

DS #: 5178

APN: 143-01-501-001 & 143-01-501-002

PROJECT: The Lindell

SUBMITTAL: 2nd

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: April 29, 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: The Lindell	
Cross Streets:	SEC of Charleston Boulevard & Lindell Road	
File Number:	F:\Depot\DSMemos\DS5178B.doc	
Parcel Number:	163-01-501-001 & 163-01-501-002	
Zoning Action:	SDR-75858	
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES	NO X
COPIES TO:		Baughman & Turner, Inc.
		Centura Development
		Bart Anderson, P.E., DevCo
		CCRFCD

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	8/12/2019	9/11/2019	Not Approved	\$400.00	3527101: \$400
2 nd Submittal	4/6/2020	4/28/2020	See Comments Below	\$400.00	3806550: \$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:
	must be resubmitted or supplemented including the following:
X	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	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 April 6, 2020, only electronic submittals to the CCRFCD will be accepted for regional acceptance. Contact cwang@regionalflood.org for direction.

2. A One-lot Parcel Map or Reversionary Map to consolidate the two onsite parcels into one must be recorded prior to the approval of the subject improvement plans.
3. **Second Request: FIG 11 (Existing Conditions Map):** Basin EXN is wrongly labeled as EXW, review and revise accordingly.

Basin EXN is still wrongly labeled as EXW in the last submittal.

4. Provide a 10'-wide public drainage easement (privately maintained) subscribing the proposed onsite storm drain system. Show it on the grading plans and dedicate as such on the one-lot parcel map or by separate document prior to the final approval of the improvement plans.
5. Revise all drop inlets in public right-of-ways to Type "C-D" Modified Drop Inlet per Standard Drawing 412.1 or Neenah Pre-cast inlets. Revise D.I. #5 and 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

ays

T/R/S: T21S/R60E/01
AREA Q-01

Neil Wacaser

From: Neil Wacaser
Sent: Monday, April 6, 2020 16:15
To: 'pamp@baughman-turner.com'
Cc: Oh-Sang Kwon; Albert Sung
Subject: Lindell drainage study

Dear Ms. Pitcher,

This email is to acknowledge that the City of Las Vegas Flood Control section has received the addendum that Baughman & Turner submitted for the Lindell – Senior Living technical drainage study. You'll need the following Hansen application number in order to pay the \$400 review fee online:

DS05178

If you have any questions or problems regarding paying the fee online, please call me at the number shown below and I'll be happy to help you.

Thanks,

Neil Wacaser

Engineering Associate
City of Las Vegas, Department of Public Works
City Engineer Division, Flood Control Section
333 N. Rancho Drive | Las Vegas, NV 89106
Phone: (702) 229-2475 | email: nwacaser@lasvegasnevada.gov



lasvegasnevada.gov



Your opinion is important! Click [here](#) to take a short survey.

**TECHNICAL DRAINAGE STUDY FOR
THE LINDELL
SECTION 01, TOWNSHIP 21 SOUTH, RANGE 60 EAST
CITY OF LAS VEGAS, NEVADA**

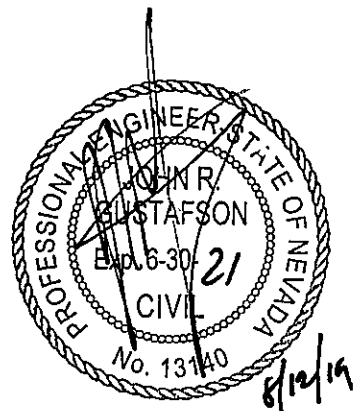
August 6, 2019

PREPARED FOR:

CENTURA DEVELOPMENT
1210 HINSON STREET
LAS VEGAS, NV 89102

PREPARED BY:

BAUGHMAN & TURNER, INC.
1210 HINSON STREET
LAS VEGAS, NEVADA 89102
TEL: (702) 870-8771/FAX: (702) 878-2695



HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: The Lindell – Senior Living Date: July 11, 2019
 Location of Development: a) Descriptive (Cross Streets) North/South: Lindell Road
 East/West: Charleston Boulevard
 b) Section: 01 Township: 21 S Range: 60 E
 c) APN: 163-01-501-001 & 002

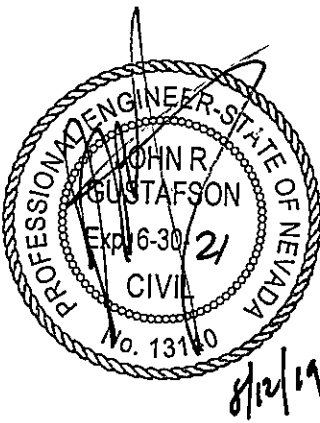
Name of Owner: Centura Development
 Telephone No.: (702) 901-3183 Fax No.: 702-878-2695 E-Mail Address: rjordan@centuradev.com
 Address 1210 Hinson Street Las Vegas NV 89102

Contact Person-Name: Pamela Pitcher Telephone No.: 702-870-8771
 *E-Mail Address: pamp@baughman-turner.com Fax No.: 702-878-2695
 Firm: Baughman & Turner, Inc.
 Address: 1210 Hinson Street Las Vegas, NV 89102

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: 4.62 acres Being Developed/Disturbed: 4.62 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.): residential
5. Approximate upstream land area which drains to the subject site: 25 acres
6. Has the site drainage been evaluated in the past? ☐ YES ☒ NO If yes, please identify documentation: _____
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site:
Northeast to Charleston
8. Briefly describe your proposed schedule for the subject project: ASAP

 Engineer's Seal	Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study *New Required Field **Review and concurrence of the Clark County Regional Flood Control District is required. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Revision</th> <th style="width: 40%;">Date</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table> Local Entity File No. _____	Revision	Date						
Revision	Date								

REFERENCE:	STANDARD FORM 1
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Baughman & Turner, Inc.

Consulting Engineers & Land Surveyors

1210 HINSON ST.
LAS VEGAS, NEVADA 89102-1604

PHONE (702) 870-8771
FAX (702) 878-2695

August 6, 2019
01-21-60

City of Las Vegas Flood Control
Attn.: Mr. Albert Sung, PE
2200 N. Rancho Drive
Las Vegas, Nevada 89103

**Re: Technical Drainage Study for The Lindell
Charleston and Lindell**

Dear Mr. Sung,

Transmitted herewith for your approval are one (1) copy and one (1) CD of the hydrology study for The Lindell, a senior living apartment complex on 4.62 acres. The property lies at the southeast corner of the intersection of Charleston Boulevard and Lindell Road.

If there are any questions concerning this study, please contact this office.

Sincerely,
Baughman & Turner, Inc.

Pamela Pitcher
Hydrology and Traffic Manager

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I. INTRODUCTION

This study analyzes the development of a senior living, age restricted apartment complex on 4.62 acres. Analysis presented herein was established after first consulting with the CCRFCD's 2018 Master Plan Update, City of Las Vegas Central Neighborhood study, FEMA regulations and policies, and the CCRFCD's Hydrologic Criteria and Drainage Design Manual (referred to hereafter as the HCDDM).

II. GENERAL DESCRIPTION

A. Location

The property being developed is approximately 4.62 acres of undeveloped land located in a portion of the North Half (N½) of the Northeast Quarter (NE¼) of Section 01, Township 21 South, Range 60 East, M.D.B.&M., Clark County, Nevada. The property lies at the southeast corner of the intersection of Charleston Boulevard and Lindell Road (see Figure 1, Vicinity Map). The site is more specifically described as Assessor's Parcel Numbers 163-01-501-001 and 002 (see Figure 2, Assessor's Parcel Map).

B. Property Description

The property is about 2.62 acres of undeveloped land. The proposed site has undeveloped land to the west, residential single family homes to the south and commercial development to the north and east (See Figure 3 and 4, Aerial Map). The site is bordered by Charleston Boulevard to the north and Lindell Road to the west. In the existing condition, the property slopes from the west to the east at about 1.97%. The site is expected to be developed as an age restricted, senior living apartment complex.

C. Master Planning Information

The Clark County Regional Flood Control District's (CCRFCD) 2018 Master Plan Update, a comprehensive plan to facilitate construction of regionally significant flood control structures to alleviate flooding in the Las Vegas Valley, indicates that there is one proposed facility bordering the property.

A review of the 2018 CCRFCD's Master Plan Update, Figure F-29, (see Figure 5 and 5A, Flood Control Facilities), indicates that there is one proposed facility adjacent to the property. There is a proposed 8' wide x 7' RCB in Charleston Boulevard denoted as regional facility MECN 0061 (Meadows-Charleston). This is a Category A proposed 100-yr facility.

The proposed development is located in a portion of the Central watershed, sub-basin CH10, as shown on the 2018 Master Plan Watershed, Figure W-5 (see Figure 6, Central Watershed).

The 2005 City of Las Vegas' Central Neighborhood Flood Control Master Plan, Figure E-8, Existing Drainage Conditions, (See Figure 7) indicates that there is about 1029 cfs in the 100-yr storm and 441 cfs in the 10-yr, 6-hour storm event flowing east in Charleston Blvd.

Figure F-8, Future Drainage Conditions, from the same Master Plan indicates that once the proposed regional facility is built in Charleston, there will be little to no street flow (See Figure 8.)

D. Floodplain Information

The Flood Insurance Rate Map, Clark County, Nevada, Community Panel No. 32003C 2165D (effective date September 27, 2002) published by the Federal Emergency Management Agency (FEMA), indicates that the site is located in a Zone X. A Zone X is determined to be an area outside the 0.2% annual chance floodplain. (see Figure 9, Flood Insurance Rate Map).

E. Previous Hydrology Studies

The following approved drainage studies were utilized in preparation of this study. Baughman & Turner, Inc. concurs with the engineering analyses presented in the studies, subject to the modifications discussed in the text of this report.

Technical Drainage Study for Desert Shadows Apartments and associated Updates, by Stantec Engineering, Orion Engineering, and Triton Engineering, Inc., last dated December 13, 2007, approved January 3, 2008, (referred to hereafter as the Desert Shadows Study). DS3226H.

This study discusses the flows leaving the development to the Holmsby alignment. Flows from this study will not be referenced since they have been found to pond in Westwind and do not affect the site.

Technical Drainage Study for TMP-67900 at Charleston and Jones by Baughman & Turner, Inc., dated March 1, 2018 and approved March 13, 2018 (referred to hereafter as the TMP Study). DS4958A

This study discusses the flows leaving the development to the Holmsby alignment. Flows from this study will not be referenced since they have been found to pond in Westwind and do not affect the site.

Technical Drainage Study for St George Roman Orthodox Church and subsequent addendum, by DeLuna Engineering, dated September 3, 2004 and approved December 8, 2006, (referred to hereafter as the St George study). DS-3647B.

This study discusses the flows leaving the development to the Holmsby alignment. Flows from this study will not be referenced since they have been found to pond in Westwind and do not affect the site.

III. HYDROLOGY

A. Existing Offsite Drainage Conditions

The local offsite drainage basin extends west to Jones Boulevard. The offsite basin is comprised of commercial and some residential properties. The offsite basin is a portion of the Central Neighborhood master plan basin CH09 (See Figure 7 and Figure 10). Basin CH09 is about 6.30 acres and generates about 14 and 5 cfs in the 100- and 10-yr, 6-hour storm event. Runoff associated with CH09 travels east to Lindell Road and into the property at low points in the street. These flows eventually make their way to Charleston Boulevard through the development to the east.

According to the CLV's Central Neighborhood study, the flows in Charleston Boulevard are

1029 cfs and 441 cfs in the 100- year and 10-year storm event. These flows travel east in Charleston past the site.

B. Existing Onsite Drainage Conditions

See Figure 11, Existing Onsite Drainage Basin Map, for existing flow patterns, basin delineation, and peak flow rates for existing onsite drainage conditions. In the existing condition, the parcel was analyzed as two (2) undeveloped basins, labeled as EXN and EXS.

Basin EXS is the majority of the lot and is about 3.55 acres in size. Basin EXS is undeveloped land in poor hydrologic condition. Basin EXS produces about 8 and 3 cfs during the major and minor storms. These flows travel east and exit the property along the east property line to the Plant World development along with the flows from offsite basin CH09.

Basin EXN is a smaller undeveloped area at the northeast corner of the property. Basin EXN is about 1.07 acres and generates 2 and 1 cfs in the 100 and 10-yr storm event. Runoff associated with basin EXN discharge from the site to Charleston Boulevard and combine with offsite flows at CP2.

An existing condition HEC-1 model has been included in Appendix E. Table 1 summarizes the HEC-1 results for the existing conditions.

C. Developed Drainage Conditions

In the developed condition, the offsite is the same as the existing condition and is as discussed in Section III.A above (See Figure 8 for offsite basins). The proposed senior living apartment complex has been analyzed as two (2) developed basins (see Figure 12a and 12b, Developed Onsite Drainage Basin Map). An onsite developed condition HEC-1 model has been included in Appendix F. Table 2 summarizes the HEC-1 results for the developed conditions.

In the developed condition, offsite flows are collected at a low point in Lindell by a drop inlet and carried through the site in an 18-inch RCP. This pipe discharges to a rip-rap lined channel along the north property line. These flow discharge via a series of sidewalk under drains.

Basin ONDV1 represents the majority of the site which drains east then north. Basin ONDV1 is 2.87 acres of the site and generates 9 and 5 cfs in the major and minor storm event. Flows produced by this basin travel north and discharge to Charleston via a series of sidewalk underdrains.

Basin ONDV2 is the easterly 1.18 acres of the site and produce 4 and 2 cfs in the 100 and 10-yr storm event. Runoff associated with ONDV2 travels north along the east property line in a graded swale to Charleston where they combine with runoff from onsite basin ONDV1. Onsite flows combine with runoff from offsite basins at CP2.

D. Future Drainage Conditions

In the future condition it is assumed that all offsite and onsite basins are fully developed and that all upstream regional facilities at constructed. The future offsite drainage patterns are the same as shown on Figure 8. The offsite basin CH09 is reanalyzed with developed curve numbers. The remaining basins are as discussed in Section III.C. above and as

shown on Figures 10 and 12a and 12b.

Basin CH09 is about 6.30 acres and generates about 12 and 5 cfs in the 100- and 10-yr, 6-hour storm event. Runoff associated with CH09 travels east to Lindell Road and into the property at the drop inlet in the street. These flows discharge from the site to Charleston Boulevard.

According to the CLV's Central Neighborhood study, the flows in Charleston Boulevard will be <1 cfs in the 100- year and 10-year storm event due to the construction of regional facilities which will collect the street flows. . These flows travel east in Charleston past the site.

A future condition HEC-1 model has been included in Appendix G. Reference studies can be found in Appendices I-K. Table 3 summarizes the HEC-1 results for the future conditions.

E. Compliance with Regulations and Adopted Plans

All design criteria has been established after first consulting with the CCRFCD's 2018 Master Plan Update, CLV's Central Neighborhood Flood Control Master Plan, FEMA regulations and policies, and the CCRFCD's Hydrologic Criteria and Drainage Design Manual. City of Las Vegas will review this study as it relates to development standards. CCRFCD will review this study as it relates to regional issues and facilities.

IV. HYDROLOGIC/HYDRAULIC CRITERIA

A. Soil Classification

The native soils associated with the onsite and offsite basins have been classified by the United States Department of Agriculture Soils Natural Resources Conservation Service (NRCS) in their soil survey of Las Vegas Valley Area. On and offsite soils have been identified as Soil Unit 300, Las Vegas, gravelly fine sandy loam. This soil type has a weighted hydrologic soils group of D. The curve number for the onsite and offsite existing and developed drainage areas were calculated using Table 602 and Table 602A of the HCDDM. Calculations of the on and off-site associated curve numbers can be found in Appendix B along with the soils information.

B. Precipitation

The project and associated offsite basins are located within the McCarran Airport Rainfall area as shown on Figure 513 of the CCRFCD's Hydrologic Criteria and Drainage Design Manual, Section 500. 10 and 100-year rainfall depths, 1.58 and 2.77, were referenced from Table 505. No aerial depth reduction factor was used. The aforementioned HCDDM figures and tables are included in Appendix C.

In accordance with the CCRFCD's Hydrologic Criteria and Drainage Design Manual, the design storm selected was a 6-hour duration storm. Three different 6-hour storm distributions are allowed in the Clark County area, labeled SDN-3, SDN-4, and SDN-5 (see Table 503). For drainage areas less than 8 square miles, an SDN-3 is required. The drainage area associated with this site is less than 8 square miles; therefore, an SDN-3 was used.

C. Time of Concentration and Lag Time

The Criteria Manual's Standard Form 4 was completed to determine the time of

concentration for each drainage basin.

For all basins, which comprise less than 1 square mile, the time of concentration was calculated as follows:

$$T_c = T_i + T_t$$

Where: T_c = Time of Concentration
 T_i = Initial, inlet or overland flow time
 T_t = Travel time in the ditch, gutter, etc.

The time of concentration is the sum of the initial flow time, T_i and the travel time, T_t . The minimum T_c recommended for non-urban watersheds is 10 minutes and 5 minutes minimum for urban watersheds.

Initial flow time was calculated as follows:

$$T_i = 1.8(1.1 - K) L_o^{1/2} / S^{1/3}$$

Where: T_i = Initial overland flow time (in minutes)
 $K = 0.0132CN - 0.39$ L_o = Length of overland flow (maximum 500 feet)
 CN = Curve Number S = Average basin slope (in percent)

The lag time was calculated as follows:

$$T_{lag} = 0.6T_c \text{ (in hours) (See Appendix D for calculations)}$$

D. Summary of Findings

Tables 1-3 list the 100-year and 10-year, 6-hour storm flows. The HEC-1 printouts can be found in Appendices E - G.

Table 1. Peak Flow Summary

Existing Condition			
Source	Basin Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)
CH09	6.30	14	5
EXS	3.55	8	3
CP1 (CH09+EXS)	--	22	8
CHARLESTON REFERENCED FLOWS	--	1029	441
EXN	1.07	2	1
CP2	--	1029	441

Table 2. Peak Flow Summary

Developed Condition			
Source	Basin Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)
CH09	6.30	14	5
LINDEL	0.57	2	1
CP1 (CH09+LINDEL1)	--	16	6
CHARLESTON REFERENCED FLOWS	--	1029	441

ONDV2	1.18	4	2
ONDV1	2.87	9	5
CP2	--	1057	454

Table 3. Peak Flow Summary

Future Condition			
Source	Basin Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)
CH09	6.30	12	5
LINDEL	0.57	2	1
CP1 (CH09+LINDEL)	--	14	5
CHARLESTON REFERENCED FLOWS	--	<1	<1
ONDV2	1.18	4	2
ONDV1	2.87	9	5
CP2	--	27	12

Analysis to determine peak flow rates were achieved using the SCS Unit Hydrograph Method. The input parameters discussed in Section IV, A – C were input into HEC-1, computer results are shown in the tables above. A summary of input parameters and the HEC-1 printouts can be found in Appendices E - G.

E. Facility Design Calculations

1. Street Capacity

Street capacity analyses were performed to determine the depth of flow in the surrounding streets. Table 4 summarizes the 100 and 10-year flow in the street.

Table 4.

Street Capacity Summary							
Section	Location	Slope	Q (cfs)	D (ft)	V (fps)	V x D	Remarks
10-Year Flow – Developed Conditions							
HS1	Charleston Boulevard	2.0%	441	1.0	8.41	8.41	VxD <6 is not met; D less than 1 is not met;
HS2	Charleston Boulevard	2.56%	441	0.9	9.18	8.26	VxD <6 is not met; D less than 1;
HS3	Lindell Road	0.49%	6	0.4	1.68	0.67	VxD <6 is met; D less than 1;
HS4	Lindell Road	sump	6	0.7	--	--	VxD <6 is met; D less than 1; dry lane is not met
HS5	Lindell Road	0.5%	6	0.5	1.59	0.80	VxD <6 is met; D less than 1; dry lane is not met
100-Year Flow – Developed Conditions							
HS1	Charleston Boulevard	2.0%	1029	1.3	11.52	14.98	VxD <8 is not met; D less than 2
HS2	Charleston Boulevard	2.56%	1029	1.3	12.82	16.67	VxD <8 is not met; D less than 2
HS3	Lindell Road	0.49%	16	0.6	2.04	1.22	VxD <8 is met; D less than 2

HS4	Lindell Road	sump	16	1.0	--	--	D less than 2
HS5	Lindell Road	0.5%	16	0.7	1.58	1.11	VxD <8 is met; D less than 2

See Appendix I for street capacity calculations. As shown in the hydraulic criteria tables (tables 1-4), the *HCDDM* hydraulic criteria are met as follows:

- 10-year DxV products are less than 6, and with depths of flow less than 1 foot; and the dry lane criteria is met only at Section HS3 where there is a full street section in Lindell. The dry lane criteria is not met in Charleston.
- The 10-yr dry lane criteria will be met in both streets when there is a full street section (Lindell) and the regional storm drain facilities are built.
- 100-year DxV products are less than 8, and with depths of flow less than 2 feet.

2. Finished Floor Calculations

Street capacity analyses were performed to determine the depth of flow in the private drive and finished floor elevations were checked against this depth. Table 5 below summarizes the method to determine the proposed finished floor elevation.

Table 5. Minimum Finished Floor Elevation Determination

	Top of Curb of Lindell	Free-board	FF Based on TOC of Lindell	Flowline Elevation	Depth of Flow	Free-board	Finished Floor Based on Depth of Flow	Proposed Minimum Elevation
Bldg 1	59.52	1.0	60.52	59.02	0.60	0.60	60.22	2259.20
Bldg 2	59.52	1.0	60.52	59.02	0.60	0.60	60.22	2258.55
Bldg 3	58.80	1.0	59.80	58.30	0.7	0.7	59.7	2260.75
Bldg 4	58.80	1.0	59.80	58.30	0.7	0.7	59.7	2259.75
Club House	58.78	1.0	59.78	58.28	1.0	1.0	60.28	2259.00

Finish Floor Elevation analysis for the building was determined according to the specifications outlined in the CCRFCD's *Hydrologic Criteria and Drainage Manual*. The finished floor must be set a minimum of twice the depth of flow, or 12-inches above the top of curb, whichever is highest. Buildings 1, 2, 4 and the club house do not meet 1 foot above top of curb and Buildings 1, 2 and club house do not meet the twice the depth of flow. The buildings have been provided with a flood wall along Lindell and a humped driveway to protect the buildings. The buildings are also, 5-7 ft above the top of curb in Charleston. The onsite grading will direct flows away from the building.

3. Best Management Practices

The 4.62 acre development shall conform to the Section 1500; Structural Best Management Practices as referenced within the Clark County Regional Flood Control District (CCRFCD) Hydrologic and Drainage Design Manual HCDDM).

The table below provides the calculations for the impervious area for parking lots and LID's.

Table 5. BMP Calculations

PARKING LOT AREA	ACERAGE
Property size (PS)	4.62

Building Area (BA)	1.31
Total Pervious Area (TPA)	0.69
Parking Lot Area (PLA) PLA = PS-BA-TPA	2.62
Min. PLA to be treated Min = PLA x 0.75	1.97

The total parking area is over 1 acre. The parking has been discharged into the landscaping areas then through rip rap lined 'v' ditch swales for a minimum of 40 ft per Section 1503.4.5 before exiting the site.

4. Proposed Facilities

The drainage facilities required for this site consist of:

- Positive onsite grading
- Graded swales
- 24-inch RCP
- 10 ft drop inlet
- Xx Sidewalk under drains

V. CONCLUSIONS

A. Compliance with Agency Regulations

City of Las Vegas will review the Hydrology Study as it relates to development standards and overall facility effectiveness. Clark County Regional Flood Control District will review the study as it relates to regional facilities. Below is a discussion of the effectiveness of the proposed drainage scheme. This study complies with the standards as set forth in the CCRFCD's Hydrologic Criteria and Drainage Design Manual.

B. Overall Facility Effectiveness

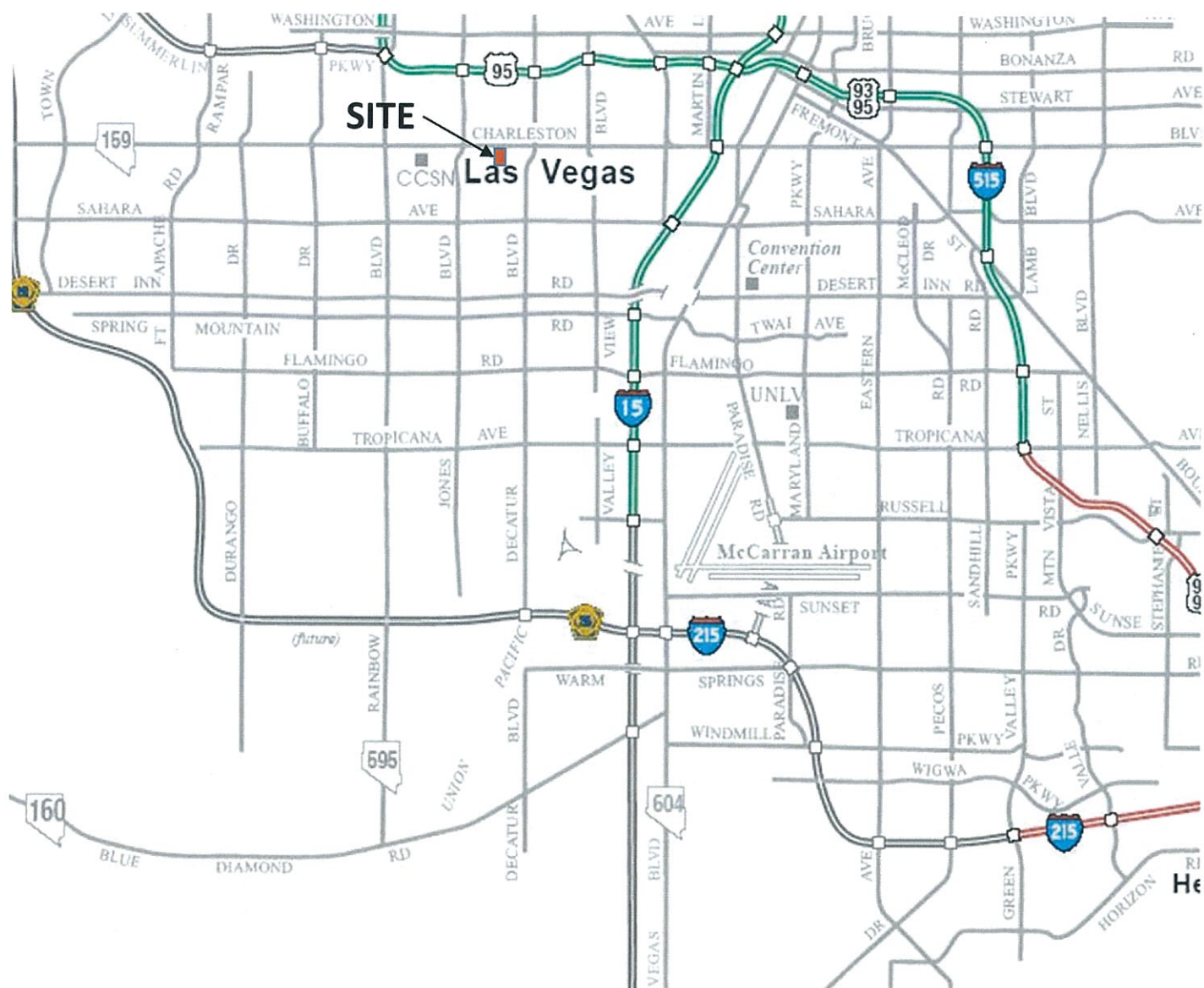
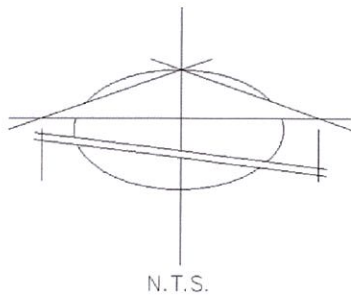
Development of this site will not adversely affect surrounding property owners, since current drainage patterns have not been significantly changed. In the developed condition, storm water runoff will be directed to Charleston Blvd. The proposed drop inlet and storm drain will reduce flows impacting the property to the east. The on-site structures will be flood protected from offsite flows by providing a flood wall along Lindell.

VI. REFERENCES

The following documents were used in the preparation of this hydrology study update:

- 1) DRAINAGE DESIGN MANUAL, 1999 - Hydrologic Criteria and Drainage Design Manual, Clark County Regional Flood Control District.
- 2) CCRFCD, 2018 - Flood Control Master Plan Update, Volume 1, Clark County Regional Flood Control District, James M. Montgomery Consulting Engineers, Inc., September, 2018.
- 3) NRCS, 2019 - Soil Survey of the Las Vegas Valley Area, Nevada, United States Department of Agriculture Soils, Natural Resources Conservation Service, Washington D.C., April 26, 2019.

- 4) FEMA, 2011 - Flood Insurance Rate Maps, Clark County, Nevada, U.S. Federal Emergency Management Agency, November 16, 2011.
- 5) HEC, 1998 - HEC-1vm v.2 Flood Hydrograph Package, User's Manual, U.S. Army Corps of Engineers, the Hydrologic Engineering Center, Davis, California, 1998.



VICINITY MAP

FIGURE 1



BAUGHMAN & TURNER, INC.
 CIVIL ENGINEERS LAND SURVEYORS LAND PLANNERS
 1210 HINSON STREET LAS VEGAS, NEVADA 89102
 (702) 870-8771

PREPARED FOR :

THE LINDELL

DATE: 5.29.19
 DESIGN: PJP
 DRAWN: PJP
 JOB: 01-21-60

NOTES

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

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

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

USE THIS SCALE (FEET) WHEN MAP REDUCED FROM 11X17 ORIGINAL

0100200400600800

MAP LEGEND

PARCEL BOUNDARY
SUB BOUNDARY
PM/LD BOUNDARY
ROAD EASEMENT
MATCH / LEADER LINE
HISTORIC LOT LINE
HISTORIC SUB BOUNDARY
HISTORIC PM/LD BOUNDARY
SECTION LINE

CONDOMINIUM UNIT
AIR SPACE PCL
RIGHT OF WAY PCL
SUB-SURFACE PCL

ASSESSOR'S PARCELS - CLARK COUNTY, NV.
Briana Johnson - Assessor

001 ROAD PARCEL NUMBER
001 PARCEL NUMBER
1.00 ACREAGE
202 PARCEL SUB/SEQ NUMBER
PB 24-45 PLAT RECORDING NUMBER
5 BLOCK NUMBER
5 LOT NUMBER
GL5 GOV. LOT NUMBER

BOOK T21S R60E
126 125 124 123
137 138 139 140
164 163 162 161
175 176 177 178

Scale: 1" = 200'

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

Rev: 1/8/2019

MAP N 2 NE 4
8 4 8 4
5 1 5 1
6 2 6 2
7 3 7 3
8 4 8 4
5 1 5 1

163-01-5
CLARK COUNTY
NEVADA

The map displays a grid of land parcels in Clark County, Nevada. Major thoroughfares include Charleston Blvd running horizontally across the top, and Lytton Ave, Holmby Ave, Longridge Ave, and Del Rey Ave running horizontally. Montclair St runs vertically on the right side. Several specific tracts are highlighted and labeled: 'CHARLESTON HILLS NO 1' (a large central tract), 'CHARLESTON HEIGHTS NO 34' (a tract to the west), 'CHARLESTON HEIGHTS TRACT NO 36' (a tract to the south), 'WEST CHARLESTON SHOPPING CENTER' (a large tract to the east), 'WESTCHESTER TRACT NO 1' (a tract to the south), and 'THE FAMILY' (a tract on the far right). Individual parcels within these tracts are numbered, often with a color-coded background (e.g., red, blue, yellow). Some parcels are marked with 'PT' (Partial Tract) or 'GL' (Government Lot). The map also shows various easements, boundaries, and other land features. A scale bar at the top left indicates distances in feet (0 to 800). A north arrow is located near the top center. The map is titled 'ASSESSOR'S PARCELS - CLARK COUNTY, NV.' and is prepared by Briana Johnson, Assessor. The map is for assessment use only and does not represent a survey. The map is compiled from official records, including surveys and deeds, but only contains the information required for assessment. See the recorded documents for more detailed legal information. The map is for assessment use only and does not represent a survey. The map is compiled from official records, including surveys and deeds, but only contains the information required for assessment. See the recorded documents for more detailed legal information.

TAX DIST 200

FIGURE 2

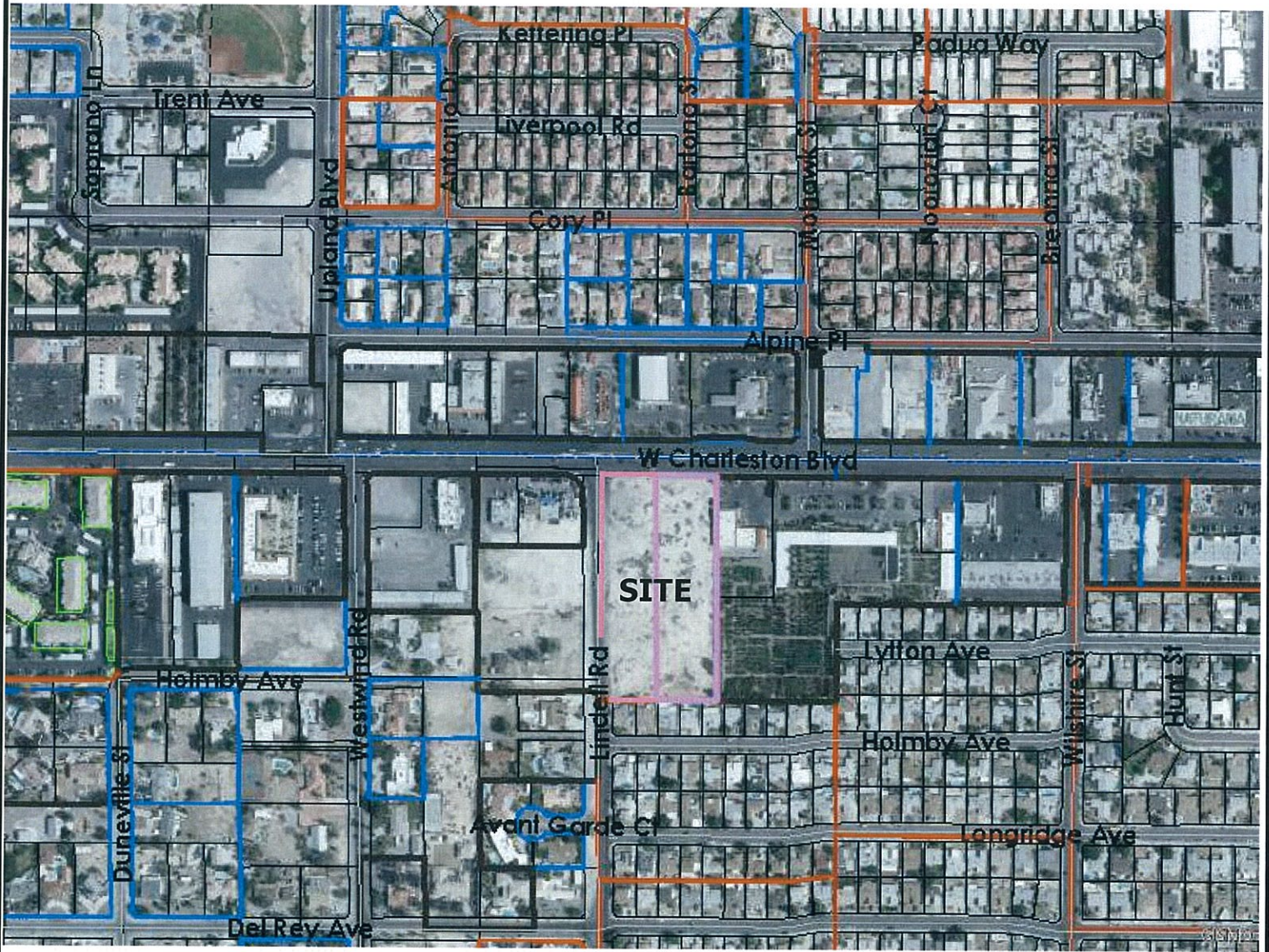
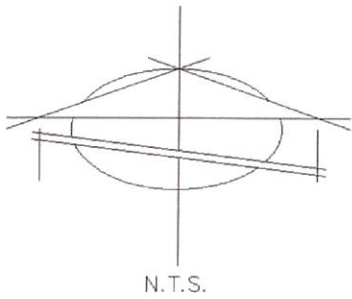


FIGURE 3



THE LINDELL

DATE: 5.29.19
DESIGN: PJP
DRAWN: PJP
JOB: 01-21-60



GENERAL AERIAL VIEW

FIGURE 4

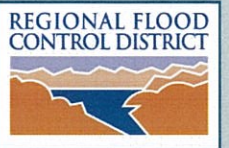


BAUGHMAN & TURNER, INC.
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 (702) 870-8771

PREPARED FOR :

THE LINDELL

DATE: 5.29.19
 DESIGN: PJP
 DRAWN: PJP
 JOB: 01-21-60



2018
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

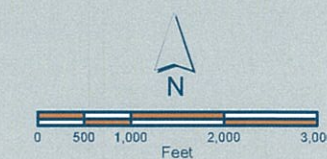
FIGURE F-29
FLOOD CONTROL FACILITIES

LEGEND

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

Remove & Replace/Parallel Facilities

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



Scale: 1 inch = 2,000 feet
AerialSource: Esri World Imagery 2017

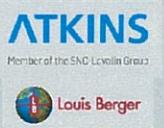
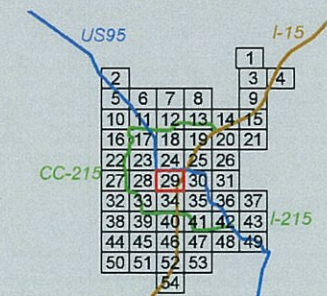
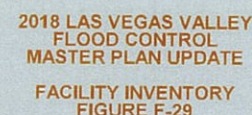


FIGURE 5

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



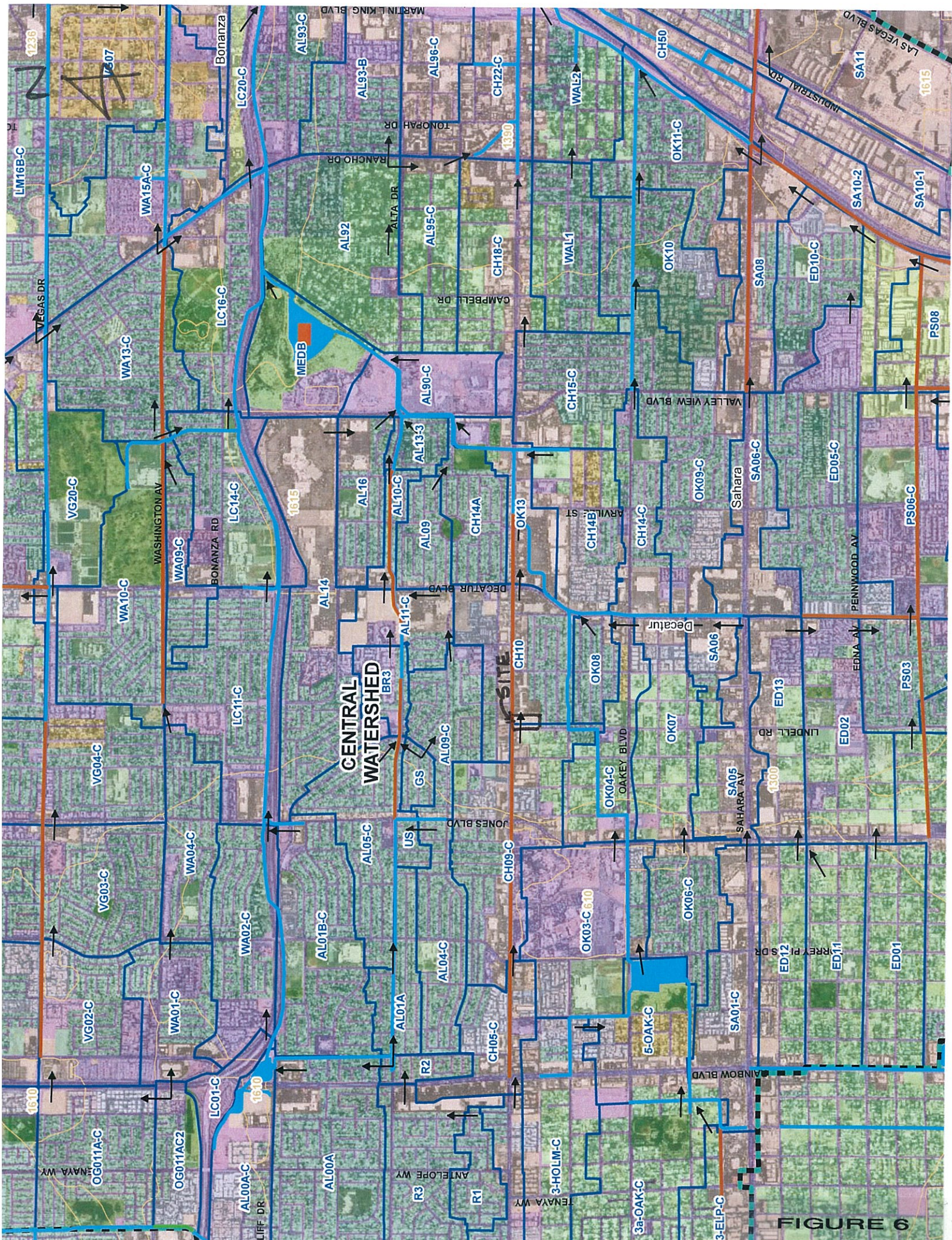
Existing Facility.....	E
Proposed or Modified Facility.....	P
Contingency Level	
Category A.....	P
Category B.....	P

	Construction Features
Cast in Place Concrete Pipe.....	CIPCP R
Corrugated Metal Arch Pipe Culvert.....	CMAP R
Corrugated Metal Pipe Culvert.....	CMPC R
High Density Polyethylene.....	HDPE R
Horizontal Elliptical Reinforced Concrete Pipe.....	HERCP R
Reinforced Concrete Arch Pipe.....	RCAP S

Reinforced Concrete Arch Culvert.....	RCAC
Reinforced Concrete Box.....	RCB
Reinforced Concrete Box Culvert.....	RCBC
Reinforced Concrete Pipe.....	RCP
Reinforced Concrete Pipe Culvert.....	RCPC
Storm Sewer Pipe.....	SSP



FIGURE 5a





**CENTRAL
NEIGHBORHOOD
FLOOD CONTROL
MASTER PLAN**

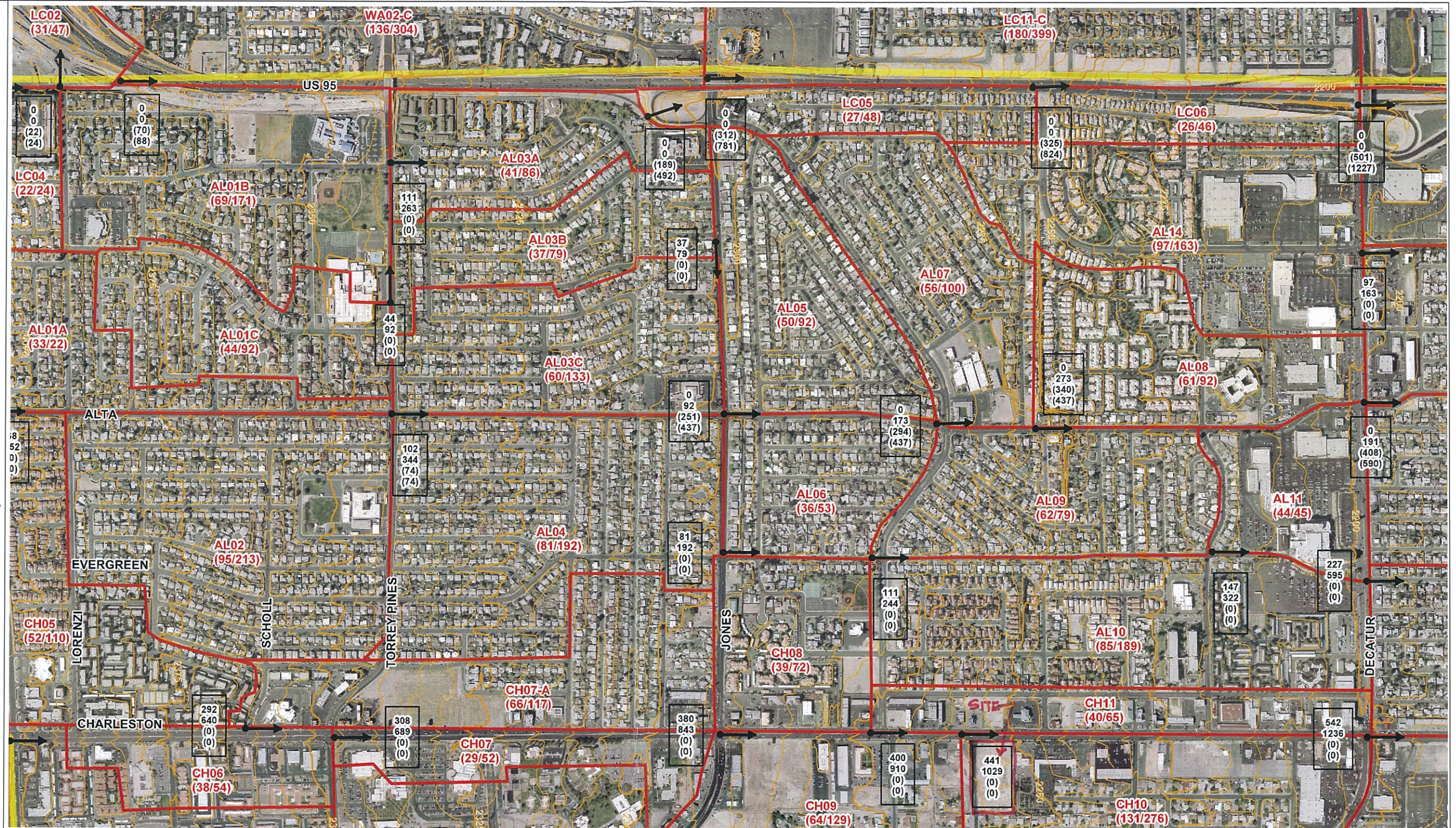
LEGEND

- Sub-basin Boundary
- LV12** Basin ID
- Contributing flow from the basin (cfs)
(10yr./100yr.)
- Flow Arrow
- | | |
|-------|------------------------|
| 250 | 10-Year Street Flow |
| 500 | 100-Year Street Flow |
| (300) | 10-Year Facility Flow |
| (800) | 100-Year Facility Flow |

(Flows in CFS)
- Study Area Limit

PHOTO DATE: SPRING 2004

FIGURE E-8



EXISTING DRAINAGE CONDITIONS



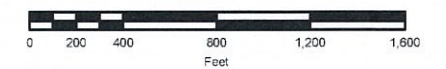
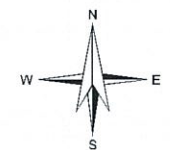
2270 Corporate Circle, Suite 100
Henderson, NV 89074
(702) 263-7275
Fax: (702) 263-7200

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

NOTE:

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

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



SCALE: 1 inch = 800 feet

FIGURE 7

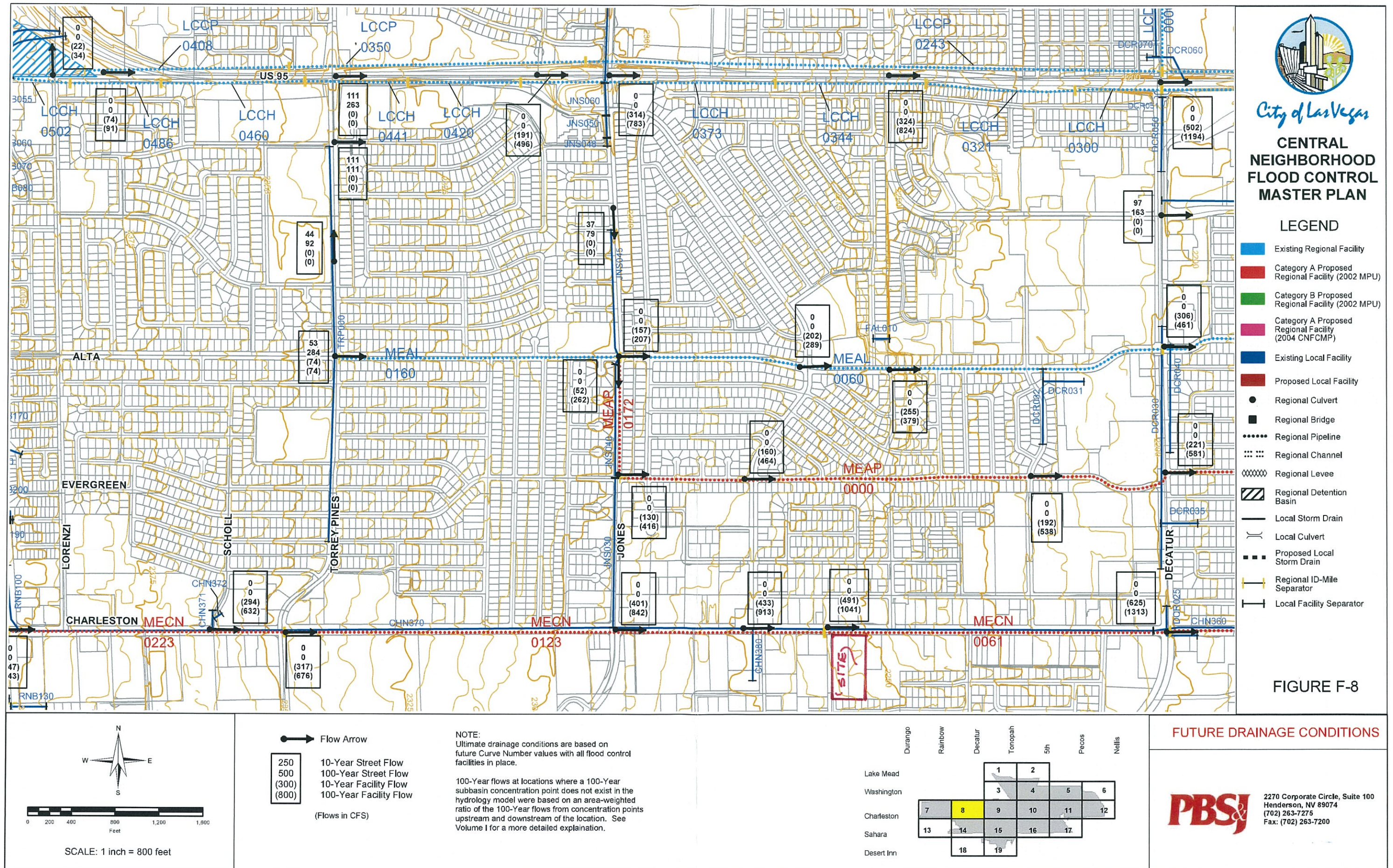


FIGURE F-8

FIGURE 8



2004 CITY OF LAS VEGAS
CENTRAL NEIGHBORHOOD
FLOOD CONTROL MASTER PLAN

LEGEND

REGIONAL STREAM NAME DESIGNATOR	AABB
REGIONAL MILE	0000
LOCAL STREAM NAME DESIGNATOR	AAB
LOCAL ID NUMBER	000
EXISTING FACILITY	E
PROPOSED OR MODIFIED FACILITY	P
CONTINGENCY LEVEL:	
CATEGORY B	P0
MASTER PLAN	P1
PRELIMINARY DESIGN	P2
DESIGN	P3
BOTTOM WIDTH	W
DEPTH	D
SIDE SLOPE, H:V	SS
LEFT SIDE SLOPE H:V	LSS
RIGHT SIDE SLOPE H:V	RSS
CORRUGATED METAL ARCH PIPE CULVERT	CMAP
CORRUGATED METAL PIPE CULVERT	CMP
DUCTILE IRON PIPE	DIP
HIGH DENSITY POLYETHYLENE PIPE	HDPE
HELICAL ELLIPTICAL REINFORCED	HERCP
CONCRETE PIPE	
PUBLIC DRAINAGE EASEMENT	PDE
POLYVINYL CHLORIDE PIPE	PVC
REINFORCED CONCRETE BOX	RCB
REINFORCED CONCRETE BOX CULVERT	RCBC
REINFORCED CONCRETE ELLIPTICAL PIPE	RCEP
REINFORCED CONCRETE PIPE	RCP
REINFORCED CONCRETE PIPE ARCH	RCPA
REINFORCED CONCRETE PIPE CULVERT	RCPC
STORM SEWER PIPE	SSP
VITRIFIED CLAY PIPE	VCP

NOTES:
FLOW = 100 YEAR HEC-1 FLOW (REGIONAL)
FLOW = FACILITY CAPACITY (LOCAL FACILITIES)

FLOOD CONTROL FACILITIES INVENTORY

SHEET I - 5



ID	MILE	Status	Plan No.	Facility Description	Facility Length L (ft)	Channel Slope S (%)	Flow (cfs)
F-8							
REGIONAL FACILITIES							
LAS VEGAS CREEK CHANNEL							
LCCH	0249	E	HWY BK E-4	60" RCP	2693	1.13	277
LCCH	0300	E	HWY BK E-4	48" RCP	1109	1.13	153
LCCH	0321	E	HWY BK E-4	48" RCP	1214	1.13	153
LCCH	0344	E	HWY BK E-5	48" RCP	1531	0.66	117
LCCH	0373	E	HWY BK E-5	60" RCP	2246	0.66	212
LCCH	0420	E	HWY BK E-5	60" RCP	1109	1.50	319
LCCH	0441	E	HWY BK E-5	48" RCP	1098	1.50	176
LCCH	0460	E	HWY BK E-5	36" RCP	1289	1.62	85
LCCH	0486	E	HWY BK E-5 & R-3	42" RCP	922	1.10	106
LCCH	0502	E		36" RCP	792	1.10	70
LAS VEGAS CREEK CHANNEL - PARALLEL SYSTEM							
LCCP	0173	E2	NDOT U.S. 95 Widening	2: 12' X 6' RCB	3690	0.58	1194
LCCP	0243	E2	NDOT U.S. 95 Widening	2: 8' X 6' RCB	5658	1.03	1194
LCCP	0350	E2	NDOT U.S. 95 Widening	60" RCP	3050	1.00	783
LCCP	0408	E2	NDOT U.S. 95 Widening	36" RCP	2452	1.86	91
LCCP	0452	E2	NDOT U.S. 95 Widening	Spillway			8260
LCCP	0453	E2	NDOT U.S. 95 Widening	36" RCP Outlet Pipe	100	1.86	91
LCCP	0454	E2	NDOT U.S. 95 Widening	55 ac-ft Rainbow Detention Basin			891
LAS VEGAS CREEK - DECATUR							
LCDE	0000	E	2002 Master Plan Update	72" RCP	720	0.50	494
MEADOWS ALTA							
MEAL	0015	E	327-V231	72" RCP	2620	1.94	461
MEAL	0060	E	327-V231	60" RCP	5200	2.81	461
MEAL	0160	E	107-V1517-A	36" RCP	2505	1.22	358
MEADOWS ALTA PARALLEL							
MEAP	0000	P1	2003 CNFCMP	8' X 5' RCB	8400	1.25	677
MEAP	0172	P1	2003 CNFCMP	8' X 6' RCB	1100	0.30	416
MEADOWS - CHARLESTON							
MECN	0000	P1	2002 Master Plan Update	10' X 9' RCB	3200	1.09	1547
MECN	0061	P1	2002 Master Plan Update	8' X 8' RCB	3300	1.82	1313
MECN	0123	P1	2002 Master Plan Update	8' X 7' RCB	5200	1.64	1041
MECN	0223	P1	2002 Master Plan Update	7' X 6' RCB	2700	2.04	676
LOCAL FACILITIES							
CHN	360	E	107-V725A	18" RCP	1347		12
CHN	370	E	107V-853	18" RCP	12796		14
CHN	371	E	107-V1133	12" RCP	250	0.22	2
CHN	372	E	107-V2079	12" RCP	89	0.31	3
CHN	380	E	107-V1055	12" RCP	495		3
DCR	025	E	113-160	12" RCP	301		3
DCR	030	E	107-V1993	48" RCP	1500	0.12	144
DCR	031	E	327-V72	6" VCP	380		
DCR	032	E	327-V72	15" RCP	564		3
DCR	035	E	107-V536	16" RCEP	256		7
DCR	040	E	327-V72	12" RCP	958	0.04	1
DCR	050	E	327-113	18" RCP	368	0.60	11
DCR	051	E	107-V717B	23" X 36" CMP	115		30
DCR	060	E	HWY BK # E-4	24" RCP	375		73
DCR	070	E	107-V817	15" RCP	713		6
FAL	010	E	327Y-4075	36" RCP	115	3.00	100
JNS	030	E	107-V948A	18" RCP	1429		6
JNS	040	E	107-V948A	15" RCP	1063		4
JNS	045	E	107-V948A	12" RCP	1306		2
JNS	048	E	327-V162 / 107-V948A	8" RCP	71		1
JNS	050	E	327-V162 / 107-V948A	12" RCP	183		2
JNS	060	E	327-V162	24" RCP	300		23
JNS	070	E	107-V948A	12" RCP	2095		2
RNB	050	E	Hwy Bk R-3	30" RCP	630	1.37	42
RNB	055	E	Hwy Bk R-6	36" RCP	666	0.40	37
RNB	100	E	Hwy Bk R-6	18" RCP	700	0.47	6
RNB	120	E	Hwy Bk R-6	60" RCP	230	5.35	522
RNB	130	E	107-V1663	36" RCP	260		94
RNB	150	E	107Y-2159-2	24" RCP	180	2.40	35
RNB	190	E	Hwy Bk R-6	30" RCP	90	0.00	
RNB	200	E	Hwy Bk R-6	18" RCP	325	0.30	6
RNB	220	E	107Y-2159-3	5" P.D.E.	30		
TRP	000	E	107-1517	18" CMP	3734		6
TRP	001	E	650.41	12" HDP	168	0.01	4
VVB	170	E	107-V1137	24" RCP	4000		23

ID	MILE	Status	Plan No.	Facility Description	Facility Length L (ft)	Channel Slope S (%)	Flow (cfs)
F-9							
REGIONAL FACILITIES							
WEST CHARLESTON DRAINS							
FWCH	0000	E	2002 Master Plan Update	84" RCP	1600	0.93	960
FWCH	0020	P1	2004 CNFCMP	10' X 7' RCB	1200	0.70	960
FWCH	0021	P1	2004 CNFCMP	8' X 4' RCB	1500	0.50	267
FWCH	0022	P1	2004 CNFCMP	8' X 6' RCB	800	0.70	515
SHADOW LANE DRAIN							
FWSH	0000	E	2002 Master Plan Update	7' X 4' RCB	1034	0.20	253
LAS VEGAS CREEK CHANNEL							
LCCH	0047	E	HWY BK E-3	Conc Chnl 9'W 8'D 3:1SS	3485	0.80	2699
LCCH	0113	E	HWY BK E-3	2: 8' X 7' RCB @ Rancho	100	0.84	1896
LCCH	0114	E	HWY BK E-4	Conc Chnl 9'W 7'D 1:1SS	2400	0.84	2515
LCCH	0176	E	HWY BK E-4	Conc Chnl 11'W 7'D	800	2.14	2362
LCCH	0184	E	HWY BK E-4	8' X 6' RCB Drain	2200	2.27	1284
LCCH	0249	E	HWY BK E-4	60" RCP	3300	1.13	277
LAS VEGAS CREEK CHANNEL - PARALLEL SYSTEM							
LCCP	0173	P2	2002 Master Plan Update	2: 12' X 6' RCB	3690	0.58	1194
LAS VEGAS CREEK - MEADOWS							
LCME	0000	E	565-354	14' X 8' RCB	1540	0.90	1336
LCME	0017	E	565-354	Spillway			3300
LCME	0018	E	565-354	1-11.5' X 5' RCB and 1-11' X 5' RCB Outlet Pipes	100	0.81	1336
LCME	0019	E	731-45-1A	200 ac-ft Meadows Detention Basin			4673
LCME	0020	E	565-354	Upgrade to 228 ac-ft Meadows Detention Basin			4673
LCME	0027	E	565-354	Conc Chnl 30'W 8.5'D	1000	0.40	4673
LCME	0039	E	731-45-1A	Conc Chnl 18'W 8'D 1:1SS	950	0.92	4292
LCME	0076	E	731-45-1A	Free Span Bridge 18'W 8'D @ Alta	100	1.89	4292
LCME	0077	E	731-45B-1A	Conc Chnl 18'W 8'D 1:1SS	370	1.89	4292
LCME	0084	E	731-45-1A	2: 10' X 6' RCB @ Valley View	174	1.89	1251
LCME	0085	E	731-45B-1B	2: 10' X 6' RCB @ Valley View	464	1.89	1251
LAS VEGAS CREEK - RANCHO							
LCRA	0000	E	2002 Master Plan Update	8' X 6' RCB	2500	0.50	773
MEADOWS ALTA							
MEAL	0000	E	731-45B-1B	Conc Chnl 8'W 11'D 1:1SS	710	1.58	1251
MEAL	0012	E	731-45B-1B	12' X 6' RCB @ Red Sky	158	3.03	1251
MEAL	0013	E	731-45B-1B	Conc Chnl 12'W 9'D 1:1SS	317	3.03	1251
MEAL	0015	E	327-V231	72" RCP	2620	1.94	461
MEADOWS ALTA PARALLEL							
MEAP	0000	P1	2003 CNFCMP	8' X 5' RCB	8400	1.25	677
EXTENSION OF MEADOWS / CHARLESTON COLLECTION SYSTEM							
MECH	0000	E	731-45B-1B	10' X 6' RCB	1190	0.50	820
MECH	0021	E	731-45B-1B	6' X 5' RCB	211	1.16	487
MECH	0025	E	731-45B-1B	78" RCP	475	1.16	565
MECH	0034	E	731-45B-1C	84" RCP	1267	0.44	424
MECH	0058	E	731-55	72" RCP	700	0.42	274
MECH	0059	E	731-55	36" RCP	1280	0.42	43
MEADOWS - CHARLESTON							
MECN	0000	P1	2002 Master Plan Update	10' X 9' RCB	3200	1.09	1547
OAKLEY-15 STORM DRAIN							
MEOK	0000	P1	2002 Master Plan Update	3: 12' X 6' RCB	3300	0.61	2550
MEOK	0063	P1	2002 Master Plan Update	12' X 8' RCB	5100	0.75	1433
LOCAL FACILITIES							
ALT	000	E	107V-1164	Chnl V-Ditch	531		12
ALT	015	E	107-V3126	60" RCP	982	0.35	215
ALT	020	E	107-V3126	54" RCP	1538	0.50	187
ALT	025	E	107-V3126	48" RCP	460	1.40	165
ALT	026	E	107-V3126	48" RCP	157	1.48	88
ALT	028	E	107-V3126	36" RCP	88	0.25	77
ALT	031	E	107-V3126	30" RCP	572	0.25	57
ALT	033	E	107-V3126	30" RCP	769	0.25	32
ALT	035	E	107-V2771	8" PVC	600		
CHN	295	E	107-V2255	6" PVC	87	0.50	1
CHN	300	E	107-V725A	24" RCP	6460		10
CHN	312	E	107-V2406	12" RCP	126	0.30	2
CHN	313	E	107-V2406	8" PVC	100	0.30	1
CHN	315	E	107-V725A	2: 34" X 53" RCP	370		86
CHN	316	E	107-V725A	43" X 68" RCP	675		169
CHN	317	E	107-V725A	38" X 60" RCP	300		123
CHN	340	E	107-V725A	36" RCP	716		80
CHN	350	E	107-V725A	24" RCP	383		18

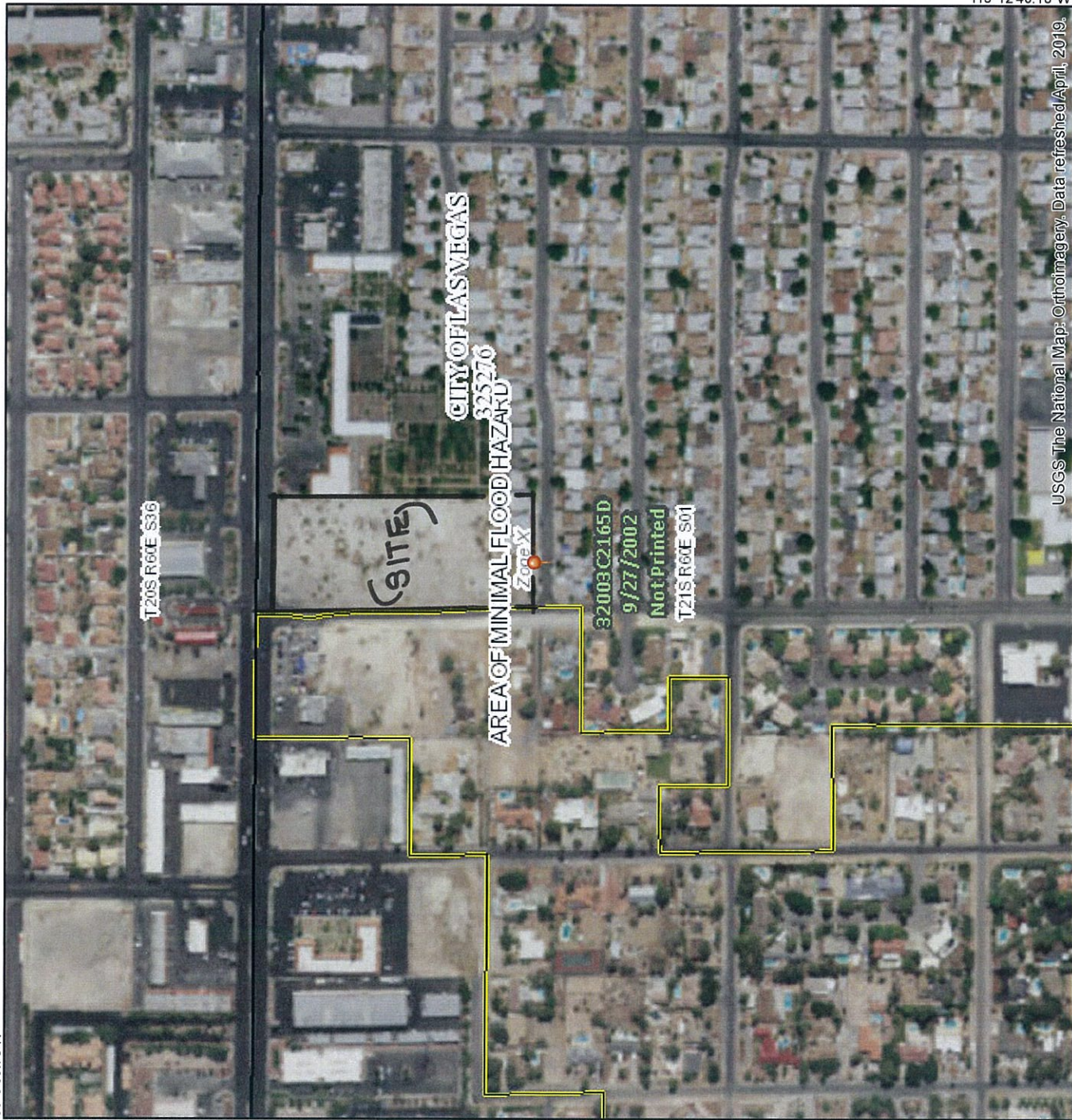
FIGURE 8a

National Flood Hazard Layer FIRMette



36°9'39.78"N

115°13'17.63"W



0 250 500 1,000 1,500 2,000 Feet 1:6,000

FIGURE 9

Legend

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

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE)
Zone A, V, A99
- With BFE or Depth
Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS

- Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

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

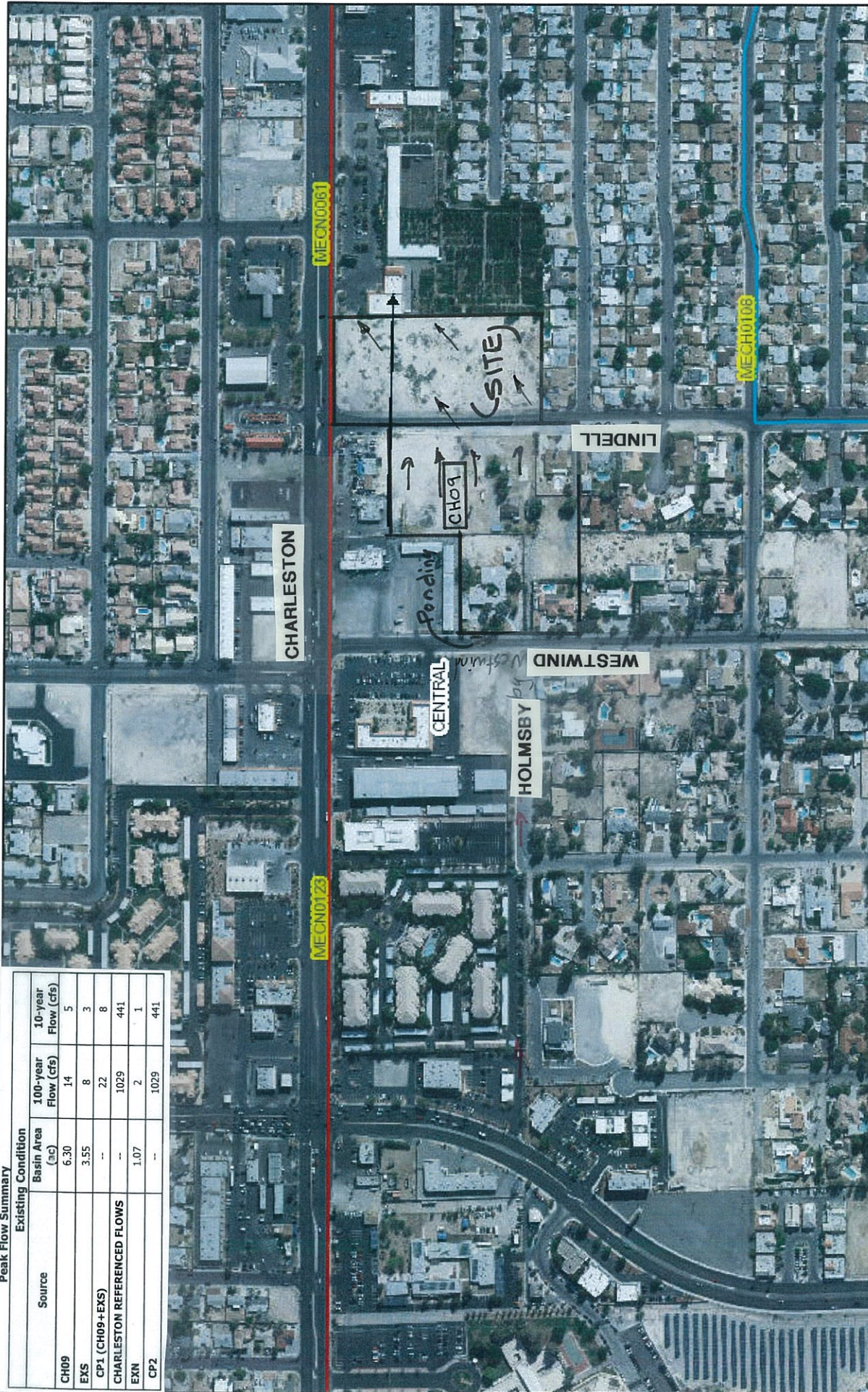
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/24/2019 at 5:29:46 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

Peak Flow Summary

Source	Existing Condition		
	Basin Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)
CH09	6.30	14	5
EXS	3.55	8	3
CP1 (CH09+EXS)	--	22	8
CHARLESTON REFERENCED FLOWS			
EXN	1.07	2	1
CP2	--	1029	441



May 28, 2019

OFFSITE BASIN MAP

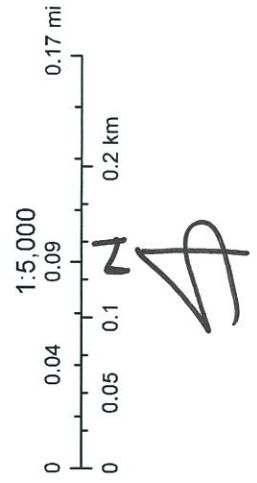


FIGURE 10A



**OFFSITE BASIN MAP
WITH CONTOURS**



United States
Department of
Agriculture

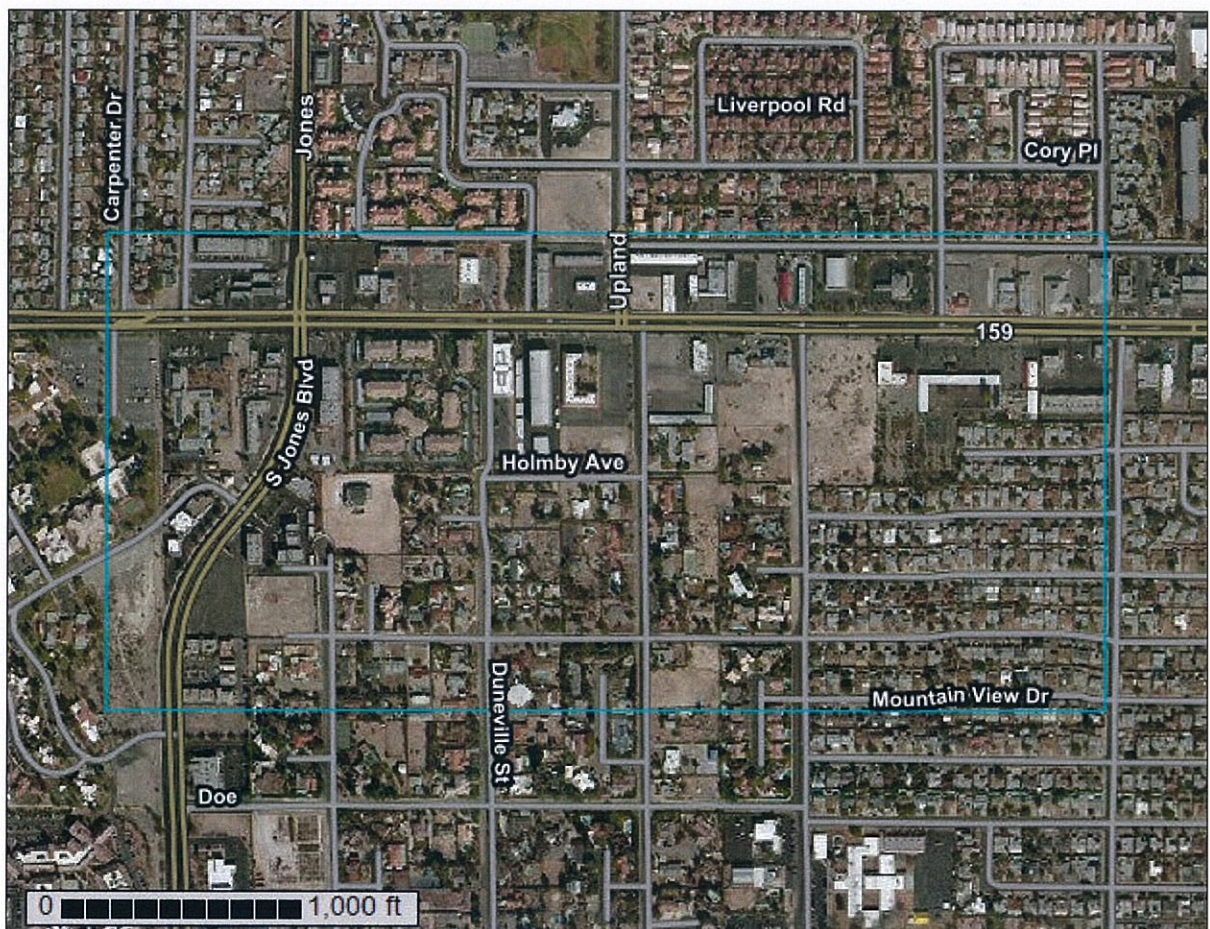
NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Las Vegas Valley Area, Nevada, Part of Clark County

Charleston and Lindell



May 24, 2019

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)			Spoil Area
	Area of Interest (AOI)		Stony Spot
Soils			Very Stony Spot
	Soil Map Unit Polygons		Wet Spot
	Soil Map Unit Lines		Other
	Soil Map Unit Points		Special Line Features
Special Point Features		Water Features	
	Blowout		Streams and Canals
	Borrow Pit	Transportation	
	Clay Spot		Rails
	Closed Depression		Interstate Highways
	Gravel Pit		US Routes
	Gravelly Spot		Major Roads
	Landfill		Local Roads
	Lava Flow	Background	
	Marsh or swamp		Aerial Photography
	Mine or Quarry		
	Miscellaneous Water		
	Perennial Water		
	Rock Outcrop		
	Saline Spot		
	Sandy Spot		
	Severely Eroded Spot		
	Sinkhole		
	Slide or Slip		
	Sodic Spot		

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Las Vegas Valley Area, Nevada, Part of Clark County
Survey Area Data: Version 13, Sep 14, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2013—Feb 25, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

Custom Soil Resource Report

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor
shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
152	Cave gravelly fine sandy loam, 0 to 4 percent slopes	20.1	10.6%
260	Jean gravelly loamy fine sand, 2 to 4 percent slopes	19.2	10.1%
300	Las Vegas gravelly fine sandy loam, 0 to 2 percent slopes	148.1	78.1%
610	Pits, gravel	2.2	1.1%
Totals for Area of Interest		189.5	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate

300—Las Vegas gravelly fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hrbp
Elevation: 1,800 to 2,600 feet
Mean annual precipitation: 4 to 6 inches
Mean annual air temperature: 63 to 68 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Las Vegas and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Las Vegas

Setting

Landform: Basin-floor remnants
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from limestone

Typical profile

H1 - 0 to 1 inches: gravelly fine sandy loam
H2 - 1 to 7 inches: fine sandy loam
H3 - 7 to 11 inches: gravelly sandy clay loam
H4 - 11 to 15 inches: indurated

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 3 to 14 inches to petrocalcic
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 85 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 12.0
Available water storage in profile: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Other vegetative classification: LIMY 3-5" P.Z. (030XB019NV_3)
Hydric soil rating: No

610—Pits, gravel

Map Unit Composition

Pits: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pits

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Convex

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition ²	A ³	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

¹Average runoff condition, and $I_a = 0.25$.

²Poor: <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: >70% ground cover.

³Curve numbers for group A have been developed only for desert shrub.

Revision	Date

WRC
ENGINEERING

REFERENCE:

SCS TR-55, USDA, June 1986.

TABLE 602
4 of 4

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (URBAN AREAS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area ²	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
Open space (lawns, parks, golf courses, cemeteries, etc.): ³					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved: curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved: open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) ⁴ ...		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					

See Table 602A

Developing urban areas

Newly graded areas (pervious areas only, no vegetation) ⁵	77	86	91	94
--	----	----	----	----

- 1 Average runoff condition, and $f_p = 0.25$.
- 2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system. Impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using Figure 603.
- 3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
- 4 Composite CN's for natural desert landscaping should be computed using Figure 603 based on the impervious area percentage (CN #98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
- 5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using Figure 603 based on the degree of development impervious area percentage) and the CN's for the newly graded pervious areas.

Revision	Date

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

Average Lot Size or Usage ¹	Percent Impervious ²	Curve Number for Hydrologic Soil Groups			
		A	B	C	D
Apartments/Condos	72	81	88	91	93
Townhouses/6,000 sq ft lots or less ³	69	80	87	90	92
7,000 sq ft lots	63	76	84	89	91
8,000 sq ft lots	58	73	82	88	90
10,000 sq ft lots	38	61	75	83	87
14,000 sq ft lots	30	57	72	81	86
20,000 sq ft lots	25	54	70	80	85
40,000 sq ft lots	20	51	68	79	84
80,000 sq ft lots	12	46	65	77	82

1 Lot size should represent the size of the average lot and not the gross acreage divided by the number of lots.

2 Actual percent impervious value should be compared to selected land use type.

3 In cases where average residential lots are smaller than 6,000 sq ft, commercial/business/industrial land use should be used.

Revision	Date

REFERENCE:

TABLE 602A

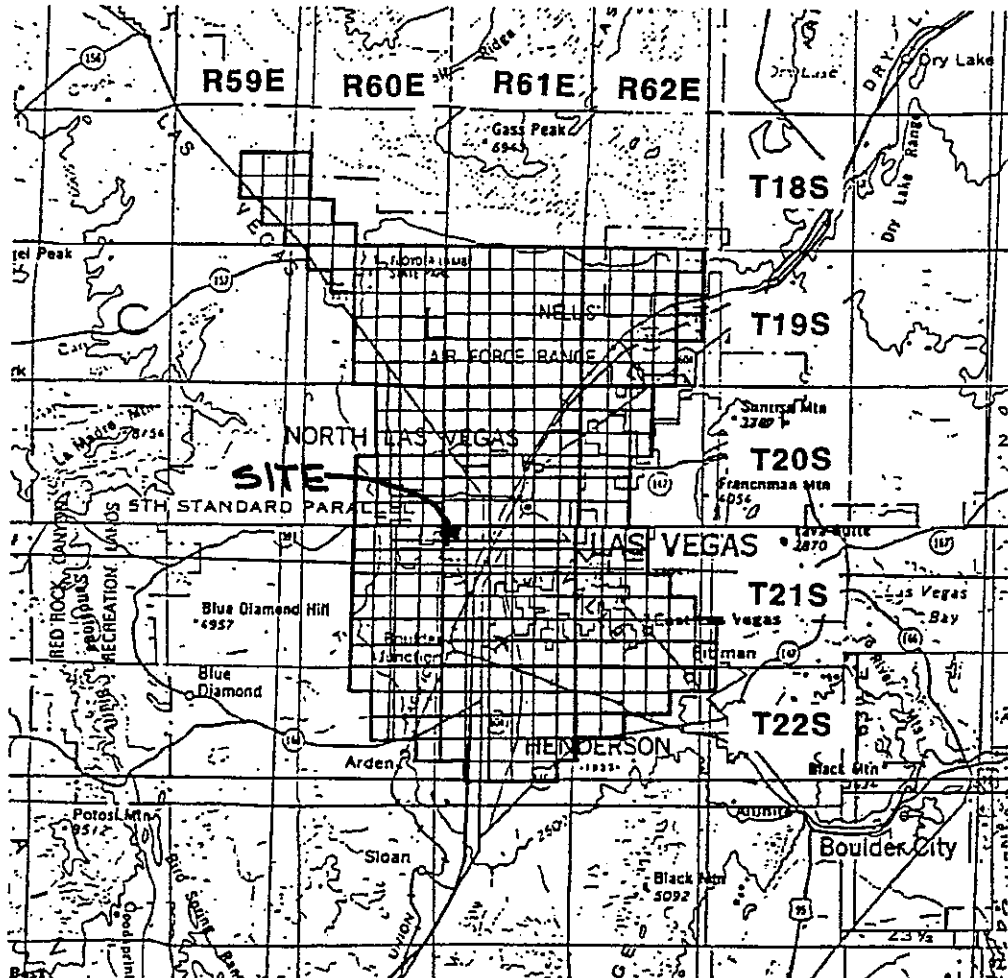
**CURVE NUMBER CALCULATIONS
EXISTING & DEVELOPED CONDITIONS**

BASIN I.D.	Cover Type	SOIL TYPE	CURVE NUMBER	BASIN AREA (acres)	% OF AREA	WEIGHTED CURVE NUMBER	CUMULATIVE CURVE NUMBER
CH09	Rural residential undeveloped	300	85		35.00%	29.75	86.95
			88		65.00%	57.2	
EXS	Undeveloped	300	88		100.00%	88	88
EXN	undeveloped	300	88		100.00%	0	88
			88			0	
ONDV1	commercial	300	95		100.00%	95	95
ONDV2	pavement desert landscape	300	98		85.00%	83.3	96.50
			88		15.00%	13.2	
						0.00	
LINDEL	pavement	300	98		100.00%	98	98
CH09	rural residential	300	85		100.00%	85	85

*Soil type 300 has a weighted hydrologic soil group D

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

McCARRAN AIRPORT RAINFALL AREA



TOWNSHIP RANGE SECTIONS

18 South 59 East 13-15,22-26,36
 18 South 60 East 30-32
 19 South 60 East 1-6,8-16,21-28,33-36
 19 South 61 East ALL SECTIONS
 19 South 62 East 2-11,14-23,27-34
 20 South 60 East 1-3,10-15,21-28,33-36
 20 South 61 East ALL SECTIONS

TOWNSHIP RANGE SECTIONS

20 South 62 East 4-9,16-20,29-32
 21 South 60 East 1-4,9-16,21-28,33-36
 21 South 61 East ALL SECTIONS
 21 South 62 East 4-9,15-23, 25-36
 22 South 60 East 1-4,10-15,24
 22 South 61 East 1-24,26-29
 22 South 62 East 1-10,17-18

Notes:

1. Refer to Table 505 and Figure 516 Depth-Duration- Frequency values in the McCarran Airport Rainfall Area.
2. Refer to Table 506 and Figure 517 for Time-Intensity-Frequency values on the McCarran Airport Rainfall Area.

Revision	Date

WRC
ENGINEERING

REFERENCE:

USACE, Los Angeles District, 1988

FIGURE 513

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA (IN INCHES)

TIME	RECURRENCE INTERVAL					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5 min.	0.15	0.27	0.35	0.46	0.54	0.63
10 min.	0.25	0.44	0.57	0.74	0.89	1.02
15 min.	0.33	0.57	0.74	0.97	1.15	1.32
30 min.	0.44	0.78	1.01	1.31	1.55	1.79
1 hour	0.52	0.89	1.15	1.50	1.78	2.06
2 hour	0.59	1.01	1.30	1.70	2.01	2.30
3 hour	0.64	1.08	1.39	1.82	2.15	2.48
6 hour	0.72	1.22	1.58	2.05	2.41	2.77
24 hour (TR-55)	1.20	1.60	1.80	2.40	2.70	2.96

- NOTE: 1. Refer to Figure 513 for a description and drawing of the area included in the McCarran Airport Rainfall Area.
2. The 24 hour values presented above are for use with TR-55 only.
3. Table 501 adjustments not required.

Revision	Date

**WRC
ENGINEERING**

REFERENCE:

USACE, Los Angeles District, 1988

TABLE 505

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SIX-HOUR STORM DISTRIBUTIONS

Percent of Total Storm Depth				Percent of Total Storm Depth			
Storm Time (In Minutes)	SDN3	SDN4	SDN5	Storm Time (In Minutes)	SDN3	SDN4	SDN5
0	0.0	0.0	0.0	185	32.2	37.6	43.0
5	2.0	2.0	2.0	190	35.2	41.5	47.7
10	5.7	5.8	5.9	195	40.9	46.2	51.4
15	7.0	7.5	8.0	200	49.9	53.0	56.1
20	8.7	9.9	11.0	205	59.0	61.0	63.0
25	10.8	12.6	14.4	210	71.0	71.0	71.0
30	12.4	13.7	15.0	215	74.4	73.2	72.0
35	13.0	14.5	16.0	220	78.1	75.6	73.1
40	13.0	14.9	16.8	225	81.2	78.2	75.2
45	13.0	15.1	17.1	230	81.9	79.9	77.9
50	13.0	15.5	18.0	235	83.5	81.3	79.0
55	13.0	15.6	18.2	240	85.1	82.3	79.5
60	13.0	15.9	18.7	245	85.6	83.0	80.4
65	13.3	16.2	19.0	250	86.0	83.5	81.0
70	14.0	16.9	19.7	255	86.8	84.4	82.0
75	14.2	17.2	20.2	260	87.6	85.1	82.6
80	14.8	17.9	21.0	265	88.8	86.4	84.0
85	15.8	18.9	22.0	270	91.0	88.5	85.9
90	17.2	20.1	23.0	275	92.6	90.8	88.9
95	18.1	21.1	24.1	280	93.7	92.4	91.0
100	19.0	22.0	25.0	285	95.0	94.4	93.8
105	19.7	22.8	25.9	290	97.0	96.8	96.6
110	19.9	23.2	26.5	295	97.6	97.3	97.0
115	20.0	24.0	28.0	300	98.2	97.8	97.4
120	20.1	24.6	29.0	305	98.5	98.2	97.9
125	20.4	25.2	30.0	310	98.7	98.4	98.1
130	21.4	26.0	30.5	315	98.9	98.6	98.3
135	22.9	26.9	30.9	320	99.0	98.8	98.5
140	24.1	27.6	31.0	325	99.3	99.1	98.9
145	24.9	28.3	31.7	330	99.3	99.2	99.0
150	25.1	28.6	32.1	335	99.4	99.3	99.2
155	25.6	29.2	32.7	340	99.5	99.4	99.3
160	27.0	30.2	33.3	345	99.8	99.7	99.6
165	27.8	31.2	34.6	350	99.8	99.8	99.7
170	28.1	32.1	36.1	355	99.9	99.9	99.9
175	28.3	33.2	38.1	360	100.0	100.0	100.0
180	29.5	35.2	40.8				

- Notes: 1. For drainage areas less than 8 square miles in size, use SDN 3.
 2. For drainage areas greater than or equal to 8 square miles and less than 12 square miles in size, use SDN 4.
 3. For drainage areas greater than or equal to 12 square miles, use SDN 5.
 4. A graphical representation of these values is presented on Figure 515.

Revision	Date

REFERENCE:

TABLE 503

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

BAUGHMAN & TURNER, INC.
CONSULTING ENGINEERS

PROJECT NO. : 26-19-61

DEVELOPMENT : The Lindell

FILE : Existing & Developed Condition

CALCULATED BY: pp

DATE : 08/05/19

Sub-Basin Data				Initial/Overland Time (T _i)				Travel Time (T _t)				T _c		T _c Check (Urbanized Basins)		Final T _c	T _{lag}	Remarks
DESIG	CN	K	AREA (acres)	AREA (mi ²)	LENGTH (ft)	SLOPE (%)	T _i (min)	LENGTH (ft)	SLOPE (%)	V ₁ (fps)	V ₂ (fps)	T _t (min)	T _c = T _i + T _t (min)	TOTAL (ft)	T _c (min)	T _c (min)	T _{lag} (hrs)	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)

Existing Condition

CH09	87	0.758	6.30	0.0098	100	1.00	6.1	650	1.40	2.39	3.62	4.2	10.3	750.0	14.2	10.3	0.103	Dev.
EXS	88	0.772	3.55	0.0055	100	1.25	5.5	330	2.270	2.23	N/A	2.5	8.0	N/A	N/A	8.0	0.100	Undev.
EXN	88	0.772	1.07	0.0017	100	1.00	5.9	290	3.200	2.65	N/A	1.8	7.7	N/A	N/A	7.7	0.100	Undev.

Developed Condition

ONDV1	95	0.864	2.87	0.0045	40	3.00	1.9	505	0.50	1.43	2.16	5.9	7.7	545.0	13.0	7.7	0.077	Dev.
ONDV2	96.5	0.884	1.18	0.0018	60	1.60	2.6	875	1.000	2.02	3.06	6.2	8.7	935.0	15.2	8.7	0.087	Dev.
LINDEL	98	0.904	0.57	0.0009	33	2.00	1.6	290	0.500	1.43	N/A	3.4	5.0	323.0	11.8	5.0	0.050	Dev.

Future Conditions

ONDV4	94	0.851	0.66	0.0010	70	2.00	3.0	105	0.50	1.43	N/A	1.2	4.2	175.0	11.0	4.2	0.050	Dev.
CH09	85	0.732	6.30	0.0098	100	1.00	6.6	650	1.40	2.39	3.62	4.2	10.8	750.0	14.2	10.8	0.108	Dev.

$$T_i = (1.8(1.1-K)L^{(1/2))} / (S^{1/3})$$

$$T_c = T_i + T_t$$

$$K = 0.0132(CN) - 39$$

$$T_{lag} = 0.6T_c$$

For the travel time (T_i) calculations,V₁ applies to the first 500 feet of travel distance;V₂ applies to the remaining travel distance.

Travel Time Velocity Formulas

Existing

$$V_1 = 14.8 * (S/100)^{1/2}$$

$$V_2 = 29.4 * (S/100)^{1/2}$$

Developed

$$V_1 = 20.2 * (S/100)^{1/2}$$

$$V_2 = 30.6 * (S/100)^{1/2}$$

All basins over one square mile
are calculated by the equation
 $T_{lag} = 20Kn(L^*L_f/S^{0.5})^{0.33}$
and denoted by shaded gray
(See Worksheet).

REFERENCE:

STANDARD FORM 4


```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 05AUG19 TIME 10:04:56
*
*****

```

```

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

```

```

X X XXXXXX XXXX X
X X X X X XX
X X X X X
XXXXXX XXXX X XXXX X
X X X X X
X X X X X
X X XXXXXX XXXX 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 -AMSK- 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
1 ID
2 ID Centura Charleston Park
3 ID
4 ID Existing Condition
5 ID
6 ID File N:\Centura lindell\DOCS\HYDROLOGY\HEC1\centurex.DAT
7 ID
8 ID
9 IT 5 300
10 IO 5
11 IN 5
12 JR PREC 0.57 1.0
* *****
* Existing Conditions *
* *****

13 KK CH09
14 BA 0.0098
15 PB 2.77
16 PC 0.00 2 5.7 7 8.7 10.8 12.4 13 13 13
17 PC 13 13 13 13.3 14 14.2 14.8 15.8 17.2 18.1
18 PC 19 19.7 19.7 20.1 20.1 20.4 21.4 22.9 24.1 24.9
19 PC 25.1 25.6 27 27.8 28.1 28.3 29.5 32.2 35.2 40.9
20 PC 49.9 59 71 74.4 78.1 81.2 81.9 83.5 85.1 85.6
21 PC 86 86.8 87.6 88.8 91 92.6 93.7 95 97 97.6
22 PC 98.2 98.5 98.7 98.9 99 99.3 99.3 99.4 99.5 99.8
23 PC 99.8 99.9 100
24 LS 87
25 UD 0.103

26 KK EXS
27 BA 0.0055
28 LS 88
29 UD 0.10

30 KK CP1
31 HC 2

32 KK EXN
33 BA 0.0017
34 LS 88
35 UD 0.10
36 ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

13 CH09
.
.
26 . EXS
.
.
30 CP1.....
.
.
32 . EXN

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
*
* RUN DATE 05AUG19 TIME 10:04:56 *
*

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

Centura Charleston Park

Existing Condition

File N:\Centura lindell\DOCS\HYDROLOGY\HEC1\centurex.DAT

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

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

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.57 1.00

1

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1 .57	RATIO 2 1.00
HYDROGRAPH AT					
+	CH09	.01	1 FLOW	5.	14.
			TIME	3.58	3.50
HYDROGRAPH AT					
+	EXS	.01	1 FLOW	3.	8.
			TIME	3.50	3.50
2 COMBINED AT					
+	CP1	.02	1 FLOW	8.	22.
			TIME	3.58	3.50
HYDROGRAPH AT					
+	EXN	.00	1 FLOW	1.	2.
			TIME	3.50	3.50

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


```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 05AUG19 TIME 10:05:37
*
*****

```

```

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

```

```

X X XXXXXX XXXX X
X X X X X XX
X X X X X X
XXXXXX XXXX X XXXX X
X X X X X X
X X X X X X
X X XXXXXX XXXX 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
1 ID
2 ID Centura Charleston Park
3 ID
4 ID Developed Condition
5 ID
6 ID File N:\Centura lindell\DOCS\HYDROLOGY\HEC1\centurdv.DAT
7 ID
8 ID
9 IT 5 300
10 IO 5
11 IN 5
12 JR PREC 0.57 1.0
* *****
* Developed Conditions *
* *****
13 KK CH09
14 BA 0.0098
15 PB 2.77
16 PC 0.00 2 5.7 7 8.7 10.8 12.4 13 13 13
17 PC 13 13 13 13.3 14 14.2 14.8 15.8 17.2 18.1
18 PC 19 19.7 19.7 20.1 20.1 20.4 21.4 22.9 24.1 24.9
19 PC 25.1 25.6 27 27.8 28.1 28.3 29.5 32.2 35.2 40.9
20 PC 49.9 59 71 74.4 78.1 81.2 81.9 83.5 85.1 85.6
21 PC 86 86.8 87.6 88.8 91 92.6 93.7 95 97 97.6
22 PC 98.2 98.5 98.7 98.9 99 99.3 99.3 99.4 99.5 99.8
23 PC 99.8 99.9 100
24 LS 87
25 UD 0.103
26 KK LINDEL
27 BA 0.0009
28 LS 98
29 UD 0.05
30 KK CP1
31 HC 2
32 KK ONDV2
33 BA 0.0018
34 LS 96.5
35 UD 0.087
36 KK ONDV1
37 BA 0.0045
38 LS 95
39 UD 0.077
40 KK CP2
41 HC 3
42 ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
13 CH09

```



```

26      .      LINDEL
      .
      .
30      CP1.....
      .
      .
32      .      ONDV2
      .
      .
36      .      .      ONDV1
      .
      .
40      CP2.....

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*      JUN 1998
*      VERSION 4.1
*
* RUN DATE 05AUG19 TIME 10:05:37
*
*****

```

```

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

```

Centura Charleston Park

Developed Condition

File N:\Centura lindell\DOCS\HYDROLOGY\HEC1\centurdrv.DAT

```

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

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

          COMPUTATION INTERVAL .08 HOURS
          TOTAL TIME BASE 24.92 HOURS

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

JP      MULTI-PLAN OPTION
          NPLAN      1 NUMBER OF PLANS

JR      MULTI-RATIO OPTION
          RATIOS OF PRECIPITATION
          .57      1.00

```

1

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION	
					RATIO 1 .57	RATIO 2 1.00
HYDROGRAPH AT						
+	CH09	.01	1	FLOW	5.	14.
				TIME	3.58	3.50
HYDROGRAPH AT						
+	LINDEL	.00	1	FLOW	1.	2.
				TIME	3.50	3.50
2 COMBINED AT						
+	CP1	.01	1	FLOW	6.	16.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ONDV2	.00	1	FLOW	2.	4.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ONDV1	.00	1	FLOW	5.	9.
				TIME	3.50	3.50

3	COMBINED AT					
+	CP2	.02	1	FLOW	13.	28.
				TIME	3.50	3.50

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


```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 05AUG19 TIME 10:06:06
*
*****

```

```

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

```

```

X X XXXXXX XXXX X
X X X X X XX
X X X X X X
XXXXXX XXXX X XXXX X
X X X X X X
X X X X X X
X X XXXXXX XXXX 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 -AMSK- 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
1         ID
2         ID Centura Charleston Park
3         ID
4         ID Future Condition
5         ID
6         ID File N:\Centura lindell\DOCS\HYDROLOGY\HEC1\centurfu.DAT
7         ID
8         ID
9         IT 5 300
10        IO 5
11        IN 5
12        JR PREC 0.57 1.0
          * *****
          * * Future Conditions *
          * *****
13        KK CH09
14        BA 0.0098
15        PB 2.77
16        PC 0.00 2 5.7 7 8.7 10.8 12.4 13 13 13
17        PC 13 13 13 13.3 14 14.2 14.8 15.8 17.2 18.1
18        PC 19 19.7 19.7 20.1 20.1 20.4 21.4 22.9 24.1 24.9
19        PC 25.1 25.6 27 27.8 28.1 28.3 29.5 32.2 35.2 40.9
20        PC 49.9 59 71 74.4 78.1 81.2 81.9 83.5 85.1 85.6
21        PC 86 86.8 87.6 88.8 91 92.6 93.7 95 97 97.6
22        PC 98.2 98.5 98.7 98.9 99 99.3 99.3 99.4 99.5 99.8
23        PC 99.8 99.9 100
24        LS 85
25        UD 0.108
26        KK LINDEL
27        BA 0.0009
28        LS 98
29        UD 0.05
30        KK CP1
31        HC 2
32        KK ONDV2
33        BA 0.0018
34        LS 96.5
35        UD 0.087
36        KK ONDV1
37        BA 0.0045
38        LS 95
39        UD 0.077
40        KK CP2
41        HC 3
42        ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

```

13

```

CH09
:
:

```



```

26      .      LINDEL
      .
      .
30      CP1.....
      .
      .
32      .      ONDV2
      .
      .
36      .      .      ONDV1
      .
      .
40      CP2.....

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*      JUN 1998                  *
*      VERSION 4.1              *
* RUN DATE 05AUG19 TIME 10:06:06 *
*                               *
*****

```

```

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

```

Centura Charleston Park

Future Condition

ID

File N:\Centura lindell\DOCS\HYDROLOGY\HEC1\centurfu.DAT

10 IO OUTPUT CONTROL VARIABLES

```

IPRNT      5 PRINT CONTROL
IPLOT      0 PLOT CONTROL
QSCAL      0. HYDROGRAPH PLOT SCALE

```

IT HYDROGRAPH TIME DATA

```

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

```

```

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

```

ENGLISH UNITS

```

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

```

JP MULTI-PLAN OPTION

```

NPLAN      1 NUMBER OF PLANS

```

JR MULTI-RATIO OPTION

```

RATIOS OF PRECIPITATION
.57      1.00

```

1

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION	
					RATIO 1 .57	RATIO 2 1.00
HYDROGRAPH AT						
+	CH09	.01	1	FLOW	5.	12.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	LINDEL	.00	1	FLOW	1.	2.
				TIME	3.50	3.50
2 COMBINED AT						
+	CP1	.01	1	FLOW	5.	14.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ONDV2	.00	1	FLOW	2.	4.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ONDV1	.00	1	FLOW	5.	9.
				TIME	3.50	3.50

3	COMBINED AT					
+	CP2	.02	1	FLOW	12.	27.
				TIME	3.50	3.50

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

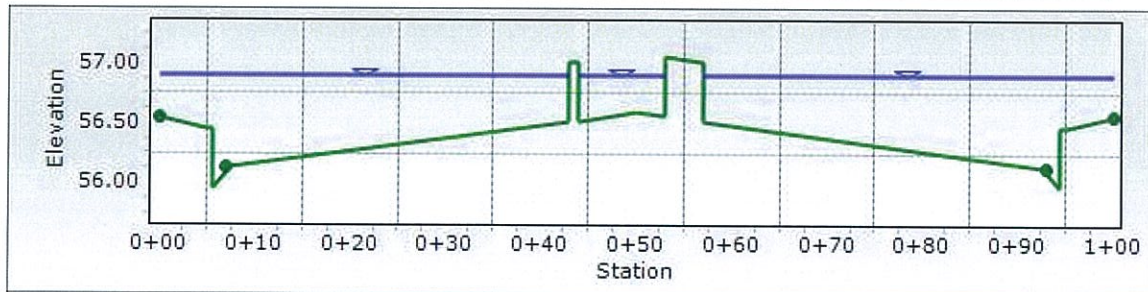
HS1 Charleston 10-yr

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.020 ft/ft
Normal Depth	1.0 ft
Discharge	441.00 cfs



Worksheet for HS1 Charleston 10-yr

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.020 ft/ft
Discharge	441.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	56.55
0+05.00	56.45
0+05.50	56.45
0+05.50	55.95
0+07.00	56.08
0+07.00	56.12
0+43.00	56.51
0+43.00	57.01
0+44.00	57.02
0+44.00	56.52
0+50.00	56.60
0+53.00	56.56
0+53.00	57.06
0+57.00	57.02
0+57.00	56.52
0+93.00	56.13
0+93.00	56.09
0+94.50	55.96
0+94.50	56.46
0+95.00	56.46
1+00.00	56.56

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 56.55)	(0+07.00, 56.12)	0.013
(0+07.00, 56.12)	(0+93.00, 56.13)	0.017
(0+93.00, 56.13)	(1+00.00, 56.56)	0.013

Options

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

Worksheet for HS1 Charleston 10-yr

Results

Normal Depth	1.0 ft
Elevation Range	55.95 to 57.06 ft
Flow Area	52.4 ft ²
Wetted Perimeter	98.32 ft
Hydraulic Radius	0.5 ft
Top Width	95.00 ft
Normal Depth	1.0 ft
Critical Depth	1.3 ft
Critical Slope	0.004 ft/ft
Velocity	8.41 ft/s
Velocity Head	1.10 ft
Specific Energy	2.06 ft
Froude Number	1.997
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.0 ft
Critical Depth	1.3 ft
Channel Slope	0.020 ft/ft
Critical Slope	0.004 ft/ft

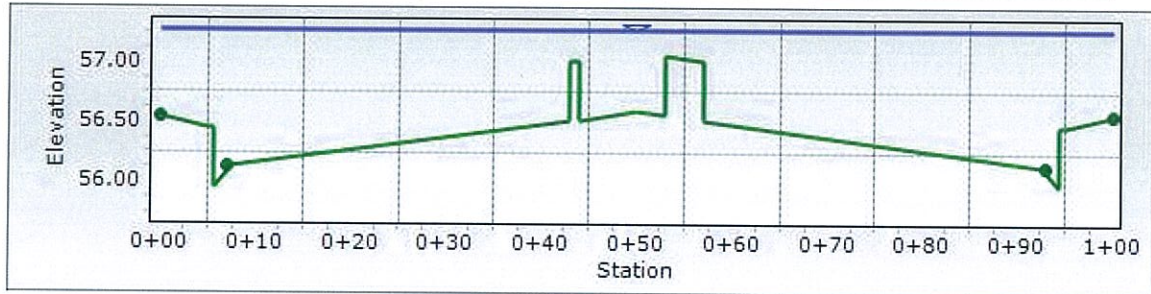
HS1 Charleston 100-yr

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.020 ft/ft
Normal Depth	1.3 ft
Discharge	1,029.00 cfs



Worksheet for HS1 Charleston 100-yr

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.020 ft/ft
Discharge	1,029.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	56.55
0+05.00	56.45
0+05.50	56.45
0+05.50	55.95
0+07.00	56.08
0+07.00	56.12
0+43.00	56.51
0+43.00	57.01
0+44.00	57.02
0+44.00	56.52
0+50.00	56.60
0+53.00	56.56
0+53.00	57.06
0+57.00	57.02
0+57.00	56.52
0+93.00	56.13
0+93.00	56.09
0+94.50	55.96
0+94.50	56.46
0+95.00	56.46
1+00.00	56.56

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 56.55)	(0+07.00, 56.12)	0.013
(0+07.00, 56.12)	(0+93.00, 56.13)	0.017
(0+93.00, 56.13)	(1+00.00, 56.56)	0.013

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

Worksheet for HS1 Charleston 100-yr

Results

Normal Depth	1.3 ft
Elevation Range	55.95 to 57.06 ft
Flow Area	89.3 ft ²
Wetted Perimeter	104.55 ft
Hydraulic Radius	0.9 ft
Top Width	100.00 ft
Normal Depth	1.3 ft
Critical Depth	1.9 ft
Critical Slope	0.004 ft/ft
Velocity	11.52 ft/s
Velocity Head	2.06 ft
Specific Energy	3.39 ft
Froude Number	2.149
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.3 ft
Critical Depth	1.9 ft
Channel Slope	0.020 ft/ft
Critical Slope	0.004 ft/ft

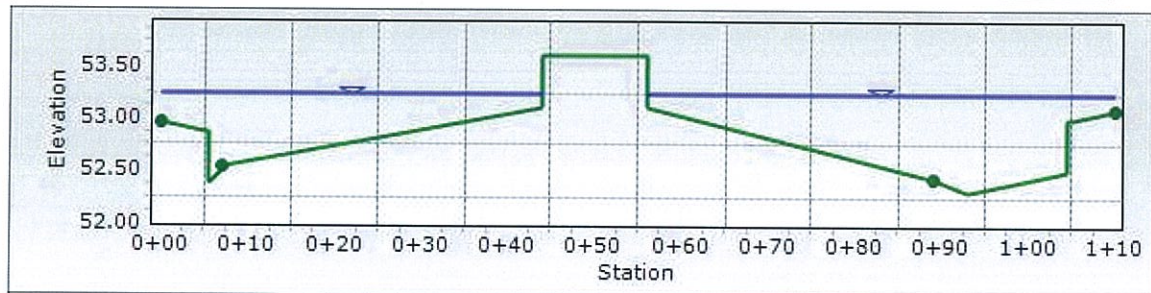
HS2 Charleston 10-yr

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0256 ft/ft
Normal Depth	0.9 ft
Discharge	441.00 cfs



Worksheet for HS2 Charleston 10-yr

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.0256 ft/ft
Discharge	441.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	52.97
0+05.00	52.87
0+05.50	52.87
0+05.50	52.37
0+07.00	52.50
0+07.00	52.54
0+44.00	53.11
0+44.00	53.61
0+56.00	53.61
0+56.00	53.11
0+89.00	52.43
0+93.00	52.30
1+04.50	52.50
1+04.50	53.00
1+05.00	53.00
1+10.00	53.10

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 52.97)	(0+07.00, 52.54)	0.0130
(0+07.00, 52.54)	(0+89.00, 52.43)	0.0170
(0+89.00, 52.43)	(1+10.00, 53.10)	0.0130

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	0.9 ft
Elevation Range	52.30 to 53.61 ft
Flow Area	48.1 ft ²

Worksheet for HS2 Charleston 10-yr

Results

Wetted Perimeter	99.73 ft
Hydraulic Radius	0.5 ft
Top Width	98.00 ft
Normal Depth	0.9 ft
Critical Depth	1.3 ft
Critical Slope	0.0041 ft/ft
Velocity	9.18 ft/s
Velocity Head	1.31 ft
Specific Energy	2.25 ft
Froude Number	2.310
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.9 ft
Critical Depth	1.3 ft
Channel Slope	0.0256 ft/ft
Critical Slope	0.0041 ft/ft

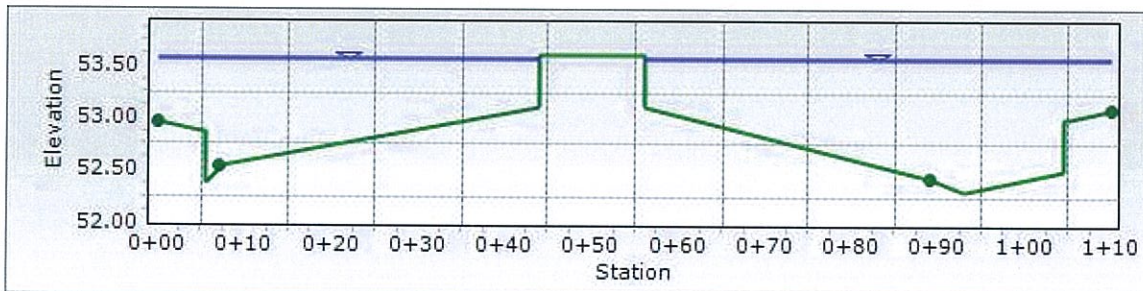
HS2 Charleston 100-yr

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0256 ft/ft
Normal Depth	1.3 ft
Discharge	1,029.00 cfs



Worksheet for HS2 Charleston 100-yr

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.0256 ft/ft
Discharge	1,029.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	52.97
0+05.00	52.87
0+05.50	52.87
0+05.50	52.37
0+07.00	52.50
0+07.00	52.54
0+44.00	53.11
0+44.00	53.61
0+56.00	53.61
0+56.00	53.11
0+89.00	52.43
0+93.00	52.30
1+04.50	52.50
1+04.50	53.00
1+05.00	53.00
1+10.00	53.10

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 52.97)	(0+07.00, 52.54)	0.0130
(0+07.00, 52.54)	(0+89.00, 52.43)	0.0170
(0+89.00, 52.43)	(1+10.00, 53.10)	0.0130

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	1.3 ft
Elevation Range	52.30 to 53.61 ft
Flow Area	80.3 ft ²

Worksheet for HS2 Charleston 100-yr

Results

Wetted Perimeter	101.05 ft
Hydraulic Radius	0.8 ft
Top Width	98.00 ft
Normal Depth	1.3 ft
Critical Depth	1.9 ft
Critical Slope	0.0035 ft/ft
Velocity	12.82 ft/s
Velocity Head	2.55 ft
Specific Energy	3.82 ft
Froude Number	2.496
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.3 ft
Critical Depth	1.9 ft
Channel Slope	0.0256 ft/ft
Critical Slope	0.0035 ft/ft

HS3 Lindell Q10

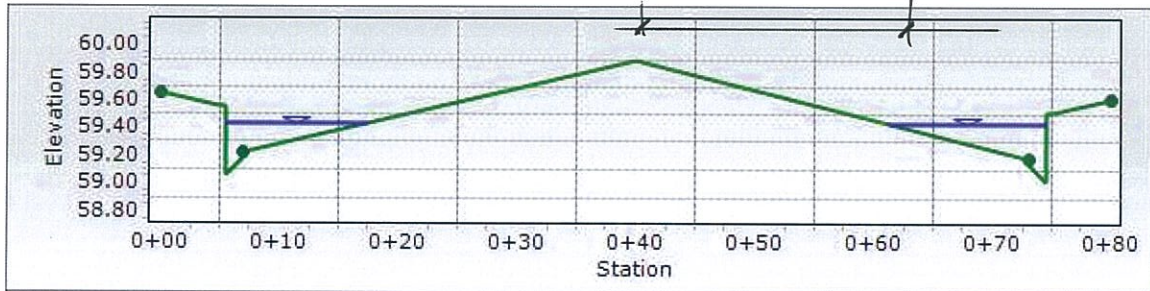
Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0049 ft/ft
Normal Depth	0.4 ft
Discharge	6.00 cfs

23.50'



$$\frac{59.89 - 59.02 + 0.4}{0.02} = \frac{0.47}{0.02} = \underline{\underline{23.50}}$$

Worksheet for HS3 Lindell Q10

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.0049 ft/ft
Discharge	6.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	59.66
0+05.00	59.56
0+05.50	59.56
0+05.50	59.06
0+07.00	59.19
0+07.00	59.23
0+40.00	59.89
0+73.00	59.19
0+73.00	59.15
0+74.50	59.02
0+74.50	59.52
0+75.00	59.52
0+80.00	59.62

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 59.66)	(0+07.00, 59.23)	0.0130
(0+07.00, 59.23)	(0+73.00, 59.19)	0.0170
(0+73.00, 59.19)	(0+80.00, 59.62)	0.0130

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	0.4 ft
Elevation Range	59.02 to 59.89 ft
Flow Area	3.6 ft ²
Wetted Perimeter	26.17 ft
Hydraulic Radius	0.1 ft
Top Width	25.27 ft

Worksheet for HS3 Lindell Q10

Results

Normal Depth	0.4 ft
Critical Depth	0.4 ft
Critical Slope	0.0082 ft/ft
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energy	0.46 ft
Froude Number	0.786
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.4 ft
Critical Depth	0.4 ft
Channel Slope	0.0049 ft/ft
Critical Slope	0.0082 ft/ft

Messages

Messages	Flow is divided.
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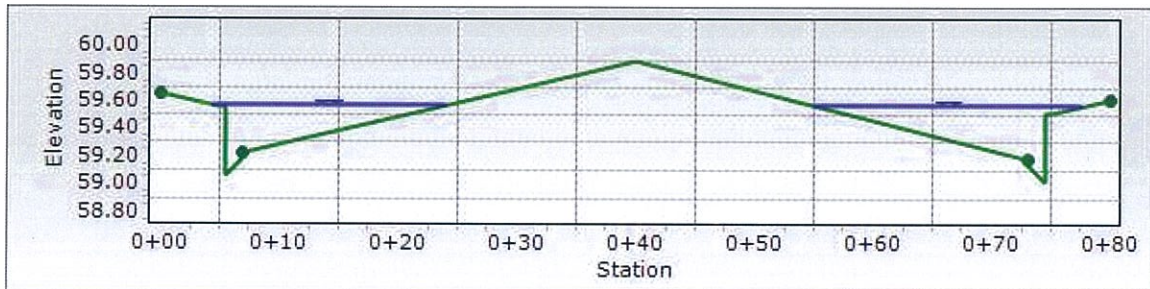
HS3 Lindell Q100

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0049 ft/ft
Normal Depth	0.6 ft
Discharge	16.00 cfs



Worksheet for HS3 Lindell Q100

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.0049 ft/ft
Discharge	16.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	59.66
0+05.00	59.56
0+05.50	59.56
0+05.50	59.06
0+07.00	59.19
0+07.00	59.23
0+40.00	59.89
0+73.00	59.19
0+73.00	59.15
0+74.50	59.02
0+74.50	59.52
0+75.00	59.52
0+80.00	59.62

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 59.66)	(0+07.00, 59.23)	0.0130
(0+07.00, 59.23)	(0+73.00, 59.19)	0.0170
(0+73.00, 59.19)	(0+80.00, 59.62)	0.0130

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	0.6 ft
Elevation Range	59.02 to 59.89 ft
Flow Area	7.8 ft ²
Wetted Perimeter	43.27 ft
Hydraulic Radius	0.2 ft
Top Width	42.18 ft

Worksheet for HS3 Lindell Q100

Results

Normal Depth	0.6 ft
Critical Depth	0.5 ft
Critical Slope	0.0071 ft/ft
Velocity	2.04 ft/s
Velocity Head	0.06 ft
Specific Energy	0.62 ft
Froude Number	0.835
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.6 ft
Critical Depth	0.5 ft
Channel Slope	0.0049 ft/ft
Critical Slope	0.0071 ft/ft

Messages

Messages	Flow is divided.
----------	------------------

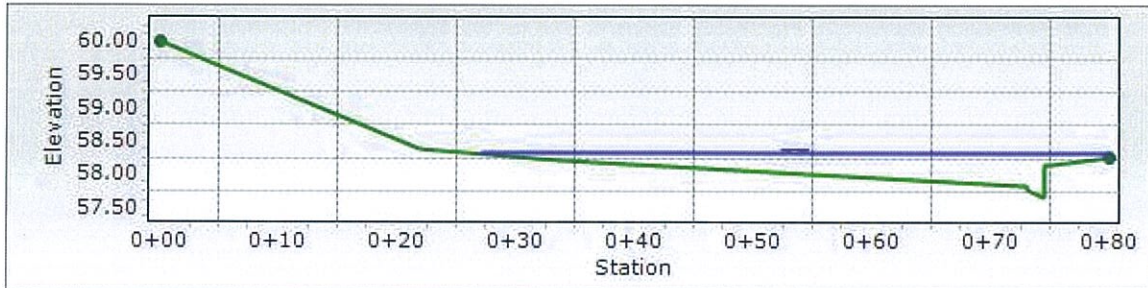
Lindell at sump HS4 - Q₁₀

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0001 ft/ft
Normal Depth	0.7 ft
Discharge	6.00 cfs



Worksheet for Lindell at sump HS4 - Q₁₀

Project Description			
Friction Method	Manning		
	Formula		
Solve For	Normal Depth		
Input Data			
Channel Slope	0.0001 ft/ft		
Discharge	6.00 cfs		
Section Definitions			
	Station (ft)	Elevation (ft)	
	0+00.00		60.00
	0+22.00		58.39
	0+34.00		58.22
	0+73.00		57.83
	0+73.00		57.79
	0+74.50		57.66
	0+74.50		58.16
	0+75.00		58.16
	0+80.00		58.26
Roughness Segment Definitions			
Start Station	Ending Station	Roughness Coefficient	
(0+00.00, 60.00)	(0+80.00, 58.26)	0.0130	
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	0.7 ft		
Elevation Range	57.66 to 60.00 ft		
Flow Area	13.3 ft ²		
Wetted Perimeter	53.54 ft		
Hydraulic Radius	0.2 ft		
Top Width	52.94 ft		
Normal Depth	0.7 ft		
Critical Depth	0.4 ft		
Critical Slope	0.0050 ft/ft		
Velocity	0.45 ft/s		
Velocity Head	0.00 ft		
Specific Energy	0.66 ft		

Worksheet for Lindell at sump HS4

Results	
Froude Number	0.159
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.7 ft
Critical Depth	0.4 ft
Channel Slope	0.0001 ft/ft
Critical Slope	0.0050 ft/ft
Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.058255475 7312508ft.

HS4

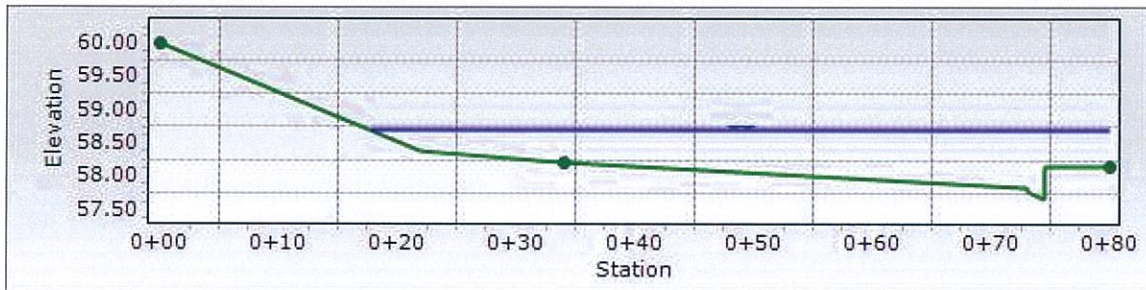
Lindell at sump Q100

Project Description

Friction Method	Manning
Solve For	Formula
	Normal Depth

Input Data

Channel Slope	0.0001 ft/ft
Normal Depth	1.0 ft
Discharge	16.00 cfs



HS4

Lindell at sump Q100

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.0001 ft/ft
Discharge	16.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	60.00
0+22.00	58.39
0+34.00	58.22
0+73.00	57.83
0+73.00	57.79
0+74.50	57.66
0+74.50	58.16
0+75.00	58.16
0+80.00	58.16

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 60.00)	(0+34.00, 58.22)	0.0350
(0+34.00, 58.22)	(0+80.00, 58.16)	0.0170

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	1.0 ft
Elevation Range	57.66 to 60.00 ft
Flow Area	36.1 ft ²
Wetted Perimeter	63.31 ft
Hydraulic Radius	0.6 ft
Top Width	62.21 ft
Normal Depth	1.0 ft
Critical Depth	0.5 ft
Critical Slope	0.0143 ft/ft
Velocity	0.44 ft/s
Velocity Head	0.00 ft

HS4

Lindell at sump Q100

Results

Specific Energy	1.04 ft
Froude Number	0.103
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.0 ft
Critical Depth	0.5 ft
Channel Slope	0.0001 ft/ft
Critical Slope	0.0143 ft/ft

Messages

Messages	Water Surface Elevation exceeds lowest end station by 0.538382510 708402ft.
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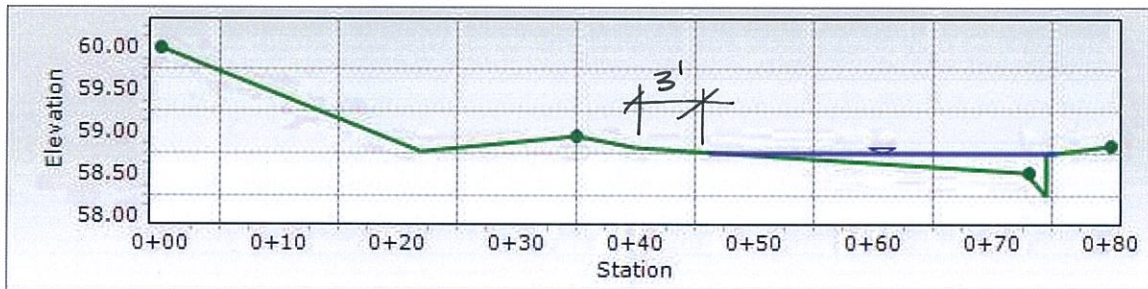
HS5 Lindell Q10

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0050 ft/ft
Normal Depth	0.5 ft
Discharge	6.00 cfs



$$\frac{58.81 - 58.25 + 0.5}{0.02} = 3.0 \text{ (half street)}$$

Worksheet for HS5 Lindell Q10

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.0050 ft/ft
Discharge	6.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	60.00
0+22.00	58.78
0+35.00	58.96
0+40.00	58.81
0+73.00	58.52
0+73.00	58.48
0+74.50	58.25
0+74.50	58.75
0+75.00	58.75
0+80.00	58.85

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 60.00)	(0+35.00, 58.96)	0.0350
(0+35.00, 58.96)	(0+73.00, 58.52)	0.0170
(0+73.00, 58.52)	(0+80.00, 58.85)	0.0130

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	0.5 ft
Elevation Range	58.25 to 60.00 ft
Flow Area	3.8 ft ²
Wetted Perimeter	29.78 ft
Hydraulic Radius	0.1 ft
Top Width	29.22 ft
Normal Depth	0.5 ft
Critical Depth	0.5 ft
Critical Slope	0.0084 ft/ft

Worksheet for HS5 Lindell Q10

Results

Velocity	1.59 ft/s
Velocity Head	0.04 ft
Specific Energy	0.55 ft
Froude Number	0.781
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.5 ft
Critical Depth	0.5 ft
Channel Slope	0.0050 ft/ft
Critical Slope	0.0084 ft/ft

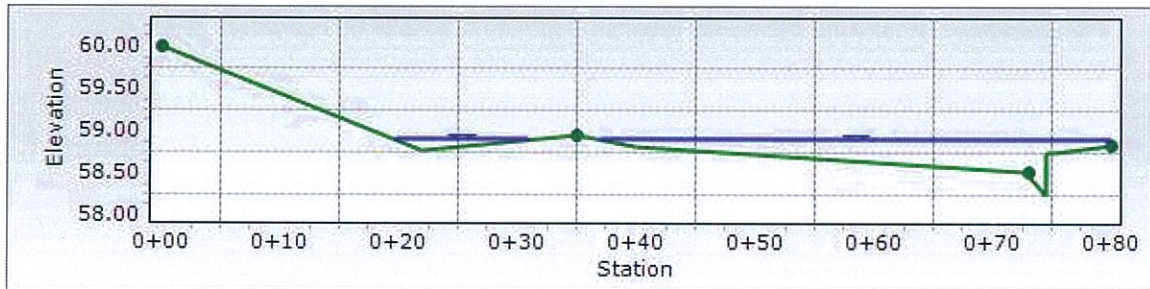
HS5 Lindell Q100

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0050 ft/ft
Normal Depth	0.7 ft
Discharge	16.00 cfs



Worksheet for HS5 Lindell Q100

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.0050 ft/ft
Discharge	16.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	60.00
0+22.00	58.78
0+35.00	58.96
0+40.00	58.81
0+73.00	58.52
0+73.00	58.48
0+74.50	58.25
0+74.50	58.75
0+75.00	58.75
0+80.00	58.85

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 60.00)	(0+35.00, 58.96)	0.0350
(0+35.00, 58.96)	(0+73.00, 58.52)	0.0170
(0+73.00, 58.52)	(0+80.00, 58.85)	0.0130

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	0.7 ft
Elevation Range	58.25 to 60.00 ft
Flow Area	10.1 ft ²
Wetted Perimeter	54.93 ft
Hydraulic Radius	0.2 ft
Top Width	54.31 ft
Normal Depth	0.7 ft
Critical Depth	0.6 ft
Critical Slope	0.0128 ft/ft

Worksheet for HS5 Lindell Q100

Results

Velocity	1.58 ft/s
Velocity Head	0.04 ft
Specific Energy	0.69 ft
Froude Number	0.645
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.7 ft
Critical Depth	0.6 ft
Channel Slope	0.0050 ft/ft
Critical Slope	0.0128 ft/ft

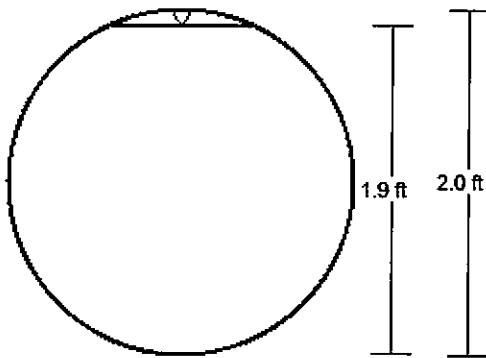
Messages

Messages	Water Surface Elevation exceeds lowest end station by 0.053852423 44137ft. Flow is divided.
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Project:	The Lindell	
Title:	Type CM2 Drop Inlet (SUMP)	
Subtitle:	10-ft Drop Inlet	
By:	PP	
Date:	8/5/2019	
Input:	Variable:	Input:
Depth at Inlet (ft)	D	1.00
Grate Width (ft)	W	1.50
Length of Grate (ft)	L _g	7.50
Length of Curb Opening (ft)	L _c	10.00
Height of Curb Opening (ft)	H	0.50
Weir Coef. - Curb Opening	W _c	2.3
Weir Coef. - Grate	W _g	3.0
Orifice Coef.	O _c	0.67
Grate Coef.	G _c	0.60
Clogging Factor - Grate (%)	CF _g	50
Clogging Factor - Curb (%)	CF _c	50
Output (Grate):	Equation:	Output (Grate):
Effective Weir Length (ft)	2*W+L _g	10.50
Adjusted Effective Weir Length (ft)	2*(1-CF _g /100)*W+(1-CF _g /100)*L _g	5.25
Grate Open Area (sf)	W*L _g	11.25
Adjusted Grate Open Area (sf)	Grate Open Area * G _c *(1-CF _g /100)	3.38
Controlling Flow Type (weir/orifice)	If D<1.792*(Adj. Grate Open Area/Adj. Eff. Length) use weir, else orifice	weir
Intercepted Flow (cfs)	weir: W _g *(Adj. Eff. Weir Length)*D ^{1.5}	15.8
	orifice: O _c *(Adj. Grate Open Area)*(64.4*D) ^{0.5}	
Output (Curb):	Equation:	Output (Curb):
Effective Weir Length (ft)	L+1.8*W	12.70
Adjusted Effective Weir Length (ft)	L+1.8(1-CF _c /100)*W	11.41
Curb Open Area (sf)	L*H	5.00
Adjusted Curb Open Area (sf)	Curb Open Area * (1-CF _c /100)	2.50
Controlling Flow Type (weir/orifice)	If D<H, weir, else orifice	orifice
Intercepted Flow (cfs)	weir: W _c *(Adj. Eff. Weir Length)*D ^{1.5}	13.42
	orifice: O _c *(Adj. Curb Open Area)*(64.4*(D-H/2)) ^{0.5}	
Output (Total):		Output (Total):
Capacity Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	29.2
Designed Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	16.0

24-inch RCP

Project Description	
Friction Method	Manning Formula
Solve For	Discharge
Input Data	
Roughness Coefficient	0.0130
Channel Slope	0.0050 ft/ft
Normal Depth	1.9 ft
Diameter	2.0 ft
Discharge	17.19 cfs



V: 1
H: 1

Worksheet for 24-inch RCP

Project Description	
Friction Method	Manning Formula
Solve For	Discharge
Input Data	
Roughness Coefficient	0.0130
Channel Slope	0.0050 ft/ft
Normal Depth	1.9 ft
Diameter	2.0 ft
Results	
Discharge	17.19 cfs
Flow Area	3.1 ft ²
Wetted Perimeter	5.38 ft
Hydraulic Radius	0.6 ft
Top Width	0.87 ft
Critical Depth	1.5 ft
Percent Full	95.0 %
Critical Slope	0.0070 ft/ft
Velocity	5.58 ft/s
Velocity Head	0.48 ft
Specific Energy	2.38 ft
Froude Number	0.523
Maximum Discharge	17.21 cfs
Discharge Full	16.00 cfs
Slope Full	0.0058 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	42.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.9 ft
Critical Depth	1.5 ft
Channel Slope	0.0050 ft/ft
Critical Slope	0.0070 ft/ft

lindell

T1 The Lindell

T2 Storm drain from Lindell to outlet

T3 c:\wspg\lindell.wsw

SO	3.6602250.090	1		2250.09										
R	43.8202251.140	1	.035											
WX	43.8202251.140	2												
R	237.0102252.110	2	.013		45.00		1							
R	302.7702252.440	2	.013		45.00		1							
R	631.8702254.090	2	.013		-45.00		1							
R	645.4502254.160	2	.013											
SH	645.4502254.160	2		2258.66										
CD	1 5 0 0.000	0.000	0.000	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
CD	2 4 0 .000	2.000	0.000	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
PTS	1 3 0.000 52.30	12.00	51.71	22.00	54.00									
Q	16.00													

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WATER SURFACE PROFILE LISTING

The Lindell

Storm drain from Lindell to outlet

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*****																	*****																
Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Width	Top Dia.	Height/ I.D.	Base Wt	ZL	No Wth Prs/Pip	*****																	
L/Elem	Ch Slope															Type Ch	*****																
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****																
3.660	2250.090	.629	2250.720	16.00	3.28	.17	2250.89	.00	.63	14.58			1		0 .0	IR-OPEN	*****																
31.958	.0261					.0261	.84	.63	1.00	.629	.035					IR-OPEN	*****																
35.618	2250.926	.629	2251.555	16.00	3.28	.17	2251.72	.00	.63	14.58			1		0 .0	IR-OPEN	*****																
.332	.0261					.0274	.01	.63	1.00	.629	.035					IR-OPEN	*****																
35.951	2250.935	.620	2251.554	16.00	3.38	.18	2251.73	.00	.63	14.58			1		0 .0	IR-OPEN	*****																
.504	.0261					.0312	.02	.62	1.04	.629	.035					IR-OPEN	*****																
36.454	2250.948	.605	2251.552	16.00	3.54	.20	2251.75	.00	.63	14.58			1		0 .0	IR-OPEN	*****																
.496	.0261					.0364	.02	.60	1.12	.629	.035					IR-OPEN	*****																
36.950	2250.961	.590	2251.551	16.00	3.72	.21	2251.77	.00	.63	14.58			1		0 .0	IR-OPEN	*****																
.478	.0261					.0419	.02	.59	1.21	.629	.035					IR-OPEN	*****																
37.429	2250.973	.576	2251.550	16.00	3.90	.24	2251.79	.00	.63	14.24			1		0 .0	IR-OPEN	*****																
.470	.0261					.0476	.02	.58	1.28	.629	.035					IR-OPEN	*****																
37.898	2250.985	.563	2251.548	16.00	4.09	.26	2251.81	.00	.63	13.90			1		0 .0	IR-OPEN	*****																
.453	.0261					.0541	.02	.56	1.36	.629	.035					IR-OPEN	*****																
38.351	2250.997	.550	2251.547	16.00	4.29	.29	2251.83	.00	.63	13.58			1		0 .0	IR-OPEN	*****																
.444	.0261					.0614	.03	.55	1.44	.629	.035					IR-OPEN	*****																
38.795	2251.009	.537	2251.545	16.00	4.50	.31	2251.86	.00	.63	13.26			1		0 .0	IR-OPEN	*****																
.429	.0261					.0698	.03	.54	1.53	.629	.035					IR-OPEN	*****																
FILE: lindell.WSW																	W S P G M - C T V I D E S T A T I O N 14.07																

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Program Package Serial Number: 1430

WATER SURFACE PROFILE LISTING

The Lindell

Storm drain from Lindell to outlet

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lindell													
Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Base Wt/ Dia.-FT or I.D.	No Wth Prs/Pip	
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N" X-Fall	ZR	Type Ch
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
39.224	2251.020	.524	2251.544	16.00	4.72	.35	2251.89	.00	.63	12.94		1	0 .0
.419	.0261					.0792	.03	.52	1.62	.629	.035		IR-OPEN
39.643	2251.031	.512	2251.543	16.00	4.95	.38	2251.92	.00	.63	12.64		1	0 .0
.408	.0261					.0900	.04	.51	1.72	.629	.035		IR-OPEN
40.051	2251.042	.500	2251.541	16.00	5.19	.42	2251.96	.00	.63	12.34		1	0 .0
.395	.0261					.1021	.04	.50	1.83	.629	.035		IR-OPEN
40.446	2251.052	.488	2251.540	16.00	5.44	.46	2252.00	.00	.63	12.05		1	0 .0
.384	.0261					.1160	.04	.49	1.94	.629	.035		IR-OPEN
40.830	2251.062	.476	2251.538	16.00	5.71	.51	2252.04	.00	.63	11.77		1	0 .0
.373	.0261					.1317	.05	.48	2.06	.629	.035		IR-OPEN
41.203	2251.072	.465	2251.537	16.00	5.99	.56	2252.09	.00	.63	11.49		1	0 .0
.362	.0261					.1495	.05	.47	2.19	.629	.035		IR-OPEN
41.565	2251.081	.454	2251.535	16.00	6.28	.61	2252.15	.00	.63	11.22		1	0 .0
.352	.0261					.1698	.06	.45	2.32	.629	.035		IR-OPEN
41.917	2251.091	.443	2251.534	16.00	6.59	.67	2252.21	.00	.63	10.95		1	0 .0
.342	.0261					.1928	.07	.44	2.46	.629	.035		IR-OPEN
42.259	2251.100	.433	2251.533	16.00	6.91	.74	2252.27	.00	.63	10.70		1	0 .0
.331	.0261					.2189	.07	.43	2.62	.629	.035		IR-OPEN
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PAGE													

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 Program Package Serial Number: 1430
 WATER SURFACE PROFILE LISTING
 Date: 8-12-2019 Time:12:16:37

The Lindell
 Storm drain from Lindell to outlet
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Date: 8-12-2019 Time:12:16:37

WATER SURFACE PROFILE LISTING

The Lindell

Storm drain from Lindell to outlet

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Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.E.L.	Super Elev	Critical Depth	Flow Width	Top Dia.-FT	Height/ or I.D.	Base Wt	No With Pys/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
237.010	2352.110	1.636	2253.746	16.00	5.82	.53	2254.27	.01	1.44	1.54	2.000	.000	.00	0 .0
29.813	.0050					.0050	.15	1.65	.77	1.64	.013	.00	.00	PIPE
266.823	2252.260	1.637	2253.896	16.00	5.81	.52	2254.42	.01	1.44	1.54	2.000	.000	.00	0 .0
35.947	.0050					.0050	.18	1.65	.77	1.64	.013	.00	.00	PIPE

302.770	2252.440	1.637	2254.077	16.00	5.81	.52	2254.60	lindell .00	1.44	1.54	2.000	.000	.00	0	.0
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
6.549	.0050					.0050	.03	1.64	.77	1.64	.013	.00	.00	PIPE	
309.319	2252.473	1.637	2254.110	16.00	5.81	.52	2254.63	.00	1.44	1.54	2.000	.000	.00	0	.0
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
322.551	.0050					.0050	1.61	1.64	.77	1.64	.013	.00	.00	PIPE	
631.870	2254.090	1.637	2255.727	16.00	5.81	.52	2256.25	.00	1.44	1.54	2.000	.000	.00	0	.0
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
13.580	.0051					.0050	.07	1.64	.77	1.62	.013	.00	.00	PIPE	
645.450	2254.160	1.633	2255.793	16.00	5.82	.53	2256.32	.00	1.44	1.55	2.000	.000	.00	0	.0
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -



**LAS VEGAS
CITY COUNCIL**

CAROLYN G. GOODMAN
Mayor

LOIS TARKANIAN
Mayor Pro Tem

STAVROS S. ANTHONY
BOB COFFIN
MICHELE FIORE
CEDRIC CREAR
WARD 2 (Vacant)

SCOTT D. ADAMS
City Manager

DEPARTMENT OF PLANNING

ROBERT SUMMERFIELD
DIRECTOR

**DEVELOPMENT
SERVICES CENTER**

333 N. RANCHO DRIVE
3RD FLOOR
LAS VEGAS, NV 89106

702.229.6301 | VOICE
702.474.7463 | FAX
711 | TTY



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lasvegasnevada.gov

RECEIVED MAY 17 2019

May 16, 2019

Mr. Rodman Jordan
Charlie Rah Rah Irrevocable, et al
P.O. Box 400188
Las Vegas, Nevada 89140

**RE: GPA-74312 [PRJ-74089] - GENERAL PLAN AMENDMENT
RELATED TO ZON-74313 AND SDR-75858 [PRJ-75792]
CITY COUNCIL MEETING OF MAY 15, 2019**

Dear Mr. Jordan:

The City Council at a regular meeting held on May 15, 2019 voted to **APPROVE** a request for a General Plan Amendment FROM: SC (SERVICE COMMERCIAL) TO: H (HIGH DENSITY RESIDENTIAL) on 4.62 acres at the southeast corner of Charleston Boulevard and Lindell Road (APNs 163-01-501-001 and 002), Ward 1 (Tarkanian) [PRJ-74089].

The Notice of Final Action was filed with the Las Vegas City Clerk on May 16, 2019.

Sincerely,

Robert Summerfield, AICP[®]
Director
Department of Planning

RTS:PL:clb

cc: Mr. Rodman Jordan
Centura Development
1210 Hinson Street
Las Vegas, Nevada 89102

Mr. David Turner
Baughman & Turner, Inc.
1210 Hinson Street
Las Vegas, Nevada 89102



**LAS VEGAS
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City Manager

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ROBERT SUMMERFIELD
DIRECTOR

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711 | TTY

May 16, 2019

Mr. Rodman Jordan
Charlie Rah Rah Irrevocable, et al
P.O. Box 400188
Las Vegas, Nevada 89140

**RE: ZON-74313 [PRJ-74089] - REZONING RELATED TO GPA-74312
AND SDR-75858 [PRJ-75972]
CITY COUNCIL MEETING OF MAY 15, 2019**

Dear Mr. Jordan:

The City Council at a regular meeting held on May 15, 2019 voted to **APPROVE** a request for a Rezoning FROM: C-1 (LIMITED COMMERCIAL) TO: R-4 (HIGH DENSITY RESIDENTIAL) on 4.62 acres at the southeast corner of Charleston Boulevard and Lindell Road (APNs 163-01-501-001 and 002), Ward 1 (Tarkanian) [PRJ-74089].

The Notice of Final Action was filed with the Las Vegas City Clerk on May 16, 2019.

Sincerely,


Robert Summerfield, AICP[®]
Director
Department of Planning

RTS:PL:clb

cc: Mr. Rodman Jordan
Centura Development
1210 Hinson Street
Las Vegas, Nevada 89102

Mr. David Turner
Baughman & Turner, Inc.
1210 Hinson Street
Las Vegas, Nevada 89102



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**LAS VEGAS
CITY COUNCIL**

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SCOTT D. ADAMS
City Manager

DEPARTMENT OF PLANNING
ROBERT SUMMERFIELD
DIRECTOR

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May 16, 2019

Mr. Rodman Jordan
Charlie Rah Rah Irrevocable, et al
P.O. Box 400188
Las Vegas, Nevada 89140

**RE: SDR-75858 [PRJ-75792] - SITE DEVELOPMENT PLAN REVIEW
RELATED TO GPA-74312 AND ZON-75313 [PRJ-74089]
CITY COUNCIL MEETING OF MAY 15, 2019**

Dear Mr. Jordan:

The City Council at a regular meeting held on May 15, 2019 voted to **APPROVE** a request for a Site Development Plan Review FOR A PROPOSED 144-UNIT SENIOR CITIZEN APARTMENTS DEVELOPMENT on 4.62 acres at the southeast corner of Charleston Boulevard and Lindell Road (APNs 163-01-501-001 and 002), C-1 (Limited Commercial) Zone [PROPOSED: R-4 (High Density Residential)], Ward 1 (Tarkanian) [PRJ-75792].

This approval is subject to the following conditions:

Planning

1. Approval of and conformance to the Conditions of Approval for General Plan Amendment (GPA-74312) and Rezoning (ZON-74313) shall be required, if approved.
2. This approval shall be void two years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.
3. All development shall be in conformance with the site plan, building elevations, and landscape plan, date stamped 05/15/19, except as amended by conditions herein.
4. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
5. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.

Mr. Rodman Jordan
Charlie Rah Rah Irrevocable, et al
SDR-75858 [PRJ-75792] - Page Two
May 16, 2019

6. A technical landscape plan, signed and sealed by a Registered Architect, Landscape Architect, Residential Designer or Civil Engineer, must be submitted prior to or at the same time application is made for a building permit. A permanent underground sprinkler system is required, and shall be permanently maintained in a satisfactory manner; the landscape plan shall include irrigation specifications. Installed landscaping shall not impede visibility of any traffic control device.
7. A fully operational fire protection system, including fire apparatus roads, fire hydrants and water supply, shall be installed and shall be functioning prior to construction of any combustible structures.
8. Sign and record a deed restriction with language determined to be satisfactory by the City Attorney which restricts the use of the site to an age-restricted community for those persons 55 years of age or older, to the full extent of the law.
9. All City Code requirements and design standards of all City Departments must be satisfied, except as modified herein.

Public Works

10. Dedicate 40-feet of right-of-way adjacent to this site for Lindell Road and dedicate a 25-foot radius along with granting a Traffic Signal Chord Easement on the southeast corner of Charleston Boulevard and Lindell Road prior to the issuance of any permits. Additionally, grant a 5-foot Pedestrian Access Easement adjacent to Charleston Boulevard prior to the issuance of building permits for this site.
11. Construct all half-street improvements meeting Current City Standards on Lindell Road including the possible reconstruction of the curb return at the southeast corner of Lindell Road and Charleston Boulevard adjacent to this site including appropriate transition paving, concurrent with the development of this site. Correct all American's with Disabilities Act (ADA) deficiencies and remove all unused driveway cuts, if any, on the sidewalk along Charleston Boulevard adjacent to this site in accordance with code requirements of Title 13.56.040 to the satisfaction of the City Engineer concurrent with development of this site. All existing paving damaged or removed by this development shall be restored at its original location and to its original width concurrent with development of this site.
- ~~12. Concurrent with development of this site, connect to the public sewer line in Charleston Boulevard at a location acceptable to the Sanitary Sewer Section of the Department of Public Works.~~

Mr. Rodman Jordan
Charlie Rah Rah Irrevocable, et al
SDR-75858 [PRJ-75792] - Page Three
May 16, 2019

13. Obtain an Occupancy Permit from the Nevada Department of Transportation (NDOT) for the construction of improvements in the Charleston Boulevard public right-of-way adjacent to this site prior to constructing any improvements within NDOT jurisdiction.
14. All landscaping and private improvements installed with this project shall be situated and maintained so as to not create sight visibility obstructions for vehicular traffic at all development access drives and abutting street intersections.
15. Contact the City Engineer's Office at 702-229-6272 to coordinate the development of this project with the "West Charleston Bus Turnouts" improvement project and any other public improvement projects adjacent to this site. Comply with the recommendations of the City Engineer.
16. A Traffic Impact Analysis must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits, submittal of any construction drawings or the recordation of a Map subdividing this site, whichever may occur first. Comply with the recommendations of the approved Traffic Impact Analysis prior to occupancy of the site. The Traffic Impact Analysis shall also include a section addressing Standard Drawings #234.1 #234.2 and #234.3 to determine additional right-of-way requirements for bus turnouts adjacent to this site, if any; dedicate all areas recommended by the approved Traffic Impact Analysis. All additional rights of way required by Standard Drawing #201.1 for exclusive right turn lanes and dual left turn lanes shall be dedicated prior to or concurrent with the commencement of on site development activities unless specifically noted as not required in the approved Traffic Impact Analysis. Phased compliance will be allowed if recommended by the approved Traffic Impact Analysis. No recommendation of the approved Traffic Impact Analysis, nor compliance therewith, shall be deemed to modify or eliminate any condition of approval imposed by the Planning Commission or the City Council on the development of this site. If the site is deed restricted and developed as senior apartments, then no Traffic Impact Analysis will be required.
17. A Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits or submittal of any construction drawings, whichever may occur first. Provide and improve all drainage ways recommended in the approved drainage plan/study. The developer of this site shall be responsible to construct such neighborhood or local drainage facility improvements as are recommended by the City of Las Vegas Neighborhood Drainage Studies and approved Drainage Plan/Study concurrent with development of this site.

Mr. Rodman Jordan
Charlie Rah Rah Irrevocable, et al
SDR-75858 [PRJ-75792] - Page Four
May 16, 2019

The Notice of Final Action was filed with the Las Vegas City Clerk on May 16, 2019.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert Summerfield". The signature is stylized with a large, looped "R" and a cursive "Summerfield".

Robert Summerfield, AICP[®]
Director
Department of Planning

RTS:PL:clb

cc: Mr. Rodman Jordan
Centura Development
1210 Hinson Street
Las Vegas, Nevada 89102

Mr. David Turner
Baughman & Turner, Inc.
1210 Hinson Street
Las Vegas, Nevada 89102

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: <u>The Lindell</u>	Map ID:	
Firm Name: <u>Baughman & Turner</u>	Engineer: <u>John Gustafson</u>	
Address: <u>1210 Hinson St</u>		
City: <u>Las Vegas</u>	State: <u>NV</u>	Zip: <u>89102</u>
Phone Number: <u>702-870-8771</u>	Fax Number: <u>702-878-2695</u>	
Property Owner: <u>Centura Development</u>		
Address: <u>1210 Hinson St</u>		
City: <u>Las Vegas</u>	State: <u>NV</u>	Zip: <u>89102</u>
Reviewed By:	Date Received:	Date Accepted for Review:

The following checklist is intended as a guide for the engineer preparing a Technical Drainage Study to submit to the local entity and Clark County Regional Flood Control District (if necessary). The listed items are the minimum information required prior to the entity performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual (MANUAL).

This document is intended as an aid in preparing Technical Drainage Studies. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

If items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT

- | Yes | No | |
|-------------------------------------|--------------------------|--|
| ☒ | ☐ | Design Manual Standard Form 1 with the engineer's seal and signature. |
| ☒ | ☐ | Design Manual Standard Form 4 . |
| ☒ | ☐ | 2 copies of the 24" x 36" Drainage Plan. |
| ☒ | ☐ | A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge. |

II. MAPS AND EXHIBITS

- | Yes | No | |
|-------------------------------------|--------------------------|---|
| ☒ | ☐ | A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated. |
| ☒ | ☐ | A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated. |

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

Yes	No	
☒	☐	Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.
☒	☐	On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs.
☒	☐	Vicinity Map with local and major cross streets identified and a north arrow.

III. DRAINAGE PLAN

Yes	No	
☒	☐	Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada.
☒	☐	Minimum scale: 1" = 60'.
☒	☐	Project name.
☒	☐	Vicinity Map with local and major cross streets.
☒	☐	Revision box.
☒	☐	North arrow and bar scale.
☒	☐	Engineer's/consultant's address and phone number.
☒	☐	Elevation datum and benchmark.
☒	☐	Legend for symbols and abbreviations.
☒	☐	Cut/fill scarps, where applicable.
☒	☐	Street names, grades, widths.
☒	☐	Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.
☒	☐	Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate.
☒	☐	Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
☒	☐	Proposed typical street sections.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
☒	☐	Streets with off-set crowns.
☒	☐	Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
☒	☐	Property lines.
☒	☐	Right-of-way lines and widths, existing and proposed.
☒	☐	Existing improvements and their elevations.
☒	☐	Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points.
☒	☐	Concentration points and drainage flow direction with Q_{100} and V_{100} and D_{100} in streets.
☒	☐	Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
☒	☐	Location and cross-section of street capacity calculations.
☐	☐	Cross-sectional detail for channels, including cutoff wall locations.
☒	☐	Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk, ditches, swales, storm drain systems, unimproved and improved channels, and culverts, etc.) stating size, material, shape, and slope with plan and profile and HGL calculations.
☒	☐	Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement.
☐	☐	Location and detail of existing, proposed, and future block wall openings. Minimum size is 16" x 48". Wrought iron gate is required for flows > 10 cfs.
☒	☐	Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.
☒	☐	Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit.
☒	☐	Building and/or lot numbers.
☒	☐	Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
☒	☐	Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

- | Yes | No | |
|-------------------------------------|--------------------------|--|
| ☒ | ☐ | For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE. |
| ☐ | ☐ | Appropriately elevated "humps" 6 inches above the 100 year water surface elevation at site accesses where the intent is to protect the site from the Q_{100} flows. |
| ☒ | ☐ | Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent. |
| ☒ | ☐ | Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required). |

IV. HYDROLOGIC ANALYSIS

- | Yes | No | |
|-------------------------------------|--------------------------|--|
| ☒ | ☐ | Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated. |
| ☒ | ☐ | Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models. |
| ☒ | ☐ | Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models. |
| ☒ | ☐ | Use of correct precipitation values in and around the McCarran Airport rainfall area. |
| ☒ | ☐ | A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations. |
| ☒ | ☐ | A summary table of stormwater flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where applicable. |
| ☒ | ☐ | Copies of supporting technical information referenced from a previously approved study and a statement accepting these results. |
| ☒ | ☐ | On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law. |
| ☒ | ☐ | Calculation for impervious area for parking lots and LIDs (if required). |

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
<u>N/A</u>	☐	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
<u>1</u>	☐	Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. $Q_{100} d \times v \leq 8$. $Q_{10} d \times v \leq 6$ and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
<u>✓</u>	☐	A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
<u>N/A</u>	☐	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
<u>✓</u>	☐	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
<u>✓</u>	☐	Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, whichever is greater.
<u>N/A</u>	☐	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
<u>✓</u>	☐	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
<u>✓</u>	☐	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
<u>✓</u>	☐	The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.
<u>✓</u>	☐	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2



CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

The following checklist is intended as a supplemental guide for the engineer preparing a Technical Drainage Study submittal to the City of Las Vegas. This supplement focuses on requirements specific to the City of Las Vegas. The requirements presented are in addition to the Clark County Regional Flood Control District (CCRFCD) Manual Standard Form 2. The listed items are the minimum information required prior to the City performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the CCRFCD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFCD Standard Form 2 prior to the City accepting a new drainage study for review. The engineer must contact the Flood Control Section at (702) 229-6541 to schedule a submittal appointment.

If items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT		
Yes	No	
		A notarized letter from the adjacent property owner(s) allowing off-site grading. (A copy of the letter must be received prior to final acceptance of the drainage study.)
✓		Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions.
✓		An electronic copy of the complete submittal is required to be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output device replicating your submittal. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats. If figures are in color, they must be scanned in color and saved as a separate file. _____ by initial here, the engineer on record acknowledges that the electronic copy is an identical replicate of the original hard copy submitted to the City of Las Vegas.

II. GRADING PLAN INFORMATION		
Yes	No	
✓		(1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer.
		Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street. Note: Proposed top of curb elevations must be provided for both sides of roadways even if only half street construction is required.
		Label existing topography at a minimum 5 foot elevation interval including adjacent developments, finished floor elevations of existing buildings and top of existing curbs extending 100 feet around the perimeter of the site. (*Measured from the centerline of the adjacent roadway.)

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

II. GRADING PLAN INFORMATION		
Yes	No	
		Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains.
✓		All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
		Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met.
		Back of lot elevations and lot drainage pattern for all lots including common lots.
		Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
		This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
		Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

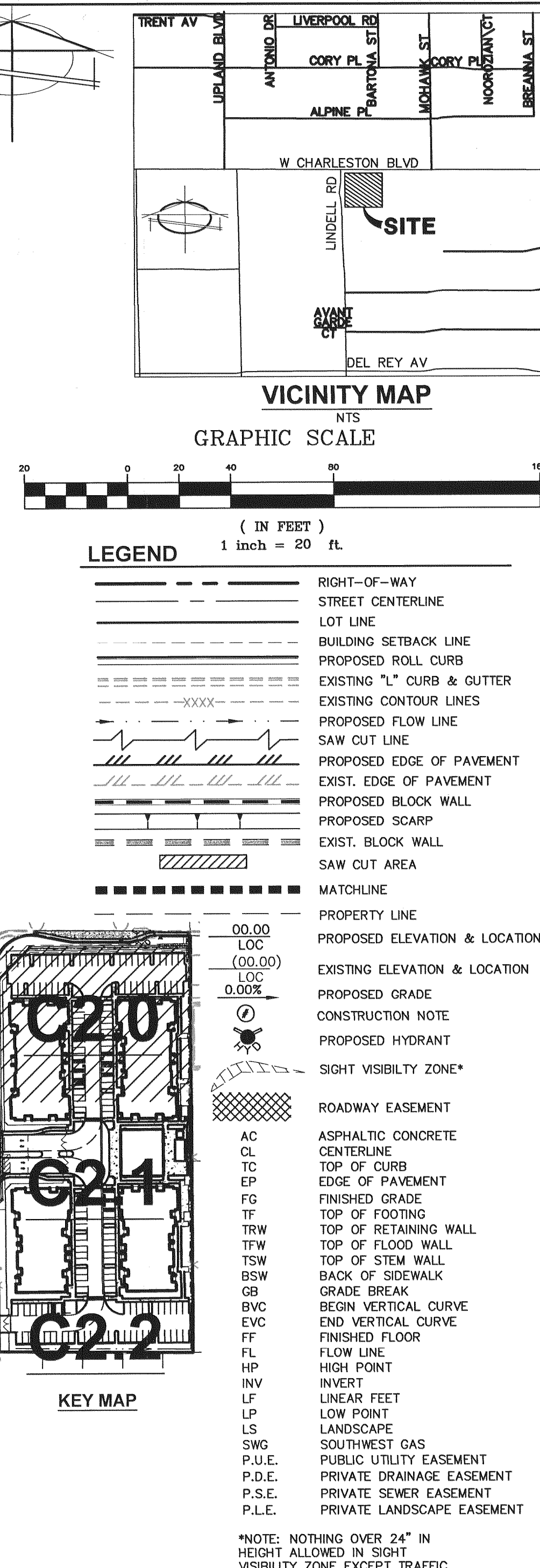
III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
✓		Concrete valley gutters are required in parking lots with slopes less than 1 percent. Slopes through cul-de-sac must be at a 1 percent minimum where flow is drained through the cul-de-sac.
		Ten-foot wide public drainage easements to be privately maintained are allowed for flow less than 20 cfs. The depth of flow entering the easement must be checked using the submerged weir calculation.
✓		The limits of the flood zones and the base flood elevations (BFE) must be shown on all grading plans for all developments within a Special Flood Hazard Zone A, AO, AE, etc.
		Minimum finish floor elevation is 6 inches above highest adjacent top of curb. Finish floor calculations must include allowances for super elevations on curves and velocity head for tee intersections.
✓		Finished floor elevations for buildings adjacent to public drainage easements must be a minimum of 18 inches above the Q100 weir of submerged weir elevation, whichever is greater.

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
N/A		Lots with "B and C Type Drainage" that drain from one lot to another through a drainage easement shall be required to install an underground nuisance drainage system or a 2-foot valley gutter. 16" x 24" minimum block wall openings are required for both options.
		Bubblers are required across 80 foot and greater ROW streets. When flows exceed 10 cfs, bubblers larger than 18 inches will be required up to a maximum of 36". Inlets must be sized to match the pipe size provided.

- Contact the Flood Control Section regarding the drainage study review fee. These fees are payable at the time of submittal.
- The Drainage Study must be conditionally approved prior to submitting improvement plans to the Civil and Planning Development of the Department of Building and Safety for review.

This document is intended as an **aid** in preparing Technical Drainage Studies for the City of Las Vegas. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all-inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.



#	ITEM	UNIT	QUANTITY	
			PUBLIC	PRIVATE
①	INSTALL "A" CURB PER CCAUSD #219.	LF	—	267
②	INSTALL "L" CURB PER CCAUSD #216.	LF	488	—
③	INSTALL SIDEWALK PER CCAUSD #234.	SF	—	—
④	CONSTRUCT 3" MIN AC PAVEMENT OVER 4" MIN TYPE II A.G. BASE.	SF	—	—
⑤	CONSTRUCT 2" MIN AC PAVEMENT OVER 4" MIN TYPE II A.G. BASE.	SF	—	—
⑥	INSTALL 2" CURB CUT PER DETAIL "1" SHEET C2.3.	EA	—	3
⑦	INSTALL SIDEWALK DRAIN PER CCAUSD #236	EA	1	—
⑧	INSTALL TRASH ENCLOSURE PER ARCHITECTURAL PLANS	EA	—	1
⑨	INSTALL RIP-RAP PER SECTION 1500: STRUCTURAL BEST MANAGEMENT PRACTICES AS REFERENCED WITHIN THE CLARK COUNTY FLOOD CONTROL DISTRICT (COFCD) HYDROLOGY AND DRAINAGE DESIGN MANUAL (HCDDM), D50=3" THICKNESS=6"	SY	—	77
⑩	INSTALL BUS TURNOUT PER CCAUSD #234.1	SF	2572	—
⑪	CONSTRUCT COMMERCIAL DRIVEWAY PER CCAUSD #225 & #222.1	EA	2	—
⑫	INSTALL 8" CROSS GUTTER PER CCAUSD #228	EA	1	—

#	ITEM	UNIT	QUANTITY	
			PUBLIC	PRIVATE
13	INSTALL TYPE "A" DROP INLET PER CCAUSD #411	EA	1	—
14	INSTALL 48" TYPE IA STORMDRAIN MANHOLE PER USDOCA No. 405.2.	EA	3	—
15	INSTALL 24" RCP STORM DRAIN.	LF	588	105

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 CLARK COUNTY 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 CLARK COUNTY BUILDING ADMINISTRATIVE CODE 24.40 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 EXCEPTION TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO NEVADA 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.

THAT PORTION OF THE EAST HALF (E 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M. LYING NORTHERLY OF CHARLESTON HEIGHTS TRACT NO. 34, AS SHOWN BY MAP THEREOF ON FILE IN BOOK 7 OF PLATS, PAGE 87, IN THE OFFICE OF THE COUNTY RECORDER OF CLARK COUNTY, NEVADA.

EXCEPTING THEREFROM THAT PORTION AS CONVEYED TO THE CITY OF LAS VEGAS BY THAT CERTAIN GRANT DEED RECORDED JANUARY 13, 1965, IN BOOK 598 OF OFFICIAL RECORDS, CLARK COUNTY, NEVADA RECORDS AS DOCUMENT NO. 481396.

AND

THAT PORTION OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M. LYING NORTHERLY OF CHARLESTON HEIGHTS TRACT NO. 34, AS SHOWN BY MAP THEREOF ON FILE IN BOOK 7 OF PLATS, PAGE 87, IN THE OFFICE OF THE COUNTY RECORDER OF CLARK COUNTY, NEVADA.

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JANUARY 13, 1965, IN BOOK 598 OF OFFICIAL RECORDS, CLARK
COUNTY, NEVADA RECORDS AS DOCUMENT NO. 481396.

CONTAINING 4.73 ACRES MORE OR LESS.

NORTH 00°06'30" WEST - THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 6, TOWNSHIP 21 SOUTH, RANGE 61 EAST, M.D.M. AS SHOWN ON PLAT MAP "HINSON HEIGHTS" IN BOOK 2 OF PLATS PAGE 82, CLARK COUNTY RECORDS, NEVADA.

CITY OF LAS VEGAS BENCHMARK 8LV10 1N4 - BEING A RIVET
AND PLATE IN TOP OF CURB, SOUTHEAST CORNER OF LINDELL
ROAD AND CHARLESTON BOULEVARD.

THE FLOOD INSURANCE RATE MAP, CLARK COUNTY
NEVADA, COMMUNITY PANEL NO. 32003C2165D
(EFFECTIVE DATE SEPTEMBER 27, 2002) PUBLISHED BY
THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA),
INDICATES THAT THE SITE LOCATED IN A ZONE X. A
ZONE X IS DETERMINED TO BE AN AREA OUTSIDE THE
0.2% ANNUAL CHANCE FLOODPLAIN.

PROPERTY OWNER IS RESPONSIBLE TO MAINTAIN THE
BEST MANAGEMENT PRACTICES
SUCH AS BUT NOT LIMITED TO THE REMOVAL OF
ACCUMULATED SEDIMENT AND DEBRIS AND CARE OF
THE VEGETATION.

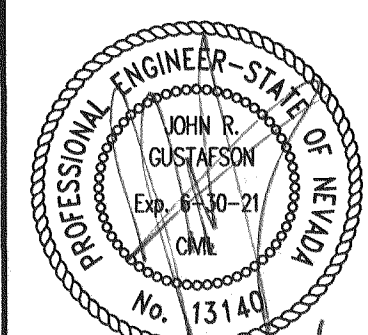
UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN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

Call before you Dig
Avoid cutting underground
utility lines. It's costly.
Call
811
OR
1-800-227-2600



FAST

Call
 **before you**
UnderGround
1-702-432-5300
FREeway and ARTERIAL
SYSTEM OF TRANSPORTATION



I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS, NEVADA.

JOHN R. GUSTAFSON, P.E. 1314C

THE LINDELL-SENIOR LIVING GRADING PLAN 1

SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B.& M.
CITY OF LAS VEGAS NEVADA
APN 163-01-501-001, 002

APN 163-01-501-001, 002

BAUGHMAN & TURNER, INC.

PREPARED FOR :

PREPARED FOR :
CENTURA DEVELOPMENT - CHARLESTON & LINDELL

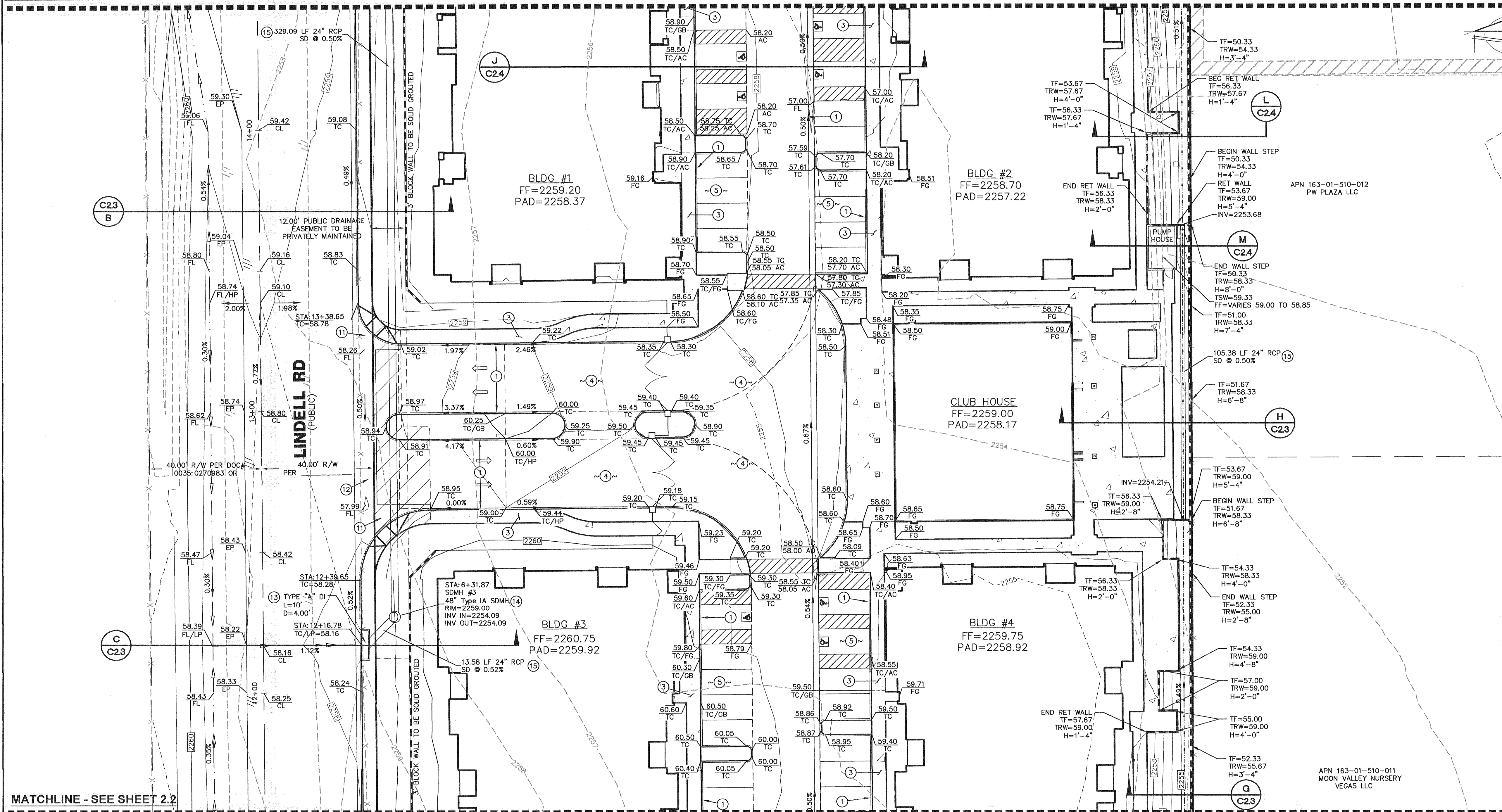
DATE CREATED NO.	REV	REVISIONS	APPRO INITIALS	DATE APPROVED
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SHE

C2.0

3 OF 10
PROJ. NO.
C231

MATCHLINE - SEE SHEET 2.0



MATCHLINE - SEE SHEET 2.2

CONSTRUCTION NOTES

#	ITEM	UNIT	QUANTITY	
			PUBLIC	PRIVATE
1	INSTALL "A" CURB PER CCAUSD #219.	LF	-	267
2	INSTALL "L" CURB PER CCAUSD #216.	LF	488	-
3	INSTALL SIDEWALK PER CCAUSD #234.	SF	-	-
4	CONSTRUCT 3" MIN AC PAVEMENT OVER 4" MIN TYPE II A.G. BASE.	SF	-	-
5	CONSTRUCT 2" MIN AC PAVEMENT OVER 4" MIN TYPE II A.G. BASE.	SF	-	-
6	INSTALL 2" CURB CUT PER DETAIL "1" SHEET C2.3.	EA	-	3
7	INSTALL SIDEWALK DRAIN PER CCAUSD #236	EA	1	-
8	INSTALL TRASH ENCLOSURE PER ARCHITECTURAL PLANS	EA	-	1
9	INSTALL RIP-RAP PER SECTION 1500; STRUCTURAL BEST MANAGEMENT PRACTICES AS REFERENCED WITHIN THE CLARK COUNTY FLOOD CONTROL DISTRICT (CCFCD) HYDROLOGIC AND DRAINAGE DESIGN MANUAL (HDDM), D50=3" THICKNESS=6"	SY	-	77
10	INSTALL BUS TURNOUT PER CCAUSD #234.1	SF	2572	-
11	CONSTRUCT COMMERCIAL DRIVEWAY PER CCAUSD #225 & #222.1	EA	2	-
12	INSTALL 8" CROSS GUTTER PER CCAUSD #228	EA	1	-

STORM DRAIN NOTES

#	ITEM	UNIT	QUANTITY	
			PUBLIC	PRIVATE
13	INSTALL TYPE "A" DROP INLET PER CCAUSD #411	EA	1	-
14	INSTALL 48" TYPE IA STORMDRAIN MANHOLE PER USDOCA No. 405.2.	EA	3	-
15	INSTALL 24" RCP STORM DRAIN.	LF	588	105

BASIS OF BEARINGS

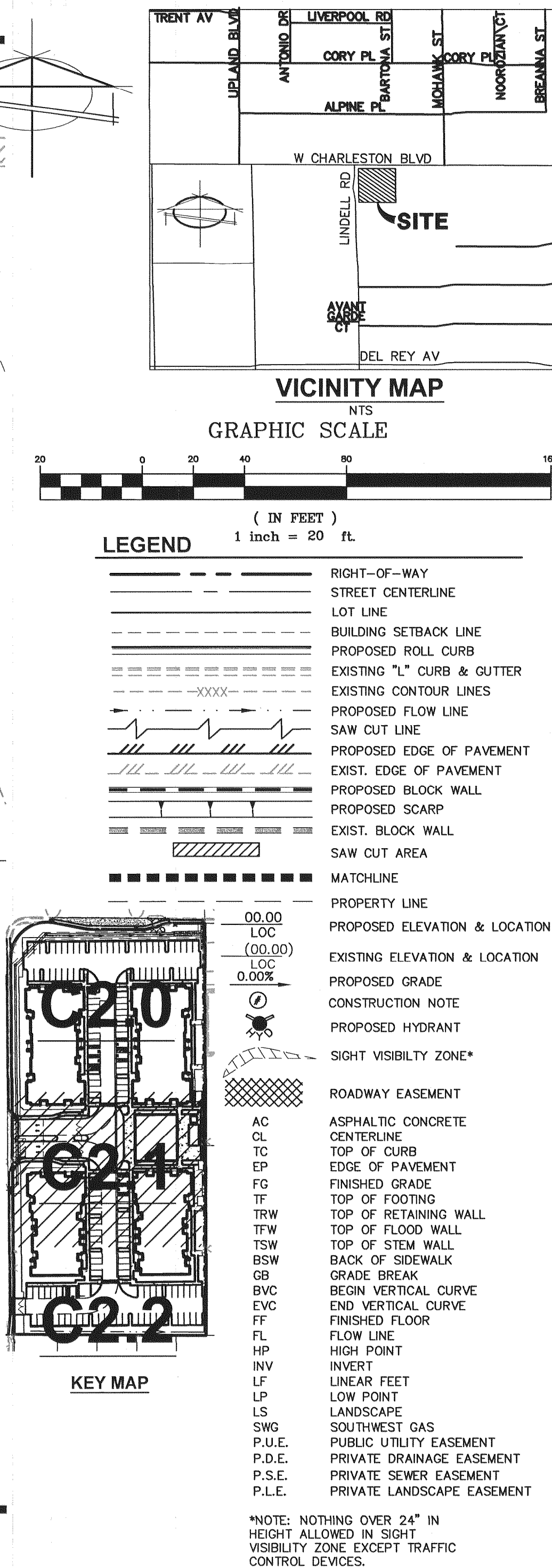
NORTH 00°06'30" WEST - THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 6, TOWNSHIP 21 SOUTH, RANGE 61 EAST, M.D.M. AS SHOWN ON PLAT MAP "HINSON HEIGHTS" IN BOOK 2 OF PLATS, PAGE 82, CLARK COUNTY RECORDS, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK BLV10 IN4 - BEING A RIVET AND PLATE IN TOP OF CURB, SOUTHEAST CORNER OF LINDELL ROAD AND CHARLESTON BOULEVARD.

687.764 METERS
NAVD 88 DATUM

2256.44 FEET



ENGINEERS CERTIFICATE

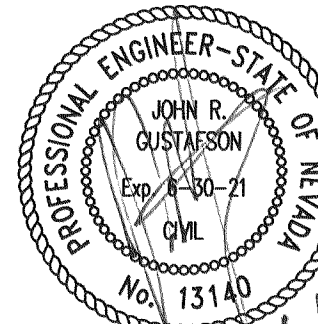
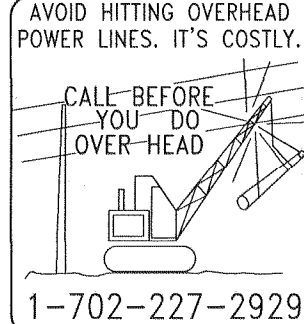
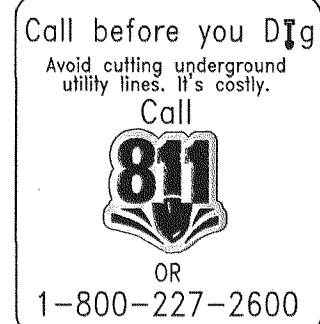
I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS, NEVADA.

JOHN R. GUSTAFSON, P.E. 13140

DATE

DISCLAIMER NOTE

UTILITY LOCATIONS SHOWN HEREON 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 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.



THE LINDELL-SENIOR LIVING GRADING PLAN 2

SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M. CITY OF LAS VEGAS

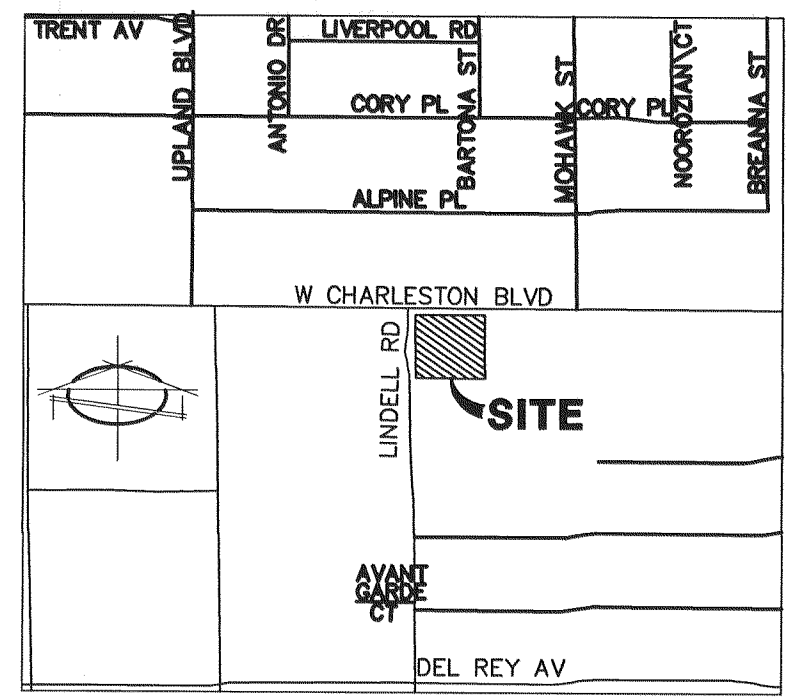
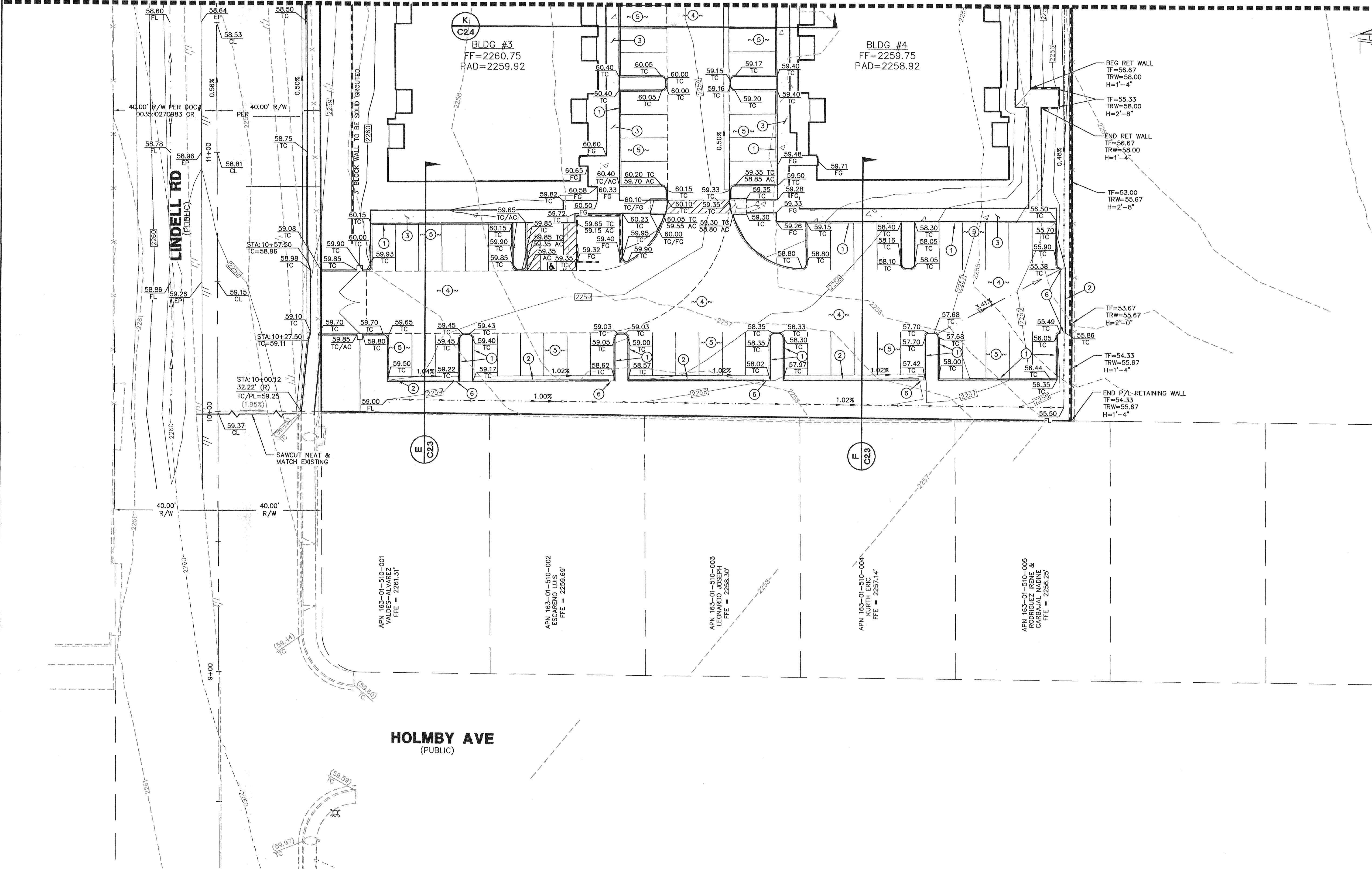
APN 163-01-501-001, 002

SHEET

C2.1

4 OF 10
PROJ. NO. C221

MATCHLINE - SEE SHEET 2.1



VICINITY MAP

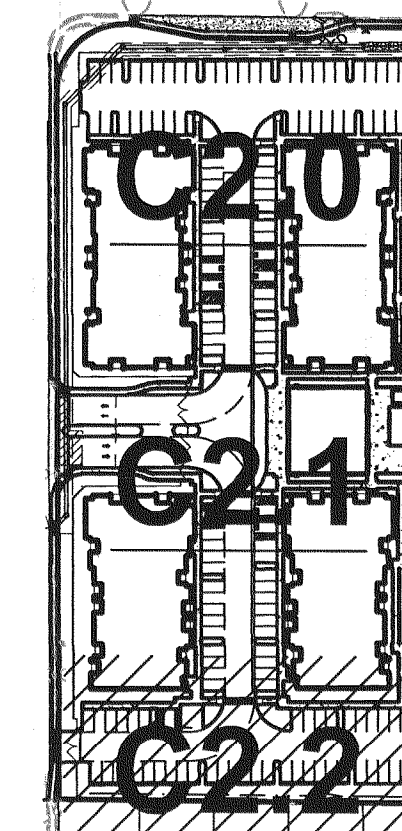
GRAPHIC SCALE



(IN FEET)
1 inch = 20 ft.

LEGEND

- RIGHT-OF-WAY
- STREET CENTERLINE
- LOT LINE
- BUILDING SETBACK LINE
- PROPOSED ROLL CURB
- EXISTING "L" CURB & GUTTER
- EXISTING CONTOUR LINES
- PROPOSED FLOW LINE
- SAW CUT LINE
- PROPOSED EDGE OF PAVEMENT
- EXIST. EDGE OF PAVEMENT
- PROPOSED BLOCK WALL
- PROPOSED SCARP
- EXIST. BLOCK WALL
- SAW CUT AREA
- MATCHLINE
- PROPERTY LINE
- PROPOSED ELEVATION & LOCATION
- EXISTING ELEVATION & LOCATION
- PROPOSED GRADE
- CONSTRUCTION NOTE
- PROPOSED HYDRANT
- SIGHT VISIBILITY ZONE*
- ROADWAY EASEMENT
- AC ASPHALTIC CONCRETE
- CL CENTERLINE
- TC TOP OF CURB
- EP EDGE OF PAVEMENT
- FG FINISHED GRADE
- TRW TOP OF RETAINING WALL
- TSW TOP OF FLOOD WALL
- BSW TOP OF STEM WALL
- GB BACK OF SIDEWALK
- GB GRADE BREAK
- BVC BEGIN VERTICAL CURVE
- EVC END VERTICAL CURVE
- FF FINISHED FLOOR
- FL FLOW LINE
- HP HIGH POINT
- INV INVERT
- LF LINEAR FEET
- LP LOW POINT
- LS LANDSCAPE
- SWG SOUTHWEST GAS
- P.U.E. PUBLIC UTILITY EASEMENT
- P.D.E. PRIVATE DRAINAGE EASEMENT
- P.S.E. PRIVATE SEWER EASEMENT
- P.L.E. PRIVATE LANDSCAPE EASEMENT



KEY MAP

*NOTE: NOTHING OVER 24" IN HEIGHT ALLOWED IN SIGHT VISIBILITY ZONE EXCEPT TRAFFIC CONTROL DEVICES.

ENGINEERS CERTIFICATE

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS, NEVADA.

JOHN R. GUSTAFSON, P.E. 13140

DATE

CONSTRUCTION NOTES

#	ITEM	UNIT	QUANTITY
1	INSTALL "A" CURB PER CCAUSD #219.	LF	267
2	INSTALL "L" CURB PER CCAUSD #216.	LF	488
3	INSTALL SIDEWALK PER CCAUSD #234.	SF	-
4	CONSTRUCT 3" MIN AC PAVEMENT OVER 4" MIN TYPE II A.G. BASE.	SF	-
5	CONSTRUCT 2" MIN AC PAVEMENT OVER 4" MIN TYPE II A.G. BASE.	SF	-
6	INSTALL 2' CURB CUT PER DETAIL "1" SHEET C2.3.	EA	3
7	INSTALL SIDEWALK DRAIN PER CCAUSD #236	EA	1
8	INSTALL TRASH ENCLOSURE PER ARCHITECTURAL PLANS	EA	1
9	INSTALL RIP-RAP PER SECTION 1500: STRUCTURAL BEST MANAGEMENT PRACTICES AS REFERENCED WITHIN THE CLARK COUNTY FLOOD CONTROL DISTRICT (CCFCD) HYDROLOGIC AND DRAINAGE DESIGN MANUAL (HDDM), D50=3" THICKNESS=6"	SY	77
10	INSTALL BUS TURNOUT PER CCAUSD #234.1	SF	2572
11	CONSTRUCT COMMERCIAL DRIVEWAY PER CCAUSD #225 & #222.1	EA	2
12	INSTALL 8" CROSS GUTTER PER CCAUSD #228	EA	1

STORM DRAIN NOTES

#	ITEM	UNIT	QUANTITY
13	INSTALL TYPE "A" DROP INLET PER CCAUSD #411	EA	1
14	INSTALL 48" TYPE 1A STORMDRAIN MANHOLE PER USDCCA No. 405.2.	EA	3
15	INSTALL 24" RCP STORM DRAIN.	LF	588

BASIS OF BEARINGS

NORTH 00°06'30" WEST - THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 6, TOWNSHIP 21 SOUTH, RANGE 61 EAST, W.D.M. AS SHOWN ON PLAT MAP "HINSON HEIGHTS" IN BOOK 2 OF PLATS, PAGE 82, CLARK COUNTY RECORDS, NEVADA.

BENCHMARK

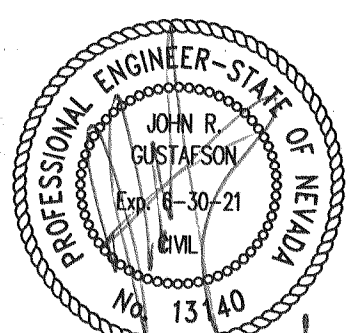
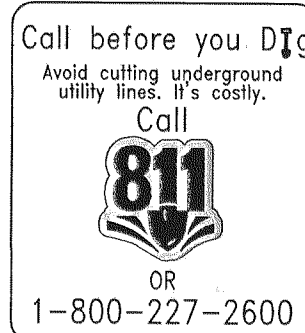
CITY OF LAS VEGAS BENCHMARK BLV10 1N4 - BEING A RIVET AND PLATE IN TOP OF CURB, SOUTHEAST CORNER OF LINDELL ROAD AND CHARLESTON BOULEVARD.

687.764 METERS NAVD 88 DATUM

2256.44 FEET

DISCLAIMER NOTE

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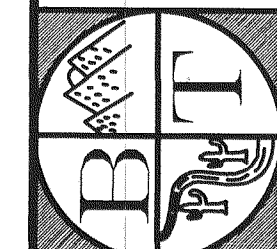
THE LINDELL-SENIOR LIVING GRADING PLAN 3

SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M. CITY OF LAS VEGAS

APN 163-01-501-001, 002

BAUGHMAN & TURNER, INC.

CIVIL ENGINEERS LAND PLANNERS LAND SURVEYORS
1210 HINSON STREET LAS VEGAS, NEVADA 89102
PHONE: (702) 870-8771 FAX: (702) 878-2695



PREPARED FOR :
CENTURA DEVELOPMENT - CHARLESTON & LINDELL
1210 HINSON ST
LAS VEGAS, NV 89102
(702) 901-3183

DATE: 8/12/2019

DESIGN: ---

DRAWN: ---

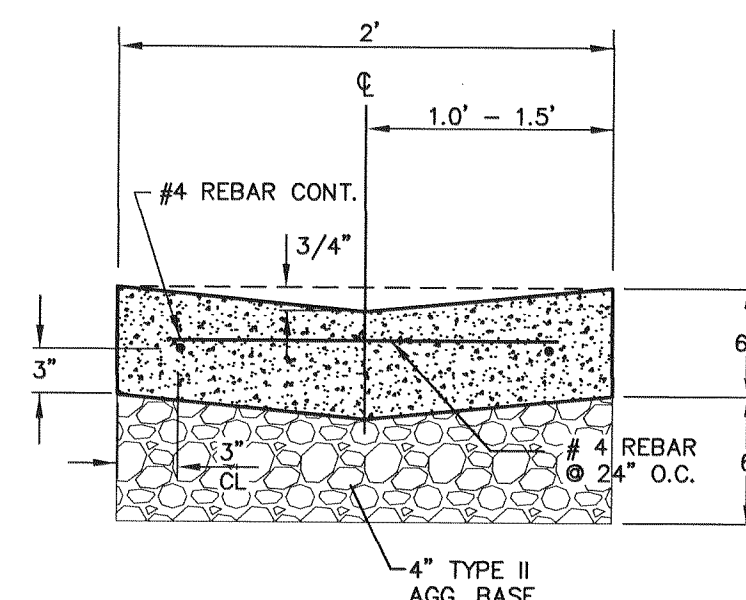
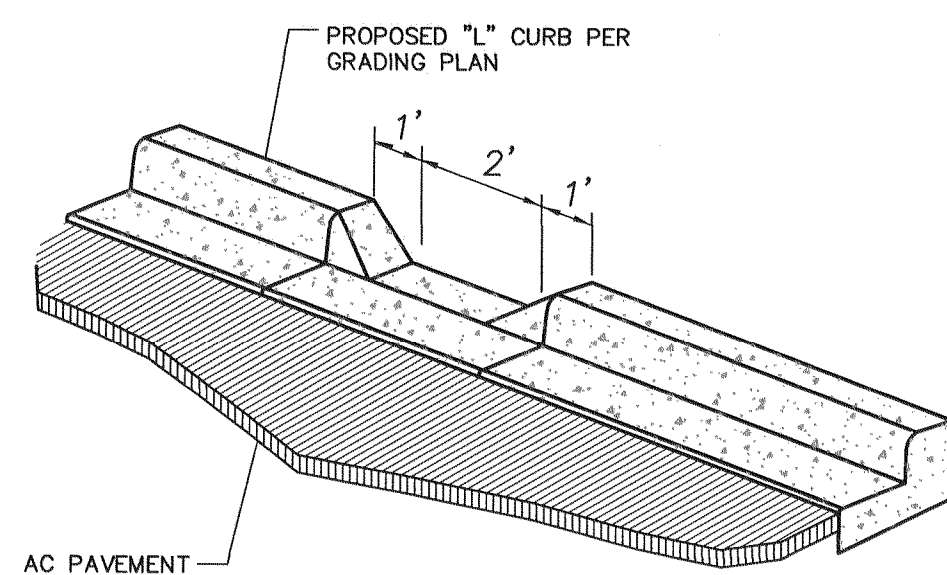
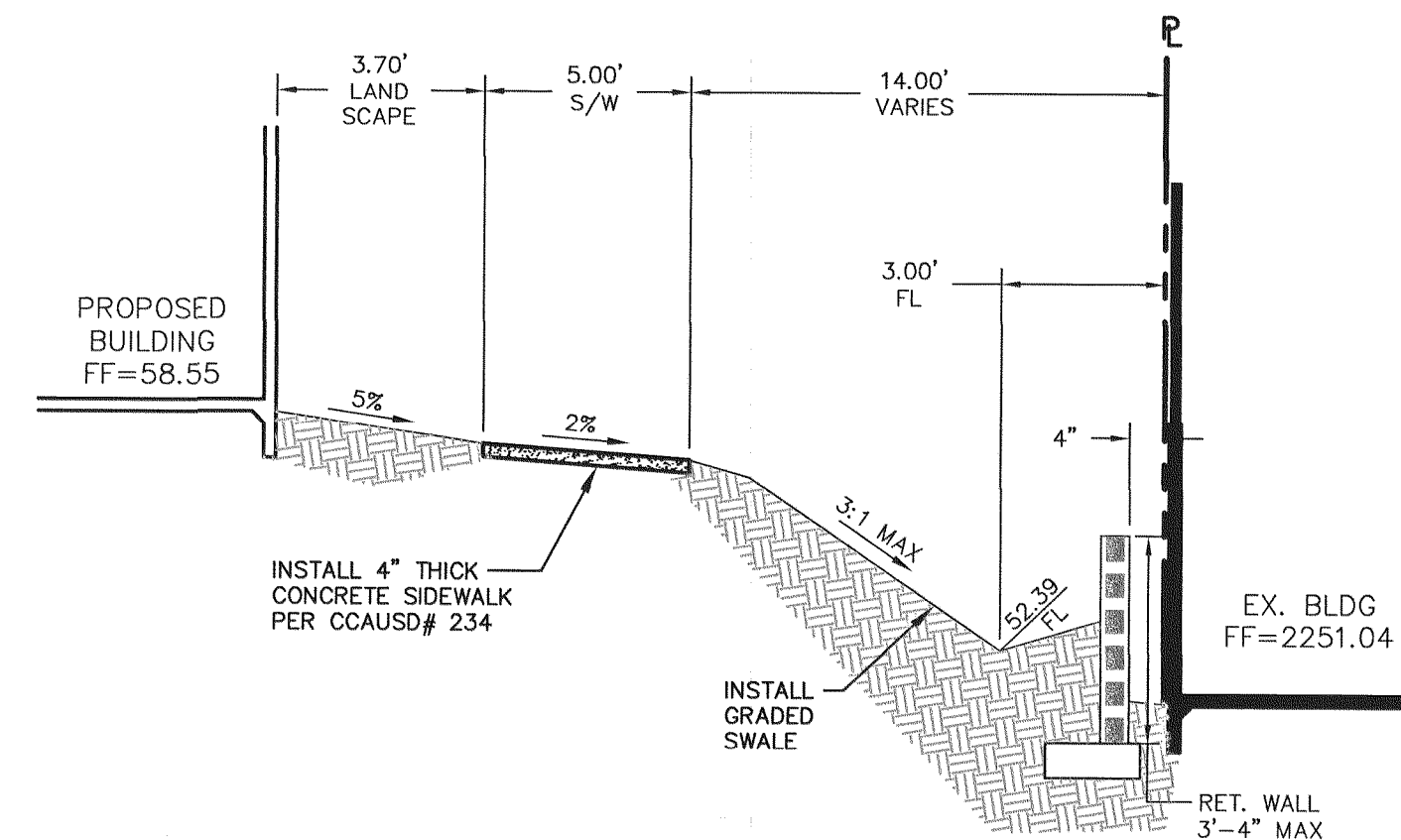
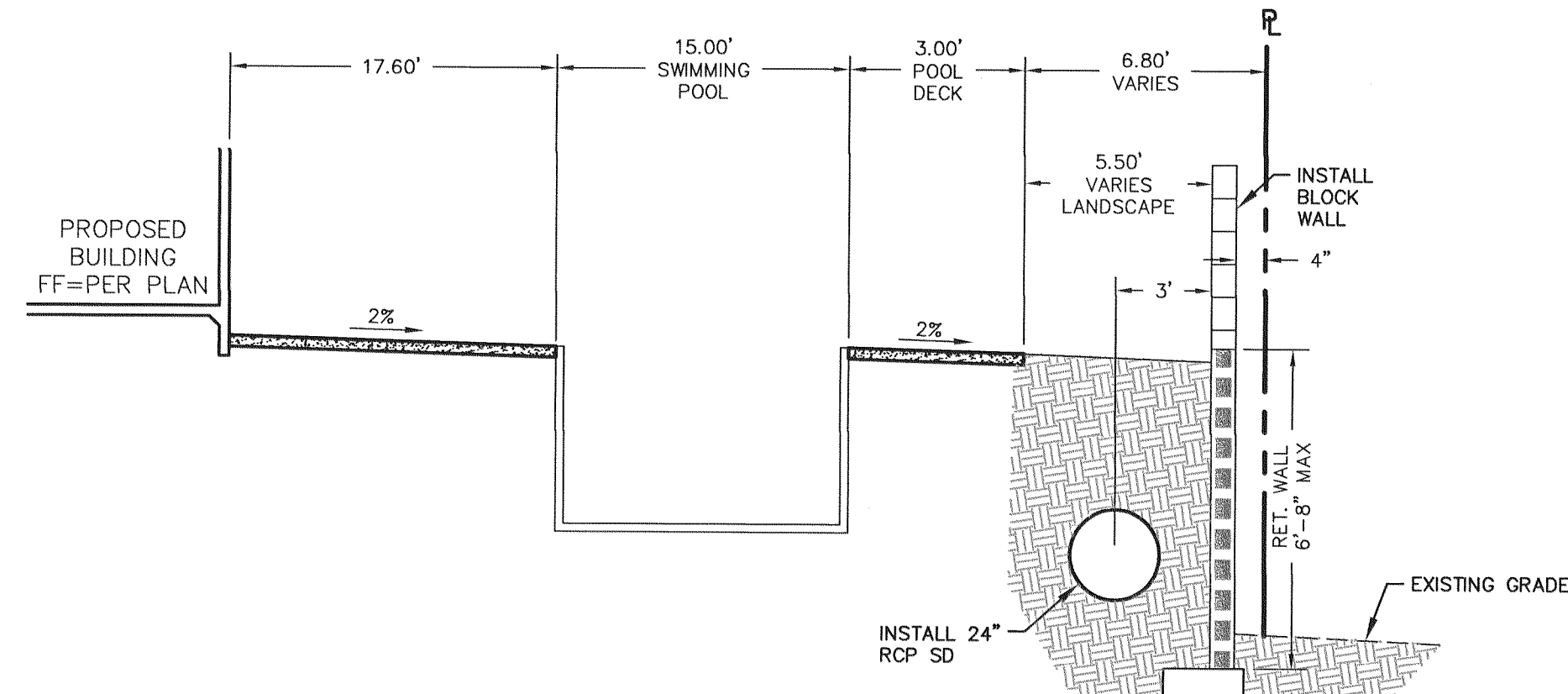
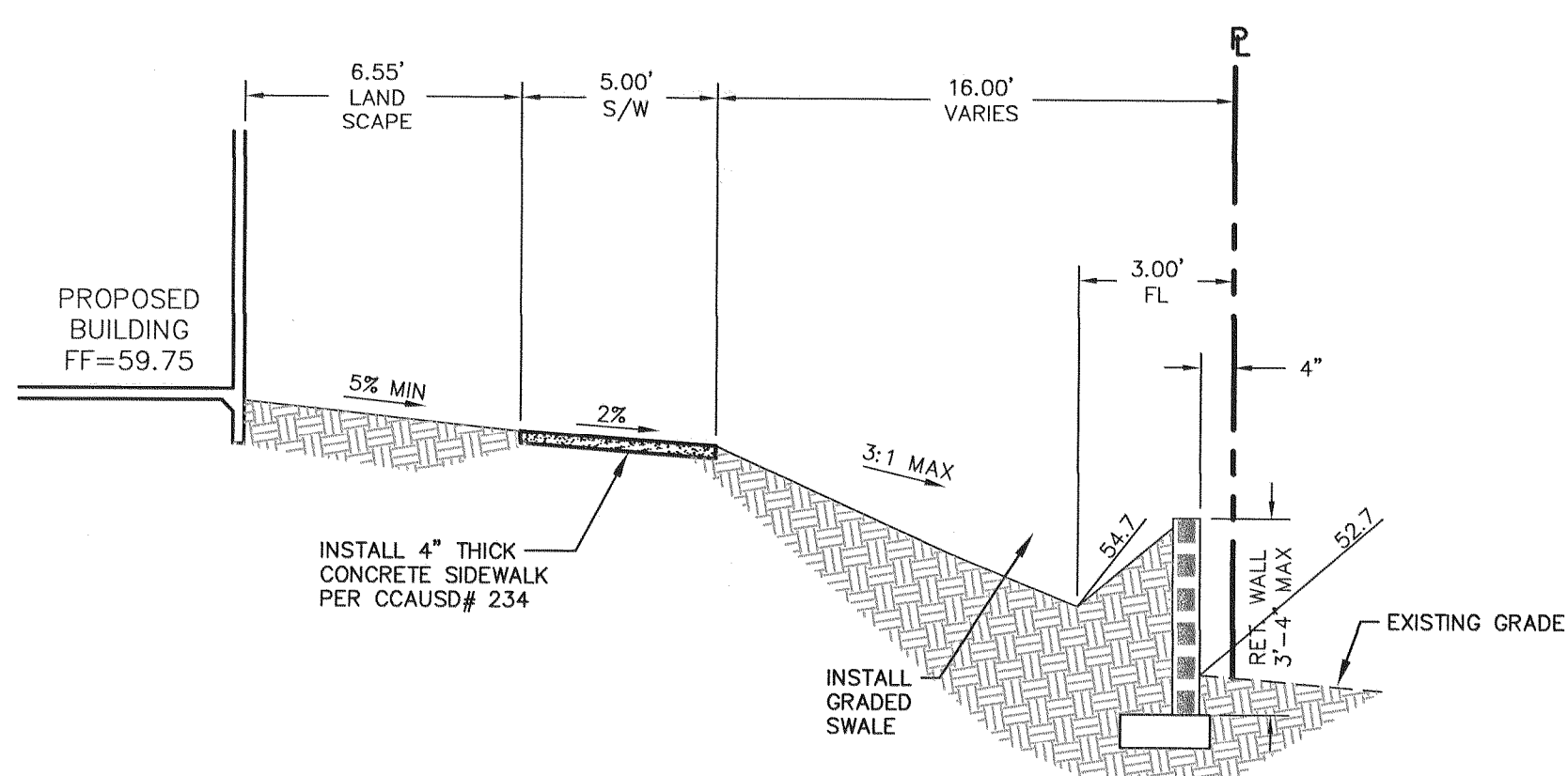
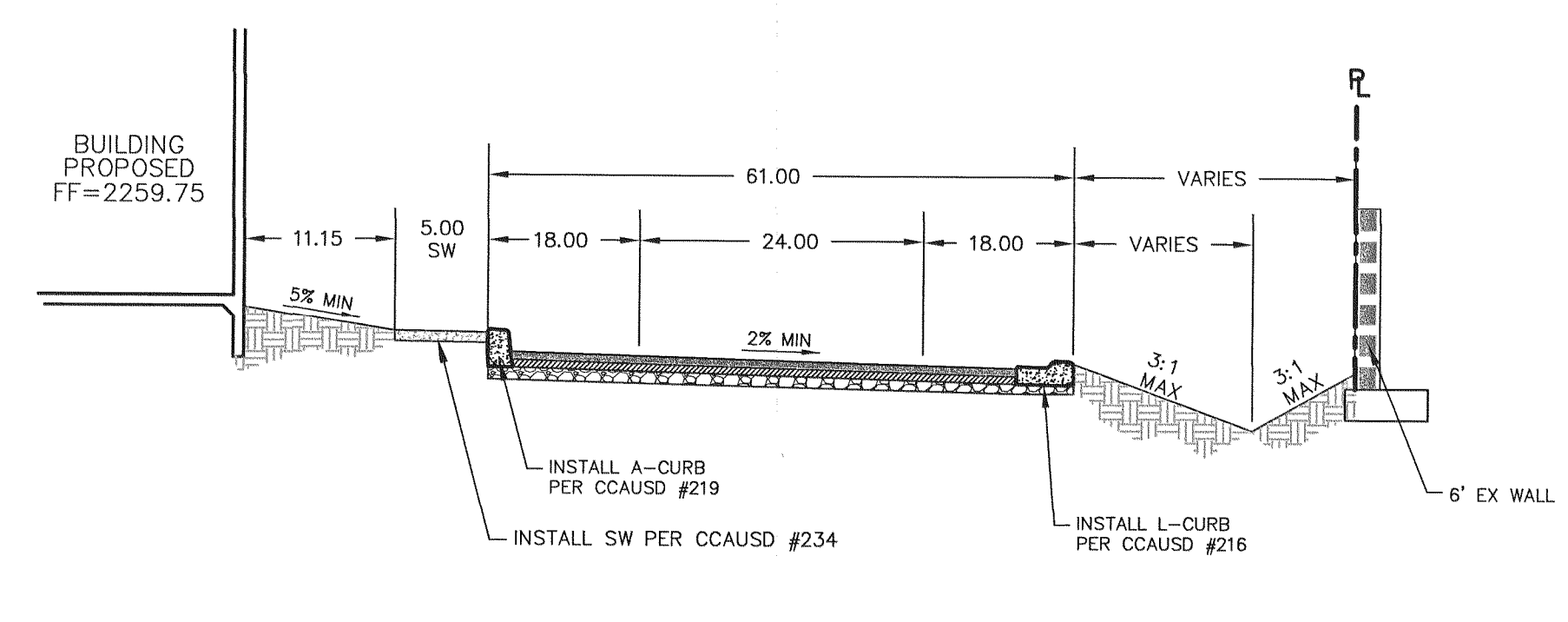
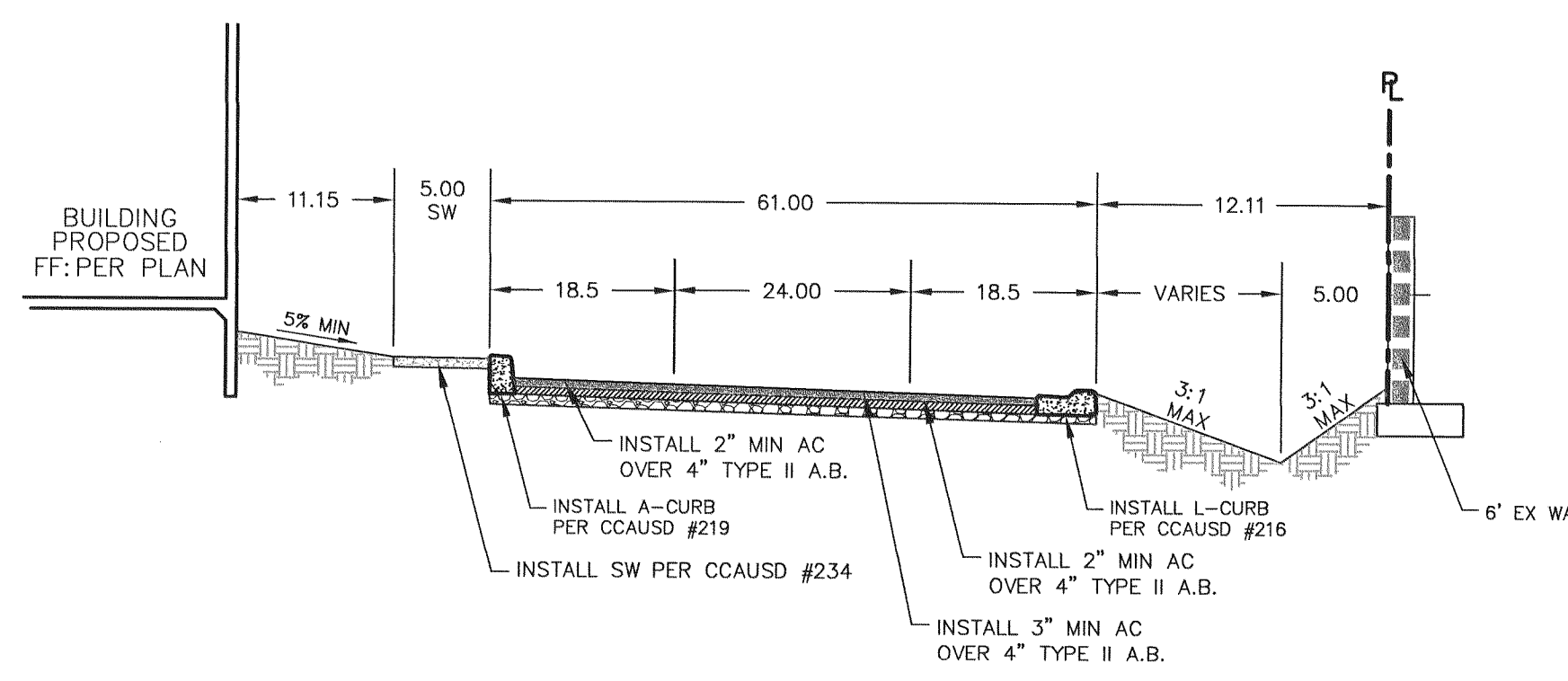
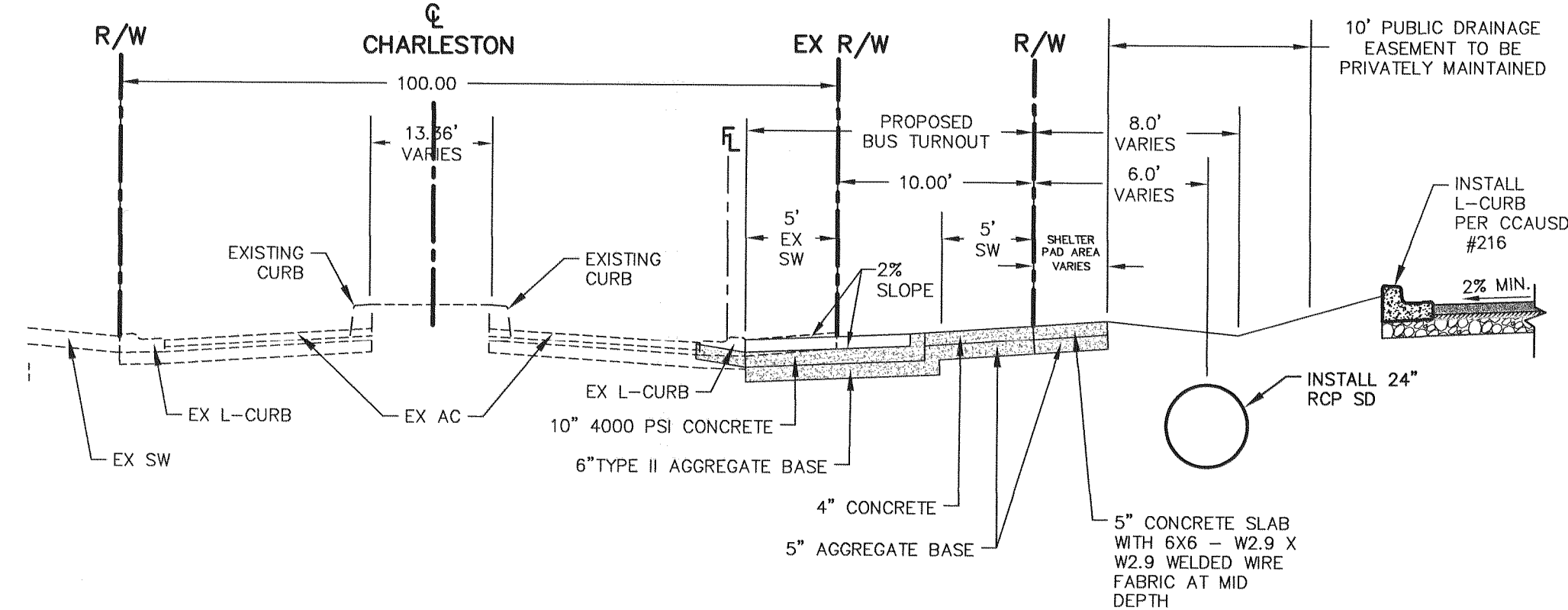
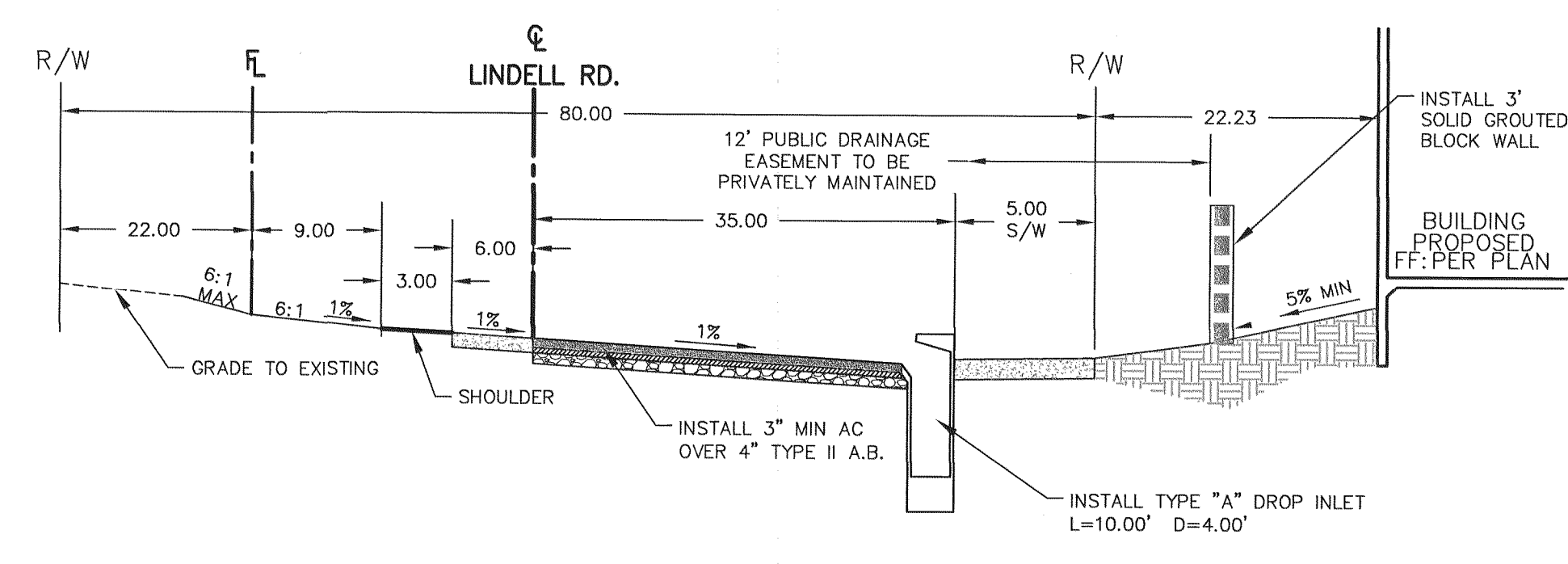
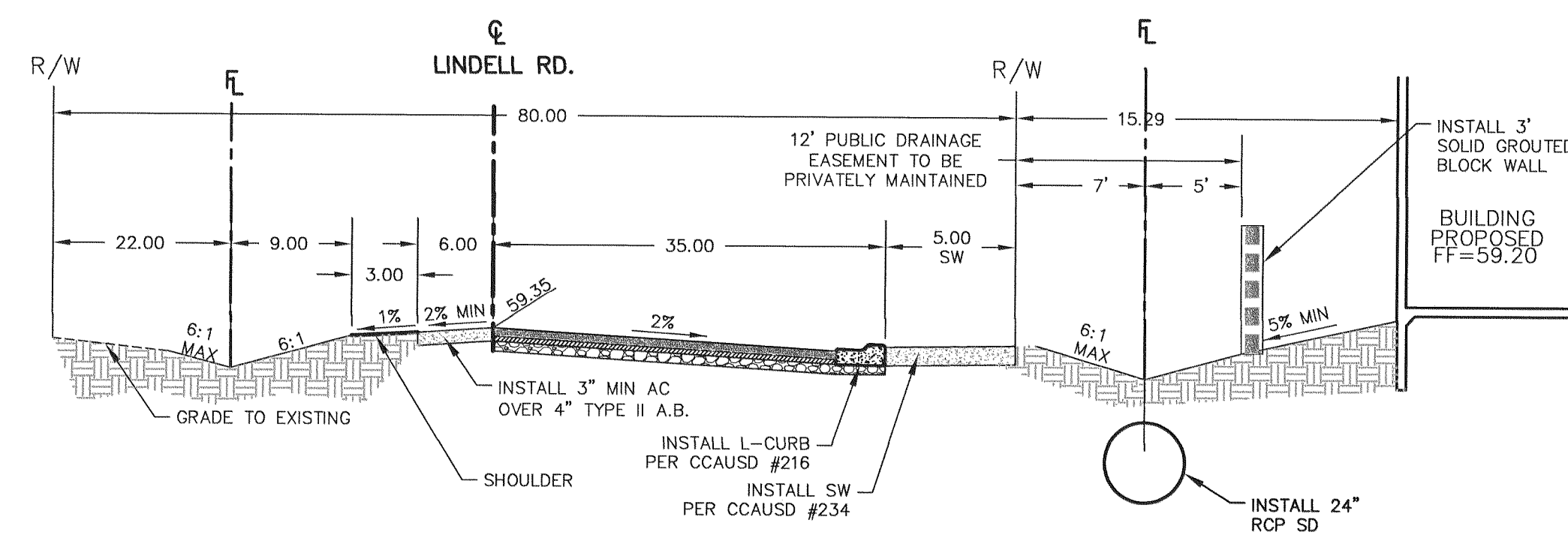
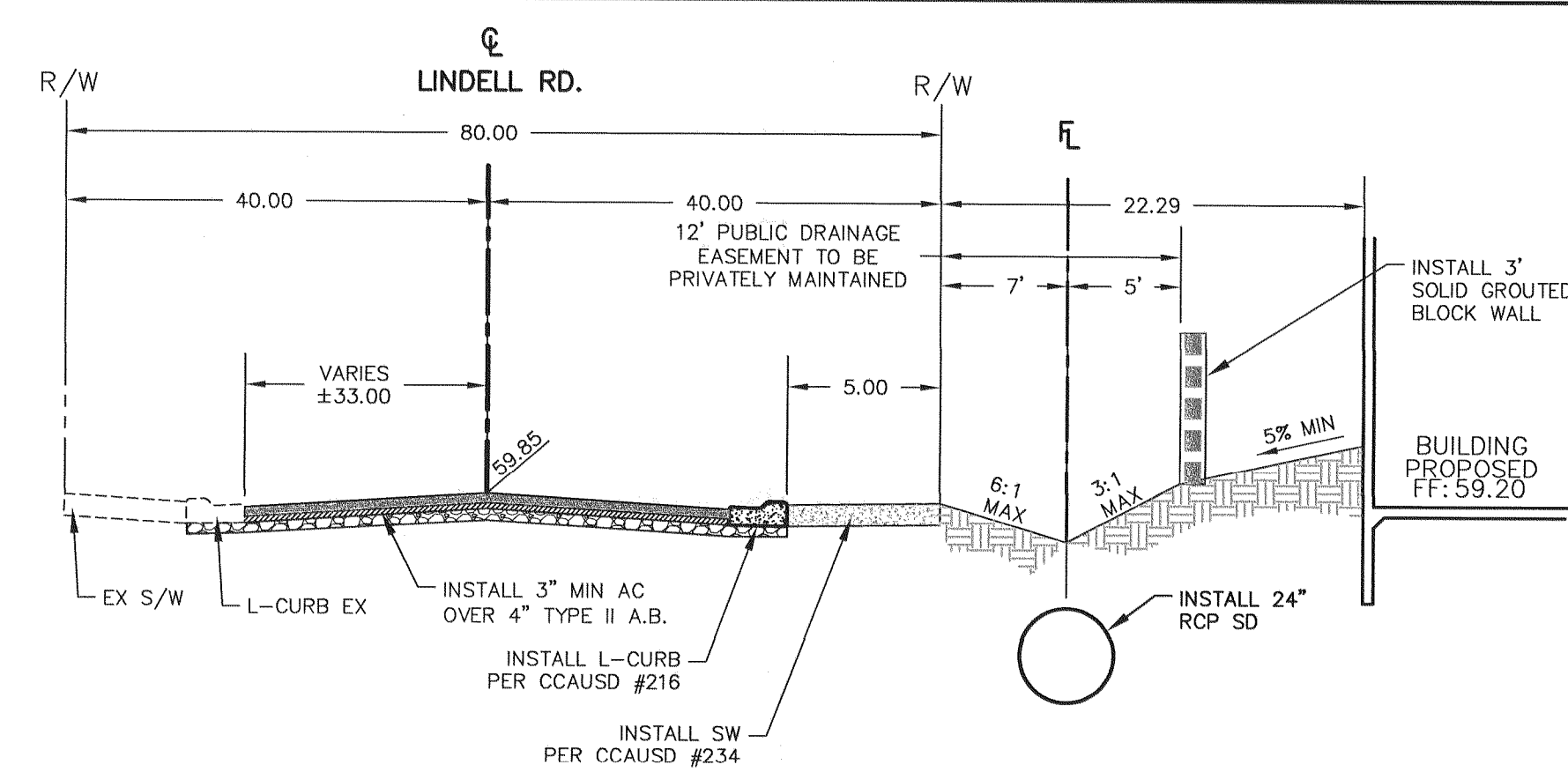
CHECK: ---

SCALE: 1"=30'

SHEET

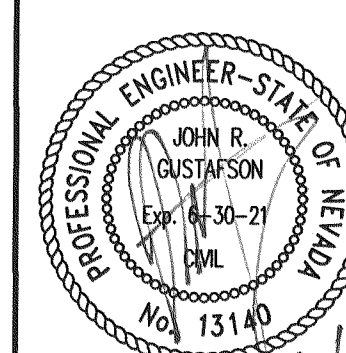
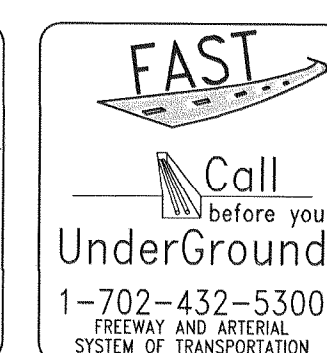
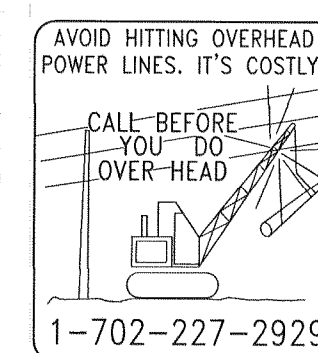
C2.2

PROJ. NO. C221



DISCLAIMER NOTE

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THE LINDELL-SENIOR LIVING GRADING DETAILS

GRADING DETAILS
SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M.
CITY OF LAS VEGAS
NEVADA
APN 163-01-501-001, 002

APN 163-01-501-001, 002

BAUGHMAN & TURNER, INC.
CIVIL ENGINEERS
LAND PLANNERS

CIVIL ENGINEERS LAND SURVEYORS LAND PLANNERS
210 HINSON STREET LAS VEGAS, NEVADA
PHONE: (702) 870-8771 FAX: (702) 878-2695 89102

PREPARED FOR :

CENTURA DEVELOPMENT - CHARLESTON
1210 HINSON ST
LAS VEGAS, NV 89102
(702)901-3183

CHADIAK

CHARLESTON & LINDELL
ON ST
S. NV 89102
3183

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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DATE	REV
CREATED	NO

by 40% from 1990 to 2000, 10% of the world population lives in cities.

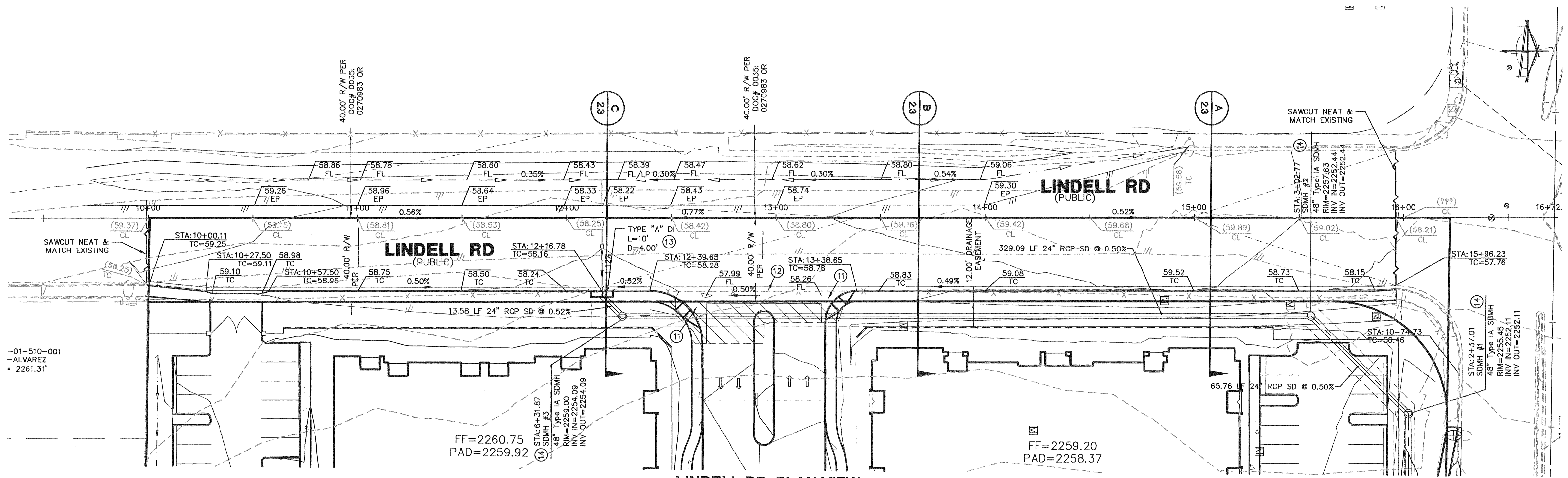
REVIS

For all $\epsilon > 0$, there exists a constant $c(\epsilon) > 0$ such that

NS

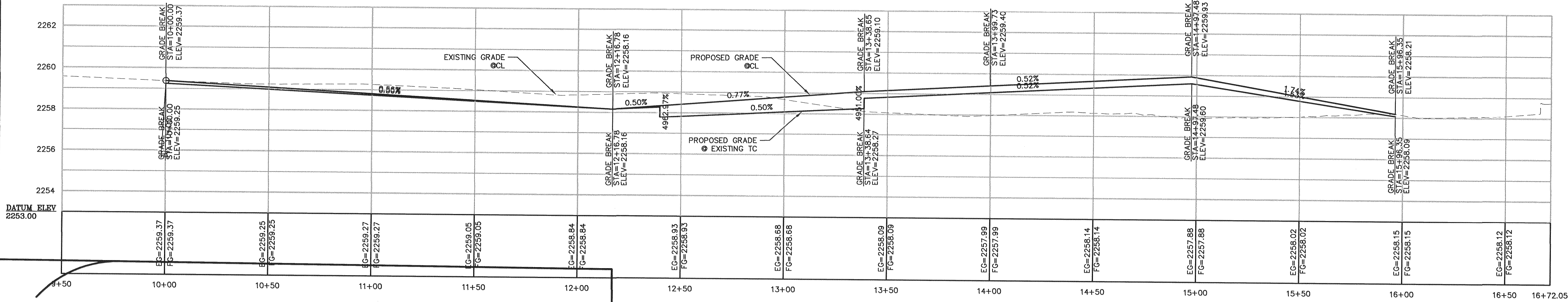
[illegible]

APPROPRIATE INITIALS	DATE
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LINDELL RD. PLAN VIEW

SCALE: HORIZONTAL 1"=30'



LINDELL RD. PROFILE VIEW

SCALE: HORIZONTAL 1"=30'
VERTICAL 1"=3'

CONSTRUCTION NOTES

#	ITEM	UNIT	QUANTITY
		PUBLIC	PRIVATE
1	INSTALL "A" CURB PER CCAUSD #219.	LF	267
2	INSTALL "L" CURB PER CCAUSD #216.	LF	488
3	INSTALL SIDEWALK PER CCAUSD #234.	SF	-
4	CONSTRUCT 3" MIN AC PAVEMENT OVER 4" MIN TYPE II A.G. BASE.	SF	-
5	CONSTRUCT 2" MIN AC PAVEMENT OVER 4" MIN TYPE II A.G. BASE.	SF	-
6	INSTALL 2' CURB CUT PER DETAIL "1" SHEET C2.3.	EA	3
7	INSTALL SIDEWALK DRAIN PER CCAUSD #236	EA	1
8	INSTALL TRASH ENCLOSURE PER ARCHITECTURAL PLANS	EA	1
9	INSTALL RIP-RAP PER SECTION 1500: 'STRUCTURAL BEST MANAGEMENT PRACTICES' AS REFERENCED WITHIN THE CLARK COUNTY FLOOD CONTROL DISTRICT (CCFCD) HYDROLOGIC AND DRAINAGE DESIGN MANUAL (HDCDM), D50=3" THICKNESS=6"	SY	77
10	INSTALL BUS TURNOUT PER CCAUSD #234.1	SF	2572
11	CONSTRUCT COMMERCIAL DRIVEWAY PER CCAUSD #225 & #222.1	EA	2
12	INSTALL 8" CROSS GUTTER PER CCAUSD #228	EA	1

SEWER CONSTRUCTION NOTES

#	ITEM	UNIT	QUANTITY
		PUBLIC	PRIVATE
1	INSTALL 48" DIA. SEWER MANHOLE PER DCSWCS SD-1A, SD-1B, SD-4 AND SD-9 WITH PERCAST BASE.	EA	-
2	INSTALL 8" PVC (SDR-35) SEWER PIPE PER DCSWCS SD-17, SD-22, SD-25.	LF	-
3	INSTALL 8" X 6" WYE W/ 6" LATERAL PER DCSWCS DRWG SD-22 AND SECTION 3.17.2.	EA	-
4	INSTALL 6" PVC (SDR-35) SEWER LATERAL PER DCSWCS DWG. NO. SD-17 & SD-22.	LF	-
5	SEE PLUMBING PLANS FOR CONNECTION	N/A	-

LEGAL DESCRIPTION

THAT PORTION OF THE EAST HALF (E 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M. LYING NORTHERLY OF CHARLESTON HEIGHTS TRACT NO. 34, AS SHOWN BY MAP THEREOF ON FILE IN BOOK 7 OF PLATS, PAGE 87, IN THE OFFICE OF THE COUNTY RECORDER OF CLARK COUNTY, NEVADA.

EXCEPTING THEREFROM THAT PORTION AS CONVEYED TO THE CITY OF LAS VEGAS BY THAT CERTAIN GRANT DEED RECORDED JANUARY 13, 1965, IN BOOK 598 OF OFFICIAL RECORDS, CLARK COUNTY, NEVADA RECORDS AS DOCUMENT NO. 481396.

AND

THAT PORTION OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M. LYING NORTHERLY OF CHARLESTON HEIGHTS TRACT NO. 34, AS SHOWN BY MAP THEREOF ON FILE IN BOOK 7 OF PLATS, PAGE 87, IN THE OFFICE OF THE COUNTY RECORDER OF CLARK COUNTY, NEVADA.

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CONTAINING 4.73 ACRES MORE OR LESS.

ENGINEER

BAUGHMAN & TURNER INC
1210 HINSON ST.
LAS VEGAS, NV 89102
CONTACT: JOHN R. GUSTAFSON P.E.
EMAIL: JGHR@BAUGHMAN-TURNER.COM

FLOOD ZONE DATA

BY GRAPHIC PLOTTING ONLY, THE PROPERTY IS ZONE X OF THE FLOOD INSURANCE RATE MAP, COMMUNITY PANEL NO. 32003C2186F, WHICH BEARS AN EFFECTIVE DATE OF NOVEMBER 16, 2011, AND IS NOT IN A SPECIAL FLOOD HAZARD.

BASIS OF BEARINGS

NORTH 00°06'30" WEST - THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 6, TOWNSHIP 21 SOUTH, RANGE 61 EAST, M.D.M. AS SHOWN ON PLAT MAP "HINSON HEIGHTS" IN BOOK 2 OF PLATS, PAGE 82, CLARK COUNTY RECORDS, NEVADA.

OWNER/DEVELOPER

CHARLIE RAH RAH IRREVOCABLE BUSINESS TRUST AND DAVIDSON INVESTMENTS LP
1984 ALCOVA RIDGE DR.
LAS VEGAS, NV 89135
(702)901-3183

OWNER

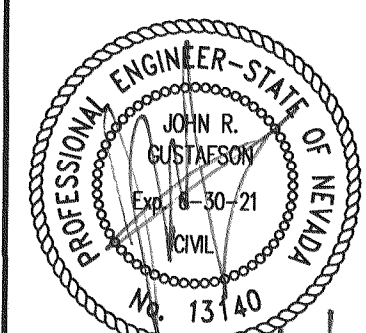
CHARLIE RAH RAH IRREVOCABLE BUSINESS TRUST AND DAVIDSON INVESTMENTS LP
1984 ALCOVA RIDGE DR.
LAS VEGAS, NV 89135
(702)901-3183

DEVELOPER

CENTURA DEVELOPMENT - CHARLESTON & LINDELL
1210 HINSON ST
LAS VEGAS, NV 89102
(702)901-3183
rjordan@centuradev.com

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CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
DEVELOPMENT REVIEW

ACCEPTANCE OF PLANS FOR FILING

BY
ACCEPTANCE OF THESE PLANS FOR FILING 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 AND / OR SPECIFICATIONS. CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM THE CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREIN. NOTE: POWER POLES AND / OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.

APPROVALS

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. 125573 FIRST APPROVED DATE: _____
LVMWD APPROVED FIRE FLOW: TOTAL 2,000 GPM/ONST _____ GPM
SHEETS CV01, GN01, DT01, PP01, PP02, PP03 & UP01.

APN 163-01-501-001, 002

SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M. CITY OF LAS VEGAS

THE LINDELL-SENIOR LIVING LINDELL PLAN AND PROFILE

APN 163-01-501-001, 002

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APN 163-01-501-001, 002

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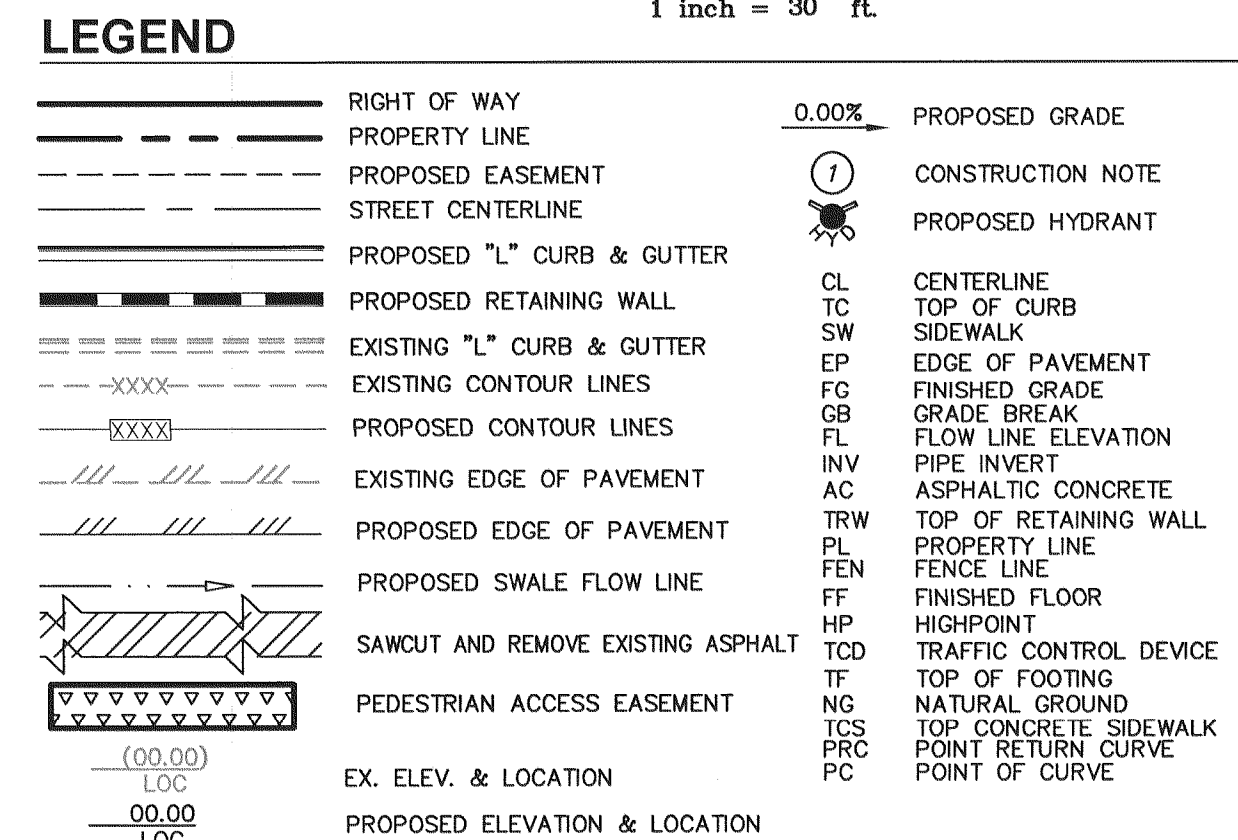
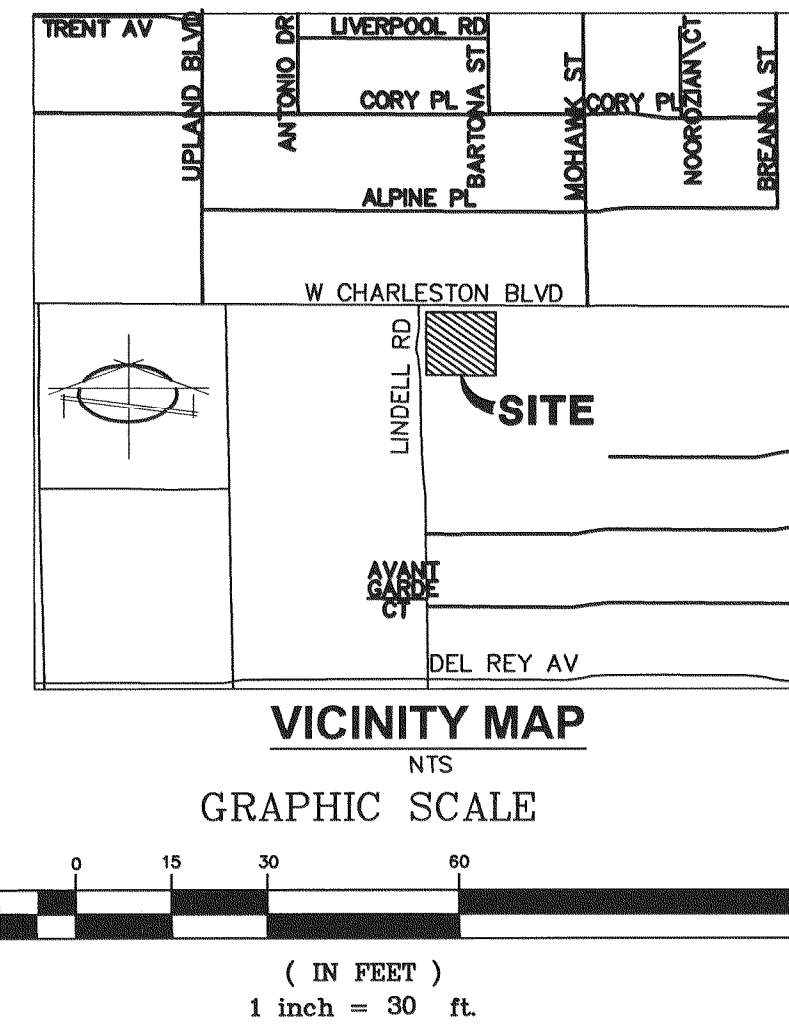
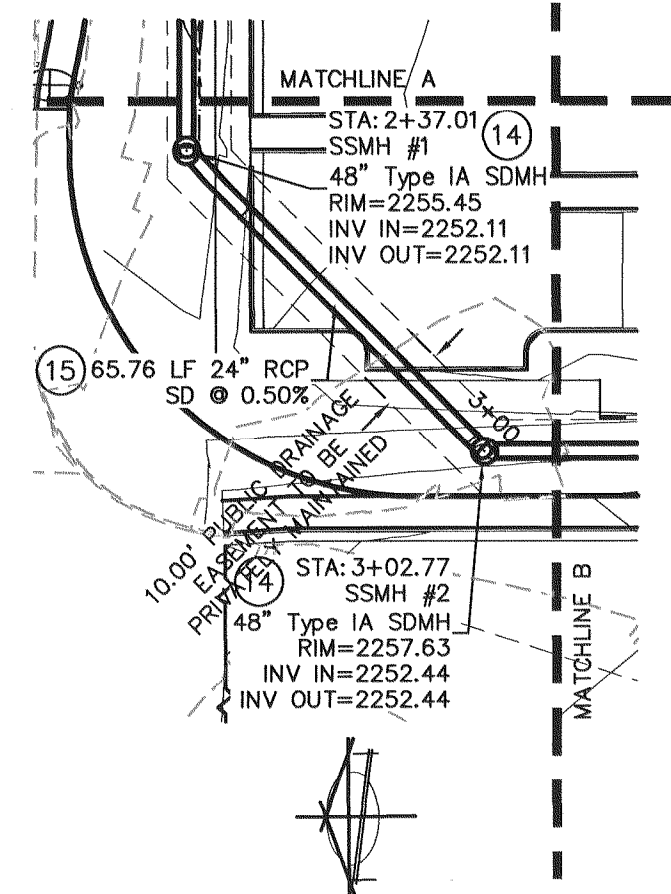
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THE LINDELL-SENIOR LIVING LINDELL PLAN AND PROFILE

APN 163-01-501-001, 002

SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M. CITY OF LAS VEGAS



(PUBLIC)

SCALE: HORIZONTAL 1"=30'
VERTICAL 1"=3'

#	ITEM	UNIT	QUANTITY	
			PUBLIC	PRIVATE
(13)	INSTALL TYPE "A" DROP INLET PER CCAUSD #411	EA	1	—
(14)	INSTALL 48" TYPE IA STORMDRAIN MANHOLE PER USDCCA No. 405.2.	EA	3	—
(15)	INSTALL 24" RCP STORM DRAIN.	LF	588	105

THAT PORTION OF THE EAST HALF (E 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M. LYING NORTHERLY OF CHARLESTON HEIGHTS TRACT NO. 34, AS SHOWN BY MAP THEREOF ON FILE IN BOOK 7 OF PLATS, PAGE 87, IN THE OFFICE OF THE COUNTY RECORDER OF CLARK COUNTY, NEVADA.

EXCEPTING THEREFROM THAT PORTION AS CONVEYED TO THE CITY OF LAS VEGAS BY THAT CERTAIN GRANT DEED RECORDED JANUARY 13, 1965, IN BOOK 598 OF OFFICIAL RECORDS, CLARK COUNTY, NEVADA RECORDS AS DOCUMENT NO. 481396.

AND

THAT PORTION OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE WEST HALF (W 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M. LYING NORTHERLY OF CHARLESTON HEIGHTS TRACT NO. 34, AS SHOWN BY MAP THEREOF ON FILE IN BOOK 7 OF PLATS, PAGE 87, IN THE OFFICE OF THE COUNTY RECORDER OF CLARK COUNTY, NEVADA.

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CONTAINING 4.73 ACRES MORE OR LESS.

BAUGHMAN & TURNER INC
1210 HINSTON ST.
LAS VEGAS, NV 89102
CONTACT: JOHN R. GUSTAFSON P.E.
EMAIL: JOHNRO@BAUGHMAN-TURNER.COM

BY GRAPHIC PLOTTING ONLY, THE PROPERTY IS ZONE X OF THE FLOOD INSURANCE RATE MAP, COMMUNITY PANEL NO. 32003C2186F, WHICH BEARS AN EFFECTIVE DATE OF NOVEMBER 16, 2011, AND IS NOT IN A SPECIAL FLOOD HAZARD.

NORTH 00°06'30" WEST — THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 6, TOWNSHIP 21 SOUTH, RANGE 61 EAST, M.D.M. AS SHOWN ON PLAT MAP "HINSON HEIGHTS" IN BOOK 2 OF PLATS, PAGE 82, CLARK COUNTY RECORDS, NEVADA.

CHARLIE RAH RAH IRREVOCABLE BUSINESS TRUST AND DAVIDSON INVESTMENTS LP
1984 ALCOVA RIDGE DR.
LAS VEGAS, NV 89135
(702)901-3183

CENTURA DEVELOPMENT - CHARLESTON & LINDELL
1210 HINSON ST
LAS VEGAS, NV 89102
(702)901-3183
rjordan@centuradev.com

UTILITY LOCATIONS SHOWN HEREON 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 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.

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Avoid cutting underground
utility lines. It's costly.
Call

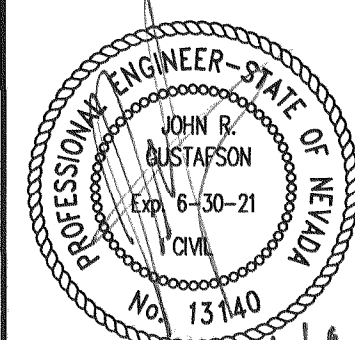
OR
1-800-227-2600

AVOID HITTING OVERHEAD
POWER LINES. IT'S COSTLY.

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YOU DO
OVER-HEAD

1-702-227-2929

FAST
Call before you
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FREEWAY AND ARTERIAL
SYSTEM OF TRANSPORTATION



PREPARED FOR :

2/2019

5

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TIME

INTRODUCTION

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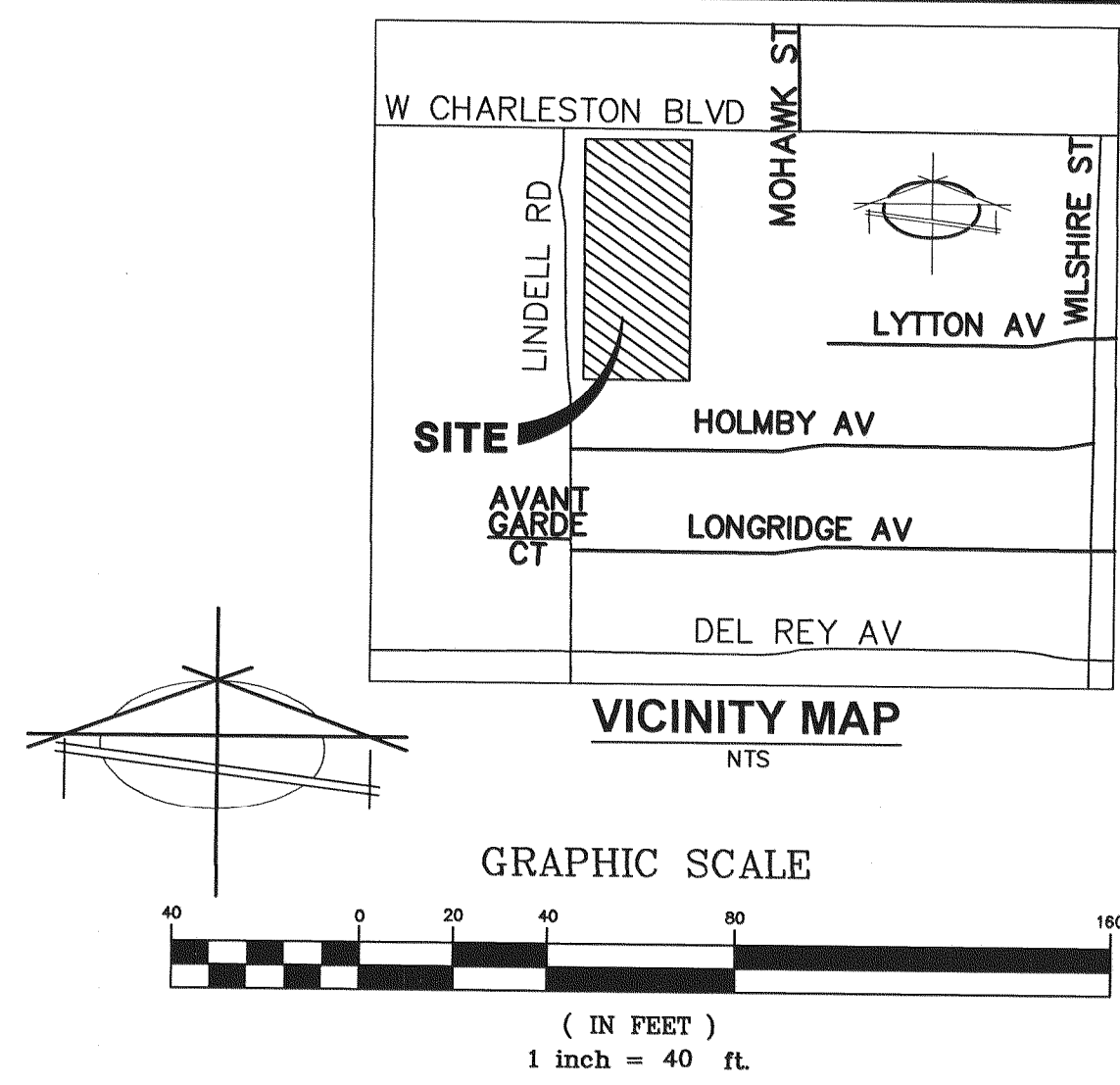
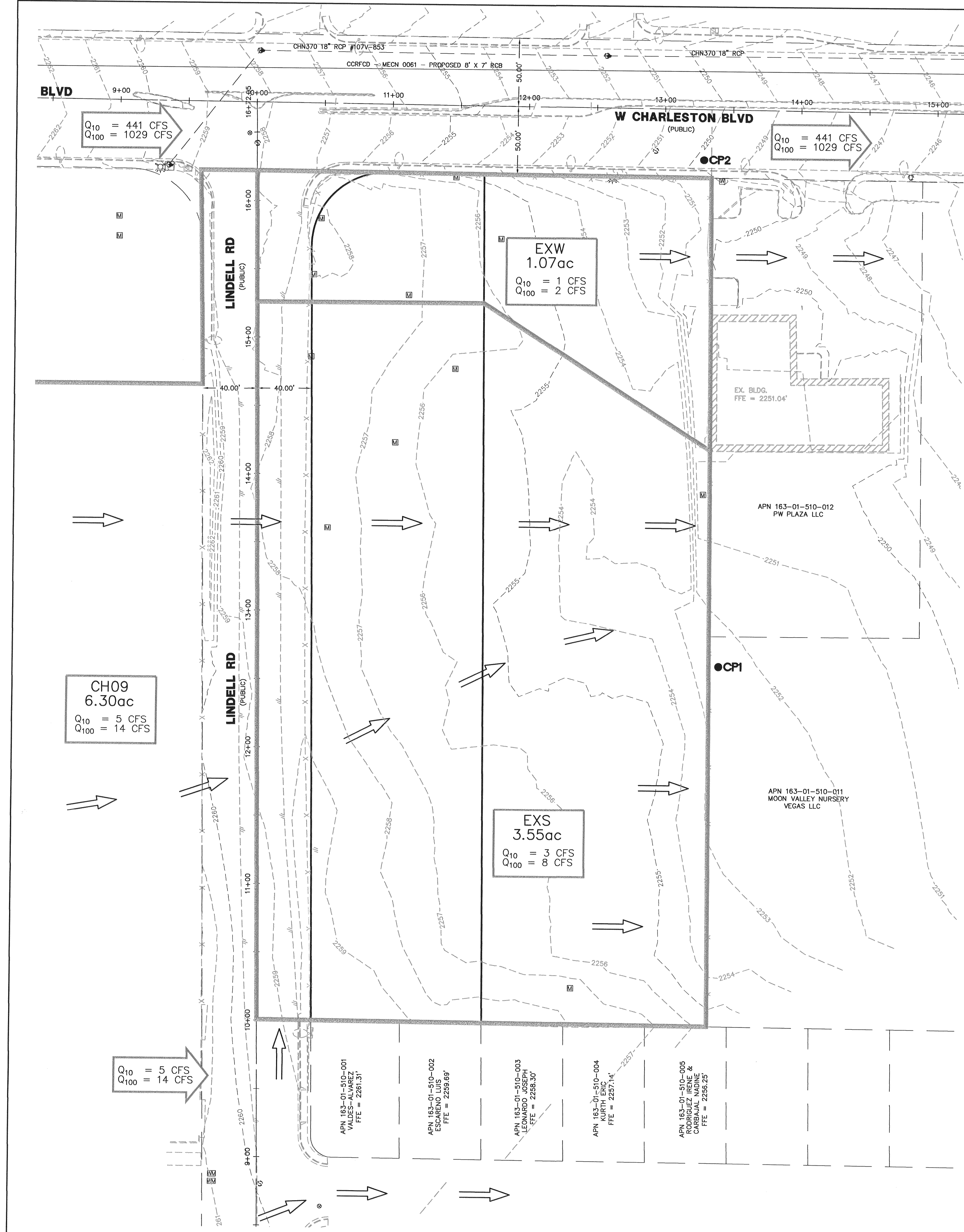
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1



- DRAINAGE LEGEND**
- PROPERTY LINE
 - LOT LINE
 - STREET CENTERLINE
 - PROPOSED WALL
 - EXISTING WALL
 - RETAINING FLOOD WALL
 - PROPOSED "L" CURB & GUTTER
 - EXISTING "L" CURB & GUTTER
 - EXISTING CONTOUR LINES
 - PROPOSED CONTOUR LINES
 - EXISTING EDGE OF PAVEMENT
 - PROP. ELEVATION & LOCATION
 - EX. ELEVATION & LOCATION
 - PROPOSED GRADE
 - EXISTING DRAINAGE FLOW
 - CENTERLINE
 - TOP OF CURB
 - EDGE OF PAVEMENT
 - FINISHED GRADE
 - GRADE BREAK
 - FINISHED FLOOR
 - HIGHPOINT
 - ASPHALTIC CONCRETE
 - BLANKET THICKNESS
 - OVERHEAD ELECTRIC LINES
 - DRAINAGE BASIN BOUNDARY
 - COMBINATION POINT
 - BASIN NAME & FLOW DATA
 - DIRECTION OF FLOWS
 - STREET CAPACITY LOCATION

Peak Flow Summary			
Existing Condition			
Source	Basin Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)
CH09	6.3	14	5
EXS	3.55	8	3
CP1 (CH09+EXS)	--	22	8
CHARLESTON REFERENCED FLOWS	--	1029	441
EXN	1.07	2	1
CP2	--	1029	441

NOTE
SEE FIGURES 7 & 10 FOR OFFSITE BASIN DELINEATION

BENCHMARK
CLARK COUNTY BENCHMARK 7010 2SSE6 - BEING A RIVET AND SQUARE ALUMINUM PLATE IN TOP OF CURB, NORTHEAST CORNER OF SAHARA AVENUE AND CHUCK LENZIE COURT/EL CAMINO ROAD NEAR THE PC OF SAHARA AVENUE.

704.337 METERS NAVD 88 DATUM 2310.81 FEET

FLOOD ZONE DATA
THE FLOOD INSURANCE RATE MAP, CLARK COUNTY, NEVADA, COMMUNITY PANEL NO. 32003 C 2165 D (EFFECTIVE DATE SEPTEMBER 27, 2002), PUBLISHED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA), INDICATES THAT THE SITE IS LOCATED IN A ZONE X. A ZONE X IS DETERMINED TO BE AN AREA OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

DISCLAIMER NOTE
UTILITY LOCATIONS SHOWN HEREON 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 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.

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before you dig
OR
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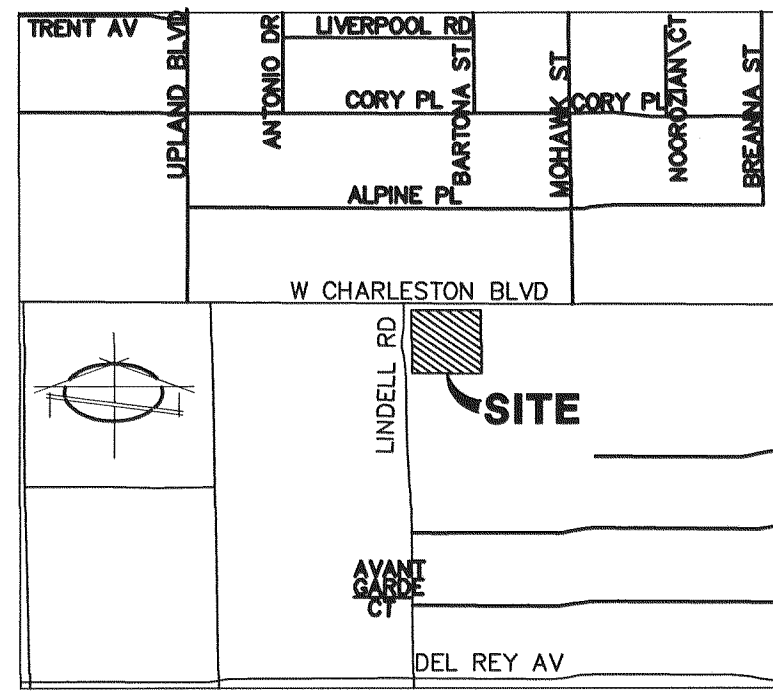
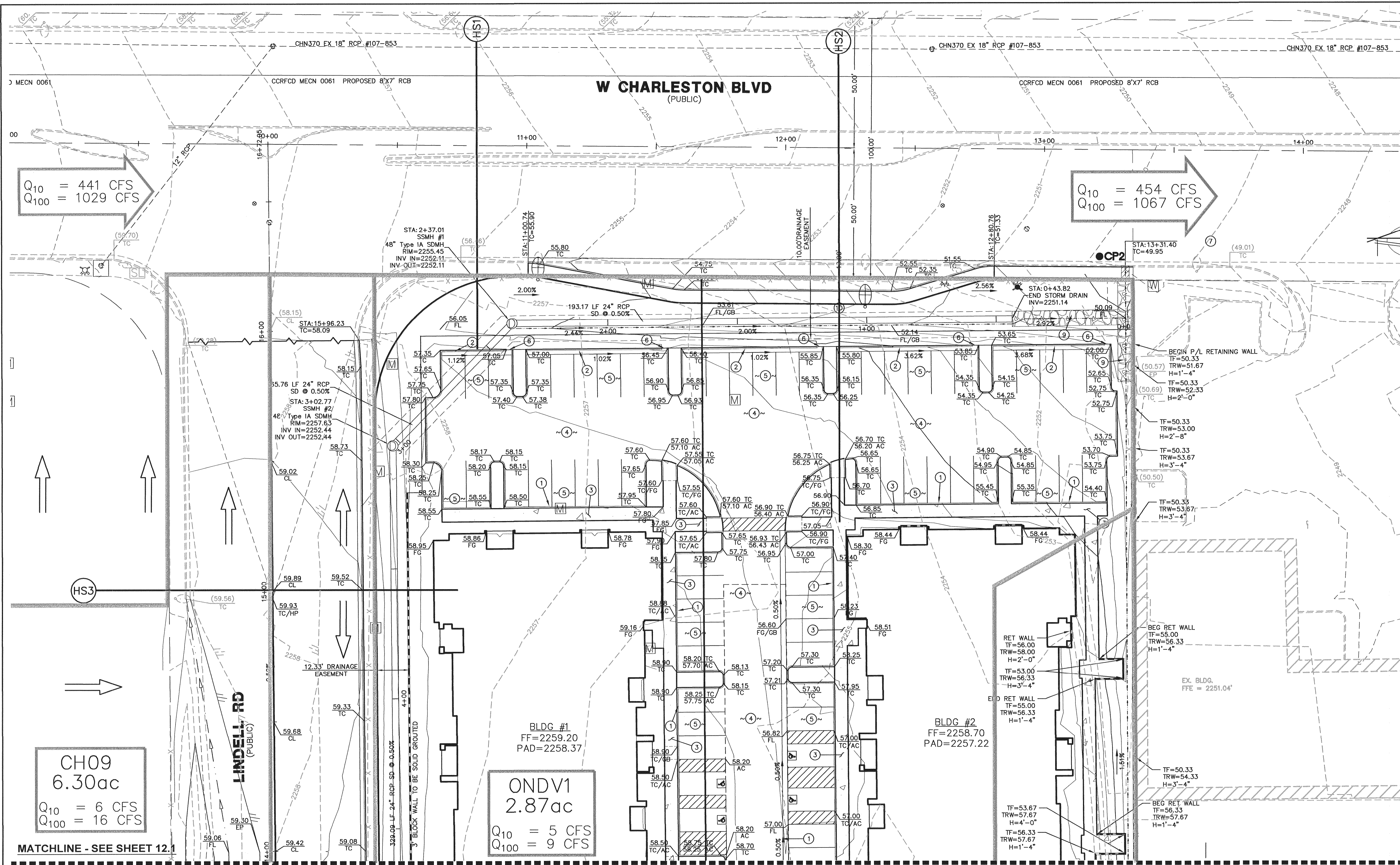
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CIVIL ENGINEERS
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PHONE: (702) 870-8771

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CENTURA - LINDELL
EXISTING CONDITIONS MAP
SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M.
CLARK COUNTY, NEVADA
APN 163-01-501-001, 002

SHEET
FIG11
1 OF 1
PROJ. NO. C21



VICINITY MAP

NTS

GRAPHIC SCALE



(IN FEET)
1 inch = 20 ft.

DRAINAGE LEGEND

- PROPERTY LINE
- LOT LINE
- STREET CENTERLINE
- PROPOSED WALL
- EXISTING WALL
- RETAINING FLOOD WALL
- PROPOSED "L" CURB & GUTTER
- EXISTING "L" CURB & GUTTER
- EXISTING CONTOUR LINES
- PROPOSED CONTOUR LINES
- EXISTING EDGE OF PAVEMENT
- PROP. ELEVATION & LOCATION
- EX. ELEVATION & LOCATION
- PROPOSED GRADE
- EXISTING DRAINAGE FLOW CENTERLINE
- TOP OF CURB
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- FINISHED GRADE
- GRADE BREAK
- FINISHED FLOOR
- HIGHPOINT
- ASPHALTIC CONCRETE
- BLANKET THICKNESS
- OVERHEAD ELECTRIC LINES
- DRAINAGE BASIN BOUNDARY
- COMBINATION POINT
- BASIN NAME & FLOW DATA
- DIRECTION OF FLOWS
- STREET CAPACITY LOCATION

Peak Flow Summary				
Developed Condition				
Source	Basin Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)	
CH09	6.3	14	5	
LINDEL	0.57	2	1	
CP1 (CH09+LINDEL)	--	16	6	
CHARLESTON REFERENCED FLOWS	--	1029	441	
ONDV2	1.18	4	2	
ONDV1	2.87	9	5	
CP2	--	1057	454	

Peak Flow Summary				
Future Condition				
Source	Basin Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)	
CH09	6.3	12	5	
LINDEL	0.57	2	1	
CP1 (CH09+LINDEL)	--	14	5	
CHARLESTON REFERENCED FLOWS	--	<1	<1	
ONDV2	1.18	4	2	
ONDV1	2.87	9	5	
CP2	--	27	12	

Street Capacity Summary						
Section	Location	Slope	Q (cfs)	D (ft)	V (fps)	V x D
10-Year Flow - Developed Conditions						
HS1	Charleston Boulevard	2.00%	441	1	8.41	8.41
HS2	Charleston Boulevard	2.56%	441	0.9	9.18	8.26
HS3	Lindell Road	0.49%	6	0.4	1.68	0.67
HS4	Lindell Road	sump	6	0.7	--	--
HS5	Lindell Road	0.50%	6	0.5	1.59	0.8
100-Year Flow - Developed Conditions						
HS1	Charleston Boulevard	2.00%	1029	1.3	11.52	14.98
HS2	Charleston Boulevard	2.56%	1029	1.3	12.82	16.67
HS3	Lindell Road	0.49%	16	0.6	2.04	1.22
HS4	Lindell Road	sump	16	1	--	--
HS5	Lindell Road	0.50%	16	0.7	1.58	1.11

BASIS OF BEARINGS

NORTH 00°06'30" WEST - THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 6, TOWNSHIP 21 SOUTH, RANGE 61 EAST, M.D.M. AS SHOWN ON PLAT MAP "HINSON HEIGHTS" IN BOOK 2 OF PLATS, PAGE 82, CLARK COUNTY RECORDS, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK BLV10 IN4 - BEING A RIVET AND PLATE IN TOP OF CURB, SOUTHEAST CORNER OF LINDELL ROAD AND CHARLESTON BOULEVARD.

687.764 METERS NAVD 88 DATUM 2256.44 FEET

FLOOD ZONE DATA

THE FLOOD INSURANCE RATE MAP, CLARK COUNTY, NEVADA, COMMUNITY PANEL NO. 32003C 2165D (EFFECTIVE DATE SEPTEMBER 27, 2002) PUBLISHED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA), INDICATES THAT THE SITE IS LOCATED IN A ZONE X. A ZONE X IS DETERMINED TO BE AN AREA OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

NOTE:

PROPERTY OWNER IS RESPONSIBLE TO MAINTAIN THE BEST MANAGEMENT PRACTICES SUCH AS BUT NOT LIMITED TO THE REMOVAL OF ACCUMULATED SEDIMENT AND DEBRIS AND CARE OF THE VEGETATION.

NOTE:

SEE FIGURES 7 & 10 FOR OFFSITE BASIN DELINEATION

DISCLAIMER NOTE

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CENTURA DEVELOPMENT - CHARLESTON & LINDELL
1210 HINSON STREET
LAS VEGAS, NV 89102
(702)901-3183

DATE: 8/7/2019
DESIGN: PP
DRAWN: JC
CHECK: PP
SCALE:

BAUGHMAN & TURNER, INC.
CIVIL ENGINEERS
1210 HINSON STREET
LAS VEGAS, NEVADA 89102
PHONE: (702) 870-8771 FAX: (702) 878-2695

THE LINDELL-SENIOR LIVING
DEVELOPED ONSITE DRAINAGE BASIN MAP 1
SECTION 1, TOWNSHIP 21 SOUTH, RANGE 60 EAST, M.D.B. & M.
CITY OF LAS VEGAS
APN 163-01-501-001 & 002

FIG12.0

PROJ. NO. C221