Sagebrush Substation

Drainage Report

Prepared for: PNM

AECOM Project Number: 60637616

October 2021

City of Albuquerque
Planning Department
Development Review Services
HYDROLOGY SECTION
APPROVED

DATE: 11/22/21

BY: Renée C. Brissette

HydroTrans # M15D049

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.

AECOM Imagine it. Delivered.

PNM

This report, entitled Sagebrush Transmission Station Drainage Report, was prepared by me or directly under my supervision.

Dana M Peterson, PE

New Mexico PE Number 23231

Table of Contents

Attachments

Purpose

The purpose of this report is to determine pre- and post- runoff drainage characteristics and drainage design for the new PNM substation on University Blvd NE, just north of Sunport Blvd.

Introduction

Project Location

The project is located within a new blanket easement to be granted to PNM on Tract A-1, Sunport Municipal Addition (see **Attachment 1-1**), and below (**Figure 1**).

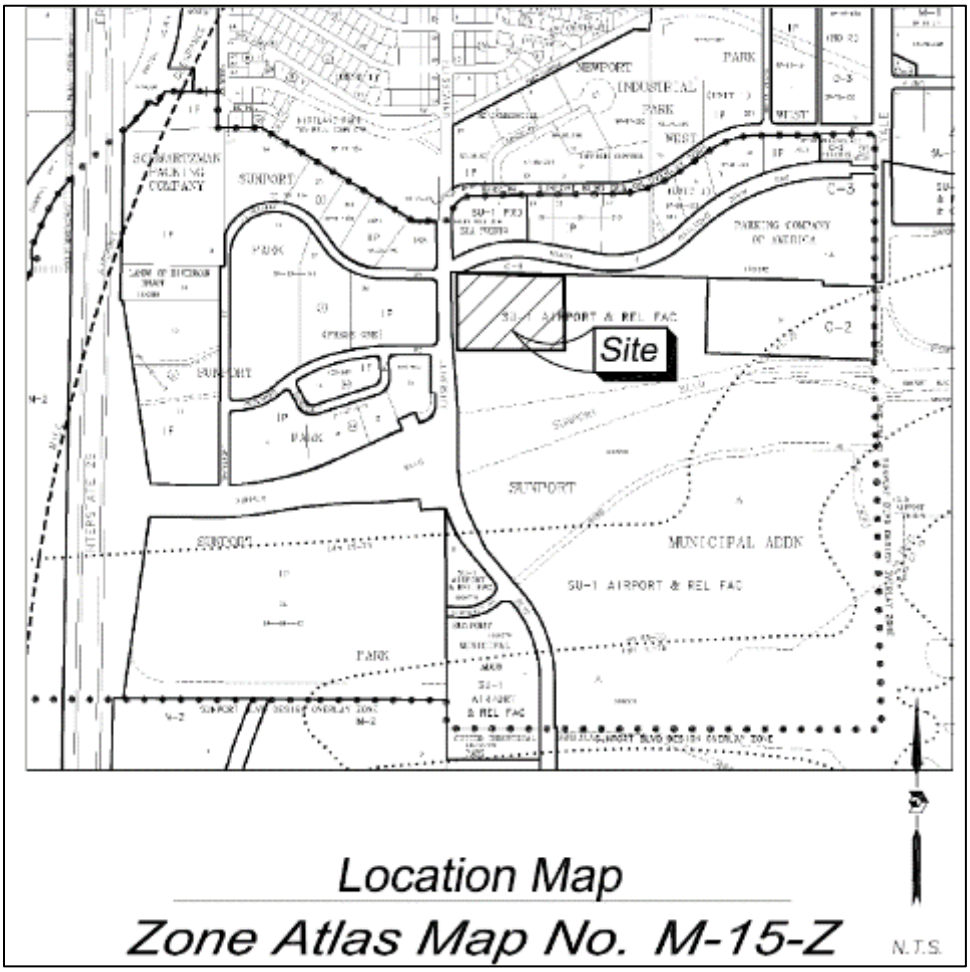


Figure 1: Project location

Because property is part of the Albuquerque International Airport (AIA or Sunport), no portion of the property may be subdivided or sold and the underlaying ownership will remain City of Albuquerque. The project site is located on the closed Yale landfill. As part of this project, a portion of the landfill and cap will be removed, excavated, and remediated.

Floodplain

This project is not located in a Special Flood Hazard Area per FEMA FIRM Panel: 35001C0342G effective: 9/26/2008 (**Figure 2**):

Figure 2: FEMA FIRM excerpt

This project is designed to result in no adverse impact to downstream floodplains.

Hydrology

The purpose of the existing and proposed Hydrology is to demonstrate that the proposed development will have no adverse impact on downstream capacity as it will not modify the discharge locations in a way that negatively impacts adjacent properties, including ROW. The proposed development will also have no adverse impact on the remaining landfill to the east; the remaining landfill outside the construction limits will remain undisturbed and no additional infiltration of water will occur.

Hydrology Design Data

Elevation data for the offsite contributing drainage areas was obtained from 2010 Bernalillo County LiDAR with 1-2ft vertical accuracy (BernCo, 2010). Onsite elevation data was obtained from the site survey conducted in April 2020 with 1ft vertical accuracy. The two datasets were merged in ArcGIS to create a seamless raster from which contour data could be derived and drainage basins delineated. All

elevation data herein is presented in NAVD 88; horizonal data is in NAD83/New Mexico State Plan Coordinate System -Central (US Foot).

The following hydrologic inputs and assumptions were used:

- Software: HEC-HMS 4.7
- Runoff Method: SCS Curve Numbers w/ CABQ Land Treatments (A, B, C, & D)
- Storm: 100 year, 24 hour storm with peak at hour 12
- Precipitation Data: NOAA Atlas 14, at centroid of study area, see **Attachment 1-2**
- Time of Concentration: SCS Upland method, per DPM 6-2(B)(2)
- Lag time: SCS Curve Number method, per DPM 6-2(B)(3)

Existing Hydrology

The existing drainage area is divided as shown in **Attachment 2-1**. Hydrologic inputs are provided in **Attachment 2-2**; HEC-HMS model development and model results are provided in **Attachment 2-3**. In the existing condition, the site and upstream offsite basins contribute 30.4 cfs and 1.2 Ac-Ft to North University Blvd near the Railroad Spur ROW during the 100-yr 24hr storm (Attachment 2-3).

- Basin EXT-1, discharges to N University down the steep slope of the landfill cap
- Basin EXT-2, discharges to Tract C-3, then to the Railroad Spur ROW
- Basin EXT-3 discharges to Tract C-3 further east (uphill from the site), then combines with Basin EXT-2 near N University
- Basin EXT-4 discharges to S University, south of Woodward
- Basin EXT-5 discharges to Tract C-3 further east (uphill from the site), then combines with Basin EXT-2 and EXT-3 near N University

The entire existing site and contributing offsite drainage is a capped landfill on steep slopes with sparse desert scrub. Land Treatment C, per the DPM Ch.6, with a curve number of 86 was applied to all basins.

A common downstream point of interest was selected on North University near the Railroad Spur to serve as a comparison point between the existing and proposed conditions. It is important to note that this analysis point does not include the adjacent offsite flows (such as direct runoff from University Blvd) as they do not impact the project site. The function of this analysis point is to demonstrate no adverse impact on downstream capacity (flow and volume) from the proposed development.

There is a high point in University, just south of the Woodward intersection; flows from Basin EXT-4 break south and discharge into inlets at South University and Sunport. The south portion of the site and upstream offsite basins contribute 8.9 cfs and 0.4 Ac-Ft to University Blvd near Sunport during the 100-yr 24hr storm (Attachment 2-3).

Proposed Hydrology

The proposed drainage area is divided as shown in **Attachment 3-1**. Hydrologic inputs are provided in **Attachment 3-2**; HEC-HMS model development and model results are provided in **Attachment 3-3**.

In the proposed condition, the site and upstream offsite basins contribute 27.7 cfs and 1.1 Ac-Ft to North University Blvd near the Railroad Spur ROW during the 100-yr 24hr storm (Attachment 3-3) via proposed sidewalk culverts and the existing Railroad Spur. The south portion of the site and upstream

offsite basins contribute 10.8 cfs and 0.4 Ac-Ft to South University Blvd near Sunport during the 100-yr 24hr storm (Attachment 3-3) via the new driveway cut and existing bike trail (see Grading Plan and Drainage Details, Attachment 5).

The proposed drainage areas are divided as shown in Attachment 3-1. The proposed grading will reroute drainage as follows:

- Basin EXT-1 will continue to discharge to N University, except it will be via new sidewalk culverts further north instead of washing across the sidewalk.
- Most of Basin EXT-2 will be rerouted to discharge to N University, reducing the discharge into Tract C-3. A small portion of EXT-2 will continue to discharge to north into Tract C-3. A small portion of EXT-2 will also be rerouted to discharge to S University, south of the Woodward high point to obtain consistency with the subbasins delineated in the Albuquerque International Airport Storm Drainage Master Plan (Molzen-Corbin, 1995 and CABQ File: M16D024, relevant portions included as **Attachment 1-3a**).
- Approximately half of Basin EXT-3 will be rerouted to discharge to N University, reducing the discharge into Tract C-3. The remaining half of EXT-3 will continue to discharge into Tract C-3.
- Basin EXT-4 will continue to discharge to S University.
- Basin EXT-5 will continue to discharge to Tract C-3.

The proposed work will push the steep slope of the landfill cap to the east of the proposed substation. The excavated landfill will be replaced with stabilized slopes and the substation. The contributing drainage area outside the substation will remain Land Treatment C with a curve number of 86. The majority of the substation will also remain Land Treatment C; impervious cover is minimized within the substation in order to accommodate the grounding field. Only an electrical enclosure and 6 control panel pads will be impervious. There are also 6 containment pads housing transformer fluid (mineral oil); these pads are required to retain at least 2x the 100-yr rainfall plus the oil volume; these areas are removed from the runoff calculations.

Proposed Alternative

As shown in the Conceptual Drainage and Grading Plan (**Attachment 5**) The western portion of the landfill will be removed in order to build the substation; the eastern portion will remain. A capped and stabilized embankment will be located at the interface of the two portions and diversion swales will be constructed around the outside of the concrete curtain wall of the substation. Within the substation, an HDPE storm drain will collect flows and convey to North University near the RR spur.

Sidewalk culverts, per CABQ Standard Detail 2236, will be used to convey flows onto North University near the RR spur under the newly constructed bike path. A stilling basin with headwall will be added on the east side of the bike path to collect flows from the west (W) swale and the storm drain and provide enough head to convey the 100-yr flow through the sidewalk culverts. The south (S) swale will capture flows from Basin PROP-4A and convey to S University via the driveway cut.

Per the approved Landfill Management Plan for Yale Landfill (INTERA, 2014; relevant portions included as **Attachment 1-3b**), section 4.2.2, development of the site includes "*Prohibition of engineered storm water retention and detention basins over and/or adjacent to landfill materials*". Therefore, the Storm Water Quality Volume of 153cf (Attachment 3-2) will not be retained onsite; payment in lieu of onsite management is requested.

Hydraulics

The drainage features identified in the proposed alternative were sized for the 100-yr peak flow and detailed calculations are provided as **Attachment 4**. The locations of these features are also shown in **Attachment 4-1**.

The four diversion swales were sized using the Manning's equation (see **Attachment 4-2**) with a Manning's n value of 0.030 for small cobble/rip-rap (3-6"). The proposed sidewalk culverts onto University near the RR Spur were sized using the orifice equation as a headwall will be constructed at the upstream end allowing full submergence and orifice-type hydraulic behavior. Channel capacity of the sidewalk culverts was also checked using the Manning's equation; the orifice equation governed (also in Attachment 4-2).

The onsite storm drain capacity was determined with the Manning's equation using Bentley FlowMaster. The minimum permissible slope for given the pipe size (18" HDPE) and flows (Q_{100} for PROP-2A, 2B, and 2C) was determined in **Attachment 4-3**.

Erosion Control

Post-construction erosion control will be accomplished by reseeding the disturbed area per CABQ Specification 1012, including gravel mulch on slopes 3:1 and greater or stabilized with gravel mulch per the landscaping plan. Areas of concentrated flow, notably the diversion swales and the storm drain outfall, will be lined with 3-6" rip-rap. The areas within the substation will not be reseeded but will instead be dressed with a layer of gravel for the grounding field. All driveways within the substation will also be gravel. During-construction erosion and sediment control will be performed by the contractor, per the site's Erosion and Sediment Control Plan and Storm Water Pollution Plan. These documents will be prepared by the owner's or contractor's Storm Water Quality sub-contractor.

Downstream Capacity

- Peak discharge and volume to North University near the RR Spur is reduced by 2.5 cfs and 0.1 Ac-Ft (**Table 1**)
- Peak discharge and volume to South University near Sunport is increased by 2.1 cfs and 0.1 Ac-Ft (Table 1)

Table 1: Change in Flow and Volume

Discharge Point	Existing		Proposed		Change (Proposed minus Existing)	
	Q_{100} (cfs)	V_{100} (Ac-Ft)	Q_{100} (cfs)	V_{100} (Ac-Ft)	Q_{100} (cfs)	V_{100} (Ac-Ft)
North University	30.35	1.19	27.72	1.08	-2.63	-0.11
South University	8.85	0.35	10.84	0.42	+1.99	+0.07
Total to ROW	**39.20**	**1.54**	**38.56**	**1.50**	**-0.64**	**-0.04**

- The drainage areas and runoff characteristics of the proposed improvements are consistent with the Albuquerque International Airport Storm Drainage Master Plan (Molzen-Corbin, 1995 and

CABQ File: M16D024); specifically Subbasin S-P 407 (Basin PROP-4A and PROP-4B, this report) and Subbasin K-C 314.1 (Basins PROP-1, PROP-2A, PROP-2B, PROP-2C, PROP-5A, and PROP 5B, this report)

- No outstanding drainage improvements (required infrastructure) are identified for in the Master Plan (Molzen-Corbin, 1995, Section IV) for Subbasin S-P 407 and Subbasin K-C 314.1; local improvements (sidewalk culverts and driveway cut) will be made along University as part of this work

References and Data Sources

BernCo. “LiDAR-derived, Topographic Contours – Bernalillo County.” Bohannan-Huston, Inc. 2010.

CABQ. “Albuquerque Development Process Manual: Chapter 6, Drainage, Flood Control, and Erosion Control.” 2020.

INTERA. “Landfill Management Plan Former Yale Landfill.” INTERA Inc. 2014

Molzen-Corbin. “Albuquerque International Airport Storm Drainage Master Plan.” Molzen-Corbin Inc. Drainage File:M16D024, 1995

NOAA. “Point Precipitation Frequency Estimates.” Version: NOAA Atlas 14, Volume 1, Version 5. Retrieved August, 2020.

Attachment 1

Supporting Documents

1-1 Letter of Authorization and Easement

1-2 NOAA 14 Precipitation

1-3 Relevant Excerpts from:

a. Albuquerque International Airport Storm Drainage Master Plan
b. Landfill Management Plan Former Yale Landfill

1-1 Letter of Authorization and Easement

April 23, 2021

Rebecca Cook, Team Leader
Ground Water Bureau, Voluntary Remediation Program
Harold Runnels Building
1190 St. Francis Drive, Suite N2150
Santa Fe, NM 87505
Via email: Rebecca.Cook@state.nm.us

Re: Voluntary Remediation Program - Sagebrush Substation

Dear Ms. Cook:

The purpose of this letter is to authorize Public Service Company of New Mexico (PNM) and AECOM Technical Services, Inc. (AECOM) to act as agents for the City of Albuquerque Aviation Department for site activities associated with the Voluntary Remediation Program (VRP) for the property located on the northeast corner of Sunport Boulevard and University Boulevard SE. The subject property is described as approximately 20.8778 acres within a portion of Tract A-1, Sunport Municipal Addition, situated in Section 33, T. 10 North, R. 3 East Albuquerque, Bernalillo County, New Mexico.

This authorization will allow PNM and AECOM access and right to remediate the property and complete associated remediation activities, including permit applications and reporting requirements, in accordance with the New Mexico Environment Department-approved Work Plan as participants in the VRP for said property.

The authorization will allow access from the date that the final Voluntary Remediation Agreement is signed until the issuance of the Certificate of Completion, unless revoked in writing by the City.

Respectfully,

DocuSigned by:
Nyika A. Allen
7F93EEDDB46946A...

4/23/2021 | 12:46 PM PDT

Nyika Allen, C.M.
Director of Aviation

Copy: Richard McCurley, Aviation Landside Deputy Director
Peter Pierotti, Aviation General Counsel
Chris Albrecht, Aviation Environmental Program Manager
Rhonda Methvin, Aviation Planning Manager
Jennifer, Muus, NMED Ground Water Bureau

Stewart File #9956280 H

PNM MT#0400262
A#004959 O#000334

PUBLIC SERVICE COMPANY OF NEW MEXICO
EASEMENT (SUBSTATION)

THIS EXCLUSIVE EASEMENT made this 22 day of Sept., 2021 by and between **City of Albuquerque**, a New Mexico municipal corporation ("Grantor") and **PUBLIC SERVICE COMPANY OF NEW MEXICO**, a New Mexico corporation ("Grantee"), and their successors and assigns.

WITNESSETH:

Grantor, for valuable consideration as provided in a separate agreement, the receipt of which is acknowledged, does hereby give, bargain, sell, grant and convey unto Grantee, its successors and assigns, an exclusive easement to build, rebuild, construct, reconstruct, locate, relocate, change, remove, replace, modify, renew, upgrade, operate and maintain an electric substation and overhead and/or underground facilities ("Facilities"). The Facilities shall be utilized only for the transmission and distribution of electric power and energy. The Facilities may include (but are not limited to) transformers, switches, circuit breakers, antennae, lines, cables, poles, guy wires, anchors, conduits, fiber optics, and other equipment, fixtures, appurtenances and structures necessary to maintain the Facilities on, over, beneath, through and across the easement hereinafter described, together with free access to, from and over said easement for the purposes set forth herein and with the right to utilize the easement to extend services to customers of Grantee and to trim and remove any trees, shrubs, bushes or vegetation and remove any structures which interfere with the purposes set forth herein. The Facilities and operation thereof must comply with Federal Aviation Administration regulations regarding height restrictions and glare. This easement is granted from the date first written above and for so long as after the electric substation is energized the electric substation provides beneficial transmission and distribution of electric power and energy, and this easement shall automatically terminate ninety (90) days after "abandonment" by Grantee, which "abandonment" shall occur only if, after the electric substation is energized, (i) the electric substation is not used in providing service to any of Grantee's customers for a continuous period of three hundred sixty-five (365) consecutive days and (ii) during such continuous period of three hundred sixty-five (365) consecutive days, no activities occur relating to any building, rebuilding, construction, reconstruction, location, relocation, change, removal, replacement, modification, renewing, upgrading, operating or maintaining the Facilities. Grantee agrees that it will use the premises in compliance with the Federal Nondiscrimination Provisions attached hereto as Exhibit "B" and incorporated herein as if set forth in full.

As part of the consideration for this grant of easement, the Grantee shall save, defend, indemnify and hold Grantor harmless from any and all liability that may arise as a result of the construction and use of the easement for the purposes set forth herein, provided however, this agreement to save, defend, indemnify and hold Grantor harmless shall not extend to liability, claims, actions, damages, losses, costs or expenses, including attorney's fees: (a) that arise out of or are related to Grantee's compliance with any codes, rules, regulations, or ordinances of Grantor or any permits, plans or approvals given by Grantor, its officers, employees or agents, and (b) to the extent NMSA 1978 §56-7-1 (2005) is applicable to this grant of easement, if at all, that arise out of bodily injury to persons or damage to property caused by or resulting from, in whole in part, the negligence, act or omission of the Grantor, its officers, employees or agents.

This easement form and provisions are specific to this transaction, and shall not serve as a precedent for existing and future easements obtained by Grantee from Grantor, or as a precedent for existing and future substations on Grantor property. The exclusive easement granted herein is within lands situate in Bernalillo County, New Mexico, and is more particularly described as follows, to wit:

PNM MT#0400262

An exclusive easement of approximately 20.8778 acres within a portion of Tract A-1, SUNPORT MUNICIPAL ADDITION, situate in Section 33, T. 10 North, R. 3 East, Albuquerque, Bernalillo County, New Mexico, as the same is shown and designated on said Plat filed for record in the Office of the County Clerk of Bernalillo County, New Mexico, on October 13, 2011, as Document No. 2011092575 in Plat Book 2011C, Page 106, and being more particularly shown and described on Exhibit "A", attached hereto and made apart hereof, to the extent and only to the extent of the surface area and depths shown and described on such Exhibit "A".

This easement is made subject to all easements affecting the above described property of record in Bernalillo County, New Mexico to the extent reflected on Exhibit "A" attached hereto.

Grantor hereby covenants that Grantor is the true and lawful owner of the land described herein, and that Grantor has a good and lawful right to convey the easement interest herein.

The provisions hereof shall inure to the benefit of and bind the heirs, executors, mortgagees, lessees, tenants, successors and assigns of the parties hereto. Grantee shall have the right to assign this easement and the rights granted herein, and its assigns shall have the same right to assign this easement and the rights granted herein.

WITNESS our hands this 22 day of Sept., 2021.

City of Albuquerque, a New Mexico municipal corporation

_____ (SIGNATURE)
Sarita Nair
Chief Administrative Officer

ACKNOWLEDGMENT FOR CORPORATION

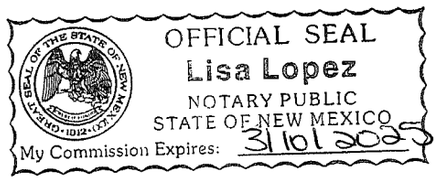
STATE OF NEW MEXICO

COUNTY OF BERNALILLO

This instrument was acknowledged before me on Sept. 22, 2021, by Lawrence Rael, Chief Operating Officer, on behalf of Sarita Nair, Chief Administrative Officer, City of Albuquerque, a New Mexico municipal corporation, on behalf of said corporation. Said officer hereby acknowledges that he is the duly authorized signatory for said corporation.

Lisa Lopez (SIGNATURE)
Notary Public

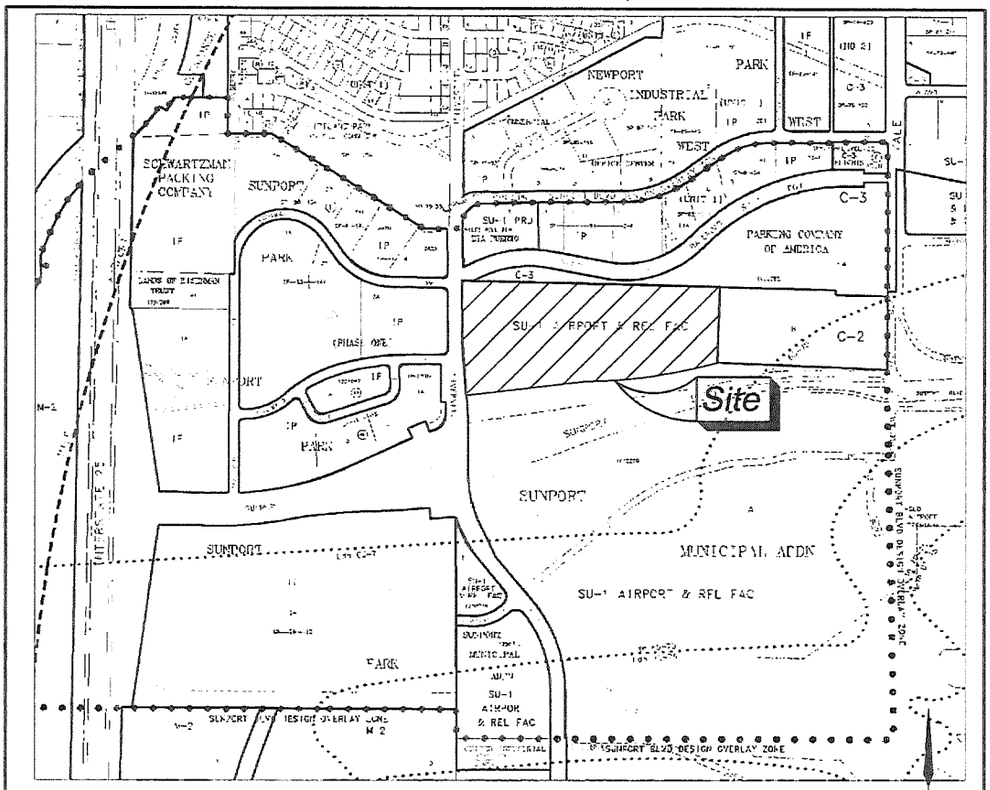
My commission expires: 3/10/2025
Seal:



FOR RECORDER'S USE ONLY

PNM REFERENCE NUMBER

EXHIBIT " A"



Location Map

Zone Atlas Map No. M-15-Z

N.T.S.

Surveyor's Certificate

I, LARRY W. MEDRANO, A REGISTERED PROFESSIONAL SURVEYOR UNDER THE LAWS OF THE STATE OF NEW MEXICO, HEREBY CERTIFY THAT THIS EXHIBIT FOR EASEMENT SURVEY WAS PREPARED FROM FIELD NOTES OF AN ACTUAL SURVEY MEETING THE MINIMUM REQUIREMENTS FOR THIS CLASSIFICATION OF SURVEY AS PER THE MINIMUM STANDARDS FOR LAND SURVEYING IN NEW MEXICO AS ADOPTED BY THE N.M. BOARD OF LICENSURE FOR ENGINEERS AND SURVEYORS, AND IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

6/25/21

LARRY W. MEDRANO
N.M.P.S. No. 11993

DATE

LARRY W. MEDRANO
NEW MEXICO
11993
REGISTERED PROFESSIONAL SURVEYOR

Acknowledgment

STATE OF NEW MEXICO)
SS
COUNTY OF BERNALILLO)

THIS INSTRUMENT WAS ACKNOWLEDGED BEFORE ME THIS 25th DAY OF June 2021 BY LARRY W. MEDRANO, PRESIDENT, PRECISION SURVEYS, INC.

BY Carol A. Cisneros MY COMMISSION EXPIRES: 8-11-2024

NOTARY PUBLIC

OFFICIAL SEAL
CAROL A CISNEROS
Notary Public
State of New Mexico
My Commission Expires 8-11-2024

RECORDING STAMP

PRECISION SURVEYS, INC.

OFFICE LOCATION:
9200 San Mateo Boulevard, NE
Albuquerque, NM 87113

505.856.5700 PHONE
505.856.7900 FAX

COORDINATE AND DIMENSION INFORMATION				PLSS INFORMATION				PROJECT INFORMATION		INDEXING INFORMATION
STATE PLANE ZONE: NM-C	GRID COORDINATES: GRID	TYPE: AGRS NETWORK		LAND GRANT: N/A				CREW/TECH: SP/DP	DATE OF SURVEY: MAY 2020	PROPERTY OWNER: CITY OF ALBUQUERQUE
HORIZONTAL DATUM: NAD83	VERTICAL DATUM: NAVD88	ROTATION ANGLE: 0° 00' 00.00"		SECTION: 33	TOWNSHIP: 10 NORTH	RANGE: 03 EAST	MERIDIAN: NMPM	DRAWN BY: MC/MA	CHECKED BY: LM	SUBDIVISION NAME: SUNPORT MUNICIPAL ADDITION
CONTROL USED: ALBUQUERQUE GEOGRAPHIC CONTROL SYSTEM		BASE POINT: N = 0 E = 0		CITY: N/A		COUNTY: BERNALILLO	STATE: NM	PSI JOB NO.: 20-4033	SHEET NUMBER: 1 OF 3	UPC: 101605420230220101
COMBINED SCALE FACTOR: GRID TO GROUND: 1.000322704 GROUND TO GRID: 0.999677401	DISTANCE ANNOTATION: GROUND	BEARING ANNOTATION: GRID								

Legal Description

EXHIBIT "A"

PNM PERMANENT EASEMENT

A PNM PERMANENT EASEMENT LYING AND SITUATE WITHIN SECTION 33, TOWNSHIP 10 NORTH, RANGE 3 EAST, ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO, COMPRISING OF A PORTION OF TRACT A–1, SUNPORT MUNICIPAL ADDITION AS THE SAME IS SHOWN AND DESIGNATED ON THE PLAT THEREOF, FILED IN THE OFFICE OF THE COUNTY CLERK OF BERNALILLO COUNTY, NEW MEXICO ON OCTOBER 13, 2011, IN BOOK 2011C AT PAGE 0106, SAID EASEMENT SITE BEING MORE PARTICULARLY DESCRIBED BY NEW MEXICO STATE PLANE COORDINATE SYSTEM GRID BEARINGS (NAD 83–CENTRAL ZONE) AND GROUND DISTANCES (US SURVEY FEET) AS FOLLOWS;

BEGINNING AT THE NORTHWEST CORNER OF DESCRIBED EASEMENT, LYING ON THE NORTH BOUNDARY LINE OF SAID TRACT A–1, FROM WHENCE A TIE TO AGRS MONUMENT "5_M14" BEARS S 79°27'16" W, A DISTANCE OF 4781.06 FEET;

THENCE FROM SAID POINT OF BEGINNING, ALONG SAID NORTH BOUNDARY LINE, S 88°41'01" E, A DISTANCE OF 1548.29 TO THE NORTHEAST CORNER OF DESCRIBED EASEMENT;

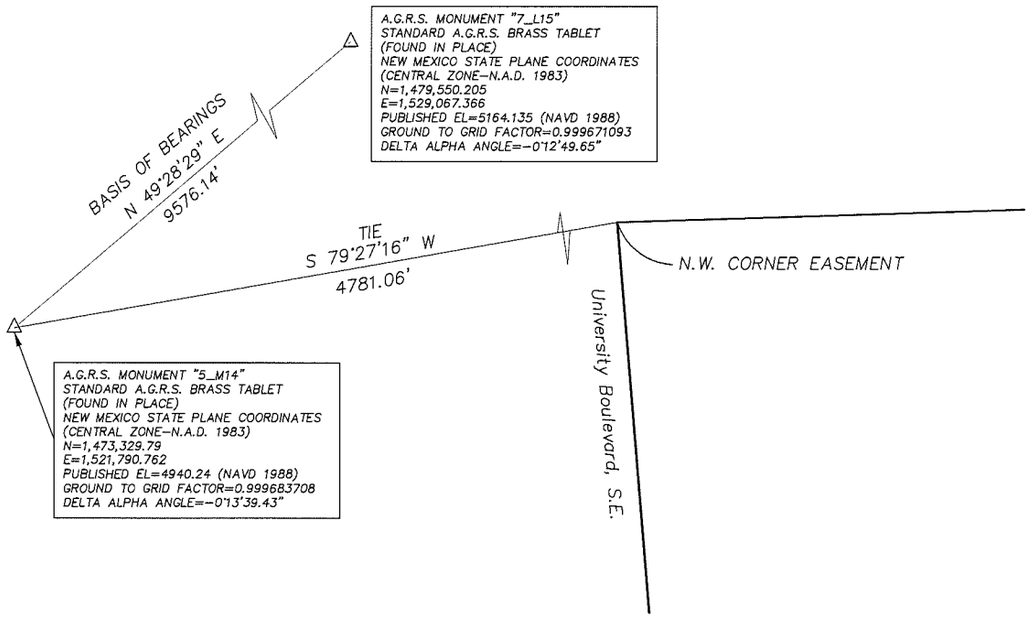
THENCE LEAVING SAID NORTH BOUNDARY LINE, S 02°00'56" W, A DISTANCE OF 451.91 FEET TO THE SOUTHEAST CORNER OF DESCRIBED EASEMENT;

THENCE S 78°52'54" W, A DISTANCE OF 908.43 FEET TO AN ANGLE POINT;

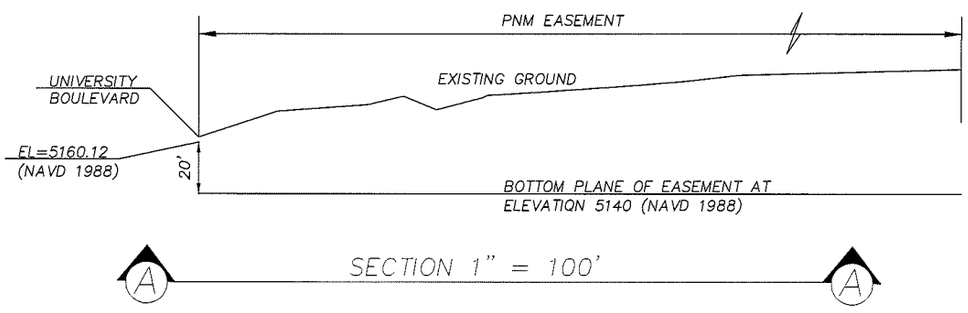
THENCE S 89°48'39" W, A DISTANCE OF 615.36 FEET TO THE SOUTHWEST CORNER OF DESCRIBED EASEMENT, LING ON THE EAST RIGHT OF WAY LINE OF UNIVERSITY BOULEVARD, S.E.;

THENCE ALONG SAID EAST RIGHT OF WAY LINE, N 04°17'02" W, A DISTANCE OF 314.75 FEET TO AN ANGLE POINT;

THENCE CONTINUING ALONG SAID EAST RIGHT OF WAY LINE, N 00°17'07" W, A DISTANCE OF 350.54 FEET TO THE POINT OF BEGINNING, CONTAINING 20.8778 ACRES (909,435 SQUARE FEET), MORE OR LESS, WITH THE BOTTOM PLANE OF EASEMENT AT 5140 FEET (NAVD 88).



Tie and Basis of Bearings Detail



PRECISION SURVEYS, INC.

OFFICE LOCATION:
9200 San Mateo Boulevard, NE
Albuquerque, NM 87113

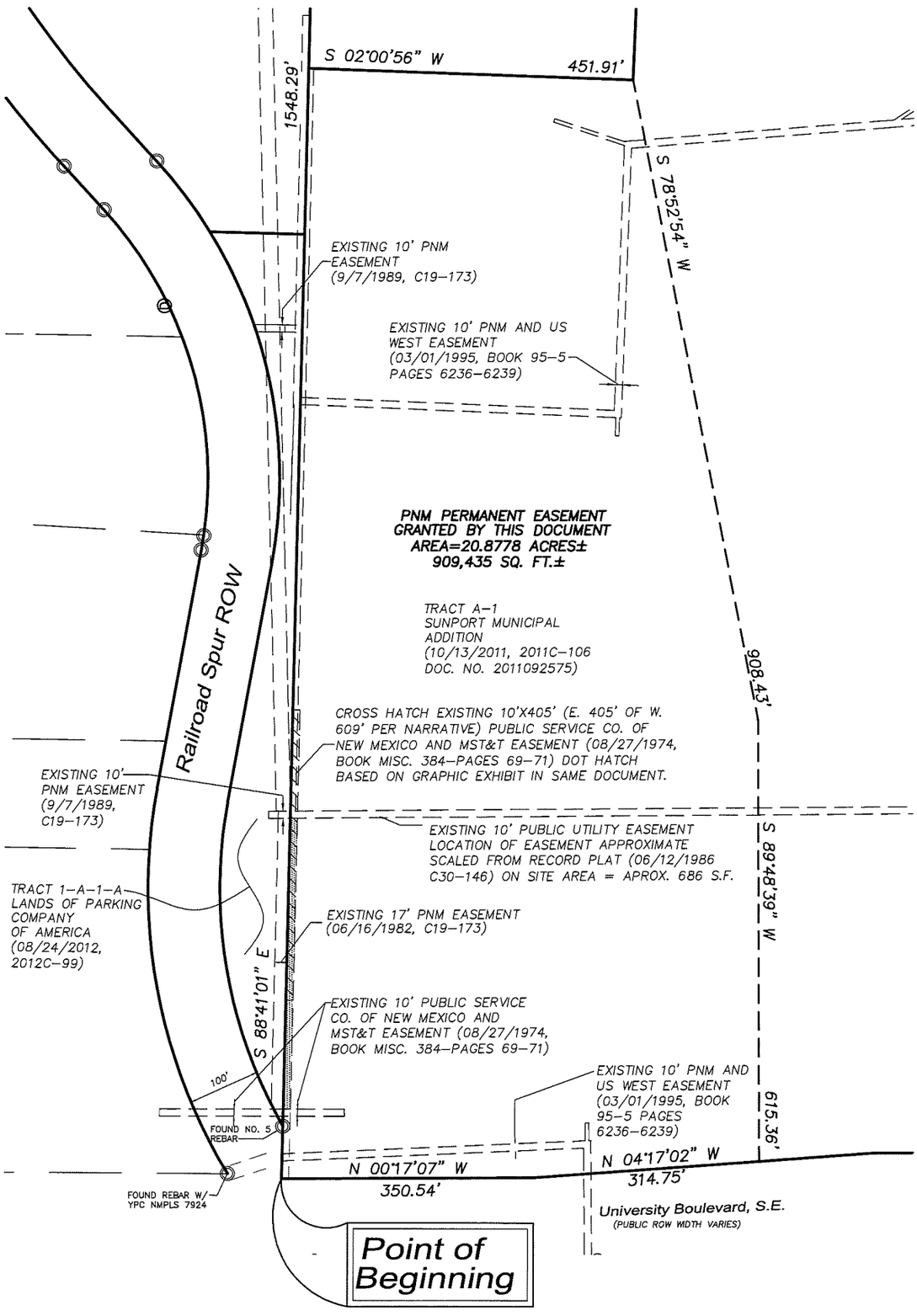
505.856.5700 PHONE
505.856.7900 FAX

COORDINATE AND DIMENSION INFORMATION				PLSS INFORMATION				PROJECT INFORMATION		INDEXING INFORMATION
STATE PLANE ZONE: NM-C	GRID /GROUND COORDINATES: GRID	TYPE: AGRS NETWORK		LAND GRANT N/A				CREW/TECH: SP/DP	DATE OF SURVEY MAY 2020	PROPERTY OWNER CITY OF ALBUQUERQUE
HORIZONTAL DATUM: NAD83	VERTICAL DATUM: NAVD88	ROTATION ANGLE: 0° 00' 00.00"		SECTION 33	TOWNSHIP 10 NORTH	RANGE 03 EAST	MERIDIAN NMPM	DRAWN BY: MC/MA	CHECKED BY: LM	SUBDIVISION NAME SUNPORT MUNICIPAL ADDITION
CONTROL USED: ALBUQUERQUE GEOGRAPHIC CONTROL SYSTEM		BASE POINT N = 0 E = 0		CITY N/A		COUNTY BERNALILLO	STATE NM	PSI JOB NO. 20-4033	SHEET NUMBER 2 OF 3	UPC 101605420230220101
COMBINED SCALE FACTOR: GRID TO GROUND: 1.000322704 GROUND TO GRID: 0.999677401	DISTANCE ANNOTATION: GROUND	BEARING ANNOTATION: GRID								

EXHIBIT "A"

0 200 400 600

SCALE 1"=200'



SEE SHEET 2 FOR TIE

COORDINATE AND DIMENSION INFORMATION			PLSS INFORMATION				PROJECT INFORMATION		INDEXING INFORMATION
STATE PLANE ZONE: NM-C	GRID /GROUND COORDINATES: GRID	TYPE: AGRS NETWORK	LAND GRANT N/A				CREW/TECH: SP/DP	DATE OF SURVEY: APRIL 2020	PROPERTY OWNER CITY OF ALBUQUERQUE
HORIZONTAL DATUM: NAD83	VERTICAL DATUM: NAVD88	ROTATION ANGLE: 0° 00' 00.00"	SECTION 33	TOWNSHIP 10 NORTH	RANGE 03 EAST	MERIDIAN NMPM	DRAWN BY: MC	CHECKED BY: LM	SUBDIVISION NAME SUNPORT MUNICIPAL ADDITION
CONTROL USED: ALBUQUERQUE GEOGRAPHIC CONTROL SYSTEM		BASE POINT N = 0 E = 0	CITY N/A		COUNTY BERNALILLO	STATE NM	PSI JOB NO. 20-4033	SHEET NUMBER 3 OF 3	UPC 101605420230220101
COMBINED SCALE FACTOR: GRID TO GROUND: 1.000322704 GROUND TO GRID: 0.999677401	DISTANCE ANNOTATION: GROUND	BEARING ANNOTATION: GRID							

EXHIBIT "B"

Federal Nondiscrimination Provisions

Grantee agrees to comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance. If Grantee transfers its obligation to another, the transferee is obligated in the same manner as the Grantee.

This provision obligates the Grantee for the period during which the property is owned, used or possessed by the Grantee and the airport remains obligated to the Federal Aviation Administration. This provision is in addition to that required by Title VI of the Civil Rights Act of 1964.

Title VI Clauses for Construction/Use/Access to Real Property

Grantee, for itself, its heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree, as a covenant running with the land that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, and (3) that the Grantee will use the premises in compliance with all other requirements imposed by or pursuant to the List of Nondiscrimination Acts And Authorities.

Title VI List of Pertinent Nondiscrimination Acts and Authorities

During the performance of this easement, the Grantee, for itself, its assignees, and successors in interest, agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 USC § 2000d *et seq.*, 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination in Federally-assisted programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 USC § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973 (29 USC § 794 *et seq.*), as amended (prohibits discrimination on the basis of disability); and 49 CFR part 27;
- The Age Discrimination Act of 1975, as amended (42 USC § 6101 *et seq.*) (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982 (49 USC § 471, Section 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987 (PL 100-209) (broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 USC §§ 12131 – 12189) as implemented by U.S. Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration's Nondiscrimination statute (49 USC § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 USC 1681 et seq).

1-2 NOAA 14 Precipitation

NOAA Atlas 14, Volume 1, Version 5
Location name: Albuquerque, New Mexico, USA*
Latitude: 35.0501°, Longitude: -106.6291°
Elevation: 5204.54 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.176 (0.155-0.202)	0.228 (0.199-0.261)	0.303 (0.264-0.347)	0.363 (0.315-0.413)	0.444 (0.384-0.504)	0.505 (0.434-0.574)	0.570 (0.487-0.649)	0.639 (0.541-0.725)	0.730 (0.612-0.832)	0.802 (0.668-0.914)
10-min	0.268 (0.235-0.307)	0.347 (0.304-0.397)	0.461 (0.403-0.528)	0.552 (0.480-0.628)	0.675 (0.584-0.767)	0.768 (0.661-0.874)	0.868 (0.741-0.987)	0.972 (0.823-1.10)	1.11 (0.932-1.26)	1.22 (1.02-1.39)
15-min	0.332 (0.292-0.380)	0.430 (0.376-0.492)	0.572 (0.499-0.655)	0.684 (0.594-0.779)	0.837 (0.724-0.951)	0.952 (0.819-1.08)	1.08 (0.918-1.22)	1.21 (1.02-1.37)	1.38 (1.16-1.57)	1.51 (1.26-1.72)
30-min	0.447 (0.393-0.512)	0.579 (0.507-0.662)	0.770 (0.672-0.882)	0.921 (0.800-1.05)	1.13 (0.975-1.28)	1.28 (1.10-1.46)	1.45 (1.24-1.65)	1.62 (1.37-1.84)	1.86 (1.56-2.11)	2.04 (1.70-2.32)
60-min	0.553 (0.486-0.634)	0.716 (0.627-0.820)	0.953 (0.831-1.09)	1.14 (0.990-1.30)	1.39 (1.21-1.58)	1.59 (1.36-1.81)	1.79 (1.53-2.04)	2.01 (1.70-2.28)	2.30 (1.93-2.61)	2.52 (2.10-2.87)
2-hr	0.630 (0.552-0.728)	0.805 (0.703-0.932)	1.06 (0.927-1.23)	1.26 (1.10-1.45)	1.55 (1.34-1.78)	1.78 (1.52-2.03)	2.02 (1.71-2.30)	2.26 (1.91-2.58)	2.61 (2.17-2.98)	2.89 (2.39-3.31)
3-hr	0.666 (0.588-0.768)	0.845 (0.744-0.975)	1.11 (0.973-1.27)	1.31 (1.15-1.50)	1.60 (1.39-1.83)	1.83 (1.57-2.08)	2.07 (1.77-2.36)	2.32 (1.97-2.65)	2.67 (2.24-3.05)	2.96 (2.46-3.39)
6-hr	0.777 (0.687-0.889)	0.974 (0.861-1.12)	1.25 (1.11-1.43)	1.47 (1.30-1.67)	1.76 (1.54-2.01)	1.99 (1.73-2.27)	2.24 (1.93-2.54)	2.48 (2.14-2.82)	2.83 (2.41-3.22)	3.11 (2.62-3.55)
12-hr	0.857 (0.762-0.963)	1.08 (0.964-1.21)	1.36 (1.21-1.52)	1.59 (1.40-1.77)	1.89 (1.67-2.11)	2.11 (1.86-2.36)	2.35 (2.05-2.63)	2.60 (2.25-2.90)	2.93 (2.52-3.28)	3.19 (2.72-3.59)
24-hr	0.977 (0.878-1.09)	1.23 (1.10-1.37)	1.53 (1.37-1.71)	1.77 (1.59-1.97)	2.09 (1.87-2.33)	2.35 (2.09-2.61)	2.60 (2.32-2.89)	2.86 (2.53-3.18)	3.21 (2.82-3.57)	3.49 (3.04-3.87)
2-day	1.03 (0.931-1.15)	1.29 (1.17-1.43)	1.61 (1.45-1.78)	1.85 (1.67-2.04)	2.19 (1.97-2.41)	2.44 (2.19-2.69)	2.70 (2.42-2.97)	2.96 (2.64-3.27)	3.32 (2.94-3.66)	3.58 (3.17-3.96)
3-day	1.11 (1.02-1.22)	1.39 (1.27-1.52)	1.71 (1.56-1.87)	1.97 (1.80-2.15)	2.32 (2.11-2.53)	2.58 (2.34-2.81)	2.85 (2.58-3.10)	3.12 (2.81-3.40)	3.47 (3.12-3.79)	3.75 (3.35-4.09)
4-day	1.19 (1.10-1.29)	1.48 (1.37-1.61)	1.82 (1.68-1.97)	2.09 (1.92-2.26)	2.44 (2.25-2.64)	2.72 (2.50-2.94)	2.99 (2.74-3.23)	3.27 (2.98-3.53)	3.63 (3.31-3.93)	3.91 (3.54-4.23)
7-day	1.37 (1.27-1.48)	1.70 (1.57-1.84)	2.07 (1.92-2.24)	2.36 (2.19-2.55)	2.74 (2.54-2.95)	3.03 (2.80-3.26)	3.31 (3.06-3.57)	3.59 (3.31-3.86)	3.95 (3.62-4.26)	4.21 (3.85-4.55)
10-day	1.51 (1.40-1.63)	1.87 (1.74-2.02)	2.29 (2.13-2.47)	2.62 (2.44-2.82)	3.06 (2.84-3.28)	3.39 (3.13-3.63)	3.72 (3.43-3.98)	4.05 (3.71-4.33)	4.46 (4.08-4.79)	4.78 (4.35-5.13)
20-day	1.91 (1.77-2.06)	2.37 (2.20-2.55)	2.88 (2.67-3.09)	3.26 (3.03-3.50)	3.75 (3.48-4.03)	4.11 (3.80-4.40)	4.46 (4.11-4.77)	4.78 (4.40-5.11)	5.19 (4.77-5.55)	5.48 (5.03-5.88)
30-day	2.28 (2.12-2.44)	2.83 (2.63-3.03)	3.41 (3.16-3.65)	3.83 (3.56-4.11)	4.37 (4.05-4.67)	4.75 (4.40-5.07)	5.11 (4.73-5.46)	5.46 (5.04-5.83)	5.87 (5.41-6.27)	6.16 (5.67-6.59)
45-day	2.77 (2.59-2.97)	3.43 (3.20-3.68)	4.09 (3.82-4.37)	4.56 (4.26-4.87)	5.13 (4.79-5.48)	5.53 (5.16-5.90)	5.89 (5.49-6.27)	6.21 (5.78-6.61)	6.57 (6.12-6.99)	6.79 (6.33-7.22)
60-day	3.20 (2.98-3.43)	3.96 (3.69-4.25)	4.73 (4.41-5.05)	5.27 (4.92-5.64)	5.93 (5.54-6.34)	6.38 (5.96-6.81)	6.79 (6.34-7.26)	7.17 (6.69-7.66)	7.59 (7.09-8.12)	7.86 (7.35-8.41)

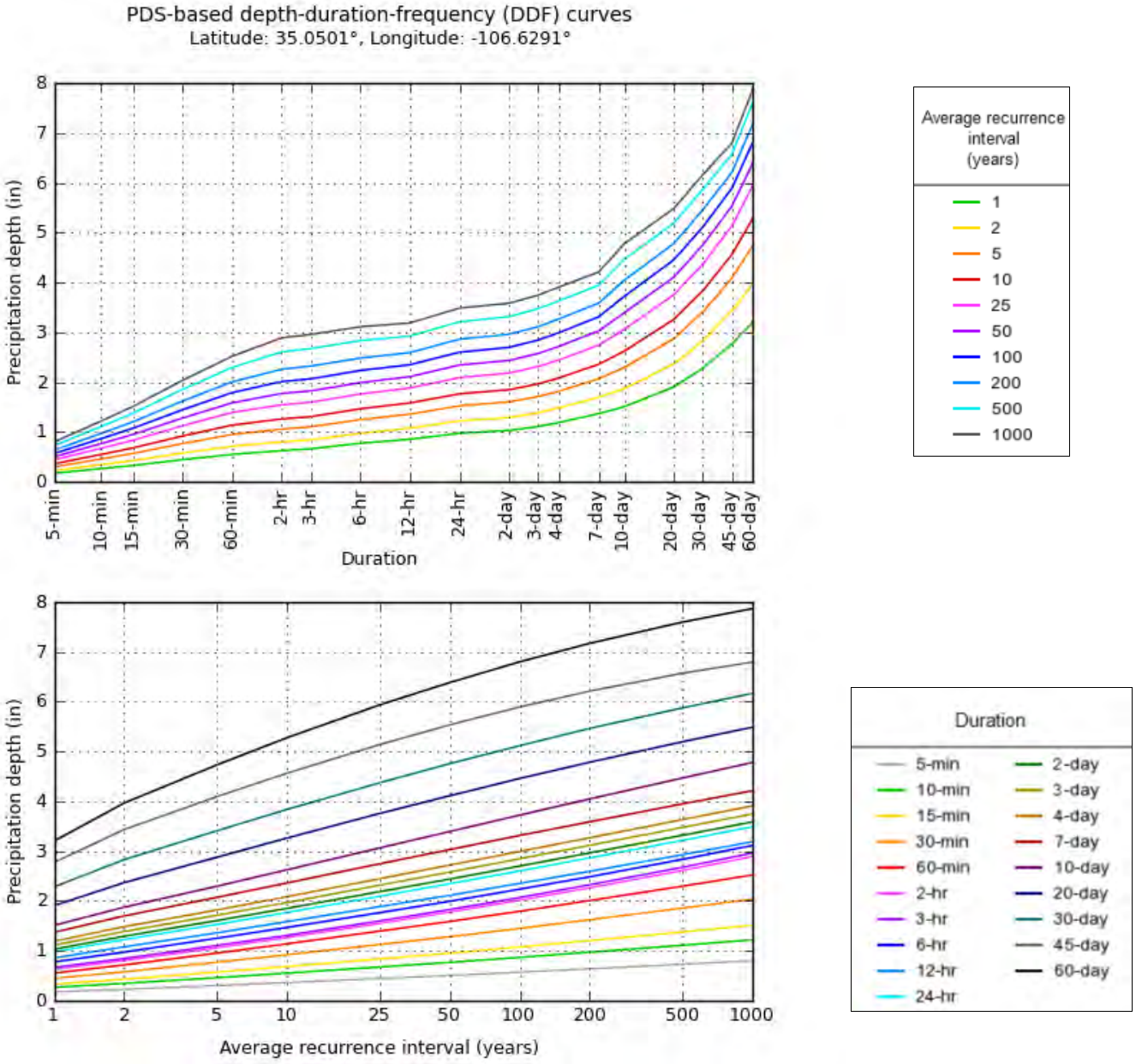
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



NOAA Atlas 14, Volume 1, Version 5

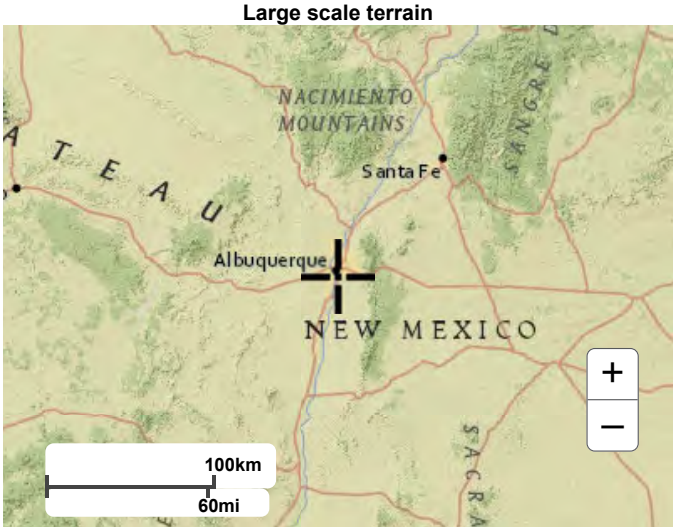
Created (GMT): Mon Aug 3 19:28:04 2020

Back to Top

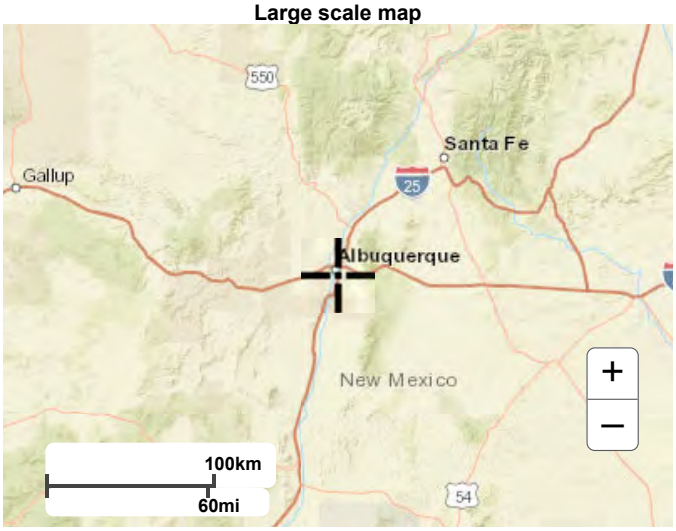
Maps & aerials

Small scale terrain

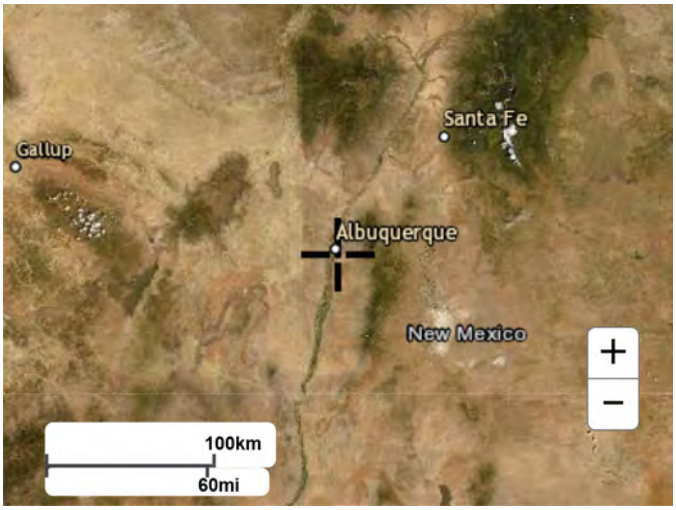
Large scale terrain



Large scale map



Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

1-3a Relevant Excerpts from:

Albuquerque International Airport Storm Drainage Master Plan

ALBUQUERQUE
INTERNATIONAL AIRPORT

STORM DRAINAGE MASTER PLAN

Project No. 4255.01

City of Albuquerque, NM
Aviation Department

May 1995

MOLZEN-CORBIN & Associates

DRAINAGE MASTER PLAN
Project No. 4255.01

✈ Albuquerque International Airport ✈

TABLE OF CONTENTS

APPENDICES

SUB-BASIN NO.	AREA (sq mi)	Q10 (cfs)	Q100 (cfs)	V10 (ac-ft)	V100 (ac-ft)	OUTFALL	DESCRIPTION
218	0.0932	116.18	165.12	6.224	9.995	24" SD	Lower parking lot
219	0.664	105.46	105.46	4.587	7.309	Surface	Parking Structure
220	0.0327	97.81	97.81	2.260	3.603	36" SD	E. Terminal Ramp
221	0.0370	46.43	46.43	2.542	4.058	36" SD	Terminal Entrance, East
222	0.0215	45.55	45.55	1.351	2.196	24" SD	Terminal Entrance, West
223	0.3651	418.23	418.23	17.521	30.882	60" SD	Areas E. of Alamo/Yale
224	0.2612	295.18	295.18	14.315	24.274	24" SD	Amfac Hotel, East
225	0.0227	49.80	49.80	0.765	1.545	Surface	Amfac Hotel, North
226	0.0428	87.14	87.14	2.397	4.003	Surface	Amfac Hotel, West
227	0.0353	70.75	70.75	2.011	3.344	24" SD	Airport Entrance by Yale
228	0.4119	514.03	514.03	20.169	35.293	24" SD	E. side of Yale
Σ	0.4119	328.37	514.53	20.169	35.293	2-42" CMP	to Basin KC

D. Basin KC. This 0.6810 square mile basin extends from Yale Blvd to the South Diversion Channel and includes commercial development on each side of Randolph. The principal drainage feature of this basin is the Kirtland Channel which begins just west of the Yale/Alamo intersection and discharges to the South Diversion Channel via a baffle chute drop structure west of Mulberry. The principal problems experienced in this basin are in the lower reaches of the Kirtland Channel where the concrete lined channel makes two rather severe horizontal bends. Very high velocities which exist in the channel have resulted in the flows overtopping the channel banks in this area.

The Kirtland Channel has experienced some problems near the box culvert crossing on Mulberry. These problems have been noted through visual observations and some damages that have occurred during past rainfall events. The Kirtland Channel in this area makes two horizontal bends on what appears to be rather severe horizontal curves. Both of these bends occur just upstream from the Mulberry to form an "S" curve. The downstream curve immediately upstream of the Mulberry crossing has experienced overtopping along the southern channel bank encroaching on some existing homes in this area. In addition to this curvilinear alignment, there is a side channel discharging into the Kirtland Channel just upstream of the Mulberry crossing. The Mulberry crossing itself is a two cell 6'X6' box culvert. Downstream of this culvert is a short segment of channel and then a baffle drop spillway discharging into the South Diversion Channel.

From visual observation it appears that the problem of flow overtopping the channel is caused by superelevation of flows with high velocities around this second curve. Additional freeboard was added to this area by constructing a one foot high concrete retaining wall along this channel

edge. However, the side channel inflow from the residential areas to the north cannot be modified in this same way as these flows cannot be blocked. It also appears that the box culvert may be causing some of the problem. If the box culvert is of insufficient capacity, then backwater might be causing some of the overtopping problem. These problems were analyzed and are discussed in the next section.

TABLE III-3
Basin KC

SUB-BASIN NO.	AREA (sq mi)	Q10 (cfs)	Q100 (cfs)	V10 (ac-ft)	V100 (ac-ft)	OUTFALL	DESCRIPTION
301	0.0197	37.04	57.39	1.304	2.099	2-54"	NE & SE Cor. Alamo/Yale
302	0.0251	47.59	73.55	1.678	2.694	2-54"	N. Side Randolph, W. of 301
303	0.4586	378.86	593.93	22.993	39.943	Surface	W. Side Yale, S. Side Randolph
304	0.0132	18.92	2.77	0.6425	1.113	Surface	W. Side Yale, S. of Randolph
305	0.0322	33.82	53.58	2.0962	3.373	Surface	S. of Randolph, W. of Yale
306	0.0163	31.40	48.31	1.1165	1.781	Surface	W. Side Yale @ Yale Airport Entrance
307	0.0235	40.32	64.18	1.410	2.316	Surface	N. Side Kirt. Chan., W. of 301
308	0.5012	440.23	691.32	25.548	44.141	Surface	BDM Complex
309	0.0527	44.08	70.93	3.078	5.075	Surface	S. Side Randolph, W. of 303
310	0.5119	459.35	720.25	26.201	45.213	Surface	S. Side Kirt. Chan., W. of 308
311	0.6619	553.86	921.55	31.081	54.644	Surface	N. Side Kirt. Chan.
312	0.6572	548.20	912.19	30.878	54.273	24" SD	S. Side Kirt. Chan. E. Side Univ.
313	0.0099	3.60	11.75	0.094	0.328	Surface	S. Side Randolph
313.1	0.0908	57.03	115.02	3.603	6.525	36" SD	SE Cor. Randolph/Univ.
314	0.0177	4.25	17.94	0.117	0.501	Surface	W. of 306
314.1	0.0282	11.29	33.97	0.431	1.122	Surface	E. Side Univ., S. of Randolph
315	0.0105	9.23	18.51	0.314	0.620	Surface	N. of Postal Facility
316	0.0090	10.78	19.47	0.345	0.645	Surface	N. Side Kirt. Chan., W. of Univ.
317	0.6995	578.50	977.11	31.956	56.593	Surface	N. Side Kirt. Chan., Univ. to SDC
Σ	0.6810	568.6	961.5	30.96	54.893	Kirt. Chan.	to South Diversion Channel

E. **Basin SP.** The Sunport Corridor basin consisting of 0.2010 square miles is currently undergoing alterations. The existing conditions of this basin has been modelled but will change with the construction of the Sunport Corridor which will be a new principal arterial connecting I-25 to the AIA. The proposed construction of the roadway was accompanied by a drainage report specifically for this roadway project and is further addressed in the next section of this report.

This basin originates at the west edge of the terminal area including the new postal facility. The flows are conveyed through earth channels south of George Road where they eventually cross University in culverts. Areas west of University drain primarily by surface conveyance and pass beneath I-25 via culverts and eventually discharge to the South Diversion Channel.

TABLE III-4
Basin SP

SUB-BASIN NO.	AREA (sq mi)	Q10 (cfs)	Q100 (cfs)	V10 (ac-ft)	V100 (ac-ft)	OUTFALL	DESCRIPTION
401	0.0280	51.96	80.77	1.839	2.959	24" SD	Post Office Site
402	0.1150	99.16	203.50	203.50	6.930	CLV	Adjacent to George Road
403	0.1560	60.30	128.40	128.40	7.761	SD	W of Univ, S of Randolf
404	0.1810	62.09	141.56	141.56	8.639	48" SD	University to I-25
405	0.1840	63.18	144.59	144.59	8.848	RR Bridge	University to RR tracks
406	0.0170	6.94	21.07	21.07	0.598	CLV	SE of I-25/SDC
407	0.1300	106.19	223.38	223.38	7.518	3-36" CLV	RR tracks to I-25
408						CLV	I-25
409						48" SD	SW of I-25/SDC
410						3-36" CLV	I-25
411						48" SD	I-25 to SDC
Σ	0.2010	60.19	150.6	3.846	9.445	Open Chan.	to South Diversion Channel

F. **WE Basin.** This 0.38 square mile basin includes the southern portion of the terminal area, the west ends of Runway 8-26 and the Taxiways A and E, and the undeveloped escarpment area between the airport and University Boulevard. The existing drainage situation consists of a collection system that is throttled into a 24" outfall to the escarpment area, the overland flow within the escarpment area, and a 2-60" culvert structure at University Boulevard. In addition to being throttled at the outfall, the collection system contains many sections that are inadequate to handle the 5 year design storm. The existing peak discharge reaching the culvert crossing is 101 cubic feet per second (cfs). The capacity of the 2-60" structure is 370 cfs

The proposed system for this basin includes many upgrades to the existing collection system necessary to handle the 10 year design storm, and to solve existing drainage problems. To

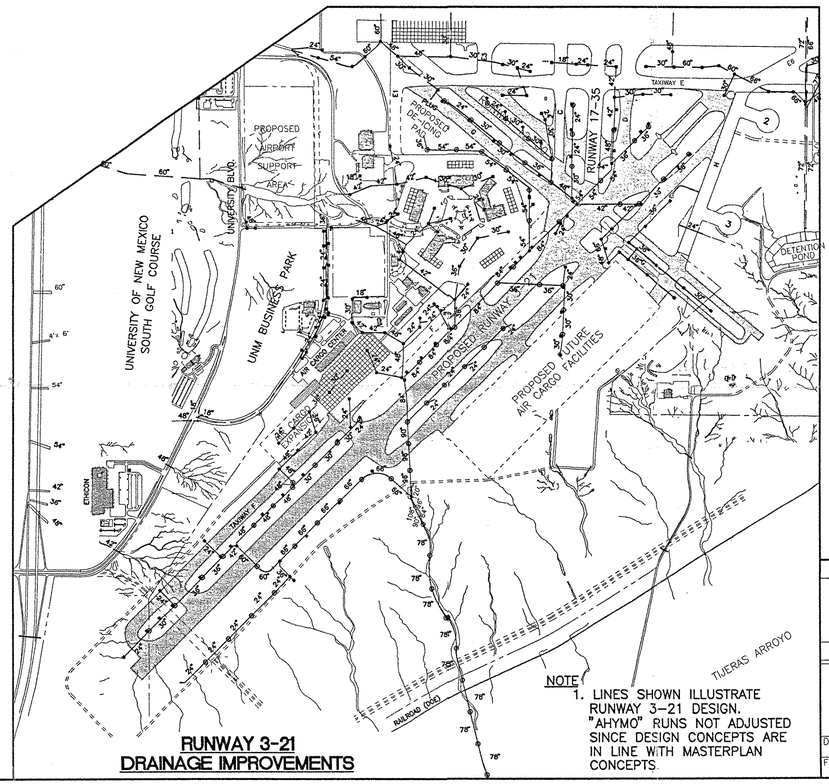
LEGEND

- MAJOR DRAINAGE BASIN
- DRAINAGE SUB-BASIN
- 601 DRAINAGE SUB-BASIN NUMBER
- EXISTING STORM DRAINS
- NEW STORMDRAINS ASSUMED FOR DRAINAGE COMPUTATIONS.

M.N. MAGNETIC DECLINATION 11° 05' EAST

0 500 1000 SCALE IN FEET

CITY GOLF COURSE
GENEVA'S ARROYO
GIBSON BLVD.
CARLISLE BLVD.
NEW DISCHARGE TO SOUTH DIVERSION CHANNEL
RE-ALIGNED KIRTLAND CHANNEL
NEW JUNCTION BOX
2-40" CMP
1-50" CMP
PROPOSED AIRPORT SUPPORT AREA
PARKING STRUCTURE
MIDDLE
KIRTLAND AIR FORCE BASE
EEND
AIR GUARD
NEW MEXICO AIR NATIONAL GUARD
FAR EAST END
RUNWAY 17-35
RUNWAY 3-21
KIRTLAND ROAD
DETENTION POND
INTERSTATE
UNIVERSITY BLVD.
UNIVERSITY OF NEW MEXICO SOUTH GOLF COURSE
UNM BUSINESS PARK
MILITARY RESERVATION BOUNDARY
LANDS OF UNM
RIO BRAVO BLVD.
TIJERAS ARROYO
RAILROAD (D&RG)
ETHICON
N/I
N 17
C 17
K C
S P
W E
G A
M 3
SE 3
SW 3
U E



RUNWAY 3-21 DRAINAGE IMPROVEMENTS

NOTE
1. LINES SHOWN ILLUSTRATE RUNWAY 3-21 DESIGN. "AHYMO" RUNS NOT ADJUSTED SINCE DESIGN CONCEPTS ARE IN LINE WITH MASTERPLAN CONCEPTS.

JOHN M. PROVINE NEW MEXICO 9672 REGISTERED PROFESSIONAL ENGINEER

CITY OF ALBUQUERQUE — NEW MEXICO

DRAINAGE BASIN MAP
PROPOSED FUTURE DEVELOPMENT

ALBUQUERQUE INTERNATIONAL AIRPORT

MOLZEN-CORBIN & Associates
ENGINEERS/PLANNERS/CONSULTANTS Albuquerque • New Mexico • Las Cruces

Designed	Drawn HC-A/JSL	Checked JMP	Sheet of
File	Date JAN. 1995		PLATE 4

PLT4REV 1" = 1000' 02/07/95

1-3b Relevant Excerpts from:

Landfill Management Plan Former Yale Landfill

LANDFILL MANAGEMENT PLAN
FORMER YALE LANDFILL

Albuquerque, New Mexico

Prepared for:

City of Albuquerque Environmental Health Department
Environmental Services Division
One Civic Plaza
P.O. Box 1293
Albuquerque, New Mexico 87103

Prepared by:

6000 Uptown Boulevard NE, Suite 220
Albuquerque, New Mexico 87110

March 31, 2014

4.0 GUIDELINES FOR DEVELOPMENT

Decisions to approve various types of development on the YALF and within its associated landfill buffer zone are guided by the requirements of the *Interim Guidelines for Development within City Designated Landfill Buffer Zones (Interim Guidelines)* (COA, 2004b). The *Interim Guidelines* provide a description of all required components of a development plan for properties on a landfill and/or within the buffer zone. *The Guidance for Compliance with the COA AEHD Interim Guidelines* is intended to assist developers and their agents through the COA's approval process (COA, 2004a).

4.1 Key Requirements of the *Interim Guidelines*

The *Interim Guidelines* (COA, 2004b) is the primary guidance document that describes the document submittal, approval, and certification process for development on a landfill or within a landfill buffer zone. The required documents for a development project within the landfill buffer zone must be stamped by a New Mexico PE who meets all AEHD requirements for rendering a qualified opinion on LFG issues. According to the *Interim Guidelines*, an LFG Assessment Report must accompany the Site Development Plan. The requirements of the LFG Assessment Report are presented in detail in the *Interim Guidelines*. The qualified PE is fully responsible for evaluating LFG risk and establishing any and all LFG mitigation measures. The AEHD maintains review authority over the qualified PE's findings and recommendations.

For construction within the buffer zone, LFG monitoring and mitigation measures (e.g., trench venting, conduit seals, passive ventilation systems,) may be required. The primary potential avenues of LFG exposure are either their proximity to landfill waste material or the potential for transport along utility corridors or similar conveyances. AEHD has the primary responsibility to ensure that reports and plans submitted by the qualified PE meet all of the requirements of the *Interim Guidelines* prior to development approval.

A qualified New Mexico-licensed PE must inspect development during construction to ensure that LFG mitigation measures have been implemented as planned. It is required that contractors working on development within the boundaries of the YALF provide to AEHD all waste quantities, waste qualifications (plastic, green, etc.), waste removal manifests, and a figure (site plan and cross-section, stamped by Qualified PE) showing the past and current locations of waste.

4.2 Planning and Zoning on the Landfill and within the Buffer Zone

The YALF is located in the southern portion of Albuquerque adjacent to the Albuquerque International Sunport. The landfill and buffer zone area is in the Albuquerque Geographic Information System (AGIS) Zone Atlas areas M15, M16, N15, and N16. The YALF is currently zoned SU-1 for Aviation. Area zoning information is shown on **Figure 6.** The zoning

designations within the landfill buffer zone include IP for hotel, IP for food service, IP for offices, R-1 for park and community center, C-2 for airport parking, and SU-1 for water well and reservoir.

4.3 Development on the Landfill

The landfill parcel is owned by the COA. Current development on the YALF includes various utilities owned by the COA or the Albuquerque Bernalillo County Water Utility Authority (ABCWUA). Any development within the boundaries of the YALF will most likely be necessary infrastructure related to Aviation Department uses or maintenance of the landfill itself. Other development purposes are discouraged. Development on the landfill has a significant potential to encounter LFG, as well as to sustain structural damage from surface subsidence due to waste decomposition. Therefore, careful consideration must be given to historical and current data concerning the distribution of waste, the location of potential subsurface migration pathways, the locations of methane detections, and changes to the surface of the landfill when decisions are made concerning development and required mitigation. All projects requiring waste removal must meet NMED Solid Waste Division requirements. Requirements for a Waste Excavation Plan (WEP) can be found on the NMED website.

A qualified New Mexico-licensed PE must inspect development during construction to ensure that LFG mitigation measures have been implemented as planned. A Qualified PE must certify any waste excavation and removal from the property. As part of the certification process, the AEHD will require written and photographic documentation of the location and approximate volume of waste remaining (if any) after construction is complete from any contractor involved in the work. If the land over the landfill is developed, it is important that this information is transmitted to the AEHD so that the COA can update its records regarding the areal extent of the waste and the dimensional/physical characteristics of the waste. The precise limits and thicknesses of the waste prism are poorly understood and should be documented when encountered. It is required that contractors working on development within the boundaries of the YALF provide to AEHD all waste quantities, waste qualifications (plastic, green, etc.), waste removal manifests, and a figure (site plan and cross-section, stamped by Qualified PE) showing the past and current locations of waste.

4.4 Development within the Buffer Zone

The buffer zone at the YALF currently extends 500 ft from the edges of the landfill. The buffer zone width was based upon known facts concerning the landfill, typical patterns of LFG migration, and potential future scenarios of development on the landfill itself. The buffer zone is designed to be protective of human health with regard to development and occupancy. The buffer zone is reviewed on a regular basis and should be confirmed by reviewing the most current version of the *Interim Guidelines* or viewing the buffer zones on the City's AGIS website.

4.4.1 Current Development within the Buffer Zone

Currently there is a significant level of existing development within the buffer zone of the YALF. Buffer zone development includes hotels, offices, food service, airport parking, and water utilities.

4.4.2 Future Development and Development Restrictions and Requirements

Current and future development on the former landfill must comply with the *Interim Guidelines* (COA, 2004b) or subsequent landfill development ordinances that exist at the time of development. Other future development considerations are as follows:

- Potential restriction of any building on buried landfill material (piers or landfill removal).
- Provision for adequate drainage of surface water runoff away from landfill areas.
- Prohibition of engineered storm water retention and detention basins over and/or adjacent to landfill materials.
- Use of landscape practices that require little or no irrigation or providing means of prohibiting irrigation water from infiltrating and reaching buried landfill materials.
- Removal of landfill material beneath subsurface utilities or adequate design to account for settlement.
- Adequate design to control the migration of LFG away from the landfill and/or off the subject property.
- Development of LFG mitigation measures that are protective of structures, utilities, and personnel.

4.5 Managing Future Land Use

Currently, development plans (building permits) for construction on or within a landfill buffer zone are referred by the COA Planning Department to AEHD for review. The review may be conducted by AEHD or a designated contractor. The initial review is to determine the location of the development relative to the landfill and buffer zone. If the development is within the landfill buffer zone, the developer is notified by AEHD of the need to comply with the *Interim Guidelines* including submittal of an LFG Assessment Report. The AEHD then reviews the developer's LFG assessment and may approve the assessment or may request additional effort/design. Once the assessment is complete, the AEHD will review the plans for mitigation of LFG (if applicable) and grant approval once the requirements are met.

AEHD will continue to communicate with the COA Planning Department to track the current development plans for the area on the YALF or within the landfill buffer zone.

4.6 Operation, Maintenance, and Monitoring

If the recommendations by a New Mexico licensed PE in the LFG assessment include actions to be taken by the owner or its agent after the construction of LFG mitigation measures, or in lieu of constructing LFG mitigation measures, the owner/developer must submit an OMMP to the AEHD for approval during the development process. A typical OMMP contains monitoring procedures, regulatory requirements, engineering specifications, equipment lists, maintenance and inspection instructions, lists of contacts, safety and risk management protocols, and stipulations for ensuring that the information in the OMMP is kept current and technically accurate.

AEHD's objective in requiring the preparation and implementation of an OMMP is the protection of human health, the environment, and public and private property. For users and occupants of properties developed over a landfill or within a City-designated landfill buffer zone, the OMMP may provide the only available description of the LFG risks associated with the property and the ongoing requirements of the measures implemented to mitigate those risks. For this reason, AEHD views proper preparation and use of the OMMP as a critical LFG mitigation measure.

An OMMP should at a minimum include the following content:

- A property description
- A property use description
- A description of the YALF and its relationship to the development
- A plan showing the location of all existing and/or proposed LFG mitigation features at the site, inclusive of mitigation features not specifically covered under the OMMP (e.g., passive trench vent barriers)
- A summary of LFG conditions and risk
- A description of LFG mitigation measures employed at the facility
- Safety and risk management protocols including action levels, detailed response protocols, notification requirements, mitigation measures, evacuation procedures, measures to mitigate ignition sources, identification of key personnel, and reentry procedures
- Regulatory requirements and mitigation milestones
- Contact information for the property owner, AEHD, the Albuquerque Fire Department/ emergency services, the occupant, etc.
- Training requirements
- OMMP review and revision protocols by the developer or property owner

- An LFG Monitoring Plan (as necessary)
- An explanation regarding any variance from LFG assessment recommendations and approval documentation
- A Maintenance Plan (as necessary)

4.7 Data Review by AEHD

AEHD will obtain and review data from private property owners, tenants, developers, or approved agent(s) that are required to collect data within the buffer zone. Data obtained may include data from LFG monitoring wells, data collected from passive and active LFG recovery systems, data from monitoring subsurface vaults and other collection points, and data from building alarms and the monitoring of interior air quality. AEHD will require the following as part of its review:

- A registered New Mexico PE will submit a report or equivalent correspondence to the AEHD to document that the LFG monitoring and mitigation systems in place are constructed and operating in accordance with engineering design plan specifications that were approved by the AEHD during the planning process.
- AEHD will require that LFG monitoring system operators provide monitoring results as specified in the AEHD schedule developed by the qualified PE and approved by AEHD.
- AEHD may require building owners to install LFG monitoring alarms and monitor building interiors according to a specified schedule. Building owners must report records of alarms within 24 hours.
- AEHD will require operator inspection reports, which will include maintenance or repair actions.
- AEHD may conduct periodic inspections of any LFG mitigation measures developed within the landfill buffer zone.

AEHD will review the information provided and may recommend additional LFG mitigation measures, if necessary. These measures may include the installation of passive venting systems, additional sensors in buildings, LFG concentration alarm systems, additional LFG monitoring wells, and other miscellaneous LFG monitoring measures.

4.8 Data Management

All data collected at the YALF must be managed in an integrated manner. Data is maintained by AEHD as the agency for safety measures at the landfill. Data records should also be maintained by property owners, and should include records of interior methane gas alarms, records of LFG data collection within buildings, maintenance or calibration records for established LFG

mitigation measures, data collected from LFG monitoring wells on landfill properties, data from passive LFG mitigation systems, and data from sumps and other collection points, as required. Data from perimeter monitoring wells should also be maintained by AEHD on a similar basis. All data submitted to AEHD must include GPS coordinate data for the collection point to facilitate the comparison of the data with data for the surrounding area to identify trends or issues of concern. Data at the AEHD is maintained in a database so that any data of interest can be easily accessed and mapped as needed.

AEHD will review data when it is received to identify any unanticipated detections of LFG that may require immediate action.

Attachment 2

Existing Hydrologic Calculations

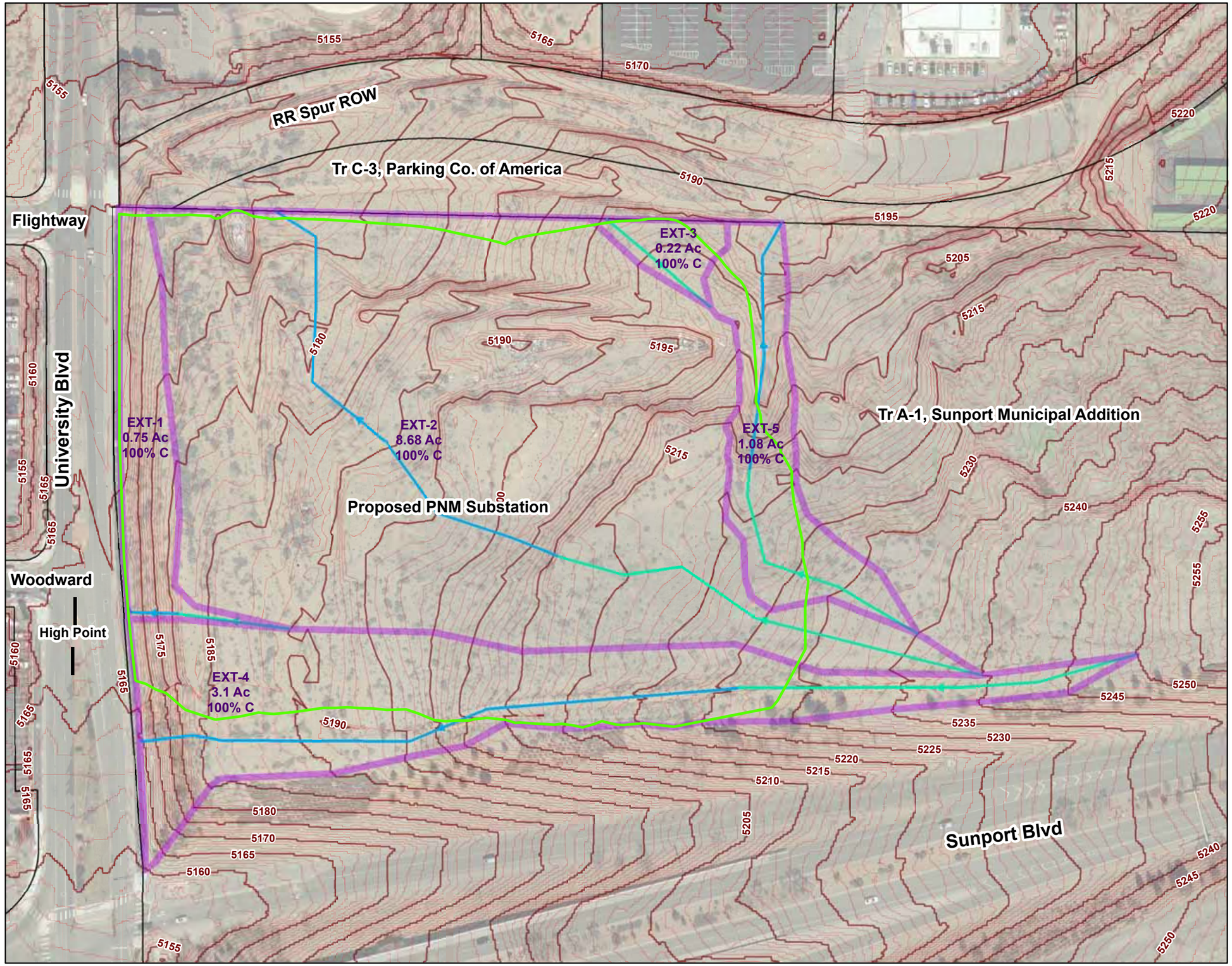
2-1 Existing Drainage Basins

2-2 Existing Hydrology Inputs

2-3 Existing HEC-HMS Inputs and Outputs

2-1 Existing Drainage Basins

Existing Conditions Drainage Basins, Longest Flow Paths, and Land Treatments



Legend

- 5ft Contours
- 1ft Contours
- Grading Limits
- Existing Drainage Basins
- Property Line

Longest Flow Paths

Reach Type:

- Sheet Flow
- Rill Flow
- Engineered Channel

0 120 240 Feet

1 inch = 120 feet

AECOM

Attachment 2-1

2-2 Existing Hydrology Inputs

Existing Conditions Drainage Basins

Basin / Reach	Area	Area	Area	Land Cover						
				A	B	C	D	Weighted	Remarks	Q100
	SF	Acre	Sq. Mi	SF	SF	SF	SF	CN		cfs
EXT-1	32528	0.747	0.0012	0	0	32528	0	86.0	Landfill Cap	**2.17**
EXT-2	377939	8.676	0.0136	0	0	377939	0	86.0	Landfill Cap	**24.57**
EXT-3	9733	0.223	0.0003	0	0	9733	0	86.0	Landfill Cap	**0.54**
EXT-4	135554	3.112	0.0049	0	0	135554	0	86.0	Landfill Cap	**8.85**
EXT-5	46949	1.078	0.0017	0	0	46949	0	86.0	Landfill Cap	**3.07**

Existing Conditions Drainage Basins

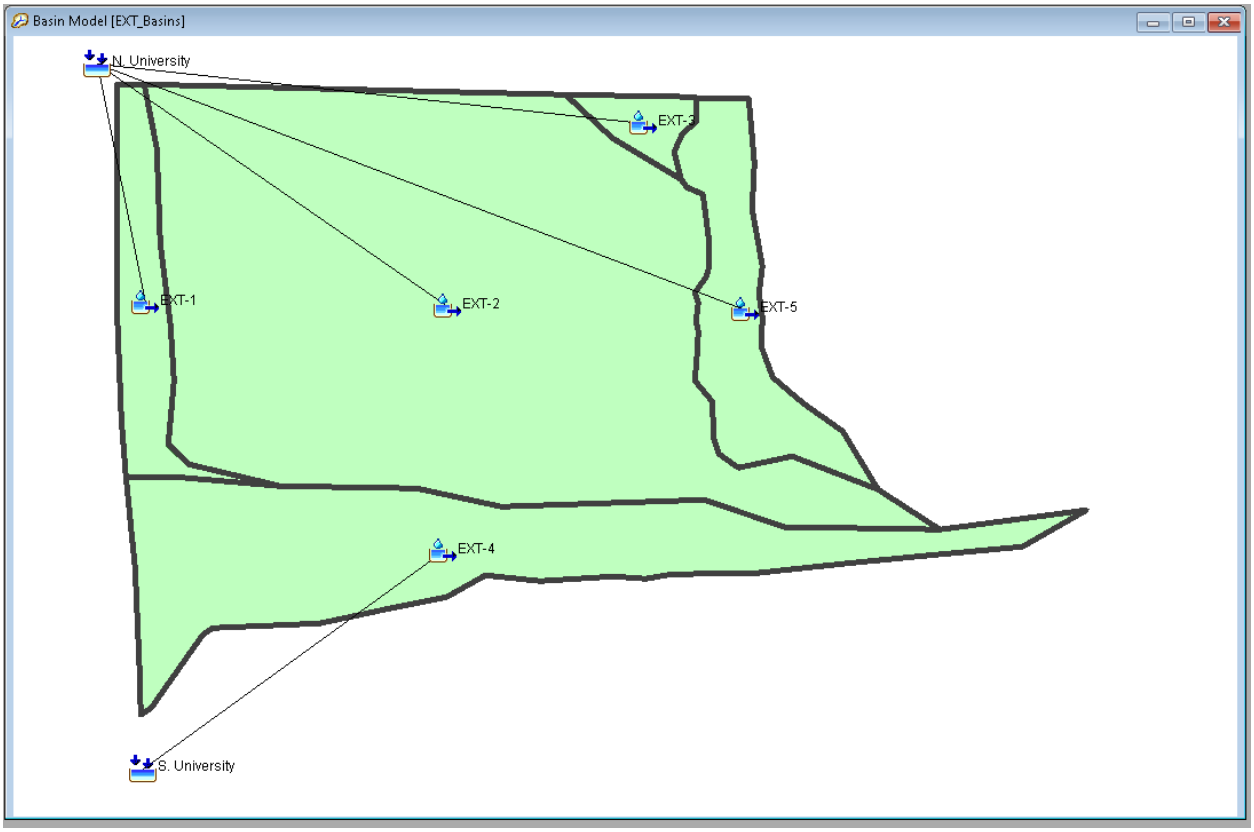
Basin / Reach	1st Reach (Sheet Flow)						2nd Reach (Rill Flow)						3rd Reach (Engineered Channel)						Time of Concentration and Lag			
	Elev High	Elev Low	Length	Slope	K	Velocity	Elev High	Elev Low	Length	Slope	K	Velocity	Elev High	Elev Low	Length	Slope	K	Velocity	tc	tc used	tL	tL
	Ft	Ft	Ft	ft/ft	unitless	FPS	Ft	Ft	Ft	ft/ft	unitless	FPS	Ft	Ft	Ft	ft/ft	unitless	FPS	hours	hours	hours	minutes
EXT-1	5190.0	5182.0	143	0.056	1	2.4	5182.3	5166.1	66	0.246	2	9.9							0.02	0.2	0.12	7.2
EXT-2	5240.0	5212.0	565	0.050	1	2.2	5212.0	5171.1	630	0.065	2	5.1							0.10	0.2	0.12	7.2
EXT-3	5203.5	5195.4	173	0.047	1	2.2													0.02	0.2	0.12	7.2
EXT-4	5250.0	5226.0	503	0.048	1	2.2	5226.0	5164.6	760	0.081	2	5.7							0.10	0.2	0.12	7.2
EXT-5	5235.0	5218.0	332	0.051	1	2.3	5218.2	5191.0	317	0.086	2	5.9							0.06	0.2	0.12	7.2

2-3 Existing HEC-HMS Inputs and Outputs

HEC-HMS Inputs and Outputs

Existing Conditions, 100yr, 24hr Storm

Basin Model



Precipitation

Frequency Storm

Met Name: Met 1

Storm Type:	HYDRO35 TP40 TP49
Annual-Partial Conversion:	--None--
Annual-Partial Ratio:	1.00
Storm Duration:	1 Day
Intensity Duration:	5 Minutes
Intensity Position:	50 Percent
Area Reduction:	--None--
Curve:	Uniform For All Subbasins

Duration	Depth (IN)
5 Minutes	0.570
15 Minutes	1.080
1 Hour	1.790
2 Hours	2.020
3 Hours	2.070
6 Hours	2.240
12 Hours	2.350
1 Day	2.600
2 Days	
4 Days	
7 Days	
10 Days	

Control

Control Specifications

Name: Control 1

Description:	
*Start Date (ddMMMYYYY)	21Apr2021
*Start Time (HH:mm)	00:00
*End Date (ddMMMYYYY)	22Apr2021
*End Time (HH:mm)	00:05
Time Interval:	1 Minute

Summary Output Table

Global Summary Results for Run "Existing 100yr"

Project: Sagebrush_Substation Simulation Run: Existing 100yr

Start of Run: 21Apr2021, 00:00
End of Run: 22Apr2021, 00:05
Compute Time: 23Sep2021, 09:05:27

Basin Model: EXT_Basins
Meteorologic Model: Met 1
Control Specifications: Control 1

Show Elements: All Elements Volume Units: IN ACRE-FT Sorting: Alphabetic

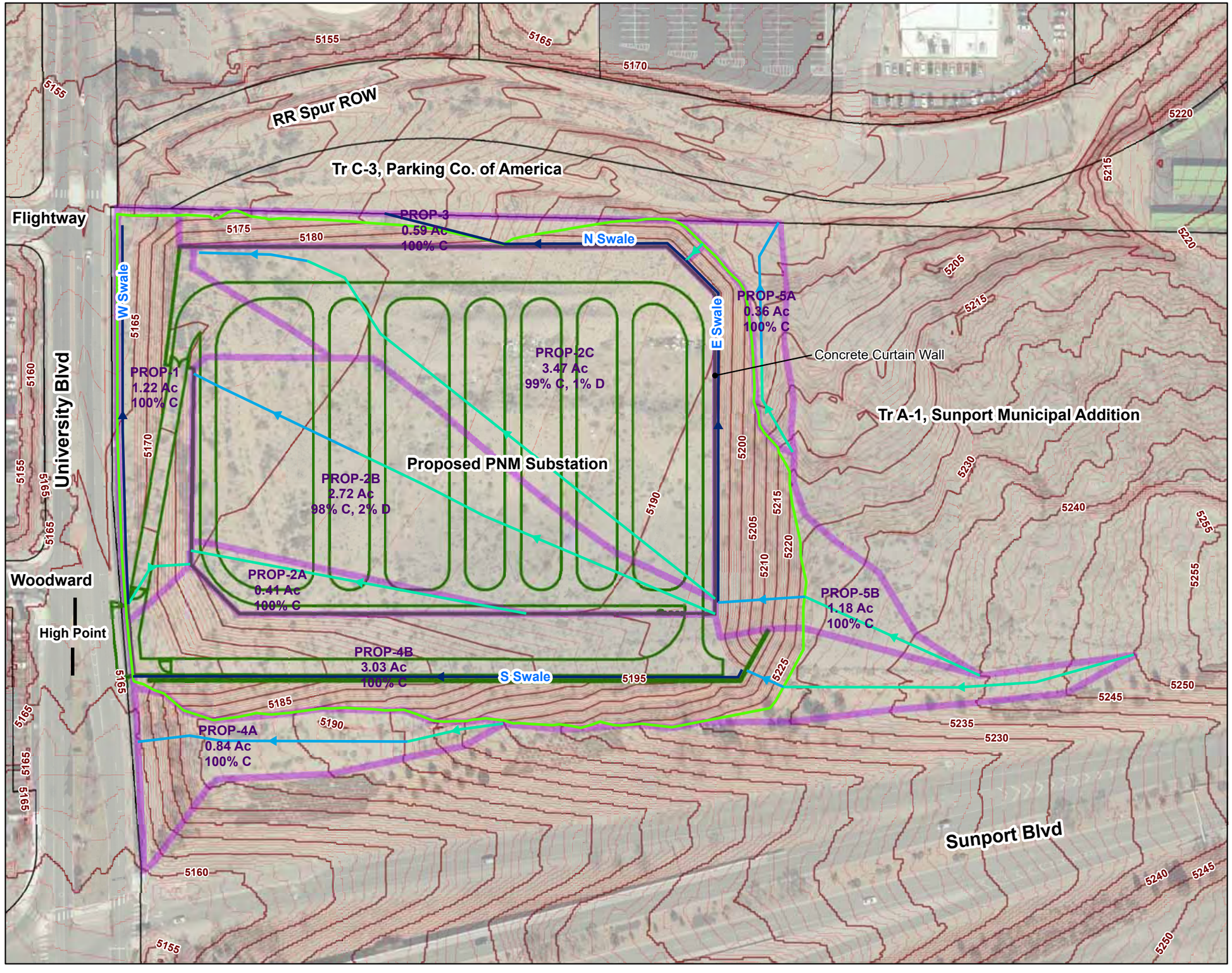
Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (ACRE-FT)
EXT-1	0.0012	2.17	21Apr2021, 12:09	0.08
EXT-2	0.0136	24.57	21Apr2021, 12:09	0.96
EXT-3	0.0003	0.54	21Apr2021, 12:09	0.02
EXT-4	0.0049	8.85	21Apr2021, 12:09	0.35
EXT-5	0.0017	3.07	21Apr2021, 12:09	0.12
N. University	0.0168	30.35	21Apr2021, 12:09	1.19
S. University	0.0049	8.85	21Apr2021, 12:09	0.35

Attachment 3

Proposed Hydrologic Calculations

3-1 Proposed Drainage Basins

Proposed Conditions Drainage Basins, Longest Flow Paths, and Land Treatments



Legend

- 5ft Contours
- 1ft Contours
- Grading Limits
- Proposed Drainage Basins
- Property Line
- Site Layout

Longest Flow Paths

Reach Type:

- Sheet Flow
- Rill Flow
- Engineered Channel

0 120 240 Feet

1 inch = 120 feet

AECOM

Attachment 3-1

3-2 Proposed Hydrology Inputs

Proposed Conditions Drainage Basins

Basin / Reach	Area	Area	Area	Land Cover						Q100
				A	B	C	D	Weighted	Remarks	
	SF	Acre	Sq. Mi	SF	SF	SF	SF	CN		cfs
PROP-1	53278	1.22	0.00191	0	0	53278	0	86.0	Univ. slope and access rd	**3.47**
PROP-2A	17884	0.41	0.00064	0	0	17884	0	86.0	Substation	**1.08**
PROP-2B	118612	2.72	0.00425	0	0	116212	2400	86.2	Substation	**7.77**
PROP-2C	145413	3.34	0.00522	0	0	143433	1980	86.2	Substation	**9.40**
PROP-3	25681	0.59	0.00092	0	0	25681	0	86.0	N. slope	**1.63**
PROP-4A	36409	0.84	0.00131	0	0	36409	0	86.0	Remaining flow to S. Univ.	**2.35**
PROP-4B	132117	3.03	0.00474	0	0	132117	0	86.0	S. access rd and slopes	**8.49**
PROP-5A	15730	0.36	0.00056	0	0	15730	0	86.0	Remaining flow to north	**1.08**
PROP-5B	51425	1.18	0.00184	0	0	51425	0	86.0	E. slope	**3.29**

Adjust 2C Area for Containment Pads:

2C Total Area:	150945	SF
Cont. Pad Size:	922	SF
No. of Cont. Pads:	6	
Area of Pads:	5532	SF
2C Adjusted Area:	145413	SF

SWQV:

Imp. Area:	4380	SF
90% runoff:	0.42	in
SWQV:	153	CF
FiL rate:	$8	$/CF
Est. FiL:	$1,226	

Impervious Areas:

Basin	Impervious Area (SF)
PROP-1	0
PROP-2A	0
PROP-2B	2400
PROP-2C	1980
PROP-3	0
PROP-4A	0
PROP-4B	0
PROP-5A	0
PROP-5B	0
Sum:	4380

	Proposed Conditions Drainage Basins																					
	1st Reach (Sheet Flow)						2nd Reach (Rill Flow)						3rd Reach (Engineered Channel)						Time of Concentration and Lag			
Basin / Reach	Elev High	Elev Low	Length	Slope	K	Velocity	Elev High	Elev Low	Length	Slope	K	Velocity	Elev High	Elev Low	Length	Slope	K	Velocity	tc	tc used	tL	tL
	Ft	Ft	Ft	ft/ft	unitless	FPS	Ft	Ft	Ft	ft/ft	unitless	FPS	Ft	Ft	Ft	ft/ft	unitless	FPS	hours	hours	hours	minutes
PROP-1	5179.6	5166.0	104	0.13	1	3.6							5166.0	5161.3	474	0.01	3.0	3.0	0.05	0.2	0.12	7.2
PROP-2A	5189.0	5182.0	427	0.016	1	1.3													0.09	0.2	0.12	7.2
PROP-2B	5191.6	5185.9	489	0.012	1	1.1	5185.9	5183.0	230	0.012	2	2.2							0.15	0.2	0.12	7.2
PROP-2C	5191.5	5184.1	668	0.011	1	1.0	5184.1	5177.0	230	0.031	2	3.5							0.20	0.2	0.12	7.2
PROP-3	5198.3	5188.7	30	0.322	1	5.7							5188.7	5175.9	391	0.033	3.0	5.4	0.02	0.2	0.12	7.2
PROP-4A	5210.0	5195.3	122	0.12	1	3.5	5195.3	5164.6	339	0.091	2	6.0							0.03	0.2	0.12	7.2
PROP-4B	5250.0	5229.0	444	0.047	1	2.2	5228.8	5212.6	50	0.32	2	11.3	5193.0	5165.9	768	0.035	3.0	5.6	0.10	0.2	0.12	7.2
PROP-5A	5218.0	5203.8	127	0.111	1	3.3	5203.8	5191.1	176	0.072	3	8.0							0.02	0.2	0.12	7.2
PROP-5B	5240.0	5228.0	240	0.05	1	2.2	5228.0	5191.2	109	0.337	2	11.6	5191.2	5188.7	444	0.006	3.0	2.3	0.09	0.2	0.12	7.2

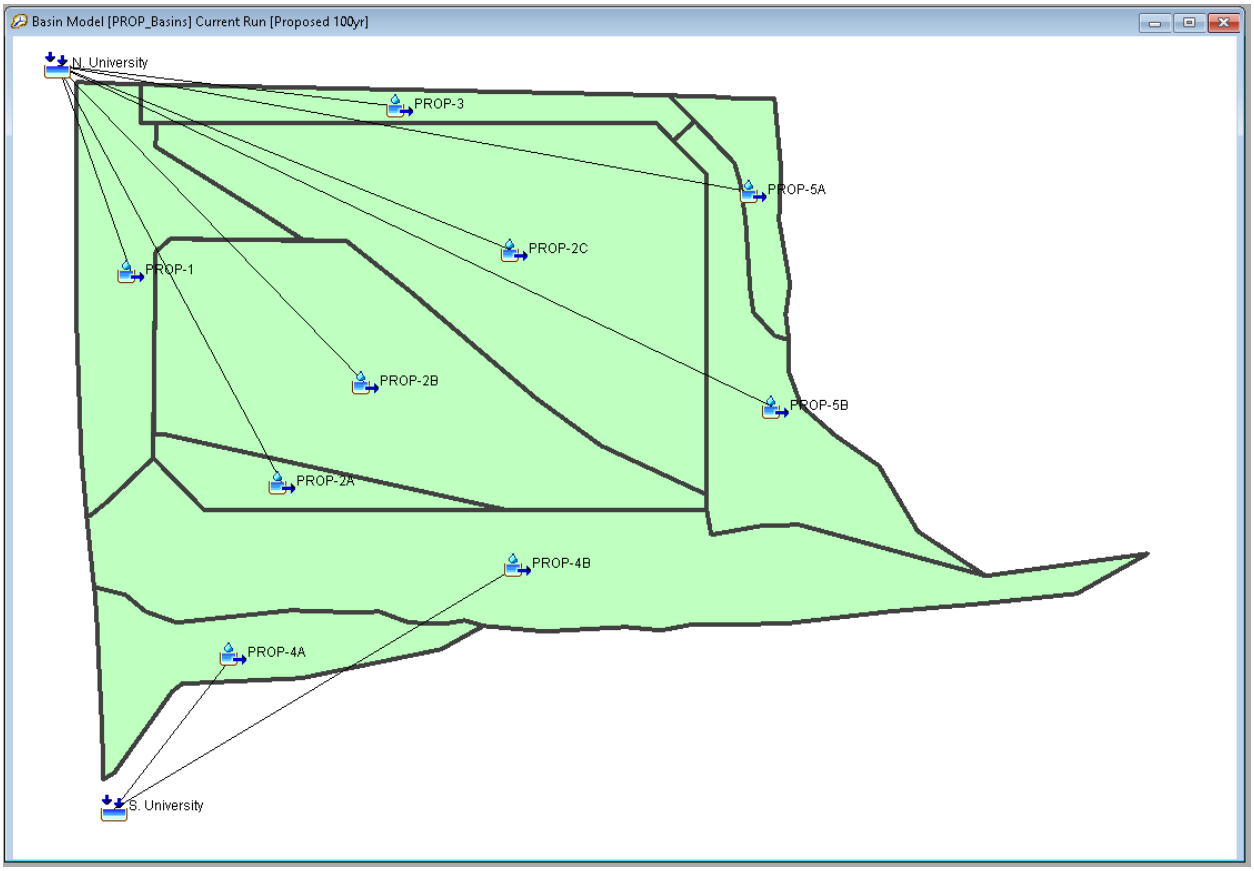
Change in Flow & Volume	Ext Q100 (CFS)	Ext Vol. (Ac-Ft)	Prop Q100 cfs	Prop Vol. (Ac-Ft)	Q Diff. (cfs)	Vol. Diff. (Ac-Ft)
N. University	30.35	1.19	27.72	1.08	-2.63	-0.11
S. University	8.85	0.35	10.84	0.42	1.99	0.07
Total to ROW:	**39.20**	**1.54**	**38.56**	**1.50**	**-0.64**	**-0.04**

3-3 Proposed HEC-HMS Inputs and Outputs

HEC-HMS Inputs and Outputs

Proposed Conditions, 100yr, 24hr Storm

Basin Model



Precipitation

Frequency Storm

Met Name: Met 1

Storm Type:	HYDRO35 TP40 TP49
Annual-Partial Conversion:	--None--
Annual-Partial Ratio:	1.00
Storm Duration:	1 Day
Intensity Duration:	5 Minutes
Intensity Position:	50 Percent
Area Reduction:	--None--
Curve:	Uniform For All Subbasins

Duration	Depth (IN)
5 Minutes	0.570
15 Minutes	1.080
1 Hour	1.790
2 Hours	2.020
3 Hours	2.070
6 Hours	2.240
12 Hours	2.350
1 Day	2.600
2 Days	
4 Days	
7 Days	
10 Days	

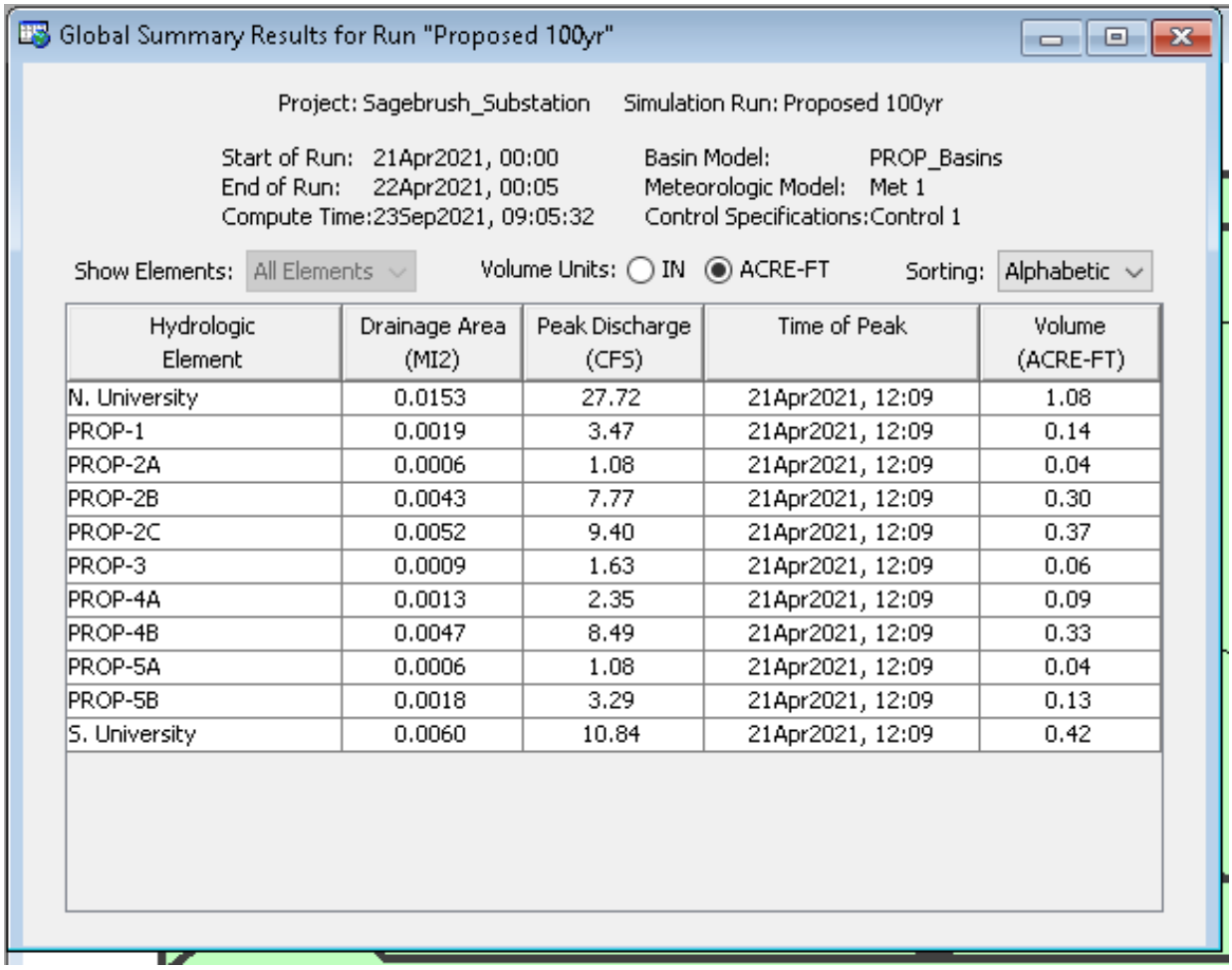
Control

Control Specifications

Name: Control 1

Description:	
*Start Date (ddMMMYYYY)	21Apr2021
*Start Time (HH:mm)	00:00
*End Date (ddMMMYYYY)	22Apr2021
*End Time (HH:mm)	00:05
Time Interval:	1 Minute

Summary Output Table



Global Summary Results for Run "Proposed 100yr"

Project: Sagebrush_Substation Simulation Run: Proposed 100yr

Start of Run: 21Apr2021, 00:00
End of Run: 22Apr2021, 00:05
Compute Time: 23Sep2021, 09:05:32

Basin Model: PROP_Basins
Meteorologic Model: Met 1
Control Specifications: Control 1

Show Elements: All Elements Volume Units: IN ACRE-FT Sorting: Alphabetic

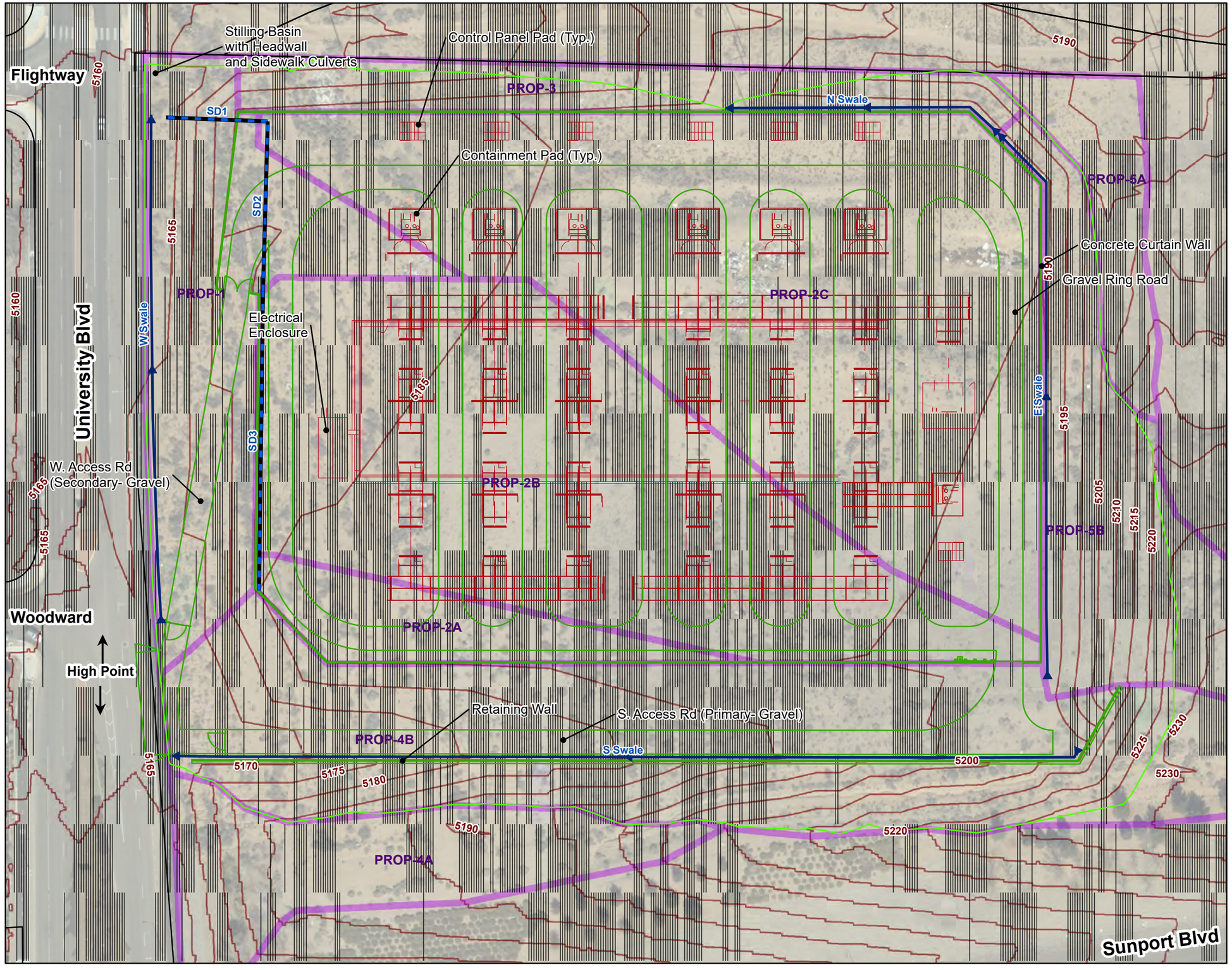
Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (ACRE-FT)
N. University	0.0153	27.72	21Apr2021, 12:09	1.08
PROP-1	0.0019	3.47	21Apr2021, 12:09	0.14
PROP-2A	0.0006	1.08	21Apr2021, 12:09	0.04
PROP-2B	0.0043	7.77	21Apr2021, 12:09	0.30
PROP-2C	0.0052	9.40	21Apr2021, 12:09	0.37
PROP-3	0.0009	1.63	21Apr2021, 12:09	0.06
PROP-4A	0.0013	2.35	21Apr2021, 12:09	0.09
PROP-4B	0.0047	8.49	21Apr2021, 12:09	0.33
PROP-5A	0.0006	1.08	21Apr2021, 12:09	0.04
PROP-5B	0.0018	3.29	21Apr2021, 12:09	0.13
S. University	0.0060	10.84	21Apr2021, 12:09	0.42

Attachment 4

Hydraulic Calculations

4-1 Drainage Improvements

Proposed Conditions Drainage Improvements, and Site Layout



Legend

- Storm Drain
- Swale
- Grading Limits
- Site Layout
- Substation Layout
- Property Line
- Proposed Drainage Basins
- 5ft Contours

N

0 80 160 Feet

1 inch = 80 feet

AECOM

Attachment 4-1

4-2 Proposed Drainage Swales and Sidewalk Culverts

Drainage Feature: **E Swale**
Description: Rock lined Vee ditch
Q100: 3.29 cfs
Contributing drainage: PROP-5B

Open Channel Flow Capacity:

Left Side Slope	3.0	unitless
Left Top Width	3.0	ft
Right Side Slope	3.0	unitless
Right Top Width	3.0	ft
Depth	1.0	ft
Area	3.00	sf
Wetted Perimeter	6.32	ft
Hydraulic Radius	0.47	ft
Manning's n	0.03	unitless
Channel Slope	0.005	ft/ft
Q Capacity	**6.41**	**cfs**

Drainage Feature: **N Swale**
Description: Rock lined Vee ditch
Q100: 4.11 cfs
Contributing drainage: 50% of PROP-3, PROP-5B

Open Channel Flow Capacity:

Left Side Slope	3.0	unitless
Left Top Width	3.0	ft
Right Side Slope	3.0	unitless
Right Top Width	3.0	ft
Depth	1.0	ft
Area	3.00	sf
Wetted Perimeter	6.32	ft
Hydraulic Radius	0.47	ft
Manning's n	0.03	unitless
Channel Slope	0.010	ft/ft
Q Capacity	**9.06**	**cfs**

Drainage Feature: **W Swale**
Description: Rock lined Vee ditch
Q100: 3.47 cfs
Contributing drainage: PROP-1

Open Channel Flow Capacity:

Left Side Slope	3.0	unitless
Left Top Width	3.0	ft
Right Side Slope	3.0	unitless
Right Top Width	3.0	ft
Depth	1.0	ft
Area	3.00	sf
Wetted Perimeter	6.32	ft
Hydraulic Radius	0.47	ft
Manning's n	0.03	unitless
Channel Slope	0.003	ft/ft
Q Capacity	**4.96**	**cfs**

Drainage Feature: **S Swale**
Description: Rock lined Vee ditch
Q100: 8.49 cfs
Contributing drainage: PROP-4B

Open Channel Flow Capacity:

Left Side Slope	2.5	unitless
Left Top Width	2.5	ft
Right Side Slope	2.5	unitless
Right Top Width	2.5	ft
Depth	1.0	ft
Area	2.50	sf
Wetted Perimeter	5.39	ft
Hydraulic Radius	0.46	ft
Manning's n	0.03	unitless
Channel Slope	0.040	ft/ft
Q Capacity	**14.89**	**cfs**

Drainage Feature: **SD1**

Q100:	**18.3**	**cfs**
Contributing drainage:	PROP 2A, 2B, 2C	
Min. allowable slope:	0.0259	ft/ft*

**per FlowMaster report*

Drainage Feature: **SD2**

Q100:	**8.9**	**cfs**
Contributing drainage:	PROP 2A, 2B	
Min. allowable slope:	0.0061	ft/ft*

**per FlowMaster report*

Drainage Feature: **SD3**

Q100:	**1.1**	**cfs**
Contributing drainage:	PROP 2A	
Min. allowable slope:	0.0001	ft/ft*

**per FlowMaster report*

Drainage Feature: **N Univ. SW Culverts**
Description: 2' wide CABQ SW Culverts
Q100: 21.72 cfs
Contributing drainage: PROP-1, 2A, 2B, 2C

Orifice Capacity w/ Headwall

C	0.6	unitless
L (length of SW culvert)	2	ft
H (height of SW culvert)	0.58	ft
A (area of SW culvert open	1.17	sf
H2 (height of headwall)	1.5	ft
h (depth of water from cen	1.79	ft
Q (per SW culvert)	7.52	cfs
No of SW culverts	3	
Q Capacity	**22.56**	**cfs**

Drainage Feature: **N Univ. SW Culverts**
Description: 2' wide CABQ SW Culverts
Q100: 21.72 cfs
Contributing drainage: PROP-1, 2A, 2B, 2C

Open Channel Flow Capacity

Wetted Perimeter	3.17	ft
Hydraulic Radius	0.37	ft
Manning's n	0.013	unitless
Channel Slope	0.015	ft/ft
Q (per SW culvert)	8.42	cfs
No of SW culverts	3	
Q Capacity	**25.25**	**cfs**

4-3 Bentley FlowMaster Reports

Worksheet for SD1

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.012
Channel Slope	0.0259
Normal Depth	18.0
Diameter	18.0
Discharge	18.30

Results	
Channel Slope	0.0259
Normal Depth	18.0
Flow Area	1.8
Wetted Perimeter	4.7
Hydraulic Radius	4.5
Top Width	0.00
Critical Depth	17.5
Percent Full	100.0
Critical Slope	0.0228
Velocity	10.36
Velocity Head	1.67
Specific Energy	3.17
Froude Number	(N/A)
Maximum Discharge	19.69
Discharge Full	18.30
Slope Full	0.0259
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	18.0
Critical Depth	17.5
Channel Slope	0.0259
Critical Slope	0.0228

Worksheet for SD2

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Slope

Input Data	
Roughness Coefficient	0.012
Channel Slope	0.0061
Normal Depth	18.0
Diameter	18.0
Discharge	8.90

Results	
Channel Slope	0.0061
Normal Depth	18.0
Flow Area	1.8
Wetted Perimeter	4.7
Hydraulic Radius	4.5
Top Width	0.00
Critical Depth	13.9
Percent Full	100.0
Critical Slope	0.0069
Velocity	5.04
Velocity Head	0.39
Specific Energy	1.89
Froude Number	(N/A)
Maximum Discharge	9.57
Discharge Full	8.90
Slope Full	0.0061
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	18.0
Critical Depth	13.9
Channel Slope	0.0061
Critical Slope	0.0069

Worksheet for SD3

Project Description	
Friction Method	Manning Formula
Solve For	Channel Slope

Input Data	
Roughness Coefficient	0.012
Normal Depth	18.0
Diameter	18.0
Discharge	1.10

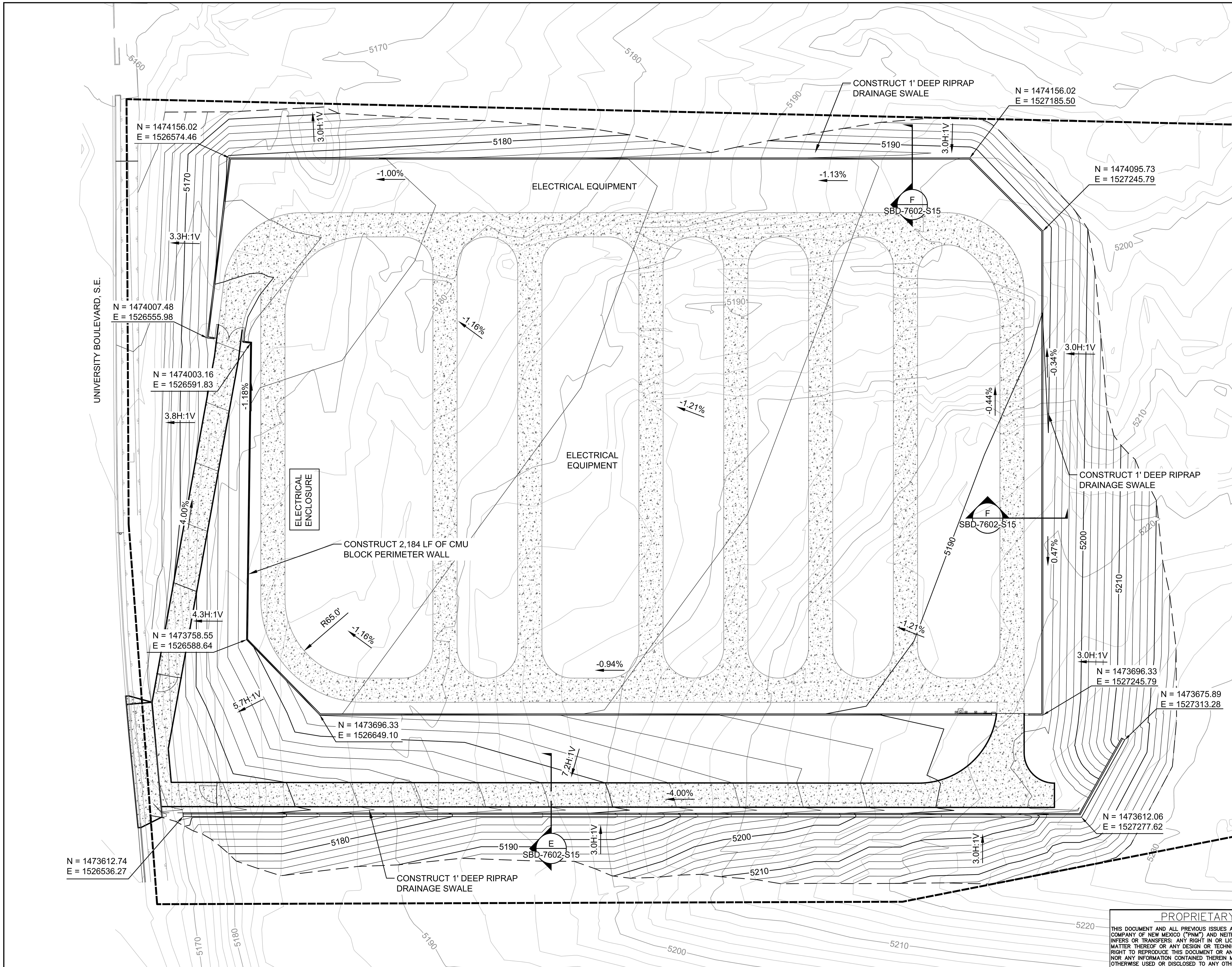
Results	
Channel Slope	0.0001
Flow Area	1.8
Wetted Perimeter	4.7
Hydraulic Radius	4.5
Top Width	0.00
Critical Depth	4.7
Percent Full	100.0
Critical Slope	0.0042
Velocity	0.62
Velocity Head	0.01
Specific Energy	1.51
Froude Number	(N/A)
Maximum Discharge	1.18
Discharge Full	1.10
Slope Full	0.0001
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	18.0
Critical Depth	4.7
Channel Slope	0.0001
Critical Slope	0.0042

Attachment 5

Conceptual Drainage and Grading Plan



DRAINAGE AND GRADING PLAN

Scale: 1"=40'

REVISION		
NO.	DATE	BY

ENGINEER'S STAMP

PRELIMINARY NOT FOR CONSTRUCTION

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO

DRAINAGE AND GRADING PLAN
--
SAGEBRUSH SUBSTATION

DR:		DATE: 02/01/21
CKD:	OK:	SCALE: As Noted
APP:		
REV. NO.	SBD-7602-S3	3 OF 6

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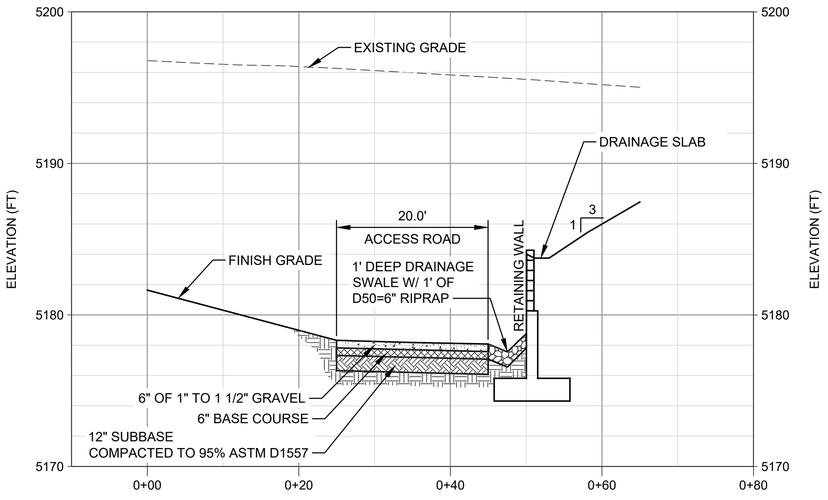
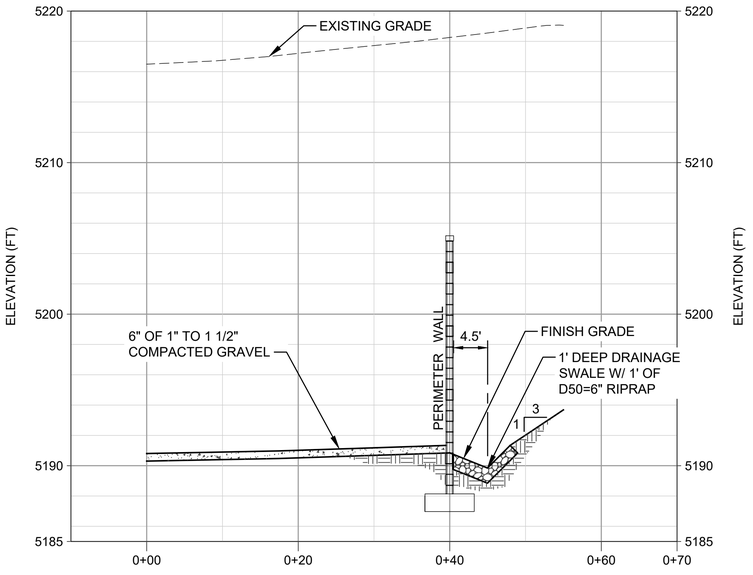


E SECTION

SBD-7602-S10 Scale: 1"=5' VERT. 1"=10' HORIZ.



F SECTION

SBD-7602-S10 Scale: 1"=5' VERT. 1"=10' HORIZ.

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DATE: Oct 07, 2020 - 4:47pm
SHEETS: SUB STATION LINEWORK
USES: ELEMENTS
USER: Jesse.Higgins
PNM Title Block
IMAGES:

NO.	DATE	BY
REVISION		

ENGINEER'S STAMP

PRELIMINARY NOT FOR CONSTRUCTION

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO

DRAINAGE SECTIONS
--
SAGEBRUSH SUBSTATION

DR:		DATE: 02/01/21
CKD:	OK:	SCALE: As Noted
APP:	SBD-7602-S4	4 OF 6
REV. NO.		

Attachment 6

Models (Electronic)

6-1 HEC-HMS Model

6-2 Bentley FlowMaster Workbook