

CITY OF ALBUQUERQUE

Planning Department
Alan Varela, Interim Director



Mayor Timothy M. Keller

December 30, 2021

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

**RE: San Roque / La Serena
441 & 457 Coors Blvd NW
Grading & Drainage Plan and Drainage Report
Engineer's Stamp Date: 11/10/21
Hydrology File: J10D049**

Dear Mr. Bohannon:

PO Box 1293

Albuquerque

Based upon the information provided in your submittal received 11/10/2021, the Grading & Drainage Plan and Drainage Report are approved for Building Permit, Grading Permit, and for action by the DRB for Preliminary Plat and Site Plan for Building Permit. Please attach a copy of this approved plan in the construction sets for Building Permit processing along with a copy of this letter.

NM 87103

PRIOR TO CERTIFICATE OF OCCUPANCY:

1. Engineer's Certification, per the DPM Part 6-14 (F): *Engineer's Certification Checklist For Non-Subdivision* is required.
2. Please provide the Drainage Covenant with Exhibit A for the stormwater quality ponds per Article 6-15(C) of the DPM prior to Permanent Release of Occupancy. Please submit the original copies along with the \$ 25.00 recording fee check made payable to Bernalillo County to Marion G. Velasquez (mgvelasquez@cabq.gov) on the 4th floor of Plaza de Sol.

www.cabq.gov

As a reminder, if the project total area of disturbance (including the staging area and any work within the adjacent Right-of-Way) is 1 acre or more, then an Erosion and Sediment Control (ESC) Plan and Owner's certified Notice of Intent (NOI) is required to be submitted to the Stormwater Quality Engineer (Doug Hughes, PE, jhughes@cabq.gov, 924-3420) 14 days prior to any earth disturbance.

CITY OF ALBUQUERQUE

Planning Department
Alan Varela, Interim Director



Mayor Timothy M. Keller

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

Sincerely,

Renée C. Brissette

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

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov



City of Albuquerque

Planning Department
Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET (REV 6/2018)

Project Title: San Roque/ La Serena **Building Permit #:** _____ **Hydrology File #:** J10D049
DRB#: PR-2021-005727 **EPC#:** _____ **Work Order#:** _____
Legal Description: Tracts F-4-A & F-6-A-2 Atrisco Business Park Unit 3
City Address: 441 & 457 Coors Blvd NW

Applicant: Tierra West, LLC **Contact:** Vinny Perea
Address: 5571 Midway Park Place NE Albuquerque NM 87109
Phone#: 505-858-3100 **Fax#:** 505-858-1118 **E-mail:** vperea@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: 11/10/21 **By:** Vinny Perea

COA STAFF:

ELECTRONIC SUBMITTAL RECEIVED: _____

FEE PAID: _____



TIERRA WEST, LLC

November 10, 2021

Ms. Renee Brissette, P.E. CFM
Senior Engineer, Hydrology
PO BOX 1293
Albuquerque, NM 87103

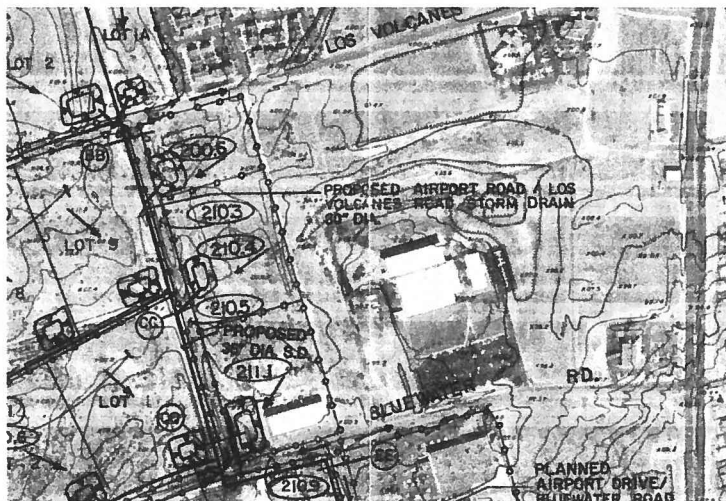
**RE: RESPONSE TO HYDROLOGY COMMENTS
SAN ROQUE / LA SERENA
441 & 457 COORS BLVD NW
GRADING & DRAINAGE PLAN AND DRAINAGE REPORT
HYDROLOGY FILE: J10D049**

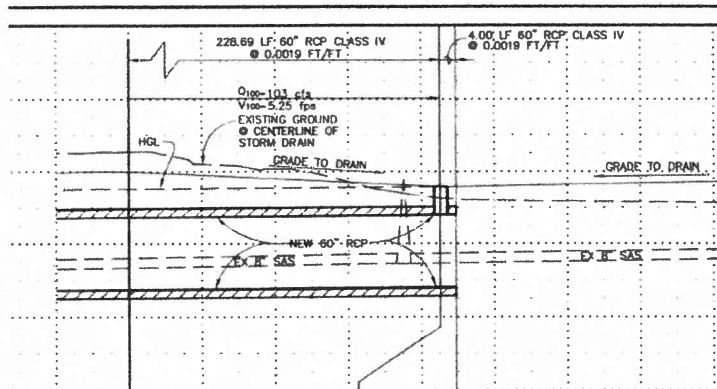
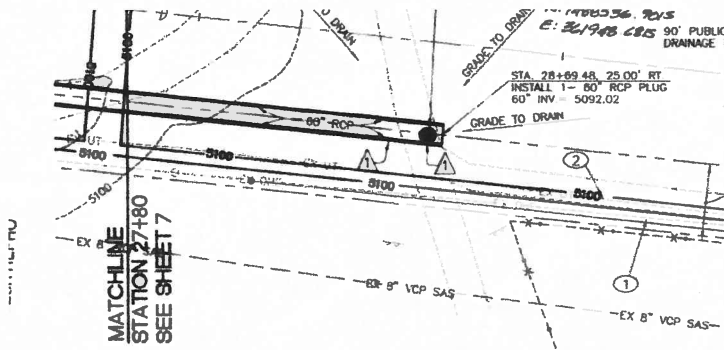
Dear Ms. Brissette:

Per the correspondence dated July 6, 2021, please find the following responses addressing the comments listed below:

Drainage Report:

1. Under Existing Conditions, the report states, "This site lies within the Atrisco Business Park Master Plan..." This is false, below is the basin map from the report and this site is not in the report area. However as noted, the exiting 60-in public storm pipe stops on the project's site without any City's plans to extend the storm system. Therefore this site will be able to freely discharge into this existing 60-in with no problem since there is plenty of capacity. Please discharge into a revised stormwater quality pond prior to the connection this existing pipe. (see below for the as-builts of that existing 60-in pipe)





Response: The Existing Conditions section of the drainage report has been modified for removing discussion about the site falling within the Atrisco Business Park Master Plan. The Existing Conditions section now states that due to the capacity of the existing 60-inch public storm pipe, the site will be allowed to free discharge into this storm pipe.

Further, the drainage concept remains the same where onsite runoff will be conveyed via private storm drain towards a pond along the west side of the property but will retain the stormwater quality volume. The pond will then have a raised outfall that will allow the remaining runoff to free discharge into the existing 60-inch storm pipe.

2. Since the site can freely discharge into the existing 60-in storm pipe, please remove and update all reference and calculations related to the detention ponds since they are no longer needed.

Response: All appendices have been updated for both storm drain calculations as well as pond calculations. There is still a small retention pond (Pond 2) that will hold runoff from the easternmost landscape area, and Pond 1 along the west side has been revised for only retaining the stormwater quality volume and free discharging the remaining onsite runoff. The stage-storage tables for these ponds have been revised and added to the appendices in the drainage report.

Grading & Drainage Plan:

3. Since the site can freely discharge into the existing 60-in storm pipe, please remove and update all reference to the detention ponds since they are no longer needed. Also you may want to ask the architect if they wish to do something with this area since the detention ponds are not needed. Please remember to discharge into a revised stormwater quality ponds prior to the connection to this existing pipe.

Response: The ponds along the west side of the property have been reconfigured for retention of the stormwater quality volume required only. Due to how the existing site

has the low point being in the SE corner of the property, this still requires the storm drain and a certain depth to the stormwater quality ponds before allowing free discharge into the existing 60-inch storm pipe. There is a dog run intended to be between the two ponds along the west side.

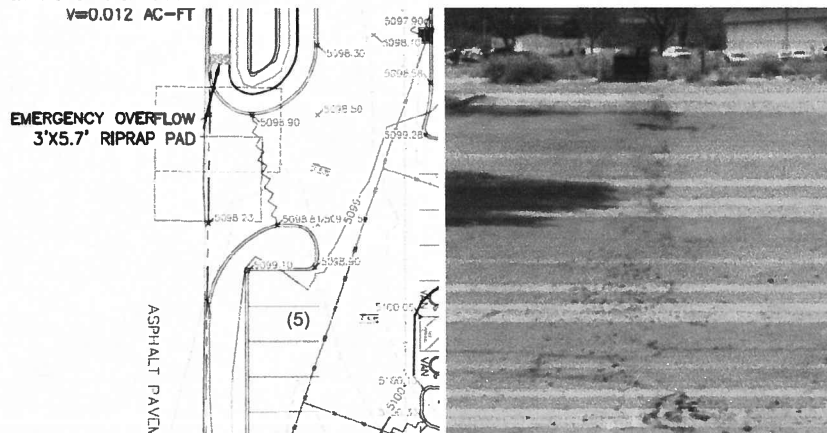
4. Sheet 2.1 & 2.2. Please add what kind of spot elevations these are. (i.e. top of curb, flow line, or top of pavement).

Response: A spot elevation note has been added to each of sheets 2.1 and 2.2 stating "All spot elevations shown are flowline/bottom of curb unless otherwise noted."

5. Sheet 2.1. & 2.2. Please add the top of grate elevation where there is a grate. It is hard to keep turning to the storm pipe sheet for that information.

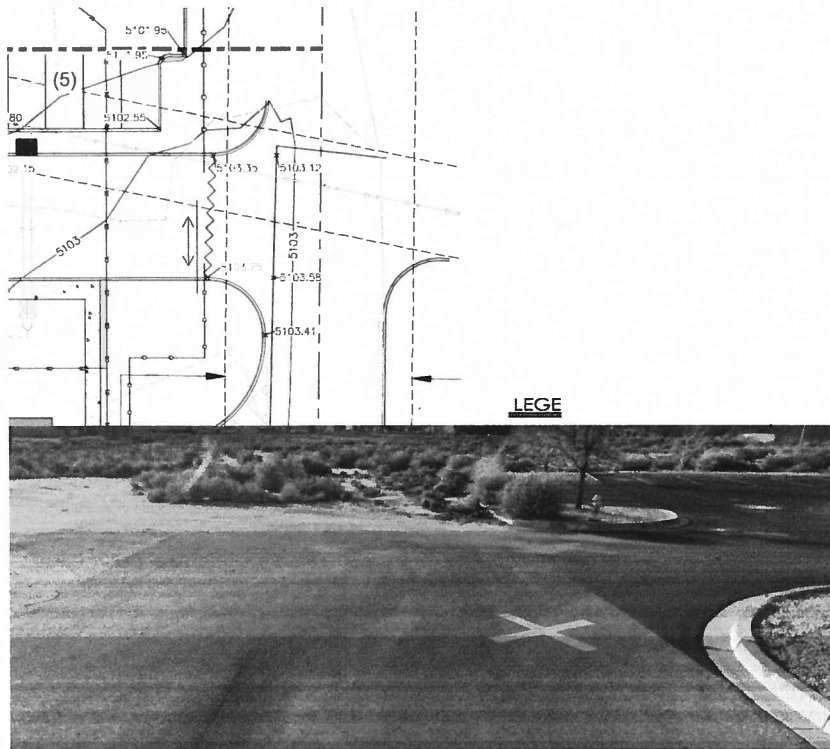
Response: Sheets 2.1 and 2.2 now show top of grate elevations for any inlet that is called out onsite.

6. Sheet 2.1. I noticed that the existing asphalt is cracked and not completely straight as shown in the photo below. Please show where there will be a saw cut on the existing pavement. Also please indicate the existing top of pavement along the saw cut. Since this work is also on the adjacent property, please provide a notarized letter stating that this work can be done by that property owner. Also please provide the top of curb information at the end of the radius on this drive entrance.



Response: Sheet 2.1 now shows where the sawcut line will be in the existing asphalt with top of existing asphalt grades shown. Due to recent discussions with NMDOT and the adjoining Bank of Albuquerque representatives, the entrance to San Roque has changed to be a shared access at Coors Blvd. The sawcut and existing asphalt removals will be limited to constructing this new driveway entrance. Both the adjoining bank and developer are amenable to the current shared access layout as proposed and we are currently working on executing and recording a shared access easement straddling both properties and against the Coors ROW for these improvements. The DRB will not fully sign-off on an approved Site Plan until we have this shared access easement fully executed and recorded.

7. Sheet 2.2. I believe that the existing edge of asphalt is partially shown but please show the entire edge of it as shown in the photo along with the top of curb for the other side of the adjacent entrance. Is there going to be some additional asphalt from the end of the propose curb radius to the existing curb on the other side of the access drive? If so, then please provide the spot elevations needed to build this.



Response: Sheet 2.2 now calls out edge of existing asphalt, sawcut line (1' off edge of existing asphalt), and top of pavement elevations. The new pavement is also hatched in gray to show how the new driveways will tie in to the existing asphalt. The existing curb and parking spaces are also shown on the adjacent properties to give a visual point of reference.

8. Sheet 2.3. Depending on the new design, this storm pipe layout may change.
Response: Although the drainage ponds along the west side have been reduced to only retain the stormwater quality volume, the storm pipe layout remains similar just due to the existing and proposed grading, with the outfall being in the NW corner and the low point of the property being at the SE corner. The storm pipe layout has been updated and sheet 2.3 shows revised grate and invert elevations.
9. Sheet 2.4, 2.5, & 2.6. Please change the title from "Grading Details" to "Grading Enlarged Area". Also on sheet 2.0, please show these areas and label them to go to the correct sheet.
Response: The titles of sheets 2.4, 2.5, and 2.6 now read "Grading Enlarged Area..." with the viewport windows and sheet number references called out on the Overall Grading Plan sheet 2.0.
10. As a reminder, if the project total area of disturbance (including the staging area and any work within the adjacent Right-of-Way) is 1 acre or more, then an Erosion and Sediment Control (ESC) Plan and Owner's certified Notice of Intent (NOI) is required to be submitted to the Stormwater Quality Engineer (Dough Hughes, PE, dhughes@cabq.gov, (924-3420) 14 days prior to any earth disturbance.
Response: An Erosion & Sediment Control Plan along with a SWPPP book and NOI is being prepared for this project to be submitted to Stormwater Quality.
11. Standard Review Fee of \$300 (for DRB Site) will be required at the time of resubmittal.
Response: Resubmittal fee will be paid at the time of this resubmittal.

If you have any questions or need additional information regarding this matter, please do not hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'Vinny Perea', with a long horizontal flourish extending to the right.

Vinny Perea, P.E

JN: 2020010
RRB/vp/ye

DRAINAGE REPORT

**San Roque & La Serena Developments
Albuquerque, NM**

November 2021

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



Prepared for:
Thomas Development Co.
420 W. Main, Suite 300
Boise, Idaho 83702

City of Albuquerque
Planning Department
Development Review Services
HYDROLOGY SECTION

APPROVED

DATE: 12/30/21

BY: *Renee C. Brissette*

HydroTrans # J10D049

THE APPROVAL OF THESE PLANS/REPORT SHALL NOT BE
CONSTRUED TO PERMIT VIOLATIONS OF ANY CITY
ORDINANCE OR STATE LAW, AND SHALL NOT PREVENT
THE CITY OF ALBUQUERQUE FROM REQUIRING
CORRECTION, OR ERROR OR DIMENSIONS IN PLANS,
SPECIFICATIONS, OR CONSTRUCTIONS. SUCH APPROVED PLANS
SHALL NOT BE CHANGED, MODIFIED OR ALTERED WITHOUT
AUTHORIZATION.



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.



Ronald R. Bohannon
11-10-21

Job No. 2020010

Table of Contents

1. Purpose & Project Background	3
2. Location	3
3. Existing Conditions	6
4. Flood Plain	6
5. Proposed Conditions	7
6. Stormwater Quality Management	8
7. Drainage Calculations	9
8. Summary	9

Appendices

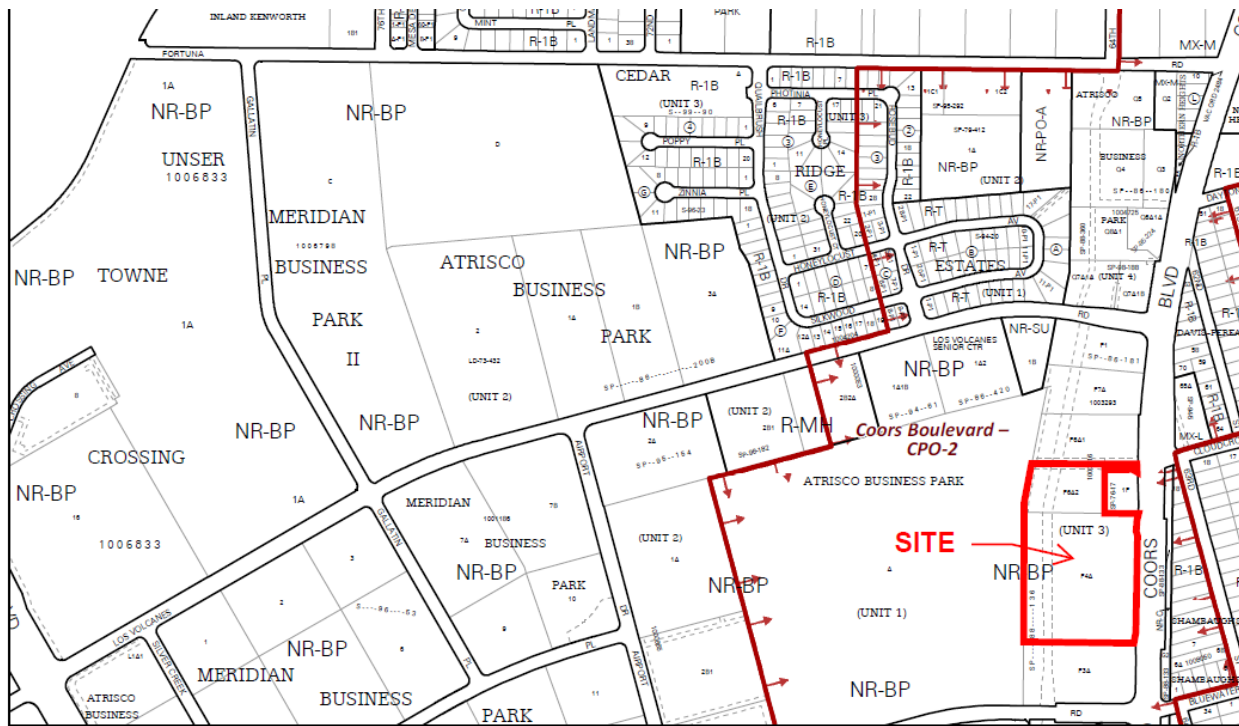
Appendix A: Hydrology Table and Drainage Basin Map – Existing Conditions
Appendix B: Hydrology Table and Drainage Basin Map – Proposed Conditions
Appendix C: Storm Drain Map and Hydraulics Calculations
Appendix D: Nyloplast Storm Inlets Table and Capacity Charts
Appendix E: Pond Volumes and Calculations

1. Purpose & Project Background

The purpose of this report is to develop a Drainage Management Plan for two new developments known as San Roque and La Serena. San Roque is an affordable housing multi-family development consisting of a 4-story main resident building plus 7 garage buildings. La Serena is an affordable independent senior living development consisting of a 3-story main resident building plus 2 garage buildings. The two developments will share site access, parking and private drainage infrastructure (storm drains and ponds). The project will be heard by the Development Review Board for Site Plan for Building Permit, Replat for adjusting the lot line between two existing vacant lots, and Vacation of a 90'-Wide Public Drainage Easement along the west side of the site. Cross-lot private parking, drainage, and access easements will be granted for these two lots and developments during the replatting process with the DRB.

2. Location

The project site is located at the northwest corner of the Coors Blvd/Bluewater Rd intersection at 441 and 457 Coors Blvd NW. The two properties' legal descriptions are F-4-A and F-6-A 2 Atrisco Business Park Unit 3, totaling 8.95 acres in area. The site is bounded by The Bank of Albuquerque to the south, Thomas & Betts manufacturing warehouse to the west, Big Lots to the north, a gas station to the northeast, and Coors Blvd to the east. The site is currently vacant and undisturbed. As previously mentioned, the two existing vacant tracts of land will be replatted for properly placing the San Roque and La Serena buildings within legal property boundaries. Figure 1 and Figure 2 show the vicinity map as well as an aerial image of the site, respectively.



For more details about the Integrated Development Ordinance visit: <http://www.cabq.gov/planning/codes-policies-regulations/integrated-development-ordinance>

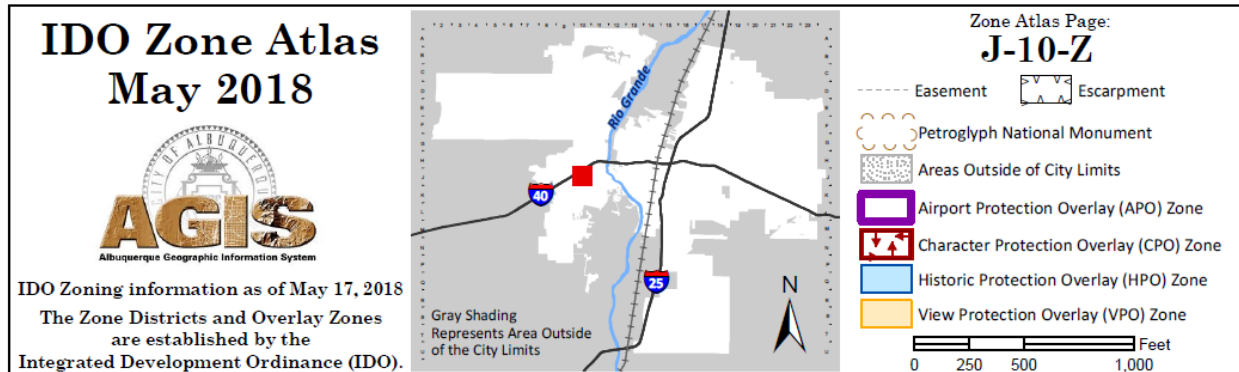


Figure 1: Vicinity Map



Figure 2: Site Aerial Image

3. Existing Conditions

The site is currently vacant and undeveloped with natural vegetation. The site is fairly flat with a majority of drainage runoff being retained onsite from various low points. There are various dirt roads used for vehicles traversing through the site and towards Bluewater Rd.

Basins E1 through E4 each have local low points within each basin for onsite runoff retention. Basin E1 and E4 include very small portions of the existing asphalt surface from the Bank of Albuquerque site. Basin E3 also contains a very small portion of existing asphalt from the drive aisle north of the site. Basin E5 slopes from NW to SE and surface flows 1.55 cfs into the Coors Blvd right-of-way. An existing drainage basin map and hydrology table can be found in Appendix A.

There is an existing 90 ft-wide public drainage easement that runs along the west boundary of the site. The only existing public infrastructure within this easement is a manhole with beehive grate inlet located at the very NW corner of the site. This inlet is the most upstream end of a 60" RCP public storm drain from the "West Mesa Diversion Project Phase 2D" with engineering stamp date 11//15/2004. There is no other public infrastructure within this drainage easement and the City Department of Municipal Development has confirmed there are no future projects planned for utilizing this easement. This development therefore, will be moving forward with vacating this public drainage easement as part of the replatting process. Due to the available capacity of the existing 60" RCP storm drain and after discussions with City Hydrology Department, this site will be allowed to free discharge into this storm drain.

4. Flood Plain

The site is located on FIRM Map 35001C0329H. The map indicates that the site does not fall within any Special Flood Hazard Area. The site is considered an Area of Minimal Flood Hazard and will not require any flood insurance for the development. The FIRM Map for this area can be seen in Figure-3.

National Flood Hazard Layer FIRMette

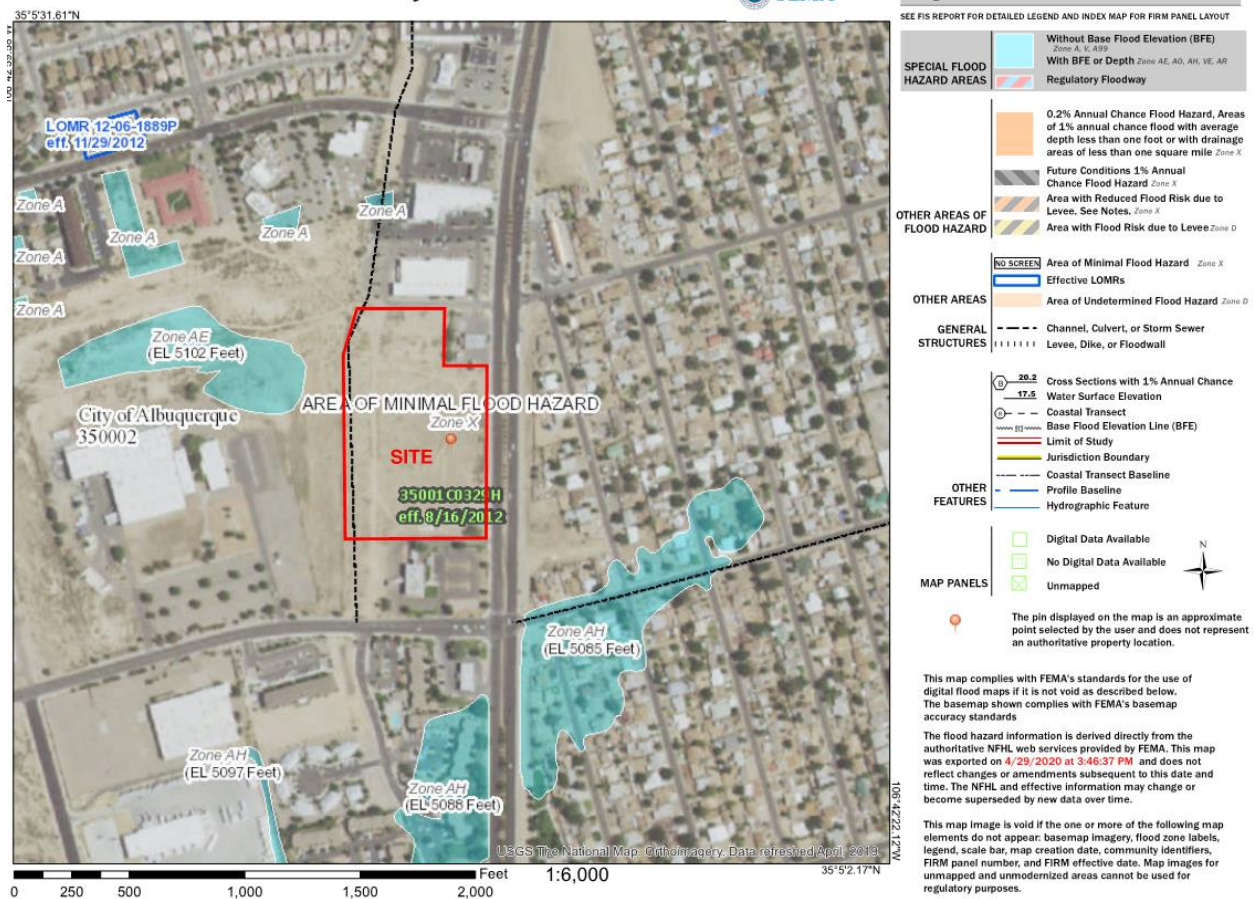


Figure 3: FEMA FIRM Map

5. Proposed Conditions

All improvements will be built out in their entirety. A phasing plan is being provided in the event that the San Roque development begins before La Serena. But the developer's intent is moving forward with building out both developments simultaneously. The grading and drainage plan is configured to accommodate the proposed buildings (3-story building, 4-story building, and 9 garage buildings), parking, drive aisles, sidewalks, and landscaping. A proposed drainage basin map and hydrology table can be found in Appendix B.

Basins P2 through P11 and P16 through P17 consist of a majority of the site improvements as well as roof drainage from the garage buildings. Each of these mentioned basins will convey runoff via surface flow towards a drainage inlet located within each respective basin and private onsite storm drain network. This private storm drain network will then convey the received runoff towards an onsite private detention pond (Pond 1) that will be located along the western boundary of the site. The garage buildings' roof drainage is intended to have scuppers with downspouts that will daylight at finished grade and then

surface flow to one of the designated drainage inlets mentioned. Basins P9 and P10 do not contain drainage inlets, but rather convey runoff via surface flow west towards the mentioned detention pond with a series of curb cuts along the westernmost parking spaces.

Basins RD1 through RD9 consist of the roof drainage for the San Roque main 4-story building. Basins RD10 through RD41 consist of the roof drainage for the La Serena main 3-story building. These roof drains will connect underground to the private onsite storm drain network and ultimately be conveyed to the west detention pond (Pond 1).

Basin P14 consists of a portion of the easternmost garage loft and the adjacent landscaping area. This landscaping area will consist of a retention pond (Pond 2) for fully retaining this basin's runoff.

Basins P1 and P13 consist of the driveway entrance at the SE corner of the site and the landscape area east of the San Roque main residential building, respectively. These two basins will convey runoff via surface flow east towards the Coors Blvd right-of way. The existing surface flow from this property that flows onto Coors is 1.55 cfs so these two developed basins will reduce this runoff amount to 0.92 cfs.

Basin P12 consists of the far west landscaping area onsite and detention pond (Pond 1). There is a proposed dog run area within this landscaping, so the detention pond is split into two and connected by an equalizing 24" culvert pipe to act as one single pond. The drainage collected in this pond will free discharge towards the existing public drainage manhole at the NW corner of the site at a rate of 28.84 cfs. The outfall of the pipe is raised from the bottom of the detention pond for stormwater quality retention.

6. Stormwater Quality Management

The management of stormwater quality for this site intends to capture the "first flush" volume and retain onsite prior to any discharge off of the site. This volume was calculated per the COA drainage ordinance of new development projects as 0.42 inches over the total impervious areas of the site.

The west pond (Pond 1) will retain the stormwater quality for all the proposed basins with impervious area by raising the pond's outfall pipe to be above the bottom of the pond. This volume being retained beneath the outfall invert elevation is 0.21 ac-ft, which is greater than the required stormwater quality retention volume of 0.20 ac-ft. The stormwater quality volume calculations for Pond 1 and stage-storage table showing the outfall pipe invert can be found in Appendix E.

7. Drainage Calculations

The Weighted E Method from Chapter 6 of the COA Development Process Manual dated June 8, 2020 was used to calculate the runoff and pond volumes for the site. The hydrology tables can be found in Appendices A and B.

Drainage capacities for the storm drain pipes were determined based on the 100-year, 6-hour storm event and using Bentley FlowMaster modeling software. A storm drain map along with a capacity table and modeling results can be found in Appendix C.

Drainage capacities for the storm drain inlets were determined based on the 100-year, 6-hour storm event and are based on drainage capacity charts for Nyloplast inlet grates, which are the intended grates and inlets to be used and called out specifically on the storm drain plan. This drainage inlet chart information can be found in Appendix D.

Volume requirements for the retention pond was determined based on the 100-year, 10-day storm event. Pond stage-storage tables as well as the volume requirements calculations can be found in Appendix E.

8. Summary

The entire site will be graded and all proposed surface improvements and buildings will be built out in their entirety. The enclosed grading plan and storm drain plan shows the grades and drainage infrastructure for the entire project.

The proposed development consists of an affordable multi-family 4-story building, an independent senior living 3-story building, and 7 garage buildings. There is an onsite retention pond that will hold runoff from the easternmost onsite drainage basin while a larger retention pond will retain stormwater quality volume before free discharging runoff flow from the remaining onsite drainage basins. This project will be allowed to free discharge into the existing 60" RCP storm drain manhole located at the NW corner of the property at a rate of 28.84 cfs.

APPENDIX A

HYDROLOGY TABLE AND DRAINAGE BASIN MAP – EXISTING CONDITIONS

DPM Weighted E Method

Precipitation Zone 1

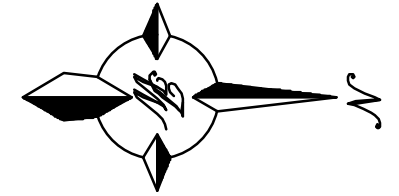
NW Corner Coors/Bluewater

San Roque / La Serena Residential Living

TWLLC VP Date 5/3/2021

Existing Conditions

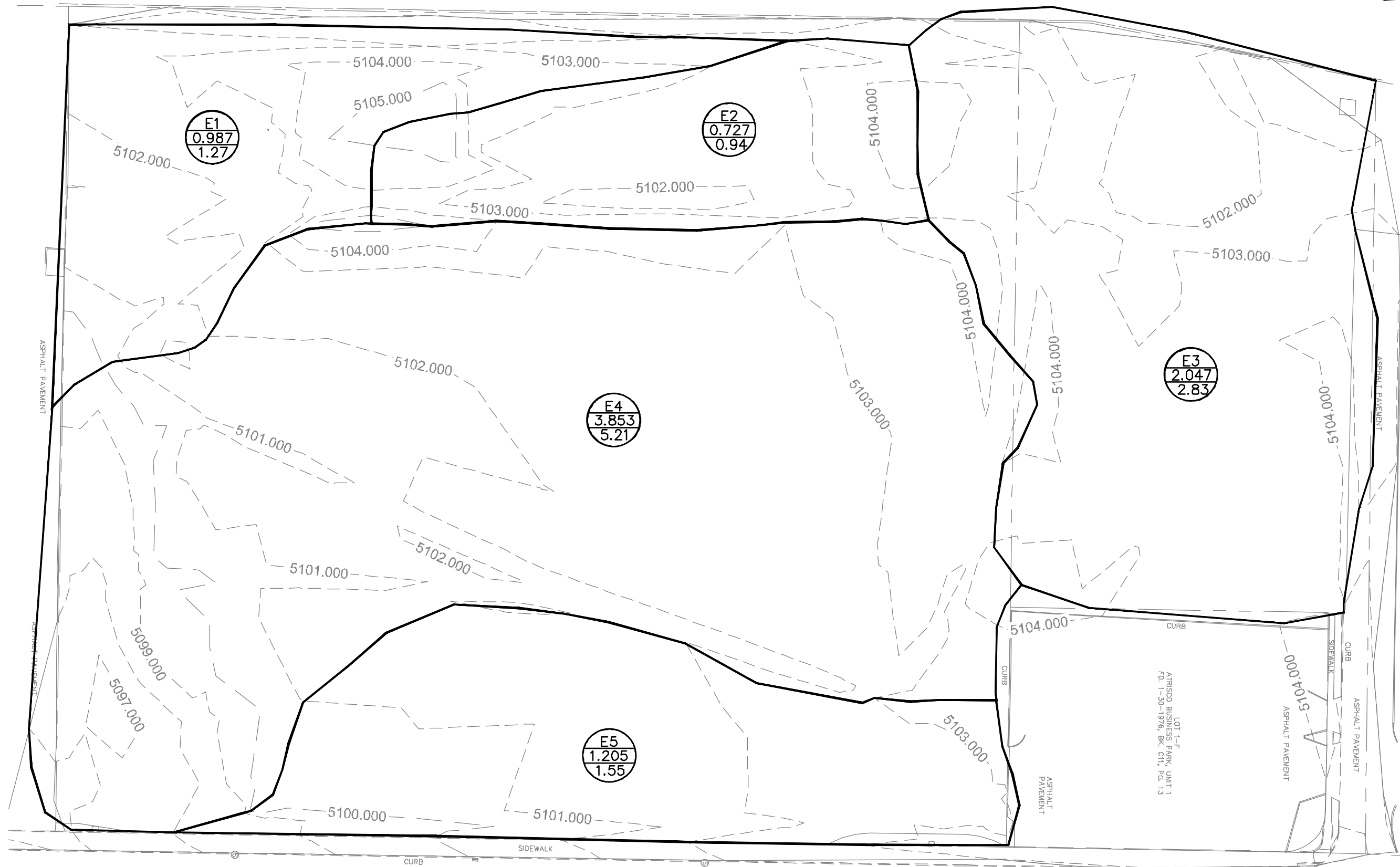
Basin Descriptions												100-Year, 6-Hr			10-Year, 6-Hr		
Basin ID	Area (sf)	Area (acres)	Area (sq miles)	Treatment A		Treatment B		Treatment C		Treatment D		Weighted E (in)	Volume (ac-ft)	Flow cfs	Weighted E (in)	Volume (ac-ft)	Flow cfs
				%	(acres)	%	(acres)	%	(acres)	%	(acres)						
E1	42,991.69	0.987	0.00154	100%	0.987	0%	0.000	0%	0.000	0%	0.000	0.440	0.036	1.27	0.080	0.007	0.24
E2	31,648.75	0.727	0.00114	100%	0.727	0%	0.000	0%	0.000	0%	0.000	0.440	0.027	0.94	0.080	0.005	0.17
E3	89,179.55	2.047	0.00320	97%	1.986	0%	0.000	0%	0.000	3%	0.061	0.486	0.083	2.83	0.115	0.020	0.65
E4	167,837.07	3.853	0.00602	98%	3.776	0%	0.000	0%	0.000	2%	0.077	0.471	0.151	5.21	0.103	0.033	1.13
E5	52468.83	1.205	0.00188	100%	1.205	0%	0.000	0%	0.000	0%	0.000	0.440	0.044	1.55	0.080	0.008	0.29
Total	384,125.89	8.818	0.01378		8.680		0.000		0.000		0.138		0.341	11.80		0.072	2.48



LEGEND

BASIN ID
AREA (AC)
FLOW (CFS)

TRACT F-6-A-1
ATRISCO BUSINESS PARK, UNIT 3
FD. 12-15-2004, BK. 2004C, PG. 388



COORS BOULEVARD N.W.
120' PUBLIC R.O.W.

EXISTING BASIN MAP

APPENDIX B

HYDROLOGY TABLE AND DRAINAGE BASIN MAP – PROPOSED CONDITIONS

DPM Weighted E Method

Precipitation Zone 1

NW Corner Coors/Bluewater

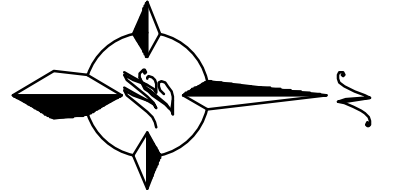
San Roque / La Serena Residential Living

TWLLC VP Date 10/12/2021

Proposed Conditions

Basin Descriptions												100-Year, 6-Hr			10-Year, 6-Hr		
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	Weighted E (in)	Volume (ac-ft)	Flow cfs
				%	(acres)	%	(acres)	%	(acres)	%	(acres)						
P1	10,082.87	0.231	0.00036	0%	0.000	50%	0.116	0%	0.000	50%	0.116	1.320	0.025	0.74	0.730	0.014	0.42
P2	17,913.63	0.411	0.00064	0%	0.000	28%	0.115	0%	0.000	72%	0.296	1.606	0.055	1.53	0.954	0.033	0.94
P3	10,596.04	0.243	0.00038	0%	0.000	11%	0.027	0%	0.000	89%	0.216	1.827	0.037	1.00	1.128	0.023	0.65
P4	12,529.78	0.288	0.00045	0%	0.000	10%	0.029	0%	0.000	90%	0.259	1.840	0.044	1.19	1.138	0.027	0.77
P5	26,170.47	0.601	0.00094	0%	0.000	21%	0.126	0%	0.000	79%	0.475	1.697	0.085	2.33	1.026	0.051	1.47
P6	23,721.49	0.545	0.00085	0%	0.000	18%	0.098	0%	0.000	82%	0.447	1.736	0.079	2.15	1.056	0.048	1.37
P7	5,798.13	0.133	0.00021	0%	0.000	14%	0.019	0%	0.000	86%	0.114	1.788	0.020	0.54	1.097	0.012	0.34
P8	25,916.88	0.595	0.00093	0%	0.000	39%	0.232	0%	0.000	61%	0.363	1.463	0.073	2.06	0.842	0.042	1.23
P9	42,379.88	0.973	0.00152	0%	0.000	16%	0.156	0%	0.000	84%	0.817	1.762	0.143	3.89	1.077	0.087	2.48
P10	24,463.22	0.562	0.00088	0%	0.000	8%	0.045	0%	0.000	92%	0.517	1.866	0.087	2.35	1.158	0.054	1.53
P11	12,042.78	0.276	0.00043	0%	0.000	19%	0.053	0%	0.000	81%	0.224	1.723	0.040	1.09	1.046	0.024	0.69
P12	49,970.61	1.147	0.00179	0%	0.000	99%	1.136	0%	0.000	1%	0.011	0.683	0.065	2.36	0.230	0.022	0.90
P13	3,879.34	0.089	0.00014	0%	0.000	100%	0.089	0%	0.000	0%	0.000	0.670	0.005	0.18	0.220	0.002	0.07
P14	17,299.83	0.397	0.00062	0%	0.000	82%	0.326	0%	0.000	18%	0.071	0.904	0.030	0.97	0.404	0.013	0.45
P15	9,406.90	0.216	0.00034	0%	0.000	25%	0.054	0%	0.000	75%	0.162	1.645	0.030	0.82	0.985	0.018	0.51
P16	8,682.12	0.199	0.00031	0%	0.000	68%	0.136	0%	0.000	32%	0.064	1.086	0.018	0.55	0.546	0.009	0.29
P17	11,632.81	0.267	0.00042	0%	0.000	68%	0.182	0%	0.000	32%	0.085	1.086	0.024	0.74	0.546	0.012	0.38
RD1	3,672.05	0.084	0.00013	0%	0.000	0%	0.000	0%	0.000	100%	0.084	1.970	0.014	0.37	1.240	0.009	0.24
RD2	4,315.67	0.099	0.00015	0%	0.000	0%	0.000	0%	0.000	100%	0.099	1.970	0.016	0.43	1.240	0.010	0.29
RD3	4,622.01	0.106	0.00017	0%	0.000	0%	0.000	0%	0.000	100%	0.106	1.970	0.017	0.46	1.240	0.011	0.31
RD4	4,997.38	0.115	0.00018	0%	0.000	0%	0.000	0%	0.000	100%	0.115	1.970	0.019	0.50	1.240	0.012	0.33
RD5	4,594.55	0.105	0.00016	0%	0.000	0%	0.000	0%	0.000	100%	0.105	1.970	0.017	0.46	1.240	0.011	0.30
RD6	4,674.24	0.107	0.00017	0%	0.000	0%	0.000	0%	0.000	100%	0.107	1.970	0.018	0.47	1.240	0.011	0.31
RD7	4,031.14	0.093	0.00014	0%	0.000	0%	0.000	0%	0.000	100%	0.093	1.970	0.015	0.40	1.240	0.010	0.27
RD8	4,427.19	0.102	0.00016	0%	0.000	0%	0.000	0%	0.000	100%	0.102	1.970	0.017	0.44	1.240	0.011	0.29
RD9	6,419.02	0.147	0.00023	0%	0.000	0%	0.000	0%	0.000	100%	0.147	1.970	0.024	0.64	1.240	0.015	0.43
RD10	193.26	0.004	0.00001	0%	0.000	0%	0.000	0%	0.000	100%	0.004	1.970	0.001	0.02	1.240	0.000	0.01
RD11	643.51	0.015	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.015	1.970	0.002	0.06	1.240	0.002	0.04
RD12	746.43	0.017	0.00003	0%	0.000	0%	0.000	0%	0.000	100%	0.017	1.970	0.003	0.07	1.240	0.002	0.05
RD13	734.18	0.017	0.00003	0%	0.000	0%	0.000	0%	0.000	100%	0.017	1.970	0.003	0.07	1.240	0.002	0.05
RD14	609.59	0.014	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.014	1.970	0.002	0.06	1.240	0.001	0.04
RD15	609.29	0.014	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.014	1.970	0.002	0.06	1.240	0.001	0.04
RD16	655.19	0.015	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.015	1.970	0.002	0.07	1.240	0.002	0.04

Basin Descriptions												100-Year, 6-Hr			10-Year, 6-Hr		
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	Weighted E (in)	Volume (ac-ft)	Flow cfs
				%	(acres)	%	(acres)	%	(acres)	%	(acres)						
RD17	735.41	0.017	0.00003	0%	0.000	0%	0.000	0%	0.000	100%	0.017	1.970	0.003	0.07	1.240	0.002	0.05
RD18	487.38	0.011	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.011	1.970	0.002	0.05	1.240	0.001	0.03
RD19	487.35	0.011	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.011	1.970	0.002	0.05	1.240	0.001	0.03
RD20	600.71	0.014	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.014	1.970	0.002	0.06	1.240	0.001	0.04
RD21	643.47	0.015	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.015	1.970	0.002	0.06	1.240	0.002	0.04
RD22	598.36	0.014	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.014	1.970	0.002	0.06	1.240	0.001	0.04
RD23	598.36	0.014	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.014	1.970	0.002	0.06	1.240	0.001	0.04
RD24	597.16	0.014	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.014	1.970	0.002	0.06	1.240	0.001	0.04
RD25	597.16	0.014	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.014	1.970	0.002	0.06	1.240	0.001	0.04
RD26	643.44	0.015	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.015	1.970	0.002	0.06	1.240	0.002	0.04
RD27	201.07	0.005	0.00001	0%	0.000	0%	0.000	0%	0.000	100%	0.005	1.970	0.001	0.02	1.240	0.000	0.01
RD28	2,111.66	0.048	0.00008	0%	0.000	0%	0.000	0%	0.000	100%	0.048	1.970	0.008	0.21	1.240	0.005	0.14
RD29	714.85	0.016	0.00003	0%	0.000	0%	0.000	0%	0.000	100%	0.016	1.970	0.003	0.07	1.240	0.002	0.05
RD30	2,421.40	0.056	0.00009	0%	0.000	0%	0.000	0%	0.000	100%	0.056	1.970	0.009	0.24	1.240	0.006	0.16
RD31	594.34	0.014	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.014	1.970	0.002	0.06	1.240	0.001	0.04
RD32	594.34	0.014	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.014	1.970	0.002	0.06	1.240	0.001	0.04
RD33	2,697.24	0.062	0.00010	0%	0.000	0%	0.000	0%	0.000	100%	0.062	1.970	0.010	0.27	1.240	0.006	0.18
RD34	2,843.06	0.065	0.00010	0%	0.000	0%	0.000	0%	0.000	100%	0.065	1.970	0.011	0.29	1.240	0.007	0.19
RD35	594.68	0.014	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.014	1.970	0.002	0.06	1.240	0.001	0.04
RD36	593.81	0.014	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.014	1.970	0.002	0.06	1.240	0.001	0.04
RD37	2,419.29	0.056	0.00009	0%	0.000	0%	0.000	0%	0.000	100%	0.056	1.970	0.009	0.24	1.240	0.006	0.16
RD38	593.85	0.014	0.00002	0%	0.000	0%	0.000	0%	0.000	100%	0.014	1.970	0.002	0.06	1.240	0.001	0.04
RD39	1,788.58	0.041	0.00006	0%	0.000	0%	0.000	0%	0.000	100%	0.041	1.970	0.007	0.18	1.240	0.004	0.12
RD40	200.87	0.005	0.00001	0%	0.000	0%	0.000	0%	0.000	100%	0.005	1.970	0.001	0.02	1.240	0.000	0.01
RD41	179.78	0.004	0.00001	0%	0.000	0%	0.000	0%	0.000	100%	0.004	1.970	0.001	0.02	1.240	0.000	0.01
Total	382,969.10	8.792	0.01374		0.000		2.936		0.000		5.856		1.125	31.55		0.659	19.15



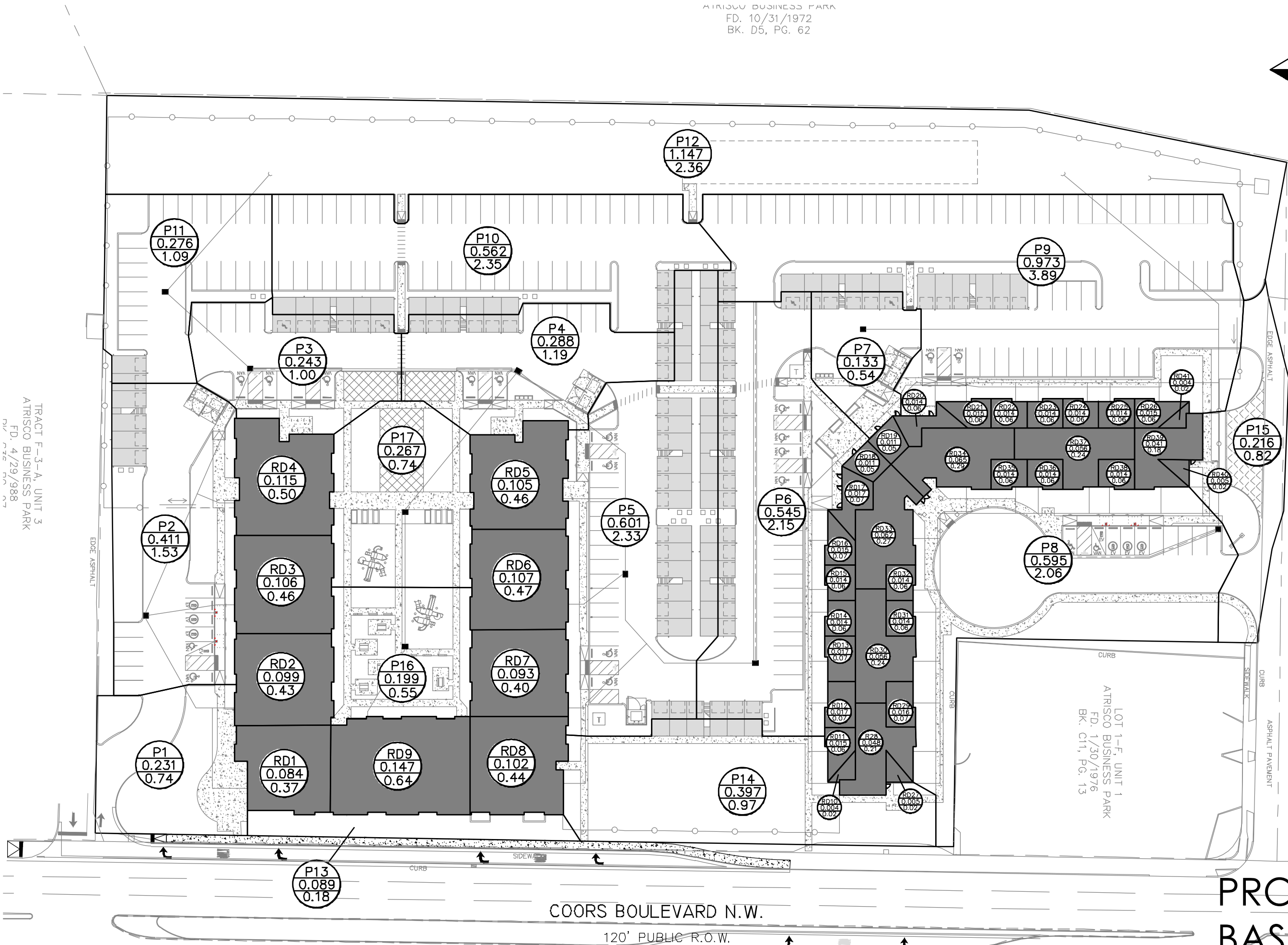
LEGEND

BASIN ID
AREA (AC)
FLOW
(CFS)

TRACT F-6-A-1, UNIT 3
ATRISCO BUSINESS PARK
FD. 12/15/2004
BK. 2004C, PG. 388

LOT 1-F, UNIT 1
ATRISCO BUSINESS PARK
FD. 1/30/1976
BK. C11, PG. 13

PROPOSED BASIN MAP

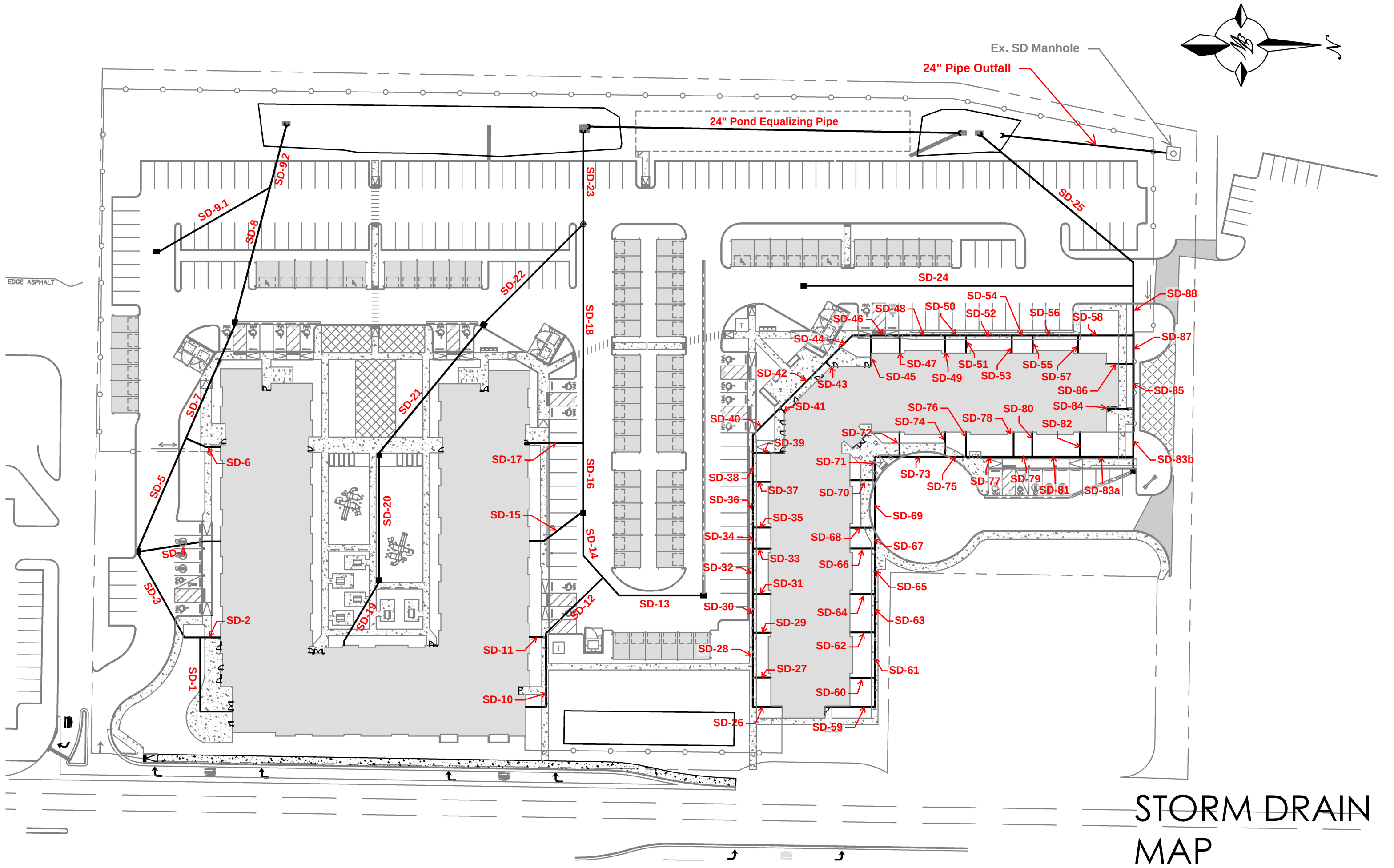


COORS BOULEVARD N.W.

120' PUBLIC R.O.W.

APPENDIX C

STORM DRAIN MAP AND HYDRAULICS CALCULATIONS



Storm Drain Information Table						
Storm Drain ID	Contributing Basin(s)	Contributing Flow (cfs)	Pipe Slope (%)	Pipe Material	Pipe Diameter (in.)	Pipe Capacity (cfs)
SD-1	RD1	0.37	0.3	HDPE	6	0.40
SD-2	RD2	0.43	1.6	HDPE	6	0.99
SD-3	RD1-RD2	0.80	1.6	HDPE	6	0.99
SD-4	RD3	0.46	2.5	HDPE	6	1.24
SD-5	P2, RD1-RD3	2.79	0.5	HDPE	12	3.52
SD-6	RD4	0.50	9.1	HDPE	6	2.37
SD-7	P2, RD1-RD4	3.29	0.5	HDPE	12	3.52
SD-8	P2-P3, RD1-RD4	4.29	0.4	HDPE	15	5.71
SD-9.1	P11	1.09	3.5	HDPE	12	1.36
SD-9.2	P2-P3, P11, RD1-RD4	5.38	0.4	HDPE	15	5.71
SD-10	RD8	0.44	1.2	HDPE	6	0.86
SD-11	RD7	0.40	6.7	HDPE	6	2.03
SD-12	RD7-RD8	0.84	1.2	HDPE	6	0.86
SD-13	P6	2.15	0.4	HDPE	12	3.15
SD-14	P6, RD7-RD8	2.99	0.4	HDPE	12	3.15
SD-15	RD6	0.47	3.9	HDPE	6	1.55
SD-16	P5-P6, RD6-RD8	5.79	0.4	HDPE	18	9.29
SD-17	RD5	0.46	4.5	HDPE	6	1.66
SD-18	P5-P6, RD5-RD8	6.25	0.4	HDPE	18	9.29
SD-19	RD9	0.64	0.7	HDPE	6	0.66
SD-20	P16, RD9	1.19	0.4	HDPE	12	3.15
SD-21	P16-P17, RD9	1.93	0.4	HDPE	12	3.15
SD-22	P4, P16-P17, RD9	3.12	1.3	HDPE	12	5.68
SD-23	P4-P6, P16-P17, RD5-RD9	9.37	1.3	HDPE	18	16.75
SD-24	P7	0.54	0.4	HDPE	12	3.15
SD-25	P7-P8, RD10-RD41	5.48	0.7	HDPE	15	7.56
SD-26	RD10	0.02	0.5	HDPE	3	0.09
SD-27	RD11	0.06	1.6	HDPE	3	0.16
SD-28	RD10-RD11	0.08	0.5	HDPE	3	0.09

Storm Drain Information Table						
Storm Drain ID	Contributing Basin(s)	Contributing Flow (cfs)	Pipe Slope (%)	Pipe Material	Pipe Diameter (in.)	Pipe Capacity (cfs)
SD-29	RD12	0.07	2.8	HDPE	3	0.21
SD-30	RD10-RD12	0.15	0.5	HDPE	4	0.19
SD-31	RD13	0.07	3.9	HDPE	3	0.24
SD-32	RD10-RD13	0.22	0.5	HDPE	6	0.55
SD-33	RD14	0.06	5.2	HDPE	3	0.28
SD-34	RD10-RD14	0.28	0.5	HDPE	6	0.55
SD-35	RD15	0.06	5.8	HDPE	3	0.30
SD-36	RD10-RD15	0.34	0.5	HDPE	6	0.55
SD-37	RD16	0.07	7.0	HDPE	3	0.33
SD-38	RD10-RD16	0.41	0.5	HDPE	6	0.55
SD-39	RD17	0.07	4.6	HDPE	3	0.27
SD-40	RD10-RD17	0.48	0.5	HDPE	6	0.55
SD-41	RD18	0.05	24.7	HDPE	3	0.61
SD-42	RD10-RD18	0.53	0.5	HDPE	6	0.55
SD-43	RD19	0.05	29.5	HDPE	3	0.67
SD-44	RD10-RD19	0.58	0.5	HDPE	8	1.19
SD-45	RD20	0.06	7.5	HDPE	3	0.34
SD-46	RD10-RD20	0.64	0.5	HDPE	8	1.19
SD-47	RD21	0.06	14.1	HDPE	3	0.46
SD-48	RD10-RD21	0.70	0.5	HDPE	8	1.19
SD-49	RD22	0.06	15.4	HDPE	3	0.48
SD-50	RD10-RD22	0.76	0.5	HDPE	8	1.19
SD-51	RD23	0.06	16.0	HDPE	3	0.49
SD-52	RD10-RD23	0.82	0.5	HDPE	8	1.19
SD-53	RD24	0.06	17.3	HDPE	3	0.51
SD-54	RD10-RD24	0.88	0.5	HDPE	8	1.19
SD-55	RD25	0.06	17.9	HDPE	3	0.52
SD-56	RD10-RD25	0.94	0.5	HDPE	8	1.19
SD-57	RD26	0.06	19.2	HDPE	3	0.54
SD-58	RD10-RD26	1.00	9.56	HDPE	8	5.22
SD-59	RD27	0.02	0.50	HDPE	3	0.08

Storm Drain Information Table						
Storm Drain ID	Contributing Basin(s)	Contributing Flow (cfs)	Pipe Slope (%)	Pipe Material	Pipe Diameter (in.)	Pipe Capacity (cfs)
SD-60	RD28	0.21	1.70	HDPE	6	1.02
SD-61	RD27-RD28	0.23	0.54	HDPE	6	0.55
SD-62	RD29	0.07	2.70	HDPE	3	0.20
SD-63	RD27-RD29	0.30	0.54	HDPE	6	0.55
SD-64	RD30	0.24	3.50	HDPE	6	1.47
SD-65	RD27-RD30	0.54	0.54	HDPE	6	0.55
SD-66	RD31	0.06	4.50	HDPE	3	0.26
SD-67	RD27-RD31	0.60	0.54	HDPE	8	1.19
SD-68	RD32	0.06	4.99	HDPE	3	0.28
SD-69	RD27-RD32	0.66	0.54	HDPE	8	1.19
SD-70	RD33	0.27	6.00	HDPE	6	1.92
SD-71	RD27-RD33	0.93	0.54	HDPE	8	1.19
SD-72	RD34	0.29	7.20	HDPE	6	2.11
SD-73	RD27-RD34	1.22	0.54	HDPE	12	3.52
SD-74	RD35	0.06	8.20	HDPE	3	0.35
SD-75	RD27-RD35	1.28	0.54	HDPE	12	3.52
SD-76	RD36	0.06	8.60	HDPE	3	0.36
SD-77	RD27-RD36	1.34	0.54	HDPE	12	3.52
SD-78	RD37	0.24	9.70	HDPE	6	2.44
SD-79	RD27-RD37	1.58	0.54	HDPE	12	3.52
SD-80	RD38	0.06	10.20	HDPE	3	0.39
SD-81	RD27-RD38	1.64	0.54	HDPE	12	3.52
SD-82	RD39	0.18	11.30	HDPE	6	2.64
SD-83.a	RD27-RD39	1.82	9.44	HDPE	12	15.31
SD-83.b	P8, RD27-39	3.88	0.70	HDPE	12	4.17
SD-84	RD40	0.02	37.50	HDPE	3	0.76
SD-85	P8, RD27-RD40	3.90	0.70	HDPE	12	4.17
SD-86	RD41	0.02	39.10	HDPE	3	0.77
SD-87	P8, RD27-RD41	3.92	0.70	HDPE	12	4.17
SD-88	P8, RD10-RD41	4.94	0.70	HDPE	15	7.56

Worksheet for 3" PVC Roof Drain @ 0.5% Slope

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft ← Min. Slope of all 3" Roof Drains
Diameter	3.0 in
Discharge	0.08 cfs ← Max. Contributing Flow of all 3" Roof Drains
Results	
Normal Depth	2.4 in
Flow Area	0.0 ft ²
Wetted Perimeter	0.6 ft
Hydraulic Radius	0.9 in
Top Width	0.20 ft
Critical Depth	2.1 in
Percent Full	80.7 %
Critical Slope	0.007 ft/ft
Velocity	1.88 ft/s
Velocity Head	0.06 ft
Specific Energy	0.26 ft
Froude Number	0.716
Maximum Discharge	0.09 cfs
Discharge Full	0.08 cfs
Slope Full	0.005 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	2.4 in
Critical Depth	2.1 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for 4" PVC Roof Drain @ 0.5% Slope

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Diameter	4.0 in
Discharge	0.15 cfs
Results	
Normal Depth	2.9 in
Flow Area	0.1 ft ²
Wetted Perimeter	0.7 ft
Hydraulic Radius	1.2 in
Top Width	0.30 ft
Critical Depth	2.6 in
Percent Full	71.3 %
Critical Slope	0.006 ft/ft
Velocity	2.25 ft/s
Velocity Head	0.08 ft
Specific Energy	0.32 ft
Froude Number	0.845
Maximum Discharge	0.19 cfs
Discharge Full	0.17 cfs
Slope Full	0.004 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	2.9 in
Critical Depth	2.6 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for 6" PVC Roof Drain @ 0.5% Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Diameter	6.0 in
Discharge	0.53 cfs
Results	
Normal Depth	5.1 in
Flow Area	0.2 ft ²
Wetted Perimeter	1.2 ft
Hydraulic Radius	1.8 in
Top Width	0.36 ft
Critical Depth	4.5 in
Percent Full	84.6 %
Critical Slope	0.007 ft/ft
Velocity	2.99 ft/s
Velocity Head	0.14 ft
Specific Energy	0.56 ft
Froude Number	0.752
Maximum Discharge	0.55 cfs
Discharge Full	0.52 cfs
Slope Full	0.005 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	36.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.1 in
Critical Depth	4.5 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Max. Contributing Flow at this pipe diameter and slope

Worksheet for 6" PVC Roof Drain @ 0.54% Slope

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Diameter	6.0 in
Discharge	0.54 cfs
 Max. Contributing Flow at this pipe diameter and slope	
Results	
Normal Depth	5.0 in
Flow Area	0.2 ft ²
Wetted Perimeter	1.1 ft
Hydraulic Radius	1.8 in
Top Width	0.38 ft
Critical Depth	4.5 in
Percent Full	82.7 %
Critical Slope	0.007 ft/ft
Velocity	3.11 ft/s
Velocity Head	0.15 ft
Specific Energy	0.56 ft
Froude Number	0.810
Maximum Discharge	0.58 cfs
Discharge Full	0.54 cfs
Slope Full	0.005 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	36.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.0 in
Critical Depth	4.5 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for 6" PVC Roof Drain @ 1.10% Slope

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.011 ft/ft
Diameter	6.0 in
Discharge	0.54 cfs
Results	
Normal Depth	3.7 in
Flow Area	0.1 ft ²
Wetted Perimeter	0.9 ft
Hydraulic Radius	1.7 in
Top Width	0.49 ft
Critical Depth	4.5 in
Percent Full	62.0 %
Critical Slope	0.007 ft/ft
Velocity	4.22 ft/s
Velocity Head	0.28 ft
Specific Energy	0.59 ft
Froude Number	1.450
Maximum Discharge	0.82 cfs
Discharge Full	0.76 cfs
Slope Full	0.005 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	62.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.7 in
Critical Depth	4.5 in
Channel Slope	0.011 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for 6" PVC Roof Drain @ 1.44% Slope

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.014 ft/ft
Diameter	6.0 in
Discharge	0.64 cfs
Results	
Normal Depth	3.8 in
Flow Area	0.1 ft ²
Wetted Perimeter	0.9 ft
Hydraulic Radius	1.7 in
Top Width	0.48 ft
Critical Depth	4.9 in
Percent Full	63.5 %
Critical Slope	0.008 ft/ft
Velocity	4.87 ft/s
Velocity Head	0.37 ft
Specific Energy	0.69 ft
Froude Number	1.641
Maximum Discharge	0.94 cfs
Discharge Full	0.88 cfs
Slope Full	0.008 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	63.5 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.8 in
Critical Depth	4.9 in
Channel Slope	0.014 ft/ft
Critical Slope	0.008 ft/ft

Worksheet for 6" PVC Roof Drain @ 1.50% Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.015 ft/ft
Diameter	6.0 in
Discharge	0.84 cfs
Results	
Normal Depth	4.6 in
Flow Area	0.2 ft ²
Wetted Perimeter	1.1 ft
Hydraulic Radius	1.8 in
Top Width	0.42 ft
Critical Depth	5.4 in
Percent Full	77.1 %
Critical Slope	0.012 ft/ft
Velocity	5.17 ft/s
Velocity Head	0.42 ft
Specific Energy	0.80 ft
Froude Number	1.468
Maximum Discharge	0.96 cfs
Discharge Full	0.89 cfs
Slope Full	0.013 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	77.1 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.6 in
Critical Depth	5.4 in
Channel Slope	0.015 ft/ft
Critical Slope	0.012 ft/ft

Max. Contributing Flow at this pipe diameter and slope

Worksheet for 6" PVC Roof Drain @ 1.70% Slope

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.017 ft/ft
Diameter	6.0 in
Discharge	0.21 cfs
Results	
Normal Depth	1.9 in
Flow Area	0.1 ft ²
Wetted Perimeter	0.6 ft
Hydraulic Radius	1.1 in
Top Width	0.47 ft
Critical Depth	2.8 in
Percent Full	31.9 %
Critical Slope	0.004 ft/ft
Velocity	3.90 ft/s
Velocity Head	0.24 ft
Specific Energy	0.40 ft
Froude Number	2.020
Maximum Discharge	1.02 cfs
Discharge Full	0.95 cfs
Slope Full	0.001 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	31.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.9 in
Critical Depth	2.8 in
Channel Slope	0.017 ft/ft
Critical Slope	0.004 ft/ft

Worksheet for 6" PVC Roof Drain @ 1.90% Slope

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.019 ft/ft
Diameter	6.0 in
Discharge	0.43 cfs
Results	
Normal Depth	2.7 in
Flow Area	0.1 ft ²
Wetted Perimeter	0.7 ft
Hydraulic Radius	1.4 in
Top Width	0.50 ft
Critical Depth	4.0 in
Percent Full	45.7 %
Critical Slope	0.006 ft/ft
Velocity	4.92 ft/s
Velocity Head	0.38 ft
Specific Energy	0.61 ft
Froude Number	2.073
Maximum Discharge	1.08 cfs
Discharge Full	1.01 cfs
Slope Full	0.003 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	45.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.7 in
Critical Depth	4.0 in
Channel Slope	0.019 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for 8" PVC Roof Drain @ 0.5% Slope

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Diameter	8.0 in
Discharge	0.94 cfs
 Max. Contributing Flow at this pipe diameter and slope	
Results	
Normal Depth	5.6 in
Flow Area	0.3 ft ²
Wetted Perimeter	1.3 ft
Hydraulic Radius	2.4 in
Top Width	0.61 ft
Critical Depth	5.5 in
Percent Full	70.6 %
Critical Slope	0.005 ft/ft
Velocity	3.57 ft/s
Velocity Head	0.20 ft
Specific Energy	0.67 ft
Froude Number	0.956
Maximum Discharge	1.19 cfs
Discharge Full	1.11 cfs
Slope Full	0.004 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	43.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.6 in
Critical Depth	5.5 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for 8" PVC Roof Drain @ 0.54% Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Diameter	8.0 in
Discharge	0.93 cfs
Results	
Normal Depth	5.4 in
Flow Area	0.3 ft ²
Wetted Perimeter	1.3 ft
Hydraulic Radius	2.3 in
Top Width	0.62 ft
Critical Depth	5.5 in
Percent Full	68.0 %
Critical Slope	0.005 ft/ft
Velocity	3.68 ft/s
Velocity Head	0.21 ft
Specific Energy	0.66 ft
Froude Number	1.016
Maximum Discharge	1.24 cfs
Discharge Full	1.15 cfs
Slope Full	0.004 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	68.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.4 in
Critical Depth	5.5 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

Max. Contributing Flow at this pipe diameter and slope

Worksheet for 12" HDPE @ 0.4%

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	12.0 in
Discharge	2.99 cfs
Results	
Normal Depth	10.1 in
Flow Area	0.7 ft ²
Wetted Perimeter	2.3 ft
Hydraulic Radius	3.6 in
Top Width	0.73 ft
Critical Depth	8.9 in
Percent Full	84.0 %
Critical Slope	0.005 ft/ft
Velocity	4.25 ft/s
Velocity Head	0.28 ft
Specific Energy	1.12 ft
Froude Number	0.764
Maximum Discharge	3.15 cfs
Discharge Full	2.93 cfs
Slope Full	0.004 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	55.6 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.1 in
Critical Depth	8.9 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Max. Contributing Flow at this pipe diameter and slope

Worksheet for 12" HDPE @ 0.5%

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Diameter	12.0 in
Discharge	3.29 cfs
Max. Contributing Flow at this pipe diameter and slope	
Results	
Normal Depth	9.9 in
Flow Area	0.7 ft ²
Wetted Perimeter	2.3 ft
Hydraulic Radius	3.7 in
Top Width	0.76 ft
Critical Depth	9.3 in
Percent Full	82.4 %
Critical Slope	0.006 ft/ft
Velocity	4.75 ft/s
Velocity Head	0.35 ft
Specific Energy	1.17 ft
Froude Number	0.879
Maximum Discharge	3.52 cfs
Discharge Full	3.27 cfs
Slope Full	0.005 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	55.6 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	9.9 in
Critical Depth	9.3 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for 12" HDPE @ 0.54%

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Diameter	12.0 in
Discharge	1.64 cfs
Results	
Normal Depth	5.9 in
Flow Area	0.4 ft ²
Wetted Perimeter	1.5 ft
Hydraulic Radius	3.0 in
Top Width	1.00 ft
Critical Depth	6.5 in
Percent Full	48.9 %
Critical Slope	0.004 ft/ft
Velocity	4.30 ft/s
Velocity Head	0.29 ft
Specific Energy	0.78 ft
Froude Number	1.225
Maximum Discharge	3.66 cfs
Discharge Full	3.40 cfs
Slope Full	0.001 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	48.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.9 in
Critical Depth	6.5 in
Channel Slope	0.005 ft/ft
Critical Slope	0.004 ft/ft

Max. Contributing Flow at this pipe diameter and slope

Worksheet for 12" HDPE @ 0.7%

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.007 ft/ft
Diameter	12.0 in
Discharge	3.92 cfs
Max. Contributing Flow at this pipe diameter and slope	
Results	
Normal Depth	10.0 in
Flow Area	0.7 ft ²
Wetted Perimeter	2.3 ft
Hydraulic Radius	3.6 in
Top Width	0.75 ft
Critical Depth	10.1 in
Percent Full	83.1 %
Critical Slope	0.007 ft/ft
Velocity	5.62 ft/s
Velocity Head	0.49 ft
Specific Energy	1.32 ft
Froude Number	1.028
Maximum Discharge	4.17 cfs
Discharge Full	3.87 cfs
Slope Full	0.007 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	83.1 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.0 in
Critical Depth	10.1 in
Channel Slope	0.007 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for 12" HDPE @ 1.3%

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.013 ft/ft
Diameter	12.0 in
Discharge	3.12 cfs
Max. Contributing Flow at this pipe diameter and slope	
Results	
Normal Depth	6.6 in
Flow Area	0.4 ft ²
Wetted Perimeter	1.7 ft
Hydraulic Radius	3.2 in
Top Width	0.99 ft
Critical Depth	9.1 in
Percent Full	55.3 %
Critical Slope	0.005 ft/ft
Velocity	7.00 ft/s
Velocity Head	0.76 ft
Specific Energy	1.32 ft
Froude Number	1.844
Maximum Discharge	5.68 cfs
Discharge Full	5.28 cfs
Slope Full	0.005 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	55.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.6 in
Critical Depth	9.1 in
Channel Slope	0.013 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for 12" HDPE @ 3.5%

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.035 ft/ft
Diameter	12.0 in
Discharge	3.29 cfs
Max. Contributing Flow at this pipe diameter and slope	
Results	
Normal Depth	5.1 in
Flow Area	0.3 ft ²
Wetted Perimeter	1.4 ft
Hydraulic Radius	2.7 in
Top Width	0.99 ft
Critical Depth	9.3 in
Percent Full	42.7 %
Critical Slope	0.006 ft/ft
Velocity	10.28 ft/s
Velocity Head	1.64 ft
Specific Energy	2.07 ft
Froude Number	3.186
Maximum Discharge	9.32 cfs
Discharge Full	8.66 cfs
Slope Full	0.005 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	42.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.1 in
Critical Depth	9.3 in
Channel Slope	0.035 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for 12" HDPE @ 9.44%

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.094 ft/ft
Diameter	12.0 in
Discharge	1.82 cfs
Results	
Normal Depth	2.9 in
Flow Area	0.1 ft ²
Wetted Perimeter	1.0 ft
Hydraulic Radius	1.7 in
Top Width	0.86 ft
Critical Depth	6.9 in
Percent Full	24.2 %
Critical Slope	0.004 ft/ft
Velocity	12.44 ft/s
Velocity Head	2.41 ft
Specific Energy	2.65 ft
Froude Number	5.307
Maximum Discharge	15.31 cfs
Discharge Full	14.23 cfs
Slope Full	0.002 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	24.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.9 in
Critical Depth	6.9 in
Channel Slope	0.094 ft/ft
Critical Slope	0.004 ft/ft

Max. Contributing Flow at this pipe diameter and slope

Worksheet for 15" HDPE @ 0.4%

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	15.0 in
Discharge	5.38 cfs
Max. Contributing Flow at this pipe diameter and slope	
Results	
Normal Depth	12.5 in
Flow Area	1.1 ft ²
Wetted Perimeter	2.9 ft
Hydraulic Radius	4.6 in
Top Width	0.93 ft
Critical Depth	11.3 in
Percent Full	83.2 %
Critical Slope	0.005 ft/ft
Velocity	4.93 ft/s
Velocity Head	0.38 ft
Specific Energy	1.42 ft
Froude Number	0.805
Maximum Discharge	5.71 cfs
Discharge Full	5.31 cfs
Slope Full	0.004 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	63.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	12.5 in
Critical Depth	11.3 in
Channel Slope	0.004 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for 15" HDPE @ 0.7%

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.007 ft/ft
Diameter	15.0 in
Discharge	5.48 cfs
Max. Contributing Flow at this pipe diameter and slope	
Results	
Normal Depth	10.0 in
Flow Area	0.9 ft ²
Wetted Perimeter	2.4 ft
Hydraulic Radius	4.4 in
Top Width	1.18 ft
Critical Depth	11.4 in
Percent Full	66.4 %
Critical Slope	0.005 ft/ft
Velocity	6.33 ft/s
Velocity Head	0.62 ft
Specific Energy	1.45 ft
Froude Number	1.303
Maximum Discharge	7.56 cfs
Discharge Full	7.03 cfs
Slope Full	0.004 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	66.4 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.0 in
Critical Depth	11.4 in
Channel Slope	0.007 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for 18" HDPE @ 0.4%

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.004 ft/ft
Diameter	18.0 in
Discharge	6.25 cfs
Max. Contributing Flow at this pipe diameter and slope	
Results	
Normal Depth	11.3 in
Flow Area	1.2 ft ²
Wetted Perimeter	2.8 ft
Hydraulic Radius	5.1 in
Top Width	1.45 ft
Critical Depth	11.6 in
Percent Full	63.0 %
Critical Slope	0.004 ft/ft
Velocity	5.33 ft/s
Velocity Head	0.44 ft
Specific Energy	1.39 ft
Froude Number	1.043
Maximum Discharge	9.29 cfs
Discharge Full	8.64 cfs
Slope Full	0.002 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	63.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	11.3 in
Critical Depth	11.6 in
Channel Slope	0.004 ft/ft
Critical Slope	0.004 ft/ft

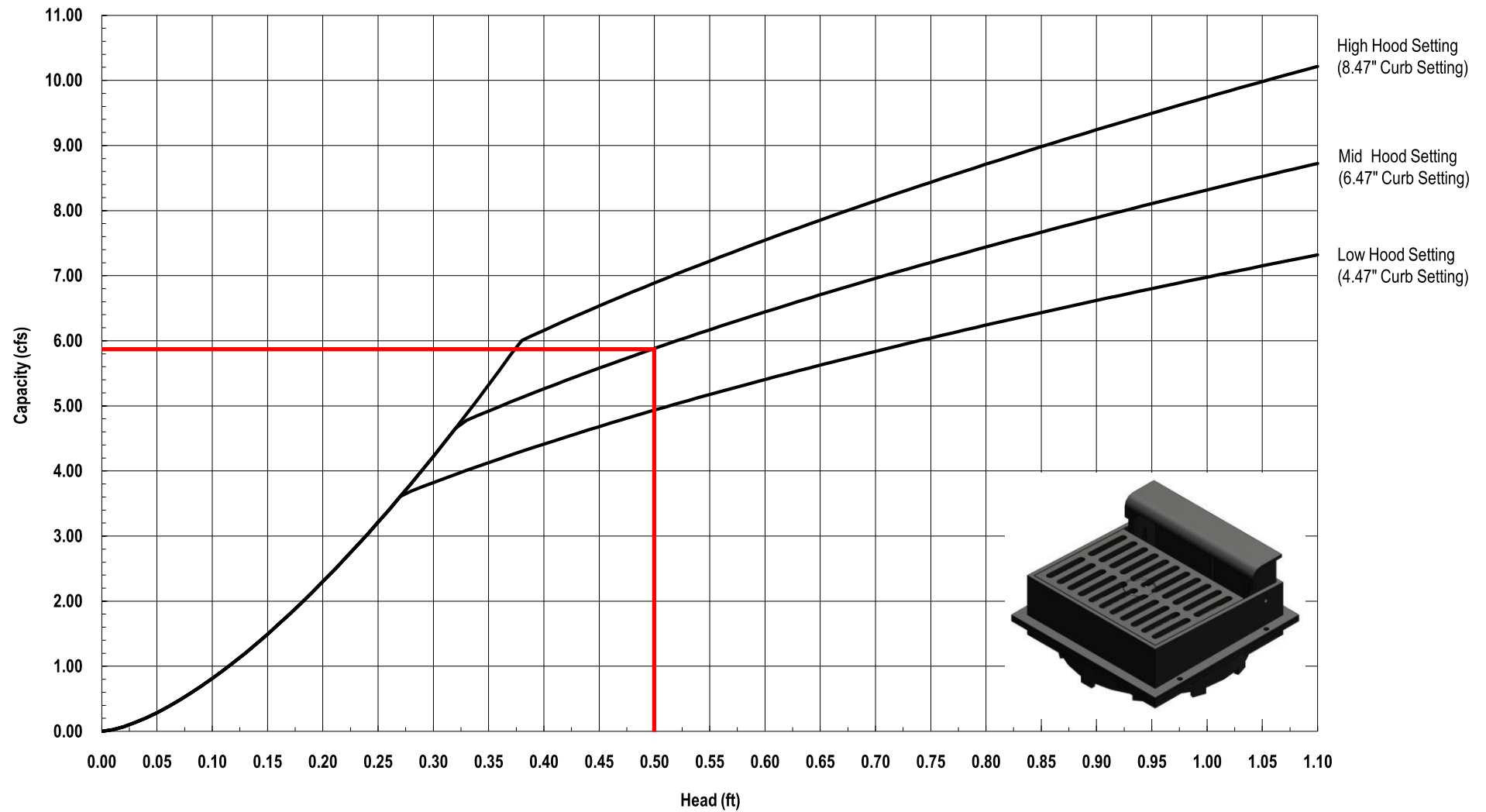
APPENDIX D

NYLOPLAST STORM INLETS TABLE AND CAPACITY CHARTS

Inlet Information Table					
Inlet ID	Contributing Basin(s)	Contributing Flow (cfs)	Inlet/Grate Type*	Inlet Capacity* (cfs)	50% Clogging Factor Inlet Capacity (cfs)
1	P2	1.53	2'x2' Curb Inlet Standard Grate (Mid Hood)	5.95	2.97
2	P3	1	2'x2' Road & Highway Grate	6.50	3.25
3	P11	1.09	2'x2' Road & Highway Grate	6.50	3.25
4	P6	2.15	2'x2' Road & Highway Grate	6.50	3.25
5	P5	2.33	2'x2' Road & Highway Grate	6.50	3.25
6	P16	0.55	12" Dome Grate	1.65	0.82
7	P17	0.74	12" Dome Grate	1.65	0.82
8	P4	1.19	2'x2' Curb Inlet Standard Grate (Mid Hood)	5.95	2.97
9	P7	0.54	2'x2' Road & Highway Grate	6.50	3.25
10	P8	2.06	2'x2' Road & Highway Grate	6.50	3.25

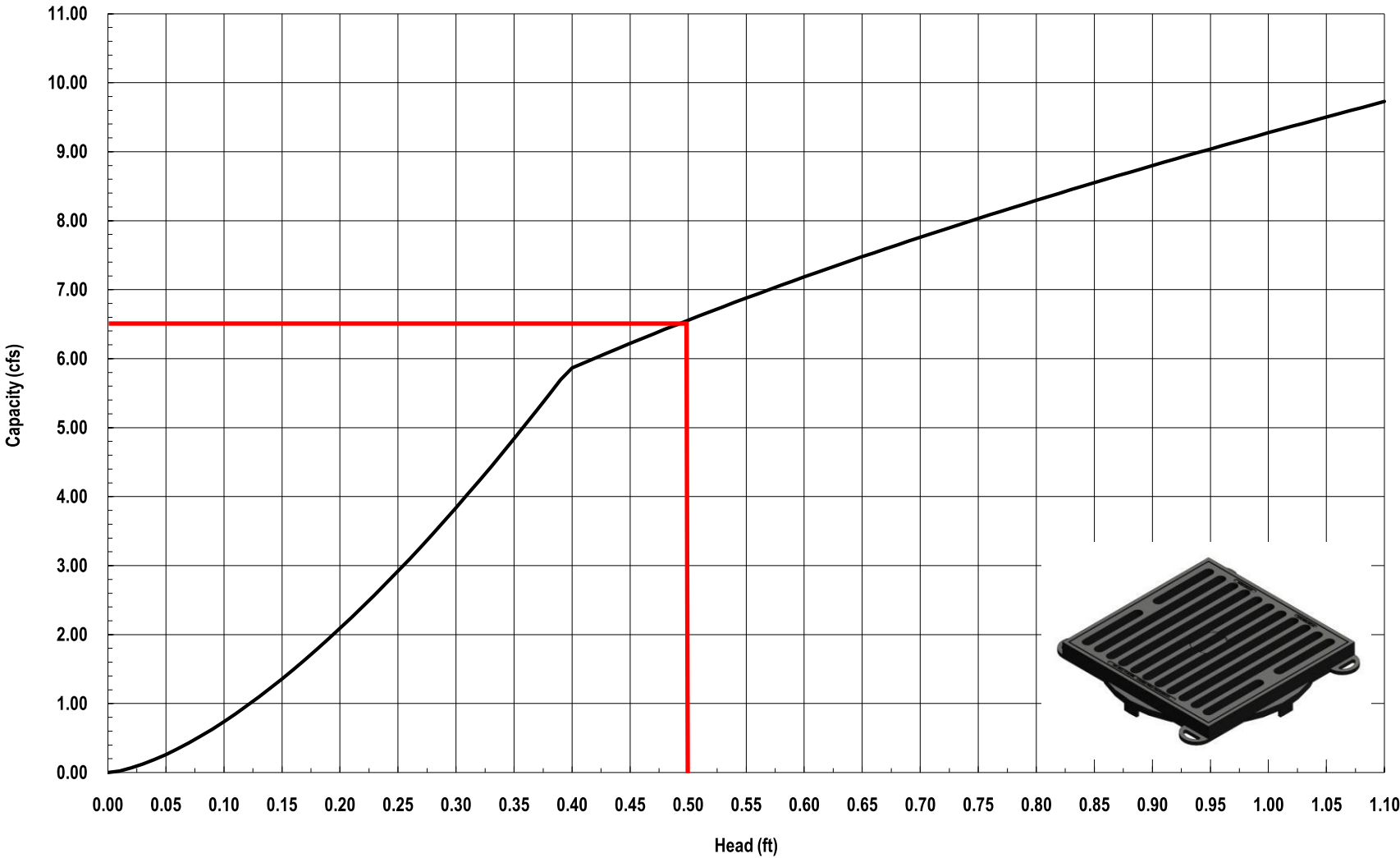
*Based on Nyloplast Inlet Basin Information

Nyloplast 2' x 2' Curb Inlet Standard Grate Inlet Capacity Chart



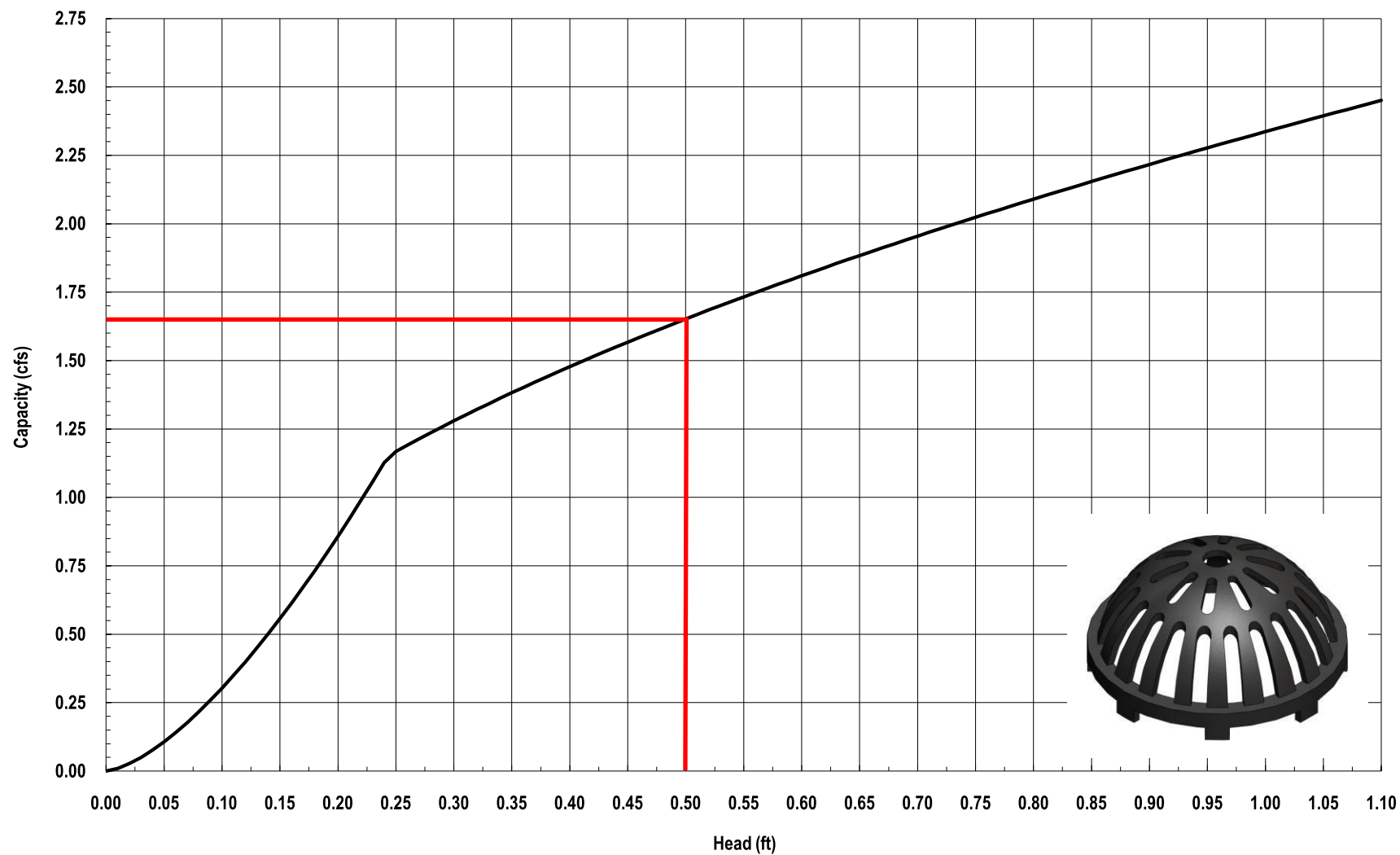
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Nyloplast 2' x 2' Road & Highway Grate Inlet Capacity Chart



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Nyloplast 12" Dome Grate Inlet Capacity Chart



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APPENDIX E

POND VOLUMES AND CALCULATIONS

POND 1 (SWQ Retention Only)

Pond Volume Calculations

A_b - Bottom Of The Pond Surface Area

A_t - Top Of The Pond Surface Area

D - Water Depth

D_t - Total Pond Depth

C - Change In Surface Area / Water Depth

$$\text{Volume} = A_b * D + 0.5 * C * D^2$$

$$C = (A_t - A_b) / D_t$$

$$A_b = 0.00 \text{ ft}^2$$

$$A_t = 11,073.27 \text{ ft}^2$$

$$D_t = 4.50 \text{ ft}$$

$$C = 2460.73$$

ACTUAL ELEVATION	DEPTH (ft)	VOLUME (ac-ft)	Note
95.50	0.00	0.0000	BOP
96.00	0.50	0.0071	
96.50	1.00	0.0282	
97.00	1.50	0.0636	
97.50	2.00	0.1130	
98.00	2.50	0.1765	
98.25	2.75	0.2136	Outfall Invert*
98.50	3.00	0.2542	
99.00	3.50	0.3460	
99.50	4.00	0.4519	
100.00	4.50	0.5720	

*Stormwater Quality Volume Retention Required = 0.20 Ac-Ft

POND 2 (Full Retention)

Contributing Basins = P14

Contributing Basin Area = 0.397 acres

Land Treatment = 82% B, 18% D

$$V_{360} = \text{Weighted E} * \text{Basin Area} = 0.904 * 0.397 = 0.358 \text{ ac-in} = 0.029 \text{ ac-ft}$$

$$\begin{aligned} V_{10\text{Days}} &= V_{360} + A_D * (P_{10\text{DAYS}} - P_{360}) / 12 \\ &= 0.029 + .071 * (3.900 - 2.170) / 12 = \mathbf{0.039 \text{ ac-ft} = 1699 \text{ ft}^3} \end{aligned}$$

Pond Volume Calculations

A_b - Bottom Of The Pond Surface Area

A_t - Top Of The Pond Surface Area

D - Water Depth

D_t - Total Pond Depth

C - Change In Surface Area / Water Depth

$$\text{Volume} = A_b * D + 0.5 * C * D^2$$

$$C = (A_t - A_b) / D_t$$

$$A_b = 1,462.22 \text{ ft}^2$$

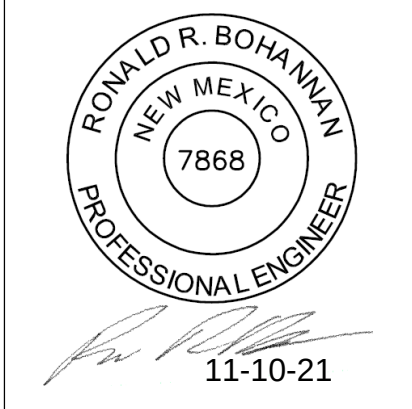
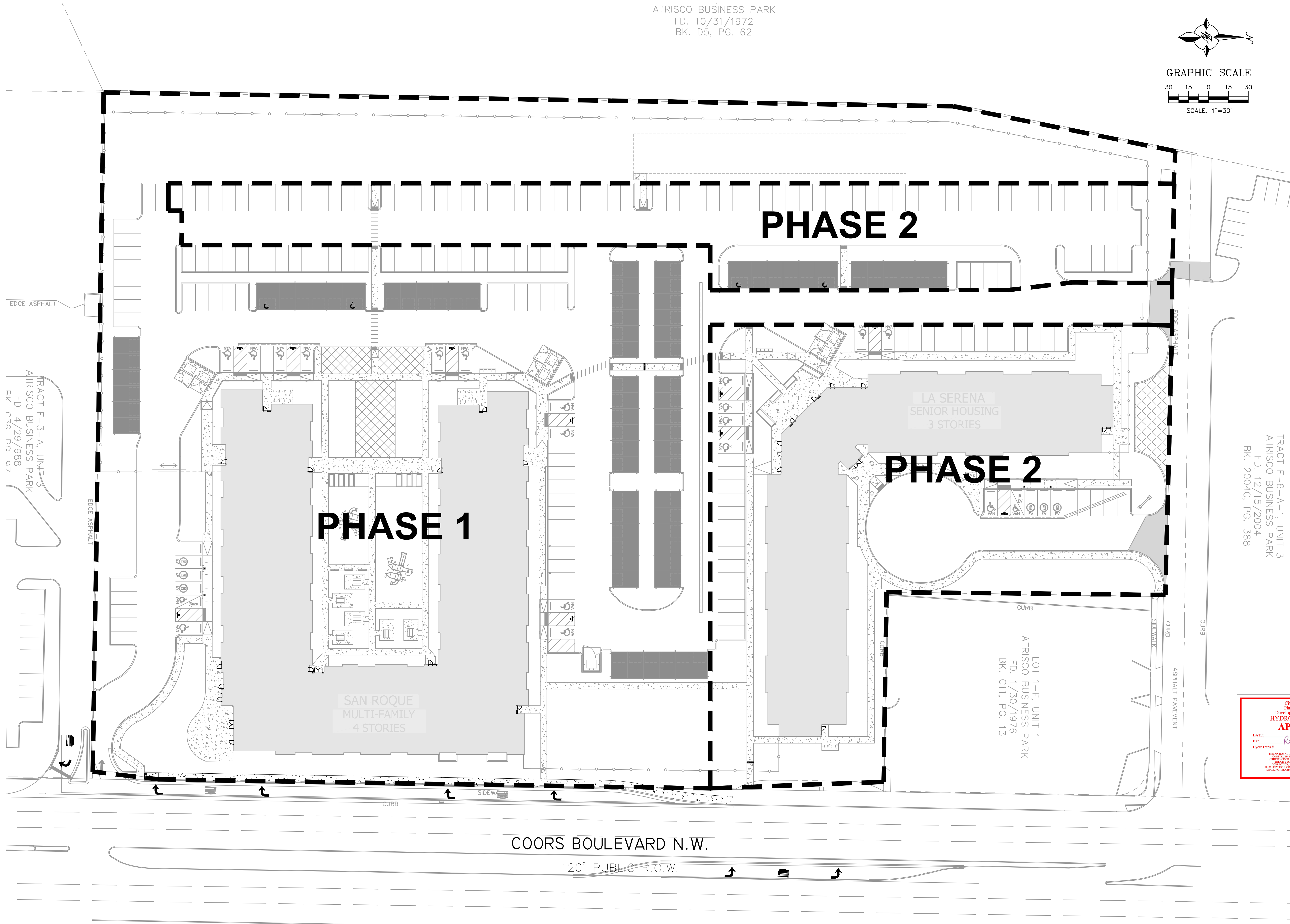
$$A_t = 3,140.58 \text{ ft}^2$$

$$D_t = 2.00 \text{ ft}$$

$$C = 839.18$$

ACTUAL ELEVATION	DEPTH (ft)	VOLUME (ac-ft)	Q (cfs)	Note
99.80	0.00	0.0000	0.0000	BOP
100.05	0.25	0.0090	0.0000	
100.30	0.50	0.0192	0.0000	
100.55	0.75	0.0306	0.0000	
100.80	1.00	0.0432	0.0000	MWSE
101.05	1.25	0.0570	0.0000	
101.30	1.50	0.0720	0.0000	TOP (Freeboard)

\\TMA5\3_Drive\2020\2020010 Coors and Bluewater Zone Change\Map\008\2020010-PHASING.dwg, Nov. 10, 2021 - 1:42pm



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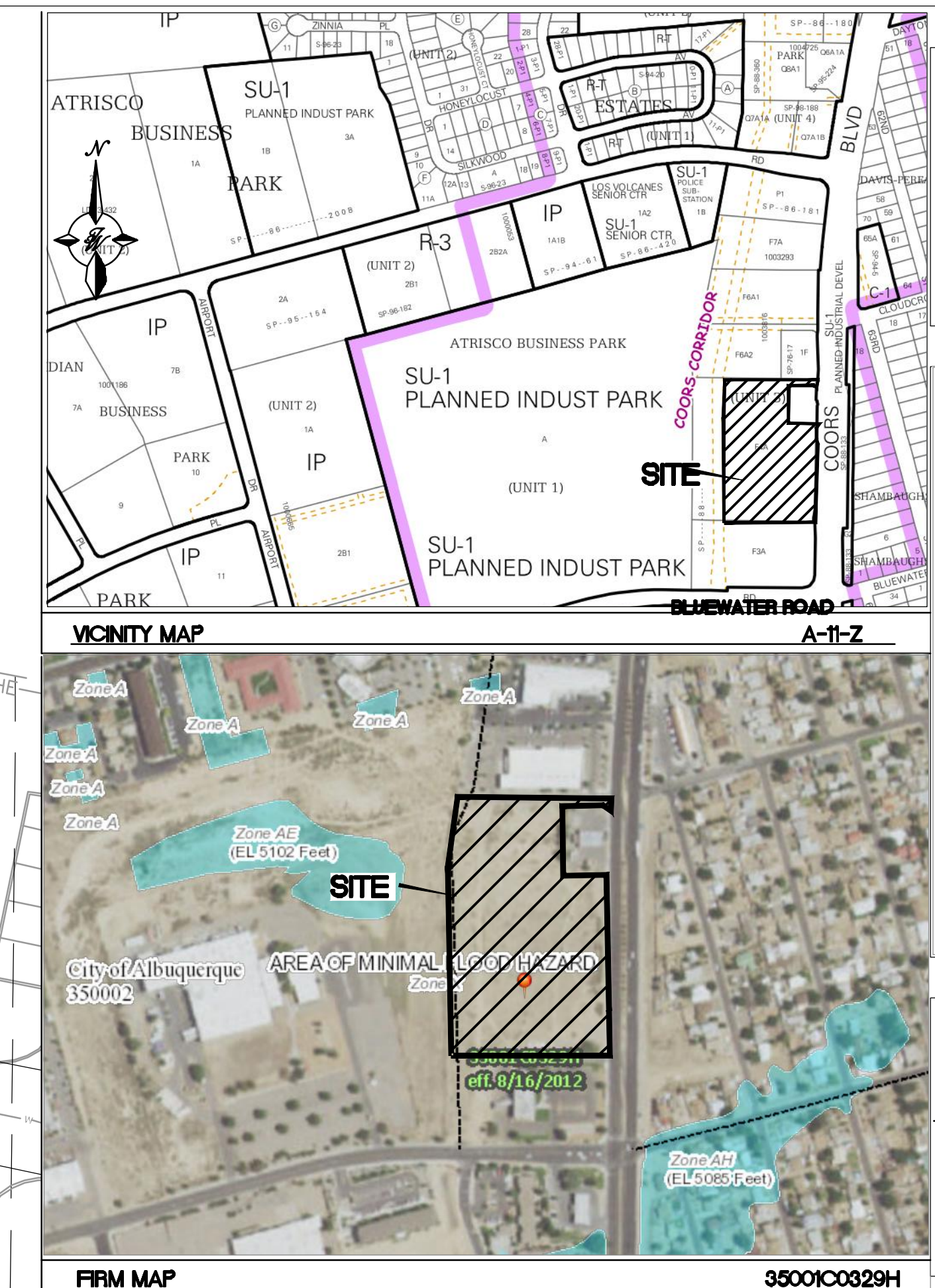
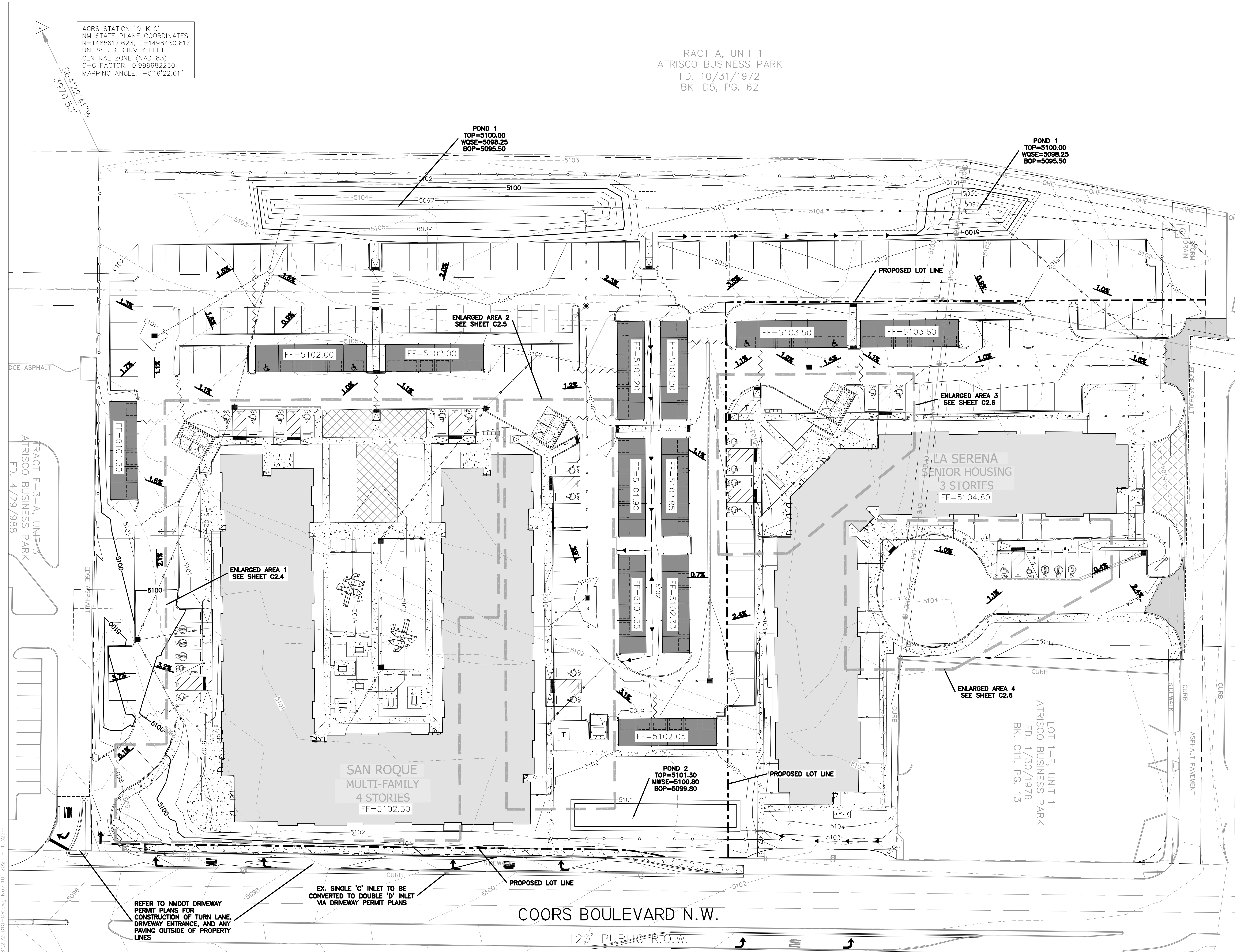
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date: 11.10.2021
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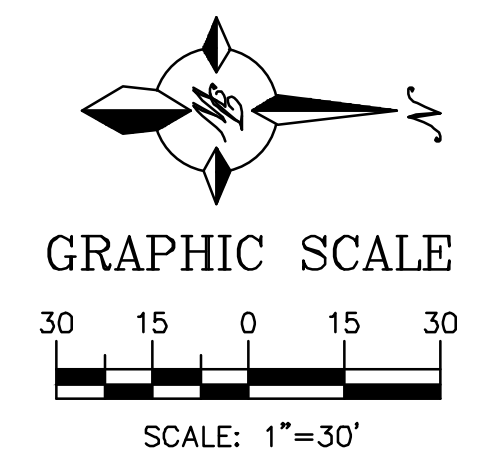
Permit Set

**PHASING
PLAN**

c1.2



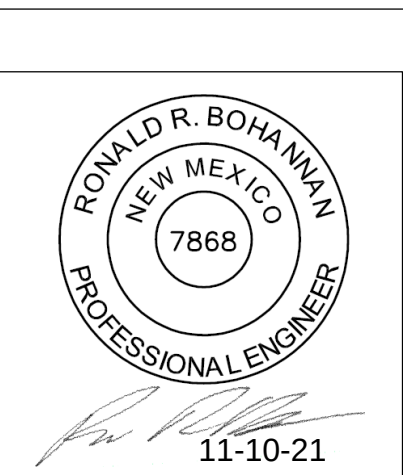
- LEGEND**
- PROPOSED CURB & GUTTER
 - BOUNDARY LINE
 - BUILDING
 - SIDEWALK
 - STORM DRAIN
 - WATER LINE
 - FIRE LINE
 - SANITARY SEWER
 - WATER BLOCK
 - 5100 CONTOUR MAJOR
 - 5101 CONTOUR MINOR
 - x 5048.25 SPOT ELEVATION
 - FLOW ARROW
 - EXISTING CURB & GUTTER
 - PROPOSED BOUNDARY LINE
 - 5100 EXISTING CONTOUR MAJOR
 - 5101 EXISTING CONTOUR MINOR
 - EXISTING WATER LINE
 - CONCRETE VALLEY GUTTER
 - SAWCUT EXISTING ASPHALT
 - LANDSCAPE SWALE



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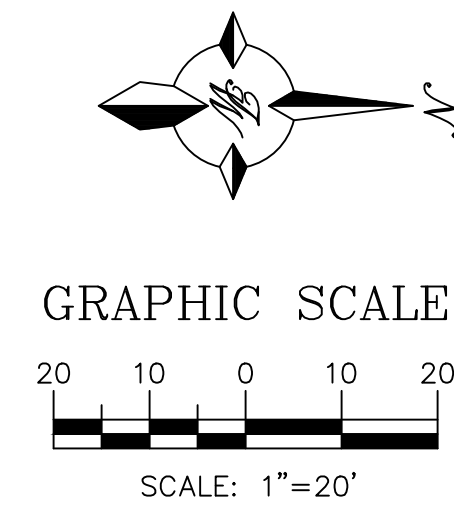
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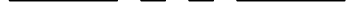
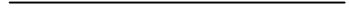
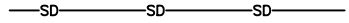
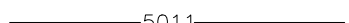
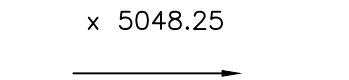
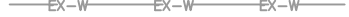
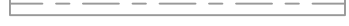
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drawn: vp, bf
checked: vp

Permit Set

**Overall
Grading &
Drainage Plan**
c2.0



SPOT ELEVATION NOTE:
ALL SPOT ELEVATIONS SHOWN ARE FLOWLINE/BOTTOM
OF CURB UNLESS OTHERWISE NOTED.

- ## LEGEND
- | | |
|---|-------------------------|
|  | PROPOSED CURB & GUTTER |
|  | BOUNDARY LINE |
|  | BUILDING |
|  | SIDEWALK |
|  | STORM DRAIN |
|  | WATER LINE |
|  | FIRE LINE |
|  | SANITARY SEWER |
|  | WATER BLOCK |
|  | CONTOUR MAJOR |
|  | CONTOUR MINOR |
|  | SPOT ELEVATION |
|  | FLOW ARROW |
|  | EXISTING CURB & GUTTER |
|  | PROPOSED BOUNDARY LINE |
|  | EXISTING CONTOUR MAJOR |
|  | EXISTING CONTOUR MINOR |
|  | EXISTING WATER LINE |
|  | CONCRETE VALLEY GUTTER |
|  | SAWCUT EXISTING ASPHALT |
| | LANDSCAPE SWALE |

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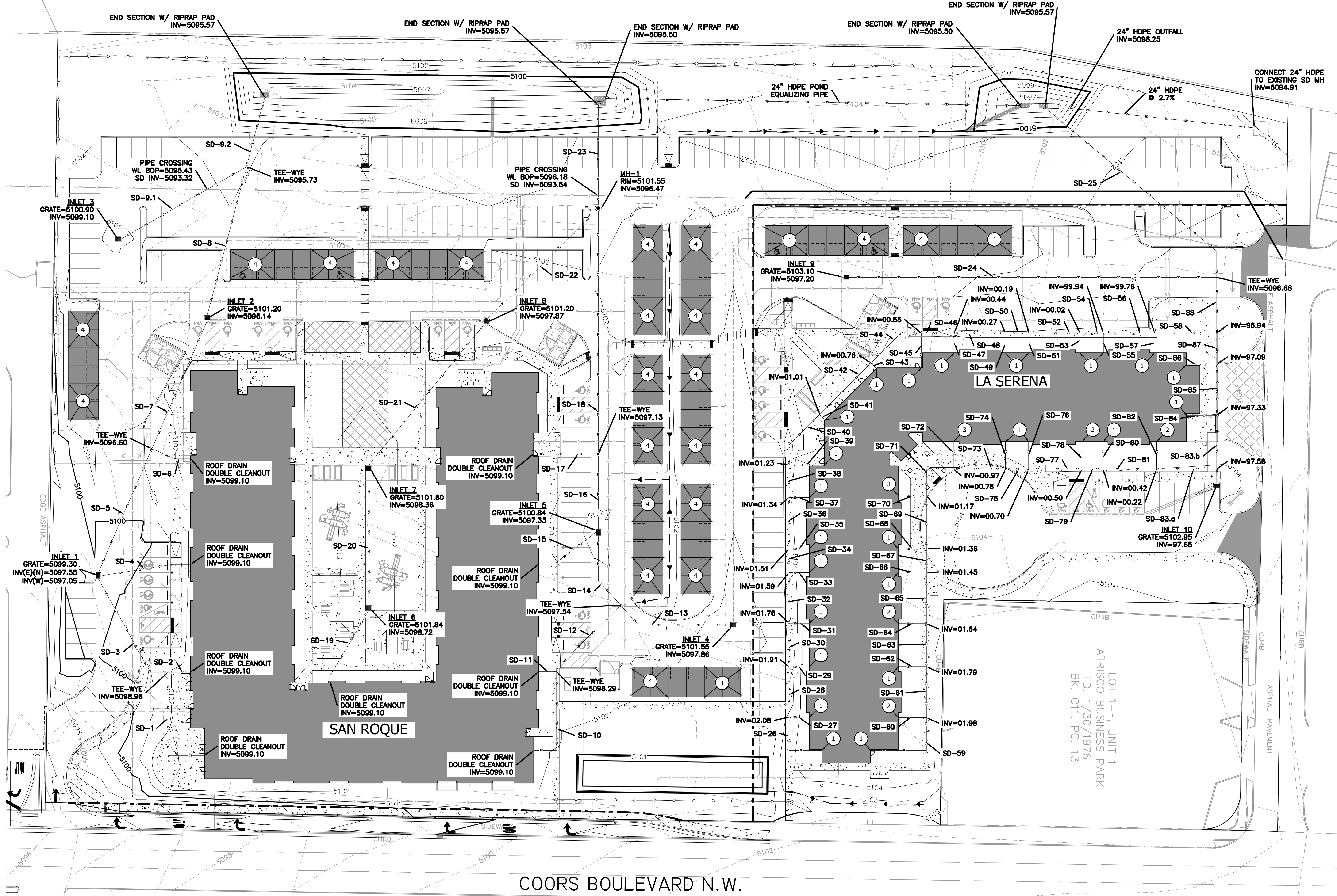
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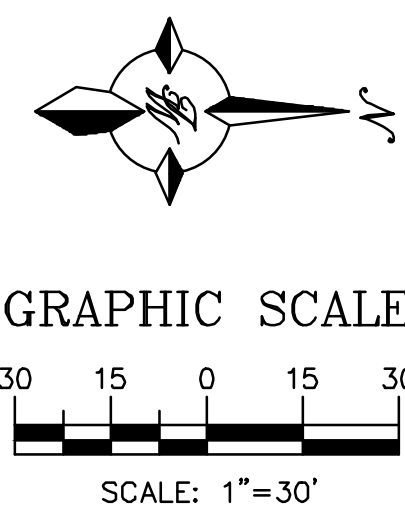
Grading & Drainage Plan

c2.1



- KEYED NOTES
- 3" ROOF DRAIN LEADER FROM 3" SHEET METAL DOWNSPOUT W/ DBL CLEANOUT (SEE PLUMBING PLANS FOR CONTINUATION) INV=5102.30
 - 6" ROOF DRAIN LEADER, WYE-CONNECTION FROM 4" ROOF DRAIN & 3" SHEET METAL DOWNSPOUT W/ DBL CLEANOUT (SEE PLUMBING PLANS FOR CONTINUATION) INV= 5102.30
 - 6" ROOF DRAIN LEADER, WYE-CONNECTION FROM 3" ROOF DRAIN & 3" SHEET METAL DOWNSPOUT W/ DBL CLEANOUT (SEE PLUMBING PLANS FOR CONTINUATION) INV=5102.30
 - GARAGE DOWNSPOUT - DAYLIGHT ABOVE FINISHED GRADE TO SURFACE FLOW AWAY FROM BLDG

- LEGEND
- HEADER CURB
 - BOUNDARY LINE
 - RIGHT-OF-WAY
 - BUILDING
 - SIDEWALK
 - STORM DRAIN
 - WATER LINE
 - FIRE LINE
 - SANITARY SEWER
 - WATER BLOCK
 - CONTOUR MAJOR
 - CONTOUR MINOR
 - SPOT ELEVATION
 - FLOW ARROW
 - EXISTING CURB & GUTTER
 - EXISTING BOUNDARY LINE
 - EXISTING CONTOUR MAJOR
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 - EXISTING WATER LINE



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no. desc. date

project: 2020010
date: 06.10.2021
drawn: vp, bf
checked: vp

Permit Set

Storm Drain
Plan

c2.3

Storm Drain Information Table						
Storm Drain ID	Contributing Basin(s)	Contributing Flow (cfs)	Pipe Slope (%)	Pipe Material	Pipe Diameter (in.)	Pipe Capacity (cfs)
SD-1	RD1	0.37	0.3	HDPE	6	0.40
SD-2	RD2	0.43	1.6	HDPE	6	0.99
SD-3	RD1-RD2	0.80	1.6	HDPE	6	0.99
SD-4	RD3	0.46	2.5	HDPE	6	1.24
SD-5	P2, RD1-RD3	2.79	0.5	HDPE	12	3.52
SD-6	RD4	0.50	9.1	HDPE	6	2.37
SD-7	P2, RD1-RD4	3.29	0.5	HDPE	12	3.52
SD-8	P2-P3, RD1-RD4	4.29	0.4	HDPE	15	5.71
SD-9.1	P11	1.09	3.5	HDPE	12	1.36
SD-9.2	P2-P3, P11, RD1-RD4	5.38	0.4	HDPE	15	5.71
SD-10	RD8	0.44	1.2	HDPE	6	0.86
SD-11	RD7	0.40	6.7	HDPE	6	2.03
SD-12	RD7-RD8	0.84	1.2	HDPE	6	0.86
SD-13	P4	2.15	0.4	HDPE	12	3.15
SD-14	P6, RD7-RD8	2.99	0.4	HDPE	12	3.15
SD-15	RD6	0.47	3.9	HDPE	6	1.55
SD-16	P5-P6, RD6-RD8	5.79	0.4	HDPE	18	9.29
SD-17	RD5	0.46	4.5	HDPE	6	1.66
SD-18	P5-P6, RD5-RD8	6.25	0.4	HDPE	18	9.29
SD-19	RD9	0.64	0.7	HDPE	6	0.66
SD-20	P16, RD9	1.19	0.4	HDPE	12	3.15
SD-21	P16-P17, RD9	1.93	0.4	HDPE	12	3.15
SD-22	P4, P16-P17, RD9	3.12	1.3	HDPE	12	5.68
SD-23	P4-P6, P16-P17, RD5-RD9	9.37	1.3	HDPE	18	16.75
SD-24	P7	0.54	0.4	HDPE	12	3.15
SD-25	P7-P8, RD10-RD41	5.48	0.7	HDPE	15	7.56
SD-26	RD10	0.02	0.5	HDPE	3	0.09
SD-27	RD11	0.06	1.6	HDPE	3	0.16
SD-28	RD10-RD11	0.08	0.5	HDPE	3	0.09

Storm Drain Information Table						
Storm Drain ID	Contributing Basin(s)	Contributing Flow (cfs)	Pipe Slope (%)	Pipe Material	Pipe Diameter (in.)	Pipe Capacity (cfs)
SD-29	RD12	0.07	2.8	HDPE	3	0.21
SD-30	RD10-RD12	0.15	0.5	HDPE	4	0.19
SD-31	RD13	0.07	3.9	HDPE	3	0.24
SD-32	RD10-RD13	0.22	0.5	HDPE	6	0.55
SD-33	RD14	0.06	5.2	HDPE	3	0.28
SD-34	RD10-RD14	0.28	0.5	HDPE	6	0.55
SD-35	RD15	0.06	5.8	HDPE	3	0.30
SD-36	RD10-RD15	0.34	0.5	HDPE	6	0.55
SD-37	RD16	0.07	7.0	HDPE	3	0.33
SD-38	RD10-RD16	0.41	0.5	HDPE	6	0.55
SD-39	RD17	0.07	4.6	HDPE	3	0.27
SD-40	RD10-RD17	0.48	0.5	HDPE	6	0.55
SD-41	RD18	0.05	24.7	HDPE	3	0.61
SD-42	RD10-RD18	0.53	0.5	HDPE	6	0.55
SD-43	RD19	0.05	29.5	HDPE	3	0.67
SD-44	RD10-RD19	0.58	0.5	HDPE	8	1.19
SD-45	RD20	0.06	7.5	HDPE	3	0.34
SD-46	RD10-RD20	0.64	0.5	HDPE	8	1.19
SD-47	RD21	0.06	14.1	HDPE	3	0.46
SD-48	RD10-RD21	0.70	0.5	HDPE	8	1.19
SD-49	RD22	0.06	15.4	HDPE	3	0.48
SD-50	RD10-RD22	0.76	0.5	HDPE	8	1.19
SD-51	RD23	0.06	16.0	HDPE	3	0.49
SD-52	RD10-RD23	0.82	0.5	HDPE	8	1.19
SD-53	RD24	0.06	17.3	HDPE	3	0.51
SD-54	RD10-RD24	0.88	0.5	HDPE	8	1.19
SD-55	RD25	0.06	17.9	HDPE	3	0.52
SD-56	RD10-RD25	0.94	0.5	HDPE	8	1.19
SD-57	RD26	0.06	19.2	HDPE	3	0.54
SD-58	RD10-RD26	1.00	9.56	HDPE	8	5.22
SD-59	RD27	0.02	0.50	HDPE	3	0.08

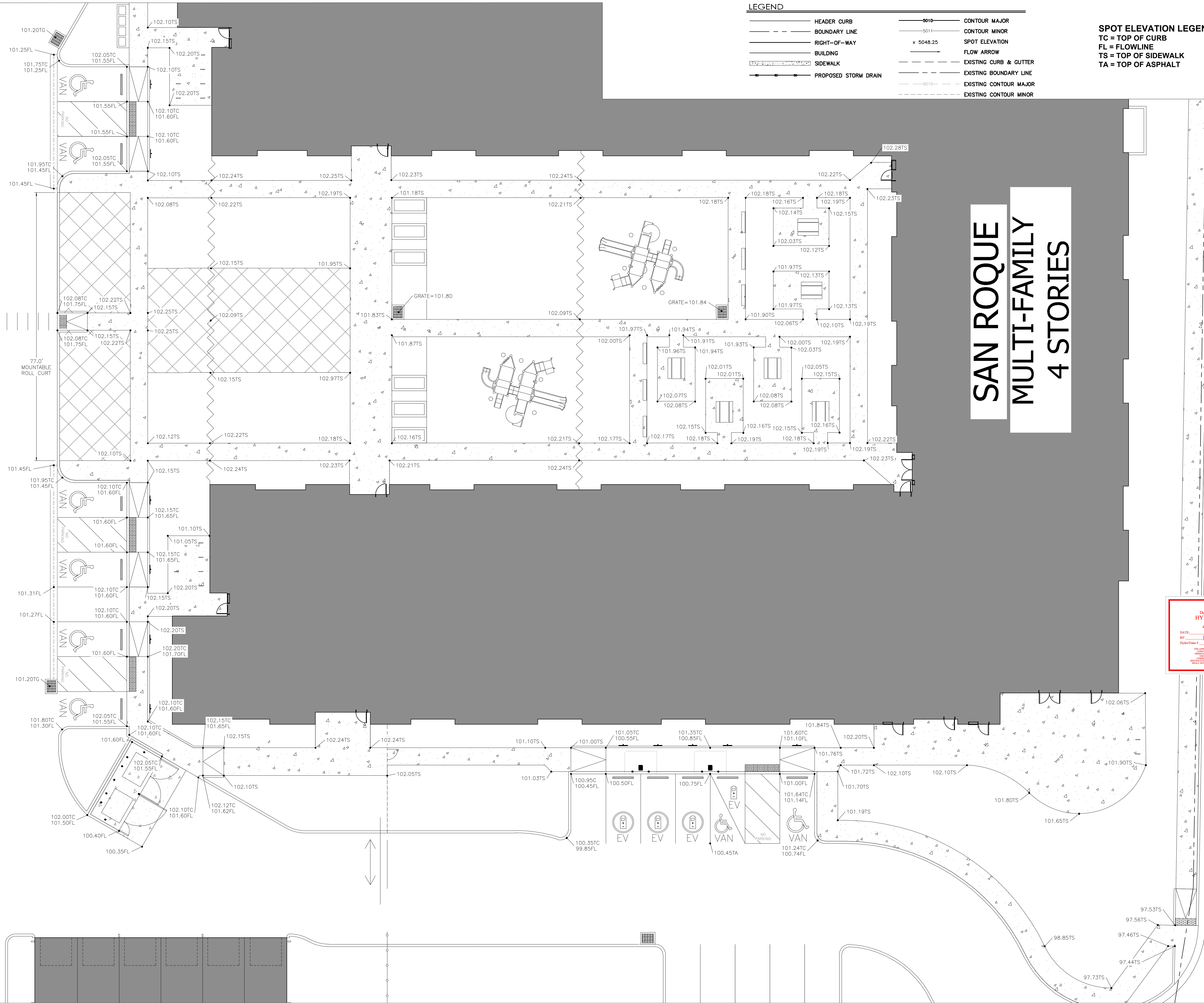
Storm Drain Information Table						
Storm Drain ID	Contributing Basin(s)	Contributing Flow (cfs)	Pipe Slope (%)	Pipe Material	Pipe Diameter (in.)	Pipe Capacity (cfs)
SD-60	RD28	0.21	1.70	HDPE	6	1.02
SD-61	RD27-RD28	0.23	0.54	HDPE	6	0.55
SD-62	RD29	0.07	2.70	HDPE	3	0.20
SD-63	RD27-RD29	0.30	0.54	HDPE	6	0.55
SD-64	RD30	0.24	3.50	HDPE	6	1.47
SD-65	RD27-RD30	0.54	0.54	HDPE	6	0.55
SD-66	RD31	0.06	4.50	HDPE	3	0.26
SD-67	RD27-RD31	0.60	0.54	HDPE	8	1.19
SD-68	RD32	0.06	4.99	HDPE	3	0.28
SD-69	RD27-RD32	0.66	0.54	HDPE	8	1.19
SD-70	RD33	0.27	6.00	HDPE	6	1.92
SD-71	RD27-RD33	0.93	0.54	HDPE	8	1.19
SD-72	RD34	0.29	7.20	HDPE	6	2.11
SD-73	RD27-RD34	1.22	0.54	HDPE	12	3.52
SD-74	RD35	0.06	8.20	HDPE	3	0.35
SD-75	RD27-RD35	1.28	0.54	HDPE	12	3.52
SD-76	RD36	0.06	8.60	HDPE	3	0.36
SD-77	RD27-RD36	1.34	0.54	HDPE	12	3.52
SD-78	RD37	0.24	9.70	HDPE	6	2.44
SD-79	RD27-RD37	1.58	0.54	HDPE	12	3.52
SD-80	RD38	0.06	10.20	HDPE	3	0.39
SD-81	RD27-RD38	1.64	0.54	HDPE	12	3.52
SD-82	RD39	0.18	11.30	HDPE	6	2.64
SD-83.a	RD27-RD39	1.82	9.44	HDPE	12	15.31
SD-83.b	P8, RD27, 39	3.88	0.70	HDPE	12	4.17
SD-84	RD40	0.02	37.50	HDPE	3	0.76
SD-85	P8, RD27-RD40	3.90	0.70	HDPE	12	4.17
SD-86	RD41	0.02	39.10	HDPE	3	0.77
SD-87	P8, RD27-RD41	3.92	0.70	HDPE	12	4.17
SD-88	P8, RD10-RD41	4.94	0.70	HDPE	15	7.56

Inlet Information Table				
Inlet ID	Contributing Basin(s)	Contributing Flow (cfs)	Inlet/Grate Type*	Inlet Capacity* (cfs)
1	P2	1.53	2'x2' Curb Inlet Standard Grate (Mid Hood)	5.95
2	P3	1	2'x2' Road & Highway Grate	6.50
3	P11	1.09	2'x2' Road & Highway Grate	6.50
4	P6	2.15	2'x2' Road & Highway Grate	6.50
5	P5	2.33	2'x2' Road & Highway Grate	6.50
6	P16	0.55	12" Dome Grate	1.65
7	P17	0.74	12" Dome Grate	1.65
8	P4	1.19	2'x2' Curb Inlet Standard Grate (Mid Hood)	5.95
9	P7	0.54	2'x2' Road & Highway Grate	6.50
10	P8	2.06	2'x2' Road & Highway Grate	6.50

*Based on Nyloplast Inlet Basin Information



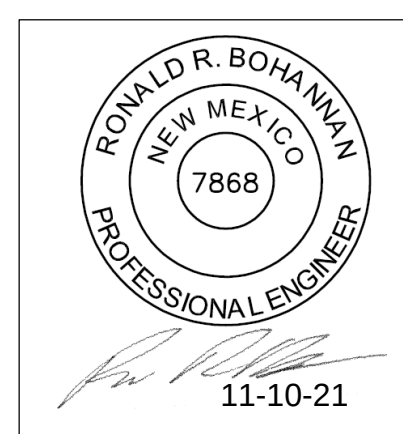
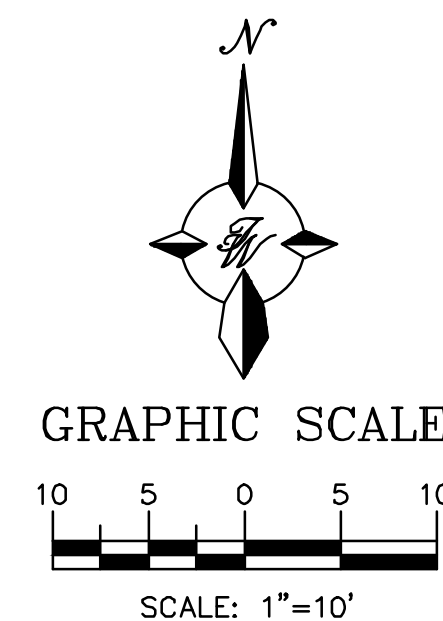
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LEGEND

- | | | | |
|-------|----------------------|-----------|------------------------|
| — | HEADER CURB | —5010— | CONTOUR MAJOR |
| - - - | BOUNDARY LINE | —5011— | CONTOUR MINOR |
| — | RIGHT-OF-WAY | x 5048.25 | SPOT ELEVATION |
| — | BUILDING | — | FLOW ARROW |
| — | SIDEWALK | — | EXISTING CURB & GUTTER |
| — | PROPOSED STORM DRAIN | — | EXISTING BOUNDARY LINE |
| | | —5010— | EXISTING CONTOUR MAJOR |
| | | —5011— | EXISTING CONTOUR MINOR |

SPOT ELEVATION LEGEND
TC = TOP OF CURB
FL = FLOWLINE
TS = TOP OF SIDEWALK
TA = TOP OF ASPHALT



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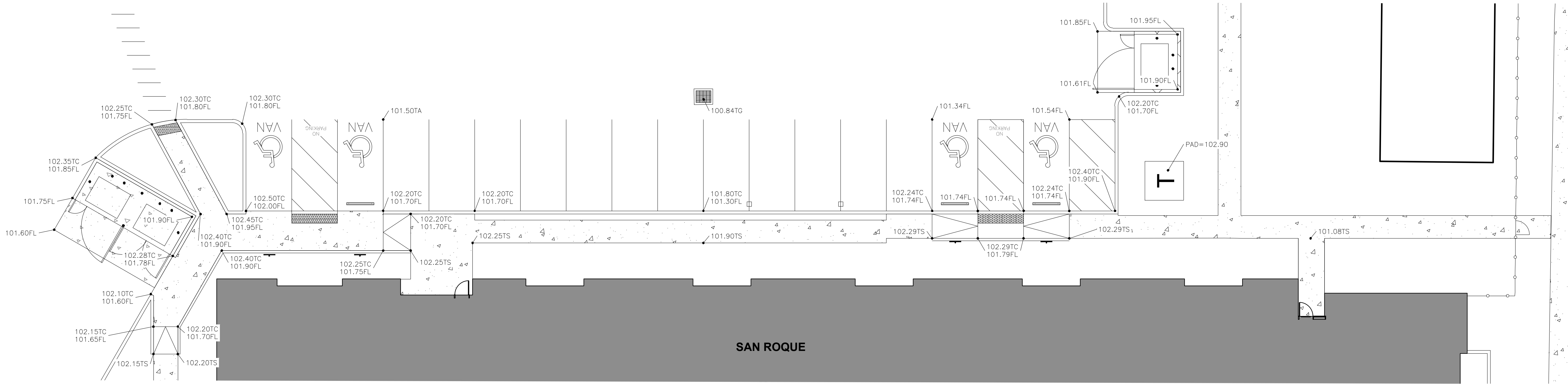
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Permit Set

Grading
Enlarged
Area 1
c2.4

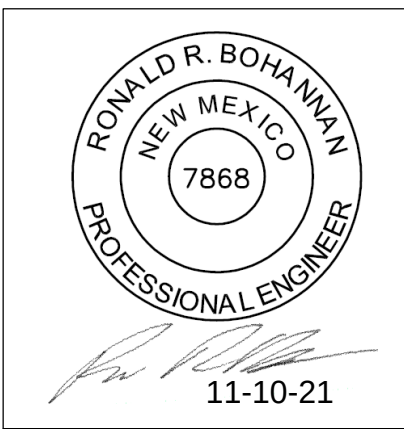
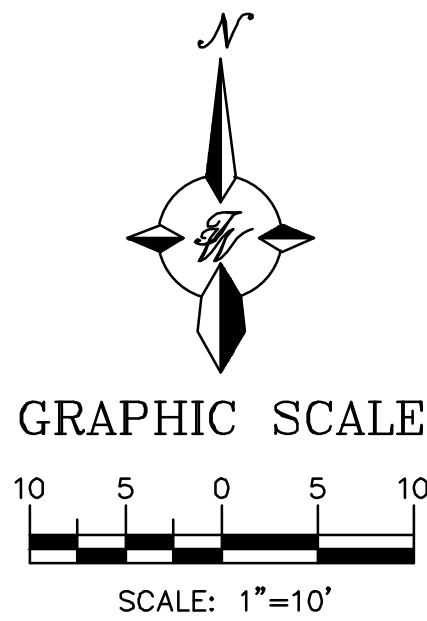
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LEGEND

HEADER CURB	5010	CONTOUR MAJOR
BOUNDARY LINE	5011	CONTOUR MINOR
RIGHT-OF-WAY	x 5048.25	SPOT ELEVATION
BUILDING		FLOW ARROW
SIDEWALK		EXISTING CURB & GUTTER
PROPOSED STORM DRAIN		EXISTING BOUNDARY LINE
		EXISTING CONTOUR MAJOR
		EXISTING CONTOUR MINOR

SPOT ELEVATION LEGEND
TC = TOP OF CURB
FL = FLOWLINE
TS = TOP OF SIDEWALK
TA = TOP OF ASPHALT



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date: 11.10.2021
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Permit Set

Grading
Enlarged
Area 2
c2.5





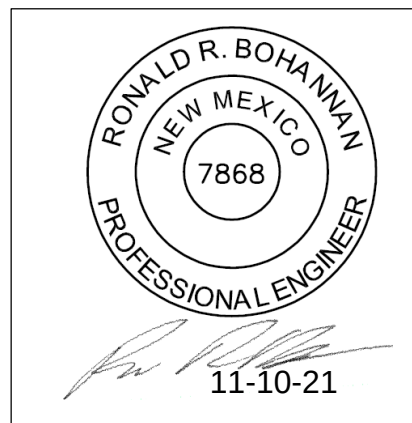
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date:	11.10.2021
drawn:	vp,bf
checked:	vp

Permit Set

**Grading
Enlarged
Area 3 & 4**

c2.6



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