CITY OF ALBUQUERQUE

Planning Department
Brennon Williams, Director

Mayor Timothy M. Keller

April 19, 2021

Dan Skeehan, P.E.
Kimley-Horn and Associates, Inc.
4582 S Ulster St, Suite 1500
Denver, CO 80237

RE: RV Storage
Volcano Rd. NW
Conceptual Grading & Drainage Plan and Drainage Report
Engineer's Stamp Date: No Stamp
Hydrology File: K09D046

Dear Mr. Skeehan:

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

Based upon the information provided in your submittal received 04/19/2021, the Conceptual Grading & Drainage Plan and Drainage Report are approved for action by the DRB on Site Plan for Building Permit.

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.

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

City of Albuquerque

Planning Department

Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET (REV 11/2018)

Project Title: RV Storage - Albuquerque Building Permit #: _____ Hydrology File #: _____

DRB#: PR-2020-004757 EPC#: _____ Work Order#: _____

Legal Description: Tracts C48 and C49 Unity 4 Town of Atrisco Grant

City Address: Central Ave NW at Volcano Rd. NW

Applicant: Kimley-Horn Associates, Inc. Contact: Stephen Litsas

Address: 4582 South Ulster Street, Suite 1500 Denver, CO 80237

Phone#: 720-647-6231 Fax#: N/A E-mail: Stephen.litsas@kimey-horn.com

Owner: Macritchie, Inc. Contact: Ben Lokhorst

Address: 715 5th Ave SW Suite 1700, Calgary AB, T2P 2X6, Canada

Phone#: 4039734882 Fax#: N/A E-mail: blokhorst@macritchie.biz

TYPE OF SUBMITTAL: _____ PLAT (___# OF LOTS) ____ RESIDENCE x___ DRB SITE ____ ADMIN SITE

IS THIS A RESUBMITTAL?: _____ Yes x_____ No

DEPARTMENT: _____ TRAFFIC/ TRANSPORTATION x____ HYDROLOGY/ DRAINAGE

Check all that Apply:

TYPE OF SUBMITTAL:

____ ENGINEER/ARCHITECT CERTIFICATION
____ PAD CERTIFICATION
____ CONCEPTUAL G & D PLAN
x___ GRADING PLAN
____ DRAINAGE MASTER PLAN
x___ DRAINAGE REPORT
____ FLOODPLAIN DEVELOPMENT PERMIT APPLIC
____ ELEVATION CERTIFICATE
____ CLOMR/LOMR
____ TRAFFIC CIRCULATION LAYOUT (TCL)
____ TRAFFIC IMPACT STUDY (TIS)
____ 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
x___ SITE PLAN FOR BLDG. PERMIT APPROVAL
____ FINAL PLAT APPROVAL
____ SIA/ RELEASE OF FINANCIAL GUARANTEE
____ FOUNDATION PERMIT APPROVAL
____ GRADING PERMIT APPROVAL
____ SO-19 APPROVAL
____ PAVING PERMIT APPROVAL
____ GRADING/ PAD CERTIFICATION
____ WORK ORDER APPROVAL
____ CLOMR/LOMR
____ FLOODPLAIN DEVELOPMENT PERMIT
____ OTHER (SPECIFY) _____

DATE SUBMITTED: 2/24/2021 By: Annie Morgan

COA STAFF: ELECTRONIC SUBMITTAL RECEIVED: _____

FEE PAID: _____

Final Drainage Report

RV Storage
City of Albuquerque, New Mexico

Prepared for:
Ben Lokhorst
Macritchie, Inc.
715 5th Ave, Suite 1700
Calgary AB T2P 2X6, Canada

Prepared by:
Kimley-Horn and Associates, Inc.
4582 S Ulster St, Suite 1500
Denver, CO 80237
(303) 228-2300
Contact: Dan Skeehan, P.E.

Project #: 096648005

Prepared: February 24, 2021

Kimley»Horn

CERTIFICATION

DESIGN ENGINEER'S STATEMENT

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparation of this report.

SIGNATURE (Affix Seal): _____

State of New Mexico P.E. No. 21773 Date

OWNER/DEVELOPER'S STATEMENT

I, the developer, have read and will comply with all of the requirements specified in this Drainage Report and Plan.

_____
Name of Developer

_____
Authorized Signature Date

_____
Printed Name

_____
Title

_____
Address:

City of Albuquerque
Planning Department
Development Review Services
HYDROLOGY SECTION
PRELIMINARY APPROVED
DATE: 04/19/21
BY: Renée C. Brissette
HydroTrans # K09D046

THESE PLANS AND/OR REPORT ARE CONCEPTUAL ONLY. MORE INFORMATION MAY BE NEEDED IN THEM AND SUBMITTED TO HYDROLOGY FOR BUILDING PERMIT APPROVAL.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The project is located on the northwestern corner of Volcano Rd and Central Ave within the City of Albuquerque. The RV parking facility will consist of canopied spots and associated facilities to operate the RV parking facility. Only canopied RV storage will be provided for the development. Stormwater runoff from the project will be retained on-site for water quality and to reduce the allowed site runoff. The site has no major offsite flows being conveyed to the project site per the AMAFCA Amole-Hubbell Drainage Master Plan Update Final Report completed by Wilson & Company Engineers & Architects, dated May 2013 (AMAFCA). Onsite flow will be directed to the proposed onsite private retention pond. The pond has been designed to infiltrate the storm water quality volume required per the City of Albuquerque Development Process Manual, dated September 2020 (DPM) and infiltrate the excess volume being capture in the pond to meet the allowable site peak discharge per the DPM. The site will outfall into Volcano Road as the site has done historically.

In conjunction with this submittal, approval is also being requested for the Site Development Plan for Building Permit, Grading Permit, and Building Permit.

INTRODUCTION

PURPOSE AND SCOPE OF STUDY

The purpose of this Final Drainage Report (FDR) is to provide the hydrologic and hydraulic calculations and to document and finalize the drainage design methodology in support of the proposed RV Storage (“the Site”); for Macritchie, Inc. The Site is located within the jurisdictional limits of City of Albuquerque (“the City”). Thus, the guidelines for the hydrologic and hydraulic design components were based on the criteria for the City of Albuquerque, described below.

PROJECT REQUIREMENTS

Offsite roadway improvements on the frontage road of the property are required and will be included as part of this development.

PROJECT DESCRIPTION

LOCATION

The Site is located within Section 21, Township 10 North, Range 2 East of the New Mexico Principle Meridian, County of Bernalillo, State of New Mexico. More specifically, this site is located north of Volcano Rd and south of Avalon Rd, City Zone Atlas page K9.

LEGAL DESCRIPTION

Current legal description:
Parcel 1:

A certain tract of land situated within the Town of Atrisco Grant, Projected Section 21, Township 10 North, Range 2 East of the N.M.P.M., City of Albuquerque, Bernalillo County, New Mexico as the same is shown and designated on the quitclaim deed filed in the Office of the County Clerk of Bernalillo County, New Mexico on September 28, 1994, in Book 94-27, page 6350, said tract being more particularly described by metes and bounds as follows:

Beginning as the southwest corner of said tract, being a set 5/8 rebar with plastic cap stamped ls 8911, also being a point on the northerly right of way line of Volcano Road northwest being the true place of point and beginning, whence for a tie to the ACS Control Station S 64° 57' 12" W, a distance of 1244.30 feet;

Thence, N 15° 19' 45" W, a distance of 1009.53 feet to the northwest corner of said tract, also being a point on the southerly boundary of Sundance Subdivision Unit 2, being a set 5/8" rebar with plastic cap stamped "8911";

Thence, S 83° 32' 41" E, a distance of 228.21 feet along southerly boundary of the Sundance Subdivision Unit 2 to the northeast corner of said tract, being a 5/8" rebar with plastic cap stamped "8911";

Thence, N 14° 53' 31" W, a distance of 1017.19 feet distance to the southeast corner of said tract also being a point on the northerly right of way line of Volcano Road northwest, being a set 5/8" rebar with plastic cap stamped "8911";

Thence; N 68° 43' 02" W, a distance of 97.76 feet distance along said right of way set 5/8" rebar with plastic cap stamped "8911";

Thence, S 89° 48' 54" W, a distance of 130.19 feet distance along said right of way to a set 5/8" rebar with plastic cap stamped "8911"; being the southwest corner of said tract and being the true point of beginning.

Parcel 2:

A certain tract of land situated within the Town of Atrisco Grant, Projected Section 21, Township 10 North, Range 2 East, of the N.M.P.M., City of Albuquerque Bernalillo County, New Mexico as the same is shown and designated on the quitclaim deed filed in the office of the County Clerk of Bernalillo County, New Mexico on September 28, 1994, in Book 94-27, page 6350, said tract being more particularly described by metes and bounds as follows:

Beginning at the southeast corner of said tract, being a set 5/8" rebar with plastic cap stamped "8911" and being a point on the northerly right of way line of Volcano Road northwest, being the true place and point of beginning, whence for a tie to the ACS Control Station "7-k9", bears S 64° 57' 12" W, a distance of 1244.30 feet distance;

Thence, N 89° 48' 54" W, a distance of 211.54 feet along said right of way to the southwest corner of said tract being a found 5/8" rebar set on concrete "disturbed",

Thence, N 15° 19' 45" W, a distance of 1035.88 feet to the northwest corner of said tract, also being point on the southerly boundary of Sundance Subdivision, Unit 2, found an aluminum cap,

Thence, S 83° 32' 41" E, a distance of 219.89 feet along said right subdivision to the northeast corner of said tract, being a set 5/8" rebar with plastic cap stamped "8911";

Thence, S 15° 19' 45" E, a distance of 1009.53 feet distance to a set 5/8" rebar with plastic cap stamped "8911", being the southeast corner of said tract and the northerly right of way line of Volcano Road northwest, being the true place and point of beginning.

BACKGROUND DOCUMENTS

PLANNING HISTORY

The Site is current an existing vacant undeveloped property and is currently zoned as NR-BP. The Site is identified within the AMAFCA with a future land use of Light Industrial. This aligns with what is being proposed for the Site. Please refer to **Appendix D** for excerpts from the AMAFCA.

DRAINAGE HISTORY AND RELATED DOCUMENTS

The following AMAFCA Final Report was used to determine the allowable developed discharge for the Site. Per the AMAFCA the Site is located within the Tierra Bayita Basin and sub-basin TB210. Per the AMAFCA report the proposed developed flow determined for sub-basin TB210 was determined to have an overall area of 47 acres and a peak runoff of 175.08 cfs for the 100-yr, 6-hr storm. Which equates to a runoff of 3.73 cfs/acre. There are no known recommendations or requirements mentioned for the Site beyond the proposed peak flow determine for the sub-basin TB210. Refer to **Appendix D** for the excerpts from the AMAFCA Final Report.

EXISTING CONDITIONS

SITE INVESTIGATION

The site is vacant and undeveloped. The existing Site drains from the northwest to the southeast and ultimately outfalls to Volcano Road. Runoff sheet flows to the east and south sides of the property. Along the west side of the site is an existing berm that directs runoff south from the property to the west to Volcano Road. There are no storm drain facilities located within Volcano Road adjacent to the Site. The property to the east is an existing concrete plant and the east property line of the site is the east boundary of sub-basin TB 210. To the north is Avalon Rd NW which is a dirt road and acts as the north basin boundary of sub-basin TB 210, to the west is a Department of Transportation maintenance yard, and to the south is Volcano Road which acts as the south boundary of sub-basin TB 210. Sub-basin TB 210 outfall is located near the southeast corner of the site in Volcano Road.

Form of Analysis

The existing and proposed drainage conditions at the Site were analyzed by calculating onsite runoff using the Peak Discharge Rate for Small Watersheds per Section 6-2(A)(5) of the DPM. These calculations are provided in **Appendix B.**

Downstream Capacity

The site outfalls into the flowline of Volcano Road where flows will be conveyed in the existing roadway as they have done historically.

DEVELOPED CONDITIONS

ONSITE

The proposed development will include 432 canopied RV parking spots, paved drive aisles, as well as the facilities required to operate the RV storage facility. The proposed site will maintain

the historic drainage pattern as much as practical. The proposed grading will continue to drain the site from the northwest to the southeast to a proposed retention pond. Runoff will sheet flow to the proposed pond. The pond is design to drain within the required 96-hours per the DMP. The proposed improvements will produce a peak 100-hr, 6-hr flow of 40.14 cfs. The allowed 100-yr, 6-hr peak flow for the site per the AMAFCA is 36.76 cfs. This was determined by taking the ratio of the areas, which was determined by dividing the site area (10 acres) by the TB 210 basin area (47 acres). By doing that the ratio was determined to be 0.21. This value was then multiplied by the TB 210 basin peak flow of 175.08 cfs, and resulted in a allowable peak discharge of 36.76 cfs. The proposed retention pond is designed to drain the required storm water quality volume (SWQV) (0.32 ac-ft) within the required 96-hours. In addition to the pond has been oversized to accommodate an additional 0.11 ac-ft to reduce the peak flow from 40.14 to 36 cfs which, is below the allowable peak flow for the site. Refer to **Appendix B** for the site peak flows and **Appendix C** for SWQV, spillway sizing, and pond drain time calculations. The proposed pond will be a private pond that will be privately operated and maintained. Measures will be taken during construction to reduce the potential of stormwater pollution.

The pond is designed to have 1-ft of freeboard while the conveying the 100-yr, 6-hr peak flow discharging through the pond spillway. The spillway will be lined with riprap to reduce the potential of erosion to the spillway and the landscape downstream of the spillway. It is not anticipated that downstream properties will be negatively impacted as the peak site discharge is discharging into Volcano Road as the site has historically done. The required pond volume for the site is the SWQV (0.32 ac-ft) plus reduce peak flow volume (0.11 ac-ft) which totals a required pond volume of 0.41 ac-ft. The proposed pond is designed to provide 0.43 ac-ft of storage.

OFFSITE

Currently off-site flow discharge to Volcano Road. Where flows will continue to the east as they have done historically. The proposed development will generally maintain the historic location for the site and outfall into the flow line of Volcano Road. This aligns with the proposed conditions identified in the AMAFCA Final Report. The City is currently installing and constructing storm drain infrastructure approximately 850 ft east of the site in Central Ave SW.

CALCULATIONS

The peak flow for existing and proposed conditions was determined using the Peak Discharge Rate for Small Watersheds per Section 6-2(A)(5) of the DMP. The site was determined to be precipitation Zone 1. The pond was sized for the required SWQV as described in Section 6-12 of the DMP for new development and sized to detain additional volume per Section 6-2(A)(7) of the DMP to meet the allowable site discharge per the AMAFCA Final Report. Refer to **Appendix B** for peak flows, **Appendix C** for pond calculations and **Appendix D** for the excerpts from the AMAFCA.

CONCLUSION

The proposed development will maintain the historic drainage patterns onsite. The site will include proposed landscaping, paved drive isles, curb and gutter, canopies over parking stalls, and the proposed retention pond. The pond will account for the required SWQV and additional storage to reduce the site peak discharge for the 100-yr, 6-hr storm is equal or less than the allowable discharge determined from the AMAFCA Final Report. The site will not have any significant offsite flows being conveyed onto the site. The pond spillway will be lined with riprap to reduce the potential of erosion. The proposed pond will be a private pond that will be privately operated and maintained.

REFERENCES

1. City of Albuquerque “Development Process Manual” (DPM), dated September 2020

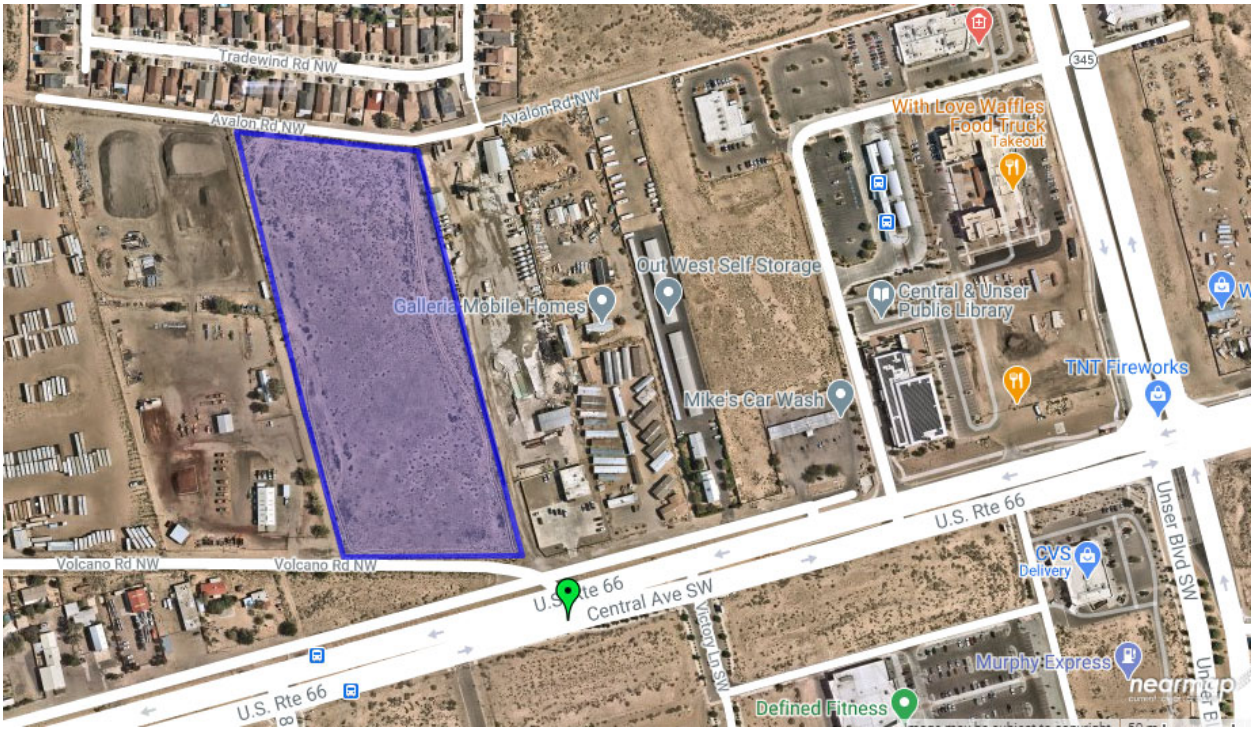
2. AMAFCA Amole-Hubbell Drainage Master Plan Update Final Report (AMAFCA), dated May 2013

3. Flood Insurance Rate Map, Bernalillo County, Colorado and Incorporated Areas, Map Number 35001C0328J, Effective Date November 4, 2016, prepared by the Federal Emergency Management Agency (FEMA).

APPENDIX

APPENDIX A: FIGURES

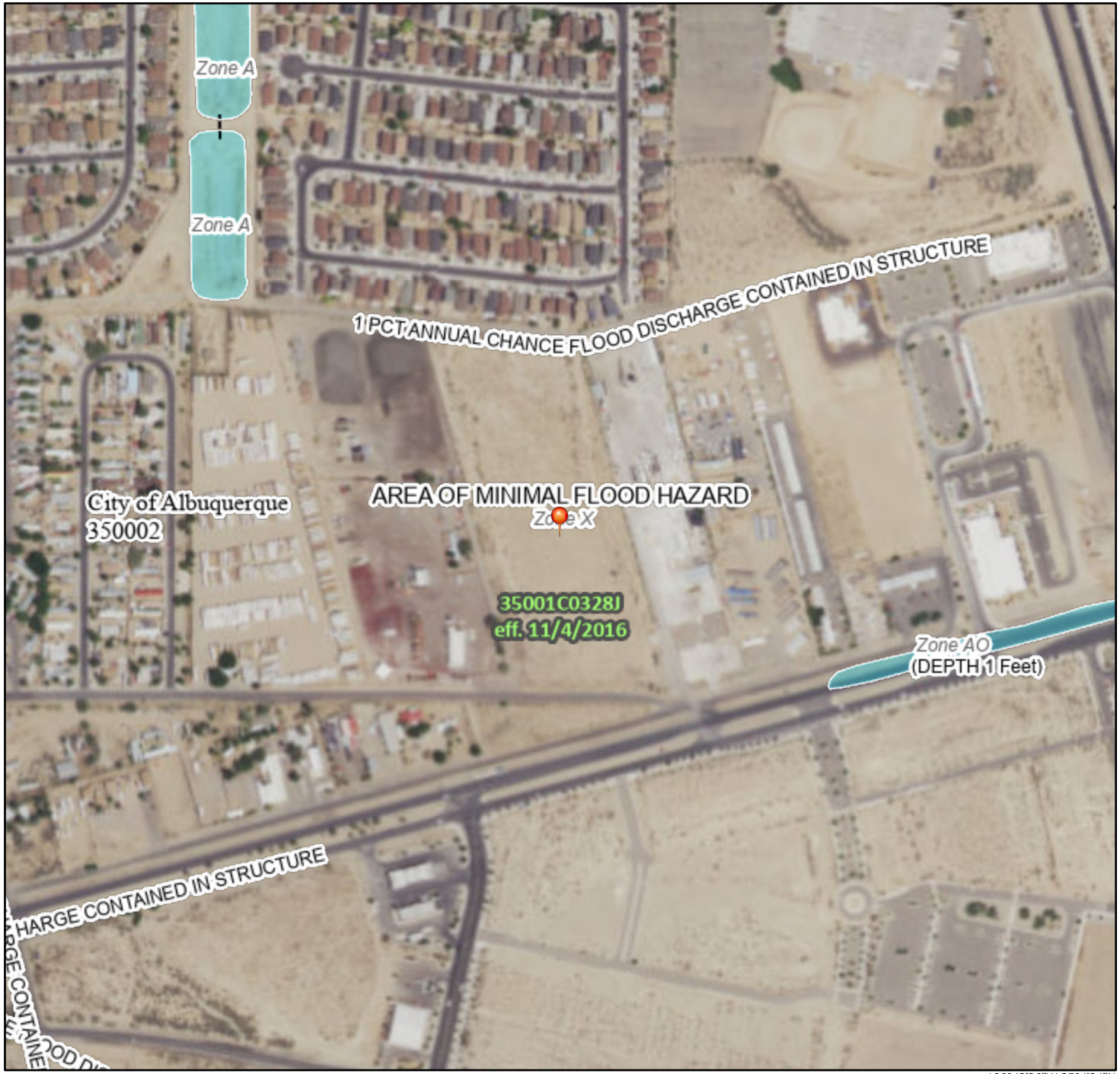
Site Vicinity Map



National Flood Hazard Layer FIRMette

FEMA

106°44'3"W 35°4'54"N



106°43'26"W 35°4'24"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

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

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

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

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

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

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

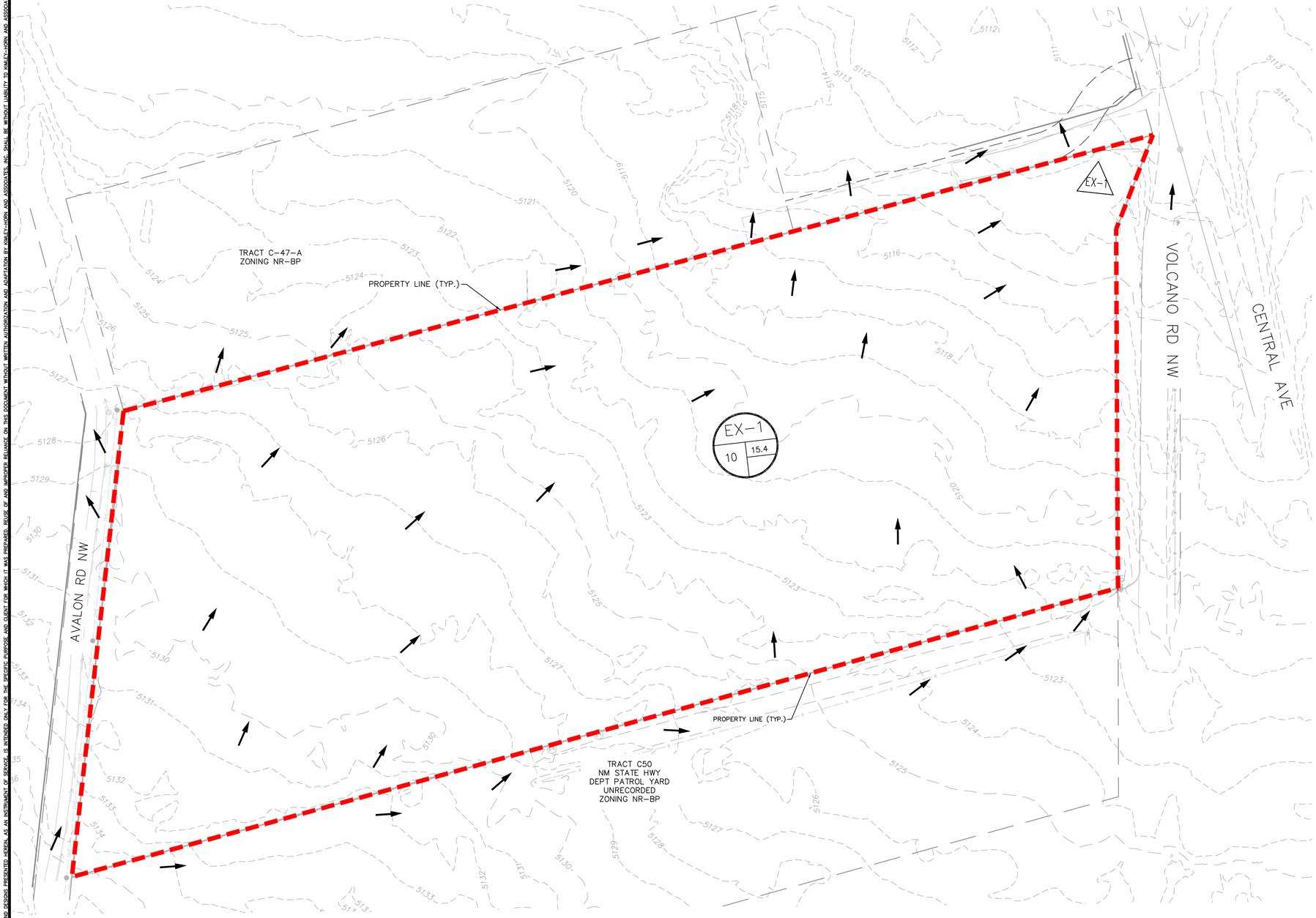
N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/15/2021 at 2:21 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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



LEGEND

- PROPERTY LINE
- BASIN BOUNDARY LINES
- EXISTING EASEMENT LINES
- XX EXISTING MAJOR CONTOUR
- XX EXISTING MINOR CONTOUR
- W EXISTING WATER MAIN
- S EXISTING SANITARY SEWER MAIN
- Ⓢ EXISTING SANITARY SEWER MANHOLE
- # = BASIN ID
- A = BASIN AREA (AC)
- B = 100-YR PEAK DISCHARGE (CFS)
- X DESIGN POINT

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn

4852 South Ulster Street, Suite 1500
Denver, Colorado 80237 (303) 228-2300

DESIGNED BY: AEM
DRAWN BY: AEM
CHECKED BY: SAL
DATE: 2/18/2020

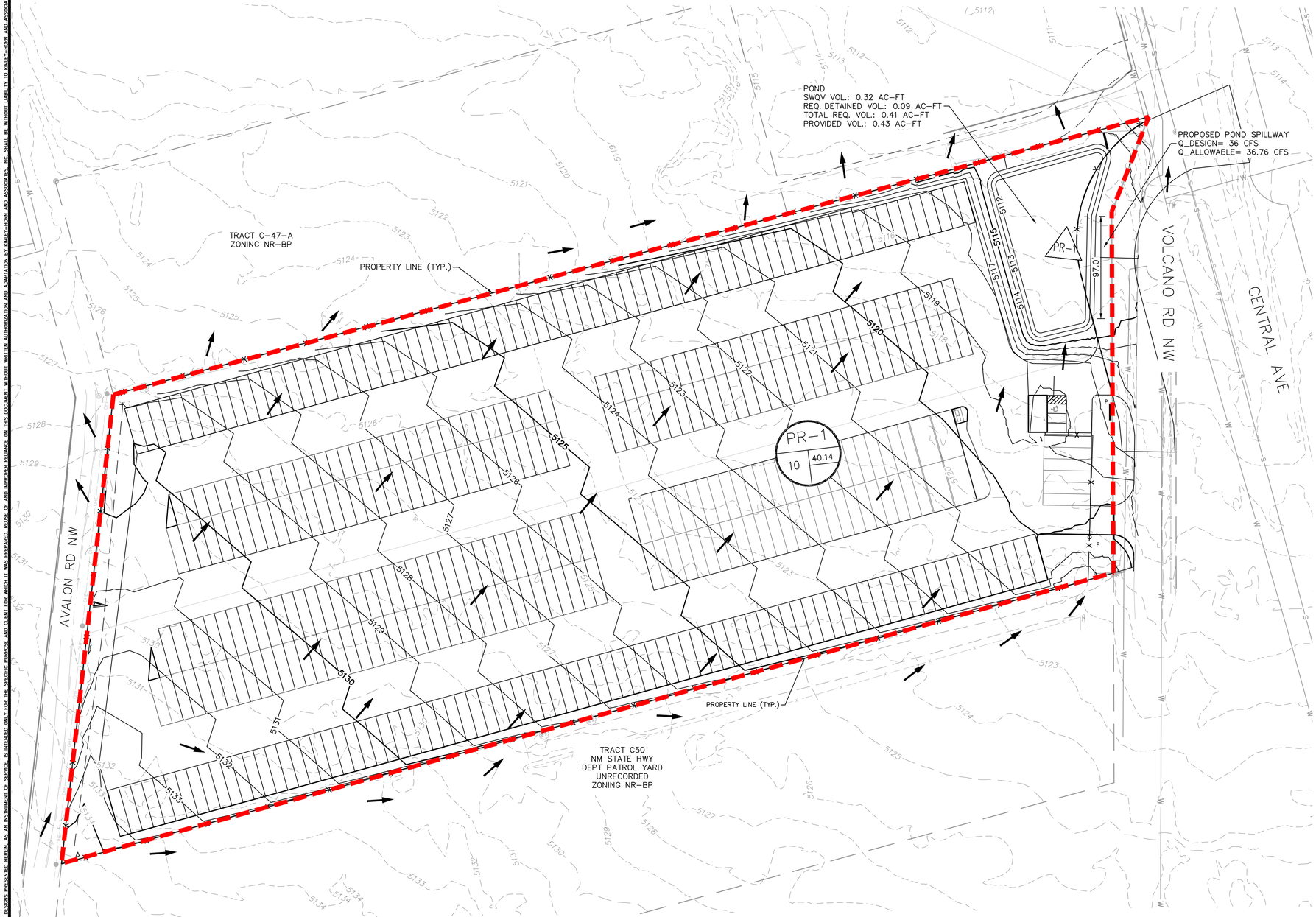
LEGAL DESCRIPTION:
SECTION 21, TOWNSHIP 10 NORTH, RANGE 2 EAST, CITY OF ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO. TRACTS C48 AND C49, UNIT 4.

RV STORAGE - ALBUQUERQUE
ALBUQUERQUE, NEW MEXICO
SITE PLAN
EXISTING DRAINAGE PLAN

PROJECT NO.
096648005

DRAWING NAME
EX DRN PLAN

SHEET 1 OF 2



LEGEND

- PROPERTY LINE
- BASIN BOUNDARY LINES
- EXISTING EASEMENT LINES
- XX EXISTING MAJOR CONTOUR
- XX EXISTING MINOR CONTOUR
- W EXISTING WATER MAIN
- S EXISTING SANITARY SEWER MAIN
- Ⓢ EXISTING SANITARY SEWER MANHOLE
- # = BASIN ID
- A = BASIN AREA (AC)
- B = 100-YR PEAK DISCHARGE (CFS)
- X DESIGN POINT

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn

4852 South Ulster Street, Suite 1500
Denver, Colorado 80237 (303) 228-2300

DESIGNED BY: AEM
DRAWN BY: AEM
CHECKED BY: SAL
DATE: 2/18/2020

LEGAL DESCRIPTION:
SECTION 21, TOWNSHIP 10 NORTH, RANGE 2 EAST, CITY OF ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO, TRACTS C48 AND C49, UNIT 4.

RV STORAGE - ALBUQUERQUE
ALBUQUERQUE, NEW MEXICO
SITE PLAN
PROPOSED DRAINAGE PLAN

PROJECT NO.
096648005

DRAWING NAME
PROP DRN PLAN

SHEET 2 OF 2

APPENDIX B: HYDROLOGY

Kimley»Horn

Peak Discharge Rate for Small Watersheds - Exisitng Conditions

Project Name: RV Storage

Project Number: 96648005

Per : DPM Chapter 6, Section 6-2(A)(5)

The peak discharge rate is given in TABLE 6.2.14 for small watersheds, less than or equal to 40 acres, where the time of concentration is assumed to be 12 minutes.

TABLE 6.2.14 **Peak Discharge**

Zone	Land Treatment			
	A	B	C	D
100-YEAR PEAK DISCHARGE (CSF/ACRE)				
1	1.54	2.16	2.87	4.12
2	1.71	2.36	3.05	4.34
3	1.84	2.49	3.17	4.49
4	2.09	2.73	3.41	4.78
2-YEAR PEAK DISCHARGE (CSF/ACRE)				
1	0.00	0.02	0.50	1.56
2	0.00	0.08	0.61	1.66
3	0.00	0.15	0.71	1.73
4	0.00	0.28	0.87	1.88
10-YEAR PEAK DISCHARGE (CSF/ACRE)				
1	0.30	0.81	1.46	2.57
2	0.41	0.95	1.59	2.71
3	0.51	1.07	1.69	2.81
4	0.70	1.28	1.89	3.04

To determine the peak rate of discharge,

1. Determine the area in each treatment, A_A, A_B, A_C, A_D
2. Multiply the peak rate for each treatment by the respective areas and sum to compute the total Q_P.

EQUATION 6.6 **Total Q_P** = $Q_{PA}A_A + Q_{PB}A_B + Q_{PC}A_C + Q_{PD}A_D$

Existing Project Site Q_P **Basin EX-1**

Assumptions:

t_c is 12 minutes

100-yr Peak Discharge (CFS/ACRE)

Site is in Zone 1

Per Table 6.2.14

Zone	Land Treatment			
	A	B	C	D
1	1.54	2.16	2.87	4.12

Eq 6.6:

Q_{PA} =	1.54	cfs/ac
A_A =	10	acres
Q_{PB} =	2.16	cfs/ac
A_B =	0	acres
Q_{PC} =	2.87	cfs/ac
A_C =	0	acres
Q_{PD} =	4.12	cfs/ac
A_D =	0	acres

Total Q_p = 15.40 cfs

Kimley»Horn

Peak Discharge Rate for Small Watersheds - Proposed Conditions

Project Name: RV Storage
Project Number: 96648005

Per : DPM Chapter 6, Section 6-2(A)(5)

The peak discharge rate is given in TABLE 6.2.14 for small watersheds, less than or equal to 40 acres, where the time of concentration is assumed to be 12 minutes.

TABLE 6.2.14 **Peak Discharge**

Zone	Land Treatment			
	A	B	C	D
100-YEAR PEAK DISCHARGE (CSF/ACRE)				
1	1.54	2.16	2.87	4.12
2	1.71	2.36	3.05	4.34
3	1.84	2.49	3.17	4.49
4	2.09	2.73	3.41	4.78
2-YEAR PEAK DISCHARGE (CSF/ACRE)				
1	0.00	0.02	0.50	1.56
2	0.00	0.08	0.61	1.66
3	0.00	0.15	0.71	1.73
4	0.00	0.28	0.87	1.88
10-YEAR PEAK DISCHARGE (CSF/ACRE)				
1	0.30	0.81	1.46	2.57
2	0.41	0.95	1.59	2.71
3	0.51	1.07	1.69	2.81
4	0.70	1.28	1.89	3.04

To determine the peak rate of discharge,
1. Determine the area in each treatment, A_A, A_B, A_C, A_D
2. Multiply the peak rate for each treatment by the respective areas and sum to compute the total Q_P.

EQUATION 6.6 **Total Q_P** = $Q_{PA}A_A + Q_{PB}A_B + Q_{PC}A_C + Q_{PD}A_D$

Proposed Project Site Q_P **Basin PR-1**

Assumptions:

t_c is 12 minutes

100-yr Peak Discharge (CFS/ACRE)
Site is in Zone 1
Per Table 6.2.14

Zone	Land Treatment			
	A	B	C	D
1	1.54	2.16	2.87	4.12

Eq 6.6:

Q_{PA} =	1.54	cfs/ac
A_A =	0	acres
Q_{PB} =	2.16	cfs/ac
A_B =	0	acres
Q_{PC} =	2.87	cfs/ac
A_C =	0.85	acres
Q_{PD} =	4.12	cfs/ac
A_D =	9.15	acres

Total Q_p = 40.14 cfs

APPENDIX C: HYDRAULICS

Kimley»Horn

Project Name: RV Storage
Project Number: 96648005

Hydrograph for Small Watersheds

Hydrograph for Small Watershed
Per : DPM, Chapter 6, Section 6-2(A)(7)

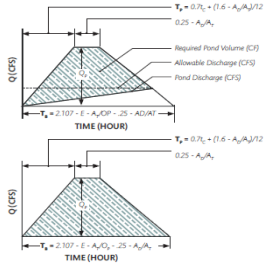
Base time, t_b, for a small watershed hydrograph is,

EQUATION 6.8 $t_b = (2.107 * E * A_T / Q_p) - (0.25 * A_D / A_T)$

Where t_b is in hours, E is the excess precipitation in inches (from TABLE 6.2.1), Q_p is the peak flow in cfs, A_D is the area in treatment D, and A_T is the total area in acres. Using the time of concentration, t_c (hours), the time to peak in hours is:

EQUATION 6.9 $t_p = (0.7 * t_c) + ((1.6 - (A_D / A_T)) / 12)$

FIGURE 6.2.5 **Time to Peak in 10-years**



	E =	2.13	inches
	A_T =	10	acres
	A_D =	9.15	acres
	Q_p	40.14	cfs
Eq 6.8:	t_b=	0.89	hrs
	t_c =	12	minutes
Eq 6.9:	t_p=	0.20	hrs
	0.25 x A_D/A_T =	0.23	hrs
	(t_p + (0.25 x A_D/A_T) =	0.43	hrs
	t_b - (t_p + (0.25 x A_D/A_T) =	0.46	hrs
Area 1:	1.5*T_p*Q_p =	42,716	cu. ft.
Area 2:	(0.25*A_D/A_T)*Q_p =	33,053	cu. ft.
Area 3:	1.5*(t_b - (t_p + (0.25 x A_D/A_T))*Q_p =	100,511	cu. ft.
	Site Total Volume =	4.05	ac-ft

Determine Required Pond Volume:

Allowable Site Discharge (Q_A) =	36.76	cfs
Pond Design Discharge (Q_D) =	36	cfs
Required Pond Volume:	0.09	ac-ft
Pond Volume for Designed Discharge	0.11	ac-ft

Solve for: Required Pond Volume

Q_p - Q_A =	3.38	cfs
Require Pond Volume A_{A1} =	302	cu. ft.
Require Pond Volume A_{A2} =	2,781	cu. ft.
Require Pond Volume A_{A3} =	712	cu. ft.

Leading Leg:

Slope of line =	203.66
Intersection point of lines =	0.18

Falling Leg:

Slope of line	-86.55
Intersection point of lines =	0.46

Total Required Pond Volume = 0.09 ac-ft

Solve for: Pond Volume for Designed Discharge

Q_p - Q_D =	4.14	cfs
Pond Volume for Design Discharge A_{A1} =	454	cu. ft.
Pond Volume for Design Discharge A_{A2} =	3,407	cu. ft.
Pond Volume for Design Discharge A_{A3} =	1068	cu. ft.

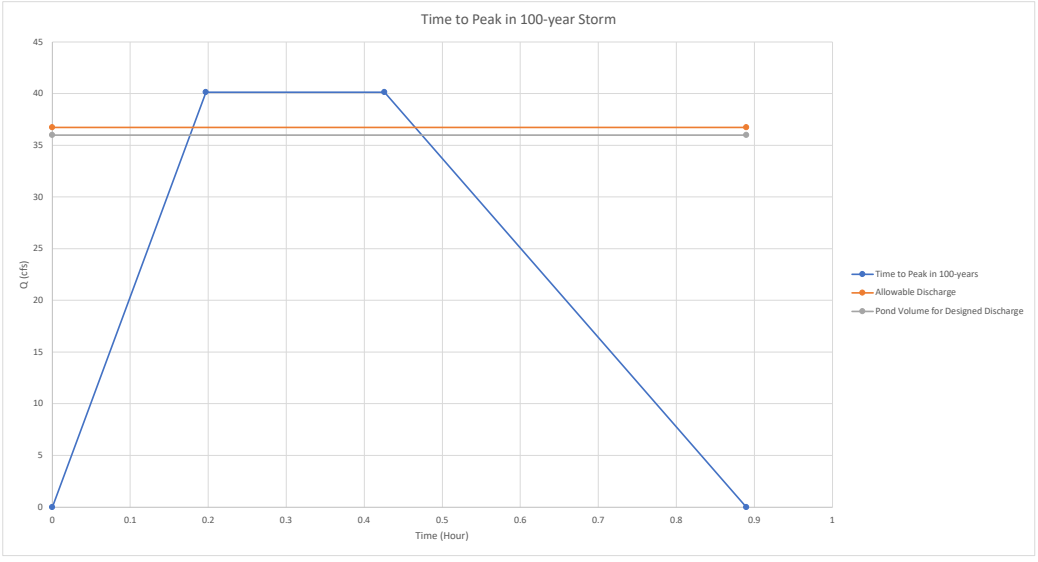
Leading Leg:

Slope of line =	203.66
Intersection point of lines =	0.18

Falling Leg:

Slope of line	-86.55
Intersection point of lines =	0.47

Total Provided Pond Volume = 0.11 ac-ft



Worksheet for Spillway

Project Description	
Solve For	Headwater Elevation

Input Data	
Discharge	36.76 cfs
Crest Elevation	0.00 ft
Tailwater Elevation	0.35 ft
Crest Surface Type	Gravel
Crest Breadth	5.00 ft
Crest Length	40.0 ft

Results	
Headwater Elevation	0.49 ft
Headwater Height Above Crest	0.49 ft
Tailwater Height Above Crest	0.35 ft
Weir Coefficient	2.69 ft^(1/2)/s
Submergence Factor	1.000
Adjusted Weir Coefficient	2.69 ft^(1/2)/s
Flow Area	19.6 ft²
Velocity	1.88 ft/s
Wetted Perimeter	41.0 ft
Top Width	40.00 ft

Storm Water Quality Volume (SWQC)

Project Name: RV Storage
Project Number: 96648005

Per Drainage, Flood Control, and Erosion Control Manual, Chapter 6, Section 6-12

SWQV:

New Development

SWQV: (Impervious area x 0.42)/12

Impervious Area = 9.15 acres

SWQV = 0.32 ac-ft

Kimley»Horn

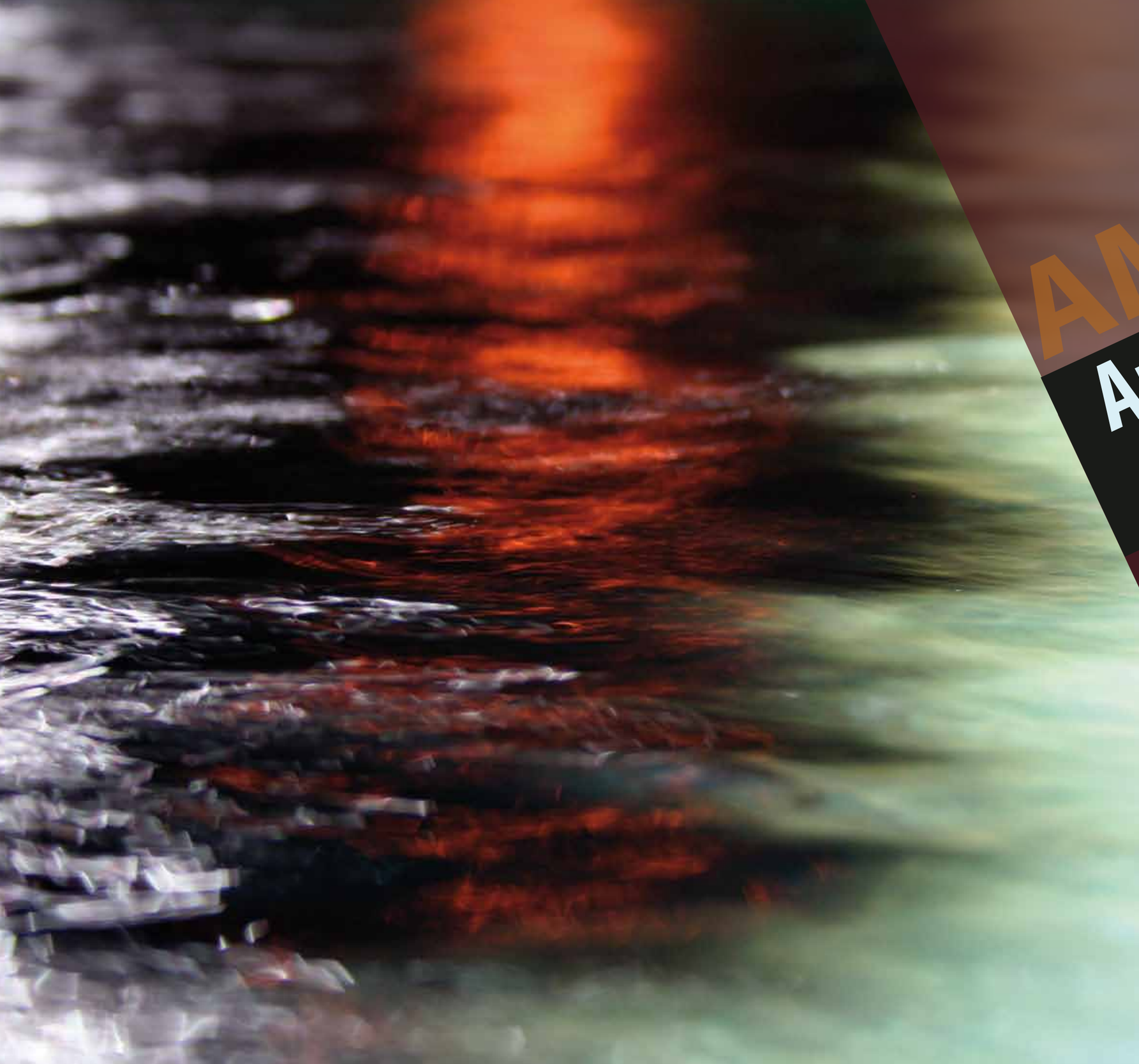
Retention Pond Drain Time

Project Name: RV Storage
Project Number: 96648005

Retention Pond Drain Time				
Pond	Volume	Percolation Rate	Pond Bottom	Drain Time
	cf	inches/hr	Sq. Ft.	hr
A	18,731	0.83	12,000	23

Pond Volume 0.43 ac-ft

APPENDIX D: REFERENCES



AMAFCA

Amole-Hubbell

Drainage Master Plan Update

May 2013

Final Report

AMAFCA

WILSON & COMPANY
ENGINEERS & ARCHITECTS

RESOLUTION 2014-03
ADOPTION OF THE AMOLE-HUBBELL DRAINAGE MANAGEMENT PLAN 2013 UPDATE

WHEREAS, July 1999, the Amole Hubbell Drainage Management Plan (DMP) was adopted by the AMAFCA Board of Directors; and

WHEREAS, the DMP identified existing drainage facilities that were to be expanded and new facilities to be constructed to address existing and future runoff quantities; and

WHEREAS, since adoption by the Board, the watershed has experienced rapid growth and many facilities identified in the DMP have been constructed, often in conjunction with development; and

WHEREAS, the aforementioned development has dictated that AMAFCA re-assess the validity of the DMP; and

WHEREAS, in November 2011, the Board engaged Wilson & Company to prepare an update to the Amole Hubbell DMP (DMP Update); and

WHEREAS, the City of Albuquerque (CITY), Bernalillo County (COUNTY) and AMAFCA all have jurisdiction in the watershed; and

WHEREAS, accordingly AMAFCA entered into a funding agreement with the CITY and the COUNTY for the preparation of the DMP Update; and

WHEREAS, AMAFCA, the COUNTY and the CITY desire to address stormwater control through the Amole Hubbell DMP Update; and

WHEREAS, AMAFCA desires to adopt the Amole Hubbell DMP Update, subject to certain limitations.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY THAT:

The improvements recommended by the Amole Hubbell Drainage Management Plan Update, prepared by Wilson & Company, dated November, 2013 are hereby adopted, subject to the following conditions:

1. Modifications to the adopted plan may be made as circumstances dictate, but major deviations shall be approved by the AMAFCA Board of Directors.

2. The DMP Update utilizes various criteria to establish general project priorities from a technical perspective. It identifies drainage and flood control infrastructure necessary to provide protection to the community from storm water runoff. It does not necessarily reflect

RESOLUTION 2014-03
ADOPTION OF THE AMOLE-HUBBELL DRAINAGE MANAGEMENT PLAN 2013 UPDATE

the priorities to be used by the AMAFCA Board of Directors for funding and construction. Specific projects, if any, will be funded and scheduled by AMAFCA Board of Directors action based on evaluation of public safety needs, cost sharing benefits, orderly development of flood control infrastructure, overall community needs and regional planning requirements.

PASSED, ADOPTED, AND SIGNED this 23th day of January 2014.

ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY

Danny Hernandez, Chair, Board of Directors

ATTEST:

Bruce M. Thomson, Secretary/Treasurer

AMOLE-HUBBELL DRAINAGE MASTER PLAN UPDATE
NOVEMBER 2013

I, Tyler J. Ashton, do hereby certify that this report was prepared by me or under my direction and that I am a duly registered Professional Engineer under the laws of the State of New Mexico.

Tyler J. Ashton, P.E.
State of New Mexico P.E. No. 16205

3-26-14
Date

TYLER J. ASHTON
NEW MEXICO
16205
LICENSED PROFESSIONAL ENGINEER

Table of Contents

List of Figures

List of Tables

List of Photos

Appendix

Executive Summary

The objective of the Amole-Hubbell Drainage Master Plan (DMP) Update is to evaluate the 1999 Amole-Hubbell Report's recommendations and determine what has been done to date and what infrastructure is still needed. In 2011 the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) contracted Wilson & Company to update the original 1999 Amole-Hubbell DMP by Leedshill-Herkenhoff, Inc. The contract was separated into two phases. Phase I Services included literature review/as-built collection and existing hydrologic/hydraulic analysis. Phase II Services analyzed existing facilities for adequacy and provided recommendations for proposed drainage facilities identified in the original DMP.

Approximately 20 square miles (sq. mi.) are analyzed and encompass the area generally bounded by Interstate 40 (I-40) to the north, Westgate Dam basin divided to the west, Gun Club Road to the south, and Coors Boulevard to the east. The project area is separated into the following nine basins as in the original DMP:

1. Powerline Channel Basin (PL)
2. South Powerline Basin (SP)
3. Snow Vista Basin (SV)
4. Amole Basin (AA)
5. Amole del Norte Basin (ADN)
6. Borrega Basin (BR)
7. Rio Bravo Basin (RB)
8. Sacate Blanco (SB)
9. Amole-Hubbell Detention (AH)

A total of 80 reports were gathered for the literature review. Key information was taken from these reports, such as sub-basin boundaries, stage-storage-outflow tables, and existing/proposed infrastructure, and these analysis points aided in the existing and proposed condition modeling.

The table below summarizes the recommendations from the 1999 report and also states whether the recommendation has been completed or if it is still needed today.

Table 0-1:Summary of Recommendations from 1999 Amole-Hubbell Report

Project Identification	Description from 1999 Report	Status 2013
1999 Deficiencies Updated Recommendations		
BR1	A 51 ac-ft Borrega Detention Basin	Completed
BR4	Borrega Inlet Freeboard Upgrade	Completed
AA1	Blake Rd. profile regrading	Completed
AA2	Westgate Heights Earthen Channel regrading	Completed
AA3	Earthen channel bank improvements	Completed
SV1A	Snow Vista Channel/Benavides Rd. Inlet	Not completed, still needed
SV1B	Westgate Heights Benavides Rd. Storm Drain	Not completed, still needed
PL2	Powerline Channel Freeboard Upgrade	Not completed, still needed
1999 Amole-Hubbell System Storage Capacity Recommendations		
AH1	Stage 1 Revise emergency spillway, connect Guac and Amole Basins, provide 150 ac-ft additional storage	Not completed, still needed
AH2	Stage 2 Increase Guac storage by 300 ac-ft	Not completed, still needed
AH3	Stage 3 Increase Guac storage to 862 ac-ft	Not completed, still needed
AH4	PMF Spillway improvements at Hubbell Lake Dam	Not completed, still needed
1999 Amole Arroyo Stabilization		
PL1	Additional detention on Powerline Channel (58 ac-ft)	Not completed, still needed
AA4	Stabilize Amole Arroyo mid reach	Completed
AA5	Construct Amole Arroyo below Snow Vista	Completed
SV2	Maintain runoff constraints in Snow Vista Basin	Completed, still needed
SV3	Snow Vista Channel freeboard upgraded	Not completed, still needed
AA6	Construct channel for lower reach of Amole Arroyo	Completed
AA7	Increase freeboard of transition and chute into Amole Basin	Completed
1999 South Powerline Channel/Detention		
SP1	Construct diversion channel with detention basins	Partially completed, still needed
1999 South Rio Bravo Arroyo at Hubbell Lake		
RB1	Convey South Rio Bravo Arroyo discharge across the Gun Club Lateral	Partially completed, still needed
1999 Development Driven Improvements/Facilities		
AD1	Tower/Sage Detention Basin	Completed
SB1	Sacate Blanco Diversion Channel	Not completed, still needed
SB2	S. Sacate Blanco Arroyo Conveyance	Not completed, still needed
SB3	Sacate Blanco Avulsion Conveyance	Not needed
BR2	N. and S. Borrega Arroyo Conveyance	Not completed, still needed
RB2	S. Rio Bravo Arroyo Conveyance	Not needed
BR3	Borrega "6B" Diversion Storm Drain	Partially completed, still needed
ADN	Amole del Norte Basin Controls	Still needed, continued enforcement required

The 20 sq. mi. watershed was reevaluated utilizing the information obtained through the literature review process. Based on the updated data the watershed was divided into seven basins for the updated DMP. The original Sacate Blanco Basin and Amole-Hubbell basin were incorporated into the South Powerline and Amole Basins respectively resulting in the follow basins for evaluation:

1. Powerline Channel Basin (PL)
2. South Powerline Basin (SP)
3. Snow Vista Basin (SV)
4. Amole Basin (AA)
5. Amole del Norte Basin (ADN)
6. Borrega Basin (BR)
7. Rio Bravo Basin (RB)

The updated watershed basins and hydrological analysis for the proposed conditions model resulted in additional recommendations to those presented in the original DMP. . These recommendations, along with the recommendations that are still needed, are summarized in Table 0-2 including conceptual costs by basin.

Table 0-2:Summary of Recommendations for 2013 Amole-Hubbell Update Report

Project Identification	Description of Project	Cost
Powerline Basin		
Pond PL1	Increase Pond storage to 21 ac-ft	$328,200
Sediment Removal PL1-PL6	Remove sediment from existing ponds to design conditions, see Figure 3-1	$/yr- AMAFCA
South Powerline		
Sediment Removal	Remove sediment from existing ponds to design conditions, see Figure 4-1	$/yr- COA
Pond SP8	Construct 17.5 ac-ft pond	$$$/Developer Cost
Pond SP1	Combine ponds SP1A and SP!B	$$$/Developer Cost
Snow Vista Basin		
Sediment Removal	Remove sediment from existing ponds to design conditions, see Figure 5-1	$/yr-AMAFCA/COA
SV4A	Route Basins SV229 and SV230 to Amole Arroyo	$$$ Developer Cost
SV1	Westgate Heights Benavides Rd. Storm Drain	$2,434,000
SV2	Maintain runoff constraints in Snow Vista Basin	Developer Cost
Pond SV8	Increase Pond size to 4 ac-ft, reconstruct outlet structure	$212,500
Pond SV205	Construct 28 ac-ft pond	$1,080,300
Amole Basin		
AH1-4	A GuacAmole/Hubbell Lake System Analysis is needed to address capacity/discharge.	$$$
Amole del Norte Basin		
Pond NE3	Relocate pond spillway	$222,800
Pond Modifications	Install orifice plates in Ponds NE2 and NE3	$
98th & Central Storm Drain	Install Storm drain per Figure 7-1	$$$/Developer Cost
Unser/214 Area		
Basin 202.1 restriction	Restrict future development to 2.0 cfs/ac.	$$
West I-40 Diversion	Complete construction of channel	$3,000,000
Pond U1	Install orificeplate in Pond	$
Unser Storm Drain	Upsize 42” to 60”	$$$
Tierra Bayita		
Pond TB1	Construct detention pond	$$$
Basin 202.1 and 202.2 restrictions	Restrict future developments to 2.05 cfs/ac	Developer cost
Coors N-S Pond	Increase volume to 75 ac-ft.	$$/AMAFCA
Atrisco Business Park Basin		
Basin Restrictions	Continue to restrict all development to 0.1 cfs/ac	Developer cost
Tower/Sage Basin		
Tower Road Storm drain	Complete storm drain	$$$
Pond TS2	Install storm drain in Sage Rd.	$$$
South Amole del Norte		
Pond SA2	5 ac-ft expansion of pond	$175,900
Pond SA3	Increase pond size by 1 ac-ft	$61,800
Borrega Basin		
Pond B1	Construct 6 ac-ft pond	$
Borrega Dam Expansion	Expand Borrega Dam to ultimate condition	$540,700
Rio Bravo Basin		
Amole Hubbell Analysis	GuacAmole/Hubbell System analysis	$$$

$) < $25,000

$$) $25,000 - $100,000

$$$) $100,000 - $300,000

1. Literature Review

The following documents were included in the Phase I Literature Review to develop the existing conditions study and identify critical drainage features in the study area. These resources were revisited to guide and inform proposed recommendations.

1.1 Amole-Hubbell DMP 1999

Wilson & Company, Inc., Engineers & Architects (Wilson & Company) was contracted by Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) to update the Amole-Hubbell Drainage Management Plan (DMP) dated July 1999 (original Amole-Hubbell DMP). The original DMP was prepared by Leedshill-Herkenhoff, Inc. and was prepared for AMAFCA. Four volumes were prepared and include the following:

"Amole-Hubbell Drainage Management Plan Volume I" July 1999

"Amole-Hubbell Drainage Management Plan Volume II" July 1999

"Amole-Hubbell Drainage Management Plan Volume III" July 1999

"Amole-Hubbell Drainage Management Plan Volume IV" July 1999

1.2 Other Researched Documents

Wilson & Company researched documents at City of Albuquerque's (COA's) Drainage Division, COA's Maps and Records, and Bernalillo County Public Works Department.

Continued efforts for investigating drainage patterns and problems at a macro level led to researching site development drainage reports and plans for areas within the Amole-Hubbell Watershed. These reports and plans are not summarized in this section, yet are referenced throughout the text. Valuable insight into the hydrologic patterns and proposed development is provided in these reports and is helpful in sub-basin delineation, as well as in determining the existing and proposed infrastructure. Drainage reports, construction plan sets, and basin maps were acquired to aid in the hydrologic and hydraulic analysis. The list is provided below. The COA categorizes their drainage reports by the zone atlas number, followed by the number that represents the order in which the reports were submitted. For example, a file number of M-09/D023 is a drainage report located in zone M-9 and was the 23rd drainage report submitted in that zone.

1. "Amole-Hubbell Drainage Management Plan Volume I, II, III, & IV" July 1999
2. "Borrega Detention Dam and North Borrega Channel-Design Analysis Report" April 2000
3. "West I-40 DMP" 2006
4. "Final Design Report for Amole Arroyo including Revisions to the Amole-Hubbell Drainage Management Plan" August 2003, File M-09/D023
5. "Drainage Report for Anderson Heights Subdivision" April 2004, File P-08/D003
6. "Anderson Hills Subdivision Drainage Report", File P-09/D002
7. "Drainage Report for Ceja Vista Subdivision" January 9, 2007
8. "El Rancho Subdivisions Drainage Reports"
9. "Rio Bravo Sector Development Plan"
10. "Facility Plan for Arroyos" AMAFCA #376.04.00
11. "Drainage Report for the Amole Channel from Confluence with Snow Vista Channel down to the Amole Dam" July 2004, File J-08
12. "Arenal/Unser Drainage Management Plan" June 1997
13. "Borrega/PaakWeree Village Final Design Report"
14. "Amole del Norte Tower/Sage Drainage Master Plan" April 1995, AMAFCA #359.03
15. "Unser Diversion-Design Analysis Report" September 1993
16. "Drainage Study for Sierra Ranch Subdivision" December 16, 2004, File N-08/D003

17. “Talavera Subdivision Drainage Management Plan” January 2009
18. “Southwest Valley Flood Damage Reduction Study Volume I, II, and III”
19. “Drainage Report for Sunrise Ranch Subdivision” June 2000, File L-09/D006
20. “Final Design Report Amole del Norte Storm Diversion Facilities Tierra Bayita Drainage Facilities Phase III” March 1998
21. “Anderson Heights Grading & Drainage Plan” COA #753981
22. “Anderson Heights Unit 9 Grading and Drainage Plan” COA #753981
23. “Preliminary Design Report for Amole del Norte Storm Diversion Facilities Tierra Bayita Drainage Facilities” October 31, 1990 COA #4076-01
24. “Design Report for Amole del Norte Storm Diversion Facilities Tierra Bayita Drainage Facilities Phase IIIC”
25. “Design Report for Amole Arroyo including Revisions to the Amole-Hubbell Drainage Management Plan” February 2003
26. “El Rancho Grande Units 14 & 15” October 10, 2003, File N-09/D005
27. “Sunrise Ranch Unit 4 Pond Reclamation” August 6, 2002, File L-09/D006
28. “Sunrise Ranch Unit 2 Supplemental Information” November 21, 00, File L-09/D006
29. “Master Drainage Plan Sunrise Terrace Units III, IV, & V” March 1994: Revised June 1994, File L-08/D01A
30. “Drainage Study for Timarron West Subdivision” April 6, 2000, File M-08/D005A
31. “Drainage Study for the Timarron West Subdivision Unit 5” May 25, 2000, File M-08/D005B
32. “Master Drainage Study Gibson Blvd. Corridor Between 118th Street and the Amole Arroyo” May 8, 2003, File N-09
33. “Sierra Ranch Unit 2 Offsite Pond” June 2002, File N-08/D003
34. “Sierra Ranch Subdivision Unit I Grading and Drainage Plan” N-08/D003
35. “Anderson Heights Units 4 & 6” File N-08/D003A
36. “Drainage Study for Sun Gate Subdivision” January 8, 2004, File N-09/D007
37. “Arrowwood Development Phase I Grading and Drainage Plan” COA #747281
38. “Longford at Arrowwood Grading and Drainage Plan” COA #747281
39. “Tracts 29, 30, 31 at Arrowwood Drainage Master Plan” October 11, 2004, File N-09/D008A
40. “Drainage Report for Sun Gate Estates” September 8, 2004, File N-09/D008B
41. “118th Street Powerline Ponds Revisions to Ponds #5 and #6” File P-08/D003
42. “Anderson Heights Grading and Drainage Plan” COA #753981
43. “As-builts for Anderson Heights Grading and Drainage Plan” File P-08/D003
44. “Supplemental Drainage Information for Ceja Vista Unit 1, 2, 3” April 2010, DRB 1004428
45. “Drainage Management Plan for Anderson Hills The Highlands, The Meadows, The Mesa Volume II” August 19, 2003, File P-09/D002
46. “Sunrise Estates Units 2 & 3”
47. “Timarron West Unit 5 Grading & Erosion Control Plan”
48. “Timarron West Unit 4 Grading & Erosion Control Plan”
49. “Drainage Report for Meridian Business Park II A Supplement to the Master Drainage Plan for Atrisco Business Park” August 2007, File J-10/D002G
50. “Master Drainage Plan for Atrisco Business Park” September 1992, File J-10/D002
51. “Master Drainage Plan for Atrisco Business Park” October 1993, File J-10/D002
52. “Unser Towne Crossing Plan Set” COA #26048
53. “Preliminary Drainage Report for Paradise RV Park-Phase I” August 2011, File K-09/D003
54. “Drainage Report for Commercial Development NW Corner of 98th Street & Central Avenue” February 2007, File K-9/D033
55. “Drainage Masterplan for Avalon Subdivision” February 1998, File K-9/D012
56. “Zanios Food Warehouse Addition Phase 4 Grading and Drainage Plan”
57. “Unser Crossing Plan Set”
58. “Central and Unser Site Plan” File K-10/D055
59. “West Ridge Mobile Home Park” October 1997, File K-09/D006
60. “West Ridge Mobile Home Park Detention Pond Grading and Drainage Plan” File K-09/D006
61. “Drainage Analysis for Bluewater Road near 90th Street” December 2001, File K-09/D022
62. “Drainage Report for Clifford West Business Park” September 1997, File K-09/D023
63. “Town of Atrisco Grant, Unit 5 Plan Set” File K-09/D026
64. “Drainage Report for Southwynd Subdivision” January 2002, File L10-D020
65. “Sunset West Unit III Units 17, 18, and 19 Grading and Drainage Plan” File L-09/D012A
66. “Drainage Report & Grading Plan for Valle del Canto Subdivision” August 1997, File L-09/D18
67. “Sunset West, Unit 2 Temporary Retention Pond Reclamation Improvements” File L-09/D004A
68. “Supplemental Information for Sage & Unser Marketplace” File M-10/D019
69. “Truman Middle School Phase I Improvements Grading and Drainage Plan” File M-09/D013
70. “Drainage Report for Sunset West Unit 2” April 1994, File M-09/D004
71. “Drainage Report for Blake Road Subdivision” June 1998, File N-10/D003
72. “Casa del Sueno & Casa de Ver” File N-10/D001
73. “Master Drainage Plan for the West Side Transit Facility” February 2001, File S-9/D016
74. “Revision to the Master Drainage Plan for the Rio Bravo Sector Development Plan”

March 2000, AMAFCA #377.05.03
75. “Final Drainage Report for PaakWeree Village” March 2000, AMAFCA #358.02.05
76. “Westgate Diversion Channels Snow Vista Channel-Phase I”
77. “Westgate Diversion Channels Snow Vista Channel-Phase II & III”
78. “Amole del Norte Storm Diversion Facilities Tierra Bayita Drainage Facilities” June 1995
79. “Master Drainage Report Tracts B, C, & D PaakWeree Bulk Land Plat” County #PWDN 70112
80. “Paradise RV Park Drainage Report” August 2011

2. Hydrologic Analysis

2.1 Methodology

The Arid-lands Hydrologic Model-S4 (AHYMO) was used to calculate the 100-year peak flow rates and volumetric runoff. The unit hydrograph procedure is utilized in the AHYMO program to compute individual sub-basin runoff hydrographs. AHYMO's hydrologic methodology is discussed in the COA's Development Process Manual (DPM), Chapter 22– Drainage, Flood Control and Erosion Control (July 1997). The basin's physical properties input into the command include sub-basin area, percent of land treatment types, rainfall distribution, and the time to peak. Previous computations for the rainfall distribution and time to peak are linked into the command. The "Rainfall" and "Compute LT TP" commands compute the rainfall distribution and the time to peak, respectively. The AHYMO computations for 24-hour storm will be used for volumes; the 6-hour storm computations will be used for peak flow rates.

Hydrographs were routed using the channel, pipe, and reservoir routing commands. A rating curve command, followed by the computed travel time for channels and pipes, was used to account for the discharge relations based on headwater and slope. Ponds were modeled using the route reservoir command. Input of the route reservoir command requires stage, storage, and discharge for each incremental elevation.

2.2 Hydrologic Characteristics

2.2.1 Watershed Delineation

The Amole-Hubbell Watershed is divided into seven sub-basin for evaluation. The following list outlines the seven basins that were delineated:

1. Powerline Basin (PL)
2. South Powerline Basin (SP)
3. Snow Vista Basin (SV)
4. Amole Basin (A)
5. Amole del Norte Basin
    - 98th & Central Basin (NE)
    - Unser/214 Basin (U)
    - Tierra Bayita Basin (TB)
    - Atrisco Business Park Basin (AB)
    - Tower/Sage Basin (TS)
    - South Amole del Norte Basin (SA)
6. Borrega Basin (B)
7. Rio Bravo Basin (RB)

The basin boundaries vary slightly from the original DMP. Basin variations are due to drainage infrastructure realignments, constructed development since the adopted Amole-Hubbell DMP routed runoff differently, and master plans differing from the original DMP. The basin names were kept the same as those used in the original Amole-Hubbell DMP. The existing sub-basin identifications are 100 series; the proposed sub-basin identifications are 200 series.

Resources used to define sub-basins included 2010 Bernalillo County Light Detection and Ranging (LIDAR) mapping data, 2010 Bernalillo County Orthoimagery, and the latest COA parcel shapefile. LIDAR point and breakline files were provided by AMAFCA. By using the mapping data, contour intervals of 2-ft were generated in AutoCAD.

2.2.2 Precipitation

The precipitation depths for the 0.25-, 1-, 6-, and 24-hour storms, 100-year storm frequency were obtained from the original Amole-Hubbell DMP. Rainfall amounts were gathered from the COA DPM and the National Oceanographic and Atmospheric Administration (NOAA), Atlas 14. Table 2-1 lists the precipitation depths used to determine the rainfall distribution.

Table 2-1: NOAA Precipitation Depths	
Storm Duration for 100-Year Frequency (hr)	**Precipitation Depth (in)**
0.25	1.46
1	1.87
6	2.20
24	2.66

2.2.3 Sediment Bulking

Sediment is gathered into flowing water when the land surface erodes. Sediment bulking factors are applied to both the existing and proposed conditions to account for the increase in runoff due to sediment transport. Two factors influence sediment bulking: pervious area and slope of the terrain. An undeveloped site produces more sediment due to the higher percentage of pervious area. Existing conditions produce a higher bulking factor due to the undeveloped sites. All basins have undeveloped areas, but the basins' undeveloped percentages vary. Basins with a higher percentage of undeveloped sites than developed sites were allocated a 12% bulking factor. These basins include the Powerline Basin, South Powerline Basin, and Borrega Basin. An increase of impervious area reduces land surface erosion. Therefore, a bulking factor of 6% was applied for the basins that have a higher percentage of developed sites than undeveloped sites. These basins include the Amole Basin, Amole del Norte Basin, Rio Bravo Basin, and Snow Vista Basin. An increase of impervious area in a fully-developed watershed reduces land surface erosion.

2.2.4 Land Use

A sub-basin's land condition is recognized in AHYMO by either land treatment or curve number. Land treatment percentages were input into AHYMO_97 under this analysis. COA's 1997 DPM describes and classifies the land treatments into four categories (A, B, C, and D). A 2010 orthoimagery, 2010 LIDAR, digitized parcel base map, and current zoning were used to help determine the land use for the existing condition. Table 2-2 distributes the land treatment percentages accordingly. The right column of the table (Methodology/Notes) presents the procedure used to distribute the land treatment percentages. Land treatment percentages were weighted for sub-basins with two or more land uses. Each basin may contain a land treatment or a mixture of land treatments. For an illustration of the existing land uses, refer to Figure A-2 (Existing Land Use Map). For the proposed conditions, various sector plans were used to determine proposed land uses. Land treatments were determined by using Table 2-2. Refer to Figure 2-2 (Proposed Land Use Map) for an illustration of the proposed land uses.

Table 2-2: Land Treatment Type Percentage Summary					
Layer	**Land Treatment Percentages (%)**				**Methodology/Notes**
	Type A	**Type B**	**Type C**	**Type D**	
Land Use 1 Du/Ac	0	41	42	17	DPM for D, Split B & C
Land Use 4 Du/Ac	0	29	29	42	DPM for D, Split B & C
Land Use 5 Du/Ac	0	25	26	49	DPM for D, Split B & C
Land Use 6 Du/Ac	0	21	22	57	DPM for D, Split B & C
Land Use 7 Du/Ac	0	18	18	64	DPM for D, Split B & C
Land Use 8 Du/Ac	0	14	15	71	DPM for D, Split B & C
Land Use 9 Du/Ac	0	10	11	79	DPM for D, Split B & C
Land Use Commercial	0	5	5	90	DPM for D, Split B & C
Land Use Heavy Industrial	0	10	10	80	DPM for D, Split B & C
Land Use Light Industrial	0	15	15	70	DPM for D, Split B & C
Land Use Mobile Homes	0	20	20	60	DPM for D, Split B & C
Land Use Open Space	79	8	8	5	DPM for 5 Ac
Land Use Platted Mass Graded	0	0	95	5	Assumed 5% D, Remaining C
Land Use Platted Undeveloped	79	8	8	5	Treatment from SSCAFCA Table
Land Use School	0	25	25	50	DPM for D, Split B & C
Land Use Townhomes	0	15	15	70	DPM for D, Split B & C
Land Use Slope 0 to 10	100	0	0	0	DPM
Land Use Slope 10 to 20	0	100	0	0	DPM
Land Use SU-1	0	5	5	90	DPM for D, Split B & C
Land Use SU-2	0	5	5	90	DPM for D, Split B & C

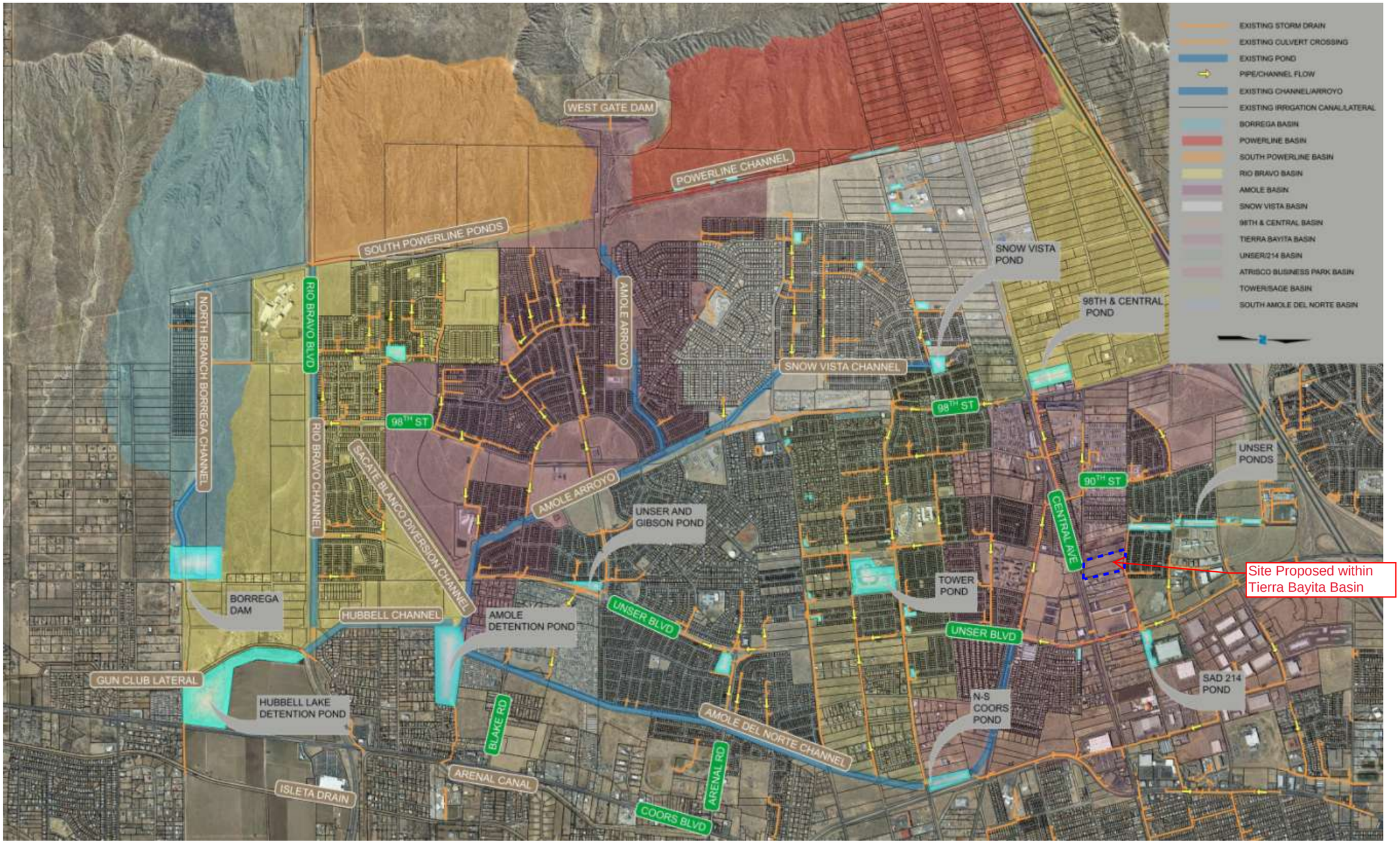


Figure 2-1: Amole-Hubbell Watershed Overall Basin Map

Figure 2-2: Proposed Land Use Map

3.5.3 Tierra Bayita Area

Existing Conditions

The Tierra Bayita Basin is approximately 1.40 sq. mi. and is irregularly shaped with I-40 bounding the north, 98th Street bounding the west, Eucariz Avenue being the most southern boundary, and Coors Boulevard being the most eastern boundary. Several land uses in Tierra Bayita Basin include industrial, commercial, undeveloped platted lots, mass graded platted lots, and residential. Main storm drain systems have been constructed in the Tierra Bayita Basin. Stub-outs have been set along the storm drain portion on Bluewater Road. Most developments are allowed free discharge to the public storm drain. The developments in Sub-Basin TB103 and TB105 were required to construct Pond TB2 and Pond TB3, respectively. There are three major storm drain systems which convey runoff to the Tierra Bayita Channel.

Runoff from Sub-Basin TB101 and Sub-Basin TB102 is retained in Pond TB1. Once these sub-basins are developed, the storm drain on Bluewater Road will intercept its controlled runoff release. From the Bluewater Road and 90th Street intersection, this storm drain system bends 90 degrees and follows 90th Street to Volcano Road, then bends at 90th Street to Bridge, then finally it runs along Bridge Boulevard until outletting into the Tierra Bayita Channel. Pond TB2 and TB3 release a controlled rate into this system. A lateral is extended from 90th Street on Central Avenue to the two cell pond located in the 98th & Central Area.

The second major storm drain in the Tierra Bayita Basin is on Sunset Garden Road, which begins near its intersection with 86th Street and runs east to Unser Boulevard, then north on Unser Boulevard until emptying into the Tierra Bayita Channel. This system receives free discharge from its respective drainage area. The third system begins in the Unser/214 Area. The portion in the Tierra Bayita Basin is in Unser Boulevard from Avalon Road to Tierra Bayita Channel. Refer to Appendix A for hydrologic data and existing hydrologic model diagram.

Proposed Conditions

Per the Bluewater Road near 90th Street Drainage Analysis by Tierra West dated 12-20-01 basins 202.1 and 202.2 have been restricted to 2.05 cfs/ac. To achieve this restriction, ponds were created in AHYMO to reduce runoff to the restricted rate. Also, in the proposed condition TB 101 has been shifted to the 98th & Central Basin. The Coors North South pond in the proposed condition is overtopping. The pond needs to be increased in size to hold 75 ac-ft of runoff. Refer to Table 3-11 for hydrologic data and Figure 3-14 for proposed hydrologic model diagram.

Recommendations:

Below are the recommendations from 1999 Amole-Hubbell DMP for the basin along with the status of the recommendation:

- No recommendations from the 1999 Amole Hubbell DMP

Additional Recommendations for the basin based on updated basin analysis are below:

- Restrict future basin flows to 2.5 cfs/acre for basins 202.1 and 202.2.
- Increase volume of Coors N-S Pond to 75 ac-ft.

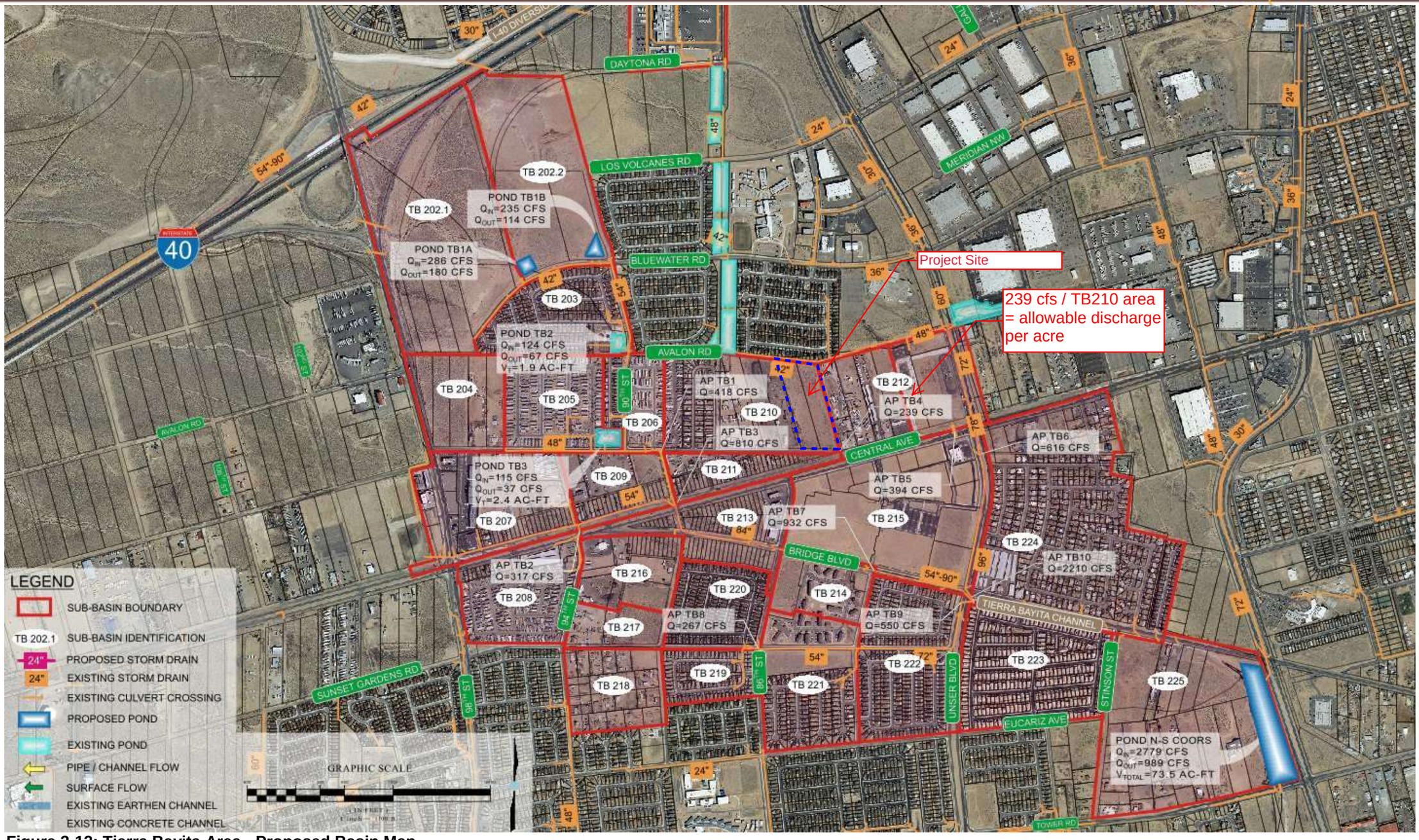


Figure 3-13: Tierra Bayita Area - Proposed Basin Map

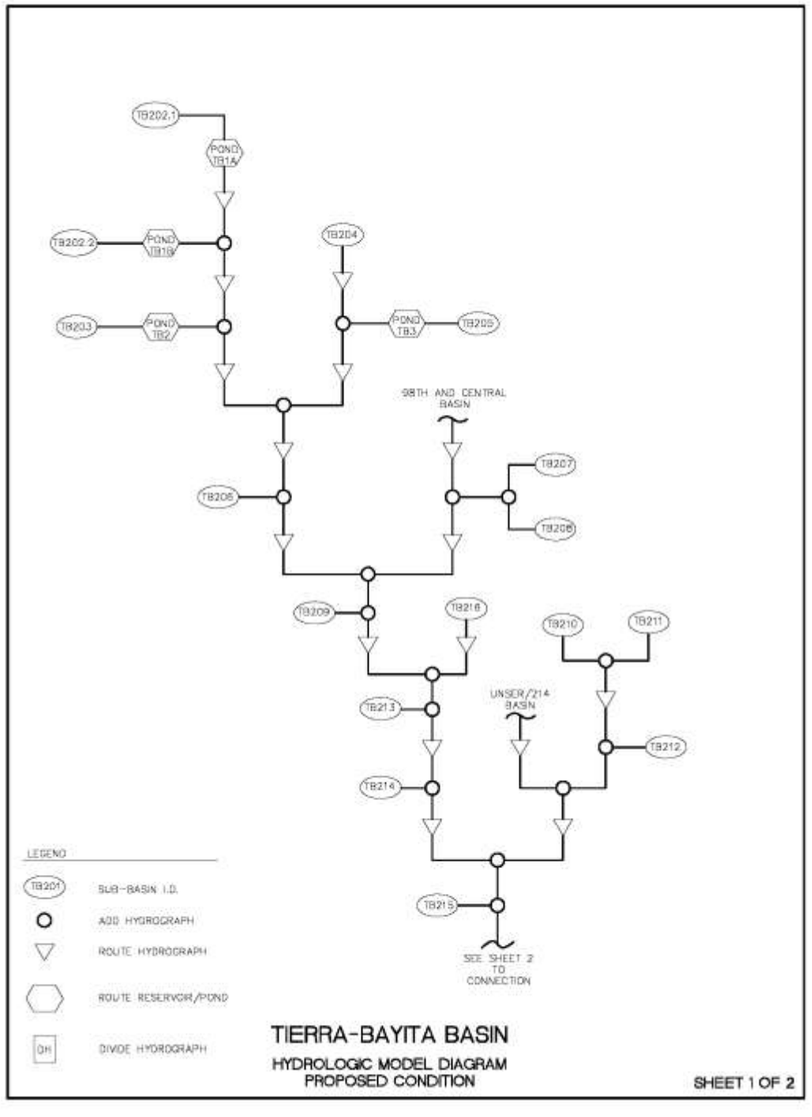


Figure 3-14: Tierra Bayita Basin - Proposed Hydrologic Model Diagram

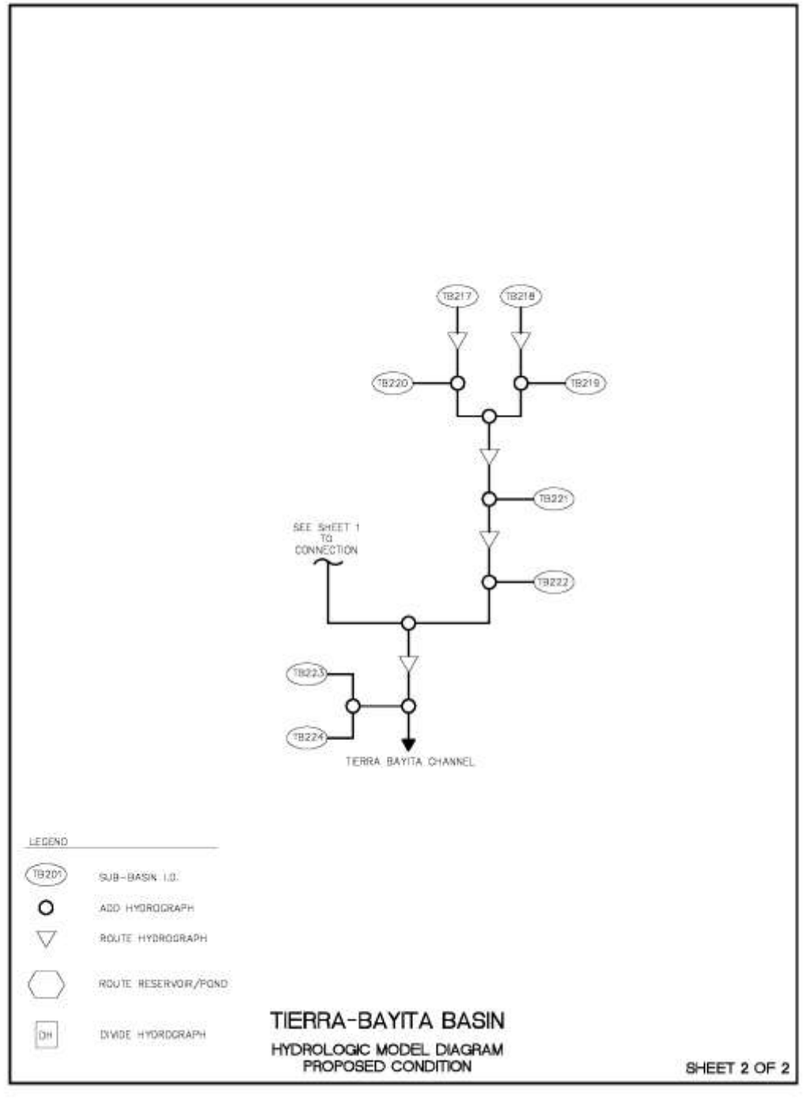


Figure 3-14: Tierra Bayita Basin - Proposed Hydrologic Model Diagram

Table 3-11: Tierra Bayita Area - Proposed Sub-Basin Peak Discharge and Volumes			
Sub-Basin	Area (ac)	$Q_{100yr-6hr}$ (cfs)	$V_{100yr-24hr}$ (ac-ft)
TB202.1	88	286.10	11.871
TB202.2	56	234.77	9.208
TB203	32	123.90	4.854
TB204	25	106.80	4.584
TB205	29	115.37	4.583
TB206	16	64.63	2.570
TB207	44	180.99	7.480
TB208	32	125.02	5.303
TB209	20	85.75	3.659
TB210	47	175.08	7.917
TB211	15	66.05	2.870
TB212	44	159.66	7.680
TB213	30	133.59	5.771
TB214	17	68.55	2.713
TB215	72	195.06	9.623
TB216	21	89.82	3.817
TB217	12	50.87	2.147
TB218	23	73.14	2.353
TB219	15	58.43	2.347
TB220	24	96.97	3.995
TB221	37	137.45	5.770
TB222	45	155.17	7.233
TB223	46	129.70	6.937
TB224	102	236.51	15.234
TB202.1	88	286.10	11.871

Site is 10 acres of sub-basin TB210.

Appendix A

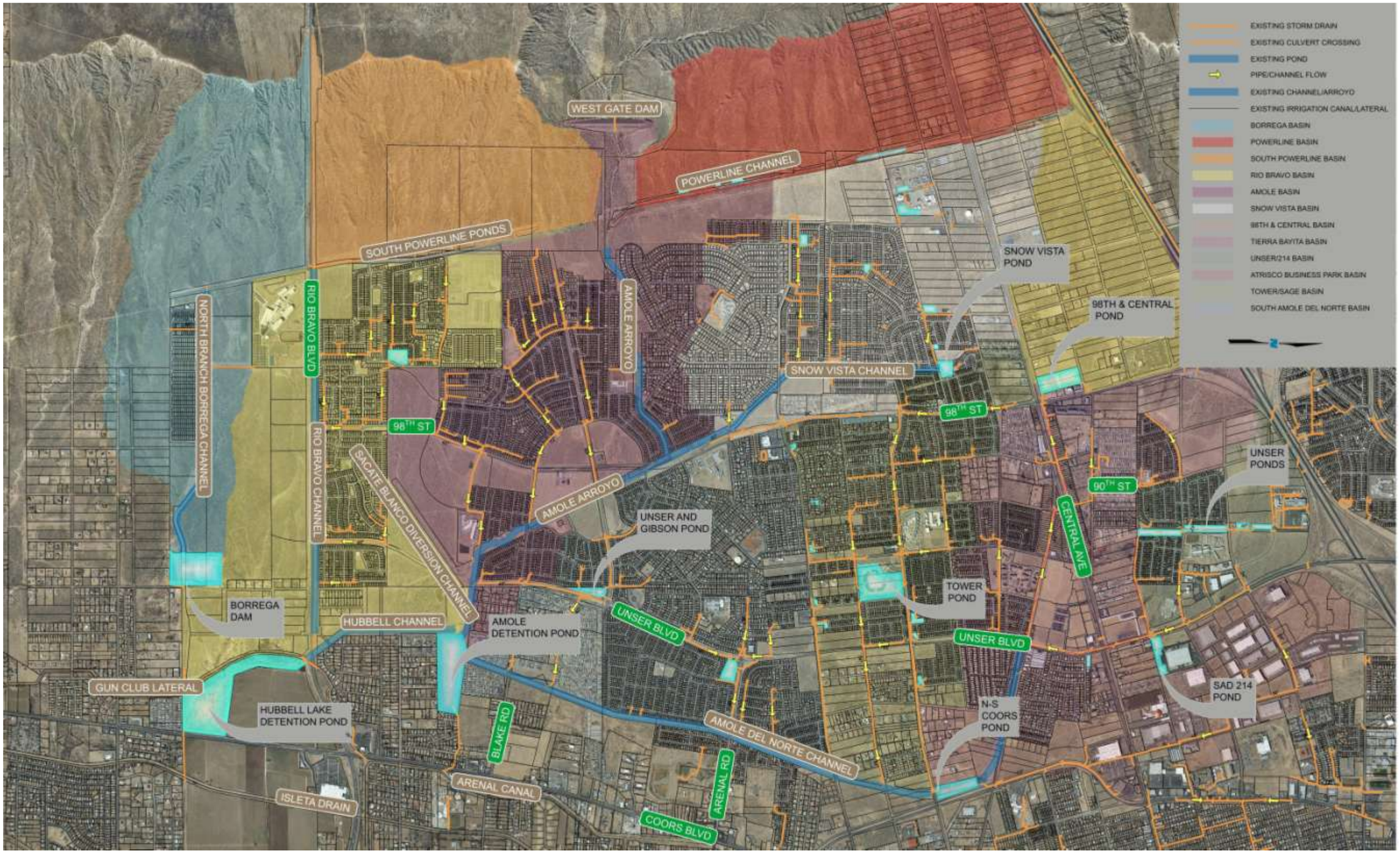


Figure A-1: Existing Amole-Hubbell Watershed Overall Basin Map


LEGEND
COMMERCIAL
HEAVY INDUSTRIAL
LIGHT INDUSTRIAL
RESIDENTIAL ESTATES 4 DU/AC
RESIDENTIAL ESTATES 5 DU/AC
RESIDENTIAL ESTATES 6 DU/AC
RESIDENTIAL ESTATES 7 DU/AC
RESIDENTIAL ESTATES 8 DU/AC
RESIDENTIAL ESTATES 9 DU/AC
PLATTED UNDEVELOPED LOTS
PLATTED MASS GRADED LOTS
ESCARPMENT 0 TO 10% SLOPES
ESCARPMENT 10 TO 20% SLOPES
WEST GATE DAM
POWERLINE CHANNEL
SOUTH POWERLINE PONDS
SNOW VISTA POND
98TH & CENTRAL POND
NORTH BRANCH BORREGA CHANNEL
RIO BRAVO BLVD
AMOLE ARROYO
SNOW VISTA CHANNEL
98TH ST
RIO BRAVO CHANNEL
SACATE BLANCO DIVERSION CHANNEL
AMOLE ARROYO
UNSER AND GIBSON POND
UNSER PONDS
90TH ST
CENTRAL AVE
TOWER POND
BORREGA DAM
HUBBELL CHANNEL
AMOLE DETENTION POND
UNSER BLVD
UNSER BLVD
GUN CLUB LATERAL
HUBBELL LAKE DETENTION POND
BLAKE RD
SAD 214 POND
N-S COORS POND
AMOLE DEL NORTE CHANNEL
ARENAL RD
ISLETA DRAIN
ARENAL CANAL

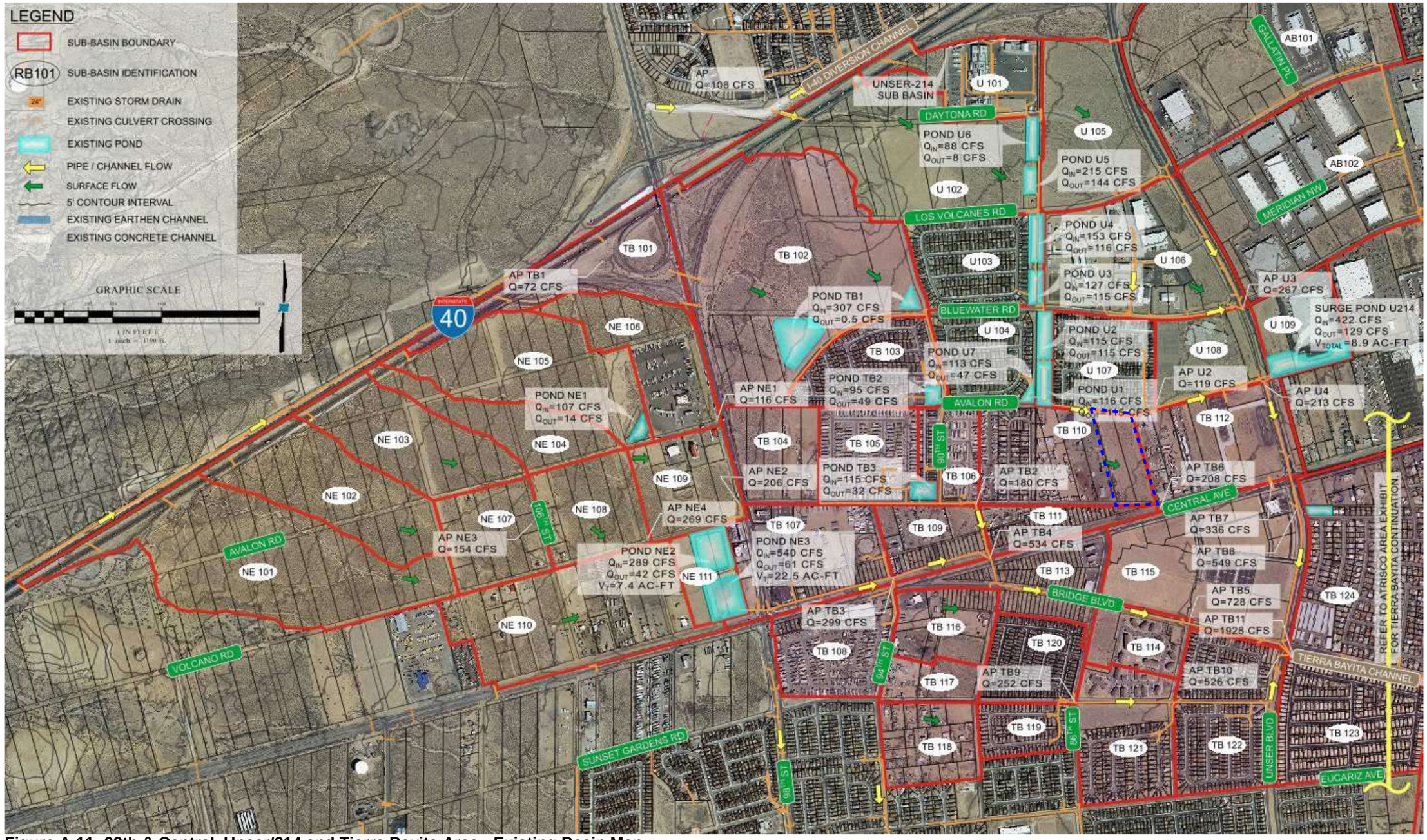


Figure A-11: 98th & Central, Unser/214 and Tierra Bayita Area - Existing Basin Map

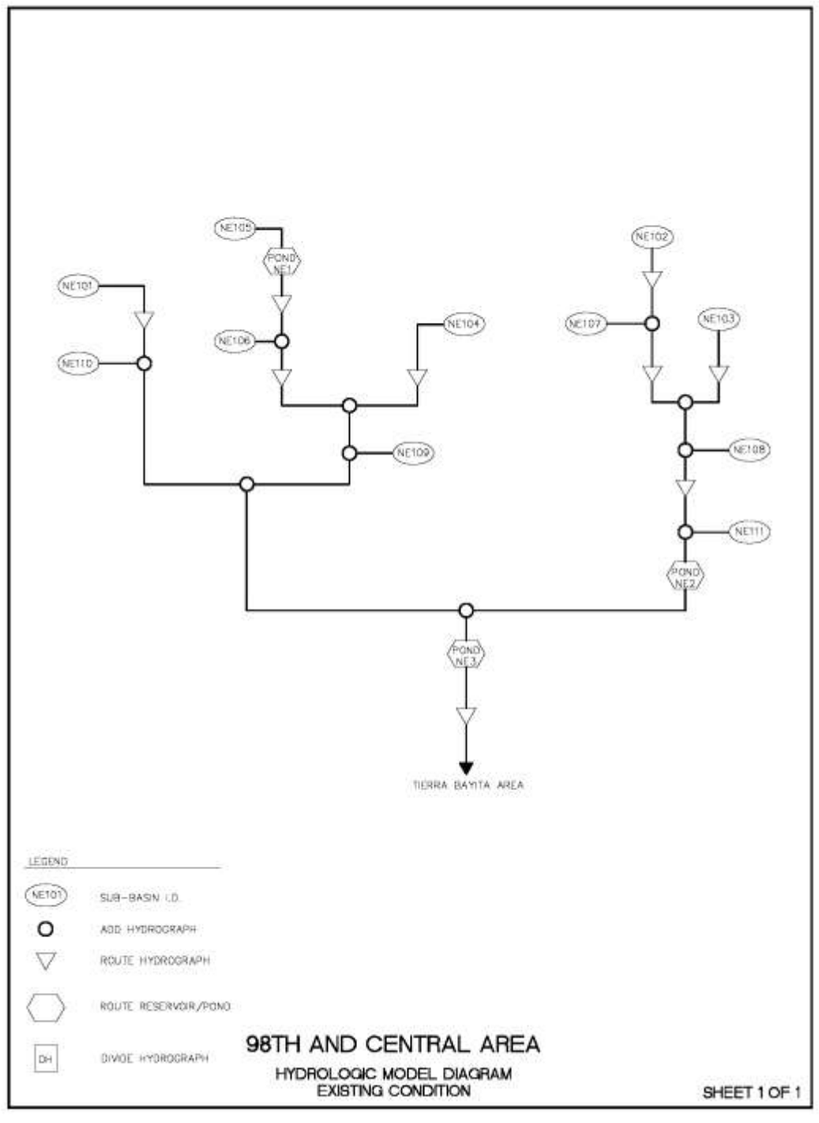


Figure A-12: 98th & Central Area - Existing Hydrologic Model Diagram

Table A-5: 98th & Central Area - Existing Sub-Basin Peak Discharge and Volumes

Sub-Basin	Area (ac)	$Q_{100yr-6hr}$ (cfs)	$V_{100yr-24hr}$ (ac-ft)
NE101	92.9344	174.96	6.135
NE102	48.6656	104.16	3.213
NE103	41.2224	86.91	2.721
NE104	26.8608	50.09	1.773
NE105	54.0096	107.10	3.565
NE106	36.7424	112.05	4.958
NE107	27.68	62.04	1.933
NE108	28.9408	66.03	2.060
NE109	27.7504	70.00	2.429
NE110	83.104	226.50	11.018
NE111	15.0784	21.87	0.995

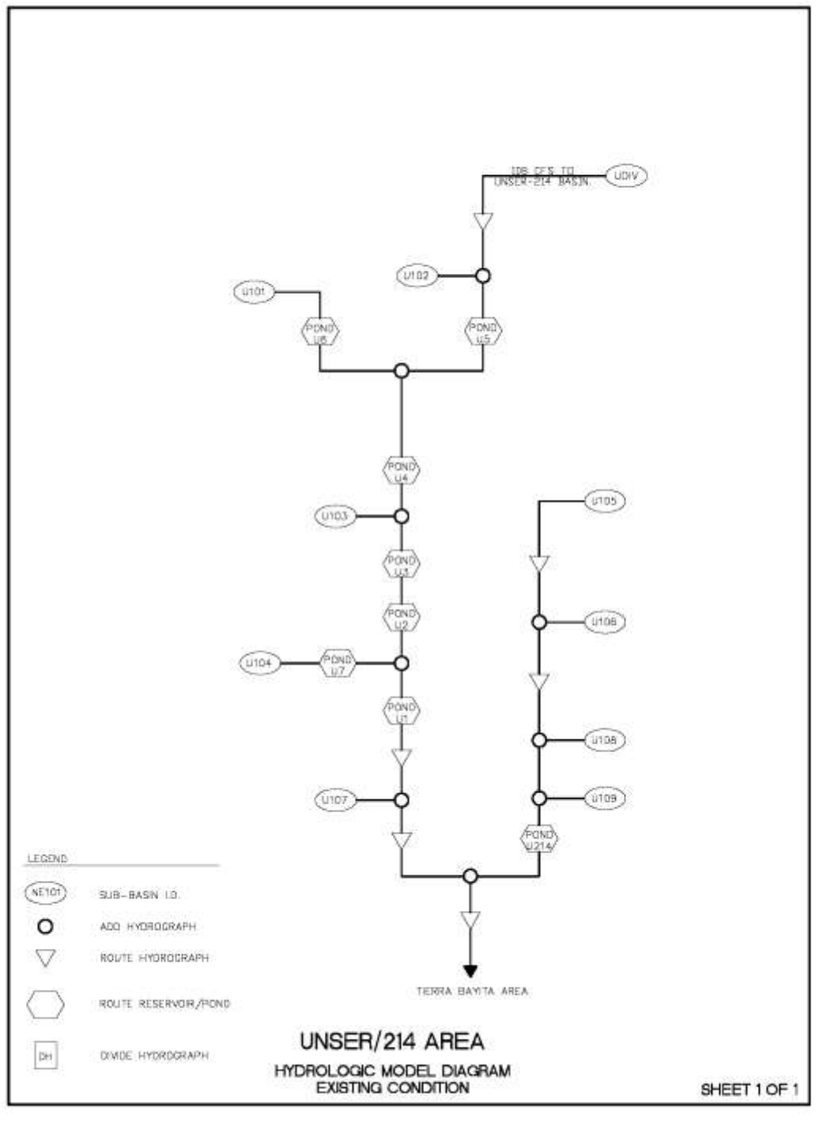


Figure A-13: Unser/214 Area - Existing Hydrologic Model Diagram

Table A-6: Unser/214 Area - Existing Sub-Basin Peak Discharge and Volumes

Sub-Basin	Area (ac)	$Q_{100yr\text{-}6hr}$ (cfs)	$V_{100yr\text{-}24hr}$ (ac-ft)
U101	29	87.84	3.250
U102	83	210.77	6.342
U103	34	124.08	4.785
U104	32	113.20	4.336
U105	50	87.38	3.688
U106	62	185.29	8.330
U107	29	114.78	4.611
U108	25	100.24	3.901
U109	21	85.46	3.341

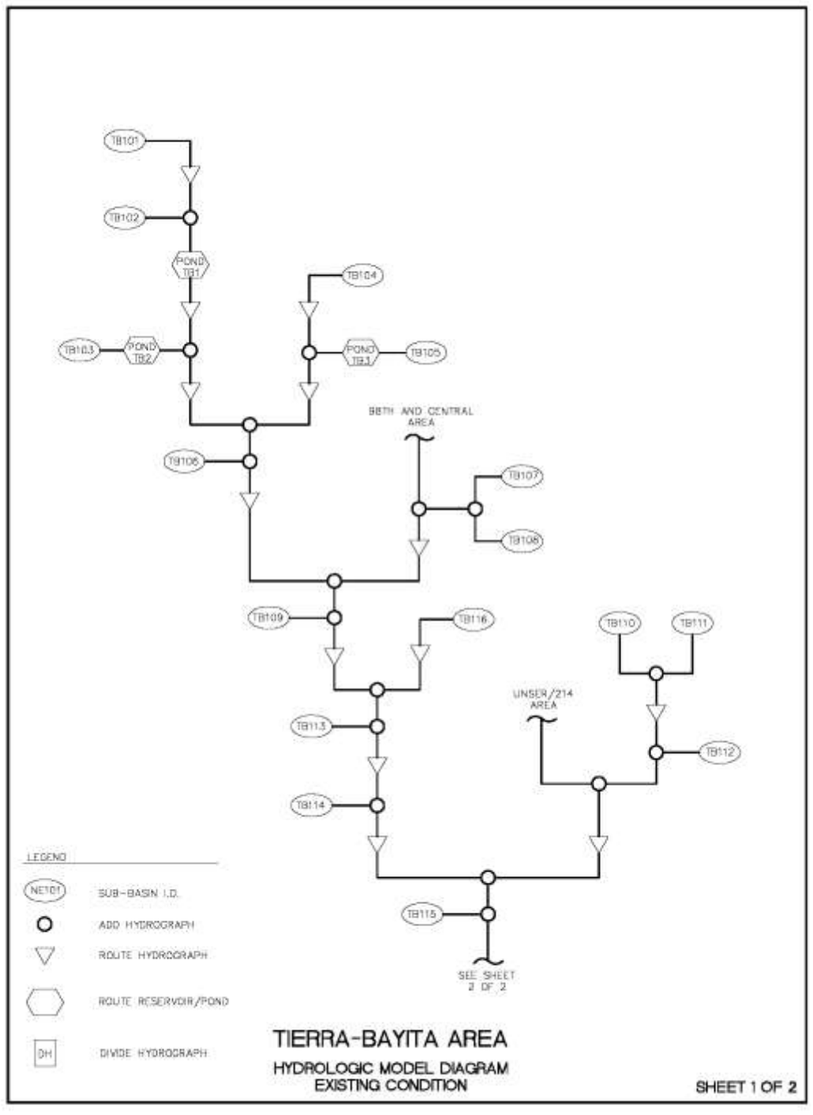


Figure A-14: Tierra Bayita Area - Existing Hydrologic Model Diagram

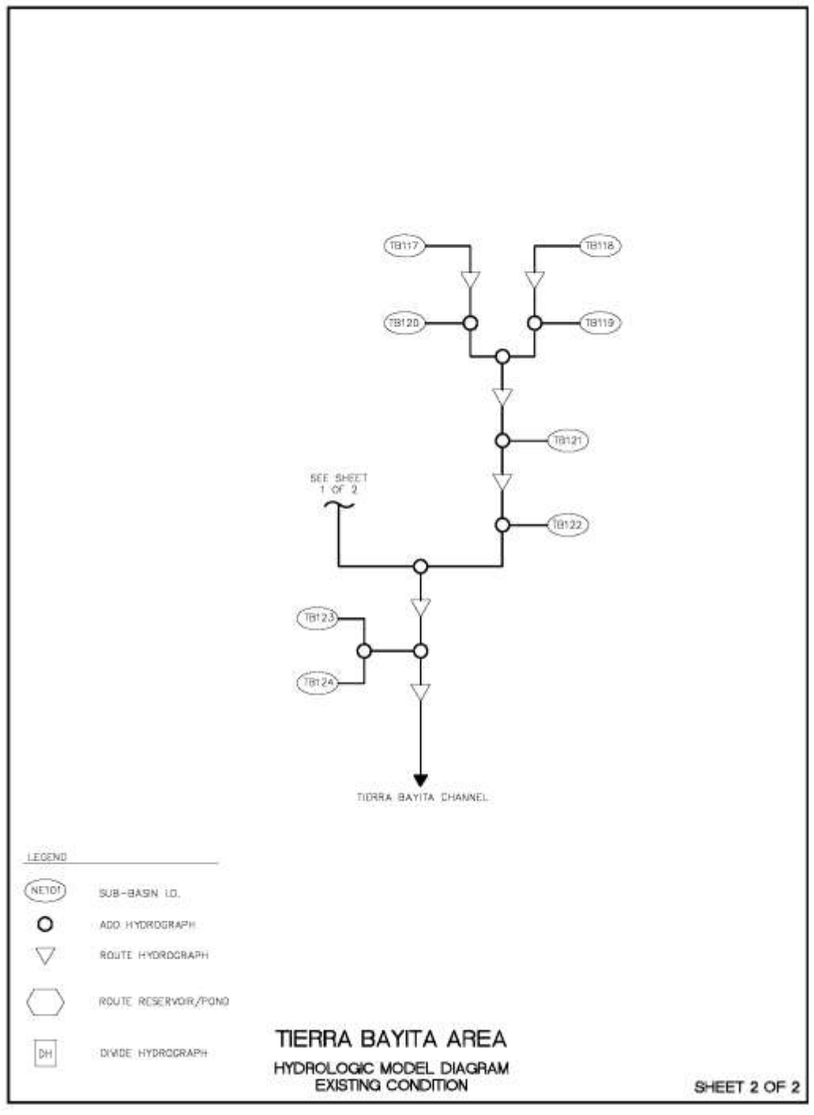


Figure A-14 Continued: Tierra Bayita Area - Existing Hydrologic Model Diagram

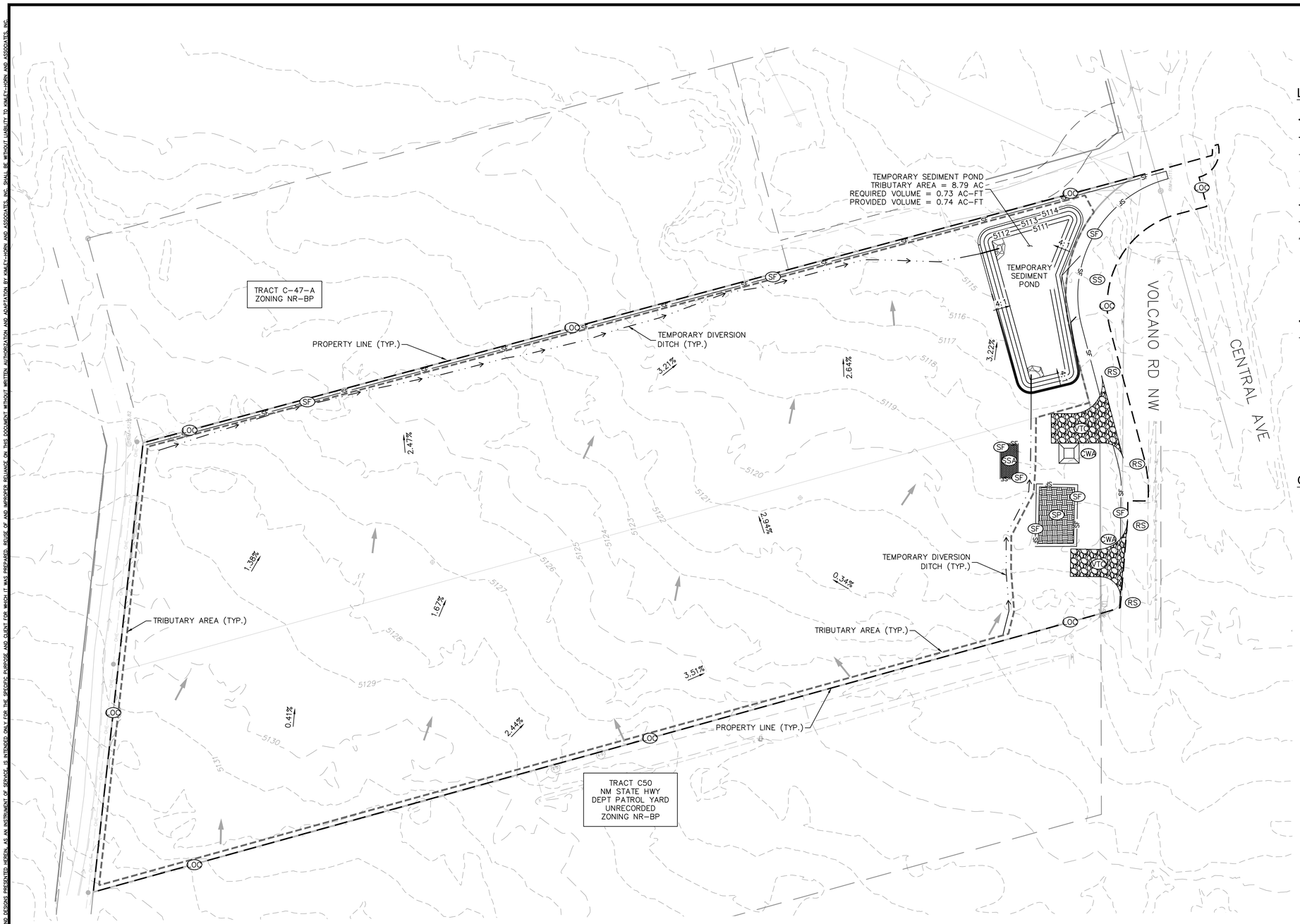
Table A-7: Tierra Bayita Area - Existing Sub-Basin Peak Discharge and Volumes			
Sub-Basin	Area (ac)	$Q_{100yr\text{-}6hr}$ (cfs)	$V_{100yr\text{-}24hr}$ (ac-ft)
TB101	38	72.00	2.541
TB102	127	262.15	9.045
TB103	32	95.47	3.466
TB104	25	65.34	2.276
TB105	29	114.69	4.547
TB106	16	63.21	2.493
TB107	44	167.57	6.744
TB108	32	125.04	5.303
TB109	20	64.51	2.501
TB110	47	151.15	6.595
TB111	15	59.32	2.489
TB112	44	129.57	6.200
TB113	30	81.29	2.917
TB114	17	68.45	2.708
TB115	72	161.37	8.077
TB116	21	72.69	2.883
TB117	12	36.81	1.381
TB118	23	73.05	2.350
TB119	15	58.42	2.347
TB120	24	96.96	3.996
TB121	37	126.91	5.266
TB122	45	155.20	7.233
TB123	46	129.72	6.937
TB124	102	229.28	14.742
TB125	84	193.74	6.855

Appendix B

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 3 NOTATION
ROUTE MCUNGE	U206SUMRt	1	2	0.17626	344.43	18.512	1.96923	1.667	3.053	CCODE = 0.2
COMPUTE NM HYD	U208	-	1	0.03976	98.33	3.902	1.84009	1.533	3.864	PER IMP= 56.50
ADD HYD	U208SUMB	2& 1	1	0.21602	411.84	22.414	1.94546	1.633	2.979	
COMPUTE NM HYD	U209	-	2	0.03339	85.47	3.341	1.87591	1.533	4.000	PER IMP= 58.20
ADD HYD	U209SUM	1& 2	1	0.24941	480.60	25.754	1.93614	1.567	3.011	
ROUTE RESERVOIR	PONDU214	1	30	0.24941	137.74	25.754	1.93614	2.000	0.863	AC-FT= 11.990
ADD HYD	U208SUMA	10&30	42	0.54526	226.00	55.103	1.89483	1.600	0.648	
*S APU3										
*S**********	END OF UNSER-214 BASIN									
*S**********	TIERRA BAYITA BASIN									
COMPUTE NM HYD	TB202.1	-	1	0.13801	286.10	13.441	1.82608	1.567	3.239	PER IMP= 63.00
ROUTE RESERVOIR	PondTB1A	1	30	0.13801	180.05	13.441	1.82608	1.733	2.038	AC-FT= 2.194
ROUTE MCUNGE	PONDTB1RT	30	1	0.13801	180.05	13.438	1.82563	1.766	2.038	CCODE = 0.1
COMPUTE NM HYD	TB202.2	-	2	0.08784	234.77	10.586	2.25974	1.533	4.176	PER IMP= 86.90
ROUTE RESERVOIR	PondTB1B	2	30	0.08784	114.06	10.586	2.25973	1.733	2.029	AC-FT= 2.530
ADD HYD	TB202.2SUM	1&30	1	0.22585	294.11	24.024	1.99446	1.733	2.035	
ROUTE MCUNGE	TB202.2SUMRT	1	2	0.22585	293.91	23.863	1.98114	1.933	2.033	CCODE = 0.2
COMPUTE NM HYD	TB103	-	1	0.04991	123.90	4.854	1.82356	1.533	3.879	PER IMP= 57.00
ROUTE RESERVOIR	PondTB2	1	30	0.04991	66.57	4.854	1.82355	1.667	2.084	AC-FT= 1.918
*S Outflow equals to 49.4 cfs From "DMP for Avalon Subdivision" on Pg 3										
ADD HYD	PONDTB2SUM	2&30	1	0.27576	355.53	28.717	1.95261	1.733	2.014	
ROUTE MCUNGE	PONDTB2SUMRT	1	2	0.27576	344.83	28.170	1.91538	1.900	1.954	CCODE = 0.2
COMPUTE NM HYD	TB204	-	1	0.03918	106.93	4.584	2.19364	1.533	4.265	PER IMP= 83.50
ROUTE MCUNGE	TB204RT	1	3	0.03918	106.92	4.583	2.19316	1.533	4.264	CCODE = 0.2
COMPUTE NM HYD	TB205	-	1	0.04575	115.37	4.583	1.87843	1.533	3.940	PER IMP= 60.80
ROUTE RESERVOIR	PondTB3	1	30	0.04575	31.73	4.583	1.87842	1.800	1.084	AC-FT= 2.420
*S Pond never graded per proposed G&D with date 12-7-10										
*S Pond likely will be modified per plan, but left as existing										
*S Assumed existing 30" RCP outlet with 0.5% slope										
ADD HYD	PONDTB3SUM	3&30	1	0.08493	129.96	9.166	2.02348	1.567	2.391	
ROUTE MCUNGE	PondTB3SUMRT	1	3	0.08493	129.92	9.166	2.02347	1.567	2.390	CCODE = 0.2
ADD HYD	TB206SUMA	2& 3	1	0.36069	407.53	37.335	1.94083	1.800	1.765	
ROUTE MCUNGE	TB206SUMART	1	2	0.36069	400.53	36.930	1.91978	1.833	1.735	CCODE = 0.2
COMPUTE NM HYD	TB206	-	1	0.02559	64.63	2.570	1.88298	1.533	3.946	PER IMP= 61.10
ADD HYD	TB206SUMB	2& 1	1	0.38628	417.80	39.500	1.91734	1.766	1.690	
*S APTB1										
ROUTE MCUNGE	TB206SUMBRT	1	10	0.38628	412.09	39.069	1.89639	1.833	1.667	CCODE = 0.2
ROUTE MCUNGE	NEBASINRT	41	1	0.81688	21.80	61.037	1.40100	14.765	0.042	CCODE = 0.2
COMPUTE NM HYD	TB207	-	2	0.06805	180.99	7.490	2.06089	1.533	4.156	PER IMP= 72.90
COMPUTE NM HYD	TB208	-	3	0.05040	125.02	5.303	1.97290	1.533	3.876	PER IMP= 67.20
ADD HYD	TB208SUMA	2& 3	2	0.11845	306.01	12.783	2.02344	1.533	4.037	
ADD HYD	TB208SUMB	1& 2	1	0.93533	315.55	73.820	1.47983	1.533	0.527	
*S APTB2										
ROUTE MCUNGE	TB208SUMBRT	1	2	0.93533	314.41	73.819	1.47981	1.533	0.525	CCODE = 0.2
ADD HYD	TB209SUMA	10& 2	1	1.32161	677.91	112.888	1.60156	1.567	0.801	
COMPUTE NM HYD	TB209	-	2	0.03089	85.75	3.659	2.22091	1.500	4.338	PER IMP= 84.00
ADD HYD	TB209SUMB	1& 2	1	1.35250	757.08	116.547	1.61571	1.567	0.875	
ROUTE MCUNGE	TB209SUMBRT	1	2	1.35250	723.70	116.383	1.61345	1.633	0.836	CCODE = 0.2

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 4 NOTATION
COMPUTE NM HYD	TB216	-	1	0.03257	89.82	3.817	2.19729	1.533	4.309	PER IMP= 82.40
ROUTE MCUNGE	TB216RT	1	3	0.03257	89.27	3.809	2.19265	1.600	4.283	CCODE = 0.1
ADD HYD	TB213SUMA	2& 3	1	1.38507	809.90	120.192	1.62707	1.633	0.914	
*S APTB3										
COMPUTE NM HYD	TB213	-	2	0.04712	133.59	5.771	2.29632	1.500	4.430	PER IMP= 89.10
ADD HYD	TB213SUMB	1& 2	1	1.43219	915.95	125.963	1.64909	1.600	0.999	
ROUTE MCUNGE	TB213SUMBRT	1	2	1.43219	884.55	125.699	1.64563	1.633	0.965	CCODE = 0.2
COMPUTE NM HYD	TB214	-	1	0.02685	68.55	2.713	1.89453	1.533	3.989	PER IMP= 60.76
ADD HYD	TB214SUM	2& 1	1	1.45904	931.52	128.412	1.65021	1.633	0.998	
*S APTB7										
ROUTE MCUNGE	TB214SUMRT	1	10	1.45904	887.60	127.822	1.64264	1.667	0.951	CCODE = 0.2
ROUTE MCUNGE	UNBASINRT	42	11	0.54526	224.57	55.089	1.89435	1.633	0.644	CCODE = 0.1
COMPUTE NM HYD	TB210	-	1	0.07272	175.08	7.917	2.04123	1.567	3.762	PER IMP= 71.83
COMPUTE NM HYD	TB211	-	2	0.02330	66.05	2.870	2.30948	1.533	4.429	PER IMP= 90.00
ADD HYD	TB211SUM	1& 2	1	0.09602	238.63	10.787	2.10631	1.533	3.883	
*S APTB4										
ROUTE MCUNGE	TB211SUMRT	1	2	0.09602	236.24	10.769	2.10288	1.600	3.844	CCODE = 0.1
COMPUTE NM HYD	TB212	-	1	0.06855	159.66	7.680	2.10058	1.567	3.639	PER IMP= 75.20
ADD HYD	TB212SUMA	1& 2	1	0.16457	394.32	18.449	2.10191	1.600	3.744	
*S APTB5										
ADD HYD	TB212SUMB	11& 1	1	0.70983	615.80	73.537	1.94247	1.600	1.356	
*S APTB6										
ROUTE MCUNGE	TB212SUMBRT	1	2	0.70983	612.49	73.532	1.94232	1.633	1.348	CCODE = 0.2
ADD HYD	TB215SUMA	10& 2	1	2.16887	1491.18	201.351	1.74069	1.633	1.074	
COMPUTE NM HYD	TB215	-	2	0.11272	195.06	9.623	1.60072	1.633	2.704	PER IMP= 36.70
ADD HYD	TB215SUMB	1& 2	10	2.28159	1686.25	210.974	1.73378	1.633	1.155	
COMPUTE NM HYD	TB217	-	1	0.01861	50.87	2.147	2.16346	1.533	4.271	PER IMP= 80.10
ROUTE MCUNGE	TB217RT	1	2	0.01861	50.80	2.145	2.16146	1.567	4.266	CCODE = 0.1
COMPUTE NM HYD	TB220	-	1	0.03690	96.97	3.995	2.03023	1.533	4.106	PER IMP= 71.00
ADD HYD	TB220SUM	2& 1	1	0.05551	143.04	6.141	2.07421	1.533	4.026	
COMPUTE NM HYD	TB218	-	2	0.03573	73.14	2.353	1.23479	1.533	3.198	PER IMP= 17.12
ROUTE MCUNGE	TB218RT	2	3	0.03573	71.94	2.347	1.23144	1.567	3.146	CCODE = 0.1
COMPUTE NM HYD	TB219	-	2	0.02285	58.43	2.347	1.92566	1.533	3.995	PER IMP= 64.00
ADD HYD	TB219SUM	2& 3	2	0.05858	126.10	4.693	1.50222	1.567	3.363	
ADD HYD	TB221SUMA	1& 2	1	0.11409	267.16	10.834	1.78052	1.533	3.659	
*S APTB8										
ROUTE MCUNGE	TB221SUMART	1	2	0.11409	267.14	10.823	1.77867	1.567	3.659	CCODE = 0.1
COMPUTE NM HYD	TB221	-	1	0.05769	137.45	5.770	1.87544	1.533	3.723	PER IMP= 60.54
ADD HYD	TB221SUMB	2& 1	1	0.17178	401.85	16.593	1.81116	1.567	3.655	
ROUTE MCUNGE	TB221SUMBRT	1	2	0.17178	396.95	16.569	1.80854	1.600	3.611	CCODE = 0.2
COMPUTE NM HYD	TB222	-	1	0.07064	155.17	7.233	1.91976	1.567	3.432	PER IMP= 63.60
ADD HYD	TB222SUMA	2& 1	1	0.24242	550.22	23.802	1.84094	1.600	3.546	
*S APTB9										
ADD HYD	TB222SUMB	10& 1	1	2.52401	2210.89	234.776	1.74407	1.633	1.369	
*S APTB10										
ROUTE MCUNGE	TB222SUMBRT	1	2	2.52401	2205.93	234.732	1.74375	1.633	1.366	CCODE = 0.1
COMPUTE NM HYD	TB223	-	1	0.07133	129.70	6.937	1.82355	1.633	2.841	PER IMP= 57.00
COMPUTE NM HYD	TB224	-	3	0.15974	236.51	15.234	1.78814	1.733	2.313	PER IMP= 54.40
ADD HYD	TB224SUMA	1& 3	1	0.23107	355.12	22.171	1.79907	1.700	2.401	
ADD HYD	TB224SUMB	2& 1	43	2.75508	2549.14	256.903	1.74838	1.667	1.446	
*S**********	END OF TIERRA BAYITA BASIN									

APPENDIX E: EROSION AND SEDIMENT CONTROL PLANS



LEGEND

- PROPERTY LINE
- 50 PROPOSED MAJOR CONTOURS
- 49 PROPOSED MINOR CONTOURS
- 50 EXISTING MAJOR CONTOURS
- 49 EXISTING MINOR CONTOURS
- PROPOSED RISER PIPE
- PROPOSED DIVERSION DITCH
- PROPOSED TRIBUTARY AREA
- PROPOSED STORM RIPRAP
- X.XX% DRAINAGE SLOPE DIRECTION
- DRAINAGE FLOW DIRECTION
- LOC LIMITS OF CONSTRUCTION
- SF SILT FENCE
- SP STOCKPILE
- CWA CONCRETE WASHOUT
- VTC VEHICLE TRACKING CONTROL
- SS STREET SWEEPING
- SSA STABILIZED STAGING AREA
- RS ROCK SOCKS

GENERAL NOTES

1. TOTAL AREA OF DISTURBANCE = 9.89 AC

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn

4852 South Ulster Street, Suite 1500
Denver, Colorado 80237 (303) 228-2300

DESIGNED BY: AEM
DRAWN BY: AEM
CHECKED BY: SAL
DATE: 2/18/2020

LEGAL DESCRIPTION:
SECTION 21, TOWNSHIP 10 NORTH, RANGE 2 EAST, CITY OF ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO. TRACTS C48 AND C49, UNIT 4.

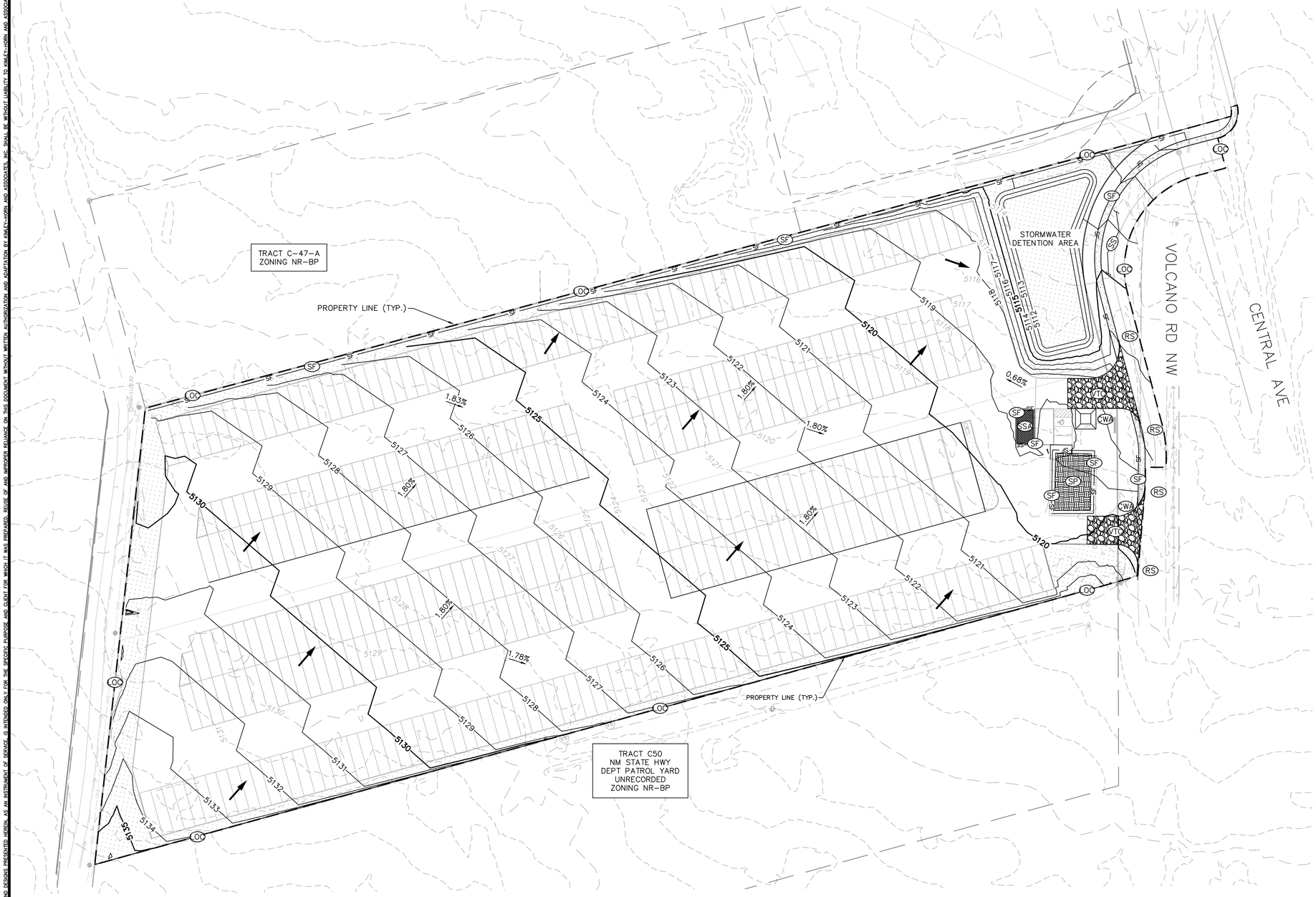
RV STORAGE - ALBUQUERQUE
ALBUQUERQUE, NEW MEXICO
SITE PLAN
INITIAL EROSION AND SEDIMENT CONTROL PLAN

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
096648005

DRAWING NAME
EC PLAN

SHEET
3



LEGEND

- PROPERTY LINE
- 50 PROPOSED MAJOR CONTOURS
- 49 PROPOSED MINOR CONTOURS
- 50 EXISTING MAJOR CONTOURS
- 49 EXISTING MINOR CONTOURS
- X.XX% DRAINAGE SLOPE DIRECTION
- DRAINAGE FLOW DIRECTION
- (LOC) LIMITS OF CONSTRUCTION
- (SF) SILT FENCE
- (SP) STOCKPILE
- (CWA) CONCRETE WASHOUT
- (VTC) VEHICLE TRACKING CONTROL
- (SS) STREET SWEEPING
- (SSA) STABILIZED STAGING AREA
- (RS) ROCK SOCKS

GENERAL NOTES

1. TOTAL AREA OF DISTURBANCE = 9.89 AC

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn

4852 South Ulster Street, Suite 1500
Denver, Colorado 80237 (303) 228-2300

DESIGNED BY: AEM
DRAWN BY: AEM
CHECKED BY: SAL
DATE: 2/18/2020

LEGAL DESCRIPTION:
SECTION 21, TOWNSHIP 10 NORTH, RANGE 2 EAST, CITY OF ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO. TRACTS C48 AND C49, UNIT 4.

RV STORAGE - ALBUQUERQUE
ALBUQUERQUE, NEW MEXICO
SITE PLAN
FINAL EROSION AND SEDIMENT CONTROL PLAN

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
096648005

DRAWING NAME
EC PLAN

SHEET
3

Diversion Channel Dike and Swale (continued)

MAINTENANCE REQUIREMENTS

Earth Dike (Berm)

Dikes must be inspected on a weekly basis and after each significant (>0.5 inch) rainfall to determine if silt is building up behind the dike, or if erosion is occurring on the face of the dike. Silt shall be removed in a timely manner. If erosion is occurring on the face of the dike, the slopes of the face shall either be stabilized through mulch or seeding, or the slopes of the face shall be reduced.

Diversion Channel (Swale)

Inspection must be made weekly and after each significant (>0.5 inch) rainfall to locate and repair any damage to the channel or to clear debris or other obstructions so as not to diminish flow capacity. Damage from storms or normal construction activities, such as tire ruts or disturbance of swale stabilization, shall be repaired as soon as practical.

NOTES

- Berms shall have a minimum height of 18 inches, side slopes of 2:1 or flatter, and a minimum base width of 2 feet.
- The minimum freeboard shall be 6 inches.
- Berms and diversions should be constructed of compacted soil or coarse aggregate.
- All berms shall have an uninterrupted positive grade to a stabilized outlet.
- Diversion channels shall be excavated or shaped to line, grade, and cross section as indicated in the plans and as required to meet the criteria specified.
- Berms and diversion channels should be stabilized within 14 days of their construction.
- Periodically, and after each rain event, berms and dikes should be inspected, and accumulated sediments against berms should be removed.

Sediment Basin

DESCRIPTION

A sediment basin is a pond area with a controlled outlet in which suspended sediment is allowed to settle. Provides treatment plus controlled outflow, minimizing flood problems down gradient.

PRIMARY USE

Sediment basins should be used where there is adequate open space to direct most of the site drainage into the basin. For sites with disturbed areas of more than 10 acres that are part or the same drainage area, sediment basins are required as either temporary or permanent controls, if there are no site limitations.

APPLICATIONS

A sediment basin is a treatment device, highly effective for removing sediment and other pollutants for the design storm event. Sediment basins shall be designed for two-year storm runoff. Maximum embankment height shall be 9 feet with a minimum top width of 8 feet. The side slopes shall be 2:1 or flatter.

LIMITATIONS

Sediment basins can be rather large, depending on site conditions, requiring the use of expensive development area and comprehensive planning for construction phasing prior to implementation.

Storm events that exceed the design storm event can cause damage to the spillway structure of the basin and may impact downstream concerns.

MAINTENANCE REQUIREMENTS

Sediment shall be removed and the basin shall be re-graded to its original dimensions when the capacity of the impoundment has been reduced to 20% of its original storage capacity. The removed sediment shall be stockpiled or redistributed in areas that are protected from erosion.

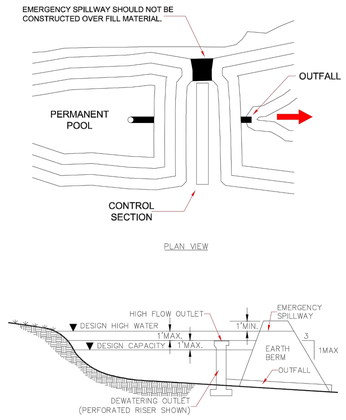
The basin outlet structure and emergency spillway (if present) should be checked frequently and after each major rain event to inspect for damage and to insure that obstructions are not diminishing the effectiveness of the structures.

Applications
- Perimeter Control
- Slope Protection
- ✓ Sediment Trapping
- Channel Protection
- Temporary Stabilization
- Permanent Stabilization
- Waste Management
- Housekeeping Practices

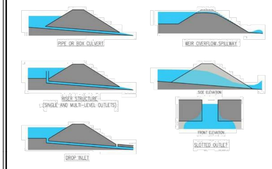
Targeted Constituents
- ✓ Sediment
- Nutrients
- Toxic Materials
- Oil and Grease
- ✓ Floatable Materials
- Construction Wastes

Impact
- ✓ Significant
- ✓ Medium
- Low
- Unknown or Questionable

Sediment Basin (continued)



Outlet Structure



DESCRIPTION

A flow restrictive device placed at the discharge point of a storm water detention basin or check structure. Outlet structures can provide mitigation for flowrates, velocities, floatables, and can provide sedimentation. Outlet Structures include a wide range of designs, including orifice plates, baffle-boxes, mechanical screens, ported risers, trash racks, and weir configurations.

PRIMARY USE

Primarily utilized to be utilized in conjunction with detention basins. May be utilized as temporary BMP for construction phase activities. Out Structures provide mechanism for metering flowrates and reducing velocities to allow particles and associated pollutants to settle.

APPLICATIONS

If constructed with initial grading operations, an outlet structure can provide a site-wide BMP for sediment control. In post-construction applications, Outlet Structures can provide mitigation of a wide range of pollutants. Outlet Structures are also utilized for site storm water flowrate mitigation, and are typically designed to provide both storm water quality as well as flowrate mitigation.

LIMITATIONS

Construction phase Outlet Structure may require regular maintenance to remove accumulated sediment.

Outlet Structure requires an impoundment mechanism to convey flows into structure.

MAINTENANCE REQUIREMENTS

Inspections should be made on a monthly basis, especially after large storm events. If the Outlet Structure becomes inundated, debris and sediment removal are immediately required.

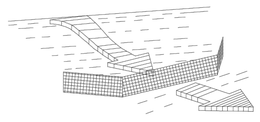
Applications
- Perimeter Control
- Slope Protection
- ✓ Sediment Trapping
- ✓ Channel Protection
- ✓ Temporary Stabilization
- ✓ Permanent Stabilization
- Waste Management
- Housekeeping Practices

Targeted Constituents
- ✓ Sediment
- ✓ Nutrients
- Toxic Materials
- Oil and Grease
- ✓ Floatable Materials
- Construction Wastes

Impact
- ✓ Significant
- ✓ Medium
- Low Unknown or Questionable

OS

Silt Fence



DESCRIPTION

A silt fence consists of geotextile fabric supported by backing stretched between posts, with the lower edge securely embedded in soil downstream of disturbed areas. Intercepts runoff in the form of sheet flow and provides filtration, sedimentation, and velocity reduction.

PRIMARY USE

Silt fences are used as perimeter control downstream of disturbed areas, and for non-concentrated sheet-flow conditions.

APPLICATIONS

Silt fences provide an economical way to mitigate overflow, non-concentrated flows, and as a perimeter control device. Best with coarse to silty soil types and to control wind erosion on sandy soils.

LIMITATIONS

Minor ponding will likely occur at the upstream side of the silt fence, resulting in minor localized flooding.

Fences that are constructed in swales or low areas subject to concentrated flow may be overtopped, resulting in failure of the filter fence. Silt fences subject to areas of concentrated flow (waterways with flows >1 cfs) are not acceptable.

Silt fence can interfere with construction operations; therefore, planning of access routes onto the site is critical.

Silt fence can fail structurally under heavy storm flows, creating maintenance problems and reducing the effectiveness of the system.

MAINTENANCE REQUIREMENTS

Inspections should be made on a weekly basis, especially after large storm events. If the fabric becomes clogged, it should be cleaned or, if necessary, replaced.

Sediment should be removed when it reaches approximately one-half the height of the fence.

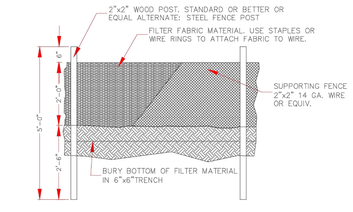
Applications
- ✓ Perimeter Control
- ✓ Slope Protection
- ✓ Sediment Trapping
- Channel Protection
- Temporary Stabilization
- Permanent Stabilization
- Waste Management
- Housekeeping Practices

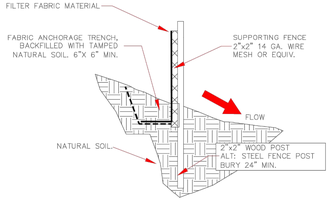
Targeted Constituents
- ✓ Sediment
- Nutrients
- Toxic Materials
- Oil and Grease
- ✓ Floatable Materials
- Construction Wastes

Impact
- ✓ Significant
- ✓ Medium
- Low
- Unknown or Questionable

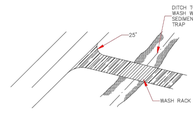
SF

Silt Fence (continued)





Stabilized Construction Entrance/Exit



DESCRIPTION

A stabilized construction entrance consists of a pad of crushed stone, recycled concrete, or other rock-like material on top of a geotextile filter cloth, which is used to facilitate the washdown and removal of sediment and other debris from construction equipment prior to exiting the site. During the construction phase of a project, regular street sweeping should be performed to remove debris carried from the site.

PRIMARY USE

Stabilized construction entrances are used to reduce offsite sediment tracking from trucks and construction equipment, and for sites where considerable truck traffic occurs each day. They also reduce the need to clean adjacent pavement as often, and help route site traffic through a single point.

APPLICATIONS

As a part to the erosion-control plan required for sites larger than five acres, and recommended for all construction sites.

LIMITATIONS

Selection of the construction entrance location is critical. To be effective, it must be used exclusively.

Stabilized entrances are rather expensive, considering that they must be installed in combination with one or more other sediment control techniques. It may be more cost effective, however, than labor-intensive street cleaning.

MAINTENANCE REQUIREMENTS

Inspections should be made on a regular basis and after large storm events in order to ascertain whether or not sediment and pollution are being effectively detained on site.

When sediment has substantially clogged the void area between the rocks, the aggregate mat must be washed down or replaced.

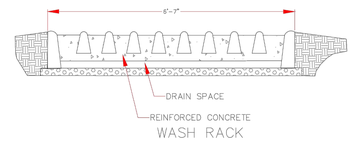
Periodic re-grading and top dressing with additional stone must be done to keep the efficiency of the entrance from diminishing.

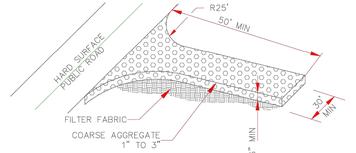
Applications
- Perimeter Control
- Slope Protection
- Sediment Trapping
- Channel Protection
- ✓ Temporary Stabilization
- Permanent Stabilization
- Waste Management
- Housekeeping Practices

Targeted Constituents
- ✓ Sediment
- Nutrients
- Toxic Materials
- Oil and Grease
- Floatable Materials
- Construction Wastes

Impact
- ✓ Significant
- ✓ Medium
- Low
- Unknown or Questionable

Stabilized Construction Entrance/Exit (continued)





Concrete Waste Management

DESCRIPTION

Concrete waste management prevents or reduces the discharge of pollutants to storm water by conducting washout offsite, performing onsite washout in a designated area, and training employees and subcontractors.

APPLICATIONS

The following low-cost measures will help reduce storm water pollution from concrete wastes:

- Store dry and wet materials under cover, away from drainage areas.
- Avoid mixing excess amounts of fresh concrete or cement onsite.
- Perform washout of concrete trucks offsite or in designated areas only.
- Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
- Do not allow excess concrete to be dumped onsite except in designated areas.
- For onsite washout:
  - (a) Locate washout area at least 50 feet from storm drains, open ditches, or water bodies. Prevent runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - (b) Wash out wastes into the temporary pit where the concrete can set, be broken up, and then disposed of properly.
- When washing concrete to remove fine particles and expose the aggregate, avoid creating runoff by draining the water to a bermed or level area.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stock pile, or dispose in the trash.
- Train employees and subcontractors in proper concrete waste management.

LIMITATIONS

Offsite washout of concrete wastes may not always be possible.

MAINTENANCE REQUIREMENTS

Inspect subcontractors to ensure that concrete wastes are being properly managed.

If using a temporary pit, dispose of hardened concrete on a regular basis.

Applications
- Perimeter Control
- Slope Protection
- Sediment Trapping
- Channel Protection
- Temporary Stabilization
- Permanent Stabilization
- ✓ Waste Management
- ✓ Housekeeping Practices

Targeted Constituents
- Sediment
- Nutrients
- Toxic Materials
- Oil and Grease
- Floatable Materials
- ✓ Construction Wastes

Impact
- Significant
- ✓ Medium
- Low
- Unknown or Questionable

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
© 2021 KIMLEY-HORN AND ASSOCIATES, INC.
4852 South Ulster Street, Suite 1500
Denver, Colorado 80237 (303) 228-2300

DESIGNED BY: AEM
DRAWN BY: AEM
CHECKED BY: SAL
DATE: 2/18/2020

LEGAL DESCRIPTION:
SECTION 21, TOWNSHIP 10 NORTH, RANGE 2 EAST, CITY OF ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO. TRACTS C48 AND C49, UNIT 4.

RV STORAGE - ALBUQUERQUE
ALBUQUERQUE, NEW MEXICO
SITE PLAN
EROSION AND SEDIMENT CONTROL DETAILS

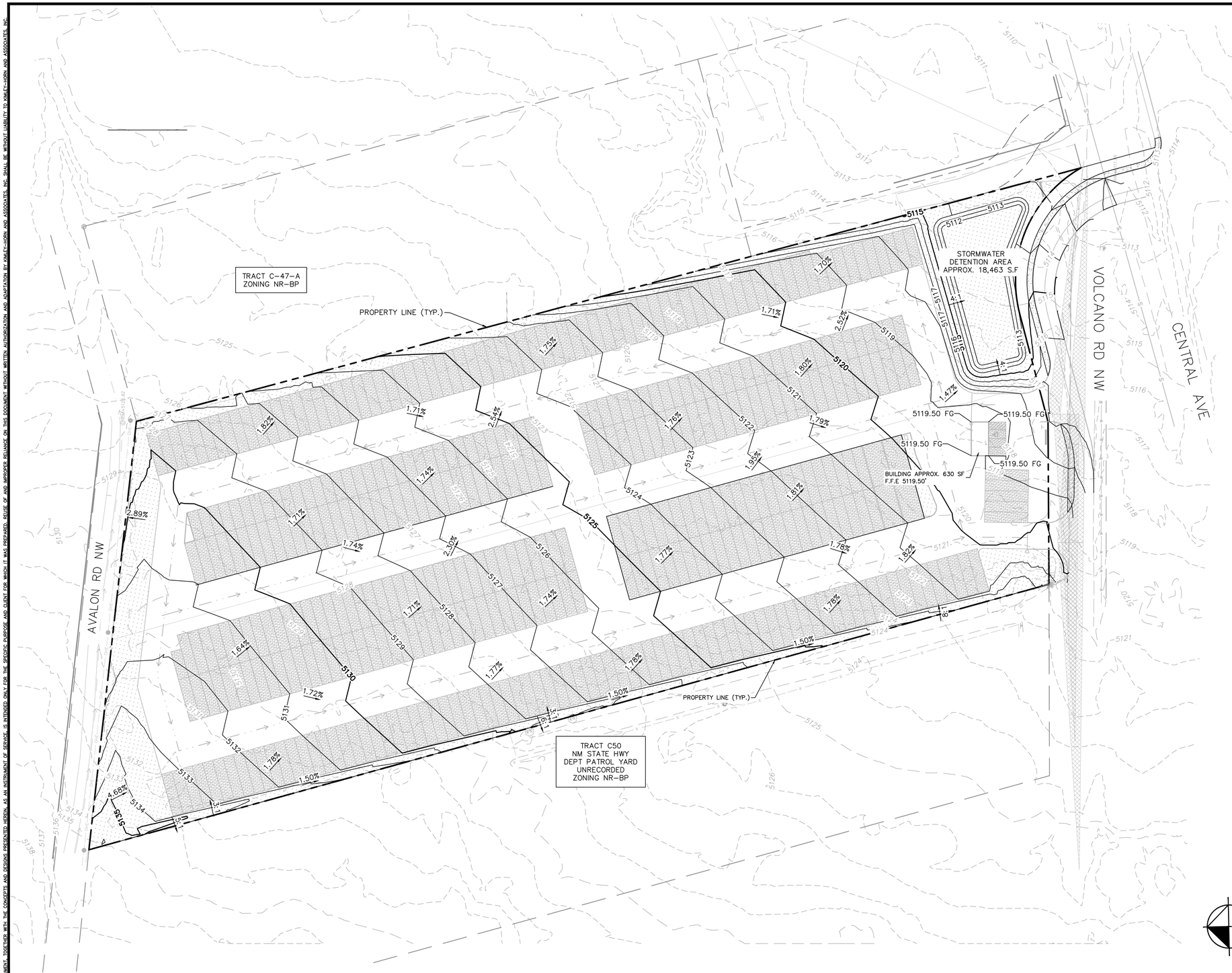
PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
096648005

DRAWING NAME
EC PLAN

SHEET
3

APPENDIX F: GRADING AND DRAINAGE PLAN



LEGEND

- SITE PROPERTY LINE
- 5747 PROPOSED CONTOUR
- 5747 EXISTING CONTOUR
- PROPOSED STORM DRAINAGE INLET
- PROPOSED STORM OUTLET
- PROPOSED FIRE HYDRANT
- PROPOSED PARKING BAYS
- 6" CURB AND GUTTER, TYPICAL
- PROPOSED FLOW DIRECTION

City of Albuquerque
Planning Department
Development Review Services
HYDROLOGY SECTION
PRELIMINARY APPROVED
DATE: 04/19/21
BY: Renée Brissette
HydroTrans # K09D046

THESE PLANS AND/OR REPORT ARE CONCEPTUAL ONLY. MORE INFORMATION MAY BE NEEDED IN THEM AND SUBMITTED TO HYDROLOGY FOR BUILDING PERMIT APPROVAL.

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn

© 2021 KIMLEY-HORN AND ASSOCIATES, INC.
4852 South Ulster Street, Suite 1500
Denver, Colorado 80237 (303) 228-2300

DESIGNED BY: AEM
DRAWN BY: AEM
CHECKED BY: SAL
DATE: 2/18/2020

LEGAL DESCRIPTION:
SECTION 21, TOWNSHIP 10 NORTH, RANGE 2 EAST, CITY OF ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO. TRACTS C48 AND C49, UNIT 4.

RV STORAGE - ALBUQUERQUE
ALBUQUERQUE, NEW MEXICO
SITE PLAN
GRADING AND DRAINAGE PLAN

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
096648005

DRAWING NAME
FIRE PLAN

SHEET 1 OF 1
3