

CITY OF ALBUQUERQUE

Planning Department
David Campbell, Director



Mayor Timothy M. Keller

March 1, 2019

Ronald Bohannon, P.E.
Tierra West, LLC
5571 Midway Park Place NE
Albuquerque, NM, 87109

**RE: Coors & Western Trail
Tract 3A & 3B
Revised Grading & Drainage Plan and Drainage Report
Engineer's Stamp Date: 02/26/19
Hydrology File: F11D007**

Dear Mr. Bohannon:

PO Box 1293

Based upon the information provided in your submittal received 02/26/2019, the revised Grading & Drainage Plan and Drainage Report is approved for action by the DRB on Site Plan for Subdivision and for DRC Work Order.

Albuquerque

Just a reminder, this site currently shows more than 1 acre of disturbance is being proposed. An Erosion and Sediment Control Plan is required and has to be submitted to the storm water quality engineer (Curtis Cherne, PE, ccherne@cabq.gov). Hydrology's approval for Grading or Building Permit will not be given until the submittal of the ESC Plan.

NM 87103

www.cabq.gov

Also prior to Hydrology's approval for DRC Work Order Plans, a paper easement for revised 20' private drainage easement must be recorded.

If you have any questions, please contact me at 924-3995 or rbrissette@cabq.gov.

Sincerely,

Renée C. Brissette, P.E. CFM
Senior Engineer, Hydrology
Planning Department



City of Albuquerque

Planning Department
Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET (REV 6/2018)

Project Title: Coors and Western Trail **Building Permit #:** _____ **Hydrology File #:** _____

DRB#: _____ **EPC#:** 1000032 **Work Order#:** _____

Legal Description: Tract 3A & 3B

City Address: 4500 Quaker Heights PL NW Albuquerque NM 87120

Applicant: Tierra West, LLC **Contact:** Richard Stevenson

Address: 5571 Midway Park Place NE Albuquerque NM 87109

Phone#: 505-858-3100 **Fax#:** 505-858-1118 **E-mail:** rstevenson@tierrawestllc.com

Other Contact: _____ **Contact:** _____

Address: _____

Phone#: _____ **Fax#:** _____ **E-mail:** _____

TYPE OF DEVELOPMENT: _____ PLAT (# of lots) _____ RESIDENCE ☒ DRB SITE _____ ADMIN SITE

IS THIS A RESUBMITTAL? ☒ Yes _____ No

DEPARTMENT _____ TRANSPORTATION ☒ HYDROLOGY/DRAINAGE

Check all that Apply:

TYPE OF SUBMITTAL:

- ☐ ENGINEER/ARCHITECT CERTIFICATION
- ☐ PAD CERTIFICATION
- ☒ CONCEPTUAL G & D PLAN
- ☐ GRADING PLAN
- ☒ DRAINAGE REPORT
- ☒ DRAINAGE MASTER PLAN
- ☐ FLOODPLAIN DEVELOPMENT PERMIT APPLIC
- ☐ ELEVATION CERTIFICATE
- ☐ CLOMR/LOMR
- ☐ TRAFFIC CIRCULATION LAYOUT (TCL)
- ☐ TRAFFIC IMPACT STUDY (TIS)
- ☐ STREET LIGHT LAYOUT
- ☐ OTHER (SPECIFY) _____
- ☐ PRE-DESIGN MEETING?

TYPE OF APPROVAL/ACCEPTANCE SOUGHT:

- ☐ BUILDING PERMIT APPROVAL
- ☐ CERTIFICATE OF OCCUPANCY
- ☐ PRELIMINARY PLAT APPROVAL
- ☒ SITE PLAN FOR SUB'D APPROVAL
- ☐ SITE PLAN FOR BLDG. PERMIT APPROVAL
- ☐ FINAL PLAT APPROVAL
- ☐ SIA/ RELEASE OF FINANCIAL GUARANTEE
- ☐ FOUNDATION PERMIT APPROVAL
- ☒ GRADING PERMIT APPROVAL
- ☐ SO-19 APPROVAL
- ☐ PAVING PERMIT APPROVAL
- ☐ GRADING/ PAD CERTIFICATION
- ☐ WORK ORDER APPROVAL
- ☐ CLOMR/LOMR
- ☐ FLOODPLAIN DEVELOPMENT PERMIT
- ☐ OTHER (SPECIFY) _____

DATE SUBMITTED: 2/26/2019 **By:** Richard Stevenson

COA STAFF:

ELECTRONIC SUBMITTAL RECEIVED: _____

FEE PAID: _____

**DRAINAGE REPORT
REVISION 1
For**

**Coors Village Tract 3A & 3B
4501 Coors Blvd. NW
Albuquerque, NM 87120**

Prepared by:

Tierra West, LLC
5571 Midway Park Place NE
Albuquerque, New Mexico 87109

February, 2019

I certify that this report was prepared under my supervision, and I am a registered professional engineer in the State of New Mexico in good standing.

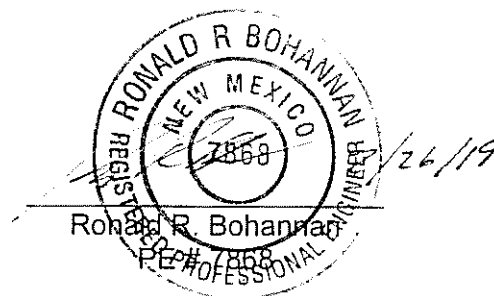


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Purpose

The purpose of this report is to provide an update to the Drainage Management Plan which covers Tracts 3-A and 3-B of the Coors Village Subdivision. A new independent age restricted living facility consisting of $\pm 175,500$ square-foot three story building is proposed for Tract 3-A and with an medical Urgent Care Facility and medical offices being proposed for Tract 3-B. The proposed development falls within the existing undeveloped ± 13.5 acre tract at 4501 Coors Blvd. NW.

In developing the drainage master plan for Tracts 3-A and 3-B a developed condition was assigned to both parcels to ensure the size of the downstream stormdrain can convey the developed runoff from the entire ± 13.3 acres subdivision.

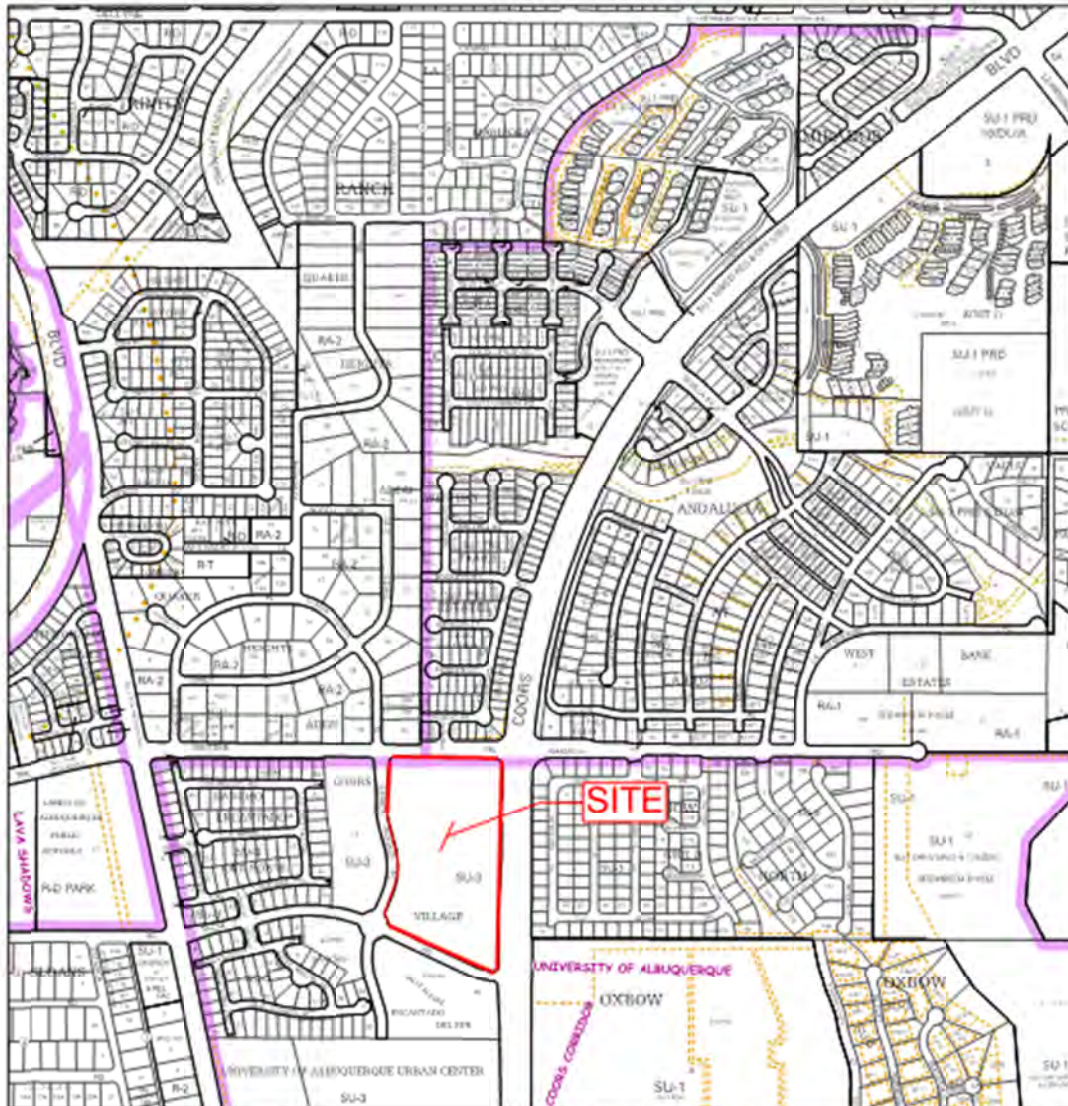
The entire subdivision is under a free discharge condition, as detailed in the "Drainage Master Plan for Coors Village Subdivision", February 2000. As such this report outlines the proposed grading scheme and stormwater management to accommodate the 100 yr 6 hr developed flows. This report is being submitting in conjunction with a conceptual grading and drainage plan for Tract 3-A.

The shared drainage infrastructure needed to convey the developed runoff from both parcels shall be installed during the development of either tract, which ever tract is developed first.

Location

The site is located on the northeast corner of Quaker Heights Pl. and Milne Rd. The assigned address of the parcel is 4501 Coors Blvd. and 4500 Quaker Heights Pl, NW 87120. To the east the site is bounded by Coors Boulevard and Western Trail to the North. The entire site is currently undeveloped with areas of scrub and small vegetation.

Exhibit A – Vicinity Map



For more current information and details visit: <http://www.cabq.gov/gis>



Exhibit B – Site Aerial Image



Existing (Pre-Developed) Conditions

The entire ±13.3 acres is currently undeveloped and in its natural state and surface drains to various depressions throughout the site, as the elevation of the road network

surrounding the parcel is generally higher. No offsite flows are conveyed into the property. A storm drain system exists within Quaker Heights PI with a 54-inch RCP storm drain stubbed into the southwest portion of the property as detailed on the plans for the Rancho Encantado Off-Site Improvements from 2003.

The total undeveloped 100 yr. 6 hr. storm runoff for Tracts 3A and 3B is 17.5 cfs. The hydrology calculations/table and existing basin map is included in Appendix B.

Flood Plain

The project area is included on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel 35001C0114H dated August 16, 2012 and is shown on the following page. The map indicates the site lies within Flood Zone X, an area of minimal flood hazard.

Review of Drainage Master Plan for Coors Village Subdivision

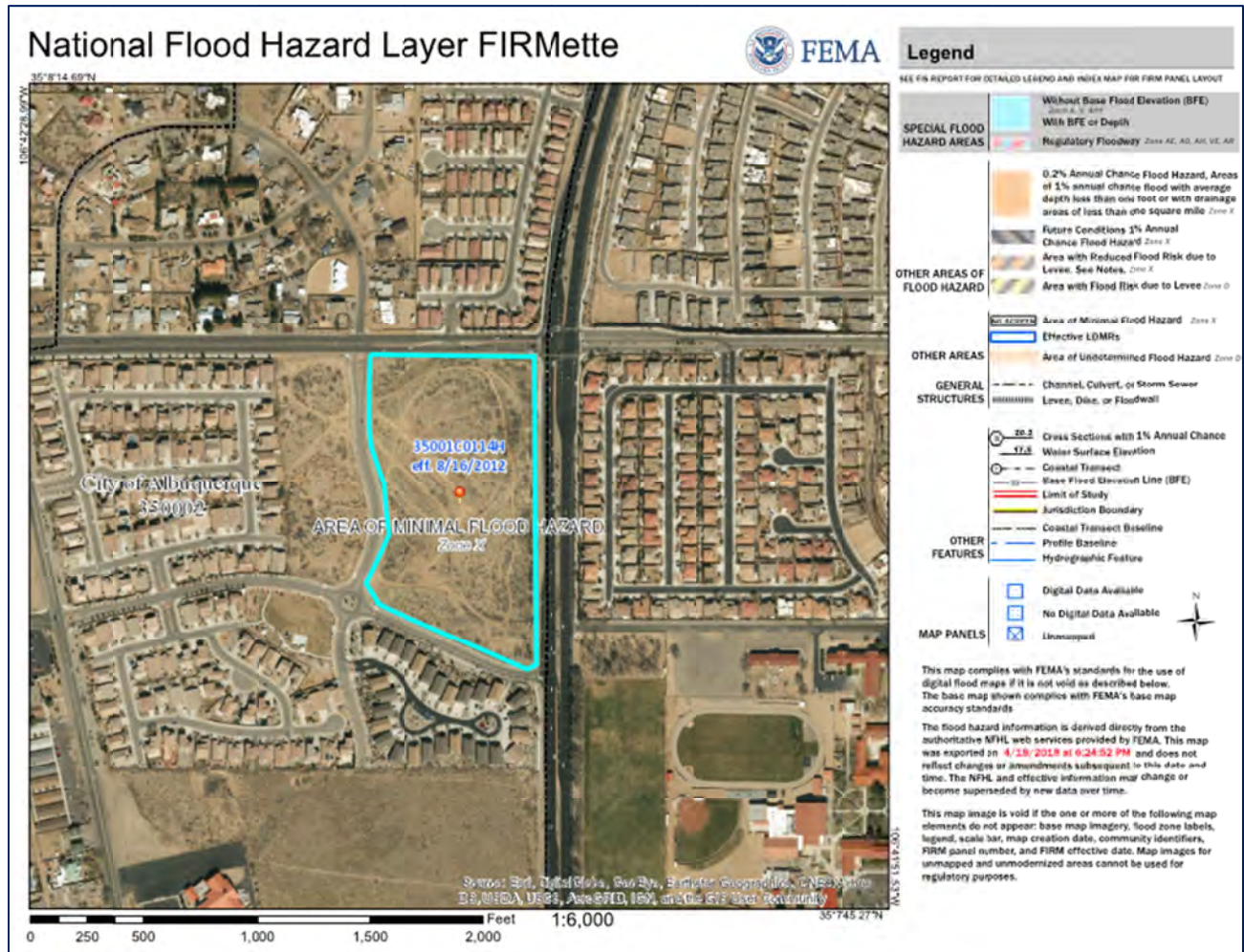
A review of the "Drainage Master Plan for Subdivision" prepared by Thompson Engineering Consultants, Inc. dated 2000 was completed to ensure the criteria established in the Master Plan is still current, the coefficients applied to the drainage basins were suitable, and the developed flows for this parcel were adequately considered during the design of the storm drain conveyance system that discharges runoff to the Ladera Pond west of the project site. The review included walking the basin boundaries, review of the basin conditions and completing and verifying all of the flows in the Master Plan. We have verified the flows and basin discharge points that are used in this report. Based on the available 2ft 2010 contour World Street Map downloaded from the COA GIS, the boundary areas were recreated and using the coefficients listed in the DPM, the 100 yr. 24 hr. peak flow and volumes were calculated and compared with the approved Coors Village Masterplan Report.

In review, the 100 yr. 24 hr. storm even for peak flow and runoff volumes was used in accordance with the DPM to determine the peak flows to adequately size the storm drain conveyance system. A AHYMO97 model was used for the pond modelling in the Coors Village Masterplan Report. No offsite flows reach the site boundary which is

consistent with the overall watershed today. The Masterplan adequately designed for the developed and full buildout of the watershed areas and sized the storm drain to adequately convey the peak flows. In the Master Plan report for this parcel the Q100 for the 24 hr storm was calculated to be 57.1 cfs, and in comparison with the runoff determined based on the present day review, was slightly higher than the 55.0 cfs calculated.

Included in appendix A is the detailed review calculations and basin map created to review the runoff volumes and peak flows of the approved Coors Village Masterplan. In a summary, the acreage average difference between the Masterplan and this review was -1.2%. The difference of the peak flow in the Masterplan was on average -3.3% less than the calculated, a difference of 4.76 cfs. The difference of the volume in the Masterplan was on average -3.0% less than the calculated, a difference of 0.026 ac-ft. Given this review the approved Masterplan is acceptable and will safely convey the proposed flows for the parcel to be developed.

Exhibit C – FIRM Map



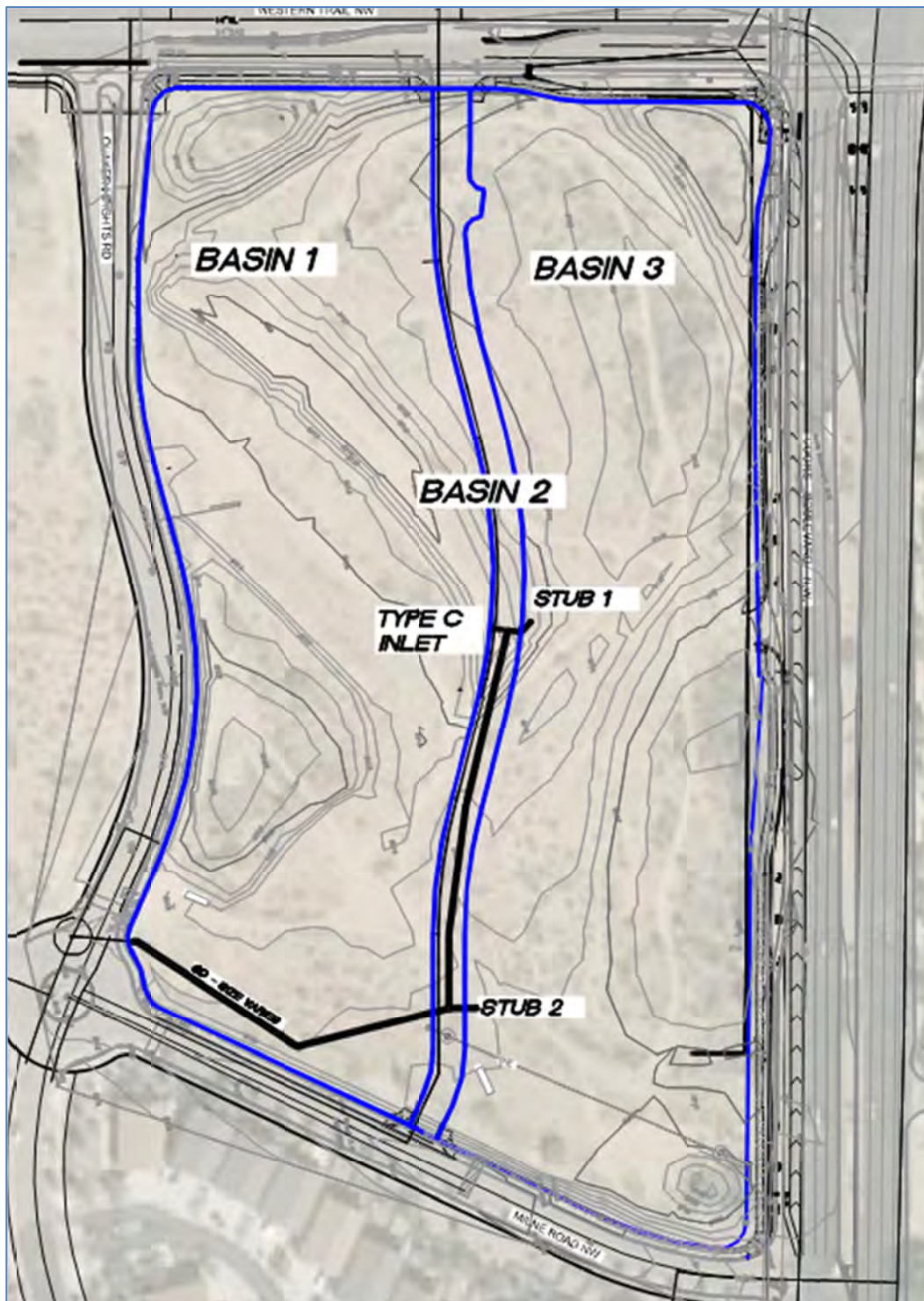
Proposed Conditions

The proposed grading for Tract 3-A details the internal roadway along the boundary line separating both lots. The revision to the site from the previously approved Master Drainage Plan detailed a traffic circle in the center of the development. This has been removed and the grading updated to reflect the change. Specific to Tract 3-A at the time of development an updated grading and drainage plan will be prepared detailing the stormwater improvements associated with a site specific development and grading plan, and the connection to the proposed storm drain. Similarly for Tract 3-B, at the time of development a grading and drainage plan will be submitted to the City for approval.

The design of the storm drain that will serve both lots was completed based on a full developed buildout across the subdivision. The excess flows are to be drained by private storm drain which shall tie to the existing 54-inch stub at the south west corner of the site. The storm drain was sized based on the anticipated developed runoff from Basins 1, 2 and 3. The private stormdrain is designed using High-density polyethylene (HDPE) stormdrain pipes. Two storm drain stubs are detailed for the development of Tract 3B, with Tract 3A having the opportunity to connect at either the road inlet or at the downstream manholes located at the southern end of the property. The size of the stormdrain varies, with the largest pipe being a 36-inch stormdrain along the downstream section. The stormdrain pipe size and the associated carrying capacity is detailed in the appendix.

Type C Curb inlets are proposed at the low point of the private street to capture all sheet flow along the roadway. The total flow for Basin 2 is 3.19 cfs which the inlets can sufficiently handle. Included in the appendix is the street carrying capacity calculations, and the review calculations for the Type C inlet capacity.

Exhibit D – Drainage Basin Map



Storm Water Quality Management

All site specific storm water quality ponding required to meet the drainage ordinance shall be detailed at the time of site specific grading and drainage plan submission.

Calculations

The Weighted E Method from the “City of Albuquerque Development Process Manual Volume I – Design Criteria, 2006 Revision” was used to calculate the runoff and volume for the site, the hydrology table can be found in Appendix B. Storm drain capacities can be found in Appendix B.

Storm Drain Easement

As the storm drain is required for Tract 3-B and crosses into Tract 3-a, a 20 foot wide private drainage easement for the benefit of Tract 3-B was granted by the Coors Village Plat (recorded 12/31/2018) with maintenance responsible by the underlying property owners each Tract 3-A and 3-B. The extent of the storm drain easement was updated with this revision and will be revised by document or by platting action to outline the modified storm drain infrastructure. Included in the appendix is the recorded Plat with the full description of the Storm Drain Easement.

Summary

The conceptual drainage design for Tract 3A details two retention ponds to as an interim drainage solution. Once Tract 3A has an approved site plan the drainage solution shall be updated. Future connection to the proposed storm drain will be allowed and has been considered in the design. Similarly for Tract 3B, two connection stubs are detailed on the design to allow the connection for any onsite subsurface drainage infrastructure.

Both site specific grading and drainage plans will need to provide the required storm water quality ponding retention onsite.

The developed flows will freely discharge as allowed and detailed in the “Drainage Master Plan for Coors Village Subdivision” prepared by Thompson Engineering Consultants, Inc. dated February 2000. The historic flow patterns are maintained and there is no historical drainage being accepted by the parcel to be managed. The calculations show the design storm can be safely conveyed through the proposed storm drain to the existing storm drain network within Quaker Heights Place.

A review of the Drainage Master Plan for Coors Village Subdivision was completed and found the criteria established in the Master Plan is still current and the developed flows for this parcel were adequately considered during the design of the conveyance system and discharge to Ladera Pond.

A storm drain easement is detailed on the recorded plat for Tract 3-A and 3-B and will be updated for the revised storm drain layout.

APPENDIX A

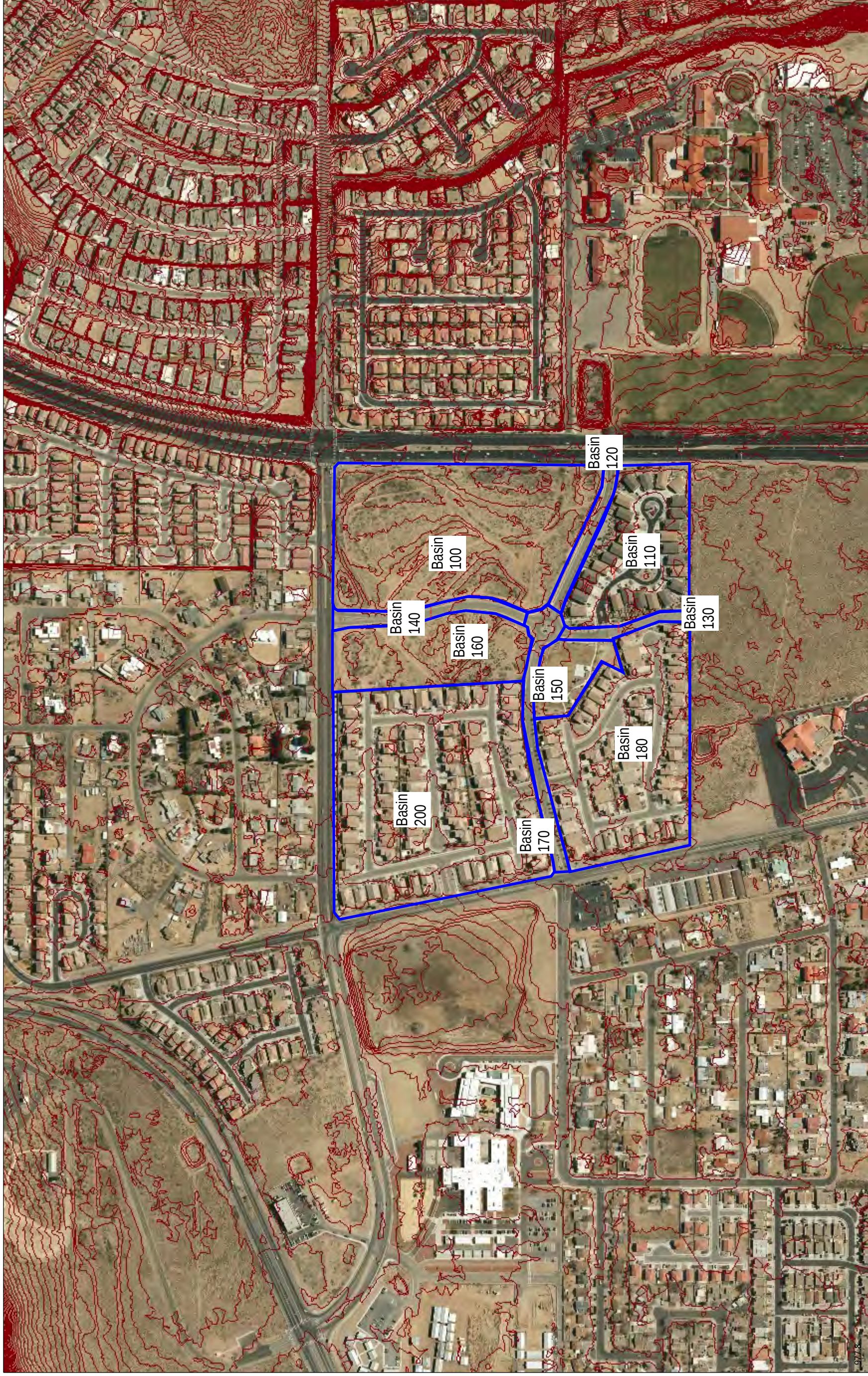
City of Albuquerque - Coors Village Drainage Masterplan Review 2018



Legend

- Contour 2ft - 2010
World Street Map

Notes



800	0	400	800 Feet
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WGS_1984_Web_Mercator_Auxiliary_Sphere
© Data From City of Albuquerque GIS@cabq.gov

8/21/2018

1:4,800



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THIS MAP IS NOT TO BE USED FOR NAVIGATION





DPM Weighted E Method
Precipitation Zone 1
Coors Village Masterplan - Review 2018

TWLLC	Date
	8/21/2018

Proposed Conditions

Basin Descriptions										100-Year, 6-Hr				100-Year, 24-Hr				Masterplan Report				
Basin ID	Area (sf)	Area (acres)	Area (sq miles)	Treatment A		Treatment B		Treatment C		Treatment D		Weighted E (in)	Volume (ac-ft)	Flow** cfs (rational method)	Volume* (ac-ft)	Flow** cfs (rational method)	Area Acres	Difference Acres	100yr 24hr Volume ac-ft	Difference Volume	100yr 24hr Peak Flow cfs	Difference Peak Flow
				%	(acres)	%	(acres)	%	(acres)	%	(acres)											
100	589,960	13.54	0.02116	0%	0.000	10%	1.354	5%	0.677	85%	11.512	1.791	2.021	2.463	55.00	13.87	-2.4%	2.431	1.3%	57.13	-3.9%	
110	269,140	6.18	0.00965	0%	0.000	35%	2.163	15%	0.927	50%	3.089	1.368	0.704	0.823	20.53	6.04	2.2%	0.976	-16.6%	23.45	-14.2%	
120	37,778	0.87	0.00136	0%	0.000	5%	0.043	5%	0.043	90%	0.781	1.856	0.134	0.132	3.62	0.83	4.3%	0.146	11.0%	3.44	5.1%	
130	25,855	0.59	0.00033	95%	0.564	5%	0.030	5%	0.030	90%	0.534	2.274	0.117	0.133	3.20	0.72	-21.3%	0.127	4.5%	2.99	6.4%	
140	50,369	1.16	0.00181	0%	0.000	5%	0.058	5%	0.058	90%	1.041	1.856	0.179	0.219	4.83	1.03	10.9%	0.181	17.3%	4.26	11.8%	
150	27,277	1.77	0.00277	0%	0.000	60%	1.064	20%	0.355	20%	0.355	1.368	0.147	0.161	4.72	1.83	-3.2%	0.163	-15.6%	4.93	-4.5%	
160	227,915	5.23	0.00818	0%	0.000	35%	1.831	15%	0.785	50%	2.616	2.368	0.596	0.697	17.39	5	4.4%	0.807	-11.6%	19.40	-11.6%	
170	70,788	1.63	0.00254	100%	1.625	5%	0.081	5%	0.081	90%	1.463	2.296	0.311	0.367	8.85	1.57	3.4%	0.275	25.1%	6.47	26.9%	
180	500,654	11.49	0.01796	100%	11.493	35%	4.023	15%	1.724	50%	1.808	1.808	1.732	1.952	52.78	10.6	7.8%	1.711	12.3%	41.12	22.1%	
200	760,486	17.46	0.02728	0%	0.000	35%	6.110	15%	2.619	50%	8.729	1.368	1.990	2.325	58.01	16.37	6.2%	2.459	-5.8%	60.99	-5.1%	
Total	2,610,223	59.92	0.09363		13.68		16.76		7.30		35.87		7.927	9.302	228.93	57.86	1.2%	9.276	3.0%	224.18	3.3%	

Equations:

$$\text{Weighted } E = E_a^*A_a + E_b^*A_b + E_c^*A_c + E_d^*A_d / (\text{Total Area})$$

Volume = Weighted E * Total Area

$$\text{Flow} = Qa^*Aa + Qb^*Ab + Qc^*Ac + Qd^*Ad$$

For 24hr Storms:

Equations 100yr, 24hr:
$$*V_{1440} = V_{360} + A_D^*(P_{1440} - P_{360}) / 12 \text{ in/ft}$$
$$^{**}Q=CIA$$

Peak Discharge (cfs/acre)		
Zone 1	100-Year	10-Year
Qa	1.29	0.24
Qb	2.03	0.76
Qc	2.87	1.49
Qd	4.37	2.89

Excess Precipitation, E (in.)			
Zone 1	100-Year	10-Year	
Ea	0.44	0.08	
Eb	0.67	0.22	
Ec	0.99	0.44	
Ed	1.97	1.24	

Peak Intensity (in./hr)		
Zone	100-Year	10-Year
1	4.7	3.14

Rational Method Coefficient, C		
Treatment	100-Year	10-Year
A	0.27	0.08
B	0.43	0.24
C	0.61	0.47
D	0.93	0.92

Table 1 Existing Drainage Conditions

BASINS	Area (acres)	100yr- 24hr Peak Flow (cfs)	100yr- 24hr Runoff Volume (acre-ft)	Land Treatment
100	13.87	18.42	0.519	100%A
110	6.04	8.03	0.226	100%A
120	0.83	1.11	0.031	100%A
130	0.72	0.97	0.027	100%A
140	1.03	1.37	0.039	100%A
150	1.83	2.44	0.069	100%A
160	5.00	6.64	0.187	100%A
170	1.57	2.09	0.059	100%A
180	10.60	14.08	0.397	100%A
200	16.37	21.74	0.613	100%A

DEVELOPED DRAINAGE CONDITIONS

DRAINAGE BASIN DELINEATION

Plate 1 shows that the site is divided into ten drainage basins, basins 100-180 and 200. It is proposed that all of the peak flows from the site will be routed in a storm sewer to Ladera Pond 16B. The eventual outfall for the Ladera Pond 16B is the San Antonio Arroyo. The LOMR request from the City of Albuquerque for the Unser Boulevard South, Rinconada Arroyo, and Ponds 16A and 16B, prepared by URS Greiner (see Appendix C) indicates that the Ladera Pond 16B has the capacity to accept the runoff from Coors Village with minimal impact.

HYDROLOGIC ANALYSIS

To determine the peak flows of each basin a hydrologic analysis was performed in accordance to section 22.2 of the Development Process Manual (DPM) using AHYMO 97. The analysis included the 100-year 24-hour storm. The 100-year 24-hour storm was the basis for determining peak flows to size the storm sewer collection system and was used to determine the required capacity of the detention ponds. The design storm values are based on Tables C-1, C-2, and C-3 of the DPM's section 22.2. The Coors Village Subdivision is contained within section F-11-Z of the City of Albuquerque Zone Atlas Map. The location of the site results in the following design storms:

- 100-year 1-hour event -- 1.90 inches,
- 100-year 6-hour event -- 2.20 inches,
- 100-year 24-hour event -- 2.65 inches.

Basins were assigned land treatment values in accordance with Tables A-4 and A-5 of the DPM's section 22.2. Table 1 shows the land treatments and areas for each drainage basin.

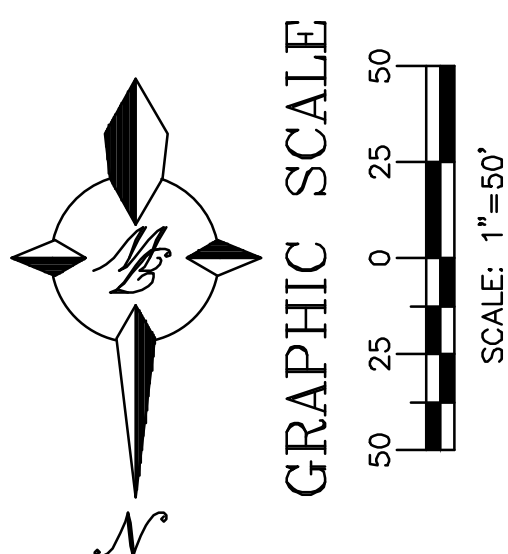
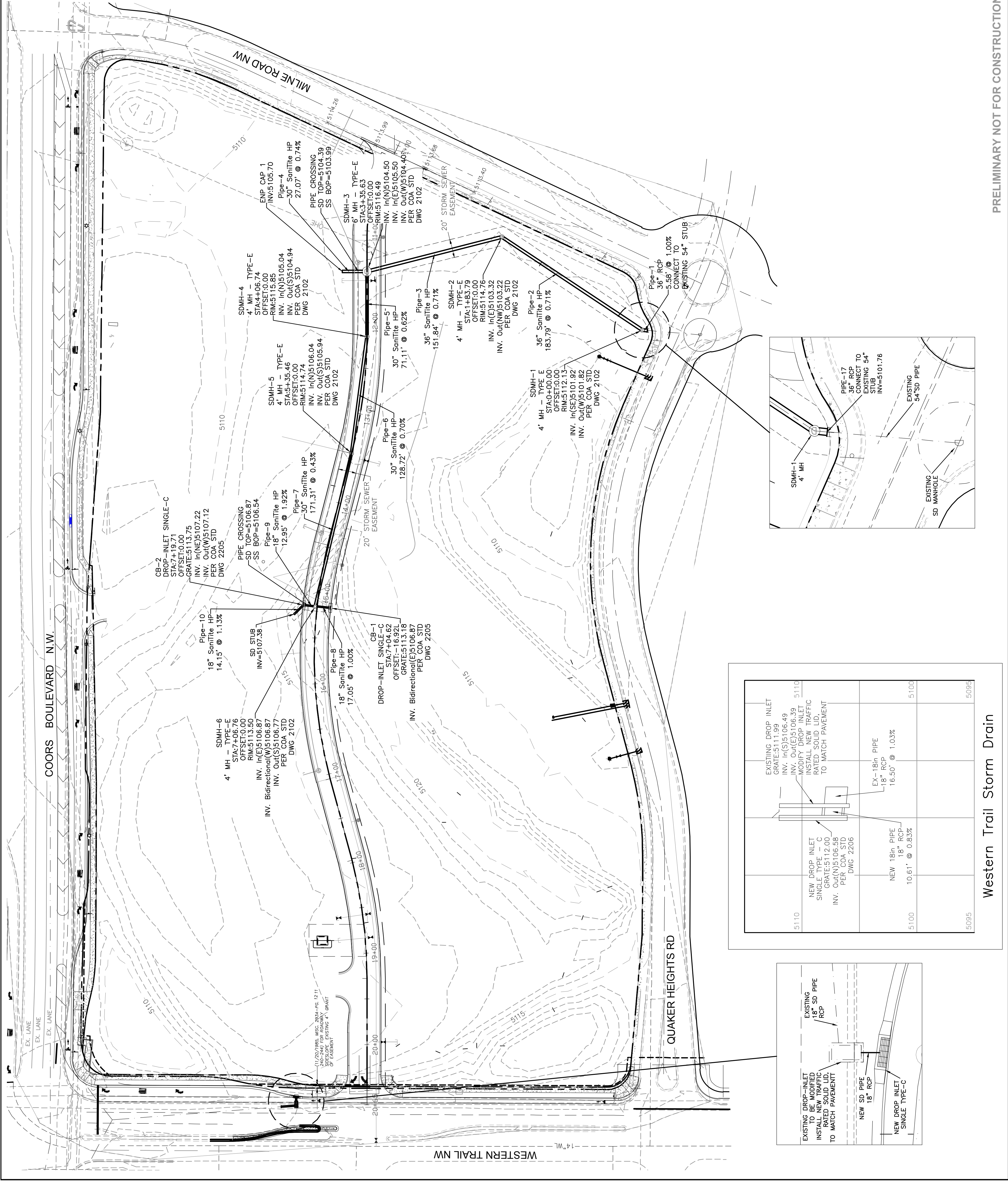
The time of concentration for all basins was calculated using the SCS Upland Method Calculated outlined in subsection B.2 of DPM section 22.2 within the AHYMO 97 model.

Because the Unser HEC-1 model was not available, an AHYMO model of the inflows to the Ladera Pond 16B and the stage-storage relationship for the pond was developed following the hydrograph parameters given in the output of the HEC-1 model for the LOMR submittal. Some trial and error was required to match the peak flow of the incoming flows and the stage-storage characteristics of Ladera Pond 16B as shown in the HEC-1 output. The AHYMO model resulted in a 100-year water surface elevation of 5102.63 with a volume of 18.42 acre-feet and a peak flow out of 32.5 cfs. This compares favorably to the values given in the HEC-1 model, which are 5102.63 water surface elevation, a volume of 18.5 acre-feet, and a peak flow of 33 cfs. Then, the revised volumes of the pond for each stage as calculated by URS Greiner was input to the AHYMO model and run to determine the 100-year water surface elevation. With the revised volumes, the 100-year water surface elevation is 5101.76 and the detained volume and peak flow out are 19.85 acre-feet and 28.8 cfs, respectively.

Table 2 Developed Drainage Conditions

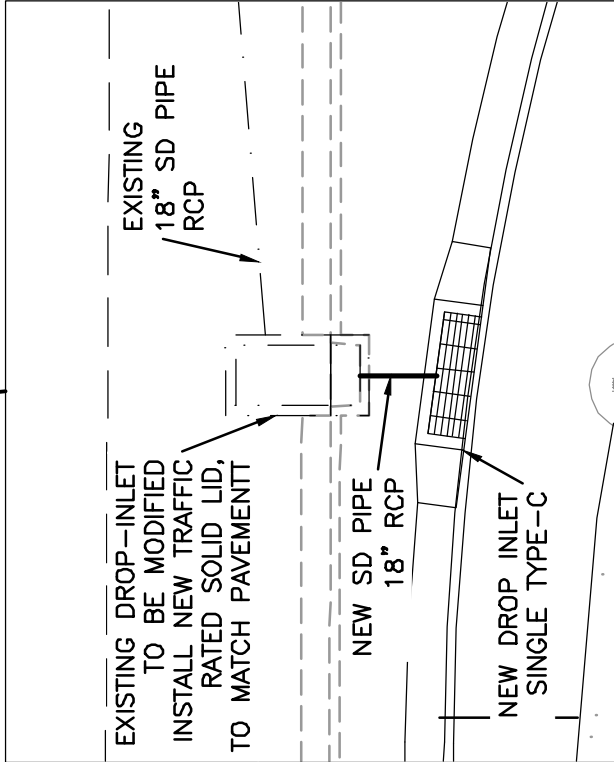
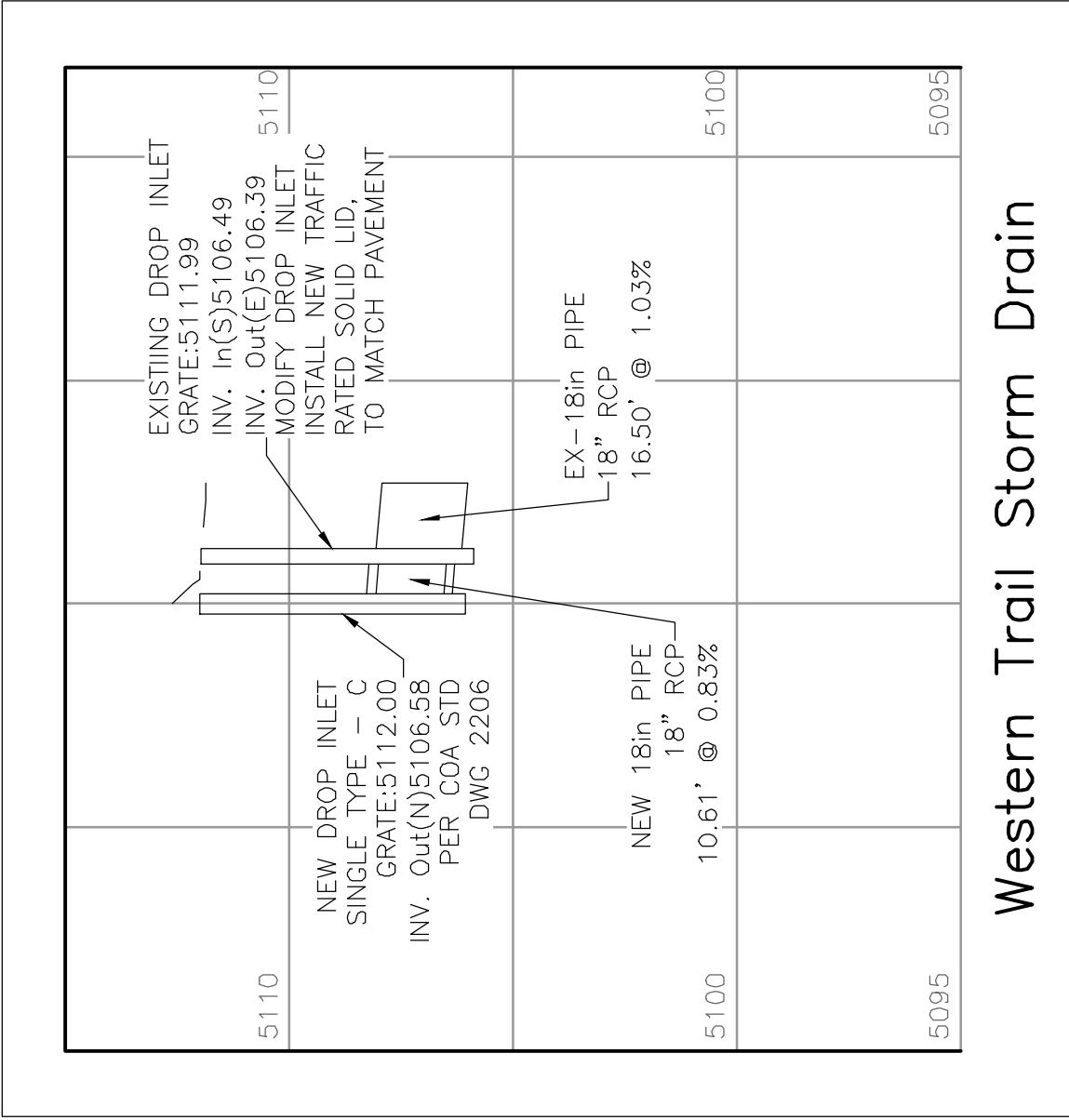
BASINS	Area (acres)	100yr- 24hr Peak Flow (cfs)	100yr- 24hr Runoff Volume (acre-ft)	Land Treatment
100	13.87	57.13	2.431	10%B,5%C,85%D
110	6.04	23.45	0.976	20%B,5%C,85%D
120	0.83	3.44	0.146	10%B,5%C,85%D
130	0.72	2.99	0.127	10%B,5%C,85%D
140	1.03	4.26	0.181	10%B,5%C,85%D
150	1.83	4.93	0.163	60%B,20%C,20%D
160	5.00	19.40	0.807	20%B,5%C,75%D
170	1.57	6.47	0.275	10%B,5%C,85%D
180	10.60	41.12	1.711	20%B,5%C,75%D
200	16.37	60.99	2.459	25%B,10%C,65%D

APPENDIX B



LEGEND	
	CURB & GUTTER
	CENTERLINE
	BOUNDARY LINE
	EASEMENT
	PROPOSED SIDEWALK
	PROPOSED CONTOUR
	PROPOSED INDEX CONTOUR
	PROPOSED SPOT ELEVATION
	FLOW ARROW
	EXISTING CURB & GUTTER
	EXISTING CONTOUR
	EXISTING INDEX CONTOUR
	EXISTING SPOT ELEVATION

ENGINEER'S SEAL	COORS VILLAGE TRACTS 3-A AND 3-B	DRAWN BY BJF
	GRADING AND DRAINAGE PLAN	DATE 1/30/19
	TERRA WEST, LLC 5571 MIDWAY PARK PLACE NE ALBUQUERQUE, NM 87109 (505)868-3100	2017017-ROAD & STORM SEWER CONSTRUCTION
		SHEET # 7
ENGINEER'S SEAL	RONALD R. BOHANNAN P.E. #7868	JOB # 2017017



PRELIMINARY NOT FOR CONSTRUCTION

Bottom

- ALL ELEVATIONS ARE AT LOWLINE UNLESS OTHERWISE NOTED.

LEGEND

The diagram illustrates a proposed sidewalk cross-section with the following components and elevations:

- CURB & GUTTER**: Represented by a solid line.
- CENTERLINE**: Represented by a dashed line.
- BOUNDARY LINE**: Represented by a dashed line.
- EASEMENT**: Represented by a dashed line.
- PROPOSED SIDEWALK**: A rectangular area with a stippled texture.
- PROPOSED CONTOUR**: A solid line with an elevation of **5011**.
- PROPOSED INDEX CONTOUR**: A solid line with an elevation of **5010**.
- PROPOSED SPOT ELEVATION**: A solid line with an elevation of **5048.25**.
- FLOW ARROW**: An arrow pointing to the right.
- EXISTING CURB & GUTTER**: Represented by a dashed line.
- EXISTING CONTOUR**: A dashed line with an elevation of **5011**.
- EXISTING INDEX CONTOUR**: A dashed line with an elevation of **5010**.
- EXISTING SPOT ELEVATION**: A dashed line with an elevation of **5048.25**.

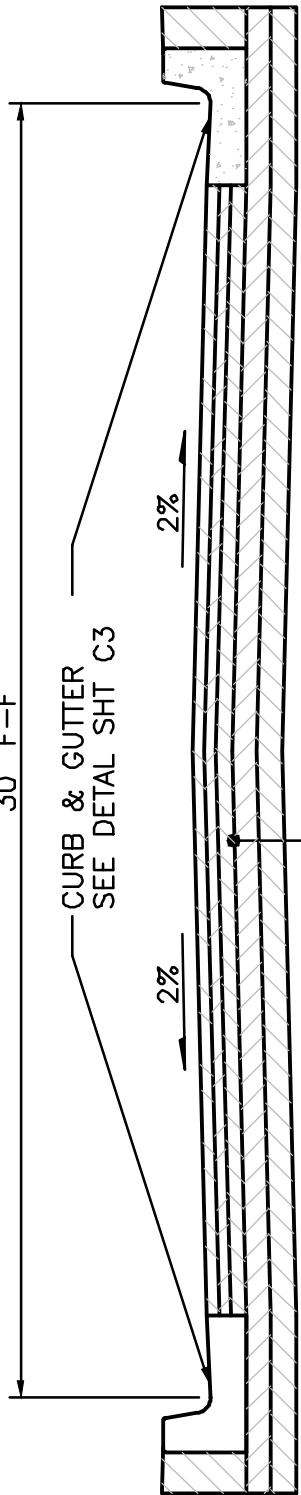
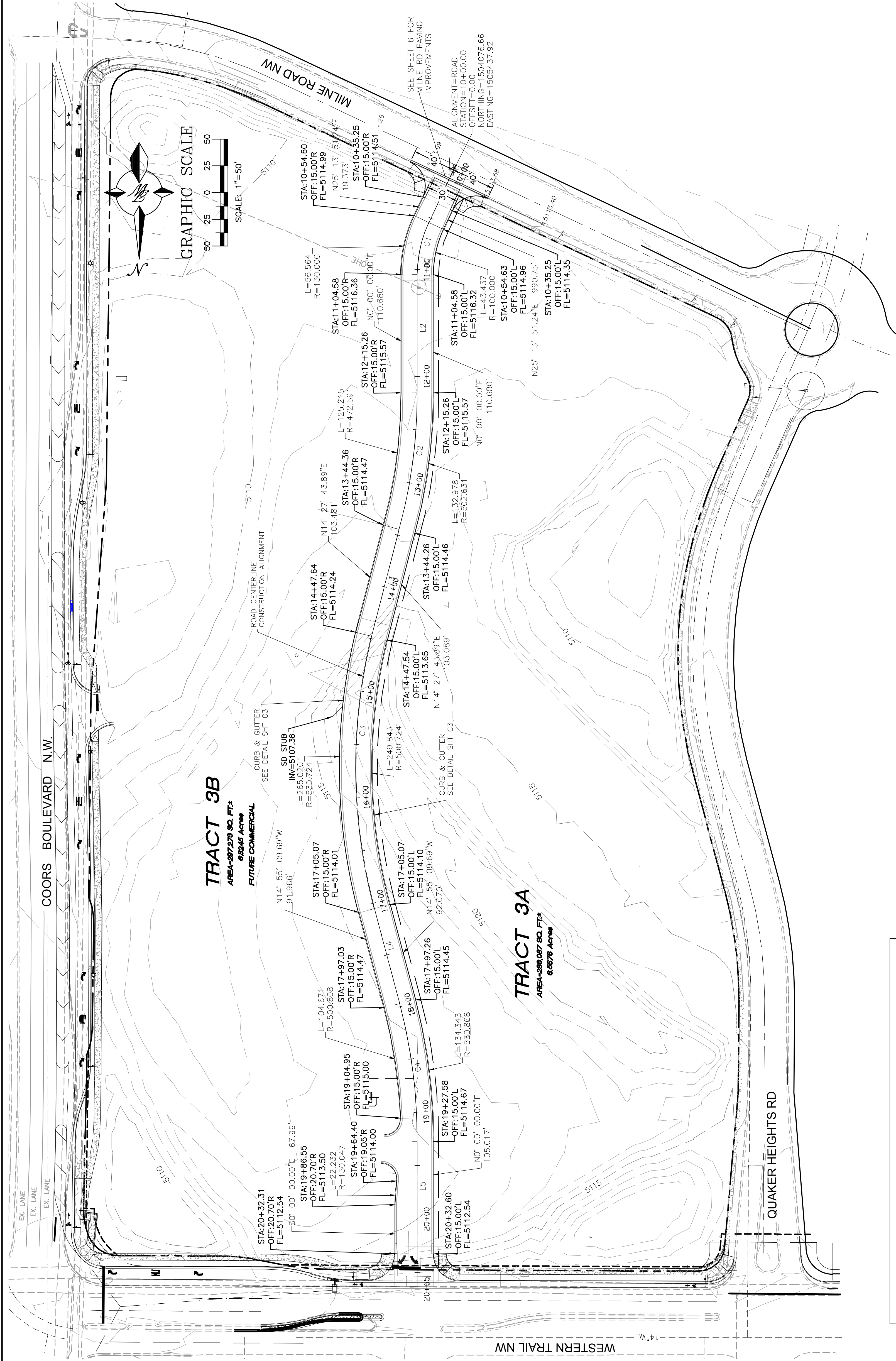
Proposed Conditions

The proposed grading for Tract 3-A details the internal roadway along the boundary line separating both lots. The revision to the site from the previously approved Master Drainage Plan detailed a traffic circle in the center of the development. This has been removed and the grading updated to reflect the change. Specific to Tract 3-A at the time of development an updated grading and drainage plan will be prepared detailing the stormwater improvements associated with a site specific development and grading plan, and the connection to the proposed storm drain. Similarly for Tract 3-B, at the time of development a grading and drainage plan will be submitted to the City for approval.

The design of the storm drain that will serve both lots was completed based on a full developed buildout across the subdivision. The excess flows to be drained by private storm drain which shall serve the anticipated 54-inch stub at the south west corner of the site. The storm drain was sized based on the existing development proposed on Basins 1, 2 and 3. The private storm drain is designed using 12 inch diameter polypropylene pipe with a 2% slope and a 150 foot run. The storm drain will be installed in the driveway of Tract 3-B, with Tract 3-A having the opportunity to connect either the stub or inlet at the designated storm drain manholes located at the southern end of the property. The size of the storm drain varies, with the largest pipe being a 36-inch storm drain along the downstream section. The storm drain pipe size and the associated carrying capacity is detailed in the appendix.

Type C curb inlets are proposed at the low point of the private street to capture all sheet flow along the roadway. The total flow for Basin 2 is 3.19 cfs which the inlets can sufficiently handle. Included in the appendix is the street carrying capacity calculations, and the review calculations for the Type C inlet capacity.

ENGINEER'S SEAL		COORS VILLAGE TRACTS 3-A AND 3-B	GRADING AND DRAINAGE PLAN	<i>TERRA WEST, LLC</i> 5571 MIDWAY PARK PLACE NE ALBUQUERQUE, NM 87109 (505) 858-3100	C5	DRAWN BY B.J.F.
				2017017-SS&M & STORM SEWER CONSTRUCTION	DATE 1/30/19	JOB # 2017017



TYPICAL ROAD SECTION
NTS

Line #	Length	Direction	Start Point	End Point
L2	110.68	N0° 00' 00.00"E	(1505471.89,1504174.47)	(1505471.89,1504285.15)
L3	103.28	N14° 27' 43.89"E	(1505488.92,1504412.74)	(1505514.72,1504512.75)
L4	92.02	N14° 55' 09.69"W	(1505512.01,1504767.50)	(1505468.32,1504856.42)
L5	137.88	N0° 00' 00.00"E	(1505471.89,1504985.52)	(1505471.89,1505123.40)

Curve Table: Alignments

Curve #	Radius	Length	Chord Direction	Start Point	End Point
C1	187.61	50.00	N12° 27' 18.38"E	(1505461.19,1504126.03)	(1505471.89,1504174.47)
C2	487.61	129.10	N7° 36' 31.83"E	(1505471.89,1504285.15)	(1505488.92,1504412.74)
C3	515.72	257.43	N7° 36' 31.83"W	(1505515.14,721504512.75)	(1505512.01,1504767.50)
C4	515.81	130.49	N7°57' 12.16"W	(1505488.32,1504856.42)	(1505471.89,1504985.52)

PRELIMINARY NOT FOR CONSTRUCTION



DPM Weighted E Method
Precipitation Zone 1
NE Corner of Quaker Heights Pl and Milne Rd
4606 Quaker Heights Pl NW, Albuquerque, NM 87120
TWLLC Date 2/26/2019

Existing Conditions

Basin Descriptions																	100-Year, 6-Hr			10-Year, 6-Hr		
Basin ID	Tract	Area (sf)	Area (acres)	Area (sq miles)	Treatment A		Treatment B		Treatment C		Treatment D		Weighted E (in)	Volume (ac-ft)	Flow cfs	Weighted E (in)	Volume (ac-ft)	Flow cfs				
					%	(acres)	%	(acres)	%	(acres)	%	(acres)										
3A	3A	282,937	6.50	0.01015	100%	6.495	0%	0.000	0%	0.000	0%	0.000	0.440	0.238	8.38	0.080	0.043	1.56				
3B	3B	307,023	7.05	0.01101	100%	7.048	0%	0.000	0%	0.000	0%	0.000	0.440	0.258	9.09	0.080	0.047	1.69				
Total		589,960	13.54	0.02116		13.544		0.000		0.000		0.000		0.497	17.47		0.090	3.25				

Proposed Conditions

Basin Descriptions																		
Basin ID	Tract	Area (sf)	Area (acres)	Area (sq miles)	Treatment A		Treatment B		Treatment C		Treatment D		100-Year, 6-Hr			10-Year, 6-Hr		
					%	(acres)	%	(acres)	%	(acres)	%	(acres)	Weighted E (in)	Volume (ac-ft)	Flow cfs	Weighted E (in)	Volume (ac-ft)	Flow cfs
B1	3A	270,937	6.22	0.00972	0%	0.000	0%	0.000	15%	0.933	85%	5.287	1.823	0.945	25.78	1.120	0.581	16.67
B2	roadway	31,828	0.73	0.00114	0%	0.000	0%	0.000	0%	0.000	100%	0.731	1.970	0.120	3.19	1.240	0.076	2.11
B3	3B	280,712	6.44	0.01007	0%	0.000	0%	0.000	15%	0.967	85%	5.478	1.823	0.979	26.71	1.120	0.601	17.27
Total		583,477	13.39	0.02093		0.000		0.000		1.900		11.495		2.044	55.686		1.257	36.051

Equations:

Weighted E = Ea*Aa + Eb*Ab + Ec*Ac + Ed*Ad / (Total Area)
Volume = Weighted E * Total Area
Flow = Qa*Aa + Qb*Ab + Qc*Ac + Qd*Ad

Excess Precipitation, E (in.)		
Zone 1	100-Year	10-Year
Ea	0.44	0.08
Eb	0.67	0.22
Ec	0.99	0.44
Ed	1.97	1.24

Peak Discharge (cfs/acre)		
Zone 1	100-Year	10-Year
Qa	1.29	0.24
Qb	2.03	0.76
Qc	2.87	1.49
Qd	4.37	2.89

LEGEND



Proposed Conditions

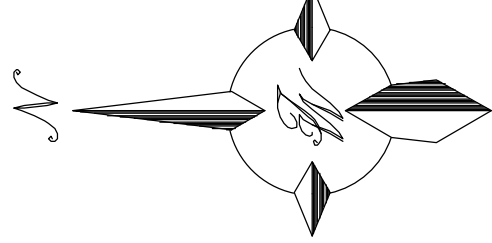
Basin Descriptions									
Basin ID	Tract	Area (sf)	Area (acres)	Treatment A		Treatment B		Treatment C	
				%	(acres)	%	(acres)	%	(acres)
B1	3A	270,937	6.22	0.000	0%	0.000	0%	0.933	85%
B2	roadway	31,828	0.73	0.000	0%	0.000	0%	0.000	100%
B3	3B	280,712	6.44	0.000	0%	0.000	0%	0.967	85%
Total		583,477	13.39	0.000	0%	0.000	0%	1.900	85%

100-Year, 6-Hr			
Weighted E (in)	Volume (ac-ft)	Flow (cfs)	10-Year, 6-Hr Volume (ac-ft)
1.823	0.945	25.78	1.120
1.970	0.120	3.19	1.240
1.823	0.979	26.71	1.120
2.044	55.688		1.257

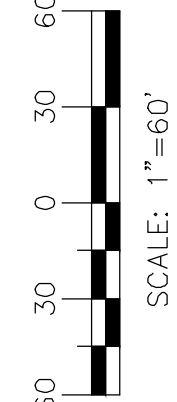
Equations:
Weighted E = Ea/Aa + Eb/Ab + Ec/Ac + Ed/Ad / (Total Area)
Volume = Weighted E * Total Area
Flow = Qa/Aa + Qb/Ab + Qc/Ac + Qd/Ad

Excess Precipitation, E (in.)			
Zone 1	100-Year	10-Year	
Ea	0.44	0.08	
Eb	0.87	0.22	
Ec	0.99	0.44	
Ed	1.97	1.24	

Peak Discharge (cfs/acre)			
Zone 1	100-Year	10-Year	
Qa	1.29	0.24	
Qb	2.03	0.76	
Qc	2.87	1.49	
Qd	4.37	2.89	



GRAPHIC SCALE



ENGINEER'S SEAL	COORS VILLAGE TRACT 3A AND 3B			DRAWN BY RS	
	DRAINAGE BASINS MAP			DATE 2/26/19	
RONALD R. BOHANNAN P.E. #7868	<i>TERRA WEST LLC</i> 5571 MIDWAY PARK PLACE NE ALBUQUERQUE, NM 87109 (505) 858-3100 www.terrawestllc.com			2010-X_DRE_BASIN	
				SHEET #	
				C1	
				JOB #	
				2017017	

TERRA WEST, LLC
5571 MIDWAY PARK PLACE NE
ALBUQUERQUE, NM 87109
(505) 858-3100
www.tierawestllc.com

Pipe Capacity

Pipe Number	D	Slope	Area	R	Q Provided	Q Required	Velocity	Invert	Invert	HGL	HGL
	(in)	(%)	(ft^2)		(cfs)	(cfs)	(ft/s)	Start (ft)	Stop (ft)	In (ft)	Out (ft)
1	36	1	7.1	0.75	66.9	55.7	7.9	5101.82	5101.65	5104.17	5104.05
2	36	0.71	7.1	0.75	56.4	55.7	7.9	5103.32	5101.82	5105.09	5104.17
3	36	0.71	7.1	0.75	56.4	55.7	7.9	5104.50	5103.32	5106.27	5104.83
4	30	0.74	4.9	0.625	35.4	26.7	5.4	5105.70	5104.50	5106.91	5106.27
5	30	0.62	4.9	0.625	32.4	16.5	3.4	5104.94	5104.50	5106.32	5106.27
6	30	0.7	4.9	0.625	34.4	16.5	3.4	5105.94	5104.94	5107.32	5106.13
7	30	0.43	4.9	0.625	27.0	16.5	3.4	5106.87	5105.94	5108.25	5107.27
8	18	1	1.8	0.375	10.5	3.2	1.8	5107.50	5106.87	5108.21	5108.25
9	18	1.92	1.8	0.375	14.6	13.4	7.6	5107.12	5106.87	5108.53	5108.21
10	18	1.13	1.8	0.375	11.2	13.4	7.6	5107.38	5107.12	5108.75	5108.53

Manhole / Inlet

	Elevation (Rim) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Elevation Invert (ft)	Flow (Total Out) (cfs)
SDMH-1	5112.13	5104.17	5104.17	5101.82	54.70
SDMH-2	5114.76	5105.09	5105.09	5103.32	29.70
SDMH-3	5116.49	5106.27	5106.27	5104.50	29.70
SDMH-4	5115.85	5106.32	5106.32	5104.94	16.70
SDMH-5	5114.74	5107.32	5107.32	5105.94	16.70
SDMH-6	5113.50	5108.25	5108.25	5106.87	16.70
SDMH-22	5109.95	5104.05	5104.05	5101.65	54.70
SDMH-20	5109.80	5105.50	5105.50	5101.45	88.60
CB-1	5113.18	5108.21	5108.21	5107.50	1.60
CB-2	5113.75	5108.53	5108.53	5107.12	15.10

Cross Section for 0.5% Roadway Crowned Section

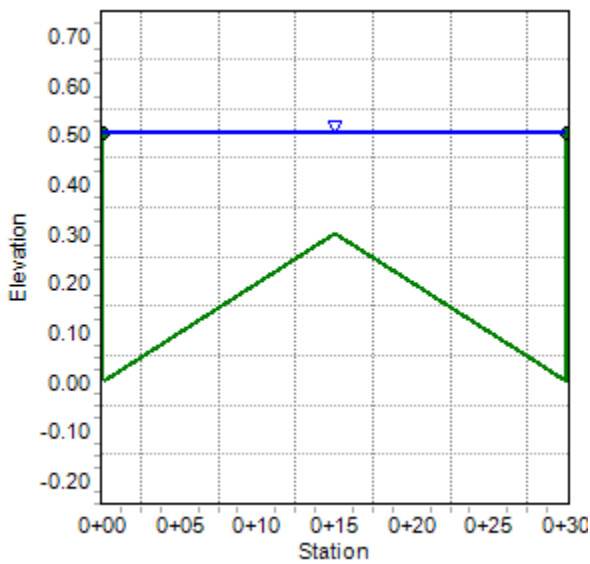
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00050	ft/ft
Normal Depth	0.50	ft
Discharge	13.04	ft ³ /s

Cross Section Image



Capacity of a Single 'C' Storm Drop Inlet

Capacity of the grate:

$$\begin{aligned} L &= 40'' - 2(2''_{\text{ends}}) - 7(\frac{1}{2}''_{\text{middle bars}}) \\ &= 32 \frac{1}{2}'' \\ &= 2.7083' \end{aligned}$$

$$\begin{aligned} W &= 25'' - 13(\frac{1}{2}''_{\text{middle bars}}) \\ &= 18.5'' \\ &= 1.54' \end{aligned}$$

$$\begin{aligned} \text{Area} &= 2.7083' \times 1.54' \\ &= 4.18 \text{ ft}^2 \end{aligned}$$

$$\begin{aligned} \text{Effective Area} &= 4.18 - 4.18 (0.5_{\text{clogging factor}}) \\ &= 2.09 \text{ ft}^2 \text{ at the grate} \end{aligned}$$

Orifice Equation

$$\begin{aligned} Q &= CA \sqrt{2gH} \\ Q &= 0.6 \times 2.09 \times \sqrt{2 \times 32.2 \times 0.67} \\ Q &= 8.24 \text{ cfs} \end{aligned}$$

Capacity of the Throat:

$$L = 4.00'$$

$$\begin{aligned} H &= 10 \frac{3}{4}'' - 4 \frac{1}{2}'' \\ &= 6 \frac{1}{4}'' \\ &= 0.5208' \end{aligned}$$

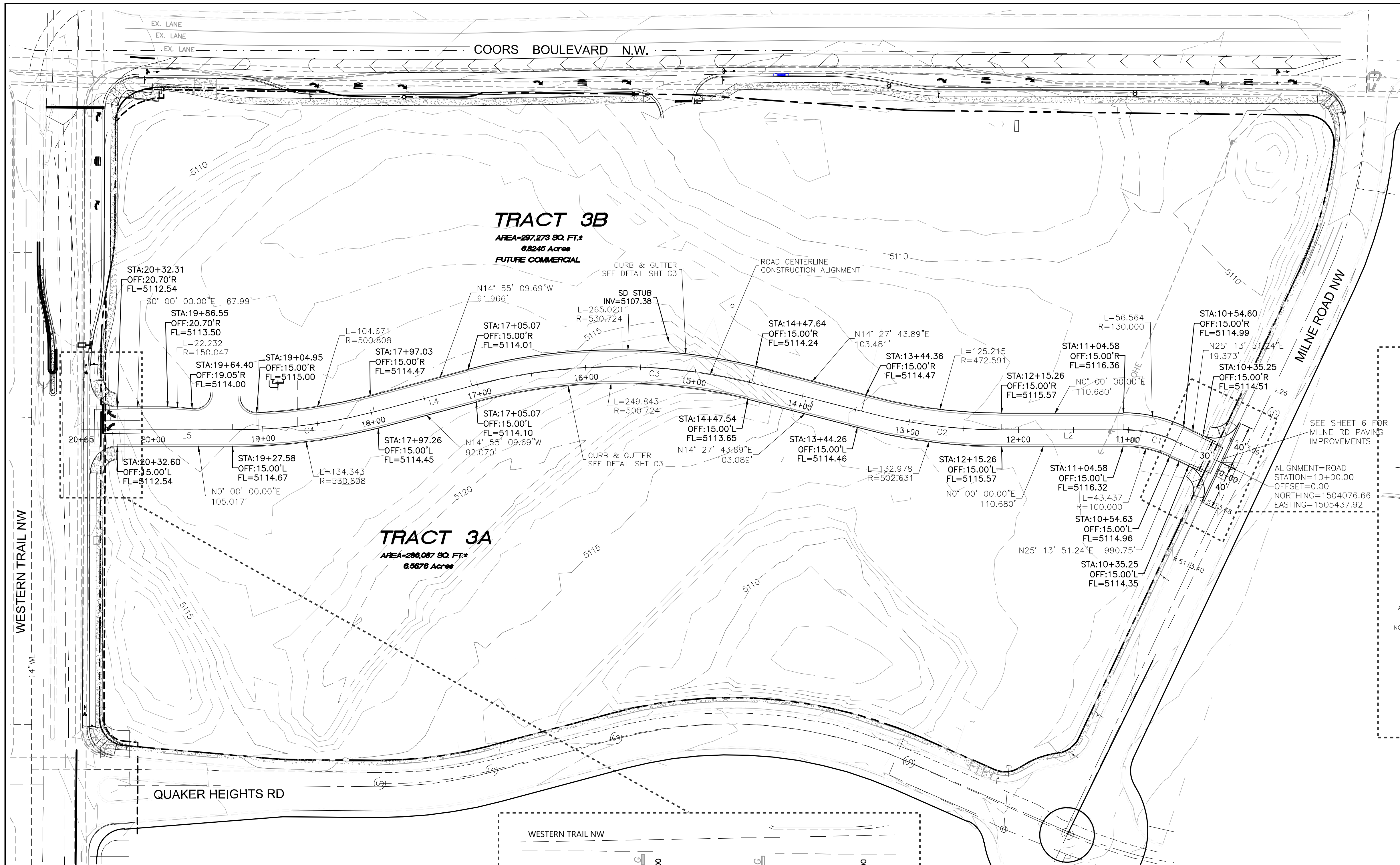
$$\begin{aligned} \text{Area} &= 4.00' \times 0.5208' \\ &= 2.08 \text{ ft}^2 \text{ at the throat} \end{aligned}$$

Weir Equation

$$\begin{aligned} Q &= CLH^{(3/2)} \\ Q &= 2.95 \times 2.08 \times 0.67^{(3/2)} \\ Q &= 3.37 \text{ cfs} \end{aligned}$$

Total Capacity:

$$\begin{aligned} Q &= 8.24_{\text{grate}} + 3.37_{\text{throat}} \\ Q &= 11.61 \text{ cfs} \end{aligned}$$

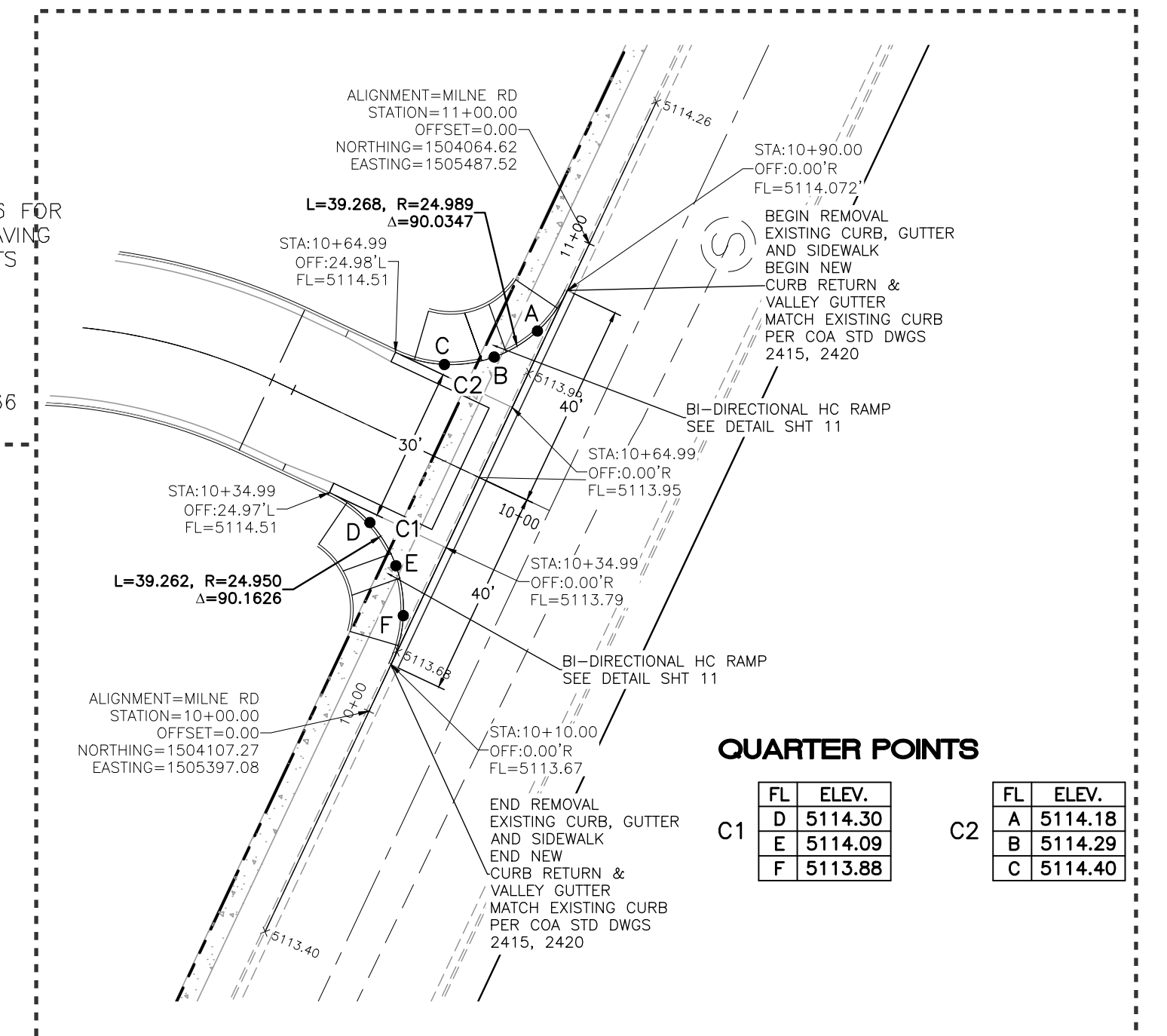


LEGEND

- CURB & GUTTER
- CENTERLINE
- BOUNDARY LINE
- EASEMENT
- PROPOSED SIDEWALK
- PROPOSED CONTOUR
- PROPOSED INDEX CONTOUR
- PROPOSED SPOT ELEVATION
- FLOW ARROW
- EXISTING CURB & GUTTER
- EXISTING CONTOUR
- EXISTING INDEX CONTOUR
- EXISTING SPOT ELEVATION

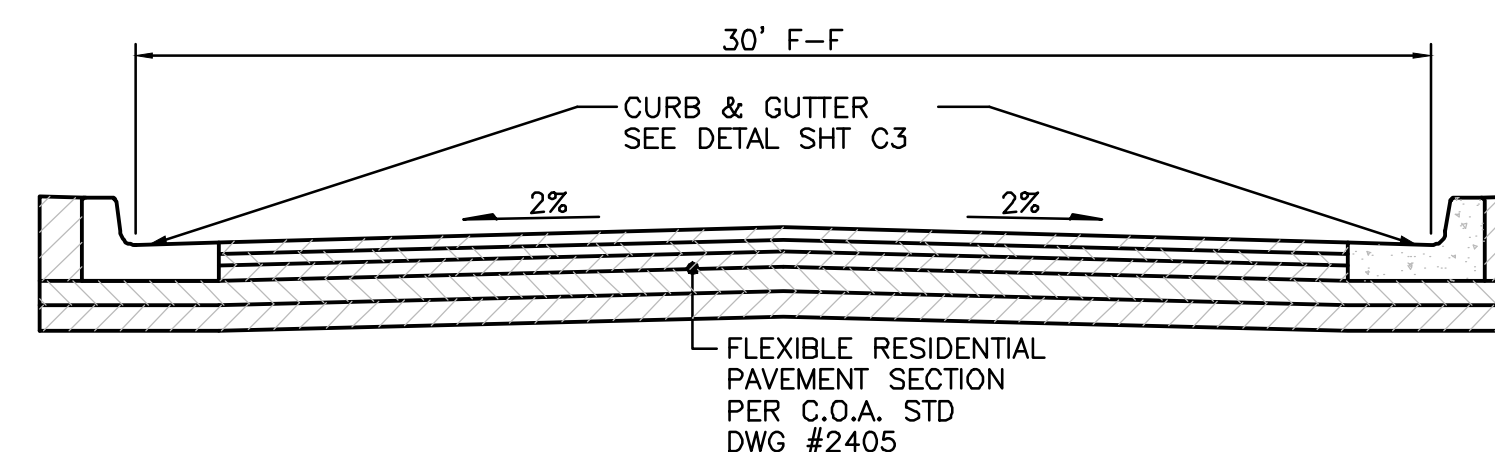
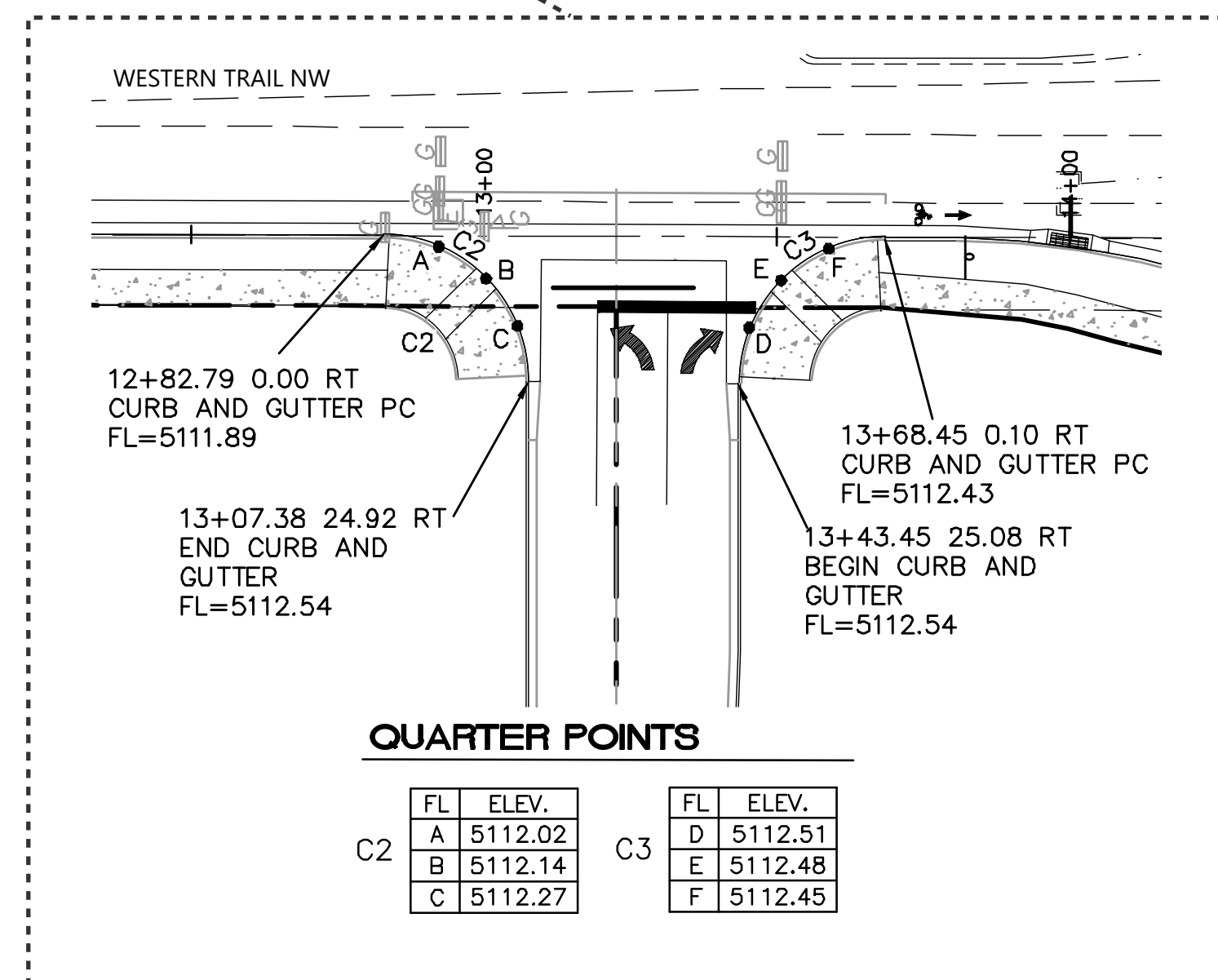
NOTES

- SPOT ELEVATIONS ARE AT FLOWLINE UNLESS OTHERWISE NOTED.

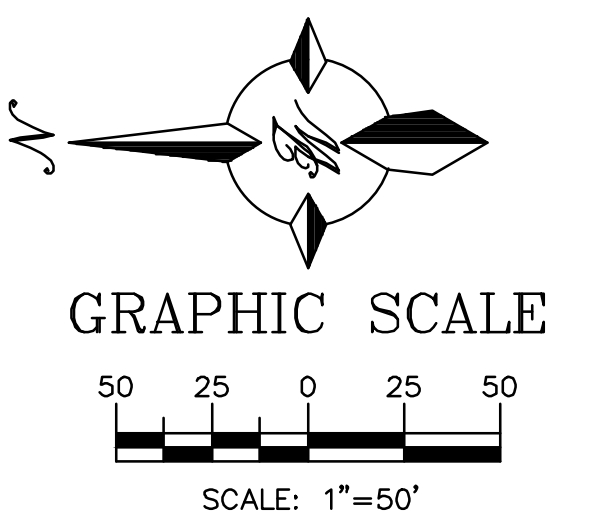


Line Table: Alignments				
Line #	Length	Direction	Start Point	End Point
L2	110.68	N0° 00' 00.00"E	(1505471.89,1504174.47)	(1505471.89,1504285.15)
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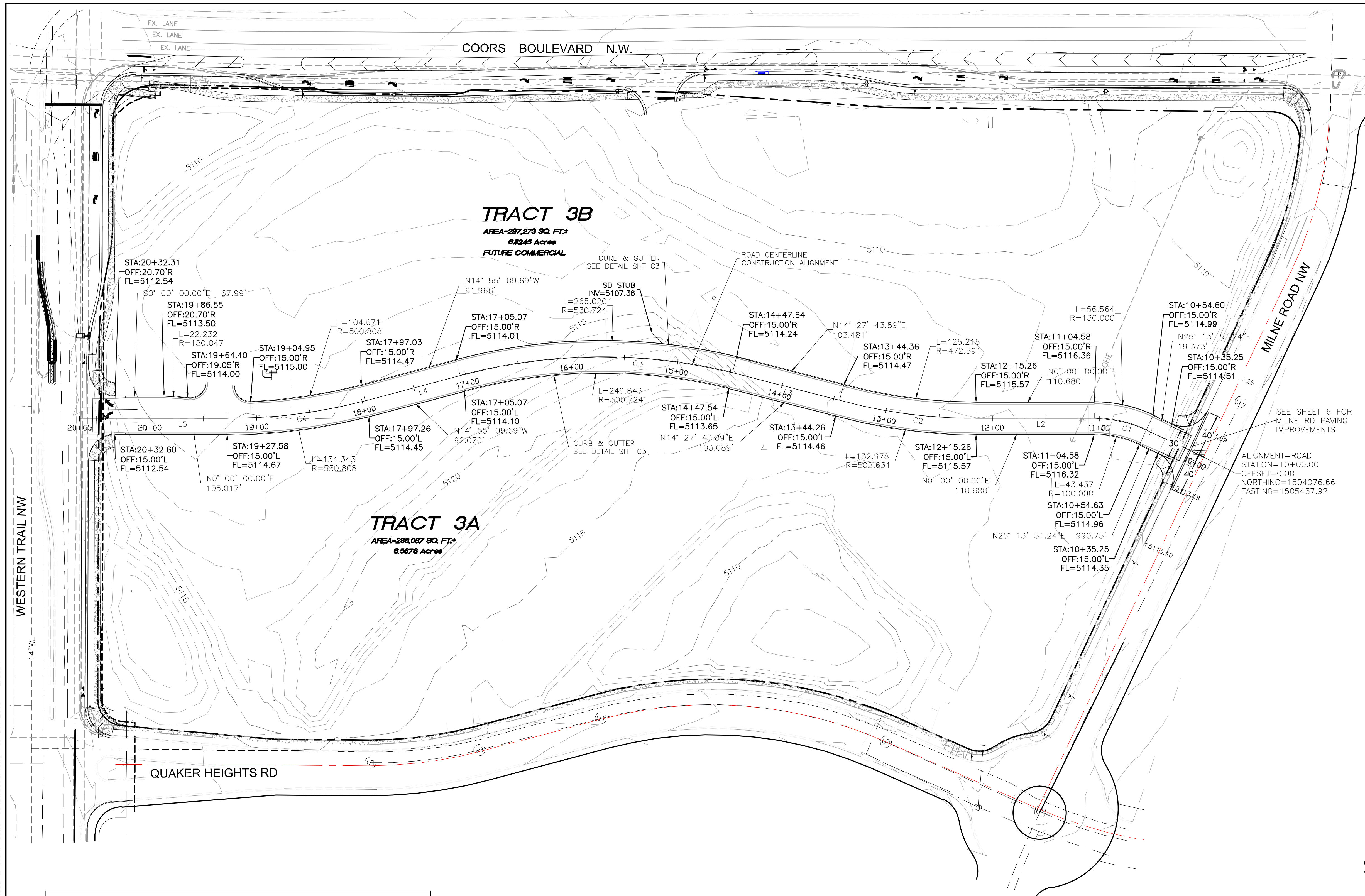
Curve Table: Alignments					
Curve #	Radius	Length	Chord Direction	Start Point	End Point
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C4	515.81	130.49	N7° 15' 12.16"W	(1505488.32,1504856.42)	(1505471.89,1504985.52)



TYPICAL ROAD SECTION
NTS



	ENGINEER'S SEAL	COORS VILLAGE TRACTS 3-A AND 3-B	DRAWN BY BJF
		GRADING AND DRAINAGE PLAN	DATE 2/26/19
		TERRA WEST, LLC 5571 MIDWAY PARK PLACE NE ALBUQUERQUE, NM 87109 (505)858-3100	2017017-ROAD & STORM SEWER CONSTRUCTION
			SHEET # C5 JOB # 2017017

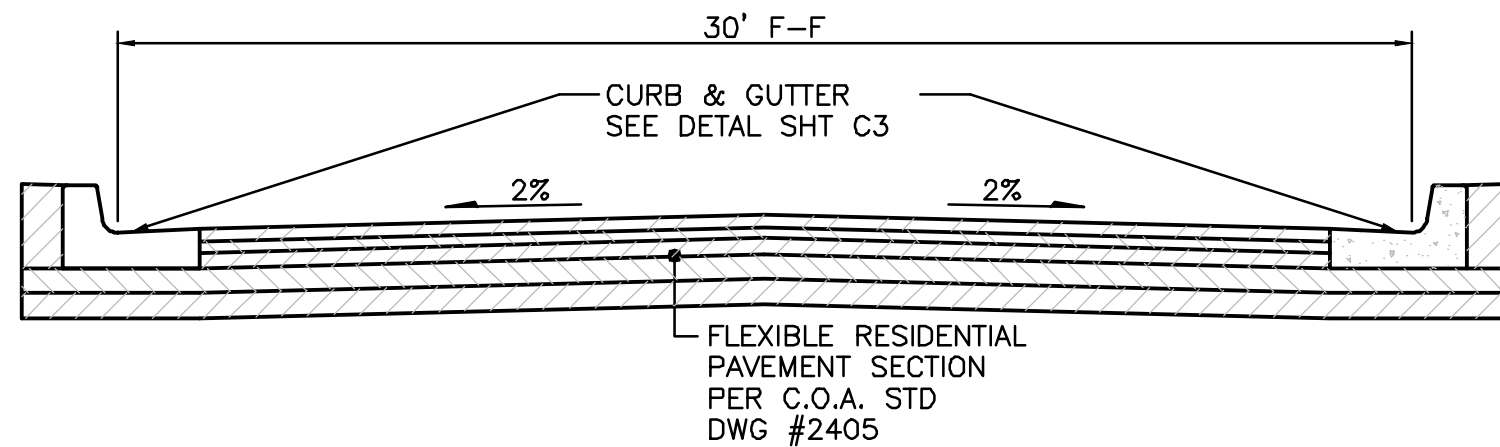


LEGEND	
	CURB & GUTTER
	CENTERLINE
	BOUNDARY LINE
	EASEMENT
	PROPOSED SIDEWALK
	PROPOSED CONTOUR
	PROPOSED INDEX CONTOUR
	PROPOSED SPOT ELEVATION
	FLOW ARROW
	EXISTING CURB & GUTTER
	EXISTING CONTOUR
	EXISTING INDEX CONTOUR
	EXISTING SPOT ELEVATION

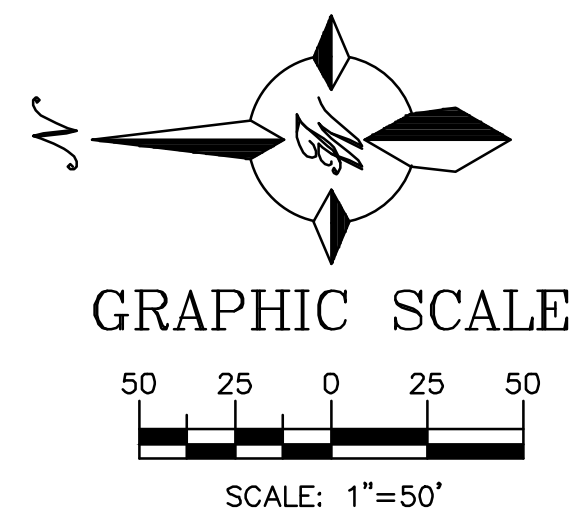
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TYPICAL ROAD SECTION
NTS



	ENGINEER'S SEAL		DRAWN BY BJF	
	COORS VILLAGE TRACTS 3-A AND 3-B		DATE 2/26/19	
	GRADING AND DRAINAGE PLAN		2017017-ROAD & STORM SEWER CONSTRUCTION	
	TERRA WEST, LLC 5571 MIDWAY PARK PLACE NE ALBUQUERQUE, NM 87109 (505)858-3100		SHEET # C5	
RONALD R. BOHANNAN P.E. #7868			JOB # 2017017	