DS #: 5204

APN: 137-23-101-002

PROJECT: Summerlin West Village 22 - Kettle Bend Road
(Sunset Run Drive to Kastral Creek Road)

SUBMITTAL: 2nd

SCANNED BY/DATE:

CHECKED BY/DATE:

CITY OF LAS VEGAS NEVADA

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: February 5, 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: **Summerlin West Village 22 - Kettle Bend Road (Sunset Run Drive to Kestrel Creek Road)**			COPIES TO: VTN Nevada
Cross Streets:	Kettle Bend Road & Summerlin Parkway		The Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS05204B.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-23-101-002		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	10/15/2019	11/20/2019	Not Approved	$400.00	3611329: $400
2nd Submittal	1/14/2020	2/5/2020	See Comments Below	$400.00	3705772: $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 subject drainage study is premised on the developed *Sunset Run Drive (Summerlin Parkway Extension West Bound)* to the south. The subject improvement plans will not be approved prior to the execution of the construction bond of *Summerlin West V21 – Summerlin Parkway Extension* and the associated facilities.

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. The street and the associated storm drain facilities will eventually be transferred to the *City of Las Vegas*, the engineer/developer must coordinate with *City of Las Vegas Streets & Sanitation Department* for their review and approval prior to the final acceptance of the subject improvement plans.

4. The project proposes to build temporary drainage facilities including drainage berms/swales along the west side of the proposed *Kettle Bend Road* and a 20'-wide *Interim Berm*. Prior to final plan 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 of Las Vegas Flood Control* for approval. Once the drainage study is conditionally approved, the engineer should contact the *City's Land Development Section* (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 offsite berms / channels are no longer necessary and can be removed.

5. Drop inlets deeper than 10' require special structural design and structural calculations. Provide a soils report, structural calculations and specifications, two wet stamped structural sets, and a grading plan to the *City of Las Vegas Building & Safety Department* for processing. The engineer must provide a copy of *Building Department* approval of the structures to *Flood Control* prior to final acceptance of the drainage study.

6. All special structures and mainline storm drain connection require details and structural calculations to be reviewed by the *City of Las Vegas Building & Safety Department*. Approval by the *Building Department* must be obtained prior to the final approval of the subject drainage study.

7. **Previous Comments #9 & #10: Figure 6 (Existing Condition Map)**: The response stated that interim facilities have been proposed at the north boundary of offsite basin OFF3 in order to convey flow east instead of going north. However, the contours presented on the *Existing Condition Map* did not reflect such a facility. A mere callout of "Atkins Interim Flowline" is not acceptable. Coordinate with Atkins about the status of the proposed interim facility and incorporate on all pertinent drainage condition maps and improvement plans.

8. **Previous Comment #17: Sheet UT1**: Provide a note and connection detail between the new and existing 8'x8' regional box culvert.

   A structural connection detail has not been provided in the last submittal.

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/23
AREA K-23

TRANSACTION REPORT

FEB/06/2020/THU 06:00 PM

FAX(TX)

#	DATE	START T.	RECEIVER	COM.TIME	PAGE	TYPE/NOTE	FILE
001	FEB/06	05:59PM	7023622597	0:00:58	2	MEMORY OK ECM	5478

CITY OF LAS VEGAS **INTER-OFFICE MEMORANDUM**			**DATE:** **February 5, 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: **Summerlin West Village 22 - Kettle Bend Road (Sunset Run Drive to Kestrel Creek Road)**		**COPIES TO:** VTN Nevada
Cross Streets:	Kettle Bend Road & Summerlin Parkway		The Howard Hughes Company, LLC
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Parcel Number:	137-23-101-002		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 #
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1. The subject drainage study is premised on the developed *Sunset Run Drive (Summerlin Parkway Extension West Bound)* to the south. The subject improvement plans will not be approved prior to the execution of the construction bond of *Summerlin West V21 – Summerlin Parkway Extension* and the associated facilities.

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. The street and the associated storm drain facilities will eventually be transferred to the *City of Las Vegas*, the engineer/developer must coordinate with *City of Las Vegas Streets & Sanitation Department* for their review and approval prior to the final acceptance of the subject improvement plans.

Addendum #1 to the Technical Drainage Study for

Summerlin West Village 22
Kettle Bend Road

Las Vegas, Nevada

Prepared for:
Howard Hughes Company, LLC

Submitted to:
City of Las Vegas
Public Works

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Summerlin West Village 22 Kettle Bend Road Date: January 14, 2020

Location of Development: a) Descriptive (Cross Streets) North/South: Kettle Bend Road

East/West: Summerlin Parkway

b) Section: 23 Township: 20S Range: 59E

c) APN : 137-23-101-002

Name of Owner: The Howard Hughes Company, LLC

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: Aaron Yup **Telephone No.:** (702)-873-7550

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

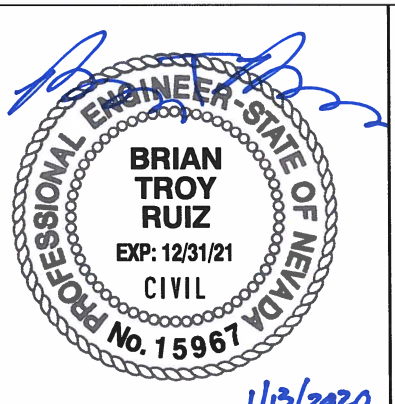
Firm: VTN Nevada

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		Roadway, Storm Drain, Grading

1. Total Owned Land Area: At Site: +/-17 Acres Being Developed/Disturbed: +/-17 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
5. Approximate upstream land area which drains to the subject site: +/- 376 acres
6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: SWPA MPU (DS4926)
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing 30" RCP southeast of the project in Carriage Hill Drive, Existing RCB in Desert Foothills Drive South of the project, Existing Western Beltway Channel east of the project
8. Briefly describe your proposed schedule for the subject project: As soon as possible



1/13/2020

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

Updated 05/01/2008

PROVIDING QUALITY PROFESSIONAL
SERVICE SINCE 1960

January 14, 2020

Albert Sung, P.E.
Flood Control Division
Department of Public Works
CITY OF LAS VEGAS
333 N. Rancho Blvd, 7th Floor
Las Vegas, NV 89106

Subject: **Addendum#1 to the Technical Drainage Study for Summerlin West Village 22 Kettle Bend Road**

Mr. Sung:

This letter certifies that all items on the **Addendum #1 to the Technical Drainage Study for Summerlin West Village 22 Kettle Bend Road** electronic submittal matches the paper version bound into the study.

Respectfully submitted,

Brian Ruiz, P.E.

ADDENDUM #1

TO THE TECHNICAL DRAINAGE STUDY

FOR

SUMMERLIN WEST VILLAGE 22

KETTLE BEND ROAD

SUNSET RUN DRIVE TO KESTREL CREEK ROAD

CLARK COUNTY, NEVADA

W.O. # 7861

Prepared for:
HOWARD HUGHES COMPANY, LLC.

Submitted to:
CITY OF LAS VEGAS
333 N. Rancho Drive
Las Vegas, Nevada 89106

PROVIDING QUALITY PROFESSIONAL
SERVICE SINCE 1960

January 13, 2020
W.O. #7861

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

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

SUBJECT: ADDENDUM #1 TO THE TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22 KETTLE BEND ROAD (SUNSET RUN DRIVE TO KESTREL CREEK ROAD)

Mr. Sung:

This *Addendum #1 to the Technical Drainage Study for Summerlin Village 22 Kettle Bend Road* is being submitted to the City of Las Vegas to address review comments dated November 22, 2019.

Comment #1

> **An Update to the Master Drainage Study for Summerlin West Village 22 recently has been submitted for review. The subject drainage study will not be approved prior to the final approval of the Update to the Master Drainage Study for Village 22.**

RESPONSE: Noted.

Comment #2

> **The subject drainage study is premised on the developed Sunset Run Drive (Summerlin Parkway Extension West Bound) to the south. The subject improvement plans will not be approved prior to the execution of the construction bond of Summerlin West V21 – Summerlin Parkway Extension and the associated facilities.**

RESPONSE: Noted.

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: Noted. A copy of the drainage study and all relevant addenda will be provided to CCRFCD upon approval by the CLV.

Comment #4

The project proposes to build temporary drainage facilities including drainage berms/swales along the west side of the proposed Kettle Bend Road and 20' – wide Interim Berm. Prior to final plan 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 of Las Vegas Flood Control for approval. Once the drainage study is conditionally approved, the engineer should contact the City's Land Development Section (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 offsite berms/channels are no longer necessary and can be removed.

RESPONSE: The engineer/developer agrees to complete a Maintenance & Liability agreement for the interim drainage improvements and to post a maintenance bond. The engineer/developer acknowledges that in order for the maintenance bond to be released in the future, a drainage letter will be required to justify that the interim facilities are no longer necessary and can be removed. Note that as stated in the previous TDS, the temporary 20' berm west of Kettle Bend in Interim Condition 1 will no longer be required after construction of the Grand Park Detention Basin.

Comment #5

The street and the associated storm drain facilities will eventually be transferred to the City of Las Vegas, the engineer/developer must coordinate with City of Las Vegas Streets & Sanitation Department for their review and approval prior to the final acceptance of the subject improvements plans.

RESPONSE: Noted. Storm drain facility design will be sent to the City of Las Vegas Streets & Sanitation Department for their review and approval.

Comment #6

Drop inlets deeper than 10' require special structural design and structural calculations. Provide a soils report, structural calculations and specifications, two wet stamped structural sets, and a grading plan to the City of Las Vegas Building & Safety Department for processing. The engineer must provide a copy of Building Department approval of the structures to Flood Control prior to final acceptance of the drainage study.

RESPONSE: See response to Comment #7.

Comment #7

All special structures and mainline storm drain connection require details and structural calculations to be reviewed by the City of Las Vegas Building & Safety Department. Approval by the Building Department must be obtained prior to the final approval of the subject drainage study.

RESPONSE: Noted. All structural details and calculations will be submitted to the City of Las Vegas Building & Safety Department. It is understood drainage approval will be conditioned for approval of the submitted structural details and calculations. Additionally, the structural details have been included with the grading plans for this drainage submittal.

Comment #8

Figure 6 (Existing Condition Map): Within offsite basin "OFF3", it appears that an existing channel swale running south to northeast at about 600' west of the basin's east boundary will in fact divert portion of OFF3's flow to the north. In other words, the totality of OFF3's flow till not convey through OFF5 as shown. Address and resolve in the next submittal.

RESPONSE: Additional temporary interim facilities have been proposed at the north boundary of offsite basin OFF3 in order to convey flow east towards basin OFF2 in Interim Condition 1 and basin OFF5 in Interim Condition 2 as originally assumed. Refer to Figures 7A and 7B for the location of the proposed berms. The proposed interim facilities are also designed to continue the channelization of the referenced Atkins flow REF**(461-cfs) along the drainage patterns assumed in the initial submittal. It is acknowledged that in the existing condition a portion of the flow of basin OFF3 is actually conveyed north in the existing swale and not through basin OFF5. The area of basin OFF3 now represents the interim drainage area west of Desert Foothills Avenue impacting the project site after interim drainage facilities are constructed.

Comment #9

Figure 6 (Existing Condition Map): Existing Condition HEC-1 Summary Table does not match the provided HEC-1 run. For example OFF3 lists 64 cfs however, the HEC-1 lists 226 cfs for the OFF3. The Q_{100} values of other basins in Figure 6 are all mixed up or wrong. Exercise better quality control in the next submittal.

RESPONSE: HEC-1 summary tables have been revised to match the HEC-1 outputs. A more thorough review has been performed for this submittal to avoid repeated major discrepancies.

Comment #10

Provide additional reference material that shows how the Atkins reference flow is getting to the locations shown in Interim Condition 1 and Interim Condition 2. The provided Atkins exhibit of the reference flow line does not show enough information, provide Atkins grading plans that show how and where that flow is to be channelized.

RESPONSE: Referenced Atkins plans have been provided in Appendix D to show the discharge point of their site into an existing wash. Additional Flowmaster sections along the existing wash have been provided in Appendix C to show the continued channelization of flow from the Atkins study to the project site. Refer to Figure 7A and Figure 7B for the locations of the added Flowmaster sections.

Comment #11

Provide inlet capture/capacity calculations for all proposed inlets.

RESPONSE: Drop inlet calculations for all proposed inlets have been provided in Appendix C.

Comment #12

Provide CN calculations for basins HH and NP-4. The CN basins calculation table seems being abruptly cutoff.

RESPONSE: A revised CN Basin calculation table has been provided to include all basins.

Comment #13

Provide precipitation map with basins overlaid for all scenarios including Existing, Interim Condition 1, Interim Condition 2, and Ultimate.

RESPONSE: Precipitation maps for each scenario have been provided in Appendix A.

Comment #14

Interim flowmaster cross sections SW5A, SW5B, and SW6 are not analyzed for the correct flows. For example per Figure 7A SW5A should be analyzed for 5 cfs however the flowmaster report input is 6 cfs. Double check all pertinent calculations in flowmaster accordingly.

RESPONSE: The calculations for sections SW5A, SW5B, and SW6 have been revised to the correct flows and have been provided in Appendix C.

Comment #15

Verify the slope for interim channel SW8. Flowmaster report input is 22.87% however the summary table in Figure 7B lists 25.14%. Double check all pertinent calculations accordingly.

RESPONSE: The Flowmaster calculation for section SW8 has been updated accordingly. Tables and reports have been revised to be consistent.

Comment #16

Velocities in Kestrel Creek Street to Gowan Tributary model are over 25 fps between stations 1645 and 1951. All locations with 100-year flow velocities greater than 25 fps require 1" sacrificial concrete in the bottom storm drain pipe for erosion.

RESPONSE: All locations where velocities exceed 25 fps have been labeled with 1" of sacrificial concrete on the relevant improvement sheets.

Comment #17

Sheet UT1: Provide a note and connection detail between the new and existing 8'x8' regional box culvert.

RESPONSE: Sheet UT1 has been revised to include a note for the connection between the existing and proposed 8'x8' RCB.

Comment #18

Sheet UT 44: The plan and the profile did not clearly show how a 30" RCP round pipe connect to a 6'x6' square shape box culvert. It appears that a special junction structure is required. Address in the next submittal.

RESPONSE: A structural detail has been provided for the 30" RCP connection into the 6'x6' RCB within this submittal.

Comment #19

In all interim sump pits, provide barricade for security.

RESPONSE: Barricades have been provided in all interim sump pits.

Comment #20

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.

RESPONSE: A note stating all temporary sumps are privately owned and maintained by the Howard Hughes Company has been added to the grading sheets.

Comment #21

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

RESPONSE: A note has been added on the applicable sheets to identify construction of all storm drain drop inlets per USDCCA Drawing No. 421.

Comment #22

Revise all drop inlets to Type "C-D" Modified Drop Inlet per Standard Drawing 412.1 or Neenah Precast inlets. Revise all pertinent construction notes and callouts accordingly.

RESPONSE: All proposed drop inlets have been designed as Type "C-D" Modified Drop Inlets per Standard Drawing 412.1.

Additional Note #1
Hydraulic WSPG model "KBQR.WSW" has been revised to analyze the 36"RCP in Fleet Wing Avenue instead of the 36" RCP in Kettle Bend Road in order to model the system with the greatest flow magnitudes. Hydraulic WSPG model "KBGW.WSW" was updated to reference tailwater information from the Technical Drainage Study for Summerlin West Village 22 Beltway Sewer to be submitted soon. Pertinent hydraulic calculations have been updated accordingly and have been provided in Appendix C.

Additional Note #2
To be consistent with updates in the Master Plan, the basin for parcel NP-4 has been renamed to NP-3.

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



Aaron Yup, E.I.

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: November 22, 2019
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Zoning Action:	N/A			
FEMA Flood Zone	YES	NO **X**		
Proposed Storm Drain	YES **X**	NO		

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10. Provide additional reference material that shows how the Atkins reference flow is getting to the locations shown in Interim Condition 1 and Interim Condition 2. The provided Atkins exhibit of the reference flow line does not show enough information, provide Atkins grading plans that show how and where that flow is to be channelized.

11. Provide inlet capture/capacity calculations for all proposed inlets.

12. Provide CN calculations for basins HH and NP-4. The CN basins calculation table seems being abruptly cutoff.

13. Provide precipitation map with basins overlaid for all scenarios including *Existing*, *Interim Condition 1*, *Interim Condition 2*, and *Ultimate*.

14. Interim flowmaster cross sections SW5A, SW5B, and SW6 are not analyzed for the correct flows. For example per Figure 7A SW5A should be analyzed for 5 cfs however the flowmaster report input is 6 cfs. Double check all pertinent calculations in Flowmaster accordingly.

15. Verify the slope for interim channel SW8. Flowmaster report input is 22.87% however the summary table in Figure 7B lists 25.14%. Double check all pertinent calculations accordingly.

16. Velocities in *Krestel Creek Street* to Gowan Tributary model are over 25 fps between stations 1645 and 1951. All locations with 100-year flow velocities greater than 25 fps require 1" sacrificial concrete in the bottom storm drain pipe for erosion.
17. **Sheet UT1**: Provide a note and connection detail between the new and existing 8'x8' regional box culvert.
18. **Sheet UT44**: The plan and the profile did not clearly show how a 30"-RCP round pipe connect to a 6'x6' square shape box culvert. It appears that a special junction structure is required. Address in the next submittal.
19. In all interim sump pits, provide barricade for security.
20. 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.
21. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).
22. Revise all drop inlets to Type "C-D" Modified Drop Inlet per Standard Drawing 412.1 or Neenah Pre-cast inlets. Revise all pertinent construction notes and callouts accordingly.

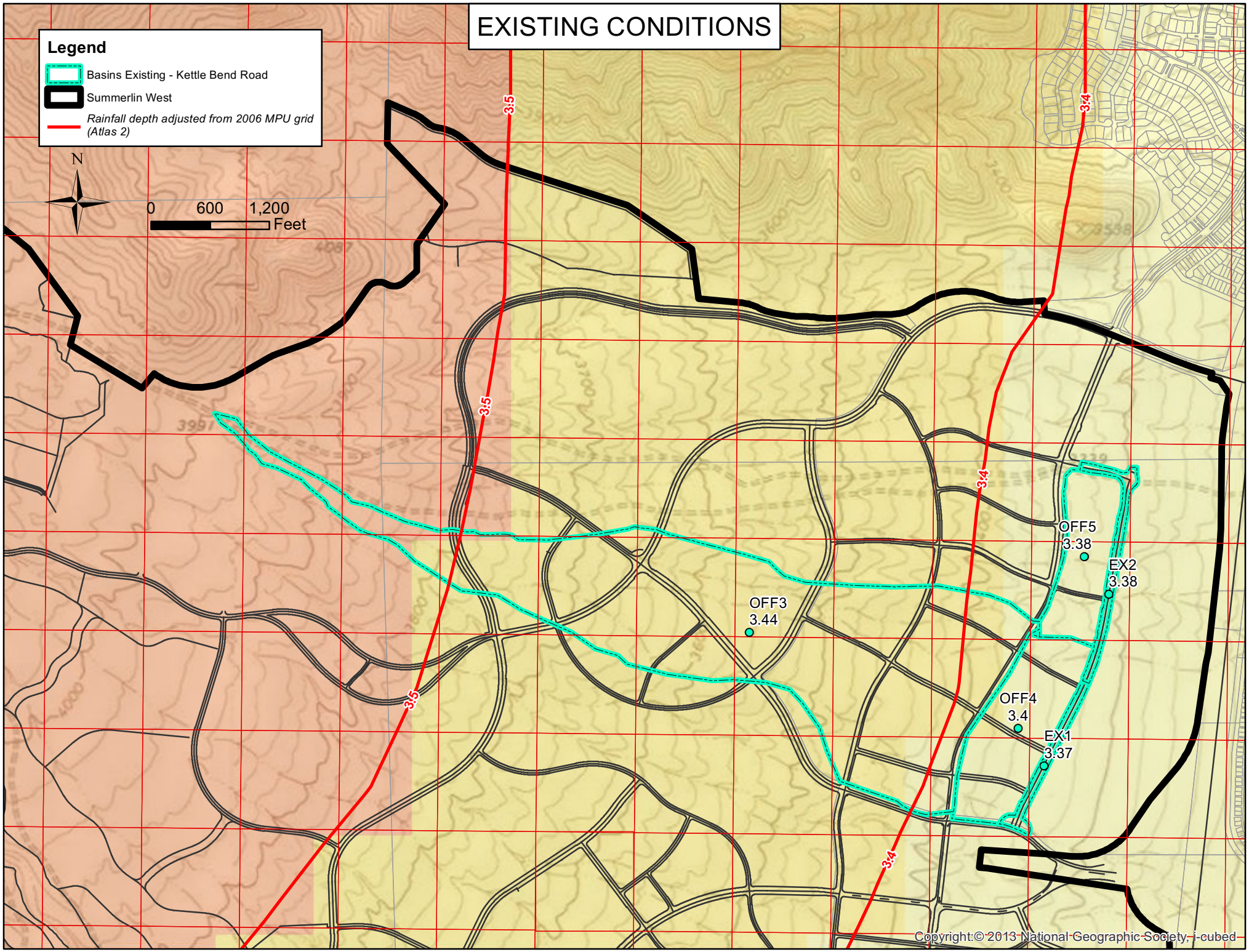
NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on 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/23
AREA K-23

APPENDIX

APPENDIX A
FIGURES



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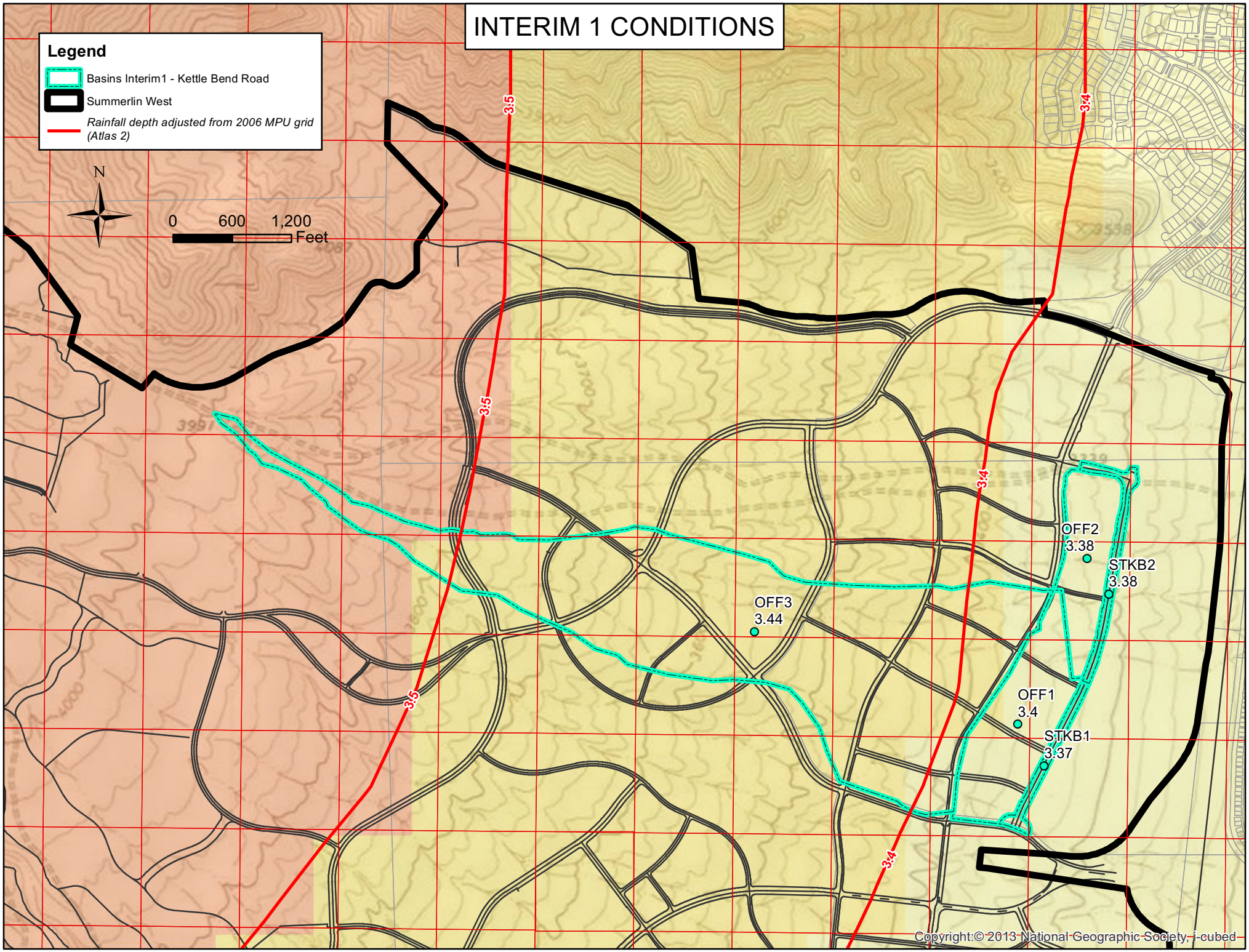

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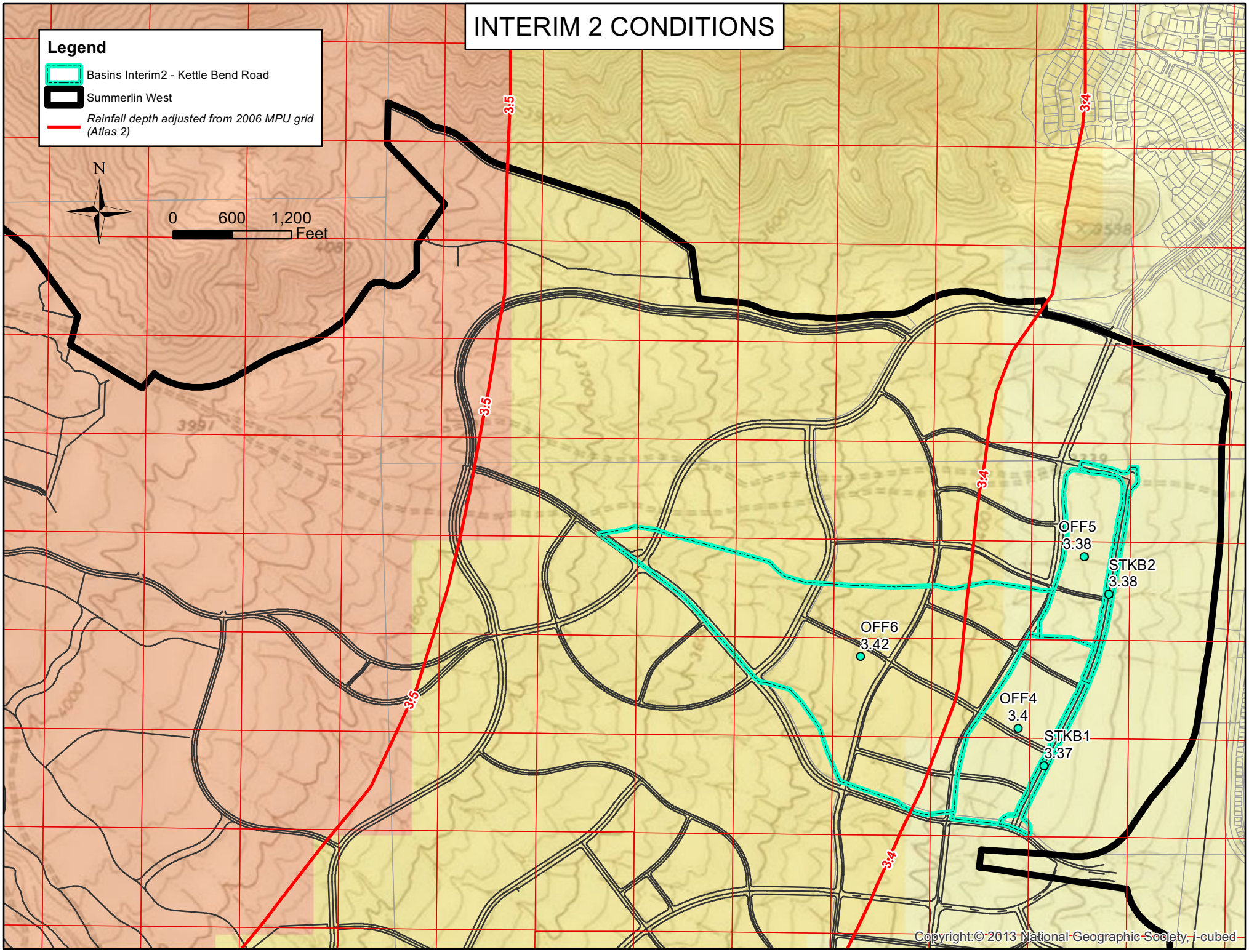

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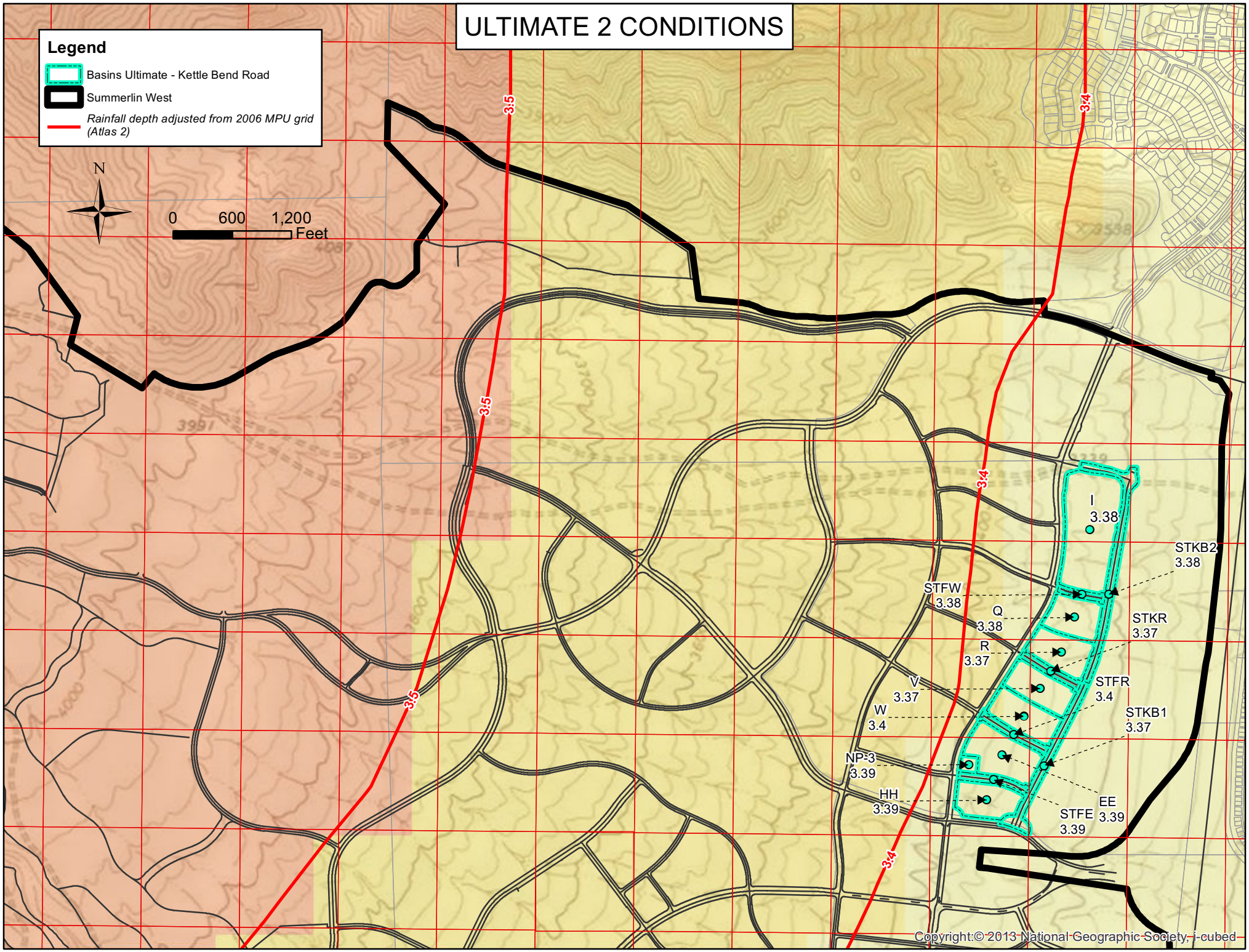

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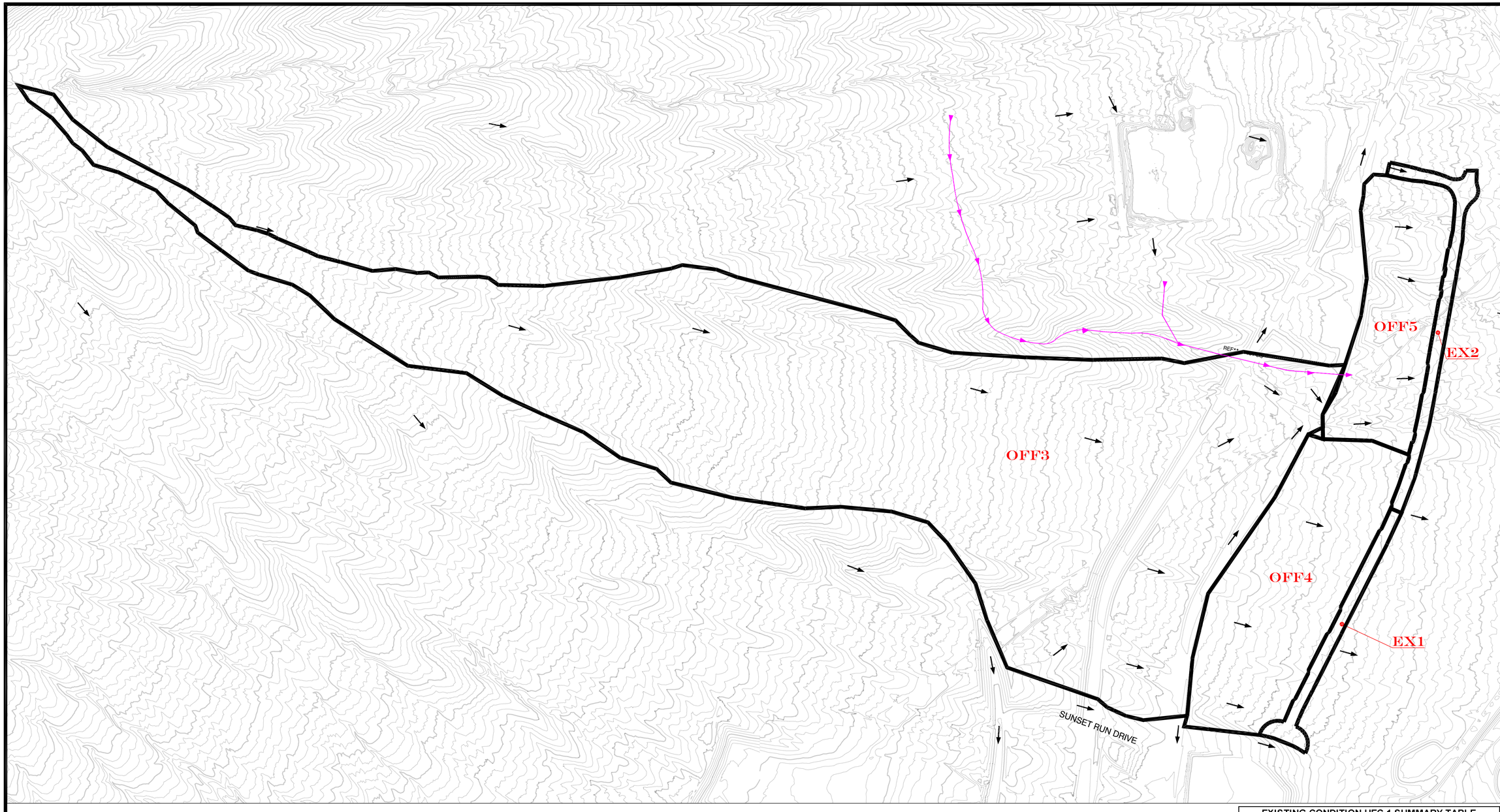

LEGEND

- BASIN BOUNDARY
- ST7 BASIN DESIGNATION
- FLOW ARROW
- ATKINS INTERIM FLOWLINE
- LOCAL STORM DRAIN ALIGNMENT
- CCRFCD STORM DRAIN ALIGNMENT

NORTH

GRAPHIC SCALE

300 0 150 300 600

1" = 300'

EXISTING CONDITION HEC-1 SUMMARY TABLE		
BASIN ID	AREA (ac)	Q100 (CFS)
OFF3	196.33	233
OFF4	33.12	64
OFF5	21.09	62
EX1	3.58	7
EX2	5.02	14
REF**	-	461

**Referenced from Kettle Ridge Drive Technical Drainage Study by Atkins

REV	DATE	BY	REVISION

####

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####

EXISTING CONDITION MAP
FIGURE 6

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD

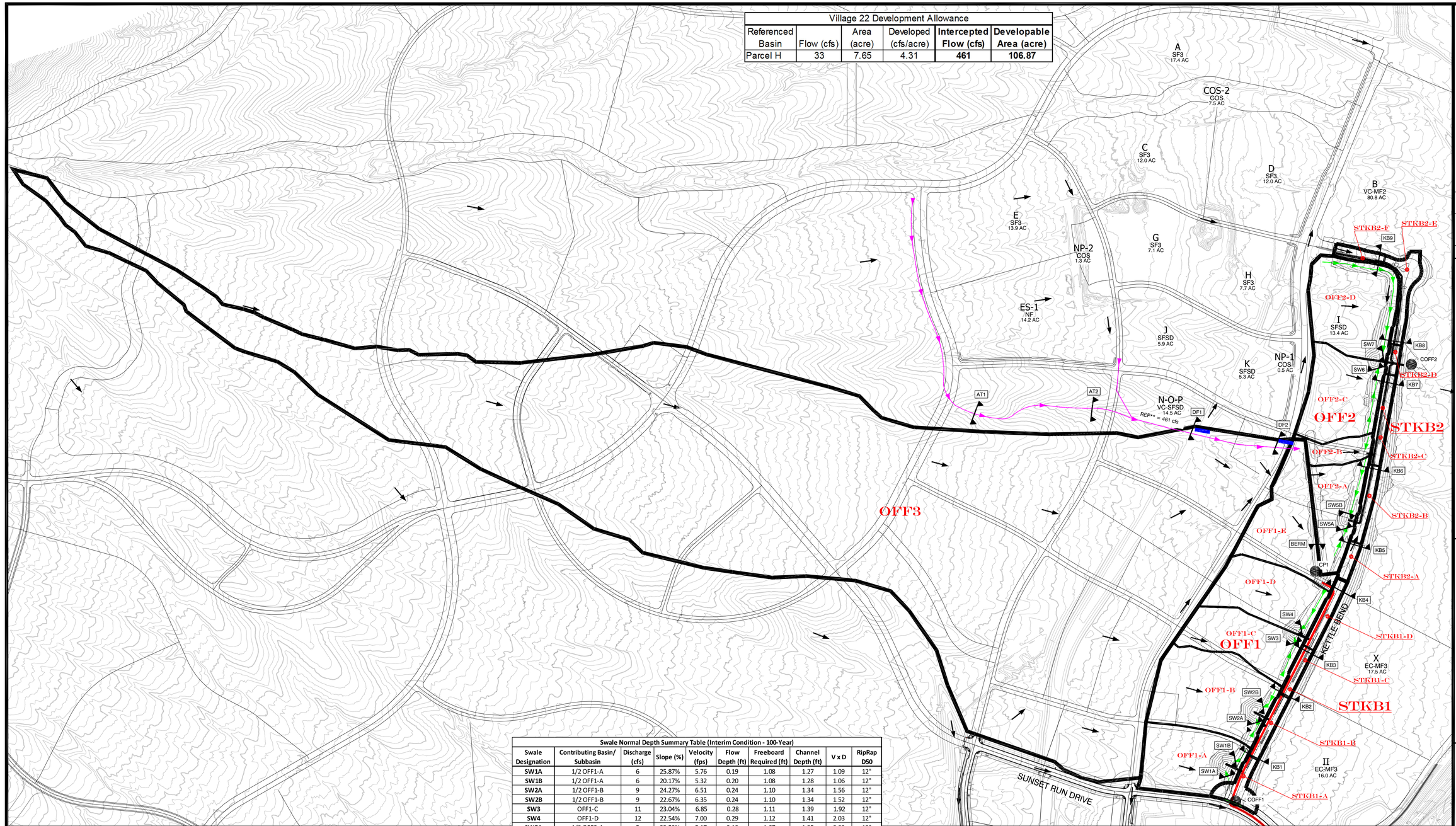
DRAWN BY: ACY 9/12/19
DESIGNED BY: #### ####
CHECKED BY:
PROJECT NO: 7981-5.2
SCALE: 1" = 300' HORIZ. 1" = 300' VERT.

SHEET
FIG 6
########HEETS

DRAWING NO.
####

H:\7981\Kettle Bend Road\Drainage\2_ADD1\A_Figures\Figure 6 - Existing Condition Map.dwg, Jan 14, 2020

Village 22 Development Allowance					
Referenced Basin	Flow (cfs)	Area (acre)	Developed (cfs/acre)	**Intercepted Flow (cfs)**	**Developable Area (acre)**
Parcel H	33	7.65	4.31	**461**	**106.87**



Swale Normal Depth Summary Table (Interim Condition - 100-Year)									
Swale Designation	**Contributing Basin/ Subbasin**	**Discharge (cfs)**	**Slope (%)**	**Velocity (fps)**	**Flow Depth (ft)**	**Freeboard Required (ft)**	**Channel Depth (ft)**	**V x D**	**RipRap D50**
SW1A	1/2 OFF1-A	6	25.87%	5.76	0.19	1.08	1.27	1.09	12"
SW1B	1/2 OFF1-A	6	20.17%	5.32	0.20	1.08	1.28	1.06	12"
SW2A	1/2 OFF1-B	9	24.27%	6.51	0.24	1.10	1.34	1.56	12"
SW2B	1/2 OFF1-B	9	22.67%	6.35	0.24	1.10	1.34	1.52	12"
SW3	OFF1-C	11	23.04%	6.85	0.28	1.11	1.39	1.92	12"
SW4	OFF1-D	12	22.54%	7.00	0.29	1.12	1.41	2.03	12"
SW5A	1/3 OFF2-A	5	22.59%	5.17	0.18	1.07	1.25	0.93	12"
SW5B	2/3 OFF2-A	9	1.00%	3.07	0.46	1.00	1.46	1.41	N/A
SW6	OFF2-C	18	25.14%	8.31	0.36	1.15	1.51	2.99	12"
SW7	OFF2-D	23	21.85%	8.59	0.43	1.16	1.59	3.69	12"
BERM	CP1	707	1.00%	7.64	4.78	1.32	6.10	36.52	8"
DF1	OFF3+REF**	694	0.90%	7.58	2.42	1.25	3.67	18.34	8"
DF2	OFF3+REF**	694	2.40%	9.63	1.90	1.30	3.20	18.30	8"
AT1	REF**	461	9.86%	18.28	1.78	Existing	1.78	32.54	N/A
AT2	REF**	461	7.58%	17.96	1.95	Existing	1.95	35.02	N/A

NOTE: Velocities under 5-fps are non erosive, no erosion protection required.

Street Section Normal Depth Summary Table (100-year)						
Cross Section Designation	**Contributing Basin/ Subbasin**	**Discharge (cfs)**	**Slope (%)**	**Velocity (fps)**	**Flow Depth (ft)**	**V x D**
KB1	STKB1-A	4	3.00%	3.33	0.31	1.03
KB2	STKB1-B	3	0.70%	1.74	0.35	0.61
KB3	STKB1-C	2	0.70%	1.62	0.31	0.50
KB4	STKB1-D	3	0.70%	1.74	0.35	0.61
KB5	STKB2-A	2	3.60%	3.50	0.25	0.88
KB6	STKB2-B	3	0.70%	1.74	0.35	0.61
KB7	STKB2-C	4	0.70%	1.83	0.37	0.68
KB8	STKB2-E	5	0.70%	1.93	0.39	0.75
KB9	STKB2-F	2	10.20%	5.47	0.24	1.31

LEGEND

- BASIN BOUNDARY
- ST7 BASIN DESIGNATION
- FLOW ARROW
- ATKINS INTERIM FLOWLINE
- LOCAL STORM DRAIN ALIGNMENT
- CCRFCD STORM DRAIN ALIGNMENT
- SUBBASIN BOUNDARY
- FLOW CONCENTRATION POINT
- INTERIM CHANNEL FLOWLINE
- PROPOSED BERM LOCATIONS

NORTH

GRAPHIC SCALE

300 0 150 300 600

1" = 300'

INTERIM CONDITION 1 HEC-1 SUMMARY TABLE		
BASIN ID	**AREA (ac)**	**Q100 (CFS)**
REF**	-	461
OFF1	33.73	66
STKB1	3.58	13
OFF3	196.33	233
CP1 (OFF3 + OFF1E + REF**)	-	707
COFF1 (OFF1A-D + STKB1 + CP1)	-	773
OFF2	20.63	59
STBK2	5.02	18
COFF2	-	76

**Referenced from Kettle Ridge Drive Technical Drainage Study by Atkins

PRORATED ONSITE SUBBASIN SUMMARY INTERIM CONDITION			
BASIN	**BASIN AREA**		**Q100**
STKB1	3.58		13
STKB2	5.02		18
SUBBASIN	**SUB AREA**	**SUB AREA**	**Q100**
STKB1-A	1.16	32.4%	4
STKB1-B	0.84	23.5%	3
STKB1-C	0.66	18.4%	2
STKB1-D	0.92	25.7%	3
TOTAL	**3.58**	**100.0%**	**13**
STKB2-A	0.49	9.8%	2
STKB2-B	0.95	18.9%	3
STKB2-C	1.13	22.5%	4
STKB2-D	0.37	7.4%	1
STKB2-E	1.48	29.5%	5
STKB2-F	0.60	12.0%	2
TOTAL	**5.02**	**100.0%**	**18**

PRORATED OFFSITE SUBBASIN SUMMARY INTERIM CONDITION 1			
BASIN	**BASIN AREA**		**Q100**
OFF1	33.73		66
OFF2	20.63		59
SUBBASIN	**SUB AREA**	**SUB AREA**	**Q100**
OFF1-A	6.21	18.4%	12
OFF1-B	9.16	27.2%	18
OFF1-C	5.49	16.3%	11
OFF1-D	6.05	17.9%	12
OFF1-E	6.82	20.2%	13
TOTAL	**33.73**	**100.0%**	**66**
OFF2-A	4.74	23.0%	14
OFF2-B	1.52	7.4%	4
OFF2-C	6.44	31.2%	18
OFF2-D	7.93	38.4%	23
TOTAL	**20.63**	**100.0%**	**59**

REV	DATE	BY	REVISION

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INTERIM CONDITION 1 MAP
FIGURE 7A

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD

DRAWN BY: NBRACY
DESIGNED BY:
CHECKED BY:
PROJECT NO: 7861-5.2
9/12/19
SCALE: 1" = 300' HORIZ. 1" = 300' VERT.

SHEET
FIG 7A
#######SHEETS
DRAWING NO.
####

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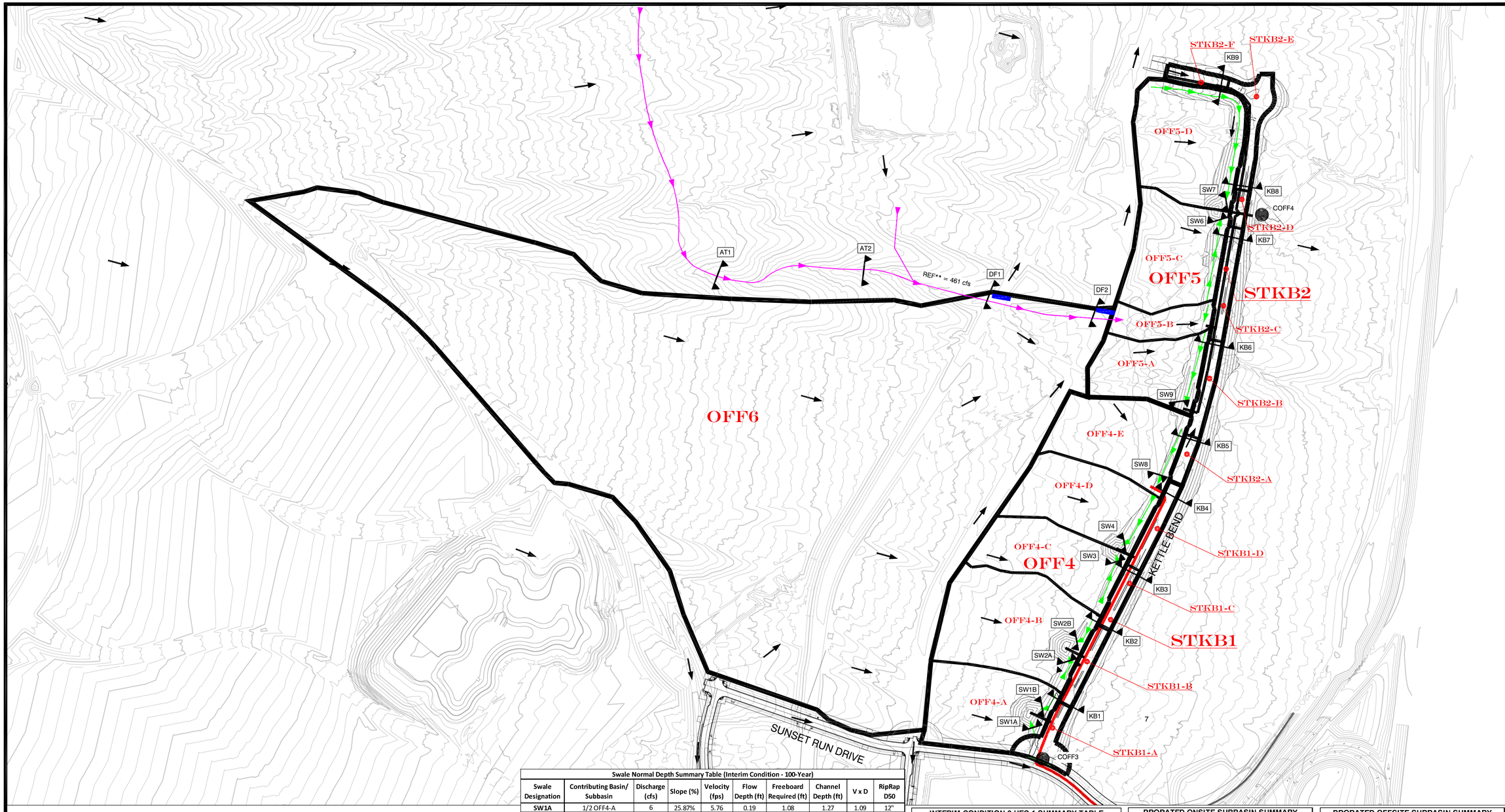

LEGEND

- BASIN BOUNDARY
- ST7 BASIN DESIGNATION
- FLOW ARROW
- ATKINS INTERIM FLOWLINE
- LOCAL STORM DRAIN ALIGNMENT
- CCRFCD STORM DRAIN ALIGNMENT
- SUBBASIN BOUNDARY
- FLOW CONCENTRATION POINT
- INTERIM CHANNEL FLOWLINE
- PROPOSED BERM LOCATIONS

NORTH

GRAPHIC SCALE

250 0 125 250 500

1" = 250'

Swale Normal Depth Summary Table (Interim Condition - 100-Year)

Swale Designation	Contributing Basin/ Subbasin	Discharge (cfs)	Slope (%)	Velocity (fps)	Flow Depth (ft)	Freeboard Required (ft)	Channel Depth (ft)	V x D	RipRap D50
SW1A	1/2 OFF4-A	6	25.87%	5.76	0.19	1.08	1.27	1.09	12"
SW1B	1/2 OFF4-A	6	20.17%	5.32	0.20	1.08	1.28	1.06	12"
SW2A	1/2 OFF4-B	9	24.27%	6.51	0.24	1.10	1.34	1.56	12"
SW2B	1/2 OFF4-B	9	22.67%	6.35	0.24	1.10	1.34	1.52	12"
SW3	OFF4-C	11	23.04%	6.85	0.28	1.11	1.39	1.92	12"
SW4	OFF4-D	12	22.54%	7.00	0.29	1.12	1.41	2.03	12"
SW6	OFF5-C	18	25.14%	8.31	0.36	1.15	1.51	2.99	12"
SW7	OFF5-D	23	21.85%	8.59	0.43	1.16	1.59	3.69	12"
SW8	OFF4-E	12	20.74%	6.82	0.30	1.11	1.41	2.05	12"
SW9	OFF5-A+B + REF**	480	1.00%	6.54	4.18	1.26	5.44	27.34	12"
DF1	OFF3+REF**	694	0.90%	7.58	2.42	1.25	3.67	18.34	8"
DF2	OFF3+REF**	694	2.40%	9.63	1.90	1.30	3.20	18.30	8"
AT1	REF**	461	9.86%	18.28	1.78	Existing	1.78	32.54	N/A
AT2	REF**	461	7.58%	17.96	1.95	Existing	1.95	35.02	N/A

NOTE: Velocities under 5-fps are non erosive, no erosion protection required.

Street Section Normal Depth Summary Table (100-year)

Cross Section Designation	Contributing Basin/ Subbasin	Discharge (cfs)	Slope (%)	Velocity (fps)	Flow Depth (ft)	V x D
KB1	STKB1-A	4	3.00%	3.33	0.31	1.03
KB2	STKB1-B	3	0.70%	1.74	0.35	0.61
KB3	STKB1-C	2	0.70%	1.62	0.31	0.50
KB4	STKB1-D	3	0.70%	1.74	0.35	0.61
KB5	STKB2-A	2	3.60%	3.50	0.25	0.88
KB6	STKB2-B	3	0.70%	1.74	0.35	0.61
KB7	STKB2-C	4	0.70%	1.83	0.37	0.68
KB8	STKB2-E	5	0.70%	1.93	0.39	0.75
KB9	STKB2-F	2	10.20%	5.47	0.24	1.31

INTERIM CONDITION 2 HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)
OFF4	33.12	64
STKB1	3.58	13
OFF6	129.13	229
COFF3	-	291
REF**	-	461
OFF5	21.09	62
STBK2	5.02	18
COFF4	-	80
COFF4 + REF**	-	541

**Referenced from Kettle Ridge Drive Technical Drainage Study by Atkins

PRORATED ONSITE SUBBASIN SUMMARY INTERIM CONDITION

BASIN	BASIN AREA		Q100
STKB1	3.58		13
STKB2	5.02		18
SUBBASIN	**SUB AREA**	**SUB AREA**	**Q100**
STKB1-A	1.16	32.4%	4
STKB1-B	0.84	23.5%	3
STKB1-C	0.66	18.4%	2
STKB1-D	0.92	25.7%	3
TOTAL	**3.58**	**100.0%**	**13**
STKB2-A	0.49	9.8%	2
STKB2-B	0.95	18.9%	3
STKB2-C	1.13	22.5%	4
STKB2-D	0.37	7.4%	1
STKB2-E	1.48	29.5%	5
STKB2-F	0.60	12.0%	2
TOTAL	**5.02**	**100.0%**	**18**

PRORATED OFFSITE SUBBASIN SUMMARY INTERIM CONDITION 2

BASIN	BASIN AREA		Q100
OFF4	33.12		64
OFF5	21.09		62
SUBBASIN	**SUB AREA**	**SUB AREA**	**Q100**
OFF4-A	6.21	18.4%	12
OFF4-B	9.16	27.2%	18
OFF4-C	5.49	16.3%	11
OFF4-D	6.05	17.9%	12
OFF4-E	6.21	18.4%	12
TOTAL	**33.12**	**100.0%**	**65**
OFF5-A	4.70	22.8%	13
OFF5-B	2.02	9.8%	6
OFF5-C	6.44	31.2%	18
OFF5-D	7.93	38.4%	23
TOTAL	**21.09**	**100.0%**	**60**

REV	DATE	BY	REVISION

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INTERIM CONDITION 2 MAP
FIGURE 7B

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD

DRAWN BY: ACY 4/12/19
DESIGNED BY: #### ####
CHECKED BY: JDA
PROJECT NO: 7961-5.2
SCALE: 1"= 250' HORIZ 1"= 250' VERT

SHEET
FIG 7
#######SHEETS
DRAWING NO.
####

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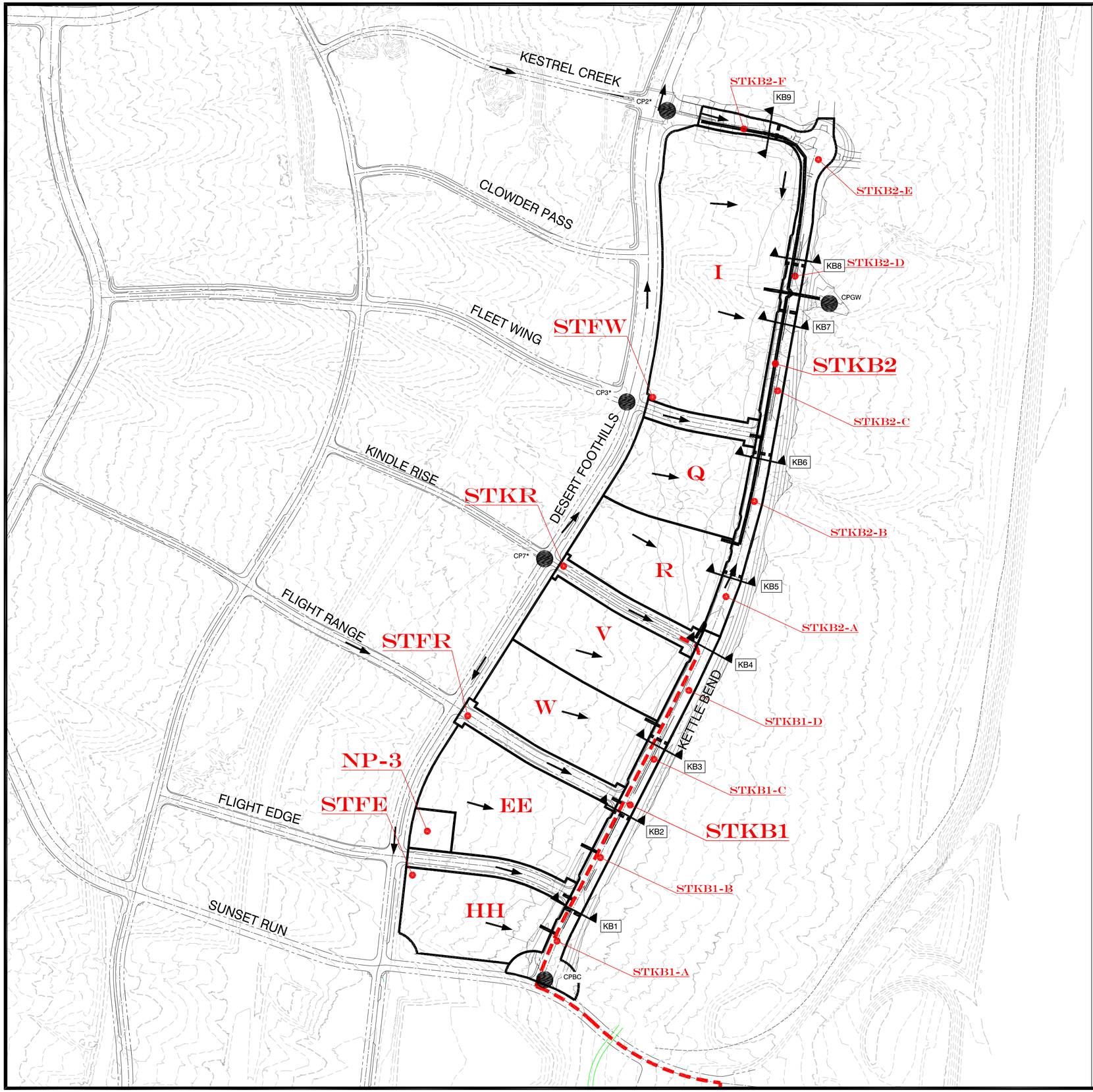

ULTIMATE CONDITION HEC-1 SUMMARY TABLE		
BASIN ID	**AREA (ac)**	**Q100 (CFS)**
CP7*	-	639
STKR	1.32	6
STKB1	3.58	13
V	5.01	16
W	5.28	16
STFR	1.50	7
EE	6.8	22
NP-3	0.7	2
STFE	1.36	6
CPFE	-	8
HH	4.85	19
CPBC	-	747
CP2*	-	190
CP3*	-	77
STKB2	5.02	18
I	13.44	50
STFW	0.9	4
Q	4.58	17
R	4.97	18
CPGW	-	374

*Referenced from V22 MCDS by VTN (DS#5005)

PRORATED ONSITE SUBBASIN SUMMARY ULTIMATE CONDITION			
BASIN	**BASIN AREA**		**Q100**
STKB1	3.58		13
STKB2	5.02		18
SUBBASIN	**SUB AREA**	**SUB AREA**	**Q100**
STKB1-A	1.16	32.4%	4
STKB1-B	0.84	23.5%	3
STKB1-C	0.66	18.4%	2
STKB1-D	0.92	25.7%	3
TOTAL	**3.58**	**100.0%**	**13**
STKB2-A	0.49	9.8%	2
STKB2-B	0.95	18.9%	3
STKB2-C	1.13	22.5%	4
STKB2-D	0.37	7.4%	1
STKB2-E	1.48	29.5%	5
STKB2-F	0.60	12.0%	2
TOTAL	**5.02**	**100.0%**	**18**

Street Section Normal Depth Summary Table (100-year)						
Cross Section Designation	**Contributing Basin/ Subbasin**	**Discharge (cfs)**	**Slope (%)**	**Velocity (fps)**	**Flow Depth (ft)**	**V x D**
KB1	STKB1-A	4	3.00%	3.33	0.31	1.03
KB2	STKB1-B	3	0.70%	1.74	0.35	0.61
KB3	STKB1-C	2	0.70%	1.62	0.31	0.50
KB4	STKB1-D	3	0.70%	1.74	0.35	0.61
KB5	STKB2-A	2	3.60%	3.50	0.25	0.88
KB6	STKB2-B	3	0.70%	1.74	0.35	0.61
KB7	STKB2-C	4	0.70%	1.83	0.37	0.68
KB8	STKB2-E	5	0.70%	1.93	0.39	0.75
KB9	STKB2-F	2	10.20%	5.47	0.24	1.31

NORTH

GRAPHIC SCALE

200 0 100 200 400

1" = 200'

LEGEND

- BASIN BOUNDARY
- ST7 BASIN DESIGNATION
- FLOW ARROW
- LOCAL STORM DRAIN ALIGNMENT
- CCRFCD STORM DRAIN ALIGNMENT
- SUBBASIN BOUNDARY
- FLOW CONCENTRATION POINT

REV	DATE	BY	REVISION

####

####
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ULTIMATE CONDITION MAP FIGURE 8

SUMMERLIN WEST VILLAGE 22 KETTLE BEND ROAD

DRAWN BY: RBR
9/12/19
DESIGNED BY: ####
CHECKED BY: ####
PROJECT NO: 7861-5.2
SCALE: 1"= 200' HORIZ. 1"= 200' VERT.

SHEET
FIG 8
########SHEETS
DRAWING NO.
####

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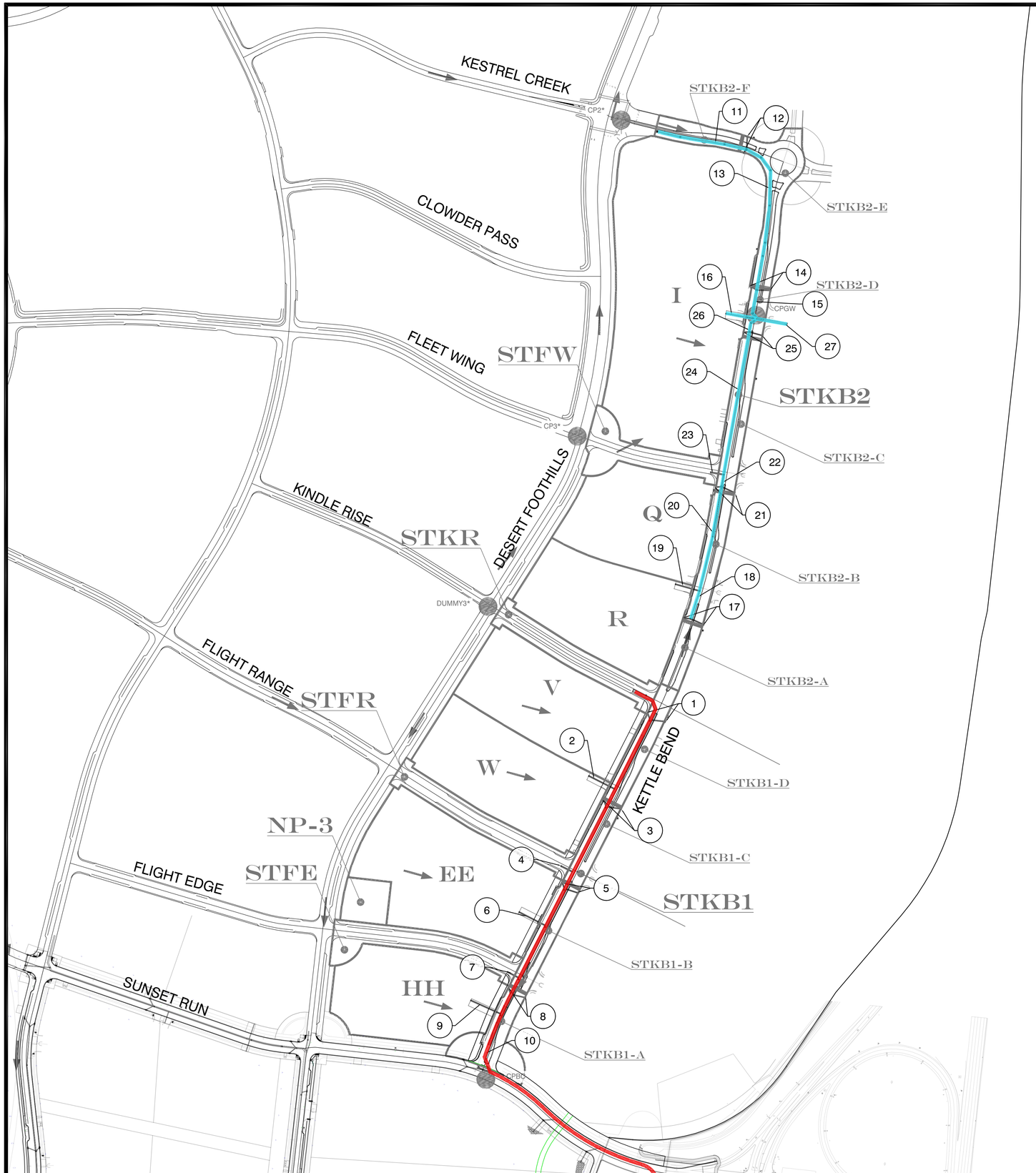


LOCAL FLOOD PROTECTION FACILITIES

System	Facility #	Q100 cfs	Tributary Basin/CP	Facility
Beltway Channel	1	3	STKB1-D	(2) DI W/ 24" RCP
	2	32	V+W	30" RCP
	3	2	STKB1-C	(2) DI W/ 24" RCP
	4	7	STFR	30" RCP
	5	3	STKB1-B	(2) DI W/ 24" RCP
	6	22	EE	30" RCP
	7	8	NP-3+STFE	30" RCP
	8	4	STKB1-A	(2) DI W/ 24" RCP
	9	19	HH	30" RCP
	10	747	CPBC	8'x8' RCB
Gowan Lone Mountain Beltway	11	190	CP2*	54" RCP
	12	2	STKB2-F	(2) DI W/ 24" RCP
	13	192	CP2*+STKB2-F	54" RCP
	14	5	STKB2-E	(2) DI W/ 24" RCP
	15	197	CP2*+STKB2-F,E	60" RCP
	16	50	I	30" RCP
	17	2	STKB2-A	(2) DI W/ 24" RCP
	18	2	STKB2-A	24" RCP
	19	35	R+Q	30" RCP
	20	37	STKB2-A+R+Q	36" RCP
	21	3	STKB2-B	(2) DI W/ 24" RCP
	22	40	STKB2-A,B+R+Q	36" RCP
	23	81	STFW + CP3*	36" RCP
	24	121	STKB2-A,B+R+Q+STFW+CP3*	42" RCP
	25	4	STKB2-C	(2) DI W/ 24" RCP
	26	125	STKB2-A,B,C+R+Q+STFW+CP3*	42" RCP
	27	374	CPGW	6'x6' RCB

GRAPHIC SCALE

200 0 100 200 400

1" = 200'

LEGEND

- BASIN BOUNDARY
- ST7 BASIN DESIGNATION
- FLOW ARROW
- GOWAN CHANNEL SYSTEM
- BELTWAY CHANNEL SYSTEM
- SUBBASIN BOUNDARY
- FLOW CONCENTRATION POINT
- (1) LOCAL FACILITY DESIGNATION

REVISION

REV	DATE	BY

####

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

####
####
####
####

FACILITY MAP
FIGURE 9

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:
ACY	####	####	HORIZ. 1"= 200'
9/12/19	####	####	VERT. 1"= 200'

PROJECT NO: 7681-6.2

SHEET
FIG 9
########SHEETS

DRAWING NO.
####

H:\7681\Kettle Bend Road\Drainage\2_ADD1\A_Figures\Figure 9 - Local Facility Map.dwg, Jan 13, 2020

APPENDIX B
HYDROLOGIC CALCULATIONS

SOIL INFORMATION

CURVE NUMBERS FOR SOILS

Soil # 152 Cave gravelly fine sandy loam, 0 to 4 percent slopes								
Soil	Percent	Group	Existing$_1$	Open Space$_{2\ (Poor\ Condition)}$	Townhouses$_3$	Apartments/Condos$_4$	Commercial$_5$	Impervious$_6$
Cave	100%	D	88	89	92	93	95	98
Total	**100%**		**88**	**89**	**92**	**93**	**95**	**98**

Soil # 155 Cave gravelly fine sandy loam, 4 to 15 percent slopes								
Soil	Percent	Group	Existing$_1$	Open Space$_{2\ (Poor\ Condition)}$	Townhouses$_3$	Apartments/Condos$_4$	Commercial$_5$	Impervious$_6$
Cave	100%	D	88	89	92	93	95	98
Total	**100%**		**88**	**89**	**92**	**93**	**95**	**98**

Soil # 156 Vace - Wechech association								
Soil	Percent	Group	Existing$_1$	Open Space$_{2\ (Poor\ Condition)}$	Townhouses$_3$	Apartments/Condos$_4$	Commercial$_5$	Impervious$_6$
Vace and Similar	45%	D	88	89	92	93	95	98
Wechech and Similar	25%	D	88	89	92	93	95	98
Wechech, steep, and similar	15%	D	88	89	92	93	95	98
Weiser	8%	B	77	79	87	88	92	98
Irongold	4%	D	88	89	92	93	95	98
Commski	2%	B	77	79	87	88	92	98
Threelakes	1%	A	63	68	80	81	89	98
Total	**100%**		**87**	**88**	**91**	**92**	**95**	**98**

Soil # 191 Dalian very cobbly fine sandy loam, 2 to 8 percent slopes								
Soil	Percent	Group	Existing$_1$	Open Space$_{2\ (Poor\ Condition)}$	Townhouses$_3$	Apartments/Condos$_4$	Commercial$_5$	Impervious$_6$
Cave	100%	A	63	68	80	81	89	98
Total	**100%**		**63**	**68**	**80**	**81**	**89**	**98**

Soil #502 Canutio- Cave gravelly fine sandy loams, 2 to 8 percent slopes								
Soil	Percent	Group	Existing$_1$	Open Space$_{2\ (Poor\ Condition)}$	Townhouses$_3$	Apartments/Condos$_4$	Commercial$_5$	Impervious$_6$
Canutio	55%	A	63	68	80	81	89	98
Cave	40%	D	88	89	92	83	95	98
Arizo	5%	A	63	68	80	81	89	98
Total	**100%**		**73**	**76**	**85**	**82**	**91**	**98**

Notes:

3- Referenced from Table 602A, Townhouses (Single Family Attached (SFA)
4- Referenced from Table 602A, Apartments/Condos (Multi Family MF)
5- Referenced from Table 602 (1 of 4) Commercial, Single Family Residential <6,000 sqft lots
6- Referenced from Table 602 (1 of 4), Impervious Paved Streets and Roads
5- Referenced from Table 602 page 1 of 4 (Commercial/Business)
6- Referenced from Table 602 page 1 of 4 (Impervious)

Curve Number Calculations for Basins

Basin	Type	Soil	Existing$_1$	Open Space$_{2\ (Poor\ Condition)}$	Townhouses$_3$	Apartments/Condos$_4$	Commercial$_5$	Impervious$_6$	CN Value
UNDEVELOPED BASINS									
OFF1	155	12%	100%						**77.8**
	156	22%	100%						
	502	66%	100%						
OFF2	152	7%	100%						**87.1**
	155	87%	100%						
	502	6%	100%						
OFF3	155	20%	100%						**77.0**
	156	11%	100%						
	191	5%	100%						
	502	64%	100%						
OFF4	155	9%	100%						**77.4**
	156	22%	100%						
	502	69%	100%						
OFF5	152	7%	100%						**88.0**
	155	93%	100%						
OFF6	155	30%	100%						**79.7**
	156	16%	100%						
	502	54%	100%						
EX1	156	32%	100%						**77.4**
	502	68%	100%						
EX2	152	6%	100%						**86.1**
	155	81%	100%						
	502	13%	100%						
DEVELOPED BASINS									
STKB1	156	32%						100%	**98.0**
	502	68%						100%	
STKB2	152	6%						100%	**98.0**
	155	81%						100%	
	502	13%						100%	
STFE	156	100%						100%	**98.0**
STFR	502	100%						100%	**98.0**
STKR	155	9%						100%	**98.0**
	502	91%						100%	
STFW	152	6%						100%	**98.0**
	155	94%						100%	
I	152	15%			100%				**92.0**
	155	85%			100%				
Q	155	100%			95%		5%		**92.2**
R	155	77%			95%		5%		**90.5**
	502	23%			95%		5%		
V	502	100%				40%	60%		**87.6**
W	502	100%				40%	60%		**87.6**
EE	156	11%				40%	60%		**88.2**
	502	89%				40%	60%		
HH	156	100%				40%	60%		**93.6**
NP-3	156	61%		100%					**83.3**
	502	39%		100%					

LAG TIME CALCULATIONS

TRAVEL TIME CALCULATIONS

DEVELOPMENT: Kettle Bend Road
W.O. # 7851-5.2 **CALCULATED BY:** RBR

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

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

Non-urban		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)
UNDEVELOPED BASINS								
OFF1	1120	3370	3343	0.024	14.8	2.3	29.4	4.6
OFF2	1250	3386	3333	0.043	14.8	3.1	29.4	6.1
OFF3	10931	3956	3380	0.053	14.8	3.4	29.4	6.7
OFF4	1120	3370	3343	0.024	14.8	2.3	29.4	4.6
OFF5	1250	3386	3333	0.042	14.8	3.0	29.4	6.1
OFF6	5021	3655	3380	0.055	14.8	3.5	29.4	6.9
EX1	270	3345	3325	0.074	14.8	4.0	29.4	8.0
EX2	573	3325	3287	0.066	14.8	3.8	29.4	7.6
DEVELOPED BASINS								
STKB1	1640	3354	3331	0.014	20.2	2.4	30.6	3.7
STKB2	1660	3333	3318	0.009	20.2	1.9	30.6	2.9
STFE	685	3384	3340	0.064	20.2	5.1	30.6	7.8
STFR	725	3382	3335	0.065	20.2	5.1	30.6	7.8
STKR	650	3362	3324	0.058	20.2	4.9	30.6	7.4
STFW	490	3343	3304	0.080	20.2	5.7	30.6	8.6
I	1044	3347	3299	0.046	20.2	4.3	30.6	6.6
Q	640	3353	3315	0.059	20.2	4.9	30.6	7.5
R	622	3364	3319	0.072	20.2	5.4	30.6	8.2
V	680	3370	3329	0.060	20.2	5.0	30.6	7.5
W	700	3381	3333	0.069	20.2	5.3	30.6	8.0
EE	555	3393	3341	0.094	20.2	6.2	30.6	9.4
HH	505	3387	3343	0.087	20.2	6.0	30.6	9.0
NP-3	123	3391	3376	0.122	20.2	7.1	30.6	10.7

STANDARD FORM 4

DEVELOPMENT: Kettle Bend Road

CONDITION: Interim

W.O. # 7851-5.2 **CALCULATED BY:** RBR

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

Non-Urban:		Urban	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

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

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

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.	
UNDEVELOPED BASINS																	
OFF1	77.8	0.637	33.73	0.0527	175	3.0	7.61	1120	2.4	2.3	4.6	5.89	1295	17.19	13.50	0.135	
OFF2	87.1	0.760	20.63	0.0322	240	4.2	5.87	1250	4.3	3.1	6.1	4.77	1490	18.28	10.64	0.106	
OFF3	77.0	0.626	196.33	0.3068	500	3.0	13.29	10931	5.3	3.4	6.7	28.21	11431	73.51	41.50	0.415	
OFF4	77.4	0.631	33.12	0.0518	175	3.0	7.74	1120	2.4	2.3	4.6	5.89	1295	17.19	13.63	0.136	
OFF5	88.0	0.772	21.09	0.0330	240	4.2	5.68	1250	4.2	3.0	6.1	4.80	1490	18.28	10.48	0.105	
OFF6	79.7	0.662	129.13	0.2018	300	3.0	9.47	5021	5.5	3.5	6.9	13.36	5321	39.56	22.83	0.228	
EX1	77.4	0.631	3.58	0.0056	50	3.0	4.14	270	7.4	4.0	8.0	1.12	320	11.78	5.25	0.053	
EX2	86.1	0.746	5.02	0.0078	50	3.0	3.13	573	6.6	3.8	7.6	2.35	623	13.46	5.47	0.055	
DEVELOPED BASINS																	
STKB1	98.0	0.904	3.58	0.0056	42	2.0	1.82	1640	1.4	2.4	3.7	8.63	1682	19.34	10.44	0.104	
STKB2	98.0	0.904	5.02	0.0078	42	2.0	1.82	1660	0.9	1.9	2.9	11.01	1702	19.46	12.83	0.128	
STFE	98.0	0.904	1.36	0.0021	20	2.0	1.25	685	6.4	5.1	7.8	2.03	705	13.92	3.28	0.033	
STFR	98.0	0.904	1.50	0.0023	20	2.0	1.25	725	6.5	5.1	7.8	2.10	745	14.14	3.36	0.034	
STKR	98.0	0.904	1.32	0.0021	20	2.0	1.25	650	5.8	4.9	7.4	2.04	670	13.72	3.30	0.033	
STFW	98.0	0.904	0.90	0.0014	20	2.0	1.25	490	8.0	5.7	8.6	1.43	510	12.83	2.69	0.027	
I	92.0	0.824	13.44	0.0210	100	1.0	4.96	685	6.4	5.1	7.8	2.03	785	14.36	6.99	0.070	
Q	92.2	0.826	4.58	0.0072	100	1.0	4.93	725	6.5	5.1	7.8	2.10	825	14.58	7.03	0.070	
R	90.5	0.805	4.97	0.0078	100	1.0	5.31	650	5.8	4.9	7.4	2.04	750	14.17	7.35	0.074	
V	87.6	0.766	5.01	0.0078	100	1.0	6.02	490	8.0	5.7	8.6	1.43	590	13.28	7.45	0.074	
W	87.6	0.766	5.28	0.0083	100	1.0	6.02	1044	4.6	4.3	6.6	3.31	1144	16.36	9.32	0.093	
EE	88.2	0.775	6.80	0.0106	100	1.0	5.86	640	5.9	4.9	7.5	2.01	740	14.11	7.86	0.079	
HH	93.6	0.845	4.85	0.0076	100	1.0	4.58	622	7.2	5.4	8.2	1.78	722	14.01	6.37	0.064	
NP-3	83.3	0.710	0.70	0.0011	100	1.0	7.02	680	6.0	5.0	7.5	2.08	780	14.33	9.10	0.091	

EXISTING CONDITION
HEC-1 ANALYSIS

```
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   09JAN20  TIME  13:57:45  *                                                  *           (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    EXISTING CONDITION HYDROLOGIC MODEL
             2          ID    INPUT FILE DATE = JANUARY 8, 2020
             3          ID    DESIGN STORM = 100-YEAR 6-HR STORM
             4          ID    STORM DISTRIBUTION = SDN #3
             5          ID    MODELED BY VTN (ACY)
             6          ID
             7          ID    ********************************************************
             8          ID    * SUMMERLIN WEST VILLAGE 22                            *
             9          ID    * KETTLE BEND ROAD                                     *
            10          ID    ********************************************************
            11          ID
            12          ID
            13          ID
            14          ID   10YR AND 100YR STORM EVENT FOR 6 HOUR STORM
            15          IT       5       0       0     300
            16          IN       5       0       0
            17          IO       5       0       0
            18          JR    PREC     .59    1.00
                        *

            19          KK    OFF3
            20          KM   OFFSITE BASIN
            21          BA  0.3068
            22          PB    3.44
            23          PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
            24          PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
            25          PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
            26          PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
            27          PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
            28          PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
            29          PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
            30          PC   0.998   0.999       1
            31          LS       0    77.0
            32          UD   0.415
                        *

            33          KK    OFF4
            34          KM   OFFSITE BASIN
            35          BA  0.0518
            36          PB    3.40
            37          LS       0    77.4
            38          UD   0.136
                        *

            39          KK    OFF5
            40          KM   OFFSITE BASIN
            41          BA  0.0330
            42          PB    3.38
            43          LS       0    88.0
            44          UD   0.105
                        *
```

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


            45          KK     EX1
            46          KM   ONSITE BASIN
            47          BA  0.0056
            48          PB    3.37
            49          LS       0    77.4
            50          UD   0.100
                        *

            51          KK     EX2
            52          KM   ONSITE BASIN
            53          BA  0.0078
            54          PB    3.38
            55          LS       0    86.1
            56          UD   0.100
                        *
            57          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    19        OFF3
                .
                .
    33          .        OFF4
                .           .
                .           .
    39          .           .        OFF5
                .           .           .
                .           .           .
    45          .           .           .         EX1
                .           .           .           .
                .           .           .           .
    51          .           .           .           .         EX2

 (***) 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   09JAN20  TIME  13:57:45  *                                                  *           (916) 756-1104            *
 *                                      *                                                  *                                     *
 ****************************************                                                  ***************************************



                            EXISTING CONDITION HYDROLOGIC MODEL
                            INPUT FILE DATE = JANUARY 8, 2020
                            DESIGN STORM = 100-YEAR 6-HR STORM
                            STORM DISTRIBUTION = SDN #3
                            MODELED BY VTN (ACY)

                            ********************************************************
                            * SUMMERLIN WEST VILLAGE 22                            *
                            * KETTLE BEND ROAD                                     *
                            ********************************************************



                           10YR AND 100YR STORM EVENT FOR 6 HOUR STORM

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

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

                   COMPUTATION INTERVAL     .08 HOURS
                        TOTAL TIME BASE   24.92 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
```

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

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                     .59      1.00
1

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


                                                                  RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1  RATIO 2
                                                         .59     1.00

 HYDROGRAPH AT
+                  OFF3       .31     1   FLOW          76.     233.
                                           TIME         3.92     3.92

 HYDROGRAPH AT
+                  OFF4       .05     1   FLOW          21.      64.
                                           TIME         3.58     3.58

 HYDROGRAPH AT
+                  OFF5       .03     1   FLOW          28.      62.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   EX1       .01     1   FLOW           2.       7.
                                           TIME         3.58     3.50

 HYDROGRAPH AT
+                   EX2       .01     1   FLOW           6.      14.
                                           TIME         3.50     3.50


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

INTERIM CONDITION 1
HEC-1 ANALYSIS

```
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   09JAN20  TIME  14:22:12  *                                                  *           (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    INTERIM CONDITION 1 HYDROLOGIC MODEL
             2         ID    INPUT FILE DATE = JANUARY 8, 2020
             3         ID    DESIGN STORM = 100-YEAR 6-HR STORM
             4         ID    STORM DISTRIBUTION = SDN #3
             5         ID    MODELED BY VTN (RBR)
             6         ID
             7         ID    ********************************************************
             8         ID    * SUMMERLIN WEST VILLAGE 22                            *
             9         ID    * KETTLE BEND ROAD                                     *
            10         ID    ********************************************************
            11         ID
            12         ID
            13         ID
            14         ID   10YR AND 100YR STORM EVENT FOR 6 HOUR STORM
            15         IT       5       0       0     300
            16         IN       5       0       0
            17         IO       5       0       0
            18         JR    PREC     .59    1.00
                       *

            19         KK    OFF1
            20         KM   OFFSITE BASIN
            21         BA  0.0527
            22         PB    3.40
            23         PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
            24         PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
            25         PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
            26         PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
            27         PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
            28         PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
            29         PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
            30         PC   0.998   0.999       1
            31         LS       0    77.8
            32         UD   0.135
                       *

            33         KK   STKB1
            34         KM   ONSITE BASIN
            35         BA  0.0056
            36         PB    3.37
            37         LS       0    98.0
            38         UD   0.104
                       *

            39         KK    OFF3
            40         KM   OFFSITE BASIN
            41         BA  0.3068
            42         PB    3.44
            43         LS       0    77.0
            44         UD   0.415
                       *
```

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

            45          KK   COFF1
            46          KM   COMBINE OFF1, OFF3 AND STBK1
            47          HC       3
                        *

            48          KK    OFF2
            49          KM   OFFSITE BASIN
            50          BA  0.0322
            51          BF       0
            52          PB    3.38
            53          LS       0    87.1
            54          UD   0.106
                        *

            55          KK   STKB2
            56          KM   ONSITE BASIN
            57          BA  0.0078
            58          PB    3.38
            59          LS       0    98.0
            60          UD   0.128
                        *

            61          KK   COFF2
            62          KM   COMBINE COMBINE OFF2, AND STBK2
            63          HC       2
                        *
            64          ZZ
1
                   SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    19        OFF1
                 .
                 .
    33           .       STKB1
                 .           .
                 .           .
    39           .           .        OFF3
                 .           .           .
                 .           .           .
    45       COFF1.......................
                 .
                 .
    48           .        OFF2
                 .           .
                 .           .
    55           .           .       STKB2
                 .           .           .
                 .           .           .
    61           .       COFF2............

 (***) 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   09JAN20  TIME  14:22:12  *                    *           (916) 756-1104             *
 *                                      *                    *                                      *
 ****************************************                    ****************************************



                           INTERIM CONDITION 1 HYDROLOGIC MODEL
                           INPUT FILE DATE = JANUARY 8, 2020
                           DESIGN STORM = 100-YEAR 6-HR STORM
                           STORM DISTRIBUTION = SDN #3
                           MODELED BY VTN (RBR)

                           ********************************************************
                           * SUMMERLIN WEST VILLAGE 22                            *
                           * KETTLE BEND ROAD                                     *
                           ********************************************************



                          10YR AND 100YR STORM EVENT FOR 6 HOUR STORM

   17 IO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
```

```
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

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

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   24.92 HOURS

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

     JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                    .59      1.00
1

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


                                                          RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1  RATIO 2
                                                        .59     1.00

 HYDROGRAPH AT
+                  OFF1       .05     1   FLOW          22.      66.
                                           TIME         3.58     3.58

 HYDROGRAPH AT
+                 STKB1       .01     1   FLOW           8.      13.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                  OFF3       .31     1   FLOW          76.     233.
                                           TIME         3.92     3.92

  3 COMBINED AT
+                 COFF1       .37     1   FLOW          88.     270.
                                           TIME         3.83     3.83

 HYDROGRAPH AT
+                  OFF2       .03     1   FLOW          26.      59.
                                           TIME         3.58     3.50

 HYDROGRAPH AT
+                 STKB2       .01     1   FLOW          10.      18.
                                           TIME         3.58     3.58

  2 COMBINED AT
+                 COFF2       .04     1   FLOW          37.      76.
                                           TIME         3.58     3.50


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

INTERIM CONDITION 2
HEC-1 ANALYSIS

```
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   09JAN20  TIME  13:58:19  *                                                  *           (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    INTERIM CONDITION 2 HYDROLOGIC MODEL
            2          ID    INPUT FILE DATE = JANUARY 8, 2020
            3          ID    DESIGN STORM = 100-YEAR 6-HR STORM
            4          ID    STORM DISTRIBUTION = SDN #3
            5          ID    MODELED BY VTN (ACY)
            6          ID
            7          ID    ********************************************************
            8          ID    * SUMMERLIN WEST VILLAGE 22                            *
            9          ID    * KETTLE BEND ROAD                                     *
           10          ID    ********************************************************
           11          ID
           12          ID
           13          ID
           14          ID   10YR AND 100YR STORM EVENT FOR 6 HOUR STORM
           15          IT       5       0       0     300
           16          IN       5       0       0
           17          IO       5       0       0
           18          JR    PREC     .59    1.00
                       *

           19          KK    OFF4
           20          KM   OFFSITE BASIN
           21          BA  0.0518
           22          PB    3.40
           23          PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
           24          PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
           25          PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
           26          PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
           27          PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
           28          PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
           29          PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
           30          PC   0.998   0.999       1
           31          LS       0    77.4
           32          UD   0.136
                       *

           33          KK   STKB1
           34          KM   ONSITE BASIN
           35          BA  0.0056
           36          PB    3.37
           37          LS       0    98.0
           38          UD   0.104
                       *

           39          KK    OFF6
           40          KM   OFFSITE BASIN
           41          BA  0.2018
           42          PB    3.42
           43          LS       0    79.7
           44          UD   0.228
                       *
```

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

            45          KK   COFF3
            46          KM   COMBINE OFF4, OFF6 AND STBK1
            47          HC       3
                        *

            48          KK    OFF5
            49          KM   OFFSITE BASIN
            50          BA  0.0330
            51          BF       0
            52          PB    3.38
            53          LS       0    88.0
            54          UD   0.105
                        *

            55          KK   STKB2
            56          KM   ONSITE BASIN
            57          BA  0.0078
            58          PB    3.38
            59          LS       0    98.0
            60          UD   0.128
                        *

            61          KK   COFF4
            62          KM   COMBINE COMBINE OFF5, AND STBK2
            63          HC       2
                        *
            64          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    19        OFF4
                .
                .
    33          .       STKB1
                .           .
                .           .
    39          .           .        OFF6
                .           .           .
                .           .           .
    45       COFF3.......................
                .
                .
    48          .        OFF5
                .           .
                .           .
    55          .           .       STKB2
                .           .           .
                .           .           .
    61          .       COFF4............

 (***) 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   09JAN20  TIME  13:58:19  *                    *           (916) 756-1104             *
 *                                      *                    *                                      *
 ****************************************                    ****************************************



                           INTERIM CONDITION 2 HYDROLOGIC MODEL
                           INPUT FILE DATE = JANUARY 8, 2020
                           DESIGN STORM = 100-YEAR 6-HR STORM
                           STORM DISTRIBUTION = SDN #3
                           MODELED BY VTN (ACY)

                           ********************************************************
                           * SUMMERLIN WEST VILLAGE 22                            *
                           * KETTLE BEND ROAD                                     *
                           ********************************************************



                          10YR AND 100YR STORM EVENT FOR 6 HOUR STORM

   17 IO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
```

```
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

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

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   24.92 HOURS

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

      JP          MULTI-PLAN OPTION
                     NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                    .59      1.00
1

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


                                                                  RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1  RATIO 2
                                                         .59     1.00

 HYDROGRAPH AT
+                   OFF4       .05     1   FLOW          21.      64.
                                           TIME         3.58     3.58

 HYDROGRAPH AT
+                   STKB1      .01     1   FLOW           8.      13.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   OFF6       .20     1   FLOW          82.     229.
                                           TIME         3.67     3.67

   3 COMBINED AT
+                   COFF3      .26     1   FLOW         105.     291.
                                           TIME         3.67     3.67

 HYDROGRAPH AT
+                   OFF5       .03     1   FLOW          28.      62.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   STKB2      .01     1   FLOW          10.      18.
                                           TIME         3.58     3.58

   2 COMBINED AT
+                   COFF4      .04     1   FLOW          39.      80.
                                           TIME         3.58     3.50


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

ULTIMATE CONDITION
HEC-1 ANALYSIS

```
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   09JAN20  TIME  14:13:01  *                                                  *           (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    ULTIMATE CONDITION HYDROLOGIC MODEL
            2          ID    INPUT FILE DATE = JANUARY 8, 2019
            3          ID    DESIGN STORM = 100-YEAR 6-HR STORM
            4          ID    STORM DISTRIBUTION = SDN #3
            5          ID    MODELED BY VTN (ACY)
            6          ID
            7          ID    ********************************************************
            8          ID    * SUMMERLIN WEST VILLAGE 22                            *
            9          ID    * KETTLE BEND ROAD                                     *
           10          ID    ********************************************************
           11          ID
           12          ID
           13          ID
           14          ID   10YR AND 100YR STORM EVENT FOR 6 HOUR STORM
           15          IT       5       0       0     300
           16          IN       5       0       0
           17          IO       5       0       0
           18          JR    PREC     .59    1.00
                       *

           19          KK    27-F
           20          KM   REFERENCED FROM THE OVERALL SWPA MPU
           21          BA  0.0299
           22          PB    3.48
           23          PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
           24          PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
           25          PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
           26          PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
           27          PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
           28          PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
           29          PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
           30          PC   0.998   0.999       1
           31          LS       0    94.2
           32          UD   0.050
                       *

           33          KK 27-COS2
           34          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
           35          BA  0.0082
           36          PB    3.46
           37          LS       0    89.0
           38          UD   0.052
                       *

           39          KK     LM2
           40          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
           41          BA  0.0113
           42          PB    3.41
           43          LS       0    98.0
           44          UD   0.093
                       *
```

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

  45          KK    CLM2
  46          KM   COMBINES OFFSITE V27 BASINS 27-F, V27-COS2, AND LM2
  47          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
  48          HC       3
              *

  49          KK 27-COS3
  50          BA  0.0273
  51          PB    3.47
  52          LS       0    89.0
  53          UD   0.113
              *

  54          KK    COFF
  55          KM   COMBINES OFFSITE V27 BASINS
  56          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
  57          KM   COMBINE CLM2 AND V27-COS3
  58          HC       2
              *

  59          KK   RCOFF
  60          KM   ROUTE COFF TO CSTJ1
  61          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
  62          RD     744   0.058   0.013       0    CIRC     4.5
              *

  63          KK       E
  64          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
  65          BA  0.0217
  66          PB    3.43
  67          LS       0    95.0
  68          UD   0.062
              *

  69          KK    STJ1
  70          KM   KETTLE RIDGE
  71          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
  72          BA  0.0055
  73          PB    3.43
  74          LS       0    98.0
  75          UD   0.069
              *

  76          KK   CSTJ1
  77          KM   COMBINE COFF, E, AND STJ1
  78          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
  79          HC       3
              *
```



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

  80          KK  RCSTJ1
  81          KM   ROUTE COFF TO CSTJ1
  82          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
  83          RD     380   0.005   0.013       0    CIRC       5
              *

  84          KK    NP-2
  85          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
  86          BA  0.0021
  87          PB    3.43
  88          LS       0    89.0
  89          UD   0.058
              *

  90          KK   CNP-2
  91          KM   COMBINE CSTJ1 AND CNP-2
  92          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
  93          HC       2
              *

  94          KK  RCNP-2
  95          KM   ROUTE CNP-2 TO CF
  96          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
  97          RD     390   0.005   0.013       0    DEEP       6
              *

  98          KK       F
  99          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 100          BA  0.0222
 101          PB    3.43
 102          LS       0    95.0
 103          UD   0.063
              *
```

```
 104          KK      CF
 105          KM   COMBINE CNP-1 AND CF
 106          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 107          HC       2
              *

 108          KK     RCF
 109          KM   ROUTE CF  TO CP6
 110          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 111          RD     320   0.005   0.013       0    DEEP       6
              *

 112          KK  25-HS1
 113          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 114          BA  0.0773
 115          PB    3.44
 116          LS       0    94.8
 117          UD   0.056
              *
1                                          HEC-1 INPUT                                          PAGE  4

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


 118          KK    STN1
 119          KM   SCURRY BEND
 120          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 121          BA  0.0056
 122          PB    3.44
 123          LS       0    98.0
 124          UD   0.125
              *

 125          KK   CSTN1
 126          KM   COMBINE 25-HS1 AND STN1
 127          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 128          HC       2
              *

 129          KK  RCSTN1
 130          KM   ROUTE CSTN1 TO CSTG1
 131          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 132          RD    1010   0.090   0.013       0    CIRC     4.5
              *

 133          KK    STG1
 134          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 135          BA  0.0029
 136          PB    3.42
 137          LS       0    98.0
 138          UD   0.050
              *

 139          KK   CSTG1
 140          KM   COMBINE CSTN1 AND STG1
 141          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 142          HC       2
              *

 143          KK     CP6
 144          KM   COMBINE CF AND CSTG1
 145          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 146          HC       2
              *

 147          KK    RCP6
 148          KM   ROUTE CP6 TO CSTJ2
 149          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 150          RD     530   0.005   0.013       0    DEEP       6       0
              *

 151          KK     L-M
 152          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 153          BA  0.0330
 154          PB    3.42
 155          LS       0    94.4
 156          UD   0.084
              *
1                                          HEC-1 INPUT                                          PAGE  5

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


 157          KK    STJ2
 158          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 159          BA  0.0048
 160          PB    3.42
 161          LS       0    98.0
 162          UD   0.058
              *
```

```
 163          KK   CSTJ2
 164          KM   COMBINE CP6, L-M AND STJ2
 165          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 166          HC       3
              *

 167          KK  RCSTJ2
 168          KM   ROUTE CSTJ2 TO CSTF
 169          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 170          RD    1000   0.069   0.015       0    DEEP       6       0
              *

 171          KK     STF
 172          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 173          BA  0.0029
 174          PB    3.40
 175          LS       0    98.0
 176          UD   0.050
              *

 177          KK    CSTF
 178          KM   COMBINE CSTJ2 AND CSTF
 179          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 180          HC       2
              *

 181          KK       U
 182          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 183          BA  0.0055
 184          PB    3.40
 185          LS       0    86.3
 186          UD   0.069
              *

 187          KK    DES4
 188          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 189          BA  0.0028
 190          PB    3.40
 191          LS       0    98.0
 192          UD   0.050
              *
```



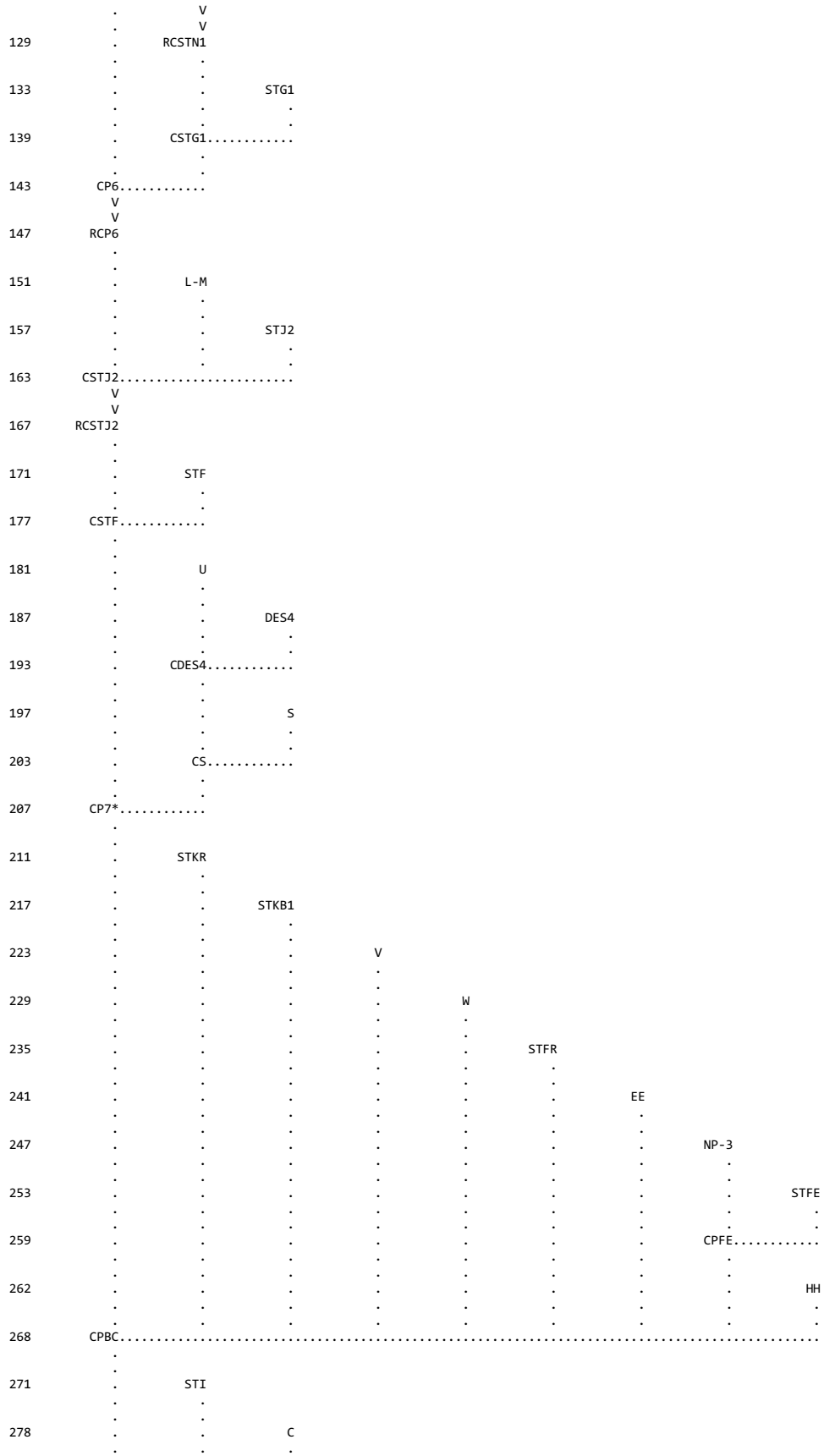
```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 193          KK   CDES4
 194          KM   COMBINE U AND DES4
 195          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 196          HC       2
              *

 197          KK       S
 198          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 199          BA  0.0047
 200          PB    3.40
 201          LS       0    87.9
 202          UD   0.088
              *

 203          KK      CS
 204          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 205          KM   CDES4 AND S
 206          HC       2
              *

 207          KK    CP7*
 208          KM   COMBINE CSTF AND CS
 209          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 210          HC       2
              *

 211          KK    STKR
 212          KM   DEVELOPED STREET BASIN
 213          BA  0.0021
 214          PB    3.37
 215          LS       0    98.0
 216          UD   0.050
              *

 217          KK   STKB1
 218          KM   ONSITE BASIN
 219          BA  0.0056
 220          PB    3.37
 221          LS       0    98.0
 222          UD   0.104
              *

 223          KK       V
 224          KM   DEVELOPED PARCEL BASIN
```

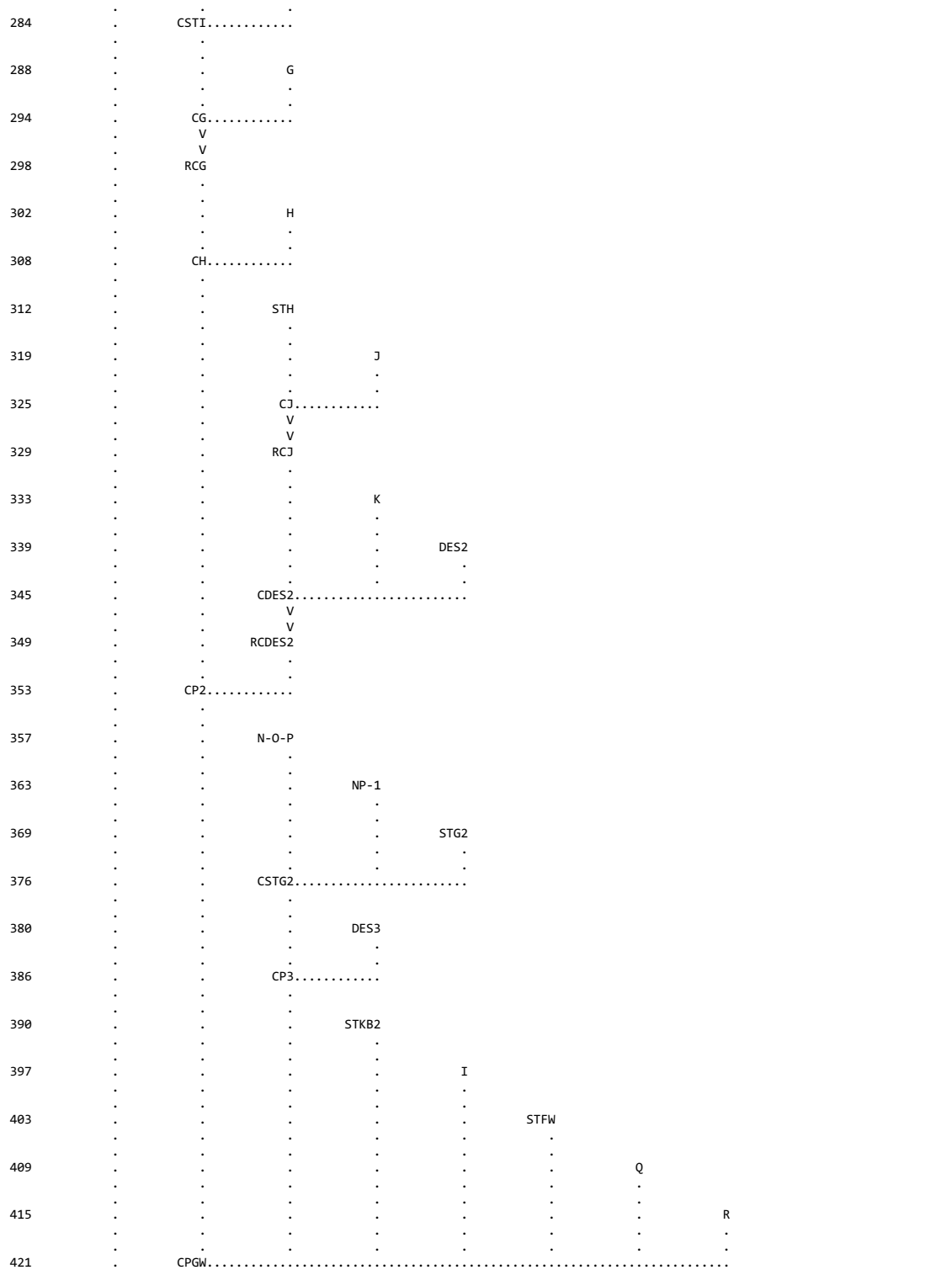
```
 225          BA  0.0078
 226          PB    3.37
 227          LS       0    87.6
 228          UD   0.074
              *
1                                        HEC-1 INPUT                                          PAGE  7

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


 229          KK       W
 230          KM   DEVELOPED PARCEL BASIN
 231          BA  0.0083
 232          PB    3.40
 233          LS       0    87.6
 234          UD   0.093
              *

 235          KK    STFR
 236          KM   DEVELOPED STREET BASIN
 237          BA  0.0023
 238          PB    3.40
 239          LS       0    98.0
 240          UD   0.050
              *

 241          KK      EE
 242          KM   DEVELOPED PARCEL BASIN
 243          BA  0.0106
 244          PB    3.39
 245          LS       0    88.2
 246          UD   0.079
              *

 247          KK    NP-3
 248          KM   DEVELOPED PARK BASIN
 249          BA  0.0011
 250          PB    3.39
 251          LS       0    83.3
 252          UD   0.091
              *

 253          KK    STFE
 254          KM   DEVELOPED STREET BASIN
 255          BA  0.0021
 256          PB    3.39
 257          LS       0    98.0
 258          UD   0.050
              *

 259          KK    CPFE
 260          KM   COMBINE NP-4 AND STFE
 261          HC       2
              *

 262          KK      HH
 263          KM   DEVELOPED PARCEL BASIN
 264          BA  0.0076
 265          PB    3.39
 266          LS       0    93.6
 267          UD   0.064
              *
1                                        HEC-1 INPUT                                          PAGE  8

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


 268          KK    CPBC
 269          KM   COMBINE CP7* STKR, STKB1, V, W, STFR, EE, CPFE, AND HH
 270          HC       9
              *

 271          KK     STI
 272          KM   KESTREL CREEK AVE
 273          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 274          BA  0.0038
 275          PB    3.41
 276          LS       0    98.0
 277          UD   0.050
              *

 278          KK       C
 279          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 280          BA  0.0188
 281          PB    3.41
 282          LS       0    95.0
 283          UD   0.054
              *

 284          KK    CSTI
 285          KM   COMBINE C AND STI
```

```
 286          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 287          HC       2
              *

 288          KK       G
 289          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 290          BA  0.0110
 291          PB    3.41
 292          LS       0    95.0
 293          UD   0.056
              *

 294          KK      CG
 295          KM   COMBINE CSTI AND CG
 296          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 297          HC       2
              *

 298          KK     RCG
 299          KM   ROUTE CG TO CH
 300          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 301          RD     556   0.081   0.013       0    CIRC     3.5
              *

 302          KK       H
 303          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 304          BA  0.0119
 305          PB    3.41
 306          LS       0    95.0
 307          UD   0.053
              *
1                                    HEC-1 INPUT                                        PAGE  9

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


 308          KK      CH
 309          KM   COMBINE CG AND CH
 310          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 311          HC       2
              *

 312          KK     STH
 313          KM   CLOWDER PASS WAY
 314          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 315          BA  0.0036
 316          PB    3.41
 317          LS       0    98.0
 318          UD   0.050
              *

 319          KK       J
 320          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 321          BA  0.0093
 322          PB    3.41
 323          LS       0    92.0
 324          UD   0.058
              *

 325          KK      CJ
 326          KM   COMBINE J AND STH
 327          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 328          HC       2
              *

 329          KK     RCJ
 330          KM   ROUTE CJ TO CDES2
 331          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 332          RD     637   0.080   0.013       0    CIRC     2.5
              *

 333          KK       K
 334          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 335          BA  0.0081
 336          PB    3.40
 337          LS       0    95.0
 338          UD   0.050
              *

 339          KK    DES2
 340          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 341          BA  0.0048
 342          PB    3.38
 343          LS       0    98.0
 344          UD   0.071
              *
1                                    HEC-1 INPUT                                        PAGE 10

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

```
 345          KK   CDES2
 346          KM   COMBINE DES2, CJ, AND K
 347          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 348          HC       3
              *

 349          KK  RCDES2
 350          KM   ROUTE CDES2 TO CP2
 351          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 352          RD     643   0.014   0.013       0    CIRC     3.5
              *

 353          KK     CP2
 354          KM   COMBINE CDES2 & CH
 355          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 356          HC       2
              *

 357          KK   N-O-P
 358          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 359          BA  0.0227
 360          PB    3.40
 361          LS       0    90.3
 362          UD   0.090
              *

 363          KK    NP-1
 364          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 365          BA  0.0027
 366          PB    3.40
 367          LS       0    89.0
 368          UD   0.059
              *

 369          KK    STG2
 370          KM   FLEET WING AVE
 371          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 372          BA  0.0045
 373          PB    3.40
 374          LS       0    98.0
 375          UD   0.050
              *

 376          KK   CSTG2
 377          KM   COMBINE N-O-P, NP-1 AND STG2
 378          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 379          HC       3
              *
1                                          HEC-1 INPUT                                          PAGE 11

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


 380          KK    DES3
 381          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 382          BA  0.0031
 383          PB    3.38
 384          LS       0    98.0
 385          UD   0.050
              *

 386          KK     CP3
 387          KM   COMBINES CSTG2 & DES3
 388          KM   REFERENCED FROM THE UP2 TO THE V22 MCDS
 389          HC       2
              *

 390          KK   STKB2
 391          KM   ONSITE BASIN
 392          BA  0.0078
 393          BF       0
 394          PB    3.38
 395          LS       0    98.0
 396          UD   0.128
              *

 397          KK       I
 398          KM   DEVELOPED PARCEL BASIN
 399          BA  0.0210
 400          PB    3.38
 401          LS       0    92.0
 402          UD   0.070
              *

 403          KK    STFW
 404          KM   DEVELOPED STREET BASIN
 405          BA  0.0014
 406          PB    3.38
 407          LS       0    98.0
 408          UD   0.050
              *
```

```
          409          KK       Q
          410          KM   DEVELOPED PARCEL BASIN
          411          BA  0.0072
          412          PB    3.38
          413          LS       0    92.2
          414          UD   0.070
                       *

          415          KK       R
          416          KM   DEVELOPED PARCEL BASIN
          417          BA  0.0078
          418          PB    3.37
          419          LS       0    90.5
          420          UD   0.074
                       *
1                                                HEC-1 INPUT                                                PAGE 12

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


          421          KK    CPGW
          422          KM   COMBINE COMBINE CP2*, CP3*, STKB2, I, STFW, Q, AND R
          423          HC       7
                       *
          424          ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    19        27-F
                .
                .
    33          .     27-COS2
                .           .
                .           .
    39          .           .         LM2
                .           .           .
                .           .           .
    45        CLM2.......................
                .
                .
    49          .     27-COS3
                .           .
                .           .
    54        COFF............
                V
                V
    59       RCOFF
                .
                .
    63          .           E
                .           .
                .           .
    69          .           .        STJ1
                .           .           .
                .           .           .
    76       CSTJ1.......................
                V
                V
    80      RCSTJ1
                .
                .
    84          .        NP-2
                .           .
                .           .
    90       CNP-2............
                V
                V
    94      RCNP-2
                .
                .
    98          .           F
                .           .
                .           .
   104         CF............
                V
                V
   108        RCF
                .
                .
   112          .      25-HS1
                .           .
                .           .
   118          .           .        STN1
                .           .           .
                .           .           .
   125          .       CSTN1............
```


RCSTN1
STG1
CSTG1
CP6
RCP6
L-M
STJ2
CSTJ2
RCSTJ2
STF
CSTF
U
DES4
CDES4
S
CS
CP7*
STKR
STKB1
V
W
STFR
EE
NP-3
STFE
CPFE
HH
CPBC
STI
C



```
              .          .          .
  284         .       CSTI............
              .          .
              .          .
  288         .          .          G
              .          .          .
              .          .          .
  294         .         CG............
              .          V
              .          V
  298         .        RCG
              .          .
              .          .
  302         .          .          H
              .          .          .
              .          .          .
  308         .         CH............
              .          .
              .          .
  312         .          .        STH
              .          .          .
              .          .          .
  319         .          .          .          J
              .          .          .          .
              .          .          .          .
  325         .          .         CJ............
              .          .          V
              .          .          V
  329         .          .        RCJ
              .          .          .
              .          .          .
  333         .          .          .          K
              .          .          .          .
              .          .          .          .
  339         .          .          .          .       DES2
              .          .          .          .          .
              .          .          .          .          .
  345         .          .      CDES2........................
              .          .          V
              .          .          V
  349         .          .     RCDES2
              .          .          .
              .          .          .
  353         .        CP2............
              .          .
              .          .
  357         .          .      N-O-P
              .          .          .
              .          .          .
  363         .          .          .       NP-1
              .          .          .          .
              .          .          .          .
  369         .          .          .          .       STG2
              .          .          .          .          .
              .          .          .          .          .
  376         .          .      CSTG2........................
              .          .          .
              .          .          .
  380         .          .          .       DES3
              .          .          .          .
              .          .          .          .
  386         .          .        CP3............
              .          .          .
              .          .          .
  390         .          .          .      STKB2
              .          .          .          .
              .          .          .          .
  397         .          .          .          .          I
              .          .          .          .          .
              .          .          .          .          .
  403         .          .          .          .          .       STFW
              .          .          .          .          .          .
              .          .          .          .          .          .
  409         .          .          .          .          .          .          Q
              .          .          .          .          .          .          .
              .          .          .          .          .          .          .
  415         .          .          .          .          .          .          .          R
              .          .          .          .          .          .          .          .
              .          .          .          .          .          .          .          .
  421         .       CPGW.........................................................................

 (***) 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   09JAN20  TIME  14:13:01  *                                                  *           (916) 756-1104             *
 *                                      *                                                  *                                      *
 ****************************************                                                  ****************************************
```

ULTIMATE CONDITION HYDROLOGIC MODEL
INPUT FILE DATE = JANUARY 8, 2019
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY VTN (ACY)

****
* SUMMERLIN WEST VILLAGE 22 *
* KETTLE BEND ROAD *
****

10YR AND 100YR STORM EVENT FOR 6 HOUR STORM

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

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

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.59 1.00
1

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .59	RATIO 2 1.00
HYDROGRAPH AT						
+	27-F	.03	1	FLOW	46.	83.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	27-COS2	.01	1	FLOW	10.	20.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	LM2	.01	1	FLOW	16.	28.
				TIME	3.50	3.50
3 COMBINED AT						
+	CLM2	.05	1	FLOW	72.	132.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	27-COS3	.03	1	FLOW	26.	53.
				TIME	3.58	3.50
2 COMBINED AT						
+	COFF	.08	1	FLOW	97.	185.
				TIME	3.50	3.50
ROUTED TO						
+	RCOFF	.08	1	FLOW	95.	182.
				TIME	3.50	3.50

```
 HYDROGRAPH AT
+                     E       .02     1   FLOW          32.      58.
                                           TIME        3.50     3.50

 HYDROGRAPH AT
+                  STJ1       .01     1   FLOW           9.      15.
                                           TIME        3.50     3.50

  3 COMBINED AT
+                 CSTJ1       .10     1   FLOW         136.     255.
                                           TIME        3.50     3.50

 ROUTED TO
+                RCSTJ1       .10     1   FLOW         133.     250.
                                           TIME        3.50     3.50

 HYDROGRAPH AT
+                  NP-2       .00     1   FLOW           2.       5.
                                           TIME        3.50     3.50

  2 COMBINED AT
+                 CNP-2       .11     1   FLOW         135.     255.
                                           TIME        3.50     3.50

 ROUTED TO
+                RCNP-2       .11     1   FLOW         131.     250.
                                           TIME        3.50     3.50

 HYDROGRAPH AT
+                     F       .02     1   FLOW          33.      59.
                                           TIME        3.50     3.50

  2 COMBINED AT
+                    CF       .13     1   FLOW         164.     309.
                                           TIME        3.50     3.50

 ROUTED TO
+                   RCF       .13     1   FLOW         161.     303.
                                           TIME        3.50     3.50

 HYDROGRAPH AT
+                25-HS1       .08     1   FLOW         117.     211.
                                           TIME        3.50     3.50

 HYDROGRAPH AT
+                  STN1       .01     1   FLOW           8.      13.
                                           TIME        3.58     3.58

  2 COMBINED AT
+                 CSTN1       .08     1   FLOW         124.     224.
                                           TIME        3.50     3.50

 ROUTED TO
+                RCSTN1       .08     1   FLOW         122.     220.
                                           TIME        3.50     3.50

 HYDROGRAPH AT
+                  STG1       .00     1   FLOW           5.       8.
                                           TIME        3.50     3.50

  2 COMBINED AT
+                 CSTG1       .09     1   FLOW         127.     229.
                                           TIME        3.50     3.50

  2 COMBINED AT
+                   CP6       .21     1   FLOW         288.     532.
                                           TIME        3.50     3.50

 ROUTED TO
+                  RCP6       .21     1   FLOW         278.     518.
                                           TIME        3.50     3.50

 HYDROGRAPH AT
+                   L-M       .03     1   FLOW          44.      81.
                                           TIME        3.50     3.50

 HYDROGRAPH AT
+                  STJ2       .00     1   FLOW           8.      13.
                                           TIME        3.50     3.50

  3 COMBINED AT
+                 CSTJ2       .25     1   FLOW         330.     612.
                                           TIME        3.50     3.50

 ROUTED TO
+                RCSTJ2       .25     1   FLOW         323.     602.
                                           TIME        3.50     3.50

 HYDROGRAPH AT
+                   STF       .00     1   FLOW           5.       8.
                                           TIME        3.50     3.50
```

```
  2 COMBINED AT
+                   CSTF       .25     1   FLOW         328.     610.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                      U       .01     1   FLOW           5.      11.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                   DES4       .00     1   FLOW           5.       8.
                                              TIME        3.50     3.50

  2 COMBINED AT
+                  CDES4       .01     1   FLOW          10.      19.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                      S       .00     1   FLOW           4.      10.
                                              TIME        3.50     3.50

  2 COMBINED AT
+                     CS       .01     1   FLOW          14.      29.
                                              TIME        3.50     3.50

  2 COMBINED AT
+                   CP7*       .27     1   FLOW         342.     639.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                   STKR       .00     1   FLOW           3.       6.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                  STKB1       .01     1   FLOW           8.      13.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                      V       .01     1   FLOW           7.      16.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                      W       .01     1   FLOW           7.      16.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                   STFR       .00     1   FLOW           4.       7.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                     EE       .01     1   FLOW          10.      22.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                   NP-3       .00     1   FLOW           1.       2.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                   STFE       .00     1   FLOW           3.       6.
                                              TIME        3.50     3.50

  2 COMBINED AT
+                   CPFE       .00     1   FLOW           4.       8.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                     HH       .01     1   FLOW          10.      19.
                                              TIME        3.50     3.50

  9 COMBINED AT
+                   CPBC       .32     1   FLOW         397.     747.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                    STI       .00     1   FLOW           6.      11.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                      C       .02     1   FLOW          28.      51.
                                              TIME        3.50     3.50

  2 COMBINED AT
+                   CSTI       .02     1   FLOW          35.      62.
                                              TIME        3.50     3.50

 HYDROGRAPH AT
+                      G       .01     1   FLOW          17.      30.
                                              TIME        3.50     3.50

  2 COMBINED AT
+                     CG       .03     1   FLOW          51.      92.
```

```
                                        TIME         3.50     3.50

 ROUTED TO
+                    RCG       .03     1   FLOW          51.      91.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
+                      H       .01     1   FLOW          18.      33.
                                         TIME         3.50     3.50

   2 COMBINED AT
+                     CH       .05     1   FLOW          69.     124.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
+                    STH       .00     1   FLOW           6.      10.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
+                      J       .01     1   FLOW          12.      24.
                                         TIME         3.50     3.50

   2 COMBINED AT
+                     CJ       .01     1   FLOW          18.      34.
                                         TIME         3.50     3.50

 ROUTED TO
+                    RCJ       .01     1   FLOW          18.      33.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
+                      K       .01     1   FLOW          12.      22.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
+                   DES2       .00     1   FLOW           7.      13.
                                         TIME         3.50     3.50

   3 COMBINED AT
+                  CDES2       .03     1   FLOW          38.      68.
                                         TIME         3.50     3.50

 ROUTED TO
+                 RCDES2       .03     1   FLOW          36.      66.
                                         TIME         3.50     3.50

   2 COMBINED AT
+                    CP2       .07     1   FLOW         105.     190.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
+                  N-O-P       .02     1   FLOW          24.      49.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
+                   NP-1       .00     1   FLOW           3.       6.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
+                   STG2       .00     1   FLOW           7.      13.
                                         TIME         3.50     3.50

   3 COMBINED AT
+                  CSTG2       .03     1   FLOW          35.      68.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
+                   DES3       .00     1   FLOW           5.       9.
                                         TIME         3.50     3.50

   2 COMBINED AT
+                    CP3       .03     1   FLOW          40.      77.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
+                  STKB2       .01     1   FLOW          10.      18.
                                         TIME         3.58     3.58

 HYDROGRAPH AT
+                      I       .02     1   FLOW          26.      50.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
+                   STFW       .00     1   FLOW           2.       4.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
+                      Q       .01     1   FLOW           9.      17.
                                         TIME         3.50     3.50

 HYDROGRAPH AT
```

```
+                     R       .01     1   FLOW           9.      18.
                                          TIME         3.50     3.50

  7 COMBINED AT
+                   CPGW      .15     1   FLOW         201.     374.
                                          TIME         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
             RCOFF  MANE           .43     96.30    210.49      1.33      5.00     95.11    210.00        1.33


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5428E+01 EXCESS= .0000E+00 OUTFLOW= .5428E+01 BASIN STORAGE= .4331E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCOFF  MANE           .38    183.88    210.27      2.65      5.00    182.24    210.00        2.65


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1084E+02 EXCESS= .0000E+00 OUTFLOW= .1084E+02 BASIN STORAGE= .4273E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCSTJ1  MANE           .54    133.33    210.62      1.39      5.00    132.66    210.00        1.39


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7704E+01 EXCESS= .0000E+00 OUTFLOW= .7702E+01 BASIN STORAGE= .5896E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCSTJ1  MANE           .48    250.37    210.43      2.73      5.00    250.31    210.00        2.73


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1511E+02 EXCESS= .0000E+00 OUTFLOW= .1511E+02 BASIN STORAGE= .5607E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCNP-2  MANE           .61    132.53    210.75      1.38      5.00    131.43    210.00        1.38


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7824E+01 EXCESS= .0000E+00 OUTFLOW= .7823E+01 BASIN STORAGE= .1076E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCNP-2  MANE           .52    250.86    210.48      2.72      5.00    250.12    210.00        2.72


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1538E+02 EXCESS= .0000E+00 OUTFLOW= .1538E+02 BASIN STORAGE= .1047E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCF  MANE           .48    161.76    210.51      1.41      5.00    161.01    210.00        1.41


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9611E+01 EXCESS= .0000E+00 OUTFLOW= .9609E+01 BASIN STORAGE= .8727E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCF  MANE           .41    304.65    210.23      2.75      5.00    303.48    210.00        2.75


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1879E+02 EXCESS= .0000E+00 OUTFLOW= .1878E+02 BASIN STORAGE= .8389E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCSTN1  MANE           .47    123.16    210.45      1.51      5.00    121.66    210.00        1.52


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .6695E+01 EXCESS= .0000E+00 OUTFLOW= .6695E+01 BASIN STORAGE= .4944E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCSTN1  MANE           .41    221.54    210.18      2.88      5.00    220.20    210.00        2.89


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1275E+02 EXCESS= .0000E+00 OUTFLOW= .1275E+02 BASIN STORAGE= .5014E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCP6  MANE           .69    280.66    210.30      1.45      5.00    278.18    210.00        1.45


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1660E+02 EXCESS= .0000E+00 OUTFLOW= .1659E+02 BASIN STORAGE= .1410E-03 PERCENT ERROR=    .0
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          FOR PLAN = 1  RATIO=  .00
              RCP6  MANE          .59    520.09    210.36      2.81      5.00    517.62    210.00        2.81


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3204E+02 EXCESS= .0000E+00 OUTFLOW= .3203E+02 BASIN STORAGE= .1553E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCSTJ2  MANE          .52    328.09    210.60      1.46      5.00    323.23    210.00        1.46


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1961E+02 EXCESS= .0000E+00 OUTFLOW= .1961E+02 BASIN STORAGE= .1097E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCSTJ2  MANE          .45    608.79    210.39      2.81      5.00    602.17    210.00        2.82


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3779E+02 EXCESS= .0000E+00 OUTFLOW= .3779E+02 BASIN STORAGE= .1206E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCG  MANE          .33     50.92    210.20      1.53      5.00     50.59    210.00        1.53


CONTINUITY SUMMARY (AC-FT) - INFLOW= .2737E+01 EXCESS= .0000E+00 OUTFLOW= .2737E+01 BASIN STORAGE= .2788E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCG  MANE          .29     91.58    210.20      2.89      5.00     91.06    210.00        2.89


CONTINUITY SUMMARY (AC-FT) - INFLOW= .5175E+01 EXCESS= .0000E+00 OUTFLOW= .5175E+01 BASIN STORAGE= .2873E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCJ  MANE          .49     18.11    210.40      1.40      5.00     17.88    210.00        1.40


CONTINUITY SUMMARY (AC-FT) - INFLOW= .9618E+00 EXCESS= .0000E+00 OUTFLOW= .9618E+00 BASIN STORAGE= .3583E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCJ  MANE          .43     33.61    210.51      2.73      5.00     33.37    210.00        2.73


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1875E+01 EXCESS= .0000E+00 OUTFLOW= .1875E+01 BASIN STORAGE= .3567E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCDES2  MANE          .82     37.10    210.88      1.50      5.00     36.44    210.00        1.50


CONTINUITY SUMMARY (AC-FT) - INFLOW= .2059E+01 EXCESS= .0000E+00 OUTFLOW= .2059E+01 BASIN STORAGE= .7113E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCDES2  MANE          .73     67.25    210.43      2.84      5.00     66.40    210.00        2.85


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3910E+01 EXCESS= .0000E+00 OUTFLOW= .3910E+01 BASIN STORAGE= .7532E-04 PERCENT ERROR=    .0



*** NORMAL END OF HEC-1 ***
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APPENDIX C
HYDRAULIC CALCULATIONS

INTERIM CHANNEL
NORMAL DEPTH CALCULATIONS

Worksheet for SW5A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.22590	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	5.00	ft^3/s

Results

Normal Depth	0.18	ft
Flow Area	0.97	ft^2
Wetted Perimeter	6.11	ft
Hydraulic Radius	0.16	ft
Top Width	6.05	ft
Critical Depth	0.30	ft
Critical Slope	0.03737	ft/ft
Velocity	5.17	ft/s
Velocity Head	0.42	ft
Specific Energy	0.59	ft
Froude Number	2.28	
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	0.18	ft
Critical Depth	0.30	ft
Channel Slope	0.22590	ft/ft

Worksheet for SW5A

GVF Output Data

Critical Slope	0.03737	ft/ft

Messages

Notes

Roughness coefficient, n= 0.04 for 12- inch riprap.

Cross Section for SW5A

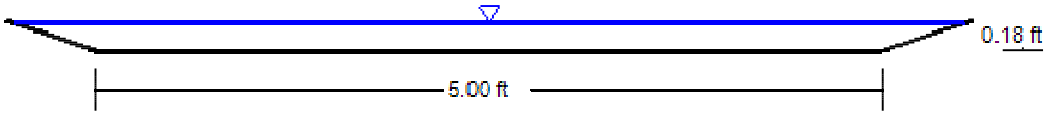
Project Description

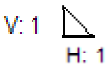
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.22590	ft/ft
Normal Depth	0.18	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	5.00	ft³/s

Cross Section Image





Worksheet for SW5B

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	0.01000	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	9.00	ft³/s

Results

Normal Depth	0.46	ft
Flow Area	2.93	ft²
Wetted Perimeter	7.91	ft
Hydraulic Radius	0.37	ft
Top Width	7.76	ft
Critical Depth	0.43	ft
Critical Slope	0.01320	ft/ft
Velocity	3.07	ft/s
Velocity Head	0.15	ft
Specific Energy	0.61	ft
Froude Number	0.88	
Flow Type	Subcritical	

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	0.46	ft
Critical Depth	0.43	ft
Channel Slope	0.01000	ft/ft

Worksheet for SW5B

GVF Output Data

Critical Slope	0.01320	ft/ft

Cross Section for SW5B

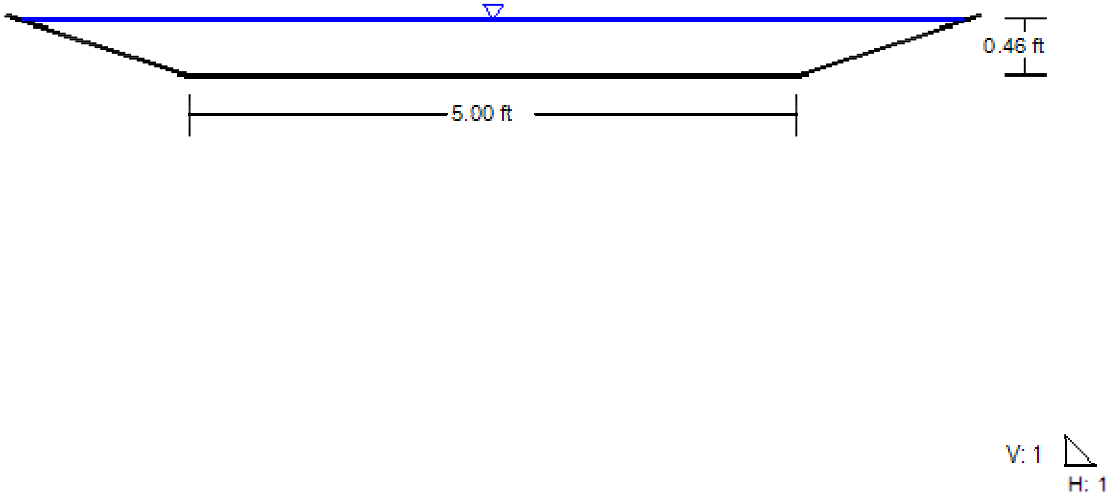
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	0.01000	ft/ft
Normal Depth	0.46	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	9.00	ft³/s

Cross Section Image



Worksheet for SW6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.25140	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	18.00	ft³/s

Results

Normal Depth	0.36	ft
Flow Area	2.17	ft²
Wetted Perimeter	7.26	ft
Hydraulic Radius	0.30	ft
Top Width	7.14	ft
Critical Depth	0.64	ft
Critical Slope	0.03022	ft/ft
Velocity	8.31	ft/s
Velocity Head	1.07	ft
Specific Energy	1.43	ft
Froude Number	2.66	
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	0.36	ft
Critical Depth	0.64	ft
Channel Slope	0.25140	ft/ft

Worksheet for SW6

GVF Output Data

Critical Slope	0.03022	ft/ft

Messages

Notes

Roughness coefficient, n= 0.04 for 12- inch riprap.

Cross Section for SW6

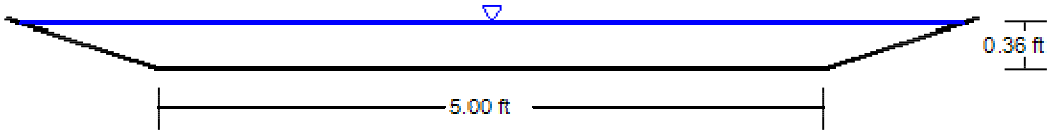
Project Description

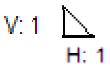
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.25140	ft/ft
Normal Depth	0.36	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	18.00	ft³/s

Cross Section Image





Worksheet for SW8

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.20740	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	12.00	ft³/s

Results

Normal Depth	0.30	ft
Flow Area	1.76	ft²
Wetted Perimeter	6.89	ft
Hydraulic Radius	0.26	ft
Top Width	6.79	ft
Critical Depth	0.51	ft
Critical Slope	0.03222	ft/ft
Velocity	6.82	ft/s
Velocity Head	0.72	ft
Specific Energy	1.02	ft
Froude Number	2.36	
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	0.30	ft
Critical Depth	0.51	ft
Channel Slope	0.20740	ft/ft

Worksheet for SW8

GVF Output Data

Critical Slope	0.03222	ft/ft

Messages

Notes

Roughness coefficient, n= 0.04 for 12- inch riprap.

Cross Section for SW8

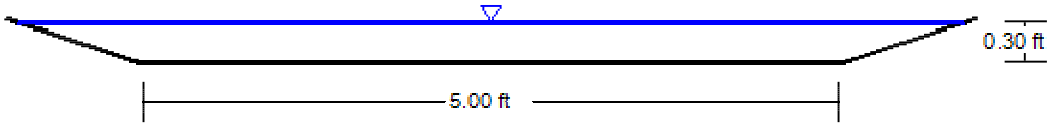
Project Description

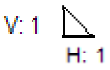
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.20740	ft/ft
Normal Depth	0.30	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	12.00	ft³/s

Cross Section Image





Worksheet for BERM

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Discharge	707.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+14	3333.44
0+44	3323.30
0+50	3321.34
0+50	3321.34
0+55	3321.33
0+60	3323.04
0+73	3327.31
0+89	3327.61
0+93	3327.68
0+94	3328.13
0+95	3328.18

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+14, 3333.44)	(0+95, 3328.18)	0.037

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	4.78	ft
Elevation Range	3321.33 to 3333.44 ft	

Worksheet for BERM

Results

Flow Area		92.59	ft²
Wetted Perimeter		35.32	ft
Hydraulic Radius		2.62	ft
Top Width		33.77	ft
Normal Depth		4.78	ft
Critical Depth		4.34	ft
Critical Slope		0.01555	ft/ft
Velocity		7.64	ft/s
Velocity Head		0.91	ft
Specific Energy		5.68	ft
Froude Number		0.81	
Flow Type	Subcritical		

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	4.78	ft
Critical Depth	4.34	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.01555	ft/ft

Cross Section for BERM

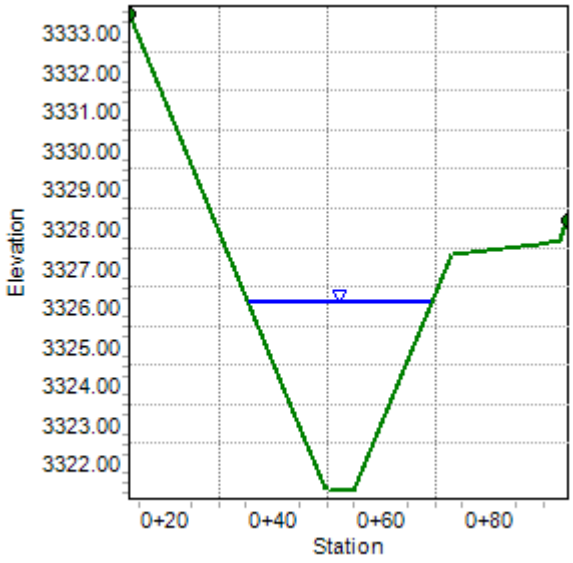
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	4.78	ft
Discharge	707.00	ft³/s

Cross Section Image



Worksheet for DF1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00900	ft/ft
Discharge	694.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	3382.76
0+03	3382.45
0+04	3382.38
0+06	3382.26
0+09	3382.10
0+21	3381.53
0+24	3381.33
0+31	3380.99
0+44	3380.70
0+47	3380.58
0+57	3380.23
0+68	3382.92
0+73	3383.69
0+74	3383.67
0+77	3383.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 3382.76)	(0+77, 3383.60)	0.023

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for DF1

Results

Normal Depth		2.42	ft
Elevation Range	3380.23 to 3383.69 ft		
Flow Area		91.55	ft²
Wetted Perimeter		66.55	ft
Hydraulic Radius		1.38	ft
Top Width		66.19	ft
Normal Depth		2.42	ft
Critical Depth		2.56	ft
Critical Slope		0.00681	ft/ft
Velocity		7.58	ft/s
Velocity Head		0.89	ft
Specific Energy		3.32	ft
Froude Number		1.14	
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	2.42	ft
Critical Depth	2.56	ft
Channel Slope	0.00900	ft/ft
Critical Slope	0.00681	ft/ft

Cross Section for DF1

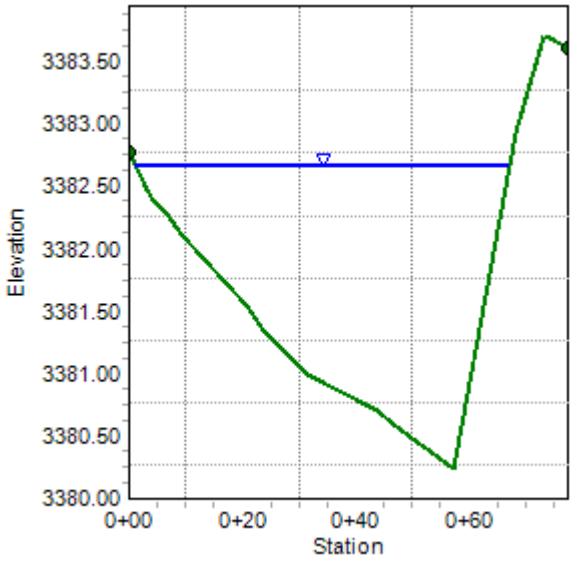
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00900	ft/ft
Normal Depth	2.42	ft
Discharge	694.00	ft³/s

Cross Section Image



Worksheet for DF2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02400	ft/ft
Discharge	694.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	3351.24
0+16	3350.96
0+24	3350.79
0+27	3350.69
0+53	3349.84
0+62	3349.59
0+69	3349.39
0+78	3349.16
0+80	3349.20
0+86	3350.91
0+92	3353.02
0+93	3353.01
0+96	3352.94
0+96	3352.92
0+97	3352.92

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 3351.24)	(0+97, 3352.92)	0.023

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for DF2

Results

Normal Depth		1.90	ft
Elevation Range	3349.16 to 3353.02 ft		
Flow Area		72.08	ft²
Wetted Perimeter		76.39	ft
Hydraulic Radius		0.94	ft
Top Width		76.08	ft
Normal Depth		1.90	ft
Critical Depth		2.34	ft
Critical Slope		0.00723	ft/ft
Velocity		9.63	ft/s
Velocity Head		1.44	ft
Specific Energy		3.34	ft
Froude Number		1.74	
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	1.90	ft
Critical Depth	2.34	ft
Channel Slope	0.02400	ft/ft
Critical Slope	0.00723	ft/ft

Cross Section for DF2

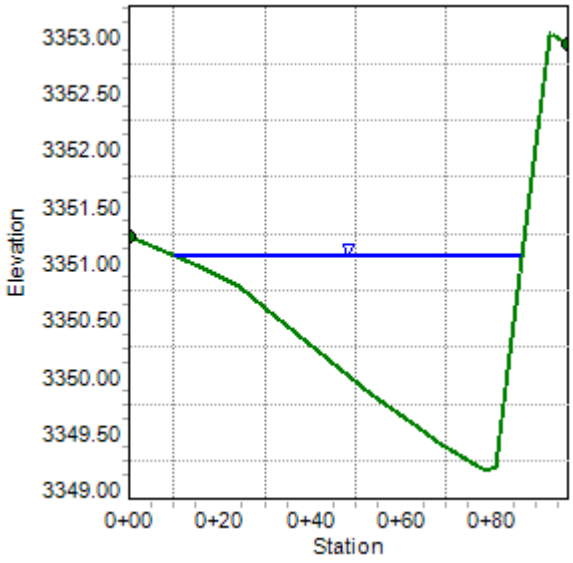
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02400	ft/ft
Normal Depth	1.90	ft
Discharge	694.00	ft³/s

Cross Section Image



Worksheet for AT1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.09860	ft/ft
Discharge	461.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	3514.11
0+00	3514.11
0+08	3514.20
0+16	3513.69
0+22	3513.56
0+25	3513.45
0+27	3513.29
0+31	3512.78
0+34	3512.49
0+39	3511.89
0+47	3510.73
0+49	3510.40
0+58	3508.68
0+63	3507.66
0+65	3507.19
0+68	3506.69
0+82	3504.07
0+86	3503.31
0+89	3502.91
0+90	3502.64
0+95	3501.70
1+00	3500.91
1+01	3500.76
1+02	3500.54
1+05	3500.01
1+15	3497.78
1+16	3497.67

Worksheet for AT1

Input Data

Station (ft)	Elevation (ft)
1+24	3496.16
1+24	3496.04
1+24	3495.93
1+31	3493.82
1+45	3490.08
1+45	3489.97
1+45	3489.95
1+46	3489.57
1+49	3488.36
1+51	3487.93
1+51	3487.87
1+51	3487.87
1+52	3487.91
1+54	3487.99
1+55	3488.02
1+60	3488.60
1+62	3488.76
1+63	3488.89
1+69	3489.43
1+71	3489.56
1+72	3489.62
1+74	3489.60
1+75	3489.66
1+80	3490.57
1+81	3490.74
2+04	3494.34
2+05	3494.44
2+05	3494.51
2+06	3494.55
2+07	3494.80
2+11	3495.44
2+13	3495.76
2+19	3497.13
2+29	3499.13
2+30	3499.38
2+39	3500.53
2+39	3500.57

Worksheet for AT1

Input Data

Station (ft)	Elevation (ft)
2+55	3503.20
2+56	3503.42
2+59	3504.05
2+62	3504.38
2+74	3505.90
2+83	3506.99
2+88	3507.43
2+94	3507.96
2+97	3508.03
3+00	3508.12
3+01	3508.16

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 3514.11)	(3+01, 3508.16)	0.023

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		1.78	ft
Elevation Range	3487.87 to 3514.20 ft		
Flow Area		25.21	ft²
Wetted Perimeter		29.48	ft
Hydraulic Radius		0.86	ft
Top Width		29.03	ft
Normal Depth		1.78	ft

Worksheet for AT1

Results

Critical Depth		2.92	ft
Critical Slope		0.00671	ft/ft
Velocity		18.28	ft/s
Velocity Head		5.19	ft
Specific Energy		6.98	ft
Froude Number		3.46	
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	1.78	ft
Critical Depth	2.92	ft
Channel Slope	0.09860	ft/ft
Critical Slope	0.00671	ft/ft

Cross Section for AT1

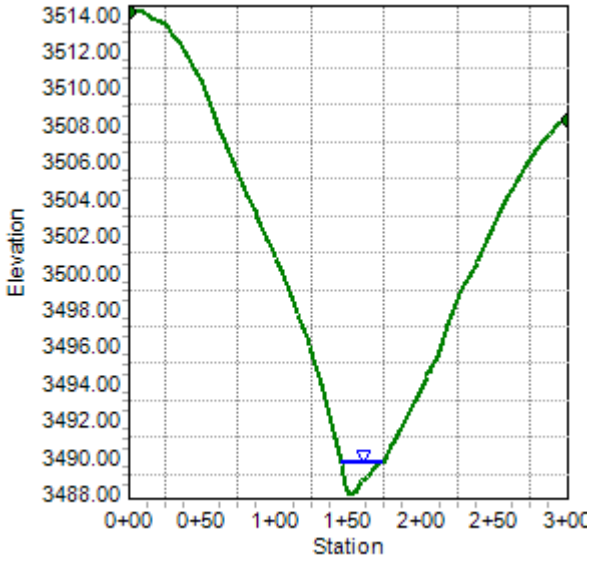
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.09860	ft/ft
Normal Depth	1.78	ft
Discharge	461.00	ft³/s

Cross Section Image



Worksheet for AT2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.07580	ft/ft
Discharge	461.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	3448.55
0+07	3448.68
0+11	3448.61
0+22	3448.01
0+32	3447.44
0+35	3447.00
0+43	3446.13
0+47	3445.67
0+61	3443.39
0+64	3442.86
0+65	3442.66
0+67	3442.30
0+76	3440.24
0+81	3439.39
0+83	3439.10
0+88	3438.17
0+89	3438.03
0+89	3437.96
0+95	3436.65
0+96	3436.37
0+99	3436.27
1+04	3435.79
1+05	3435.76
1+07	3435.35
1+16	3433.91
1+25	3431.63
1+25	3431.61

Worksheet for AT2

Input Data

Station (ft)	Elevation (ft)
1+25	3431.61
1+35	3429.39
1+36	3429.13
1+39	3428.47
1+45	3426.96
1+47	3426.69
1+47	3426.64
1+48	3426.67
1+48	3426.72
1+50	3426.88
1+50	3426.85
1+56	3427.71
1+57	3427.74
1+57	3427.76
1+61	3428.17
1+69	3429.41
1+69	3429.43
1+69	3429.45
1+77	3430.84
1+87	3433.03
1+90	3433.63
1+93	3434.45
2+05	3437.04
2+15	3439.51
2+15	3439.53
2+15	3439.54
2+26	3441.38
2+55	3445.24
2+56	3445.34
2+56	3445.36
2+57	3445.39
2+64	3445.99
2+73	3446.66
2+74	3446.62
2+76	3446.52

Section Definitions

Worksheet for AT2

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+00, 3448.55)	(2+76, 3446.52)	0.023

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		1.95	ft
Elevation Range	3426.64 to 3448.68 ft		
Flow Area		25.66	ft²
Wetted Perimeter		25.29	ft
Hydraulic Radius		1.01	ft
Top Width		24.94	ft
Normal Depth		1.95	ft
Critical Depth		3.13	ft
Critical Slope		0.00663	ft/ft
Velocity		17.96	ft/s
Velocity Head		5.01	ft
Specific Energy		6.96	ft
Froude Number		3.12	
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		

Worksheet for AT2

GVF Output Data

Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.95	ft
Critical Depth	3.13	ft
Channel Slope	0.07580	ft/ft
Critical Slope	0.00663	ft/ft

Cross Section for AT2

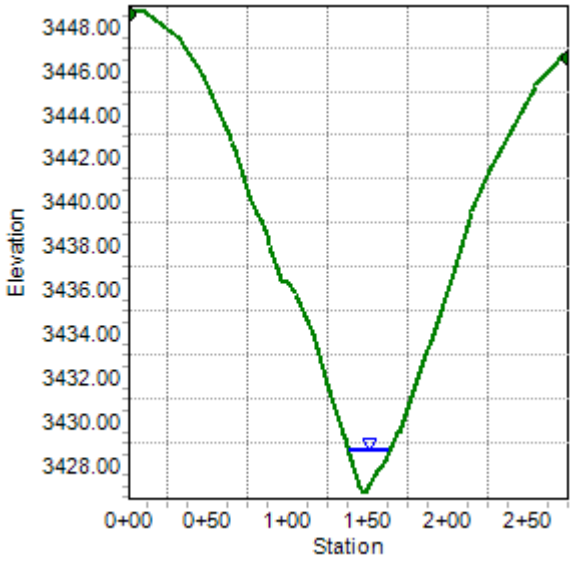
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.07580	ft/ft
Normal Depth	1.95	ft
Discharge	461.00	ft³/s

Cross Section Image



FREEBOARD CALCULATIONS

FREEBOARD CALCULATIONS

DEVELOPMENT Kettle Bend Road
W.O. # 7861 **CALCULATED BY** RBR

EQUATIONS*

$$Fb_{sup} = 1 + 0.025 * V * D^{1/3} \qquad Fb_{sub} = \frac{1}{2} + \frac{V^2}{2g}$$

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)	Channel Depth (ft)
SW1A	SUPER	5.76	0.19		1.08	1.27
SW1B	SUPER	5.32	0.20		1.08	1.28
SW2A	SUPER	6.51	0.24		1.10	1.34
SW2B	SUPER	6.35	0.24		1.10	1.34
SW3	SUPER	6.85	0.28		1.11	1.39
SW4	SUPER	7.00	0.29		1.12	1.41
SW5A	SUPER	5.17	0.18		1.07	1.25
SW5B	SUB	3.07	0.46		1.00	1.46
SW6	SUPER	8.31	0.36		1.15	1.51
SW7	SUPER	8.59	0.43		1.16	1.59
SW8	SUPER	6.82	0.30		1.11	1.41
SW9	SUPER	6.54	4.18		1.26	5.44
BERM	SUPER	7.64	4.78		1.32	6.10
DF1	SUPER	7.58	2.42		1.25	3.67
DF2	SUPER	9.63	1.90		1.30	3.20

RIPRAP CALCULATIONS

RIP-RAP CALCULATIONS

DEVELOPMENT Kettle Bend Road
Work Order # 7861 **CALCULATED BY** RBR

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 pages 746 and 747 of the CCRFCD HC&DDM
Minimum rip rap size utilized is D_{50} = 8"

Section	Q_{100} (cfs)	Max. Velocity (fps)	Slope (ft/ft)	Specific Gravity	D_{50} (ft)	n-value
SW1A	6	5.76	0.259	2.65	0.7	0.037
SW1B	6	5.32	0.202	2.65	0.7	0.037
SW2A	9	6.51	0.243	2.65	0.7	0.037
SW2B	9	6.35	0.227	2.65	0.7	0.037
SW3	11	6.85	0.230	2.65	0.7	0.037
SW4	12	7.00	0.225	2.65	0.7	0.037
SW5A	5	5.17	0.226	2.65	0.7	0.037
SW6	18	8.31	0.251	2.65	0.9	0.039
SW7	23	8.59	0.219	2.65	0.9	0.039
SW8	12	6.82	0.207	2.65	0.7	0.037
SW9	480	6.54	0.010	2.65	0.7	0.037
BERM	707	7.64	0.010	2.65	0.7	0.037
DF1	694	7.58	0.009	2.65	0.7	0.037
DF2	694	9.63	0.024	2.65	0.7	0.037

WSPG
MAINLINE MODELS

8’X8’ RCB
BELTWAY CHANNEL
KBBC.WSW

```
T1 KETTLE BEND ROAD
T2 MAINLINE 1 - 8'X8' RCB (ULTIMATE CONDITION)
T3 KETTLE BEND - KINDLE RISE TO SUNSET RUN
SO   1000.00 3309.53   3      .015
R    1136.70 3310.04   3      .015                                  0.00    0.00  0
R    1173.70 3310.22   3      .015                                 10.63    0.00  0
R    1207.70 3310.39   3      .015                                  2.88    0.00  0
R    1263.30 3310.67   3      .015                                  0.00    0.00  0
R    1336.40 3311.03   3      .015                                  0.00    0.00  0
R    1423.90 3311.47   3      .015                                  0.00    0.00  0
R    1560.70 3312.15   3      .015                                  0.00    0.00  0
R    1726.00 3312.98   3      .015                                  0.00    0.00  0
R    1795.10 3313.33   3      .015                                  0.00    0.00  0
R    1853.20 3313.62   3      .015                                  0.00    0.00  0
R    2086.00 3314.78   3      .015                                  0.00    0.00  0
R    2158.70 3315.14   3      .015                                  0.00    0.00  0
R    2394.80 3316.33   3      .015                                  0.00    0.00  0
R    2464.60 3316.68   3      .015                                  0.00    0.00  0
R    2468.60 3316.70   3      .015                                  0.00  -15.00  0
R    2472.60 3316.72   3      .015                                  0.00  -15.00  0
R    2509.60 3316.90   3      .015                                  0.00  -15.00  0
R    2513.60 3316.92   3      .015                                  0.00  -12.00  0
R    2517.60 3316.94   3      .015                                  0.00  -15.00  0
R    2545.90 3317.08   3      .015                                  0.00  -15.00  0
R    2631.10 3317.51   3      .015                                  0.00    0.00  0
SH   2631.10 3317.51   3      .015
CD   1  3   0   0.00    8.00     6.00  0.00  0.00
CD   2  3   0   0.00    8.00    10.00  0.00  0.00
CD   3  3   0   0.00    8.00     8.00  0.00  0.00
Q           747.000   .0
```

KETTLE BEND ROAD
MAINLINE 1 - 8'X8' RCB (ULTIMATE CONDITION)
KETTLE BEND - KINDLE RISE TO SUNSET RUN

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	3309.530	6.470	3316.000	747.00	14.43	3.23	3319.23	.00	6.47	8.00	8.000	8.000	.00	0 .0
9.633	.0037					.0056	.05	6.47	1.00	8.00	.015	.00	.00	BOX
1009.633	3309.566	6.786	3316.352	747.00	13.76	2.94	3319.29	.00	6.47	8.00	8.000	8.000	.00	0 .0
40.203	.0037					.0050	.20	6.79	.93	8.00	.015	.00	.00	BOX
1049.836	3309.716	7.117	3316.833	747.00	13.12	2.67	3319.51	.00	6.47	8.00	8.000	8.000	.00	0 .0
86.864	.0037					.0045	.39	7.12	.87	8.00	.015	.00	.00	BOX
1136.700	3310.040	7.422	3317.462	747.00	12.58	2.46	3319.92	.10	6.47	8.00	8.000	8.000	.00	0 .0
37.000	.0049					.0045	.17	7.52	.81	7.20	.015	.00	.00	BOX

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

1173.700	3310.220	7.386	3317.606	747.00	12.64	2.48	3320.09	.03	6.47	8.00	8.000	8.000	.00	0 .0
34.000	.0050					.0046	.16	7.42	.82	7.12	.015	.00	.00	BOX

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

1207.700	3310.390	7.344	3317.734	747.00	12.71	2.51	3320.24	.00	6.47	8.00	8.000	8.000	.00	0 .0
55.600	.0050					.0046	.26	7.34	.83	7.10	.015	.00	.00	BOX

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

KETTLE BEND ROAD
MAINLINE 1 - 8'X8' RCB (ULTIMATE CONDITION)
KETTLE BEND - KINDLE RISE TO SUNSET RUN

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
1263.300	3310.670	7.280	3317.950	747.00	12.83	2.55	3320.50	.00	6.47	8.00	8.000	8.000	.00	0 .0
73.100	.0049					.0047	.35	7.28	.84	7.16	.015	.00	.00	BOX

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

1336.400	3311.030	7.240	3318.270	747.00	12.90	2.58	3320.85	.00	6.47	8.00	8.000	8.000	.00	0 .0
87.500	.0050					.0048	.42	7.24	.84	7.10	.015	.00	.00	BOX

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

1423.900	3311.470	7.183	3318.653	747.00	13.00	2.62	3321.28	.00	6.47	8.00	8.000	8.000	.00	0 .0
136.800	.0050					.0049	.67	7.18	.85	7.14	.015	.00	.00	BOX
1560.700	3312.150	7.155	3319.305	747.00	13.05	2.64	3321.95	.00	6.47	8.00	8.000	8.000	.00	0 .0
165.300	.0050					.0049	.82	7.16	.86	7.11	.015	.00	.00	BOX
1726.000	3312.980	7.122	3320.102	747.00	13.11	2.67	3322.77	.00	6.47	8.00	8.000	8.000	.00	0 .0
69.100	.0051					.0050	.35	7.12	.87	7.08	.015	.00	.00	BOX
1795.100	3313.330	7.107	3320.437	747.00	13.14	2.68	3323.12	.00	6.47	8.00	8.000	8.000	.00	0 .0
58.100	.0050					.0050	.29	7.11	.87	7.13	.015	.00	.00	BOX
1853.200	3313.620	7.113	3320.733	747.00	13.13	2.68	3323.41	.00	6.47	8.00	8.000	8.000	.00	0 .0
232.800	.0050					.0050	1.16	7.11	.87	7.13	.015	.00	.00	BOX

KETTLE BEND ROAD
MAINLINE 1 - 8'X8' RCB (ULTIMATE CONDITION)
KETTLE BEND - KINDLE RISE TO SUNSET RUN

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
2086.000	3314.780	7.129	3321.909	747.00	13.10	2.66	3324.57	.00	6.47	8.00	8.000	8.000	.00	0	.0
72.700	.0049				.0050	.36	7.13	.86	7.15	.015	.00	.00	BOX		
2158.700	3315.140	7.137	3322.277	747.00	13.08	2.66	3324.93	.00	6.47	8.00	8.000	8.000	.00	0	.0
236.100	.0050				.0050	1.17	7.14	.86	7.10	.015	.00	.00	BOX		
2394.800	3316.330	7.101	3323.431	747.00	13.15	2.68	3326.12	.00	6.47	8.00	8.000	8.000	.00	0	.0
69.800	.0050				.0050	.35	7.10	.87	7.11	.015	.00	.00	BOX		
2464.600	3316.680	7.106	3323.786	747.00	13.14	2.68	3326.47	.00	6.47	8.00	8.000	8.000	.00	0	.0
4.000	.0050				.0050	.02	7.11	.87	7.12	.015	.00	.00	BOX		
2468.600	3316.700	7.107	3323.806	747.00	13.14	2.68	3326.49	.00	6.47	8.00	8.000	8.000	.00	0	.0
4.000	.0050				.0050	.02	7.11	.87	7.12	.015	.00	.00	BOX		
2472.600	3316.720	7.107	3323.827	747.00	13.14	2.68	3326.51	.00	6.47	8.00	8.000	8.000	.00	0	.0
37.000	.0049				.0050	.18	7.11	.87	7.20	.015	.00	.00	BOX		
2509.600	3316.900	7.128	3324.028	747.00	13.10	2.66	3326.69	.00	6.47	8.00	8.000	8.000	.00	0	.0
4.000	.0050				.0050	.02	7.13	.86	7.12	.015	.00	.00	BOX		
2513.600	3316.920	7.128	3324.048	747.00	13.10	2.66	3326.71	.00	6.47	8.00	8.000	8.000	.00	0	.0
4.000	.0050				.0050	.02	7.13	.86	7.12	.015	.00	.00	BOX		
2517.600	3316.940	7.128	3324.068	747.00	13.10	2.66	3326.73	.00	6.47	8.00	8.000	8.000	.00	0	.0
28.300	.0050				.0050	.14	7.13	.86	7.15	.015	.00	.00	BOX		

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-10-2020 Time: 8:46:33

KETTLE BEND ROAD
MAINLINE 1 - 8'X8' RCB (ULTIMATE CONDITION)
KETTLE BEND - KINDLE RISE TO SUNSET RUN

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	
2545.900	3317.080	7.132	3324.212	747.00	13.09	2.66	3326.87	.00	6.47	8.00	8.000	8.000	.00	0	.0
85.200	.0050				.0050	.42	7.13	.86	7.09	.015	.00	.00	BOX		
2631.100	3317.510	7.115	3324.625	747.00	13.12	2.67	3327.30	.00	6.47	8.00	8.000	8.000	.00	0	.0

GOWAN CHANNEL

30” RCP & 6’X6’ RCB
PARCEL I TO GOWAN CHANNEL
KBGW.WSW

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T1 KETTLE BEND ROAD
T2 PARCEL I 30" RCP STUB TO 6'X6' RCB (ULTIMATE CONDITION)
T3 KETTLE BEND - PARCEL I TO PARCEL B
SO   1000.00 3273.80   2      .015               3278.82
R    1122.09 3276.27   2      .015                                    0.00    0.00  0
JX   1122.09 3276.27   2  3  4.015  125.0    197.0  3276.77 3276.77 -45.0039.00  0
R    1135.11 3276.53   2      .015                                    0.00    0.00  0
WX   1135.11 3276.53   1      .015
R    1242.51 3282.13   1      .015                                    0.00    0.00  0
SH   1242.51 3382.13   1      .015
CD   1  4   0   0.00    2.50     0.00  0.00  0.00
CD   2  3   0   0.00    6.00     6.00  0.00  0.00
CD   3  4   0   0.00    3.00     0.00  0.00  0.00
CD   4  4   0   0.00    5.00     0.00  0.00  0.00
Q            50.000   .0
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Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-10-2020 Time: 8:40:57

KETTLE BEND ROAD
PARCEL I 30" RCP STUB TO 6'X6' RCB (ULTIMATE CONDITION)
KETTLE BEND - PARCEL I TO PARCEL B

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	3273.800	3.568	3277.368	372.00	17.37	4.69	3282.06	.00	4.92	6.00	6.000	6.000	.00	0 .0
39.434	.0202				.0153	.60	3.57	1.62	3.27	.015	.00	.00	BOX	
1039.434	3274.598	3.698	3278.296	372.00	16.77	4.36	3282.66	.00	4.92	6.00	6.000	6.000	.00	0 .0
33.465	.0202				.0138	.46	3.70	1.54	3.27	.015	.00	.00	BOX	
1072.899	3275.275	3.878	3279.153	372.00	15.99	3.97	3283.12	.00	4.92	6.00	6.000	6.000	.00	0 .0
21.275	.0202				.0122	.26	3.88	1.43	3.27	.015	.00	.00	BOX	
1094.175	3275.705	4.068	3279.773	372.00	15.24	3.61	3283.38	.00	4.92	6.00	6.000	6.000	.00	0 .0
13.679	.0202				.0108	.15	4.07	1.33	3.27	.015	.00	.00	BOX	
1107.854	3275.982	4.266	3280.248	372.00	14.53	3.28	3283.53	.00	4.92	6.00	6.000	6.000	.00	0 .0
8.407	.0202				.0095	.08	4.27	1.24	3.27	.015	.00	.00	BOX	
1116.261	3276.152	4.475	3280.627	372.00	13.86	2.98	3283.61	.00	4.92	6.00	6.000	6.000	.00	0 .0
4.468	.0202				.0085	.04	4.47	1.15	3.27	.015	.00	.00	BOX	
1120.729	3276.242	4.693	3280.935	372.00	13.21	2.71	3283.65	.00	4.92	6.00	6.000	6.000	.00	0 .0
1.361	.0202				.0075	.01	4.69	1.07	3.27	.015	.00	.00	BOX	
1122.090	3276.270	4.923	3281.193	372.00	12.59	2.46	3283.66	.00	4.92	6.00	6.000	6.000	.00	0 .0
JUNCT STR	.0000				.0001	.00	4.92	1.00		.015	.00	.00	BOX	
1122.090	3276.270	7.356	3283.626	50.00	1.39	.03	3283.66	.00	1.29	6.00	6.000	6.000	.00	0 .0
13.020	.0200				.0001	.00	7.36	.10	.81	.015	.00	.00	BOX	

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-10-2020 Time: 8:40:57

KETTLE BEND ROAD
PARCEL I 30" RCP STUB TO 6'X6' RCB (ULTIMATE CONDITION)
KETTLE BEND - PARCEL I TO PARCEL B

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	
1135.110	3276.530	7.097	3283.627	50.00	1.39	.03	3283.66	.00	1.29	6.00	6.000	6.000	.00	0 .0
WALL	EXIT													
1135.110	3276.530	7.098	3283.628	50.00	10.19	1.61	3285.24	.00	2.30	.00	2.500	.000	.00	0 .0
107.400	.0521				.0198	2.12	7.10	.00	1.42	.015	.00	.00	PIPE	
1242.510	3282.130	3.623	3285.753	50.00	10.19	1.61	3287.36	.00	2.30	.00	2.500	.000	.00	0 .0

54” – 60” RCP
KESTREL CREEK TO GOWAN CHANNEL
KBKC.WSW

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T1 KETTLE BEND ROAD
T2 KESTREL CREEK (60" RCP)
T3 KETTLE BEND - KESTREL CREEK TO GOWAN TRIBUTARY
SO   1000.00 3276.77   3      .015                3283.626
R    1004.00 3276.80   3      .015                                  0.00   15.00  0
R    1008.00 3276.84   3      .015                                  0.00   15.00  0
R    1023.00 3276.96   3      .015                                  0.00   15.00  0
R    1115.80 3277.72   3      .015                                  0.00    0.00  0
R    1250.40 3278.83   3      .015                                  0.00    0.00  0
R    1303.30 3279.36   2      .015                                  0.00   -3.00  0
R    1449.30 3280.82   2      .015                                  0.00   -5.00  0
R    1453.30 3280.88   2      .015                                  0.00   -8.00  0
R    1457.30 3280.92   2      .015                                  0.00  -15.00  0
R    1587.80 3282.20   2      .015                                  0.00  -15.00  0
R    1591.80 3282.36   2      .015                                  0.00   -9.00  0
R    1649.60 3284.67   2      .015                                  0.00  -15.00  0
R    1714.60 3287.27   2      .015                                  0.00  -15.00  0
R    1803.00 3293.46   2      .015                                  0.00   -4.00  0
R    1978.53 3308.73   2      .015                                  0.00    4.00  0
R    2072.95 3316.94   2      .015                                  0.00    0.00  0
SH   2072.95 3316.94   2      .015
CD   1  3   0   0.00    8.00     6.00  0.00  0.00
CD   2  4   0   0.00    4.50     0.00  0.00  0.00
CD   3  4   0   0.00    5.00     0.00  0.00  0.00
Q           197.000   .0
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KETTLE BEND ROAD
KESTREL CREEK (60" RCP)
KETTLE BEND - KESTREL CREEK TO GOWAN TRIBUTARY

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	3276.770	6.856	3283.626	197.00	10.03	1.56	3285.19	.00	4.01	.00	5.000	.000	.00	0 .0
4.000	.0075					.0076	.03	6.86	.00	4.13	.015	.00	.00	PIPE
1004.000	3276.800	6.934	3283.734	197.00	10.03	1.56	3285.30	.00	4.01	.00	5.000	.000	.00	0 .0
4.000	.0100					.0076	.03	6.93	.00	3.61	.015	.00	.00	PIPE
1008.000	3276.840	7.002	3283.842	197.00	10.03	1.56	3285.40	.00	4.01	.00	5.000	.000	.00	0 .0
15.000	.0080					.0076	.11	7.00	.00	4.00	.015	.00	.00	PIPE
1023.000	3276.960	7.073	3284.033	197.00	10.03	1.56	3285.60	.00	4.01	.00	5.000	.000	.00	0 .0
92.800	.0082					.0076	.71	7.07	.00	3.95	.015	.00	.00	PIPE
1115.800	3277.720	7.020	3284.740	197.00	10.03	1.56	3286.30	.00	4.01	.00	5.000	.000	.00	0 .0
134.600	.0082					.0076	1.03	7.02	.00	3.93	.015	.00	.00	PIPE
1250.400	3278.830	6.935	3285.766	197.00	12.39	2.38	3288.15	.00	4.02	.00	4.500	.000	.00	0 .0
52.900	.0100					.0134	.71	6.94	.00	4.50	.015	.00	.00	PIPE
1303.300	3279.360	7.136	3286.496	197.00	12.39	2.38	3288.88	.00	4.02	.00	4.500	.000	.00	0 .0
146.000	.0100					.0134	1.95	7.14	.00	4.50	.015	.00	.00	PIPE
1449.300	3280.820	7.666	3288.486	197.00	12.39	2.38	3290.87	.00	4.02	.00	4.500	.000	.00	0 .0
4.000	.0150					.0134	.05	7.67	.00	3.48	.015	.00	.00	PIPE
1453.300	3280.880	7.723	3288.603	197.00	12.39	2.38	3290.98	.00	4.02	.00	4.500	.000	.00	0 .0
4.000	.0100					.0134	.05	7.72	.00	4.50	.015	.00	.00	PIPE

KETTLE BEND ROAD
KESTREL CREEK (60" RCP)
KETTLE BEND - KESTREL CREEK TO GOWAN TRIBUTARY

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
1457.300	3280.920	7.854	3288.774	197.00	12.39	2.38	3291.16	.00	4.02	.00	4.500	.000	.00	0 .0
130.500	.0098					.0134	1.74	7.85	.00	4.50	.015	.00	.00	PIPE
1587.800	3282.200	8.436	3290.635	197.00	12.39	2.38	3293.02	.00	4.02	.00	4.500	.000	.00	0 .0
4.000	.0400					.0134	.05	8.44	.00	2.45	.015	.00	.00	PIPE
1591.800	3282.360	8.400	3290.760	197.00	12.39	2.38	3293.14	.00	4.02	.00	4.500	.000	.00	0 .0
30.991	.0400					.0134	.41	8.40	.00	2.46	.015	.00	.00	PIPE
1622.791	3283.599	7.637	3291.236	197.00	12.39	2.38	3293.62	.00	4.02	.00	4.500	.000	.00	0 .0
HYDRAULIC JUMP														
1622.791	3283.599	2.214	3285.813	197.00	25.28	9.93	3295.74	.00	4.02	4.50	4.500	.000	.00	0 .0
26.809	.0400					.0580	1.55	2.21	3.39	2.46	.015	.00	.00	PIPE
1649.600	3284.670	2.180	3286.850	197.00	25.79	10.33	3297.18	.00	4.02	4.50	4.500	.000	.00	0 .0
30.250	.0400					.0623	1.89	2.18	3.49	2.45	.015	.00	.00	PIPE
1679.850	3285.880	2.123	3288.003	197.00	26.68	11.05	3299.05	.00	4.02	4.49	4.500	.000	.00	0 .0
34.750	.0400					.0696	2.42	2.12	3.67	2.45	.015	.00	.00	PIPE
1714.600	3287.270	2.047	3289.317	197.00	27.98	12.16	3301.47	.00	4.02	4.48	4.500	.000	.00	0 .0

88.400	.0700					.0768	6.79	2.05	3.93	2.08	.015	.00	.00	PIPE					
1803.000	3293.460	2.007	3295.466	197.00	28.72	12.81	3308.27	.00	4.02	4.47	4.500	.000	.00	0	.0				
39.125	.0870					.0780	3.05	2.01	4.09	1.96	.015	.00	.00	PIPE					

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-10-2020 Time: 8:53:25

KETTLE BEND ROAD
KESTREL CREEK (60" RCP)
KETTLE BEND - KESTREL CREEK TO GOWAN TRIBUTARY

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	
1842.125	3296.863	2.029	3298.892	197.00	28.30	12.44	3311.33	.00	4.02	4.48	4.500	.000	.00	0 .0
69.477	.0870					.0718	4.99	2.03	4.00	1.96	.015	.00	.00	PIPE
1911.602	3302.907	2.105	3305.012	197.00	26.98	11.31	3316.32	.00	4.02	4.49	4.500	.000	.00	0 .0
39.822	.0870					.0632	2.52	2.11	3.73	1.96	.015	.00	.00	PIPE
1951.424	3306.372	2.184	3308.556	197.00	25.73	10.28	3318.83	.00	4.02	4.50	4.500	.000	.00	0 .0
27.106	.0870					.0556	1.51	2.18	3.48	1.96	.015	.00	.00	PIPE
1978.530	3308.730	2.267	3310.998	197.00	24.53	9.34	3320.34	.00	4.02	4.50	4.500	.000	.00	0 .0
1.843	.0870					.0518	.10	2.27	3.24	1.96	.015	.00	.00	PIPE
1980.373	3308.890	2.274	3311.165	197.00	24.44	9.27	3320.44	.00	4.02	4.50	4.500	.000	.00	0 .0
19.648	.0870					.0485	.95	2.27	3.22	1.96	.015	.00	.00	PIPE
2000.021	3310.599	2.361	3312.960	197.00	23.30	8.43	3321.39	.00	4.02	4.49	4.500	.000	.00	0 .0
15.250	.0870					.0427	.65	2.36	2.99	1.96	.015	.00	.00	PIPE
2015.271	3311.925	2.453	3314.378	197.00	22.22	7.66	3322.04	.00	4.02	4.48	4.500	.000	.00	0 .0
12.179	.0870					.0377	.46	2.45	2.78	1.96	.015	.00	.00	PIPE
2027.449	3312.984	2.550	3315.534	197.00	21.18	6.97	3322.50	.00	4.02	4.46	4.500	.000	.00	0 .0
9.906	.0870					.0333	.33	2.55	2.58	1.96	.015	.00	.00	PIPE
2037.356	3313.845	2.652	3316.497	197.00	20.20	6.33	3322.83	.00	4.02	4.43	4.500	.000	.00	0 .0
8.137	.0870					.0295	.24	2.65	2.40	1.96	.015	.00	.00	PIPE

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-10-2020 Time: 8:53:25

KETTLE BEND ROAD
KESTREL CREEK (60" RCP)
KETTLE BEND - KESTREL CREEK TO GOWAN TRIBUTARY

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	
2045.493	3314.552	2.760	3317.313	197.00	19.26	5.76	3323.07	.00	4.02	4.38	4.500	.000	.00	0 .0
6.712	.0870					.0261	.18	2.76	2.22	1.96	.015	.00	.00	PIPE
2052.206	3315.136	2.875	3318.011	197.00	18.36	5.23	3323.25	.00	4.02	4.32	4.500	.000	.00	0 .0
5.547	.0870					.0232	.13	2.88	2.05	1.96	.015	.00	.00	PIPE
2057.753	3315.619	2.997	3318.616	197.00	17.51	4.76	3323.37	.00	4.02	4.24	4.500	.000	.00	0 .0
4.546	.0870					.0206	.09	3.00	1.89	1.96	.015	.00	.00	PIPE
2062.299	3316.014	3.128	3319.142	197.00	16.69	4.33	3323.47	.00	4.02	4.14	4.500	.000	.00	0 .0
3.679	.0870					.0184	.07	3.13	1.74	1.96	.015	.00	.00	PIPE
2065.977	3316.334	3.269	3319.603	197.00	15.91	3.93	3323.54	.00	4.02	4.01	4.500	.000	.00	0 .0
2.886	.0870					.0164	.05	3.27	1.60	1.96	.015	.00	.00	PIPE
2068.864	3316.585	3.423	3320.008	197.00	15.17	3.58	3323.58	.00	4.02	3.84	4.500	.000	.00	0 .0
2.148	.0870					.0148	.03	3.42	1.45	1.96	.015	.00	.00	PIPE
2071.012	3316.771	3.593	3320.365	197.00	14.47	3.25	3323.61	.00	4.02	3.61	4.500	.000	.00	0 .0

```
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
   1.407    .0870                                          .0134      .02     3.59    1.31    1.96    .015       .00   .00  PIPE
        |         |        |         |         |              |         |       |        |        |       |       |      |
2072.419  3316.894    3.785  3320.679    197.00   13.79    2.95  3323.63     .00    4.02     3.29    4.500     .000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
    .531    .0870                                          .0123      .01     3.79    1.17    1.96    .015       .00   .00  PIPE
        |         |        |         |         |              |         |       |        |        |       |       |      |
2072.950  3316.940    4.015  3320.955    197.00   13.15    2.69  3323.64     .00    4.02     2.79    4.500     .000   .00   0   .0
       -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
```

30” – 42” RCP
FLEET WING TO GOWAN CHANNEL
KBQR.WSW

```
T1 KETTLE BEND ROAD
T2 KETTLE BEND (42" RCP)
T3 KETTLE BEND - FLEET WING TO GOWAN TRIBUTARY
SO   1000.00 3276.77   4      .015                3283.626
R    1025.23 3277.61   4      .015                                  0.00    0.00  0
R    1029.23 3277.75   4      .015                                  0.00  -15.00  0
R    1033.23 3277.88   4      .015                                  0.00  -15.00  0
R    1060.68 3278.79   4      .015                                  0.00  -15.00  0
JX   1060.68 3278.79   4  1  1.015    2.00     2.00 3278.79 3278.79  75.0-90.0
R    1627.57 3297.66   4      .015                                  0.00    0.00  0
JX   1627.57 3297.66   4  2   .015   40.00          3297.66          90.0
R    1631.57 3297.75   3      .015                                  0.00   13.00  0
R    1635.57 3297.84   3      .015                                  0.00   15.00  0
R    1639.57 3297.92   3      .015                                  0.00   15.00  0
R    1643.57 3298.01   3      .015                                  0.00   15.00  0
R    1647.57 3298.09   3      .015                                  0.00   15.00  0
R    1679.82 3298.78   3      .015                                  0.00   15.00  0
SH   1679.82 3298.78   3      .015                                  0.00    0.00  0

CD   1  4   0   0.00    2.00     0.00  0.00  0.00
CD   2  4   0   0.00    2.50     0.00  0.00  0.00
CD   3  4   0   0.00    3.00     0.00  0.00  0.00
CD   4  4   0   0.00    3.50     0.00  0.00  0.00
Q            81.000   .0
```

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-13-2020 Time: 9:39:39

KETTLE BEND ROAD
KETTLE BEND (42" RCP)
KETTLE BEND - FLEET WING TO GOWAN TRIBUTARY

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	3276.770	6.856	3283.626	125.00	12.99	2.62	3286.25	.00	3.28	.00	3.500	.000	.00	0 .0
25.230	.0333					.0206	.52	6.86	.00	2.34	.015	.00	.00	PIPE
1025.230	3277.610	6.534	3284.145	125.00	12.99	2.62	3286.77	.00	3.28	.00	3.500	.000	.00	0 .0
4.000	.0350					.0206	.08	6.53	.00	2.30	.015	.00	.00	PIPE
1029.230	3277.750	6.606	3284.356	125.00	12.99	2.62	3286.98	.00	3.28	.00	3.500	.000	.00	0 .0
4.000	.0325					.0206	.08	6.61	.00	2.36	.015	.00	.00	PIPE
1033.230	3277.880	6.689	3284.568	125.00	12.99	2.62	3287.19	.00	3.28	.00	3.500	.000	.00	0 .0
27.450	.0332					.0206	.56	6.69	.00	2.34	.015	.00	.00	PIPE
1060.680	3278.790	6.472	3285.262	125.00	12.99	2.62	3287.88	.00	3.28	.00	3.500	.000	.00	0 .0
JUNCT STR	.0000					.0199	.00	6.47	.00		.015	.00	.00	PIPE
1060.680	3278.790	6.801	3285.591	121.00	12.58	2.46	3288.05	.00	3.26	.00	3.500	.000	.00	0 .0
155.135	.0333					.0193	2.99	6.80	.00	2.28	.015	.00	.00	PIPE
1215.815	3283.954	4.623	3288.577	121.00	12.58	2.46	3291.03	.00	3.26	.00	3.500	.000	.00	0 .0
HYDRAULIC JUMP														
1215.815	3283.954	2.287	3286.241	121.00	18.17	5.12	3291.37	.00	3.26	3.33	3.500	.000	.00	0 .0
114.360	.0333					.0330	3.78	2.29	2.26	2.28	.015	.00	.00	PIPE
1330.176	3287.761	2.292	3290.053	121.00	18.11	5.09	3295.15	.00	3.26	3.33	3.500	.000	.00	0 .0
165.276	.0333					.0311	5.14	2.29	2.25	2.28	.015	.00	.00	PIPE

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 1-13-2020 Time: 9:39:39

KETTLE BEND ROAD
KETTLE BEND (42" RCP)
KETTLE BEND - FLEET WING TO GOWAN TRIBUTARY

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	
1495.452	3293.262	2.391	3295.653	121.00	17.27	4.63	3300.28	.00	3.26	3.26	3.500	.000	.00	0 .0
56.124	.0333					.0277	1.55	2.39	2.08	2.28	.015	.00	.00	PIPE
1551.576	3295.130	2.498	3297.628	121.00	16.47	4.21	3301.84	.00	3.26	3.16	3.500	.000	.00	0 .0
31.357	.0333					.0247	.78	2.50	1.90	2.28	.015	.00	.00	PIPE
1582.932	3296.174	2.613	3298.787	121.00	15.70	3.83	3302.61	.00	3.26	3.04	3.500	.000	.00	0 .0
19.953	.0333					.0222	.44	2.61	1.74	2.28	.015	.00	.00	PIPE
1602.885	3296.838	2.740	3299.578	121.00	14.97	3.48	3303.06	.00	3.26	2.89	3.500	.000	.00	0 .0
13.187	.0333					.0201	.26	2.74	1.58	2.28	.015	.00	.00	PIPE
1616.072	3297.277	2.882	3300.159	121.00	14.27	3.16	3303.32	.00	3.26	2.67	3.500	.000	.00	0 .0
8.190	.0333					.0183	.15	2.88	1.41	2.28	.015	.00	.00	PIPE
1624.262	3297.550	3.047	3300.597	121.00	13.61	2.88	3303.47	.00	3.26	2.35	3.500	.000	.00	0 .0
3.308	.0333					.0171	.06	3.05	1.23	2.28	.015	.00	.00	PIPE
1627.570	3297.660	3.256	3300.916	121.00	12.97	2.61	3303.53	.00	3.26	1.78	3.500	.000	.00	0 .0
JUNCT STR	.0000					.0126	.00	3.26	1.00		.015	.00	.00	PIPE
1627.570	3297.660	6.166	3303.826	81.00	11.46	2.04	3305.87	.00	2.78	.00	3.000	.000	.00	0 .0

```
    4.000    .0225                                        .0196      .08     6.17     .00    2.30    .015       .00   .00  PIPE
         |         |         |         |         |              |         |       |        |        |       |       |      |
 1631.570  3297.750    6.242  3303.992     81.00   11.46    2.04  3306.03     .00    2.78      .00    3.000     .000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
    4.000    .0225                                        .0196      .08     6.24     .00    2.30    .015       .00   .00  PIPE
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                          Program Package Serial Number: 1513
                                                WATER SURFACE PROFILE LISTING                    Date: 1-13-2020  Time: 9:39:39
                      KETTLE BEND ROAD
                        KETTLE BEND (42" RCP)
                          KETTLE BEND - FLEET WING TO GOWAN TRIBUTARY
*************************************************************************************************************************** ********
         | 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
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|***** |*******
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1635.570  3297.840    6.332  3304.172     81.00   11.46    2.04  3306.21     .00    2.78      .00    3.000     .000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
    4.000    .0200                                        .0196      .08     6.33     .00    2.44    .015       .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1639.570  3297.920    6.431  3304.351     81.00   11.46    2.04  3306.39     .00    2.78      .00    3.000     .000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
    4.000    .0225                                        .0196      .08     6.43     .00    2.30    .015       .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1643.570  3298.010    6.521  3304.531     81.00   11.46    2.04  3306.57     .00    2.78      .00    3.000     .000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
    4.000    .0200                                        .0196      .08     6.52     .00    2.43    .015       .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1647.570  3298.090    6.620  3304.710     81.00   11.46    2.04  3306.75     .00    2.78      .00    3.000     .000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
   32.250    .0214                                        .0196      .63     6.62     .00    2.35    .015       .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1679.820  3298.780    6.664  3305.444     81.00   11.46    2.04  3307.48     .00    2.78      .00    3.000     .000   .00   0   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     |-
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STANDARD FORM 6 CALCULATIONS

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)
3323.79	3317.18	6.61	1.62	2.0	1.812	3323.79	0.00	3323.79

*Reference WSPG Model: KBBC.WSW

$Sf = \frac{\Phi Hv}{R^{1.33}}$ $\Phi = \frac{2g\,(n^2)}{2.21}$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 1W (SDDI#7 Station 66+69.20)
DESCRIPTION: 100-Year Ultimate Condition

Phi Index

n Value	Phi
0.013	0.004925

$H_j = ({V_2}^2/_{2g})\text{-}K_j({V_1}^2/_{2g})$ $H_m = K_m({V_2}^2/_{2g})$ $H_b = K_b({V_2}^2/_{2g})$ $H_i = K_i({V_2}^2/_{2g})$

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+22.69	2	3317.18	3321.71	22.69	3.14	0.00492	1.5	20.00	0.48	0.00	0.00004	0.00004	0.00						0.00	3323.79	3323.79	Yes	3323.72	3323.79	3323.79
2	SDDI#7	10+22.69	10+22.69	2	3321.71	3321.71	0.00	3.14	0.00492	1.5	N/A	0.48	0.00	0.00004	0.00004	0.00				0.00		0.00	3323.79	3323.79				

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	0.004	0.002

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#7	3332.19	8.40	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)
3323.79	3317.18	6.61	1.62	2.0	1.812	3323.79	0.00	3323.79

*Reference WSPG Model: KBBC.WSW

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 1E (SDDI#8 Station 66+69.35)
DESCRIPTION: 100-Year Ultimate Condition

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+50.31	2	3317.18	3318.68	50.31	3.14	0.00492	1.5	3.00	0.48	0.00	0.00004	0.00004	0.00						0.00	3323.79	3323.79	Yes	3320.69	3323.79	3323.79
2	SDDI#8	10+50.31	10+50.31	2	3318.68	3318.68	0.00	3.14	0.00492	1.5	N/A	0.48	0.00	0.00004	0.00004	0.00				0.00		0.00	3323.79	3323.79				

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	0.004	0.002

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#8	3332.00	8.210	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)
3321.91	3315.65	6.26	2.03	2.5	2.266	3321.91	0.66	3322.57

*Reference WSPG Model: KBBC.WSW

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility #2 (Lateral to SDMH#5)
DESCRIPTION: 100-Year Ultimate Condition

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+13.04	2.5	3315.65	3317.54	113.04	4.91	0.00492	32.0	1.68	6.52	0.66	0.00607	0.00607	0.69						0.69	3323.26	3322.60	Yes	3320.70	3323.26	3322.60
2	INLET	11+13.04	11+13.04	2.5	3317.54	3317.54	0.00	4.91	0.00492	32.0	N/A	6.52	0.66	0.00607	0.00607	0.00						0.00	3323.26	3322.60				

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			
INLET	3334.52	11.92	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)
3320.73	3315.27	5.46	1.62	2.0	1.812	3320.73	0.00	3320.73

*Reference WSPG Model: KBBC.WSW

$Sf = \frac{\Phi Hv}{R^{1.33}}$ $\Phi = \frac{2g\,(n^2)}{2.21}$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 3W (SDDI#5 Station 62+88.34)
DESCRIPTION: 100-Year Ultimate Condition

Phi Index

n Value	Phi
0.013	0.004925

$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g})$ $H_m = K_m({V_2}^2/_{2g})$ $H_b = K_b({V_2}^2/_{2g})$ $H_i = K_i({V_2}^2/_{2g})$

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+22.75	2	3315.27	3319.82	22.75	3.14	0.00492	1.0	20.00	0.32	0.00	0.00002	0.00002	0.00						0.00	3320.74	3320.73	Yes	3321.82	3321.82	3321.82
2	SDDI#5	10+22.75	10+22.75	2	3319.82	3319.82	0.00	3.14	0.00492	1.0	N/A	0.32	0.00	0.00002	0.00002	0.00				0.00		0.00	3321.82	3321.82				

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	0.002	0.001

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#5	3334.86	13.04	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)
3320.73	3315.27	5.46	1.62	2.0	1.812	3320.73	0.00	3320.73

*Reference WSPG Model: KBBC.WSW

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 3E (SDDI#6 Station 62+88.34)
DESCRIPTION: 100-Year Ultimate Condition

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+50.23	2	3315.27	3319.79	50.23	3.14	0.00492	1.0	9.00	0.32	0.00	0.00002	0.00002	0.00						0.00	3320.74	3320.73	Yes	3321.79	3321.79	3321.79
2	SDDI#6	10+50.23	10+50.23	2	3319.79	3319.79	0.00	3.14	0.00492	1.0	N/A	0.32	0.00	0.00002	0.00002	0.00				0.00		0.00	3321.80	3321.79				

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	0.002	0.001

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#6	3334.71	12.91	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)
3320.44	3313.83	6.61	2.03	2.5	2.266	3320.44	0.03	3320.47

*Reference WSPG Model: KBBC.WSW

$Sf = \frac{\Phi Hv}{R^{1.33}}$ $\Phi = \frac{2g\,(n^2)}{2.21}$

Phi Index

n Value	Phi
0.013	0.004925

$H_j = ({V_2}^2/_{2g})\text{-}K_j({V_1}^2/_{2g})$ $H_m = K_m({V_2}^2/_{2g})$ $H_b = K_b({V_2}^2/_{2g})$ $H_i = K_i({V_2}^2/_{2g})$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility #4
DESCRIPTION: 100-Year Ultimate Condition

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+49.75	2.5	3313.83	3318.80	49.75	4.91	0.00492	7.0	10.00	1.43	0.03	0.00029	0.00029	0.01						0.01	3320.48	3320.45	Yes	3321.33	3321.33	3321.30
2	INLET	10+49.75	10+49.75	2.5	3318.80	3318.80	0.00	4.91	0.00492	7.0	N/A	1.43	0.03	0.00029	0.00029	0.00						0.00	3321.33	3321.30				

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			
INLET	3337.37	16.07	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)
3320.10	3313.48	6.62	1.62	2.0	1.812	3320.10	0.00	3320.11

*Reference WSPG Model: KBBC.WSW

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 5W (SDDI#3 Station 59+30.31)
DESCRIPTION: 100-Year Ultimate Condition

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+22.75	2	3313.48	3318.03	22.75	3.14	0.00492	1.5	20.00	0.48	0.00	0.00004	0.00004	0.00						0.00	3320.11	3320.10	Yes	3320.03	3320.11	3320.10
2	SDDI#3	10+22.75	10+22.75	2	3318.03	3318.03	0.00	3.14	0.00492	1.5	N/A	0.48	0.00	0.00004	0.00004	0.00				0.00		0.00	3320.11	3320.10				

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	0.004	0.002

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#3	3337.36	17.26	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)
3320.10	3313.48	6.62	1.62	2.0	1.812	3320.10	0.00	3320.11

*Reference WSPG Model: KBBC.WSW

Phi Index

n Value	Phi
0.013	0.004925

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 5E (SDDI#4 Station 59+19.81)
DESCRIPTION: 100-Year Ultimate Condition

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+48.20	2	3313.48	3318.30	48.20	3.14	0.00492	1.5	10.00	0.48	0.00	0.00004	0.00004	0.00						0.00	3320.11	3320.10	Yes	3320.30	3320.30	3320.30
2	SDDI#4	10+48.20	10+48.20	2	3318.30	3318.30	0.00	3.14	0.00492	1.5	N/A	0.48	0.00	0.00004	0.00004	0.00				0.00		0.00	3320.31	3320.30				

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	0.004	0.002

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#4	3337.29	16.98	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)
3319.31	3312.66	6.65	2.03	2.5	2.266	3319.31	0.31	3319.62

*Reference WSPG Model: KBBC.WSW

$Sf = \frac{\Phi Hv}{R^{1.33}}$ $\Phi = \frac{2g\,(n^2)}{2.21}$

Phi Index

n Value	Phi
0.013	0.004925

$H_j = ({V_2}^2/_{2g})\text{-}K_j({V_1}^2/_{2g})$ $H_m = K_m({V_2}^2/_{2g})$ $H_b = K_b({V_2}^2/_{2g})$ $H_i = K_i({V_2}^2/_{2g})$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility # 6 (Lateral to SDMH#3)
DESCRIPTION: 100-Year Ultimate Condition

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+14.60	2.5	3312.66	3319.99	114.60	4.91	0.00492	22.0	6.40	4.48	0.31	0.00287	0.00287	0.33						0.33	3319.95	3319.63	Yes	3322.80	3322.80	3322.49
2	INLET	11+14.60	11+14.60	2.5	3319.99	3319.99	0.00	4.91	0.00492	22.0	N/A	4.48	0.31	0.00287	0.00287	0.00						0.00	3322.80	3322.49				

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			
INLET	3338.693	16.20	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)
3317.95	3311.53	6.42	2.03	2.5	2.266	3317.95	0.04	3317.99

*Reference WSPG Model: KBBC.WSW

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility #7 (Lateral to SDMH#2)
DESCRIPTION: 100-Year Ultimate Condition

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+49.75	2.5	3311.53	3316.51	49.75	4.91	0.00492	8.0	10.00	1.63	0.04	0.00038	0.00038	0.02						0.02	3318.01	3317.97	Yes	3319.05	3319.05	3319.01
2	INLET	10+49.75	10+49.75	2.5	3316.51	3316.51	0.00	4.91	0.00492	8.0	N/A	1.63	0.04	0.00038	0.00038	0.00						0.00	3319.05	3319.01				

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			
INLET	3340.97	21.96	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)
3317.73	3311.17	6.57	1.62	2.0	1.812	3317.73	0.01	3317.74

*Reference WSPG Model: KBBC.WSW

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 8W (SDDI#1 Station 54+67.60)
DESCRIPTION: 100-Year Ultimate Condition

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+22.75	2	3311.17	3315.72	22.75	3.14	0.00492	2.0	20.00	0.64	0.01	0.00008	0.00008	0.00						0.00	3317.74	3317.74	Yes	3317.72	3317.74	3317.74
2	SDDI#1	10+22.75	10+22.75	2	3315.72	3315.72	0.00	3.14	0.00492	2.0	N/A	0.64	0.01	0.00008	0.00008	0.00				0.00		0.00	3317.75	3317.74				

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	0.006	0.003

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#1	3341.57	23.83	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)
3317.73	3311.17	6.57	1.62	2.0	1.812	3317.73	0.01	3317.74

*Reference WSPG Model: KBBC.WSW

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 8E (SDDI#2 Station 54+61.10)
DESCRIPTION: 100-Year Ultimate Condition

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+48.54	2	3311.17	3320.88	48.54	3.14	0.00492	2.0	20.00	0.64	0.01	0.00008	0.00008	0.00						0.00	3317.74	3317.74	Yes	3322.88	3322.88	3322.88
2	SDDI#2	10+48.54	10+48.54	2	3320.88	3320.88	0.00	3.14	0.00492	2.0	N/A	0.64	0.01	0.00008	0.00008	0.00				0.00		0.00	3322.89	3322.88				

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	0.006	0.003

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#2	3341.57	18.69	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)
3318.61	3310.72	7.89	2.03	2.5	2.266	3318.61	0.23	3318.84

*Reference WSPG Model: KBBC.WSW

Phi Index

n Value	Phi
0.013	0.004925

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility #9 (Lateral to SDMH#1)
DESCRIPTION: 100-Year Ultimate Condition

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+27.38	2.5	3310.72	3321.62	127.38	4.91	0.00492	19.0	8.55	3.87	0.23	0.00214	0.00214	0.27						0.27	3319.11	3318.88	Yes	3324.35	3324.35	3324.12
2	INLET	11+27.38	11+27.38	2.5	3321.62	3321.62	0.00	4.91	0.00492	19.0	N/A	3.87	0.23	0.00214	0.00214	0.00						0.00	3324.35	3324.12				

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			
INLET	3344.81	20.70	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)
3289.32	3287.27	2.04	1.62	2.0	1.812	3289.32	0.00	3289.32

*Reference WSPG Model: KBKC.WSW

Phi Index

n Value	Phi
0.013	0.004925

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 12S (SDDI#19 Station 30+55.97)
DESCRIPTION: 100-Year Ultimate Condition

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+14.91	2	3287.27	3289.02	14.91	3.14	0.00492	1.0	11.68	0.32	0.00	0.00002	0.00002	0.00						0.00	3289.32	3289.32	Yes	3291.02	3291.02	3291.02
2	SDDI#19	10+14.91	10+14.91	2	3289.02	3289.02	0.00	3.14	0.00492	1.0	N/A	0.32	0.00	0.00002	0.00002	0.00				0.00		0.00	3291.02	3291.02				

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	0.002	0.001

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#19	3301.47	10.45	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)
3289.32	3287.23	2.09	1.62	2.0	1.812	3289.32	0.00	3289.32

*Reference WSPG Model: KBKC.WSW

Phi Index

n Value	Phi
0.013	0.004925

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 12N (SDDI#20 Station 30+41.86)
DESCRIPTION: 100-Year Ultimate Condition

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+48.42	2	3287.23	3287.71	48.42	3.14	0.00492	1.0	1.00	0.32	0.00	0.00002	0.00002	0.00						0.00	3289.32	3289.32	Yes	3289.71	3289.71	3289.71
2	SDDI#20	10+48.42	10+48.42	2	3287.71	3287.71	0.00	3.14	0.00492	1.0	N/A	0.32	0.00	0.00002	0.00002	0.00				0.00		0.00	3289.71	3289.71				

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	0.002	0.001

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#20	3301.43	11.72	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)
3284.74	3277.72	7.02	1.62	2.0	1.812	3284.74	0.01	3284.75

*Reference WSPG Model: KBKC.WSW

Phi Index

n Value	Phi
0.013	0.004925

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 14W (SDDI#17 Station 83+99.77)
DESCRIPTION: 100-Year Ultimate Condition

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+21.44	2	3277.72	3280.87	21.44	3.14	0.00492	2.5	14.68	0.80	0.01	0.00012	0.00012	0.00						0.00	3284.75	3284.74	Yes	3282.88	3284.75	3284.74
2	SDDI#17	10+21.44	10+21.44	2	3280.87	3280.87	0.00	3.14	0.00492	2.5	N/A	0.80	0.01	0.00012	0.00012	0.00				0.00		0.00	3284.76	3284.75				

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	0.010	0.005

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#17	3294.65	9.90	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)
3284.74	3277.74	7.00	1.62	2.0	1.812	3284.74	0.01	3284.75

*Reference WSPG Model: KBKC.WSW

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 14E (SDDI#18 Station 83+99.77)
DESCRIPTION: 100-Year Ultimate Condition

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+52.13	2	3277.74	3281.36	52.13	3.14	0.00492	2.5	6.96	0.80	0.01	0.00012	0.00012	0.01						0.01	3284.76	3284.75	Yes	3283.37	3284.76	3284.75
2	SDDI#18	10+52.13	10+52.13	2	3281.36	3281.36	0.00	3.14	0.00492	2.5	N/A	0.80	0.01	0.00012	0.00012	0.00				0.00		0.00	3284.76	3284.75				

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	0.010	0.005

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#18	3294.50	9.75	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)
3306.51	3304.01	2.50	1.62	2.0	1.812	3306.51	0.01	3306.51

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

Phi Index

n Value	Phi
0.013	0.004925

$$H_j = ({V_2}^2/_{2g})\text{-}K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 17W+18 (SDDI#9 Station 70+72.95)
DESCRIPTION: 100-Year Ultimate Condition

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+13.80	2	3304.01	3305.56	113.80	3.14	0.00492	2.0	1.37	0.64	0.01	0.00008	0.00008	0.01						0.01	3306.52	3306.52	Yes	3307.57	3307.57	3307.56
2	SDMH	11+13.80	11+13.80	2	3305.56	3305.56	0.00	3.14	0.00492	2.0	N/A	0.64	0.01	0.00008	0.00008	0.00	0.00					0.00	3306.53	3306.52	Yes	3307.56	3307.56	3307.56
3	PIPE	11+13.80	11+41.38	2	3305.56	3306.21	27.58	3.14	0.00492	1.0	2.35	0.32	0.00	0.00002	0.00005	0.00						0.00	3306.53	3306.53	Yes	3308.21	3308.21	3308.21
4	SDDI#9	11+41.38	11+41.38	2	3306.21	3306.21	0.00	3.14	0.00492	1.0	N/A	0.32	0.00	0.00002	0.00002	0.00				0.00		0.00	3308.21	3308.21				

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					75	0.30	0.01	0.01	0.004							
3																
4														0.5	0.002	0.001

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDMH	3324.31	17.79	Yes
PIPE			
SDDI#9	3324.33	16.11	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)
3307.56	3305.56	2.00	1.62	2.0	1.812	3307.56	0.00	3307.56

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

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: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 17E (SDDI#10 Station 70+72.80)
DESCRIPTION: 100-Year Ultimate Condition

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+52.65	2	3305.56	3310.83	52.65	3.14	0.00492	1.0	10.00	0.32	0.00	0.00002	0.00002	0.00						0.00	3307.56	3307.56	Yes	3312.83	3312.83	3312.83
2	SDDI#10	10+52.65	10+52.65	2	3310.83	3310.83	0.00	3.14	0.00492	1.0	N/A	0.32	0.00	0.00002	0.00002	0.00				0.00		0.00	3312.83	3312.83				

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	0.002	0.001

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#10	3324.33	11.50	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)
3300.92	3297.66	3.26	2.44	3.0	2.719	3300.92	0.50	3301.41

*Reference WSPG Model: KBQR.WSW

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 19+20+22
DESCRIPTION: 100-Year Ultimate Condition

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+47.87	3	3297.66	3298.31	47.87	7.07	0.00492	40.0	1.36	5.66	0.50	0.00359	0.00359	0.17						0.17	3301.59	3301.09	Yes	3301.81	3301.81	3301.31
2	SDMH#11	10+47.87	10+47.87	3	3298.31	3298.31	0.00	7.07	0.00492	40.0	N/A	5.66	0.50	0.00359	0.00359	0.00	0.35					0.35	3301.93	3301.44	Yes	3301.74	3301.93	3301.44
3	PIPE	10+47.87	12+46.39	3	3298.31	3301.03	198.52	7.07	0.00492	37.0	1.37	5.23	0.43	0.00307	0.00333	0.66						0.66	3302.59	3302.17	Yes	3304.45	3304.45	3304.03
4	SDMH#10	12+46.39	12+46.39	3	3301.03	3301.03	0.00	7.07	0.00492	37.0	N/A	5.23	0.43	0.00307	0.00307	0.00		0.01				0.01	3302.61	3302.18	Yes	3304.45	3304.45	3304.03
5	PIPE	12+46.39	14+64.67	3	3301.03	3304.01	218.28	7.07	0.00492	37.0	1.37	5.23	0.43	0.00307	0.00307	0.67						0.67	3303.28	3302.85	Yes	3307.43	3307.43	3307.01
6	SDMH#8	14+64.67	14+64.67	3	3304.01	3304.01	0.00	7.07	0.00492	37.0	N/A	5.23	0.43	0.00307	0.00307	0.00	0.32					0.32	3303.60	3303.17	Yes	3307.30	3307.30	3306.51
7	PIPE	14+64.67	15+62.53	2.5	3304.01	3307.82	97.86	4.91	0.00492	35.0	3.90	7.13	0.79	0.00726	0.00517	0.51						0.51	3304.10	3303.31	Yes	3311.11	3311.11	3310.32
8	INLET	15+62.53	15+62.53	2.5	3307.82	3307.82	0.00	4.91	0.00492	35.0	N/A	7.13	0.79	0.00726	0.00726	0.00						0.00	3311.11	3310.32				

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					75	0.30	0.50	0.50	0.348							
3																
4	3	0.03	0.425	0.014												
5																
6					90	0.25	0.43	0.43	0.319091							
7																
8																

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDMH#11	3317.09	15.65	Yes
PIPE			
SDMH#10	3318.49	16.30	Yes
PIPE			
SDMH#8	3320.93	17.75	Yes
PIPE			
INLET	3320.93	10.60	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)
3301.44	3298.31	3.12	1.62	2.0	1.812	3301.44	0.00	3301.44

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 21W (SDDI#13 Station 76+06.26)
DESCRIPTION: 100-Year Ultimate Condition

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+20.69	2	3298.31	3299.97	20.69	3.14	0.00492	1.5	8.00	0.48	0.00	0.00004	0.00004	0.00						0.00	3301.44	3301.44	Yes	3301.97	3301.97	3301.97
2	SDDI#19	10+20.69	10+20.69	2	3299.97	3299.97	0.00	3.14	0.00492	1.5	N/A	0.48	0.00	0.00004	0.00004	0.00				0.00		0.00	3301.97	3301.97				

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	0.004	0.002

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#19	3317.03	15.06	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)
3301.44	3298.31	3.12	1.62	2.0	1.812	3301.44	0.00	3301.44

*Reference WSPG Model: KBQR.WSW

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 21E (SDDI#14 Station 75+97.76)
DESCRIPTION: 100-Year Ultimate Condition

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+53.33	2	3298.31	3303.65	53.33	3.14	0.00492	1.5	10.00	0.48	0.00	0.00004	0.00004	0.00						0.00	3301.44	3301.44	Yes	3305.65	3305.65	3305.65
2	SDDI#14	10+53.33	10+53.33	2	3303.65	3303.65	0.00	3.14	0.00492	1.5	N/A	0.48	0.00	0.00004	0.00004	0.00				0.00		0.00	3305.65	3305.65				

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	0.004	0.002

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#14	3316.94	11.30	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)
3285.59	3278.79	6.80	1.62	2.0	1.812	3285.59	0.01	3285.60

*Reference WSPG Model: KBQR.WSW

Phi Index

n Value	Phi
0.013	0.004925

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 25W (SDDI#15 Station 82+20.64)
DESCRIPTION: 100-Year Ultimate Condition

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+20.69	2	3278.79	3281.04	20.69	3.14	0.00492	2.0	10.87	0.64	0.01	0.00008	0.00008	0.00						0.00	3285.60	3285.59	Yes	3283.05	3285.60	3285.59
2	SDDI#15	10+20.69	10+20.69	2	3281.04	3281.04	0.00	3.14	0.00492	2.0	N/A	0.64	0.01	0.00008	0.00008	0.00				0.00		0.00	3285.60	3285.60				

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	0.006	0.003

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#15	3296.93	11.33	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)
3285.59	3278.79	6.80	1.62	2.0	1.812	3285.59	0.01	3285.60

*Reference WSPG Model: KBQR.WSW

Phi Index

n Value	Phi
0.013	0.004925

$$Sf = \frac{\Phi Hv}{R^{1.33}} \qquad \Phi = \frac{2g\,(n^2)}{2.21}$$

$$H_j = ({V_2}^2/_{2g}) - K_j({V_1}^2/_{2g}) \qquad H_m = K_m({V_2}^2/_{2g}) \qquad H_b = K_b({V_2}^2/_{2g}) \qquad H_i = K_i({V_2}^2/_{2g})$$

STANDARD FORM 6

DEVELOPMENT: Kettle Bend Road
CALCULATED BY: RBR **WO#** 7861
STORM DRAIN SEGMENT: Facility 25E (SDDI#16 Station 82+20.91)
DESCRIPTION: 100-Year Ultimate Condition

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+51.81	2	3278.79	3283.63	51.81	3.14	0.00492	2.0	9.35	0.64	0.01	0.00008	0.00008	0.00						0.00	3285.60	3285.60	Yes	3285.64	3285.64	3285.63
2	SDDI#16	10+51.81	10+51.81	2	3283.63	3283.63	0.00	3.14	0.00492	2.0	N/A	0.64	0.01	0.00008	0.00008	0.00				0.00		0.00	3285.64	3285.64				

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	0.006	0.003

HGL Criteria Check			
Segment Description	TMH Elevation	Cover (ft)	Criteria Met?
PIPE			
SDDI#16	3296.80	11.163	Yes

DROP INLET CALCULATIONS

Drop Inlet Interception

Project: Kettle Bend Road
Work Order no.: 7861
Calculated By: ACY
Date: Jan-20

Inlet ID: Facility #1
Drainage Condition: Ultimate 100-Year Storm
Flow Summary: (1/2)STKB1-D = 1.5-cfs
Inlet Description: (2) Modified Type C Drop Inlet

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	1.5
Longitudinal Slope (ft/ft)	S_o	0.007
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	1.74
Street Flow Depth (ft)	D	0.35
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2
Length of Grate (ft)	L_g	5
Length of Curb Opening (ft)	L_c	7.5
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	2.5
Effective Curb Opening Lenth (ft)	L_{ce}	3.75

Output (Grate):	**Equation:**	**Output (Grate):**
R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else 1	1.00
V_o - Splash Over Velocity (fps)	p+q*L_{ge}-r*L_{ge}^2+sy*L_{ge}^3; where p=0.30, q=4.85, r=1.31, sy=0.15 (vane grate)	6.58
E - grate Flow Ratio	Q_w/Q_s	0.61
Q_w - Frontal Flow (cfs)	$Q[1-(1-(W/T))^{2.67}]$	0.57
Q_s - Side Flow (cfs)	$Q-Q_w$	0.93
T - Side Flow Spread (ft)	$(D-D_g)/S_x$	9.17
R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.29
Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	**1.1**

Output (Curb):	**Equation:**	**Output (Curb):**
S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.09
Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	0.41
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.11
L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*[1/(n*S_e)]^{0.6}$	4.81
Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$ or Q_{sx} if $L_t<L_{ce}$	**0.4**

Output (Combination):	**Equation:**	**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**1.5**
Bypass Flow (cfs)	Street Flow - Total Intercepted Flow	**0.0**

Drop Inlet Interception

Project: Kettle Bend Road
Work Order no.: 7861
Calculated By: ACY
Date: Jan-20

Inlet ID: Facility #3
Drainage Condition: Ultimate 100-Year Storm
Flow Summary: (1/2)STKB1-C = 1-cfs
Inlet Description: Modified Type C Drop Inlet

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	1.0
Longitudinal Slope (ft/ft)	S_o	0.007
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	1.62
Street Flow Depth (ft)	D	0.31
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2
Length of Grate (ft)	L_g	5
Length of Curb Opening (ft)	L_c	7.5
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	2.5
Effective Curb Opening Lenth (ft)	L_{ce}	3.75

Output (Grate):	**Equation:**	**Output (Grate):**
R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else 1	1.00
V_o - Splash Over Velocity (fps)	p+q*L_{ge}-r*L_{ge}^2+sy*L_{ge}^3; where p=0.30, q=4.85, r=1.31, sy=0.15 (vane grate)	6.58
E - grate Flow Ratio	Q_w/Q_s	0.87
Q_w - Frontal Flow (cfs)	$Q[1-(1-(W/T))^{2.67}]$	0.47
Q_s - Side Flow (cfs)	$Q-Q_w$	0.53
T - Side Flow Spread (ft)	$(D-D_g)/S_x$	7.17
R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.32
Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	**0.9**

Output (Curb):	**Equation:**	**Output (Curb):**
S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.12
Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	0.09
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.11
L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*[1/(n*S_e)]^{0.6}$	2.11
Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$ or Q_{sx} if $L_t<L_{ce}$	**0.1**

Output (Combination):	**Equation:**	**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**1.0**
Bypass Flow (cfs)	Street Flow - Total Intercepted Flow	**0.0**

Drop Inlet Interception

Project: Kettle Bend Road
Work Order no.: 7861
Calculated By: ACY
Date: Jan-20

Inlet ID: Facility #5
Drainage Condition: Ultimate 100-Year Storm
Flow Summary: (1/2)STKB1-B = 1.5-cfs
Inlet Description: Modified Type C Drop Inlet

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	1.5
Longitudinal Slope (ft/ft)	S_o	0.007
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	1.74
Street Flow Depth (ft)	D	0.35
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2
Length of Grate (ft)	L_g	5
Length of Curb Opening (ft)	L_c	7.5
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	2.5
Effective Curb Opening Lenth (ft)	L_{ce}	3.75

Output (Grate):	**Equation:**	**Output (Grate):**
R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else 1	1.00
V_o - Splash Over Velocity (fps)	p+q*L_{ge}-r*L_{ge}^2+sy*L_{ge}^3; where p=0.30, q=4.85, r=1.31, sy=0.15 (vane grate)	6.58
E - grate Flow Ratio	Q_w/Q_s	0.61
Q_w - Frontal Flow (cfs)	Q[1-(1-(W/T))$^{2.67}$]	0.57
Q_s - Side Flow (cfs)	Q-Q_w	0.93
T - Side Flow Spread (ft)	(D-D_g)/S_x	9.17
R_s - Side Flow Factor	1/(1+(0.15*$V^{1.8}$)/(S_x*$L_{ge}^{2.3}$))	0.29
Q_{gi} - Intercepted Flow (cfs)	(R_f*E+R_s*(1-E))*Q	**1.1**

Output (Curb):	**Equation:**	**Output (Curb):**
S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.09
Q_{sx} - Remaining Flow After Grate Interception (cfs)	Q-Q_{gi}	0.41
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.11
L_t - Effective Interception Length (ft)	0.60*$Q_{sx}^{0.42}$*$S_o^{0.30}$*[1/(n*S_e)]$^{0.6}$	4.81
Q_{ci} - Intercepted Flow (cfs)	(1-(1-L_{ce}/L_t)$^{1.8}$)*Q_{sx} or Q_{sx} if L_t<L_{ce}	**0.4**

Output (Combination):	**Equation:**	**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**1.5**
Bypass Flow (cfs)	Street Flow - Total Intercepted Flow	**0.0**

Drop Inlet Interception

Project: Kettle Bend Road
Work Order no.: 7861
Calculated By: ACY
Date: Jan-20

Inlet ID: Facility #8
Drainage Condition: Ultimate 100-Year Storm
Flow Summary: (1/2)STKB1-A = 2-cfs
Inlet Description: Modified Type C Drop Inlet

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	2.0
Longitudinal Slope (ft/ft)	S_o	0.03
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	3.33
Street Flow Depth (ft)	D	0.31
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2
Length of Grate (ft)	L_g	5
Length of Curb Opening (ft)	L_c	7.5
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	2.5
Effective Curb Opening Lenth (ft)	L_{ce}	3.75

Output (Grate):	**Equation:**	**Output (Grate):**
R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else 1	1.00
V_o - Splash Over Velocity (fps)	p+q*L_{ge}-r*L_{ge}^2+sy*L_{ge}^3; where p=0.30, q=4.85, r=1.31, sy=0.15 (vane grate)	6.58
E - grate Flow Ratio	Q_w/Q_s	0.87
Q_w - Frontal Flow (cfs)	$Q[1-(1-(W/T))^{2.67}]$	0.93
Q_s - Side Flow (cfs)	$Q-Q_w$	1.07
T - Side Flow Spread (ft)	$(D-D_g)/S_x$	7.17
R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.11
Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	**1.8**

Output (Curb):	**Equation:**	**Output (Curb):**
S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.12
Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	0.23
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.11
L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*[1/(n*S_e)]^{0.6}$	4.87
Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$ or Q_{sx} if $L_t<L_{ce}$	**0.2**

Output (Combination):	**Equation:**	**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**2.0**
Bypass Flow (cfs)	Street Flow - Total Intercepted Flow	**0.0**

Drop Inlet Interception

Project: Kettle Bend Road
Work Order no.: 7861
Calculated By: ACY
Date: Jan-20

Inlet ID: Facility #12
Drainage Condition: Ultimate 100-Year Storm
Flow Summary: (1/2)STKB2-F = 1-cfs
Inlet Description: Modified Type C Drop Inlet

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	1.0
Longitudinal Slope (ft/ft)	S_o	0.102
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	5.47
Street Flow Depth (ft)	D	0.24
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2
Length of Grate (ft)	L_g	5
Length of Curb Opening (ft)	L_c	7.5
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	2.5
Effective Curb Opening Lenth (ft)	L_{ce}	3.75

Output (Grate):	**Equation:**	**Output (Grate):**
R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else 1	1.00
V_o - Splash Over Velocity (fps)	p+q*L_{ge}-r*L_{ge}^2+sy*L_{ge}^3; where p=0.30, q=4.85, r=1.31, sy=0.15 (vane grate)	6.58
E - grate Flow Ratio	Q_w/Q_s	3.07
Q_w - Frontal Flow (cfs)	$Q[1-(1-(W/T))^{2.67}]$	0.75
Q_s - Side Flow (cfs)	$Q-Q_w$	0.25
T - Side Flow Spread (ft)	$(D-D_g)/S_x$	3.67
R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.05
Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	**1.0**

Output (Curb):	**Equation:**	**Output (Curb):**
S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.36
Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	0.00
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.11
L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*[1/(n*S_e)]^{0.6}$	0.00
Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$ or Q_{sx} if $L_t<L_{ce}$	**0.0**

Output (Combination):	**Equation:**	**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**1.0**
Bypass Flow (cfs)	Street Flow - Total Intercepted Flow	**0.0**

Drop Inlet Interception

Project: Kettle Bend Road
Work Order no.: 7861
Calculated By: ACY
Date: Jan-20

Inlet ID: Facility #14
Drainage Condition: Ultimate 100-Year Storm
Flow Summary: (1/2)STKB2-E = 2.5-cfs
Inlet Description: Modified Type C Drop Inlet

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	2.5
Longitudinal Slope (ft/ft)	S_o	0.007
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	1.93
Street Flow Depth (ft)	D	0.39
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2
Length of Grate (ft)	L_g	5
Length of Curb Opening (ft)	L_c	7.5
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	2.5
Effective Curb Opening Lenth (ft)	L_{ce}	3.75

Output (Grate):	**Equation:**	**Output (Grate):**
R_f - Frontal Flow Factor	$1-0.09*(V-V_x)$ if $V>V_x$; else 1	1.00
V_o - Splash Over Velocity (fps)	$p+q*L_{ge}-r*L_{ge}^2+sy*L_{ge}^3$; where p=0.30, q=4.85, r=1.31, sy=0.15 (vane grate)	6.58
E - grate Flow Ratio	Q_w/Q_s	0.47
Q_w - Frontal Flow (cfs)	$Q[1-(1-(W/T))^{2.67}]$	0.80
Q_s - Side Flow (cfs)	$Q-Q_w$	1.70
T - Side Flow Spread (ft)	$(D-D_g)/S_x$	11.17
R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.25
Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	**1.5**

Output (Curb):	**Equation:**	**Output (Curb):**
S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.07
Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	0.99
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.11
L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*[1/(n*S_e)]^{0.6}$	7.81
Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$ or Q_{sx} if $L_t<L_{ce}$	**0.7**

Output (Combination):	**Equation:**	**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**2.2**
Bypass Flow (cfs)	Street Flow - Total Intercepted Flow	**0.3**

Drop Inlet Interception

Project: Kettle Bend Road
Work Order no.: 7861
Calculated By: ACY
Date: Jan-20

Inlet ID: Facility #17
Drainage Condition: Ultimate 100-Year Storm
Flow Summary: (1/2)STKB2-A = 1-cfs
Inlet Description: Modified Type C Drop Inlet

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	1.0
Longitudinal Slope (ft/ft)	S_o	0.036
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	3.5
Street Flow Depth (ft)	D	0.25
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2
Length of Grate (ft)	L_g	5
Length of Curb Opening (ft)	L_c	7.5
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	2.5
Effective Curb Opening Lenth (ft)	L_{ce}	3.75

Output (Grate):	**Equation:**	**Output (Grate):**
R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else 1	1.00
V_o - Splash Over Velocity (fps)	p+q*L_{ge}-r*L_{ge}^2+sy*L_{ge}^3; where p=0.30, q=4.85, r=1.31, sy=0.15 (vane grate)	6.58
E - grate Flow Ratio	Q_w/Q_s	2.29
Q_w - Frontal Flow (cfs)	$Q[1-(1-(W/T))^{2.67}]$	0.70
Q_s - Side Flow (cfs)	$Q-Q_w$	0.30
T - Side Flow Spread (ft)	$(D-D_g)/S_x$	4.17
R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.10
Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	**1.0**

Output (Curb):	**Equation:**	**Output (Curb):**
S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.27
Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	0.00
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.11
L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*[1/(n*S_e)]^{0.6}$	0.00
Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$ or Q_{sx} if $L_t<L_{ce}$	**0.0**

Output (Combination):	**Equation:**	**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**1.0**
Bypass Flow (cfs)	Street Flow - Total Intercepted Flow	**0.0**

Drop Inlet Interception

Project: Kettle Bend Road
Work Order no.: 7861
Calculated By: ACY
Date: Jan-20

Inlet ID: Facility #21
Drainage Condition: Ultimate 100-Year Storm
Flow Summary: (1/2)STKB2-B = 1.5-cfs
Inlet Description: Modified Type C Drop Inlet

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	1.5
Longitudinal Slope (ft/ft)	S_o	0.007
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	1.74
Street Flow Depth (ft)	D	0.35
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2
Length of Grate (ft)	L_g	5
Length of Curb Opening (ft)	L_c	7.5
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	2.5
Effective Curb Opening Lenth (ft)	L_{ce}	3.75

Output (Grate):	**Equation:**	**Output (Grate):**
R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else 1	1.00
V_o - Splash Over Velocity (fps)	p+q*L_{ge}-r*L_{ge}^2+sy*L_{ge}^3; where p=0.30, q=4.85, r=1.31, sy=0.15 (vane grate)	6.58
E - grate Flow Ratio	Q_w/Q_s	0.61
Q_w - Frontal Flow (cfs)	$Q[1-(1-(W/T))^{2.67}]$	0.57
Q_s - Side Flow (cfs)	$Q-Q_w$	0.93
T - Side Flow Spread (ft)	$(D-D_g)/S_x$	9.17
R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.29
Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	**1.1**

Output (Curb):	**Equation:**	**Output (Curb):**
S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.09
Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	0.41
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.11
L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*[1/(n*S_e)]^{0.6}$	4.81
Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$ or Q_{sx} if $L_t<L_{ce}$	**0.4**

Output (Combination):	**Equation:**	**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**1.5**
Bypass Flow (cfs)	Street Flow - Total Intercepted Flow	**0.0**

Drop Inlet Interception

Project: Kettle Bend Road
Work Order no.: 7861
Calculated By: ACY
Date: Jan-20

Inlet ID: Facility #25
Drainage Condition: Ultimate 100-Year Storm
Flow Summary: (1/2)STKB2-C = 2-cfs
Inlet Description: Modified Type C Drop Inlet

Equations referenced from CCRFCD HCDDM and FHWA HEC-22

Input:	**Variable:**	**Input:**
Street Flow (cfs)	Q	2.0
Longitudinal Slope (ft/ft)	S_o	0.007
Manning's Coefficient	n	0.016
Street Flow Velocity (fps)	V	1.83
Street Flow Depth (ft)	D	0.37
Street Cross Slope (ft/ft)	S_x	0.02
Grate Width (ft)	W	1.5
Grate Depression (in)	D_g	2
Length of Grate (ft)	L_g	5
Length of Curb Opening (ft)	L_c	7.5
Clogging Factor - Grate (%)	CF_g	50%
Clogging Factor - Curb (%)	CF_c	50%
Effective Grate Length (ft)	L_{ge}	2.5
Effective Curb Opening Lenth (ft)	L_{ce}	3.75

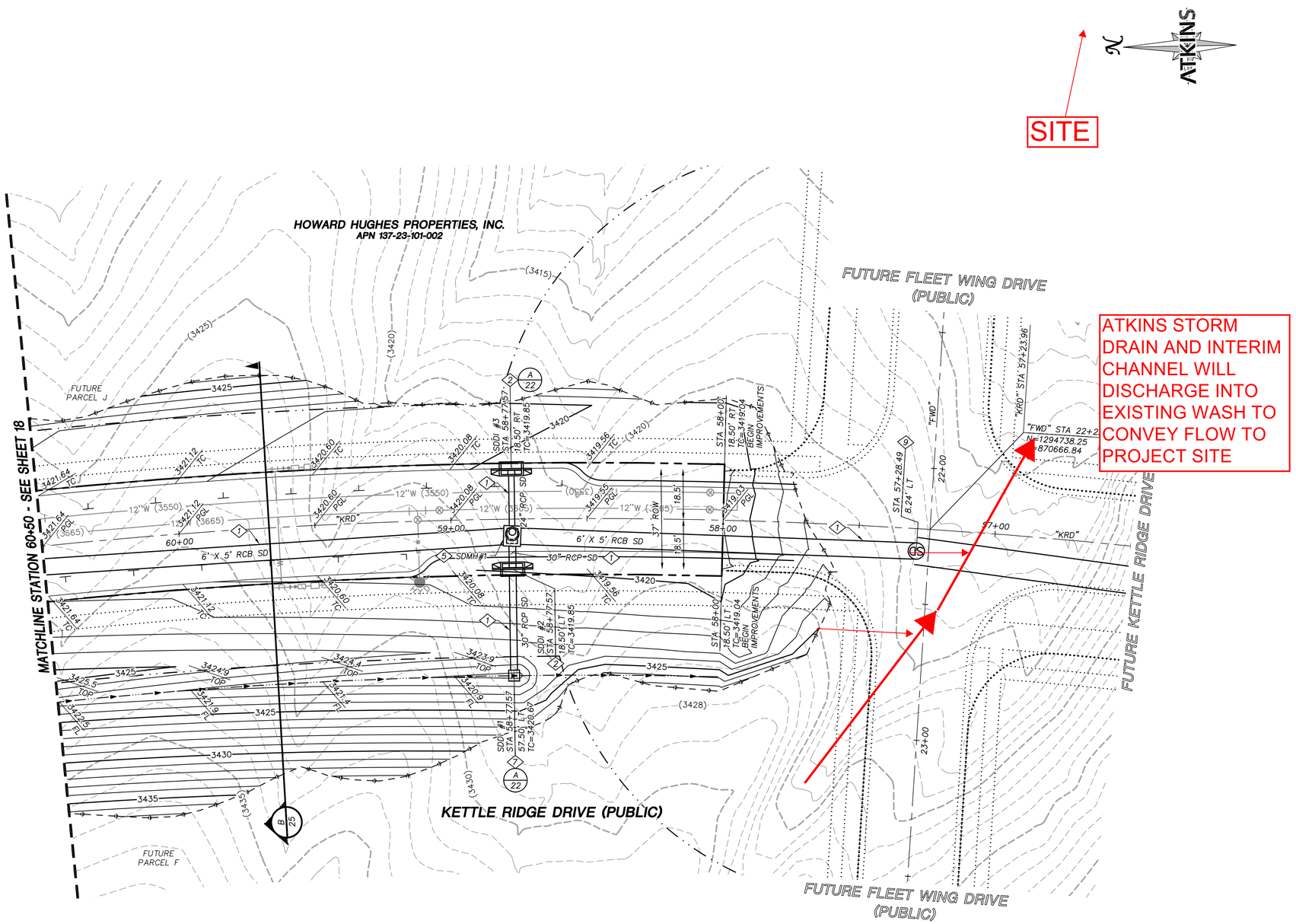
Output (Grate):	**Equation:**	**Output (Grate):**
R_f - Frontal Flow Factor	1-0.09*(V-V_x) if V>V_x; else 1	1.00
V_o - Splash Over Velocity (fps)	p+q*L_{ge}-r*L_{ge}^2+sy*L_{ge}^3; where p=0.30, q=4.85, r=1.31, sy=0.15 (vane grate)	6.58
E - grate Flow Ratio	Q_w/Q_s	0.53
Q_w - Frontal Flow (cfs)	$Q[1-(1-(W/T))^{2.67}]$	0.69
Q_s - Side Flow (cfs)	$Q-Q_w$	1.31
T - Side Flow Spread (ft)	$(D-D_g)/S_x$	10.17
R_s - Side Flow Factor	$1/(1+(0.15*V^{1.8})/(S_x*L_{ge}^{2.3}))$	0.27
Q_{gi} - Intercepted Flow (cfs)	$(R_f*E+R_s*(1-E))*Q$	**1.3**

Output (Curb):	**Equation:**	**Output (Curb):**
S_e - Equivalent Cross Slope (ft/ft)	S_x+S_g*E	0.08
Q_{sx} - Remaining Flow After Grate Interception (cfs)	$Q-Q_{gi}$	0.68
S_g - Gutter Cross Slope (ft/ft)	D_g/W	0.11
L_t - Effective Interception Length (ft)	$0.60*Q_{sx}^{0.42}*S_o^{0.30}*[1/(n*S_e)]^{0.6}$	6.33
Q_{ci} - Intercepted Flow (cfs)	$(1-(1-L_{ce}/L_t)^{1.8})*Q_{sx}$ or Q_{sx} if $L_t<L_{ce}$	**0.5**

Output (Combination):	**Equation:**	**Output (Combination):**
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	**1.9**
Bypass Flow (cfs)	Street Flow - Total Intercepted Flow	**0.1**

APPENDIX D
REFERENCE MATERIAL

ATKINS GRADING PLANS
KETTLE RIDGE DRIVE
SCURRY BEND ROAD

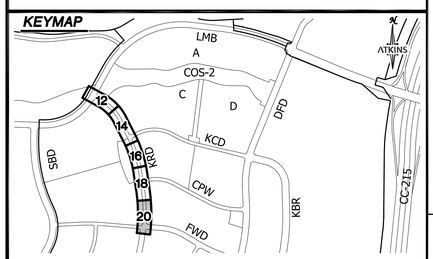


STORM DRAIN CONSTRUCTION NOTES

1. INSTALL STORM DRAIN. SEE SHEET XX FOR ADDITIONAL STORM DRAIN NOTES AND INFORMATION.
2. INSTALL TYPE "CM2" DROP INLET PER CCAUSD #412.1 & #421
3. INSTALL 24" BEEHIVE DROP INLET PER CCAUSD #416
4. INSTALL TYPE I SD MANHOLE PER CCAUSD #403
5. INSTALL TYPE II SD MANHOLE PER CCAUSD #405.2
6. INSTALL TYPE III SD MANHOLE PER CCAUSD #406
7. INSTALL NDOT TYPE 2 DROP INLET PER NDOT R-4.2.1
8. REMOVE CAP AND CONNECT TO EXISTING STORM DRAIN STUB
9. STUB & PLUG STORM DRAIN FOR FUTURE CONNECTION PER MANUFACTURER'S PLUG, OR APPROVED EQUAL
10. INSTALL RIP-RAP (D50=12", THICKNESS=24")
11. REMOVE EXISTING RIP-RAP

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL



GRAPHIC SCALE
20 0 10 20 40
HORIZONTAL: 1"=20'

GRADING PLAN CERTIFICATION

PAUL A. BATES PE#18723 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

DS#XXX-0000

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.

BENCHMARK

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

FAST Call before you UnderGround 1-702-432-5300 REGIONAL AND ARTERIAL SYSTEMS OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 or 1-800-642-2444

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

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

NOT FOR CONSTRUCTION
TDS SUBMITTAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

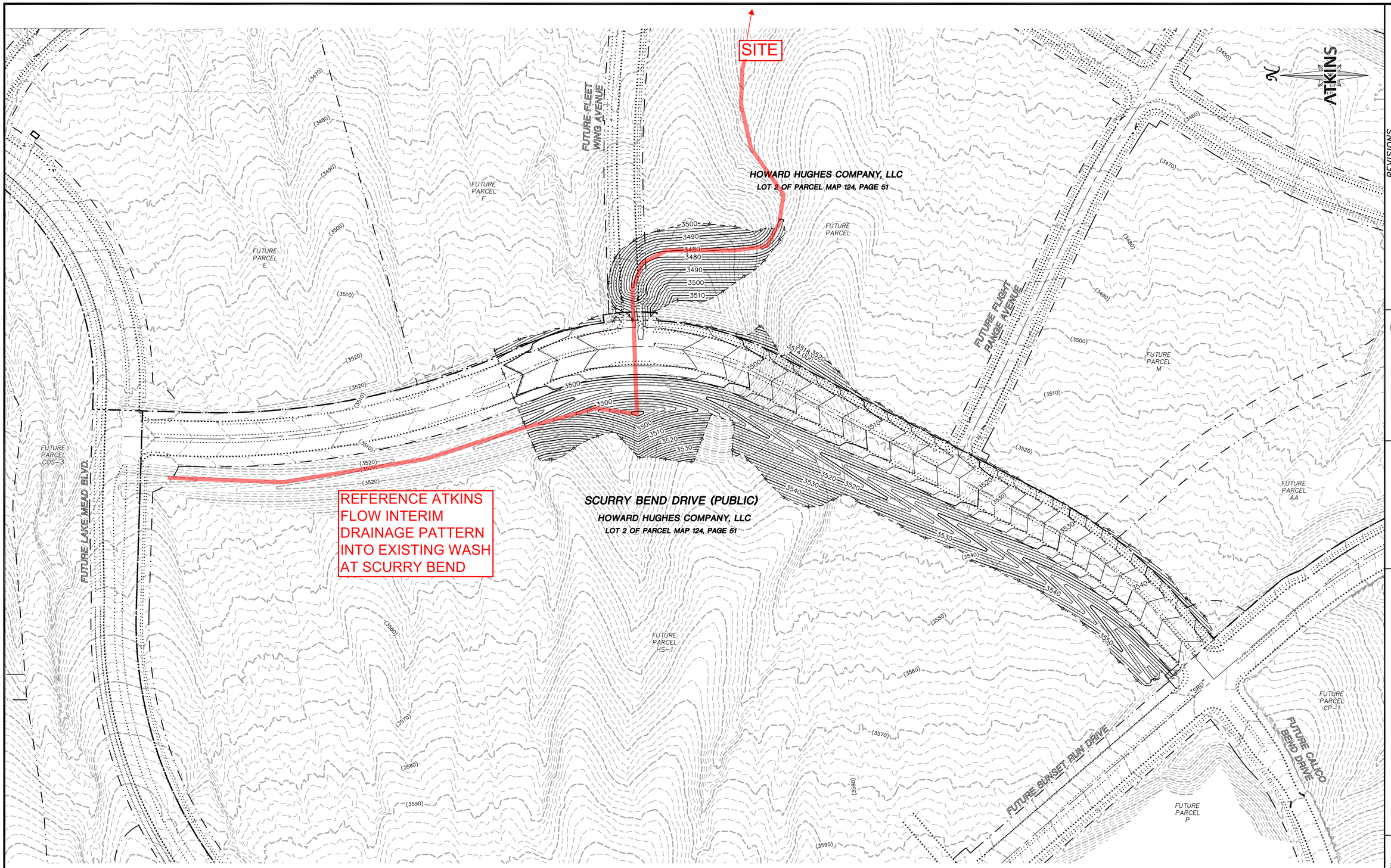
SUMMERLIN VILLAGE 22 NORTH

KETTLE RIDGE DRIVE - LAKE MEAD TO FLEET WING
SCURRY BEND DRIVE ROUGH GRADE - LAKE MEAD TO FLEET WING

ROADWAY GRADING PLAN
BEGIN TO STA. 60+50

DESIGNED BY: N. BARCOS
DRAWN BY: O. QUASSANI
CHECKED BY: P. BATES
HORIZ.: 1"=20'
VERT.: NONE
JOB NO. 100060655
DATE: MARCH, 2019
DRAWING NO. 20/30
CLV 00-00000

X:\Projects\SummWest\Village 22\100060655 - V22N Street J (Lake Mead to Street G)_Sheets\60655-09-GRAD-01.dwg LAYOUT: 20 Mar 19, 2019 - 11:46AM



GRAPHIC SCALE

100 0 50 100 200

HORIZONTAL: 1"=100'

GRADING PLAN CERTIFICATION

PAUL A. BATES PE#18723 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

DS#00000

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.

BENCHMARK

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

FAST Call before you UnderGround 1-702-432-6300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S QUICK! Call 811 or 1-800-642-2444

AVOID HITTING OVERHEAD POWER LINES. IT'S QUICK! CALL BEFORE YOU DIG OVERHEAD 1-702-227-2929

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

NOT FOR CONSTRUCTION
60% SUBMITTAL

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7375
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22

SCURRY BEND DRIVE (STREET N) ROUGH GRADE - SUNSET RUN DRIVE TO FLEET WING AVENUE (STREET G)

MASTER GRADING PLAN

DESIGNED BY: J. BANTA
DRAWN BY: C. DANIELS
CHECKED BY: P. BATES
HORIZ.: 1"=40'
VERT.: 1"=8'

JOB NO. 100068040
DATE JANUARY, 2020
DRAWING NO. 4 /12
CLV 00-00000

X:\Projects\SummWest\Village 22\100068040 - V22 Scurry Bend Dr (Sunset Run to Fleet Wing)_Sheets\68040-06-GRDA-01.dwg LAYOUT: 4 Jan 03, 2020 - 9:00AM

FUTURE FLEET WING AVE. (PUBLIC)

SITE

HOWARD HUGHES COMPANY, LLC
LOT 2 OF PARCEL MAP 124, PAGE 51

FUTURE PARCEL F

HOWARD HUGHES COMPANY, LLC
LOT 2 OF PARCEL MAP 124, PAGE 51

FUTURE PARCEL L

STA 35+84.78 PT

STA 26+07.84
SCURRY BEND DRIVE
N=1294771.13
E=869563.94

STA 39+20.18
FLEET WING AVE

STA 24+39.97

STA 28+45.10 PT

SEE SHEET 6

MATCHLINE STATION 19+50 - SEE SHEET 6

REFERENCE ATKINS FLOW INTERIM DRAINAGE PATTERN INTO EXISTING WASH AT SCURRY BEND

RY BEND DRIVE (PUBLIC)

ARD HUGHES COMPANY, LLC
2 OF PARCEL MAP 124, PAGE 51

FUTURE PARCEL HS-1

GRAPHIC SCALE
40 0 20 40 80
HORIZONTAL: 1"=40'

SUMMARY OF QUANTITIES

DESCRIPTION	QUANTITY	UNIT
DRAINAGE		
48" RCP CLASS III	290	LF
RIP-RAP (D50=8", 16" THICKNESS)	3965	CY
--	--	--
--	--	--

MASTER PLAN NOTE

THIS SHEET IS FOR INFORMATIONAL PURPOSES ONLY. IT IS AN OVERALL REPRESENTATION OF THE UTILITY FOR REVIEW AND COORDINATION WITH OTHER PROJECT DETAILS WITHIN THIS PLAN SET.

STORM DRAIN NOTES

1. SEE ROUGH GRADING PLAN AND PROFILE SHEETS FOR CONSTRUCTION DETAILS.
2. ALL STORM DRAIN MATERIAL TO BE CLASS III REINFORCED CONCRETE PIPE, UNLESS OTHERWISE NOTED IN PROFILES.
3. CONTRACTOR TO PROVIDE 6" MINIMUM OF CLEARANCE BETWEEN OUTSIDE OF PIPE TO INSIDE WALL OF STORM DRAIN STRUCTURES.

SOILS REPORT

BY NOVA
PROJECT NO. G-18-176
DATED 12/30/19
EARTHWORK QUANTITIES (RAW):
CUT= 111,836 CU YDS
FILL= 10,453 CU YDS

GRADING PLAN CERTIFICATION

PAUL A. BATES PE#18723 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

DS#00000

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.

BENCHMARK

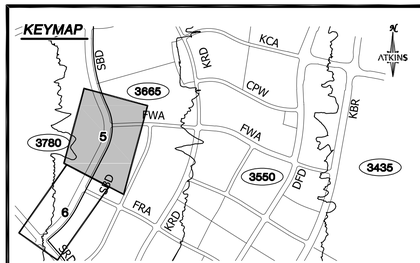
CITY OF LAS VEGAS BENCHMARK: D368
(REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS
(3,246.63 FEET)
FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

FAST Call before you UnderGround 1-702-432-5300 FEDERAL AND NATIONAL SYSTEMS OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES IN CLARK COUNTY. Call 811 or 1-800-642-2444

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

KEYMAP



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

NOT FOR CONSTRUCTION
60% SUBMITTAL

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7375
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 22
SCURRY BEND DRIVE (STREET H) ROUGH GRADE - SUNSET RUN DRIVE TO FLEET WING AVENUE (STREET G)

MASTER DRAINAGE PLAN
STA 19+50 TO END

DESIGNED BY: J. BANTA
DRAWN BY: C. DANIELS
CHECKED BY: P. BATES
HORIZ.: 1"=40'
VERT.: 1"=8'

JOB NO. 100068040
DATE: JANUARY, 2020
DRAWING NO. 5 /12

CLV 00-00000

X:\Projects\SummitWest\Village 22\100068040 - Y22 Scurry Bend Dr (Sunset Run to Fleet Wing)_Sheets\68040-04-STRM-SD1.dwg LAYOUT: 5 Jan 03, 2020 - 9:48AM

MASTER CONCEPTUAL DRAINAGE STUDY FOR UPDATE #1 SUMMERLIN WEST VILLAGE 22

(CLV DS5005)

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: Revised December 12, 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: **Master Conceptual Drainage Study for – Update #2 Summerlin West Village 22**			**COPIES TO:** VTN Nevada
Cross Streets:	I-215 Western Beltway & Summerlin Parkway			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5005G-Rev.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-14-401-006, 137-23-101-002			CCRFCD
Zoning Action:	MDR-73901			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	6/12/2018	6/28/2018 & 7/13/2018	Not Approved	$400.00	49696: $400
2nd Submittal	7/31/2018	8/22/2018	Not Approved	$400.00	497790: $400
3rd Submittal	11/5/2018	11/27/2018	Conditional Approval	$400.00	500639: $400
Memo Revision	12/3/2018	12/3/2018	Conditional Approval	N/C	N/C
CCRFCD	1/10/2019	1/10/2019	Concurrence Recv'd	N/C	N/C
4th Submittal	2/12/2019	3/6/2019	Not Approved	$100.00	503164: $100
5th Submittal	3/21/2019	4/4/2019	Conditional Approval	$400.00	3057847: $400
CCPW & CCRFCD	4/25/2019 & 5/23/2019	5/29/2019	Concurrence Received	N/C	N/C
6th Submittal	11/13/2019	12/10/2019	Conditional Approval	$100.00	3644006: $100
Memo Revision	12/12/2019	12/12/2019	See Comments Below	N/C	N/C
			TOTAL FEES (LDDRS):	**$1,800.00**	**----**

REMARKS:

6th Submittal: Update #2 to address Village 22 Overall Development Plan changes

4th & 5th Submittals: Update #1 & Addendum #1 to revise Village 22 in accordance to the Update of the latest overall Summerlin West Master Plan Drainage Study

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

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

1. **This drainage study is acceptable in concept;** however, *City of Las Vegas* will not formally accept the study until the *Clark County Regional Flood Control District (CCRFCD)* has issued a letter of concurrence. The engineer should contact the CCRFCD to confirm that they have begun their review.

   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

2. The site is also adjacent to the Clark County Western Beltway project. The engineer must coordinate with *Clark County Department of Public Works* (CCPW) and incorporate any concerns for mutual boundary conditions. CCPW concurrence is required prior to the final approval of the master conceptual drainage study update.

3. The *Grand Park Detention Basin* is proposed to regulate and meter outflow to match the previously approved downstream flow conditions at the junction of *Far Hills* storm drain and the *Beltway Channel*. Without the *Grand Park Detention Basin*, there will be a net increase in flows at the *Beltway Channel* downstream of *Far Hills* intersection exceeding the previously approved flow.

   A technical drainage study for the analysis, design and construction plans for the *Grand Park Detention Basin* must be submitted and approved by the City prior to the individual onsite parcel developments.

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

T/R/S: T20S/R59E/14
AREA K-14

```
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   23OCT19  TIME  13:10:22  *                                                  *           (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    ULTIMATE CONDITION HYDROLOGIC MODEL
            2          ID    INPUT FILE DATE = OCTOBER 2019
            3          ID    DESIGN STORM = 100-YEAR 6-HR STORM
            4          ID    STORM DISTRIBUTION = SDN #3
            5          ID    MODELED BY VTN (JYA)
            6          ID
            7          ID    ********************************************************
            8          ID    * UPDATE #2 - SUMMERLIN WEST VILLAGE 22                *
            9          ID    ********************************************************
           10          ID
           11          ID
           12          ID
           13          ID
           14          ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
           15          ID
           16          ID  100-YEAR,  6-HOUR STORM,  SDN3
           17          ID
           18          IT       5       0       0     100
           19          IO       5       0       0
           20          IN       5       0       0
           21          JR    PREC    1.00
                       *

           22          KK      LM
           23          BA  0.0157
           24          PB    3.41
           25          PC       0   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
           26          PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
           27          PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
           28          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
           29          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
           30          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
           31          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
           32          PC   0.998   0.999       1
           33          LS       0    98.0
           34          UD   0.118
                       *

           35          KK       D
           36          BA  0.0187
           37          PB    3.39
           38          LS       0    95.0
           39          UD   0.058
                       *

           40          KK    DES1
           41          BA  0.0070
           42          PB    3.39
           43          LS       0    98.0
           44          UD   0.058
                       *
```

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

  45          KK   CDES1
  46          KM   COMBINE D AND DES1
  47          HC       2
              *

  48          KK  RCDES1
  49          KM   ROUTE CDES1 TO CCOS-2
  50          RD     241   0.027   0.013       0    CIRC     2.5
              *

  51          KK   COS-2
  52          BA  0.0117
  53          PB    3.41
  54          LS       0    89.0
  55          UD   0.142
              *

  56          KK  CCOS-2
  57          KM   COMBINE CDES1 AND COS-2
  58          HC       2
              *

  59          KK RCCOS-2
  60          KM   ROUTE CCOS-2 TO CA
  61          RD     325   0.007   0.013       0    CIRC     3.0
              *

  62          KK       A
  63          BA  0.0272
  64          PB    3.41
  65          LS       0    95.0
  66          UD   0.078
              *

  67          KK      CA
  68          KM   COMBINE CCOS-2 AND A
  69          HC       2
              *

  70          KK     RCA
  71          KM   ROUTE CA TO CP1
  72          RD     325   0.050   0.013       0    CIRC     3.5
              *

  73          KK     CP1
  74          KM   COMBINE LM AND CA
  75          HC       2
              *
```



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

  76          KK     STI
  77          KM   KESTREL CREEK AVE
  78          BA  0.0038
  79          PB    3.41
  80          LS       0    98.0
  81          UD   0.050
              *

  82          KK       C
  83          BA  0.0188
  84          PB    3.41
  85          LS       0    95.0
  86          UD   0.054
              *

  87          KK    CSTI
  88          KM   COMBINE C AND STI
  89          HC       2
              *

  90          KK       G
  91          BA  0.0110
  92          PB    3.41
  93          LS       0    95.0
  94          UD   0.056
              *

  95          KK      CG
  96          KM   COMBINE CSTI AND CG
  97          HC       2
              *

  98          KK     RCG
```

```
  99          KM   ROUTE CG TO CH
 100          RD     556   0.081   0.013       0    CIRC     3.5
              *

 101          KK       H
 102          BA  0.0119
 103          PB    3.41
 104          LS       0    95.0
 105          UD   0.053
              *

 106          KK      CH
 107          KM   COMBINE CG AND CH
 108          HC       2
              *
1                                          HEC-1 INPUT                                          PAGE  4

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


 109          KK     RCH
 110          KM   ROUTE CH TO CP2
 111          RD     255   0.093   0.013       0    CIRC     3.5
              *

 112          KK     STH
 113          KM   CLOWDER PASS WAY
 114          BA  0.0036
 115          PB    3.41
 116          LS       0    98.0
 117          UD   0.050
              *

 118          KK       J
 119          BA  0.0093
 120          PB    3.41
 121          LS       0    92.0
 122          UD   0.058
              *

 123          KK      CJ
 124          KM   COMBINE J AND STH
 125          HC       2
              *

 126          KK     RCJ
 127          KM   ROUTE CJ TO CDES2
 128          RD     637   0.080   0.013       0    CIRC     2.5
              *

 129          KK       K
 130          BA  0.0081
 131          PB    3.40
 132          LS       0    95.0
 133          UD   0.050
              *

 134          KK    DES2
 135          BA  0.0048
 136          PB    3.38
 137          LS       0    98.0
 138          UD   0.071
              *

 139          KK   CDES2
 140          KM   COMBINE DES2, CJ, AND K
 141          HC       3
              *
1                                          HEC-1 INPUT                                          PAGE  5

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


 142          KK  RCDES2
 143          KM   ROUTE CDES2 TO CP2
 144          RD     643   0.014   0.013       0    CIRC     3.5
              *

 145          KK     CP2
 146          KM   COMBINE CDES2 & CH
 147          HC       2
              *

 148          KK    RCP2
 149          KM   ROUTE CP2 TO CP5
 150          RD    1226   0.039   0.013       0    CIRC     4.5
              *

 151          KK   CARR1
 152          BA  0.0109
 153          PB    3.38
```

```
 154          LS       0    98.0
 155          UD   0.070
              *

 156          KK       I
 157          BA  0.0165
 158          PB    3.38
 159          LS       0    92.0
 160          UD   0.083
              *

 161          KK   N-O-P
 162          BA  0.0227
 163          PB    3.40
 164          LS       0    90.3
 165          UD   0.090
              *

 166          KK    NP-1
 167          BA  0.0027
 168          PB    3.40
 169          LS       0    89.0
 170          UD   0.059
              *

 171          KK    STG2
 172          KM   FLEET WING AVE
 173          BA  0.0045
 174          PB    3.40
 175          LS       0    98.0
 176          UD   0.050
              *
```



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


 177          KK   CSTG2
 178          KM   COMBINE N-O-P, NP-1 AND STG2
 179          HC       3
              *

 180          KK    DES3
 181          BA  0.0031
 182          PB    3.38
 183          LS       0    98.0
 184          UD   0.050
              *

 185          KK     CP3
 186          KM   COMBINES CSTG2 & DES3
 187          HC       2
              *

 188          KK    RCP3
 189          KM   ROUTE CP3 TO CSTG3
 190          RD     513   0.080   0.013       0    CIRC     3.0
              *

 191          KK    STG3
 192          BA  0.0011
 193          PB    3.38
 194          LS       0    98.0
 195          UD   0.050
              *

 196          KK   CSTG3
 197          KM   COMBINES CP3 AND STG
 198          HC       2
              *

 199          KK       Q
 200          BA  0.0072
 201          PB    3.38
 202          LS       0    92.2
 203          UD   0.069
              *

 204          KK       R
 205          BA  0.0078
 206          PB    3.37
 207          LS       0    93.2
 208          UD   0.065
              *

 209          KK     CQR
 210          KM   COMBINE R AND Q
 211          HC       2
              *
```

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

 212          KK   CARR2
 213          BA  0.0056
 214          PB    3.37
 215          LS       0    98.0
 216          UD   0.064
              *

 217          KK  CCARR2
 218          KM   COMBINE CQR AND CARR2
 219          HC       2
              *

 220          KK RCCARR2
 221          KM   ROUTE CCARR2 TO CP4
 222          RD     414   0.033   0.013       0    CIRC     2.5
              *

 223          KK     CP4
 224          KM   COMBINE CP3 AND CCARR2
 225          HC       2
              *

 226          KK    RCP4
 227          KM   ROUTE CP4 TO CP5
 228          RD     582   0.010   0.013       0    CIRC     3.5
              *

 229          KK     CP5
 230          KM   COMBINE CARR1, I, CP2 AND CP4
 231          HC       4
              *

 232          KK      II
 233          BA  0.0250
 234          PB    3.37
 235          LS       0    93.2
 236          UD   0.072
              *

 237          KK       X
 238          BA  0.0273
 239          PB    3.37
 240          LS       0    90.0
 241          UD   0.080
              *

 242          KK       B
 243          BA  0.1262
 244          PB    3.36
 245          LS       0    93.5
 246          UD   0.077
              *
1                                    HEC-1 INPUT                                          PAGE  8

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

 247          KK    DC-1
 248          BA  0.0197
 249          PB    3.35
 250          LS       0      98
 251          UD   0.257
              *

 252          KK   COS-4
 253          BA  0.0009
 254          PB    3.35
 255          LS       0    88.0
 256          UD   0.077
              *

 257          KK DUMMY1A
 258          KM   REGIONAL FACILITY - BELTWAY CHANNEL NORTH
 259          KM   COMBINE II, X, B, DC1, AND COS-4
 260          HC       5
              *

 261          KK   COS-1
 262          BA  0.0045
 263          PB    3.41
 264          LS       0    79.8
 265          UD   0.118
              *

 266          KK  DUMMY1
 267          KM   REGIONAL FACILITY - BELTWAY CHANNEL NORTH
 268          KM   COMBINE CP1, CP5, DUMMY1A, AND COS-1
 269          HC       4
```

```
                *

 270            KK    27-F
 271            BA  0.0299
 272            PB    3.48
 273            LS       0    94.2
 274            UD   0.050
                *

 275            KK 27-COS2
 276            BA  0.0082
 277            PB    3.46
 278            LS       0    89.0
 279            UD   0.052
                *

 280            KK     LM2
 281            BA  0.0113
 282            PB    3.41
 283            LS       0    98.0
 284            UD   0.093
                *
1                                       HEC-1 INPUT                                             PAGE  9

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


 285            KK    CLM2
 286            KM   COMBINES OFFSITE V27 BASINS 27-F, V27-COS2, AND LM2
 287            HC       3
                *

 288            KK 27-COS3
 289            BA  0.0273
 290            PB    3.47
 291            LS       0    89.0
 292            UD   0.113
                *

 293            KK    COFF
 294            KM   COMBINES OFFSITE V27 BASINS
 295            KM   COMBINE CLM2 AND V27-COS3
 296            HC       2
                *

 297            KK   RCOFF
 298            KM   ROUTE COFF TO CSTJ1
 299            RD     744   0.058   0.013       0    CIRC     4.5
                *

 300            KK       E
 301            BA  0.0217
 302            PB    3.43
 303            LS       0    95.0
 304            UD   0.062
                *

 305            KK    STJ1
 306            KM   KETTLE RIDGE
 307            BA  0.0055
 308            PB    3.43
 309            LS       0    98.0
 310            UD   0.069
                *

 311            KK   CSTJ1
 312            KM   COMBINE COFF, E, AND STJ1
 313            HC       3
                *

 314            KK  RCSTJ1
 315            KM   ROUTE COFF TO CSTJ1
 316            RD     380   0.005   0.013       0    CIRC       5
                *

 317            KK    NP-2
 318            BA  0.0021
 319            PB    3.43
 320            LS       0    89.0
 321            UD   0.058
                *
1                                       HEC-1 INPUT                                             PAGE 10

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


 322            KK   CNP-2
 323            KM   COMBINE CSTJ1 AND CNP-2
 324            HC       2
                *
```

```
 325          KK  RCNP-2
 326          KM   ROUTE CNP-2 TO CF
 327          RD     390   0.005   0.013       0    DEEP       6
              *

 328          KK       F
 329          BA  0.0222
 330          PB    3.43
 331          LS       0    95.0
 332          UD   0.063
              *

 333          KK      CF
 334          KM   COMBINE CNP-1 AND CF
 335          HC       2
              *

 336          KK     RCF
 337          KM   ROUTE CF  TO CP6
 338          RD     320   0.005   0.013       0    DEEP       6
              *

 339          KK  25-HS1
 340          BA  0.0773
 341          PB    3.44
 342          LS       0    94.8
 343          UD   0.056
              *

 344          KK    STN1
 345          KM   SCURRY BEND
 346          BA  0.0056
 347          PB    3.44
 348          LS       0    98.0
 349          UD   0.125
              *

 350          KK   CSTN1
 351          KM   COMBINE 25-HS1 AND STN1
 352          HC       2
              *

 353          KK  RCSTN1
 354          KM   ROUTE CSTN1 TO CSTG1
 355          RD    1010   0.090   0.013       0    CIRC     4.5
              *
1                                          HEC-1 INPUT                                                PAGE 11

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


 356          KK    STG1
 357          BA  0.0029
 358          PB    3.42
 359          LS       0    98.0
 360          UD   0.050
              *

 361          KK   CSTG1
 362          KM   COMBINE CSTN1 AND STG1
 363          HC       2
              *

 364          KK     CP6
 365          KM   COMBINE CF AND CSTG1
 366          HC       2
              *

 367          KK    RCP6
 368          KM   ROUTE CP6 TO CSTJ2
 369          RD     530   0.005   0.013       0    DEEP       6       0
              *

 370          KK     L-M
 371          BA  0.0330
 372          PB    3.42
 373          LS       0    94.4
 374          UD   0.084
              *

 375          KK    STJ2
 376          BA  0.0048
 377          PB    3.42
 378          LS       0    98.0
 379          UD   0.058
              *

 380          KK   CSTJ2
 381          KM   COMBINE CP6, L-M AND STJ2
 382          HC       3
              *
```

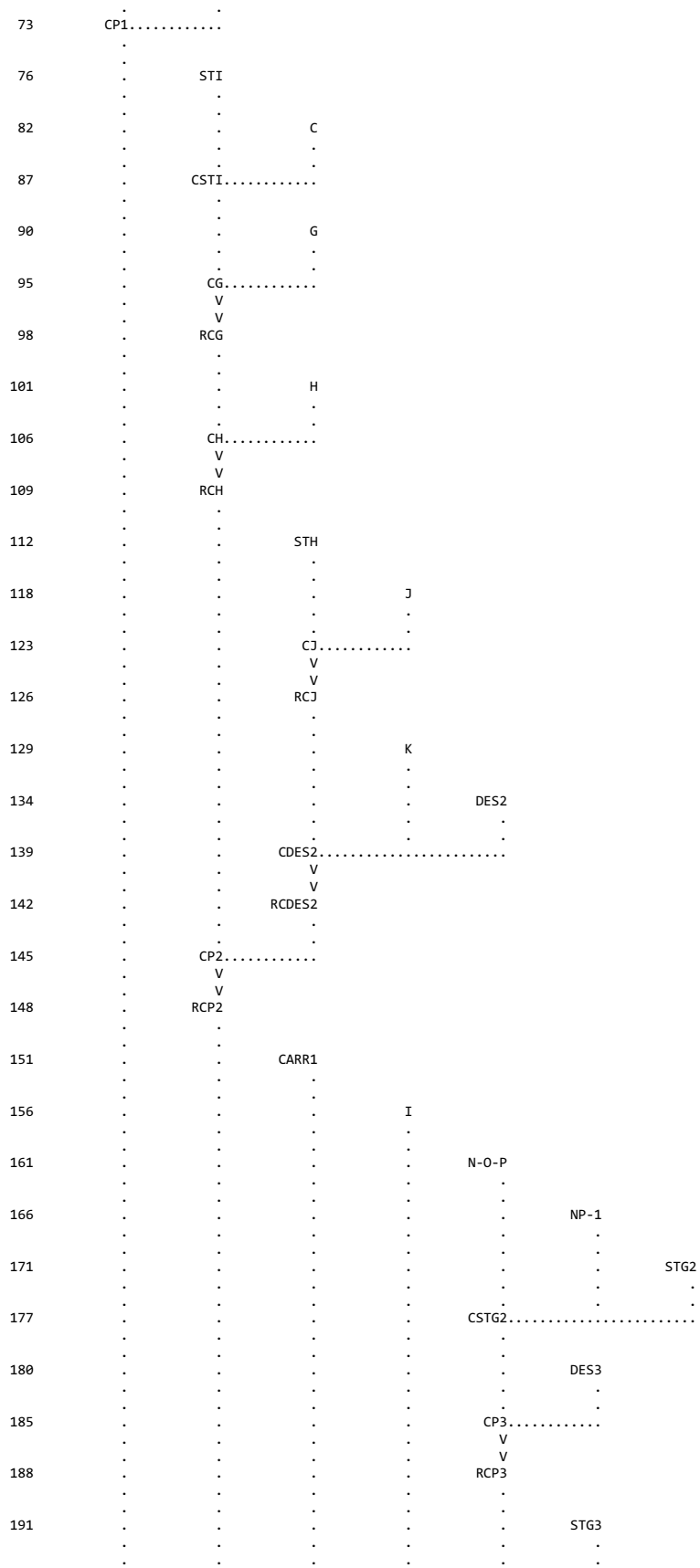
```
 383          KK  RCSTJ2
 384          KM   ROUTE CSTJ2 TO CSTF
 385          RD    1000   0.069   0.015       0    DEEP       6       0
              *

 386          KK     STF
 387          BA  0.0029
 388          PB    3.40
 389          LS       0    98.0
 390          UD   0.050
              *
1                                          HEC-1 INPUT                                          PAGE 12

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


 391          KK    CSTF
 392          KM   COMBINE CSTJ2 AND CSTF
 393          HC       2
              *

 394          KK       U
 395          BA  0.0055
 396          PB    3.40
 397          LS       0    86.3
 398          UD   0.069
              *

 399          KK    DES4
 400          BA  0.0028
 401          PB    3.40
 402          LS       0    98.0
 403          UD   0.050
              *

 404          KK   CDES4
 405          KM   COMBINE U AND DES4
 406          HC       2
              *

 407          KK       S
 408          BA  0.0047
 409          PB    3.40
 410          LS       0    87.9
 411          UD   0.088
              *

 412          KK      CS
 413          KM   CDES4 AND S
 414          HC       2
              *

 415          KK     CP7
 416          KM   COMBINE CSTF AND CS
 417          HC       2
              *

 418          KK    RCP7
 419          KM   ROUTE CP7 TO CSTF2
 420          RD     710   0.066   0.015       0    DEEP       6       0
              *

 421          KK    STF2
 422          BA  0.0019
 423          PB    3.37
 424          LS       0    98.0
 425          UD   0.050
              *
1                                          HEC-1 INPUT                                          PAGE 13

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


 426          KK   CSTF2
 427          KM   COMBINE CP7 AND STF2
 428          HC       2
              *

 429          KK  RCSTF2
 430          KM   ROUTE CSTF2 TO CCARR3
 431          RD     420   0.005   0.015       0    DEEP       8       0
              *

 432          KK       V
 433          BA  0.0078
 434          PB    3.37
 435          LS       0    90.0
 436          UD   0.075
              *
```

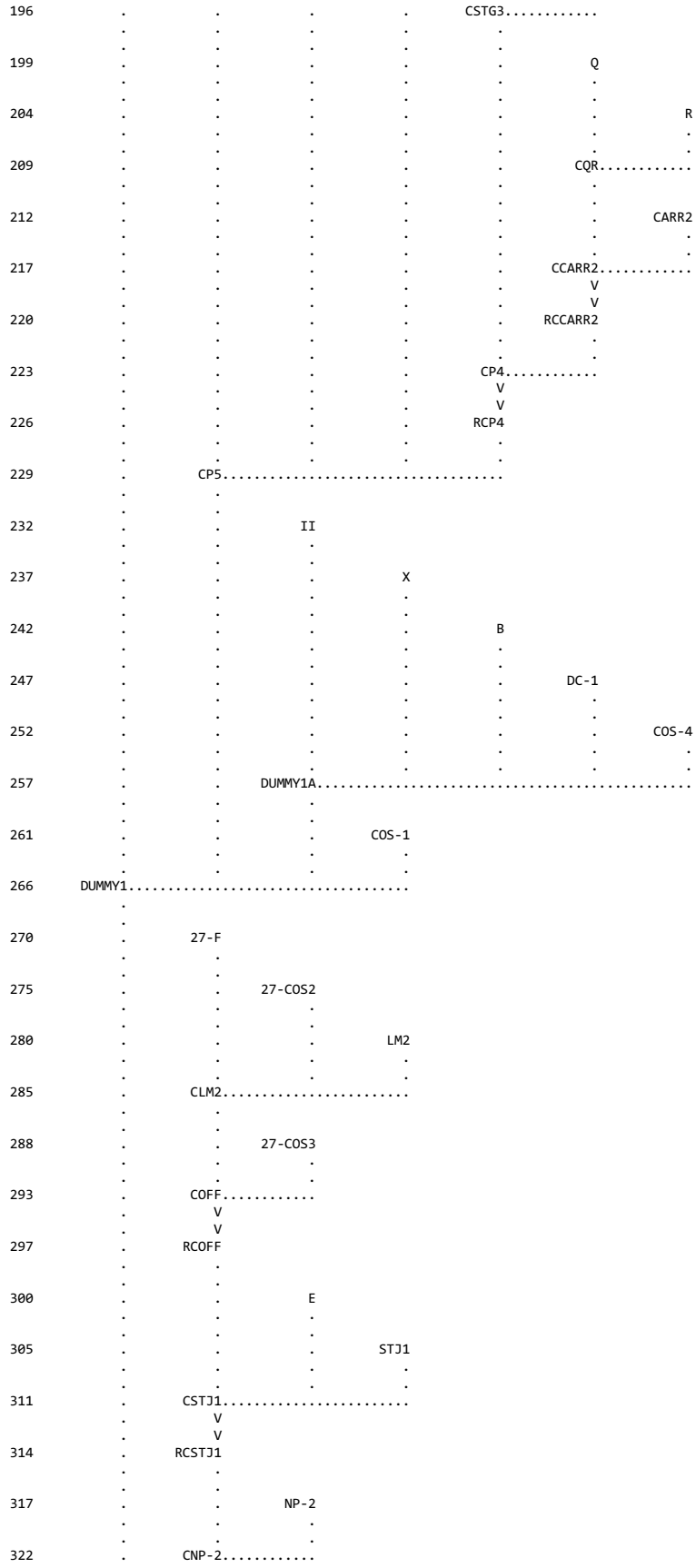
```
437          KK       W
438          BA  0.0083
439          PB    3.40
440          LS       0    90.0
441          UD   0.074
             *

442          KK     CVW
443          KM   COMBINE W AND V
444          HC       2
             *

445          KK   CARR3
446          BA  0.0033
447          PB    3.37
448          LS       0    98.0
449          UD   0.101
             *

450          KK  RCARR3
451          KM   ROUTE CCARR3 TO CP8
452          RD     360   0.005   0.015       0    DEEP       8       0
             *

453          KK  CCARR3
454          KM   COMBINE STF2, CVW AND CARR3
455          HC       3
             *

456          KK    STE3
457          BA  0.0021
458          PB    3.40
459          LS       0    98.0
460          UD   0.050
             *
1                                        HEC-1 INPUT                                        PAGE 14

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

461          KK     CP8
462          KM   COMBINE STE3 AND CCARR3
463          HC       2
             *

464          KK    RCP8
465          KM   ROUTE CP8 TO CEE
466          RD     240   0.005   0.015       0    DEEP       8       0
             *

467          KK      EE
468          BA  0.0106
469          PB    3.39
470          LS       0    90.2
471          UD   0.068
             *

472          KK     CEE
473          KM   COMBINES CP8 AND EE
474          HC       2
             *

475          KK    RCP8
476          KM   ROUTE CEE TO CP9
477          RD     220   0.005   0.015       0    DEEP       8       0
             *

478          KK    NP-3
479          BA  0.0011
480          PB    3.39
481          LS       0    80.5
482          UD   0.080
             *

483          KK   STEE3
484          BA  0.0019
485          PB    3.39
486          LS       0    98.0
487          UD   0.050
             *

488          KK  CSTEE3
489          KM   COMBINES NP-3 AND CSTEE3
490          HC       2
             *

491          KK     CP9
492          KM   COMBINES CSTEE3 AND CEE
493          HC       2
             *
1                                        HEC-1 INPUT                                        PAGE 15
```

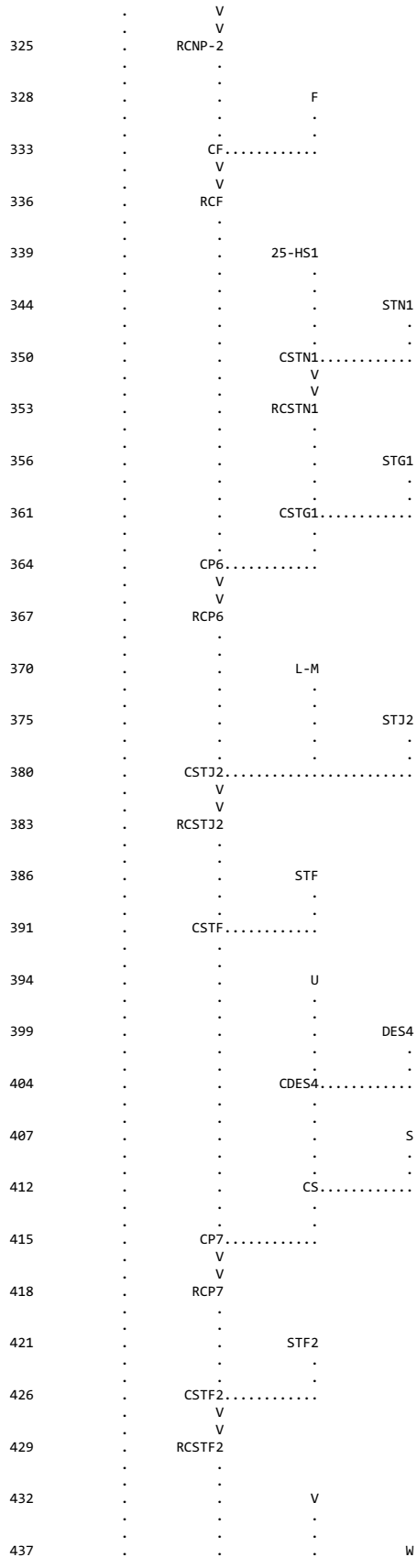
```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 494          KK    RCP9
 495          KM   ROUTE CP9 TO DUMMY2
 496          RD     281   0.005   0.015       0    DEEP       8       0
              *

 497          KK      HH
 498          BA  0.0076
 499          PB    3.39
 500          LS       0    94.2
 501          UD   0.058
              *

 502          KK   CARR4
 503          BA  0.0036
 504          PB    3.37
 505          LS       0    98.0
 506          UD   0.059
              *

 507          KK  DUMMY2
 508          KM   REGIONAL FACILITY - BELTWAY CHANNEL SOUTH
 509          HC       3
              *

 510          KK 25-HS1B
 511          BA  0.0182
 512          PB    3.44
 513          LS       0    92.2
 514          UD   0.050
              *

 515          KK    STN2
 516          BA  0.0068
 517          PB    3.44
 518          LS       0    98.0
 519          UD   0.065
              *

 520          KK   CSTN2
 521          KM   COMBINE 25-HS1B AND STN2
 522          HC       2
              *

 523          KK  RCSTN2
 524          KM   ROUTE CSTN2 TO CSTE1
 525          RD    1000   0.067   0.015       0    CIRC       3
              *

 526          KK     Y-Z
 527          BA  0.0176
 528          PB    3.42
 529          LS       0    92.2
 530          UD   0.075
              *
1                                      HEC-1 INPUT                                          PAGE 16

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

 531          KK    STE1
 532          BA  0.0027
 533          PB    3.42
 534          LS       0    98.0
 535          UD   0.050
              *

 536          KK   CSTE1
 537          KM   COMBINE CSTN2, Y-Z AND STE1
 538          HC       3
              *

 539          KK  RCSTE1
 540          KM   ROUTE CSTE1 TO CSTJ3
 541          RD     980   0.005   0.015       0    DEEP       5       0
              *

 542          KK   COS-3
 543          BA  0.0027
 544          PB    3.42
 545          LS       0    83.2
 546          UD   0.105
              *

 547          KK    STJ3
 548          BA  0.0050
 549          PB    3.42
 550          LS       0    98.0
```

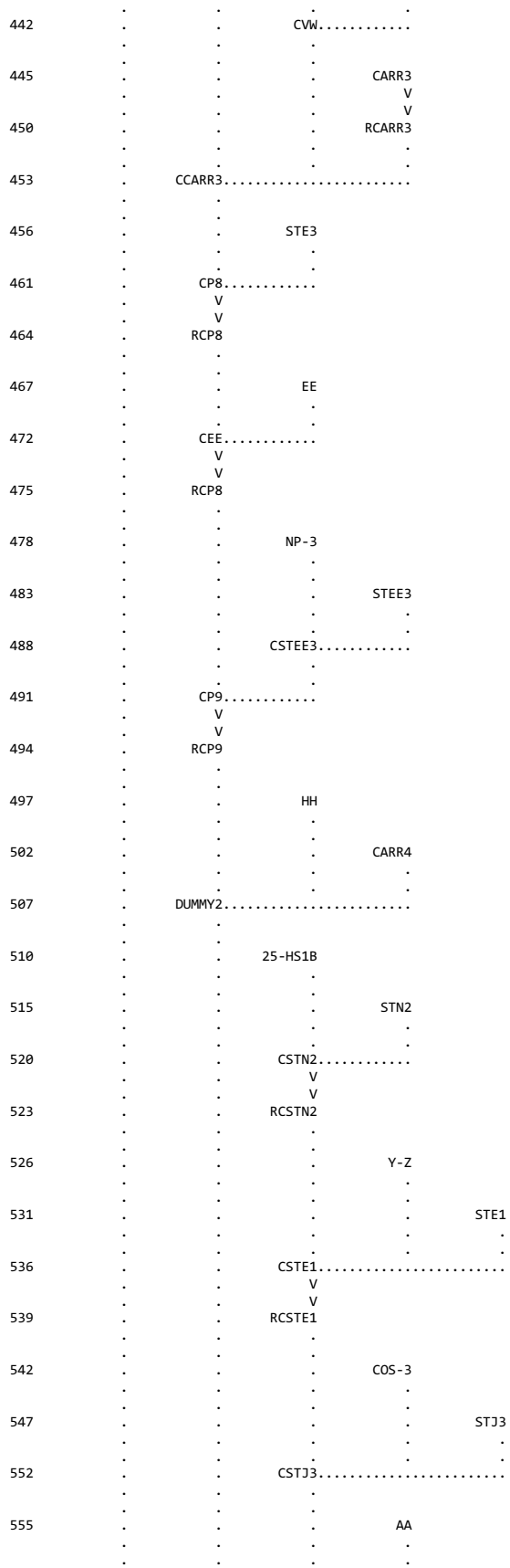
```
 551          UD   0.059
              *

 552          KK   CSTJ3
 553          KM   COMBINE CSTE1, COS-3 AND STJ3
 554          HC       3
              *

 555          KK      AA
 556          BA  0.0158
 557          PB    3.44
 558          LS       0    88.4
 559          UD   0.088
              *

 560          KK  DUMMY3
 561          KM   COMBINE CSTJ3 AND AA
 562          HC       2
              *

 563          KK    STE2
 564          BA  0.0028
 565          PB    3.40
 566          LS       0    98.0
 567          UD   0.050
              *
1                                        HEC-1 INPUT                                        PAGE 17

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

 568          KK      BB
 569          BA  0.0098
 570          PB    3.42
 571          LS       0    91.1
 572          UD   0.074
              *

 573          KK     CBB
 574          HC       2
              *

 575          KK       T
 576          BA  0.0063
 577          PB    3.42
 578          LS       0    86.3
 579          UD   0.069
              *

 580          KK      CT
 581          HC       2
              *

 582          KK      CC
 583          BA  0.0083
 584          PB    3.42
 585          LS       0    90.7
 586          UD   0.079
              *

 587          KK     CCC
 588          HC       2
              *

 589          KK    RCCC
 590          KM   ROUTE CCC TO CDD
 591          RD     570   0.005   0.015       0    CIRC       3
              *

 592          KK      DD
 593          BA  0.0074
 594          PB    3.40
 595          LS       0    90.5
 596          UD   0.075
              *

 597          KK     CDD
 598          HC       2
              *
1                                        HEC-1 INPUT                                        PAGE 18

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

 599          KK    RCDD
 600          KM   ROUTE CCDD TO CDES5
 601          RD     390   0.005   0.015       0    CIRC     3.5
              *

 602          KK    DES5
 603          BA  0.0025
```

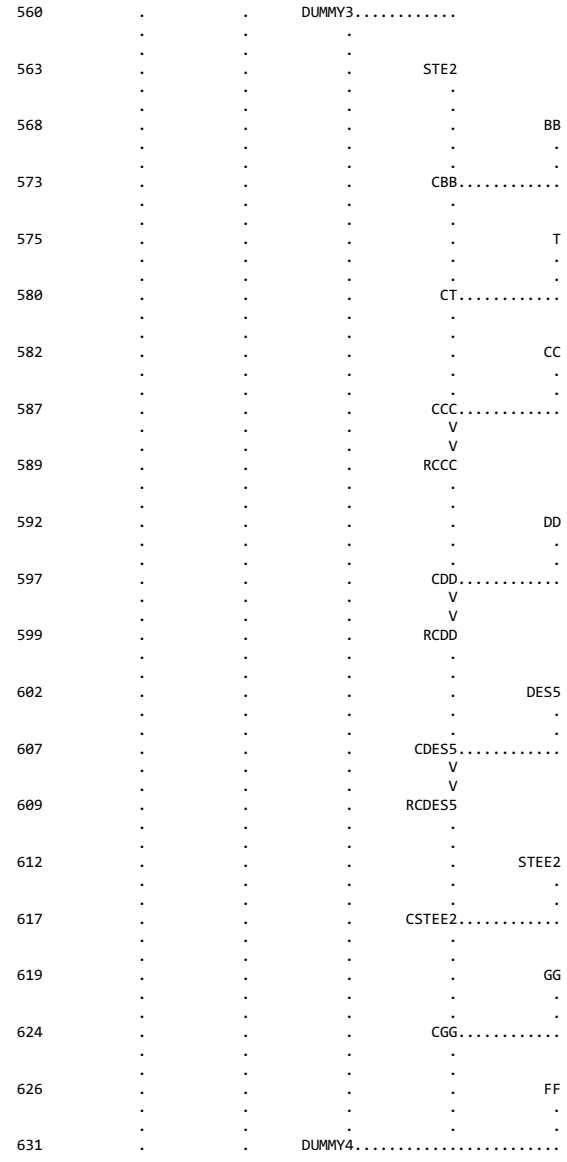
```
          604          PB    3.40
          605          LS       0    98.0
          606          UD   0.053
                       *

          607          KK   CDES5
          608          HC       2
                       *

          609          KK  RCDES5
          610          KM   ROUTE CDES5 TO CGG
          611          RD     280   0.005   0.015       0    CIRC     3.5
                       *

          612          KK   STEE2
          613          BA  0.0028
          614          PB    3.41
          615          LS       0    98.0
          616          UD   0.050
                       *

          617          KK  CSTEE2
          618          HC       2
                       *

          619          KK      GG
          620          BA  0.0078
          621          PB    3.41
          622          LS       0    94.2
          623          UD   0.055
                       *

          624          KK     CGG
          625          HC       2
                       *

          626          KK      FF
          627          BA  0.0055
          628          PB    3.41
          629          LS       0    94.2
          630          UD   0.050
                       *
1                                                  HEC-1 INPUT                                                  PAGE 19

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


          631          KK  DUMMY4
          632          KM   COMBINE DUMMY3, FF, AND CGG
          633          HC       3
                       *
          634          ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    22          LM
                .
                .
    35          .           D
                .           .
                .           .
    40          .           .        DES1
                .           .           .
                .           .           .
    45          .       CDES1............
                .           V
                .           V
    48          .      RCDES1
                .           .
                .           .
    51          .           .       COS-2
                .           .           .
                .           .           .
    56          .      CCOS-2............
                .           V
                .           V
    59          .     RCCOS-2
                .           .
                .           .
    62          .           .           A
                .           .           .
                .           .           .
    67          .          CA............
                .           V
                .           V
    70          .         RCA
                .           .
```


73 CP1
76 STI
82 C
87 CSTI
90 G
95 CG
98 RCG
101 H
106 CH
109 RCH
112 STH
118 J
123 CJ
126 RCJ
129 K
134 DES2
139 CDES2
142 RCDES2
145 CP2
148 RCP2
151 CARR1
156 I
161 N-O-P
166 NP-1
171 STG2
177 CSTG2
180 DES3
185 CP3
188 RCP3
191 STG3


196
CSTG3
199
Q
204
R
209
CQR
212
CARR2
217
CCARR2
220
RCCARR2
223
CP4
226
RCP4
229
CP5
232
II
237
X
242
B
247
DC-1
252
COS-4
257
DUMMY1A
261
COS-1
266
DUMMY1
270
27-F
275
27-COS2
280
LM2
285
CLM2
288
27-COS3
293
COFF
297
RCOFF
300
E
305
STJ1
311
CSTJ1
314
RCSTJ1
317
NP-2
322
CNP-2


V
V
325 RCNP-2
328 F
333 CF
V
V
336 RCF
339 25-HS1
344 STN1
350 CSTN1
V
V
353 RCSTN1
356 STG1
361 CSTG1
364 CP6
V
V
367 RCP6
370 L-M
375 STJ2
380 CSTJ2
V
V
383 RCSTJ2
386 STF
391 CSTF
394 U
399 DES4
404 CDES4
407 S
412 CS
415 CP7
V
V
418 RCP7
421 STF2
426 CSTF2
V
V
429 RCSTF2
432 V
437 W


CVW
CARR3
RCARR3
CCARR3
STE3
CP8
RCP8
EE
CEE
RCP8
NP-3
STEE3
CSTEE3
CP9
RCP9
HH
CARR4
DUMMY2
25-HS1B
STN2
CSTN2
RCSTN2
Y-Z
STE1
CSTE1
RCSTE1
COS-3
STJ3
CSTJ3
AA



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*************************************
 *                                   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998           *
 *           VERSION 4.1             *
 *                                   *
 *  RUN DATE   23OCT19  TIME  13:10:22   *
 *                                   *
 *************************************
```

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

ULTIMATE CONDITION HYDROLOGIC MODEL
INPUT FILE DATE = OCTOBER 2019
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY VTN (JYA)

```
*******************************************************
* UPDATE #2 - SUMMERLIN WEST VILLAGE 22                *
*******************************************************
```

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

```
                         100-YEAR,  6-HOUR STORM,  SDN3


   19 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         100  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      1    0  ENDING DATE
                       NDTIME        0815  ENDING TIME
                       ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .08 HOURS
                         TOTAL TIME BASE    8.25 HOURS

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

      JP          MULTI-PLAN OPTION
                        NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                     1.00
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
                                                        1.00

 HYDROGRAPH AT
+                    LM       .02     1   FLOW          36.
                                          TIME         3.50

 HYDROGRAPH AT
+                     D       .02     1   FLOW          50.
                                          TIME         3.50

 HYDROGRAPH AT
+                  DES1       .01     1   FLOW          20.
                                          TIME         3.50

  2 COMBINED AT
+                 CDES1       .03     1   FLOW          70.
                                          TIME         3.50

 ROUTED TO
+                RCDES1       .03     1   FLOW          69.
                                          TIME         3.50

 HYDROGRAPH AT
+                 COS-2       .01     1   FLOW          22.
                                          TIME         3.58

  2 COMBINED AT
+                CCOS-2       .04     1   FLOW          89.
                                          TIME         3.50

 ROUTED TO
+               RCCOS-2       .04     1   FLOW          87.
                                          TIME         3.50

 HYDROGRAPH AT
+                     A       .03     1   FLOW          68.
                                          TIME         3.50

  2 COMBINED AT
+                    CA       .06     1   FLOW         156.
                                          TIME         3.50

 ROUTED TO
+                   RCA       .06     1   FLOW         155.
                                          TIME         3.50
```

```
  2 COMBINED AT
+                    CP1       .08     1   FLOW         191.
                                           TIME        3.50

 HYDROGRAPH AT
+                    STI       .00     1   FLOW          11.
                                           TIME        3.50

 HYDROGRAPH AT
+                      C       .02     1   FLOW          51.
                                           TIME        3.50

  2 COMBINED AT
+                   CSTI       .02     1   FLOW          62.
                                           TIME        3.50

 HYDROGRAPH AT
+                      G       .01     1   FLOW          30.
                                           TIME        3.50

  2 COMBINED AT
+                     CG       .03     1   FLOW          92.
                                           TIME        3.50

 ROUTED TO
+                    RCG       .03     1   FLOW          91.
                                           TIME        3.50

 HYDROGRAPH AT
+                      H       .01     1   FLOW          33.
                                           TIME        3.50

  2 COMBINED AT
+                     CH       .05     1   FLOW         124.
                                           TIME        3.50

 ROUTED TO
+                    RCH       .05     1   FLOW         123.
                                           TIME        3.50

 HYDROGRAPH AT
+                    STH       .00     1   FLOW          10.
                                           TIME        3.50

 HYDROGRAPH AT
+                      J       .01     1   FLOW          24.
                                           TIME        3.50

  2 COMBINED AT
+                     CJ       .01     1   FLOW          34.
                                           TIME        3.50

 ROUTED TO
+                    RCJ       .01     1   FLOW          33.
                                           TIME        3.50

 HYDROGRAPH AT
+                      K       .01     1   FLOW          22.
                                           TIME        3.50

 HYDROGRAPH AT
+                   DES2       .00     1   FLOW          13.
                                           TIME        3.50

  3 COMBINED AT
+                  CDES2       .03     1   FLOW          68.
                                           TIME        3.50

 ROUTED TO
+                 RCDES2       .03     1   FLOW          66.
                                           TIME        3.50

  2 COMBINED AT
+                    CP2       .07     1   FLOW         189.
                                           TIME        3.50

 ROUTED TO
+                   RCP2       .07     1   FLOW         184.
                                           TIME        3.50

 HYDROGRAPH AT
+                  CARR1       .01     1   FLOW          29.
                                           TIME        3.50

 HYDROGRAPH AT
+                      I       .02     1   FLOW          38.
                                           TIME        3.50

 HYDROGRAPH AT
+                  N-O-P       .02     1   FLOW          49.
                                           TIME        3.50
```

```
 HYDROGRAPH AT
+                   NP-1       .00     1   FLOW          6.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STG2       .00     1   FLOW         13.
                                           TIME         3.50

  3 COMBINED AT
+                  CSTG2       .03     1   FLOW         68.
                                           TIME         3.50

 HYDROGRAPH AT
+                   DES3       .00     1   FLOW          9.
                                           TIME         3.50

  2 COMBINED AT
+                    CP3       .03     1   FLOW         77.
                                           TIME         3.50

 ROUTED TO
+                   RCP3       .03     1   FLOW         76.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STG3       .00     1   FLOW          3.
                                           TIME         3.50

  2 COMBINED AT
+                  CSTG3       .03     1   FLOW         79.
                                           TIME         3.50

 HYDROGRAPH AT
+                      Q       .01     1   FLOW         17.
                                           TIME         3.50

 HYDROGRAPH AT
+                      R       .01     1   FLOW         20.
                                           TIME         3.50

  2 COMBINED AT
+                    CQR       .01     1   FLOW         37.
                                           TIME         3.50

 HYDROGRAPH AT
+                  CARR2       .01     1   FLOW         15.
                                           TIME         3.50

  2 COMBINED AT
+                 CCARR2       .02     1   FLOW         52.
                                           TIME         3.50

 ROUTED TO
+                RCCARR2       .02     1   FLOW         51.
                                           TIME         3.50

  2 COMBINED AT
+                    CP4       .05     1   FLOW        131.
                                           TIME         3.50

 ROUTED TO
+                   RCP4       .05     1   FLOW        127.
                                           TIME         3.50

  4 COMBINED AT
+                    CP5       .15     1   FLOW        379.
                                           TIME         3.50

 HYDROGRAPH AT
+                     II       .03     1   FLOW         61.
                                           TIME         3.50

 HYDROGRAPH AT
+                      X       .03     1   FLOW         60.
                                           TIME         3.50

 HYDROGRAPH AT
+                      B       .13     1   FLOW        304.
                                           TIME         3.50

 HYDROGRAPH AT
+                   DC-1       .02     1   FLOW         36.
                                           TIME         3.67

 HYDROGRAPH AT
+                  COS-4       .00     1   FLOW          2.
                                           TIME         3.50

  5 COMBINED AT
+                DUMMY1A       .20     1   FLOW        454.
```

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                                        TIME         3.50

 HYDROGRAPH AT
+                  COS-1       .00     1   FLOW          6.
                                        TIME         3.58

  4 COMBINED AT
+                 DUMMY1       .44     1   FLOW       1030.
                                        TIME         3.50

 HYDROGRAPH AT
+                    27-F       .03     1   FLOW         83.
                                        TIME         3.50

 HYDROGRAPH AT
+                 27-COS2       .01     1   FLOW         20.
                                        TIME         3.50

 HYDROGRAPH AT
+                     LM2       .01     1   FLOW         28.
                                        TIME         3.50

  3 COMBINED AT
+                    CLM2       .05     1   FLOW        132.
                                        TIME         3.50

 HYDROGRAPH AT
+                 27-COS3       .03     1   FLOW         53.
                                        TIME         3.50

  2 COMBINED AT
+                    COFF       .08     1   FLOW        185.
                                        TIME         3.50

 ROUTED TO
+                   RCOFF       .08     1   FLOW        182.
                                        TIME         3.50

 HYDROGRAPH AT
+                       E       .02     1   FLOW         58.
                                        TIME         3.50

 HYDROGRAPH AT
+                    STJ1       .01     1   FLOW         15.
                                        TIME         3.50

  3 COMBINED AT
+                   CSTJ1       .10     1   FLOW        255.
                                        TIME         3.50

 ROUTED TO
+                  RCSTJ1       .10     1   FLOW        250.
                                        TIME         3.50

 HYDROGRAPH AT
+                    NP-2       .00     1   FLOW          5.
                                        TIME         3.50

  2 COMBINED AT
+                   CNP-2       .11     1   FLOW        255.
                                        TIME         3.50

 ROUTED TO
+                  RCNP-2       .11     1   FLOW        250.
                                        TIME         3.50

 HYDROGRAPH AT
+                       F       .02     1   FLOW         59.
                                        TIME         3.50

  2 COMBINED AT
+                      CF       .13     1   FLOW        309.
                                        TIME         3.50

 ROUTED TO
+                     RCF       .13     1   FLOW        303.
                                        TIME         3.50

 HYDROGRAPH AT
+                  25-HS1       .08     1   FLOW        211.
                                        TIME         3.50

 HYDROGRAPH AT
+                    STN1       .01     1   FLOW         13.
                                        TIME         3.58

  2 COMBINED AT
+                   CSTN1       .08     1   FLOW        224.
                                        TIME         3.50

 ROUTED TO
```

```
+                RCSTN1       .08     1   FLOW         220.
                                             TIME         3.50

 HYDROGRAPH AT
+                  STG1       .00     1   FLOW           8.
                                             TIME         3.50

  2 COMBINED AT
+                 CSTG1       .09     1   FLOW         229.
                                             TIME         3.50

  2 COMBINED AT
+                   CP6       .21     1   FLOW         532.
                                             TIME         3.50

 ROUTED TO
+                  RCP6       .21     1   FLOW         518.
                                             TIME         3.50

 HYDROGRAPH AT
+                   L-M       .03     1   FLOW          81.
                                             TIME         3.50

 HYDROGRAPH AT
+                  STJ2       .00     1   FLOW          13.
                                             TIME         3.50

  3 COMBINED AT
+                 CSTJ2       .25     1   FLOW         612.
                                             TIME         3.50

 ROUTED TO
+                RCSTJ2       .25     1   FLOW         602.
                                             TIME         3.50

 HYDROGRAPH AT
+                   STF       .00     1   FLOW           8.
                                             TIME         3.50

  2 COMBINED AT
+                  CSTF       .25     1   FLOW         610.
                                             TIME         3.50

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

 HYDROGRAPH AT
+                  DES4       .00     1   FLOW           8.
                                             TIME         3.50

  2 COMBINED AT
+                 CDES4       .01     1   FLOW          19.
                                             TIME         3.50

 HYDROGRAPH AT
+                     S       .00     1   FLOW          10.
                                             TIME         3.50

  2 COMBINED AT
+                    CS       .01     1   FLOW          29.
                                             TIME         3.50

  2 COMBINED AT
+                   CP7       .27     1   FLOW         639.
                                             TIME         3.50

 ROUTED TO
+                  RCP7       .27     1   FLOW         632.
                                             TIME         3.50

 HYDROGRAPH AT
+                  STF2       .00     1   FLOW           5.
                                             TIME         3.50

  2 COMBINED AT
+                 CSTF2       .27     1   FLOW         637.
                                             TIME         3.50

 ROUTED TO
+                RCSTF2       .27     1   FLOW         623.
                                             TIME         3.50

 HYDROGRAPH AT
+                     V       .01     1   FLOW          17.
                                             TIME         3.50

 HYDROGRAPH AT
+                     W       .01     1   FLOW          19.
                                             TIME         3.50
```

```
  2 COMBINED AT
+                    CVW       .02     1   FLOW          36.
                                           TIME        3.50

 HYDROGRAPH AT
+                   CARR3       .00     1   FLOW           8.
                                           TIME        3.50

 ROUTED TO
+                  RCARR3       .00     1   FLOW           8.
                                           TIME        3.50

  3 COMBINED AT
+                  CCARR3       .29     1   FLOW         667.
                                           TIME        3.50

 HYDROGRAPH AT
+                    STE3       .00     1   FLOW           6.
                                           TIME        3.50

  2 COMBINED AT
+                     CP8       .29     1   FLOW         673.
                                           TIME        3.50

 ROUTED TO
+                    RCP8       .29     1   FLOW         664.
                                           TIME        3.50

 HYDROGRAPH AT
+                      EE       .01     1   FLOW          25.
                                           TIME        3.50

  2 COMBINED AT
+                     CEE       .30     1   FLOW         689.
                                           TIME        3.50

 ROUTED TO
+                    RCP8       .30     1   FLOW         680.
                                           TIME        3.50

 HYDROGRAPH AT
+                    NP-3       .00     1   FLOW           2.
                                           TIME        3.50

 HYDROGRAPH AT
+                   STEE3       .00     1   FLOW           5.
                                           TIME        3.50

  2 COMBINED AT
+                  CSTEE3       .00     1   FLOW           7.
                                           TIME        3.50

  2 COMBINED AT
+                     CP9       .30     1   FLOW         688.
                                           TIME        3.50

 ROUTED TO
+                    RCP9       .30     1   FLOW         678.
                                           TIME        3.50

 HYDROGRAPH AT
+                      HH       .01     1   FLOW          20.
                                           TIME        3.50

 HYDROGRAPH AT
+                   CARR4       .00     1   FLOW          10.
                                           TIME        3.50

  3 COMBINED AT
+                  DUMMY2       .32     1   FLOW         708.
                                           TIME        3.50

 HYDROGRAPH AT
+                25-HS1B       .02     1   FLOW          48.
                                           TIME        3.50

 HYDROGRAPH AT
+                    STN2       .01     1   FLOW          19.
                                           TIME        3.50

  2 COMBINED AT
+                   CSTN2       .03     1   FLOW          67.
                                           TIME        3.50

 ROUTED TO
+                  RCSTN2       .03     1   FLOW          65.
                                           TIME        3.50

 HYDROGRAPH AT
+                     Y-Z       .02     1   FLOW          42.
                                           TIME        3.50
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```
 HYDROGRAPH AT
+                   STE1       .00     1   FLOW          8.
                                           TIME         3.50

  3 COMBINED AT
+                  CSTE1       .05     1   FLOW        115.
                                           TIME         3.50

 ROUTED TO
+                 RCSTE1       .05     1   FLOW        107.
                                           TIME         3.50

 HYDROGRAPH AT
+                   COS-3      .00     1   FLOW          4.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STJ3       .00     1   FLOW         14.
                                           TIME         3.50

  3 COMBINED AT
+                  CSTJ3       .05     1   FLOW        126.
                                           TIME         3.50

 HYDROGRAPH AT
+                     AA       .02     1   FLOW         33.
                                           TIME         3.50

  2 COMBINED AT
+                 DUMMY3       .07     1   FLOW        159.
                                           TIME         3.50

 HYDROGRAPH AT
+                   STE2       .00     1   FLOW          8.
                                           TIME         3.50

 HYDROGRAPH AT
+                     BB       .01     1   FLOW         23.
                                           TIME         3.50

  2 COMBINED AT
+                    CBB       .01     1   FLOW         31.
                                           TIME         3.50

 HYDROGRAPH AT
+                      T       .01     1   FLOW         13.
                                           TIME         3.50

  2 COMBINED AT
+                     CT       .02     1   FLOW         44.
                                           TIME         3.50

 HYDROGRAPH AT
+                     CC       .01     1   FLOW         19.
                                           TIME         3.50

  2 COMBINED AT
+                    CCC       .03     1   FLOW         63.
                                           TIME         3.50

 ROUTED TO
+                   RCCC       .03     1   FLOW         60.
                                           TIME         3.50

 HYDROGRAPH AT
+                     DD       .01     1   FLOW         17.
                                           TIME         3.50

  2 COMBINED AT
+                    CDD       .03     1   FLOW         77.
                                           TIME         3.50

 ROUTED TO
+                   RCDD       .03     1   FLOW         74.
                                           TIME         3.50

 HYDROGRAPH AT
+                   DES5       .00     1   FLOW          7.
                                           TIME         3.50

  2 COMBINED AT
+                  CDES5       .04     1   FLOW         81.
                                           TIME         3.50

 ROUTED TO
+                 RCDES5       .04     1   FLOW         80.
                                           TIME         3.50

 HYDROGRAPH AT
+                  STEE2       .00     1   FLOW          8.
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```
                                        TIME         3.50

  2 COMBINED AT
+                 CSTEE2       .04     1   FLOW          88.
                                        TIME         3.50

 HYDROGRAPH AT
+                    GG        .01     1   FLOW          21.
                                        TIME         3.50

  2 COMBINED AT
+                    CGG       .05     1   FLOW         109.
                                        TIME         3.50

 HYDROGRAPH AT
+                     FF       .01     1   FLOW          15.
                                        TIME         3.50

  3 COMBINED AT
+                 DUMMY4       .12     1   FLOW         282.
                                        TIME         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
            RCDES1  MANE          .22     69.31    210.22      2.92      5.00     69.07    210.00        2.92


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4002E+01 EXCESS= .0000E+00 OUTFLOW= .4002E+01 BASIN STORAGE= .1969E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCCOS-2  MANE          .47     87.71    210.20      2.72      5.00     87.19    210.00        2.72


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5425E+01 EXCESS= .0000E+00 OUTFLOW= .5424E+01 BASIN STORAGE= .4464E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCA  MANE          .19    155.37    210.19      2.77      5.00    154.65    210.00        2.78


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .9561E+01 EXCESS= .0000E+00 OUTFLOW= .9561E+01 BASIN STORAGE= .1942E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCG  MANE          .29     91.58    210.20      2.89      5.00     91.06    210.00        2.89


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5175E+01 EXCESS= .0000E+00 OUTFLOW= .5175E+01 BASIN STORAGE= .2873E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCH  MANE          .12    123.23    210.04      2.88      5.00    123.08    210.00        2.88


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .6989E+01 EXCESS= .0000E+00 OUTFLOW= .6989E+01 BASIN STORAGE= .1204E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
               RCJ  MANE          .43     33.61    210.51      2.73      5.00     33.37    210.00        2.73


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1875E+01 EXCESS= .0000E+00 OUTFLOW= .1875E+01 BASIN STORAGE= .3567E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
            RCDES2  MANE          .73     67.25    210.43      2.84      5.00     66.40    210.00        2.85


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3910E+01 EXCESS= .0000E+00 OUTFLOW= .3910E+01 BASIN STORAGE= .7532E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP2  MANE          .73    186.67    210.84      2.87      5.00    184.26    210.00        2.87


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1091E+02 EXCESS= .0000E+00 OUTFLOW= .1091E+02 BASIN STORAGE= .8878E-04 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
              RCP3  MANE          .29     76.78    210.29      2.55      5.00     76.14    210.00        2.55
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4490E+01 EXCESS= .0000E+00 OUTFLOW= .4490E+01 BASIN STORAGE= .2690E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCCARR2	MANE	.37	51.68	210.13	2.74	5.00	51.44	210.00	2.74	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3006E+01 EXCESS= .0000E+00 OUTFLOW= .3006E+01 BASIN STORAGE= .3196E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP4	MANE	.66	129.07	210.69	2.64	5.00	127.48	210.00	2.64	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7688E+01 EXCESS= .0000E+00 OUTFLOW= .7688E+01 BASIN STORAGE= .6725E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCOFF	MANE	.38	183.88	210.27	2.65	5.00	182.24	210.00	2.65	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1084E+02 EXCESS= .0000E+00 OUTFLOW= .1084E+02 BASIN STORAGE= .4273E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCSTJ1	MANE	.48	250.37	210.43	2.73	5.00	250.31	210.00	2.73	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1511E+02 EXCESS= .0000E+00 OUTFLOW= .1511E+02 BASIN STORAGE= .5607E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCNP-2	MANE	.52	250.86	210.48	2.72	5.00	250.12	210.00	2.72	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1538E+02 EXCESS= .0000E+00 OUTFLOW= .1538E+02 BASIN STORAGE= .1047E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCF	MANE	.41	304.65	210.23	2.75	5.00	303.48	210.00	2.75	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1879E+02 EXCESS= .0000E+00 OUTFLOW= .1878E+02 BASIN STORAGE= .8389E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCSTN1	MANE	.41	221.54	210.18	2.88	5.00	220.20	210.00	2.89	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1275E+02 EXCESS= .0000E+00 OUTFLOW= .1275E+02 BASIN STORAGE= .5014E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP6	MANE	.59	520.09	210.36	2.81	5.00	517.62	210.00	2.81	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3204E+02 EXCESS= .0000E+00 OUTFLOW= .3203E+02 BASIN STORAGE= .1553E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCSTJ2	MANE	.45	608.79	210.39	2.81	5.00	602.17	210.00	2.82	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3779E+02 EXCESS= .0000E+00 OUTFLOW= .3779E+02 BASIN STORAGE= .1206E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP7	MANE	.32	635.65	210.19	2.80	5.00	631.67	210.00	2.80	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3994E+02 EXCESS= .0000E+00 OUTFLOW= .3994E+02 BASIN STORAGE= .8070E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCSTF2	MANE	.50	626.08	210.22	2.80	5.00	622.83	210.00	2.80	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4028E+02 EXCESS= .0000E+00 OUTFLOW= .4027E+02 BASIN STORAGE= .1270E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCARR3	MANE	1.27	7.90	211.47	3.14	5.00	7.63	210.00	3.14	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5521E+00 EXCESS= .0000E+00 OUTFLOW= .5521E+00 BASIN STORAGE= .1050E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP8	MANE	.28	665.68	210.11	2.78	5.00	664.00	210.00	2.78	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4321E+02 EXCESS= .0000E+00 OUTFLOW= .4320E+02 BASIN STORAGE= .7574E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP8	MANE	.26	681.97	210.12	2.77	5.00	680.39	210.00	2.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4455E+02 EXCESS= .0000E+00 OUTFLOW= .4454E+02 BASIN STORAGE= .6454E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCP9	MANE	.33	679.63	210.08	2.77	5.00	677.90	210.00	2.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4497E+02 EXCESS= .0000E+00 OUTFLOW= .4496E+02 BASIN STORAGE= .8376E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCSTN2	MANE	.70	65.57	210.88	2.76	5.00	65.03	210.00	2.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3685E+01 EXCESS= .0000E+00 OUTFLOW= .3685E+01 BASIN STORAGE= .6612E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCSTE1	MANE	1.78	110.49	211.63	2.72	5.00	107.44	210.00	2.72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6575E+01 EXCESS= .0000E+00 OUTFLOW= .6571E+01 BASIN STORAGE= .3348E-03 PERCENT ERROR= .1

FOR PLAN = 1 RATIO= .00

RCCC	MANE	1.13	61.16	210.84	2.44	5.00	59.99	210.00	2.44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3534E+01 EXCESS= .0000E+00 OUTFLOW= .3533E+01 BASIN STORAGE= .1137E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCDD	MANE	.73	75.16	210.34	2.43	5.00	74.39	210.00	2.43

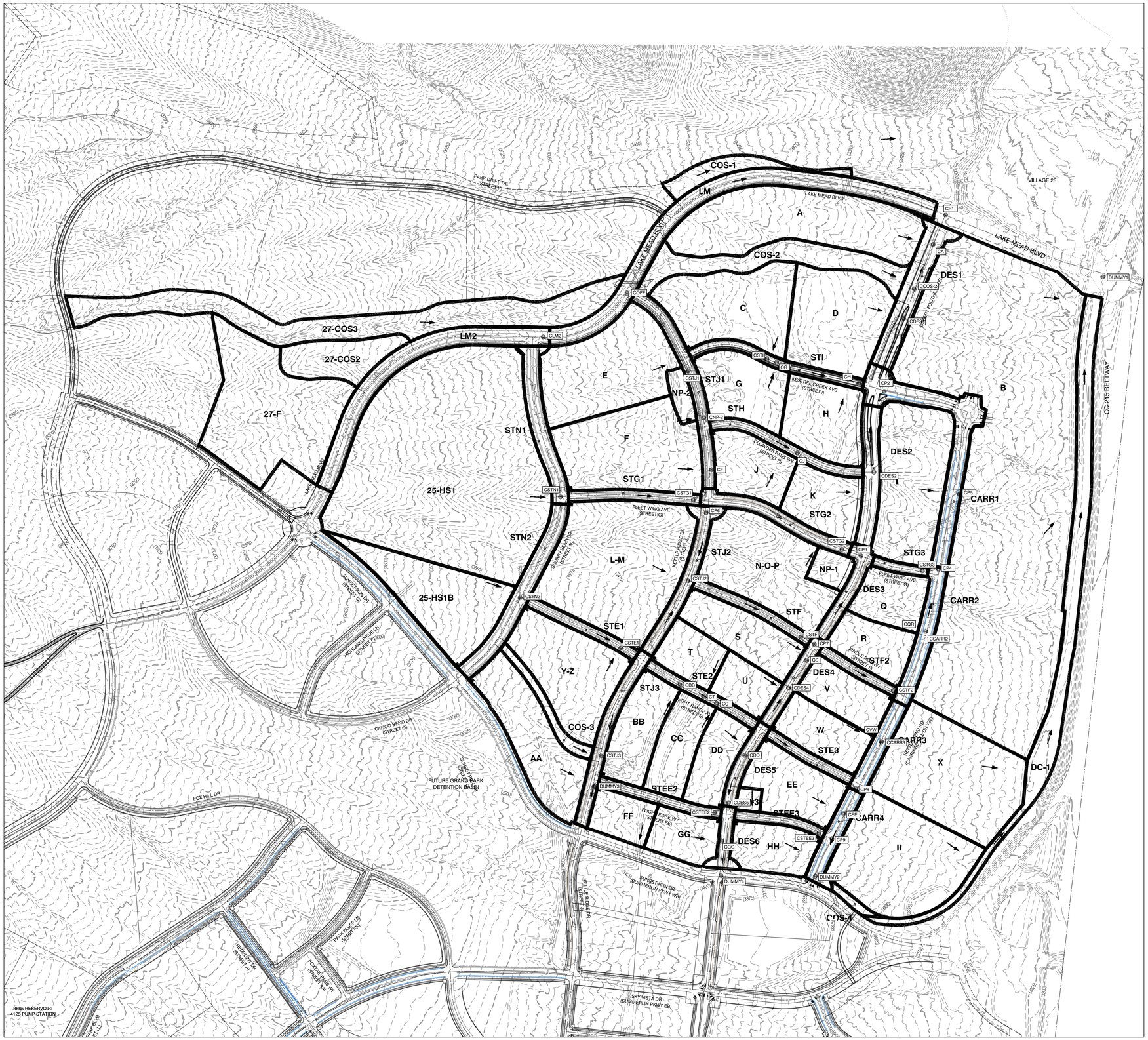
CONTINUITY SUMMARY (AC-FT) - INFLOW= .4482E+01 EXCESS= .0000E+00 OUTFLOW= .4481E+01 BASIN STORAGE= .7532E-04 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

RCDES5	MANE	.52	80.22	210.45	2.48	5.00	79.73	210.00	2.48

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4905E+01 EXCESS= .0000E+00 OUTFLOW= .4903E+01 BASIN STORAGE= .5246E-04 PERCENT ERROR= .0

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



GRAPHIC SCALE

350 0 175 350 700

1" = 350'

LEGEND

- BASIN BOUNDARY
- A — BASIN DESIGNATION
- CONCENTRATION POINT
- FLOW ARROW

ULTIMATE CONDITION HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)	BASIN ID	AREA (ac)	Q100 (CFS)
LM	10.04	36	STN1	3.61	13
D	11.96	50	CSTN1	-	244
DES1	4.46	20	STG1	1.85	8
CDES1	-	70	CSTG1	-	229
COS-2	7.51	22	CP6	-	532
CCOS-2	-	89	L-M	21.14	81
A	17.39	68	STJ2	3.10	13
CA	-	156	CSTJ2	-	612
CP1	-	191	STF	1.84	8
STI	2.42	11	CSTF	-	610
C	12.05	51	U	3.49	11
CSTI	-	62	DES4	1.77	8
G	7.05	30	CDES4	-	19
CG	-	92	S	3.01	10
H	7.64	33	CS	-	29
CH	-	124	CP7	-	639
STH	2.29	10	STF2	1.21	5
J	5.93	24	CSTF2	-	637
CJ	-	34	V	5.01	17
K	5.28	22	W	5.28	19
DES2	3.09	13	CVW	-	36
CDES2	-	68	CARR3	2.14	8
CP2	-	189	CCARR3	-	667
CARR1	6.95	29	STE3	1.36	6
I	13.44	38	CP8	-	673
N-O-P	14.52	49	EE	6.80	25
NP-1	1.73	6	CEE	-	689
STG2	2.86	13	NP3	0.70	2
CSTG2	-	68	STEE3	1.23	5
DES3	2.00	9	CSTEE3	-	7
CP3	-	77	CP9	-	205
STG3	0.72	3	HH	4.85	20
CSTG3	-	79	CARR4		10
Q	4.58	17	25-HS1B		48
R	4.97	20	STN2		19
CQR	-	37	CSTN2	-	67
CARR2	3.58	15	Y-Z	11.28	42
CCARR2	-	52	STE1	1.75	8
CP4	-	131	CSTE1	-	115
CP5	-	379	COS-3	1.70	4
II	16.03	61	STJ3	3.22	14
X	17.45	60	CSTJ3	-	126
B	80.77	304	AA	10.13	33
DC-1	12.59	36	STE2		8
COS-4	0.57	2	BB	6.29	23
COS-1	2.87	6	CBB	-	31
V27-F	19.13	83	T	4.02	13
V27-COS2	5.25	20	CT	-	44
LM2	7.23	28	CC	5.34	19
CLM2	-	132	CCC	-	63
27-COS3	17.46	53	DD	4.76	17
COFF	-	185	CDD	-	77
E	13.91	58	DES5	1.57	7
STJ1	3.52	15	CDES5	-	81
CSTJ1	-	255	STEE2	1.79	8
NP-2	1.34	5	CSTEE2	-	88
CNP-2	-	255	GG	4.98	21
F	14.22	59	CGG	-	109
CF	-	309	FF	3.49	15
25-HS1	49.49	211			

REV	DATE	BY	REVISION

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

VTN NEVADA
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

FIGURE 6
ULTIMATE CONDITION BASIN MAP

SUMMERLIN WEST VILLAGE 22

DRAWN BY: JYA
DESIGNED BY:
CHECKED BY:
OCT 2019
SCALE: 1" = 350' HORIZ. N/A VERT.
PROJECT NO: 7881

SHEET
OF SHEETS
DRAWING NO.

H:\7881\Village 22 Master\Drainage\8_LIP2\A_Figures\Figure 6 - Village 22 Drainage Basin Map.dwg

TECHNICAL DRAINAGE STUDY FOR SUMMERLIN WEST VILLAGE 22 BELTWAY SEWER

```
T1 TDS FOR VILLAGE 22 BELTWAY SEWER
T2 EXISTING BELTWAY CHANNEL TO PROPOSED 6'X6' RCB SD
T3 FILE NAME: W22-BS.WSW
SO -45735.91 3216.110  1      .015
R  -45735.91 3216.110  1      .015                                    .000    .000 0
TS -45685.91 3216.360  3      .015                                    .000    .000 0
R  -45297.91 3218.300  3      .015                                    .000    .000 0
JX -45297.91 3218.300  3 60   .015  152.000         3218.800               45.0    .000
R  -45285.91 3218.360  3      .015                                    .000    .000 0
TS -45235.91 3219.110  2      .015
R  -44663.83 3221.970  2      .015                                    .000    .000 0
TS -44653.83 3222.020  1      .015
R  -43960.00 3225.490  1      .015                                    .000    .000 0
R  -43950.00 3225.990  1      .015                                    .000    .000 0
R  -43767.02 3226.905  1      .015                                    .000  15.000 0
JX -43767.02 3226.905  1  1   .015  157.000         3226.905                .0    .000
R  -43725.15 3227.200  1      .015                                    .000    .000 0
WX -43725.15 3227.200  5
R  -43700.15 3227.325  5      .015                                    .000    .000 0
WX -43700.15 3227.325  4
R  -43672.99 3227.462  4      .015                                    .000  15.000 0
R  -43613.82 3230.993  4      .015                                    .000  15.000 0
JX -43563.27 3234.011  4 48   .015  152.000         3234.011              30.0    .000
SH -42895.95 3273.830  4
CD   1  1   0    .000   5.700   20.000 2.000 2.000   .00
CD   2  1   0    .000   8.700   20.000 2.000 2.000   .00
CD   3  3   1   1.667   9.000   21.667 0.000 0.000   .00
CD   4  3   0    .000   6.000    6.000  .000  .000   .00
CD   5  1   0    .000   5.700    6.000 2.000 2.000   .00
CD  48  4   0    .000   4.000    0.000  .000  .000   .00
CD  60  4   0    .000   5.000    0.000  .000  .000   .00
Q           379.000   .0
```

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date:12-11-2019 Time: 3: 0: 4

TDS FOR VILLAGE 22 BELTWAY SEWER
EXISTING BELTWAY CHANNEL TO PROPOSED 6'X6' RCB SD
FILE NAME: W22-BS.WSW

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
-45735.910	3216.110	2.391	3218.501	840.00	14.18	3.12	3221.62	.00	3.37	29.56	5.700	20.000	2.00	0 .0
TRANS STR	.0050					.0068	.34	2.39	1.76		.015	.00	2.00	TRAP
-45685.910	3216.360	3.646	3220.006	840.00	11.52	2.06	3222.07	.00	3.80	21.67	9.000	21.667	.00	1 1.7
351.656	.0050					.0050	1.76	3.65	1.11	3.65	.015	.00	.00	BOX
-45334.250	3218.118	3.646	3221.765	840.00	11.52	2.06	3223.82	.00	3.80	21.67	9.000	21.667	.00	1 1.7
36.344	.0050					.0047	.17	3.65	1.11	3.65	.015	.00	.00	BOX
-45297.910	3218.300	3.798	3222.098	840.00	11.06	1.90	3224.00	.00	3.80	21.67	9.000	21.667	.00	1 1.7
JUNCT STR	.0000					.0015	.00	3.80	1.04		.015	.00	.00	BOX
-45297.910	3218.300	4.874	3223.174	688.00	7.06	.77	3223.95	.00	3.32	21.67	9.000	21.667	.00	1 1.7
12.000	.0050					.0015	.02	4.87	.59	3.16	.015	.00	.00	BOX
-45285.910	3218.360	4.812	3223.172	688.00	7.15	.79	3223.97	.00	3.32	21.67	9.000	21.667	.00	1 1.7
TRANS STR	.0150					.0011	.05	4.81	.60		.015	.00	.00	BOX
-45235.910	3219.110	4.520	3223.630	688.00	5.24	.43	3224.06	.00	2.99	38.08	8.700	20.000	2.00	0 .0
27.207	.0050					.0006	.02	4.52	.50	2.48	.015	.00	2.00	TRAP
-45208.700	3219.246	4.358	3223.604	688.00	5.50	.47	3224.07	.00	2.99	37.43	8.700	20.000	2.00	0 .0
25.641	.0050					.0007	.02	4.36	.53	2.48	.015	.00	2.00	TRAP
-45183.060	3219.374	4.202	3223.576	688.00	5.77	.52	3224.09	.00	2.99	36.81	8.700	20.000	2.00	0 .0
24.008	.0050					.0008	.02	4.20	.56	2.48	.015	.00	2.00	TRAP

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date:12-11-2019 Time: 3: 0: 4

TDS FOR VILLAGE 22 BELTWAY SEWER
EXISTING BELTWAY CHANNEL TO PROPOSED 6'X6' RCB SD
FILE NAME: W22-BS.WSW

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
-45159.050	3219.494	4.049	3223.544	688.00	6.05	.57	3224.11	.00	2.99	36.20	8.700	20.000	2.00	0 .0
22.289	.0050					.0009	.02	4.05	.60	2.48	.015	.00	2.00	TRAP
-45136.770	3219.606	3.902	3223.508	688.00	6.34	.62	3224.13	.00	2.99	35.61	8.700	20.000	2.00	0 .0
20.457	.0050					.0011	.02	3.90	.64	2.48	.015	.00	2.00	TRAP
-45116.310	3219.708	3.759	3223.467	688.00	6.65	.69	3224.15	.00	2.99	35.04	8.700	20.000	2.00	0 .0
18.469	.0050					.0012	.02	3.76	.68	2.48	.015	.00	2.00	TRAP
-45097.840	3219.800	3.621	3223.421	688.00	6.98	.76	3224.18	.00	2.99	34.48	8.700	20.000	2.00	0 .0
8.105	.0050					.0013	.01	3.62	.73	2.48	.015	.00	2.00	TRAP
-45089.730	3219.841	3.556	3223.397	688.00	7.14	.79	3224.19	.00	2.99	34.22	8.700	20.000	2.00	0 .0
HYDRAULIC JUMP														
-45089.730	3219.841	2.484	3222.324	688.00	11.09	1.91	3224.24	.00	2.99	29.93	8.700	20.000	2.00	0 .0
196.492	.0050					.0050	.98	2.48	1.36	2.48	.015	.00	2.00	TRAP
-44893.240	3220.823	2.484	3223.307	688.00	11.09	1.91	3225.22	.00	2.99	29.93	8.700	20.000	2.00	0 .0
229.414	.0050					.0050	1.15	2.48	1.36	2.48	.015	.00	2.00	TRAP
-44663.830	3221.970	2.484	3224.454	688.00	11.09	1.91	3226.36	.00	2.99	29.94	8.700	20.000	2.00	0 .0

TRANS STR	.0050					.0050	.05	2.48	1.36		.015	.00	2.00	TRAP		
-44653.830	3222.020	2.483	3224.503	688.00	11.10	1.91	3226.42	.00	2.99	29.93	5.700	20.000	2.00	0	.0	
208.469	.0050					.0050	1.05	2.48	1.36	2.48	.015	.00	2.00	TRAP		

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date:12-11-2019 Time: 3: 0: 4

TDS FOR VILLAGE 22 BELTWAY SEWER
EXISTING BELTWAY CHANNEL TO PROPOSED 6'X6' RCB SD
FILE NAME: W22-BS.WSW

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
-44445.360	3223.062	2.478	3225.541	688.00	11.12	1.92	3227.46	.00	2.99	29.91	5.700	20.000	2.00	0	.0	
229.027	.0050					.0054	1.24	2.48	1.36	2.48	.015	.00	2.00	TRAP		
-44216.340	3224.208	2.381	3226.589	688.00	11.67	2.11	3228.70	.00	2.99	29.53	5.700	20.000	2.00	0	.0	
95.613	.0050					.0062	.60	2.38	1.45	2.48	.015	.00	2.00	TRAP		
-44120.720	3224.686	2.288	3226.974	688.00	12.24	2.33	3229.30	.00	2.99	29.15	5.700	20.000	2.00	0	.0	
65.395	.0050					.0072	.47	2.29	1.55	2.48	.015	.00	2.00	TRAP		
-44055.330	3225.013	2.197	3227.211	688.00	12.83	2.56	3229.77	.00	2.99	28.79	5.700	20.000	2.00	0	.0	
51.680	.0050					.0083	.43	2.20	1.66	2.48	.015	.00	2.00	TRAP		
-44003.650	3225.272	2.110	3227.382	688.00	13.46	2.81	3230.20	.00	2.99	28.44	5.700	20.000	2.00	0	.0	
43.648	.0050					.0095	.42	2.11	1.77	2.48	.015	.00	2.00	TRAP		
-43960.000	3225.490	2.026	3227.516	688.00	14.12	3.09	3230.61	.00	2.99	28.10	5.700	20.000	2.00	0	.0	
1.574	.0500					.0100	.02	2.03	1.89	1.28	.015	.00	2.00	TRAP		
-43958.420	3225.569	2.051	3227.620	688.00	13.92	3.01	3230.63	.00	2.99	28.20	5.700	20.000	2.00	0	.0	
4.609	.0500					.0091	.04	2.05	1.85	1.28	.015	.00	2.00	TRAP		
-43953.810	3225.799	2.136	3227.935	688.00	13.27	2.73	3230.67	.00	2.99	28.54	5.700	20.000	2.00	0	.0	
3.813	.0500					.0079	.03	2.14	1.74	1.28	.015	.00	2.00	TRAP		
-43950.000	3225.990	2.224	3228.214	688.00	12.65	2.49	3230.70	.00	2.99	28.90	5.700	20.000	2.00	0	.0	
13.164	.0050					.0075	.10	2.22	1.63	2.48	.015	.00	2.00	TRAP		

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date:12-11-2019 Time: 3: 0: 4

TDS FOR VILLAGE 22 BELTWAY SEWER
EXISTING BELTWAY CHANNEL TO PROPOSED 6'X6' RCB SD
FILE NAME: W22-BS.WSW

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
-43936.840	3226.056	2.205	3228.260	688.00	12.79	2.54	3230.80	.00	2.99	28.82	5.700	20.000	2.00	0	.0	
52.492	.0050					.0082	.43	2.20	1.65	2.48	.015	.00	2.00	TRAP		
-43884.350	3226.318	2.117	3228.435	688.00	13.41	2.79	3231.23	.00	2.99	28.47	5.700	20.000	2.00	0	.0	
44.164	.0050					.0094	.42	2.12	1.76	2.48	.015	.00	2.00	TRAP		
-43840.180	3226.539	2.033	3228.572	688.00	14.06	3.07	3231.64	.00	2.99	28.13	5.700	20.000	2.00	0	.0	
38.609	.0050					.0108	.42	2.03	1.88	2.48	.015	.00	2.00	TRAP		
-43801.570	3226.732	1.951	3228.684	688.00	14.75	3.38	3232.06	.00	2.99	27.81	5.700	20.000	2.00	0	.0	
34.555	.0050					.0125	.43	1.95	2.01	2.48	.015	.00	2.00	TRAP		
-43767.020	3226.905	1.873	3228.778	688.00	15.47	3.72	3232.49	.00	2.99	27.49	5.700	20.000	2.00	0	.0	
JUNCT STR	.0000					.0265	.00	1.87	2.14		.015	.00	2.00	TRAP		
-43767.020	3226.905	1.175	3228.080	531.00	20.22	6.35	3234.43	.00	2.56	24.70	5.700	20.000	2.00	0	.0	
11.574	.0070					.0417	.48	1.18	3.46	1.94	.015	.00	2.00	TRAP		
-43755.440	3226.987	1.140	3228.126	531.00	20.91	6.79	3234.92	.00	2.56	24.56	5.700	20.000	2.00	0	.0	

```
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
   15.648    .0070                                               .0473       .74      1.14     3.62     1.94     .015       .00  2.00  TRAP
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43739.790  3227.097    1.091  3228.188    531.00   21.93    7.47  3235.66     .00     2.56    24.37    5.700   20.000  2.00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
   14.645    .0070                                               .0549       .80      1.09     3.88     1.94     .015       .00  2.00  TRAP
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43725.150  3227.200    1.045  3228.245    531.00   23.00    8.22  3236.46     .00     2.56    24.18    5.700   20.000  2.00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
  WALL  EXIT
↑ FILE: V22-BS.WSW                          W S P G W - CIVILDESIGN Version 14.05                                      PAGE    5
                              Program Package Serial Number: 1513
                                         WATER SURFACE PROFILE LISTING                  Date:12-11-2019  Time: 3: 0: 4
                           TDS FOR VILLAGE 22 BELTWAY SEWER
                             EXISTING BELTWAY CHANNEL TO PROPOSED 6'X6' RCB SD
                               FILE NAME: W22-BS.WSW
****************************************************************************************************************** ********
          | 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
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|***** |*******
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43725.150  3227.200    2.275  3229.475    531.00   22.13    7.60  3237.08     .00     4.09    15.10    5.700    6.000  2.00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
   25.000    .0050                                               .0315       .79      2.27     3.09     3.53     .015       .00  2.00  TRAP
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43700.150  3227.325    2.202  3229.527    531.00   23.17    8.34  3237.86     .00     4.09    14.81    5.700    6.000  2.00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
  WALL  EXIT
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43700.150  3227.325    4.048  3231.373    531.00   21.86    7.42  3238.79     .00     6.00     6.00    6.000    6.000   .00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
   27.160    .0050                                               .0251       .68      4.05     1.91     6.00     .015       .00   .00  BOX
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43672.980  3227.462    3.862  3231.324    531.00   22.91    8.15  3239.48     .00     6.00     6.00    6.000    6.000   .00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
    5.535    .0597                                               .0261       .14      3.86     2.05     2.84     .015       .00   .00  BOX
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43667.450  3227.792    3.922  3231.714    531.00   22.57    7.91  3239.62     .00     6.00     6.00    6.000    6.000   .00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
   14.824    .0597                                               .0241       .36      3.92     2.01     2.84     .015       .00   .00  BOX
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43652.630  3228.677    4.113  3232.790    531.00   21.52    7.19  3239.98     .00     6.00     6.00    6.000    6.000   .00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
   11.805    .0597                                               .0213       .25      4.11     1.87     2.84     .015       .00   .00  BOX
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43640.820  3229.382    4.314  3233.696    531.00   20.51    6.53  3240.23     .00     6.00     6.00    6.000    6.000   .00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
    9.402    .0597                                               .0189       .18      4.31     1.74     2.84     .015       .00   .00  BOX
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43631.420  3229.943    4.525  3234.468    531.00   19.56    5.94  3240.41     .00     6.00     6.00    6.000    6.000   .00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
    7.438    .0597                                               .0167       .12      4.52     1.62     2.84     .015       .00   .00  BOX
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43623.980  3230.387    4.745  3235.132    531.00   18.65    5.40  3240.53     .00     6.00     6.00    6.000    6.000   .00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
    5.785    .0597                                               .0149       .09      4.75     1.51     2.84     .015       .00   .00  BOX
↑ FILE: V22-BS.WSW                          W S P G W - CIVILDESIGN Version 14.05                                      PAGE    6
                              Program Package Serial Number: 1513
                                         WATER SURFACE PROFILE LISTING                  Date:12-11-2019  Time: 3: 0: 4
                           TDS FOR VILLAGE 22 BELTWAY SEWER
                             EXISTING BELTWAY CHANNEL TO PROPOSED 6'X6' RCB SD
                               FILE NAME: W22-BS.WSW
****************************************************************************************************************** ********
          | 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
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|***** |*******
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43618.200  3230.732    4.977  3235.709    531.00   17.78    4.91  3240.62     .00     6.00     6.00    6.000    6.000   .00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
    4.375    .0597                                               .0132       .06      4.98     1.40     2.84     .015       .00   .00  BOX
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43613.820  3230.993    5.220  3236.213    531.00   16.95    4.46  3240.68     .00     6.00     6.00    6.000    6.000   .00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
 JUNCT STR   .0597                                               .0097       .49      5.22     1.31              .015       .00   .00  BOX
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-43563.270  3234.011    4.985  3238.996    379.00   12.67    2.49  3241.49     .00     4.99     6.00    6.000    6.000   .00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
          |         |        |         |         |                     |         |        |        |         |        |        |        |
-42895.950  3273.830    4.985  3278.815    379.00   12.67    2.49  3281.31     .00     4.99     6.00    6.000    6.000   .00   0    .0
       -|-        -|-       -|-        -|-        -|-      -|-       -|-        -|-       -|-       -|-       -|-       -|-      -|-      |-
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SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

APN: 137-23-201-101

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

FUTURE S.I.D. PROJECT

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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	HC6	HORIZONTAL CONTROL PLAN 6	
9	HC7	HORIZONTAL CONTROL PLAN 7	
10	HC8	HORIZONTAL CONTROL PLAN 8	
11	HC9	HORIZONTAL CONTROL PLAN 9	
12	HC10	HORIZONTAL CONTROL PLAN 10	
13	HC11	HORIZONTAL CONTROL PLAN 11	
14	MUTW	MASTER UTILITY WATER	
15	MUTSS	MASTER UTILITY SANITARY SEWER	
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17	MGRD-1	MASTER GRADING PLAN 1	
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34	DT3	DETAIL SHEET 3	
35	DT4	DETAIL SHEET 4	
36	DT5	DETAIL SHEET 5	
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38	UT1A	UTILITY PROFILE 1A	
39	UT2	UTILITY PLAN 2	54+00 TO 59+00
40	UT2A	UTILITY PROFILE 2A	
41	UT3	UTILITY PLAN 3	59+00 TO 64+25
42	UT3A	UTILITY PROFILE 3A	
43	UT4	UTILITY PLAN & PROFILE 4	64+25 TO 68+50
44	UT5	UTILITY PLAN & PROFILE 5	68+50 TO 72+80
45	UT6	UTILITY PLAN & PROFILE 6	72+80 TO 77+40
46	UT7	UTILITY PLAN & PROFILE 7	77+40 TO 81+00
47	UT8	UTILITY PLAN & PROFILE 8	81+00 TO 84+20
48	UT9	UTILITY PLAN & PROFILE 9	84+20 TO 87+75
49	UT10	UTILITY PLAN & PROFILE 10	10+00 TO 14+19
50	UT11	UTILITY PLAN & PROFILE 11	10+00 TO 12+20
51	UT12	UTILITY PLAN & PROFILE 12	7+50 TO 4+60
52	UT13	UTILITY PLAN & PROFILE 13	7+50 TO 10+00
53	UT14	UTILITY PLAN & PROFILE 14 WATER LATERAL	
54	UT15	UTILITY PLAN & PROFILE 15 SEWER LATERAL	
55	UT16	UTILITY PLAN & PROFILE 16 SEWER & WATER LATERAL	
56	UT17	UTILITY PLAN & PROFILE 17 SEWER LATERAL	
57	UT18	UTILITY PLAN & PROFILE 18 WATER LATERAL	
58	UT19	UTILITY PLAN & PROFILE 19 SEWER LATERAL	
59	UT20	UTILITY PLAN & PROFILE 20 SEWER & WATER LATERAL	
60	UT21	UTILITY PLAN & PROFILE 21 WATER LATERAL	
61	UT22	UTILITY PLAN & PROFILE 22 SEWER LATERAL	
62	UT23	UTILITY PLAN & PROFILE 23 SEWER LATERAL	
63	UT24	UTILITY PLAN & PROFILE 24 WATER LATERAL	
64	UT25	UTILITY PLAN & PROFILE 25 SEWER & WATER LATERAL	
65	UT26	UTILITY PLAN & PROFILE 26 SEWER & WATER LATERAL	
66	UT27	UTILITY PLAN & PROFILE 27 WATER LATERAL	
67	UT28	UTILITY PLAN & PROFILE 28 WATER LATERAL	
68	UT29	UTILITY PLAN & PROFILE 29 STORM DRAIN LATERAL	
69	UT30	UTILITY PLAN & PROFILE 30 STORM DRAIN LATERAL	
70	UT31	UTILITY PLAN & PROFILE 31 STORM DRAIN LATERAL	
71	UT32	UTILITY PLAN & PROFILE 32 STORM DRAIN LATERAL	
72	UT33	UTILITY PLAN & PROFILE 33 STORM DRAIN LATERAL	
73	UT34	UTILITY PLAN & PROFILE 34 STORM DRAIN LATERAL	
74	UT35	UTILITY PLAN & PROFILE 35 STORM DRAIN LATERAL	
75	UT36	UTILITY PLAN & PROFILE 36 STORM DRAIN LATERAL	
76	UT37	UTILITY PLAN & PROFILE 37 STORM DRAIN LATERAL	
77	UT38	UTILITY PLAN & PROFILE 38 STORM DRAIN LATERAL	
78	UT39	UTILITY PLAN & PROFILE 39 STORM DRAIN LATERAL	
79	UT40	UTILITY PLAN & PROFILE 40 STORM DRAIN LATERAL	
80	UT41	UTILITY PLAN & PROFILE 41 STORM DRAIN LATERAL	
81	UT42	UTILITY PLAN & PROFILE 42 STORM DRAIN LATERAL	
82	UT43	UTILITY PLAN & PROFILE 43 STORM DRAIN LATERAL	
83	UT44	UTILITY PLAN & PROFILE 44 STORM DRAIN LATERAL	
84	UT45	UTILITY PLAN & PROFILE 45 STORM DRAIN LATERAL	
85	UT46	UTILITY PLAN & PROFILE 46 STORM DRAIN LATERAL	
86	UT47	UTILITY PLAN & PROFILE 47 STORM DRAIN LATERAL	
87	TR1	TRAFFIC PLAN 1	
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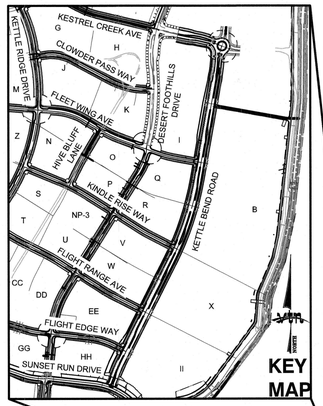
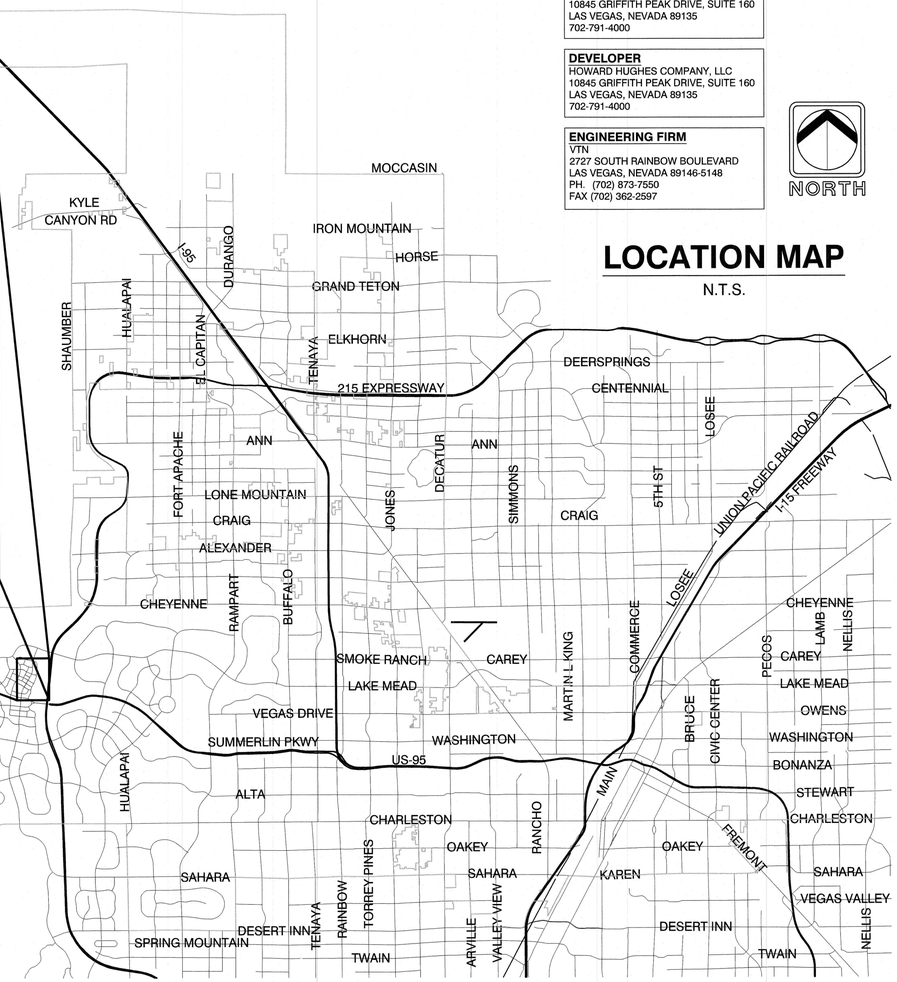
91	TR5	TRAFFIC PLAN 5	
92	TR6	TRAFFIC PLAN 6	
93	S1	STRUCTURAL SHEET 1	
94	S2	STRUCTURAL SHEET 2	





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

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

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

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS IT'S COSTLY.
Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6511
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

FIRE DEPARTMENT APPROVAL

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

THESE PLANS AND THE DESIGN CRITERIA CONTAINED WITHIN THESE PLANS ARE BASED UPON THE INFORMATION PRESENTLY KNOWN BY THE ENGINEER AND INTENDED SOLELY AS A GENERAL GUIDELINE FOR CONSTRUCTION. 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

ACTING 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.

DEPARTMENT OF PLANNING, CITY OF LAS VEGAS DATE

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

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

LAS VEGAS FIRE & RESCUE DATE

OWNER:DEVELOPER

KEVIN T. ORROCK, VICE PRESIDENT DATE

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY

LAS VEGAS VALLEY WATER DISTRICT

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

PROJECT:---- DATE:_____

SHEETS:

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

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 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	
BCC	BCC	WJM	7861	---	HORIZ.
05/28/2019	06/28/2019	01/13/2020		N/A	VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/13/20

SHEET
CV
1 OF 94 SHEETS

DRAWING NO.

H:\7861\Kettle Bend Road\Sheet Set\7861-CV.dwg 1/13/2020 12:56 PM bhanelsonc

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".
2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE 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 OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.
8. AC PAVEMENT TO BE ONE-HALF INCH (½") ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.
9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.
10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.
11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.
12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY: NOVA GEOTECHNICAL, PROJECT NO. G-18-003, DATED MARCH 5, 2018.
    APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLANS.
13. EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.
14. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. STATUTE NO. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

16. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.
17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.
18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.
19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.
20. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC, THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.
21. SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S) SHALL BE PROVIDED TO THE 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.
24. REVISED 06/04/2018

CITY OF LAS VEGAS STREET LIGHT 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. DESIGN PROFESSIONAL AND CONTRACTOR SHALL VERIFY CITY'S LATEST LED FIXTURE SPECIFICATIONS AND APPROVED FIXTURES PER CLV WEBSITE, UNDER BUILDING AND SAFETY FORMS, PRIOR TO ORDERING MATERIALS.
3. 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.
4. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION IN ACCORDANCE WITH SECTION 623 G.03.01 OF THE USS.
5. 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
6. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, 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.
7. 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.
8. 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.
9. 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.
10. THE CONTRACTOR SHALL FURNISH COMPLETE CONDUIT, WIRE, ETC. FROM SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON THE PLANS.

REVISED JUNE 4, 2018 (LD VERSION)

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 III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPS WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF 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.

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 #6631 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS.
2. ONLY FIRE HYDRANTS THAT ARE ON THE LAS VEGAS VALLEY 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 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 § C102.10]
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 2 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 WHEN ANY PORTION OF AN EXTERIOR WALL OF THE FIRST STORY IS LOCATED MORE THAN 150 FT FROM A FIRE DEPARTMENT VEHICLE ACCESS. [IFC § 503.1.1]
25. APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 200 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS OR A SINGLE POINT OF ACCESS IN EXCESS OF 600 FT. CLV REGULATION AND MOU
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. CLV REGULATION
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
29. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS, OR HAVING FOUR OR MORE TRAVEL LANES AND A TRAFFIC COUNT OF MORE THAN 30,000 VEHICLES PER DAY, ALL HYDRANTS BEING UTILIZED TO DELIVER FIRE FLOW TO THE PROPOSED LOCATION SHALL BE LOCATED ON THE SAME SIDE OF THE STREET AS THE PROPOSED DEVELOPMENT. CLV REGULATION

    EFFECTIVE DATE: FEBRUARY 4th, 2019

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 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 REGIONAL TRANSPORTATION COMMISSION OF SOUTHERN NEVADA (RTC). 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 JUNE 4, 2018

DEPARTMENT OF PUBLIC WORKS NOTES

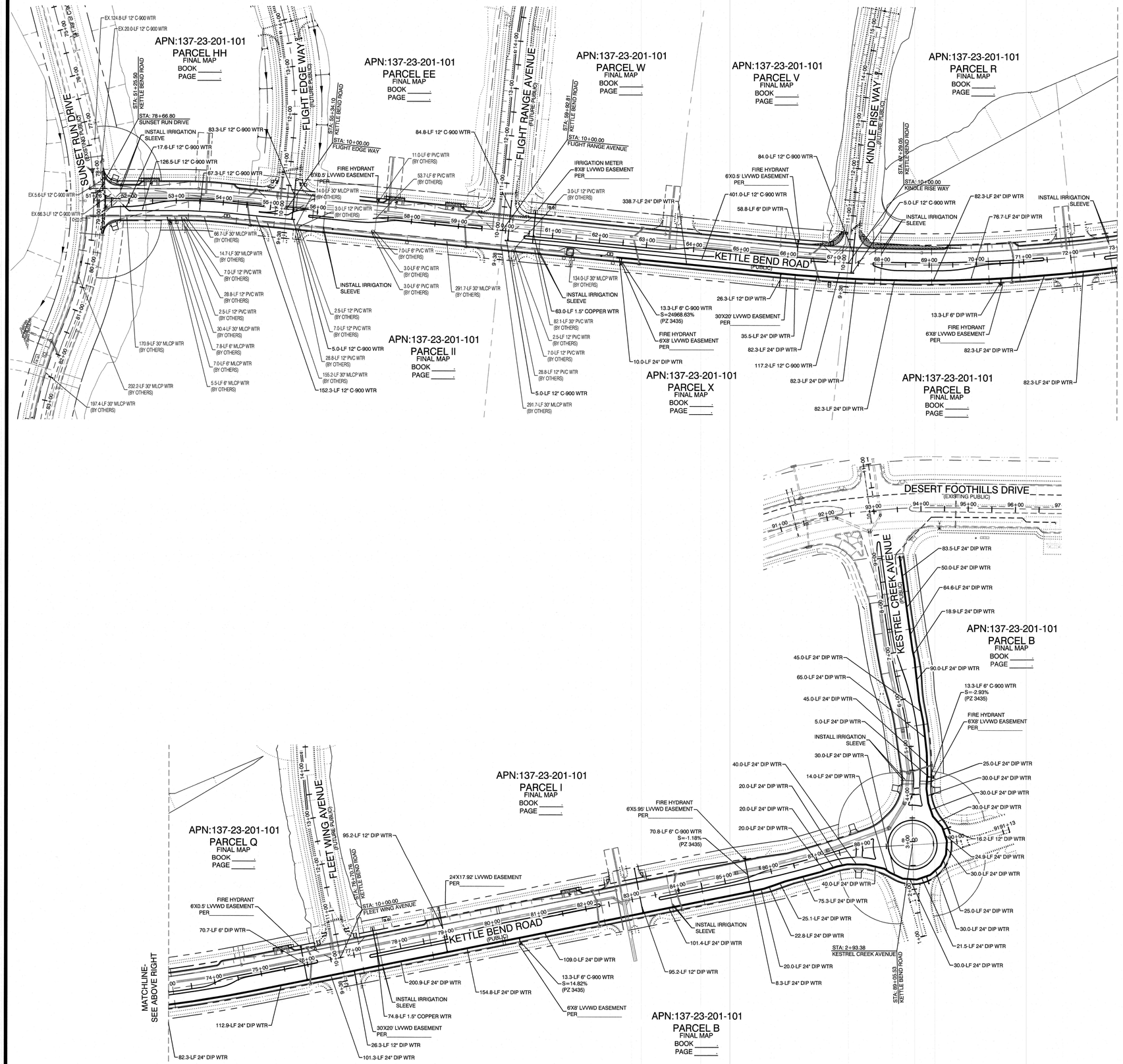
1. NON-STANDARD KNUCKLES APPROVED PER TMP-50117

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 CROSSIN



WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

WATER MAIN JOINT DEFLECTION

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

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

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.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 AND 3550 PRESSURE ZONES.

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____.

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE:_____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
1-702-228-6811
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

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
702-791-4300

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5146
PH: (702) 873-7500 FAX (702) 382-2397 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

MASTER UTILITY WATER

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ.
BCC	BCC	WJM	7981	1"=80'	VERT:
05/30/2019	05/30/2019	01/13/2020		N/A	

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
MUTW
14 OF 94 SHEETS

DRAWING NO.

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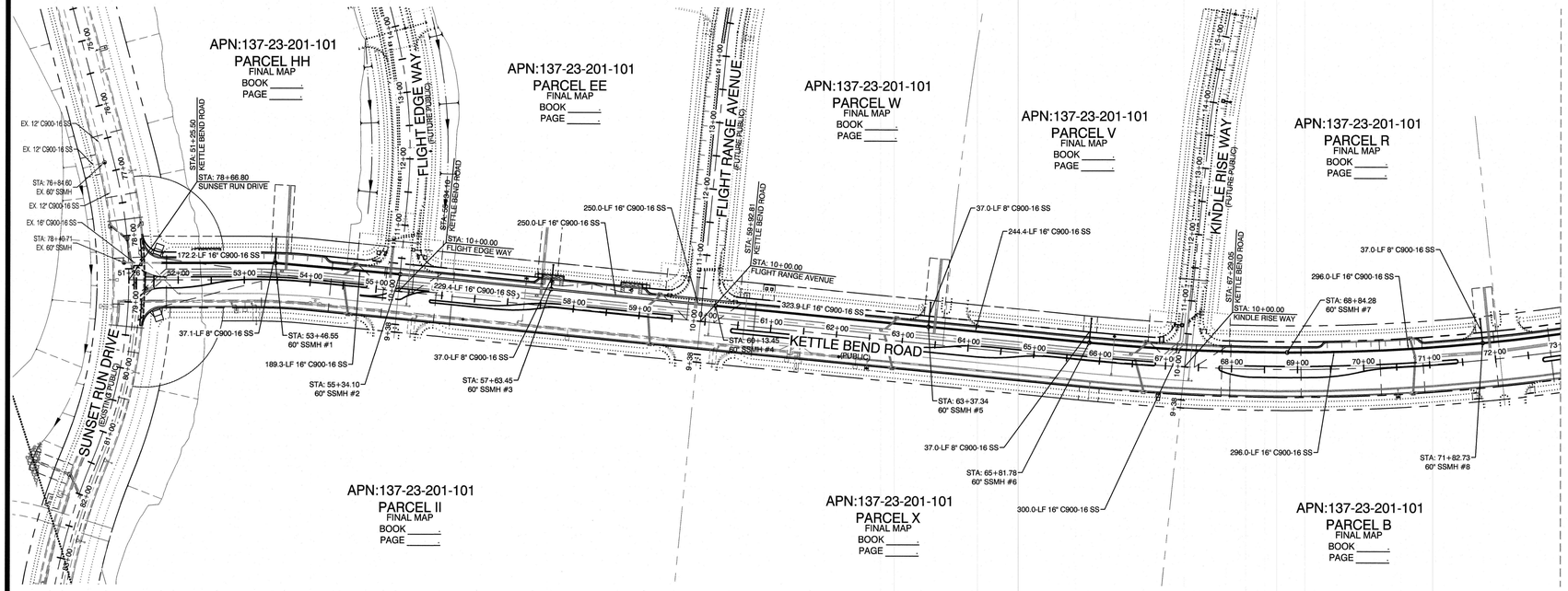

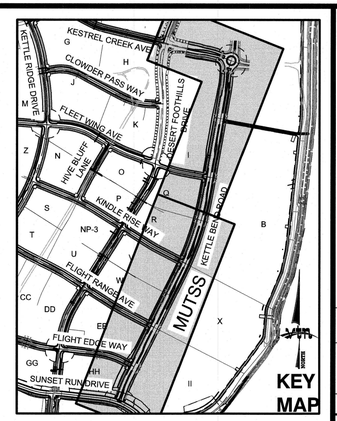

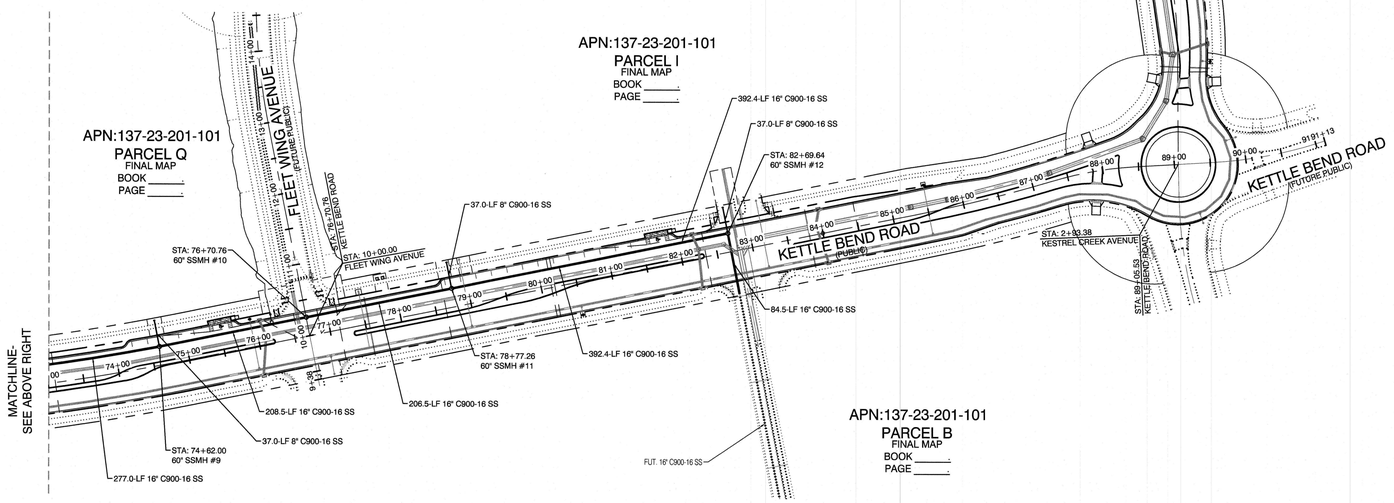

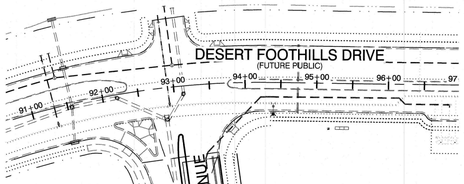

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

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

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

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.

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____.
APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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CLARK COUNTY TRAFFIC OPERATIONS
OR
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DIG OVERHEAD
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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 89146-5146
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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

MASTER UTILITY SANITARY SEWER

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	06/30/2019	CHECKED BY: WJM	01/13/2020
DESIGNED BY: BCC	06/30/2019	SCALE:	1"=80' HORIZ N/A VERT
		PROJECT NO: 7901	

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
MUTSS
15 OF **94** SHEETS
DRAWING NO.

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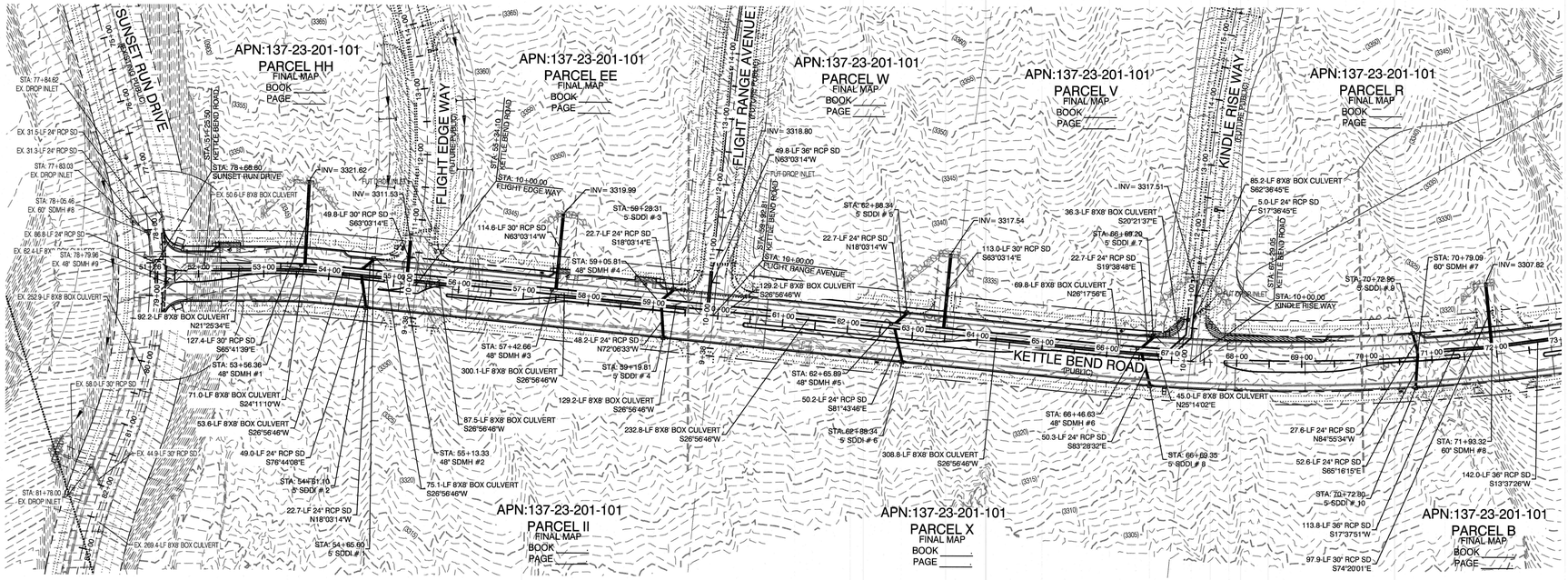

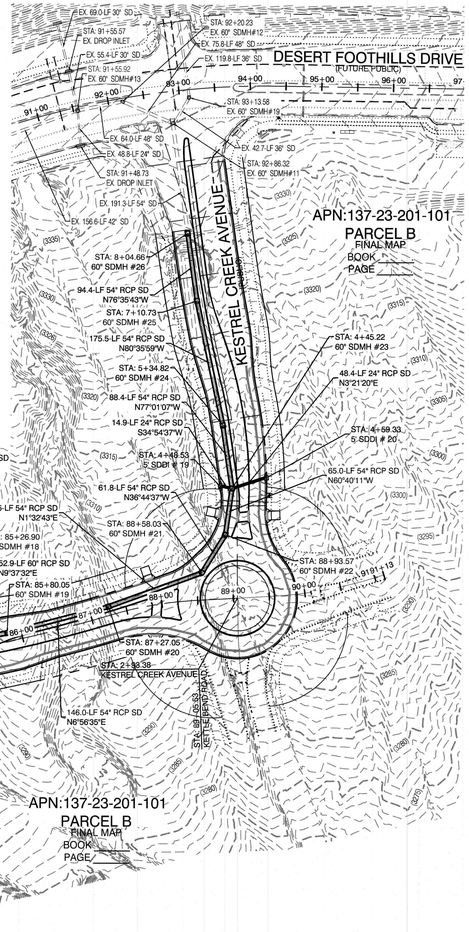

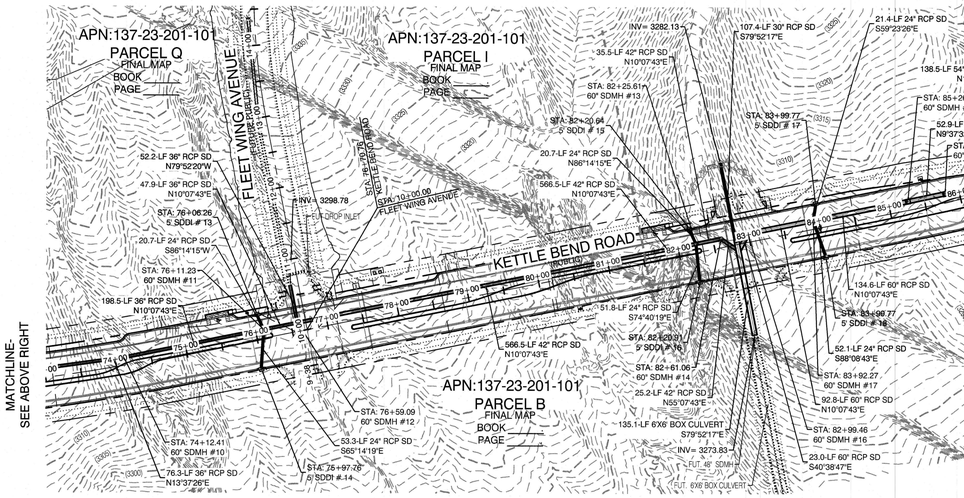

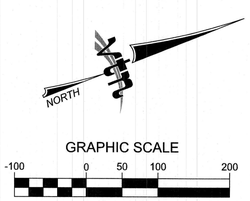

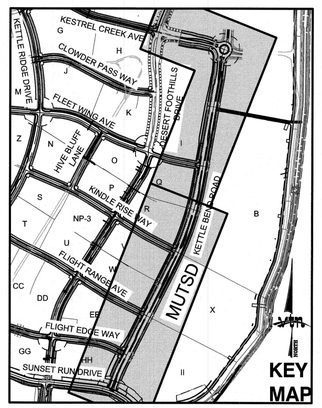

GRADING PERMIT NOTE

THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHERS STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-003, DATED MARCH 5, 2018
HTE #----

SIGHT VISIBILITY ZONES:

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

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS
FTS CONDUIT

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1-702-455-7511
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1-702-229-6811
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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OR
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I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #DS05204

WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
(702) 476-4300

2707 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

CITY OF LAS VEGAS

MASTER UTILITY STORM DRAIN

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	05/30/2019	SCALE:	HORIZ. 1"=80'
DESIGNED BY: BCC	05/30/2019		VERT. N/A
CHECKED BY: WJM	01/13/2020	PROJECT NO: 7861	

PROFESSIONAL ENGINEER-STATE OF NEVADA
WILLIAM J MEYER
EXP: 12/31/21
CIVIL
No. 15745
01-14-20

SHEET
MUTSD
16 OF 94 SHEETS
DRAWING NO.

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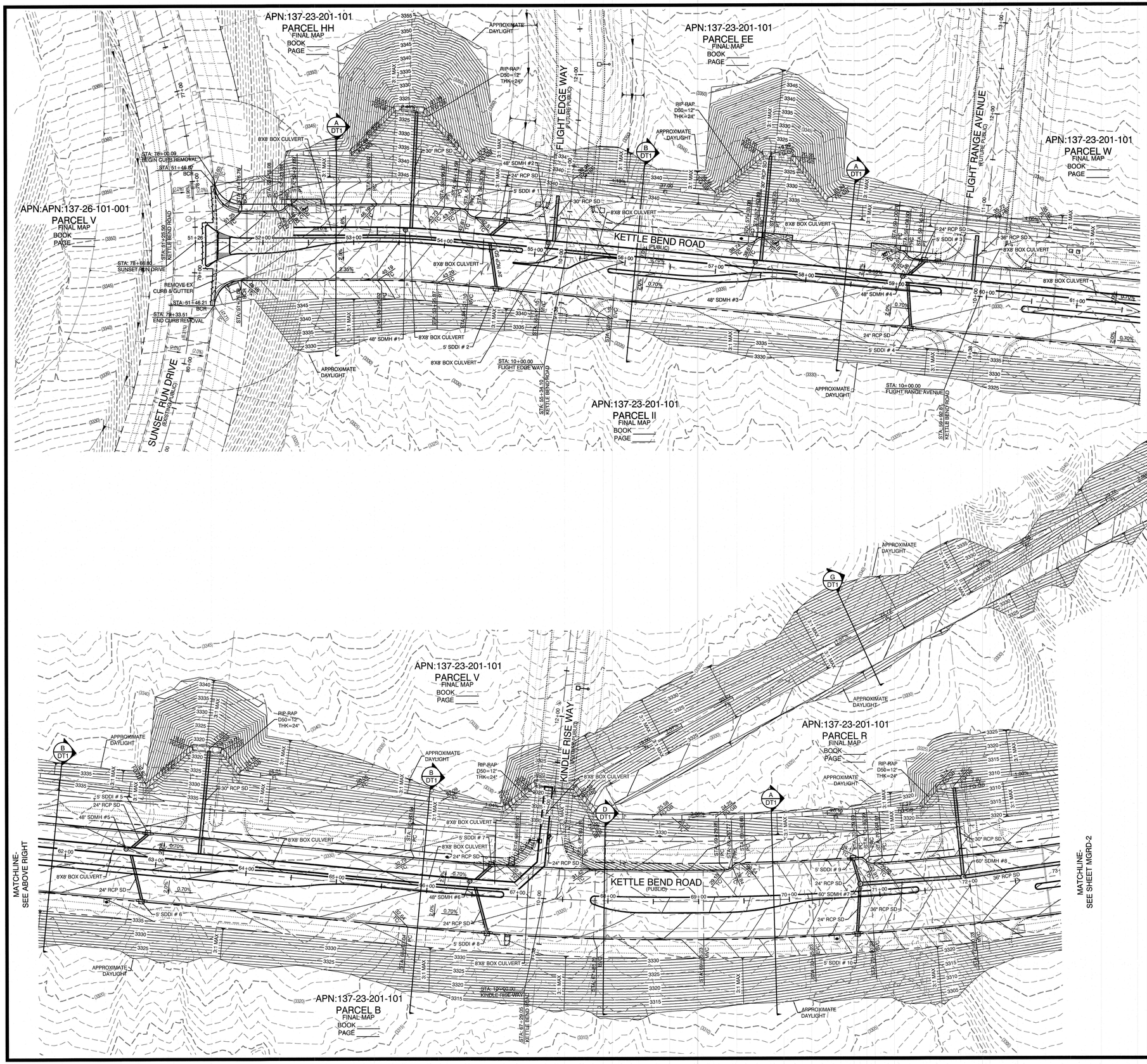

STORM DRAIN DROP INLET NOTE:

ALL STORM DRAIN INLETS SHALL INCLUDE A STORM WATER INLET CONCRETE STAMP IN ACCORDANCE WITH CCAUSD DWG NO. 421

OFFSITE FLOOD CONTROL NOTE:

ALL OFFSITE INTERIM FLOOD CONTROL FACILITIES SUCH AS BUT NOT LIMITED TO BERMS/DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY THE HOWARD HUGHES COMPANY.

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PROJECT #G-18-003, DATED MARCH 5, 2018

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WILLIAM J MEYER , P.E. No. 15745 DATE

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS
Call before you Underground
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AND
1-702-229-6811
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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CLARK COUNTY TRAFFIC OPERATIONS

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1-702-227-2929

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4400

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

MASTER GRADING PLAN 1

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	07/25/2019		
DESIGNED BY: BCC	07/25/2019		
CHECKED BY: WJM	01/13/2020		
PROJECT NO: 7881	SCALE:	1"=50'	HORIZ.
		N/A	VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1-14-20

SHEET
MGRD-1
17 OF **94** SHEETS
DRAWING NO.

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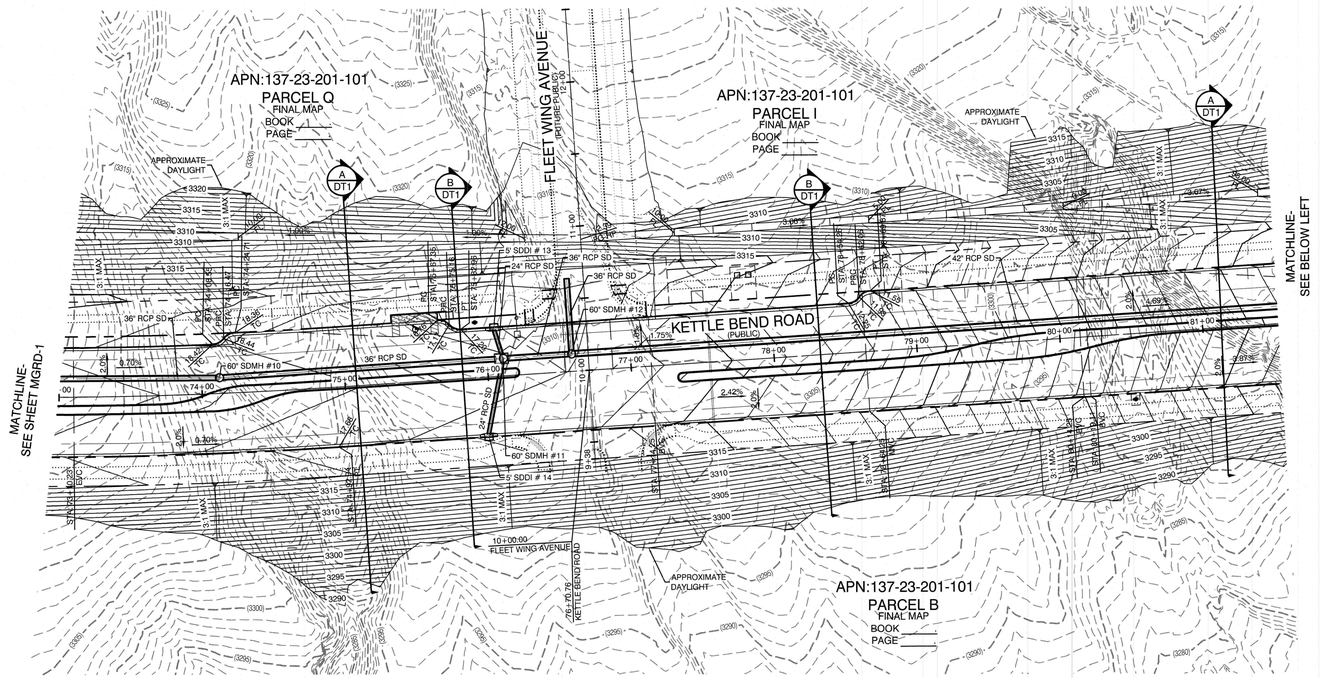

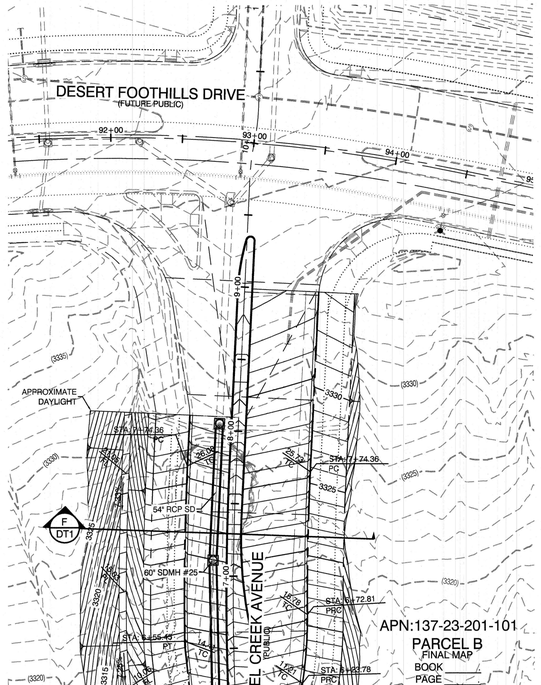

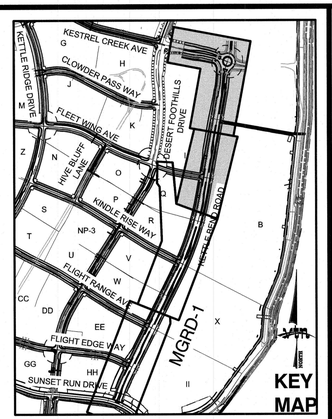

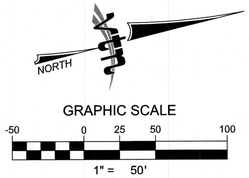

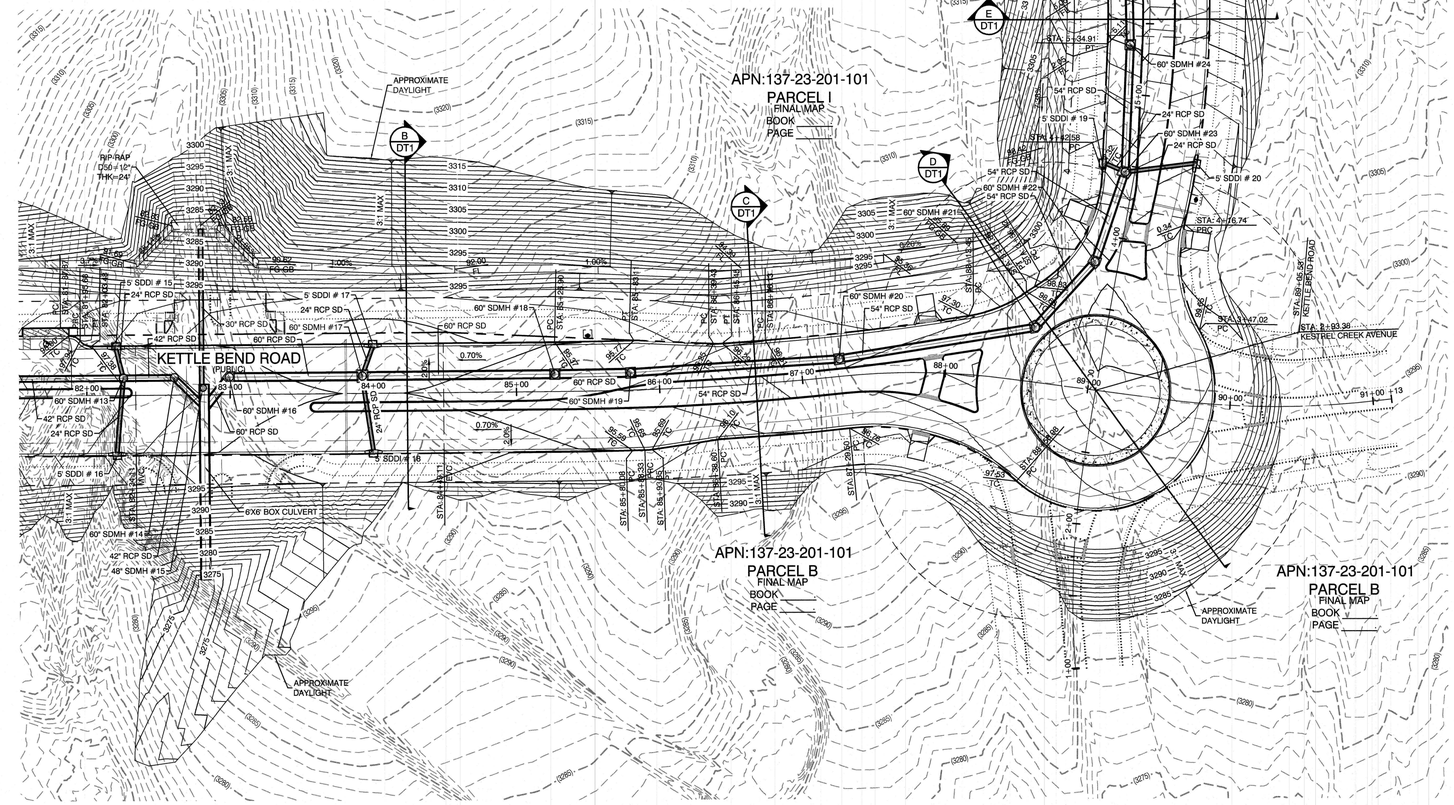

STORM DRAIN DROP INLET NOTE:

ALL STORM DRAIN INLETS SHALL INCLUDE A STORM WATER INLET CONCRETE STAMP IN ACCORDANCE WITH CCAUSD DWG NO. 421

OFFSITE FLOOD CONTROL NOTE:

ALL OFFSITE INTERIM FLOOD CONTROL FACILITIES SUCH AS BUT NOT LIMITED TO BERMS/DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY THE HOWARD HUGHES COMPANY.

GRADING PERMIT NOTE

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GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL PROJECT #G-18-003, DATED MARCH 5, 2018

SIGHT VISIBILITY ZONES:

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I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #DS05204

WILLIAM J MEYER , P.E. No. 15745 DATE

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS IT'S COSTLY.
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CLARK COUNTY TRAFFIC OPERATIONS
OR
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

Call before you Dig
Avoid cutting underground utility lines. It's costly.
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AND
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CLARK COUNTY TRAFFIC OPERATIONS

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CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4050

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 382-2897 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

MASTER GRADING PLAN 2

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:
BCC	BCC	WJM	7861
07/25/2019	07/25/2019	01/13/2020	SCALE: 1"=50' HORIZ. N/A VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
No. 15745
EXP: 12/31/21
CIVIL

SHEET
MGRD-2
18 OF **94** SHEETS

DRAWING NO.

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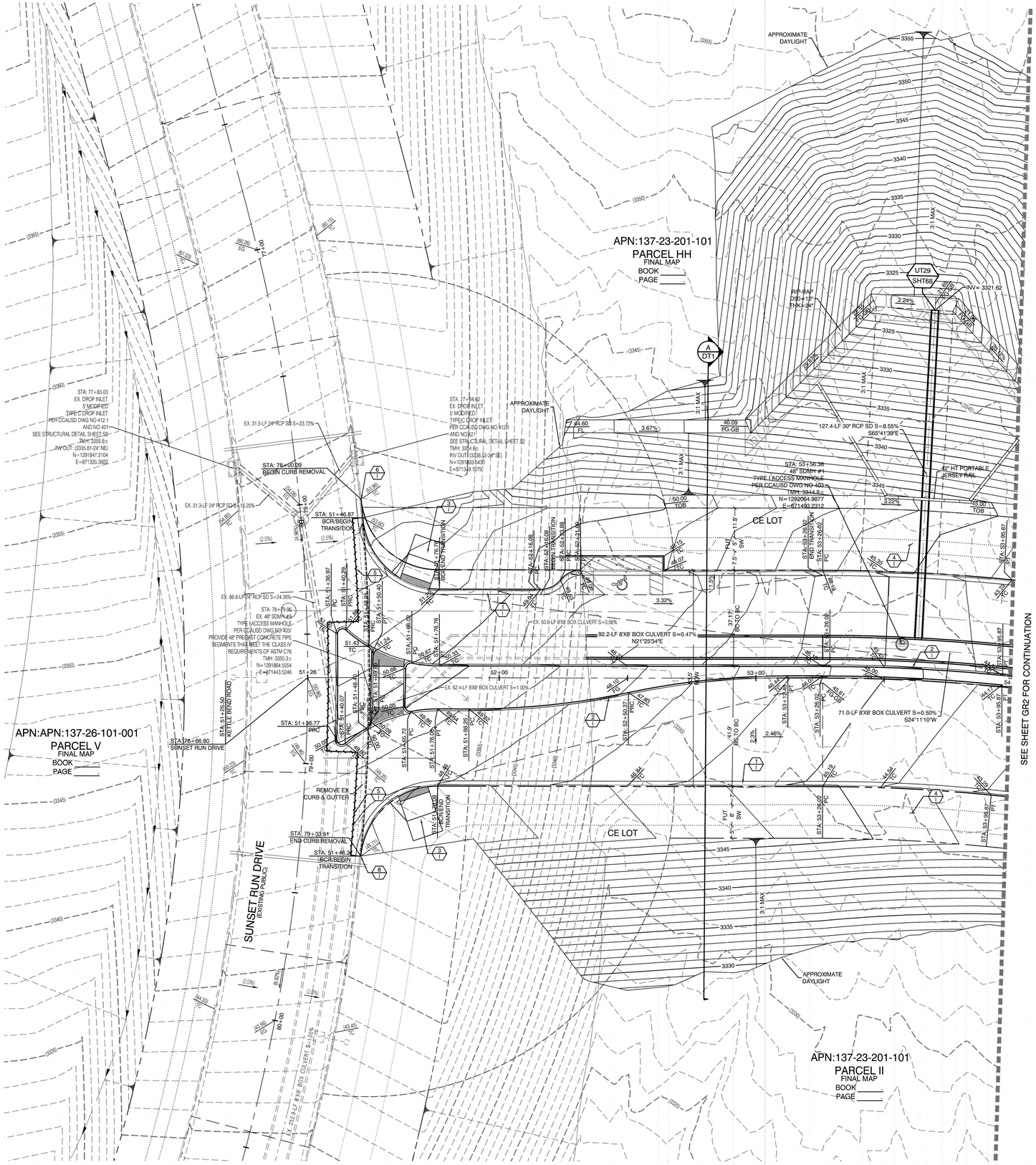

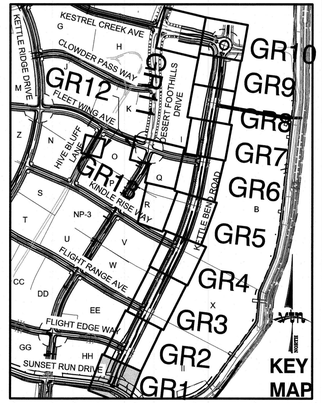



CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. CONSTRUCT HANDICAP RAMP SEE DETAIL ON SHEET DT 2,3 & 4
4. FUTURE SIDEWALK
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT APRON CURB SEE SHEET DT1

STORM DRAIN DROP INLET NOTE:

ALL STORM DRAIN INLETS SHALL INCLUDE A STORM WATER INLET CONCRETE STAMP IN ACCORDANCE WITH CCAUSD DWG NO. 421

OFFSITE FLOOD CONTROL NOTE:

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GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-003, DATED MARCH 5, 2018

SIGHT VISIBILITY ZONES:

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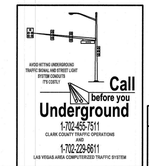





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WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-261-4000

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7590 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 1

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	06/28/2019		
DESIGNED BY: BCC	06/28/2019		
CHECKED BY: WJM	01/13/2020		
PROJECT NO: 7881	SCALE:	1"=20'	HORIZ.
		N/A	VERT.

NEVADA — PROFESSIONAL ENGINEER — STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
GR1
19 OF **94** SHEETS

DRAWING NO.

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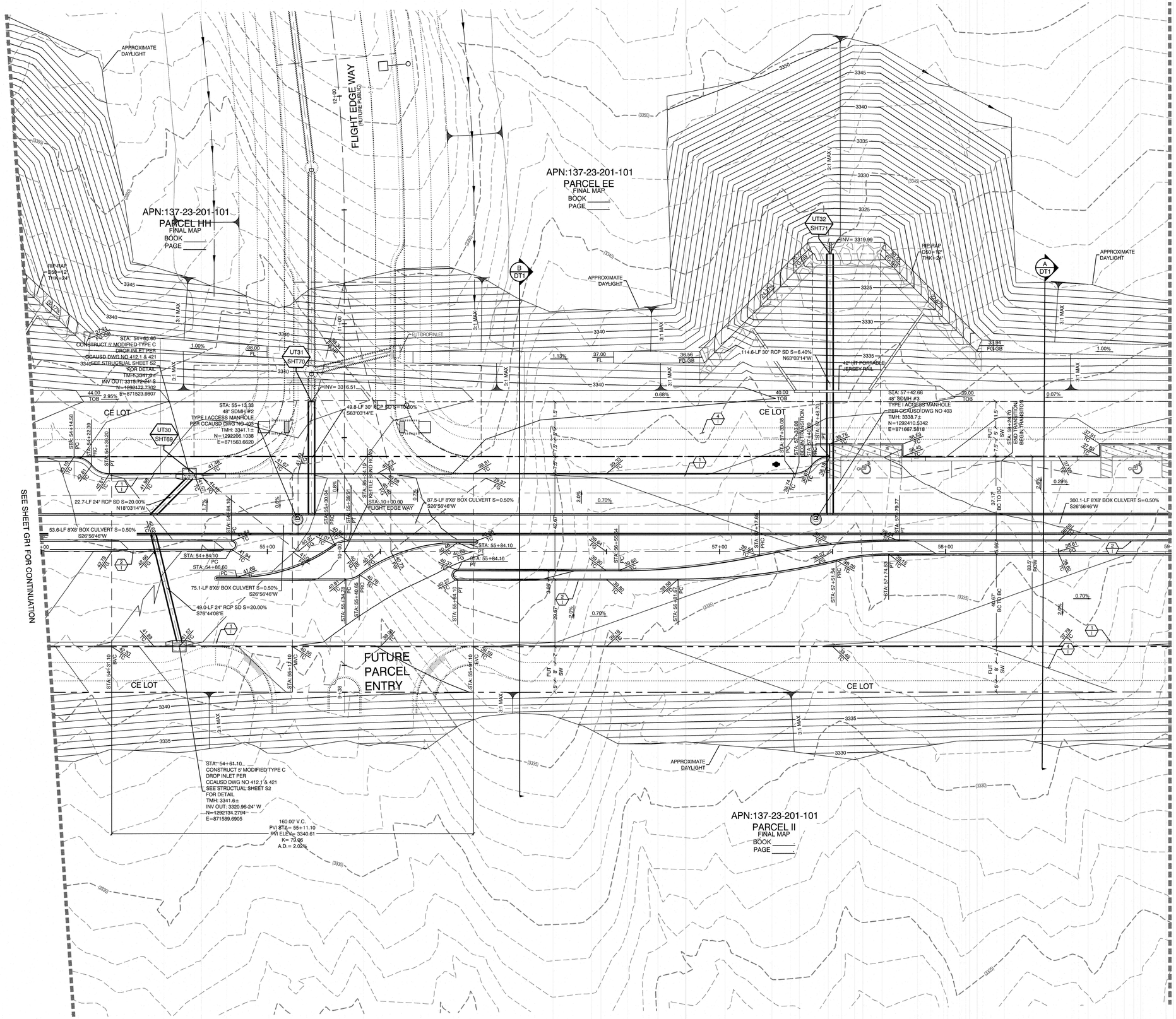

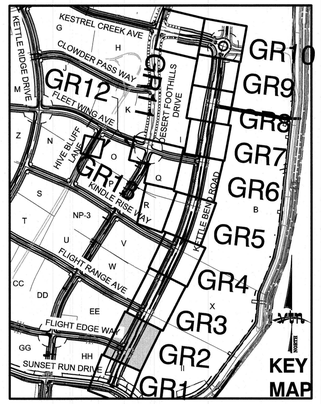

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1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
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7. CONSTRUCT APRON CURB SEE SHEET DT1

NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

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CALL BEFORE YOU DIG OVERHEAD

1-702-227-2929

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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AND
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CLARK COUNTY TRAFFIC OPERATIONS

STORM DRAIN DROP INLET NOTE:

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PROJECT #G-18-003, DATED MARCH 5, 2018

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WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 180
LAS VEGAS, NEVADA 89135
(702) 914-4000

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-3997 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

CITY OF LAS VEGAS

GRADING PLAN 2

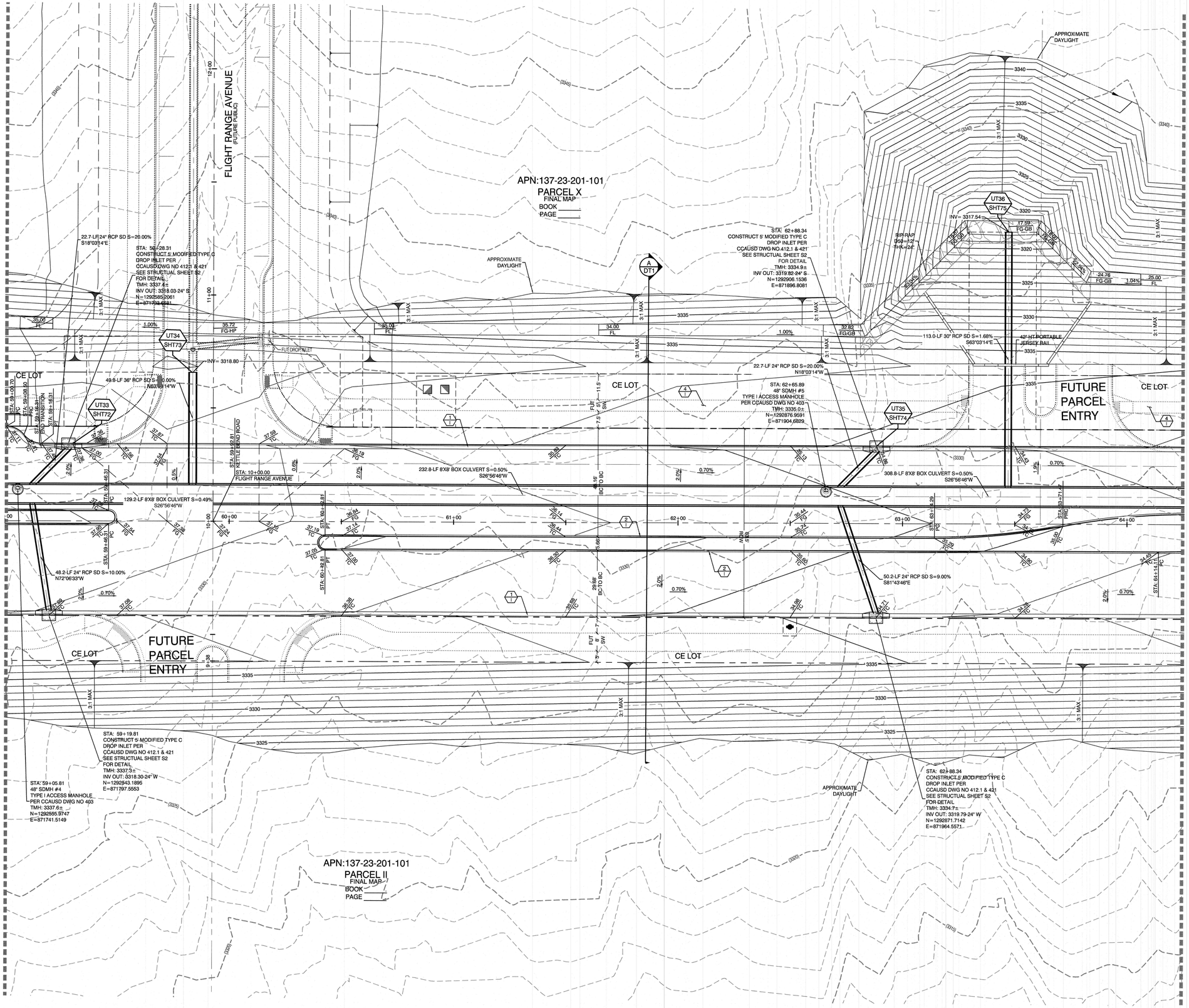
SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

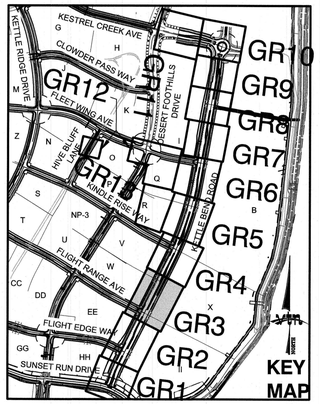
DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ.
BCC	BCC	VJM	7861	1"=20'	VERT.
06/28/2019	06/28/2019	01/13/2020		N/A	

NEVADA PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/13/20

SHEET
GR2
20 OF **94** SHEETS
DRAWING NO.

H:\7861\Kettle Bend Road\Sheet Set\7861-GRD-1.dwg 7/10/2020 11:53 AM dcordonc





NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. CONSTRUCT HANDICAP RAMP SEE DETAIL ON SHEET DT 2,3 & 4
4. FUTURE SIDEWALK
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT APRON CURB SEE SHEET DT1





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

STORM DRAIN DROP INLET NOTE:

ALL STORM DRAIN INLETS SHALL INCLUDE A STORM WATER INLET CONCRETE STAMP IN ACCORDANCE WITH CCAUSD DWG NO. 421

GRADING PERMIT NOTE

THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHERS STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-003, DATED MARCH 5, 2018

OFFSITE FLOOD CONTROL NOTE:

ALL OFFSITE INTERIM FLOOD CONTROL FACILITIES SUCH AS BUT NOT LIMITED TO BERMS/DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY THE HOWARD HUGHES COMPANY.

SIGHT VISIBILITY ZONES:

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

ENGINEER DISCLAIMER NOTE:

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I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #DS05204

WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 382-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 3

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:
BCC	BCC	WJM	7991

06/28/2019 | 06/28/2019 | 01/13/2020 | SCALE: 1"=20' HORIZ, N/A VERT.

WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
STATE OF NEVADA
No. 15745
PROFESSIONAL ENGINEER
1/14/20

SHEET
GR3
21 OF 94 SHEETS

DRAWING NO.

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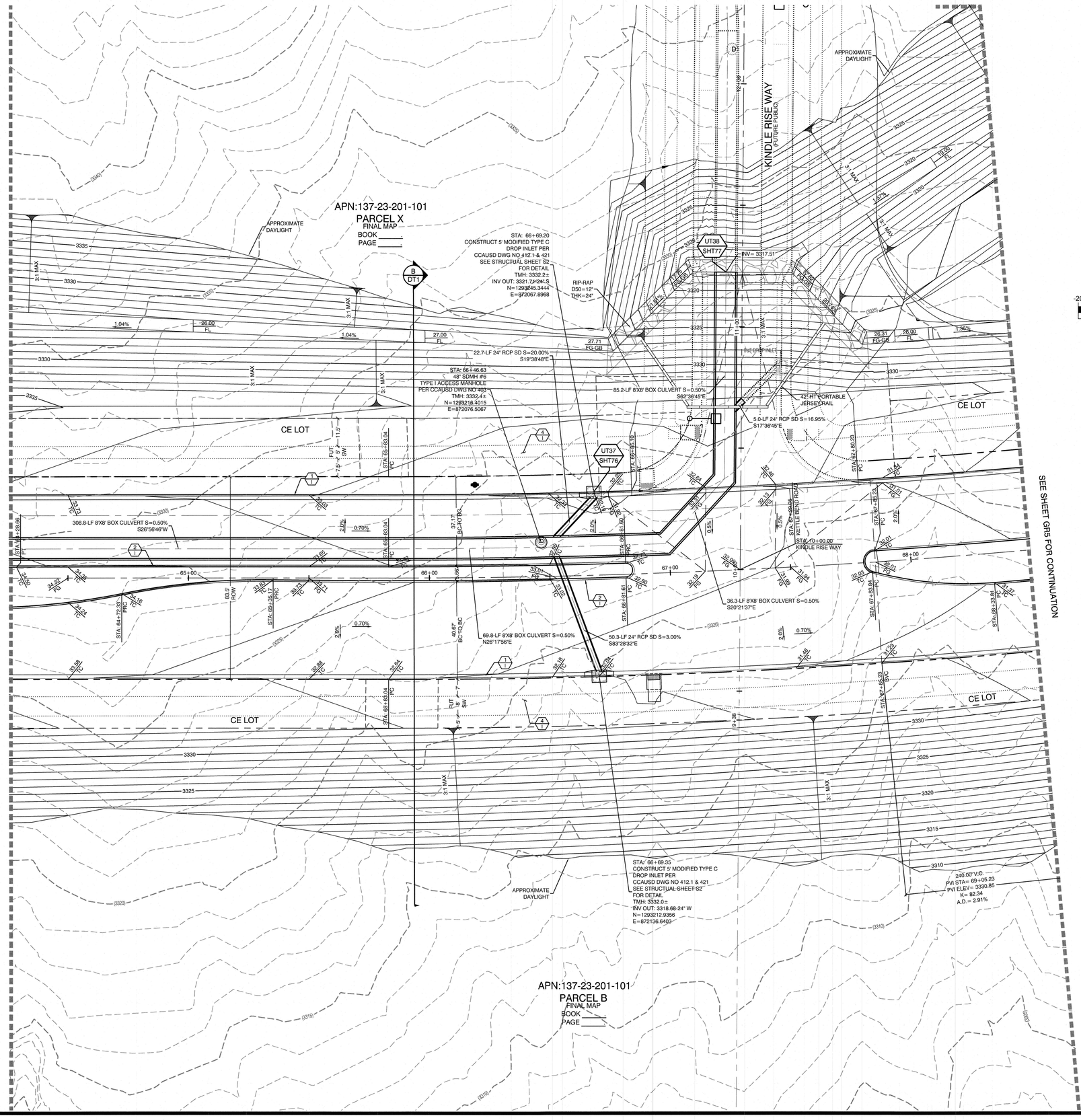

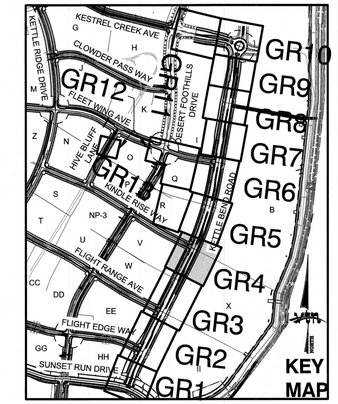



CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. CONSTRUCT HANDICAP RAMP SEE DETAIL ON SHEET DT 2,3 & 4
4. FUTURE SIDEWALK
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT APRON CURB SEE SHEET DT1

STORM DRAIN DROP INLET NOTE:

ALL STORM DRAIN INLETS SHALL INCLUDE A STORM WATER INLET CONCRETE STAMP IN ACCORDANCE WITH CCAUSD DWG NO. 421

OFFSITE FLOOD CONTROL NOTE:

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GRADING PERMIT NOTE

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GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL PROJECT #G-18-003, DATED MARCH 5, 2018

SIGHT VISIBILITY ZONES:

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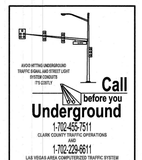

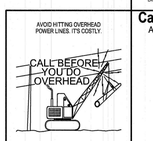



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WILLIAM J MEYER , P.E. No. 15745 DATE

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

GRADING PLAN 4

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7590 FAX (702) 362-2997 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

DRAWN BY: BCC 05/28/2019
DESIGNED BY: BCC 05/28/2019
CHECKED BY: WJM 01/13/2020
PROJECT NO: 7881
SCALE: 1"=20' HORZ. N/A VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/13/20

SHEET
GR4
22 OF 94 SHEETS
DRAWING NO.

H:\7881\Kettle Bend Road\Sheet Set\7881-GR0-1.dwg,7/10/2020 11:53 AM,bmonroe

SEE SHEET GR13 FOR CONTINUATION

SEE SHEET GR4 FOR CONTINUATION

SEE SHEET GR6 FOR CONTINUATION

APN:137-23-201-101
PARCEL R
FINAL MAP
BOOK
PAGE

APN:137-23-201-101
PARCEL B
FINAL MAP
BOOK
PAGE

APPROXIMATE DAYLIGHT

STA: 71+93.32
60' SDMH #8
TYPE III ACCESS MANHOLE
PER CCAUSD DWG NO 406
TMH: 3320.9±
INV IN: 3304.01-30" W
INV IN: 3304.01-36" S
INV OUT: 3304.01-36" N
N=1293723.9266
E=872271.7843

STA: 70+72.95
CONSTRUCT 5' MODIFIED TYPE C
DROP INLET PER
CCAUSD DWG NO 412.1 & 421
SEE STRUCTUAL SHEET S2
FOR DETAIL
TMH: 3324.3±
INV OUT: 3306.21-24" E
N=1293618.5799
E=872207.7855

STA: 70+72.80
CONSTRUCT 5' MODIFIED TYPE C
DROP INLET PER
CCAUSD DWG NO 412.1 & 421
SEE STRUCTUAL SHEET S2
FOR DETAIL
TMH: 3324.3±
INV OUT: 3310.83-24" NW
N=1293592.7833
E=872287.1961

STA: 70+79.09
60' SDMH #7
TYPE III ACCESS MANHOLE
PER CCAUSD DWG NO 406
TMH: 3324.3±
INV IN: 3305.56-24" W
INV IN: 3305.56-24" SE
INV OUT: 3305.56-36" N
N=1293615.4717
E=872312.3160

RIP-RAP
D50=12"
T=5'x5'

UT40
SH779

UT39
SH778

FUTURE PARCEL ENTRY

CE LOT

42" HT PORTABLE JERSEY RAIL

97.9-LF 30" RCP SD S=3.90%
S74°20'01"E

142.0-LF 36" RCP SD S=1.37%
S13°37'26"W

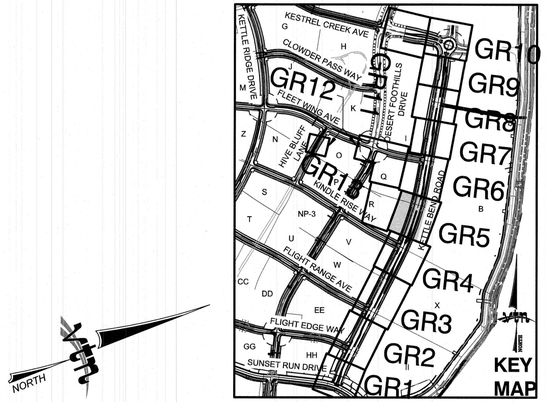
113.8-LF 36" RCP SD S=1.37%
S17°37'51"W

27.6-LF 24" RCP SD S=2.35%
N8°15'34"W

52.6-LF 24" RCP SD S=10.00%
S26°15'9"E

240.00' V.C.
PVI STA= 69+05.23
PVI ELEV= 3336.85
K= 82.34
A.D.= 2.91%

220.00' V.C.
PVI STA= 72+00.23
PVI ELEV= 3320.19
K= 75.48
A.D.= 2.91%



GRAPHIC SCALE
-20 0 10 20 40
1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. CONSTRUCT HANDICAP RAMP SEE DETAIL ON SHEET DT 2,3 & 4
4. FUTURE SIDEWALK
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT APRON CURB SEE SHEET DT1

STORM DRAIN DROP INLET NOTE:

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OFFSITE FLOOD CONTROL NOTE:

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GRADING PERMIT NOTE

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GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-003, DATED MARCH 5, 2018

SIGHT VISIBILITY ZONES:

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

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS IT'S COSTLY
Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
OR
1-702-229-6211
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

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WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-261-4000

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

GRADING PLAN 5

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC 05/28/2019
DESIGNED BY: BCC 05/28/2019
CHECKED BY: WJM 01/13/2020
PROJECT NO: 7861
SCALE: 1"=20' HORIZ. N/A VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
GR5
23 OF 94 SHEETS

DRAWING NO.

H:\7861 Kettle Bend Road\Sheet Set\7861-GR5-1.dwg,1/10/2020 11:53 AM,brandonc

SEE SHEET GR12 FOR CONTINUATION



SEE SHEET GR5 FOR CONTINUATION

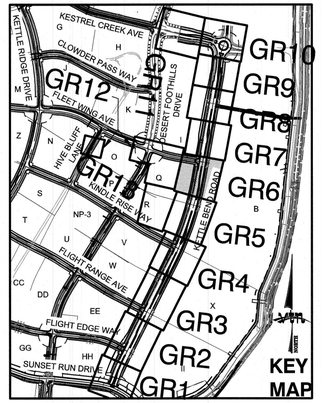
SEE SHEET GR7 FOR CONTINUATION

NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'



CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. CONSTRUCT HANDICAP RAMP SEE DETAIL ON SHEET DT 2,3 & 4
4. FUTURE SIDEWALK
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT APRON CURB SEE SHEET DT1

STORM DRAIN DROP INLET NOTE:

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OFFSITE FLOOD CONTROL NOTE:

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GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-003, DATED MARCH 5, 2018

SIGHT VISIBILITY ZONES:

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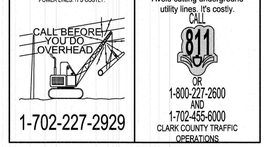

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WILLIAM J MEYER , P.E. No. 15745 DATE

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) 362-2397 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 6

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	BCC 05/28/2019
DESIGNED BY:	BCC 05/28/2019
CHECKED BY:	YUM 01/13/2020
PROJECT NO:	7881
SCALE:	1"=20' HORIZ. N/A VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
GR6
24 OF **94** SHEETS

DRAWING NO.

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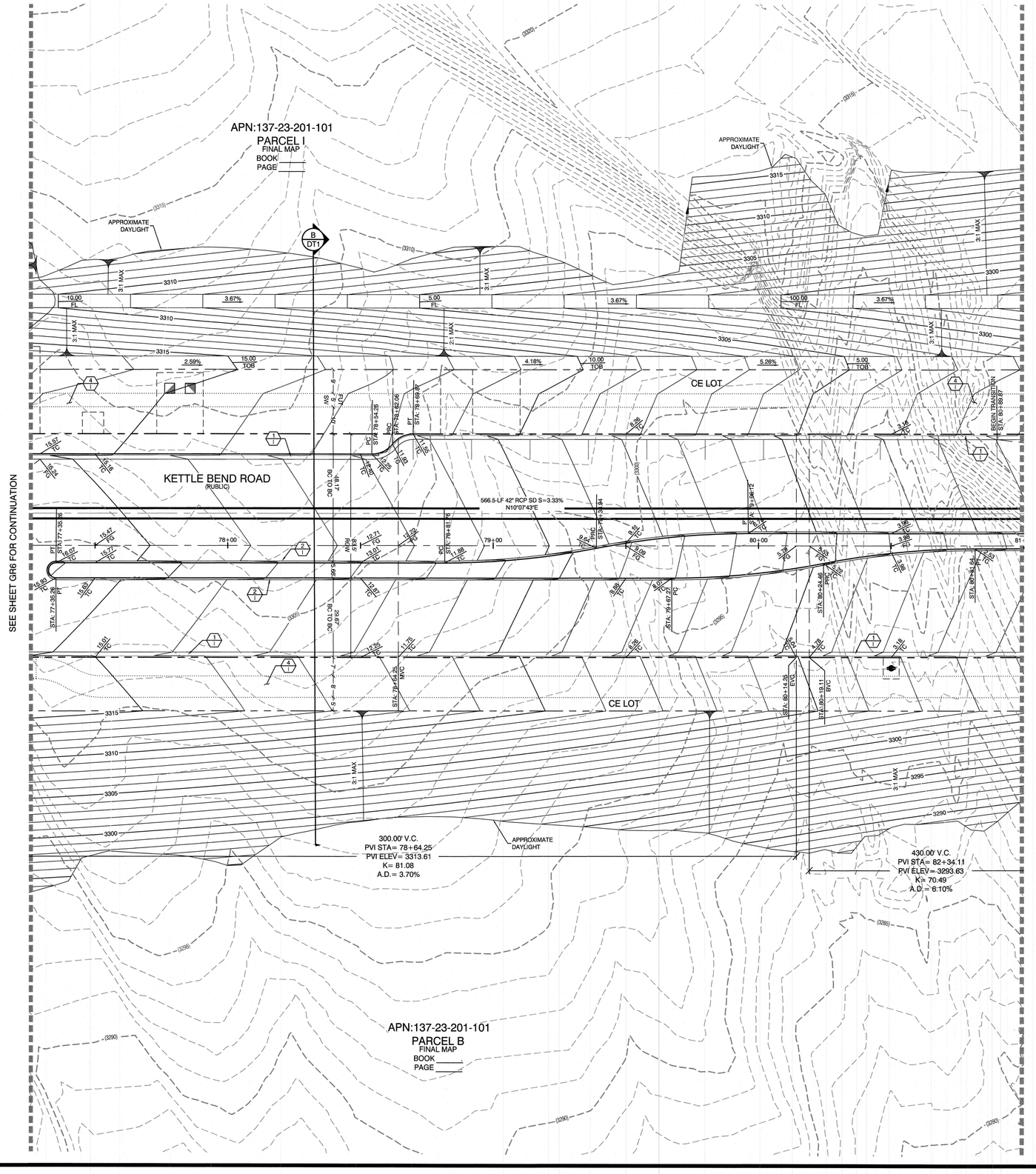

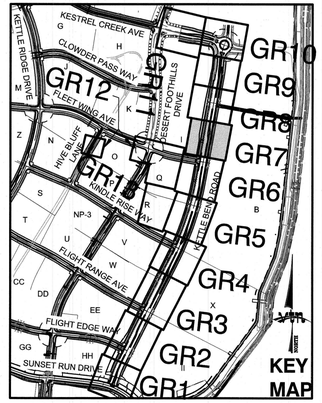

NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. CONSTRUCT HANDICAP RAMP SEE DETAIL ON SHEET DT 2,3 & 4
4. FUTURE SIDEWALK
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT APRON CURB SEE SHEET DT1

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REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-003, DATED MARCH 5, 2018

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Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
OR
1-702-229-6811
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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CLARK COUNTY TRAFFIC OPERATIONS

ENGINEER DISCLAIMER NOTE:

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I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #DS05204

WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-214-4000

VTN
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2997 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 7

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	05/28/2019	SCALE:	1"=20' HORIZ.
DESIGNED BY: BCC	05/28/2019		N/A VERT.
CHECKED BY: WJM	01/13/2020		
PROJECT NO: 7861			

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745

SHEET
GR7
25 OF 94 SHEETS

DRAWING NO.

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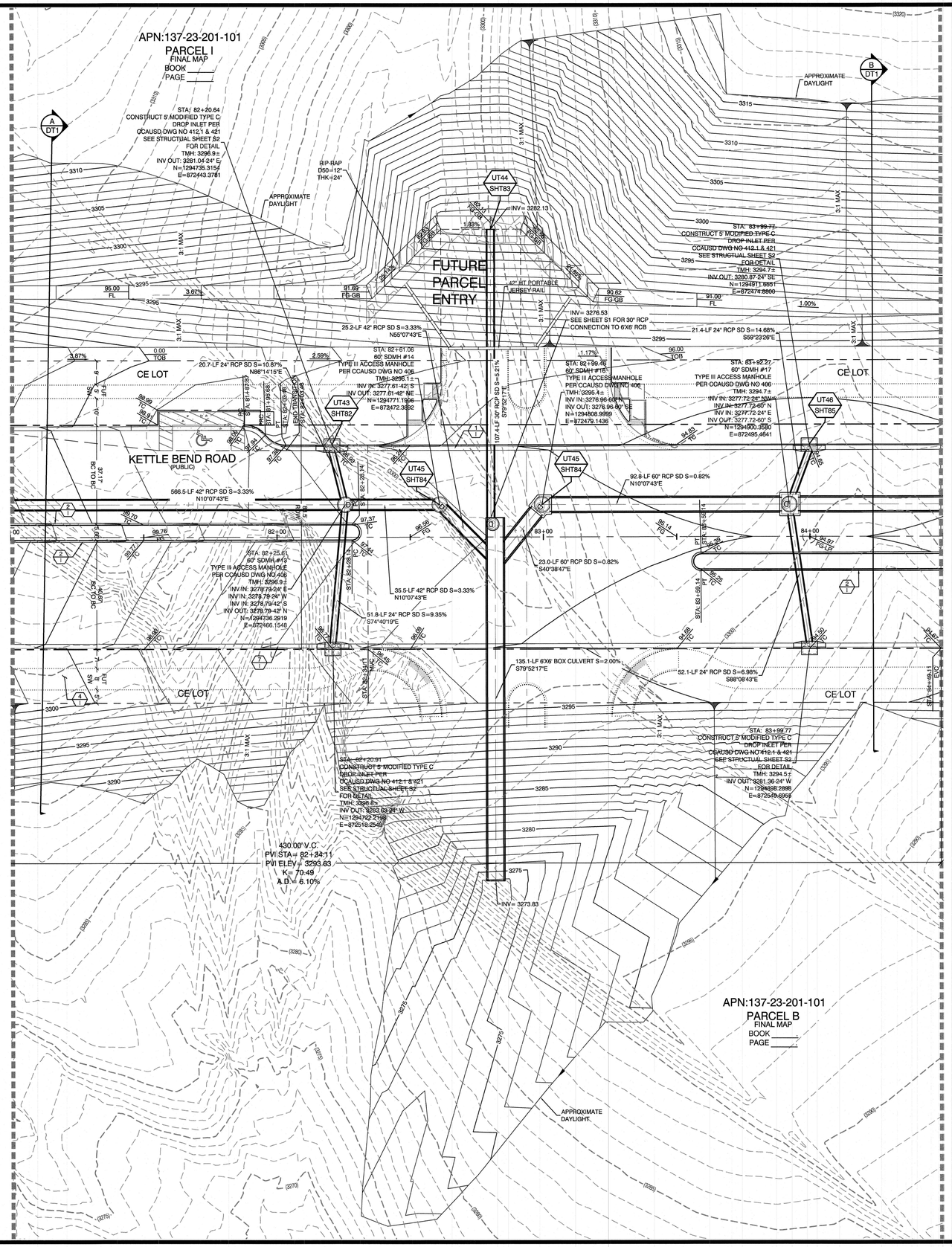

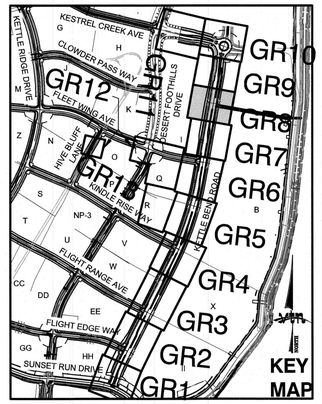

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. CONSTRUCT HANDICAP RAMP SEE DETAIL ON SHEET DT 2,3 & 4
4. FUTURE SIDEWALK
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT APRON CURB SEE SHEET DT1

STORM DRAIN DROP INLET NOTE:

ALL STORM DRAIN INLETS SHALL INCLUDE A STORM WATER INLET CONCRETE STAMP IN ACCORDANCE WITH CCAUSD DWG NO. 421

OFFSITE FLOOD CONTROL NOTE:

ALL OFFSITE INTERIM FLOOD CONTROL FACILITIES SUCH AS BUT NOT LIMITED TO BERMS/DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY THE HOWARD HUGHES COMPANY.

GRADING PERMIT NOTE

THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHERS STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL PROJECT #G-18-003, DATED MARCH 5, 2018

SIGHT VISIBILITY ZONES:

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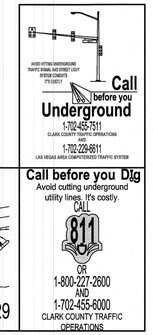

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WILLIAM J MEYER , P.E. No. 15745 DATE

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 89146-5148
PH: (702) 873-7550 FAX (702) 382-2397 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 8

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	05/28/2019	SCALE:	1"=20' HORIZ
DESIGNED BY: BCC	05/28/2019		N/A VERT.
CHECKED BY: WJM	01/13/2020		
PROJECT NO: 7891			

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/13/20

SHEET
GR8
26 OF **94** SHEETS

DRAWING NO.

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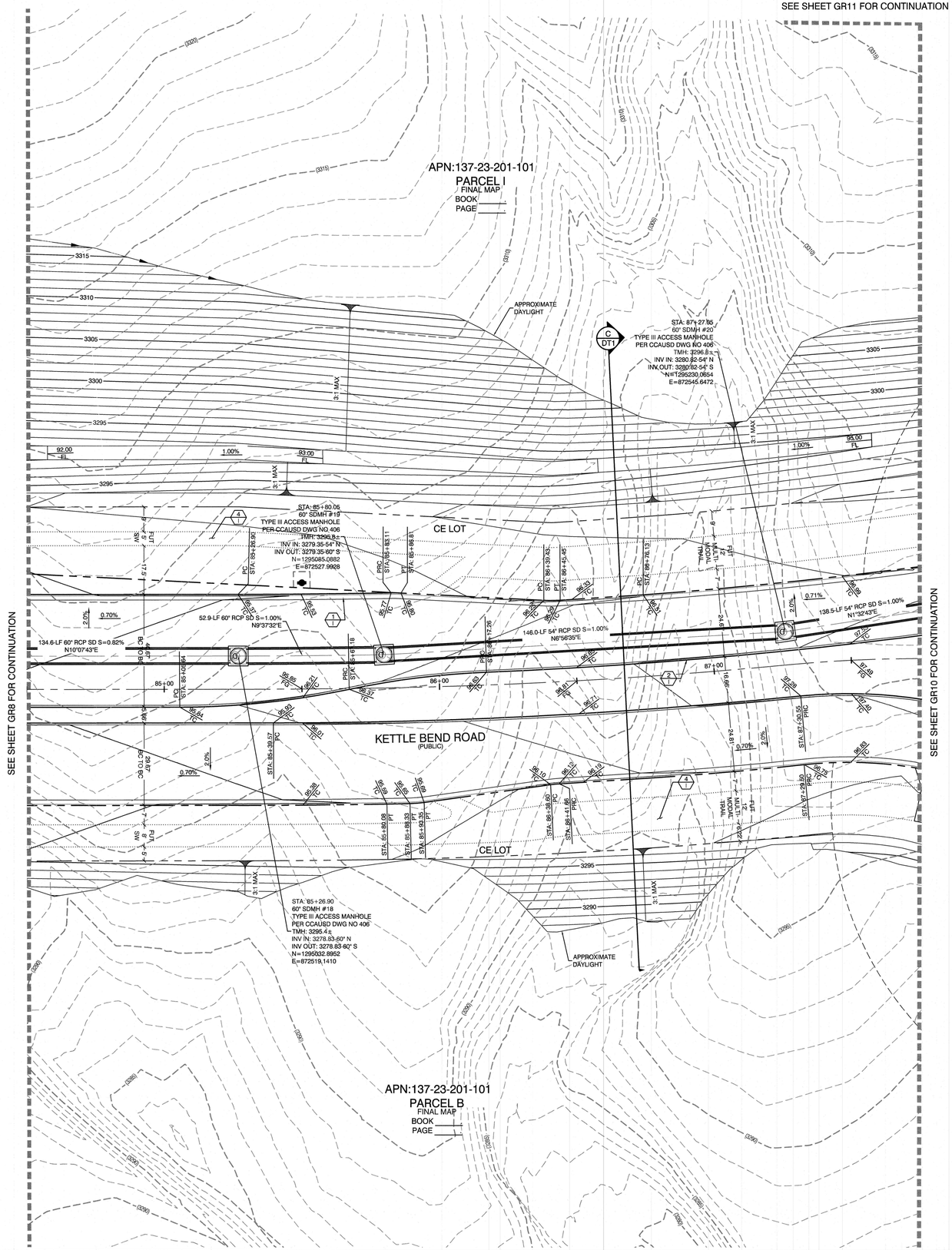
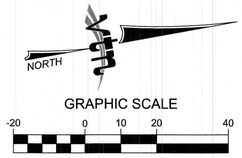
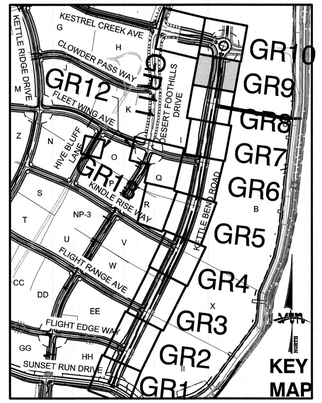
SEE SHEET GR11 FOR CONTINUATION



SEE SHEET GR8 FOR CONTINUATION

SEE SHEET GR10 FOR CONTINUATION





CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. CONSTRUCT HANDICAP RAMP SEE DETAIL ON SHEET DT 2,3 & 4
4. FUTURE SIDEWALK
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT APRON CURB SEE SHEET DT1

OFFSITE FLOOD CONTROL NOTE:

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GRADING PERMIT NOTE

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GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-003, DATED MARCH 5, 2018

SIGHT VISIBILITY ZONES:

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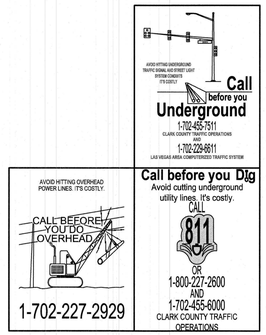

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WILLIAM J MEYER , P.E. No. 15745 DATE

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

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 382-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

CITY OF LAS VEGAS

GRADING PLAN 9

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	05/28/2019		
DESIGNED BY: BCC	05/28/2019		
CHECKED BY: WJM	01/13/2020	SCALE:	1"=20' HORIZ. N/A VERT.
PROJECT NO: 7861			

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/13/20

SHEET
GR9
27 OF 94 SHEETS
DRAWING NO.

1

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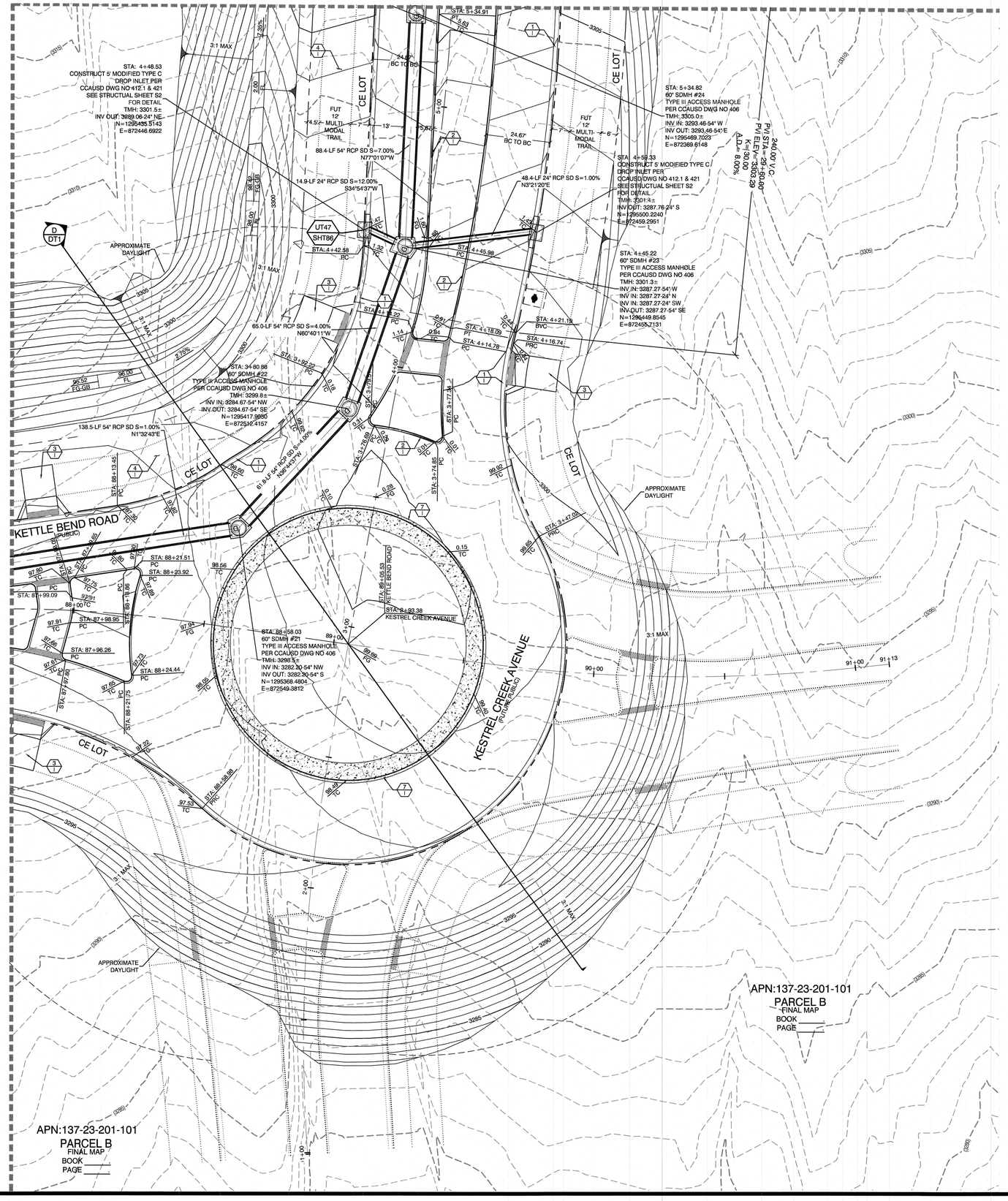
SEE SHEET GR11 FOR CONTINUATION



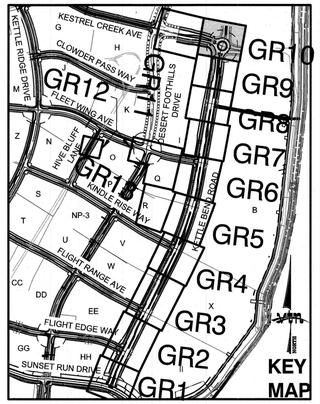
SEE SHEET GR9 FOR CONTINUATION



GRAPHIC SCALE

-20 0 10 20 40

1" = 20'



CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. CONSTRUCT HANDICAP RAMP SEE DETAIL ON SHEET DT 2,3 & 4
4. FUTURE SIDEWALK
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT APRON CURB SEE SHEET DT1

STORM DRAIN DROP INLET NOTE:

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OFFSITE FLOOD CONTROL NOTE:

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GEOTECHNICAL NOTE:

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PROJECT #G-18-003, DATED MARCH 5, 2018

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WILLIAM J MEYER , P.E. No. 15745 DATE

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) 873-7590 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 10

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
BCC 05/28/2019	BCC 05/28/2019	WMM 01/13/2020	7861	1"=20' HORIZ. N/A VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
GR10
28 OF 94 SHEETS

DRAWING NO.

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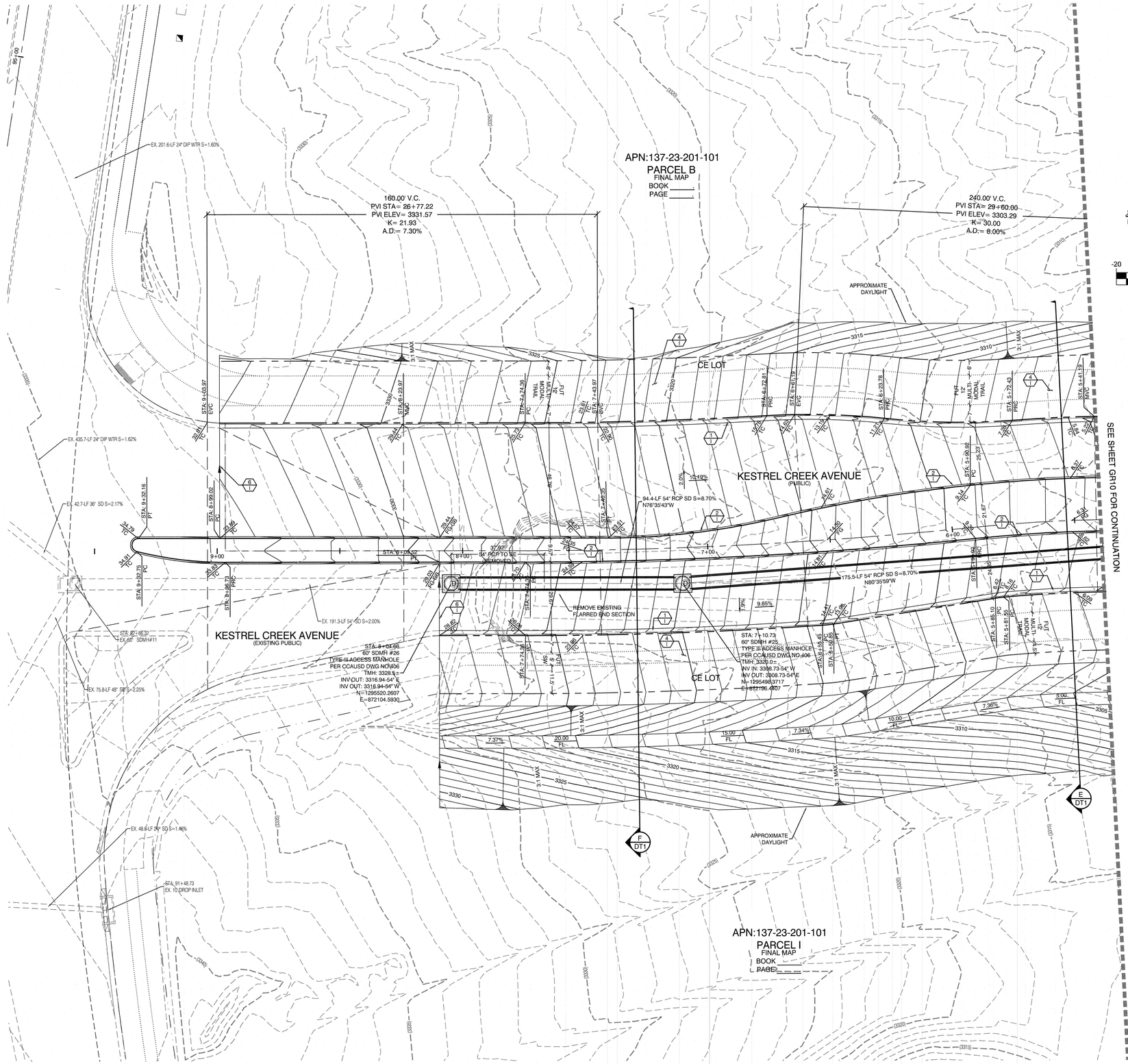

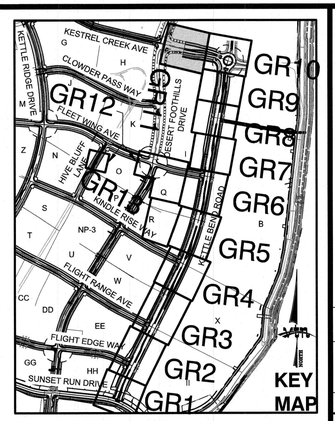

NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. CONSTRUCT HANDICAP RAMP SEE DETAIL ON SHEET DT 2,3 & 4
4. FUTURE SIDEWALK
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT APRON CURB SEE SHEET DT1

OFFSITE FLOOD CONTROL NOTE:

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WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-291-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7590 FAX (702) 362-2397 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 11

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC 05/28/2019
DESIGNED BY: BCC 05/28/2019
CHECKED BY: WJM 01/13/2020
PROJECT NO: 7861
SCALE: 1"=20' HORIZ. N/A VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
No. 15745
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
1/14/20

SHEET
GR11
29 OF 94 SHEETS

DRAWING NO.

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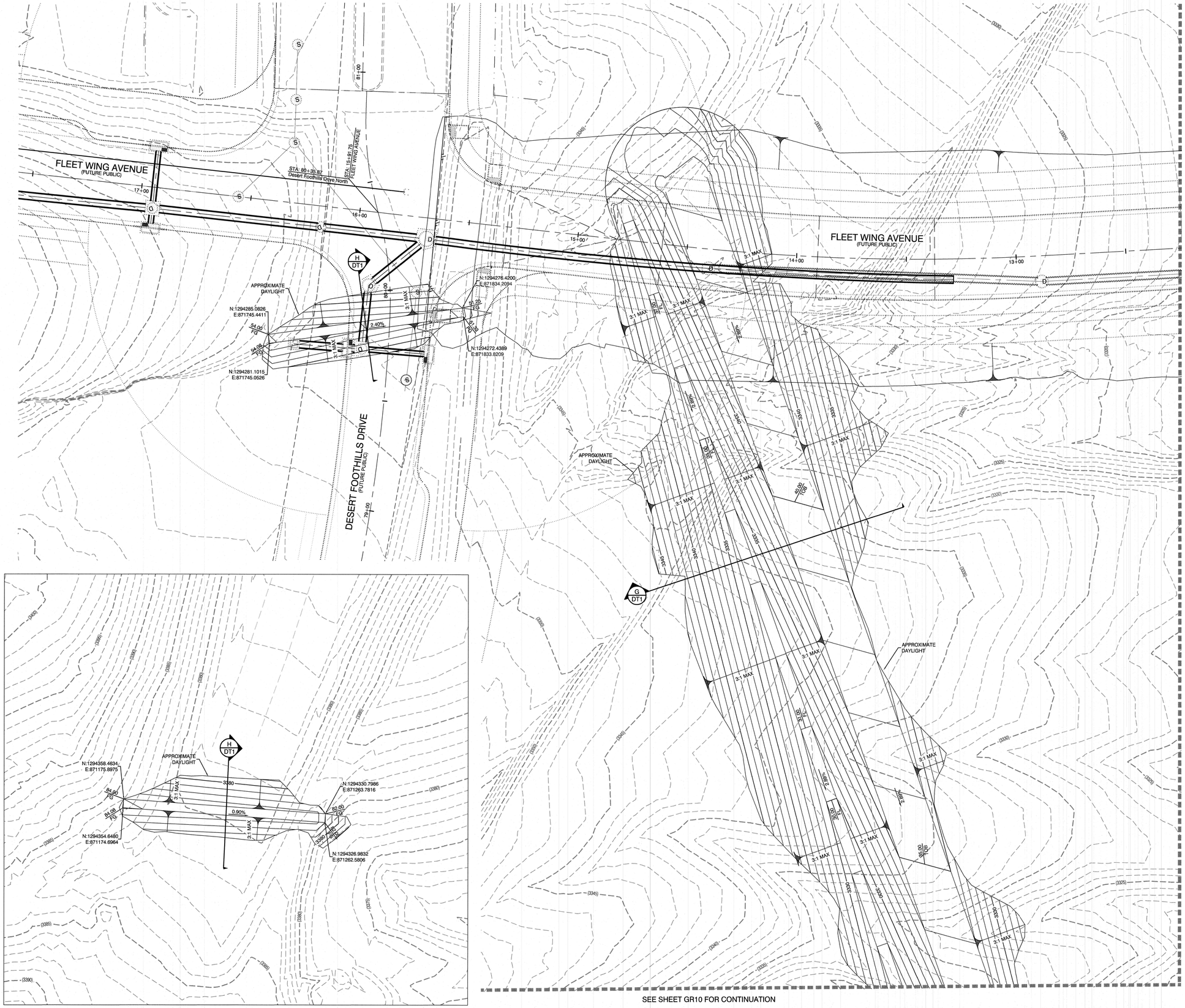

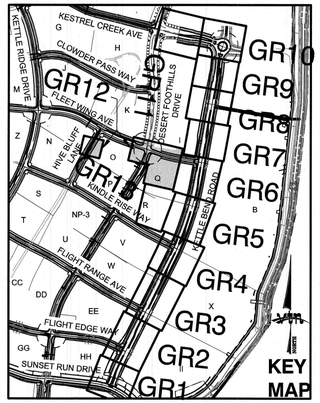

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. CONSTRUCT HANDICAP RAMP SEE DETAIL ON SHEET DT 2,3 & 4
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6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT APRON CURB SEE SHEET DT1

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Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

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

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WILLIAM J MEYER , P.E. No. 15745 DATE

REV	DATE	BY	REVISION

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CITY OF LAS VEGAS

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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 12

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	BCC
DESIGNED BY:	BCC
CHECKED BY:	WJM
PROJECT NO:	7861
SCALE:	1"=20' HORZ. / N/A VERT.
	07/29/2019
	07/29/2019
	01/13/2020

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
GR12
30 OF **94** SHEETS
DRAWING NO.

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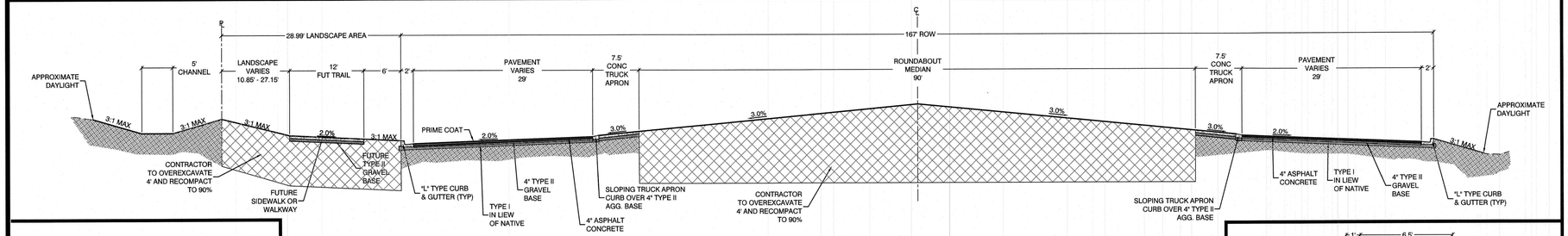
APPROXIMATE DAYLIGHT
APPROXIMATE DAYLIGHT
3:1 MAX
3:1 MAX
3:1 MAX



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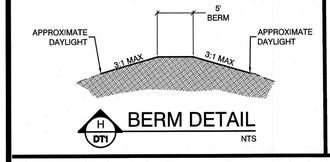
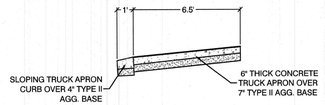
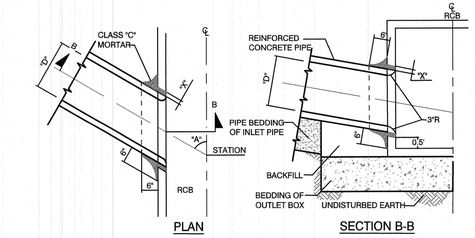


H DT1 BERM DETAIL
NTS



TRUCK APRON BLOW-UP
NTS



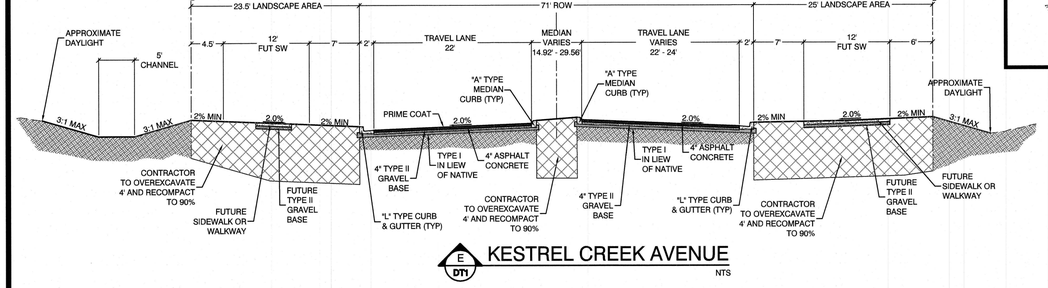
PLAN

SECTION B-B

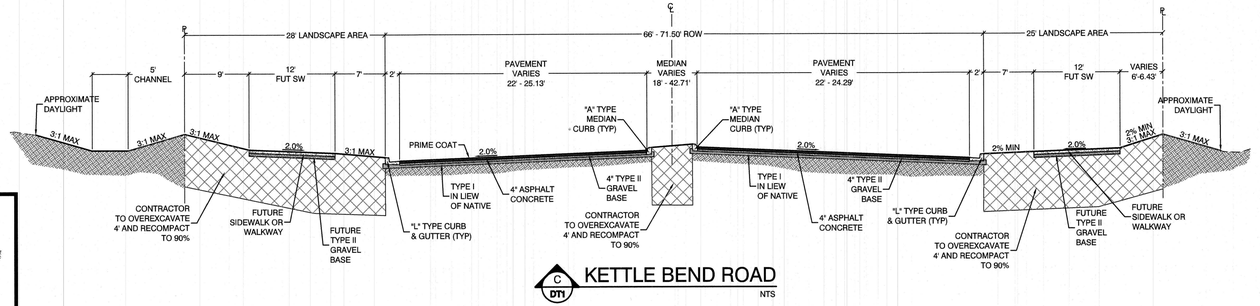
NOTES:

1. SEE PLAN FOR ANGLE "A"
2. DIMENSION "X" SHALL BE 2" MINIMUM AND 4" MAXIMUM
3. BURN OR CHIP END OF INLET PIPE FLUSH WITH INNER SURFACE OF MAINLINE. ROUND EDGES OF MAINLINE AND INLET PIPE.

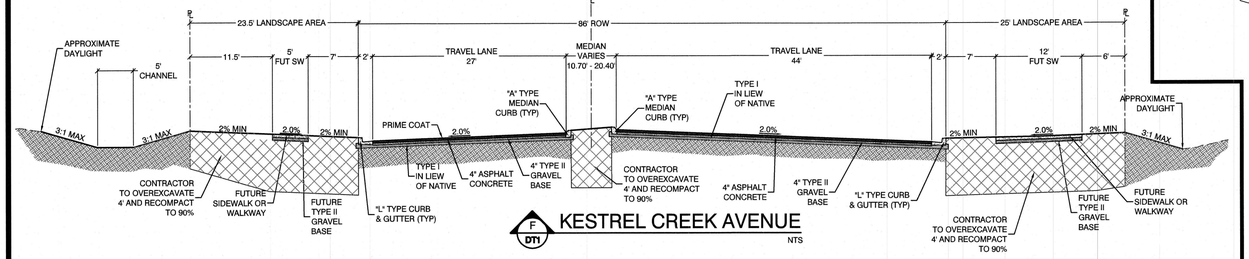
RCB PENETRATION DETAIL
NTS



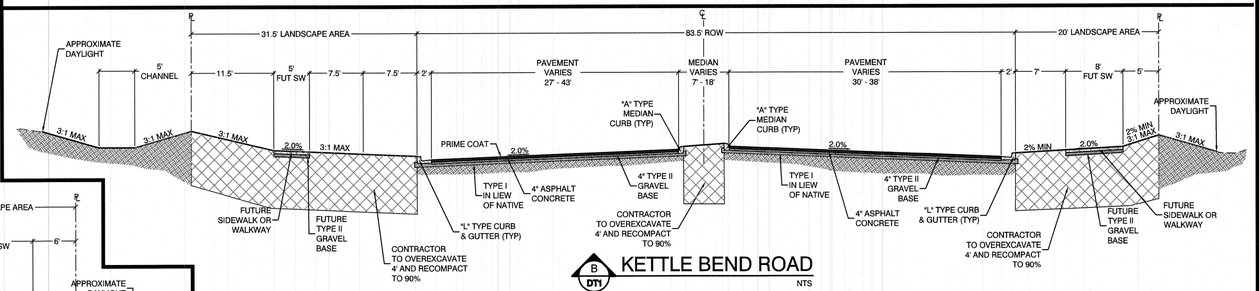
E DT1 KESTREL CREEK AVENUE
NTS



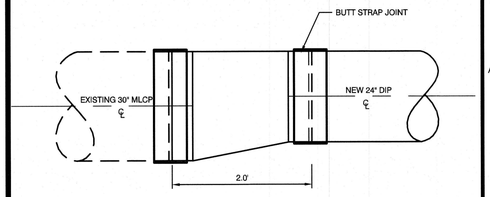
C DT1 KETTLE BEND ROAD
NTS



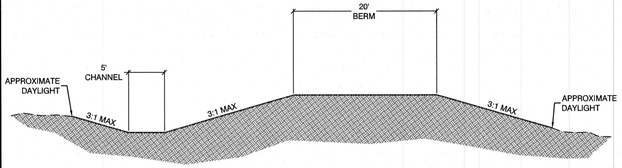
F DT1 KESTREL CREEK AVENUE
NTS



B DT1 KETTLE BEND ROAD
NTS



CONNECTION WITH ECCENTRIC REDUCER
NTS



G DT1 TYPICAL GRADING SECTION
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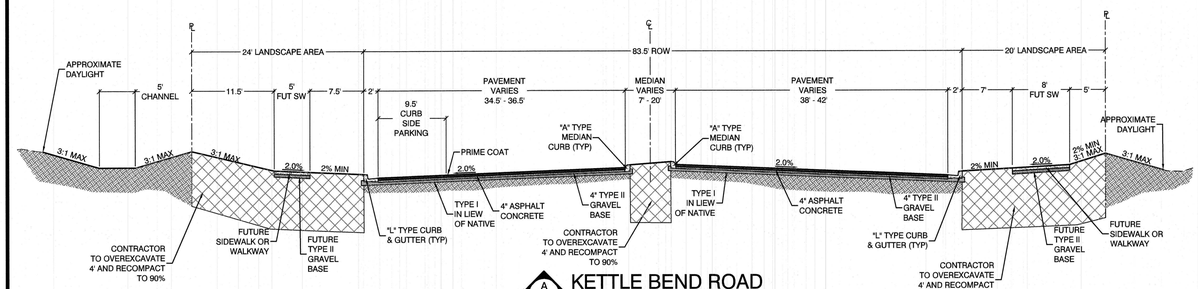

A DT1 KETTLE BEND ROAD
NTS

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4500

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

DETAIL SHEET 1

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	06/04/2019	SCALE:	HORIZ. —
DESIGNED BY: BCC	06/04/2019		VERT. N/A
CHECKED BY: WJM	01/13/2020		
PROJECT NO.: 7861			

PROFESSIONAL ENGINEER-STATE OF NEVADA
WILLIAM J. MEYER
EXP. 12/31/21
CIVIL
No. 15745
1 / 8 / 20

SHEET
DT1
32 OF **94** SHEETS

DRAWING NO.

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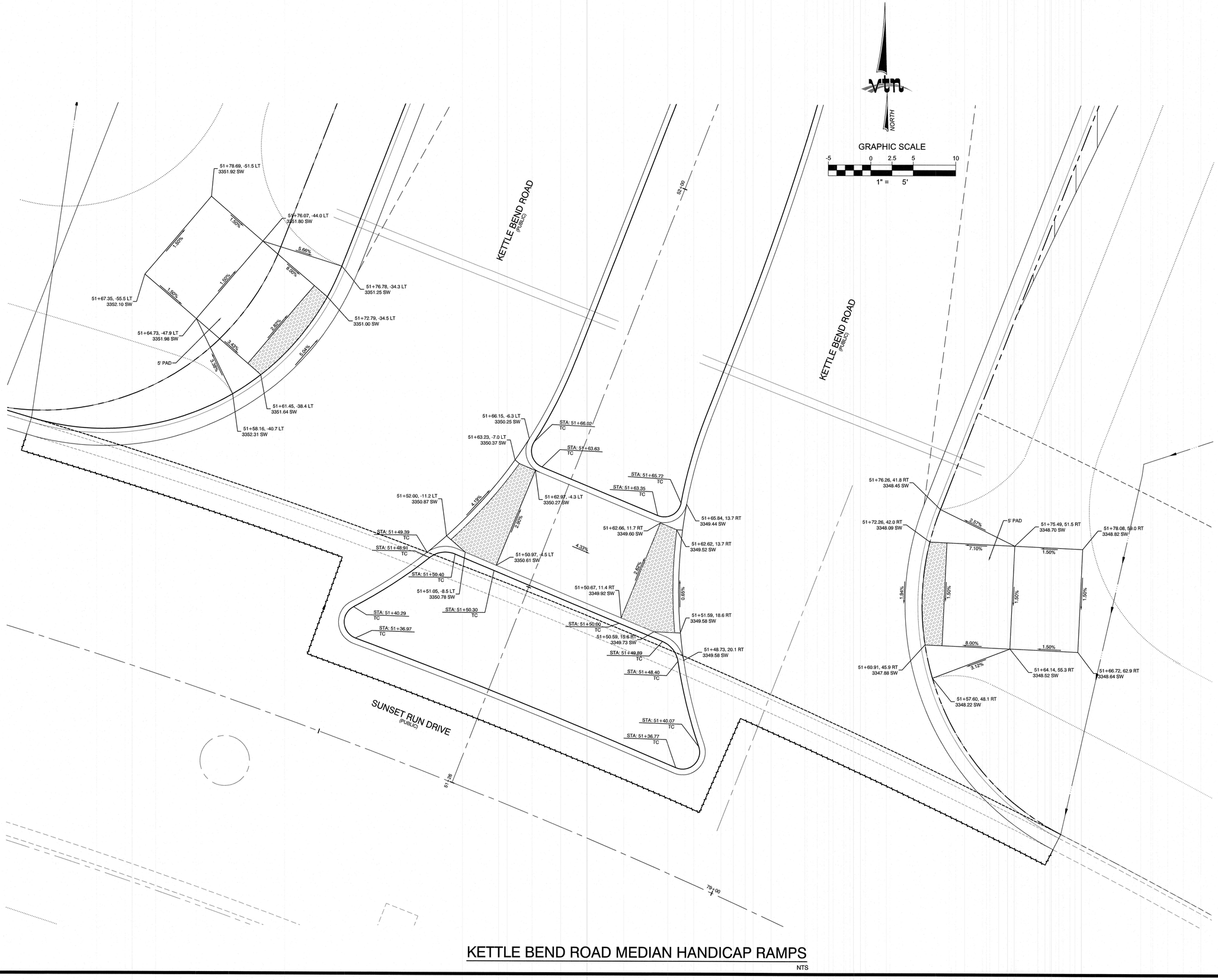

KETTLE BEND ROAD MEDIAN HANDICAP RAMPS

NTS

REV	DATE	BY	REVISION

HOWARD HUGES 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 2

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ.
BCC 06/04/2019	BCC 06/04/2019	WJM 01/13/2020	7861	1"=5'	VERT: N/A

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745

SHEET
DT2
33 OF 94 SHEETS

DRAWING NO.

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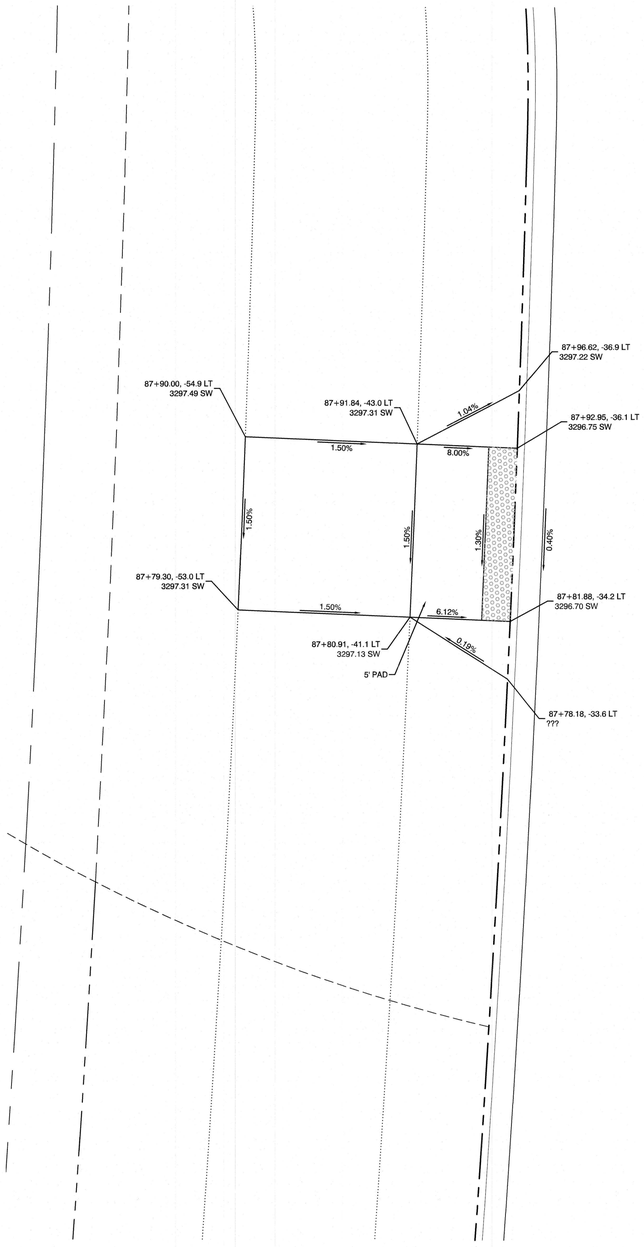

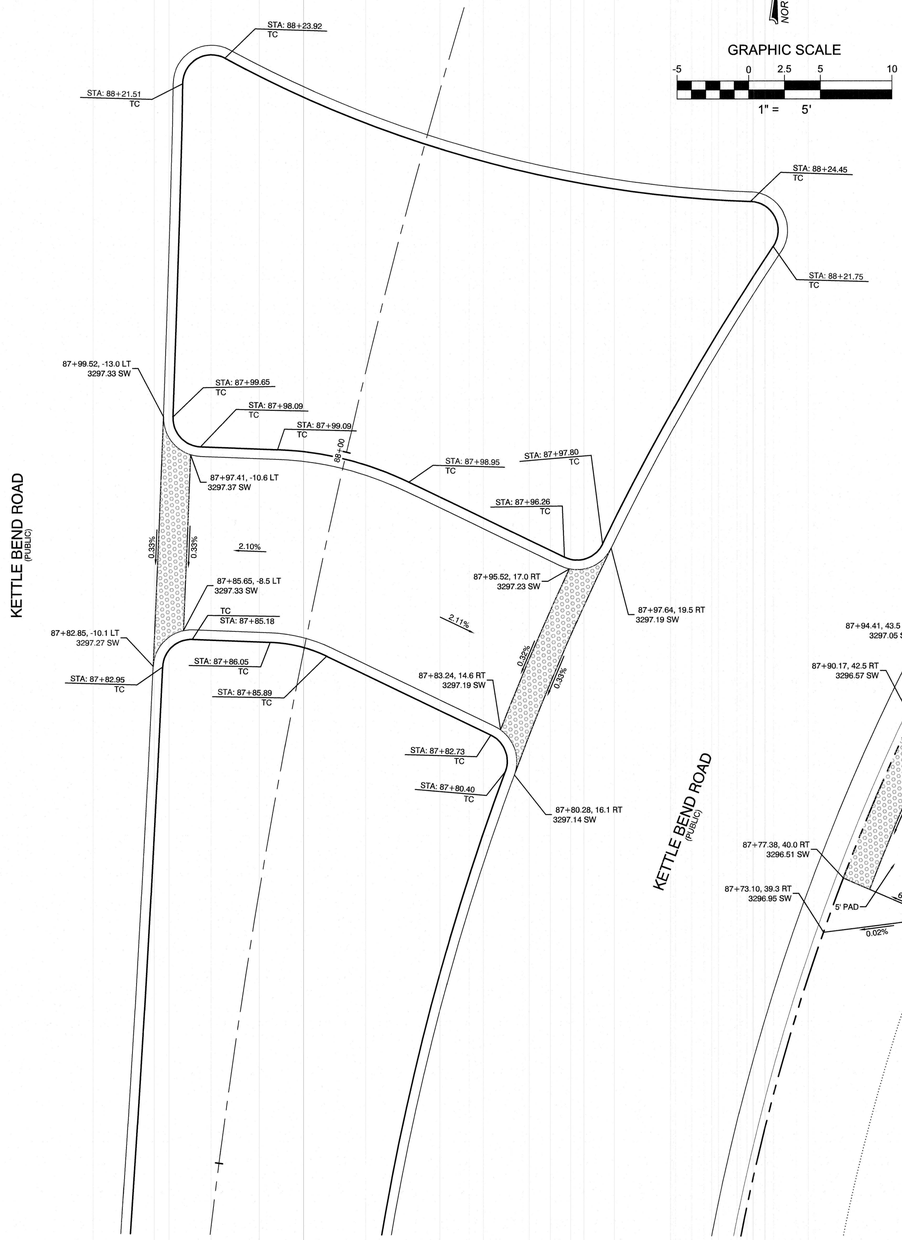

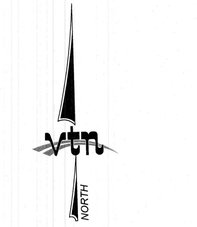

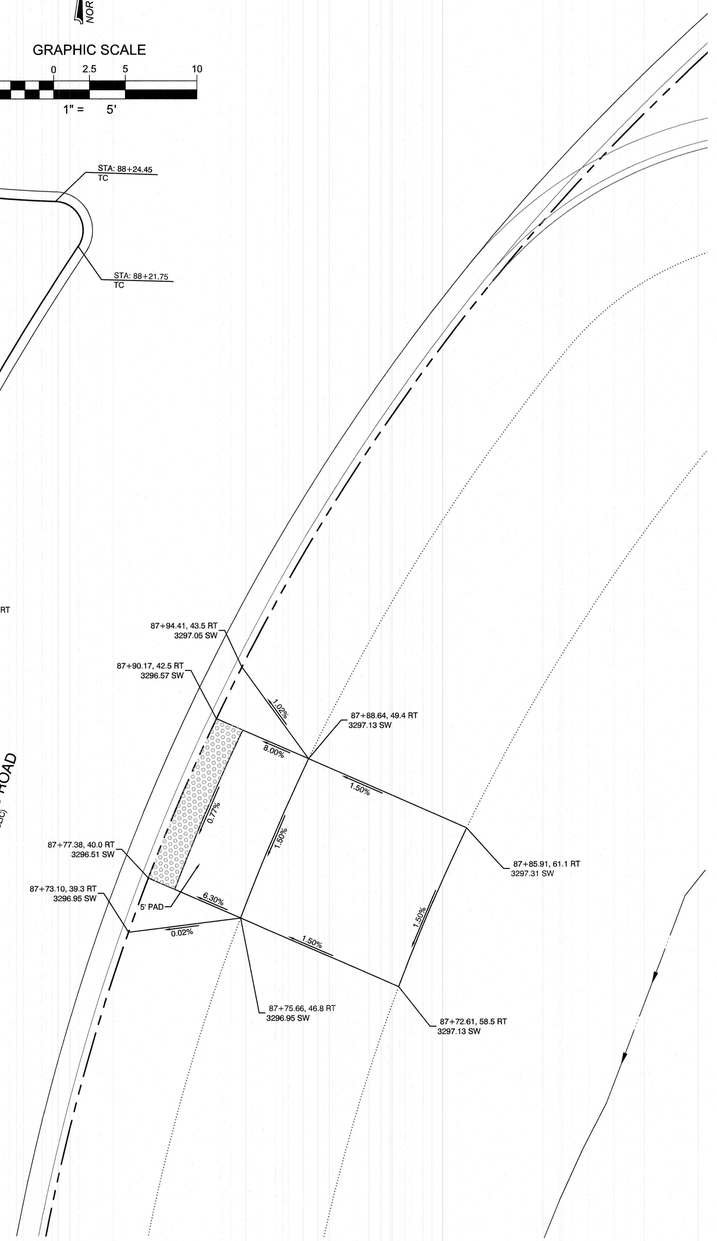

KETTLE BEND ROAD MEDIAN HANDICAP RAMPS

NTS

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4500

CITY OF LAS VEGAS

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LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

DETAIL SHEET 3

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	06/04/2019		
DESIGNED BY: BCC	06/04/2019		
CHECKED BY: WJM	01/13/2020	SCALE:	1"=5' HORIZ. N/A VERT.
PROJECT NO: 7861			

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 13749
1/16/20

SHEET
DT3
34 OF **94** SHEETS

DRAWING NO.

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KETTLE BEND ROAD MEDIAN HANDICAP RAMPS

NTS

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
(702) 214-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
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DETAIL SHEET 4

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	06/04/2019	SCALE:	1"=5' HORIZ.
DESIGNED BY: BCC	06/04/2019		N/A VERT.
CHECKED BY: WJM	01/13/2020		
PROJECT NO: 7861			

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
DT4
35 OF **94** SHEETS

DRAWING NO.

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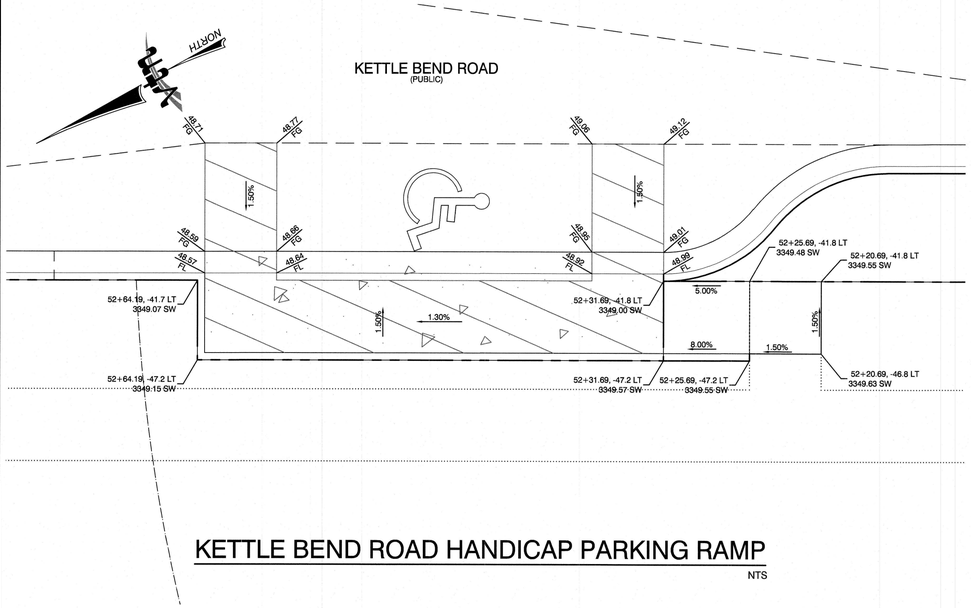


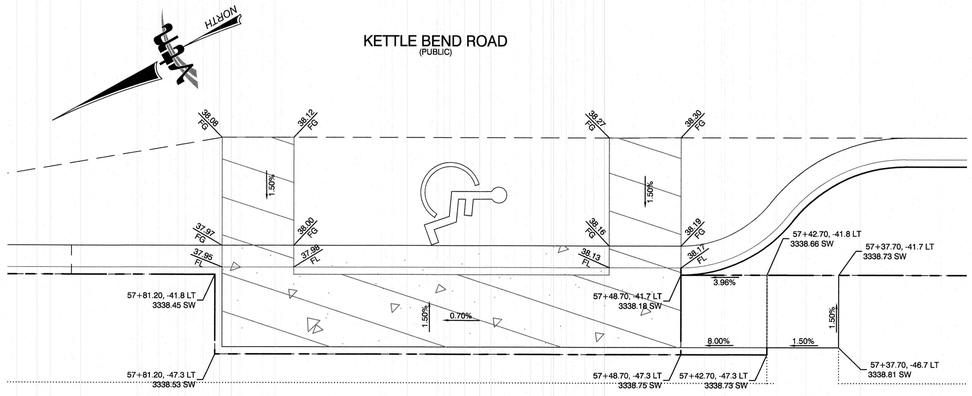
KETTLE BEND ROAD HANDICAP PARKING RAMP

NTS

GRAPHIC SCALE

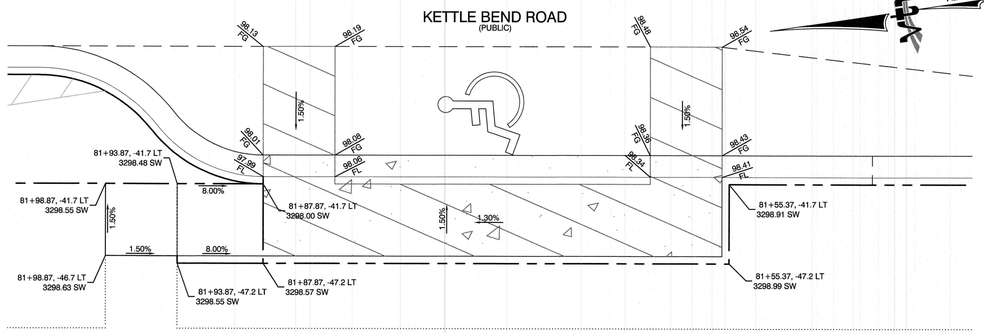
-5 0 2.5 5 10

1" = 5'



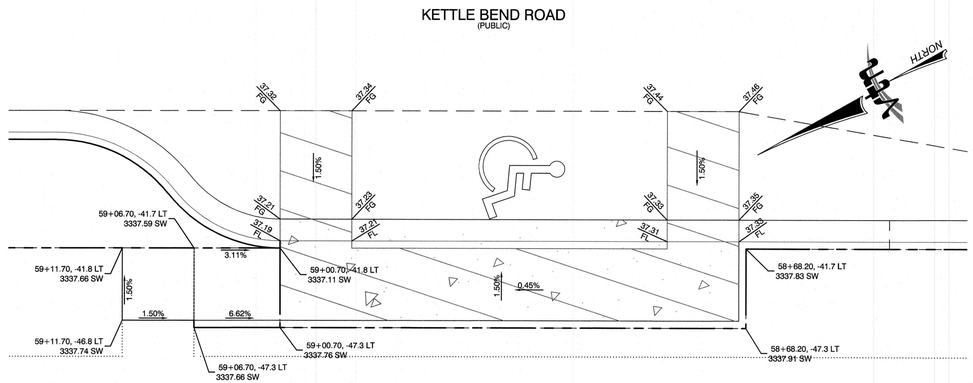
KETTLE BEND ROAD HANDICAP PARKING RAMP

NTS



KETTLE BEND ROAD HANDICAP PARKING RAMP

NTS



KETTLE BEND ROAD HANDICAP PARKING RAMP

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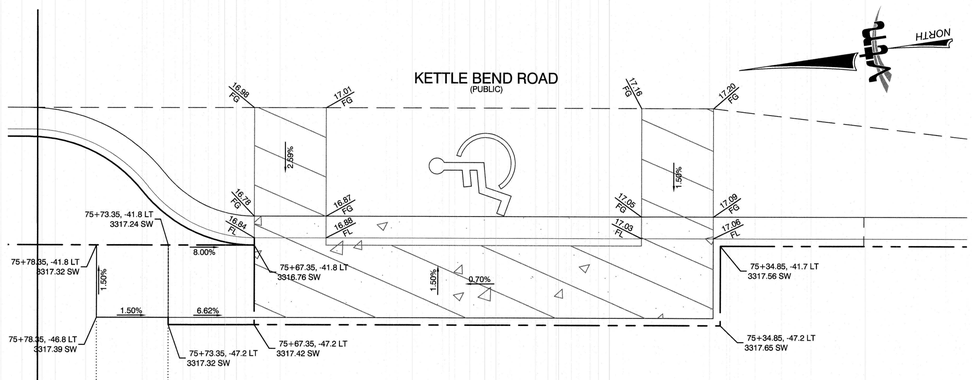

KETTLE BEND ROAD HANDICAP PARKING RAMP

NTS

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
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DETAIL SHEET 5

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ	VERT:
BCC	BCC	WJM	7861	1"=5'	N/A	
09/11/2019	09/11/2019	01/13/2020				

PROFESSIONAL ENGINEER - STATE OF NEVADA
No. 15745
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
1/16/20

SHEET
DT5
36 OF **94** SHEETS

DRAWING NO.

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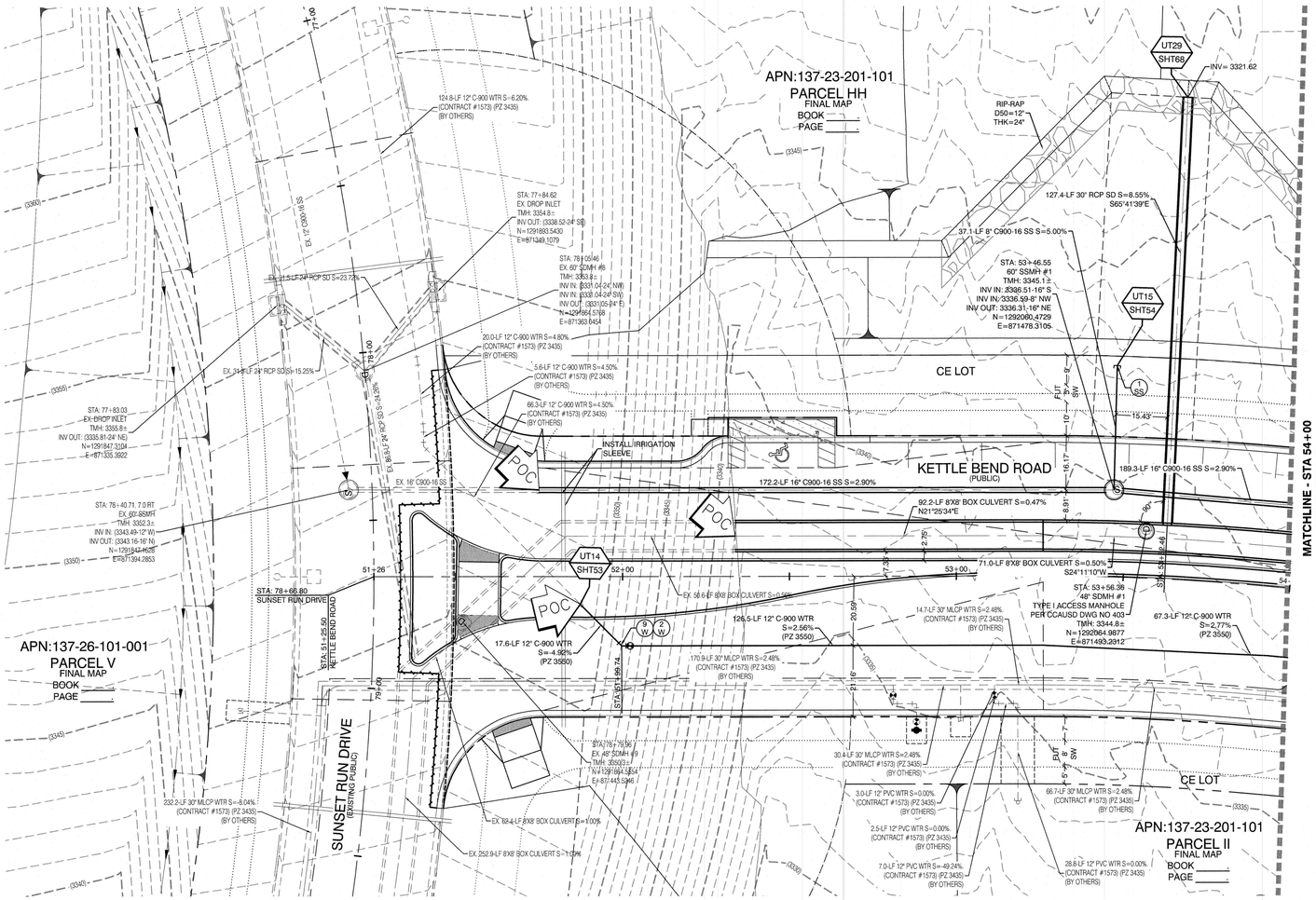

SEE SHEET UT1A FOR UTILITY PROFILE



GRAPHIC SCALE

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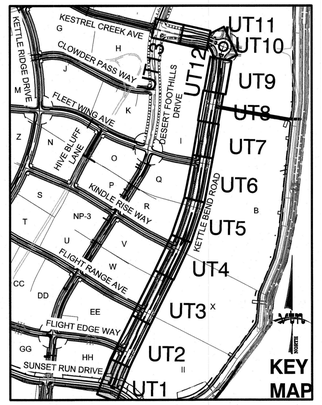
1" = 20'



CONSTRUCTION NOTES

	WATER	PUBLIC
FH	FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
GV	12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
BO	12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4	12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5	24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6	24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7	24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8	24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9	12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10	1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11	1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
	24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
POC	WATER POINT OF CONNECTION	

NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

WATER MAIN JOINT DEFLECTION

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

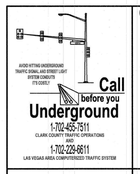
FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.

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 CONTRACTORS 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.







LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE:
PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

CONSTRUCTION NOTES

	SEWER	PUBLIC
S	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	8" C-900-16 SANITARY SEWER MAIN	296 LF.
	16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
12 SS	12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
POC	SEWER POINT OF CONNECTION	

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 AND 3550 PRESSURE ZONES.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

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 89146-5148
PH: (702) 873-7550 FAX (702) 362-2397 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN 1
51+00 TO 54+00

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	05/28/2019		
DESIGNED BY: BCC	05/28/2019		
CHECKED BY: WJM	01/13/2020		
PROJECT NO: 7981	SCALE:	1"=20'	HORIZ.
		1"=4'	VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
UT1
37 OF 94 SHEETS

DRAWING NO.

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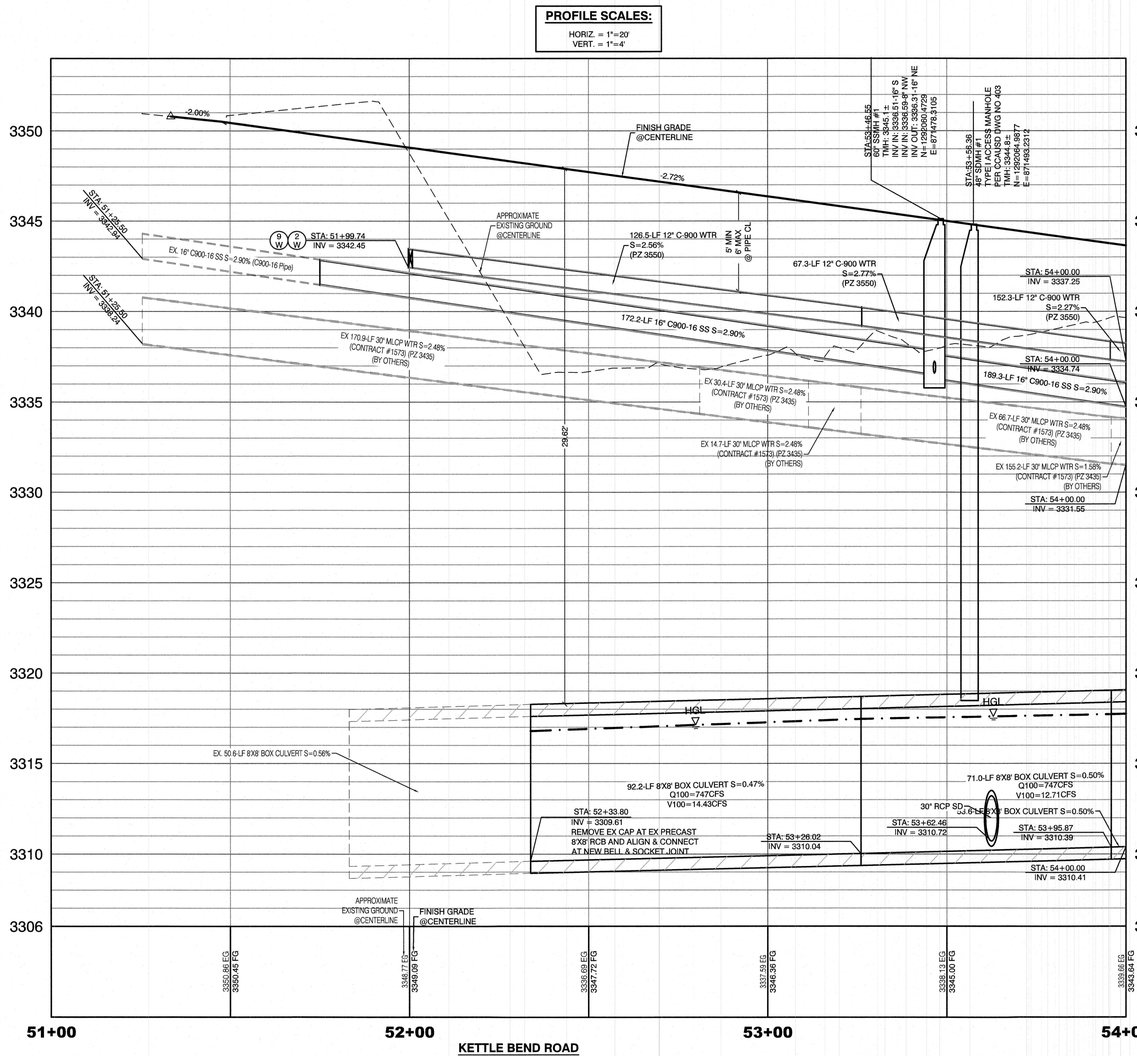
SEE SHEET UT1 FOR PLAN VIEW

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:
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2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

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

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

UTILITY CROSSING NOTE:
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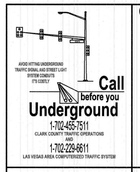

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL
811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS



CONSTRUCTION NOTES

		WATER	PUBLIC
1W		FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2W		12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3W		12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4W		12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5W		24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6W		24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7W		24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8W		24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9W		12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10W		1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11W		1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
		6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
		12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
		24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
POC		WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

	SEWER	PUBLIC
S	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	8" C-900-16 SANITARY SEWER MAIN	296 LF.
	16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
1 SS	12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
POC	SEWER POINT OF CONNECTION	

WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 AND 3550 PRESSURE ZONES.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____
APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7590 FAX (702) 382-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PROFILE 1A

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE: HORIZ. / VERT.
BCC 05/28/2019	BCC 05/28/2019	WJM 01/13/2020	1"=20' / 1"=4'

PROJECT NO: 7861

WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
PROFESSIONAL ENGINEER - STATE OF NEVADA
No. 15745

SHEET
UT1A
38 OF 94 SHEETS
DRAWING NO.

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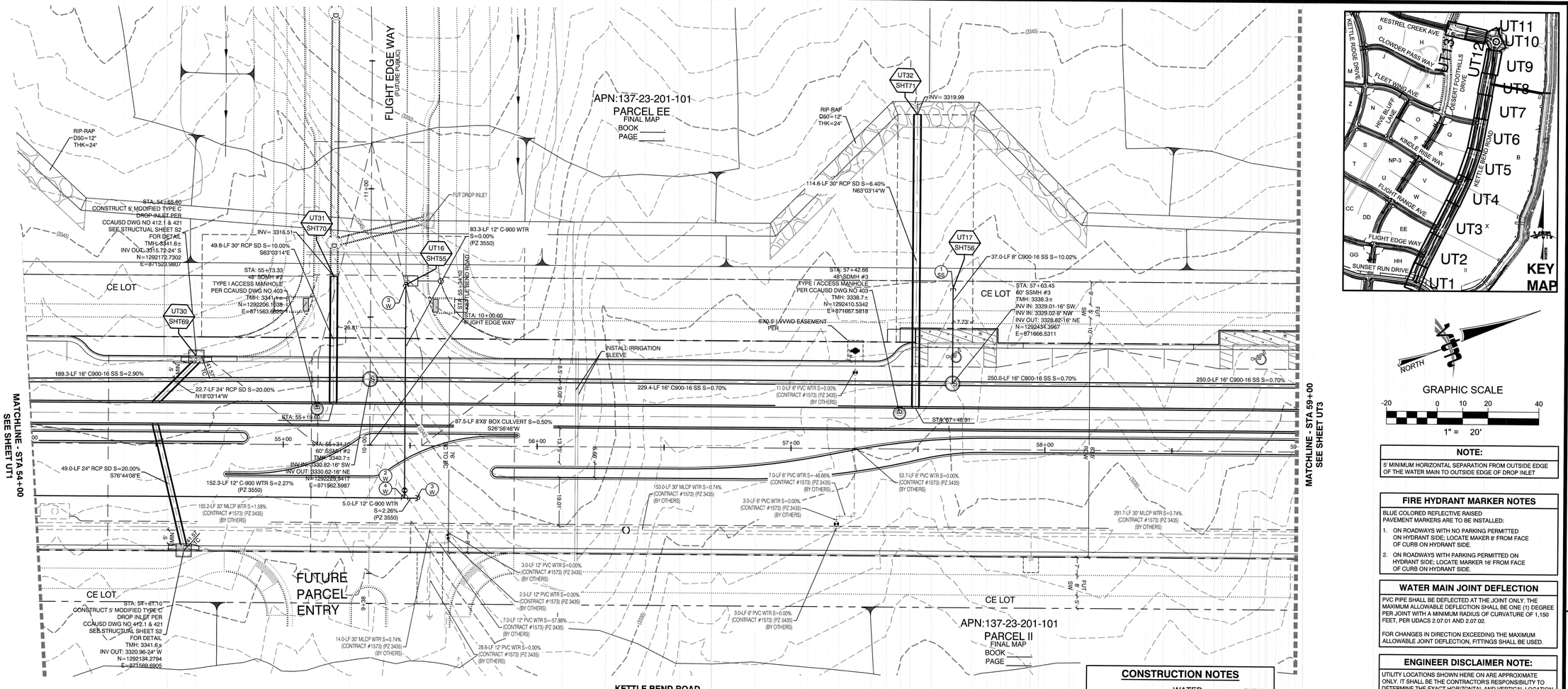

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

WATER MAIN JOINT DEFLECTION

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

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

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WATER SERVICE LOCATED IN THE 3435 AND 3550 PRESSURE ZONES.

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WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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		WATER POINT OF CONNECTION	

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	SEWER POINT OF CONNECTION	



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OR
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AND
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CLARK COUNTY TRAFFIC OPERATIONS



1-702-227-2929

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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) 382-2397 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN 2
54+00 TO 59+00

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	BCC
DESIGNED BY:	BCC
CHECKED BY:	WJM
PROJECT NO:	7861
05/28/2019	
05/28/2019	
01/13/2020	
SCALE:	HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No 15745
1/14/20

SHEET
UT2
39 OF **94** SHEETS

DRAWING NO.

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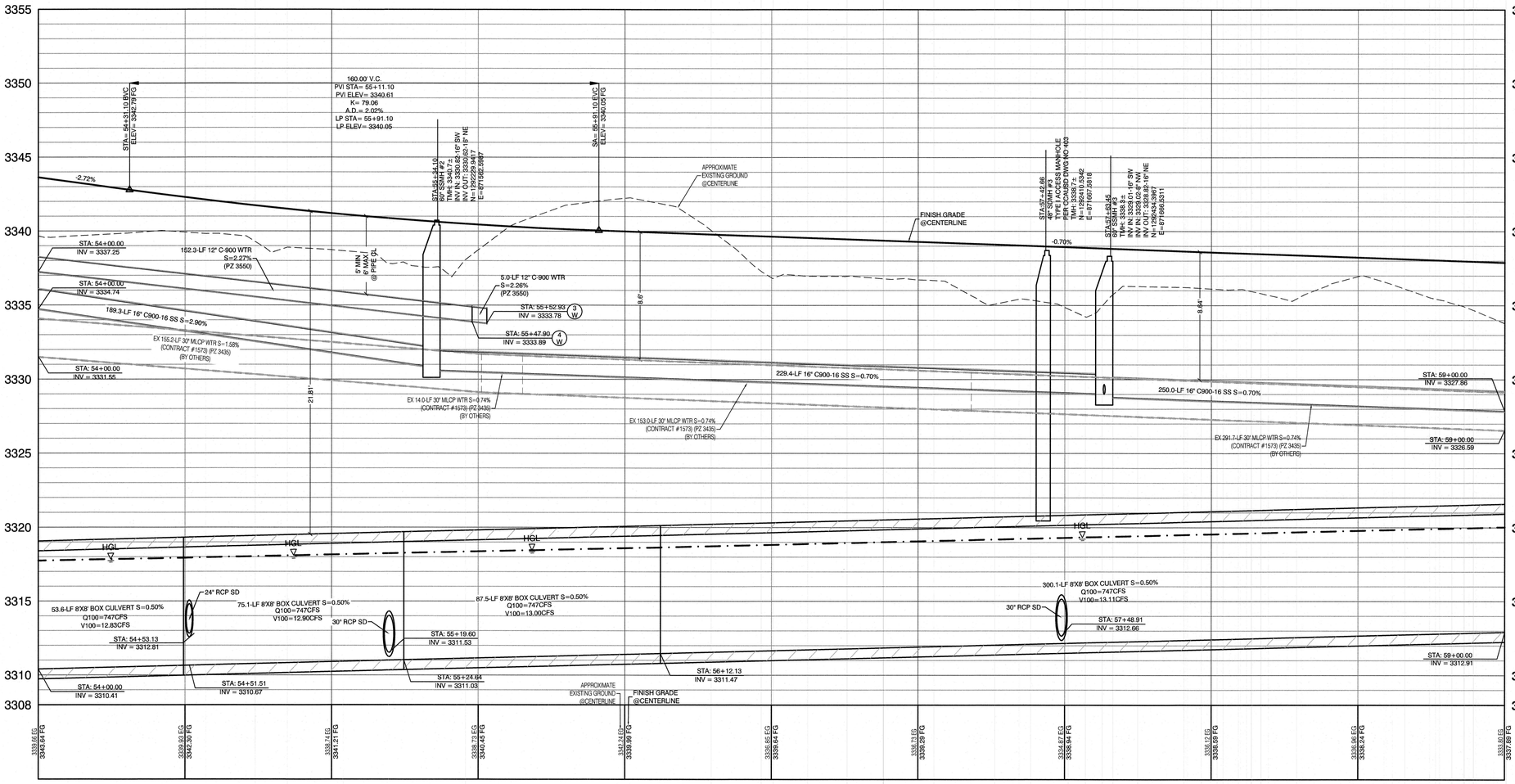
SEE SHEET UT2 FOR PLAN VIEW

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'

NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET



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WPOC	WATER POINT OF CONNECTION	

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LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS
IT'S COSTLY!
Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

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

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4300

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7590 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

UTILITY PROFILE 2A

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC 05/28/2019
DESIGNED BY: BCC 05/28/2019
CHECKED BY: WM 01/13/2020
SCALE: HORIZ. 1"=20' VERT. 1"=4'
PROJECT NO: 7861

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 19749
1 / 14 / 20

SHEET
UT2A
40 OF 94 SHEETS
DRAWING NO.

1

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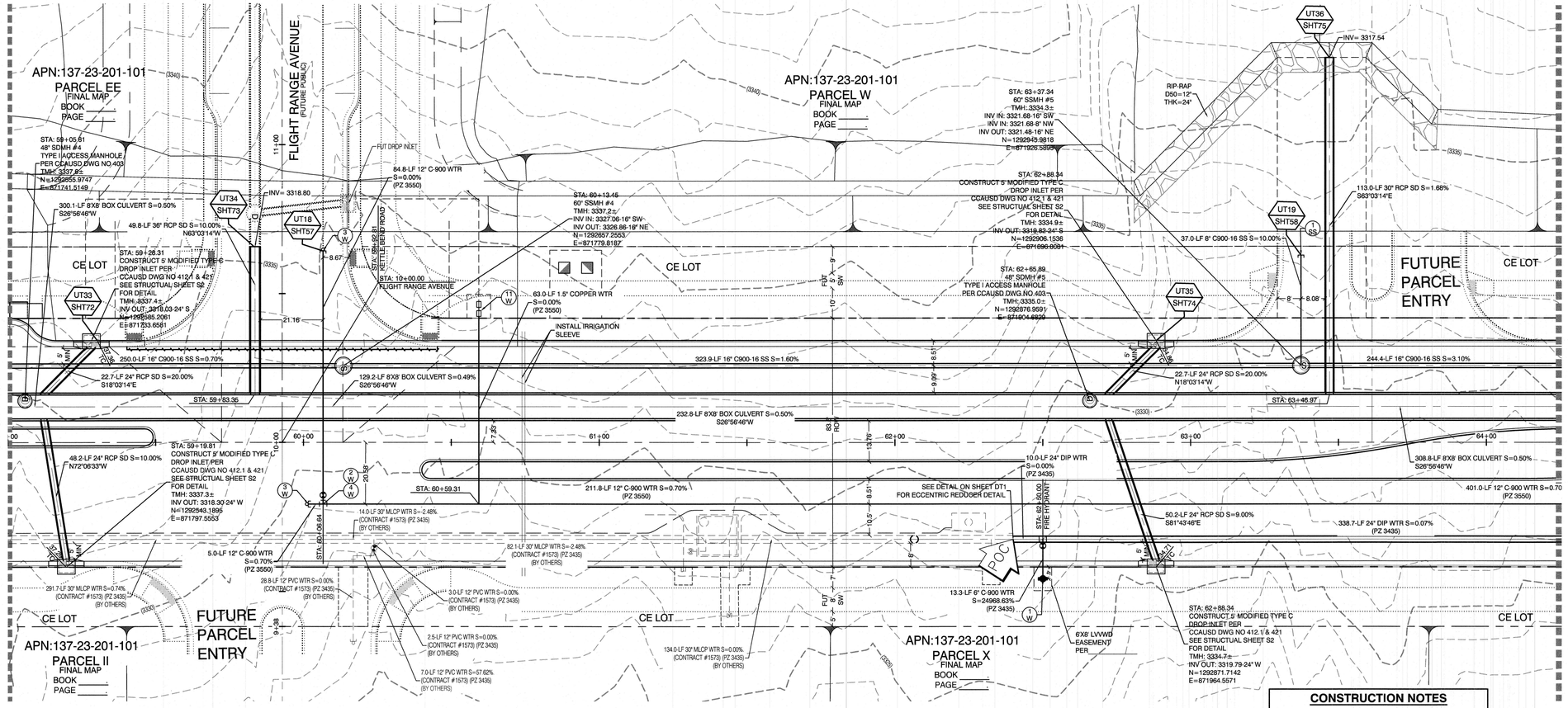
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PARCEL EE
FINAL MAP
BOOK
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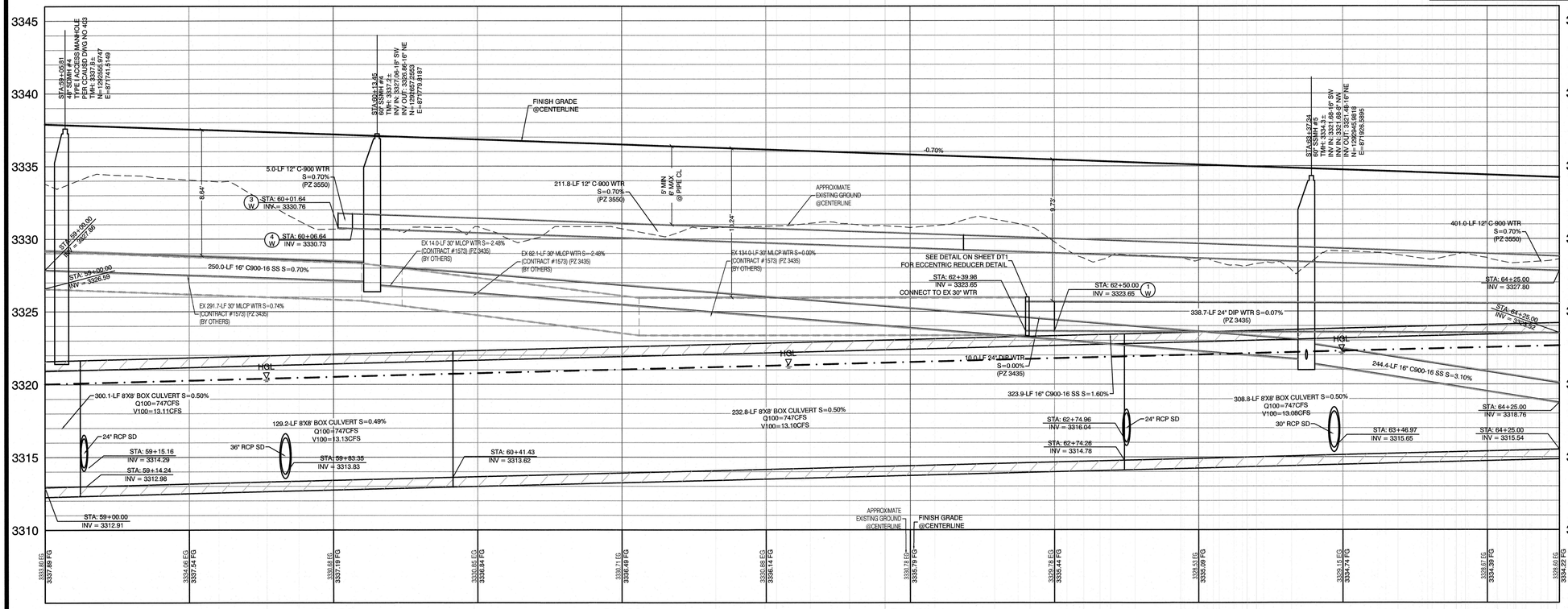
APN:137-23-201-101
PARCEL W
FINAL MAP
BOOK
PAGE
APN:137-23-201-101
PARCEL II
FINAL MAP
BOOK
PAGE
APN:137-23-201-101
PARCEL X
FINAL MAP
BOOK
PAGE
FLIGHT RANGE AVENUE
(FUTURE PUBLIC)
KETTLE BEND ROAD
(PUBLIC)
FUTURE PARCEL ENTRY
CE LOT
MATCHLINE - STA 59+00
SEE SHEET UT2
MATCHLINE - STA 64+25
SEE SHEET UT4
STA: 59+05.61
48" SDMH #4
TYPE I ACCESS MANHOLE
PER CCAUSD DWG NO 403
TMH: 3337.8±
N=1292855.9747
E=871741.5149
STA: 59+26.31
CONSTRUCT 5' MODIFIED TYPE C
DROP INLET PER
CCAUSD DWG NO 412.1 & 421
SEE STRUCTUAL SHEET S2
FOR DETAIL
TMH: 3337.4±
INV OUT: 3318.03-24" S
N=1292835.2061
E=871733.6581
STA: 59+19.81
CONSTRUCT 5' MODIFIED TYPE C
DROP INLET,PER
CCAUSD DWG NO 412.1 & 421
SEE STRUCTUAL SHEET S2
FOR DETAIL
TMH: 3337.3±
INV OUT: 3318.30-24" W
N=1292843.1895
E=871797.5563
STA: 60+13.45
60" SSMH #4
TMH: 3337.2±
INV IN: 3327.06-16" SW
INV OUT: 3326.66-16" NE
N=1292857.2553
E=871779.8187
STA: 62+88.34
CONSTRUCT 5' MODIFIED TYPE C
DROP INLET PER
CCAUSD DWG NO 412.1 & 421
SEE STRUCTUAL SHEET S2
FOR DETAIL
TMH: 3334.9±
INV OUT: 3319.83-24" S
N=1292906.1536
E=871696.0081
STA: 63+37.34
60" SSMH #5
TMH: 3334.3±
INV IN: 3321.68-16" SW
INV IN: 3321.68-8" NW
INV OUT: 3321.48-16" NE
N=1292949.9818
E=871926.5895
STA: 62+65.89
48" SDMH #5
TYPE I ACCESS MANHOLE
PER CCAUSD DWG NO 403
TMH: 3335.0±
N=1292876.9591
E=871904.8829
STA: 62+88.34
CONSTRUCT 5' MODIFIED TYPE C
DROP INLET PER
CCAUSD DWG NO 412.1 & 421
SEE STRUCTUAL SHEET S2
FOR DETAIL
TMH: 3334.7±
INV OUT: 3319.79-24" W
N=1292871.7142
E=871964.5571
STA: 10+00.00
FLIGHT RANGE AVENUE
STA: 60+92.91
KETTLE BEND ROAD
STA: 63+46.97
STA: 59+83.35
STA: 60+59.31
STA: 60+06.64
STA: 62+30.00
FIRE HYDRANT
INV= 3318.80
INV= 3317.54
RIP-RAP
D50=12"
THK=24"
UT34
SHT73
UT18
SHT57
UT36
SHT75
UT19
SHT58
UT33
SHT72
UT35
SHT74
84.8-LF 12" C-900 WTR
S=0.00%
(PZ 3550)
300.1-LF 8'X8' BOX CULVERT S=0.50%
S26°56'46"W
49.8-LF 36" RCP SD S=10.00%
N83°03'14"W
63.0-LF 1.5" COPPER WTR
S=0.00%
(PZ 3550)
INSTALL IRRIGATION
SLEEVE
250.0-LF 16" C900-16 SS S=0.70%
323.9-LF 16" C900-16 SS S=1.60%
244.4-LF 16" C900-16 SS S=3.10%
113.0-LF 30" RCP SD S=1.68%
S63°03'14"E
37.0-LF 8" C900-16 SS S=10.00%
22.7-LF 24" RCP SD S=20.00%
S18°03'14"E
22.7-LF 24" RCP SD S=20.00%
N18°03'14"W
129.2-LF 8'X8' BOX CULVERT S=0.49%
S26°56'46"W
232.8-LF 8'X8' BOX CULVERT S=0.50%
S26°56'46"W
308.8-LF 8'X8' BOX CULVERT S=0.50%
S26°56'46"W
48.2-LF 24" RCP SD S=10.00%
N72°06'33"W
211.8-LF 12" C-900 WTR S=0.70%
(PZ 3550)
401.0-LF 12" C-900 WTR S=0.70
(PZ 3550)
10.0-LF 24" DIP WTR
S=0.00%
(PZ 3435)
50.2-LF 24" RCP SD S=9.00%
S81°43'46"E
338.7-LF 24" DIP WTR S=0.07%
(PZ 3435)
SEE DETAIL ON SHEET DT1
FOR ECCENTRIC REDUCER DETAIL
14.0-LF 30" MLCP WTR S=-2.48%
(CONTRACT #1573) (PZ 3435)
(BY OTHERS)
82.1-LF 30" MLCP WTR S=-2.48%
(CONTRACT #1573) (PZ 3435)
(BY OTHERS)
5.0-LF 12" C-900 WTR
S=0.70%
(PZ 3550)
291.7-LF 30" MLCP WTR S=0.74%
(CONTRACT #1573) (PZ 3435)
(BY OTHERS)
28.8-LF 12" PVC WTR S=0.00%
(CONTRACT #1573) (PZ 3435)
(BY OTHERS)
3.0-LF 12" PVC WTR S=0.00%
(CONTRACT #1573) (PZ 3435)
(BY OTHERS)
13.3-LF 6" C-900 WTR
S=24968.63%
(PZ 3435)
2.5-LF 12" PVC WTR S=0.00%
(CONTRACT #1573) (PZ 3435)
(BY OTHERS)
7.0-LF 12" PVC WTR S=57.62%
(CONTRACT #1573) (PZ 3435)
(BY OTHERS)
134.0-LF 30" MLCP WTR S=0.00%
(CONTRACT #1573) (PZ 3435)
(BY OTHERS)
6'X8' LVVWD
EASEMENT
PER
POC
FUT 8" SSWR
FUT DROP INLET
FUT 15" SSWR
FUT 10" SSWR
FUT 8" SSWR
FUT 8" SSWR
FUT 8

SEE SHEET UT3 FOR PLAN VIEW

PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)







NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

CONSTRUCTION NOTES

	WATER	PUBLIC
W	FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
W	12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
W	12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
W	12"X12" TEE (PER UDACS PLATE 31)	4 EA.
W	24"X12" TEE (PER UDACS PLATE 31)	6 EA.
W	24" 5° BEND (PER UDACS PLATE 31)	10 EA.
W	24" 11° BEND (PER UDACS PLATE 31)	5 EA.
W	24" 22° BEND (PER UDACS PLATE 31)	9 EA.
W	12" 45° BEND (PER UDACS PLATE 31)	1 EA.
W	1° HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
W	1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
	24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

	SEWER	PUBLIC
S	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	8" C-900-16 SANITARY SEWER MAIN	296 LF.
	16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
4S	12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
POC	SEWER POINT OF CONNECTION	

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

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.

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

WATER MAIN JOINT DEFLECTION

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

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

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 AND 3550 PRESSURE ZONES.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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

UTILITY PROFILE 3A

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	BCC
DESIGNED BY:	BCC
CHECKED BY:	WJM
PROJECT NO:	7861
05/28/2019	
05/28/2019	
01/13/2020	
SCALE:	HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15743
1/13/20

SHEET
UT3A
42 OF 94 SHEETS

DRAWING NO.

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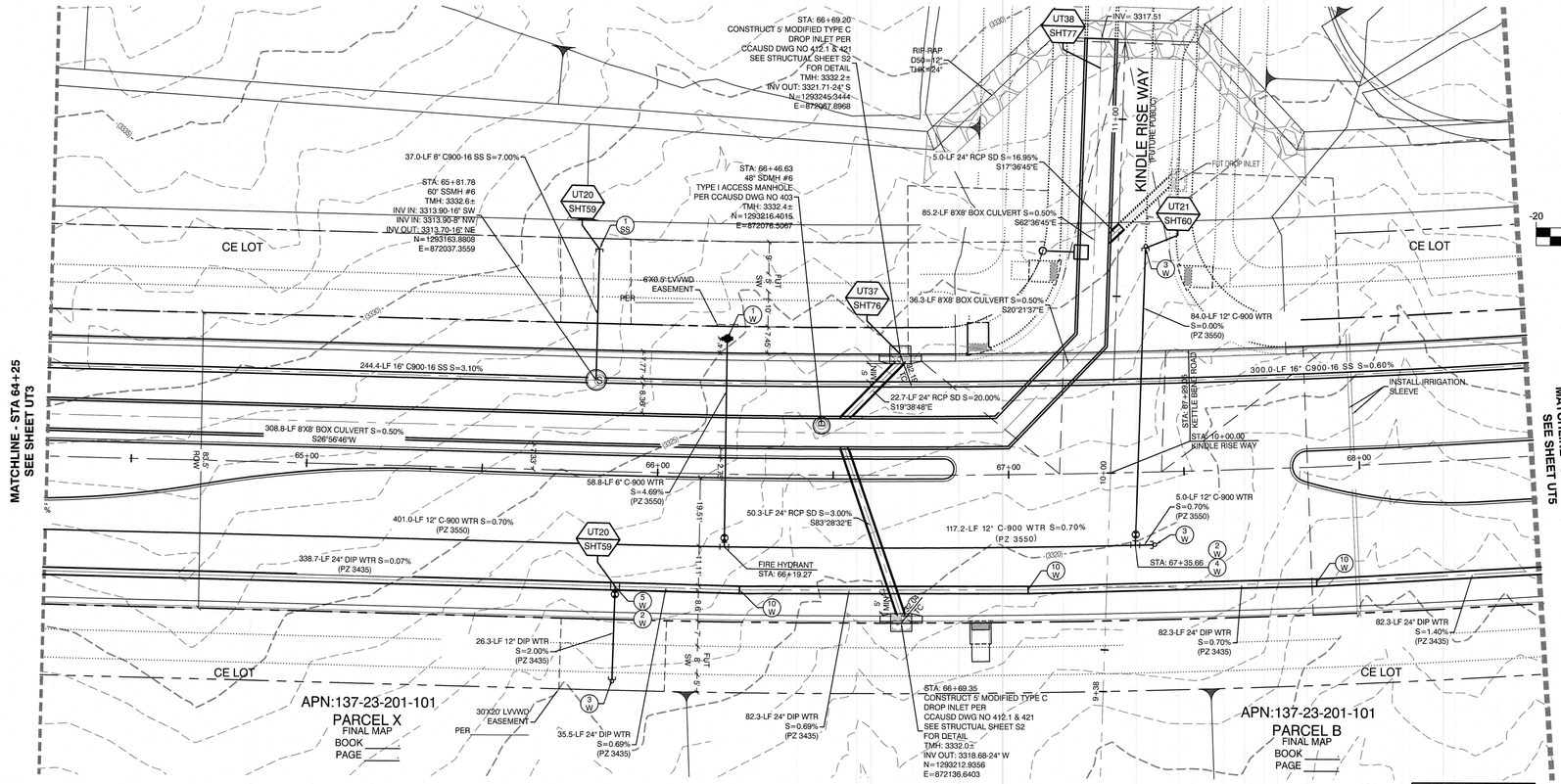
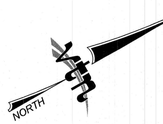
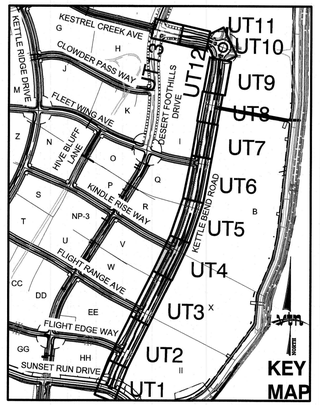




GRAPHIC SCALE

-20 0 10 20 40

1" = 20'



CONSTRUCTION NOTES

		WATER	PUBLIC
1 W	⬟	FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2 W	⊖	12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3 W	◂	12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4 W	ↄ	12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5 W	ↄ	24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6 W	⌐	24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7 W	⌐	24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8 W	⌐	24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9 W	⌐	12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10 W	⊢	1° HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11 W	⊸	1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
	——	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
	——	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
	——	24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
		WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

		SEWER	PUBLIC
S	Ⓢ	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	——	8" C-900-16 SANITARY SEWER MAIN	296 LF.
	——	16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
SS	⊏	12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
		SEWER POINT OF CONNECTION	

NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

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WATER MAIN JOINT DEFLECTION

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UTILITY CROSSING NOTE:

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WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 AND 3550 PRESSURE ZONES.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT:----

LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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

Call before you Underground
AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

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
702-791-4004

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7550 FAX (702) 362-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 4
64+25 TO 68+50

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 05/28/2019
DESIGNED BY: BCC — 05/28/2019
CHECKED BY: WJM — 01/13/2020
PROJECT NO: 7991 — SCALE: HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J MEYER
EXP: 12/31/21
CIVIL
No. 15742
1/14/20

SHEET
UT4
43 OF 94 SHEETS

DRAWING NO.

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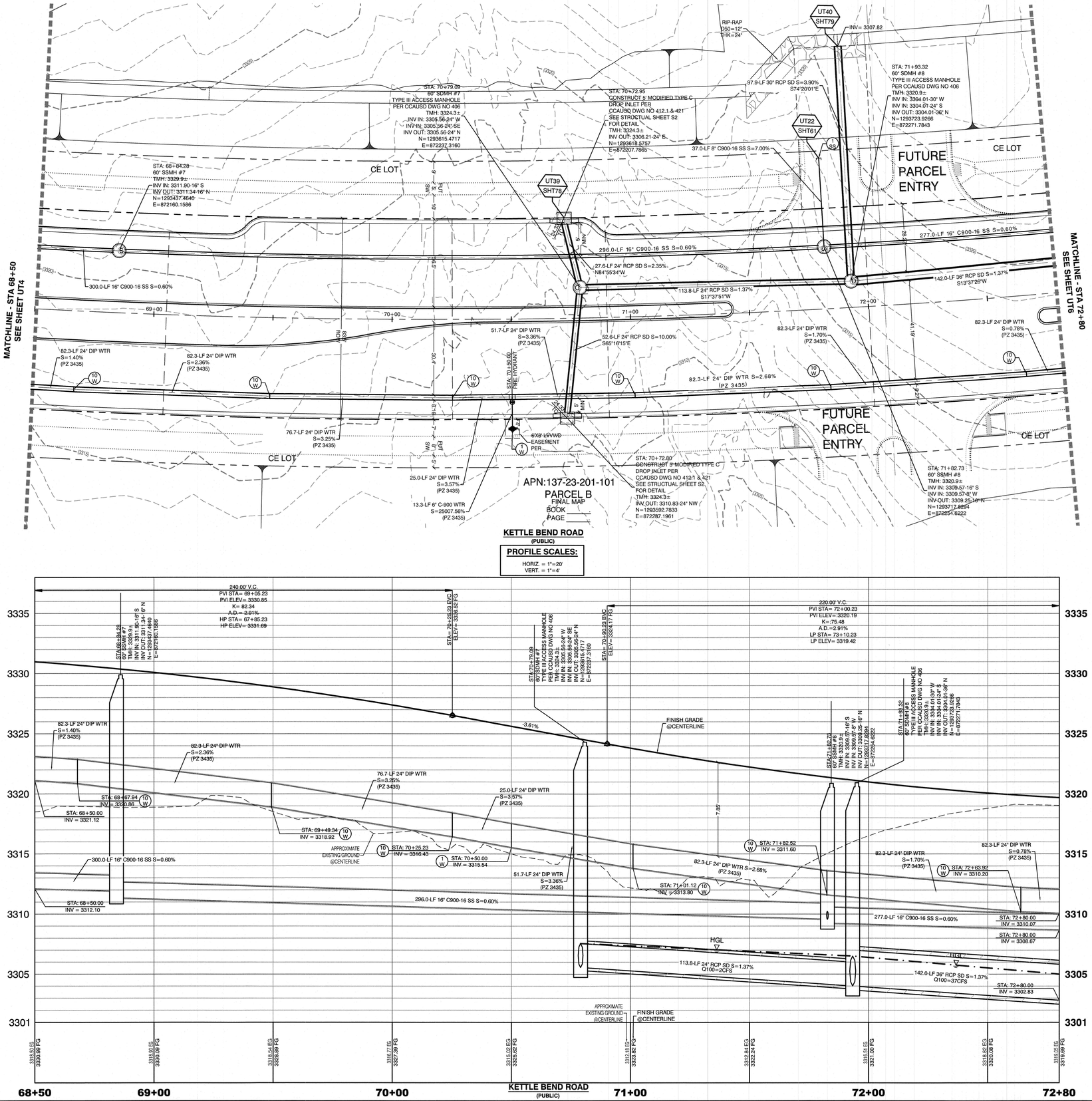
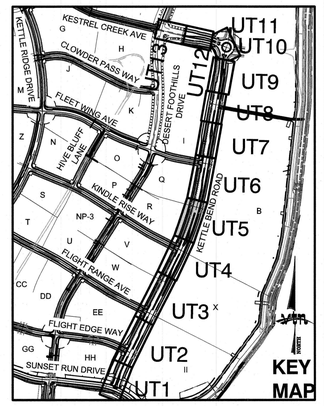
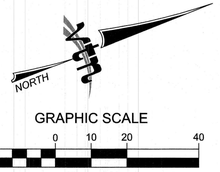


PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'





GRAPHIC SCALE
-20 0 10 20 40
1" = 20'

NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

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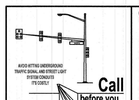

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS



CONSTRUCTION NOTES

		WATER	PUBLIC
1W	⬬	FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2W	⧳	12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
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6W	⌐	24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7W	⌐	24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8W	⌐	24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9W	⌐	12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10W		1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11W		1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
		6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
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	POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

		SEWER	PUBLIC
	S	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
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	POC	SEWER POINT OF CONNECTION	

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 AND 3550 PRESSURE ZONES.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____
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LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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

UTILITY PLAN & PROFILE 5
68+50 TO 72+80

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	05/28/2019
DESIGNED BY: BCC	05/28/2019
CHECKED BY: WJM	01/13/2020
PROJECT NO: 7981	SCALE: 1"=20' HORIZ. 1"=4' VERT.

PROFESSIONAL ENGINEER-STATE OF NEVADA
WILLIAM J MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
UT5
44 OF 94 SHEETS
DRAWING NO.

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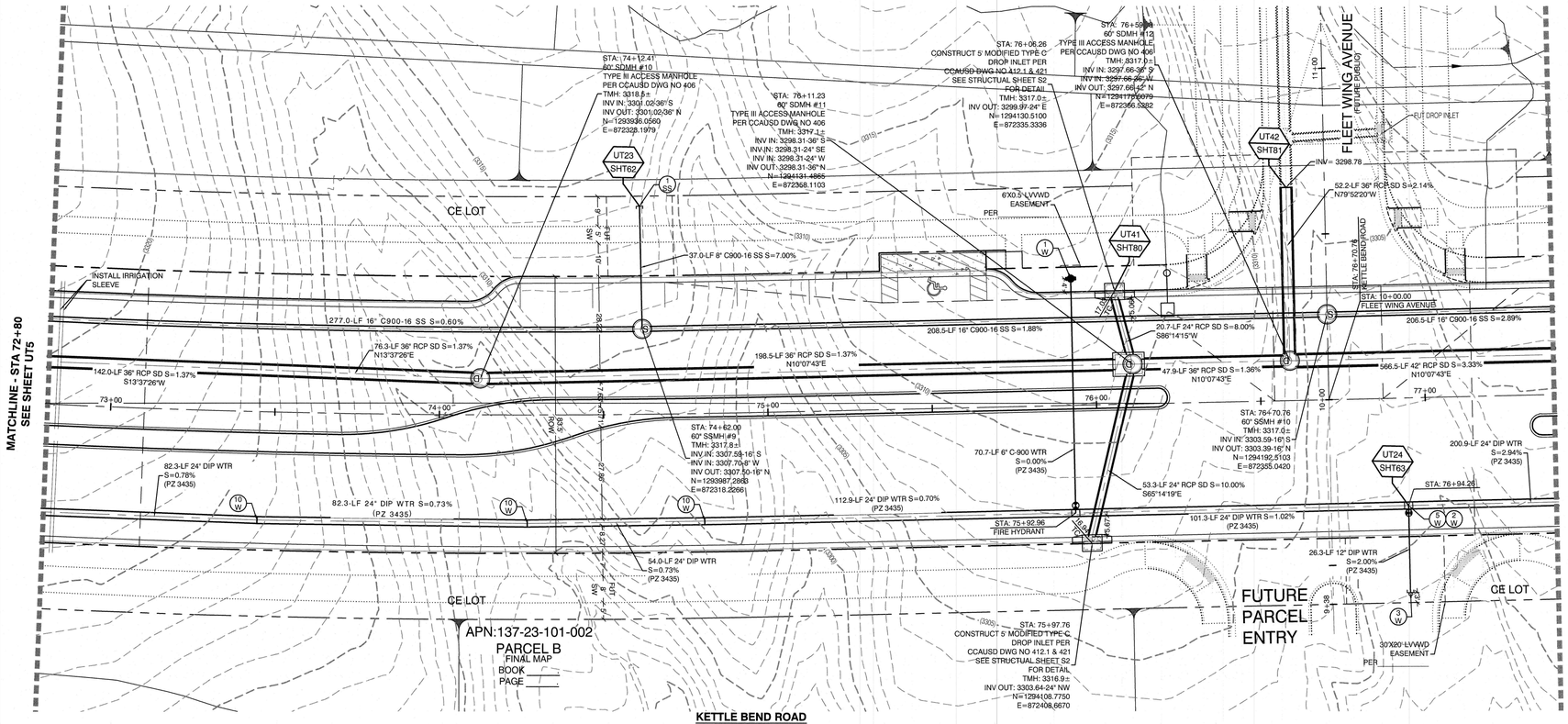



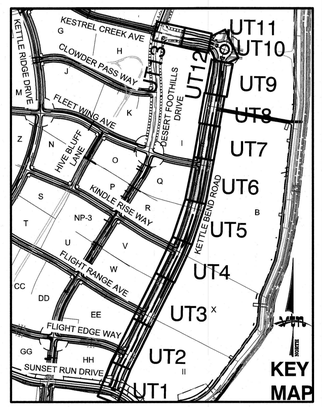

CONSTRUCTION NOTES

	WATER	PUBLIC
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WPOC	WATER POINT OF CONNECTION	

NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

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INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

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2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

WATER MAIN JOINT DEFLECTION

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

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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
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CLARK COUNTY TRAFFIC OPERATIONS



WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 AND 3550 PRESSURE ZONES.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

LAS VEGAS FIRE & RESCUE APPROVAL

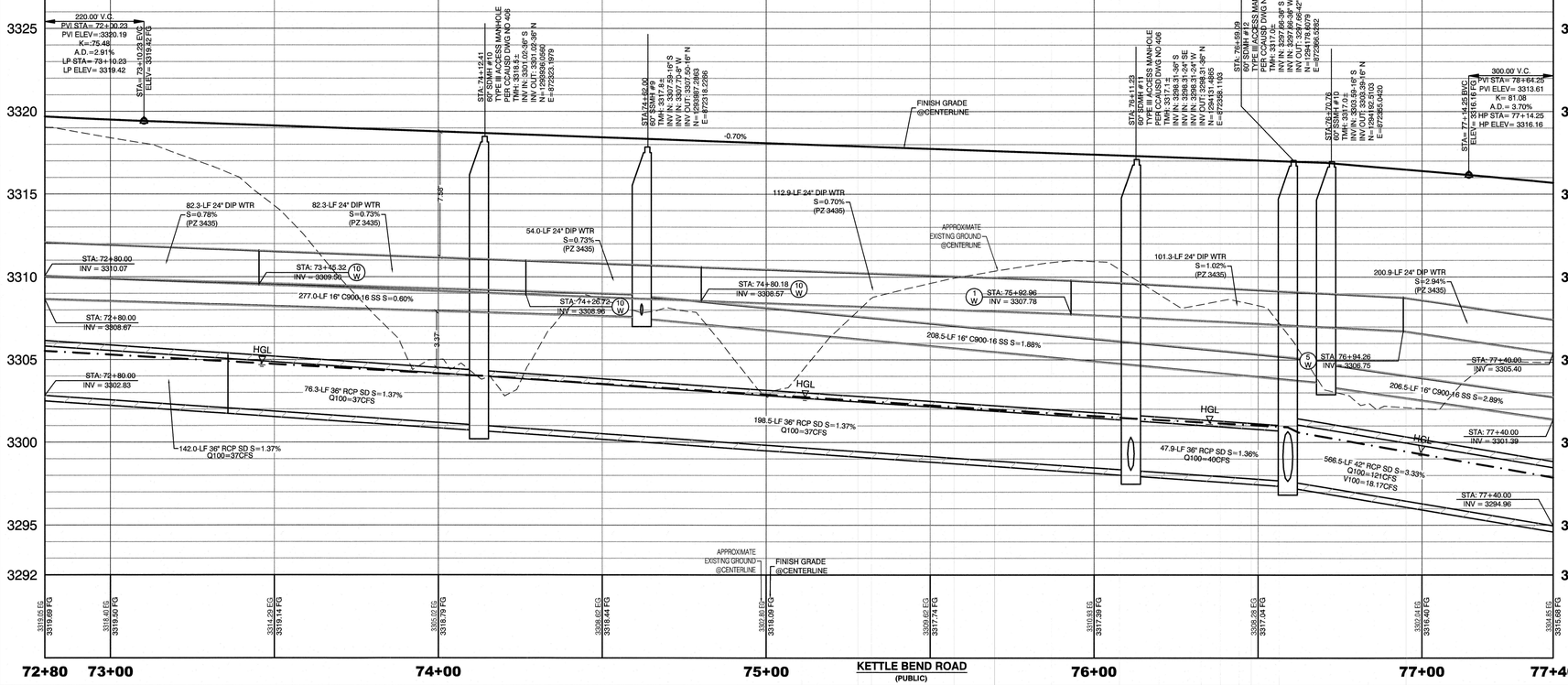
BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL



PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'

HOWARD HUGES 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

REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 6
72+80 TO 77+40

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC 06/28/2019
DESIGNED BY: BCC 06/28/2019
CHECKED BY: WJM 01/13/2020
PROJECT NO: 7861
SCALE: HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 17457
1/14/20

SHEET
UT6
45 OF 94 SHEETS

DRAWING NO.

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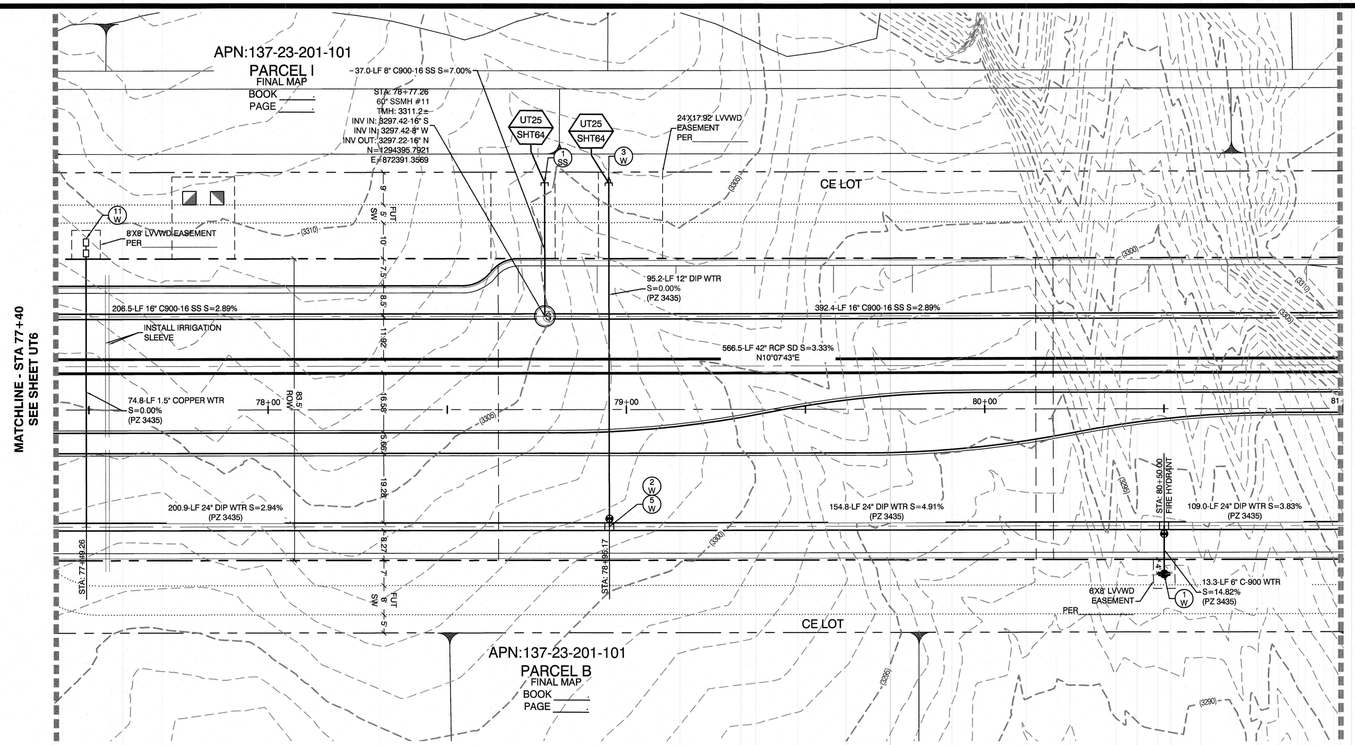

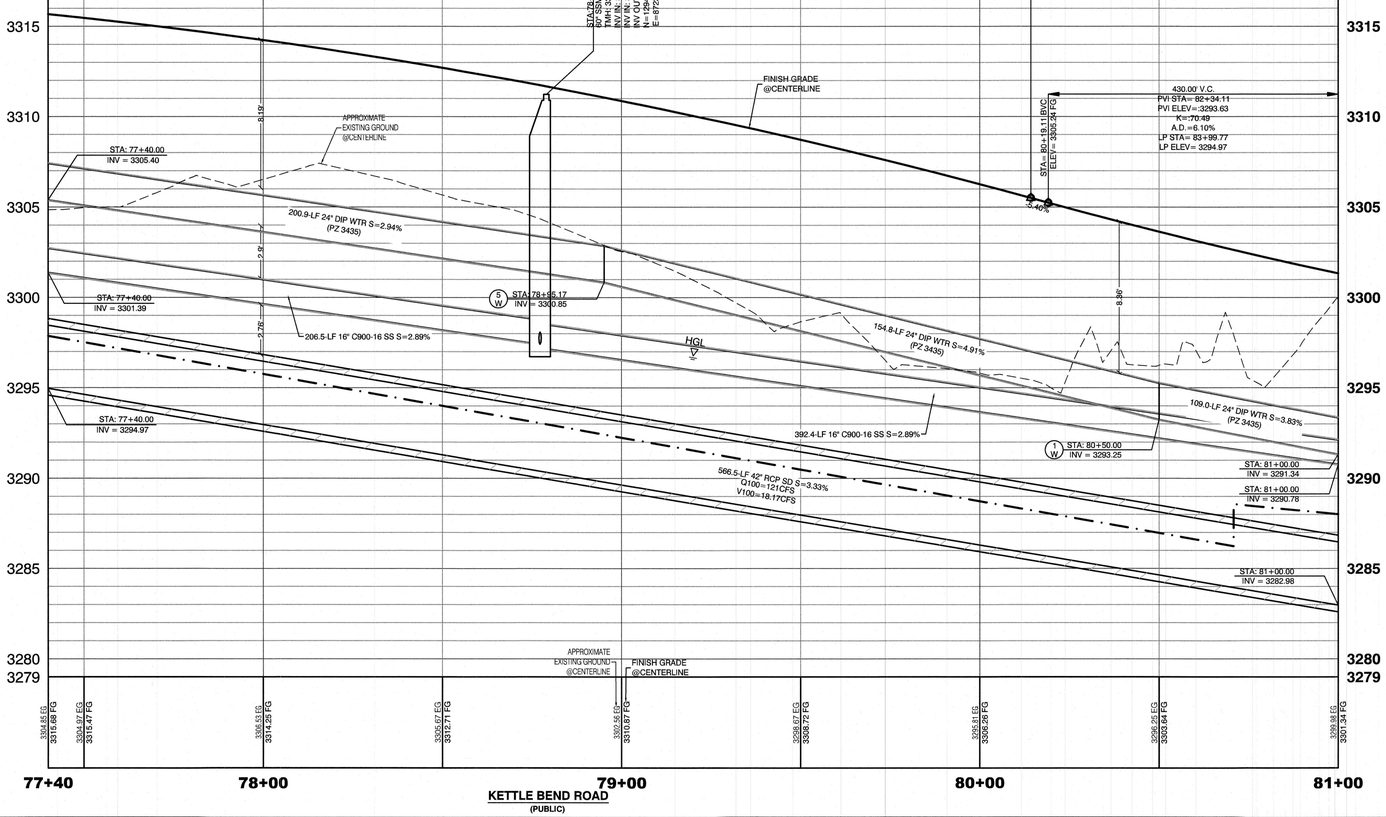

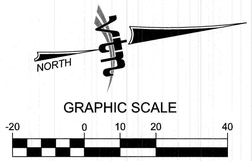

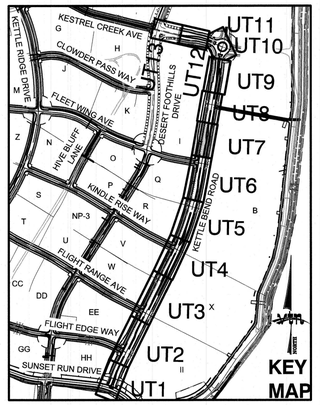

KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'

CONSTRUCTION NOTES

	WATER	PUBLIC
W	FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2 W	12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3 W	12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4 W	12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5 W	24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6 W	24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7 W	24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8 W	24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9 W	12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10 W	1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11 W	1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
	24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

	SEWER	PUBLIC
S	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	8" C-900-16 SANITARY SEWER MAIN	296 LF.
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POC	SEWER POINT OF CONNECTION	

NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

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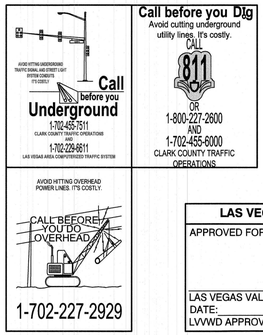
LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL



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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UTILITY PLAN & PROFILE 7
77+40 TO 81+00

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 05/28/2019
DESIGNED BY: BCC — 05/28/2019
CHECKED BY: WJM — 01/13/2020
PROJECT NO: 7861
SCALE: HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15145
1/14/20

SHEET
UT7
46 OF **94** SHEETS

DRAWING NO.

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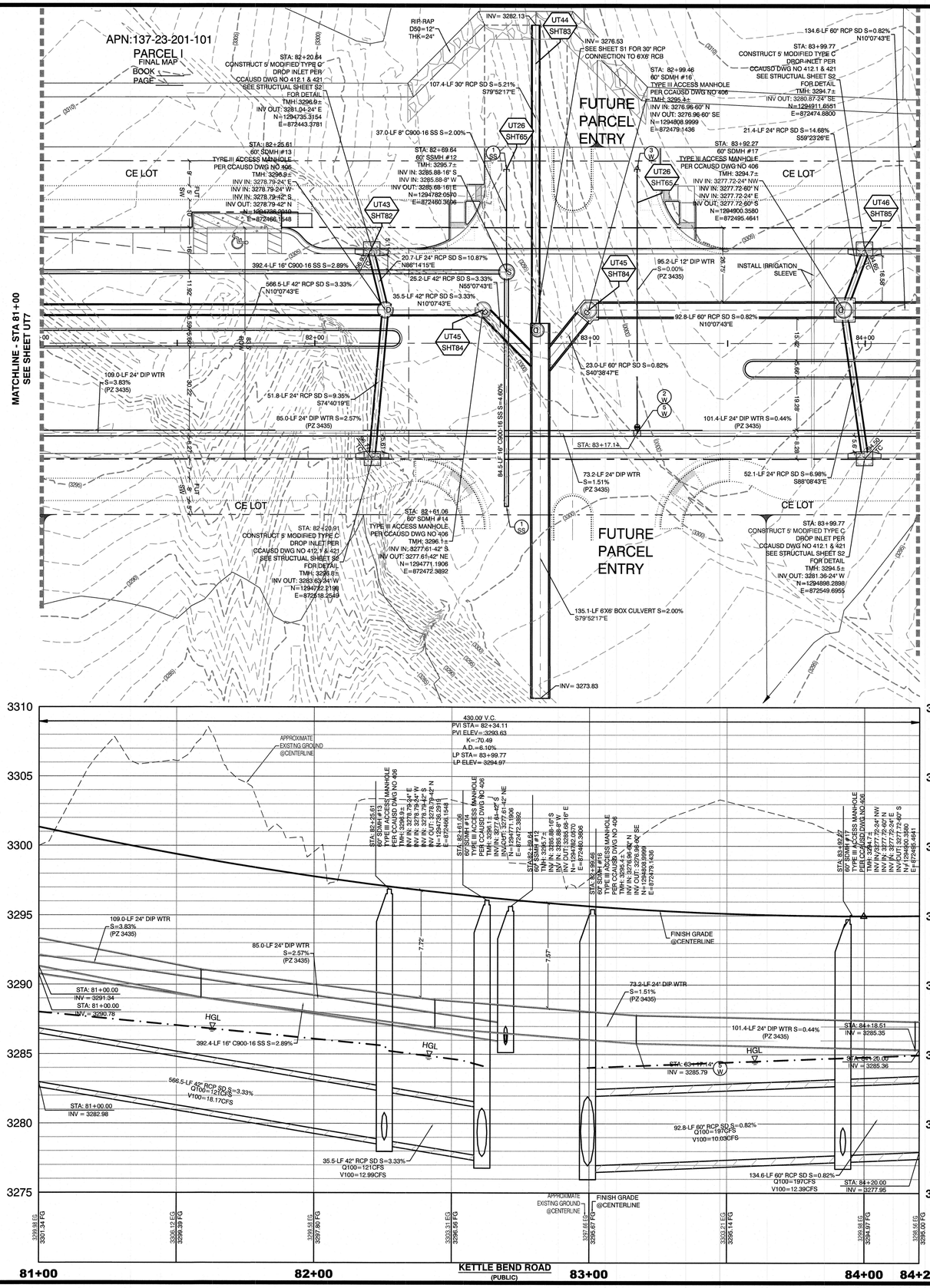

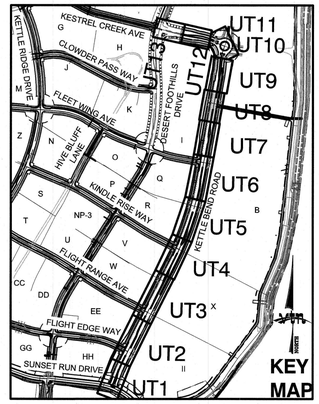



GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

KETTLE BEND ROAD
(PUBLIC)

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POC	WATER POINT OF CONNECTION	

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-701-4500

2727 SOUTH RAINBOW BOULEVARD
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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 8
81+00 TO 84+20

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DATE: 05/28/2019
DESIGNED BY: BCC	DATE: 05/28/2019
CHECKED BY: WJM	DATE: 01/13/2020
PROJECT NO: 7861	SCALE: 1"=20' HORIZ. 1"=4' VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15749
1/14/20

SHEET
UT8
47 OF 94 SHEETS

DRAWING NO.

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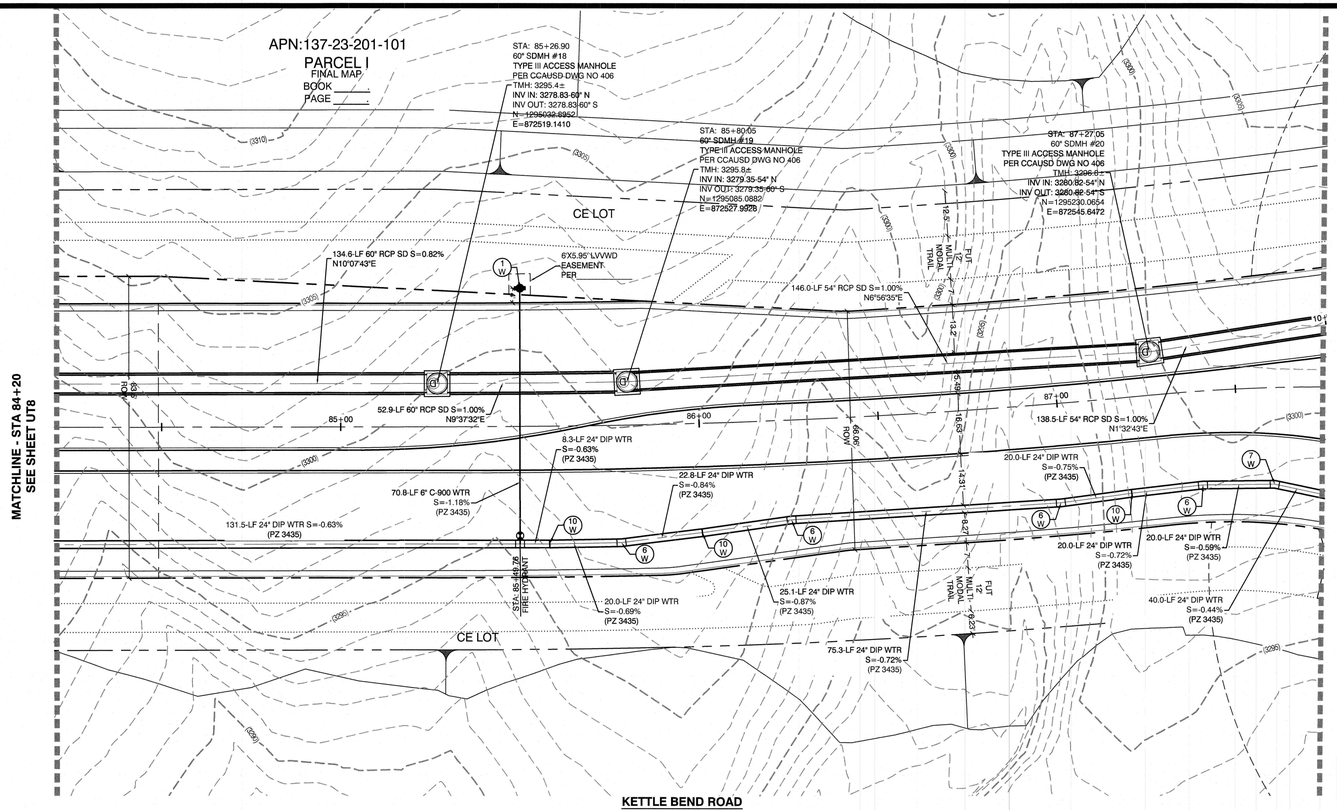

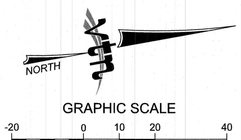

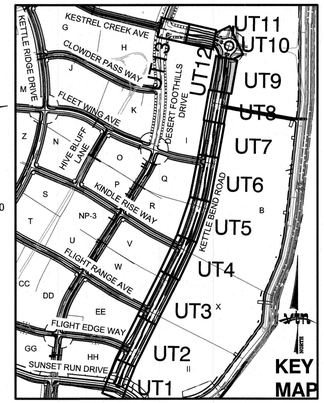

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POC	WATER POINT OF CONNECTION	

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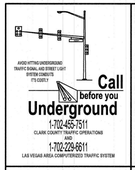





LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4500

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7590 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 9
84+20 TO 87+75

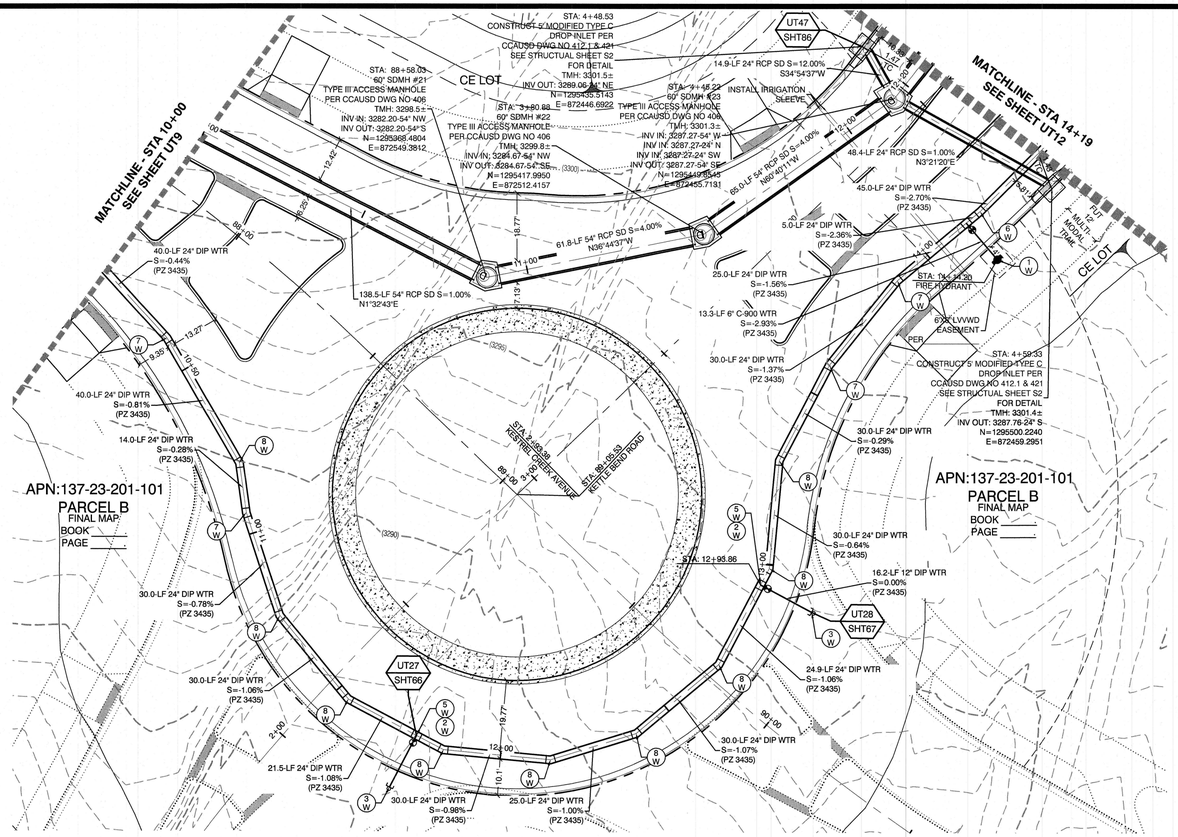
SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 05/28/2019
DESIGNED BY: BCC — 05/28/2019
CHECKED BY: JAM — 01/13/2020
SCALE: HORIZ. 1"=20' VERT. 1"=4'
PROJECT NO: 7861

NEVADA PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/19/20

SHEET
UT9
48 OF 94 SHEETS
DRAWING NO.

H:\7861\Kettle Bend Road\Sheet Set\7861-UT-2.dwg,1/13/2020 10:35 PM,brandonc

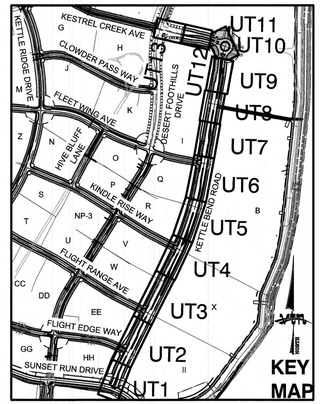




GRAPHIC SCALE

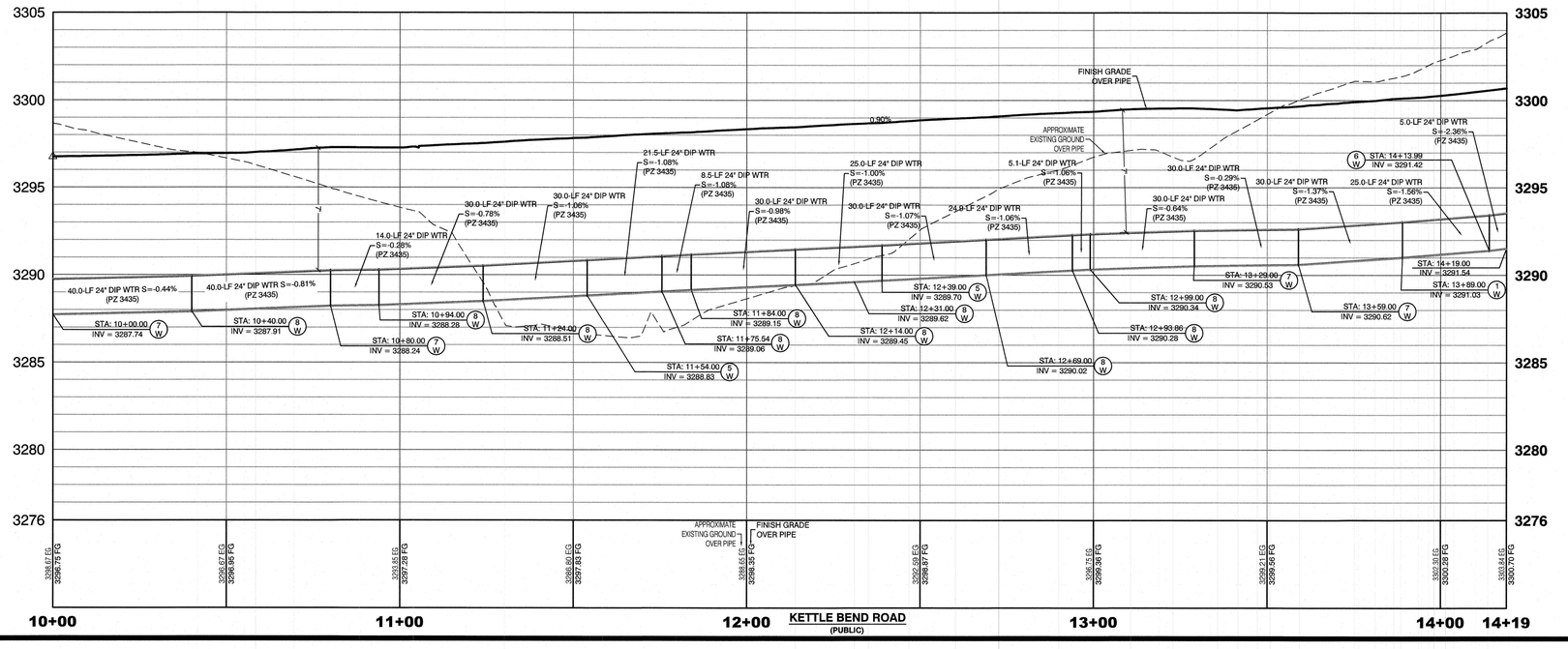
-20 0 10 20 40

1" = 20'



KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



CONSTRUCTION NOTES

	WATER	PUBLIC
1 W	FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2 W	12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3 W	12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4 W	12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5 W	24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6 W	24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7 W	24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8 W	24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9 W	12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10 W	1° HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11 W	1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
	24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
PC	WATER POINT OF CONNECTION	

NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:
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CLARK COUNTY TRAFFIC OPERATIONS



CONSTRUCTION NOTES

	SEWER	PUBLIC
S	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	8" C-900-16 SANITARY SEWER MAIN	296 LF.
	16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
SS	12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
SPC	SEWER POINT OF CONNECTION	

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 AND 3550 PRESSURE ZONES.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:
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LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____
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LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

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UTILITY PLAN & PROFILE 10
10+00 TO 14+19

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	BCC
DESIGNED BY:	BCC
CHECKED BY:	WJM
PROJECT NO:	7861
	05/28/2019
	05/28/2019
	01/13/2020
SCALE:	1"=20' HORIZ. 1"=4' VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15747
1/14/20

SHEET
UT10
49 OF 94 SHEETS

DRAWING NO.

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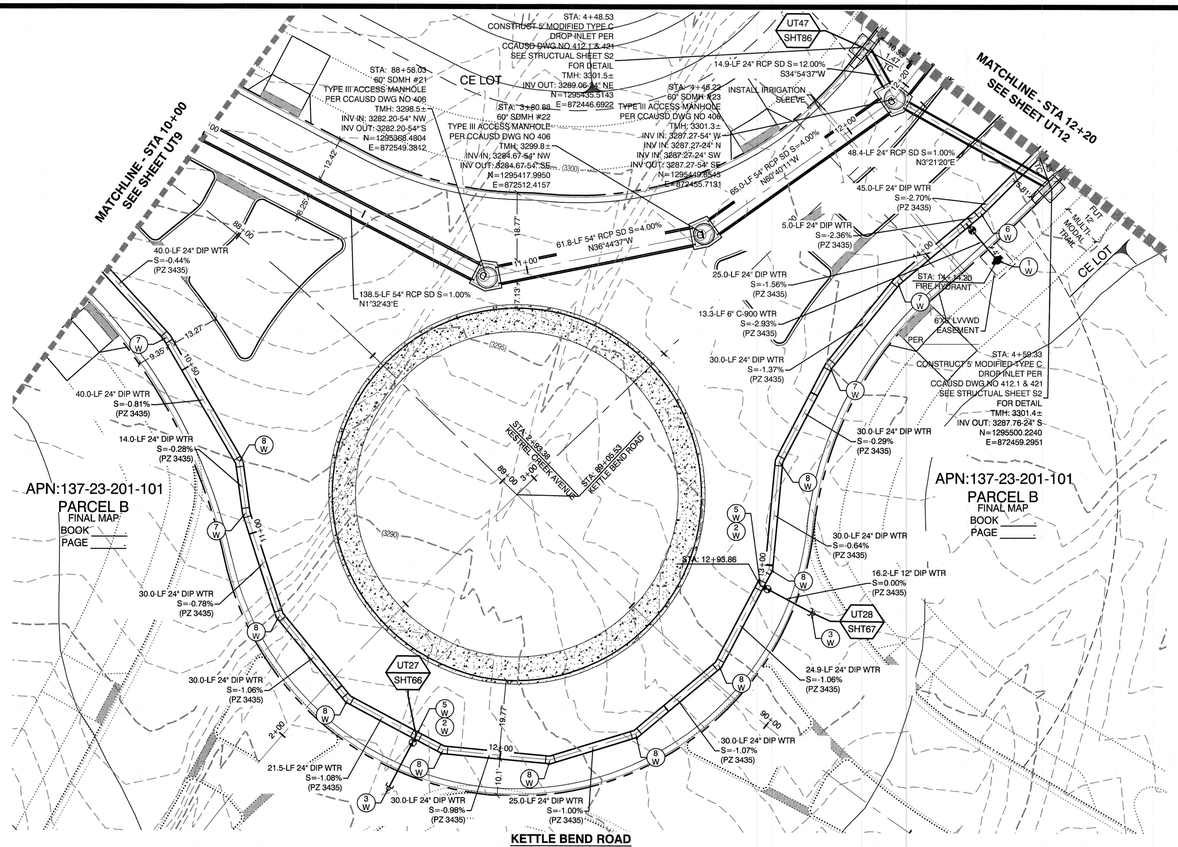

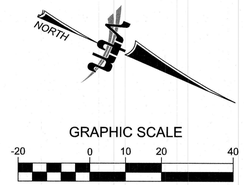

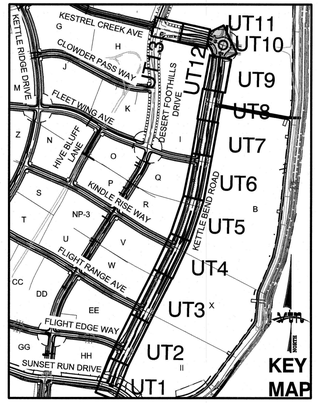

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POC	WATER POINT OF CONNECTION	

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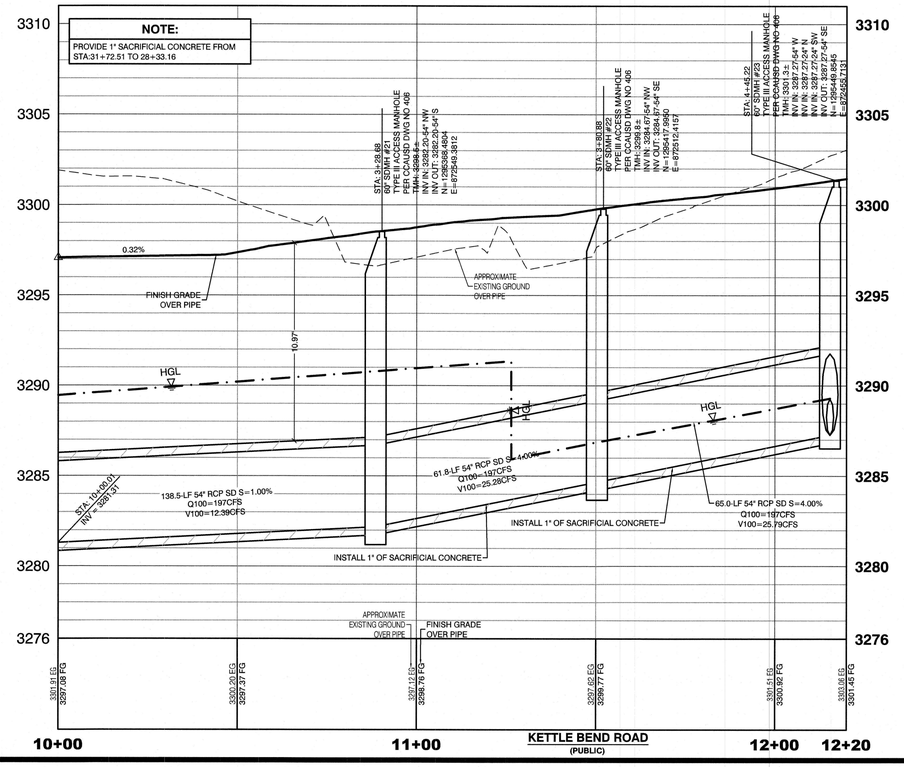
LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



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REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 11
10+00 TO 12+20

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BGC
DESIGNED BY: BCC
CHECKED BY: WJM
PROJECT NO: 7861
07/23/2019
07/23/2019
01/13/2020
SCALE: HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15749
1/14/20

SHEET
UT11
50 OF 94 SHEETS

DRAWING NO.

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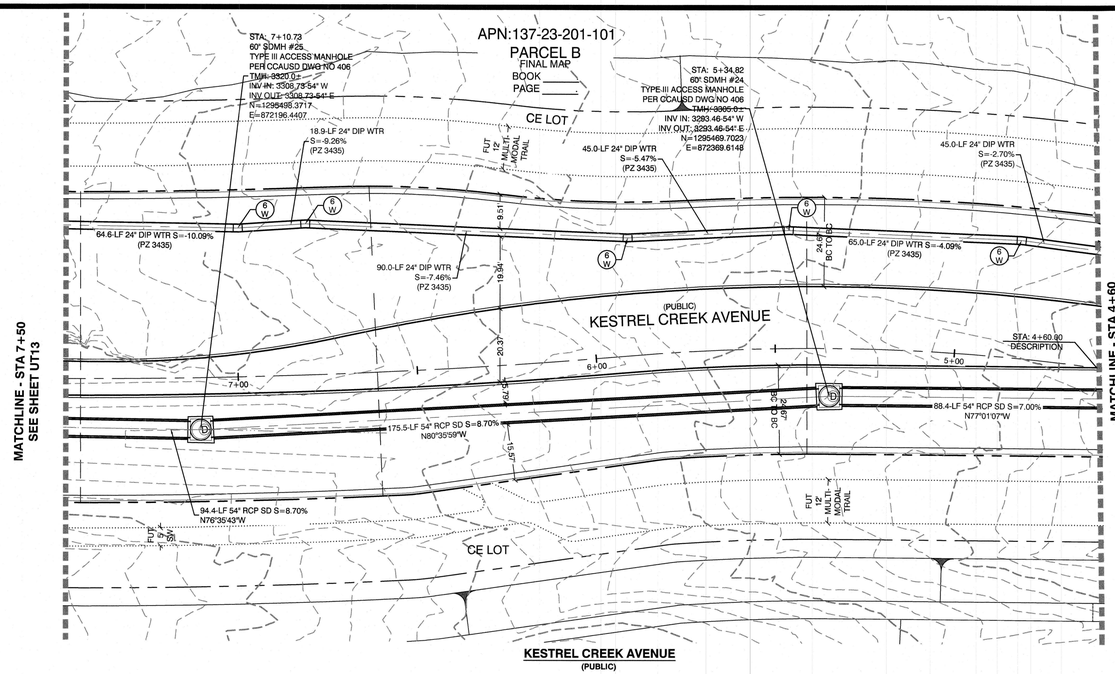

KESTREL CREEK AVENUE
(PUBLIC)

PROFILE SCALES:
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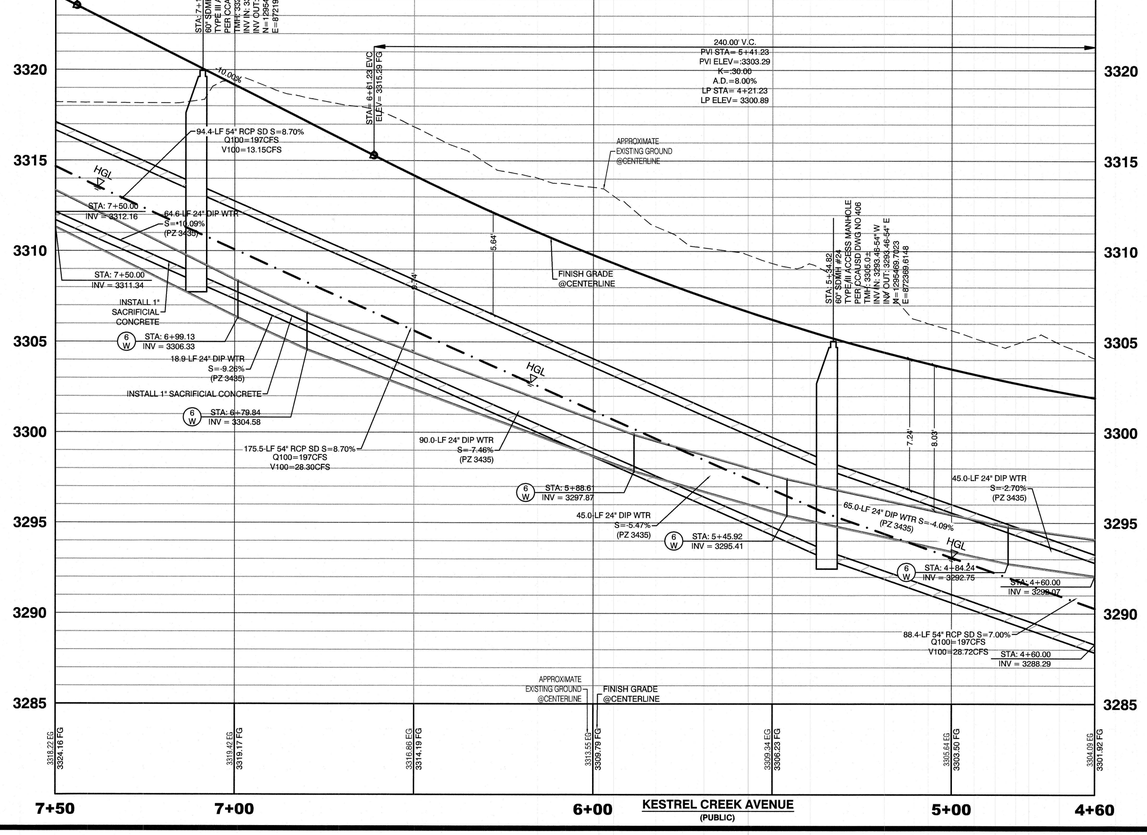
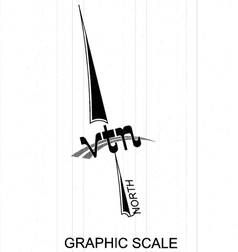
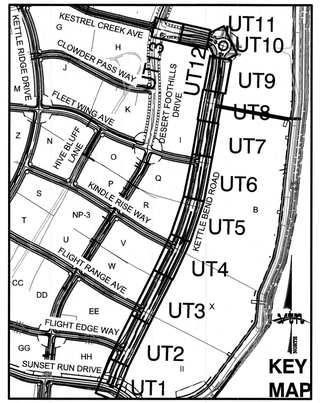


NOTE:
PROVIDE 1" SACRIFICIAL CONCRETE FROM STA:31+72.51 TO 28+33.16





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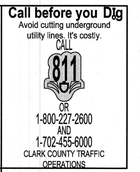



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PWC	WATER POINT OF CONNECTION	

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UTILITY PLAN & PROFILE 12
7+50 TO 4+60

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

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UT12
51 OF 94 SHEETS
DRAWING NO.

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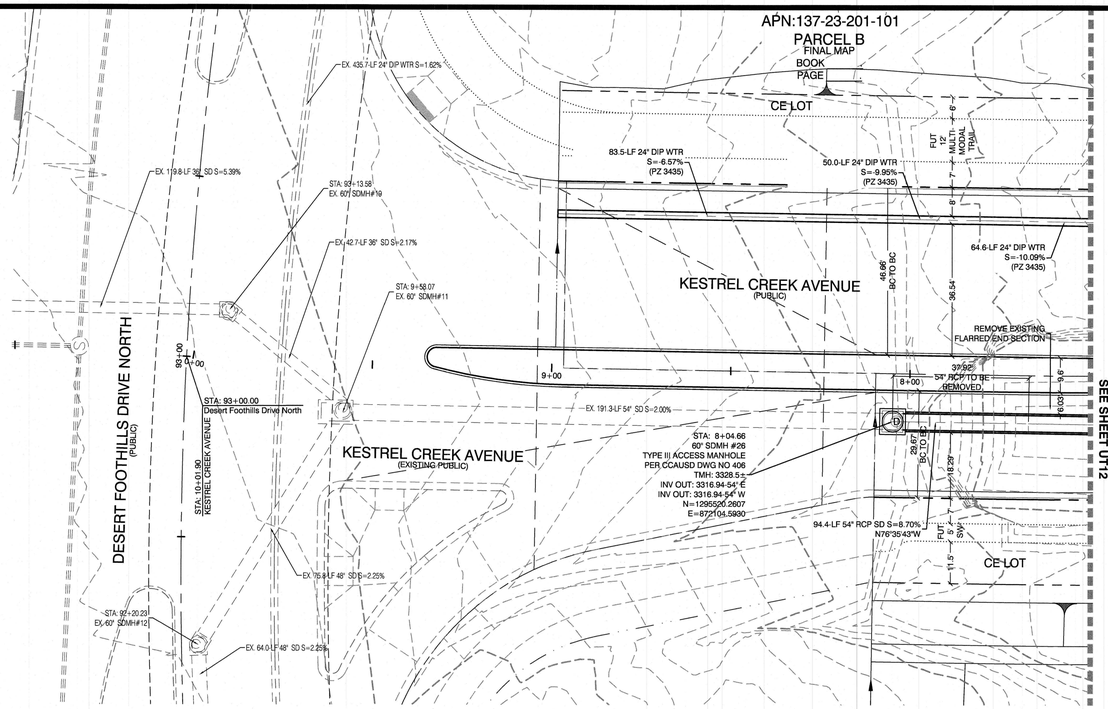
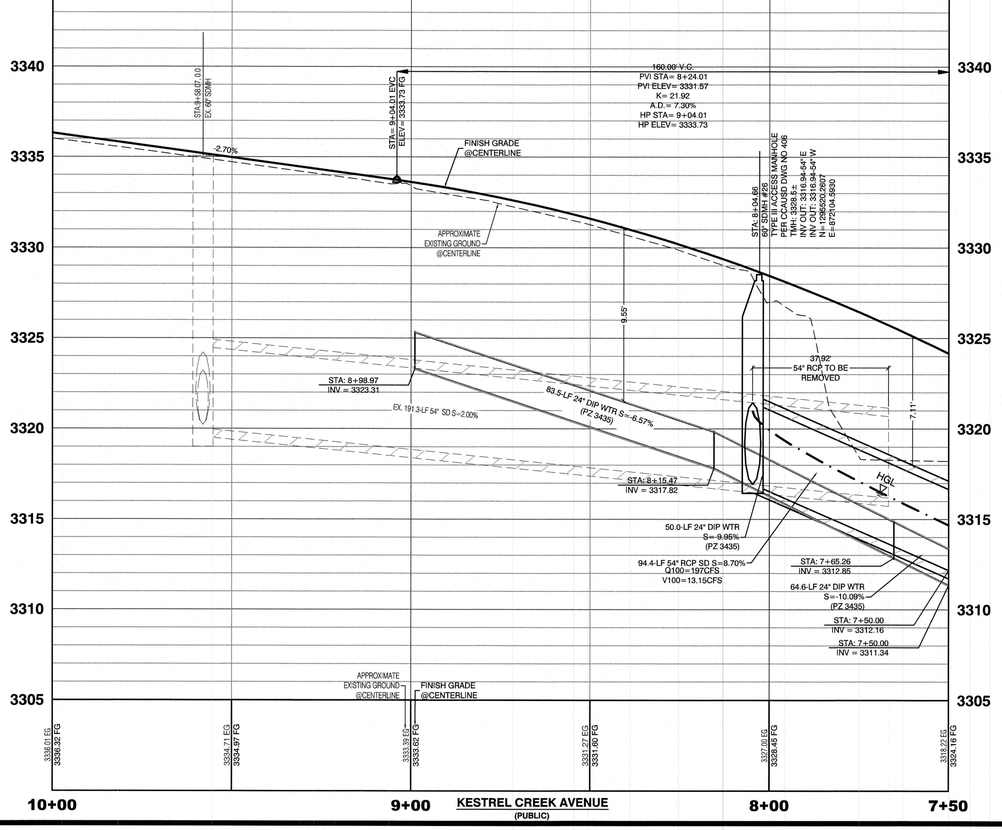
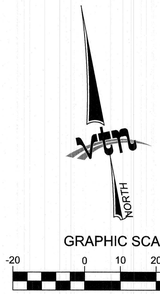


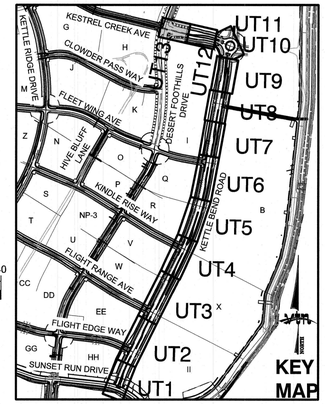
KESTREL CREEK AVENUE
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'





GRAPHIC SCALE
-20 0 10 20 40
1" = 20'



CONSTRUCTION NOTES

		WATER	PUBLIC
1W		FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2W		12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3W		12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4W		12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5W		24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6W		24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7W		24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8W		24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9W		12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10W		1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11W		1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 ((RRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
		6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
		12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
		24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
	POC	WATER POINT OF CONNECTION	

NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:
1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

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

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

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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CONSTRUCTION NOTES

		SEWER	PUBLIC
S		STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
		8" C-900-16 SANITARY SEWER MAIN	296 LF.
		16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
		12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
	POC	SEWER POINT OF CONNECTION	

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 AND 3550 PRESSURE ZONES.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____
APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-207-4500

CITY OF LAS VEGAS

2707 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-3597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 13
7+50 TO 10+00

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 06/03/2019
DESIGNED BY: BCC — 06/03/2019
CHECKED BY: VMM — 01/13/2020
PROJECT NO: 7861
SCALE: HORIZ. 1"=20' VERT. 1"=4'

WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
PROFESSIONAL ENGINEER - STATE OF NEVADA
No. 15745
1/14/20

SHEET
UT13
52 OF 94 SHEETS

DRAWING NO.

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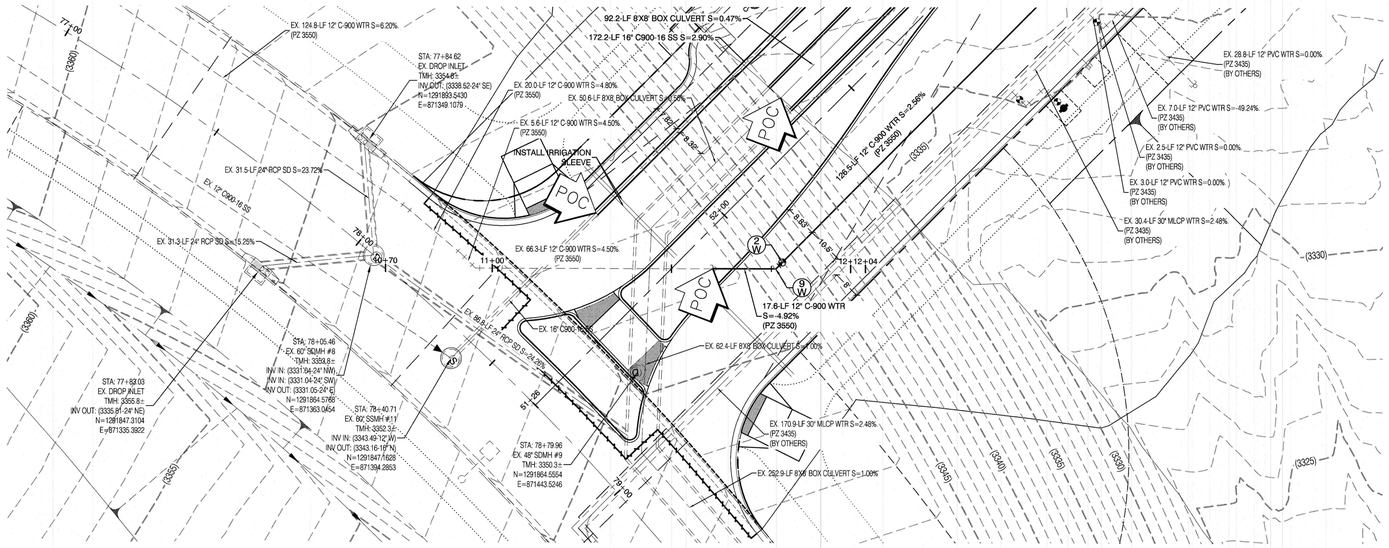
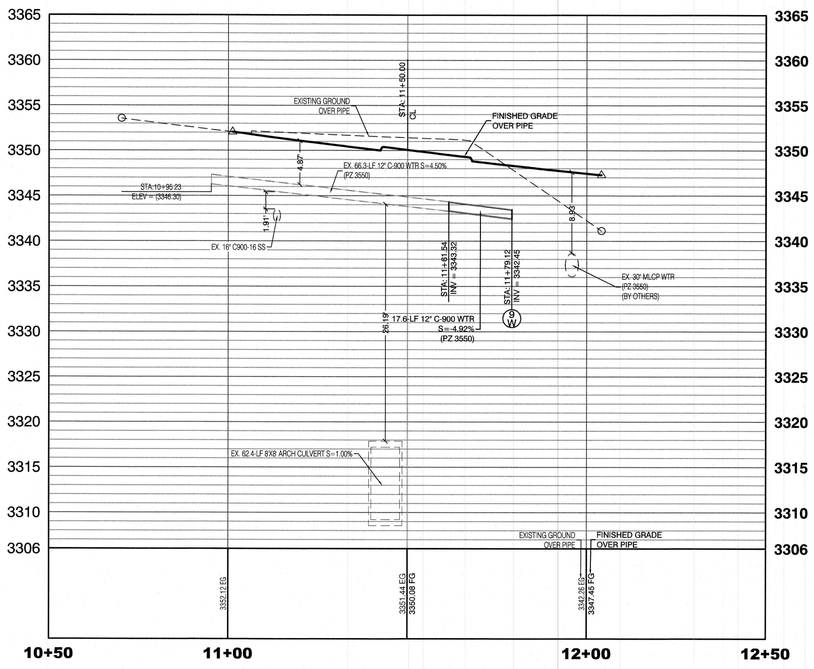


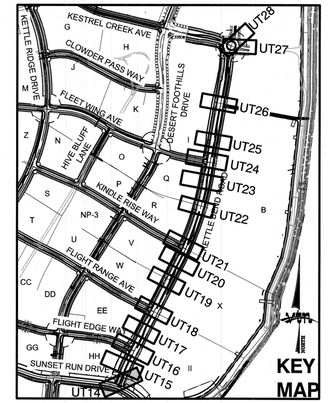
KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)





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	POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

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POC	SEWER POINT OF CONNECTION	

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES
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WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE:
PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL



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



1-702-227-2929

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
(702) 207-4500

2787 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

REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 14
WATER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 08/08/2019
DESIGNED BY: BCC — 08/08/2019
CHECKED BY: WJM — 01/13/2020
SCALE: HORIZ. 1"=20' VERT. 1"=4"
PROJECT NO: 7861

PROFESSIONAL ENGINEER STATE OF NEVADA
No. 15745
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
1/14/20

SHEET
UT14
53 OF **94** SHEETS
DRAWING NO.

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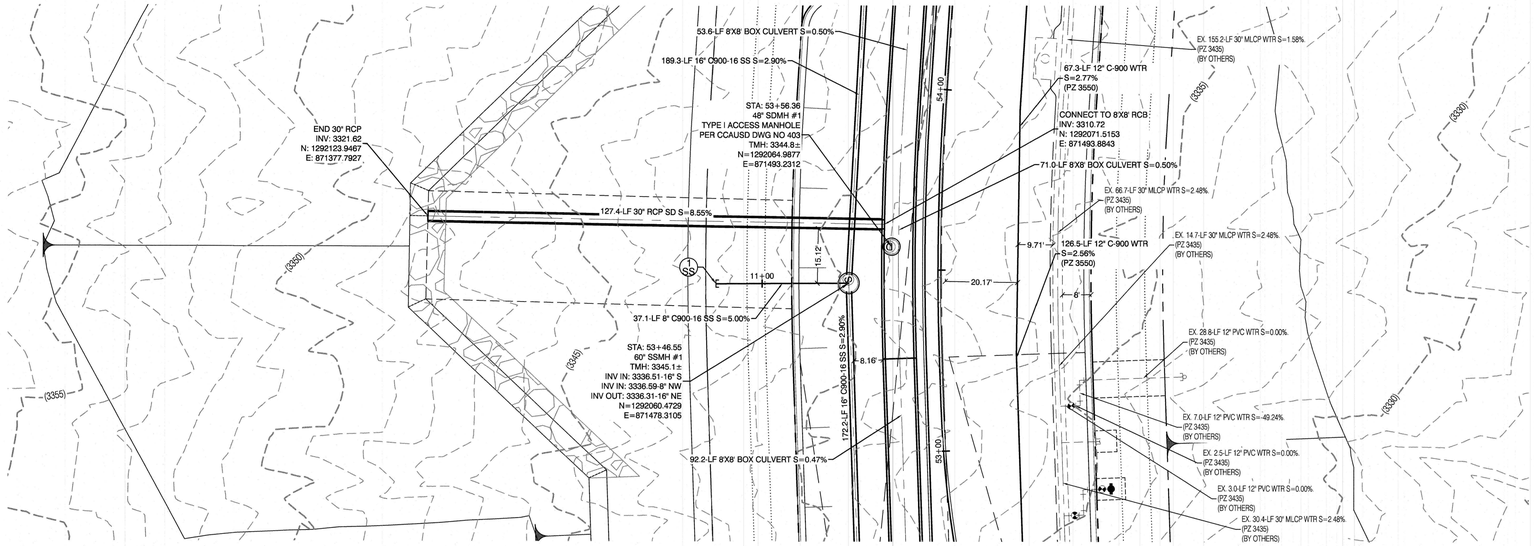
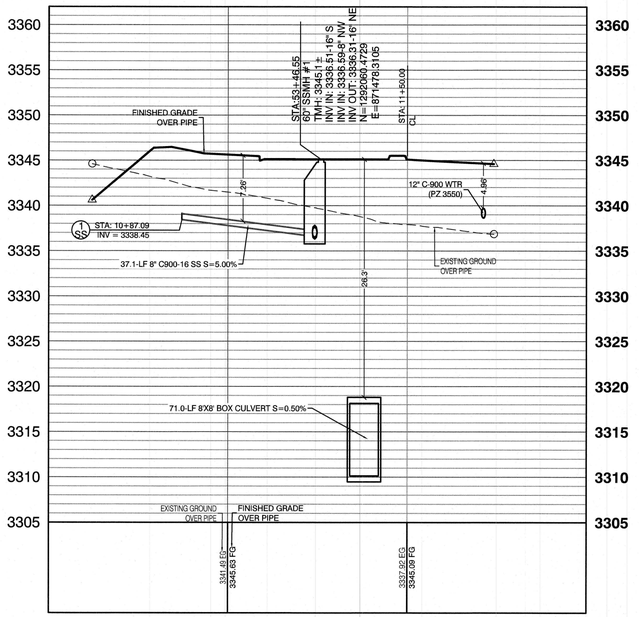


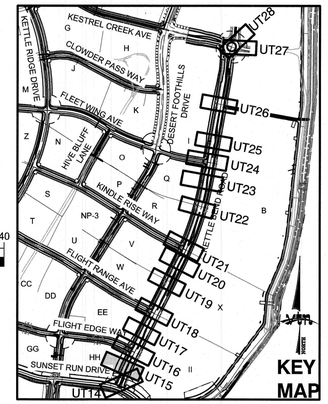
KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)





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	PCC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

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	PCC	SEWER POINT OF CONNECTION	

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WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

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LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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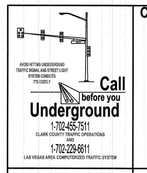
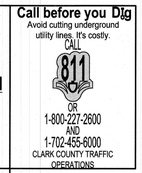
LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

_____
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL







HOWARD HUGES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
(702) 791-4300

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
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PH. (702) 873-7550 FAX (702) 360-3597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 15
SEWER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC 08/09/2019
DESIGNED BY: BCC 08/09/2019
CHECKED BY: WM 01/13/2020
SCALE: HORIZ. 1"=20' VERT. 1"=4'
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PROFESSIONAL ENGINEER STATE OF NEVADA No. 15745
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
1/14/20

SHEET
UT15
54 OF 94 SHEETS

DRAWING NO.

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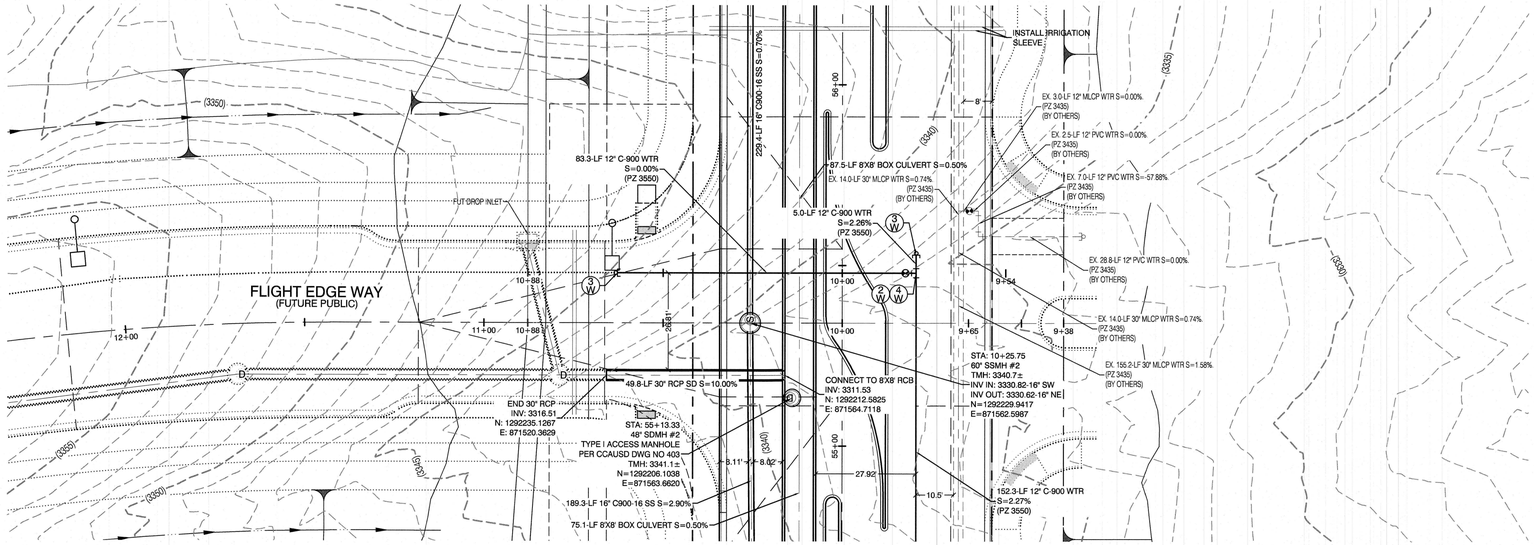
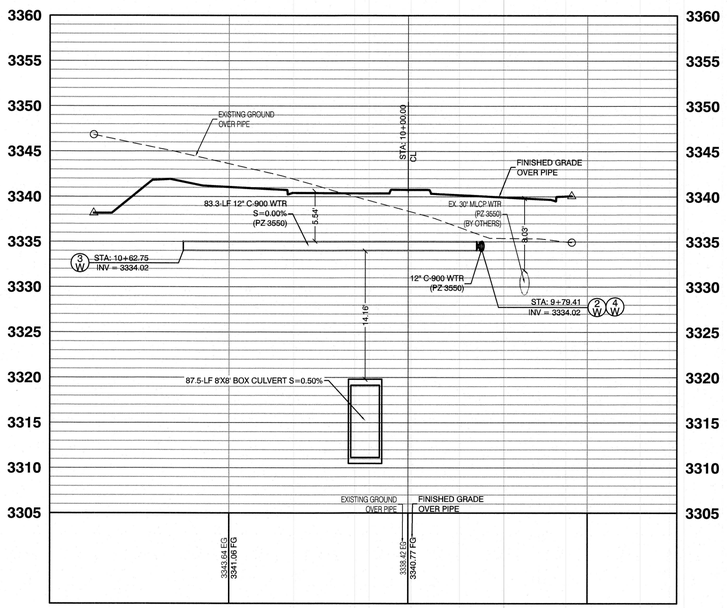
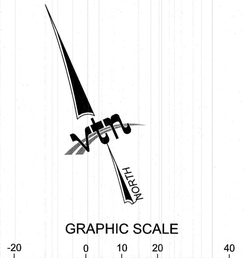


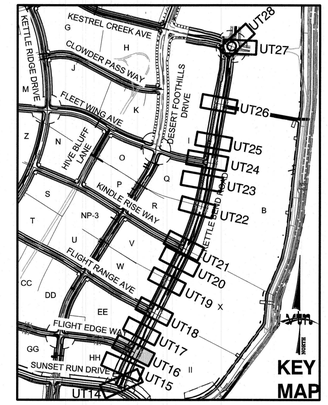
KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)





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1W		FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2W		12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3W		12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4W		12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5W		24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6W		24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7W		24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8W		24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9W		12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10W		1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11W		1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
		6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
		12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
		24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
	POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

		SEWER	PUBLIC
S		STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
		8" C-900-16 SANITARY SEWER MAIN	296 LF.
		16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
1SS		12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
	POC	SEWER POINT OF CONNECTION	

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:
1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

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

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

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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WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

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

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
1-702-229-6811
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
(702) 791-4000

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

UTILITY PLAN & PROFILE 16
SEWER & WATER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	HORIZ.
BCC	BCC	WM	1"=20'	VERT.
08/09/2019	08/09/2019	01/13/2020	1"=4'	

PROJECT NO: 7861

PROFESSIONAL ENGINEER · STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/13/20

SHEET
UT16
55 OF 94 SHEETS

DRAWING NO.

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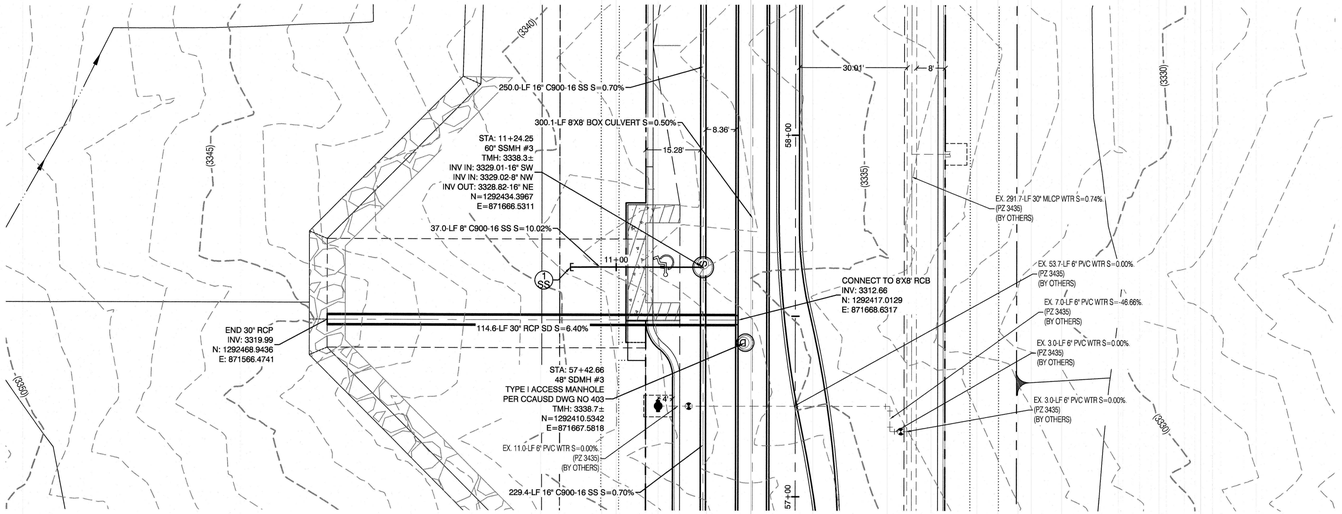
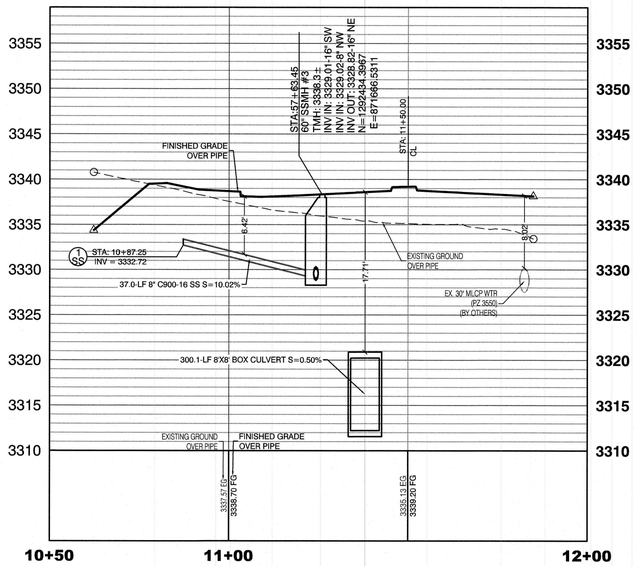


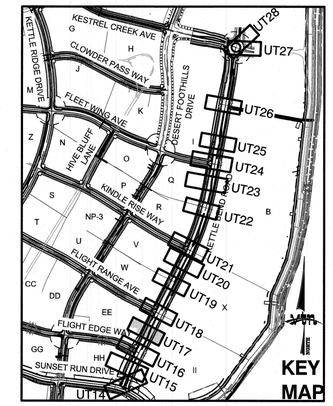
KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)

GRAPHIC SCALE
-20 0 10 20 40
1" = 20'



CONSTRUCTION NOTES

	WATER	PUBLIC
1W	FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2W	12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3W	12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4W	12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5W	24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6W	24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7W	24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8W	24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9W	12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10W	1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
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	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
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	24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
WPC	WATER POINT OF CONNECTION	

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

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WATER MAIN JOINT DEFLECTION

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UTILITY CROSSING NOTE:

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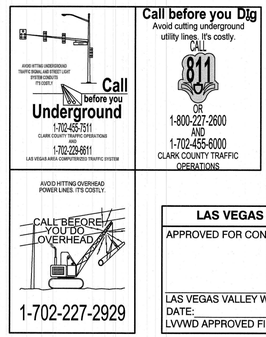

CONSTRUCTION NOTES

	SEWER	PUBLIC
S	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	8" C-900-16 SANITARY SEWER MAIN	296 LF.
	16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
1 SSD	12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
SPC	SEWER POINT OF CONNECTION	

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

_____
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE:_____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
(702) 207-4500

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

UTILITY PLAN & PROFILE 17
SEWER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	HORIZ.
08/09/2019	08/09/2019	01/13/2020	1"=20'	
BCC	BCC	WJM	1"=4'	VERT.

PROJECT NO: 7861

WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15795
PROFESSIONAL ENGINEER, STATE OF NEVADA

SHEET
UT17
56 OF **94** SHEETS

DRAWING NO.

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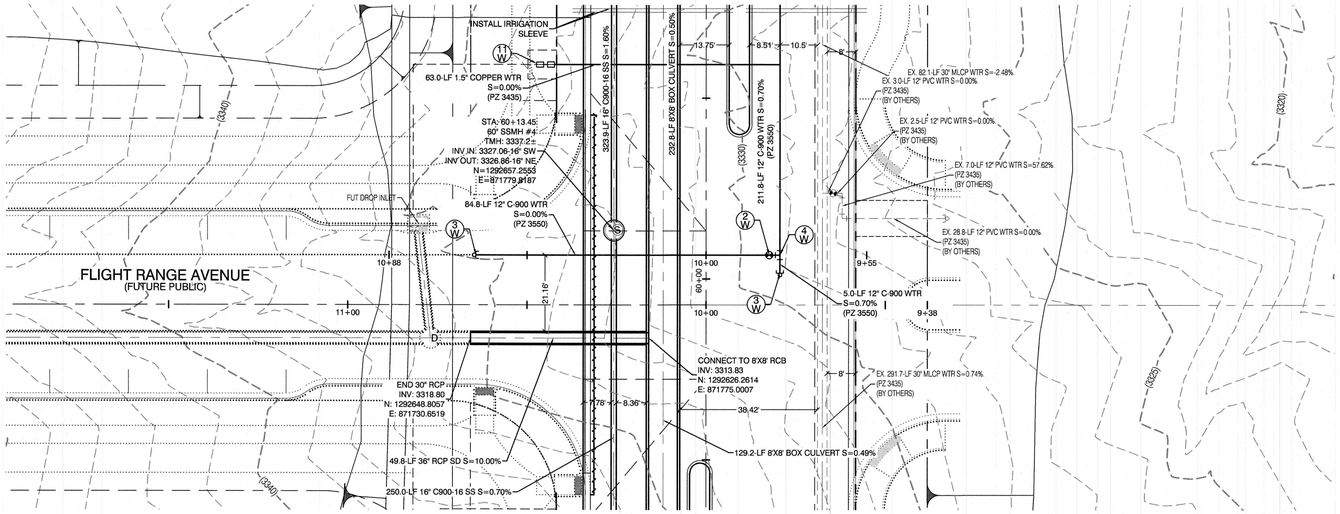
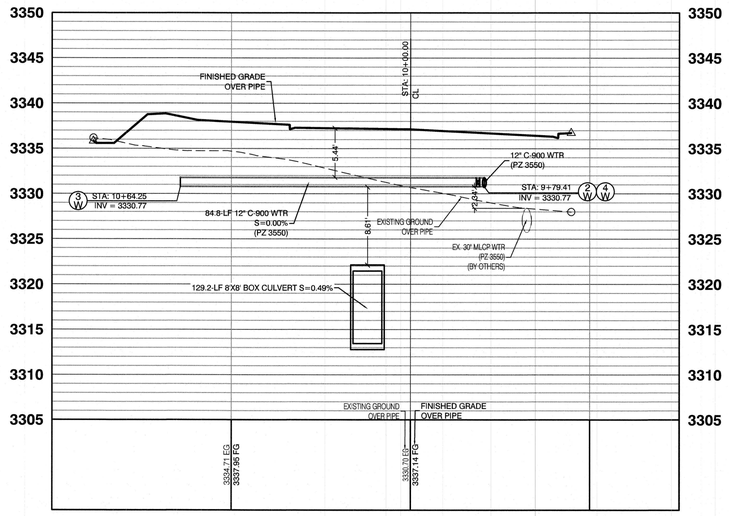
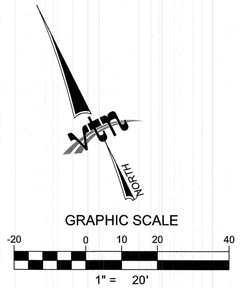


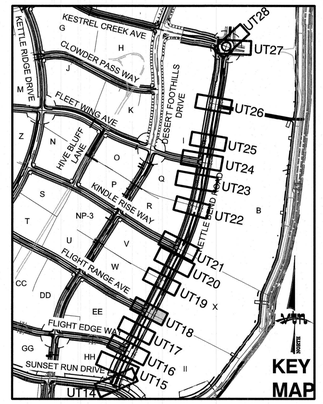
KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)





CONSTRUCTION NOTES

		WATER	PUBLIC
1W	⬢	FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2W	⊖	12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3W	◂	12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4W	ↄ	12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5W	ↄ	24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6W	⌇	24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7W	⌇	24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8W	⌇	24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9W	⌇	12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10W		1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11W	⊸⊸	1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
	——	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
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	——	24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
	POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

		SEWER	PUBLIC
	Ⓢ	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	——	8" C-900-16 SANITARY SEWER MAIN	296 LF.
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1 SS	⊏	12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
	POC	SEWER POINT OF CONNECTION	

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

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WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

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LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

Call before you Dig
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CLARK COUNTY TRAFFIC OPERATIONS

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

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

_____
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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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PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 18
WATER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 08/26/2019
DESIGNED BY: BCC — 08/26/2019
CHECKED BY: WJM — 01/13/2020
PROJECT NO: 7861
SCALE: HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER STATE OF NEVADA No. 15142
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
1/14/20

SHEET
UT18
57 OF 94 SHEETS
DRAWING NO.

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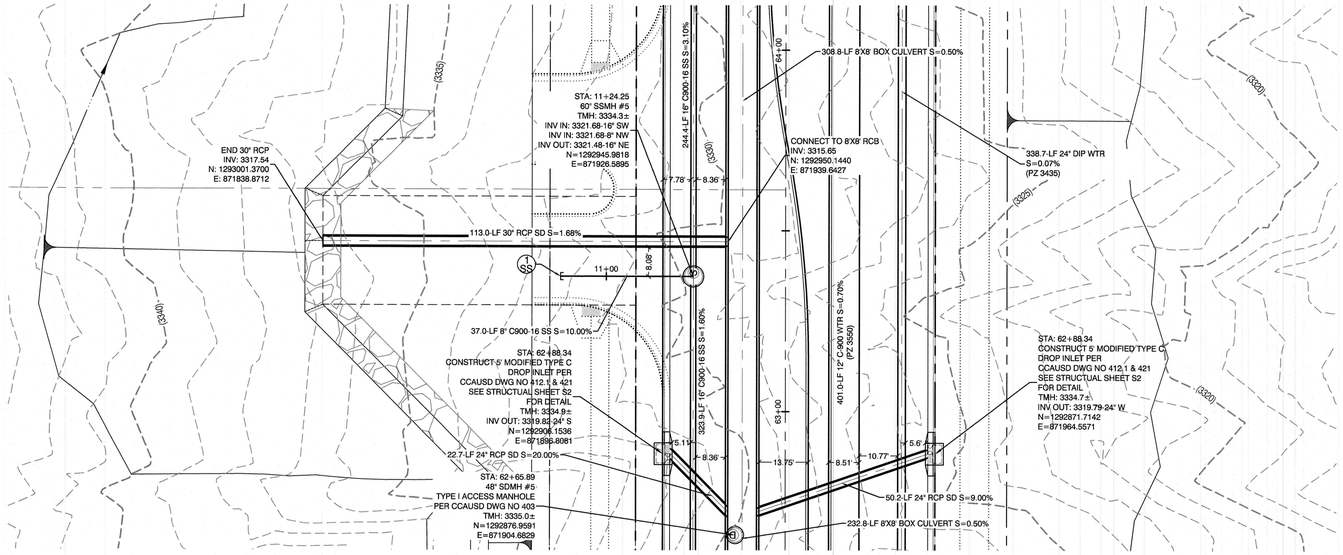
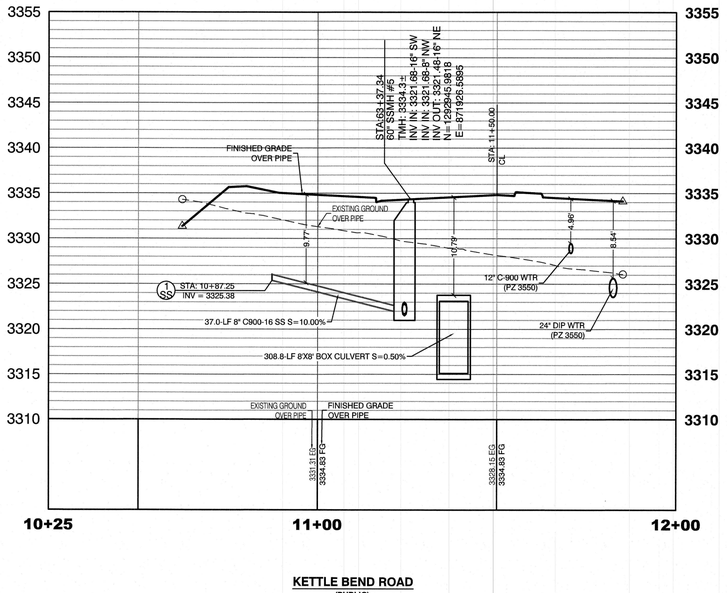


KETTLE BEND ROAD
(PUBLIC)

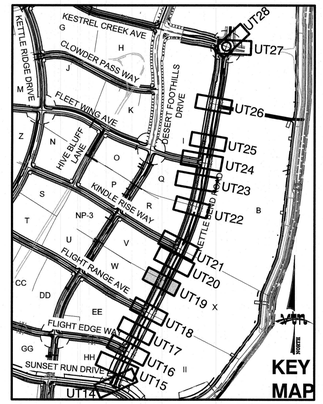
PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)



GRAPHIC SCALE
-20 0 10 20 40
1" = 20'



CONSTRUCTION NOTES

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	POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

		SEWER	PUBLIC
	S	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
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	POC	SEWER POINT OF CONNECTION	

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

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WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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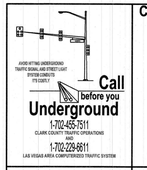
LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL



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REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 19
SEWER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
BCC 09/09/2019	BCC 09/09/2019	WJM 01/13/2020	7861	HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER · STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15749
1/14/20

SHEET
UT19
58 OF 94 SHEETS
DRAWING NO.

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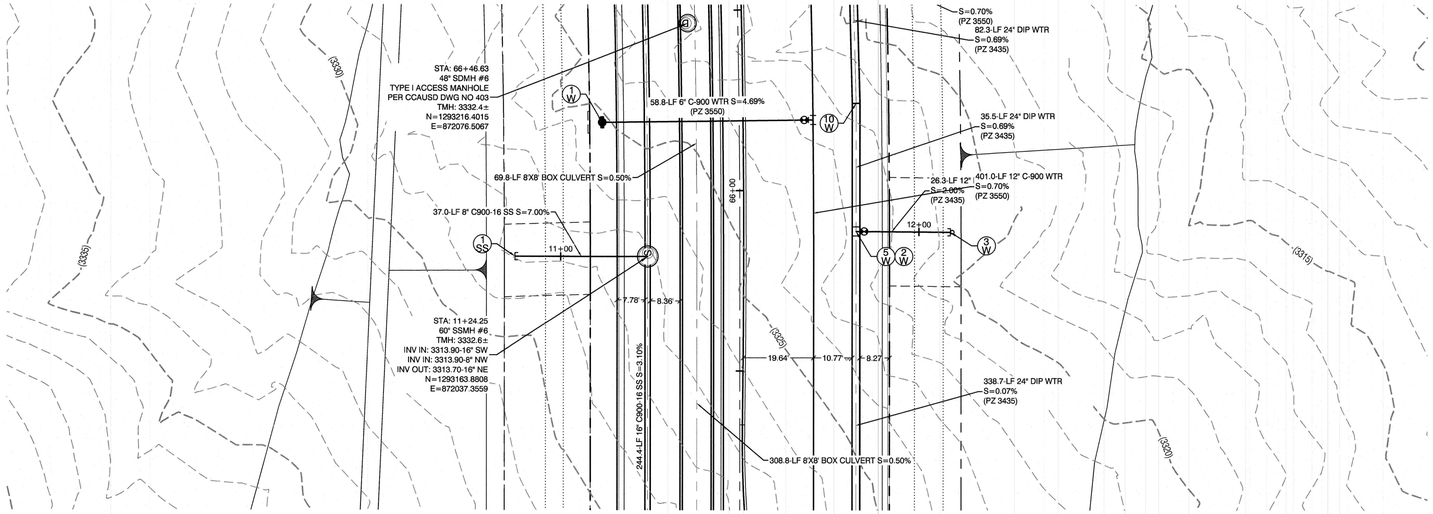
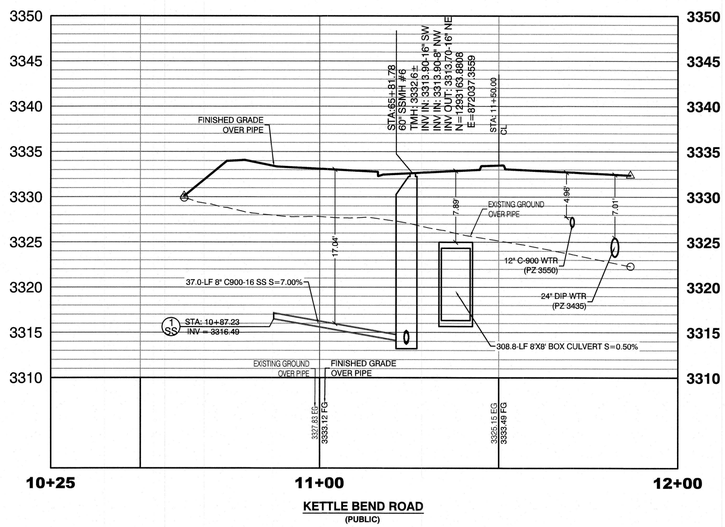


KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



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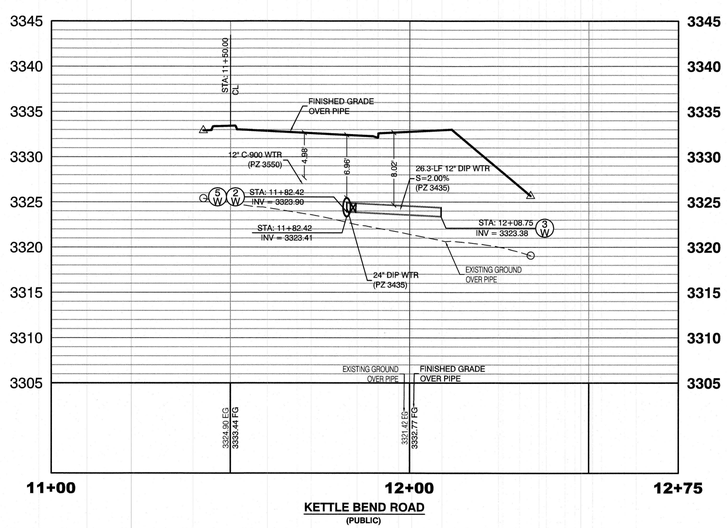

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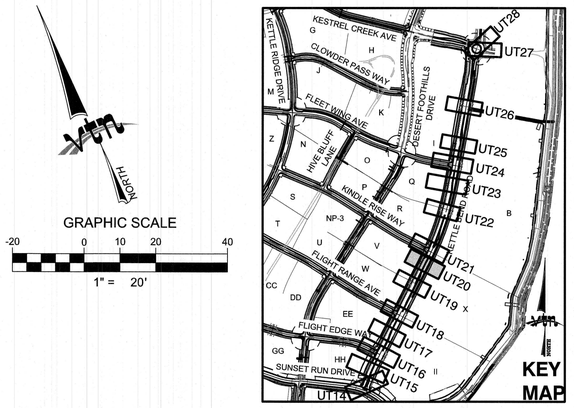

CONSTRUCTION NOTES

		WATER	PUBLIC
1 W	⬢	FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2 W	⊖	12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3 W	⊂	12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4 W	⊃	12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5 W	⊃	24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6 W	⌐	24" 5° BEND (PER UDACS PLATE 31)	10 EA.
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9 W	⌐	12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10 W	⊢	1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11 W	⊢□	1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
	——	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
	——	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
	——	24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
	POC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

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S	Ⓢ	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	——	8" C-900-16 SANITARY SEWER MAIN	296 LF.
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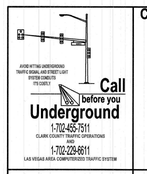

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APPROVED FOR CONSTRUCTION

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DATE: PROJECT:----
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HOWARD HUGHES COMPANY, LLC
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702-791-4500

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UTILITY PLAN & PROFILE 20
SEWER & WATER LATERAL

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KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	08/09/2019	SCALE:	1"=20' HORIZ. 1"=4' VERT.
DESIGNED BY: BCC	08/09/2019		
CHECKED BY: WJM	01/13/2020		
PROJECT NO: 7861			

PROFESSIONAL ENGINEER STATE OF NEVADA
No. 15745
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
1/14/20

SHEET
UT20
59 OF **94** SHEETS
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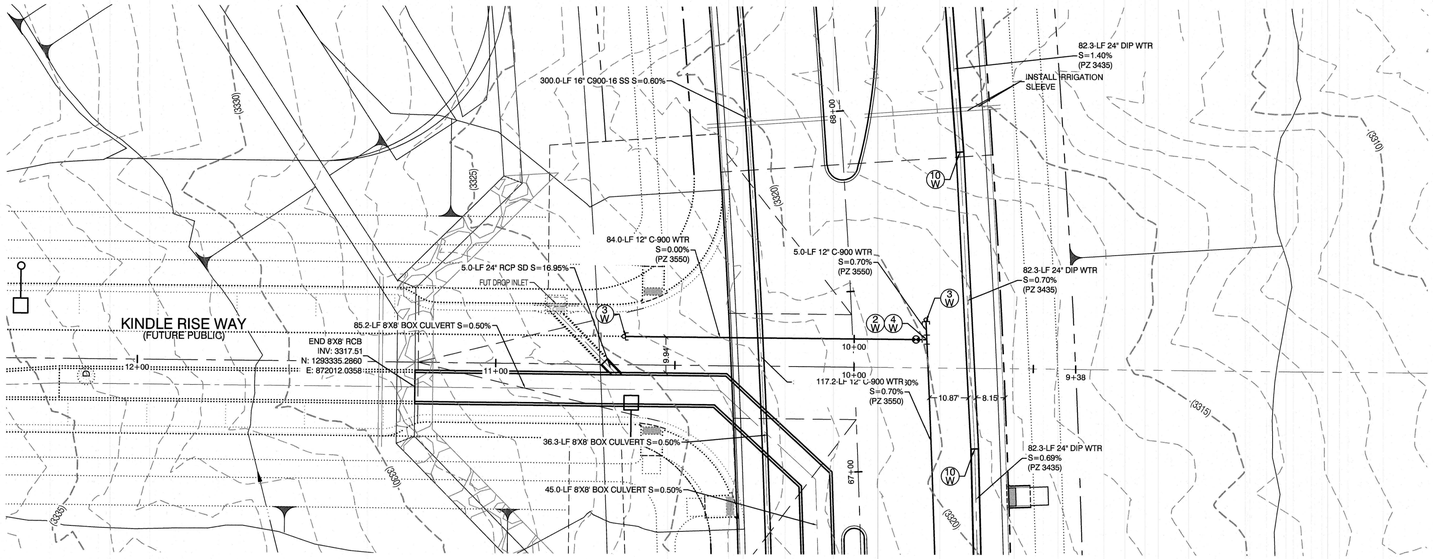

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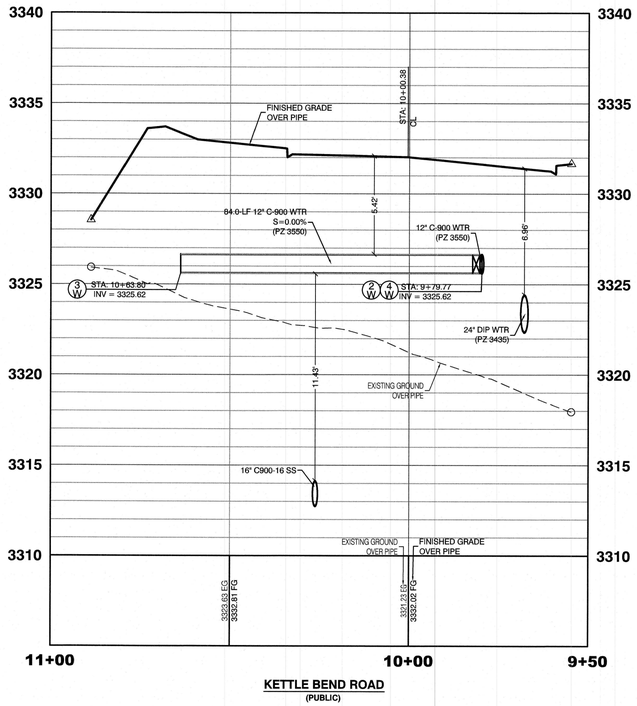

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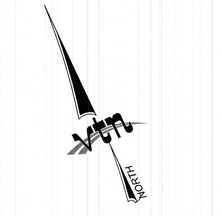

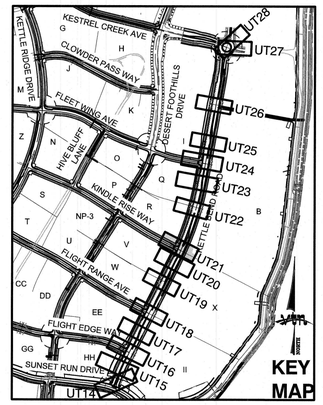

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APPROVED FOR CONSTRUCTION

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REV	DATE	BY	REVISION

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SHEET
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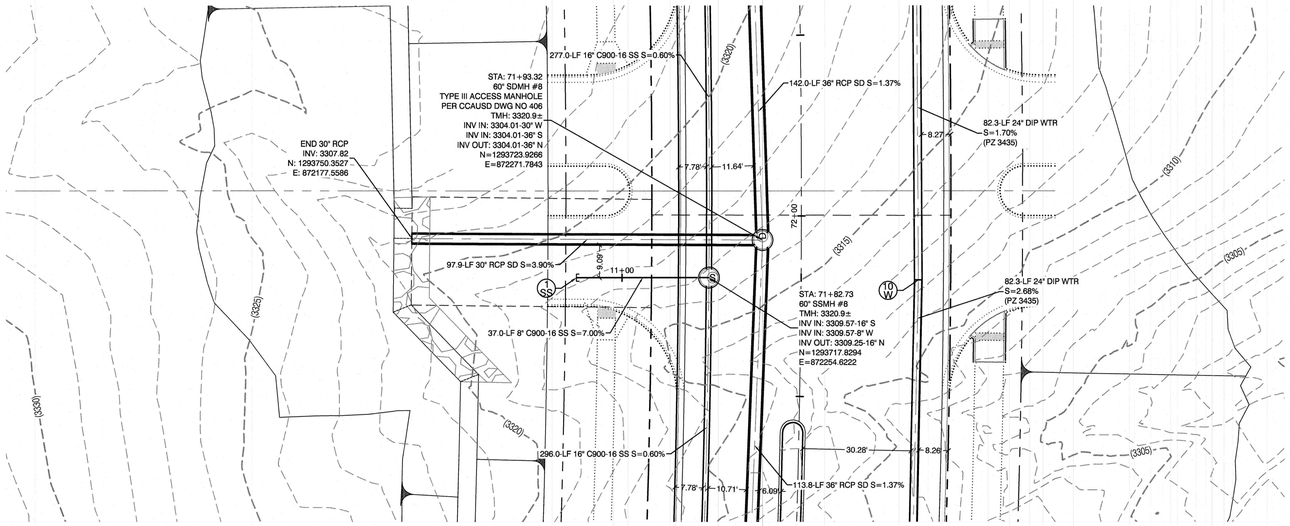

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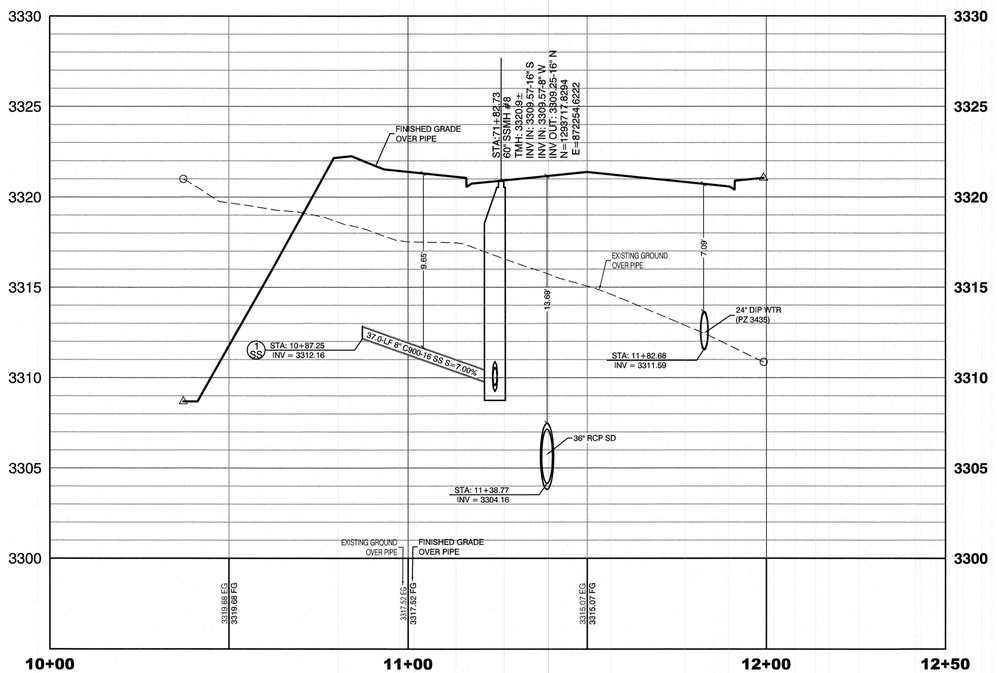

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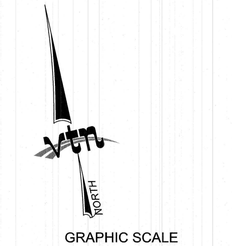

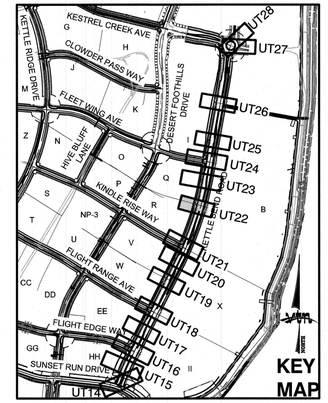

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CONSTRUCTION NOTES

		SEWER	PUBLIC
S		STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
		8" C-900-16 SANITARY SEWER MAIN	296 LF.
		16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
1 SS		12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
		SEWER POINT OF CONNECTION	

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

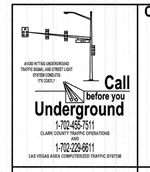
WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL







LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:-----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4500

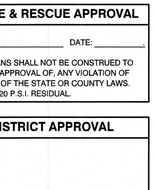
CITY OF LAS VEGAS

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

UTILITY PLAN & PROFILE 22
SEWER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
BCC	BCC	WMM	7881	HORIZ. 1"=20' VERT. 1"=4'
08/09/2019	08/09/2019	01/13/2020		



SHEET
UT22
61 OF **94** SHEETS

DRAWING NO.

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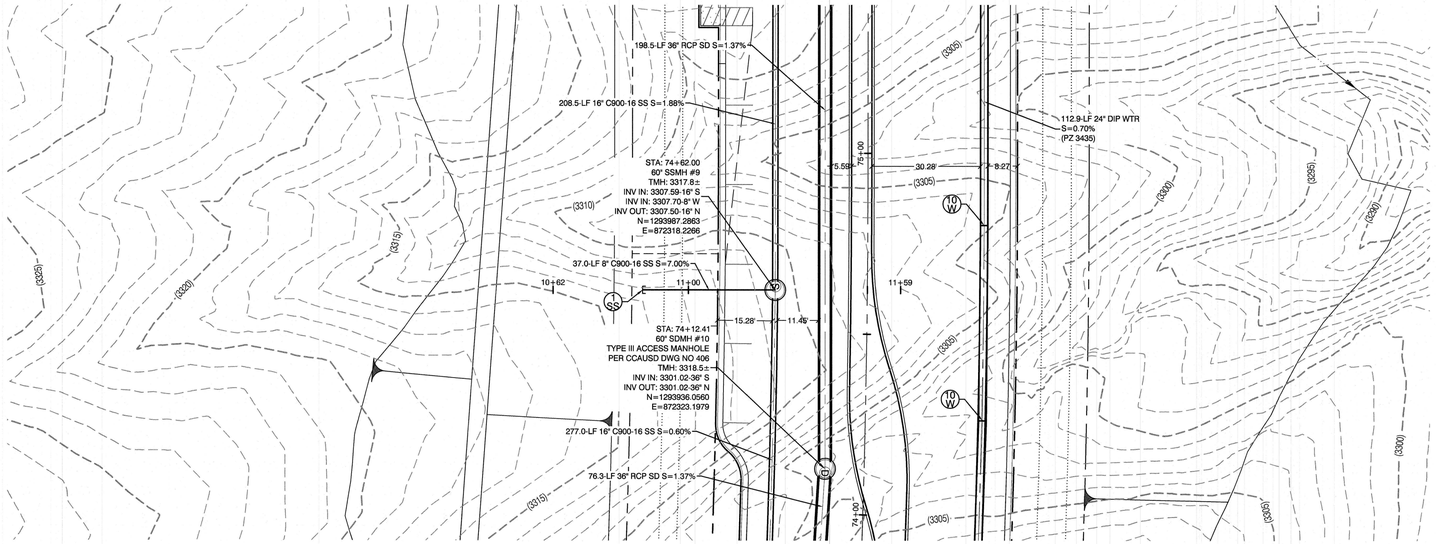
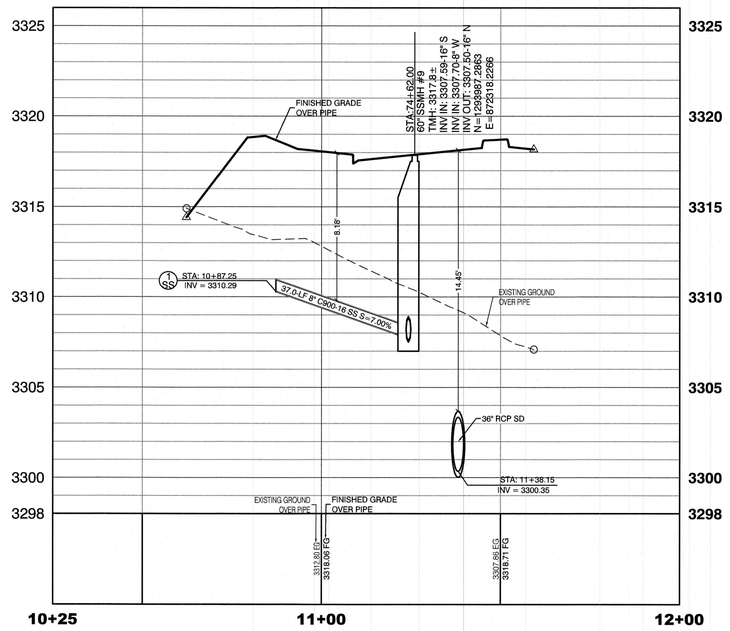


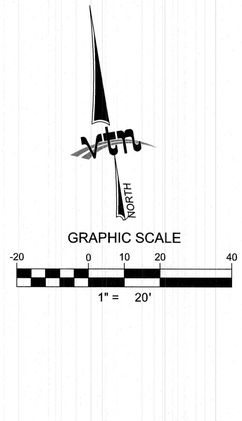
KETTLE BEND ROAD
(PUBLIC)

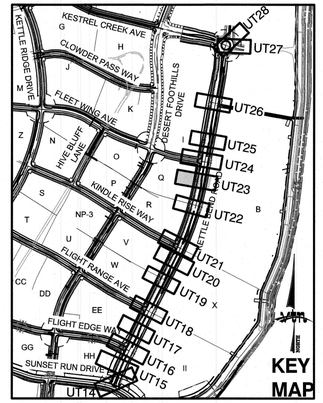
PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)





CONSTRUCTION NOTES

	WATER	PUBLIC
1W	FIRE HYDRANT ASSEMBLY; (PER UDACS PLATE NO. 39 & 40)	8 EA.
2W	12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3W	12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4W	12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5W	24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6W	24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7W	24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8W	24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9W	12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10W	1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11W	1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
	24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
PC	WATER POINT OF CONNECTION	

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

WATER MAIN JOINT DEFLECTION

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

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

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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CONSTRUCTION NOTES

	SEWER	PUBLIC
S	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	8" C-900-16 SANITARY SEWER MAIN	296 LF.
	16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
1 SSD	12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
PC	SEWER POINT OF CONNECTION	

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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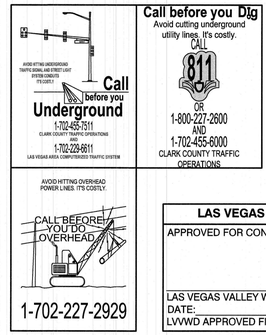
LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

_____
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL



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CITY OF LAS VEGAS

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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 23
SEWER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 08/09/2019
DESIGNED BY: BCC — 08/09/2019
CHECKED BY: WJM — 01/13/2020
SCALE: HORIZ. 1"=20' VERT. 1"=4'
PROJECT NO: 7861

PROFESSIONAL ENGINEER STATE OF NEVADA
No. 15743
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
1/14/20

SHEET
UT23
62 OF 94 SHEETS
DRAWING NO.

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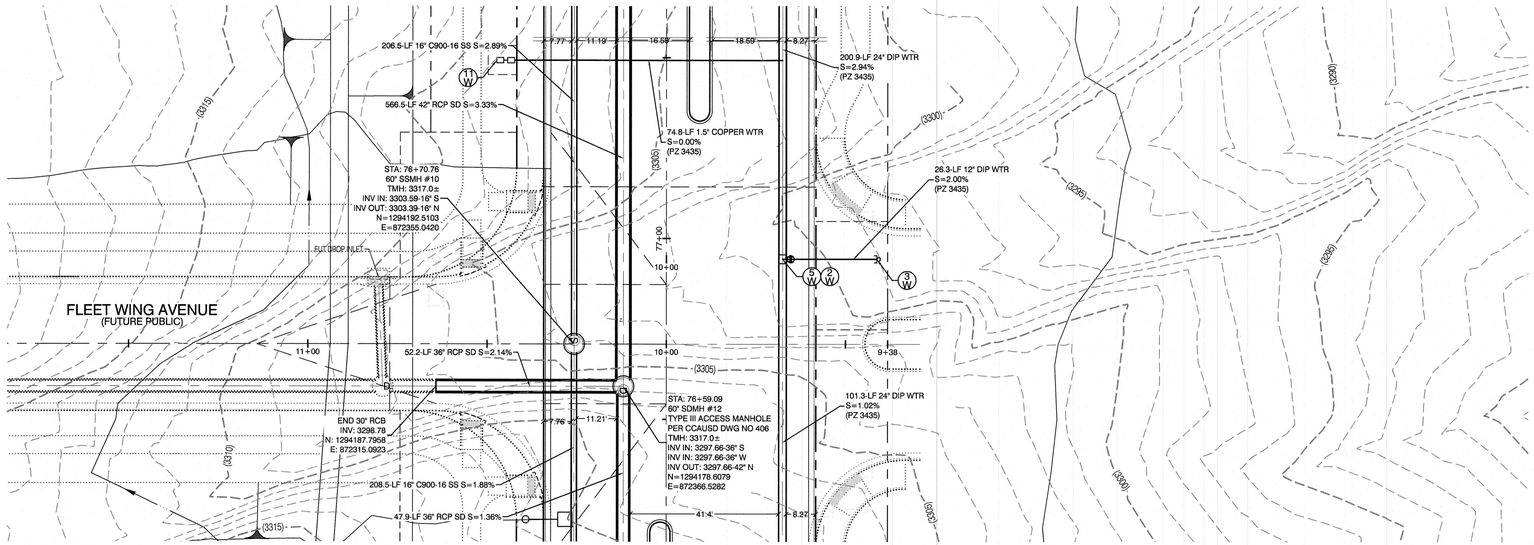
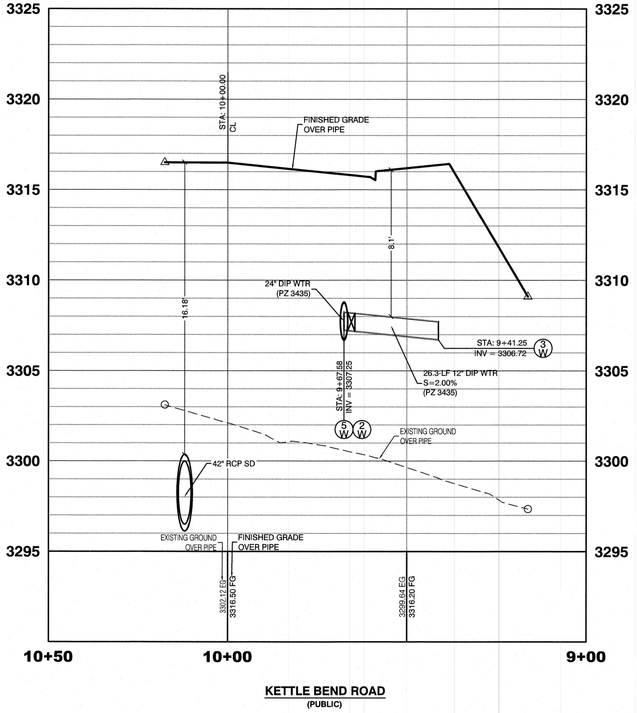


KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)



GRAPHIC SCALE
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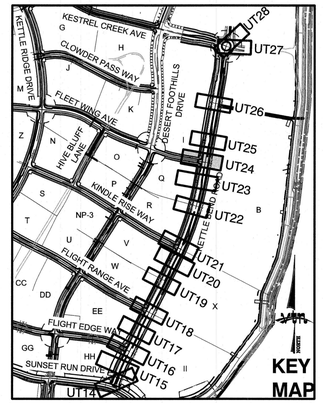
1" = 20'



CONSTRUCTION NOTES

		WATER	PUBLIC
1 W	⬢	FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2 W	⊖	12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
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4 W	⊃	12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5 W	⊃	24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6 W	⌇	24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7 W	⌇	24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8 W	⌇	24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9 W	⌇	12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10 W	⌇	1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11 W	○—○	1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
	——	6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
	——	12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
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	24"	WATER POINT OF CONNECTION	

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

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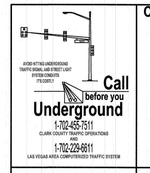





CONSTRUCTION NOTES

		SEWER	PUBLIC
S	Ⓢ	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	——	8" C-900-16 SANITARY SEWER MAIN	296 LF.
	——	16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
1 SS	⊏	12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
	SSMH	SEWER POINT OF CONNECTION	

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

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LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:-----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
(702) 791-4000

2727 SOUTH RAINBOW BOULEVARD
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PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 24
WATER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	08/09/2019	CHECKED BY: VMM	01/13/2020	SCALE: 1"=20' HORIZ. 1"=4' VERT.
DESIGNED BY: BCC	09/09/2019	PROJECT NO: 7861		

WILLIAM J. MEYER
PROFESSIONAL ENGINEER - STATE OF NEVADA
No. 15749
EXP: 12/31/21
CIVIL
1/14/20

SHEET
UT24
63 OF **94** SHEETS

DRAWING NO.

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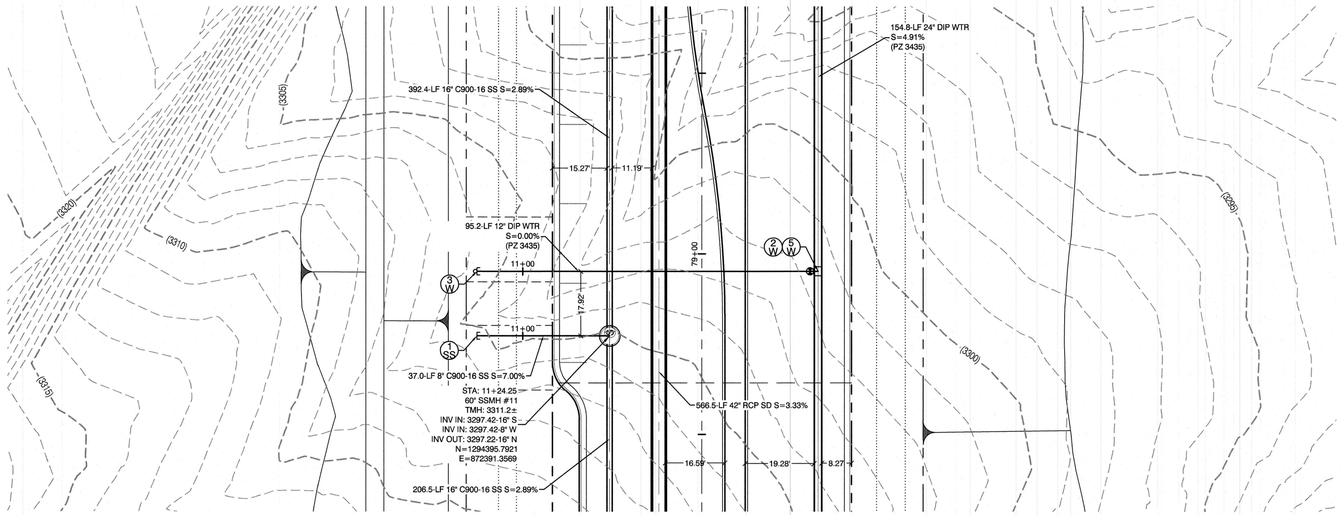

GRAPHIC SCALE

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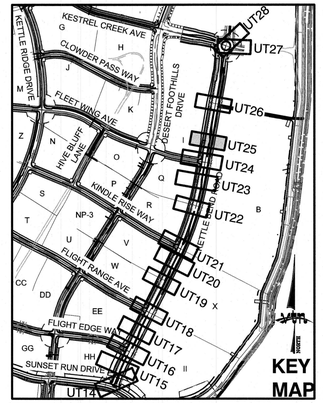
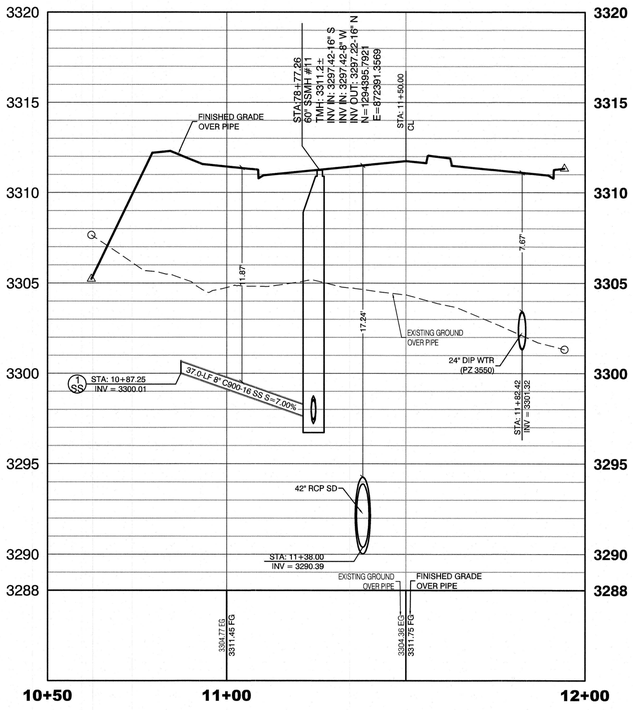
1" = 20'

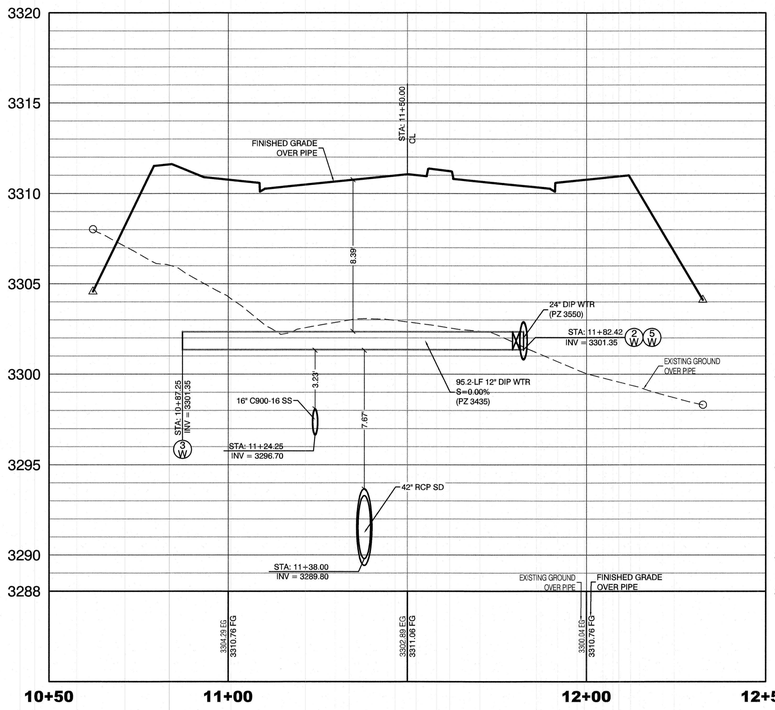


KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)



KETTLE BEND ROAD
(PUBLIC)

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

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2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

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CONSTRUCTION NOTES

		WATER	PUBLIC
1W		FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2W		12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3W		12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4W		12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5W		24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6W		24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7W		24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8W		24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9W		12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10W		1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11W		1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
		6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
		12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
		24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
PC		WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

		SEWER	PUBLIC
S		STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
		8" C-900-16 SANITARY SEWER MAIN	296 LF.
		16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
SS		12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
SPC		SEWER POINT OF CONNECTION	

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

_____
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL





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LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 25
SEWER & WATER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 09/06/2019
DESIGNED BY: BCC — 09/09/2019
CHECKED BY: WJM — 01/13/2020
SCALE: HORIZ 1"=20' VERT. 1"=4'
PROJECT NO: 7861

SHEET
UT25
64 OF 94 SHEETS
DRAWING NO.

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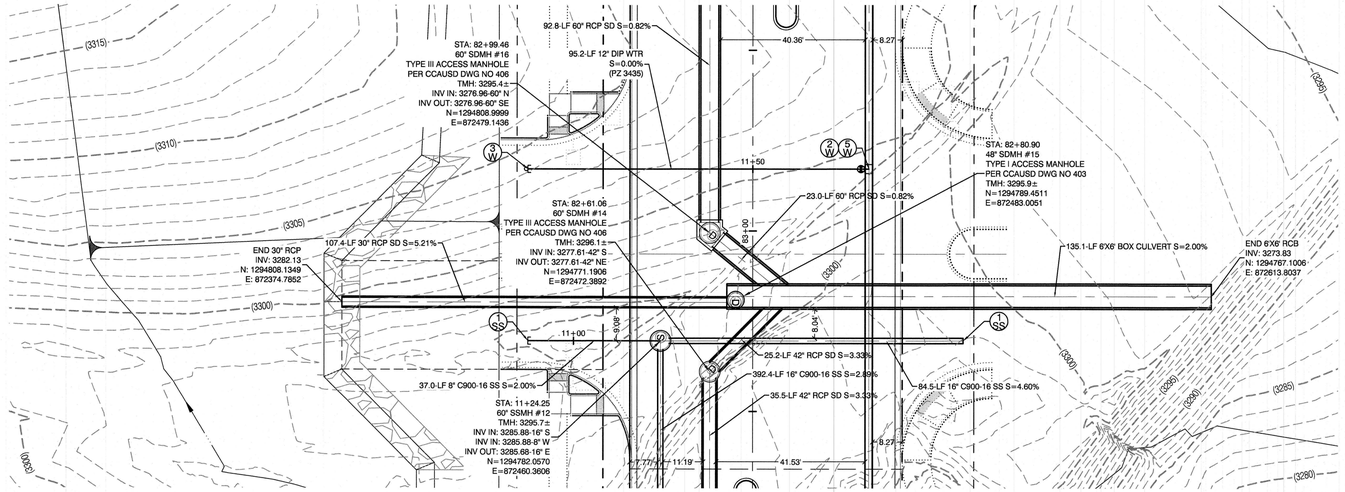
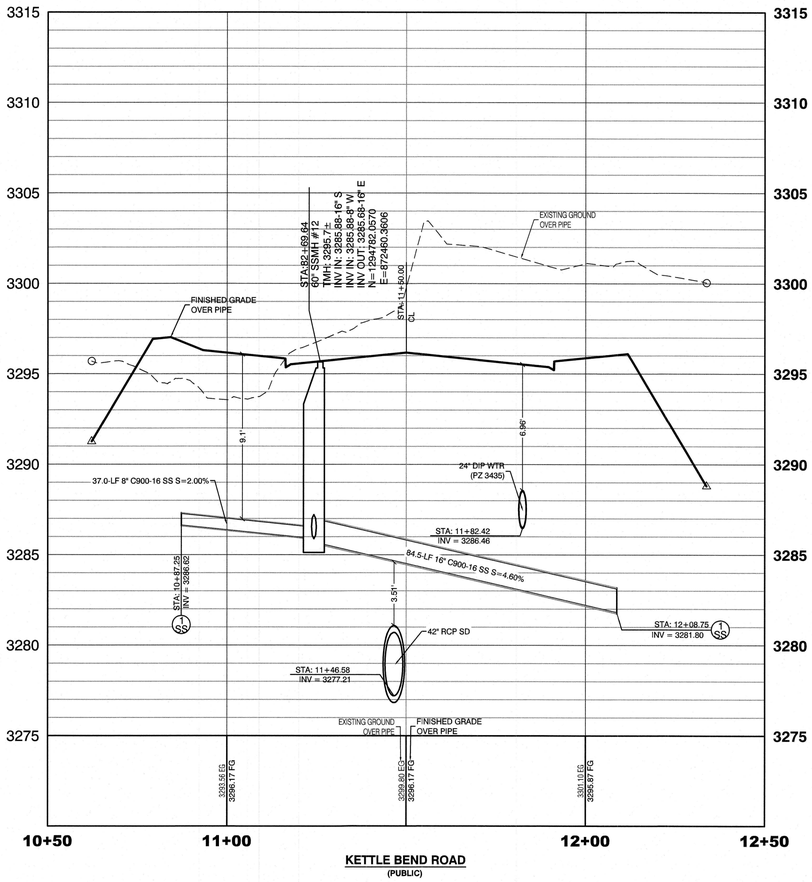


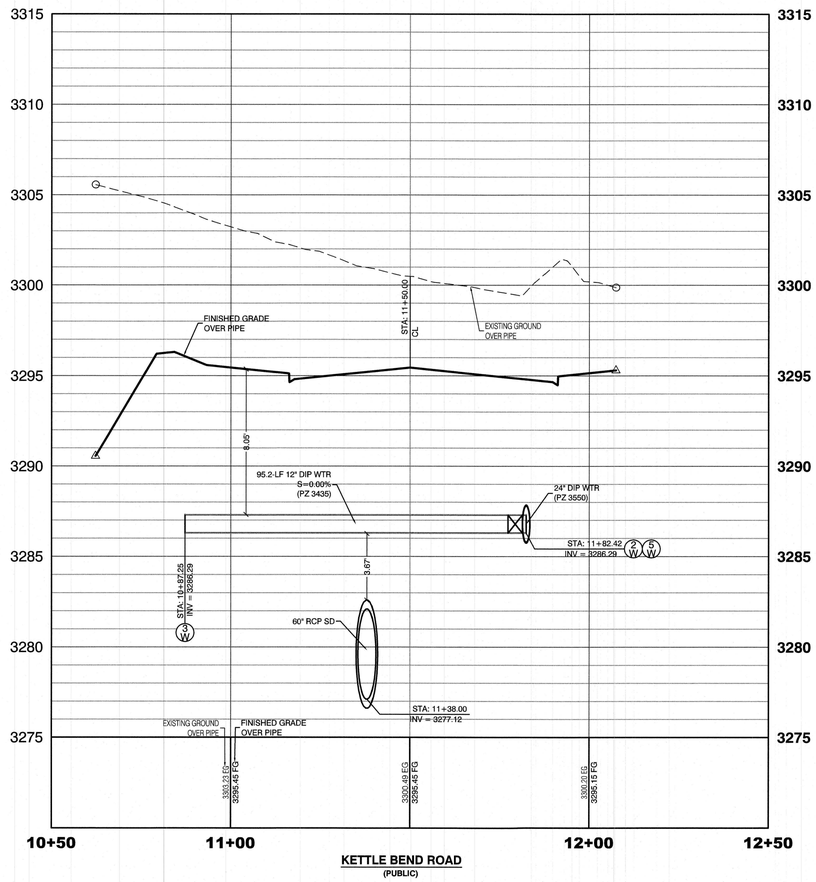
KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:

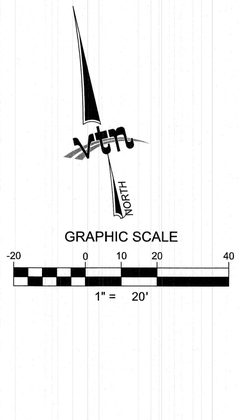
HORIZ. = 1"=20'
VERT. = 1"=4'

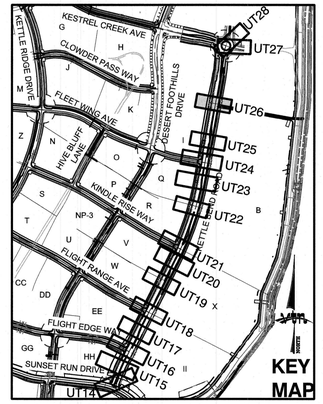


KETTLE BEND ROAD
(PUBLIC)



KETTLE BEND ROAD
(PUBLIC)





CONSTRUCTION NOTES

		WATER	PUBLIC
1W		FIRE HYDRANT ASSEMBLY: (PER UDACS PLATE NO. 39 & 40)	8 EA.
2W		12" GATE VALVE (PER UDACS PLATE 39)	10 EA.
3W		12" CAP & BLOW OFF (PER UDACS PLATE 36)	12 EA.
4W		12"X12" TEE (PER UDACS PLATE 31)	4 EA.
5W		24"X12" TEE (PER UDACS PLATE 31)	6 EA.
6W		24" 5° BEND (PER UDACS PLATE 31)	10 EA.
7W		24" 11° BEND (PER UDACS PLATE 31)	5 EA.
8W		24" 22° BEND (PER UDACS PLATE 31)	9 EA.
9W		12" 45° BEND (PER UDACS PLATE 31)	1 EA.
10W		1" HORIZONTAL DEFLECTION (PER UDACS 2.07)	15 EA.
11W		1.5" TYPE K SOFT COPPER WATER LATERAL SERVICE WITH 1.5" METER PER UDACS PLATE #4 (IRRIGATION) AND 1.5" RPPA PER UDACS PLATE #8	2 EA.
		6" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	254 LF.
		12" C-900 WATER MAIN PER UDACS 2.06.01 & PLATE 17	1,636 LF.
		24" DIP WATER MAIN PER UDACS 2.06.01 & PLATE 17	3,412 LF.
	PWC	WATER POINT OF CONNECTION	

CONSTRUCTION NOTES

	SEWER	PUBLIC
S	STANDARD MANHOLE PER SD-1 & SD-4 W/ SINGLE 24" DIAMETER MANHOLE COVER AND CORROSION PROTECTION	12 EA.
	8" C-900-16 SANITARY SEWER MAIN	296 LF.
	16" C-900-16 SANITARY SEWER MAIN	3,174 LF.
1 SS	12" SEWER CAP (PER STD 4.6 & 4.11)	8 EA.
PSC	SEWER POINT OF CONNECTION	

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
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UTILITY CROSSING NOTE:

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WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

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LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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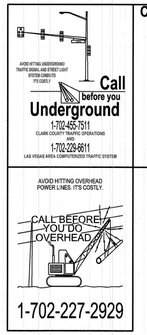
LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL



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UTILITY PLAN & PROFILE 26
SEWER & WATER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ.
BCC 08/26/2019	BCC 08/26/2019	WJM 01/13/2020	7861	1"=20'	VERT. 1"=4'

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 16745
1/14/20

SHEET
UT26
65 OF **94** SHEETS

DRAWING NO.

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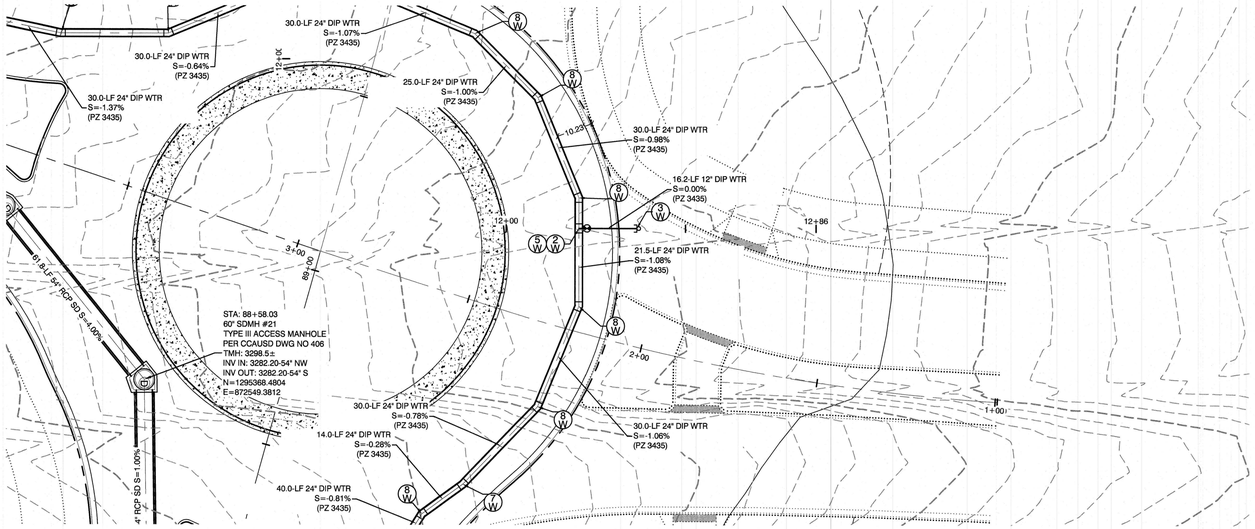

KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
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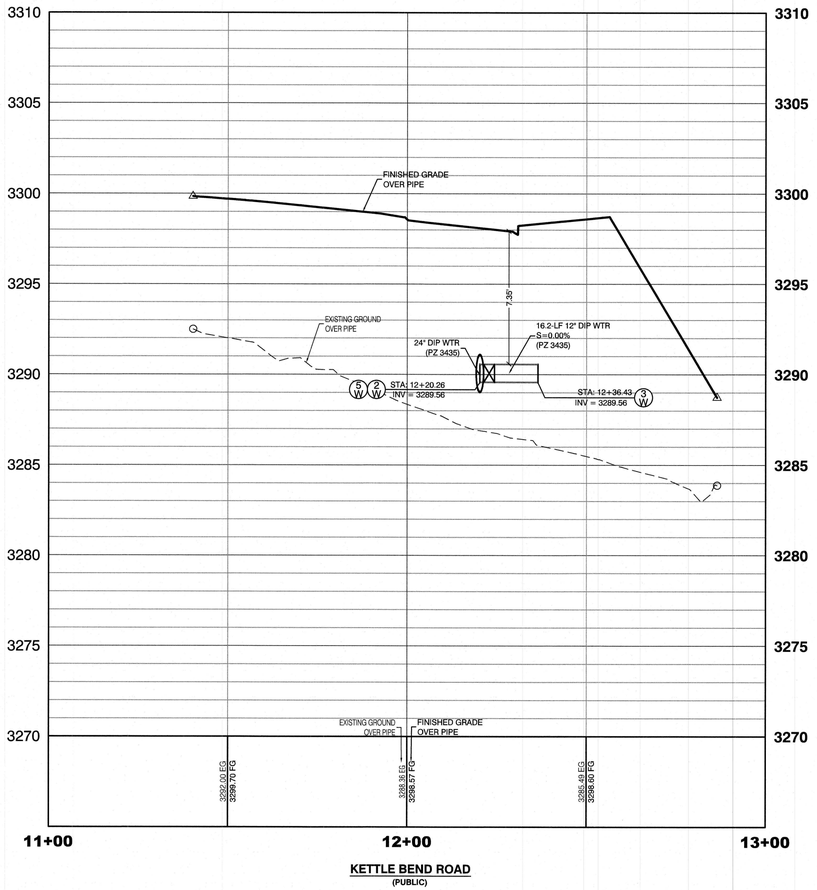

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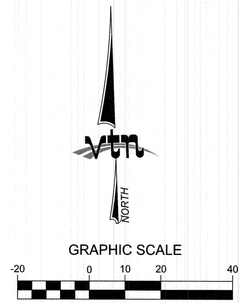

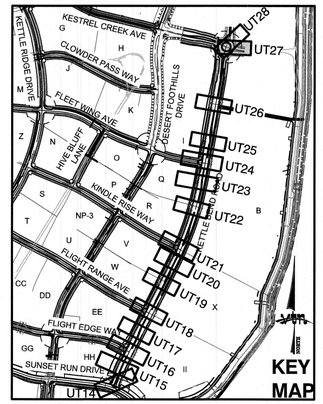

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WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

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LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

_____
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
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UTILITY PLAN & PROFILE 27
WATER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 08/30/2019
DESIGNED BY: BCC — 08/30/2019
CHECKED BY: WJM — 01/13/2020
SCALE: HORIZ. 1"=20' VERT. 1"=4'
PROJECT NO: 7861

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15749
1/19/20

SHEET
UT27
66 OF **94** SHEETS
DRAWING NO.

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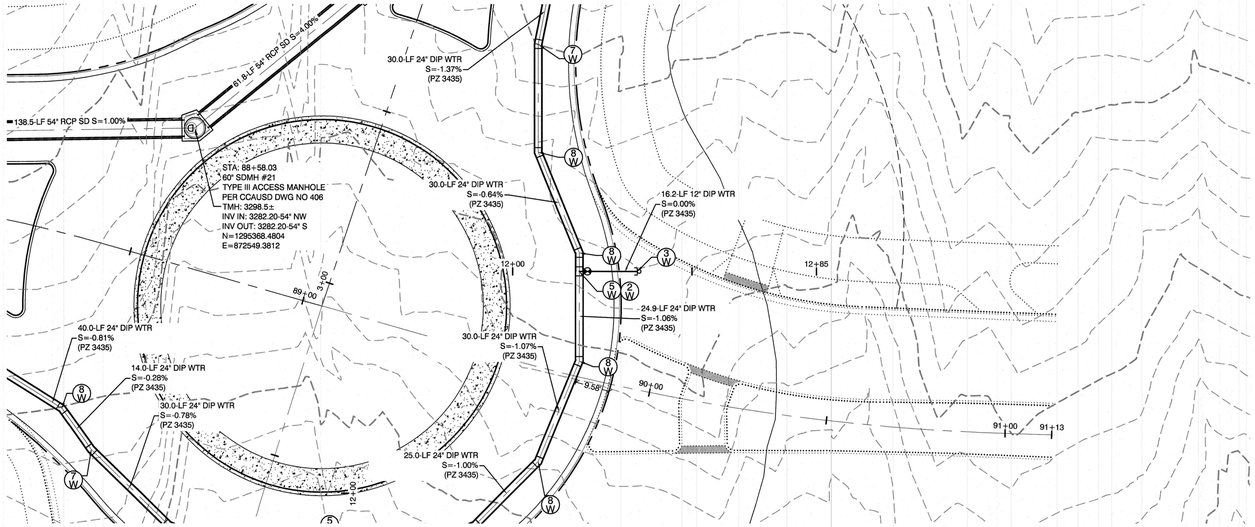
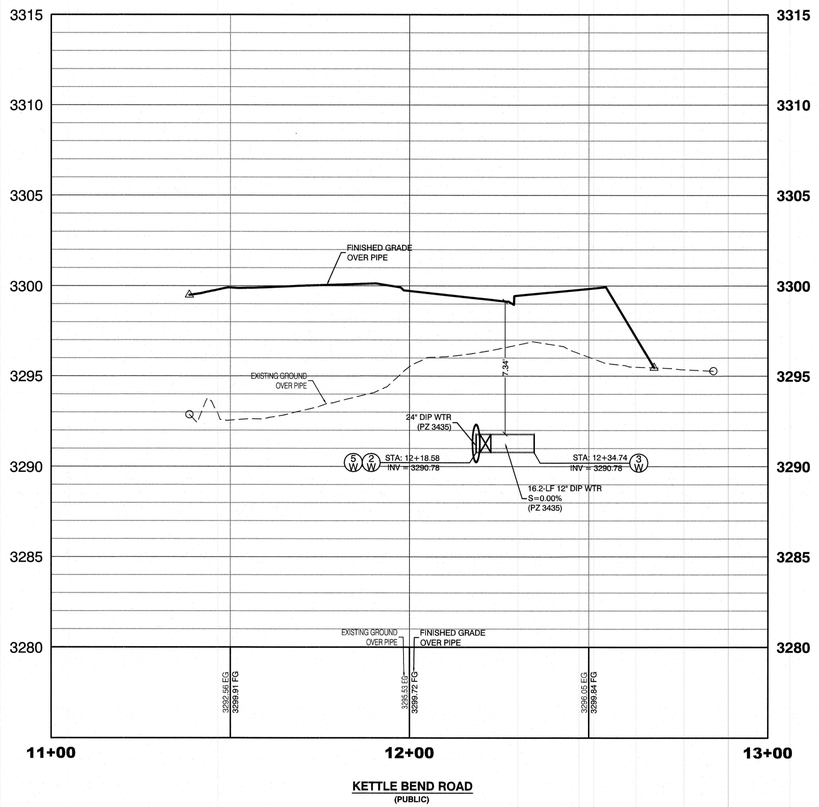


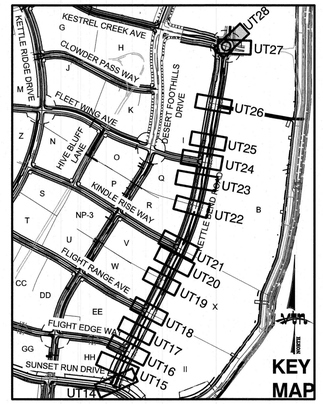
KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)

GRAPHIC SCALE
-20 0 10 20 40
1" = 20'



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		WATER POINT OF CONNECTION	

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SOC		SEWER POINT OF CONNECTION	

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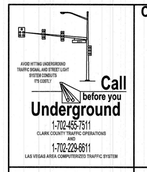





LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
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2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 28
WATER LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
BCC	BCC	JWM	7861	HORIZ. 1"=20' VERT. 1"=4'
08/09/2019	09/09/2019	01/13/2020		

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
UT28
67 OF 94 SHEETS

DRAWING NO.

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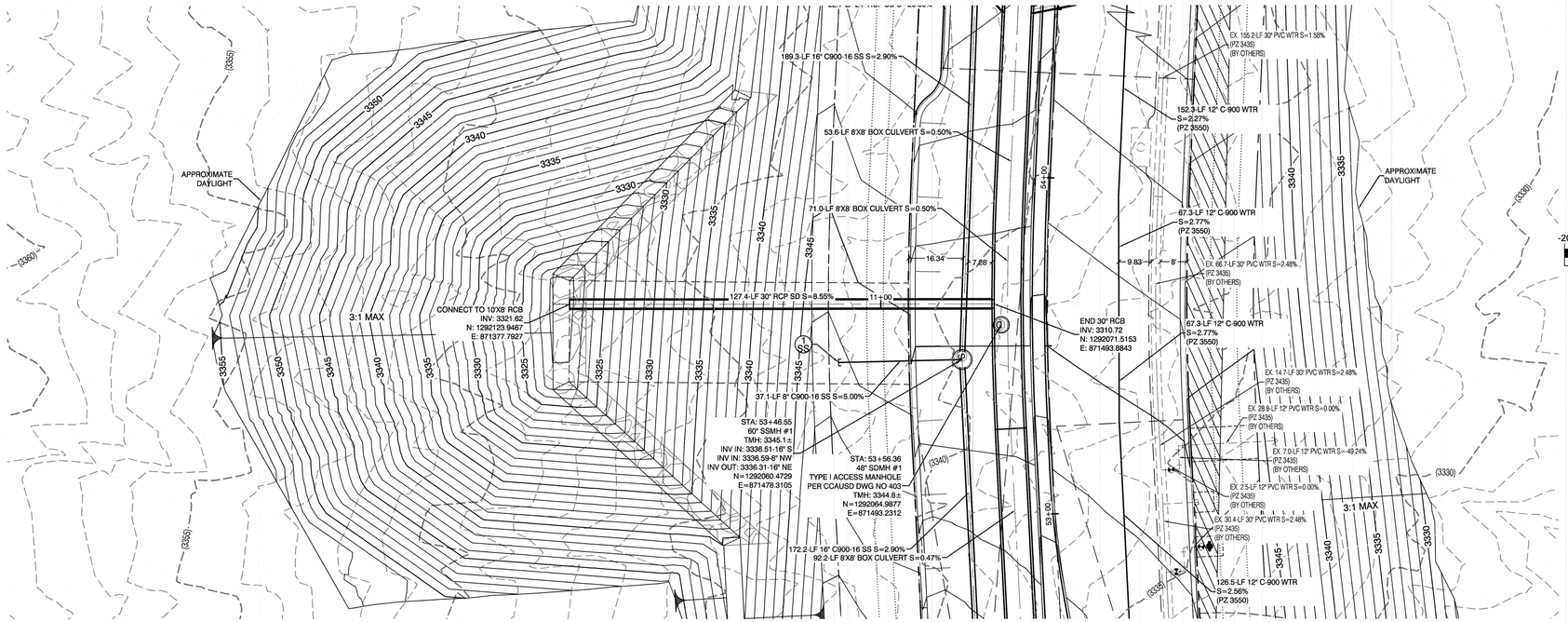

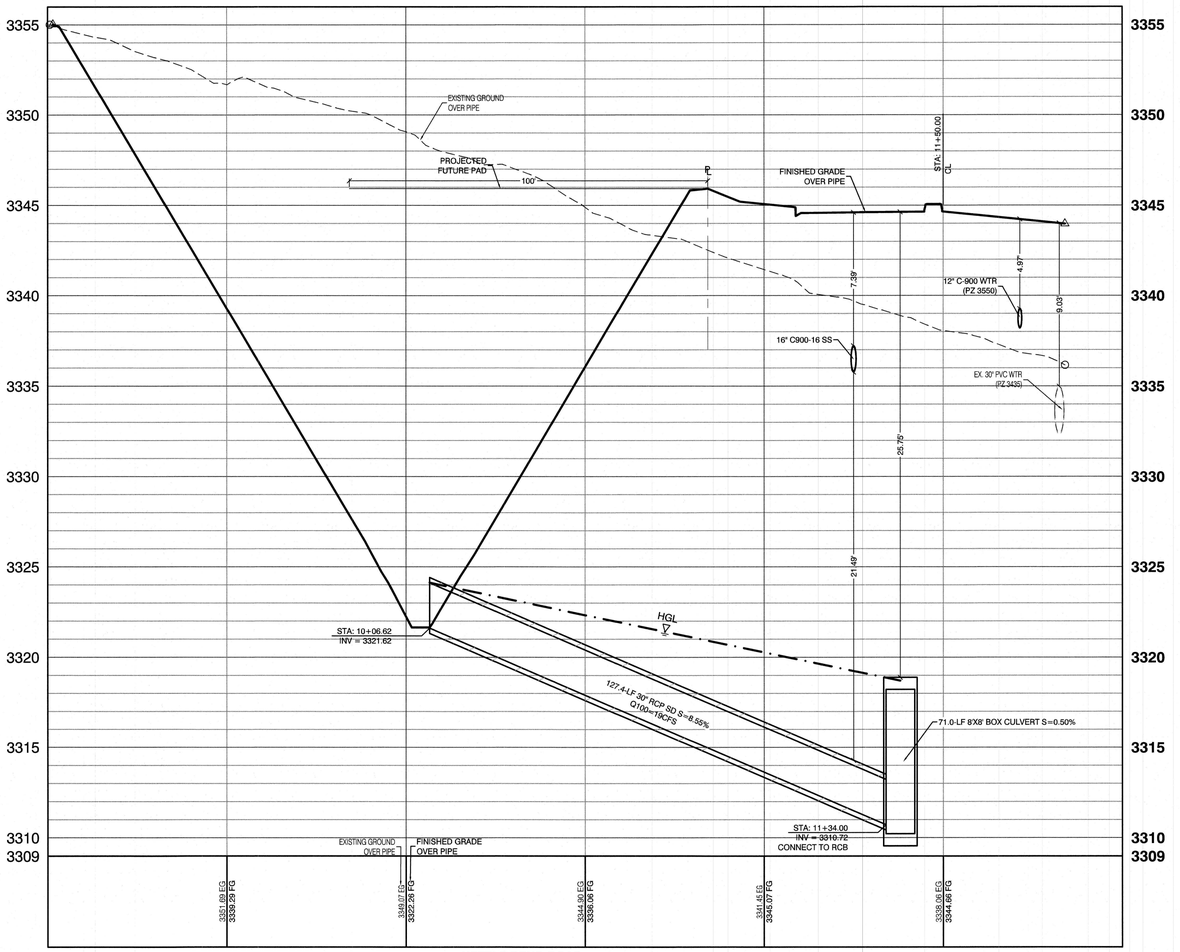

KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
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WATER MAIN JOINT DEFLECTION

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

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

UTILITY CROSSING NOTE:

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WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS.
FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS AND
1-702-229-6511
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

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

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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PH. (702) 873-7590 FAX (702) 382-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 29
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
BCC 08/10/2019	BCC 08/10/2019	MJM 01/13/2020	7881	HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 17545
1/13/20

SHEET
UT29
68 OF 94 SHEETS
DRAWING NO.

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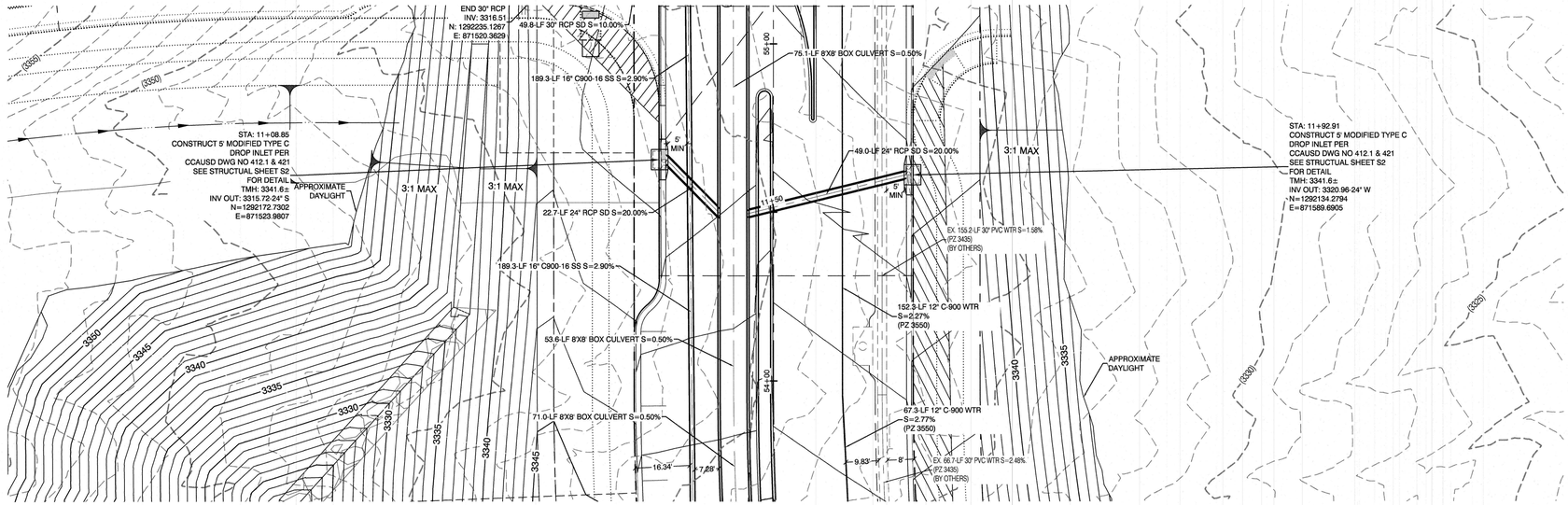
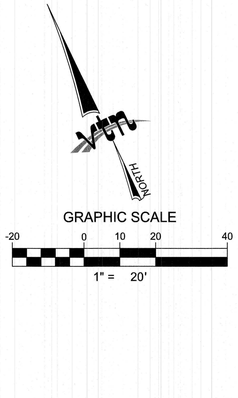
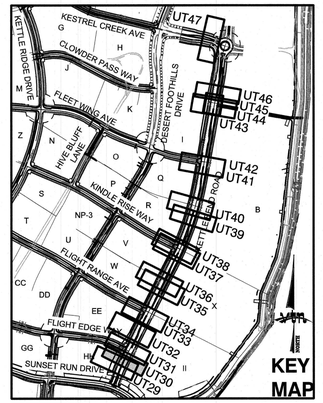


KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'

KETTLE BEND ROAD
(PUBLIC)





NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:
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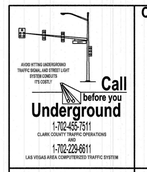
WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____
APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL



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AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS



LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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

UTILITY PLAN & PROFILE 30 STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22 KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 08/10/2019
DESIGNED BY: BCC — 09/10/2019
CHECKED BY: MM — 01/13/2020
PROJECT NO: 7861
SCALE: HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15715
1/14/20

SHEET
UT30
69 OF **94** SHEETS

DRAWING NO.

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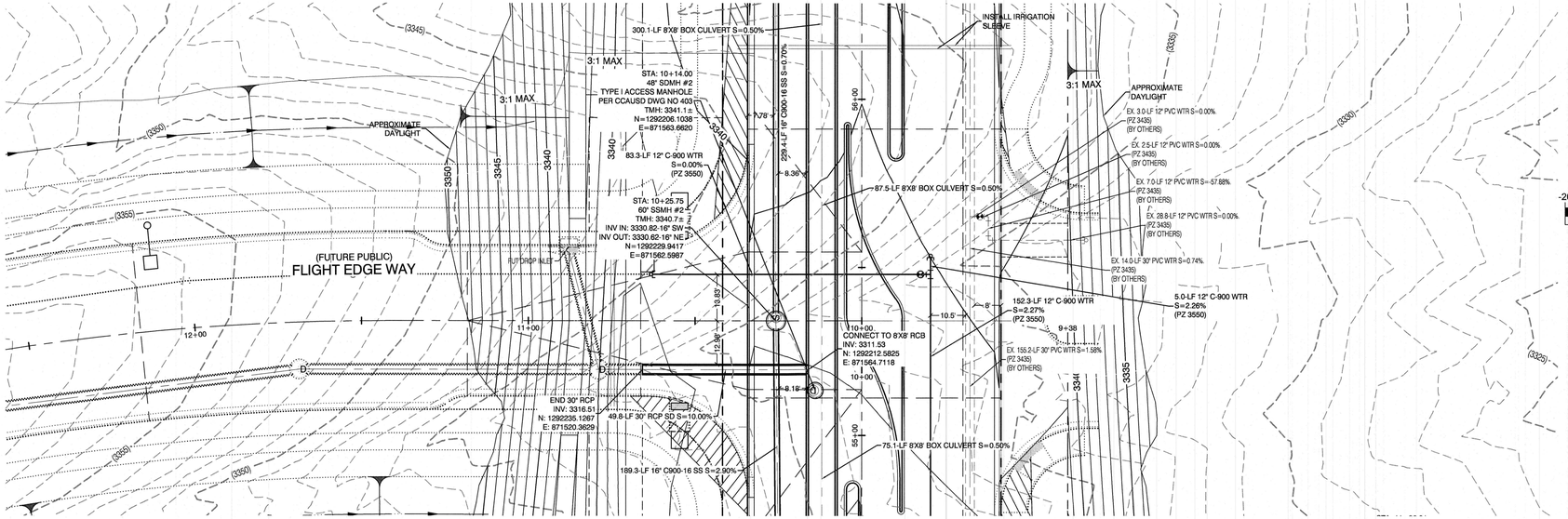
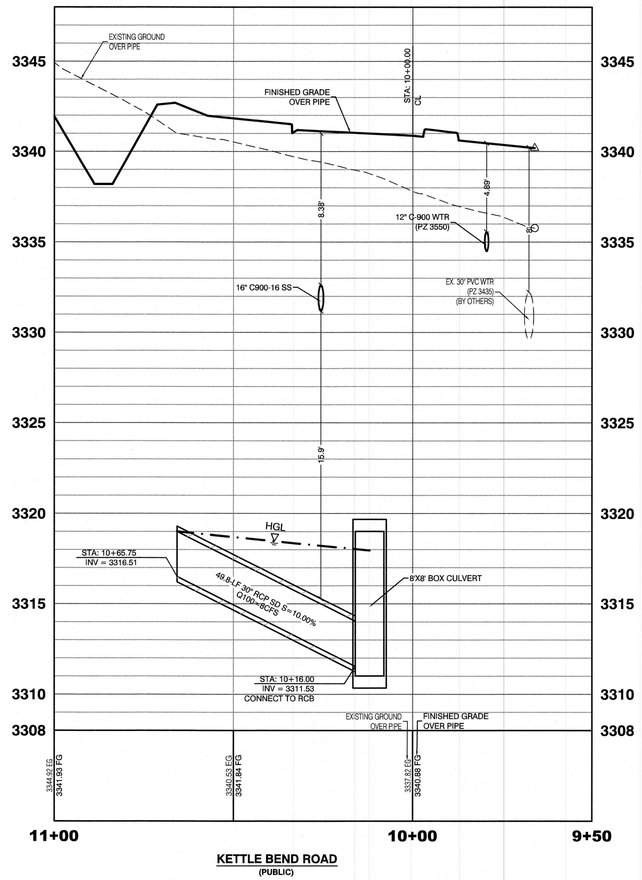


KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)

GRAPHIC SCALE
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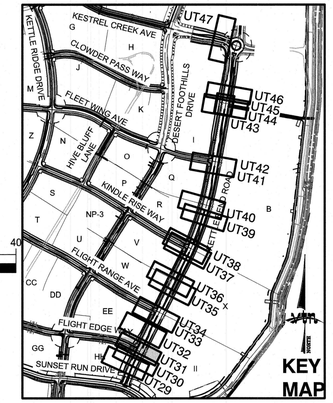
1" = 20'



KEY MAP

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

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WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:-----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS
Call before you Underground
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CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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DIAL 811
OR
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AND
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CLARK COUNTY TRAFFIC OPERATIONS

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

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A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

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PH. (702) 873-7590 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 31
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	09/10/2019		
DESIGNED BY: BCC	09/10/2019		
CHECKED BY: WJM	01/13/2020	SCALE:	HORIZ 1"=20'
PROJECT NO: 7881			VERT. 1"=4'

WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
PROFESSIONAL ENGINEER - STATE OF NEVADA
No. 15745
1/13/20

SHEET
UT31
70 OF **94** SHEETS

DRAWING NO.

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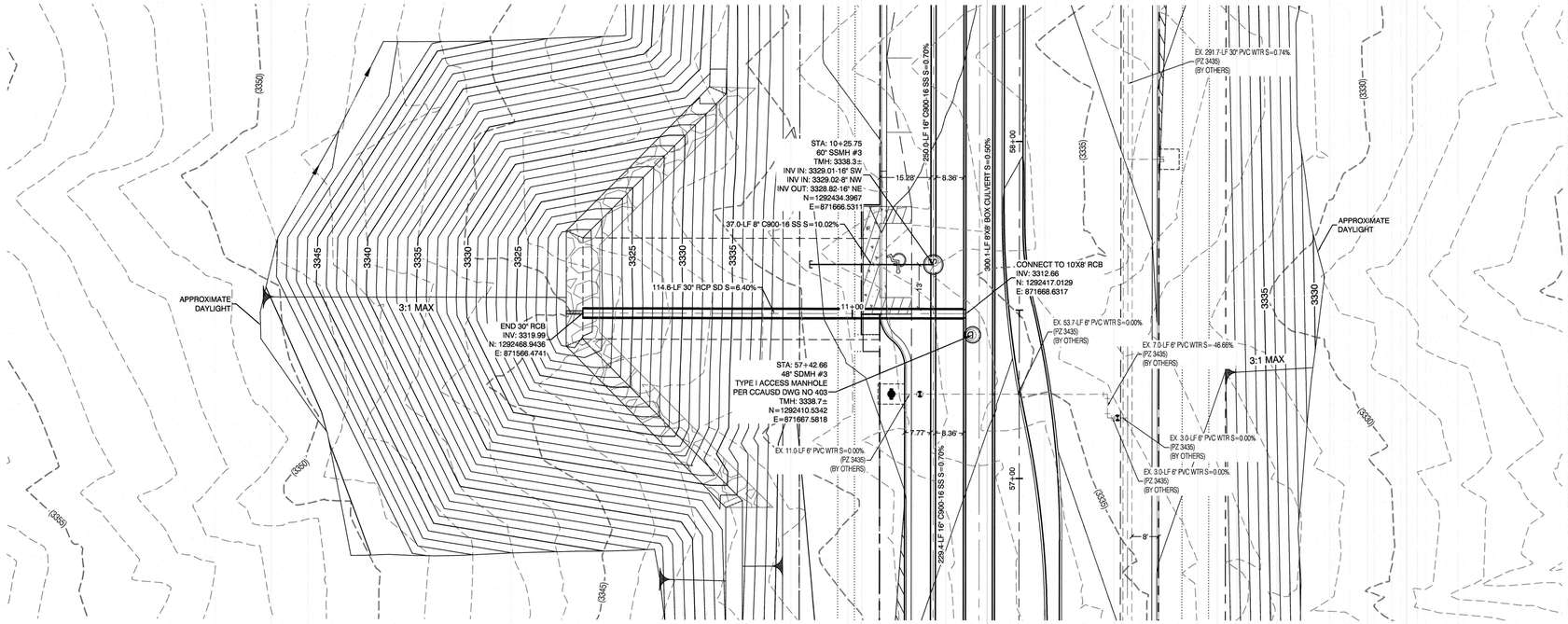
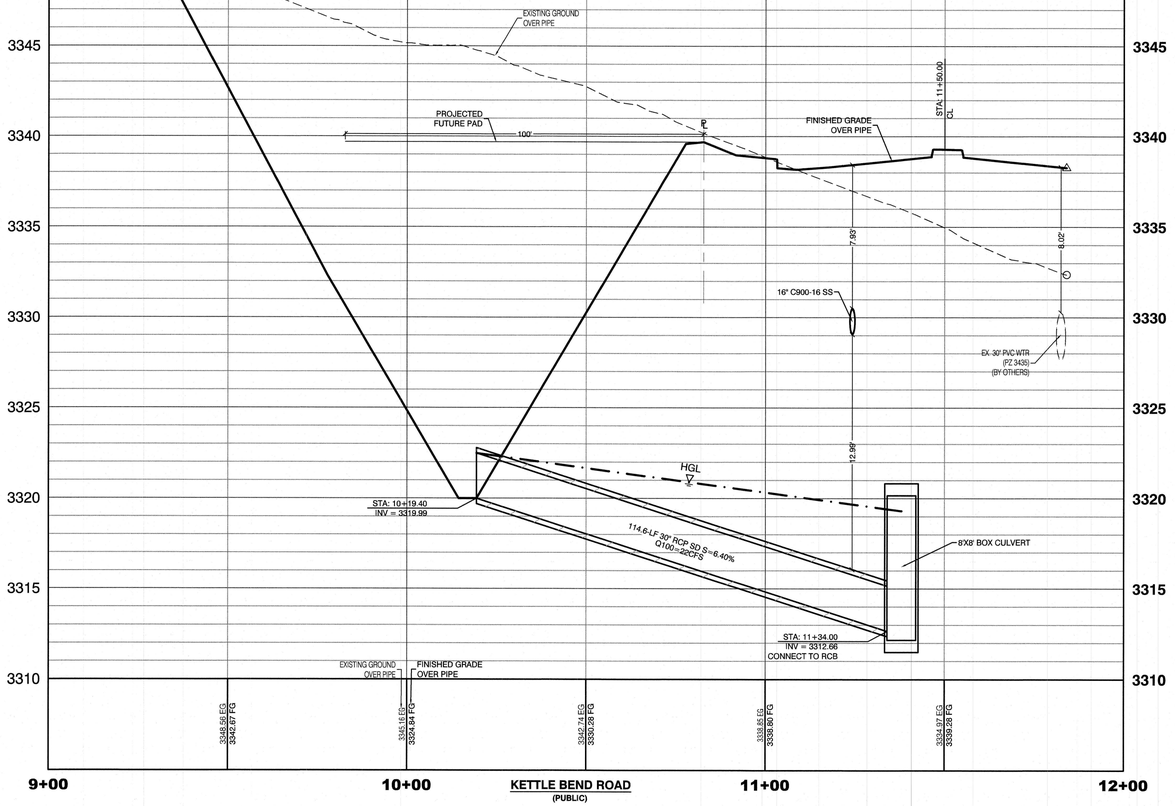


KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)

GRAPHIC SCALE
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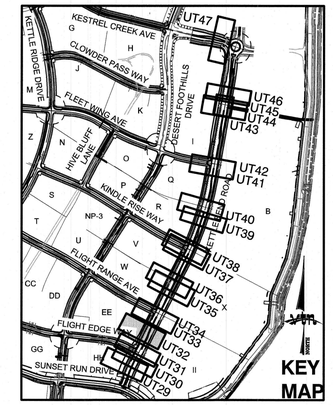
1" = 20'



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LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
(702) 214-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7590 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 32
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	
BCC 08/10/2019	BCC 08/10/2019	WJM 01/13/2020	1"=20'	HORIZ.
			1"=4'	VERT.

PROJECT NO: 7861

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745

SHEET
UT32
71 OF 94 SHEETS
DRAWING NO.

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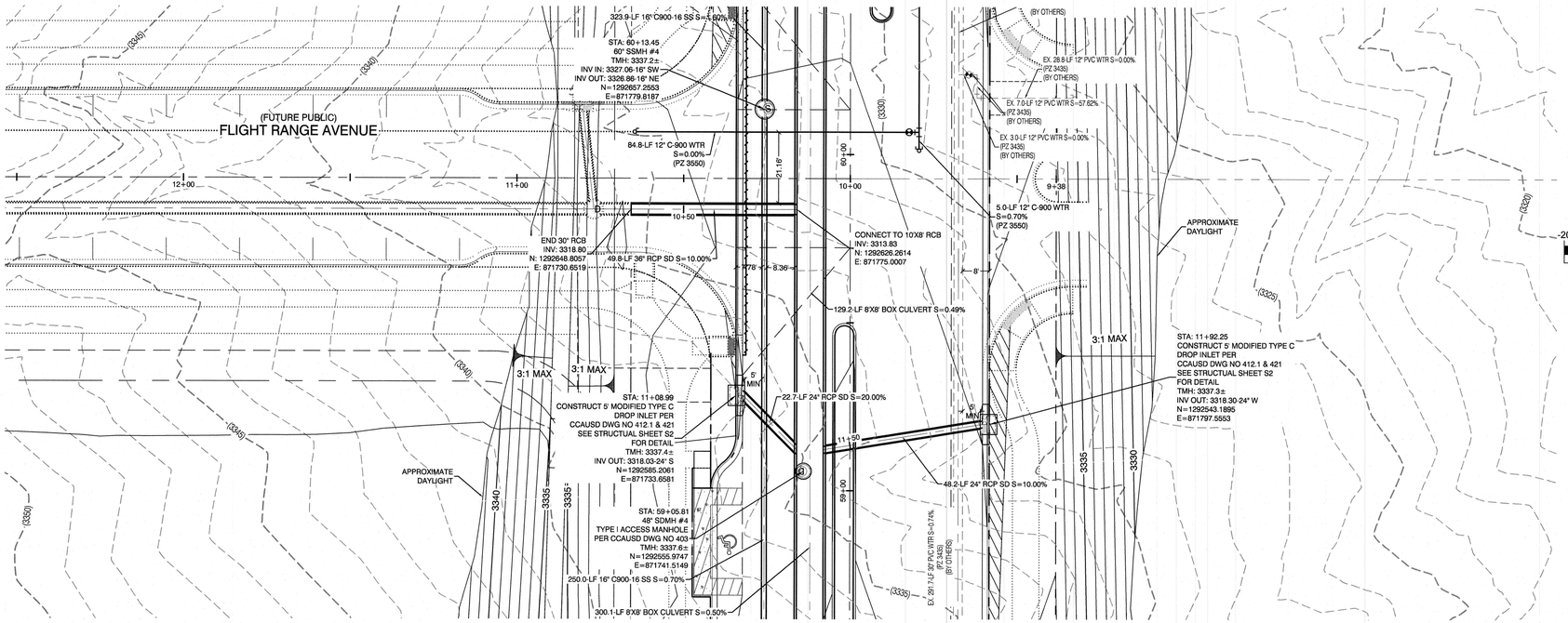
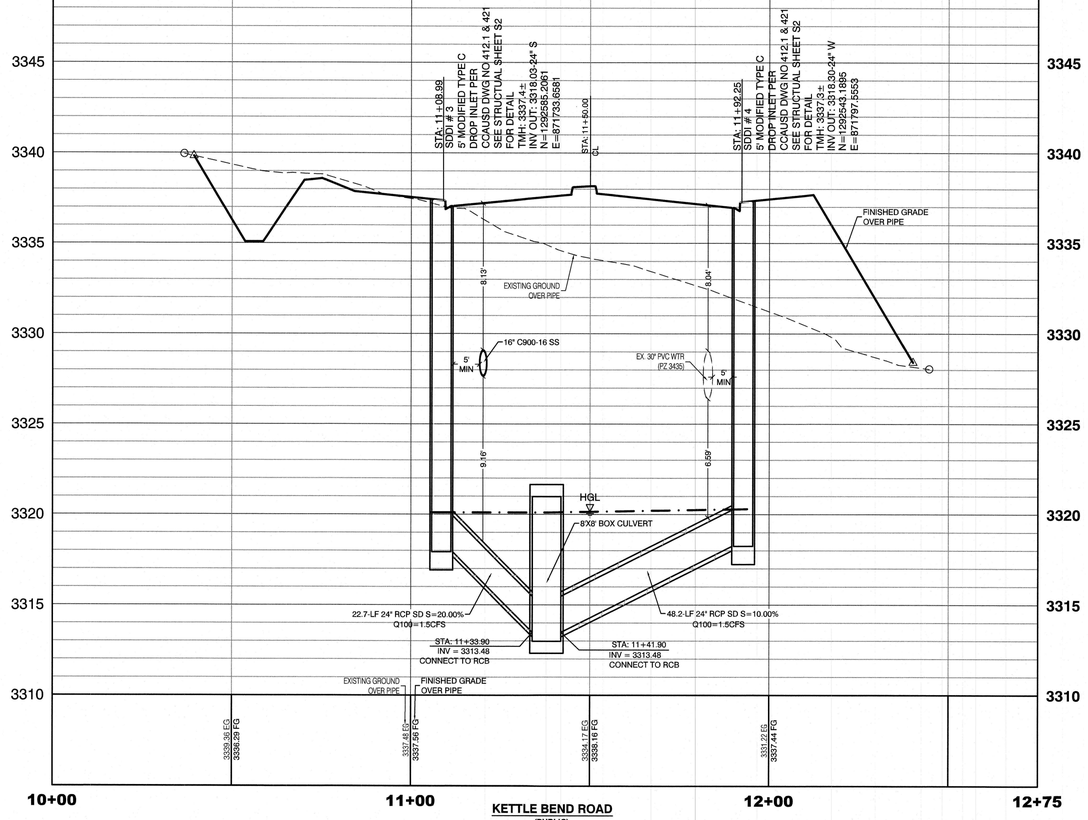
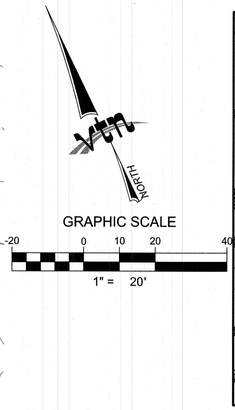


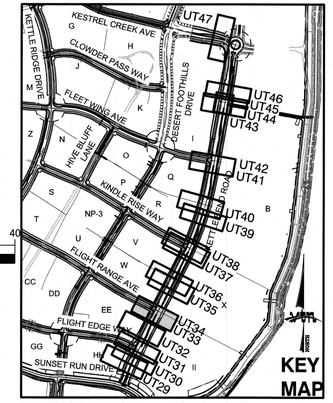
KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)





NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:
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WATERLINE TRENCH NOTE:
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WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____
APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL.

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

Call before you Underground
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CLARK COUNTY TRAFFIC OPERATIONS
1-702-229-6811
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LAS VEGAS, NEVADA 89135
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CITY OF LAS VEGAS

VTN
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

REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 33
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
BCC	BCC	WJM	7881	HORIZ. 1"=20' VERT. 1"=4'
09/10/2019	09/10/2019	01/13/2020		

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 19745
1/14/20

SHEET
UT33
72 OF 94 SHEETS
DRAWING NO.

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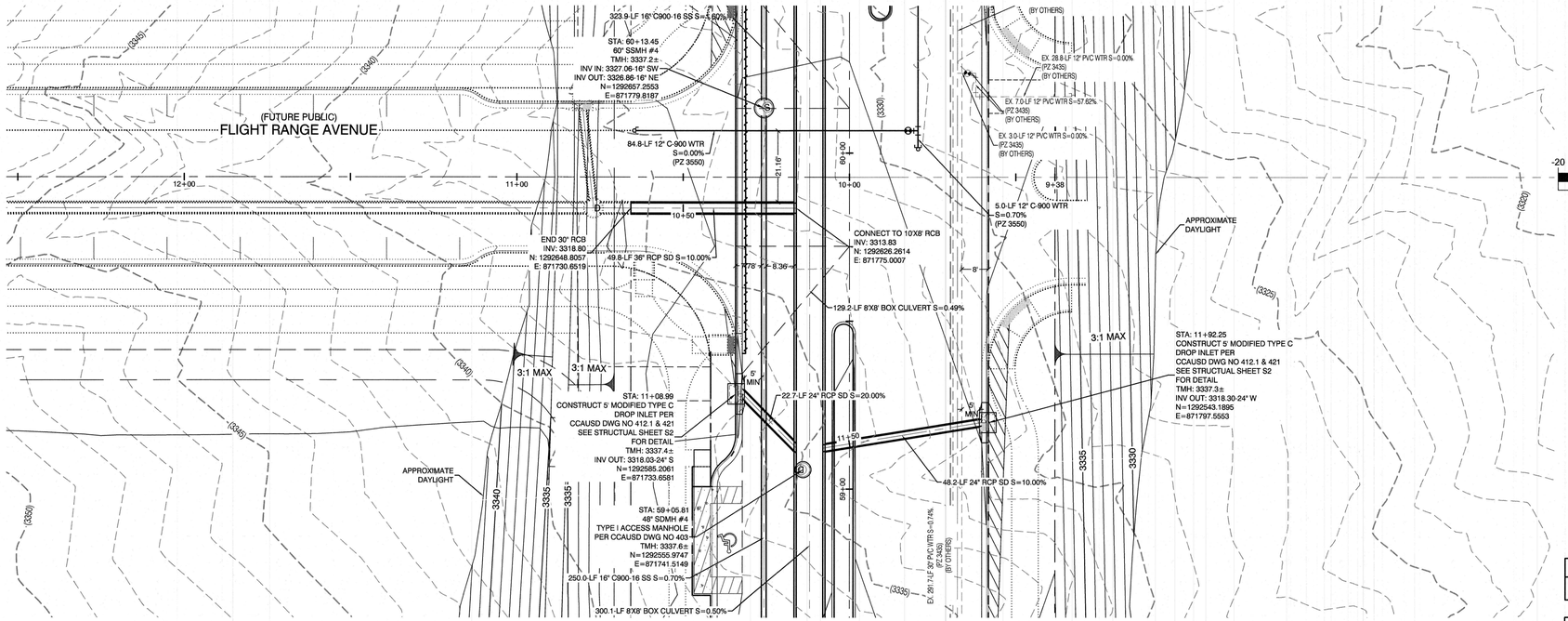
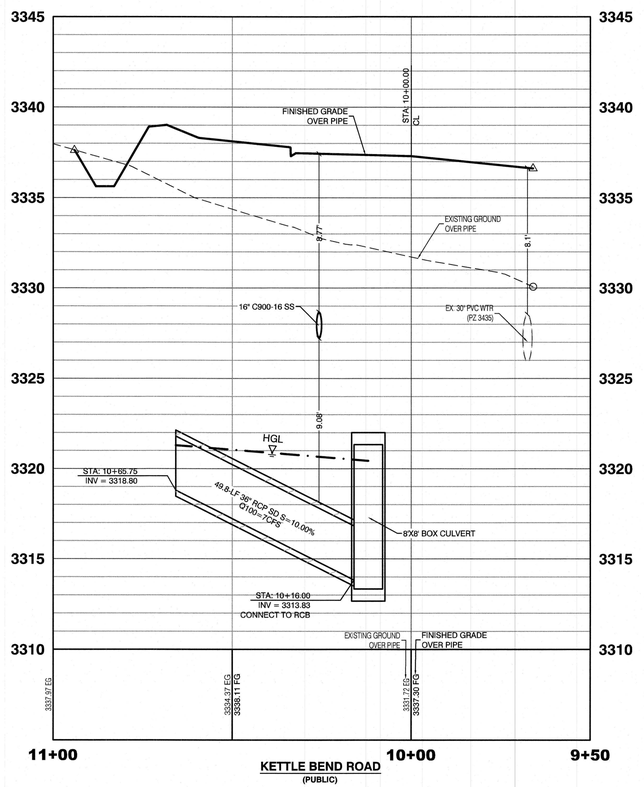


KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)

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5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:-----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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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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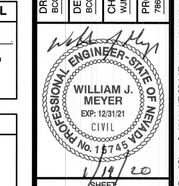
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 34
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	09/10/2019	SCALE:	1"=20' HORIZ. 1"=4' VERT.
DESIGNED BY: BCC	09/10/2019		
CHECKED BY: WME	01/13/2020		
PROJECT NO: 7861			



SHEET
UT34
73 OF **94** SHEETS
DRAWING NO.

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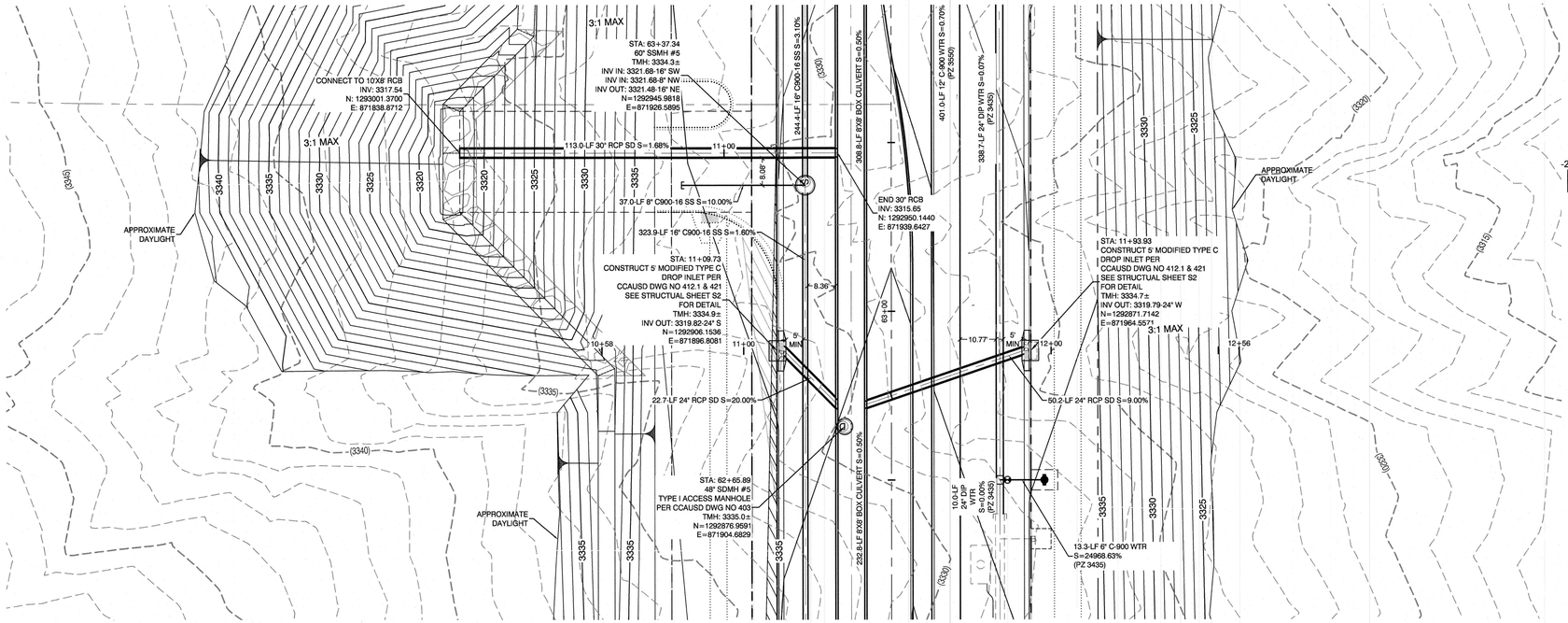
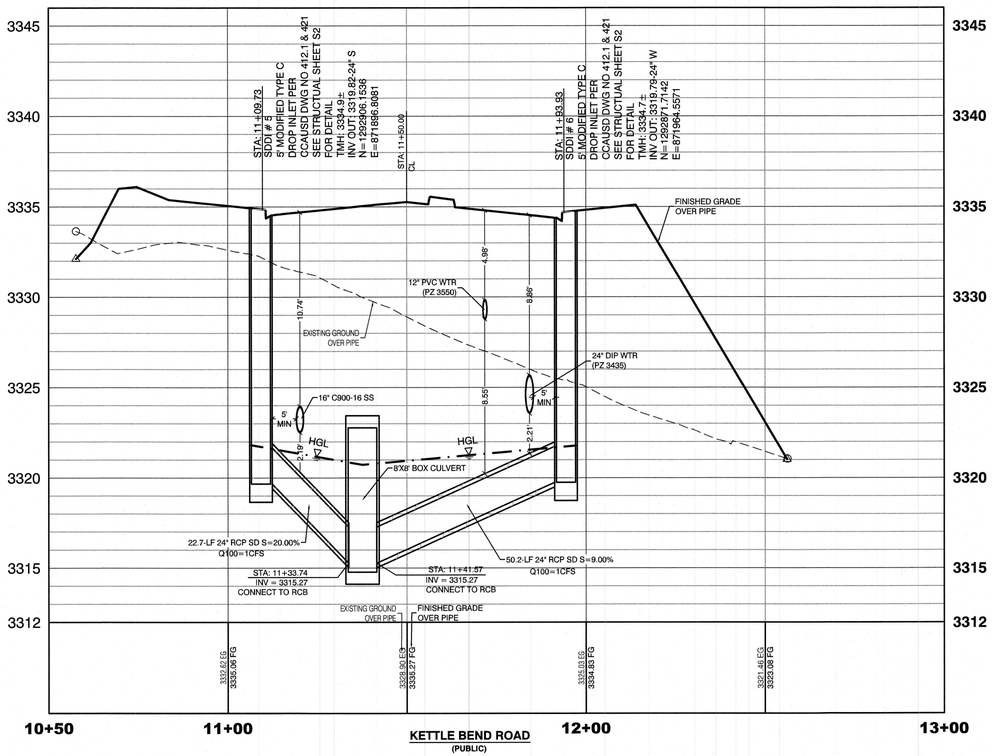
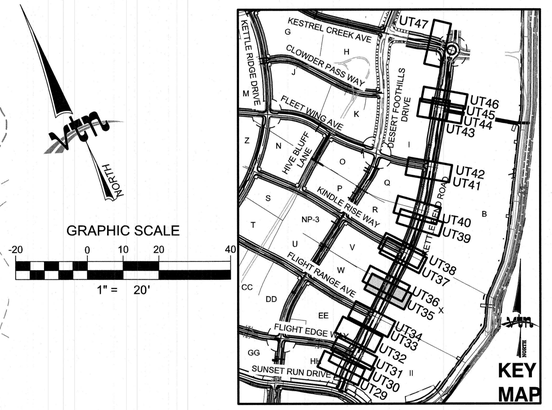


KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)



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LAS VEGAS FIRE & RESCUE APPROVAL
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LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE:_____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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CITY OF LAS VEGAS

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PH. (702) 873-7590 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 35
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 09/10/2019
DESIGNED BY: BCC — 09/10/2019
CHECKED BY: WJM — 01/13/2020
PROJECT NO: 7861
SCALE: HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/19/20

SHEET
UT35
74 OF 94 SHEETS
DRAWING NO.

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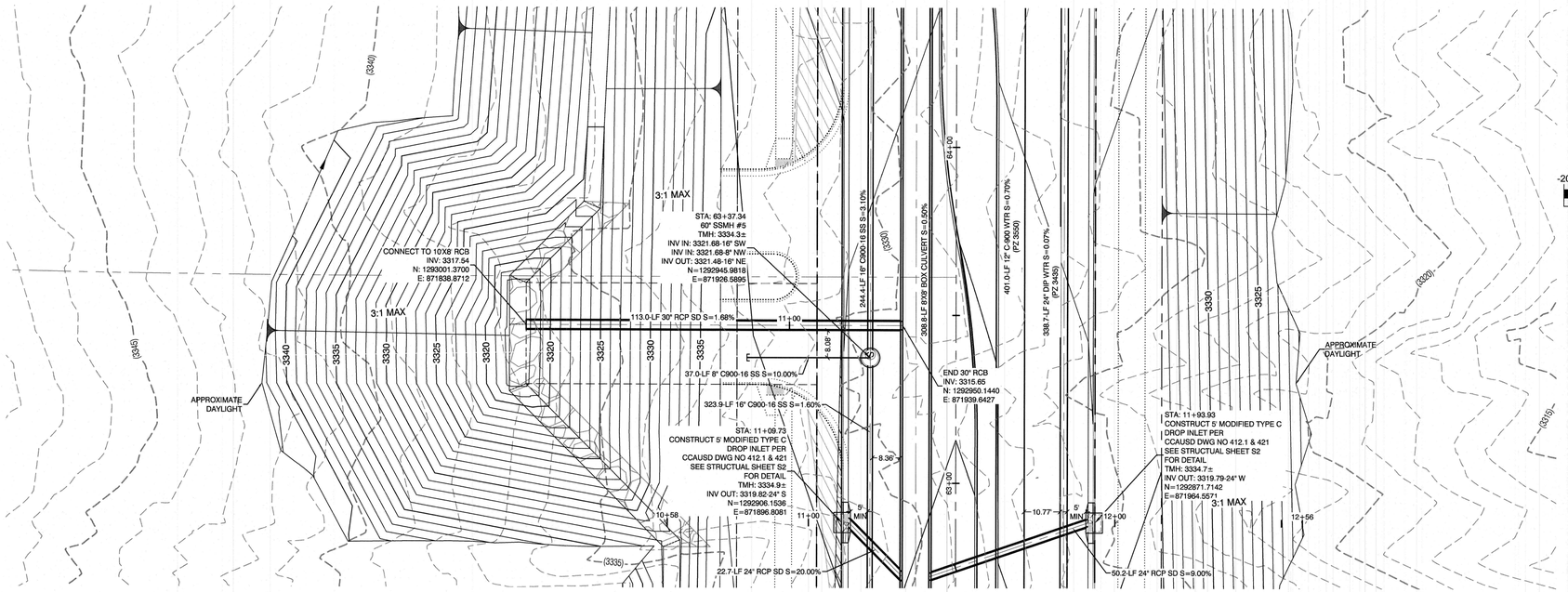
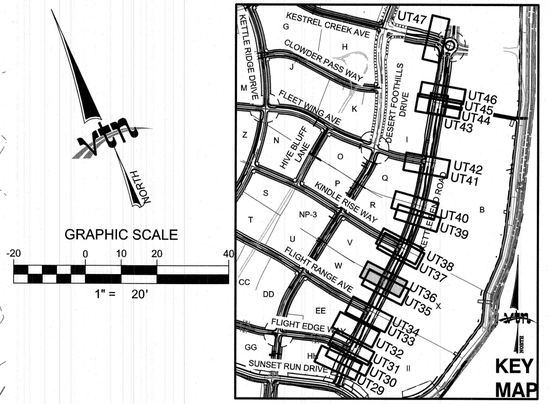




GRAPHIC SCALE

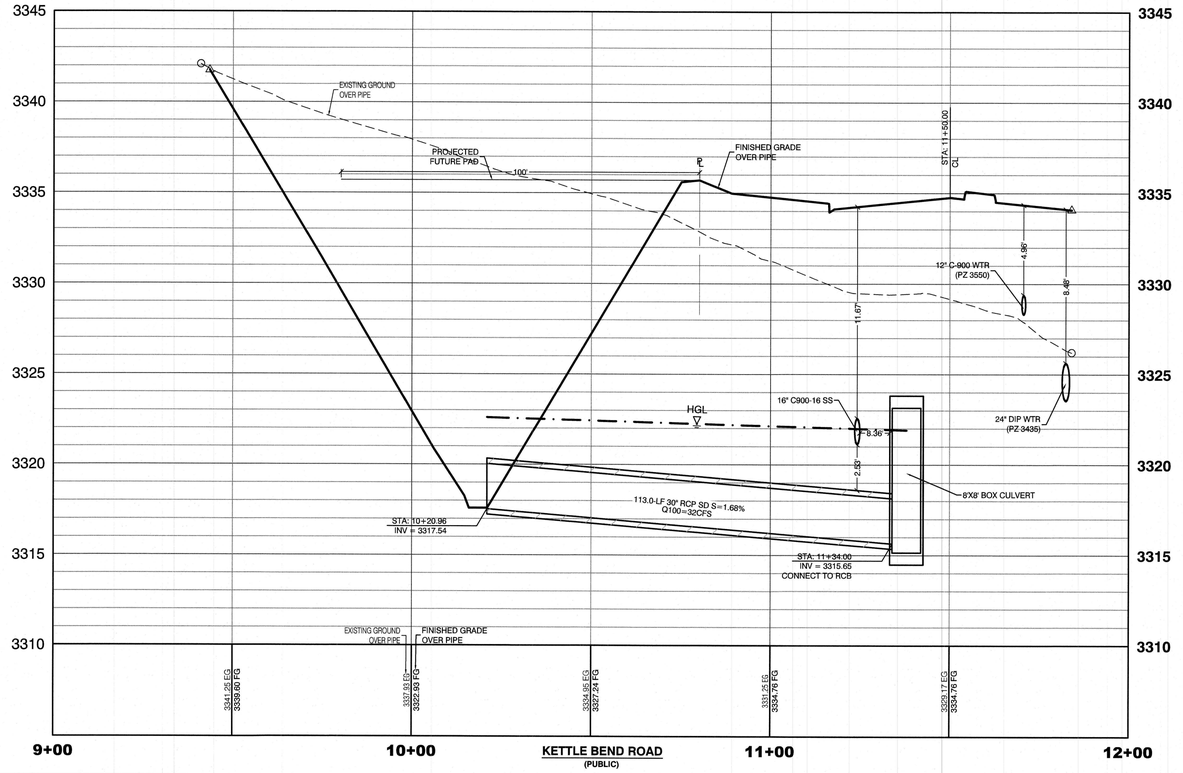
-20 0 10 20 40

1" = 20'

KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'



NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

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APPROVED FOR CONSTRUCTION

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REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 36
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCS — 08/10/2019
DESIGNED BY: BCC — 08/10/2019
CHECKED BY: WJM — 01/13/2020
SCALE: HORIZ. 1"=20' VERT. 1"=4"
PROJECT NO: 7861

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
UT36
75 OF 94 SHEETS
DRAWING NO.

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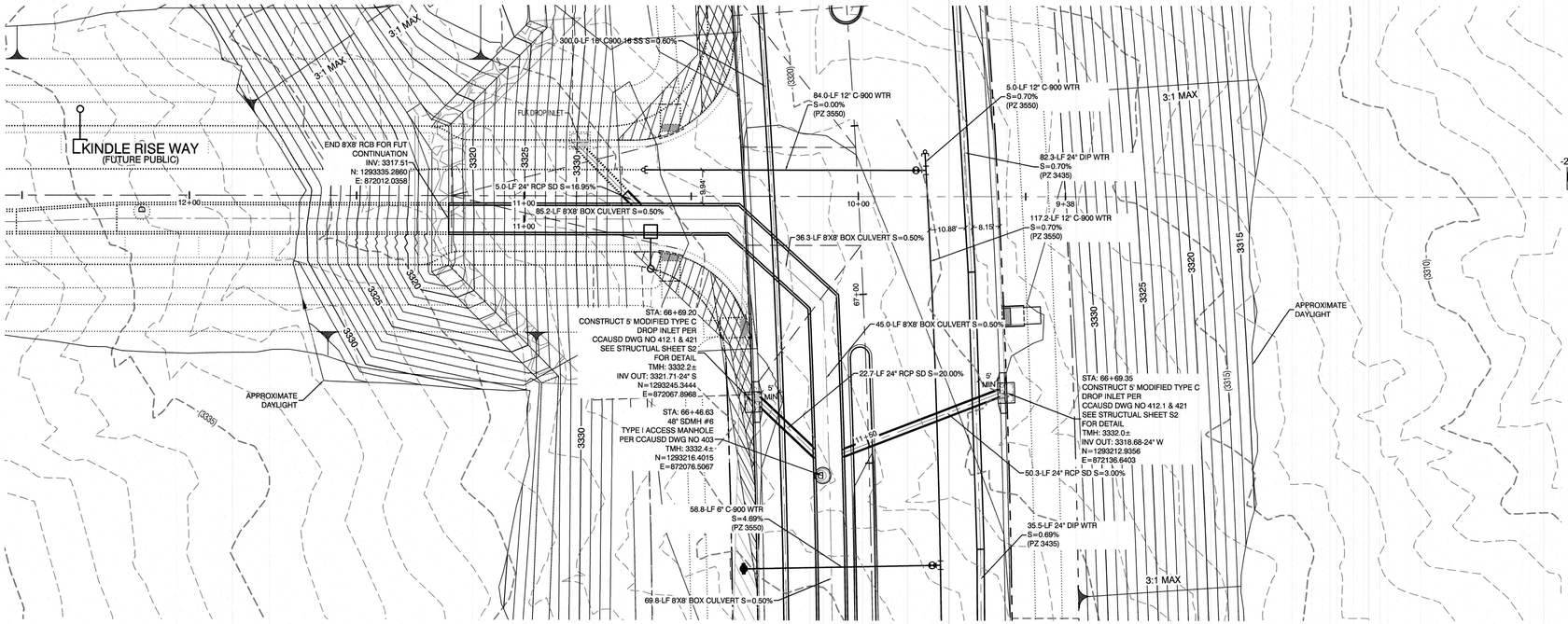

KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
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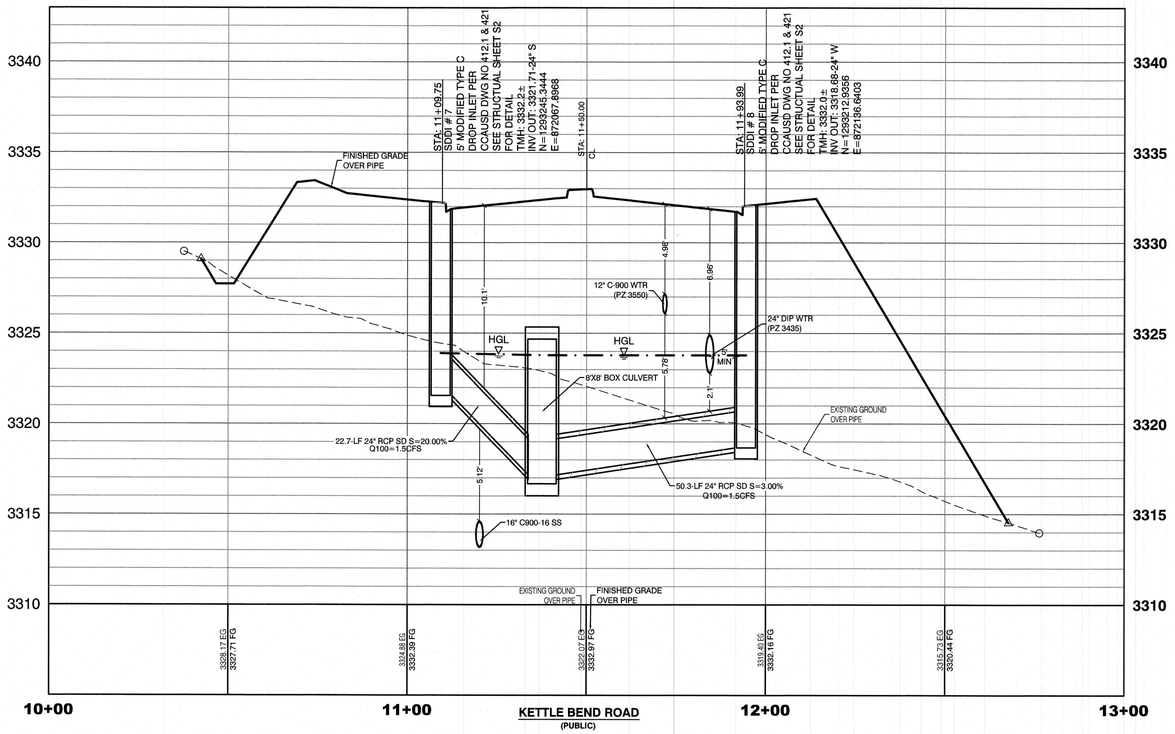
VERT. = 1"=4'



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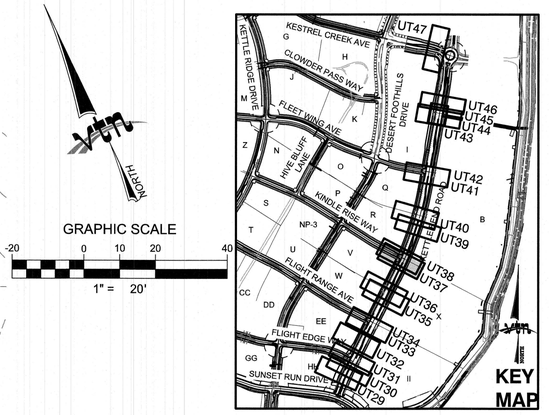

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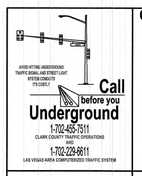
WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____
APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS.
FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL







LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
(702) 207-4500

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7599 FAX (702) 362-2697 WEB WWW.LTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 37
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC	08/10/2019	SCALE:	1"=20' HORIZ.
DESIGNED BY: BCC	08/10/2019		1"=4' VERT.
CHECKED BY: WJM	01/13/2020		
PROJECT NO: 7861			

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
UT37
76 OF **94** SHEETS

DRAWING NO.

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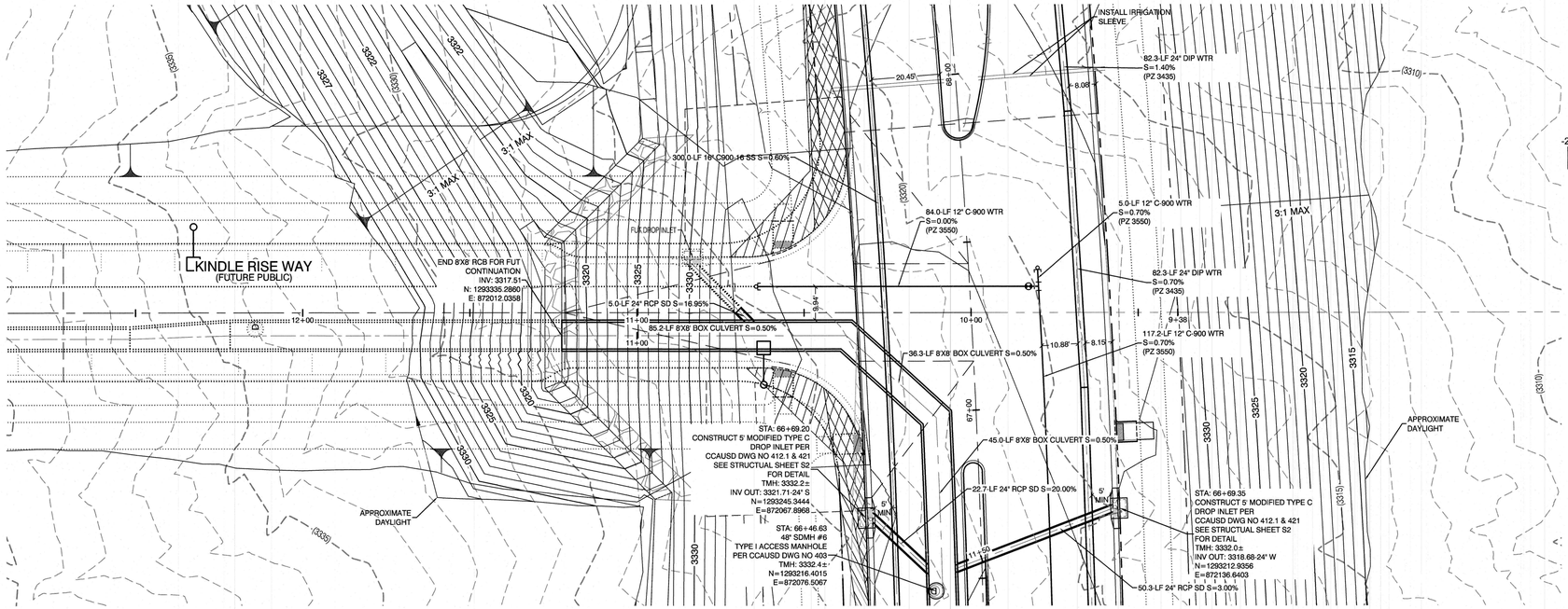
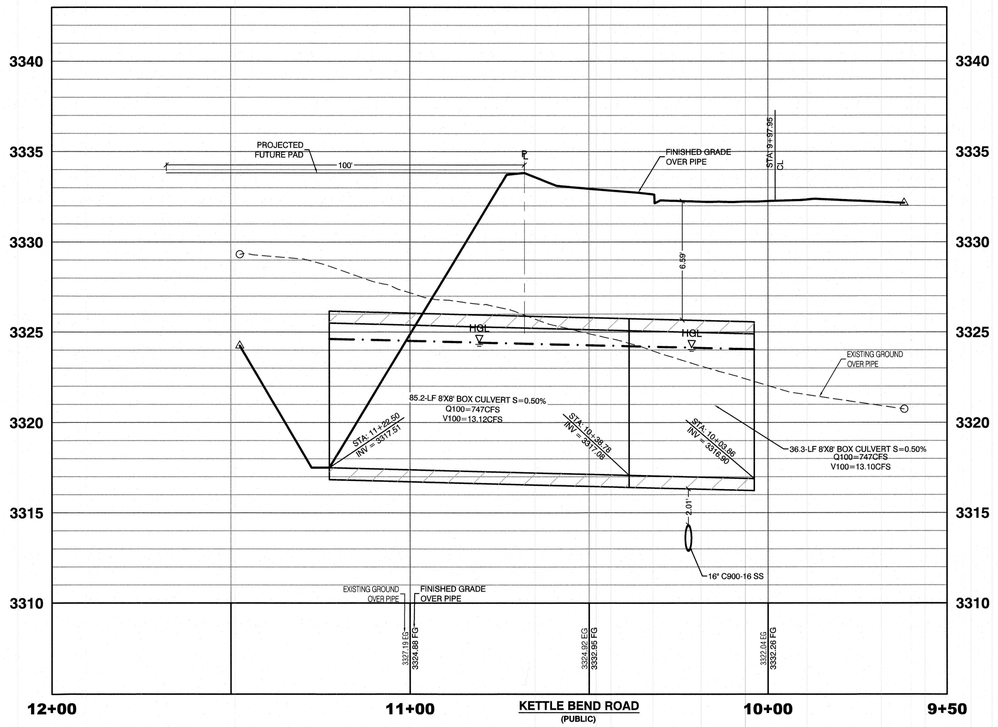


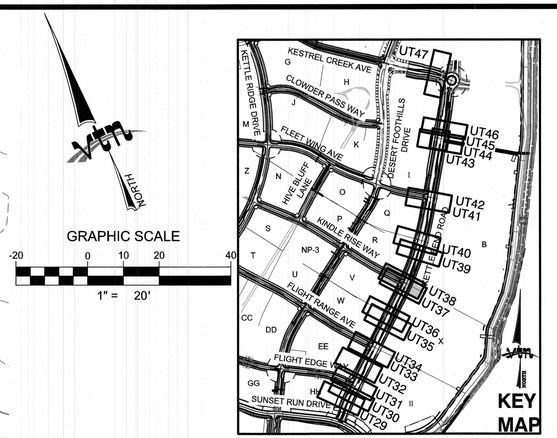
KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)



NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
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WATER MAIN JOINT DEFLECTION

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WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

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LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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Call before you Dig
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1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

Call before you Underground
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CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
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1-702-227-2929

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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) 362-2397 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 38
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 09/10/2019
DESIGNED BY: BCC — 09/10/2019
CHECKED BY: WJM — 01/13/2020
PROJECT NO: 7861
SCALE: HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
UT38
77 OF 94 SHEETS

DRAWING NO.

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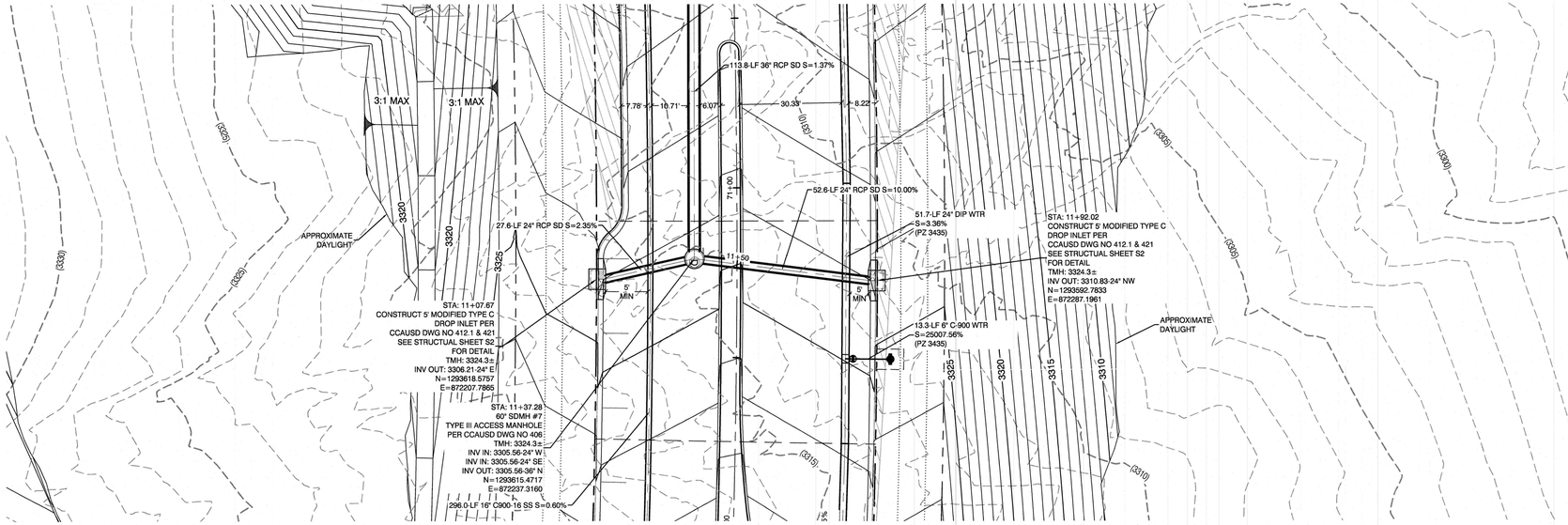
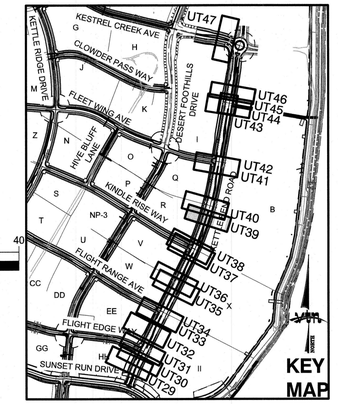


GRAPHIC SCALE

-20 0 10 20 40

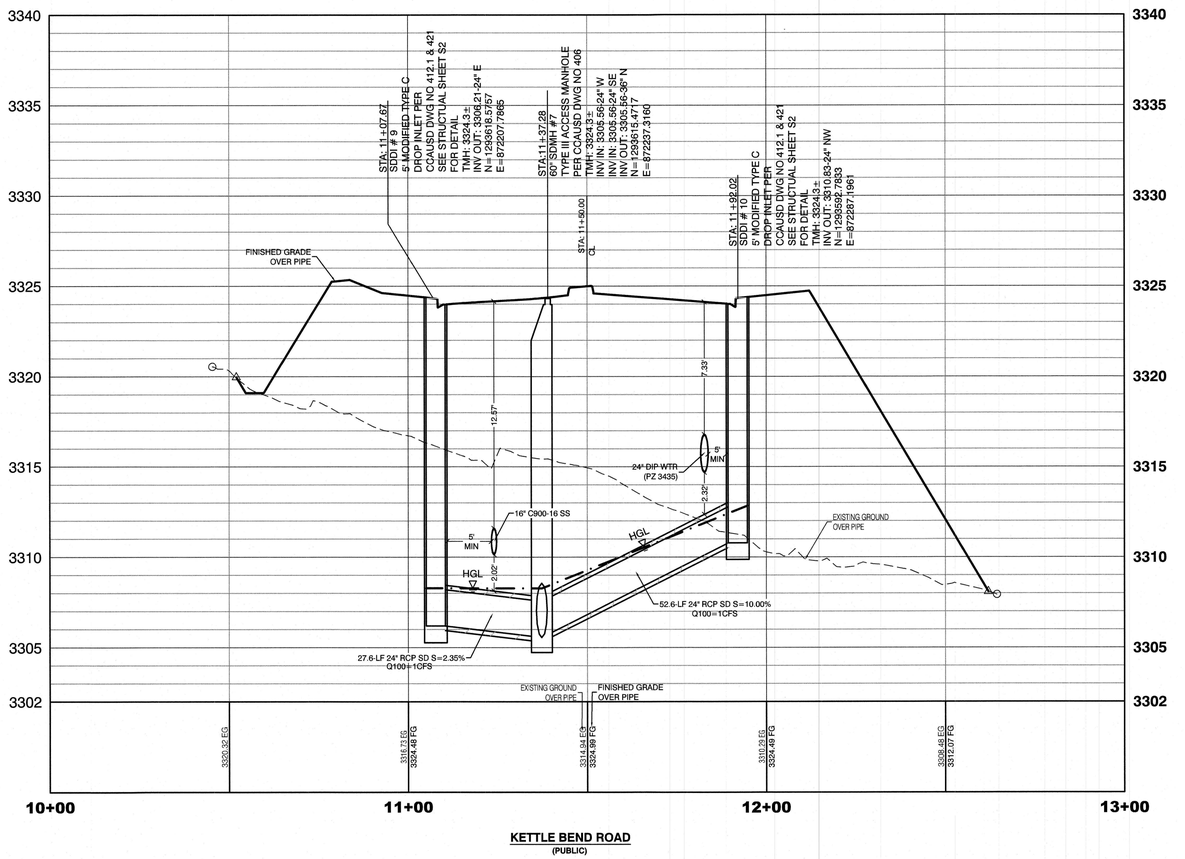
1" = 20'

NORTH



KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)

NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

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WATERLINE TRENCH NOTE:
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WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:
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LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____
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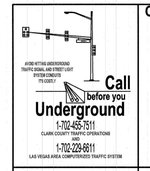

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Avoid cutting underground utility lines. It's costly.
CALL 811 OR
1-800-227-2600 AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS



LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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 89146-5148
PH: (702) 873-7550 FAX (702) 362-2397 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 39
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
BCC	BCC	WJM	7861	HORIZ. 1"=20' VERT. 1"=4'
09/10/2019	09/10/2019	01/13/2020		

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
No. 15795
EXP: 12/31/21
CIVIL
1/14/20

SHEET
UT39
78 OF **94** SHEETS

DRAWING NO.

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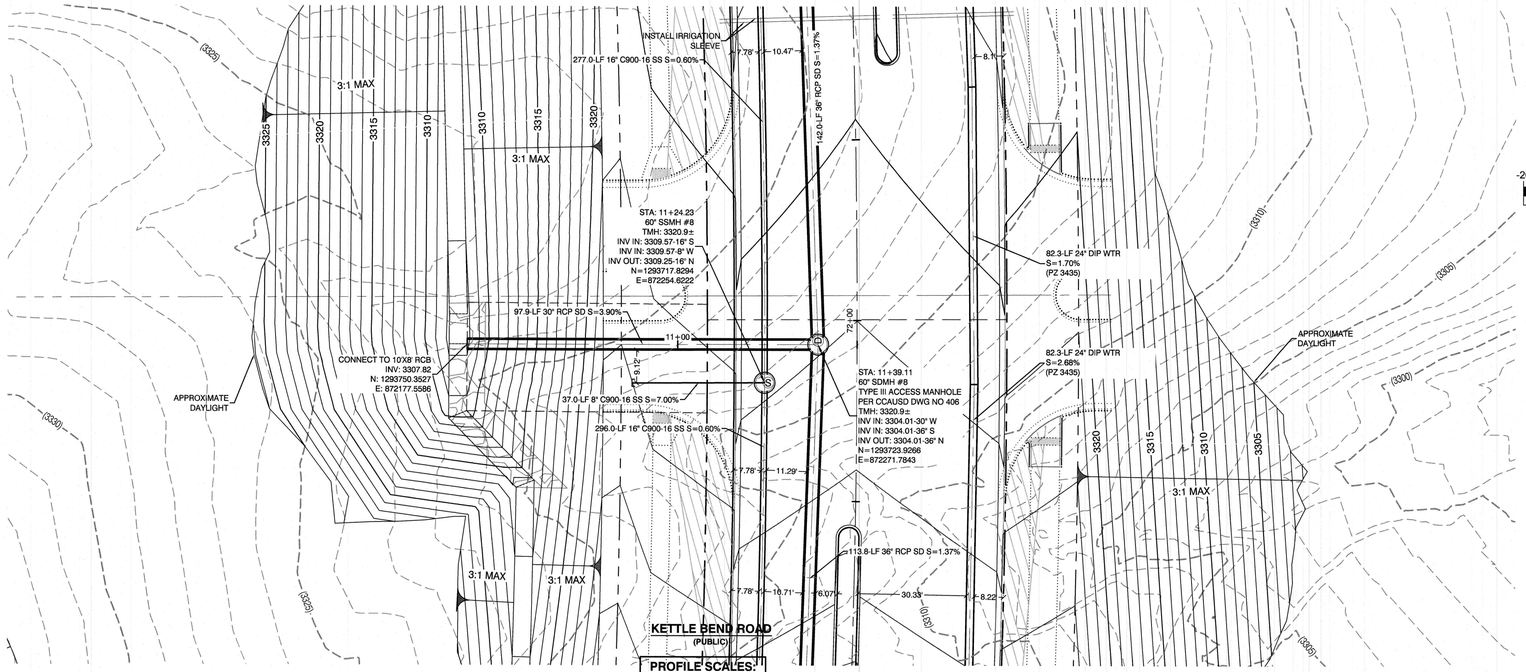
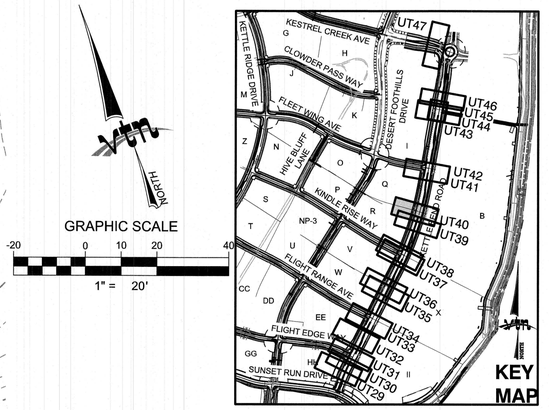
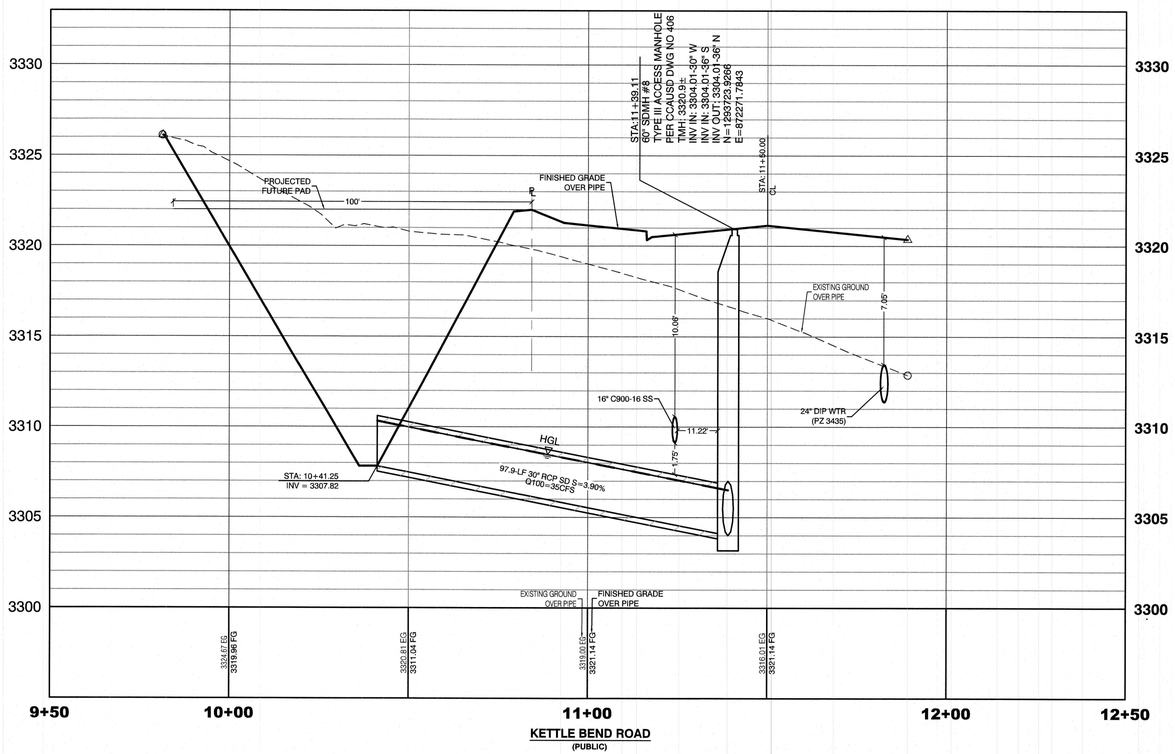


PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=40'





PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'

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1-702-227-2929

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

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WATERLINE TRENCH NOTE:

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WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

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LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

_____
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE:_____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REVISION	DATE	BY

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 180
LAS VEGAS, NEVADA 89135
(702) 792-4400

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2697 WEB WWW.LTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 40
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
BCS	BCC	WJM	7861	HORIZ. 1"=20' VERT. 1"=40'
09/10/2019	09/10/2019	01/13/2020		

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745

SHEET
UT40
79 OF 94 SHEETS
DRAWING NO.

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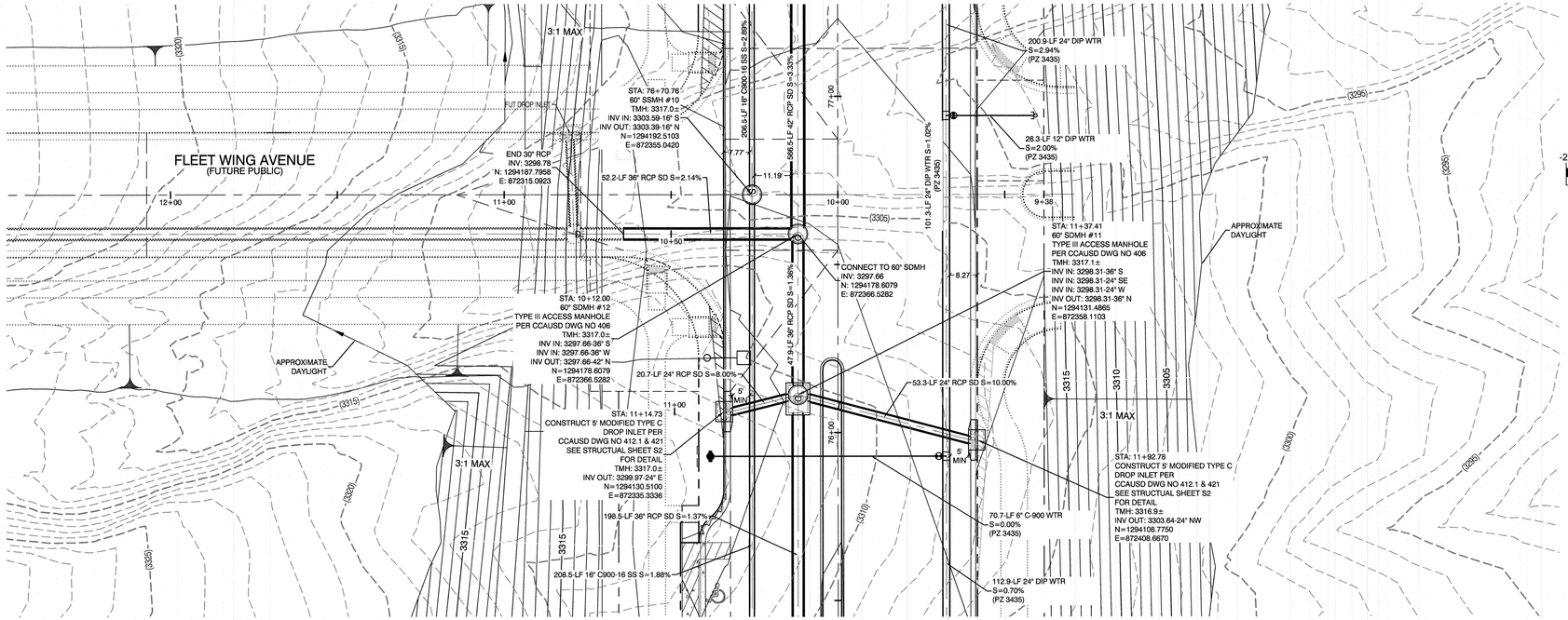
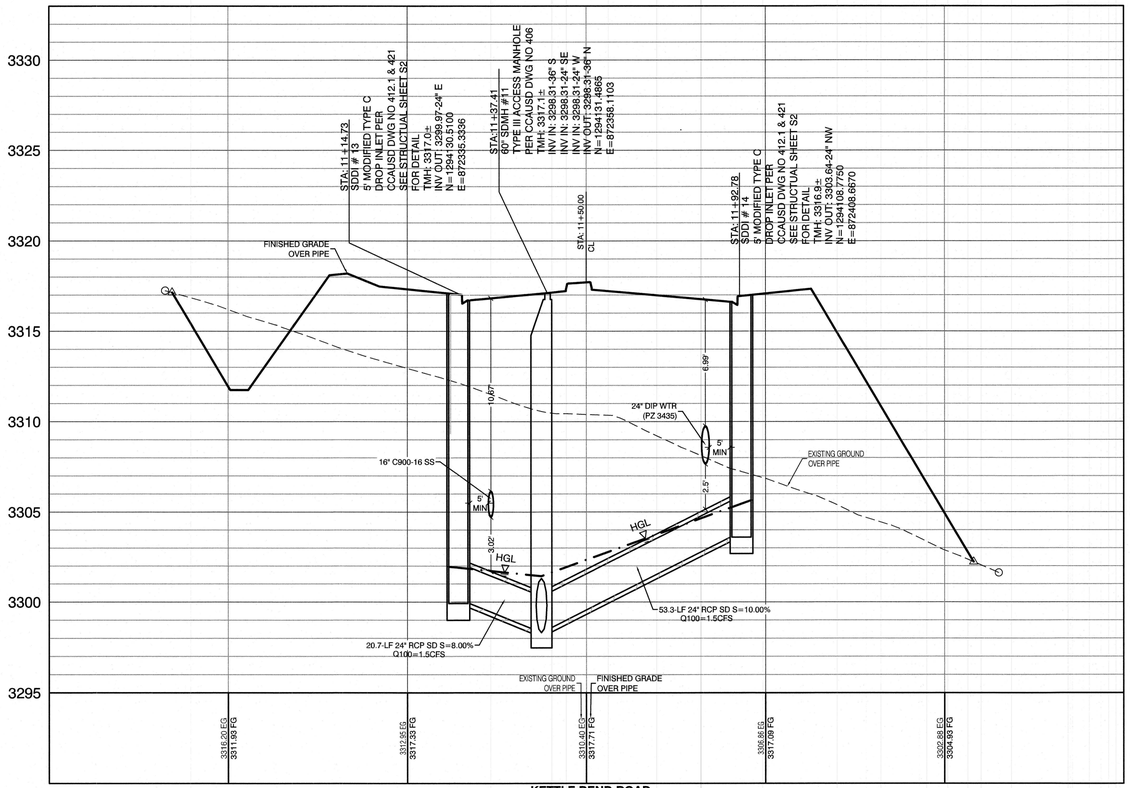


KETTLE BEND ROAD
(PUBLIC)

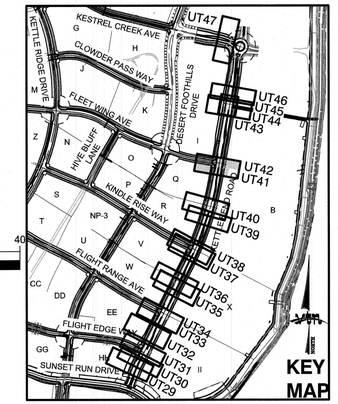
PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)

GRAPHIC SCALE
-20 0 10 20 40
1" = 20'

NORTH



NOTE:
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LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____
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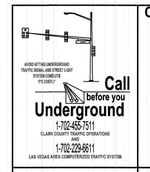



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LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE:_____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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

UTILITY PLAN & PROFILE 41
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 09/10/2019
DESIGNED BY: BCC — 09/10/2019
CHECKED BY: WJM — 01/13/2020
SCALE: HORIZ. 1"=20' VERT. 1"=4'
PROJECT NO: 7861

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
UT41
80 OF **94** SHEETS
DRAWING NO.

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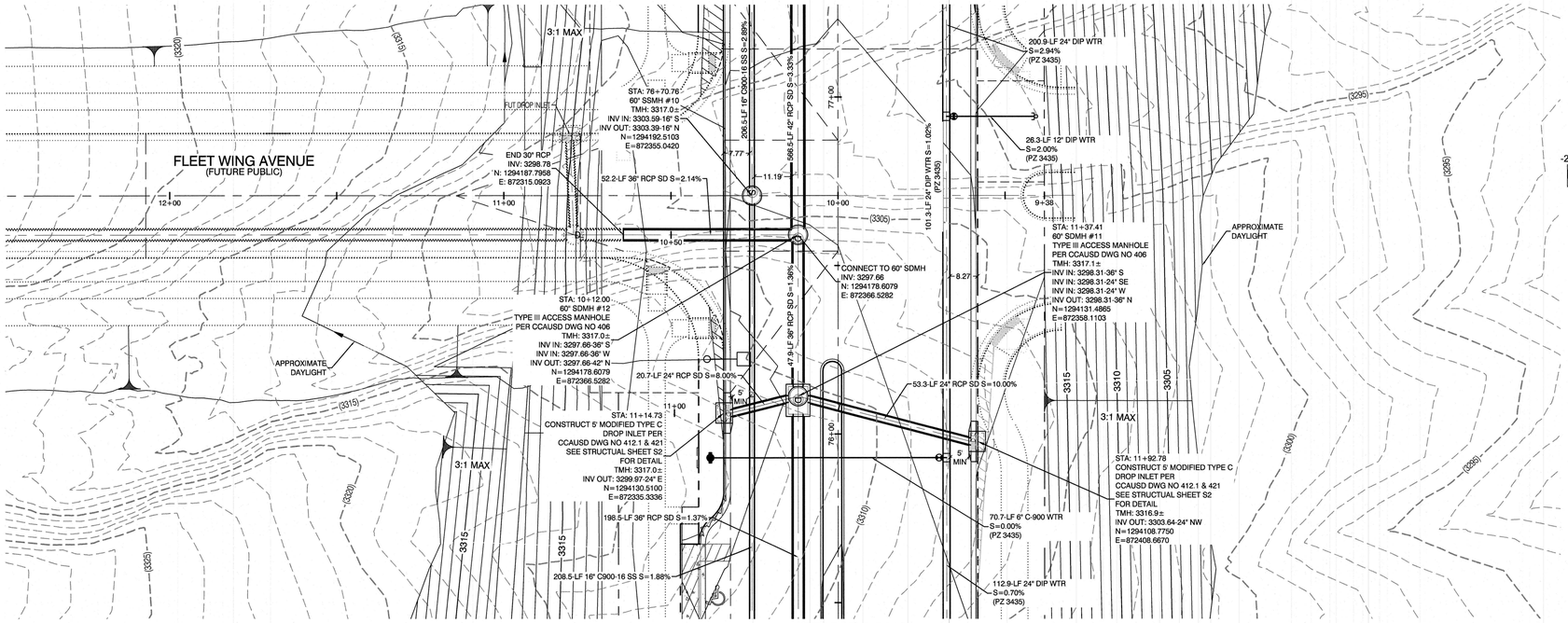
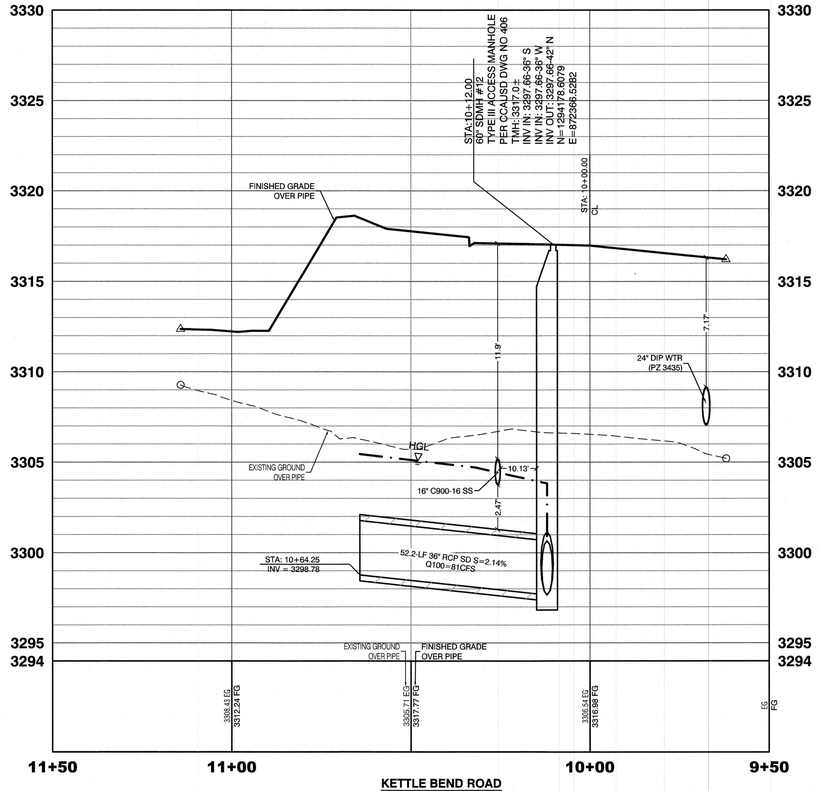
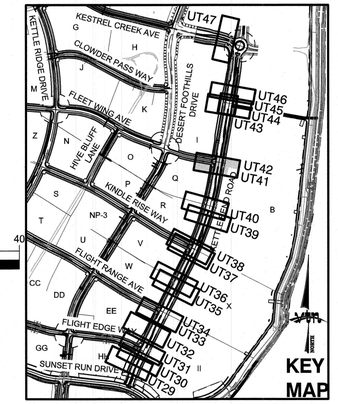


PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'





GRAPHIC SCALE
-20 0 10 20 40
1" = 20'

NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
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WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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CLARK COUNTY TRAFFIC OPERATIONS

Call before you Underground
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CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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CALL BEFORE YOU DIG OVERHEAD
1-702-227-2929

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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UTILITY PLAN & PROFILE 42
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
BCC 08/10/2019	BCC 09/10/2019	MJM 01/13/2020	7881	HORIZ. 1"=20' VERT. 1"=4'

WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
PROFESSIONAL ENGINEER - STATE OF NEVADA
1/14/20

SHEET
UT42
81 OF 94 SHEETS

DRAWING NO.

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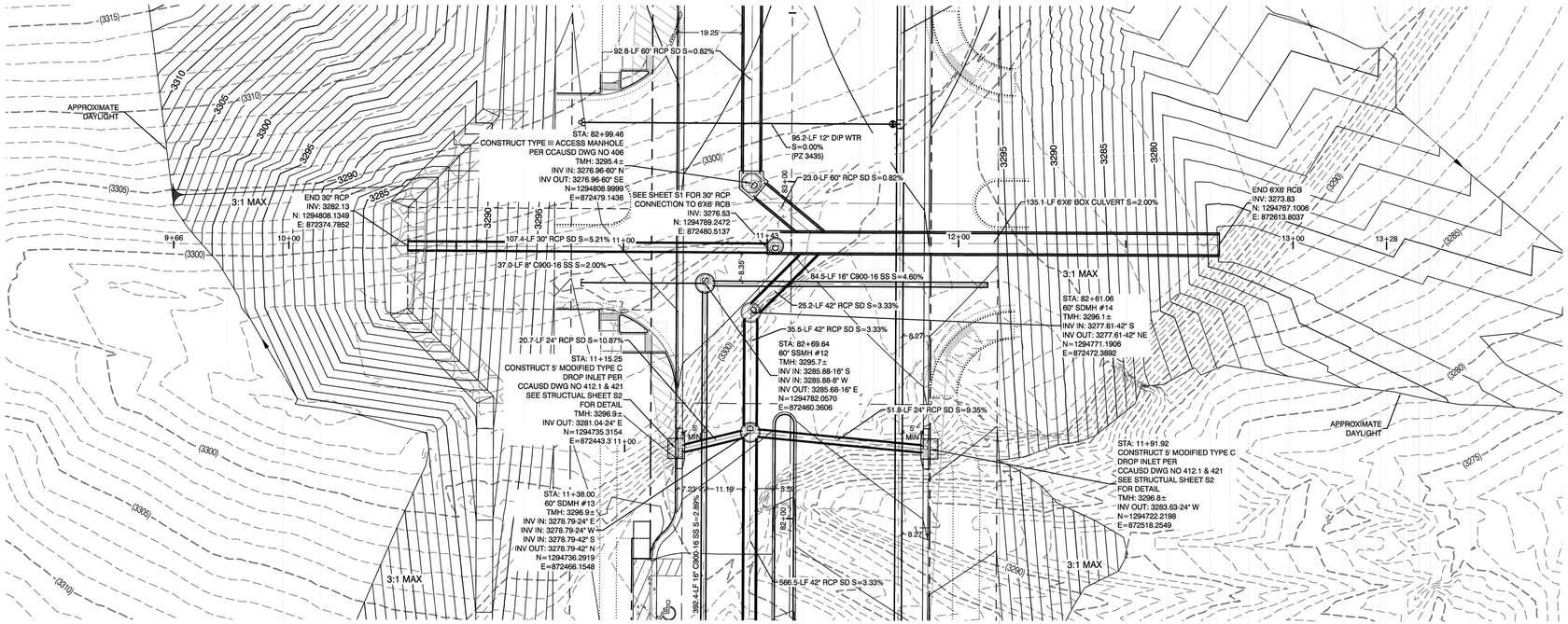
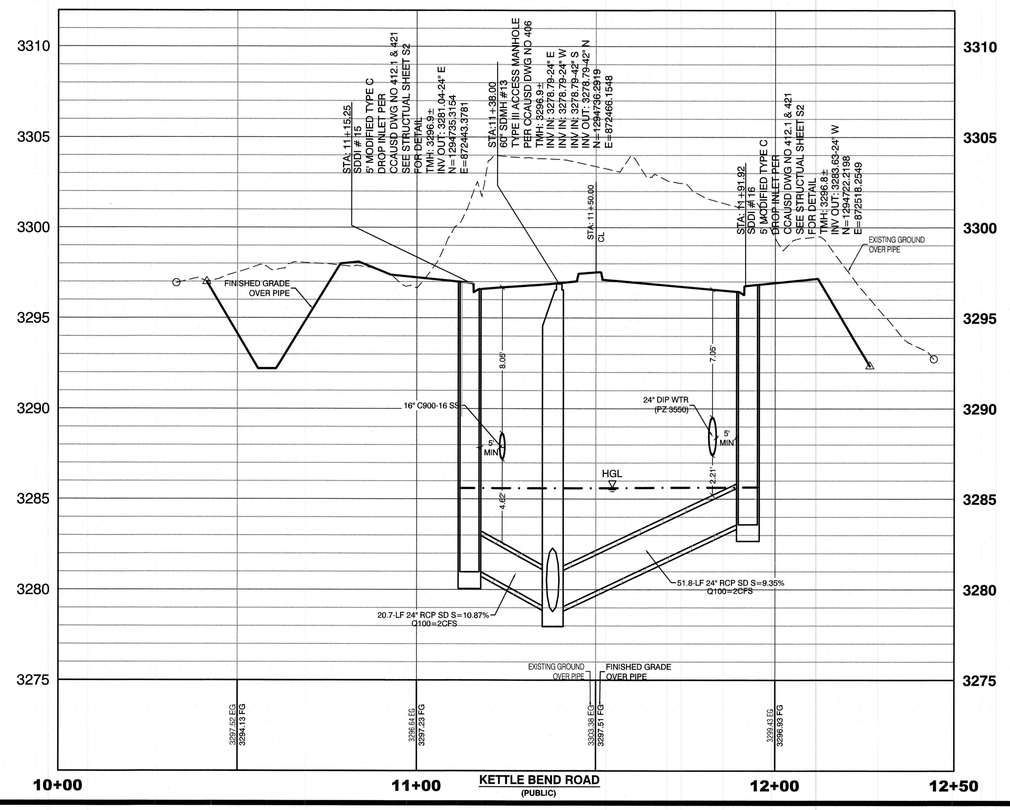


KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

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WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE:_____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

Call before you Underground
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1-702-229-6811
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM
AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT WIRING CONDUITS
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
AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DIG OVERHEAD
1-702-227-2929

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REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 43
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE: HORIZ. 1"=20' VERT. 1"=4'
BCC 09/10/2019	BCC 09/10/2019	WJM 01/13/2020	

PROJECT NO: 7861

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15749
1/14/20

SHEET
UT43
82 OF 94 SHEETS

DRAWING NO.

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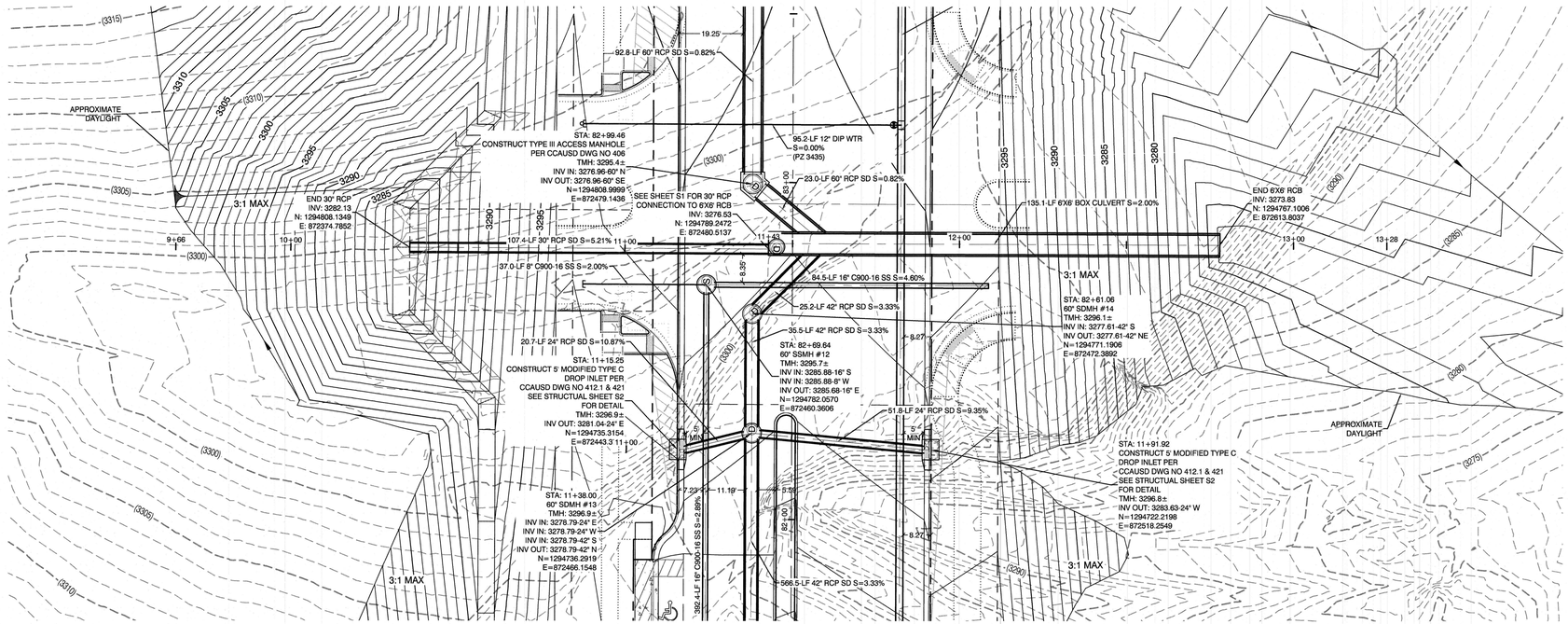
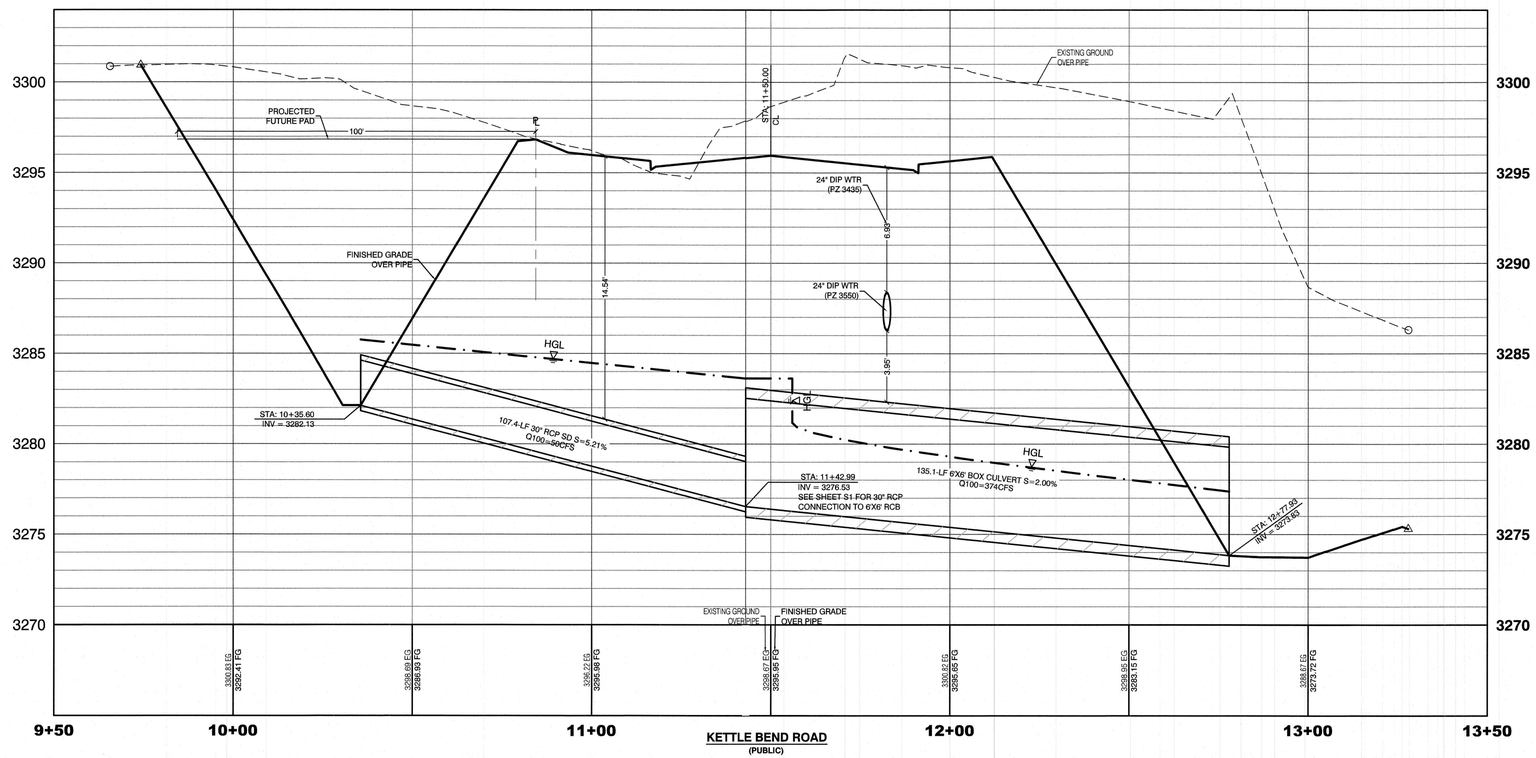
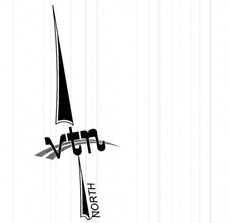


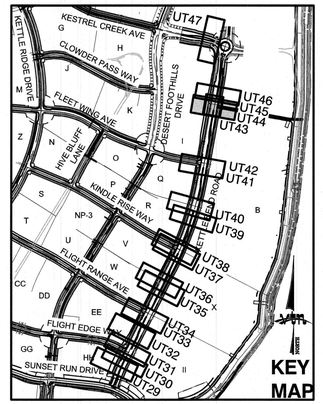
KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)





NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

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LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:
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LAS VEGAS FIRE & RESCUE APPROVAL
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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) 207-4500

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

UTILITY PLAN & PROFILE 44
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	
BCC 08/10/2019	BCC 08/10/2019	WJM 01/13/2020	1"=20'	HORIZ.
			1"=4'	VERT.

PROJECT NO: 7861

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15748
1/14/20

SHEET
UT44
83 OF **94** SHEETS

DRAWING NO.

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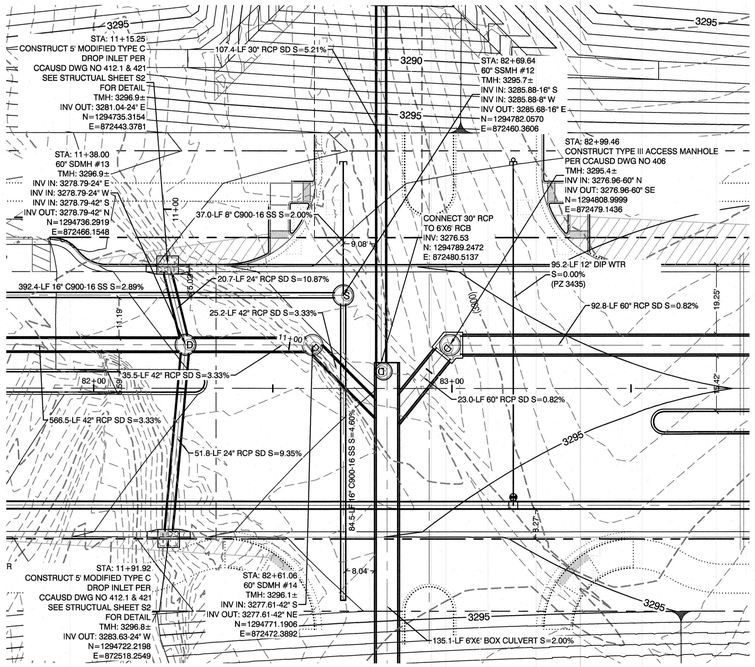
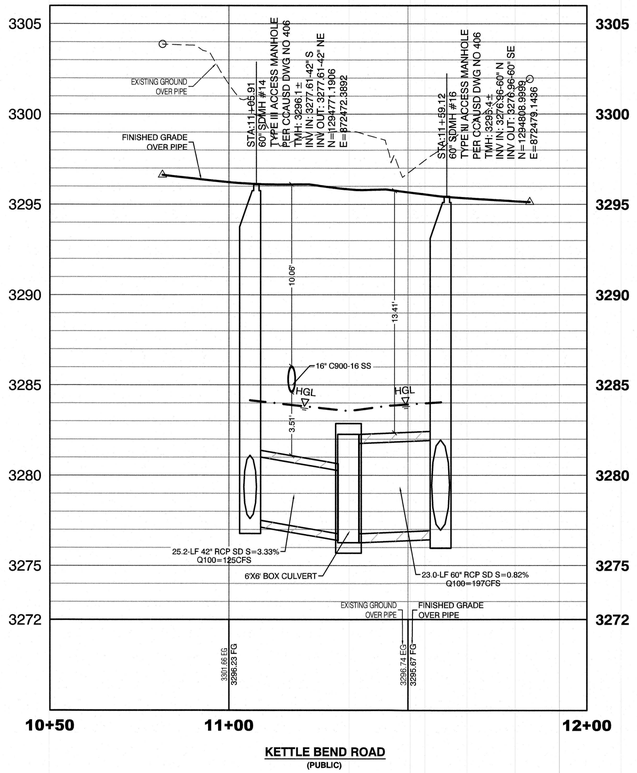
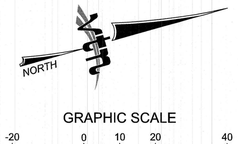


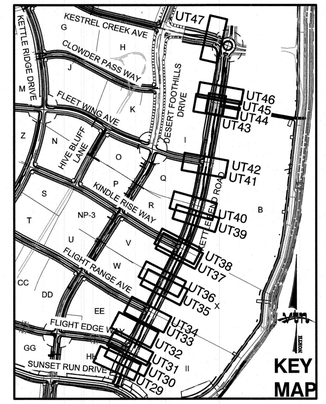
KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)





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APPROVED FOR CONSTRUCTION

_____
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UTILITY PLAN & PROFILE 45
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	HORIZ. / VERT.
BCC 08/10/2019	BCC 08/10/2019	WJM 01/13/2020	1"=20' 1"=4'	

PROJECT NO: 7861

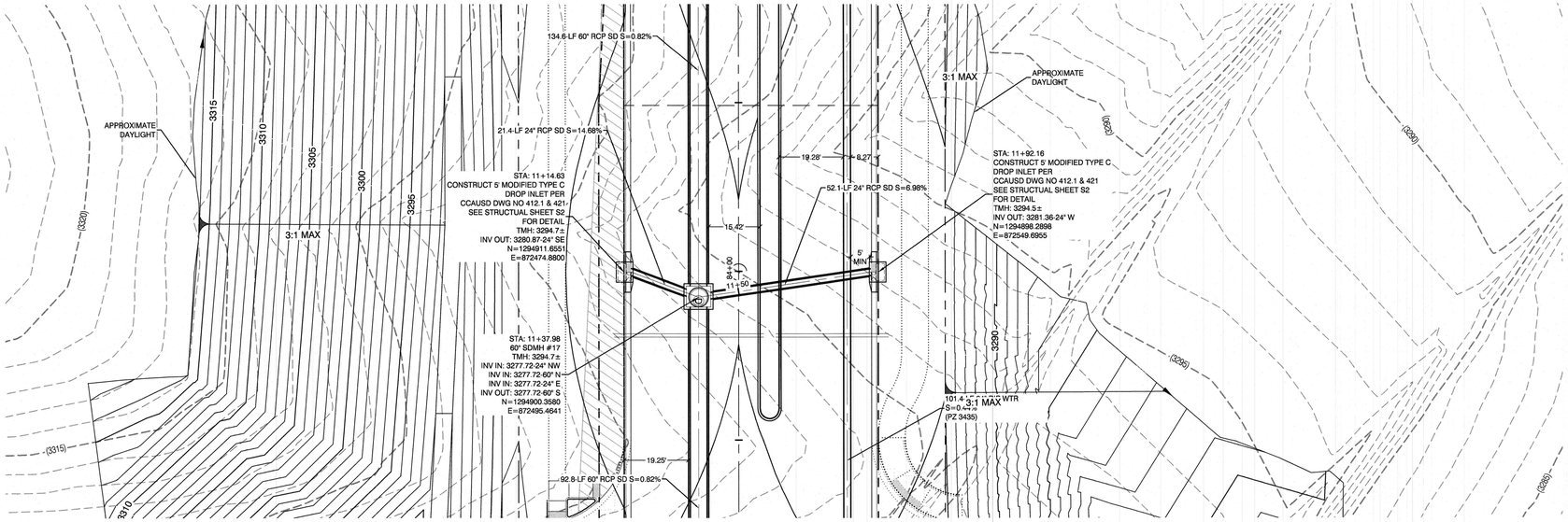
PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15748
1/13/20

SHEET
UT45
84 OF **94** SHEETS

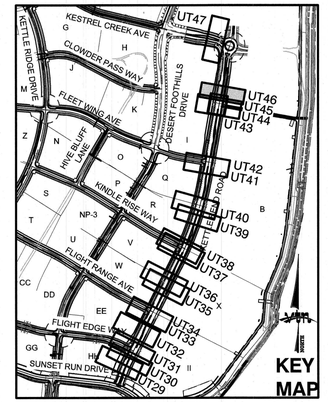
DRAWING NO.

H:\7861\Kettle Bend Road\Sheet Set\7861-UT-SD LAT-1.dwg 1/13/2020 12:52 PM Brandon

WARNING
THE CONTRACTOR IS RESPONSIBLE FOR THE SAFETY OF THE WORK AND SHALL COMPLY WITH ALL APPLICABLE REGULATIONS OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE NEVADA INDUSTRIAL COMMISSION (NIC). THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR INITIATING, MAINTAINING AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK. THESE REQUIREMENTS SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR ENGINEER.

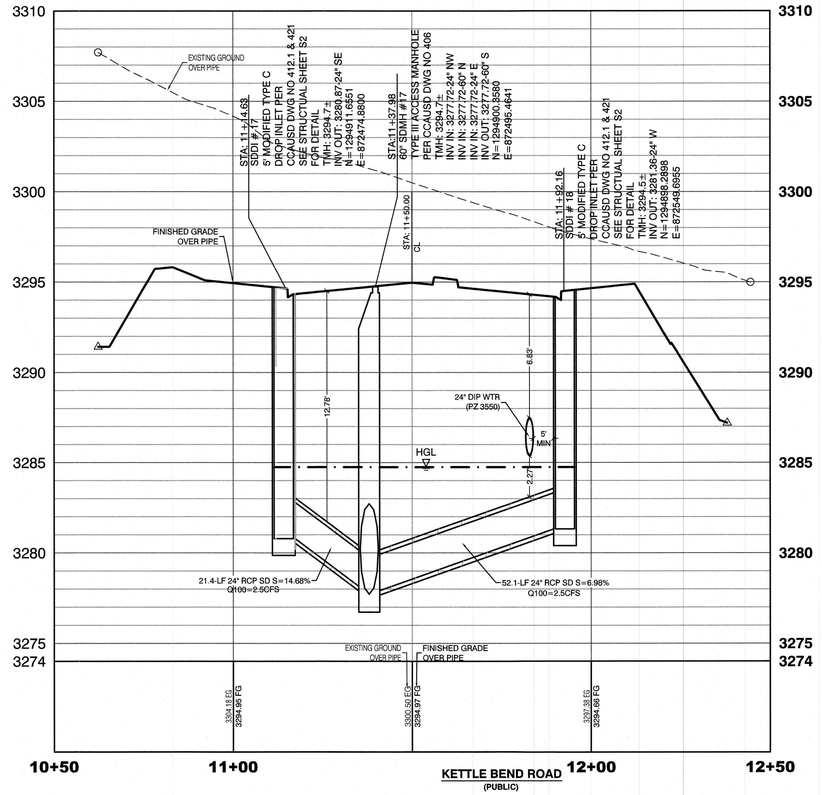






KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:
HORIZ. = 1"=20'
VERT. = 1"=4'



KETTLE BEND ROAD
(PUBLIC)

NOTE:
5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15

FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:
1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

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

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

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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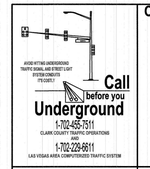
WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

LAS VEGAS FIRE & RESCUE APPROVAL
BY: _____ DATE: _____
APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL



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



1-702-227-2929

LAS VEGAS VALLEY WATER DISTRICT APPROVAL
APPROVED FOR CONSTRUCTION

_____
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE:_____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

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

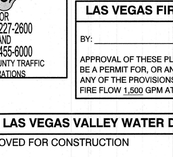
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2397 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

UTILITY PLAN & PROFILE 46
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
BCC 09/10/2019	BCC 09/10/2019	MJM 01/13/2020	7881	HORIZ. 1"=20' VERT. 1"=4'



SHEET
UT46
85 OF 94 SHEETS

DRAWING NO.

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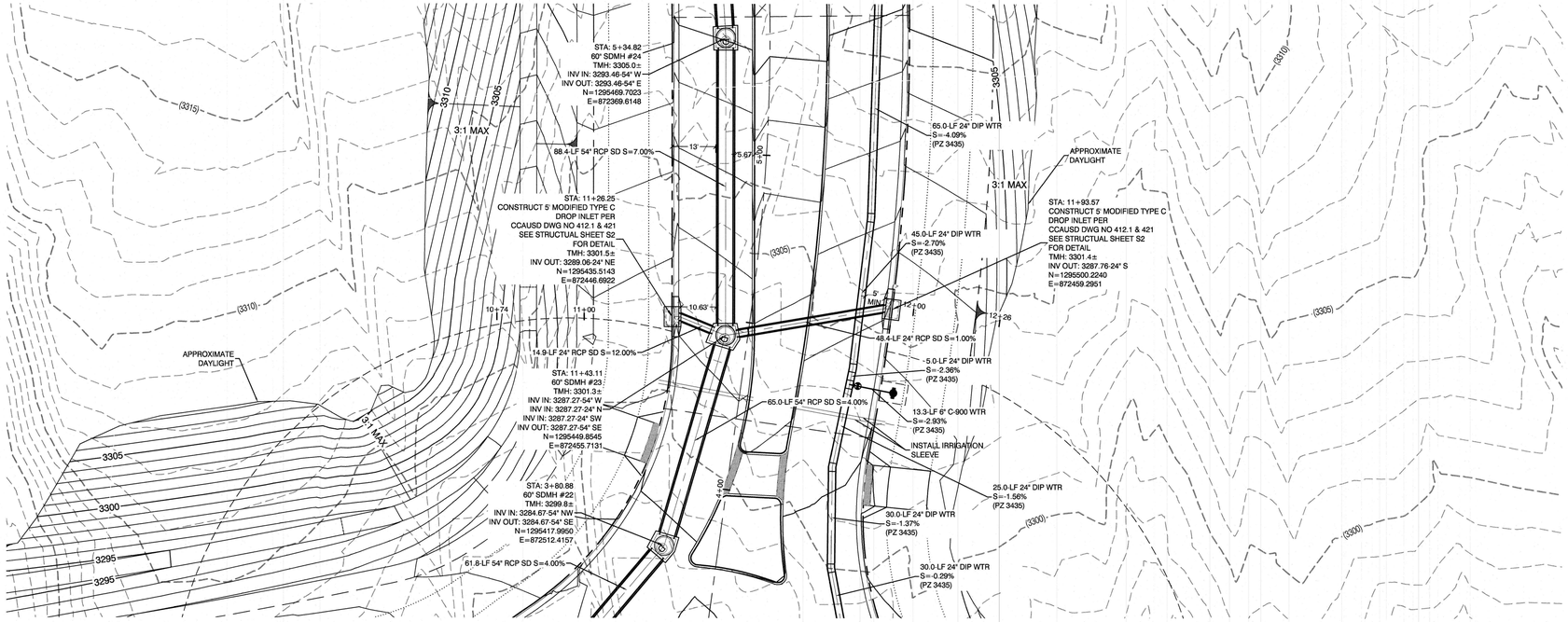
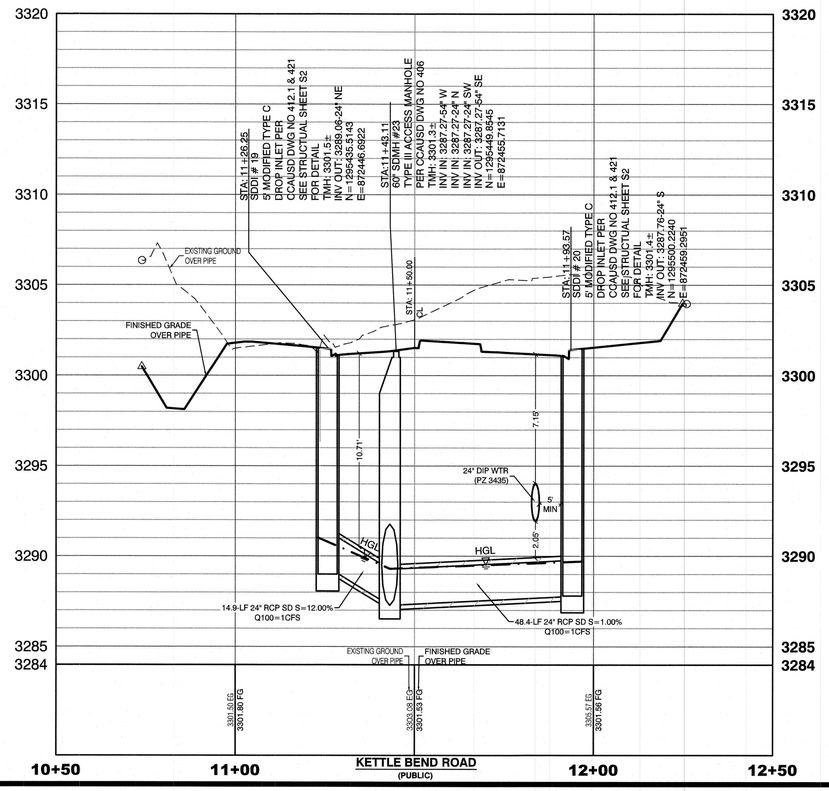


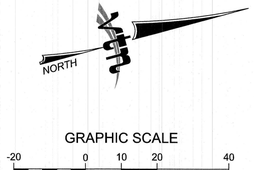
KETTLE BEND ROAD
(PUBLIC)

PROFILE SCALES:

HORIZ. = 1"=20'
VERT. = 1"=4'



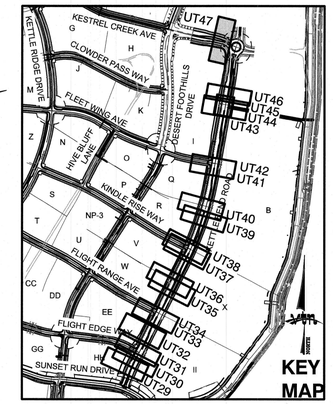
KETTLE BEND ROAD
(PUBLIC)



GRAPHIC SCALE

-20 0 10 20 40

1" = 20'



NOTE:

5' MINIMUM HORIZONTAL SEPARATION FROM OUTSIDE EDGE OF THE WATER MAIN TO OUTSIDE EDGE OF DROP INLET

WATER LINE MARKER BALLS NOTE

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LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

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Call before you Dig
Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811 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 DIG OVERHEAD
1-702-227-2929

LAS VEGAS VALLEY WATER DISTRICT APPROVAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: _____ PROJECT:----
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 P.S.I. RESIDUAL

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-207-4500

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-3597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 47
STORM DRAIN LATERAL

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN DRIVE TO KESTREL CREEK AVENUE

DRAWN BY: BCC — 08/10/2019
DESIGNED BY: BCC — 08/10/2019
CHECKED BY: VAM — 01/13/2020
PROJECT NO: 7861
SCALE: 1"=20' HORIZ. 1"=4' VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745
1/14/20

SHEET
UT47
86 OF **94** SHEETS

DRAWING NO.

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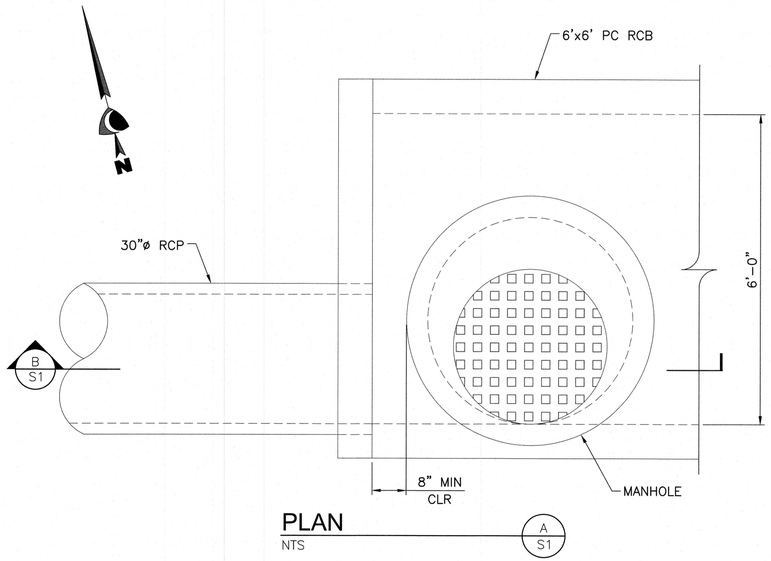
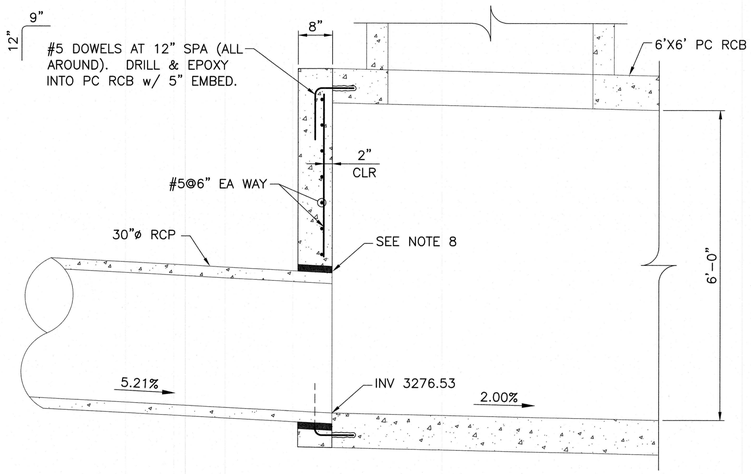


PLAN
NTS

A
S1



SECTION
NTS

B
S1

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 OR ENGINEER APPROVED EQUAL.
8. THE OPENING SIZE MAY BE INCREASED (±3") FOR EASE OF INSTALLATION. SEAL THE GAP WITH NON-SHRINK GROUT.

REVISION | BY | DATE | REV

HOWARD HUGHES COMPANY, LLC
A DELEWARD LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NV 89135
702-791-4000

CITY OF LAS VEGAS

PREPARED BY
CA Group, Inc
CIVIL ENGINEERS
2785 S. RAINBOW BLVD
LAS VEGAS, NV 89146
PHONE: (702) 685-5945

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

STRUCTURAL DETAILS
6'x6' PC RCB TO 30" RCP
CONNECTION

DRAWN BY: CW
DESIGNED BY: CW
CHECKED BY: JM
PROJECT NO: #
SCALE: N/A N/A HORIZ: VERT:

PROFESSIONAL ENGINEER-STATE OF NEVADA
CHRISTOPHER A. WUNSCH
EXP. 6/30/20
CIVIL
No. 18369

12/30/2019

SHEET
S1
93 OF 94 SHEETS

DRAWING NO.
#

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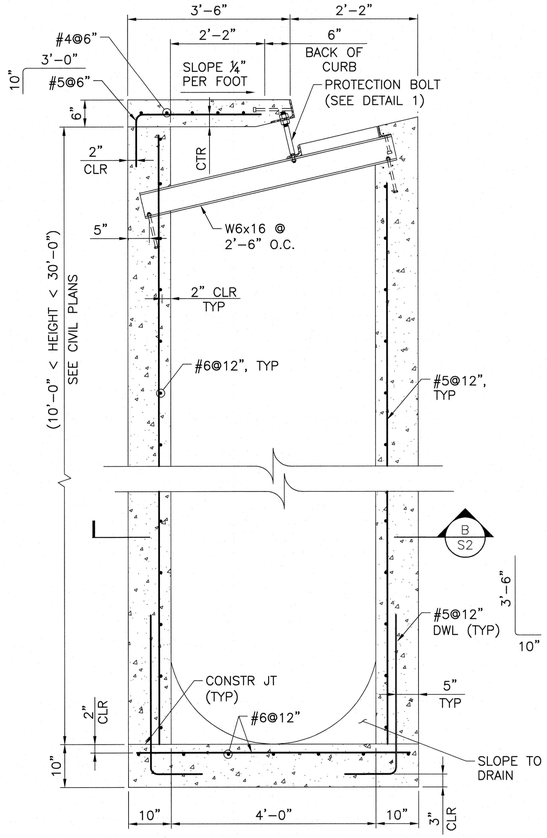
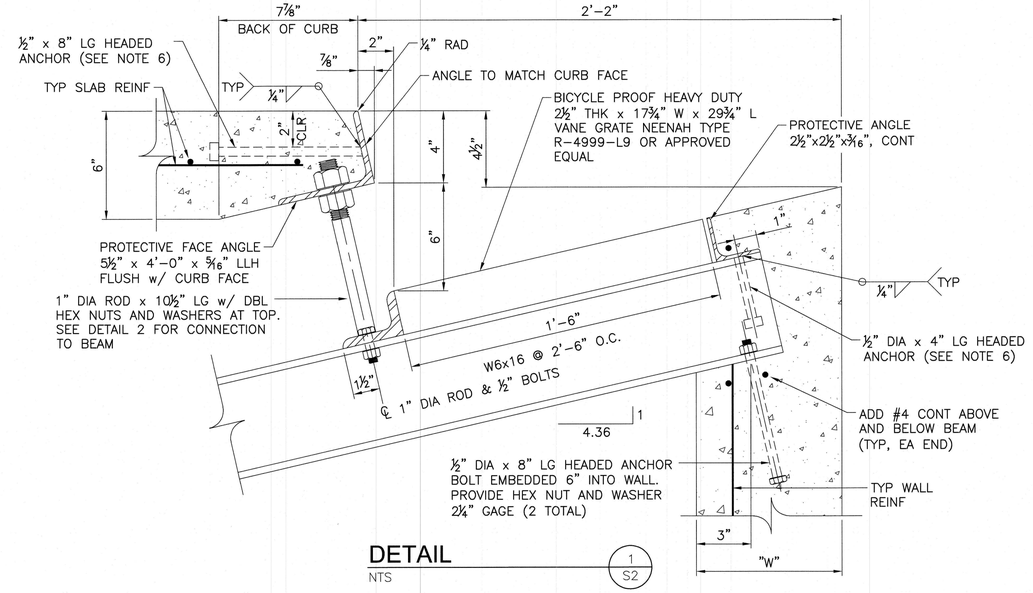


TYPE C MOD DROP INLET SECTION

SCALE: 3/4"=1'

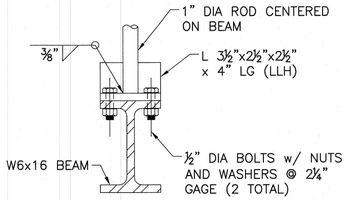
A S2



DETAIL

NTS

1 S2



DETAIL

NTS

2 S2

DROP INLET LAYOUT PLAN

SCALE: 1/4"=1'

C S2

SECTION

NTS

D S2

SECTION

NTS

B S2

DETAIL

NTS

3 S2

SECTION

NTS

E S2

NOTES:

1. ALL EXPOSED METALS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.
2. PROVIDE ½" MIN CLEARANCE ALL AROUND THE STEEL BEAM. DRY PACK AFTER INSTALLATION.
3. WHEN REQUIRED BY LENGTH OF OPENING, PLATE ANGLE MAY BE DELIVERED IN SECTIONS AND BUTT WELDED IN PLACE.
4. ALL GALVANIZED DAMAGED BY WELDING SHALL RECEIVE TWO COATS OF GALVALLOY OR APPROVED EQUAL.
5. CONCRETE SHALL BE MODIFIED CLASS DA 4000 PSI. SEE SPECIAL PROVISIONS SECTION 501.
6. ANGLE ANCHORS SHALL BE EMBEDDED MIDPOINT IN EACH ENDWALL AND EVENLY SPACED (MAXIMUM SPACING OF 2").
7. FOR MODIFIED TYPE 'C' INLETS THAT ARE 10' DEEP OR LESS, SEE CCAUSD DWG. NO. 412.1.

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELEWARD LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DR.
LAS VEGAS, NV 89135
702-791-4000

PREPARED BY:

CA Group, Inc
CIVIL ENGINEERING
2785 S. RAINBOW BLVD
LAS VEGAS, NV 89146
PHONE: (702) 685-5945

CITY OF LAS VEGAS

STRUCTURAL DETAILS
MOD. TY C INLET

SUMMERLIN WEST VILLAGE 22
KETTLE BEND ROAD-SUNSET RUN
DRIVE TO KESTREL CREEK AVENUE

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. 18345
12/30/2019

SHEET
S2
94 OF **94** SHEETS
DRAWING NO.
#

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