Final Technical Drainage Report

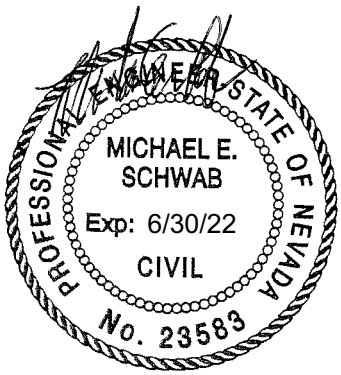
Supplemental Memorandum

for

HARRIS AVENEUE
BRUCT STREET TO MOJAVE ROAD

Date Prepared:
July 2020

Prepared for:
City of Las Vegas Public Works
333 North Rancho Drive
Las Vegas, NV 89106



Prepared by:
Kimley-Horn and Associates, Inc.
6671 Las Vegas Boulevard South, Suite 320
Las Vegas, NV 89119
702.862.3600

Kimley»Horn

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September 2020
KH Project #092256037

Kimley»Horn

Table of Contents

1.0 INTRODUCTION

1.1 STUDY OVERVIEW AND PUPOSE

On March 22, 2018, the City of Las Vegas (herein referred to as "City") entered into a Prime Design Services Agreement with Kimley-Horn and Associated, Incorporated for Harris Avenue Safe Routes To School project. The scope of services includes the design and preparation of contract drawings, special provisions, construction cost estimates, and reports for the establishment of Harris Avenue, between Bruce Street and Wardelle Street, as a "Safe Route to School". However, due to right-of-way issues the project scope expanded to a sidewalk infill and roadway improvement project, and now extends to Mojave Road. As part of the project, proposed improvements include storm drain, design of half street improvements, full-depth roadway improvements, sidewalk installation, walking path installation, PROWAG compliant curb ramps, crosswalks, striping bike lanes and crosswalks, and installing streetlights where none currently exist.

Certain improvements to existing drainage facilities are needed. A headwall will be placed on a pipe outlet along with U-channel and sidewalk underdrain for sidewalk improvements, and combination drop inlets will replace existing field drop inlets. A storm drain is proposed from 21st Street to Eastern Avenue. This Final Design Report Supplemental Memorandum is submitted to provide updated design calculations due to review comments from the 60 percent submittal pertaining to the proposed storm drain from 21st Street to Eastern Avenue.

1.2 SITE LOCATION

The project alignment is located in Sections 25 and 26 of Township 20 South, Range 61 East in Clark County, Nevada. The project area is located in Las Vegas, Nevada and within City of Las Vegas right-of-way. The project limits are between Bruce Street to the west and Mojave Road to the east. See **Figure 1** – *Vicinity Map*, following this page, for the project location in relation to the Las Vegas Valley.

2.0 HYDRAULIC ANALYSIS

A storm drain is proposed between 21st Street and Eastern Avenue along the pedestrian trail corridor. At the upstream end of this storm drain are two 15-foot Type "DM2" drop inlets to intercept the 10-year flow. Previous submittals proposed 20-foot Type "DM2" drop inlets; however; the proposed storm drain could not handle the increase in interception due to sanitary sewer crossing conflicts. Therefore, 15-foot drop inlets are proposed. These two inlets replace the existing drop inlets that tie into the sanitary

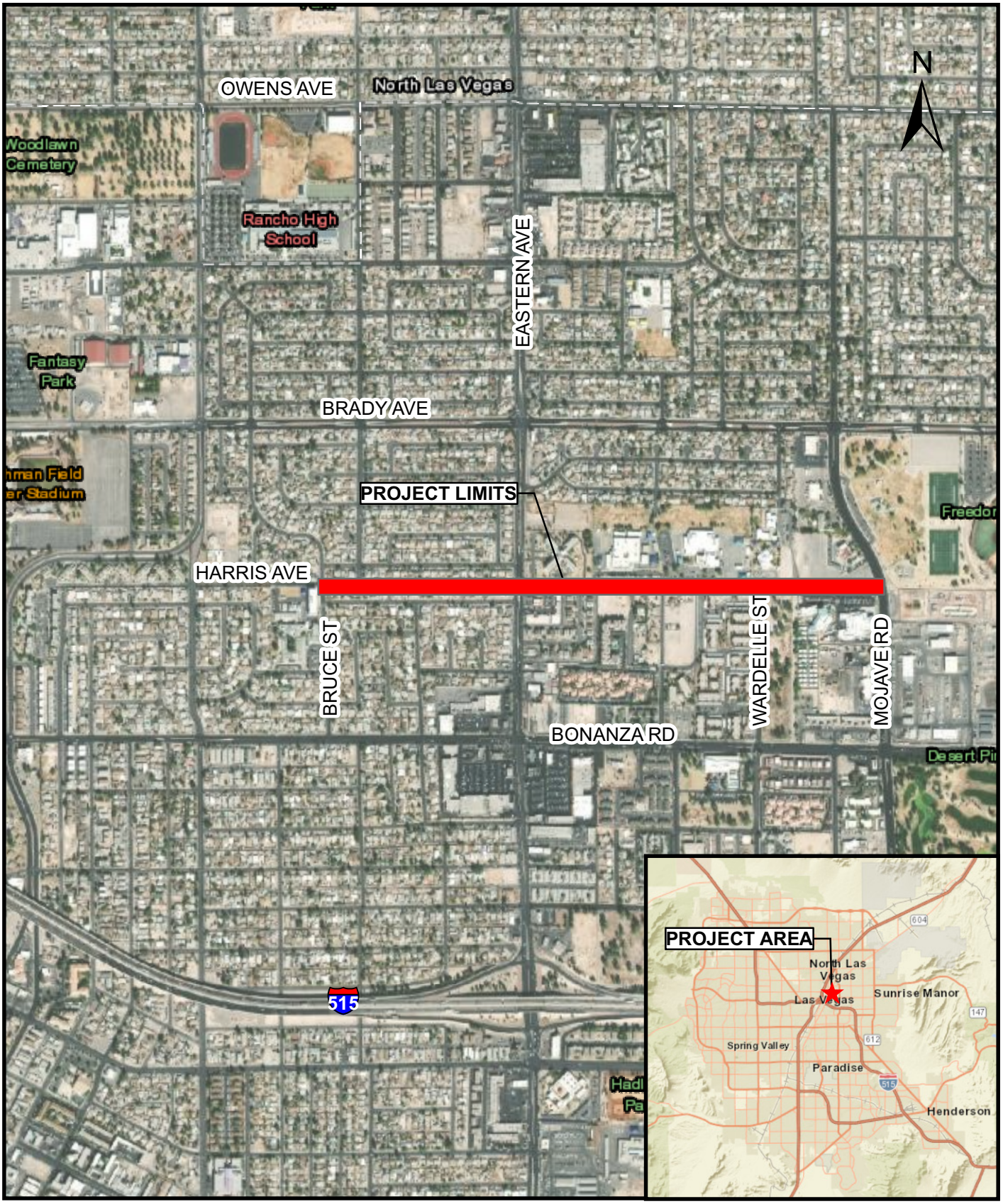

FIGURE 1 - VICINITY MAP
HARRIS AVENUE
BRUCE STREET TO MOJAVE ROAD

Kimley»Horn

Date: July 2020

sewer. At the downstream end of the proposed storm drain is a proposed 60-inch Type III storm drain manhole that connects the proposed storm drain to an existing 30-inch RCP. The proposed storm drain consists of 18-inch through 30-inch RCP, 30"x19" and 23"x14" HERCP, and 18" through 24" C900 storm drain pipe to avoid sanitary sewer conflicts. Refer to storm drain sheets in **Appendix B**.

Water Surface Pressure Gradient for Windows (WSPGW) by Civil Design was used to model the proposed storm drain. FlowMaster by Bentley Systems, Incorporated was used to size the drop inlets. A 50% clogging factor was used to size the drop inlets per the CCRFCD HCDDM. This resulted in the need for 15-foot drop inlets to intercept the 10-year flow. The calculated HGL is not 1-foot below the future grade as required by the CCRFCD Manual; however, multiple discussion were held with the City, and it was agreed the proposed storm drain will vastly improve the existing conditions through this corridor and provide a higher level of safety to pedestrians using this route during a rain storm. Refer to **Appendix A** for all hydraulic calculations and **Appendix B** for the storm drain plans.

3.0 CONCLUSIONS

The purpose of this Final Technical Drainage Report Supplemental Memorandum is to address review comments from the 60 percent submittal regarding the proposed storm drain between 21st Street and Eastern Avenue. The proposed drop inlets east of 21st Street are 15' Type "DM2" drop inlets. These inlets allow for approximately 3.5 feet of horizontal clearance from the back of the inlet to the outside of the existing 21-inch sanitary sewer running west to east along the north side of Harris Avenue. The HGL at the upstream end of the proposed storm drain is not 1-foot below the future grade. Due to an existing sanitary sewer crossing near storm drain station 15+60, it is not achievable to upsize the proposed storm drain and lower the HGL. Lowering the HGL at the upstream end to the requirement of 1-foot below ground as stated in the CCRFCD Manual would only be achievable with a parallel storm drain system until after the existing sanitary sewer crossing. In conversations with the City, it was deemed the proposed storm drain system as shown in the storm drain plans would vastly improve existing conditions between 21st Street and Eastern Avenue.

Current proposed improvements to existing storm drain facilities include installing a culvert headwall and U-channel near station "HA" 116+50. Existing inlets that currently drain to an existing sanitary sewer line will be removed, and two 15-foot Type "DM2" drop inlets will be installed along with a proposed storm drain between 21st Street and Eastern Avenue.

4.0 REFERENCES

1. Clark County Regional Flood Control District, "*Hydrologic Criteria and Drainage Design Manual*," August 1999, Revise September 2013.

2. Clark County Regional Flood Control District, "*2018 Las Vegas Valley Flood Control Master Plan Update*," December 2018.

3. Drainage Study for Escobedo Plaza; Prepared by Gomez Consulting Group, April 9, 1998.

4. Technical Drainage Study for Halle Hewetson Addition; Prepared by Integrity Engineering, June 2002.

5. Technical Drainage Study for McKnight Senior Village Unit 2. Prepared by RedRock Engineering & Surveying, Inc., April 12, 2007.

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LIST OF APPENDICES

Appendix A – Hydraulic Analysis

- FlowMaster Inlet Calculations
- WSPGW Model – Mainline
- WSPGW Models – Laterals

Appendix B – Storm Drain Plans

Appendix C – Data CD

- Final Technical Drainage Report Supplemental Memorandum, Harris Avenue, Bruce Street to Mojave Road
- 90% Plans, Harris Avenue, Bruce Street to Mojave Road

Appendix A – Hydraulic Analysis

- FlowMaster Inlet Calculations
- WSPGW Model - Mainline
- WSPGW Model - Laterals

Worksheet for 15-FOOT DM2 @ "SD" 10+07

Project Description	
Solve For	Efficiency

Input Data	
Discharge	16.00 cfs
Slope	0.007 ft/ft
Gutter Width	2.00 ft
Gutter Cross Slope	0.110 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.013
Local Depression	5.0 in
Local Depression Width	2.0 in
Grate Width	1.00 ft
Grate Length	12.75 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %
Curb Opening Length	15.00 ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results	
Efficiency	86.88 %
Intercepted Flow	13.90 cfs
Bypass Flow	2.10 cfs
Spread	19.50 ft
Depth	6.8 in
Flow Area	4.0 ft²
Gutter Depression	2.2 in
Total Depression	7.2 in
Velocity	4.02 ft/s
Splash Over Velocity	15.94 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.436
Grate Flow Ratio	0.183
Equivalent Cross Slope	0.118 ft/ft
Active Grate Length	6.38 ft
Length Factor	0.410
Total Interception Length	21.04 ft

Messages

Worksheet for 15-FOOT DM2 @ "SD" 10+07

Messages		
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).	

```
T1 HARRIS AVENUE BRUCE ST TO MOJAVE RD
T2 MAINLINE FOR HARRIS AVENUE - 10-YR FLOW
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Program Package Serial Number: 7214

WATER SURFACE PROFILE LISTING Date: 1-14-2020 Time:12:31:56

HARRIS AVENUE SAFE ROUTES TO SCHOOL
MAINLINE FOR HARRIS AVENUE - 10-YR FLOW
FILE NAME: HARRISMAIN-10YR.WSW BY: MS

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	
-2262.360	1831.030	2.500	1833.530	32.00	6.52	.66	1834.19	.00	1.93	.00	2.500	.000	.00	0 .0
33.020	.0040				.0061	.20	2.50	.00	2.50	.013	.00	.00	PIPE	
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.422	.0036				.0059	.00	2.50	.16	2.50	.013	.00	.00	PIPE	
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HARRIS AVENUE SAFE ROUTES TO SCHOOL
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FILE NAME: HARRISMAIN-10YR.WSW BY: MS

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	
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282.300	.0127				.0176	4.96	4.37	.00	2.00	.013	.00	.00	PIPE	
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HARRIS AVENUE BRUCE ST TO MOJAVE RD

LATERAL #2 FOR HARRIS AVENUE - 10-YR FLOW

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L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-1033.370	1840.270	6.592	1846.862	14.00	7.92	.97	1847.84	.00	1.38	.00	1.500	.000	.00	0 .0
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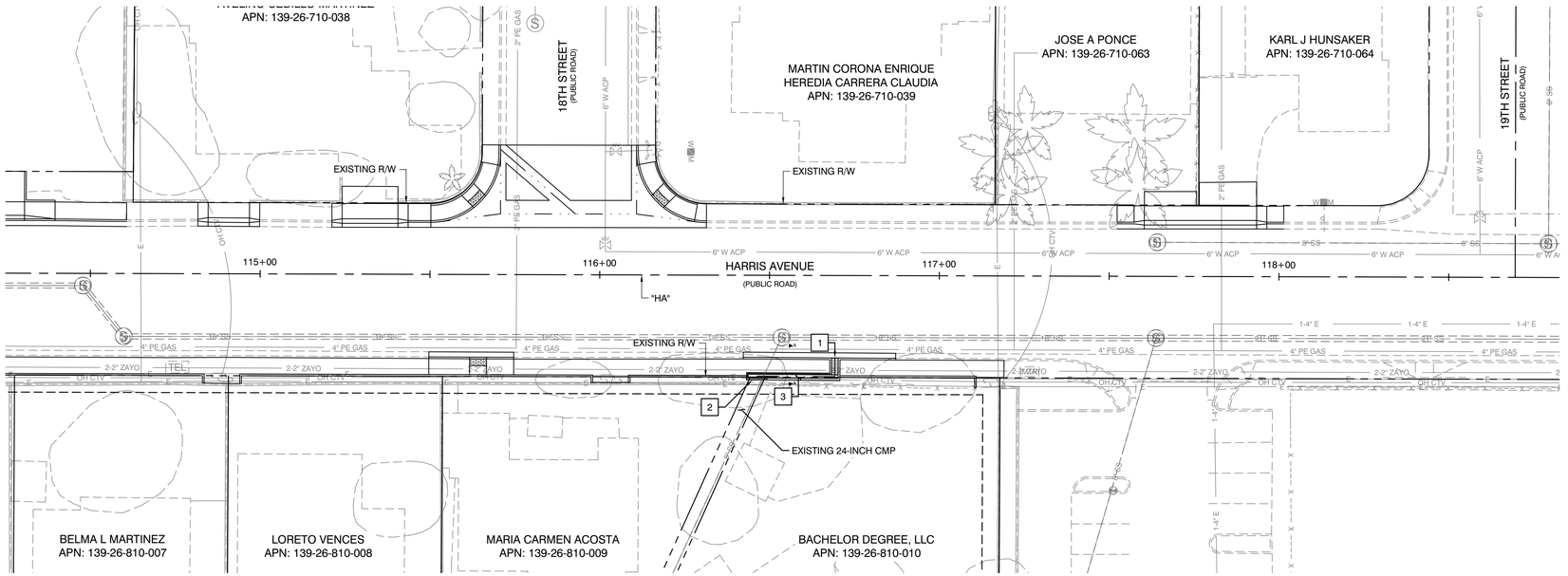
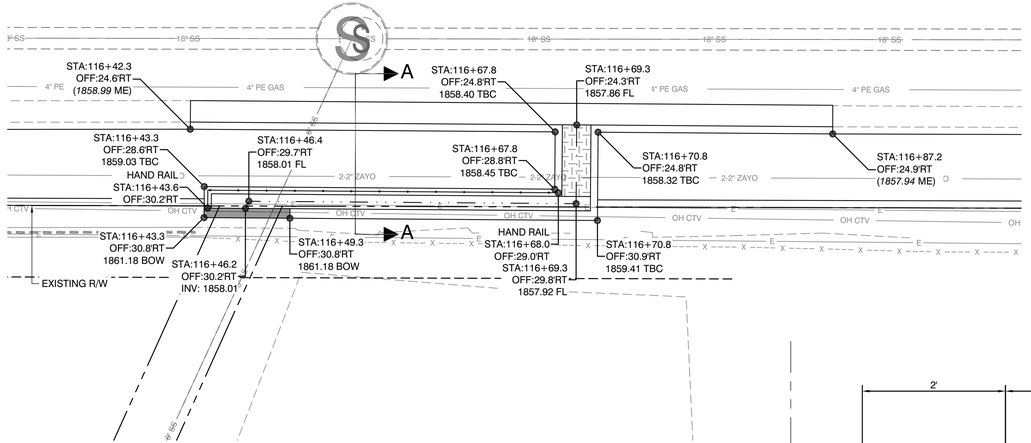
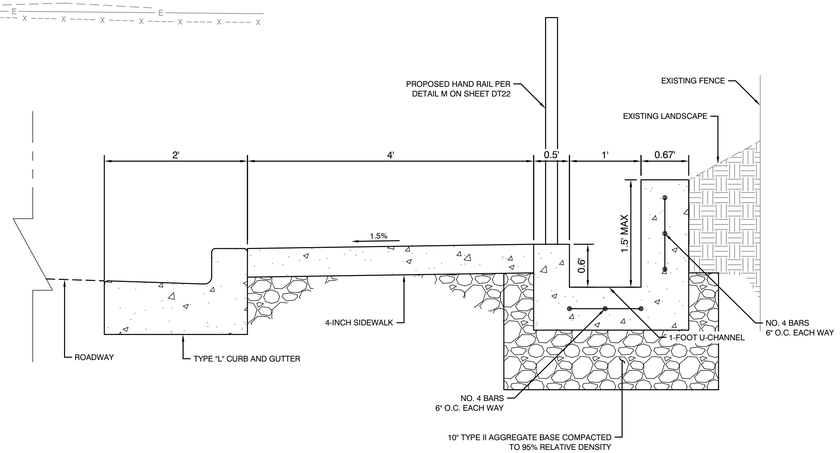
Appendix B – Storm Drain Plans







SECTION A-A

NORTH

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(IN FEET)
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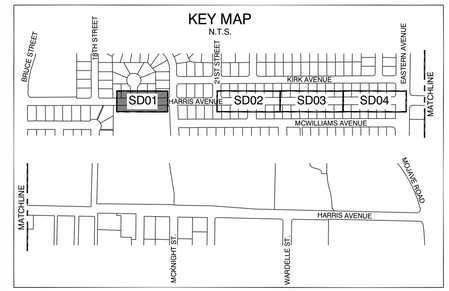
(VERIFY SCALE - PLANS MAY HAVE BEEN REDUCED)



STORM DRAIN NOTES

1. CONSTRUCT SIDEWALK DRAIN PER CCAUSD DWG NO. 236. BID ITEM 613.09
2. CONSTRUCT CULVERT HEADWALL SINGLE CMP PER NDOT STANDARD DETAILS NO. DS-16A AND DS-16B (SEE SHEETS DT16 AND DT17 FOR DETAILS). BID ITEM 502.01
3. CONSTRUCT 1-FOOT WIDE U-CHANNEL WITH 6-INCH CURB AND 8-INCH VARIABLE HEIGHT CURB (SEE SPECIAL DETAIL ON THIS SHEET). BID ITEM 613.13

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

REVISIONS | NO. | DATE | SHEET

PREPARED BY
Kimley»Horn
Engineering, Planning, and Environmental Consultants
6671 LAS VEGAS BOULEVARD, SOUTH SUITE 320.
LAS VEGAS, NV 89119
PH. (702) 862-3500

PROFESSIONAL ENGINEER — STATE OF NEVADA — DAVID A. TUSNER — Expires 6/30/22 — CIVIL — No. 23199 — NOT FOR CONSTRUCTION

TITLE
HARRIS AVENUE
BRUCE STREET TO MOJAVE ROAD

SHEET
STORM DRAIN PLAN
CMP U-CHANNEL

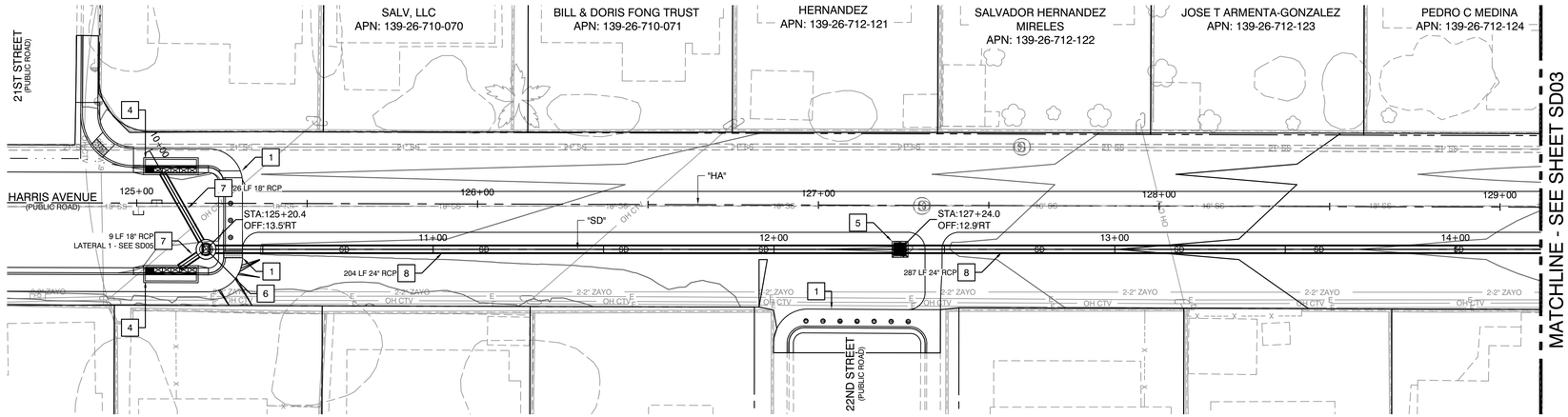
PREPARED FOR
CITY OF LAS VEGAS

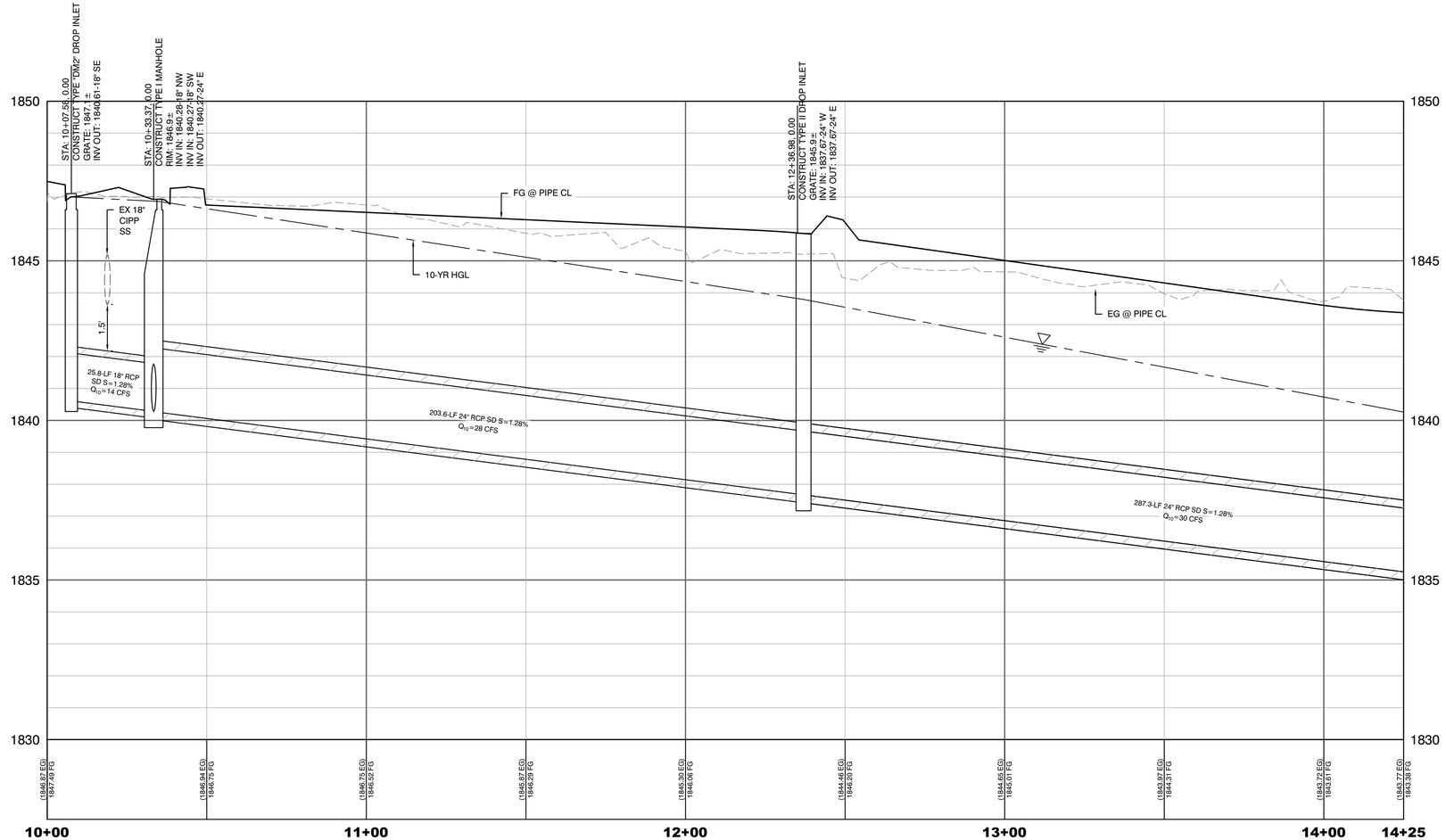
BID # XX.XXXXX | DATE: 07/07/2020
H # 66623 | DESIGNED BY: CAS
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: CAS | CHECKED BY: DAT

SHEET
SD01
91 OF 105
DRAWING NO.

NOT FOR CONSTRUCTION

7/7/20 K:\LAV_PUBLIC\TAN\S\092290183 HARRIS AVENUE\7 PRODUCTION\DWG\092256033-SD01-SD02.DWG





VERTICAL SCALE: 1" = 2'

NORTH

GRAPHIC SCALE
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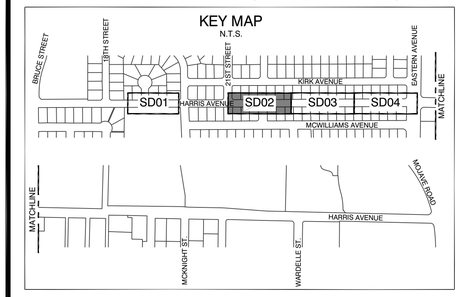
(IN FEET)
1"=20 ' (H)

(VERIFY SCALE - PLANS MAY HAVE BEEN REDUCED)

KEY MAP
N.T.S.



STORM DRAIN NOTES

1. CONSTRUCT SIDEWALK DRAIN PER CCAUSD DWG NO. 236. BID ITEM 613.09
4. CONSTRUCT 15-FOOT TYPE "DM2" DROP INLET PER CCAUSD DWG NO. 412.1 WITH WATER QUALITY STAMP PER CCAUSD DWG NO. 421. BID ITEM 609.03
5. CONSTRUCT NDOT TYPE 2B DROP INLET WITH CONCRETE APRON PER NDOT STANDARD DETAIL NO. DS-34 (SEE SHEET DT18 FOR DETAILS). BID ITEM 609.04
6. CONSTRUCT 60-INCH TYPE III STORM DRAIN MANHOLE PER CCAUSD DWG NO. 406.1. BID ITEM 609.02
7. INSTALL 18-INCH RCP STORM DRAIN PIPE WITH TRENCH DETAIL PER CCAUSD DWG NO. 503.2. BID ITEM 603.01
8. INSTALL 24-INCH RCP STORM DRAIN PIPE WITH TRENCH DETAIL PER CCAUSD DWG NO. 503.2. BID ITEM 603.02

CALL BEFORE CONSTRUCTION

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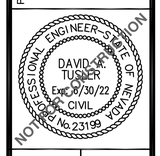
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

REVISIONS | NO. | DATE | SHEET

PREPARED BY
Kimley»Horn
Engineering, Planning, and Environmental Consultants
6671 LAS VEGAS BOULEVARD, SOUTH SUITE 320.
LAS VEGAS, NV 89119
PH. (702) 862-3500



TITLE
HARRIS AVENUE
BRUCE STREET TO MOJAVE ROAD

SHEET
STORM DRAIN PLAN AND PROFILE

PREPARED FOR
CITY OF LAS VEGAS

BID # XX.XXXXX
H # 66623

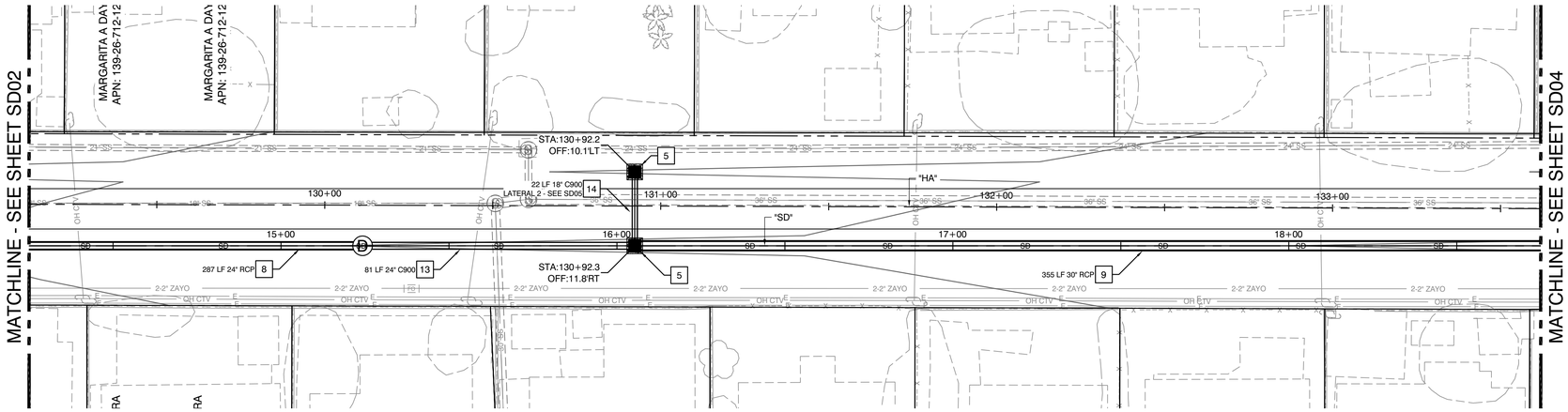
DATE: 07/07/2020
DESIGNED BY: CAS
DRAWN BY: CAS
CHECKED BY: DAT

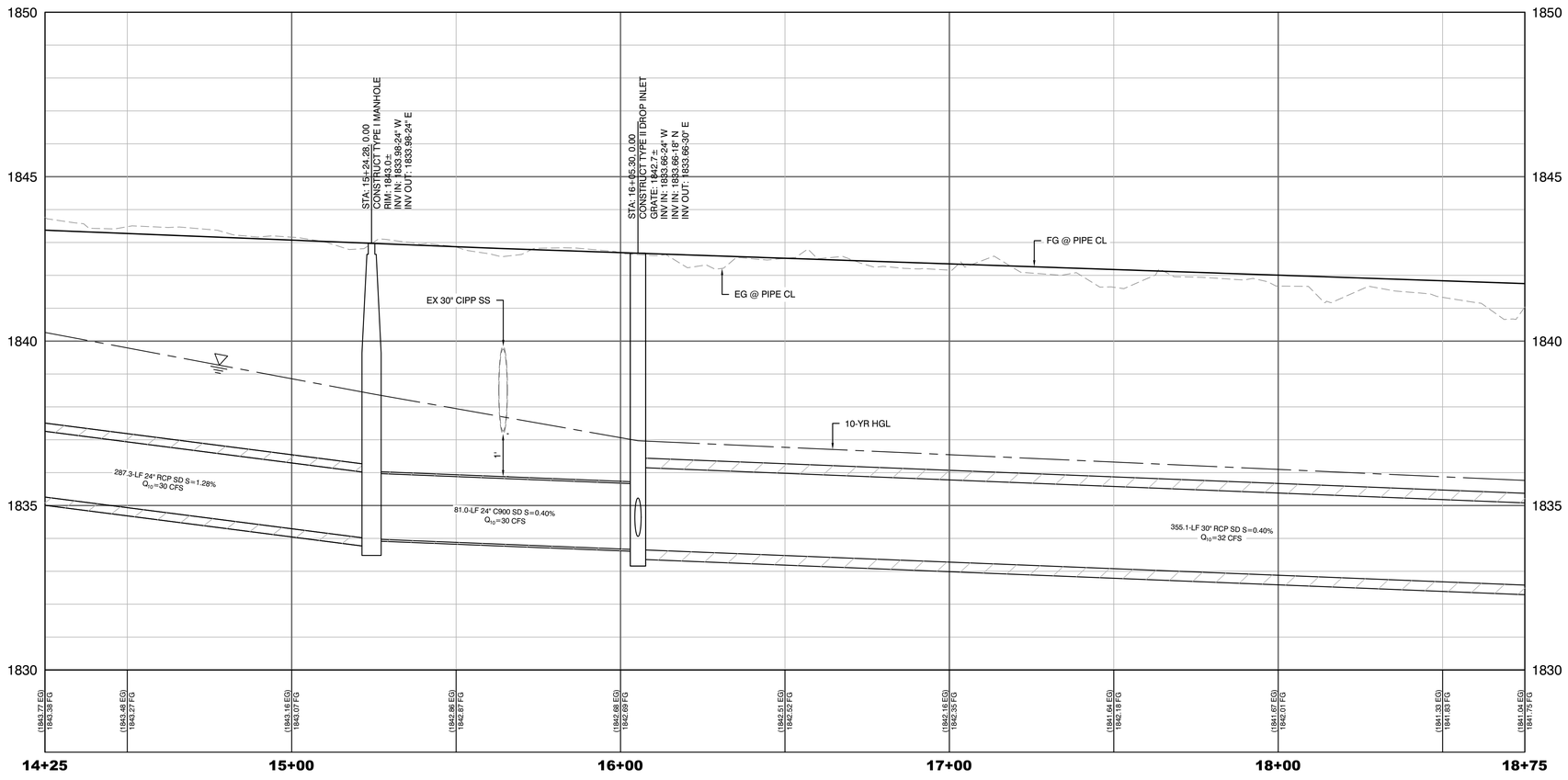
SUBMITTAL STAGE: **90% SUBMITTAL**

SHEET
SD02
92 OF 105
DRAWING NO.

NOT FOR CONSTRUCTION

7/7/20 K:\LAV_PUBLIC\TRANS\092290103\HARRIS AVENUE\7 PRODUCTION\DWG\092256503-SD01-SD02.DWG





VERTICAL SCALE: 1" = 2'

NORTH

GRAPHIC SCALE
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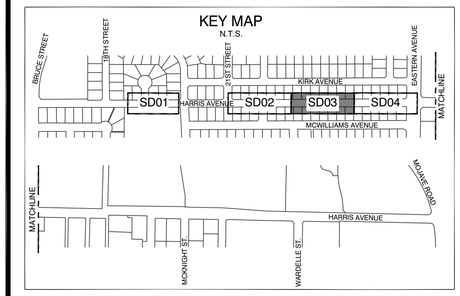
(IN FEET)
1"=20 ' (H)

(VERIFY SCALE - PLANS MAY HAVE BEEN REDUCED)

KEY MAP
N.T.S.



STORM DRAIN NOTES

5 CONSTRUCT NDOT TYPE 2B DROP INLET WITH CONCRETE APRON PER NDOT STANDARD DETAIL NO. DS-34 (SEE SHEET DT18 FOR DETAILS). BID ITEM 609.04

8 INSTALL 24-INCH RCP STORM DRAIN PIPE WITH TRENCH DETAIL PER CCAUSD DWG NO. 503.2. BID ITEM 603.02

9 INSTALL 30-INCH RCP STORM DRAIN PIPE WITH TRENCH DETAIL PER CCAUSD DWG NO. 503.2. BID ITEM 603.03

13 INSTALL 24-INCH C900 STORM DRAIN PIPE WITH TRENCH DETAIL PER UDACS PLATE NO. 17. BID ITEM 603.05

14 INSTALL 18-INCH C900 STORM DRAIN PIPE WITH TRENCH DETAIL PER UDACS PLATE NO. 17. BID ITEM 603.04

CALL BEFORE CONSTRUCTION

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	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

NO.	DATE	SHEET	REVISIONS

PREPARED BY
Kimley»Horn
Engineering, Planning, and Environmental Consultants
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LAS VEGAS, NV 89119
PH. (702) 862-3500

PROFESSIONAL ENGINEER — STATE OF NEVADA — DAVID A. TUSNER — Exp. 6/30/22 — CIVIL — No. 23199 — NOT FOR CONSTRUCTION

PREPARED FOR
CITY OF LAS VEGAS

BID # XX.XXXXX
H # 66623

DATE: 07/07/2020
DESIGNED BY: CAS
DRAWN BY: CAS
CHECKED BY: DAT

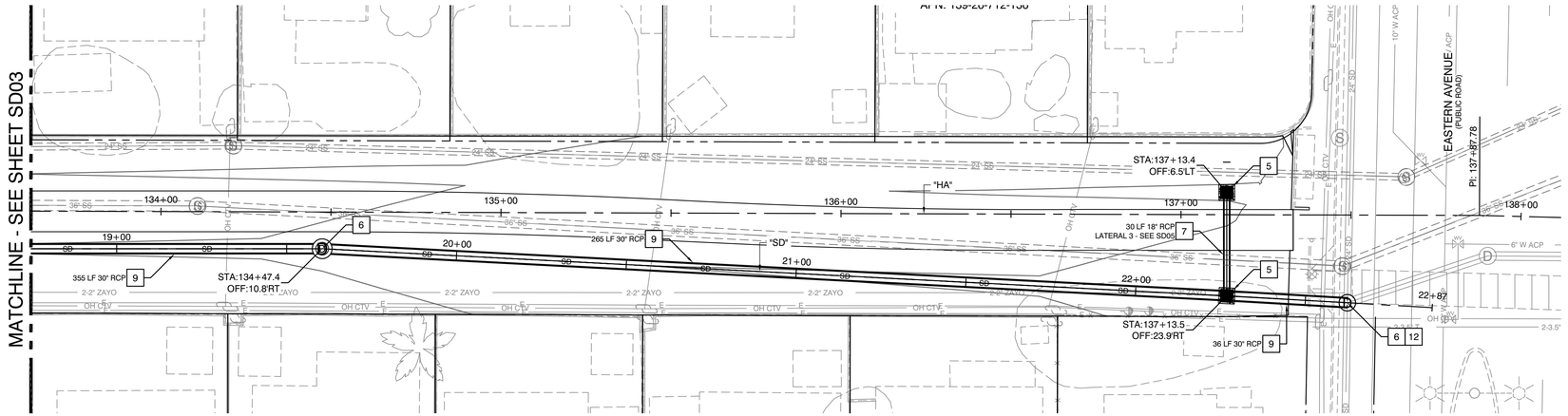
SUBMITTAL STAGE: 90% SUBMITTAL

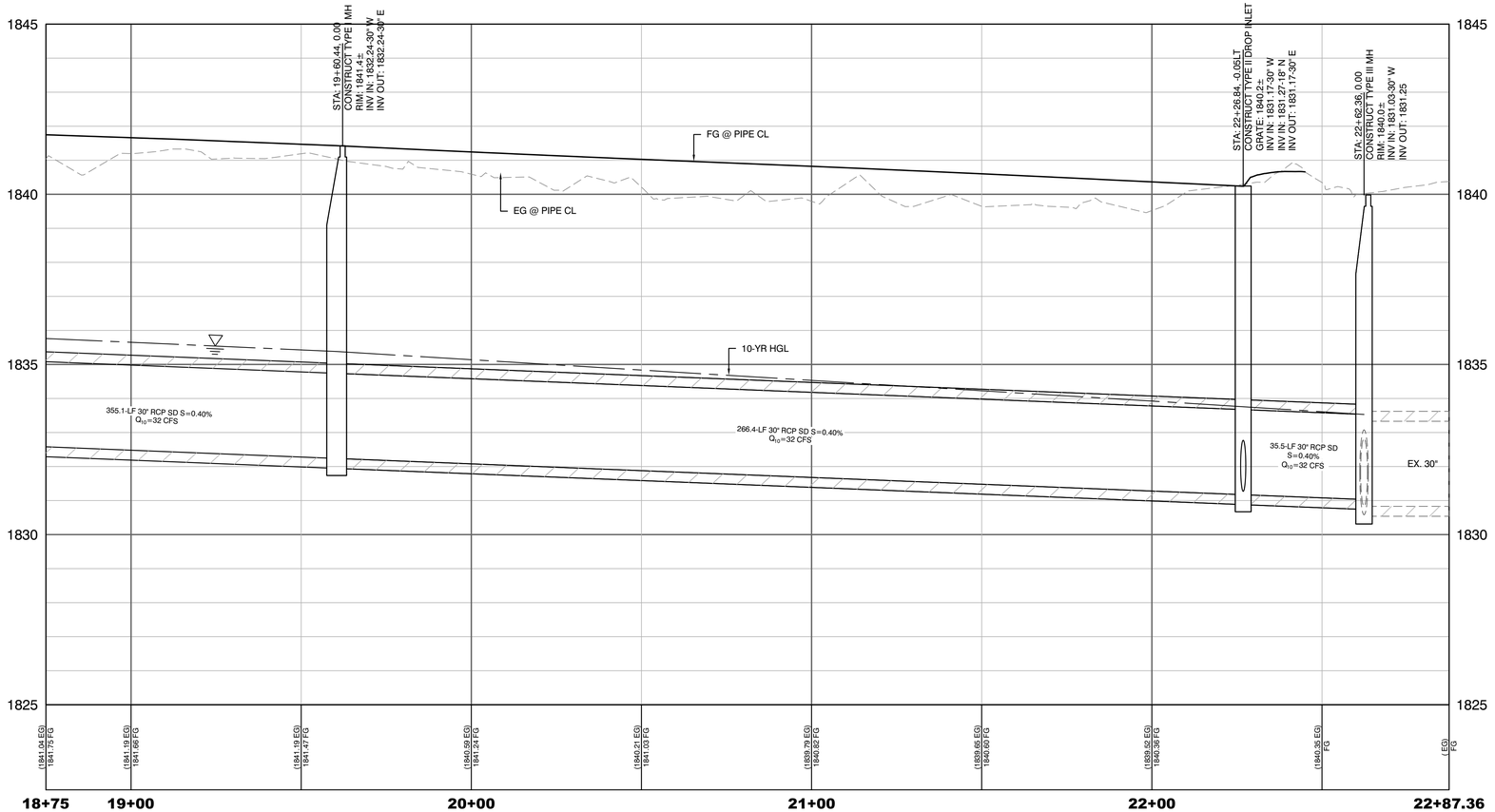
TITLE
HARRIS AVENUE
BRUCE STREET TO MOJAVE ROAD
STORM DRAIN PLAN AND PROFILE

SHEET
SD03
93 OF 105
DRAWING NO.

NOT FOR CONSTRUCTION

7/1/20 K:\LAV_PUBLIC\TRANS\092256333-HARRIS AVENUE\7. PRODUCTION\DWG\092256333-SD01-SD02.DWG



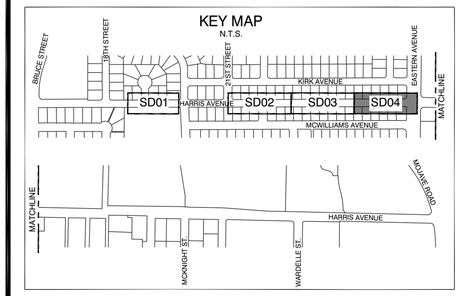


VERTICAL SCALE: 1" = 2'

NORTH

GRAPHIC SCALE
20 0 10 20 40
(IN FEET)
1"=20 ' (H)

(VERIFY SCALE - PLANS MAY HAVE BEEN REDUCED)



STORM DRAIN NOTES

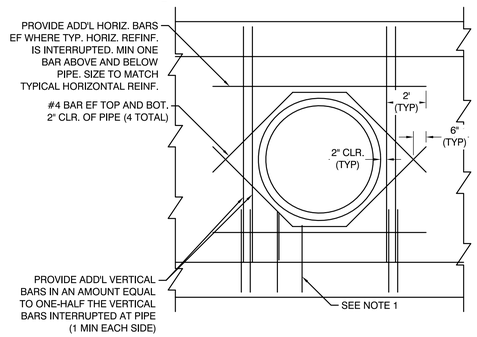
5 CONSTRUCT NDOT TYPE 2B DROP INLET WITH CONCRETE APRON PER NDOT STANDARD DETAIL NO. DS-34 (SEE SHEET DT18 FOR DETAILS). BID ITEM 609.04

6 CONSTRUCT 60-INCH TYPE III STORM DRAIN MANHOLE PER CCAUSD DWG NO. 406.1. BID ITEM 609.02

7 INSTALL 18-INCH RCP STORM DRAIN PIPE WITH TRENCH DETAIL PER CCAUSD DWG NO. 503.2. BID ITEM 603.01

9 INSTALL 30-INCH RCP STORM DRAIN PIPE WITH TRENCH DETAIL PER CCAUSD DWG NO. 503.2. BID ITEM 603.03

12 CONNECT EXISTING 24-INCH STORM DRAIN AND 30-INCH STORM DRAIN TO PROPOSED 60-INCH TYPE III STORM DRAIN MANHOLE, PER DETAIL A ON THIS SHEET



NOTES:
1. FIELD CUT TYPICAL WALL REINFORCING 2" CLR. OF PIPE.
2. WHEN WALL IS LESS THAN 9" THICK REINFORCING DOES NOT NEED TO BE PLACED IN EACH FACE AS STATED ABOVE.
3. IF BARS CANNOT EXTEND BEYOND PIPE AS SHOWN, EXTEND AS FAR AS POSSIBLE AND PROVIDE STANDARD HOOK.

DETAIL A

SCALE: NTS

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	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
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REVISIONS | NO. | DATE | SHEET

PREPARED BY
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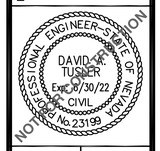
6671 LAS VEGAS BOULEVARD, SOUTH SUITE 320.
LAS VEGAS, NV 89119
PH. (702) 862-3500



TITLE
HARRIS AVENUE
BRUCE STREET TO MOJAVE ROAD
STORM DRAIN PLAN AND PROFILE

PREPARED FOR
CITY OF LAS VEGAS

DATE: 07/07/2020
DESIGNED BY: CAS
DRAWN BY: CAS
CHECKED BY: DAT

BID # XX.XXXXX
H # 66623
SUBMITTAL STAGE: 90% SUBMITTAL

SHEET
SD04
94 OF 105
DRAWING NO.

NOT FOR CONSTRUCTION

K:\LAV_PUBLIC\TRANS\092256\03 HARRIS AVENUE\7. PRODUCTION\DWG\SD225033-SD01.DWG
7/1/20

GRAPHIC SCALE

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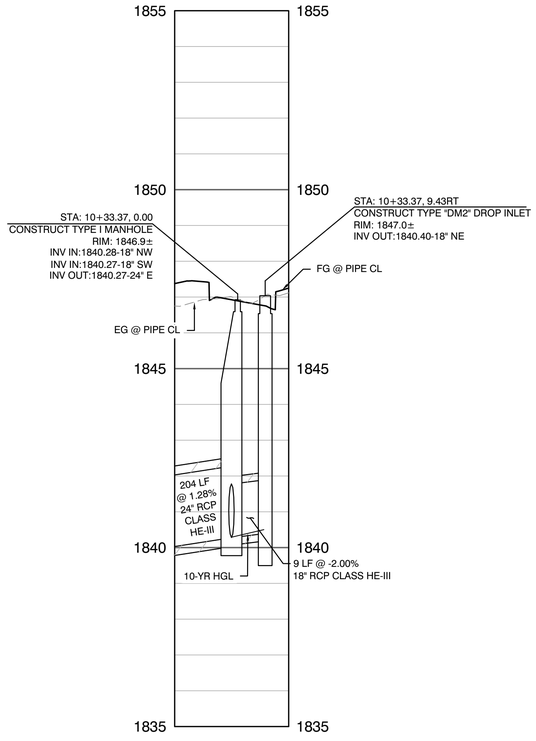
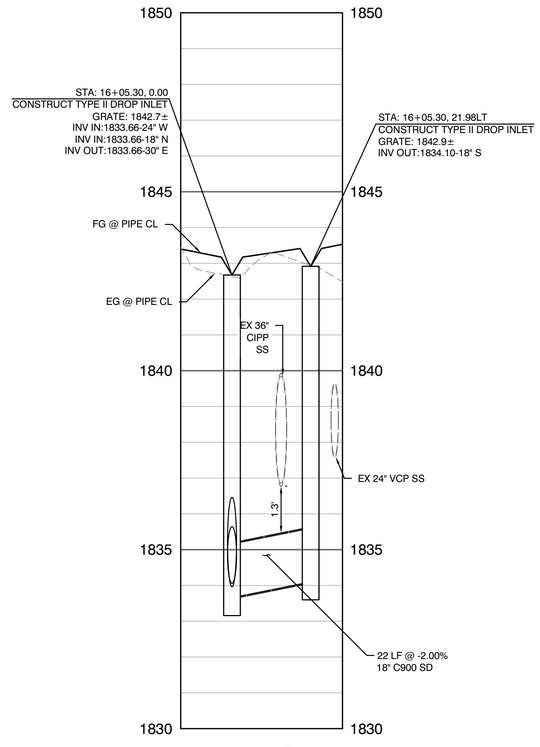
(IN FEET)
1"=20 ' (H)
1"=2' (V)
(VERIFY SCALE - PLANS MAY HAVE BEEN REDUCED)



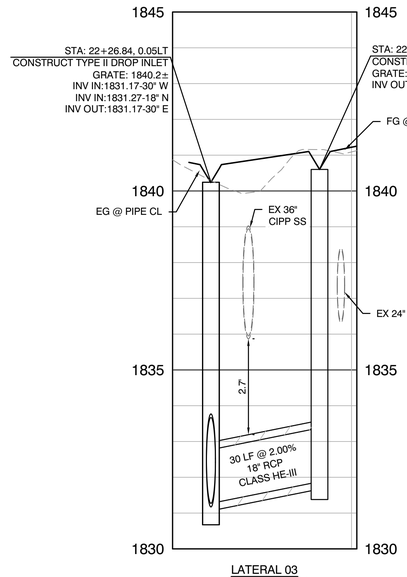
LATERAL 1
18" RCP LATERAL @ "SD" STA: 10+33

VERTICAL SCALE: 1" = 2'



LATERAL 2
23"X14" HERCP LATERAL @ "SD" STA: 16+05

VERTICAL SCALE: 1" = 2'



LATERAL 03
18" RCP LATERAL @ "SD" STA: 22+26

VERTICAL SCALE: 1" = 2'

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PH. (702) 862-3500

PROFESSIONAL ENGINEER STATE OF NEVADA
DAVID A. TUSNER
Exp. 6/30/22
CIVIL
No. 23199
NOT FOR CONSTRUCTION

TITLE
HARRIS AVENUE
BRUCE STREET TO MOJAVE ROAD

SHEET
STORM DRAIN PLAN
LATERALS

PREPARED FOR
CITY OF LAS VEGAS

BID # XX.XXXXX
H # 66623

DATE: 07/07/2020
DESIGNED BY: CAS
DRAWN BY: CAS
CHECKED BY: DAT

SUBMITTAL STAGE:
90% SUBMITTAL

SHEET
SD05
95 OF 105
DRAWING NO.

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7/7/20 K:\LAV_PUBLIC\TRANS\29229\03 HARRIS AVENUE\7. PRODUCTION\DWG\90229033-SD01.DWG

Appendix C – Data CD

- Final Technical Drainage Report Supplemental Memorandum, Harris Avenue, Bruce Street to Mojave Road
- 90% Plans, Harris Avenue, Bruce Street to Mojave Road