

DS #: 4856

APN: 125-18-201-015

PROJECT: Farm and Jensen Elementary Schos I

SUBMITTAL: 2nd

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: April 13, 2017
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: Farm and Jensen Elementary School		COPIES TO: Collins Engineers, Inc.
Cross Streets:	NWC of Farm Road & Jensen Street	SH Architecture
File Number:	F:\Depot\DSMemos\DS4856B.doc	Bart Anderson, P.E., DevCo
Parcel Number:	125-18-201-015	
Zoning Action:	SDR-xxxxx	
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES NO X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	12/22/2016	1/11/2017	Not Approved	\$400.00	469882: \$400
2 nd Submittal	4/6/2017	4/17/2017	See Comments Below	\$400.00	480960: \$400
TOTAL FEES (LDDRS):				\$800.00	----

REMARKS:

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

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

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

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: T19S/R60E/18
AREA G-18



Addendum 1 to the TDS for Farm and Jensen Elementary School

APN 125-18-201-015

April 2017

Prepared for:

SH Architecture
7250 Peak Drive Suite 216
Las Vegas Nevada 89128
Contact: Mark McGinty
(702) 363-2222

Prepared by:

COLLINS
ENGINEERS INC.

3130 S. Durango Drive, Suite 404
Las Vegas, Nevada 89117
702.248.8000 • www.collinsengr.com

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

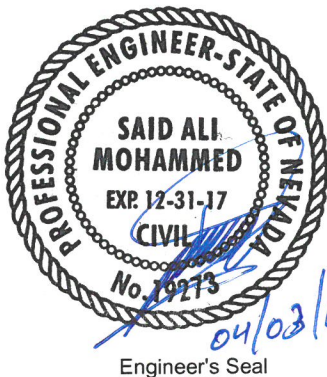
DRAINAGE STUDY INFORMATION FORM

Name of Development: **Farm & Jensen Elementary School** Date: **4/3/2017**
 Location of Development: a) Descriptive (Cross Streets) (E/W) Farm Road, (N/S) Jensen Street
 b) Section **18** Township **19 South** Range **60 East**
 Name of Owner :USA Assessors Parcel Number: **125-18-201-015**
 Telephone Number: **(702) 363-2222**
 Address: 7250 Peak Drive Suite 216
 Las Vegas Nevada 89128
 Contact Person Name: **Thomas Miller, P.E.** Telephone Number: **(702) 248-8000**
 Firm: **Collins Engineers** Fax Number: **(702) 248-8070**
 Address: **3130 South Durango Dr., Suite 404** Email: **tmiller@collinsengr.com**
Las Vegas, Nevada 89117

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	☐	

- Total Owned Land Area: At Site: **±14.92 Ac** Being Developed: **± 14.92 Ac**
- Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? **NO**
- Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? **No**
- Proposed type of development (Residential, Commercial, Etc.)? **Elementary School (Commercial)**
- Approximate upstream land area which drains to the subject site? **1.5 ± Ac**
- Has the site drainage been evaluated in the past? **Yes**
 TDS for Valley Crest II DS # DS3377 and North Creek (Previously Sable Creek)
 (.HTE # 02-42901 and DS4615)
- If known, please briefly identify the proposed discharge point(s) of runoff from the site:
 Flow generated by the proposed site drains towards Jensen St and Farm Road.
- Briefly describe your proposed schedule for the subject project: **As Soon As Possible**



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.

Local Entity File No.

Revision	Date

REFERENCE: Collins Engineers Project No. 9748

STANDARD FORM 1



April 4, 2017

Albert Sung, P.E.
Principal engineer
City of Las Vegas Flood Control
333 N. Rancho Drive
Las Vegas, Nevada 89106

**SUBJECT: Addendum 1 to the TDS for Farm and Jensen Elementary School (DS 4856A)
Collins Engineers Project No. 9748**

Dear Mr. Sung:

This letter is in response to the comments received from your office dated January 11, 2017. The comments are reiterated for your convenience, and a copy of the original comment letter is included in Appendix A. We believe that the material included in this addendum will address each of the comments issued in the previous submittal and supply the needed information for approval.

Comment #1

Provide a copy of the zoning/planning conditions associated with this site (SDR-xxxxx) with the next submittal to verify compliance with conditions. Flood Control will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the City Council). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.

Response #1

Noted. The Site Development Review is in the process. The copy of the approval document will be submitted to the Flood Control Section as soon as possible upon approval. Please note that the School onsite development will be reviewed by School District. If any off-site change by city council, the study will be revised and resubmitted to the Flood Control Section.

Comment #2

Sites with a grade difference of 2 feet above or below existing are required to have approval from the City Planning and Development Department. The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the City Planning Department (229-6301). The engineer must provide Planning approval with the next submittal.

Response #2

The copy of the approval is included in Appendix A.

Comment #3

The study stated that the northern half of Donald Nelson Avenue and the east half of Jensen Street in both the existing and proposed conditions drain through Marble Heights Avenue in the adjacent residential community to the east. However, the reviewer in a recent field trip found that there is a hump in Marble Heights Avenue to prevent offsite flow from

entering the community. Review and revise the existing and proposed drainage condition maps accordingly in the next submittal.

Response #3

Noted. Basin maps have been revised. In the revised plans all flow (11.3/25.2 cfs) from Donald Nelson Avenue drains directly towards Farm Road. The 100-year flow (25.2 cfs) creates 0.58' depth of flow over the flowline elevation. Per the Marble Heights Avenue Plan and Profile Sheet, the street has a 0.65' freeboard above the 100-year flow (for more information the copy of the Marble Canyon Plan and Profile sheet is included in Appendix B).

Comment #4

Concentration Flow Points such as "CP1", "CP2" are missing in the drainage condition maps.

Response #4

*Concentration point CP-1 is the combination point of onsite basin ONX1 and STX2 at the southeast corner of the site (6/21cfs). In existing condition, CP-2 is the sum of flows on Farm Road (CP-2=REF** (-) SD+STX1+STX3) =282/552 cfs in 10 and 100-year storm events respectively.*

In the Proposed Condition which is shown in Figure 10, at the southeast corner of the site (at CP-2 or FlowMaster Section FM-5) generated a total of 287.5/560.6 cfs, and at CP-1(at FM-6) a total of 11.3/25.2 cfs. Basin Maps have been revised to show the combination points and included in Appendix B.

Comment #5

The proposed courtyard drainage system is not clear whether overflow path(s) are provided in a worst case scenario that the drain pipes are totally clogged or broken.

If overflow path(s) are not the intention, provide a notarized letter from the property owner to indemnify the City of Las Vegas of any liability for any future flooding potential in the courtyard area and the building. This letter will suffice in lieu of the courtyard drainage satisfying the City's minimum requirements. The letter must be submitted to City of Las Vegas Flood Control Section prior to the final acceptance of the drainage study.

Response #5

On both sides of the courtyard, there are doors. On the north and south side of the doors, there is a chain-link fence. Since the east side fence is narrow, it is ignored for the emergency overflow calculation. The west side fence ($\pm 39'$) is considered as emergency overflow.

In the event that the proposed storm drain system will be 100% clogged, flow generated by the middle portion of the buildings, and courtyard (sub-basins: I, J, K, L, M, N, S, T, U) which supposed to be carried by the main storm drain system from the courtyard assumed to drain toward the west.

Per the specification, the weight of the chain-link fence, diameter, and density, the wire covers 9% of the fence (the weight and density of the fence tables are included in Appendix B). From the total length, 91% (35.5') is available for Weir flow towards the west. Assuming 50% clogging factor, only 17.7' is used for calculating of Weir depth flow.

The Weir calculation shows that 3.5 cfs create 0.16' depth of flow over the west side door elevation (13.58). The water surface elevation is 13.74' which is 0.51' lower than the proposed finished floor elevation (means the FFE is set 3rd above the weir WSE).

In the event the main storm drain is 100% clogged, the above mention the courtyard flow and flow generated by the sub-basin A, B and H will be captured by the proposed catch basin #15 and conveyed by the proposed 18" emergency storm drain along the south side of the proposed building and discharged into the proposed CB #14 (at the southeast corner of the site). This flow discharged into the Farm Road. Catch Basin 14 (CB #14) is used to capture 100-year flow generated by sub-basin "E" and discharge into the proposed U-Channel and sidewalk drains then to Farm Road.

Comment #6

City of Las Vegas does not allow HDPE pipe in public right-of-ways or public drainage easements. Note that City of Las Vegas only allows the use of HOPE storm drain pipes for privately owned and privately maintained storm drain systems which serve and are located exclusively on private properties. Any proposed HOPE storm drain pipes must also meet all design criteria established by the Clark County Regional Flood Control District and must be installed per Clark County Regional Transportation Commission Uniform Standard Drawings and Specifications.

Response #6

The development does not propose any storm drain on the public ROW. The HDPE pipes are proposed on-site which is Clark County School District (CCSD) owned and privately maintained.

Comment #7

Label an existing storm drain in Farm Road with City of Las Vegas recorded drawing number and pipe size information on the grading plans. Identify all existing drop inlets and laterals if any.

Response #7

The drawing number for the 36" storm drain has been labeled as requested.

Comment #8

Show finish floor elevation of the existing houses in the residential communities adjacent to all of the four perimeter streets on the grading plans.

Response #8

All finish floor elevations have been labeled.

Comment #9

Provide a note on the grading plans: All onsite storm drains and the associated facilities are privately owned and to be privately maintained.

Response #9

The note is added.

Comment #10

The study merely stated that Stormwater quality features had been provided without any quantitative description or design per Section 1500 of the CCRFCD Hydrologic Criteria

and Drainage Design Manual. Provide calculations in the next submittal to verify that the proposed length, width and depth of the landscape swales are meeting the design guidelines.

Response #10

The total area of the onsite development is ± 12.3 acres. The development proposes a surface parking lot on the north side of the proposed building and a bus access asphalt to access the south side of the building. The total area of the parking and driveway covers ± 3.2 acres. Per the manual, the site is considered as a large parking lot category and parking lot BMP is required.

To quantify the parking lot data the following table is prepared Per Figure 1503 of the Manual.

<i>Parking Lot Data (acres)</i>	<i>Acreage</i>
<i>Property Size (PS)</i>	<i>12.3</i>
<i>Building Area (BA)</i>	<i>3.3</i>
<i>Total Pervious Area (TPA)</i>	<i>5.8</i>
<i>Parking Lot Area (PLA) = PS-BA-TPA</i>	<i>3.2</i>
<i>Min PLA to be Treated = $0.75 \times PLA$</i>	<i>2.4</i>

As shown on the table the total parking lot area is only ± 3.2 acres. Per the manual, only 75% of the parking lot area (2.4 acres) should be treated. This study proposes 3 BMP locations. From the above 3.2 acres, the 24' wide truck access driveway around the proposed building covers 0.6 acres. A portion of the access driveway drains towards the proposed landscaping and BMP #1. BMP #1 with 46' treatment length with riprap ($d_{50}=3"$), treats the northwest portion of the parking lot area with the total area of 4.2 acres from which 69% pervious area. BMP #2 treats the north portion of the parking area with the total area of 1.7 acres. The northeast portion of the parking lot area with the total area of 2 acres (47% of the area covers by previous landscaping and turf area) will be treated by BMP #3 with 105 total riprap treatment length (please see the BMP locations in Figure 10 and Grading Plans). Figure 10 and the BMP Design Peak Discharge calculation table are included in Appendix B, whereas the Grading Plan is included in Appendix C).

Comment #11

Sheet C8.01: Detail Section A: Clearly label the 18"-stem wall to be solid grouted 8"-CMU or equivalent.

Response #11

The detail has labeled as 18" concrete stem wall above the TC elevation.

Comment #12

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

Response #12

The note is added in all drop inlets.

NOTE:

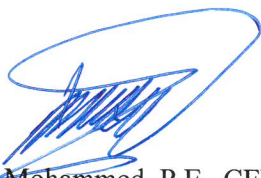
Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a storm water pollution prevention plan has been developed and is maintained on site; for inclusion in the Storm water 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.

Response:

Noted

We hope this addresses your concerns regarding this project. If you have any questions or additional information is needed, please feel free to contact this office.

Respectfully,



Said A. Mohammed, P.E., CFM, Ph.D.
Sr. Project Engineer
Collins Engineers, Inc.



Thomas Miller, P.E.
Sr. Transportation Manager
Collins Engineers, Inc.

TABLE OF APPENDICES

APPENDIX A (Comment Letter)

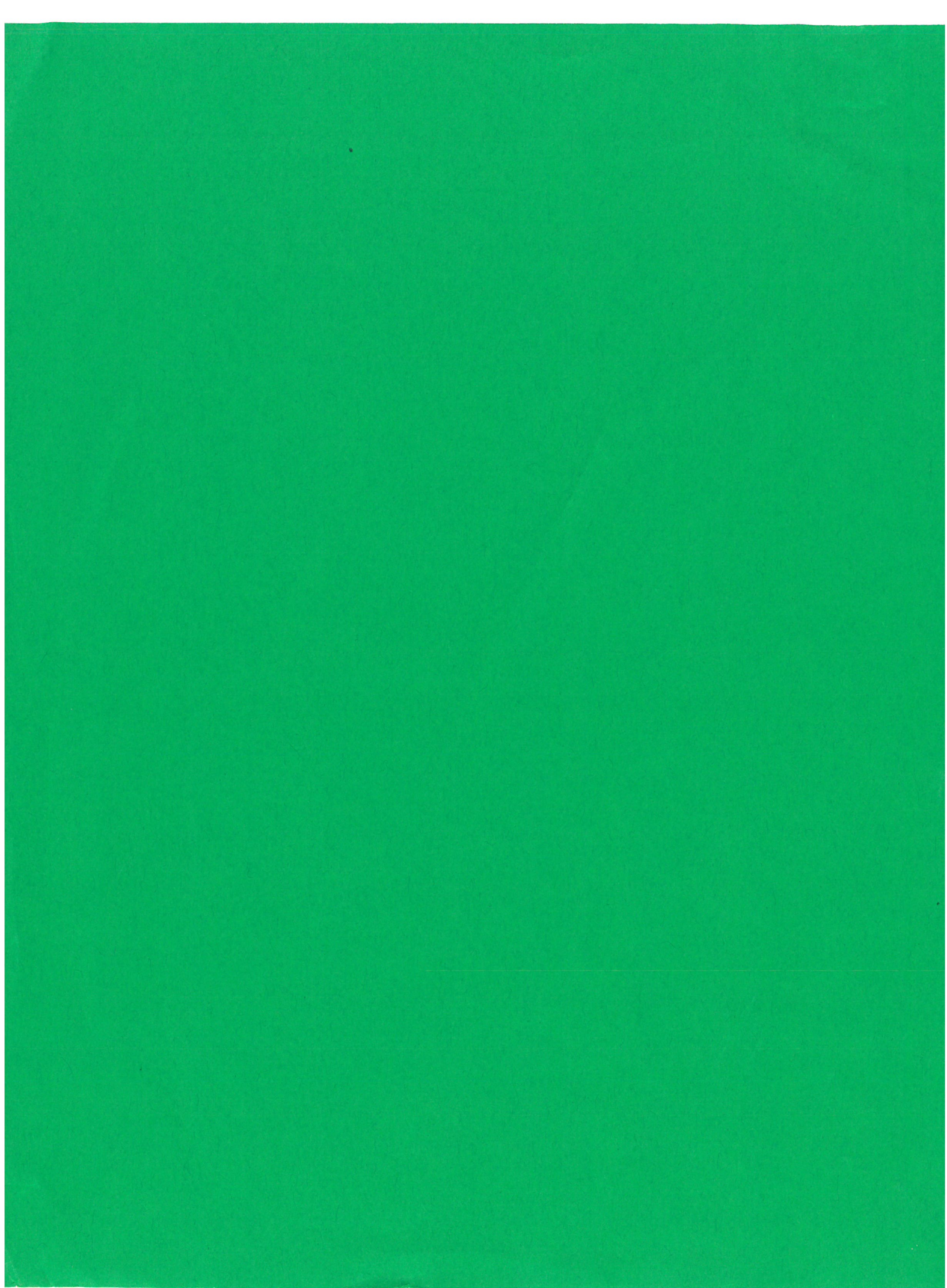
- City of Las Vega Comment Letter
- Grade Difference Approval

APPENDIX B (Exhibits, Hydrology & Hydraulic Analysis)

- Existing Condition Drainage Basin Map
- Developed Condition Drainage Basin Map
- Prorated Flow Table for Onsite Sub-basins
- Calculated and prorated Flow Table for FM Sections
- FlowMaster Section
- Emergency Overflow Depth from Courtyard (Weir Flow Calculation)
- Pipe and Drip inlets Capacity Analysis
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- Water Quality Table (Peak Design Flow and BMP Area)
- Marble Canyon Plan and Profile (Free Board)

APPENDIX C (Plans)

- Grading Plan
- Plan and Profile Sheet
- Detail Sheet



APPENDIX A
(Comment Letter)

- City of Las Vega Comment Letter
- Grade Difference Approval

CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		January 11, 2017
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	COPIES TO:	
Drainage Study for:	Collins Engineers, Inc.	
Farm and Jensen Elementary School	SH Architecture	
Cross Streets:	NWC of Farm Road & Jensen Street	Bart Anderson, P.E., DevCo
File Number:	F:\Depot\DSMemos\DS4856A.doc	
Parcel Number:	125-18-201-015	
Zoning Action:	SDR-xxxxx	
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES NO X	

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TOTAL FEES (LDDRS):				\$400.00	----

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4. *Concentration Flow Points* such as "CP1", "CP2" are missing in the drainage condition maps.

5. The proposed courtyard drainage system is not clear whether overflow path(s) are provided in a worst case scenario that the drain pipes are totally clogged or broken.

If overflow path(s) are not the intention, provide a notarized letter from the property owner to indemnify the **City of Las Vegas** of any liability for any future flooding potential in the courtyard area and the building. This letter will suffice in lieu of the courtyard drainage satisfying the **City's** minimum requirements. The letter must be submitted to **City of Las Vegas Flood Control Section** prior to the final acceptance of the drainage study.

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7. Label an existing storm drain in **Farm Road** with **City of Las Vegas** recorded drawing number and pipe size information on the grading plans. Identify all existing drop inlets and laterals if any.
8. Show finish floor elevation of the existing houses in the residential communities adjacent to all of the four perimeter streets on the grading plans.
9. Provide a note on the grading plans: *All onsite storm drains and the associated facilities are privately owned and to be privately maintained.*
10. The study merely stated that stormwater quality features had been provided without any quantitative description or design per **Section 1500** of the **CCRFCD Hydrologic Criteria and Drainage Design Manual**. Provide calculations in the next submittal to verify that the proposed length, width and depth of the landscape swales are meeting the design guidelines.
11. **Sheet C8.01: Detail Section A:** Clearly label the 18"-stem wall to be solid grouted 8"-CMU or equivalent.
12. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).

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: T19S/R60E/18
AREA G-18

COLLINS ENGINEERS^{INC}

125 18 201 015
SDR-68790
C-V

March 7, 2017

City of Las Vegas
Planning and Development Department
333 N Rancho Dr.
Las Vegas, Nevada 89106

**Re: Farm & Jensen Elementary School Grade Difference Approval
Civil Squared Engineering Job No. 9748**

To Whom It May Concern:

This letter is to address a drainage study review comment provided by Albert Sung in regards to the proposed grade differences on the Farm and Jensen Elementary School project exceeding a two foot difference from existing elevations. At present, we are seeking planning approval of the proposed elevation differences.

At locations on or adjacent to the proposed building A, B, and C as shown in the attached grading plans and shown in the summary table below, the proposed elevations exceed a two foot difference from existing elevations due to the size of the proposed buildings and the existing slope of the parcel (36' elevation difference between the highest elevation (2828') to the lowest elevation (2792')). This occurs due to several factors:

1. A level finished floor elevation is necessary throughout the building for the operation of the proposed school building which is approximately 408 feet in length (for building A).
2. The existing elevation of the parcel changes approximately fourteen feet across the 408 feet where the building "A" is to be located.
3. School district is aware of the grade difference in excess of two feet for this proposed Elementary School.

PLANS APPROVED
PLANNING
Building & Safety Dept.
City of Las Vegas, Nevada
2' GRADE DIFFERENCE
LHM MAR 30 2017 ONLY

Conforms to the minimum requirements of
LVDC Title 19, applicable Master Plan
development standards and/or Conditions of
Approval. Make No Change Without Approval.
Plan is Not a Permit to Violate Any Ordinance.

COLLINS ENGINEERS^{INC}

Prop.	Existing	Existing	Prop	Grade
Bldg.	High	Low	FFE	Difference
	(Ft.)	(Ft.)	(Ft.)	
A	2817	2804	2814.35	10.35
B	2812	2805	2814.35	9.35
C	2818	2813	2814.35	3.65

Due to the combination of the building size and the change in elevation across the parcel, the elevation difference exceeding two feet occurs through the proposed buildings and adjacent areas. The grade difference does not adversely impact the properties around the subject site nor the off-sites.

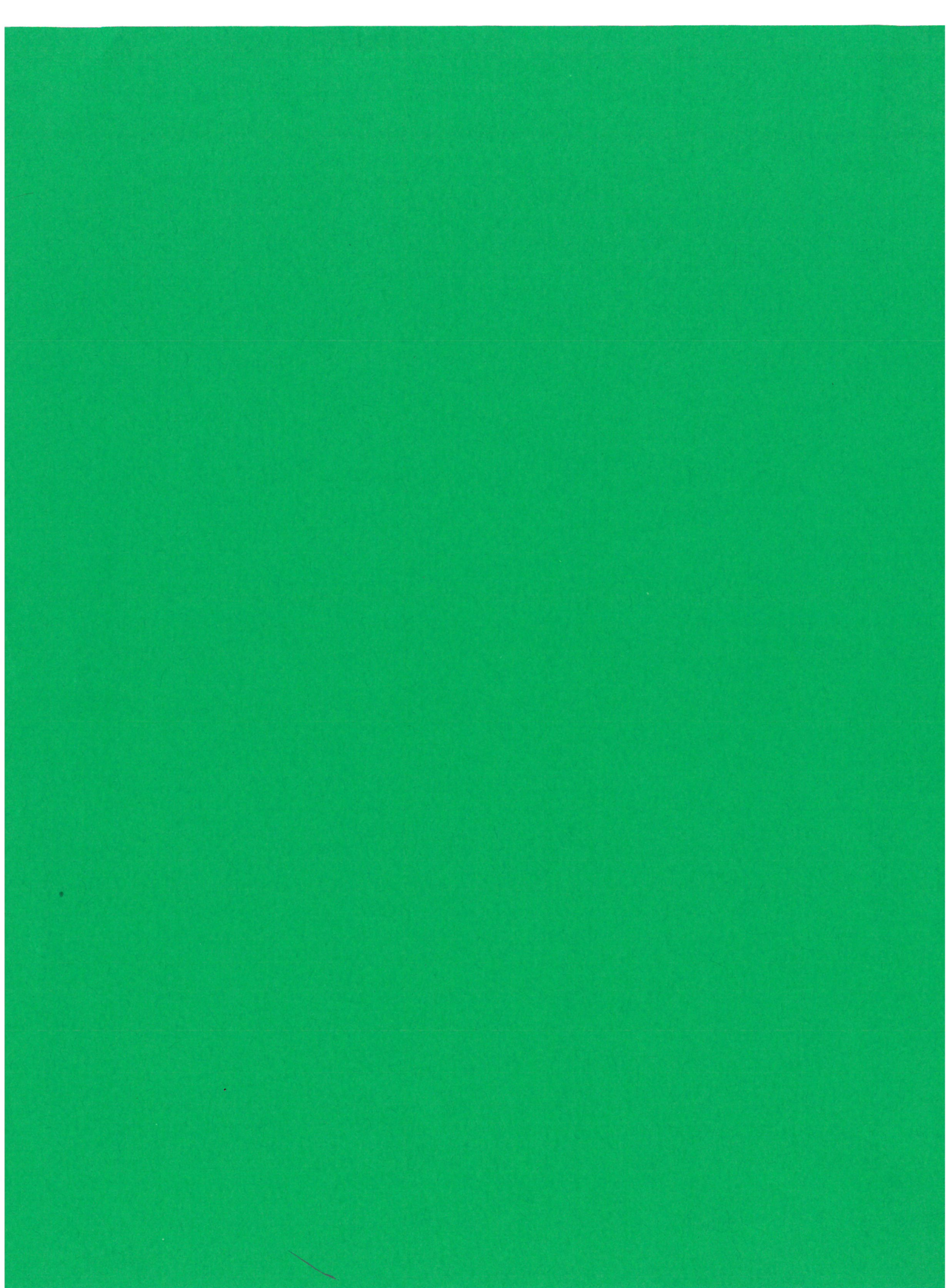
Sincerely,



Thomas Miller, P.E.

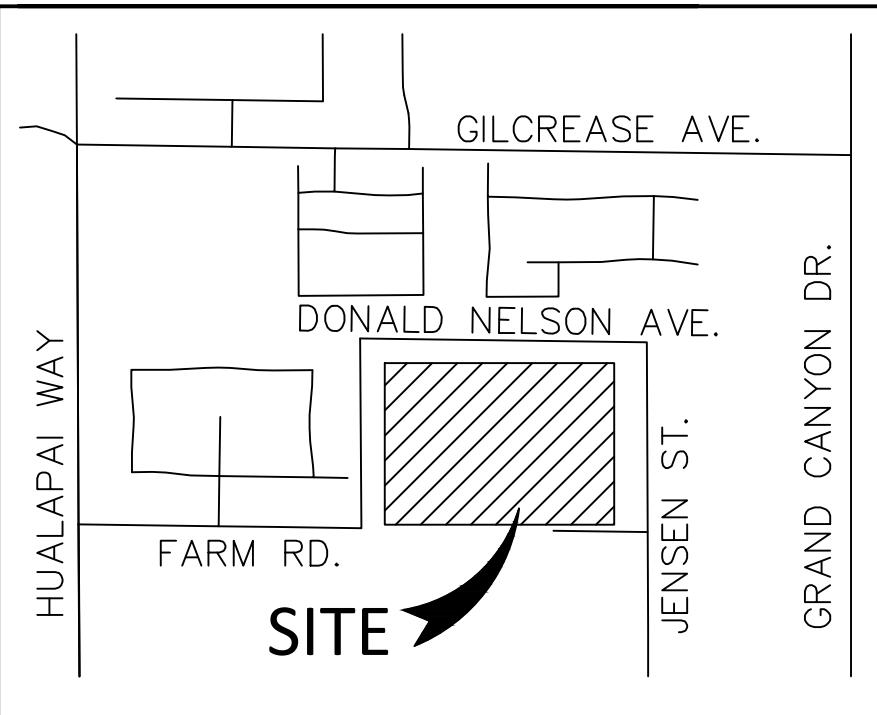
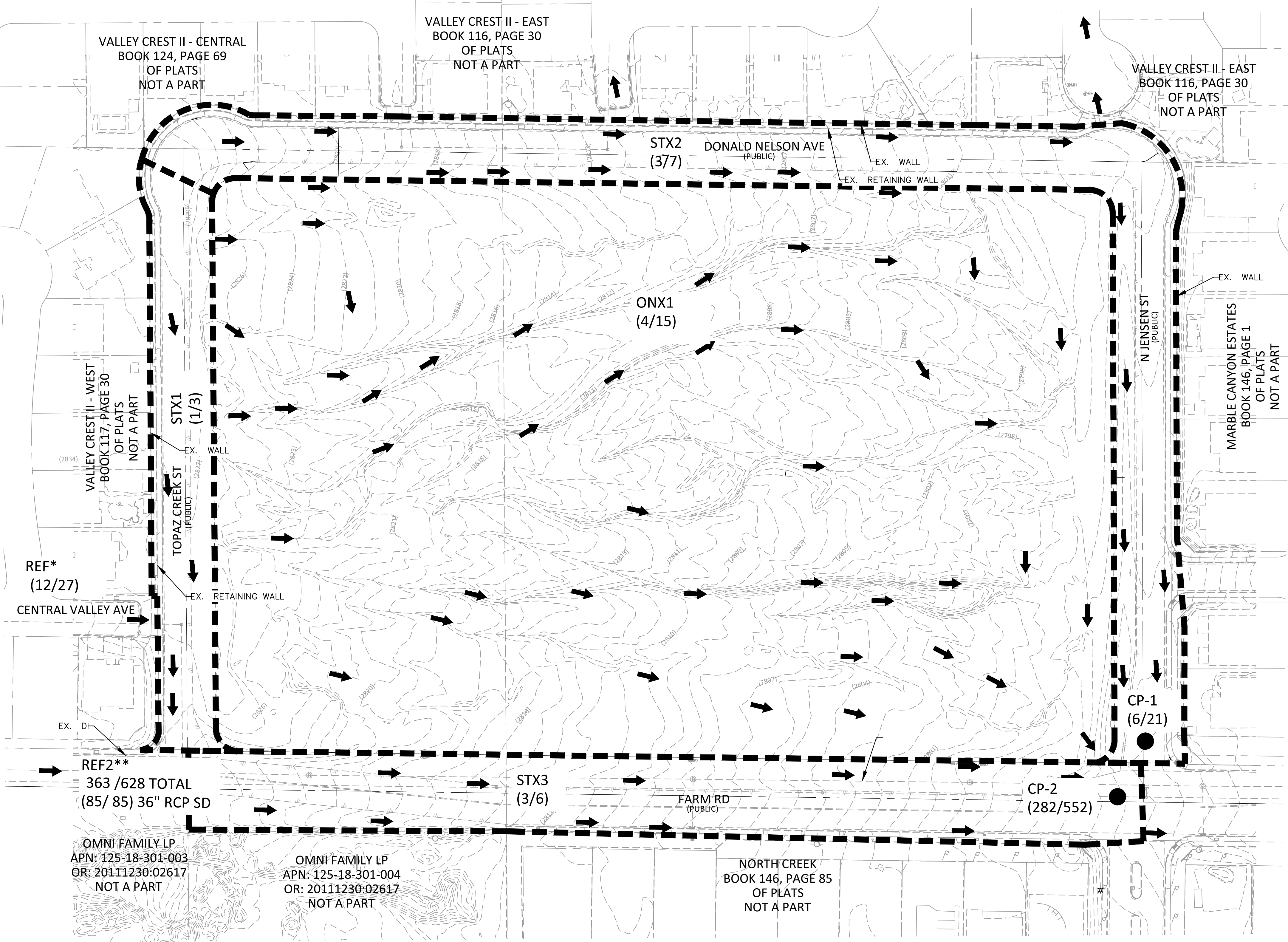
Collins Engineering

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APPENDIX B
(Exhibits, Hydrology & Hydraulic Analysis)

- Existing Condition Drainage Basin Map
- Developed Condition Drainage Basin Map
- Prorated Flow Table for Onsite Sub-basins
- Calculated and prorated Flow Table for FM Sections
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- Pipe and Drip inlets Capacity Analysis
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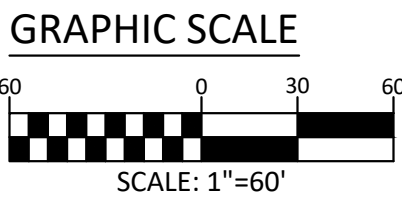


VICINITY MAP
NTS

DRAINAGE AREA SUMMARY TABLE			
BASIN ID	AREA (ACRES)	Q ₁₀ (CFS)	Q ₁₀₀ (CFS)
ONX1	13.0	4	15
STX1	0.9	1	3
STX2	2.6	3	7
STX3	1.9	3	6
CP-1	STX2+ONX1	6	21

REF* REPRESENT THE VALLEY CREST II STUDY (DS 3377)
REF** REPRESENT THE NORTH CREEK STUDY (DS 4615D)

REF**	EX PIPE	STX1	STX3	CP2
363	-85	1	3	282
628	-85	3	6	552
CP-2=REF**SD+STX1+STX3				



FLOOD ZONE NOTE:
THE PROJECT SITE LIES WITHIN UNSHADED FLOOD ZONE "X". PER FIRM PANEL 32003C1745E REVISED SEPTEMBER 27, 2002. PER FEMA, UNSHADED FLOOD ZONE "X" IS AN AREAS OF OUTSIDE THE 500-YEAR FLOODPLAIN.

DRAINAGE LEGEND	
(Q _{10/100})	PEAK 10 YR FLOW / PEAK 100 YR FLOW
---	DRAINAGE AREA BOUNDARY
- - -	SOIL BOUNDARY
➔	DRAINAGE AREA FLOW DIRECTION
ONX1	AREA DESIGNATION
CP1 ●	CONCENTRATION FLOW POINT
FM1 —▶	LOCATION OF HYDRAULIC CROSS SECTION

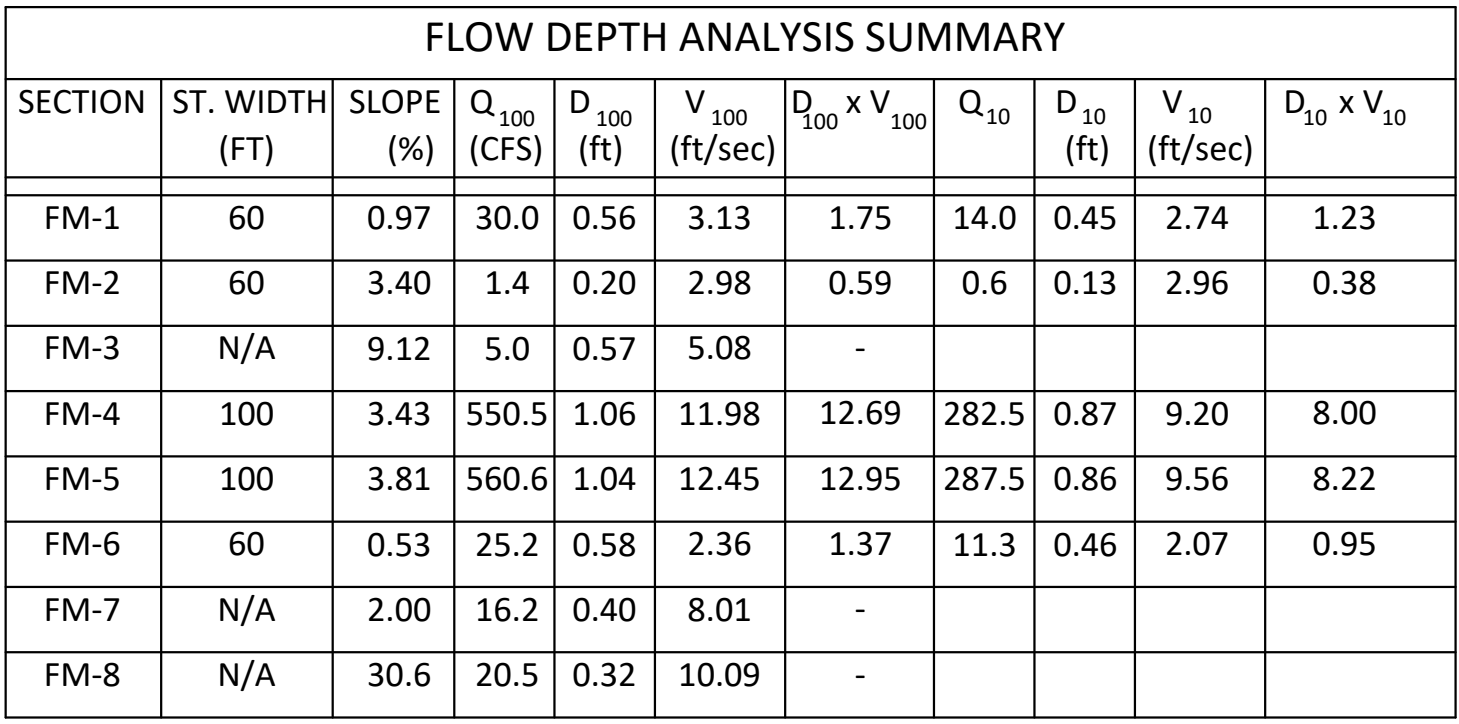
COLLINS ENGINEERS
3130 S. DURANGO DR., SUITE 404
LAS VEGAS, NV 89117
PHONE: (702) 248-8000
FAX: (702) 248-8070
www.collinsengr.com

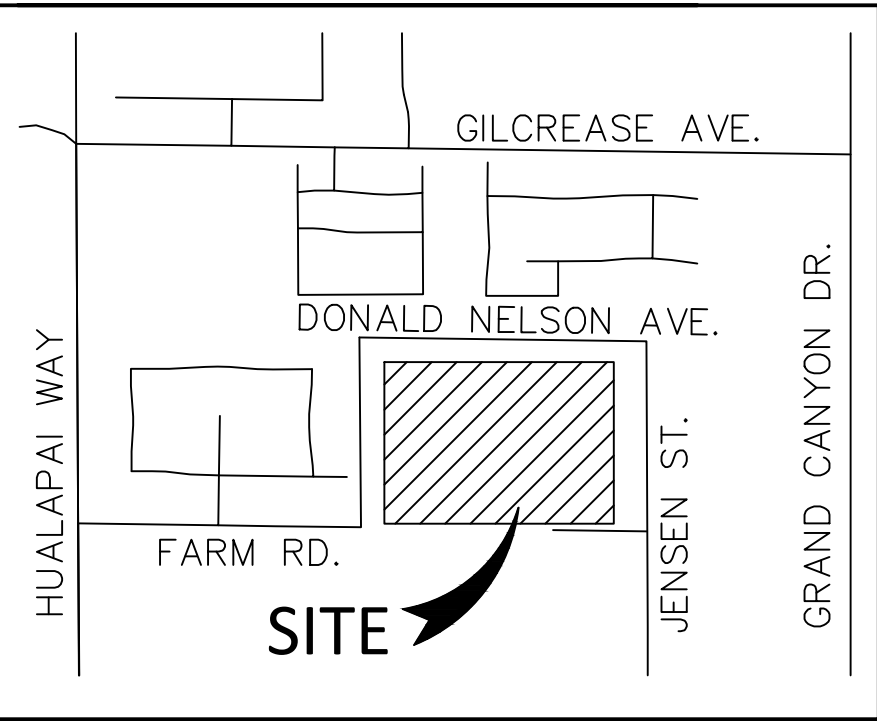
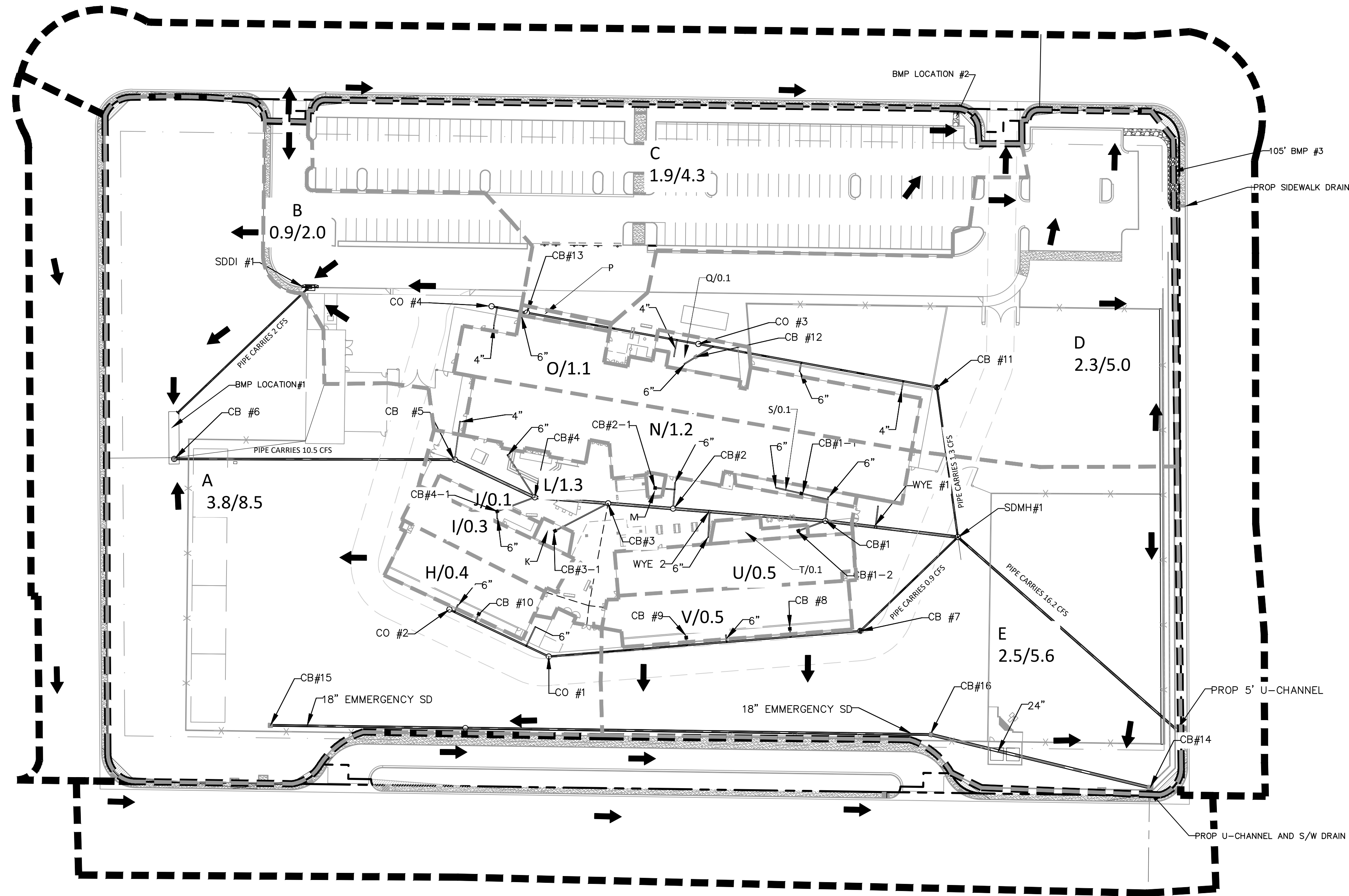
FARM AND JENSEN ELEMENTARY SCHOOL

APN: 125-18-201-015
EXISTING CONDITION BASIN MAP

DATE:	4/03/17
JOB NUMBER:	9748
DESIGNED:	ASNI
DRAWN:	ASNI
CHECKED:	S. MOHAMMED P.E.

FIG. 9





VICINITY MAP
NTS

Prorated Flows From Main Basin OND1					Captured by	Treated Area	
Sub Basin	A (sq. ft.)	Acres	Q ₁₀	Q ₁₀₀		ACRES	
A	146596	3.4	3.8	8.5	CB 6		
B	35116	0.8	0.9	2.0	SDDI #1, CB 6	BMP #1	4.2
C	73247	1.7	1.9	4.3		BMP #2	1.7
D	86361	2.0	2.3	5.0		BMP #3	2.0
E	96537	2.2	2.5	5.6			

I	5260	0.1	0.1	0.3	CB 10+RD		
J	1524	0.0	0.0	0.1	RD		
K	637	0.0	0.0	0.0	CB 4-1		
L	21640	0.5	0.6	1.3	CB 3-1		
M	309	0.0	0.0	0.0	CB 1-5		
N	20255	0.5	0.5	1.2	CB 2-1		
S	1086	0.0	0.0	0.1	CB 12	Q10	Q100
T	1240	0.0	0.0	0.1	CB 1-1	Court yard total	
U	8368	0.2	0.2	0.5	CB 1-2	1.6	3.5
O	18715	0.4	0.5	1.1	RD	North	
P	671	0.0	0.0	0.0	RD		
Q	2424	0.1	0.1	0.1	CB 13	0.6	1.3
H	6463	0.1	0.2	0.4	RD	South	
V	9376	0.2	0.2	0.5	CB 9, 8 +RD	0.4	0.9
Total		12.3	14.1	31.1			

BASIN	AREA	Q ₁₀	Q ₁₀₀	Unit Prorated Flow	
OND1	12.3	14	31	Q ₁₀ /ACRE	Q ₁₀₀ /acre
OND1	12.3	14	31	1.1	2.5

DRAINAGE LEGEND

(Q_{10/100}) PEAK 10 YR FLOW / PEAK 100 YR FLOW

--- DRAINAGE AREA BOUNDARY

- - - SOIL BOUNDARY

➔ DRAINAGE AREA FLOW DIRECTION

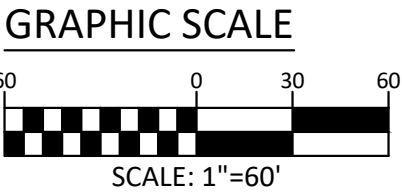
ONX1 AREA DESIGNATION

CP1 ● CONCENTRATION FLOW POINT

FM1 LOCATION OF HYDRAULIC CROSS SECTION

FLOOD ZONE NOTE:
THE PROJECT SITE LIES WITHIN UNSHADED FLOOD ZONE "X". PER FIRM PANEL 32003C1745E REVISED SEPTEMBER 27, 2002. PER FEMA, UNSHADED FLOOD ZONE "X" IS AN AREAS OF OUTSIDE THE 500-YEAR FLOODPLAIN.

DRAINAGE AREA SUMMARY TABLE			
BASIN ID	AREA (ACRES)	Q ₁₀ (CFS)	Q ₁₀₀ (CFS)
OND1	12.3	14	31
STD1	0.9	2	3
STD2	2.7	4	9
STD3	2.5	5	9



REF* REPRESENT THE VALLEY CREST II STUDY (DS 3377)
REF** REPRESENT THE NORTH CREEK STUDY (DS 4615D)

COLLINS ENGINEERS
3130 S. DURANGO DR., SUITE 404
LAS VEGAS, NV 89117
PHONE: (702) 248-8000
FAX: (702) 248-8070
www.collinsengr.com

FARM AND JENSEN ELEMENTARY SCHOOL

APN: 125-18-201-015

ONSITE SUB BASIN FLOWS AND DROP INLET LOCATION

DATE:	04/03/17
JOB NUMBER:	9748
DESIGNED:	ASNI
DRAWN:	ASNI
CHECKED:	S. MOHAMMED P.E.
SHEET NUMBER	

FIG. 11

Prorated Flows From Main Basin OND1					Captured by	Treated Area	
Sub Basin	A (sq. ft.)	Acres	Q ₁₀	Q ₁₀₀			ACRES
A	146596	3.4	3.8	8.5	CB 6	BMP #1	4.2
B	35116	0.8	0.9	2.0	SDDI #1, CB 6		
C	73247	1.7	1.9	4.3		BMP #2	1.7
D	86361	2.0	2.3	5.0		BMP #3	2.0
E	96537	2.2	2.5	5.6			
I	5260	0.1	0.1	0.3	CB 10+RD		
J	1524	0.0	0.0	0.1	RD		
K	637	0.0	0.0	0.0	CB 4-1		
L	21640	0.5	0.6	1.3	CB 3-1		
M	309	0.0	0.0	0.0	CB 1-5		
N	20255	0.5	0.5	1.2	CB 2-1		
S	1086	0.0	0.0	0.1	CB 12	Q10	Q100
T	1240	0.0	0.0	0.1	CB 1-1	Court yard total	
U	8368	0.2	0.2	0.5	CB 1-2	1.6	3.5
O	18715	0.4	0.5	1.1	RD	North	
P	671	0.0	0.0	0.0	RD		
Q	2424	0.1	0.1	0.1	CB 13	0.6	1.3
H	6463	0.1	0.2	0.4	RD	South	
V	9376	0.2	0.2	0.5	CB 9, 8 +RD	0.4	0.9
Total		12.3	14.1	31.1			

BASIN	AREA	Q ₁₀	Q ₁₀₀	Unit Prorated Flow	
				Q ₁₀ /ACRE	Q ₁₀₀ /acre
OND1	12.3	14	31	1.1	2.5

Calculated and Prorated Flows for FM Sections										
						Q ₁₀ CFS	Q ₁₀₀	A (AC.)	Q10	Q100
FM1	REF*+ STD1		Q ₁₀ =2+12		Q ₁₀₀ =3+27				14.0	30.0
	A (sq. ft.)		A (AC.)							
FM2	18744		0.43							
FM3	Sbu-basdin D									
	SUB BASIN "E"		REF**							
FM4(Q10)	2.5		363	STD1		EX SD	STD3		TOTAL	TOTAL
FM4(Q100)	5.6		628	2.00		-85	5		287.5	
				3.00		-85	9			560.6
			sub basin E=2.5/5.6							
FM5	REF**-85+STD1+STD3+E		Q ₁₀ =363-85+2+5+2.5	Q ₁₀₀ =628-85+3+9+5.6					287.5	560.6
FM6	Pipe flow +STD2		pipe =7.3/16.2						11.3	25.2
FM7	Flow carried by SD									16.2
FM8	Flow carried by emergency SD and Sub basin E									20.5

For sub basin area and flow, See Figure 11

Cross Section for FM1-10

Project Description

Friction Method

Manning Formula

Solve For

Normal Depth

Input Data

Channel Slope

0.00970 ft/ft

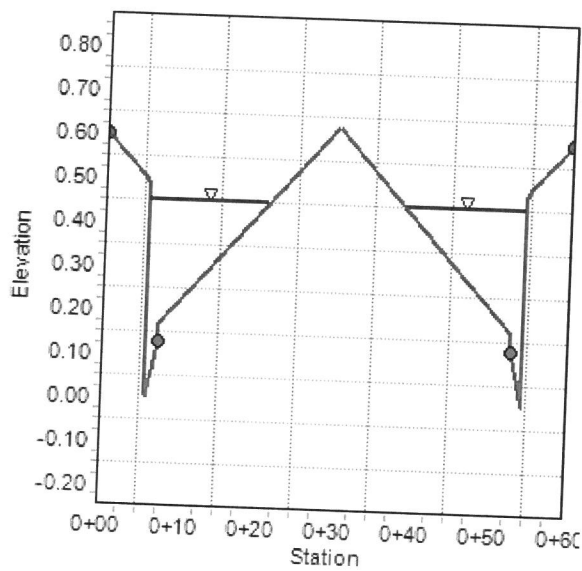
Normal Depth

0.45 ft

Discharge

14.00 ft³/s

Cross Section Image



Worksheet for FM1-10

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.00970 ft/ft
Discharge 14.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+30.00	0.63
0+53.00	0.17
0+53.00	0.13
0+54.50	0.00
0+54.50	0.48
0+55.00	0.50
0+60.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+07.00, 0.13)	0.013
(0+07.00, 0.13)	(0+53.00, 0.13)	0.016
(0+53.00, 0.13)	(0+60.00, 0.60)	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 FM1-10

Results

Normal Depth		0.45	ft
Elevation Range	0.00 to 0.63 ft		
Flow Area		5.11	ft ²
Wetted Perimeter		32.127	ft
Hydraulic Radius		0.16	ft
Top Width		31.138	ft
Normal Depth		0.45	ft
Critical Depth		0.47	ft
Critical Slope		0.00665	ft/ft
Velocity		2.74	ft/s
Velocity Head		0.12	ft
Specific Energy		0.56	ft
Froude Number		1.19	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.45	ft
Critical Depth	0.47	ft
Channel Slope	0.00970	ft/ft
Critical Slope	0.00665	ft/ft

Cross Section for FM1-100

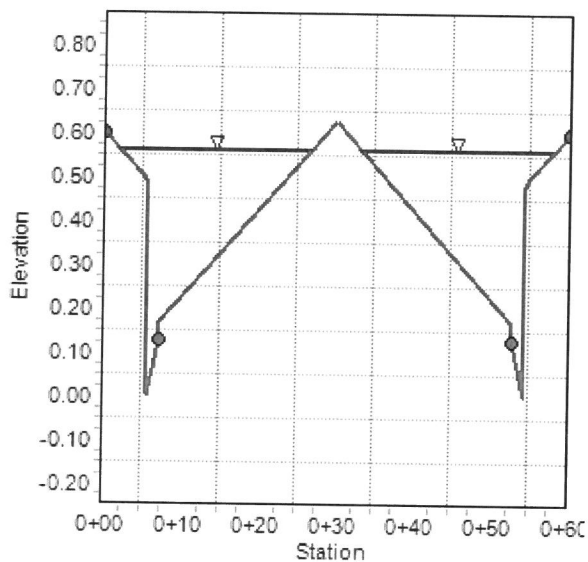
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope	0.00970	ft/ft
Normal Depth	0.56	ft
Discharge	30.00	ft ³ /s

Cross Section Image



Worksheet for FM1-100

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.00970 ft/ft
Discharge 30.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+30.00	0.63
0+53.00	0.17
0+53.00	0.13
0+54.50	0.00
0+54.50	0.48
0+55.00	0.50
0+60.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+07.00, 0.13)	0.013
(0+07.00, 0.13)	(0+53.00, 0.13)	0.016
(0+53.00, 0.13)	(0+60.00, 0.60)	0.013

Options

Current roughness weighting Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for FM1-100

Results

Normal Depth		0.56	ft
Elevation Range	0.00 to 0.63 ft		
Flow Area		9.58	ft ²
Wetted Perimeter		50.701	ft
Hydraulic Radius		0.19	ft
Top Width		49.641	ft
Normal Depth		0.56	ft
Critical Depth		0.60	ft
Critical Slope		0.00602	ft/ft
Velocity		3.13	ft/s
Velocity Head		0.15	ft
Specific Energy		0.71	ft
Froude Number		1.26	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.56	ft
Critical Depth	0.60	ft
Channel Slope	0.00970	ft/ft
Critical Slope	0.00602	ft/ft

Worksheet for FM2-10

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.03400 ft/ft
Discharge 0.60 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+30.00	0.63
0+53.00	0.17
0+53.00	0.13
0+54.50	0.00
0+54.50	0.48
0+55.00	0.50
0+60.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+07.00, 0.13)	0.013
(0+07.00, 0.13)	(0+54.50, 0.48)	0.016
(0+54.50, 0.48)	(0+60.00, 0.60)	0.013

Options

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

Worksheet for FM2-10

Results

Normal Depth		0.13	ft
Elevation Range	0.00 to 0.63 ft		
Flow Area		0.20	ft ²
Wetted Perimeter		3.281	ft
Hydraulic Radius		0.06	ft
Top Width		3.000	ft
Normal Depth		0.13	ft
Critical Depth		0.18	ft
Critical Slope		0.00816	ft/ft
Velocity		2.96	ft/s
Velocity Head		0.14	ft
Specific Energy		0.27	ft
Froude Number		2.00	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.13	ft
Critical Depth	0.18	ft
Channel Slope	0.03400	ft/ft
Critical Slope	0.00816	ft/ft

Cross Section for FM2-100

Project Description

Friction Method

Manning Formula

Solve For

Normal Depth

Input Data

Channel Slope

0.03400 ft/ft

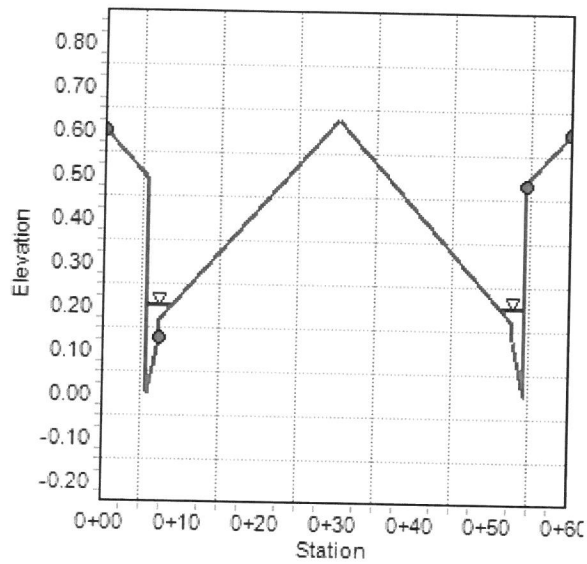
Normal Depth

0.20 ft

Discharge

1.40 ft³/s

Cross Section Image



Worksheet for FM2-100

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.03400 ft/ft
Discharge 1.40 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+30.00	0.63
0+53.00	0.17
0+53.00	0.13
0+54.50	0.00
0+54.50	0.48
0+55.00	0.50
0+60.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+07.00, 0.13)	0.013
(0+07.00, 0.13)	(0+54.50, 0.48)	0.016
(0+54.50, 0.48)	(0+60.00, 0.60)	0.013

Options

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

Worksheet for FM2-100

Results

Normal Depth		0.20	ft
Elevation Range	0.00 to 0.63 ft		
Flow Area		0.47	ft ²
Wetted Perimeter		6.940	ft
Hydraulic Radius		0.07	ft
Top Width		6.450	ft
Normal Depth		0.20	ft
Critical Depth		0.25	ft
Critical Slope		0.00853	ft/ft
Velocity		2.98	ft/s
Velocity Head		0.14	ft
Specific Energy		0.34	ft
Froude Number		1.94	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.20	ft
Critical Depth	0.25	ft
Channel Slope	0.03400	ft/ft
Critical Slope	0.00853	ft/ft

Cross Section for FM-3

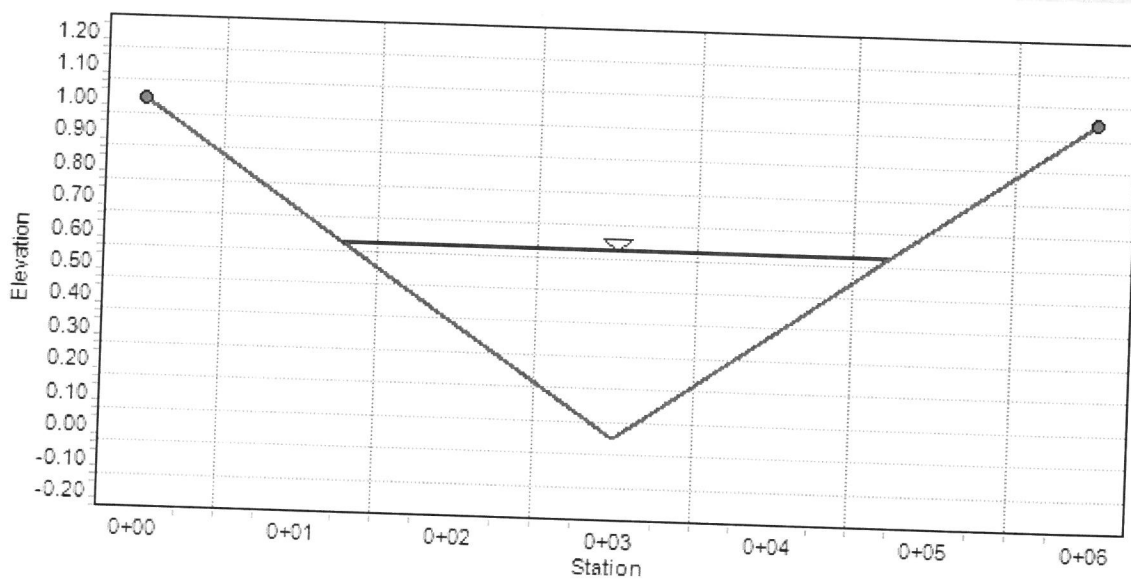
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.09120	ft/ft
Normal Depth	0.57	ft
Discharge	5.00	ft ³ /s

Cross Section Image



Worksheet for FM-3

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.09120 ft/ft
Discharge 5.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+03.00	0.00
0+06.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+06.00, 1.00)	0.037

Options

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

Results

Normal Depth	0.57	ft
Elevation Range	0.000 to 1.000	ft
Flow Area	0.98	ft ²
Wetted Perimeter	3.621	ft
Hydraulic Radius	0.27	ft
Top Width	3.436	ft
Normal Depth	0.57	ft
Critical Depth	0.70	ft
Critical Slope	0.03031	ft/ft
Velocity	5.08	ft/s

Worksheet for FM-3

Results

Velocity Head	0.40	ft
Specific Energy	0.97	ft
Froude Number	1.67	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.57	ft
Critical Depth	0.70	ft
Channel Slope	0.09120	ft/ft
Critical Slope	0.03031	ft/ft

RIP RAP PAD SIZING CALCULATIONS AT FM-3

$$d_{50} = \left[\frac{(V \cdot S^{0.17})}{(3(S_s - 1))} \right]^2 \quad n = 0.0395 \cdot (d_{50})^{1/6}$$

Where:

V = Velocity (fps)

S = Channel Slope (ft/ft)

S_s = Specific Gravity of Rock, 2.5 min.

d₅₀ = Rock size for which 50% of riprap by weight is smaller

n = Mannings roughness coefficient

$$\begin{aligned} V &= 5.08 \text{ fps} \\ S &= 0.0912 \text{ ft/ft} \\ S_s &= 2.65 \end{aligned}$$

$$\begin{aligned} d_{50} &= 0.47 \text{ ft} \\ n &= 0.03479 \end{aligned}$$

Using Minimum Recommended

$$d_{50} = \boxed{8"} \\ n = 0.037$$

Cross Section for FM4 -10-WITH SD

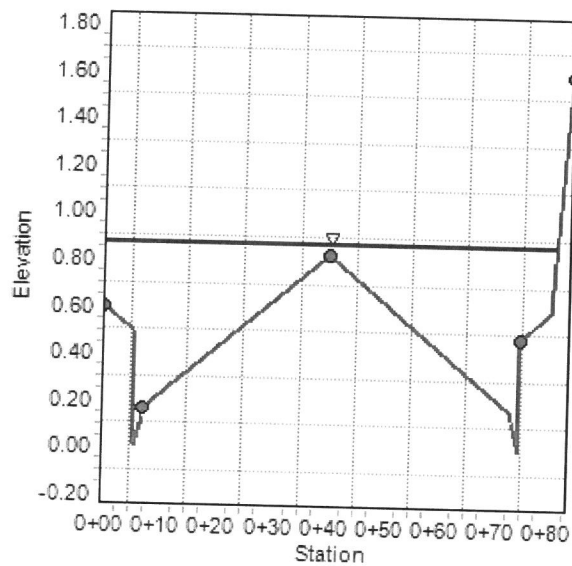
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope	0.03430	ft/ft
Normal Depth	0.87	ft
Discharge	282.50	ft ³ /s

Cross Section Image



Worksheet for FM4 -10-WITH SD

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.03430 ft/ft
Discharge 282.50 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83
0+73.00	0.17
0+73.00	0.13
0+74.50	0.00
0+74.50	0.48
0+80.00	0.60
0+83.00	1.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+07.00, 0.17)	0.013
(0+07.00, 0.17)	(0+40.00, 0.83)	0.016
(0+40.00, 0.83)	(0+74.50, 0.48)	0.016
(0+74.50, 0.48)	(0+83.00, 1.60)	0.013

Options

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

Worksheet for FM4 -10-WITH SD

Options

Closed Channel Weighting Method Pavlovskii's Method

Results

Normal Depth		0.87	ft
Elevation Range	0.00 to 1.60 ft		
Flow Area		30.70	ft²
Wetted Perimeter		82.180	ft
Hydraulic Radius		0.37	ft
Top Width		80.803	ft
Normal Depth		0.87	ft
Critical Depth		1.21	ft
Critical Slope		0.00404	ft/ft
Velocity		9.20	ft/s
Velocity Head		1.32	ft
Specific Energy		2.18	ft
Froude Number		2.63	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.87	ft
Critical Depth	1.21	ft
Channel Slope	0.03430	ft/ft
Critical Slope	0.00404	ft/ft

Cross Section for FM4 -100-WITH SD

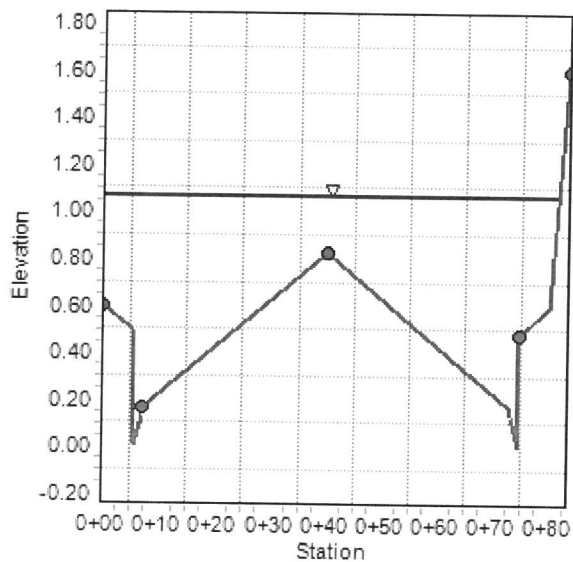
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03430	ft/ft
Normal Depth	1.06	ft
Discharge	550.50	ft ³ /s

Cross Section Image



Worksheet for FM4 -100-WITH SD

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.03430 ft/ft
Discharge 550.50 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83
0+73.00	0.17
0+73.00	0.13
0+74.50	0.00
0+74.50	0.48
0+80.00	0.60
0+83.00	1.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+07.00, 0.17)	0.013
(0+07.00, 0.17)	(0+40.00, 0.83)	0.016
(0+40.00, 0.83)	(0+74.50, 0.48)	0.016
(0+74.50, 0.48)	(0+83.00, 1.60)	0.013

Options

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

Worksheet for FM4 -100-WITH SD

Options

Closed Channel Weighting Method Pavlovskii's Method

Results

Normal Depth	1.06	ft
Elevation Range	0.00 to 1.60	ft
Flow Area	45.97	ft ²
Wetted Perimeter	82.964	ft
Hydraulic Radius	0.55	ft
Top Width	81.368	ft
Normal Depth	1.06	ft
Critical Depth	1.62	ft
Critical Slope	0.00351	ft/ft
Velocity	11.98	ft/s
Velocity Head	2.23	ft
Specific Energy	3.28	ft
Froude Number	2.81	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.06	ft
Critical Depth	1.62	ft
Channel Slope	0.03430	ft/ft
Critical Slope	0.00351	ft/ft

Cross Section for FM5 -10

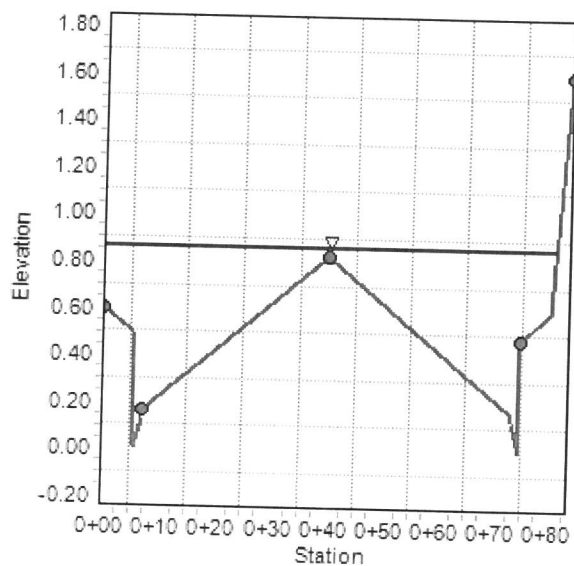
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03810	ft/ft
Normal Depth	0.86	ft
Discharge	287.50	ft ³ /s

Cross Section Image



Worksheet for FM5 -10

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.03810 ft/ft
Discharge 287.50 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83
0+73.00	0.17
0+73.00	0.13
0+74.50	0.00
0+74.50	0.48
0+80.00	0.60
0+83.00	1.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+07.00, 0.17)	0.013
(0+07.00, 0.17)	(0+40.00, 0.83)	0.016
(0+40.00, 0.83)	(0+74.50, 0.48)	0.016
(0+74.50, 0.48)	(0+83.00, 1.60)	0.013

Options

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

Worksheet for FM5 -10

Options

Closed Channel Weighting Method Pavlovskii's Method

Results

Normal Depth		0.86	ft
Elevation Range	0.00 to 1.60 ft		
Flow Area		30.07	ft ²
Wetted Perimeter		82.148	ft
Hydraulic Radius		0.37	ft
Top Width		80.780	ft
Normal Depth		0.86	ft
Critical Depth		1.22	ft
Critical Slope		0.00402	ft/ft
Velocity		9.56	ft/s
Velocity Head		1.42	ft
Specific Energy		2.28	ft
Froude Number		2.76	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.86	ft
Critical Depth	1.22	ft
Channel Slope	0.03810	ft/ft
Critical Slope	0.00402	ft/ft

Cross Section for FM5 -100

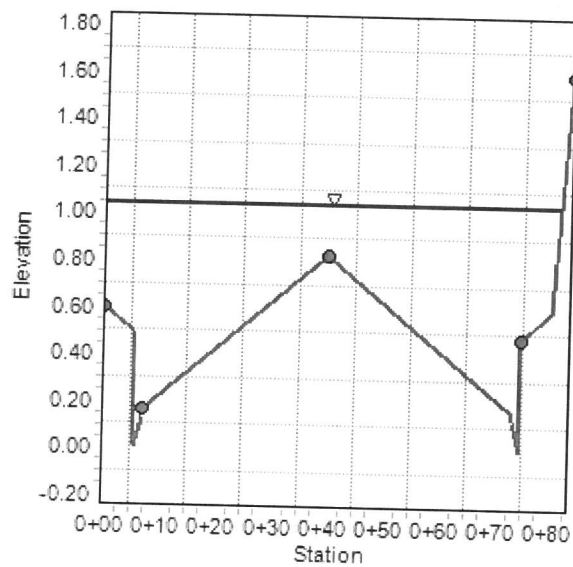
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03810	ft/ft
Normal Depth	1.04	ft
Discharge	560.60	ft ³ /s

Cross Section Image



Worksheet for FM5 -100

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.03810 ft/ft
Discharge 560.60 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83
0+73.00	0.17
0+73.00	0.13
0+74.50	0.00
0+74.50	0.48
0+80.00	0.60
0+83.00	1.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+07.00, 0.17)	0.013
(0+07.00, 0.17)	(0+40.00, 0.83)	0.016
(0+40.00, 0.83)	(0+74.50, 0.48)	0.016
(0+74.50, 0.48)	(0+83.00, 1.60)	0.013

Options

Current roughness weighting Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method

Worksheet for FM5 -100

Options

Closed Channel Weighting Method Pavlovskii's Method

Results

Normal Depth		1.04	ft
Elevation Range	0.00 to 1.60 ft		
Flow Area		45.03	ft ²
Wetted Perimeter		82.916	ft
Hydraulic Radius		0.54	ft
Top Width		81.334	ft
Normal Depth		1.04	ft
Critical Depth		1.63	ft
Critical Slope		0.00349	ft/ft
Velocity		12.45	ft/s
Velocity Head		2.41	ft
Specific Energy		3.45	ft
Froude Number		2.95	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.04	ft
Critical Depth	1.63	ft
Channel Slope	0.03810	ft/ft
Critical Slope	0.00349	ft/ft

Cross Section for FM6 -Q10

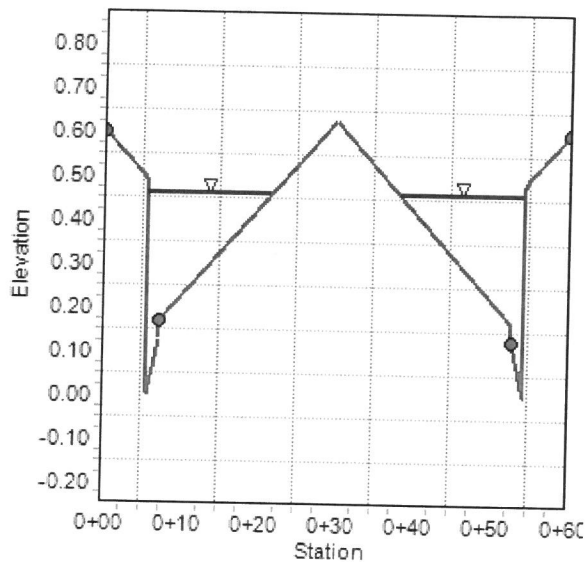
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope	0.00530	ft/ft
Normal Depth	0.46	ft
Discharge	11.30	ft ³ /s

Cross Section Image



Project Description

Manning Formula

Normal Depth

Section Definitions

Worksheet for FM6 -Q10

Results

Normal Depth		0.46	ft
Elevation Range	0.000 to 0.625 ft		
Flow Area		5.47	ft ²
Wetted Perimeter		33.276	ft
Hydraulic Radius		0.16	ft
Top Width		32.264	ft
Normal Depth		0.46	ft
Critical Depth		0.44	ft
Critical Slope		0.00685	ft/ft
Velocity		2.07	ft/s
Velocity Head		0.07	ft
Specific Energy		0.52	ft
Froude Number		0.89	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.46	ft
Critical Depth	0.44	ft
Channel Slope	0.00530	ft/ft
Critical Slope	0.00685	ft/ft

Project Description

Manning Formula

Normal Depth

25.20 ft³/s

Worksheet for FM6 -100

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.00530 ft/ft
Discharge 25.20 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+30.00	0.63
0+53.00	0.17
0+53.00	0.13
0+54.50	0.00
0+54.50	0.48
0+55.00	0.50
0+60.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+07.00, 0.17)	0.013
(0+07.00, 0.17)	(0+53.00, 0.13)	0.016
(0+53.00, 0.13)	(0+60.00, 0.60)	0.013

Options

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

Worksheet for FM6 -100

Results

Normal Depth		0.58	ft
Elevation Range	0.00 to 0.63 ft		
Flow Area		10.66	ft ²
Wetted Perimeter		54.887	ft
Hydraulic Radius		0.19	ft
Top Width		53.826	ft
Normal Depth		0.58	ft
Critical Depth		0.57	ft
Critical Slope		0.00607	ft/ft
Velocity		2.36	ft/s
Velocity Head		0.09	ft
Specific Energy		0.67	ft
Froude Number		0.94	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.58	ft
Critical Depth	0.57	ft
Channel Slope	0.00530	ft/ft
Critical Slope	0.00607	ft/ft

Cross Section for FM-7-(For Outlet WSE)

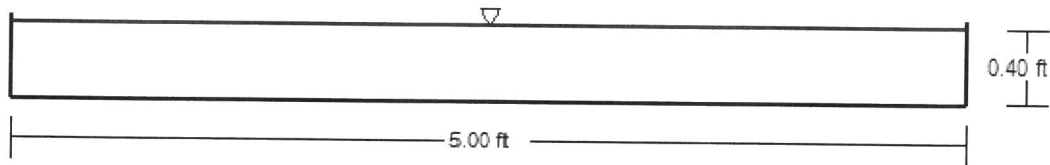
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.02000 ft/ft
Normal Depth	0.40 ft
Bottom Width	5.00 ft
Discharge	16.20 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for FM-7-(For Outlet WSE)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Bottom Width	5.00	ft
Discharge	16.20	ft ³ /s

Results

Normal Depth	0.40	ft
Flow Area	2.02	ft ²
Wetted Perimeter	5.81	ft
Hydraulic Radius	0.35	ft
Top Width	5.00	ft
Critical Depth	0.69	ft
Critical Slope	0.00386	ft/ft
Velocity	8.01	ft/s
Velocity Head	1.00	ft
Specific Energy	1.40	ft
Froude Number	2.22	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.40	ft
Critical Depth	0.69	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00386	ft/ft

Cross Section for FM-8-U-Channel At CB #14

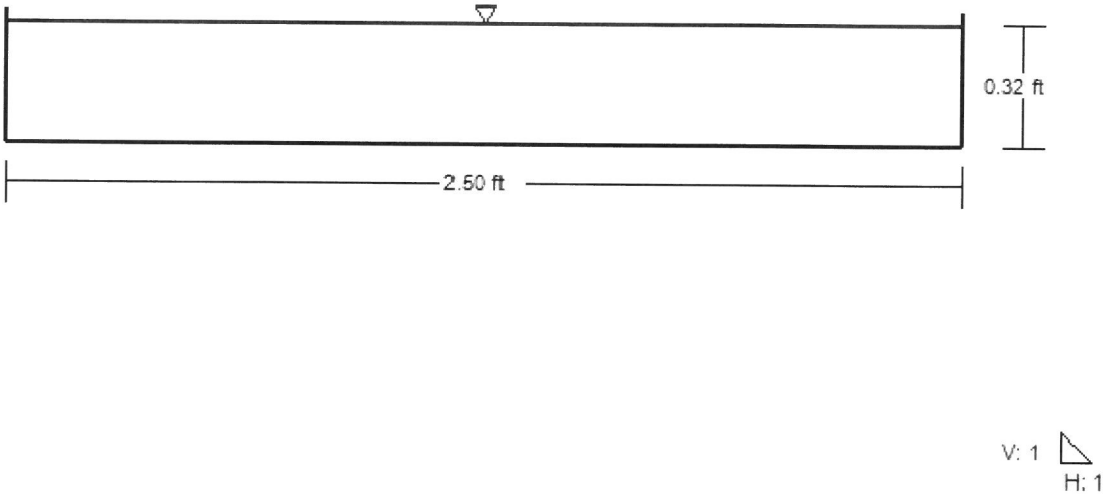
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.30600 ft/ft
Normal Depth	0.32 ft
Bottom Width	2.50 ft
Discharge	20.50 ft³/s

Cross Section Image



Worksheet for FM-8-U-Channel At CB #14

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.30600	ft/ft
Bottom Width	2.50	ft
Discharge	20.50	ft ³ /s

Results

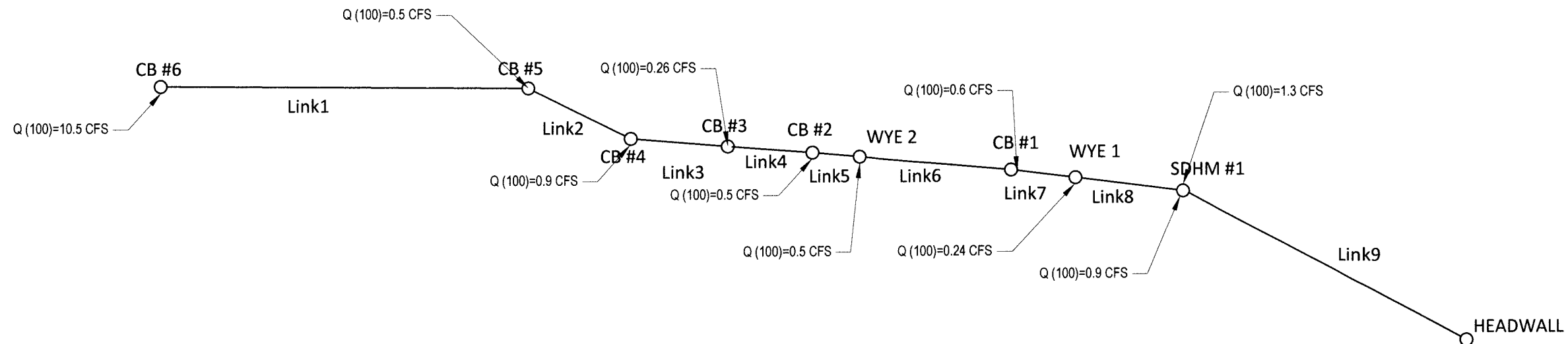
Normal Depth	0.32	ft
Flow Area	0.80	ft ²
Wetted Perimeter	3.14	ft
Hydraulic Radius	0.26	ft
Top Width	2.50	ft
Critical Depth	1.28	ft
Critical Slope	0.00580	ft/ft
Velocity	25.48	ft/s
Velocity Head	10.09	ft
Specific Energy	10.41	ft
Froude Number	7.92	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.32	ft
Critical Depth	1.28	ft
Channel Slope	0.30600	ft/ft
Critical Slope	0.00580	ft/ft



SITE OVERVIEW

SCALE: NTS

FARM & JENSEN ES SUMMARY OF WSPG MODEL FOR PROPOSED STORM DRAIN SYSTEM				
WSPG Station	NODE	FG (ft.)	HGL (ft.)	FG with respect to HGL (ft.)
1000.00	HEADWALL	797.97	793.78	4.19
1256.05	SDMH #1	812.70	802.47	10.23
1327.32	WYE #1	813.00	802.83	10.17
1372.26	CB #1	813.10	803.1	10.00
1473.51	WYE #2	813.50	803.5	10.00
1506.26	CB #2	813.40	803.65	9.75
1563.48	CB #3	813.20	803.85	9.35
1628.10	CB #4	812.80	804.09	8.71
1705.66	CB #5	813.50	804.04	9.46
1950.92	CB #6	808.20	806.66	1.54

FARM AND JENSEN ELEMENTARY
SCHOOL
MAIN STORM DRAIN WSPG MODE

[TITLE]
FARM AND JENSEN ELEMENTARY SCHOOL
MAIN STORM DRAIN CAPACITY ANALYSIS
COLLINS ENGINEERS JOB No. 9748

[REPORT]
COMPOSITE_ONLY

[NETWORK]
**TYPE NAME

Outlet "HEADWALL"
Reach "Link9"
Junction "SDMH #1"
Reach "Link8"
Junction "WYE 1"
Reach "Link7"
Junction "CB #1"
Reach "Link6"
Junction "WYE 2"
Reach "Link5"
Junction "CB #2"
Reach "Link4"
Junction "CB #3"
Reach "Link3"
Junction "CB #4"
Reach "Link2"
Junction "CB #5"
Reach "Link1"
Headwork "CB #6"

**BRANCH DEFINITIONS

[OUTLET]
**NAME STATION INVERT ELEV GROUND ELEV CHANNEL ID WATER SURFACE ELEV (opt.)
**-----
"HEADWALL" 1000 792.66 797.97 "18-INCH" 793.06

[HEADWORK]
**NAME INVERT ELEV GROUND ELEV CHANNEL ID FLOW LOSS WATER SURFACE ELEV (opt.)
**-----
"CB #6" 804.16 808.2 "18-INCH" 10.5 0

[WALLENTRENCE]
**NAME INVERT ELEV GROUND ELEV CHANNEL ID LOSS COEFFICIENT(opt.)
**-----

[WALLEXIT]

**NAME	INVERT ELEV	GROUND ELEV	CHANNEL ID	LOSS COEFFICIENT(opt.)				
**								
**								
[BRIDGEENTRANCE]								
**NAME	INVERT ELEV	GROUND ELEV	CHANNEL ID	REDUCTION FACTOR(opt.)				
**								
**								
[BRIDGEEXIT]								
**NAME	INVERT ELEV	GROUND ELEV	CHANNEL ID	REDUCTION FACTOR(opt.)				
**								
**								
[JOIN]								
**NAME	INVERT ELEV	GROUND ELEV	CHANNEL ID	LENGTH	MANNINGS n	NUMBER OF BRANCHES	CONFLUENCE ANGLE	
**								
**								
[JUNCTION]								
**Name	INVERT ELEV	GROUND ELEV	CHANNEL ID	LENGTH	MANNINGS n	NUMBER OF LATERALS	CONFLUENCE ANGLE	FLOW
**								
**								
"CB #5"	801.69	813.5	"18-INCH"	2	0.013	2		
"CB #5_Lateral1"	802.86		"6-INCH"				90	0.24
"CB #5_Lateral2"	813.5		"18-INCH"				90	0.26
"CB #4"	801.38	812.8	"24-INCH"	2	0.013	3		
"CB #4_Lateral1"	801.38		"12-INCH"				53	0.24
"CB #4_Lateral2"	801.38		"6-INCH"				-25	0.4
"CB #4_Lateral3"	812.8		"24-INCH"				90	0.26
"CB #3"	801.12	813.2	"24-INCH"	2	0.013	2		
"CB #3_Lateral1"	802.79		"12-INCH"				-32	0.001
"CB #3_Lateral2"	813.2		"24-INCH"				90	0.26
"CB #2"	800.89	813.4	"24-INCH"	2	0.013	2		
"CB #2_Lateral1"	802.56		"12-INCH"				90	0.24
"CB #2_Lateral2"	813.4		"24-INCH"				90	0.26
"WYE 2"	800.76	813.5	"24-INCH"	1	0.013	1		
"WYE 2_Lateral1"	802.56		"6-INCH"				-90	0.5
"CB #1"	800.35	813.1	"24-INCH"	2	0.013	3		
"CB #1_Lateral1"	802.02		"12-INCH"				90	0.24
"CB #1_Lateral2"	802.02		"12-INCH"				-25	0.1
"CB #1_Lateral3"	813		"24-INCH"				90	0.26
"WYE 1"	800.17	813	"24-INCH"	1	0.013	1		
"WYE 1_Lateral1"	801.84		"6-INCH"				90	0.24

MAIN LINE SD.wsx

	799.88	812.7	"24-INCH"	4	0.013	2	41	1.3
"SDMH #1"			"12-INCH"				-85	0.9
"SDMH #1_Lateral1"	800.88		"12-INCH"					
"SDMH #1_Lateral2"	800.88							

[TRANSITION]

**NAME	INVERT ELEV	GROUND ELEV	CHANNEL ID	LENGTH	MANNINGS n
**					

[REACH]

**NAME	INVERT ELEV	GROUND ELEV	CHANNEL ID	LENGTH	MANNINGS n	CURVE (opt)	ANGLE POINT(opt)	NUMBER MANHOLES(opt)
**								
"Link1"	804.16	808.2	"18-INCH"	245.26	0.013	0	0	1
"Link2"	801.69	813.5	"24-INCH"	75.56	0.013	0	0	1
"Link3"	801.38	812.8	"24-INCH"	62.62	0.013	0	0	1
"Link4"	801.12	813.2	"24-INCH"	55.22	0.013	0	0	1
"Link5"	800.89	813.4	"24-INCH"	30.75	0.013	0	0	1
"Link6"	800.76	813.5	"24-INCH"	100.25	0.013	0	0	1
"Link7"	800.35	813.1	"24-INCH"	42.94	0.013	0	0	0
"Link8"	800.17	813	"24-INCH"	70.27	0.013	0	0	1
"Link9"	799.88	812.7	"18-INCH"	252.05	0.013	0	0	0

[DROP]

**Name	INVERT ELEV	GROUND ELEV	CHANNEL ID	LOSS COEFFICIENT
**				

[ALAMEDA]

ANGLE_LOSS_COEFFICIENT "Link1" 0.25
 ANGLE_LOSS_COEFFICIENT "Link2" 0.25
 ANGLE_LOSS_COEFFICIENT "Link8" 0.35

[CHANNEL]

**REGULAR	TYPES 1-4	7-8	WIDTH	LEFT SLOPE	RIGHT SLOPE	NUMBER PIERS	AVG PIER WIDTH	INVERT CROSS FALL	NUM OF BARRELS
**									
"18-INCH"	4	1.5							1
"6-INCH"	4	0.5							1
"24-INCH"	4	2							1
"12-INCH"	4	1							1

**IRREGULAR TYPES 5-6

**ID	TYPE	NUMBER PIERS	AVG PIER WIDTH	PIER1 ELEV	PIER2 ELEV	PIER3 ELEV	PIER4 ELEV	PIER5 ELEV	PIER6 ELEV	PIER7 ELEV	PIER8 ELEV	PIER9 ELEV	PIER10 ELEV
**													

[POINT]			
**ID	XCOORD	YCOORD	
**	-----	-----	-----

[TITLE]
18-24-INCH EMERGENCY SD CAPACITY
FARM AND JENSEN ELEMENTARY SCHOOL
COLLINS ENGINEERS JOB NO. 9748

[REPORT]
COMPOSITE_ONLY

[NETWORK]
**TYPE NAME
**-----
Outlet "U-CHANNEL"
Reach "Link5"
Junction "CB #14"
Reach "Link4"
Transition "Link3"
Reach "Link2"
Reach "Link1"
Headwork "CB #15"

**BRANCH DEFINITIONS

[OUTLET] **NAME **	STATION	INVERT ELEV	GROUND ELEV	CHANNEL ID	WATER SURFACE ELEV (opt.)
"U-CHANNEL"	2000	795.18	799.29	"24-INCH"	95.5

[HEADWORK] **NAME **	INVERT ELEV	GROUND ELEV	CHANNEL ID	FLOW	WATER SURFACE ELEV (opt.)
"CB #15"	808.48	811.8	"18-INCH"	14.4	0

[WALLENTRENCE] **NAME **	INVERT ELEV	GROUND ELEV	CHANNEL ID	LOSS COEFFICIENT(opt.)

[WALLEXIT] **NAME **	INVERT ELEV	GROUND ELEV	CHANNEL ID	LOSS COEFFICIENT(opt.)

[BRIDGEENTRENCE] **NAME **	INVERT ELEV	GROUND ELEV	CHANNEL ID	REDUCTION FACTOR(opt.)

[BRIDGEEXIT] **NAME	INVERT	GROUND	CHANNEL	REDUCTION

```

**          ELEV          ELEV          ID          FACTOR(opt.)
**-----
[JOIN]
**NAME      INVERT      GROUND      CHANNEL      LENGTH      MANNINGS n  NUMBER OF  CONFLUENCE
**          ELEV        ELEV        ID          LATERALS  BRANCHES  ANGLE
**-----
[JUNCTION]
**Name      INVERT      GROUND      CHANNEL      LENGTH      MANNINGS n  NUMBER OF  CONFLUENCE
**          ELEV        ELEV        ID          LATERALS  BRANCHES  ANGLE
**-----
"CB #14"    795.41      798      "24-INCH"    3      0.013      1      90      6.1
"CB #14_Lateral1"
797.5

[TRANSITION]
**NAME      INVERT      GROUND      CHANNEL      LENGTH      MANNINGS n
**          ELEV        ELEV        ID          LATERALS  BRANCHES
**-----
"Link3"    798.586      811.4      "18-INCH"    1      0.013

[REACH]
**NAME      INVERT      GROUND      CHANNEL      LENGTH      MANNINGS n  CURVE      ANGLE      NUMBER
**          ELEV        ELEV        ID          LATERALS  BRANCHES  (opt)      POINT(opt)  MANHOLES(opt)
**-----
"Link1"    808.48      811.8      "18-INCH"    211.69      0.013      0      0      0
"Link2"    805.13      812.8      "18-INCH"    407.46      0.013      0      0      1
"Link4"    798.57      811.4      "24-INCH"    195.8      0.013      0      0      1
"Link5"    795.41      798      "24-INCH"    1      0.013      0      0      0

[DROP]
**Name      INVERT      GROUND      CHANNEL      LOSS
**          ELEV        ELEV        ID          COEFFICIENT
**-----

[ALAMEDA]
ANGLE_LOSS_COEFFICIENT "Link2" 0.25
ANGLE_LOSS_COEFFICIENT "Link4" 0.5

[CHANNEL]
**REGULAR   TYPES 1-4 7-8
**ID        TYPE HEIGHT  WIDTH  LEFT  RIGHT  NUMBER  AVG PIER  INVERT  NUM OF
**          TYPE HEIGHT  WIDTH  SLOPE SLOPE  PIERS   WIDTH    CROSS  FALL  BARRELS
**-----
"24-INCH"   4 2      24-INCH  4 2      24-INCH  4 2      24-INCH  4 2      24-INCH  4 2      24-INCH  4 2      24-INCH  4 2
"18-INCH"   4 1.5    18-INCH  4 1.5    18-INCH  4 1.5    18-INCH  4 1.5    18-INCH  4 1.5    18-INCH  4 1.5    18-INCH  4 1.5    18-INCH  4 1.5

**IRREGULAR TYPES 5-6
**ID        TYPE NUMBER  AVG PIER  PIER1  PIER2  PIER3  PIER4  PIER5  PIER6  PIER7  PIER8  PIER9  PIER10
**          TYPE NUMBER  WIDTH    ELEV    ELEV    ELEV    ELEV    ELEV    ELEV    ELEV    ELEV    ELEV    ELEV

```

*-----

[POINT]
**ID XCOORD YCOORD
**-----

Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.0 30/09/2011
 Alameda Extension
XP Solutions www.xpsolutions.com

INPUT FILE

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Computed 03/21/17 10:37:35

TITLE INFORMATION

 FARM AND JENSEN ELEMANTARY SCHOOL
 MAIN STORM DRAIN CAPACITY ANALYSIS
 COLLINS ENGINEERS JOB No. 9748

WARNING SUMMARY

WARNING 47: Junction CB #5 has a different channel than its direct downstream element.
WARNING 47: Junction SDMH #1 has a different channel than its direct downstream element.
WARNING 36: D/S processing stopped in junction CB #4 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction CB #3 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction CB #2 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction WYE 2 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction CB #1 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction WYE 1 because critical momentum is greater than maximum momentum.
WARNING 36: D/S processing stopped in junction SDMH #1 because critical momentum is greater than maximum momentum.
WARNING 64: Alameda lower junction loss limit exceeded for WYE 1..
WARNING 64: Alameda lower junction loss limit exceeded for WYE 2..
WARNING 64: Alameda lower junction loss limit exceeded for CB #2..
WARNING 64: Alameda lower junction loss limit exceeded for CB #3..

RESULTS

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 Main Line
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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION	
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###																	
"HEADWALL"	Outlet	1000.00	792.66	797.97	793.784	1.124	16.20	1	11.40	2.02	795.80	0.000	1.428	0.000	0.00000	0.000	Circular Pipe
	"i.p."	1059.55	794.37	801.45	795.490	1.124	16.20	1	11.40	2.02	797.51	0.000	1.428	1.922	0.02865	1.124	Circular Pipe
	"i.p."	1150.47	796.97	806.76	798.105	1.135	16.20	1	11.30	1.98	800.09	0.000	1.428	1.887	0.02865	1.124	Circular Pipe

H:\Cad\Land\9748\ADMIN\Drainage\ADD 1\HYDRAULC\WSPG\MAIN LINE SD.out

	"i.p."	1213.44	798.77	810.44	799.965	1.191	16.20	1	10.77	1.80	801.77	0.000	1.428	1.705	0.02865	1.124	Circular Pipe
	"i.p."	1235.86	799.42	811.75	800.670	1.254	16.20	1	10.27	1.64	802.31	0.000	1.428	1.519	0.02865	1.124	Circular Pipe
	"i.p."	1247.34	799.75	812.42	801.073	1.328	16.20	1	9.79	1.49	802.56	0.000	1.428	1.312	0.02865	1.124	Circular Pipe
"Link9"	Reach	1252.05	799.88	812.70	801.307	1.427	16.20	1	9.34	1.35	802.66	0.000	1.428	1.004	0.02865	1.124	Circular Pipe
"SDMH #1"	Junction	1256.05	799.88	812.70	802.466	2.586	14.00	1	4.46	0.31	802.77	0.000	1.348	0.000	0.00000	0.000	Circular Pipe
"Link8"	Reach	1326.32	800.17	813.00	802.858	2.688	14.00	1	4.46	0.31	803.17	0.000	1.348	0.000	0.00413	1.577	Circular Pipe
"WYE 1"	Junction	1327.32	800.17	813.00	802.883	2.713	13.76	1	4.38	0.30	803.18	0.000	1.336	0.000	0.00000	0.000	Circular Pipe
"Link7"	Reach	1370.26	800.35	813.10	803.042	2.692	13.76	1	4.38	0.30	803.34	0.000	1.336	0.000	0.00419	1.540	Circular Pipe
"CB #1"	Junction	1372.26	800.35	813.10	803.100	2.750	13.16	1	4.19	0.27	803.37	0.000	1.305	0.000	0.00000	0.000	Circular Pipe
"Link6"	Reach	1472.51	800.76	813.50	803.453	2.693	13.16	1	4.19	0.27	803.73	0.000	1.305	0.000	0.00409	1.497	Circular Pipe
"WYE 2"	Junction	1473.51	800.76	813.50	803.496	2.736	12.66	1	4.03	0.25	803.75	0.000	1.280	0.000	0.00000	0.000	Circular Pipe
"Link5"	Reach	1504.26	800.89	813.40	803.605	2.715	12.66	1	4.03	0.25	803.86	0.000	1.280	0.000	0.00423	1.430	Circular Pipe
"CB #2"	Junction	1506.26	800.89	813.40	803.650	2.760	12.16	1	3.87	0.23	803.88	0.000	1.253	0.000	0.00000	0.000	Circular Pipe
"Link4"	Reach	1561.48	801.12	813.20	803.822	2.702	12.16	1	3.87	0.23	804.05	0.000	1.253	0.000	0.00417	1.395	Circular Pipe
"CB #3"	Junction	1563.48	801.12	813.20	803.847	2.727	11.90	1	3.79	0.22	804.07	0.000	1.239	0.000	0.00000	0.000	Circular Pipe
"Link3"	Reach	1626.10	801.38	812.80	804.031	2.651	11.90	1	3.79	0.22	804.25	0.000	1.239	0.000	0.00415	1.374	Circular Pipe
"CB #4"	Junction	1628.10	801.38	812.80	804.094	2.714	11.00	1	3.50	0.19	804.28	0.000	1.189	0.000	0.00000	0.000	Circular Pipe
"Link2"	Reach	1703.66	801.69	813.50	804.330	2.640	11.00	1	3.50	0.19	804.52	0.000	1.189	0.000	0.00410	1.303	Circular Pipe
"CB #5"	Junction	1705.66	801.69	813.50	804.040	2.350	10.50	1	5.94	0.55	804.59	0.000	1.245	0.000	0.00000	0.000	Circular Pipe
"Link1"	Reach	1950.92	804.16	808.20	806.655	2.495	10.50	1	5.94	0.55	807.20	0.000	1.245	0.000	0.01007	1.224	Circular Pipe
"CB #6"	Headwrk	1950.92	804.16	808.20	806.655	2.495	10.50	1	5.94	0.55	807.20	0.000	1.245	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.0 30/09/2011
 Alameda Extension
XP Solutions www.xpsolutions.com

INPUT FILE

H:\Cad\Land\9748\ADMIN\Drainage\ADD 1\HYDRAULC\WSPG\18-em.wsx
Computed 03/21/17 10:57:13

TITLE INFORMATION

18-24-INCH EMMERGENCY SD CAPACITY
FARM AND JENSEN ELEMENTARY SCHOOL
COLLINS ENGINEERS JOB No. 9748

WARNING SUMMARY

WARNING 36: D/S processing stopped in junction CB #14 because critical momentum is greater than maximum momentum.

RESULTS

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Main Line
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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION

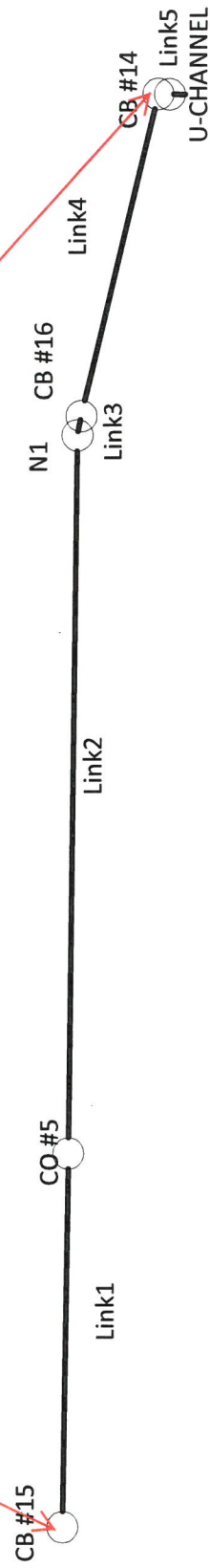
###																	
"U-CHANNE"	Outlet	2000.00	795.18	799.29	796.467	1.287	20.50	1	9.59	1.43	797.90	0.000	1.624	0.000	0.00000	0.000	Circular Pipe
	"i.p."	2000.06	795.19	799.22	796.488	1.295	20.50	1	9.53	1.41	797.90	0.000	1.624	1.582	0.23000	0.589	Circular Pipe
	"i.p."	2000.39	795.27	798.79	796.620	1.350	20.50	1	9.08	1.28	797.90	0.000	1.624	1.458	0.23000	0.589	Circular Pipe
	"i.p."	2000.65	795.33	798.45	796.740	1.410	20.50	1	8.66	1.16	797.90	0.000	1.624	1.340	0.23000	0.589	Circular Pipe
	"i.p."	2000.84	795.37	798.20	796.848	1.474	20.50	1	8.26	1.06	797.91	0.000	1.624	1.225	0.23000	0.589	Circular Pipe
	"i.p."	2000.96	795.40	798.05	796.945	1.545	20.50	1	7.87	0.96	797.91	0.000	1.624	1.113	0.23000	0.589	Circular Pipe
"Link5"	Reach	2001.00	795.41	798.00	797.033	1.623	20.50	1	7.51	0.87	797.91	0.000	1.624	1.001	0.23000	0.589	Circular Pipe
"CB #14"	Junction	2004.00	795.41	798.00	797.981	2.571	14.40	1	4.58	0.33	798.31	0.000	1.367	0.000	0.00000	0.000	Circular Pipe
HYDRAULIC JUMP at 2076.30 of length 0.04																	
	"i.p."	2065.16	796.40	802.19	798.397	2.000	14.40	1	4.58	0.33	798.72	0.000	1.367	0.077	0.01614	1.001	Circular Pipe
	"i.p."	2076.30	796.58	802.95	798.413	1.836	14.40	1	4.77	0.35	798.77	0.000	1.367	0.507	0.01614	1.001	Circular Pipe
	"i.p."	2076.30	796.58	802.95	797.577	1.000	14.40	1	9.17	1.31	798.88	0.000	1.367	1.823	0.01614	1.001	Circular Pipe
	"i.p."	2155.77	797.86	808.39	798.841	0.982	14.40	1	9.39	1.37	800.21	0.000	1.367	1.888	0.01614	1.001	Circular Pipe
"Link4"	Reach	2199.80	798.57	811.40	799.516	0.946	14.40	1	9.84	1.50	801.02	0.000	1.367	2.027	0.01614	1.001	Circular Pipe
"Link3"	Transition	2200.80	798.59	811.40	799.977	1.391	14.40	1	8.42	1.10	801.08	0.000	1.392	1.003	0.01600	0.000	Circular Pipe

	"i.p."	2247.64	799.34	811.56	800.838	1.500	14.40	1	8.15	1.03	801.87	0.000	1.392	0.000	0.01606	1.500	Circular Pipe
"Link2"	Reach	2608.26	805.13	812.80	807.661	2.531	14.40	1	8.15	1.03	808.69	0.000	1.392	0.000	0.01606	1.500	Circular Pipe
"Link1"	Reach	2819.95	808.48	811.80	811.639	3.159	14.40	1	8.15	1.03	812.67	0.000	1.392	0.000	0.01583	1.500	Circular Pipe
"CB #15"	Headwrk	2819.95	808.48	811.80	811.639	3.159	14.40	1	8.15	1.03	812.67	0.000	1.392	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

14.4 cfs Emergency flow

5.6 cfs from sub basin E, and 0.5 cfs will be added from sub basin V if the main storm drain 100% clogged.



WSPG Model for Emergency SD

[TITLE]
 18-24-INCH EMERGENCY SD CAPACITY
 FARM AND JENSEN ELEMENTARY SCHOOL
 COLLINS ENGINEERS JOB No. 9748

[REPORT]
 COMPOSITE_ONLY

[NETWORK]
 **TYPE NAME
 **-----
 Outlet "U-CHANNEL"
 Reach "Link5"
 Junction "CB #14"
 Reach "Link4"
 Transition "Link3"
 Reach "Link2"
 Reach "Link1"
 Headwork "CB #15"

**BRANCH DEFINITIONS

[OUTLET] **NAME **	STATION	INVERT ELEV	GROUND ELEV	CHANNEL ID	WATER SURFACE ELEV (opt.)
"U-CHANNEL "	2000	795.18	799.29	"24-INCH"	95.5

[HEADWORK] **NAME **	INVERT ELEV	GROUND ELEV	CHANNEL ID	FLOW	WATER SURFACE ELEV (opt.)
"CB #15"	808.2	811.8	"18-INCH"	14.4	0

[WALLENTRENCE] **NAME **	INVERT ELEV	GROUND ELEV	CHANNEL ID	LOSS COEFFICIENT(opt.)

[WALLEEXIT] **NAME **	INVERT ELEV	GROUND ELEV	CHANNEL ID	LOSS COEFFICIENT(opt.)

[BRIDGEENTRENCE] **NAME **	INVERT ELEV	GROUND ELEV	CHANNEL ID	REDUCTION FACTOR(opt.)

[BRIDGEEXIT] **NAME	INVERT	GROUND	CHANNEL	REDUCTION

**-----
 ** ELEV ELEV ID FACTOR(opt.) -----

[JOIN]

**Name
 ** INVERT GROUND CHANNEL LENGTH MANNINGS n NUMBER OF CONFLUENCE
 ** ELEV ELEV ID BRANCHES ANGLE
 **-----

[JUNCTION]

**Name
 ** INVERT GROUND CHANNEL LENGTH MANNINGS n NUMBER OF CONFLUENCE FLOW
 ** ELEV ELEV ID LATERALS ANGLE
 **-----
 "CB #14" 795.31 "24-INCH" 3 0.013 1 90 6.1
 "CB #14_Lateral1" 797.5 "24-INCH"

[TRANSITION]

**Name
 ** INVERT GROUND CHANNEL LENGTH MANNINGS n
 ** ELEV ELEV ID
 **-----
 "Link3" 798.586 811.4 "18-INCH" 1 0.013

[REACH]

**Name
 ** INVERT GROUND CHANNEL LENGTH MANNINGS n CURVE ANGLE NUMBER
 ** ELEV ELEV ID (opt) POINT(opt) MANHOLES(opt)
 **-----
 "Link1" 808.2 811.8 "18-INCH" 171.06 0.013 0 0 0
 "Link2" 805.39 812.8 "18-INCH" 407.46 0.013 0 0 1
 "Link4" 798.57 811.4 "24-INCH" 195.98 0.013 0 0 1
 "Link5" 795.31 798 "24-INCH" 1 0.013 0 0 0

[DROP]

**Name
 ** INVERT GROUND CHANNEL LOSS
 ** ELEV ELEV ID COEFFICIENT
 **-----

[ALAMEDA]

ANGLE_LOSS_COEFFICIENT "Link2" 0.25
 ANGLE_LOSS_COEFFICIENT "Link4" 0.5

[CHANNEL]

**REGULAR TYPES 1-4 7-8
 **ID TYPE HEIGHT WIDTH LEFT SLOPE RIGHT SLOPE NUMBER AVG PIER INVERT NUM OF
 ** ELEV ELEV ID PERS PERS WIDTH CROSS FALL BARRELS
 **-----
 "24-INCH" 4 2 "24-INCH" 1
 "18-INCH" 4 1.5 "18-INCH" 1

**IRREGULAR TYPES 5-6

**ID TYPE NUMBER PERS AVG PIER PIER1 PIER2 PIER3 PIER4 PIER5 PIER6 PIER7 PIER8 PIER9 PIER10
 ** ELEV ELEV ELEV ELEV ELEV ELEV ELEV ELEV ELEV ELEV ELEV ELEV ELEV ELEV ELEV

[POINT]
** ID XCOORD YCOORD
**-----

Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.0 30/09/2011
 Alameda Extension
XP Solutions www.xpsolutions.com

INPUT FILE

H:\Cad\Land\9748\ADMIN\Drainage\ADD 1\HYDRAULC\WSPG\18-em.wsx
Computed 03/21/17 11:48:05

TITLE INFORMATION

 18-24-INCH EMMERGENCY SD CAPACITY
 FARM AND JENSEN ELEMENTARY SCHOOL
 COLLINS ENGINEERS JOB No. 9748

WARNING SUMMARY

 WARNING 36: D/S processing stopped in junction CB #14 because critical momentum is greater than maximum momentum.

RESULTS

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 Main Line
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Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
###																	
"U-CHANNE"	Outlet	2000.00	795.18	799.29	796.543	1.363	20.50	1	8.99	1.25	797.80	0.000	1.624	0.000	0.00000	0.000	Circular Pipe
	"i.p."	2000.36	795.23	798.82	796.637	1.410	20.50	1	8.66	1.16	797.80	0.000	1.624	1.340	0.13000	0.683	Circular Pipe
	"i.p."	2000.71	795.27	798.37	796.747	1.474	20.50	1	8.26	1.06	797.81	0.000	1.624	1.225	0.13000	0.683	Circular Pipe
	"i.p."	2000.92	795.30	798.10	796.845	1.545	20.50	1	7.87	0.96	797.81	0.000	1.624	1.113	0.13000	0.683	Circular Pipe
"Link5"	Reach	2001.00	795.31	798.00	796.933	1.623	20.50	1	7.51	0.87	797.81	0.000	1.624	1.001	0.13000	0.683	Circular Pipe
"CB #14"	Junction	2004.00	795.31	798.00	797.881	2.571	14.40	1	4.58	0.33	798.21	0.000	1.367	0.000	0.00000	0.000	Circular Pipe
HYDRAULIC JUMP at 2072.62 of length 0.04																	
	"i.p."	2062.74	796.29	802.02	798.287	2.000	14.40	1	4.58	0.33	798.61	0.000	1.367	0.077	0.01663	0.992	Circular Pipe
	"i.p."	2072.62	796.45	802.69	798.302	1.850	14.40	1	4.74	0.35	798.65	0.000	1.367	0.493	0.01663	0.992	Circular Pipe
	"i.p."	2072.62	796.45	802.69	797.442	0.991	14.40	1	9.27	1.34	798.78	0.000	1.367	1.855	0.01663	0.992	Circular Pipe
	"i.p."	2150.44	797.75	808.01	798.723	0.978	14.40	1	9.44	1.38	800.11	0.000	1.367	1.904	0.01663	0.992	Circular Pipe
"Link4"	Reach	2199.98	798.57	811.40	799.512	0.942	14.40	1	9.90	1.52	801.03	0.000	1.367	2.043	0.01663	0.992	Circular Pipe
"Link3"	Transition	2200.98	798.59	811.40	799.922	1.336	14.40	1	8.66	1.17	801.09	0.000	1.392	1.146	0.01600	0.000	Circular Pipe
	"i.p."	2561.45	804.61	812.64	805.941	1.336	14.40	1	8.66	1.17	807.11	0.000	1.392	1.146	0.01670	1.336	Circular Pipe
"Link2"	Reach	2608.44	805.39	812.80	806.753	1.363	14.40	1	8.54	1.13	807.88	0.000	1.392	1.077	0.01670	1.336	Circular Pipe

"i.p."		2750.42	807.72	811.97	809.085	1.363	14.40	1	8.54	1.13	810.22	0.000	1.392	1.077	0.01643	1.363	Circular Pipe
"Link1"	Reach	2779.50	808.20	811.80	809.591	1.391	14.40	1	8.42	1.10	810.69	0.000	1.392	1.003	0.01643	1.363	Circular Pipe
"CB #15"	Headwrk	2779.50	808.20	811.80	809.592	1.392	14.40	1	8.42	1.10	810.69	0.000	1.392	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

The first part of the paper discusses the importance of the research and the objectives of the study. It then presents a literature review of the existing research on the topic. The next section describes the methodology used in the study, including the data sources and the statistical techniques employed. The results of the study are then presented, followed by a discussion of the findings and their implications. Finally, the paper concludes with a summary of the main points and suggestions for future research.

The research was conducted using a combination of primary and secondary data. Primary data was collected through a series of interviews with experts in the field, while secondary data was obtained from a review of the existing literature. The data was then analyzed using a range of statistical techniques, including regression analysis and factor analysis.

The findings of the study indicate that there is a significant relationship between the variables studied. The results suggest that the factors identified in the study are important in explaining the variation in the dependent variable. The implications of these findings are discussed in detail, and it is suggested that further research be conducted to explore the relationships identified in the study.

In conclusion, the study has provided valuable insights into the topic under investigation. The findings have important implications for both theory and practice, and the study has identified areas for further research.

Weir Length Calculation:

Per specification, the 2" Mesh 9 gauge, 36" (3') high) can weigh 2.1 lb.

To calculate the space of the chain-link fence which is available for drainage

1) $(2"/12) \times 3' \times 1' = 2.1 \text{ lb.}$

2) $1 \text{ ft}^3 \text{ steel can weigh } 490 \text{ lb.}$

$(2/12) \times 3 \times 1 \times A (\text{portion of area which cover by steel}) = 2.1$

$1 \text{ ft}^3 = 490$, let find the portion of the space cover by steel

Solving for the portion of area cover by steel

$A = 0.0857$ That is equal 9% of the total area of 3 sq. ft.

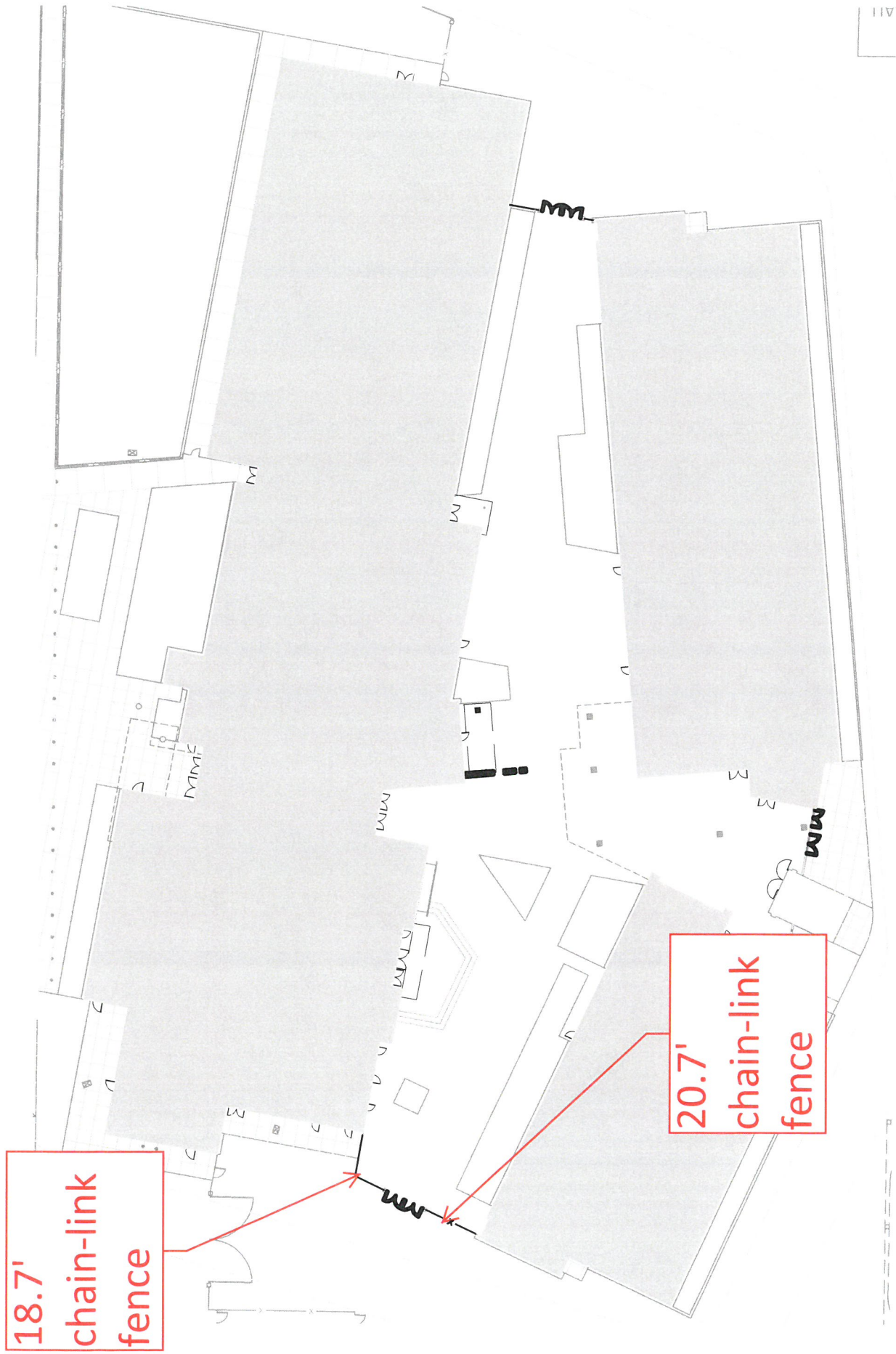
Available space $= 39/X (0.91) = 35.5'$

Assuming 50% clogging factor, only 17.7' is used for weir calculation.

Emergency over flow through the chain-link fence

18.7'
chain-link
fence

20.7'
chain-link
fence





Fence

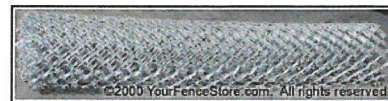
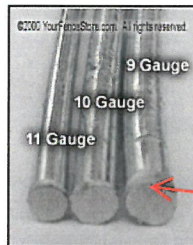
Monday, March 13, 2017

Galvanized Chain Link Fence Fabric (GBW)

1 inch, 2 inch and 3 1/2 x 5 inch Mesh Chain Link Fence

Chain link fence wire thickness
(The higher the gauge the thinner the wire.)

6 Gauge 0.192"
9 Gauge 0.148"
10 Gauge 0.130"
11 Gauge 0.120"
11 1/2 Gauge 0.113"



Chain Link Specifications:

- 1.2 ounce coating - GBW
- RR-F-191/1D
- ASTM - A-392
- AASHTO - M-181

[On-line Quote - Complete Chain Link Fence System \(click here\)](#)

Chain Link Galvanized 2" mesh 11 gauge	Weight (lbs) Per Foot	Price Per Foot Chain Link Only
36 (3' high)	1.35	\$1.53
42 (3 1/2' high)	1.60	\$1.79
48 (4' high)	1.80	\$2.04
60 (5' high)	2.30	\$2.55
72 (6' high)	2.65	\$3.06
84 (7' high)	3.10	\$3.57
96 (8' high)	3.50	\$4.08
120 (10' high)	4.40	\$5.10
144 (12' high)	5.30	\$6.12

Chain Link Galvanized 2" mesh 9 gauge	Weight (lbs) Per Foot	Price Per Foot Chain Link Only
36 (3' high)	2.10	\$2.44
42 (3 1/2' high)	2.50	\$2.85
48 (4' high)	2.80	\$3.25
60 (5' high)	3.50	\$4.07
72 (6' high)	4.20	\$4.88
96 (8' high)	5.60	\$6.51
120 (10' high)	7.00	\$8.13
144 (12' high)	8.40	\$9.76

Chain Link Galvanized 1" mesh 9 gauge	Weight (lbs) Per Foot	Price Per Foot Chain Link Only
36 (3' high)	4.92	\$5.03

Density Of Steel

Bibliographic Entry	Result (w/surrounding text)	Standardized Result
Topic 3.5b Stress probs 2 (determinate) . University of Wisconsin-Stout Physics Department, 20 January 1998.	"The density of steel is 490 pounds per cubic foot."	7.85 g/cm ³
Alcir Grohmann. Polystyrene Cutter . Ask A Scientist. Argonne National Laboratory.	"To know the area: you could weight [sic] the wire and considering that the density of steel is approximately 7.8 g/cm3 having the length you can estimate the Area [sic]."	7.8 g/cm ³
Materials Sorted by Category Then Density . Marcus Materials.	[see table 1]	7.47 –8.03 g/cm ³
<i>CRC Handbook of Chemistry and Physics</i> . 75th edition. Florida: Chemical Rubber Co, 1994.	[see table 2]	7.86 –7.9 g/cm ³
Scott Hawkins. Re: What is the density of steel? MadSci Network. 11 September 1997.	"The short answer to your question is that the density of plain mild steel is 7.85. The long answer is that depending on where you look, or the grade of steel that you are talking about can change this value. A density of 7.88 is often quoted for mild steel as well. If you add alloying elements such as tungsten, chrome or manganese to improve the steel, the density will change. So the long answer is that the density of steel can vary between 7.75 and 8.05."	7.75 –8.05 g/cm ³

A man of steel is what every girl wants and what every guy wants to be. Steel is like air, it's everywhere: from bridges to fridges and from washing machines to canteens. Steel is mostly composed of iron and carbon. It contains small amounts of manganese and even smaller amounts of silicon, phosphorous, oxygen, sulfur, and other elements. Henry Bessemer created the Bessemer process in 1856 to manufacture steel cheaply.

Density is one of the numerous properties of steel. It is calculated by dividing the mass by the volume. Steel comes in many different forms. Their densities differ by type (see tables below).

Cross Section for Weir over the West Chain-link Fence

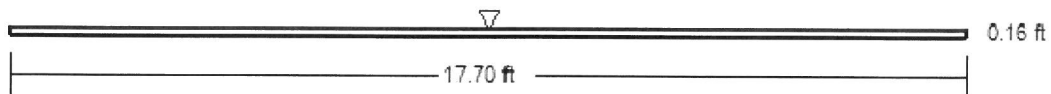
Project Description

Solve For Headwater Elevation

Input Data

Discharge	3.50	ft ³ /s
Headwater Elevation	13.74	ft
Crest Elevation	13.58	ft
Tailwater Elevation	13.58	ft
Weir Coefficient	3.10	US
Crest Length	17.70	ft
Number Of Contractions	2	

Cross Section Image



V: 1
H: 1

Worksheet for Weir over the West Chain-link Fence

Project Description

Solve For Headwater Elevation

Input Data

Discharge		3.50	ft ³ /s
Crest Elevation		13.58	ft
Tailwater Elevation		13.58	ft
Weir Coefficient		3.10	US
Crest Length		17.70	ft
Number Of Contractions	2		

Results

Headwater Elevation	13.74	ft
Headwater Height Above Crest	0.16	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	2.83	ft ²
Velocity	1.24	ft/s
Wetted Perimeter	18.02	ft
Top Width	17.70	ft

The depth above the weire
elevation =0.16', WSE=13.74'

2820.00

WEST DOOR
elev = 2813.580

HP 3
elev = 2813.400

HP 2
elev = 2813.672

PROPOSED FFE
elev = 2814.350

HP 1
elev = 2813.653

EAST DOOR
elev = 2813.641

HP
elev = 2813.740

CB #5
elev=2813.50

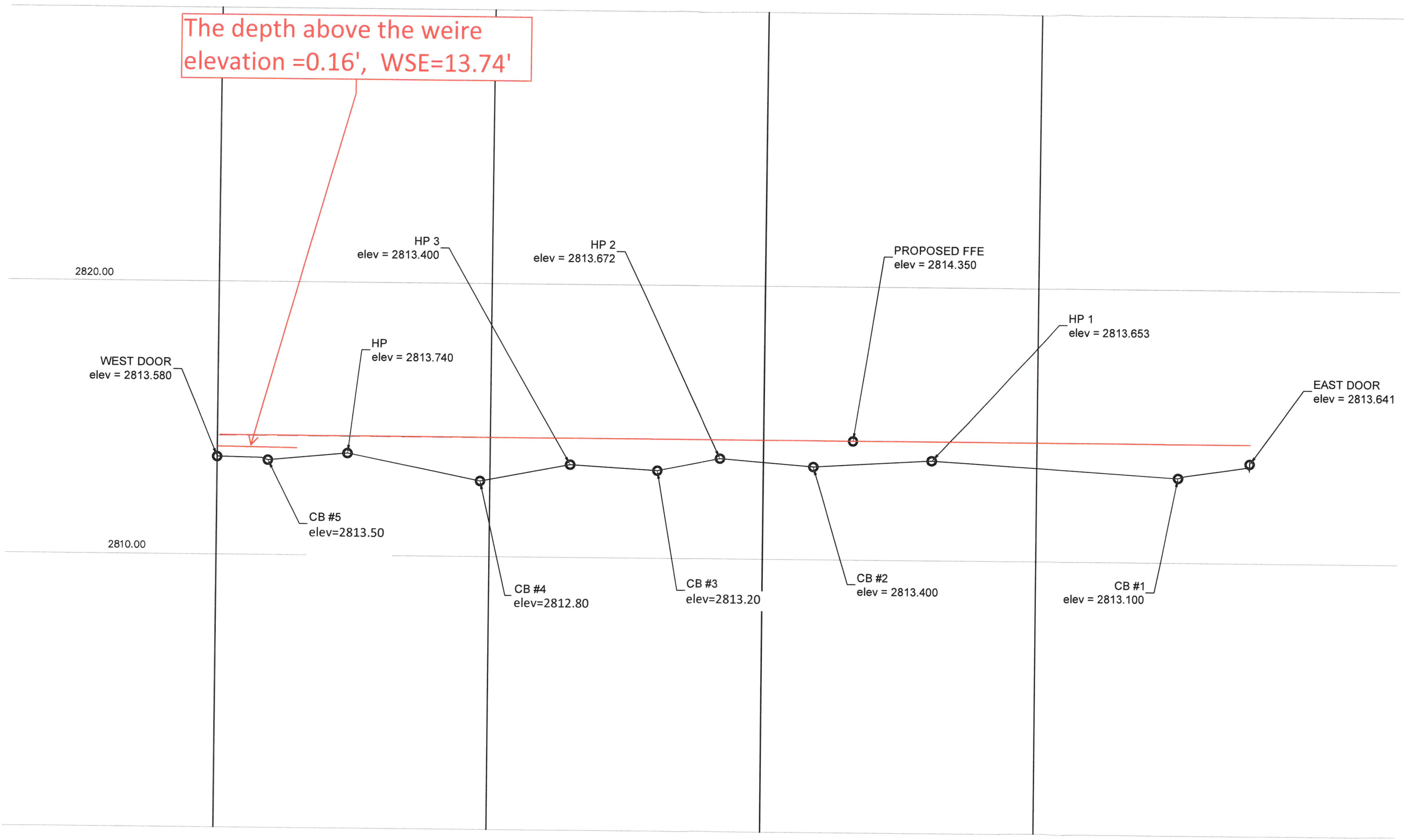
2810.00

CB #4
elev=2812.80

CB #3
elev=2813.20

CB #2
elev = 2813.400

CB #1
elev = 2813.100



100

Cross Section for 12-INCH FROM SDDI #1

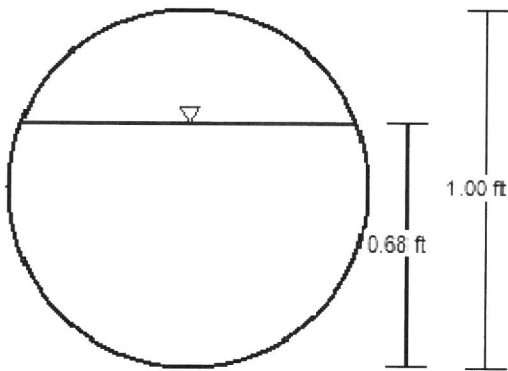
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.00480 ft/ft
Normal Depth	0.68 ft
Diameter	1.00 ft
Discharge	2.00 ft ³ /s

Cross Section Image



V: 1
H: 1

Worksheet for 12-INCH FROM SDDI #1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00480	ft/ft
Diameter	1.00	ft
Discharge	2.00	ft ³ /s

Results

Normal Depth	0.68	ft
Flow Area	0.57	ft ²
Wetted Perimeter	1.95	ft
Hydraulic Radius	0.29	ft
Top Width	0.93	ft
Critical Depth	0.60	ft
Percent Full	68.3	%
Critical Slope	0.00686	ft/ft
Velocity	3.50	ft/s
Velocity Head	0.19	ft
Specific Energy	0.87	ft
Froude Number	0.79	
Maximum Discharge	2.66	ft ³ /s
Discharge Full	2.47	ft ³ /s
Slope Full	0.00315	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	68.28	%
Downstream Velocity	Infinity	ft/s

Worksheet for 12-INCH FROM SDDI #1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.68	ft
Critical Depth	0.60	ft
Channel Slope	0.00480	ft/ft
Critical Slope	0.00686	ft/ft

Cross Section for 4' TYPE "A " (SDDI #1)

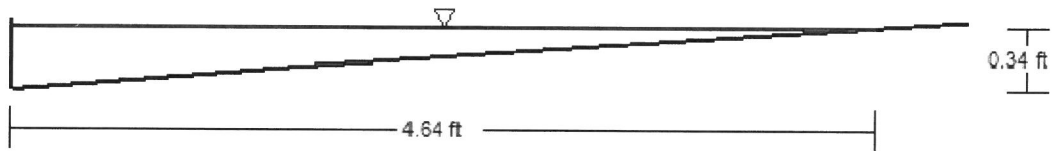
Project Description

Solve For Spread

Input Data

Discharge	2.00	ft ³ /s
Spread	4.64	ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.07	ft/ft
Curb Opening Length	2.00	ft
Opening Height	0.50	ft
Curb Throat Type	Horizontal	
Local Depression	2.00	in
Local Depression Width	1.50	ft
Throat Incline Angle	90.00	degrees

Cross Section Image



V: 1
H: 1

36"x36" Proposed Drop Inlet Capacity (CB #6, 14, AND 15)

36"x36" Jensen type DI #

Effective Opening Area Calculation:

Jensen Precast 3636 Drop Inlets

Ineffective Area Evaluation:

Bearing Bars quantit 24

Cross Bars quantity 10

Area $24 \times 3' \times 0.375 / 12 = 2.25$ (Sq. ft.)

Area $10 \times 3' \times 0.375' / 12 = 0.94$ (Sq. ft.)

Total ineffective area(ft2) **3.19** (Sq. ft.)

Gross Area 9 (Sq. ft.)

Net area 5.81 (Sq. ft.)

Account for 50% clogging due to debris

Net Area (ft2) 2.91 (Sq. ft.)

Use Orifice Equation: $Q = CA(2gh)^{0.5}$

$C = 0.65$

A= Area of the aerial drain in Sq. Ft

Q=Flow from basin OND1 in cfs

h= head in ft.

C=	0.65
A=	2.91 (Sq. ft.)
g=	32.2
h=	0.48

Depth (feet)	capacity (cfs)
0.10	4.79
0.14	5.67
0.17	6.25
0.30	8.30
0.40	9.59
0.48	10.50
0.60	11.74
0.70	12.68
0.80	15.56
0.90	14.38
0.91	14.46

CB #14

CB #14 EMERGENCY

CB #6

CB #15

Discharge Capacity

Q (cfs)= 10.50

The proposed 3'x3' Jensen Type DI from SUB-BASIN A AND B OF OND1, Q100=10.5 cfs)
can intercept with d=0.48'

From emergency CB #15, 14.4 cfs with d=0.91', WSE=812.71'

24"x24" DROP INLET CAPACITY CALCULATION

Proposed 2'x2' Jensen Type Drop Inlet.

Effective Opening Area Calculation:

Per Jensen Precast 2424 Drop Inlets H-20 Traffic Rated Grate Drawing

Bearing Bars quantity = 24	Area	24x2'x0.25/12=	1.00 (Sq. ft.)
Cross Bars quantity = 7	Area	7x2x0.25"/12=	0.29 (Sq. ft.)
		Total area(ft2)	1.29 (Sq. ft.)

Gross Area 4 (Sq. ft.)
Net area 2.71 (Sq. ft.)

Account for 50% clogging due to debris

Net Area (ft2) 1.36 (Sq. ft.)

Use Orifice Equation: $Q=CA(2gh)^{0.5}$

C=0.65

A= Area of the aerial drain in Sq. Ft

Q=Flow from basin ON1P and OF1P in cfs

h=Available head in ft. (accepted the ditch depth=0.5 feet)

Capacity		
h (ft.)	Q (cfs)	CB
0.05	1.6	
0.1	2.2	
0.2	3.2	
0.3	3.9	
0.4	4.5	
0.63	5.6	CB #14

C= 0.65

A= 1.36 (Sq. ft.)

g= 32.2

h= 0.63

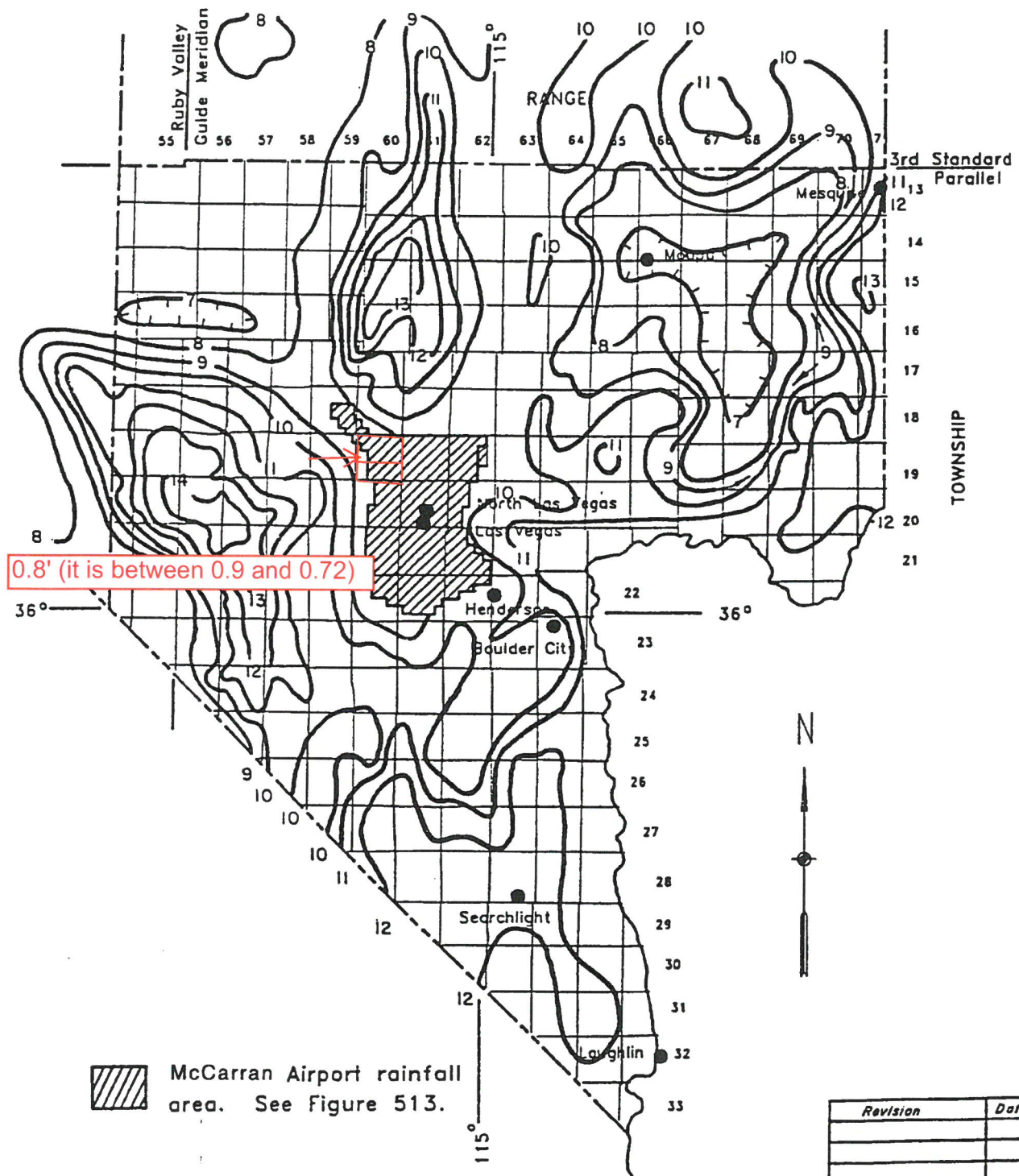
Discharge Capacity with d=0.1 is 2.2 cfs

Q(cfs) = 5.61

Total Capacity of one 2'x2' Grate with 50% Clogging factor with 0.1' depth of flow over the grate is 2.2 cfs , the size and the number of drop inlet in the court yard are assigned by the pipe size.

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RAINFALL DEPTH-DURATION-FREQUENCY 2-YEAR, 6-HOUR (DEPTHS IN TENTHS OF INCHES)



Water Quality Design Calculations

Water Quality Design Storm

1. BMP Design Precipitation - (85th Percentile Rainfall Depth)

a. Per site location on CCRFCD (2-Year, 6-Hour) rainfall depth is taken from :

Fig 501 if the site is outside the McCarran Airport Area , or
per Fig 516 or Table 505 for McCarran rainfall area

The Site property is located in 19/60/18, per Figure 513 the site is located outside McCarran Airport rainfall Area.

Depth (site) per Table 501: 0.80 in User Input
Depth (McCarran) per Table 505 or Figure 516: 0.72 in

b. Adjusted 2-yr Rainfall depth (D2)

Reduction Factor per Table 502 or FIG 514

1.00

User Input

Adjusted 2-yr Rainfall Depth, D2 (site): 0.80 in
Adjusted 2-yr Rainfall Depth, D2 (McCarran): 0.72 in
= Depth (site) * Reduction Factor
= Depth (McCarran) * Reduction Factor

c. Compute ratio of D2 site to D2 McCarran

D2 Ratio: 1.11

= Adjusted D2 (site)/Adjusted D2 (McCarran)

d. 85th percentile rainfall depth (D85)

D85: 0.36

= 0.32 x D2 ratio

2. BMP Design Peak Discharge

a. Unit discharge (Qp/A)

Qp/A: 0.53 cfs

= 1.5042(D85) - .0066

b. Unit discharge based on actual percent impervious

Site Percent Impervious (I): 31.19 %
Adjustment to Qp/A 0.65

User Input
=0.0059(I)+.4688

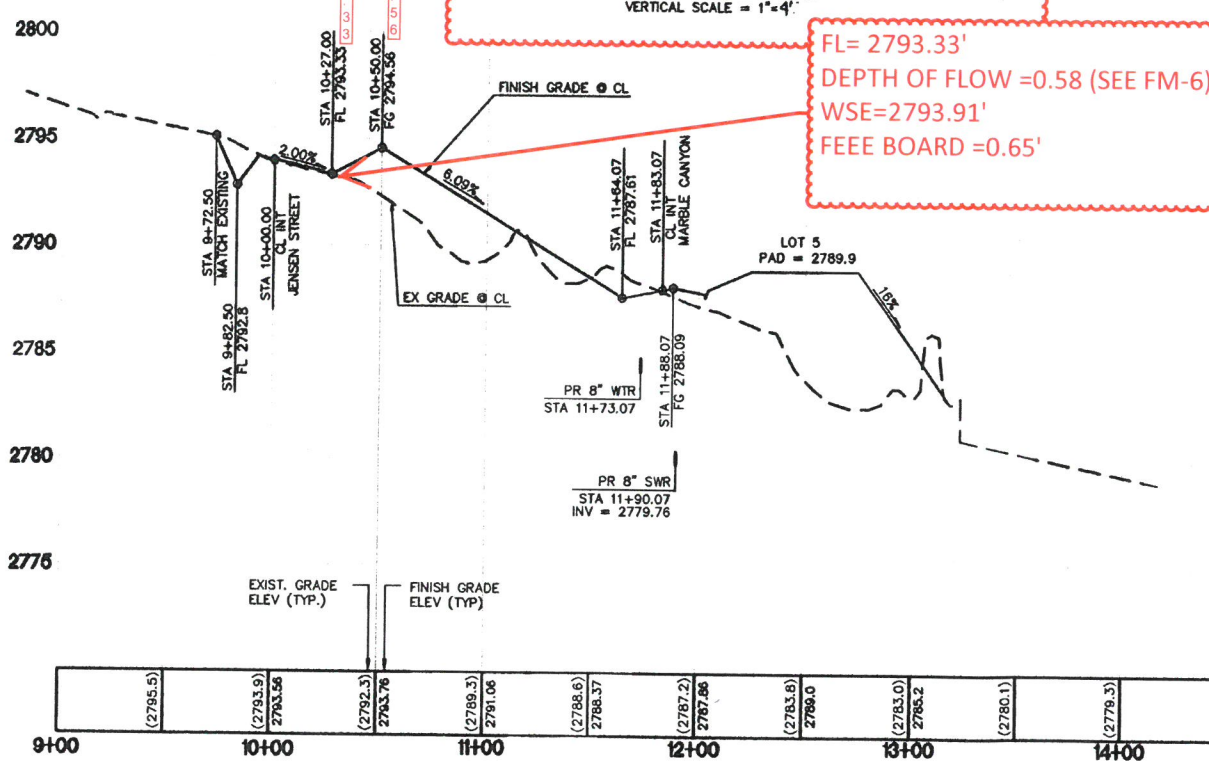
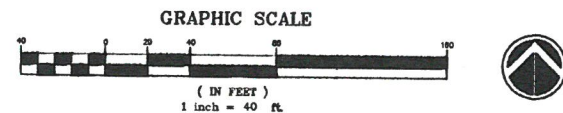
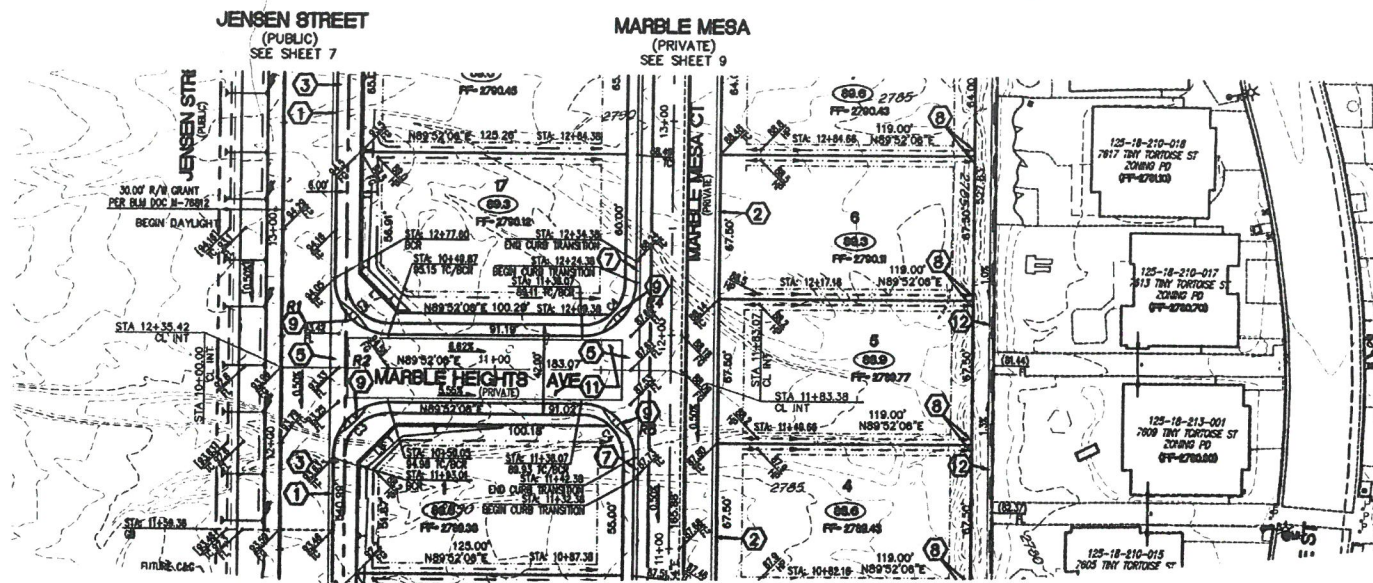
c. Peak Design Discharge in cfs

Site Area: 4.20 acre
Peak Design Discharge: 1.45 cfs

User Input
= Area * Qp/A

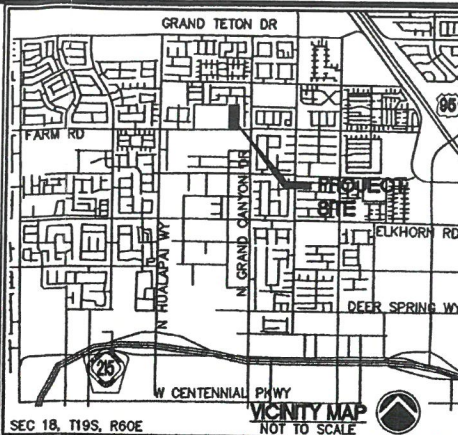
Basin ID	Area (acre)	Pervious (sq ft)	Pervious (acre)	Impervious (acre)	% Impervious	Unit Discharge (cfs)	Unit Discharge Adjustment	Peak Design Discharge (cfs)
BMP #1	4.20	125888.00	2.89	1.31	31.19	0.53	0.65	1.45
BMP#2	1.70	9147.00	0.21	1.49	87.65	0.53	0.99	0.89
BMP #3	2.00	40510.00	0.93	1.07	53.50	0.53	0.78	0.83

Items in RED are user input

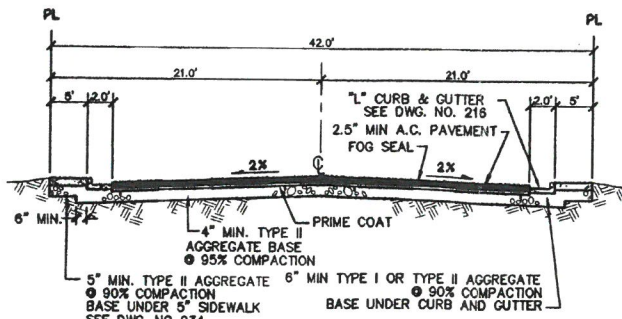


NO.	BEARING	DISTANCE
1	S00°17'44"E	3.75
2	S89°12'30"E	33.75
3	S00°17'44"E	22.68
4	N44°12'10"W	23.56
5	S89°12'10"E	34.04
6	S44°10'50"W	24.82
7	N45°10'10"W	23.07

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	5.00	90°13'28"	4.37	4.37
2	5.00	89°54'20"	7.77	4.92
3	20.00	90°14'12"	31.44	20.00
4	20.00	90°00'00"	31.42	20.00
5	20.00	89°55'48"	31.30	19.98
6	14.00	27°15'22"	6.68	3.30
7	78.00	49°30'41"	63.87	35.05
8	20.00	46°02'07"	18.07	8.50
9	40.50	22°56'14"	20.25	10.34
10	40.50	107°22'53"	25.90	25.12
11	40.50	101°48'29"	71.94	49.81
12	40.50	34°15'39"	24.22	12.48
13	40.50	23°48'30"	168.10	—



SYMBOLS		DESCRIPTION
EXISTING	PROPOSED	
---	---	RIGHT-OF-WAY
---	---	CENTERLINE
---	---	PROPERTY LINE
---	---	EASEMENT
---	---	CURB & GUTTER
---	---	SCREEN WALL
---	---	RETAINING WALL
---	---	SWALE
---	---	CONTOUR
---	---	3:1 SCARP
---	---	EDGE OF PAVEMENT
---	---	SIDEWALK RAMP
---	---	SAWCUT & MATCH
---	---	FIRE HYDRANT
---	---	STREET LIGHT
---	---	CABLE TV BOX
---	---	TELEPHONE BOX
---	---	STORM DRAIN MH
---	---	SEWER MANHOLE
---	---	GATE VALVE
---	---	WATER LINE
---	---	SEWER LINE
---	---	STORM DRAIN LINE
---	---	GAS LINE



MARBLE HEIGHTS AVE SECTION
NOT TO SCALE

ADA TABLE		
RAMP	"A"	"B"
R1	0.0	0.0
R2	0.0	0.0
R3	0.0	0.0
R4	0.0	0.0
R5	0.0	0.0

HANDICAP RAMP ARE TO BE CONSTRUCTED PER CLARK COUNTY AREA STANDARD DRAWINGS, STD DWG 235, CASE 1.

- CONSTRUCTION NOTES**
1. CONST. "L" TYPE CURB PER C.C. AREA STD. DWG. #216
 2. CONST. 30" ROLL CURB PER C.C. AREA STD. DWG. #217A
 3. CONST. 5' SIDEWALK PER C.C. AREA STD. DWG. #234
 4. CONST. DEPRESSED ROLL CURB PER DETAIL SHEET 3
 5. CONST. 8" CROSS GUTTER PER C.C. AREA STD. DWG. #228
 6. SAW-CUT AND MATCH EXISTING PAVEMENT
 7. CONST. 10-FOOT ROLL CURB TO "L" CURB TRANSITION PER DETAIL SHEET 3
 8. CONST. "SINGLE BLOCK" WALL OPENING PER DETAIL SHEET 3
 9. CONST. CASE 1 HANDICAP RAMP PER C.C. AREA STD. DWG. #235 SEE ADA TABLE THIS SHEET FOR "A" & "B" VALUES
 10. CONST. SIDEWALK UNDER DRAIN PER C.C. AREA STD. DWG. #236
 11. CONST. ASPHALT CONCRETE PAVEMENT PER SECTIONS, SHEET 3.

BASIS OF BEARING
SOUTH 89°12'14" EAST, BEING THE BEARING OF THE SOUTH LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN BY MAP THEREOF IN FILE 123, PAGE 32 OF SURVEYS IN THE CLARK COUNTY RECORDER'S OFFICE, NEVADA.

BENCHMARK
CITY OF LAS VEGAS BENCHMARK No. 6LV9018C4: RIVET & PLATE TOP CURB SE CORNER GRAND CANYON DR & FARM RD.

NAD 83
FEET = 2768.35
METERS = 843.188

NOTE TO CONTRACTOR:
IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE CITY OF LAS VEGAS AND THE CITY OF LAS VEGAS FIRE AND RESCUE ON ROAD CLOSURE AND TEMPORARY ACCESS ISSUES.

Call before you UnderGround
1-702-465-7611
CLARK COUNTY PUBLIC OPERATIONS
AND
1-702-432-5300
FREEMAN AND ARTISAN SYSTEM OF TRANSPORTATION

CAUTION TO CONTRACTOR I
EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL 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
1-702-277-2828
CLARK COUNTY PUBLIC OPERATIONS
AND
1-800-455-7544

Call Before You Dig
1-800-277-2600
CLARK COUNTY PUBLIC OPERATIONS
AND
1-800-455-7544

**MARBLE HEIGHTS AVENUE
PLAN & PROFILE**

**MARBLE CANYON ESTATES
CITY OF LAS VEGAS, NEVADA**

PETER J. LAAS
Exp: 12/31/13
CIVIL
No. 14444 WHICH 40

Impulse
Civil Engineering & Planning
1-702-277-2828
1-800-455-7544

DEVELOPER
D.R. HORTON
America's Builder
330 CAROUSEL PARKWAY
HENDERSON, NV 89014
CLV# 10744987
H# 48654
HTE# 13-12503

NOTE
FOR QUANTITY ESTIMATES
SEE SHEET 4

SHEET 10 OF 11

The first part of the paper discusses the importance of the study of the history of the English language. It is a branch of linguistics which deals with the changes in the language over time. The study of the history of the English language is important for many reasons. It helps us to understand the development of the language and the influence of other languages on it. It also helps us to understand the social and cultural changes that have taken place in the English-speaking world.

The second part of the paper discusses the importance of the study of the history of the English language. It is a branch of linguistics which deals with the changes in the language over time. The study of the history of the English language is important for many reasons. It helps us to understand the development of the language and the influence of other languages on it. It also helps us to understand the social and cultural changes that have taken place in the English-speaking world.

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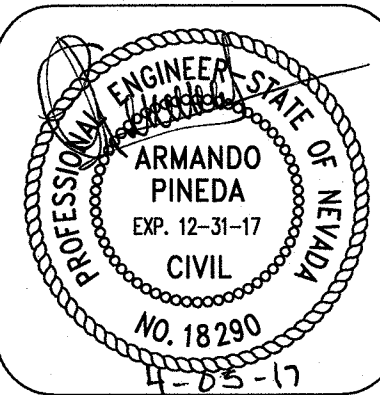
The fourth part of the paper discusses the importance of the study of the history of the English language. It is a branch of linguistics which deals with the changes in the language over time. The study of the history of the English language is important for many reasons. It helps us to understand the development of the language and the influence of other languages on it. It also helps us to understand the social and cultural changes that have taken place in the English-speaking world.

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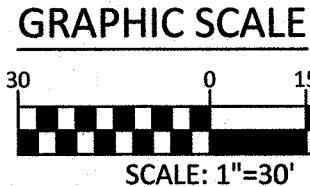
APPENDIX C

(Plans)

- Grading Plan
- Plan and Profile Sheet
- Detail Sheet



DESIGN		DESCRIPTION	
DATE	BY		
NO.			
CEI PROJECT:		9748	
DESIGN BY:		AP.	
DRAWN BY:		AP.	
CHECKED BY:		T. MILLER	
DATE:		03/28/2017	
SCALE:		1"=30'	
SHEET NUMBER		C4.01	
		SHEET 8 OF 46	



BASIS OF BEARING

NORTH 89°12'46" WEST, BEING THE NORTH LINE OF THE SOUTHWEST QUARTER (SW1/4) OF THE NORTHWEST QUARTER (NW1/4) OF SECTION 18, TOWNSHIP 18 NORTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AS SHOWN BY MAP THEREOF ON FILE IN BOOK 146, PAGE 1 OF PLATS, OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK MONUMENT ID "6LV9018W6" RIVET & PLATE TOP CURB NW CORNER TOPAZ CREEK STREET & FARM ROAD.

ELEVATION = 861.73 METERS
ELEVATION = 2827.10 FEET (NAVD 88)

CONSTRUCTION NOTES

- NO. ITEM USDOCA: UNIFORM STANDARD DRAWINGS CLARK COUNTY AREA.
- CONSTRUCT "A" TYPE CURB PER DETAIL "L" SHEET C8.01.
 - CONSTRUCT "L" TYPE CURB PER USDOCA DWG. No. 216.
 - CONSTRUCT "A" CONCRETE SIDEWALK PER USDOCA DWG. No. 234 (WIDTH PER PLAN) FOR DETAILS SEE ARCHITECTURAL PLANS.
 - CONSTRUCT SIDEWALK ADA RAMP PER USDOCA DWG. No. 235 CASE I.
 - CONSTRUCT COMMERCIAL DRIVEWAY PER USDOCA DWG. No. 225 AND 228.
 - CONSTRUCT "2" CONCRETE VALLEY GUTTER PER DETAIL "F" SHEET C8.01
 - CONSTRUCT "2" AC PAVING OVER "4" TYPE II AGGREGATE BASE (PARKING AREA ONLY) SEE DETAIL "A" SHEET C8.02
 - CONSTRUCT "3" AC PAVING OVER "4" TYPE II AGGREGATE BASE (MAIN CORRIDORS AND TRUCK ACCESS ONLY) SEE DETAIL "B" SHEET C8.02
 - INSTALL 3"x3" JENSEN PRECAST DROP INLET DETAIL "H" SHEET C8.01
 - STUB AND CAP STORM DRAIN LATERAL 5" FROM BLDG. FOR CONTINUATION REFER TO PLUMBING/MECHANICAL PLANS.
 - CONSTRUCT CURB OPENING PER DETAIL "J" SHEET C8.01
 - CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD No. 236 AND INSTALL STORMWATER QUALITY MANAGEMENT STAMP PER CCAUSD No. 421.
 - CONSTRUCT 18 INCHES CONCRETE STEM WALL.
 - CONSTRUCT "4" THICK 20"x30" CONCRETE PAD WITH THICKENED EDGE.
 - CONSTRUCT 10' WIDE SWALE PER DETAIL "K" SHEET C8.01
 - SAW CUT EXISTING AC PAVEMENT AT CENTER LINE PER USDOCA No. 500.1 AND 500.3 MATCH EXISTING PAVEMENT ELEVATIONS.
 - CONSTRUCT 10" INCH CURB FACE CONCRETE CURB. SEE ARCHITECT PLANS FOR DETAILS.
 - CONSTRUCT "3" AC PAVING OVER "4" TYPE II AGGREGATE BASE. (JENSEN ST, TOPAZ ST AND D NELSON AVE ONLY) SEE DETAIL "B" SHEET C8.02
 - CONSTRUCT "4" AC PAVING OVER "4" TYPE II AGGREGATE BASE. (FARM ROAD ONLY) SEE DETAIL "D" SHEET C8.02
 - CONSTRUCT 5 LF TOP OF CURB TO "O" "A" CURB TRANSITION
 - INSTALL D50 = 3" (WIDTH AND DEPTH PER PLAN)
 - INSTALL STORM DRAIN DROP INLET TYPE "A" PER USDOCA No. 411
 - INSTALL 48" STANDARD EXCENTRIC MANHOLE TYPE 1 PER USDOCA No. 403
 - CONSTRUCT U CHANNEL PER DETAIL "G" SHEET C8.01
 - INSTALL 2'x3' JENSEN PRECAST DROP INLET DETAIL "P" SHEET C8.01
 - INSTALL 2'x2' JENSEN PRECAST DROP INLET DETAIL "Q" SHEET C8.01
 - INSTALL STORM DRAIN CLEAN OUT PER DETAIL "E" SHEET C8.02
 - INSTALL STORM DRAIN WYE DETAIL "F" SHEET C8.02. (SIZE PER PLAN)
 - INSTALL 12"x12" GRATE INLET NYLOPLAST INLINE DRAIN DETAIL "N" SHEET C8.01
 - CONSTRUCT HANDICAP RAMP DETAIL "E" SHEET C8.02
 - CONSTRUCT ACCESS SIDEWALK SEE DETAIL "L" SHEET C8.02.
 - INSTALL PRECAST BUMPER BLOCKS PER USDOCA No. 238
 - CONSTRUCT NOT STANDARD HEADWALL PER DWG No R-2.5.1. SEE DETAIL "G" SHEET C8.02
 - CONSTRUCT CONCRETE SIDEWALK PER USDOCA DWG. No. 234.
 - CONSTRUCT STAMPED CONCRETE PER ARCHITECTURAL PLANS.
 - INSTALL BOLLARDS. SEE ARCHITECTURAL PLANS.
 - TRANSFORMER CONCRETE PAD. SEE ARCHITECTURAL PLANS.
 - CONSTRUCT LANDSCAPE PLANTER. SEE ARCHITECTURAL PLANS.
 - CONSTRUCT "4" SIDEWALK WITH THICKENED EDGE SEE DETAIL H SHEET C8.02.
 - MODIFIED "L" CURB SEE DETAIL "J" SHEET C8.02.
 - INSTALL D50 = 8" (WIDTH AND DEPTH PER PLAN)

GENERAL NOTE:

IT IS THE CONTRACTOR'S RESPONSIBILITY TO FILE A NOTICE OF INTENT/REQUEST TO BE INCLUDED IN THE STORM WATER GENERAL PERMIT, AND SUBMIT THE ASSOCIATED STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AS REQUIRED BY FEDERAL, AND MONITORED BY THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION.

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.

FLOOD ZONE NOTE:

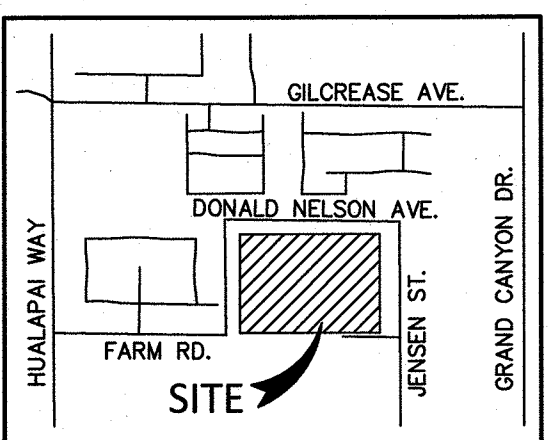
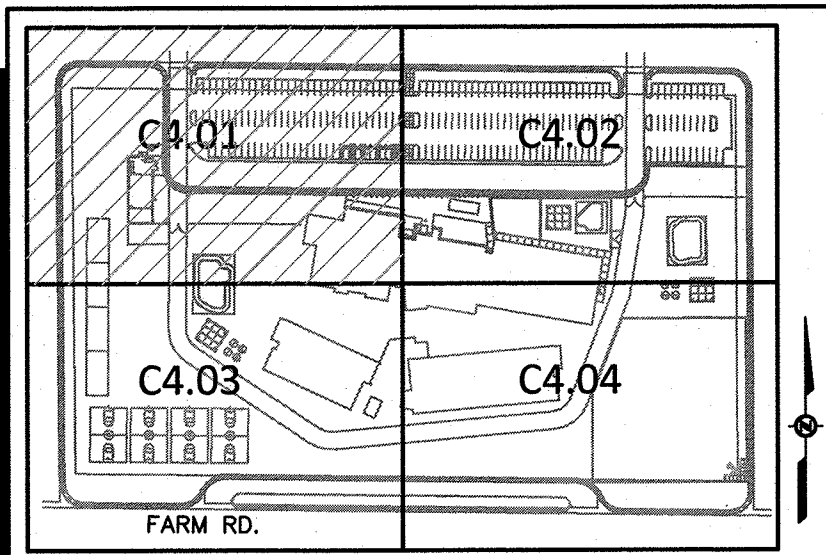
PER FIRM PANEL 32003C1745E REVISED SEPTEMBER 27, 2002, THE PROJECT SITE IS LOCATED WITHIN NON-SHADED FLOOD ZONE "X". NON-SHADED FLOOD ZONE "X" IS DEFINED BY FEMA AS AN AREA OUTSIDE THE 500-YEAR FLOOD PLAIN.

SD INFORMATION NOTE:

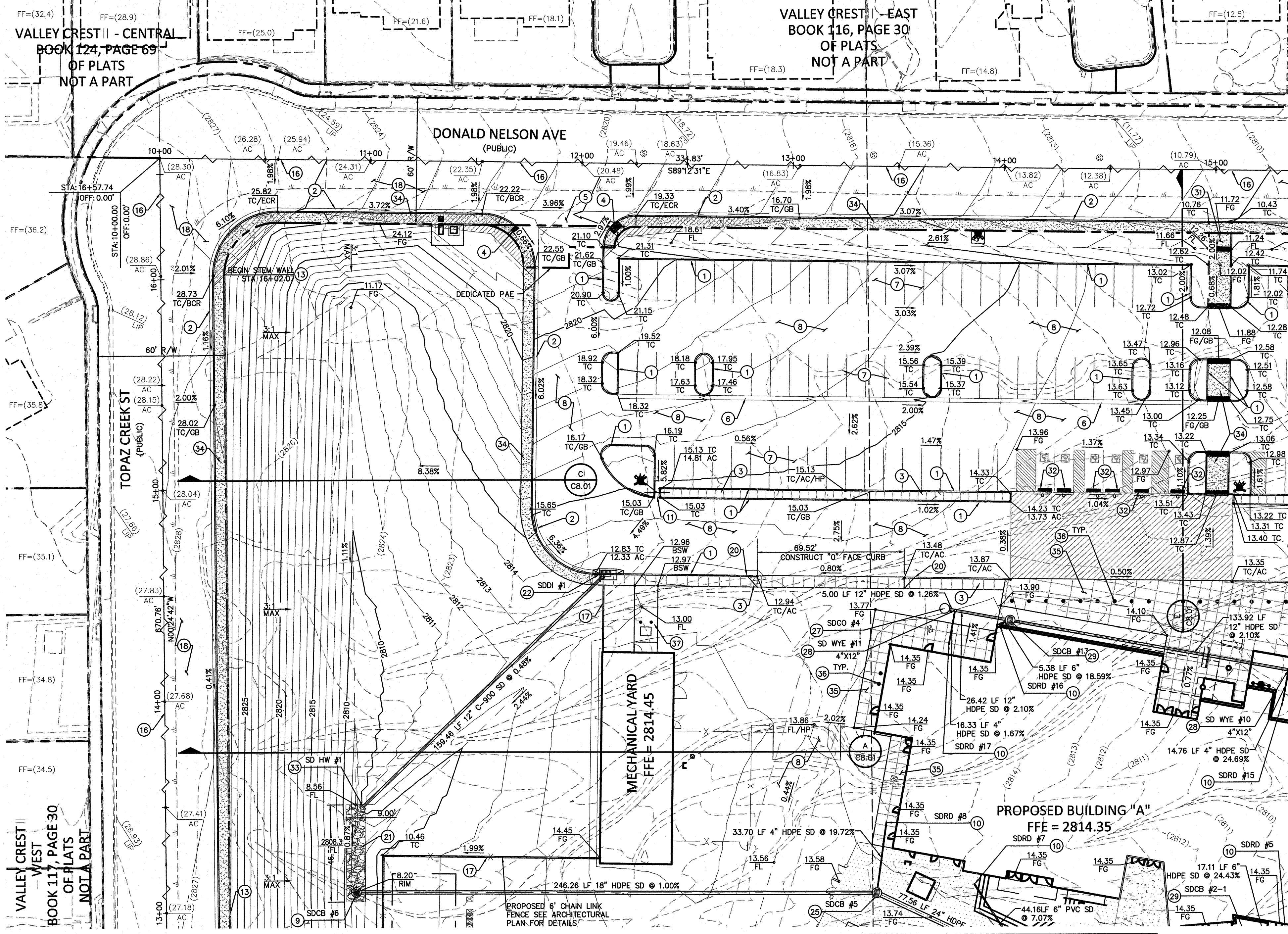
ALL ON SITE STORM DRAINS ARE PRIVATELY OWNED AND PRIVATELY MAINTAINED. REF. TO SHEET C4.01 FOR SD ROOF DRAIN, WYE, AND CLEAN OUT INFORMATION TABLES. REF. TO SHEET C4.02 FOR SD ROOF DRAIN, MANHOLE, FLARED END SECTION, AND DROP INLET INFORMATION TABLES.

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH THE CITY OF LAS VEGAS. DS# 4856A

ARMANDO PINEDA - 18290
DATE 4-05-17



FOR CONTINUATION SEE SHEET C4.02



FOR CONTINUATION SEE SHEET C4.03

SD ROOF DRAIN INFORMATION TABLE

SDRD #1 INV.OUT: 2809.50(S)	SDRD #10 INV.OUT: 2809.50(SW)
SDRD #2 INV.OUT: 2809.50(S)	SDRD #11 INV.OUT: 2809.50(SW)
SDRD #3 INV.OUT: 2809.50(E)	SDRD #12 INV.OUT: 2809.50(N)
SDRD #4 INV.OUT: 2809.50(N)	SDRD #13 INV.OUT: 2809.50(N)
SDRD #5 INV.OUT: 2809.50(S)	SDRD #14 INV.OUT: 2809.50(N)
SDRD #6 INV.OUT: 2812.35(N)	SDRD #15 INV.OUT: 2812.35(N)
SDRD #7 INV.OUT: 2806.00(SE)	SDRD #16 INV.OUT: 2812.35(E)
SDRD #8 INV.OUT: 2809.50(S)	SDRD #17 INV.OUT: 2812.35(N)
SDRD #9 INV.OUT: 2809.50(S)	

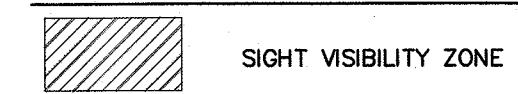
SD WYE INFORMATION TABLE

SD WYE #1 STA:14+24.10 INV. IN: 2800.17 (W) INV. IN: 2801.84 (N) INV. OUT: 2800.17 (E)	SD WYE #4 STA:14+45.66 INV. IN: 2807.67 (N) INV. IN: 2807.67 (S) INV. OUT: 2807.67 (S)	SD WYE #5B STA:12+18.10 INV. IN: 2803.80 (W) INV. IN: 2805.14 (N) INV. OUT: 2805.47 (E)	SD WYE #7 STA:13+67.19 INV. IN: 2803.80 (W) INV. IN: 2804.47 (S) INV. OUT: 2803.80 (E)	SD WYE #12 STA:10+74.72 INV. IN: 2802.18 (NW) INV. IN: 2805.39(W) INV. OUT: 2803.80 (SE)
SD WYE #2 STA:14+77.91 INV. IN: 2802.26 (S) INV. IN: 2800.76 (E)	SD WYE #5 STA:13+09.34 INV. IN: 2803.77 (W) INV. IN: 2804.44 (N) INV. OUT: 2803.77 (E)	SD WYE #6 STA:10+25.07 INV. IN: 2803.80 (NW) INV. IN: 2805.21 (S) INV. OUT: 2805.06 (SE)	SD WYE #8 STA:12+76.19 INV. IN: 2805.71 (W) INV. IN: 2806.21 (S) INV. OUT: 2805.71 (E)	SD WYE #11 STA:10+65.00 INV. IN: 2811.41 (W) INV. IN: 2812.08 (S) INV. OUT: 2811.41 (E)
SD WYE #3 STA:15+19.66 INV. IN: 2808.60 (W) INV. OUT: 2808.77 (S)	SD WYE #5A STA:12+52.84 INV. IN: 2804.82 (W) INV. OUT: 2804.82 (E)	SD WYE #6A STA:10+05.00 INV. IN: 2809.43 (NW) INV. IN: 2805.32 (NE) INV. OUT: 2809.43 (SE)	SD WYE #9 STA:12+57.43 INV. IN: 2807.36 (W) INV. IN: 2807.86 (SW) INV. OUT: 2807.36 (E)	

SD CLEAN OUT INFORMATION TABLE

SDCO #1 STA:10+96.51 RIM: 2814.1 INV. IN: 2807.73(NW) INV. OUT: 2807.73(E)	SDCO #5 STA:11+71.06 RIM: 2812.8 INV. IN: 2805.39(W) INV. OUT: 2805.39(E)
SDCO #2 STA:10+00.00 RIM: 2814.1 INV. OUT: 2809.52(SE)	SDCO #6 STA:11+84.47 INV. IN: 2807.64 (W) INV. OUT: 2807.64 (E)
SDCO #3 STA:10+00.00 RIM: 2814.1 INV. OUT: 2811.47(E)	

SIGHT VISIBILITY ZONE LEGEND



SIGHT VISIBILITY ZONE NOTE:

NO WALLS, FENCES SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBJECT, OTHER THAN TRAFFIC CONTROL DEVICES, FIRE HYDRANTS, TREES, AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR INSTALLED WITHIN THE SIGHT VISIBILITY ZONE UNLESS SAID OBJECT IS MAINTAINED AT LESS THAN 24 INCHES IN HEIGHT, MEASURED FROM TOP OF CURB, OR WHERE NO CURB EXIST, A HEIGHT OF 27 INCHES MEASURED FROM THE TOP OF ADJACENT ASPHALT, GRAVEL OR PAVEMENT STREET SURFACE. THIS RESTRICTION EXTENDS ALONG THE SIGHT VISIBILITY LINE THROUGH LANDSCAPED MEDIANS.

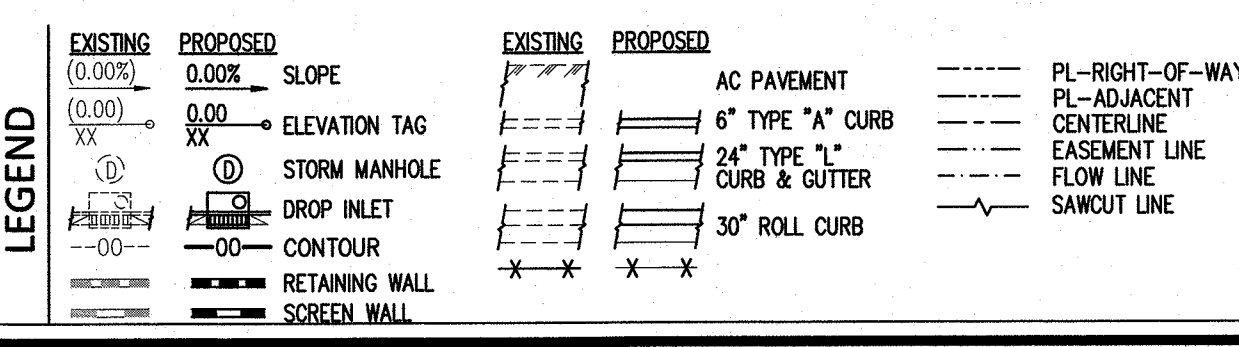
CALL BEFORE YOU DIG
AVOID HITTING UNDERGROUND UTILITY LINES. IT'S COSTLY.

CALL BEFORE YOU DO OVERHEAD WORK
AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.

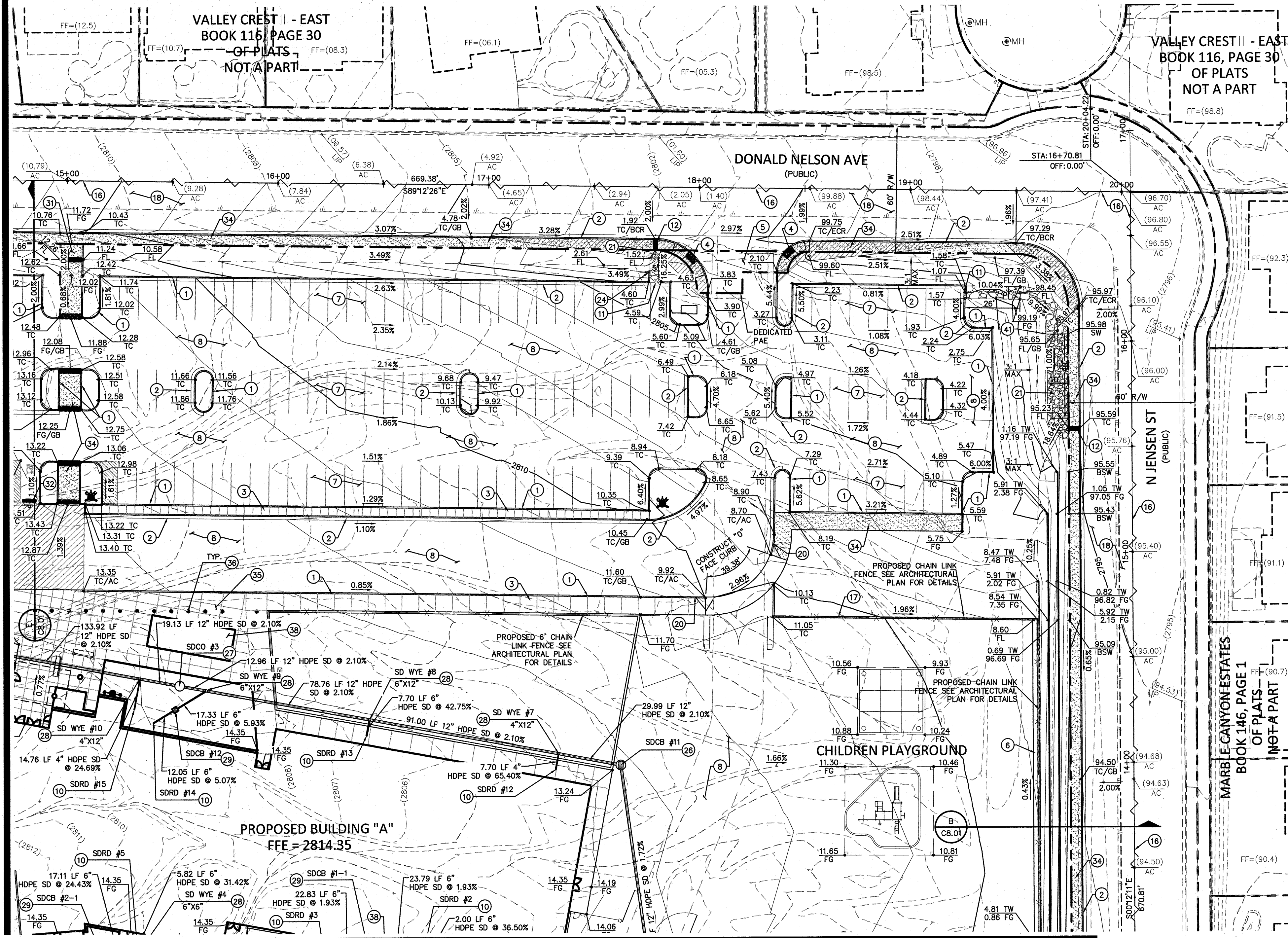
1-800-227-2600

1-702-227-2929

COLLINS ENGINEERS ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS AND ELEVATIONS. THE UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM THE BEST AVAILABLE INFORMATION. IT IS, HOWEVER, THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION AND ELEVATIONS OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION. CONTRACTOR TO FIELD VERIFY ALL EXISTING SITE CONDITIONS PRIOR TO CONSTRUCTION. IF A CONFLICT EXISTS BETWEEN WHAT IS SHOWN ON THESE DRAWINGS AND WHAT EXISTS IN THE FIELD, THE CONTRACTOR IS TO NOTIFY THE ARCHITECT OR ENGINEER IMMEDIATELY.



FOR CONTINUATION SEE SHEET C4.01



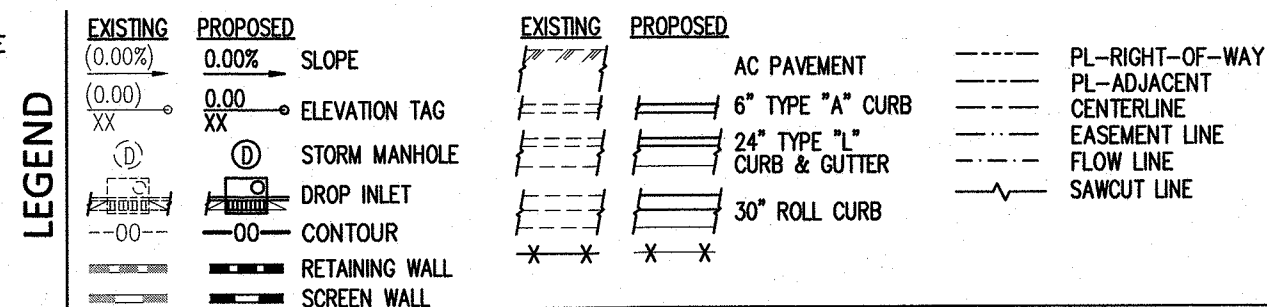
FOR CONTINUATION SEE SHEET C4.04

SD CATCH BASIN
INFORMATION TABLE

SDCB #1 STA: 15+79.66 RIM: 2813.1 INV.IN: 2800.35(W) INV.IN: 2801.85(W) INV.OUT: 2800.35(E) INV.OUT: 2811.85(W)	SDCB #2 STA: 14+45.66 RIM: 2813.4 INV.IN: 2800.89(W) INV.IN: 2802.39(W) INV.OUT: 2800.89(E)	SDCB #3-1 STA: 13+44.02 RIM: 2813.9 INV.IN: 2809.85(NW) INV.IN: 2809.85(NE)	SDCB #4 STA: 13+23.82 RIM: 2812.8 INV.IN: 2801.38(NW) INV.IN: 2803.05(W) INV.IN: 2802.88(NW) INV.IN: 2801.38(E)	SDCB #5 STA: 12+46.26 RIM: 2813.5 INV.IN: 2801.69(W) INV.IN: 2801.85(W) INV.OUT: 2801.69(SE)	SDCB #6 STA: 12+18.10 RIM: 2813.4 INV.OUT: 2808.60(S)	SDCB #7 STA: 12+18.10 RIM: 2813.4 INV.OUT: 2808.60(S)	SDCB #8 STA: 12+18.10 RIM: 2813.4 INV.OUT: 2808.60(S)	SDCB #9 STA: 12+18.10 RIM: 2813.4 INV.OUT: 2808.60(S)	SDCB #10 STA: 12+18.10 RIM: 2813.4 INV.OUT: 2808.60(S)	SDCB #11 STA: 12+18.10 RIM: 2813.4 INV.OUT: 2808.60(S)	SDCB #12 STA: 12+18.10 RIM: 2813.4 INV.OUT: 2808.60(S)	SDCB #13 STA: 12+18.10 RIM: 2813.4 INV.OUT: 2808.60(S)	SDCB #14 STA: 12+18.10 RIM: 2813.4 INV.OUT: 2808.60(S)	SDCB #15 STA: 12+18.10 RIM: 2813.4 INV.OUT: 2808.60(S)	SDCB #16 STA: 12+18.10 RIM: 2813.4 INV.OUT: 2808.60(S)
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SD MANHOLE/
HEADWALL/DROP INLET
INFORMATION TABLE

SDMH #1 STA: 15+96.86 RIM: 2812.7 INV.IN: 2798.88(W) INV.IN: 2800.88(W) INV.IN: 2800.88(N) INV.IN: 2800.88(SE)	SDHI #1 STA: 10+00.00 RIM: 2812.4 INV.IN: 2799.33(SW)	SDHI #2 STA: 10+00.00 RIM: 2812.4 INV.IN: 2799.33(SW)
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SIGHT VISIBILITY ZONE LEGEND

SIGHT VISIBILITY ZONE

SIGHT VISIBILITY ZONE NOTE:

NO WALLS, FENCES SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBJECT, OTHER THAN TRAFFIC CONTROL DEVICES, FIRE HYDRANTS, TREES, AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR INSTALLED WITHIN THE SIGHT VISIBILITY ZONE UNLESS SAID OBJECT IS MAINTAINED AT LESS THAN 24 INCHES IN HEIGHT, MEASURED FROM TOP OF CURB, OR WHERE NO CURB EXISTS, A HEIGHT OF 27 INCHES MEASURED FROM THE TOP OF ADJACENT ASPHALT, GRAVEL OR PAVEMENT STREET SURFACE. THIS RESTRICTION EXTENDS ALONG THE SIGHT VISIBILITY LINE THROUGH LANDSCAPED MEDIANS.

GENERAL NOTE:

IT IS THE CONTRACTOR'S RESPONSIBILITY TO FILE A NOTICE OF INTENT/REQUEST TO BE INCLUDED IN THE STORM WATER GENERAL PERMIT, AND SUBMIT THE ASSOCIATED STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AS REQUIRED BY FEDERAL, AND MONITORED BY THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION.

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.

FLOOD ZONE NOTE:

PER FIRM PANEL 32003C1745E REVISED SEPTEMBER 27, 2002, THE PROJECT SITE IS LOCATED WITHIN NON-SHADED FLOOD ZONE "X", NON-SHADED FLOOD ZONE "X" IS DEFINED BY FEMA AS AN AREA OUTSIDE THE 500-YEAR FLOOD PLAIN.

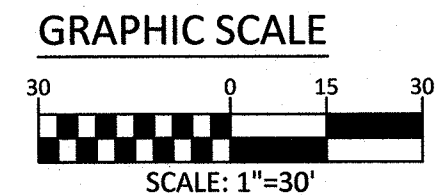
SD INFORMATION NOTE:

ALL ON-SITE STORM DRAINAGE ARE PRIVATELY OWNED AND PRIVATELY MAINTAINED. REF. TO SHEET C4.01 FOR SD ROOF DRAIN, WYE, AND CLEAN OUT INFORMATION TABLES. REF. TO SHEET C4.02 FOR SD ROOF DRAIN, MANHOLE, FLARED END SECTION, AND DROP INLET INFORMATION TABLES.

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE THE APPROVED DRAINAGE 50 FOR THIS SITE ON FILE WITH THE CITY OF LAS VEGAS. DS# 4656A

ARMANDO PINEDA - 18290

4-05-17
DATE



BASIS OF BEARING

NORTH 89°12'46\"/>

BENCHMARK

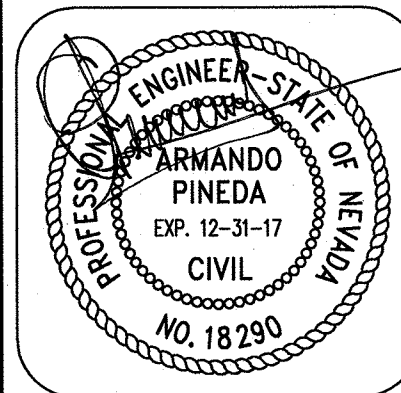
CITY OF LAS VEGAS BENCHMARK MONUMENT ID \"6LV9018W6\" RIVET & PLATE TOP CURB NW CORNER TOPAZ CREEK STREET & FARM ROAD.

ELEVATION = 861.703 METERS
ELEVATION = 2827.10 FEET (NAVD 88)

CONSTRUCTION NOTES

NO.	ITEM	USDOCA: UNIFORM STANDARD DRAWINGS CLARK COUNTY AREA.
1	CONSTRUCT \"A\" TYPE CURB PER DETAIL \"L\" SHEET C8.01.	
2	CONSTRUCT \"L\" TYPE CURB PER USDOCA DWG. No. 216.	
3	CONSTRUCT 4\" AC PAVING OVER 4\" TYPE II AGGREGATE BASE. (PARKING AREA ONLY) SEE DETAIL \"A\" SHEET C8.02	
4	CONSTRUCT SIDEWALK ADA RAMP PER USDOCA DWG. No. 235 CASE I.	
5	CONSTRUCT COMMERCIAL DRIVEWAY PER USDOCA DWG. No. 225 AND 228.	
6	CONSTRUCT 2\" CONCRETE VALLEY GUTTER PER DETAIL \"F\" SHEET C8.01	
7	CONSTRUCT 2\" AC PAVING OVER 4\" TYPE II AGGREGATE BASE. (PARKING AREA ONLY) SEE DETAIL \"A\" SHEET C8.02	
8	CONSTRUCT 3\" AC PAVING OVER 4\" TYPE II AGGREGATE BASE. (MAIN CORRIDORS AND TRUCK ACCESS ONLY) SEE DETAIL \"B\" SHEET C8.02	
9	INSTALL 3'x3' JENSEN PRECAST DROP INLET DETAIL \"H\" SHEET C8.01	
10	STUB AND CAP STORM DRAIN LATERAL 5\" FROM BLDG. FOR CONTINUATION REFER TO PLUMBING/MECHANICAL PLANS.	
11	CONSTRUCT CURB OPENING PER DETAIL \"J\" SHEET C8.01	
12	CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD No. 236 AND INSTALL STORMWATER QUALITY MANAGEMENT STAMP PER CCAUSD No. 421.	
13	CONSTRUCT 18 INCHES CONCRETE STEM WALL.	
14	CONSTRUCT 4\" THICK 20\"x30\" CONCRETE PAD WITH THICKENED EDGE.	
15	CONSTRUCT 10\" WIDE SWALE PER DETAIL \"K\" SHEET C8.01	
16	SAW CUT EXISTING AC PAVEMENT AT CENTER LINE PER USDOCA No. 500.1 AND 500.3. MATCH EXISTING PAVEMENT ELEVATIONS	
17	CONSTRUCT 10\" INCH CURB FACE CONCRETE CURB. SEE ARCHITECT PLANS FOR DETAILS	
18	CONSTRUCT 3\" AC PAVING OVER 4\" TYPE II AGGREGATE BASE. (JENSEN ST, TOPAZ ST AND D NELSON AVE ONLY) SEE DETAIL \"B\" SHEET C8.02	
19	CONSTRUCT 4\" AC PAVING OVER 4\" TYPE II AGGREGATE BASE. (FARM ROAD ONLY) SEE DETAIL \"D\" SHEET C8.02	
20	CONSTRUCT 5 LF TOP OF CURB TO \"O\" \"A\" CURB TRANSITION	
21	INSTALL D50 = 3\" (WIDTH AND DEPTH PER PLAN)	
22	INSTALL STORM DRAIN DROP INLET TYPE \"A\" PER USDOCA No. 411	
23	INSTALL 48\" STANDARD EXCENTRIC MANHOLE TYPE 1 PER USDOCA No. 403	
24	CONSTRUCT U CHANNEL PER DETAIL \"G\" SHEET C8.01	
25	INSTALL 2'x3' JENSEN PRECAST DROP INLET DETAIL \"P\" SHEET C8.01	
26	INSTALL 2'x3' JENSEN PRECAST DROP INLET DETAIL \"Q\" SHEET C8.01	
27	INSTALL STORM DRAIN CLEAN OUT PER DETAIL \"E\" SHEET C8.02	
28	INSTALL STORM DRAIN WYE DETAIL \"T\" SHEET C8.02. (SIZE PER PLAN)	
29	INSTALL 12\"x12\" GRATE INLET NYLOPLAST INLINE DRAIN DETAIL \"N\" SHEET C8.01	
30	CONSTRUCT HANDICAP RAMP DETAIL \"E\" SHEET C8.02	
31	CONSTRUCT ACCESS SIDEWALK SEE DETAIL \"L\" SHEET C8.02.	
32	INSTALL PRECAST BUMPER BLOCKS PER USDOCA No. 238	
33	CONSTRUCT NOT STANDARD HEADWALL PER DWG No R-2.5.1. SEE DETAIL \"G\" SHEET C8.02	
34	CONSTRUCT CONCRETE SIDEWALK PER USDOCA DWG. No. 234.	
35	CONSTRUCT STAMPED CONCRETE PER ARCHITECTURAL PLANS.	
36	INSTALL BOLLARDS. SEE ARCHITECTURAL PLANS.	
37	TRANSFORMER CONCRETE PAD. SEE ARCHITECTURAL PLANS.	
38	CONSTRUCT LANDSCAPE PLANTER. SEE ARCHITECTURAL PLANS.	
39	CONSTRUCT 4\" SIDEWALK WITH THICKENED EDGE SEE DETAIL H SHEET C8.02.	
40	MODIFIED \"L\" CURB SEE DETAIL \"J\" SHEET C8.02.	
41	INSTALL D50 = 8\" (WIDTH AND DEPTH PER PLAN)	

COLLINS
ENGINEERS



FARM AND JENSEN ELEMENTARY SCHOOL
APN:125-18-201-015

GRADING PLAN

FARM RD. & JENSEN ST.
LAS VEGAS, NEVADA

DESCRIPTION

DESIGN BY

DATE

CEI PROJECT: 9748

DESIGN BY: AP.

DRAWN BY: AP.

CHECKED BY: T. MILLER

DATE: 03/28/2017

SCALE: 1\"/>

SHEET NUMBER

C4.02

SHEET 9 OF 46

CALL BEFORE YOU DIG
AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY.

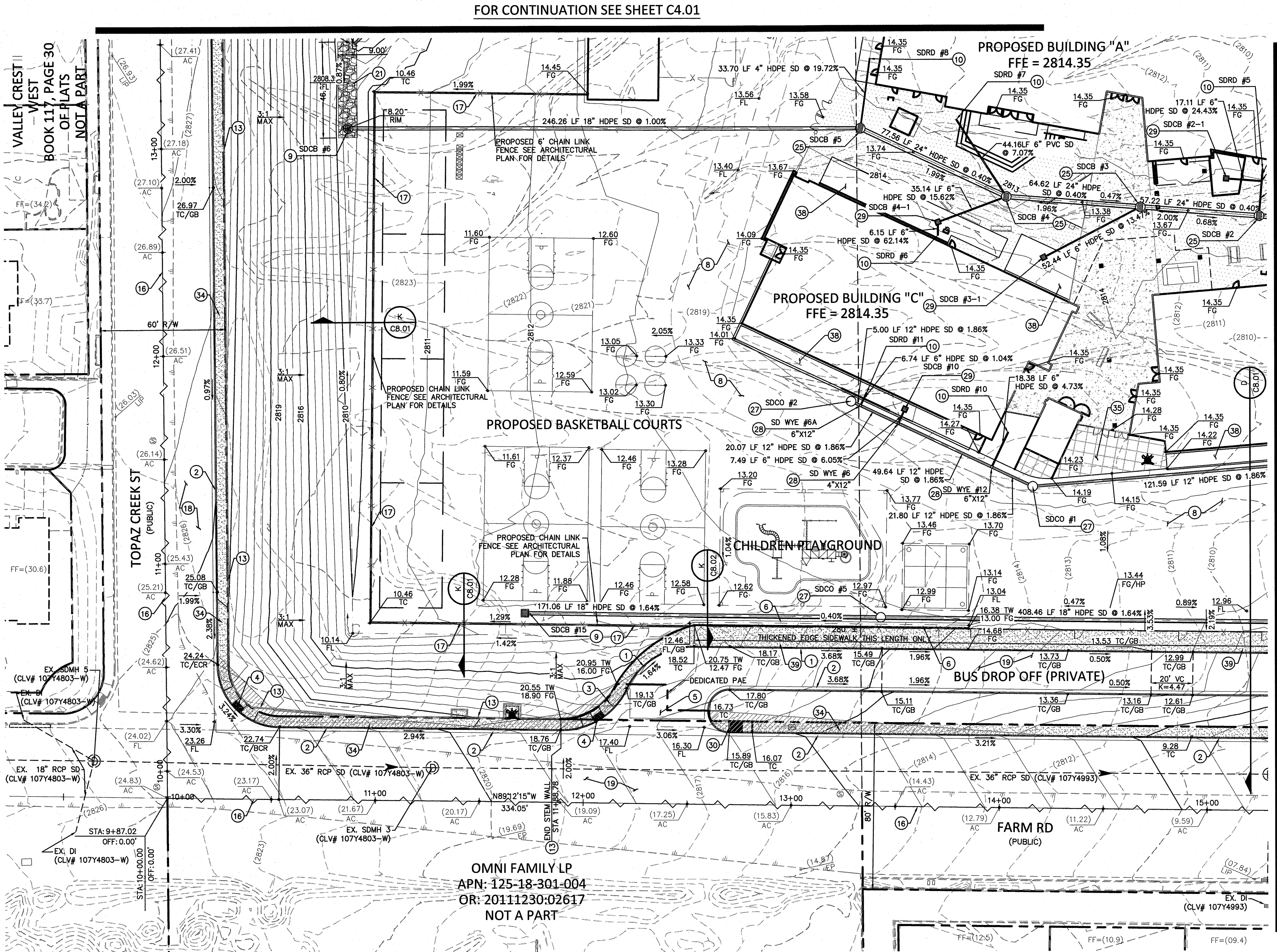
AVOID HITTING UNDERGROUND LIGHT SYSTEMS. IT'S COSTLY.

CALL BEFORE YOU DO UNDERGROUND WORK

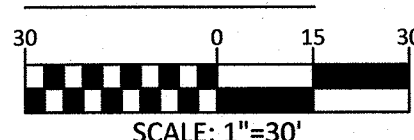
1-800-227-2600

1-702-432-5300

1-702-227-2929



GRAPHIC SCALE



BASIS OF BEARING

NORTH 89°12'46" WEST, BEING THE NORTH LINE OF THE SOUTHWEST QUARTER (SW1/4) OF THE NORTHWEST QUARTER (NW1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AS SHOWN BY MAP THEREOF ON FILE IN BOOK 146, PAGE 1 OF PLATS, OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK MONUMENT ID "6LV9018W6" RIVET & PLATE TOP CURB NW CORNER TOPAZ CREEK STREET & FARM ROAD.
ELEVATION = 861.703 FEET
ELEVATION = 2827.10 FEET (NAVD 88)

CONSTRUCTION NOTES

NO.	ITEM	USDOCA: UNIFORM STANDARD DRAWINGS CLARK COUNTY AREA.
1	CONSTRUCT "A" TYPE CURB PER DETAIL "L" SHEET C8.01.	
2	CONSTRUCT "L" TYPE CURB PER USDOCA DWG. No. 216.	
3	CONSTRUCT "A" CONCRETE SIDEWALK PER USDOCA DWG. No. 234 (WIDTH PER PLAN) FOR DETAILS SEE ARCHITECTURAL PLANS.	
4	CONSTRUCT SIDEWALK ADA RAMP PER USDOCA DWG. No. 235 CASE I.	
5	CONSTRUCT COMMERCIAL DRIVEWAY PER USDOCA DWG. No. 225 AND 228.	
6	CONSTRUCT "2" CONCRETE VALLEY GUTTER PER DETAIL "F" SHEET C8.01	
7	CONSTRUCT "2" AC PAVING OVER "4" TYPE II AGGREGATE BASE (PARKING AREA ONLY) SEE DETAIL "A" SHEET C8.02	
8	CONSTRUCT "3" AC PAVING OVER "4" TYPE II AGGREGATE BASE (MAIN CORRIDORS AND TRUCK ACCESS ONLY) SEE DETAIL "B" SHEET C8.02	
9	INSTALL 3'x3' JENSEN PRECAST DROP INLET DETAIL "H" SHEET C8.01	
10	STUB AND CAP STORM DRAIN LATERAL 5" FROM BLDG. FOR CONTINUATION REFER TO PLUMBING/MECHANICAL PLANS.	
11	CONSTRUCT CURB OPENING PER DETAIL "J" SHEET C8.01	
12	CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD No. 236 AND INSTALL STORMWATER QUALITY MANAGEMENT STAMP PER CCAUS No. 421.	
13	CONSTRUCT 18 INCHES CONCRETE STEM WALL	
14	CONSTRUCT "4" THICK 20"x30" CONCRETE PAD WITH THICKENED EDGE.	
15	CONSTRUCT 10' WIDE SWALE PER DETAIL "K" SHEET C8.01	
16	SAWCUT EXISTING AC PAVEMENT AT CENTER LINE PER USDOCA No. 500.1 AND 500.3. MATCH EXISTING PAVEMENT ELEVATIONS.	
17	CONSTRUCT "0" INCH CURB FACE CONCRETE CURB. SEE ARCHITECT PLANS FOR DETAILS.	
18	CONSTRUCT "3" AC PAVING OVER "4" TYPE II AGGREGATE BASE. (JENSEN ST, TOPAZ ST AND D NELSON AVE ONLY) SEE DETAIL "B" SHEET C8.02	
19	CONSTRUCT "4" AC PAVING OVER "4" TYPE II AGGREGATE BASE. (FARM ROAD ONLY) SEE DETAIL "D" SHEET C8.02	
20	CONSTRUCT 5 LF TOP OF CURB TO "0" "A" CURB TRANSITION	
21	INSTALL D50 = 3" (WIDTH AND DEPTH PER PLAN)	
22	INSTALL STORM DRAIN DROP INLET TYPE "A" PER USDOCA No. 411	
23	INSTALL 48" STANDARD EXCENTRIC MANHOLE TYPE 1 PER USDOCA No. 403	
24	CONSTRUCT U CHANNEL PER DETAIL "G" SHEET C8.01	
25	INSTALL 2'x3' JENSEN PRECAST DROP INLET DETAIL "P" SHEET C8.01	
26	INSTALL 2'x2' JENSEN PRECAST DROP INLET DETAIL "Q" SHEET C8.01	
27	INSTALL STORM DRAIN CLEAN OUT PER DETAIL "E" SHEET C8.02	
28	INSTALL STORM DRAIN WYE DETAIL "T" SHEET C8.02. (SIZE PER PLAN)	
29	INSTALL 12"x12" GRATE INLET NYLOPLAST INLINE DRAIN DETAIL "N" SHEET C8.01	
30	CONSTRUCT HANDICAP RAMP DETAIL "E" SHEET C8.02	
31	CONSTRUCT ACCESS SIDEWALK SEE DETAIL "L" SHEET C8.02.	
32	INSTALL PRECAST BUMPER BLOCKS PER USDOCA No. 238	
33	CONSTRUCT NOT STANDARD HEADWALL PER DWG No R-2.5.1. SEE DETAIL "G" SHEET C8.02	
34	CONSTRUCT CONCRETE SIDEWALK PER USDOCA DWG. No. 234.	
35	CONSTRUCT STAMPED CONCRETE PER ARCHITECTURAL PLANS.	
36	INSTALL BOLLARDS. SEE ARCHITECTURAL PLANS.	
37	TRANSFORMER CONCRETE PAD. SEE ARCHITECTURAL PLANS.	
38	CONSTRUCT LANDSCAPE PLANTER. SEE ARCHITECTURAL PLANS.	
39	CONSTRUCT "4" SIDEWALK WITH THICKENED EDGE SEE DETAIL H SHEET C8.02.	
40	MODIFIED "L" CURB SEE DETAIL "J" SHEET C8.02.	
41	INSTALL D50 = 8" (WIDTH AND DEPTH PER PLAN)	

SIGHT VISIBILITY ZONE LEGEND

SIGHT VISIBILITY ZONE

SIGHT VISIBILITY ZONE NOTE:

NO WALLS, FENCES SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBJECT, OTHER THAN TRAFFIC CONTROL DEVICES, FIRE HYDRANTS, TREES, AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR INSTALLED WITHIN THE SIGHT VISIBILITY ZONE UNLESS SAID OBJECT IS MAINTAINED AT LESS THAN 24 INCHES IN HEIGHT, MEASURED FROM TOP OF CURB, OR WHERE NO CURB EXIST, A HEIGHT OF 27 INCHES MEASURED FROM THE TOP OF ADJACENT ASPHALT, GRAVEL OR PAVEMENT STREET SURFACE. THIS RESTRICTION EXTENDS ALONG THE SIGHT VISIBILITY LINE THROUGH LANDSCAPED MEDIANS.

GENERAL NOTE:

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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.

FLOOD ZONE NOTE:

PER FIRM PANEL 32003C1745E REVISED SEPTEMBER 27, 2002, THE PROJECT SITE IS LOCATED WITHIN NON-SHADED FLOOD ZONE "X". NON-SHADED FLOOD ZONE "X" IS DEFINED BY FEMA AS AN AREA OUTSIDE THE 500-YEAR FLOOD PLAIN.

SD INFORMATION NOTE:

ALL ONSITE STORM DRAINS ARE PRIVATELY OWNED AND PRIVATELY MAINTAINED. REF. TO SHEET C4.01 FOR SD ROOF DRAIN, WYE, AND CLEAN OUT INFORMATION TABLES. REF. TO SHEET C4.02 FOR SD ROOF DRAIN, MANHOLE, FLARED END SECTION, AND DROP INLET INFORMATION TABLES.

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH THE CITY OF LAS VEGAS, DS# 4856A

ARMANDO PINEDA - 18290

4-05-17
DATE

CALL BEFORE YOU DIG
AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY.

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEMS. IT'S COSTLY.

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.

CALL BEFORE YOU DO UNDERGROUND WORK

1-800-227-2600

1-702-432-5300
FACILITY AND UTILITY DIVISION

1-702-227-2929

LEGEND

EXISTING (0.000) 0.00% SLOPE

PROPOSED 0.00% SLOPE

EXISTING 0.00% SLOPE

PROPOSED 0.00% SLOPE

AC PAVEMENT

6" TYPE "A" CURB

24" TYPE "1" CURB & GUTTER

30" ROLL CURB

PL-RIGHT-OF-WAY

PL-ADJACENT

CENTERLINE

EASEMENT LINE

FLOW LINE

SAWCUT LINE

STORM MANHOLE

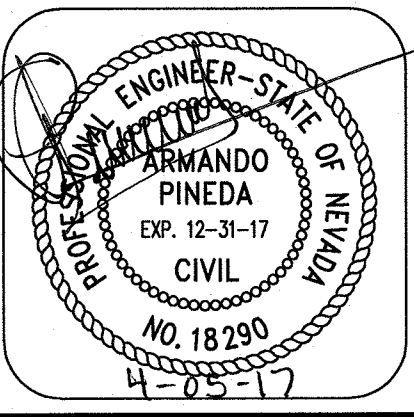
DROP INLET

CONTOUR

RETAINING WALL

SCREEN WALL

COLLINS ENGINEERS



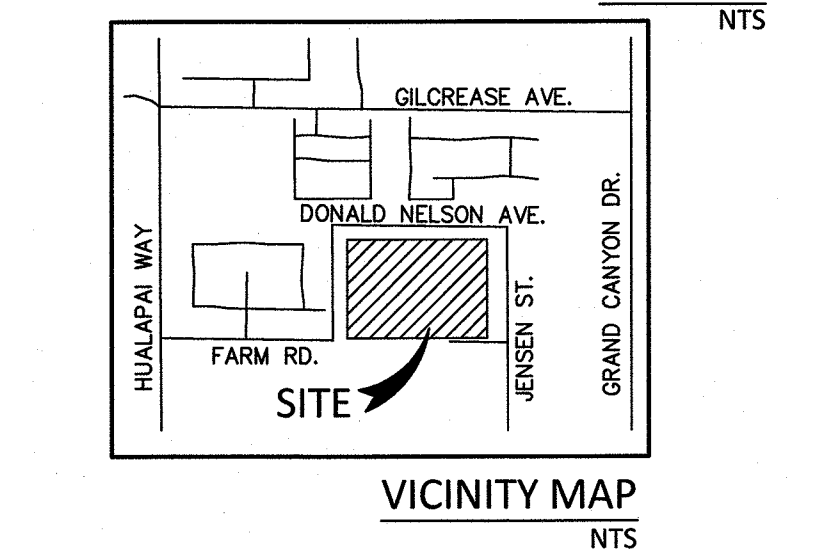
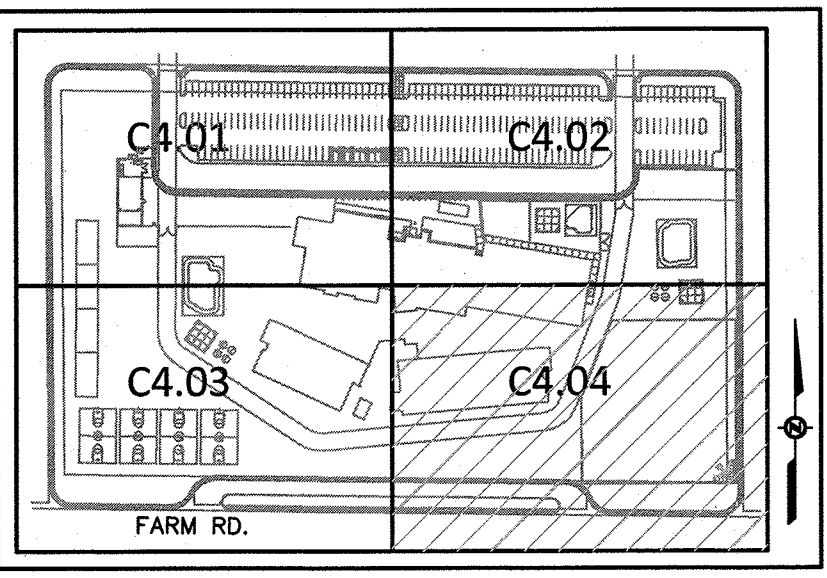
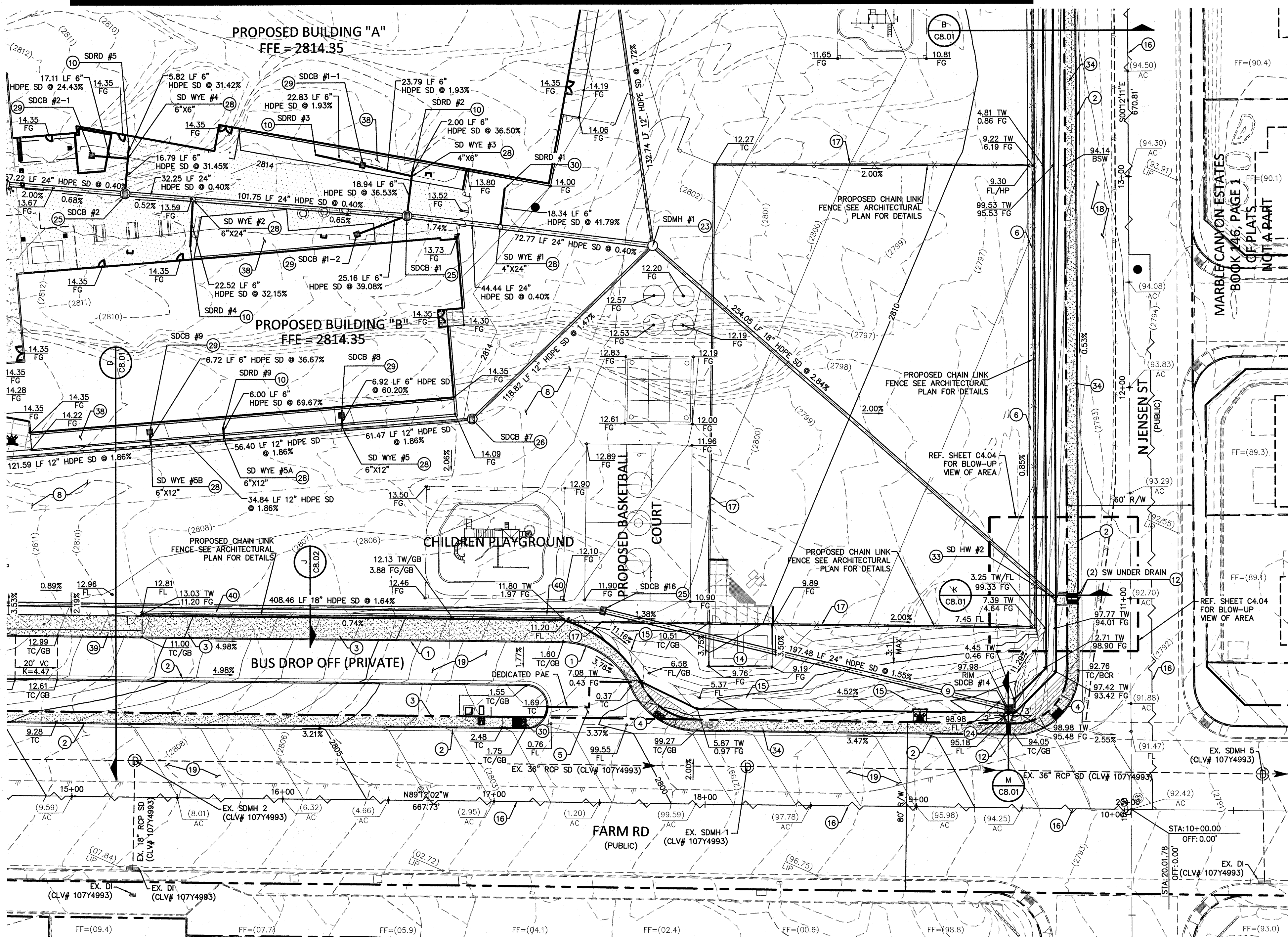
FARM AND JENSEN ELEMENTARY SCHOOL
APN: 125-18-201-015

GRADING PLAN

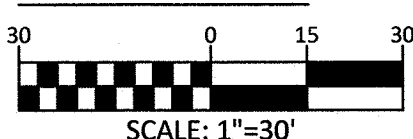
FARM RD. & JENSEN ST.
LAS VEGAS, NEVADA

DESIGN BY	DATE	NO.	DESCRIPTION
CEI PROJECT:	9748		
DESIGN BY:	AP.		
DRAWN BY:	AP.		
CHECKED BY:	T. MILLER		
DATE:	03/28/2017		
SCALE:	1"=30'		
SHEET NUMBER	C4.03		
	SHEET 10 OF 46		

FOR CONTINUATION SEE SHEET C4.02



GRAPHIC SCALE



BASIS OF BEARING

NORTH 89°12'46" WEST, BEING THE NORTH LINE OF THE SOUTHWEST QUARTER (SW1/4) OF THE NORTHWEST QUARTER (NW1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AS SHOWN BY MAP THEREOF ON FILE IN BOOK 146, PAGE 1 OF PLATS, OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

BENCHMARK

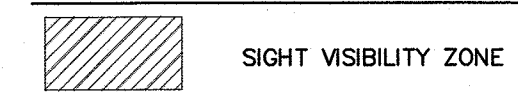
CITY OF LAS VEGAS BENCHMARK MONUMENT ID "BLV9018W6" RIVET & PLATE TOP CURB NW CORNER TOPAZ CREEK STREET & FARM ROAD.

ELEVATION = 861.703 METERS
ELEVATION = 2827.10 FEET (NAVD 88)

CONSTRUCTION NOTES

NO.	ITEM	USDOCA: UNIFORM STANDARD DRAWINGS CLARK COUNTY AREA.
1	CONSTRUCT "A" TYPE CURB PER DETAIL "L" SHEET C8.01.	
2	CONSTRUCT "L" TYPE CURB PER USDOCA DWG. No. 216.	
3	CONSTRUCT "4" CONCRETE SIDEWALK PER USDOCA DWG. No. 234 (WIDTH PER PLAN) FOR DETAILS SEE ARCHITECTURAL PLANS.	
4	CONSTRUCT SIDEWALK ADA RAMP PER USDOCA DWG. No. 235 CASE I.	
5	CONSTRUCT COMMERCIAL DRIVEWAY PER USDOCA DWG. No. 225 AND 228.	
6	CONSTRUCT 2" CONCRETE VALLEY GUTTER PER DETAIL "T" SHEET C8.01	
7	CONSTRUCT 2" AC PAVING OVER 4" TYPE II AGGREGATE BASE. (PARKING AREA ONLY) SEE DETAIL "A" SHEET C8.02	
8	CONSTRUCT 3" AC PAVING OVER 4" TYPE II AGGREGATE BASE. (MAIN CORRIDORS AND TRUCK ACCESS ONLY) SEE DETAIL "B" SHEET C8.02	
9	INSTALL 3'x3' JENSEN PRECAST DROP INLET DETAIL "H" SHEET C8.01	
10	STUB AND CAP STORM DRAIN LATERAL 5" FROM BLDG. FOR CONTINUATION REFER TO PLUMBING/MECHANICAL PLANS.	
11	CONSTRUCT CURB OPENING PER DETAIL "J" SHEET C8.01	
12	CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD No. 236 AND INSTALL STORMWATER QUALITY MANAGEMENT STAMP PER CCAUSD No. 421.	
13	CONSTRUCT 18 INCHES CONCRETE STEM WALL	
14	CONSTRUCT 4" THICK 20'x30' CONCRETE PAD WITH THICKENED EDGE.	
15	CONSTRUCT 10' WIDE SWALE PER DETAIL "K" SHEET C8.01	
16	SAW CUT EXISTING AC PAVEMENT AT CENTER LINE PER USDOCA No. 500.1 AND 500.3 MATCH EXISTING PAVEMENT ELEVATIONS	
17	CONSTRUCT 10" INCH CURB FACE CONCRETE CURB. SEE ARCHITECT PLANS FOR DETAILS	
18	CONSTRUCT 3" AC PAVING OVER 4" TYPE II AGGREGATE BASE. (JENSEN ST, TOPAZ ST AND D NELSON AVE ONLY) SEE DETAIL "B" SHEET C8.02	
19	CONSTRUCT 4" AC PAVING OVER 4" TYPE II AGGREGATE BASE. (FARM ROAD ONLY) SEE DETAIL "D" SHEET C8.02	
20	CONSTRUCT 5 LF TOP OF CURB TO "O" "A" CURB TRANSITION	
21	INSTALL D50 = 3" (WIDTH AND DEPTH PER PLAN)	
22	INSTALL STORM DRAIN DROP INLET TYPE "A" PER USDOCA No. 411	
23	INSTALL 48" STANDARD EXCENTRIC MANHOLE TYPE 1 PER USDOCA No. 403	
24	CONSTRUCT U CHANNEL PER DETAIL "G" SHEET C8.01	
25	INSTALL 2'x3' JENSEN PRECAST DROP INLET DETAIL "P" SHEET C8.01	
26	INSTALL 2'x2' JENSEN PRECAST DROP INLET DETAIL "Q" SHEET C8.01	
27	INSTALL STORM DRAIN CLEAN OUT PER DETAIL "E" SHEET C8.02	
28	INSTALL STORM DRAIN WYE DETAIL "F" SHEET C8.02. (SIZE PER PLAN)	
29	INSTALL 12"x12" GRATE INLET NYLOPLAST INLINE DRAIN DETAIL "N" SHEET C8.01	
30	CONSTRUCT HANDICAP RAMP DETAIL "E" SHEET C8.02	
31	CONSTRUCT ACCESS SIDEWALK SEE DETAIL "L" SHEET C8.02.	
32	INSTALL PRECAST BUMPER BLOCKS PER USDOCA No. 238	
33	CONSTRUCT NOT STANDARD HEADWALL PER DWG No R-2.5.1. SEE DETAIL "G" SHEET C8.02	
34	CONSTRUCT CONCRETE SIDEWALK PER USDOCA DWG. No. 234.	
35	CONSTRUCT STAMPED CONCRETE PER ARCHITECTURAL PLANS.	
36	INSTALL BOLLARDS. SEE ARCHITECTURAL PLANS.	
37	TRANSFORMER CONCRETE PAD. SEE ARCHITECTURAL PLANS.	
38	CONSTRUCT LANDSCAPE PLANTER. SEE ARCHITECTURAL PLANS.	
39	CONSTRUCT 4" SIDEWALK WITH THICKENED EDGE SEE DETAIL H SHEET C8.02.	
40	MODIFIED "L" CURB SEE DETAIL "J" SHEET C8.02.	
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SIGHT VISIBILITY ZONE LEGEND



SIGHT VISIBILITY ZONE NOTE:

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FLOOD ZONE NOTE:

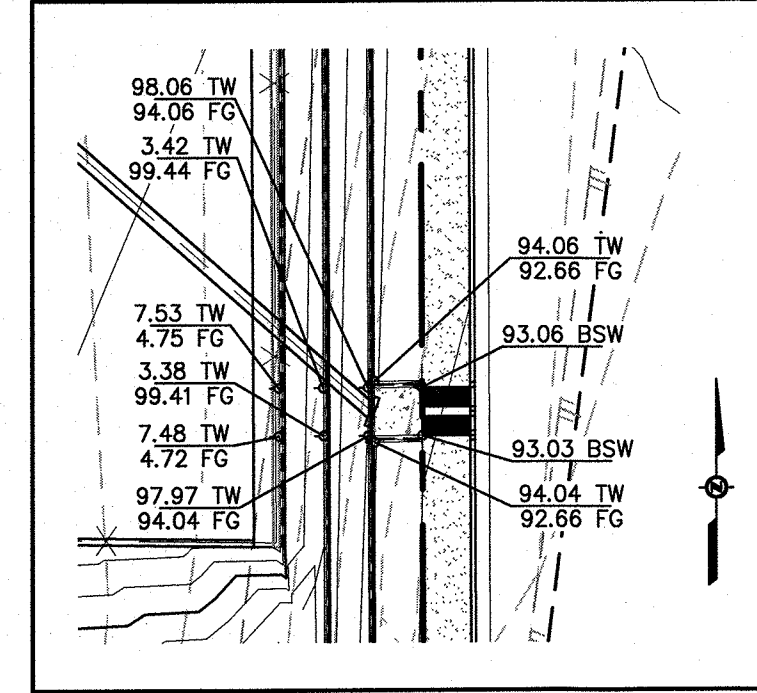
PER FIRM PANEL 32003C1745E REVISED SEPTEMBER 27, 2002, THE PROJECT SITE IS LOCATED WITHIN NON-SHADED FLOOD ZONE "X". NON-SHADED FLOOD ZONE "X" IS DEFINED BY FEMA AS AN AREA OUTSIDE THE 500-YEAR FLOOD PLAIN.

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I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH THE CITY OF LAS VEGAS. DSW 4856A

ARMANDO PINEDA - 18290
DATE 4-05-17



CALL BEFORE YOU DIG
AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY.

AVOID HITTING UNDERGROUND UTILITY LINES. IT'S COSTLY.

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.

CALL BEFORE YOU DO UNDERGROUND WORK

CALL BEFORE YOU DO OVERHEAD WORK

COLLINS ENGINEERS ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS AND ELEVATIONS. THE UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM THE BEST AVAILABLE INFORMATION. IT IS, HOWEVER, THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION AND ELEVATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION. CONTRACTOR TO FIELD VERIFY ALL EXISTING SITE CONDITIONS PRIOR TO CONSTRUCTION. IF A CONFLICT EXISTS BETWEEN WHAT IS SHOWN ON THESE DRAWINGS AND WHAT EXISTS IN THE FIELD, THE CONTRACTOR IS TO NOTIFY THE ARCHITECT OR ENGINEER IMMEDIATELY.

LEGEND

EXISTING PROPOSED
0.00% SLOPE
ELEVATION TAG
STORM MANHOLE
DROP INLET
CONTOUR
RETAINING WALL
SCREEN WALL

EXISTING PROPOSED
AC PAVEMENT
6" TYPE "A" CURB
24" TYPE "L" CURB & GUTTER
30" ROLL CURB

PL-RIGHT-OF-WAY
PL-ADJACENT CENTERLINE
EASEMENT LINE
FLOW LINE
SAWCUT LINE

1-800-227-2600

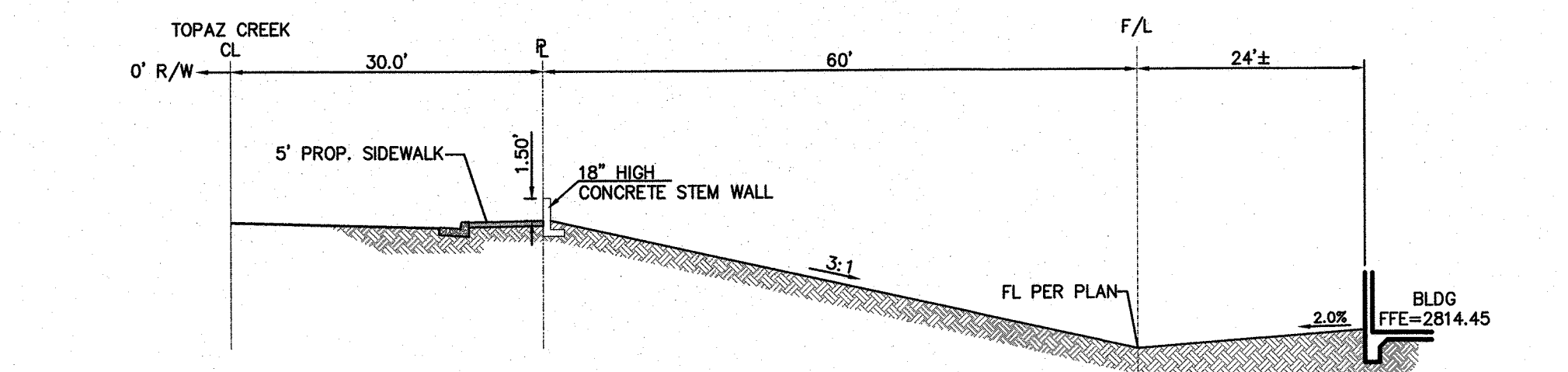
COLLINS ENGINEERS

FARM AND JENSEN ELEMENTARY SCHOOL
APN: 125-18-201-015
GRADING PLAN

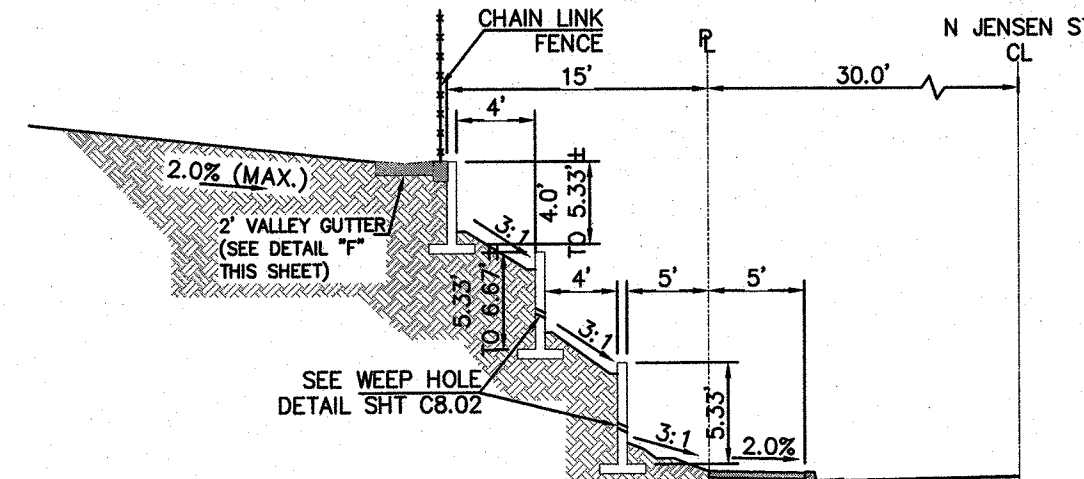
DESIGN BY: []
DATE: []
NO. []

CEI PROJECT: 9748
DESIGN BY: AP.
DRAWN BY: AP.
CHECKED BY: T. MILLER
DATE: 03/28/2017
SCALE: 1"=30'
SHEET NUMBER C4.04
SHEET 11 OF 46

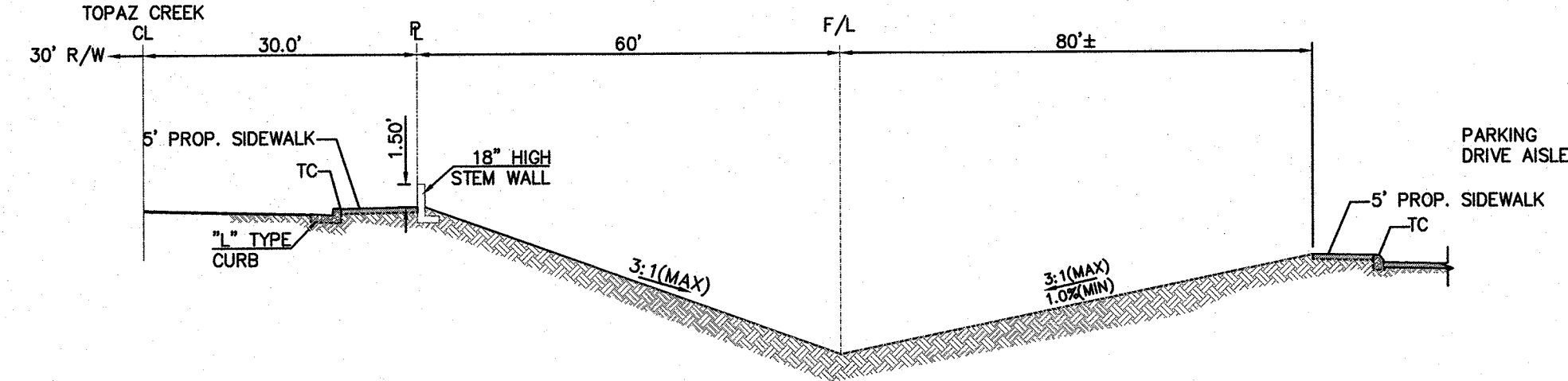
03/28/2017



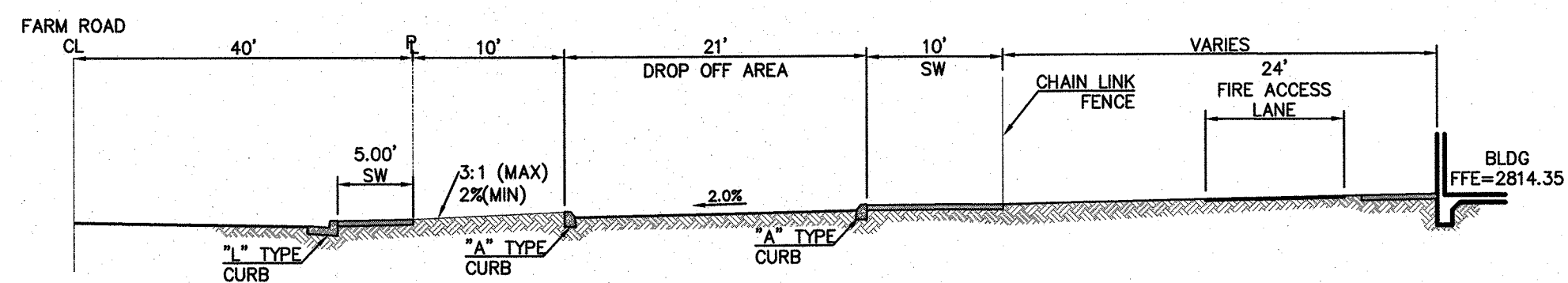
A
C8.01 CROSS SECTION
NTS



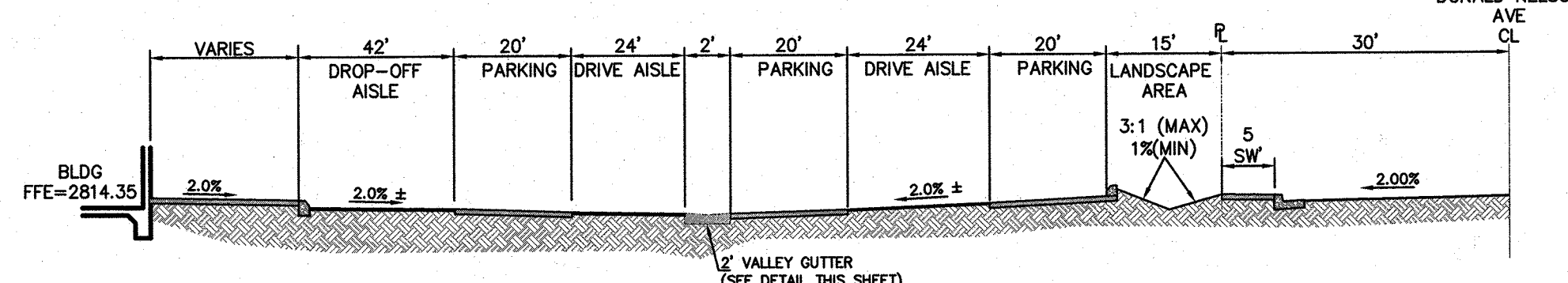
B
C8.01 CROSS SECTION
NTS



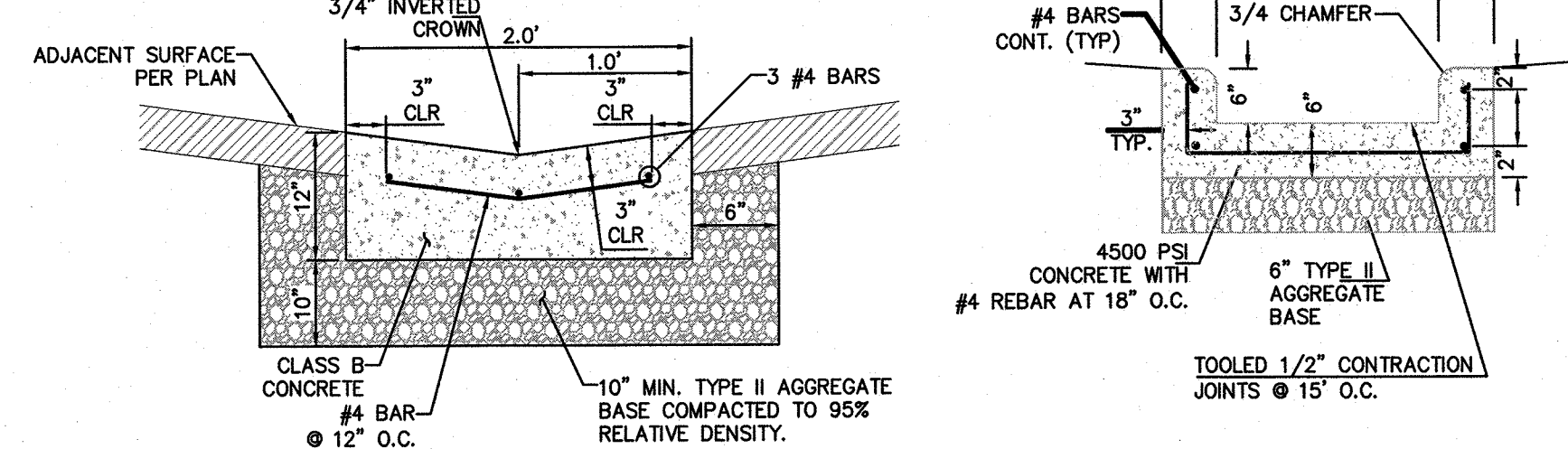
C
C8.01 CROSS SECTION
NTS



D
C8.01 CROSS SECTION
NTS

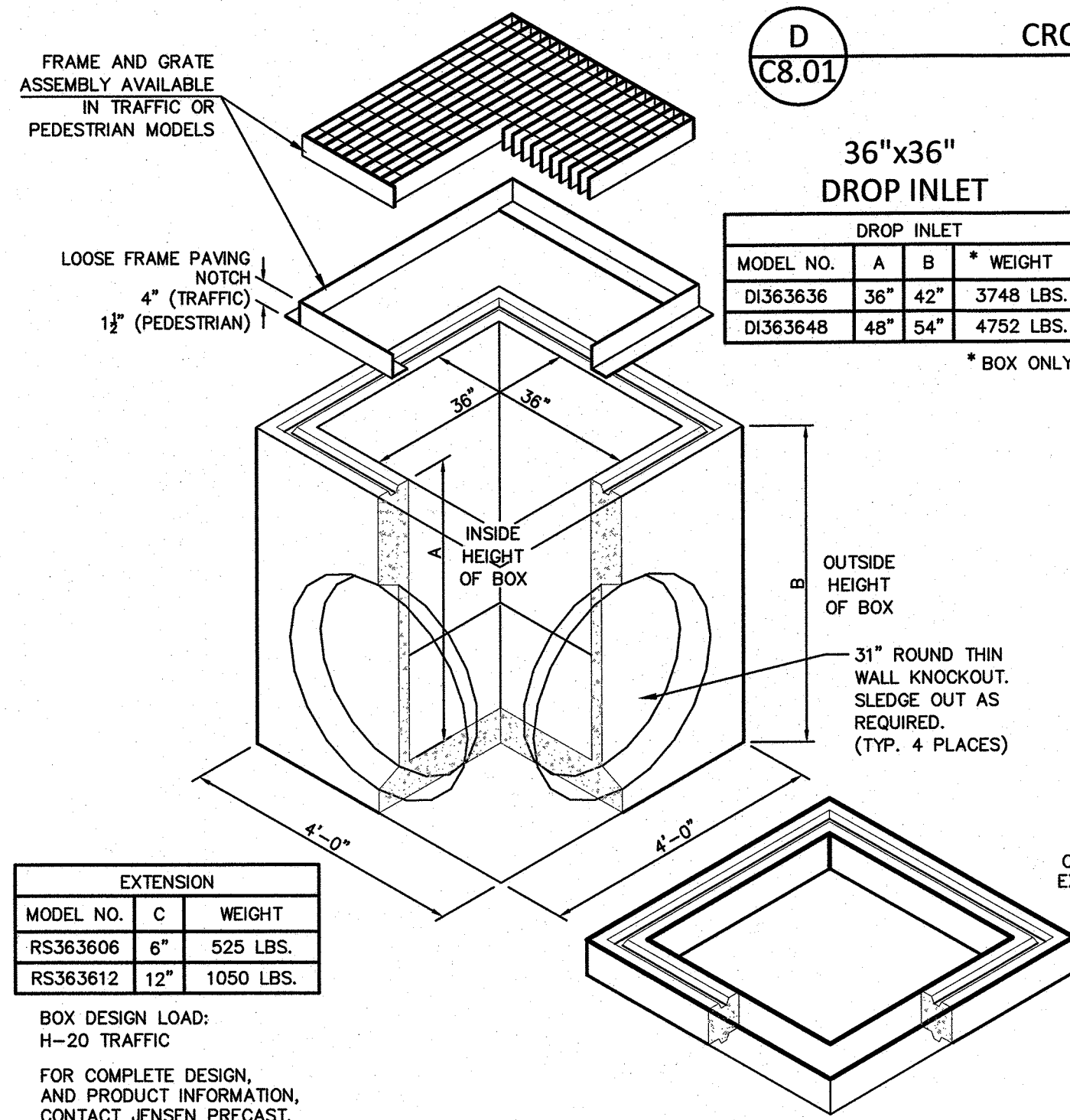


E
C8.01 CROSS SECTION
NTS

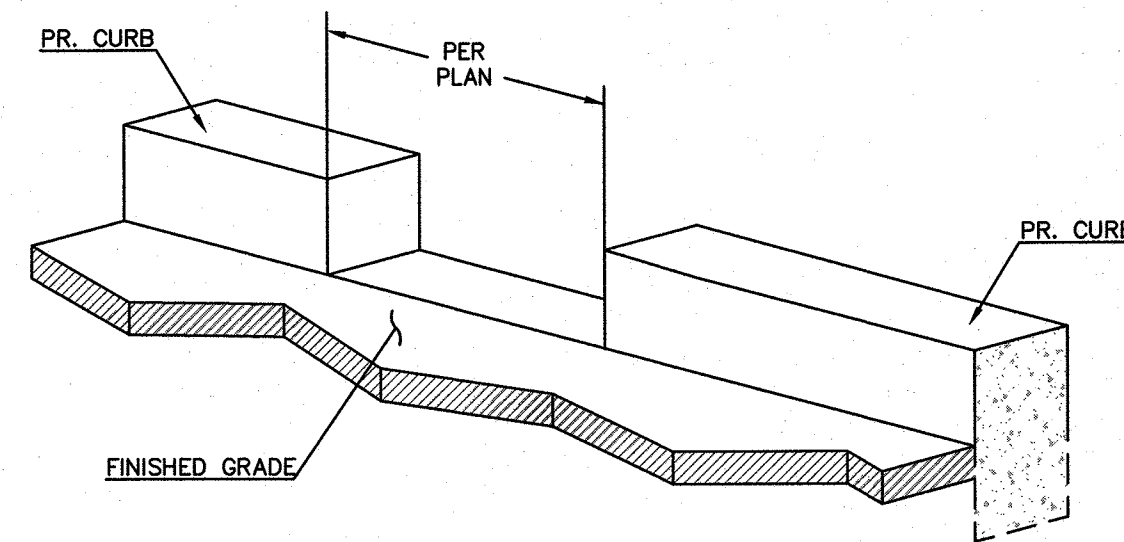


F
C8.01 VALLEY GUTTER
NTS

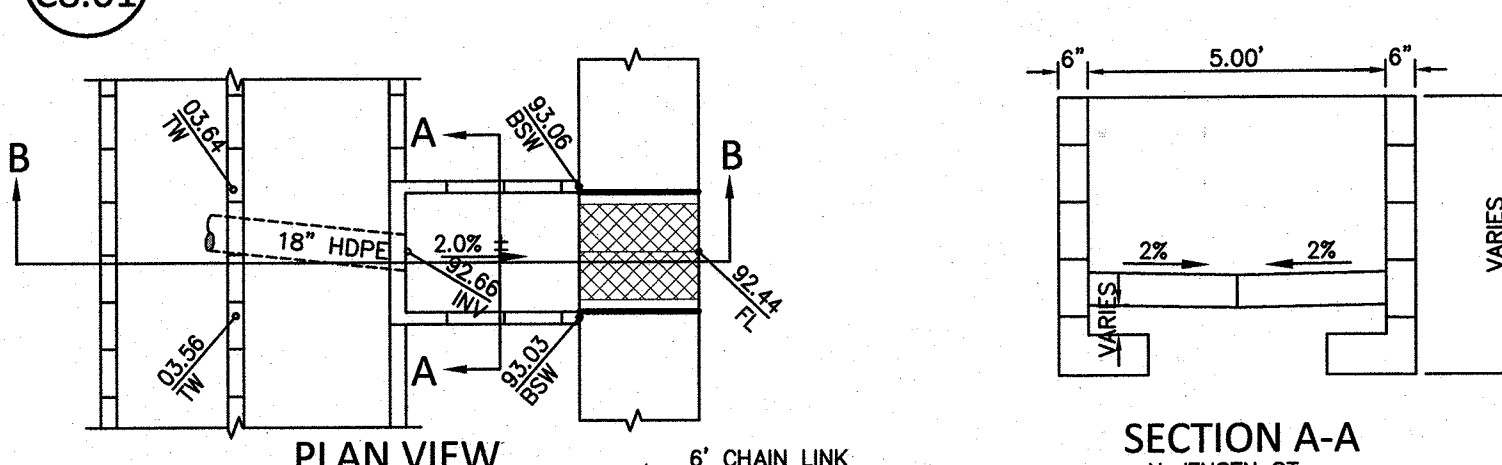
G
C8.01 U-CHANNEL DRAIN
NTS



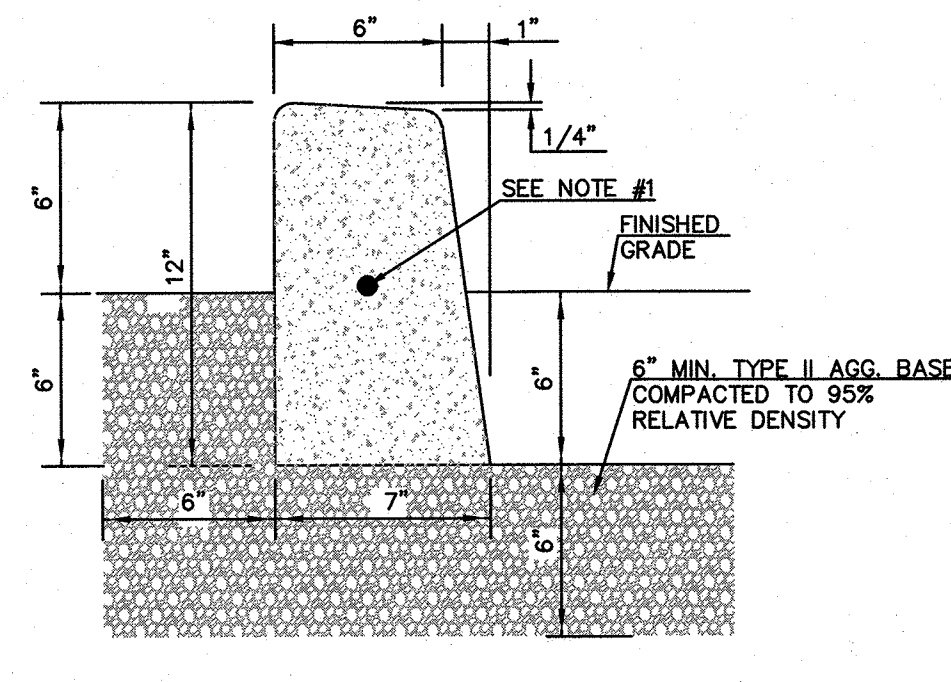
H
C8.01 36"x36" DROP INLET (REFERENCE ONLY)
NTS



J
C8.01 CURB OPENING
NTS



K
C8.01 SECTION B-B CROSS SECTION
NTS



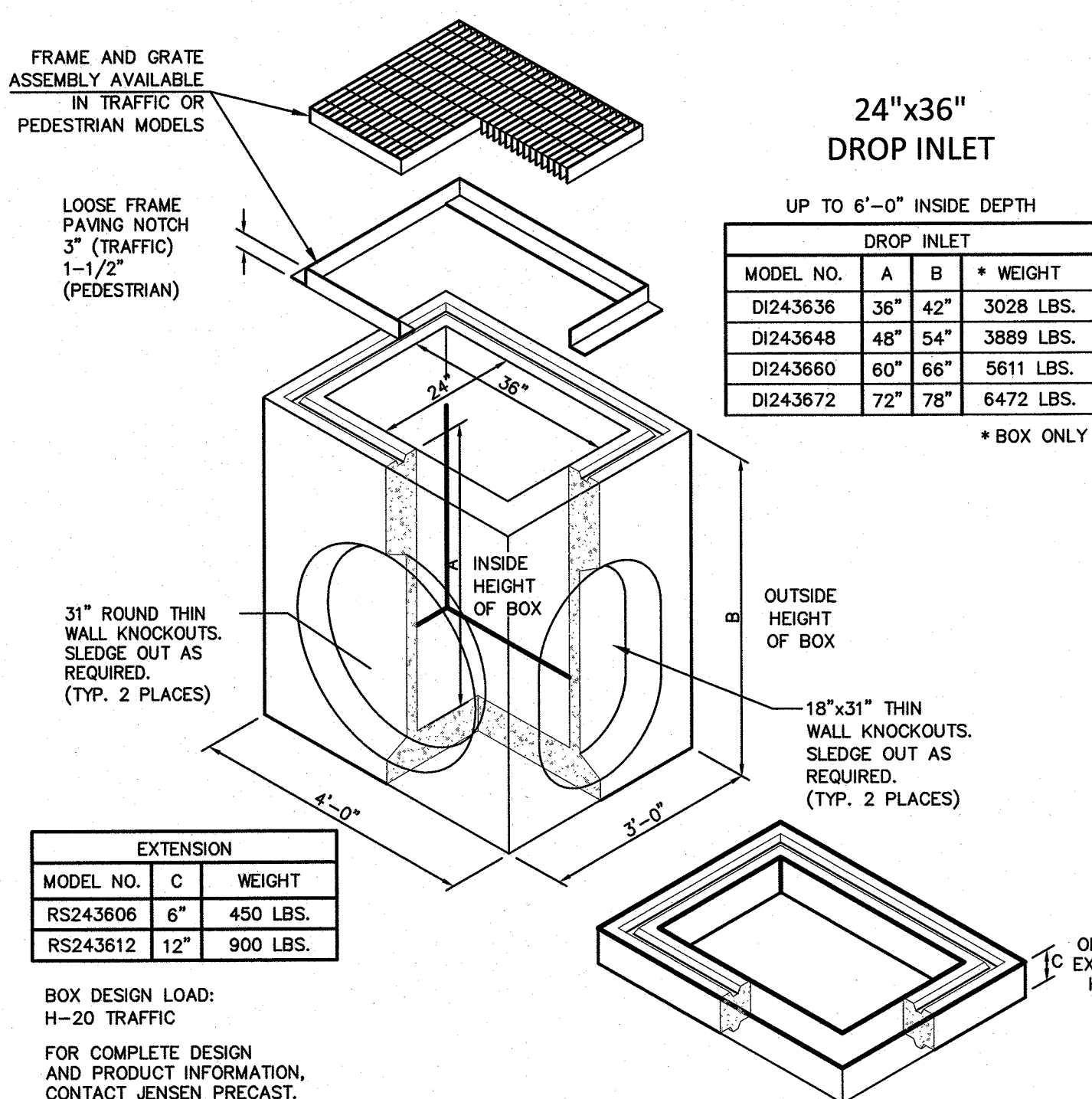
L
C8.01 "A" CURB SECTION
NTS

EXTENSION		
MODEL NO.	C	WEIGHT
RS363606	6"	525 LBS.
RS363612	12"	1050 LBS.

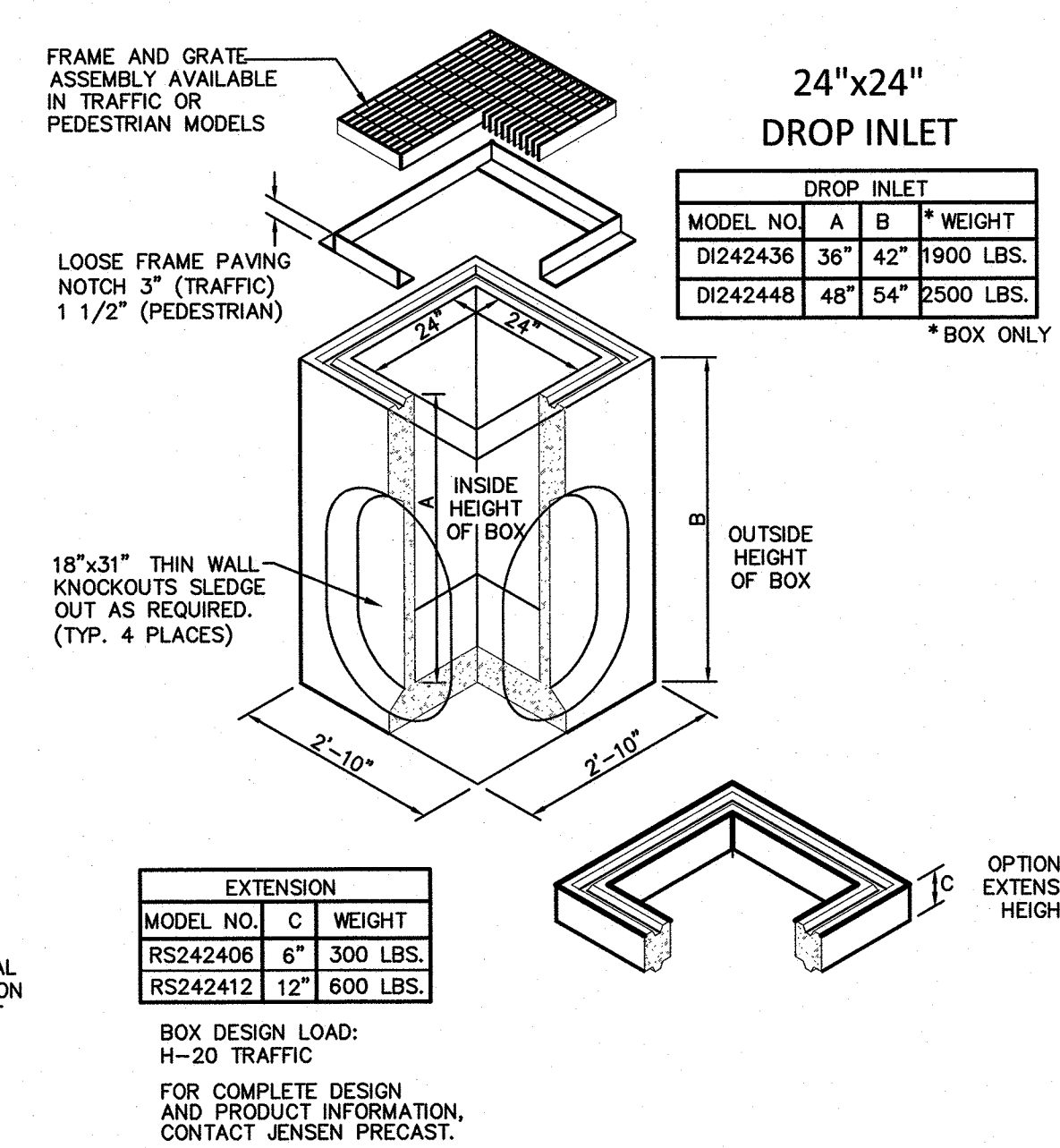
BOX DESIGN LOAD:
H-20 TRAFFIC
FOR COMPLETE DESIGN,
AND PRODUCT INFORMATION,
CONTACT JENSEN PRECAST.

GRATE OPTIONS	LOAD RATING	PART #	DRAWING #
PEDESTRIAN	MEETS H-10	1299GCP	7001-110-202
STANDARD	MEETS H-20	1299GCS	7001-110-203
SOLID COVER	MEETS H-20	1299GCG	7001-110-204
PEDESTRIAN BRONZE	N/A	1299GCPB	7001-110-205
DOMES	N/A	1299GCD	7001-110-206
DROP IN GRATE	LIGHT DUTY	1201DI	7001-110-021

- GRATES/SOLID COVER SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
- WITH THE EXCEPTION OF THE BRONZE GRATE, FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
- DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS. RISERS ARE NEEDED FOR BASINS OVER 84" DUE TO SHIPPING RESTRICTIONS.
- DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS N-12/HANCOR DUAL WALL), N-12 HP, PVC SEWER. ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0° TO 360°. TO DETERMINE MINIMUM ANGLE BETWEEN ADAPTERS SEE DRAWING NO. 7001-110-012.
- THE BACKFILL MATERIAL SHALL BE CRUSHED STONE OR OTHER GRANULAR MATERIAL MEETING THE REQUIREMENTS OF CLASS I, CLASS II, OR CLASS III MATERIAL AS DEFINED IN ASTM D2321. BEDDING & BACKFILL FOR SURFACE DRAINAGE INLETS SHALL BE PLACED & COMPACTED UNIFORMLY IN ACCORDANCE WITH ASTM D2321.



P
C8.01 24"x36" DROP INLET (REFERENCE ONLY)
NTS



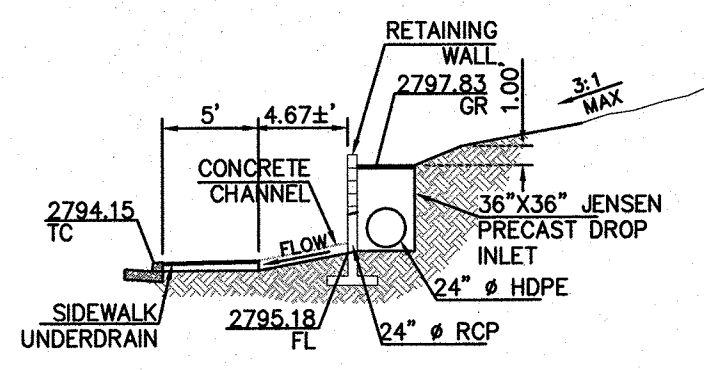
Q
C8.01 24"x24" DROP INLET (REFERENCE ONLY)
NTS

EXTENSION		
MODEL NO.	C	WEIGHT
RS243606	6"	450 LBS.
RS243612	12"	900 LBS.

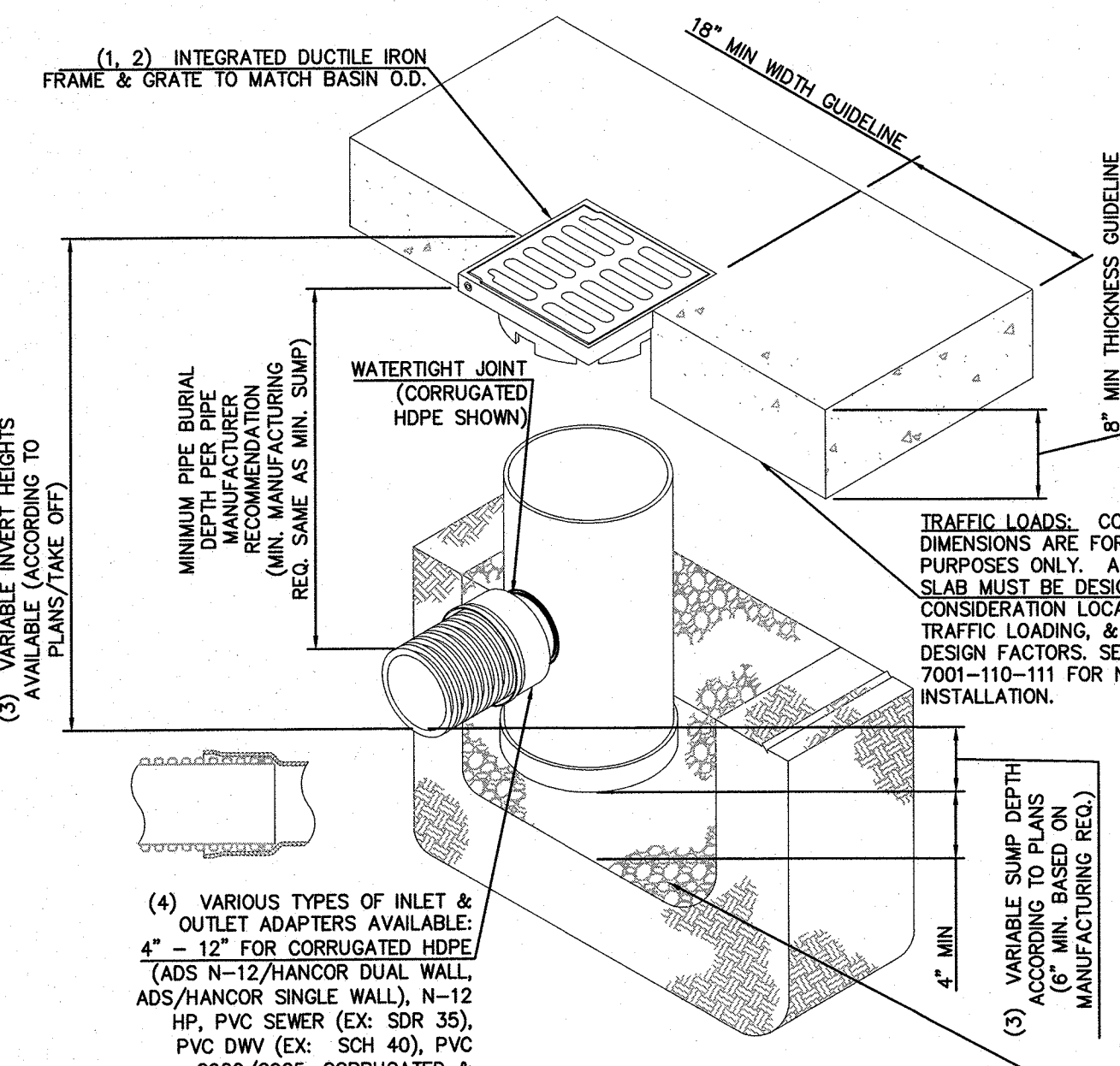
BOX DESIGN LOAD:
H-20 TRAFFIC
FOR COMPLETE DESIGN
AND PRODUCT INFORMATION,
CONTACT JENSEN PRECAST.

EXTENSION		
MODEL NO.	C	WEIGHT
RS242406	6"	300 LBS.
RS242412	12"	600 LBS.

BOX DESIGN LOAD:
H-20 TRAFFIC
FOR COMPLETE DESIGN
AND PRODUCT INFORMATION,
CONTACT JENSEN PRECAST.



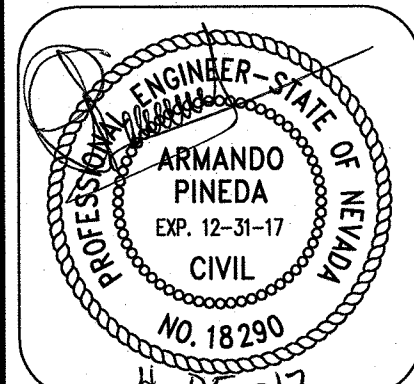
M
C8.01 CROSS SECTION
NTS



N
C8.01 NYLOPLAST 12" DRAIN BASIN: 2812AG
NTS

THE BACKFILL MATERIAL SHALL BE CRUSHED STONE OR OTHER GRANULAR MATERIAL MEETING THE REQUIREMENTS OF CLASS I, CLASS II, OR CLASS III MATERIAL AS DEFINED IN ASTM D2321. BEDDING & BACKFILL FOR SURFACE DRAINAGE INLETS SHALL BE PLACED & COMPACTED UNIFORMLY IN ACCORDANCE WITH ASTM D2321.

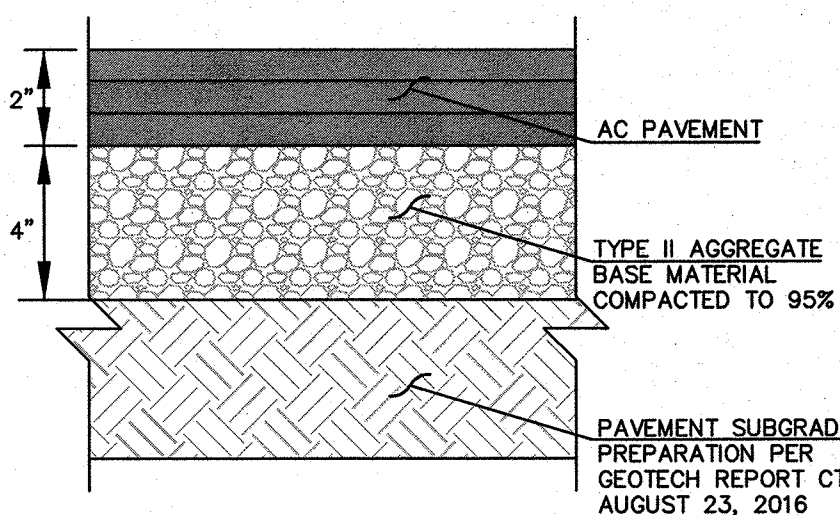
COLLINS ENGINEERS
3130 S. DURANGO DR., SUITE 404
LAS VEGAS, NV 89117
PHONE: (702) 248-8000
FAX: (702) 248-8070
WWW.COLLINSENGINEERS.COM



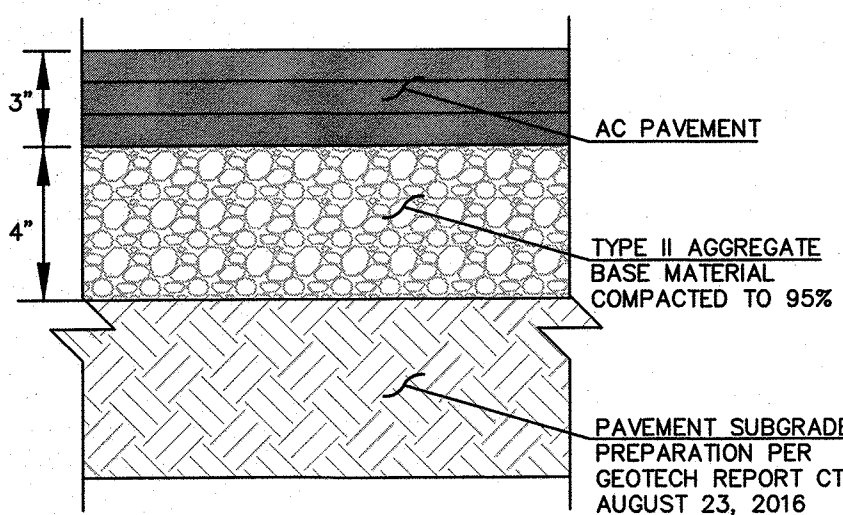
FARM AND JENSEN ELEMENTARY SCHOOL
APN: 125-18-201-015
DETAIL SHEET

DESCRIPTION	
DESIGN BY	
DATE	
NO.	

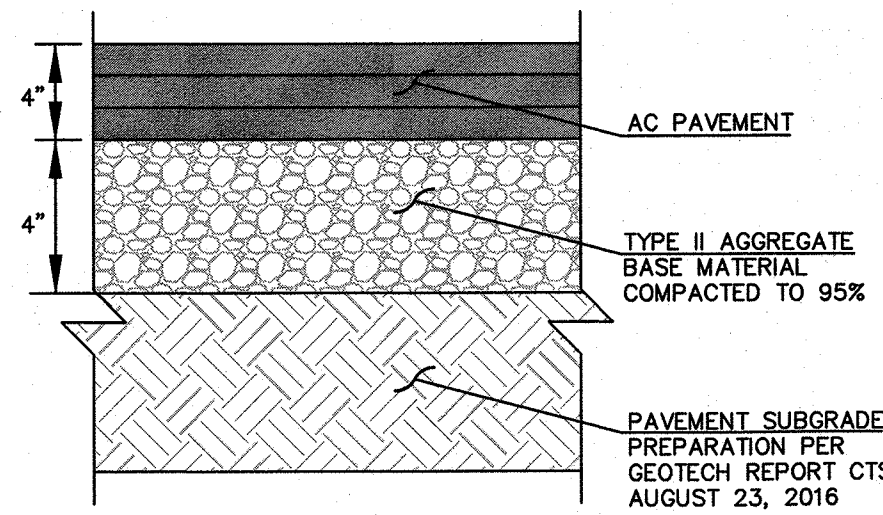
CEI PROJECT:	9748
DESIGN BY:	AP.
DRAWN BY:	AP.
CHECKED BY:	T. MILLER
DATE:	03/28/2017
SCALE:	NTS
SHEET NUMBER	C8.01
	SHEET 40 OF 46



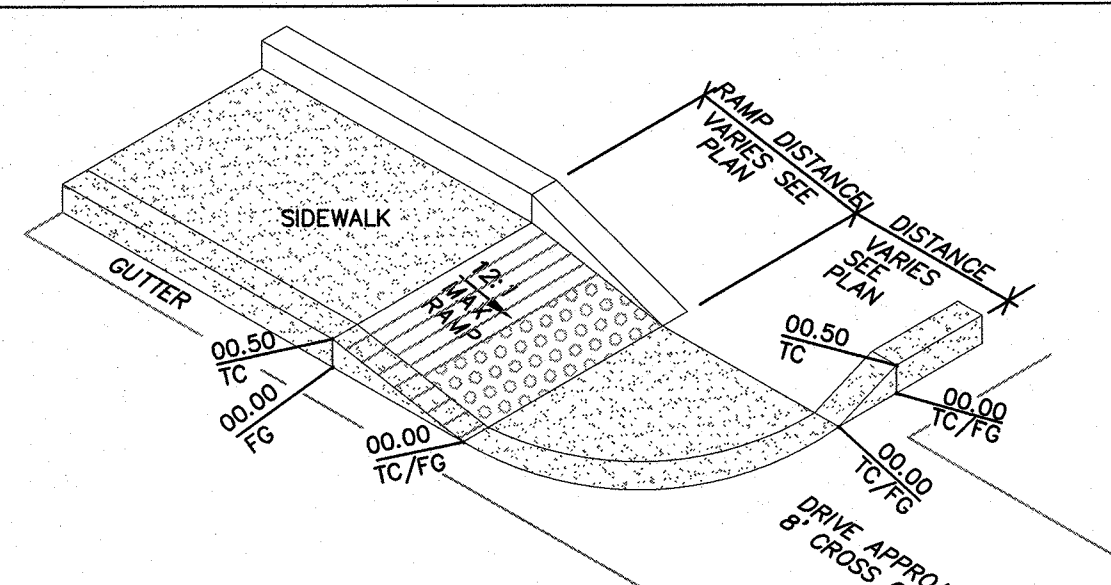
A PARKING AREA PAVING SECTION
C8.02 NTS



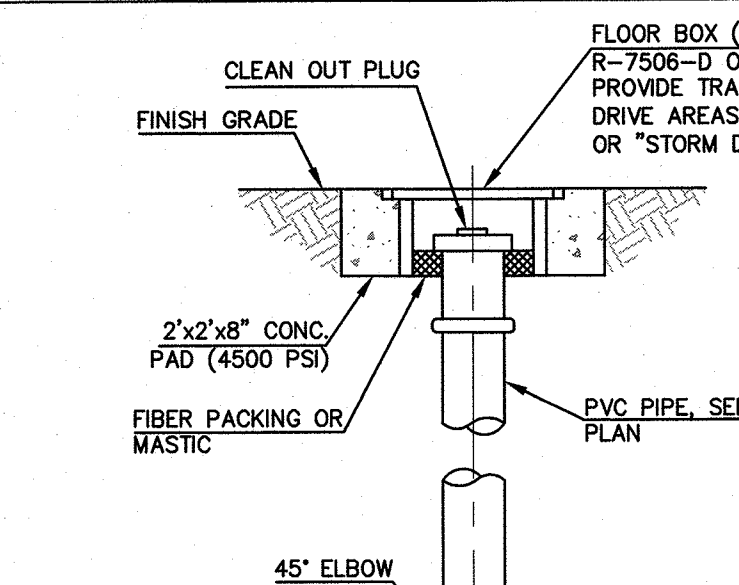
B PAVING SECTION
C8.02 NTS



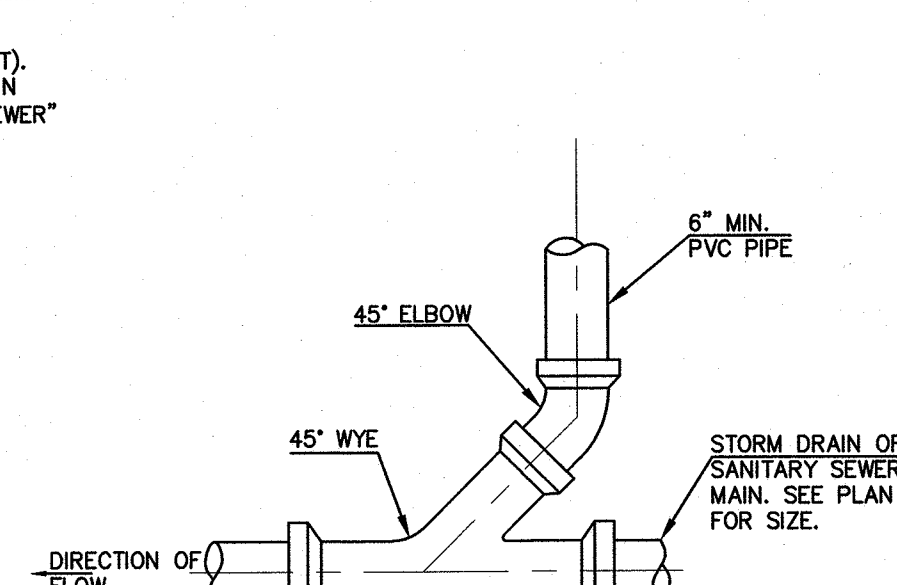
C PAVING SECTION
C8.02 NTS



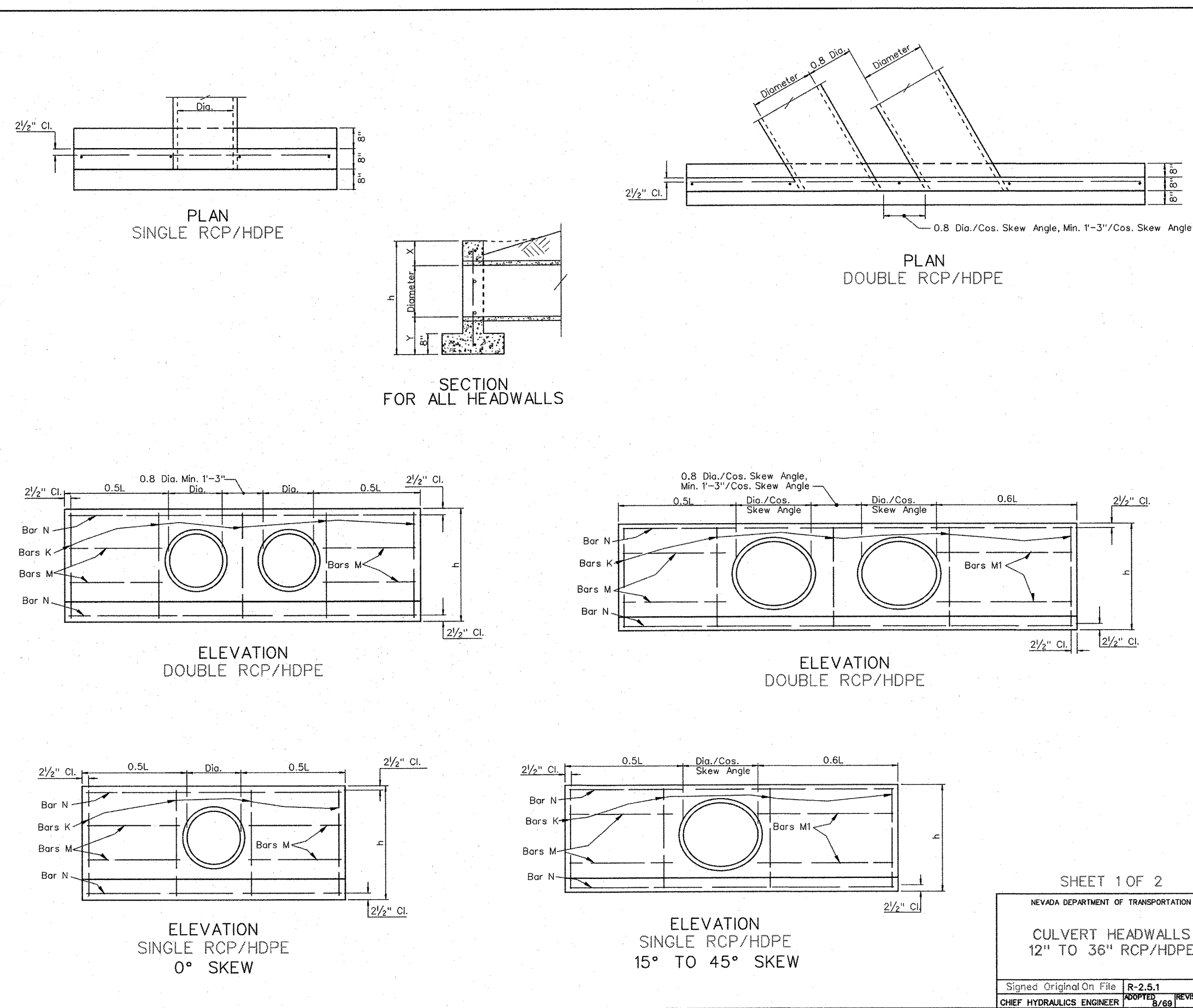
D TYPICAL OFFSITE RAMP
C8.02 NTS



E CLEAN OUT DETAIL
C8.02 NTS



F WYE DETAIL
C8.02 NTS



G NDOT STANDARD HEADWALL
C8.02 NTS

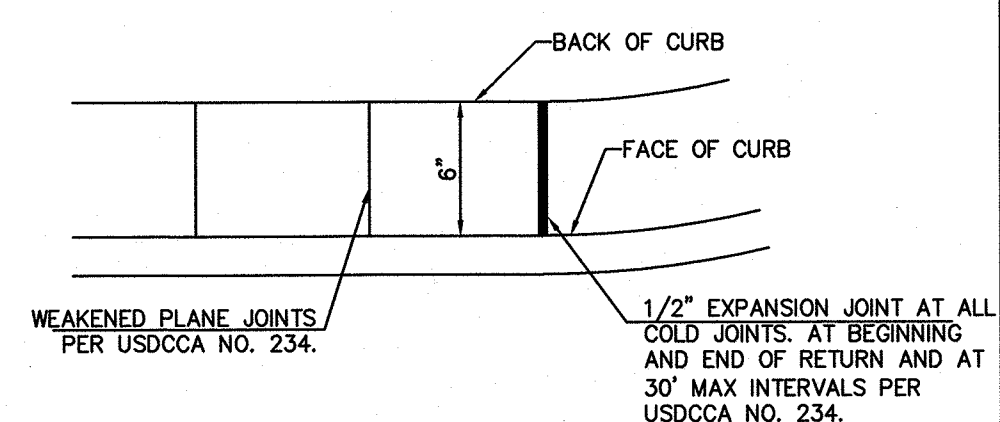
QUANTITIES SHOWN BELOW ARE FOR TWO HEADWALLS.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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QUANTITIES SHOWN BELOW ARE FOR ONE HEADWALL.

RCP/HDPE SIZE DIA.	LENGTH OF REINFORCING BARS															
	SINGLE RCP/HDPE						SINGLE OR DOUBLE RCP/HDPE						DOUBLE RCP/HDPE			
	0°-45°	0°	15°	30°	45°	0°	15°	30°	45°	0°-45°	0°	15°	30°	45°		
	N°	N°	N°	N°	N°	N°	N°	N°	N°	N°	N°	N°	N°	N°		
	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°		
	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°		
	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°		
	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°		
	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°		
	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°		
	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°		
	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°		
	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°		
	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°		
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	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°		
	0°	15°	30°	45°	0°											

- NOTES:
- CONCRETE SHALL BE CLASS A OR AA.
 - REINFORCING STEEL SHALL BE DEFORMED BARS WITH MAXIMUM SPACING OF 18" SET 2/3" CLEAR OF SURFACE OF CONCRETE EXCEPT AS NOTED. BAR ENDS SHALL BE KEPT 1/2" CLEAR OF SURFACE OF CONCRETE. REINFORCING BARS MAY BE CUT AND BENT IN FIELD.
 - FOOTINGS SHOWN ARE OF MINIMUM DEPTH AND SHALL BE EXTENDED IF SOIL IS UNSUITABLE OR LIABLE TO SCOUR.
 - CULVERT PIPES TO BE SET ON A SKEW SHALL BE MITERED WHEN HEADWALLS ARE CONSTRUCTED. WHEN HEADWALLS ARE NOT CONSTRUCTED THE PIPES SHALL NOT BE MITERED EXCEPT IN OVERFLOW SECTION.
 - FOR ESTIMATING HEADWALL QUANTITIES ON SKEWED CULVERTS: 10° TO 25° - USE QUANTITIES FOR 0° SKEW. 26° TO 40° - USE QUANTITIES FOR 15° SKEW. 41° TO 55° - USE QUANTITIES FOR 30° SKEW. OVER 55° - CALCULATE QUANTITIES REQUIRED. CULVERTS SHOULD BE INSTALLED ON 5' INCREMENTS WHERE IT IS FEASIBLE.
 - DIMENSIONS X, Y, L, AND H TO REMAIN CONSTANT REGARDLESS OF MINOR VARIATIONS IN WALL THICKNESS DUE TO CLASS OR TYPE OF PIPE USED.
 - REFER TO SHEET R-2.9.1 FOR DETAILS IF CONNECTING TO HOPE PIPE.

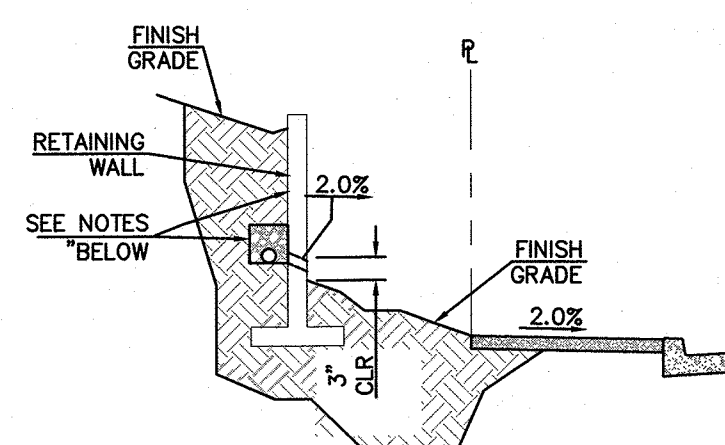
SHEET 2 OF 2
NEVADA DEPARTMENT OF TRANSPORTATION
CULVERT HEADWALLS
12" TO 36" RCP/HDPE
Signed: Original On File R-2.9.1 (5/02)
CHIEF HYDRAULICS ENGINEER 10/18/2018



TYPICAL PLAN

- NOTES:
- CONTINUOUS #4 REBAR IN RADIUS OF CURB ONLY.

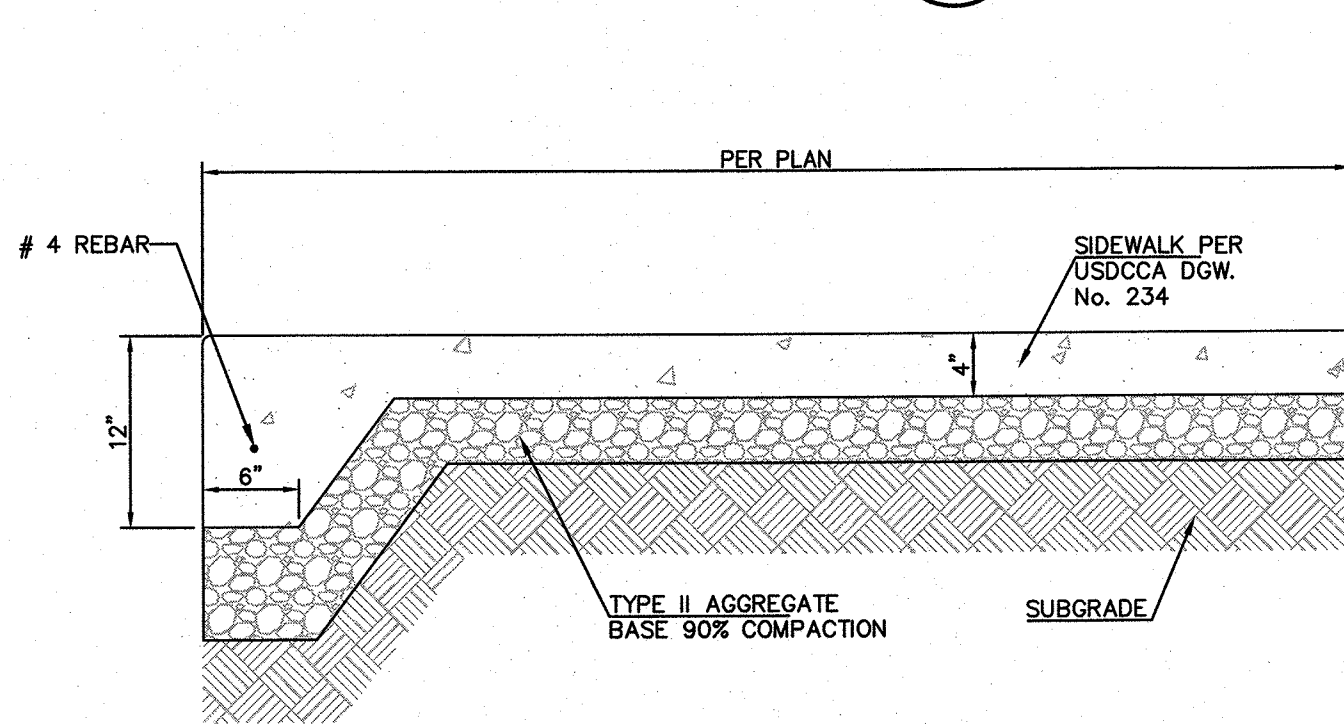
CONTROL AND EXPANSION JOINTS
NTS



NOTES:

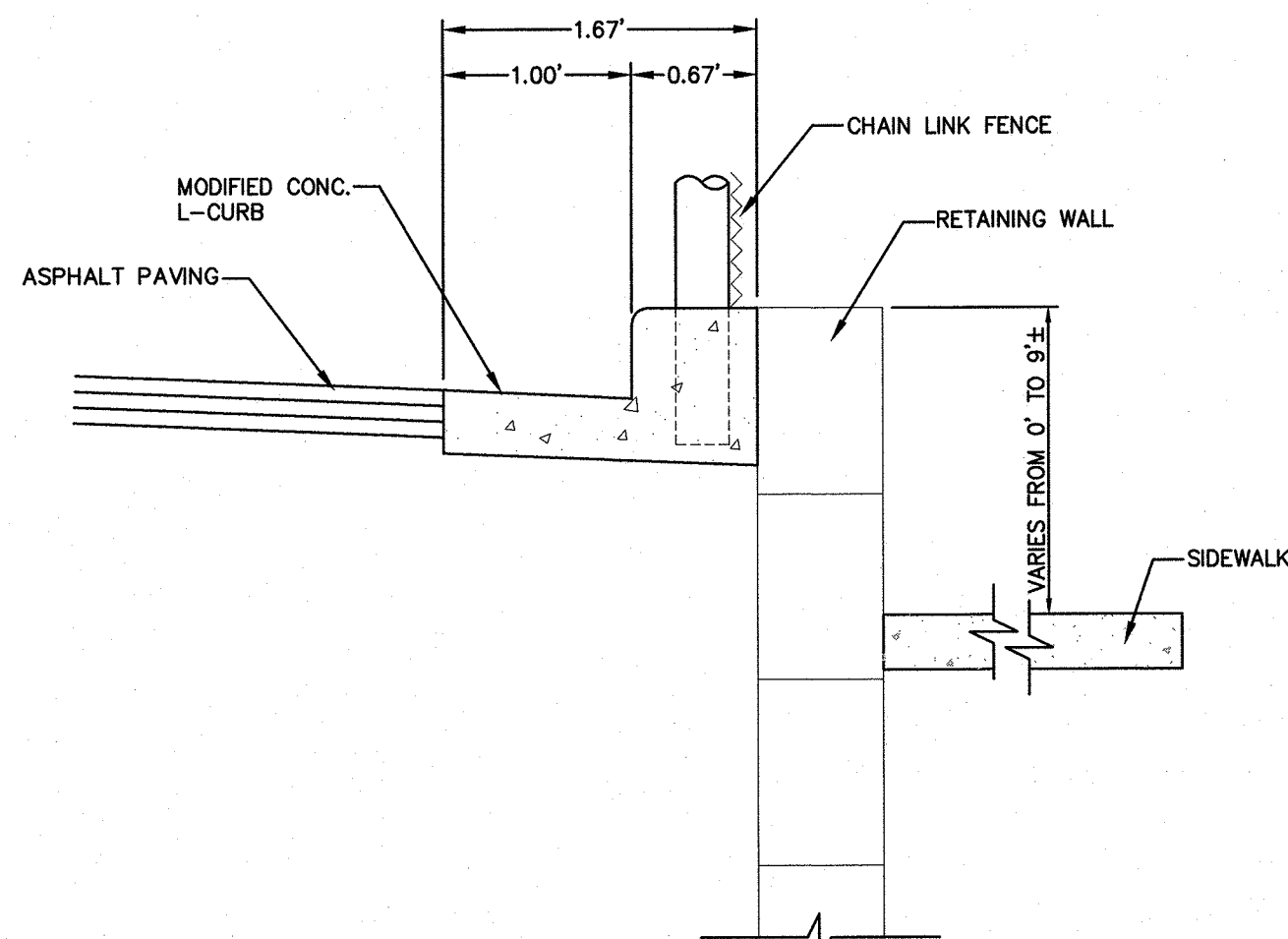
- INSTALL 3" DIA. PVC PIPE DRAIN @ 10' MAX. O.C. EXPOSED WALL DRAINS SHALL BE LOCATED 3" ABOVE FINISH GRADE.
- INSTALL GRAVEL, FILTER FABRIC, AND APPLY WATER PROOFING MEMBRANE PER GEOTECHNICAL REPORT RECOMMENDATIONS DATED AUGUST 23, 2016 PREPARED BY CONSTRUCTION TESTING SERVICES JOB NO. J5508

WEEP HOLE DETAIL
NTS

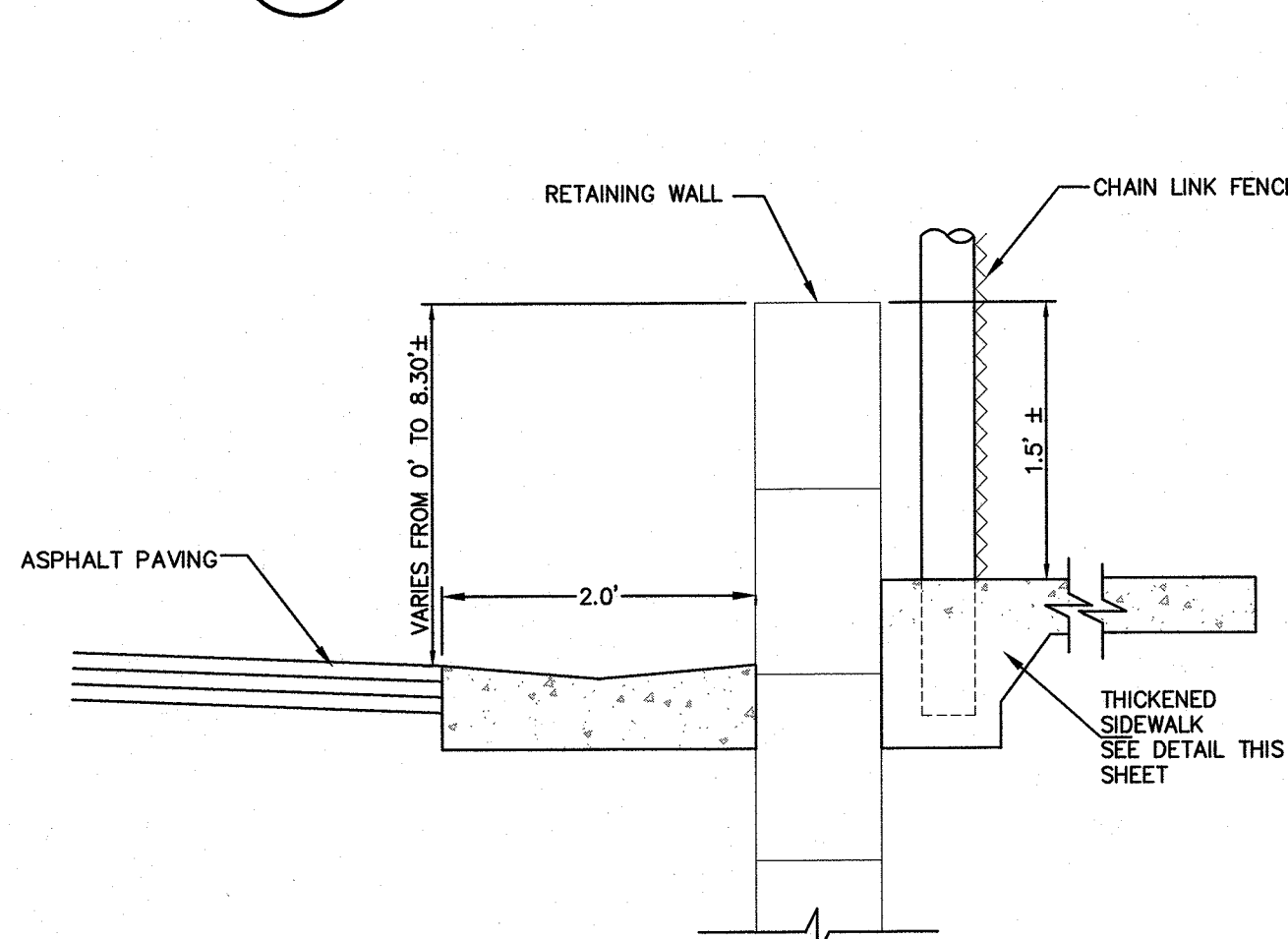


NOTE: FOR INSTALLATION OF EXPANSION JOINTS, AND CONTROL JOINTS SEE DETAIL THIS SHEET.

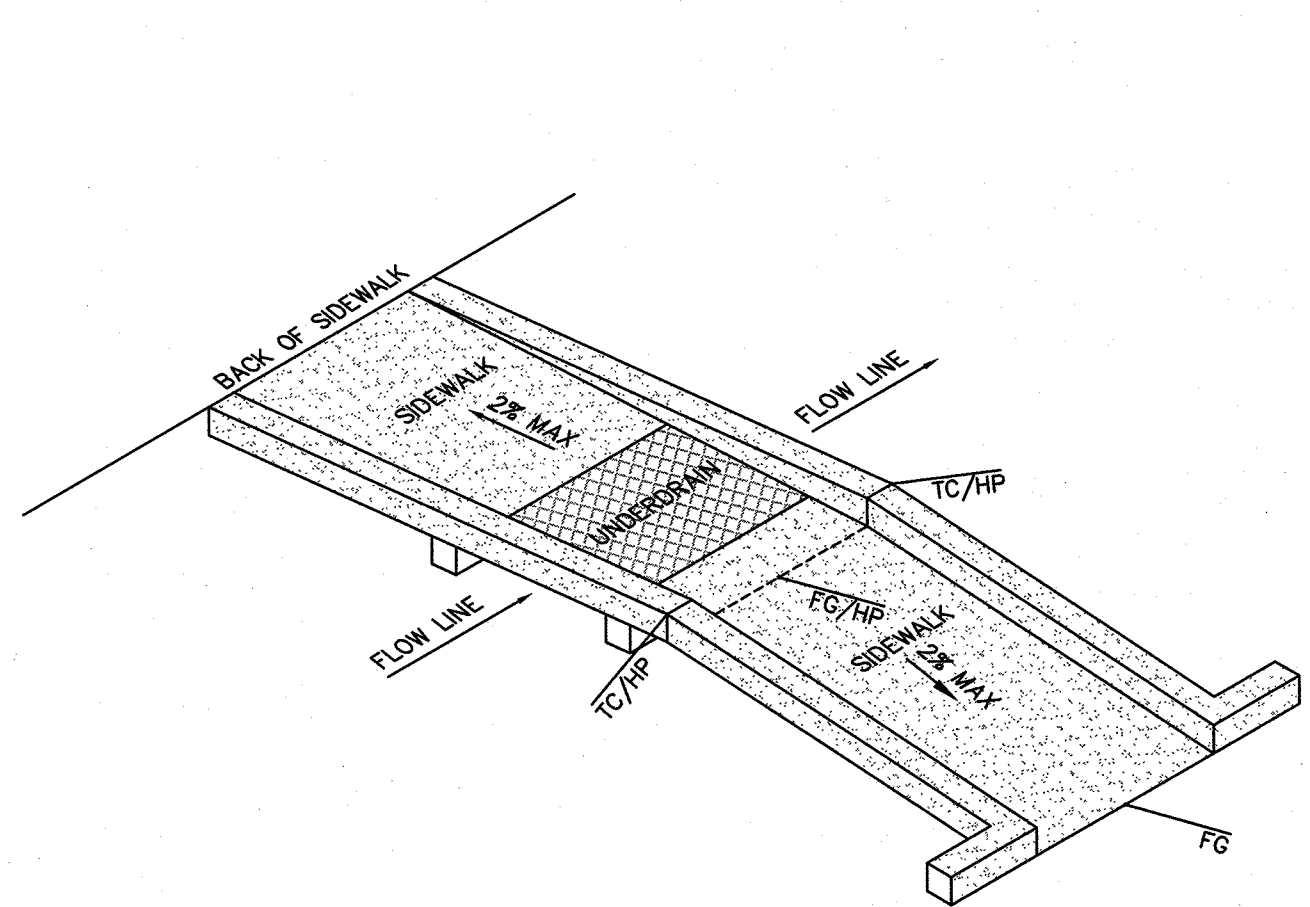
H THICKENED EDGE SIDEWALK DETAIL
C8.02 NTS



J MODIFIED "L" CURB
C8.02 NTS



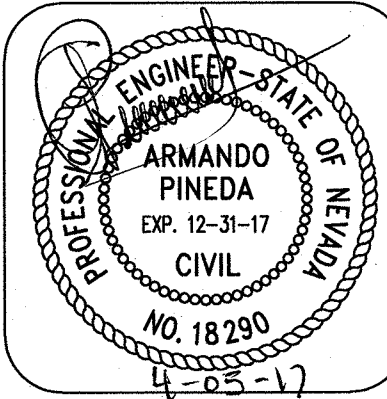
K THICKENED EDGE SIDEWALK
C8.02 NTS



L ACCESS SIDEWALK WITH UNDERDRAIN
C8.02 NTS

FARM AND JENSEN ELEMENTARY SCHOOL
APN:125-18-201-015
DETAIL SHEET

COLLINS ENGINEERS
3130 S. DURANGO DR., SUITE 404
LAS VEGAS, NV 89117
PHONE: (702) 248-8000
FAX: (702) 248-8070
www.collinsengr.com



NO.	DATE	DESIGN BY	DESCRIPTION

CEI PROJECT: 9748
DESIGN BY: AP.
DRAWN BY: AP.
CHECKED BY: T. MILLER
DATE: 03/28/2017
SCALE: NTS
SHEET NUMBER
C8.02
SHEET 41 OF 46