46** SHEETS

DRAWING NO.

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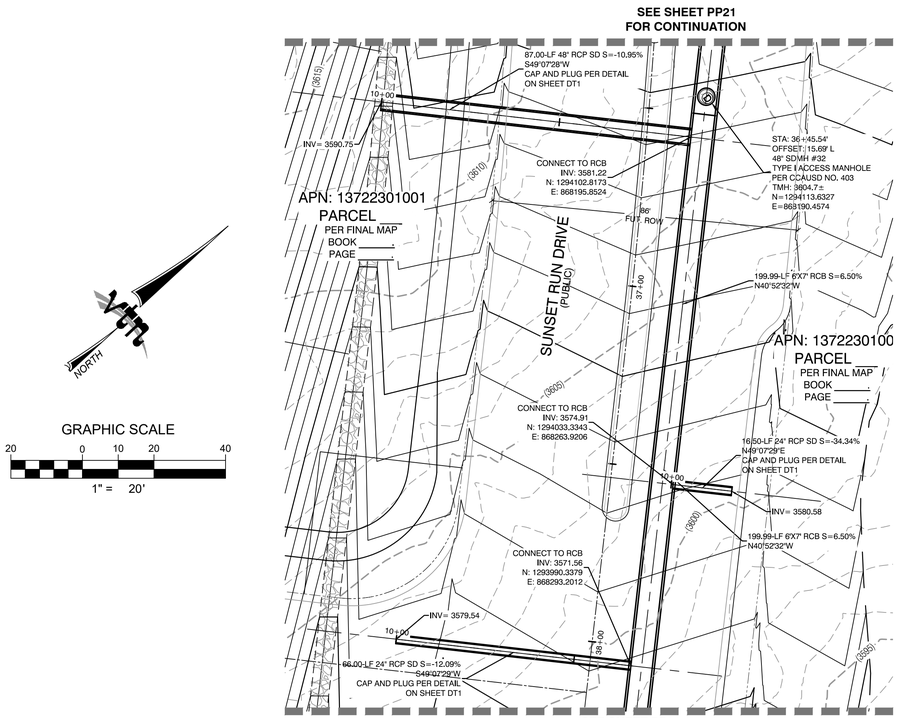

GRAPHIC SCALE

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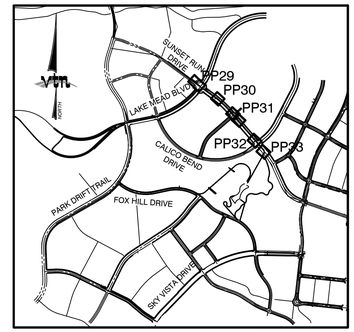
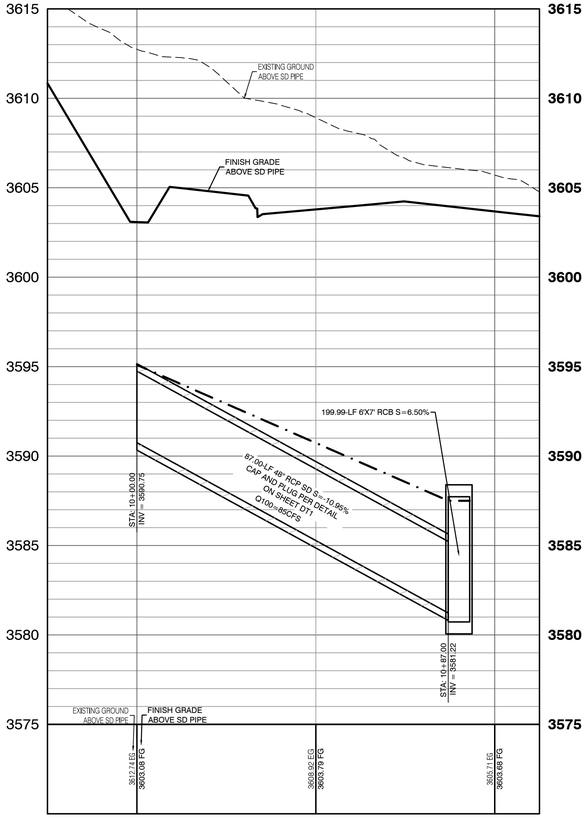


KEY MAP
N.T.S



PROFILE SCALES:

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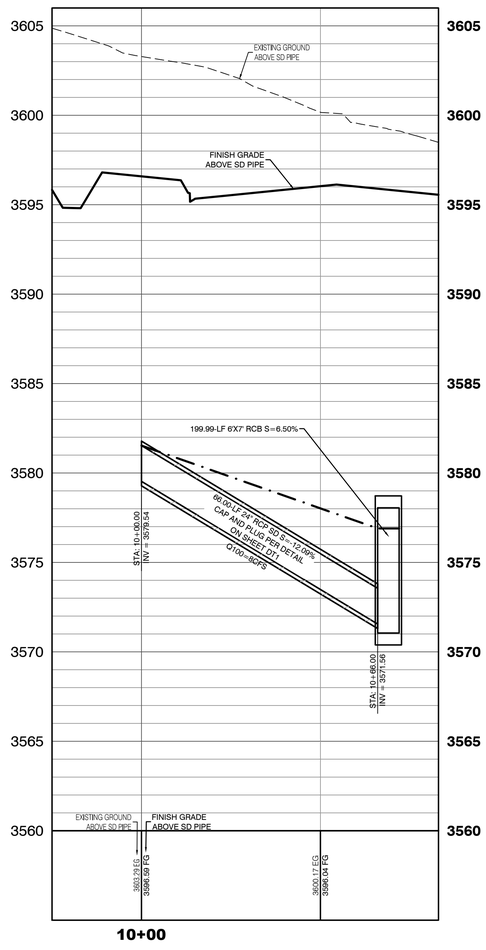

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LATERAL PROFILE 10 SUNSET RUN DRIVE

SUMMERLIN WEST VILLAGE 25 GRAND PARK DETENTION BASIN INLET PIPE

DRAWN BY: KTC	AUG 2019	SCALE:	HORIZ 1"=20' VERT 1"=4'
DESIGNED BY: DMO	MAR 2019		
CHECKED BY: BR	08/20/2019		
PROJECT NO: 7809			

PROFESSIONAL ENGINEER STATE OF NEVADA
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967

2/18/2020

SHEET
PP31
44 OF **46** SHEETS

DRAWING NO.

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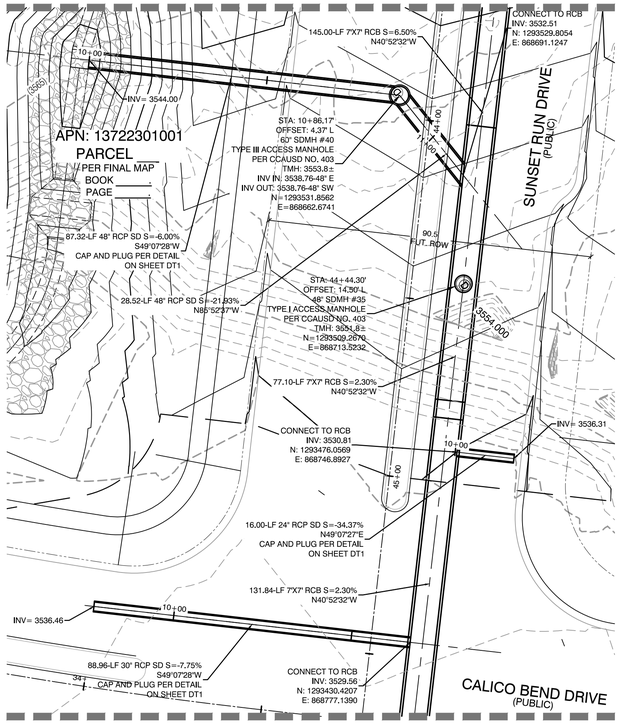
SEE SHEET PP22
FOR CONTINUATION

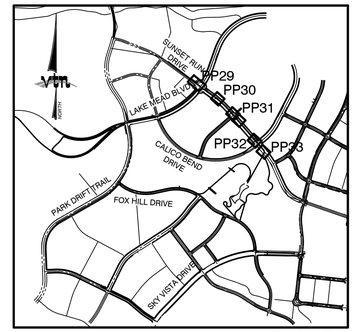


SEE SHEET PP22
FOR CONTINUATION

GRAPHIC SCALE

20 0 10 20 40

1" = 20'



KEY MAP
N.T.S

STORM DRAIN MANHOLE NOTE:

ALL STORM DRAIN MANHOLE RIMS SHOWN ON THESE PLANS ARE SET TO ROUGH GRADE ELEVATIONS. THE RIMS SHALL BE RAISED TO THE AC GRADE WHEN THE ROADWAYS ARE CONSTRUCTED.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
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2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008) NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN. T21S,R59E,S03

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

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Avoid cutting underground utility lines. It's costly.
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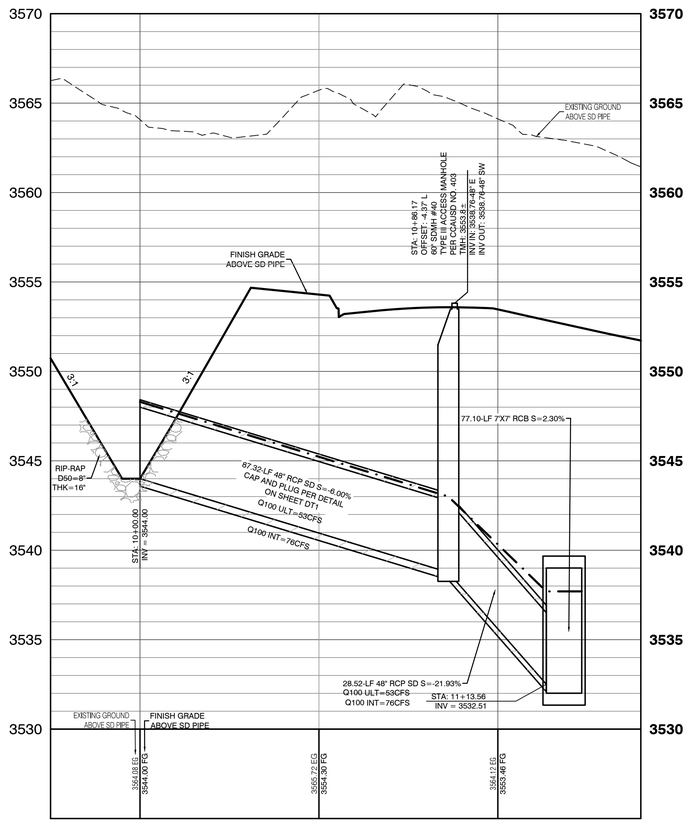
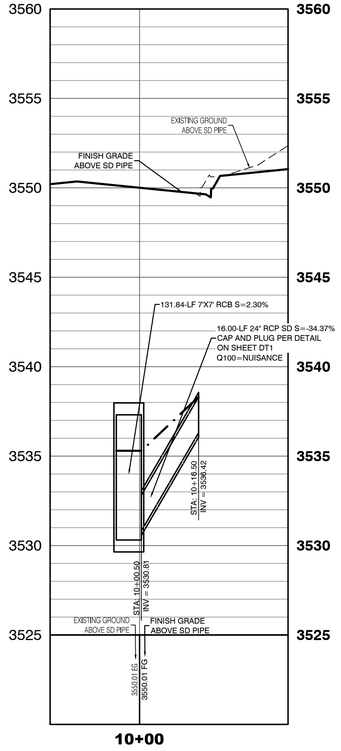
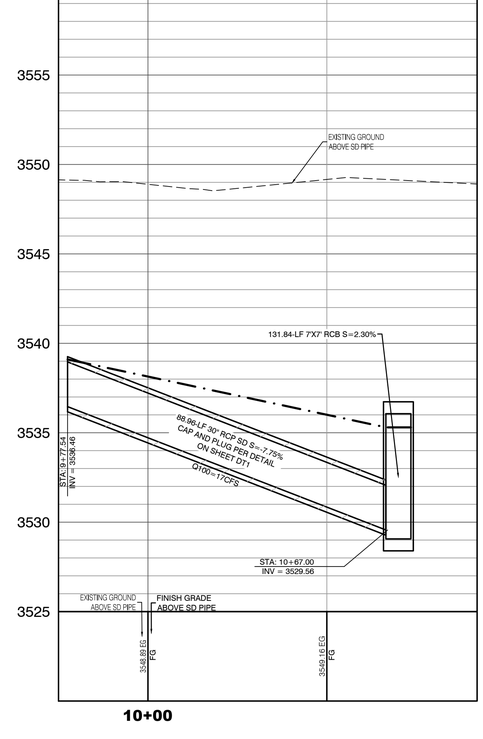
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS



PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'





REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

LATERAL PROFILE 11
SUNSET RUN DRIVE

SUMMERLIN WEST VILLAGE 25
GRAND PARK DETENTION BASIN
INLET PIPE

DRAWN BY: KTC	AUG 2019	SCALE:	HORIZ. 1"=20'
DESIGNED BY: DMO	MAR 2019		VERT. 1"=4'
CHECKED BY: BR	08/02/2019		
PROJECT NO: 7809			

PROFESSIONAL ENGINEER
BRIAN TROY RUIZ
EXP: 12/31/21
CIVIL
No. 15967
STATE OF NEVADA

2/18/2020

SHEET
PP32
45 OF **46** SHEETS

DRAWING NO.

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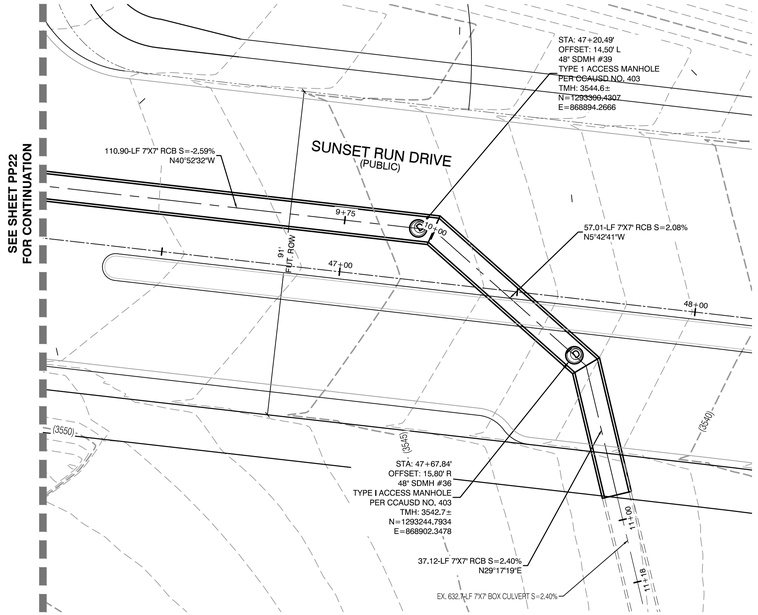

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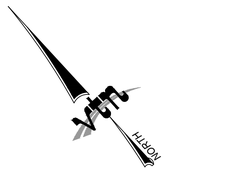

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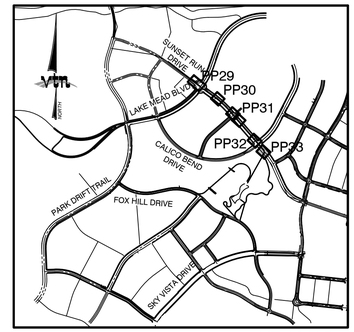

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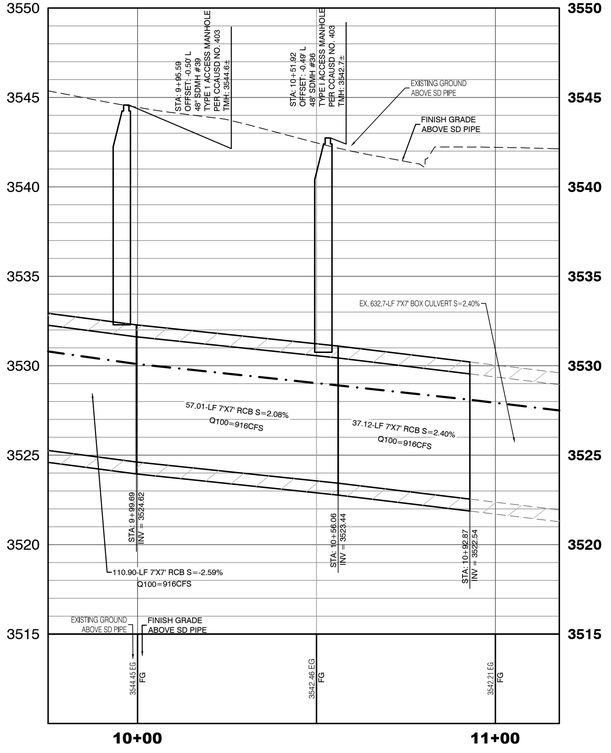

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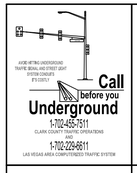

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2/18/2020

SHEET
PP33
46 OF **46** SHEETS

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