



SUMMARY REPORT

Airport Wash

CONTRACT NO.
CT-FC-15****204

BASIN MANAGEMENT STUDY PHASE 2



Prepared for: Pima County Regional Flood Control District
Prepared by: CMG Drainage Engineering, Inc.

JUNE 2016



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AIRPORT WASH BASIN MANAGEMENT STUDY – PHASE 2

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TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
1 EXECUTIVE SUMMARY	1
2 INTRODUCTION	2
2.1 PROJECT DESCRIPTION	2
2.1.1 Objective	2
2.1.2 Scope of Project	2
2.1.3 Participation	2
2.2 STUDY AREA	3
3 EXISTING CONDITIONS	4
3.1 DATA COLLECTION	4
3.1.1 Land Ownership	4
3.1.2 Existing Land Use	4
3.1.3 Proposed Land Use	4
3.1.4 Aerial Photography and Topography Data Sources	5
3.1.5 Drainage Studies	5
3.1.6 Historical Drainage Complaints	5
3.1.7 Historical Flooding Records	6
3.2 DRAINAGE FACILITIES INVENTORY	6
3.3 FIELD SURVEY	6
3.4 HYDROLOGIC AND HYDRAULIC ANALYSES	6
3.4.1 Hydrology	6
3.4.2 Hydraulics (Summarized from CMG 2016 and KHA 2016)	8
3.4.2.a Hydraulic Modeling	8
3.4.2.b Mapping Results	9
4 PUBLIC INVOLVEMENT	11
4.1 STAKEHOLDER OUTREACH	11
4.1.1 Private/Public Stakeholders	11
4.2 PROJECT WEBSITE	12
5 ALTERNATIVE IDENTIFICATION AND ANALYSIS	13
5.1 ALTERNATIVE DEVELOPMENT	13

5.1.1 Identification of Preliminary Alternatives 13

5.1.2 Evaluation Criteria 13

5.1.3 Refinement of Alternatives 14

5.2 RECOMMENDED ALTERNATIVES 15

5.2.1 Structural Alternatives Feasibility 15

 5.2.1.a Alternatives Hydraulic Analysis..... 15

5.2.2 Non-Structural Alternatives 15

5.2.3 Cost Estimates..... 16

5.3 RECOMMENDED ALTERNATIVES SUMMARY 17

6 REFERENCES 18

LIST OF FIGURES

Figure 1 – Location Map..... 3

Figure 2 – FEMA Study Limits Floodplain Map..... Appendix C.1

Figure 3 – Non-FEMA Limits Floodplain Map..... Appendix C.2

LIST OF TABLES

Table 1: HEC-HMS Parameters Summary Table 7

Table 2: Summary Table for Airport Wash HEC-HMS Discharge at Selected Major Nodes 8

Table 3: HEC-RAS Model Reach Summary 9

Table 4: Habitable Structure Weights..... 14

Table 5: Project Ranking 14

Table 6: Construction Cost Estimates..... 16

Table 7: Proposed Structure Matrix..... 17

LIST OF APPENDICES

APPENDIX A – PUBLIC INVOLVEMENT SUPPORTING INFORMATION

- A.1 STAKEHOLDER MEETINGS – INVITED LIST
- A.2 STAKEHOLDER MEETING AGENDAS, MEETING SUMMARIES AND SIGN-IN SHEETS
- A.3 MAPS/MATRIX

APPENDIX B – ALTERNATIVES ANALYSIS

- B.1 ALTERNATIVES ANALYSIS REPORT

APPENDIX C – PROJECT FIGURES

- C.1 FIGURE 2 – FEMA STUDY LIMITS FLOODPLAIN MAP
- C.2 FIGURE 3 – NON-FEMA LIMITS FLOODPLAIN MAP

APPENDIX D – DIGITAL FILES ON COMPACT DISK

- D.1 SUMMARY REPORT (TEXT, APPENDICES A, C & D IN PDF FORMAT)
- D.2 SUMMARY REPORT APPENDIX B - ALTERNATIVE ANALYSES REPORT (TEXT & APPENDICES IN PDF FORMAT)
- D.3 SUMMARY REPORT APPENDIX B - ALTERNATIVE ANALYSES COMPUTER MODELS

LIST OF SEPARATE SUPPORTING PROJECT DOCUMENTS

Airport Wash Physical Map Revision Technical Data Book, CMG Drainage Engineering, February 2016

Kimley-Horn and Associates, Inc., *Existing Conditions Report*, March 2016a.

Kimley-Horn and Associates, Inc., *Hydrology & Hydraulics Report for Locally Regulated Watercourses in Airport Wash*, January 2016b.

1 EXECUTIVE SUMMARY

The Airport Wash Basin Management Study Phase 2 (AWBMS2) covers a heterogeneous area of governmental, industrial, residential and undeveloped land in South Central Tucson and Unincorporated Pima County. This Phase 2 continues the comprehensive study by covering the Airport Wash Watershed, which is located north of the previous South Phase Study Area. Goals of the study were to update floodplain delineations used for daily administration of the floodplain and identify existing flooding constraints. Using the list of flooding constraints, the goal was to generate alternatives that would improve conveyance, thus reducing flooding impacts on properties and improving all-weather access. The study also served to provide a framework for accommodating planned and future development/corridors.

The consulting team, led by CMG Drainage Engineering, evaluated 14.3 miles of Federal Emergency Management Agency (FEMA) designated floodplain, and approximately 11.5 miles of undesignated floodplains using 1-Dimensional hydrologic/hydraulic methodology. The results from the modeling provided new floodplain delineations that were mapped and used in combination with existing studies and other collected data to identify problem areas and re-affirm previously identified complaints throughout the study area. Additionally, the remapped FEMA designated floodplain was submitted to FEMA through the Letter of Map Revision (LOMR) process.

Meetings were held with major stakeholders identified by the project team for the purpose of informing them of the study, the results, and the intention of identifying projects in the watershed. Stakeholders were appreciative of the opportunity to understand the project objectives and were also able to provide insight into their future activities/plans for their ongoing operations in the study area.

Resulting floodplain modeling output revealed a significant reduction in the amount of area inundated by the 1% chance storm. Areas that continued to be substandard or lack containment of the design storm were documented on an Existing Constraints Map. The project team generated an initial list of 22 alternatives for improving identified drainage problems in the study area. Applying an Alternative Criteria Matrix to the alternatives resulted in a rank and prioritization of all projects. The final projects list was generated and advanced to a final four projects after review and consideration of the ranking and hydraulic feasibility. Each project was modeled hydraulically to a concept level sufficient to generate a 15% conceptual cost estimate. Following the alternatives analysis, the consulting team compiled the results into the final deliverable, which consists of a multiple-volume document to be used as a resource by the District and the public for evaluating potential drainage impacts by future development and paving the way for implementation of projects to mitigate problem areas.

2 INTRODUCTION

2.1 PROJECT DESCRIPTION

2.1.1 Objective

The purpose of AWBMS2 is to provide the Regional Flood Control District (District) staff a tool to effectively plan for improvements and to manage floodplain development and permitting in the study area. More specifically the study would update the FEMA Special Flood Hazard Area (SFHA) on the associated effective Flood Insurance Rate Maps (FIRMs), provide new floodplain delineations on currently unmapped portions of Airport Wash and tributaries, and develop cost-effective alternatives to alleviate flood and erosion hazards for the study area. The deliverable for the study is a report that summarizes the findings, including existing conditions data, hydrologic & hydraulic information, updated FEMA floodplain areas, alternative analyses, and public outreach for this study.

2.1.2 Scope of Project

The general scope of the AWBMS2 included identifying existing constraints by updating and re-evaluating existing floodplain delineations for watercourses and tributaries in the FEMA mapped portion of Airport Wash; and non-FEMA areas consisting of the Old Rodeo Wash, North Fork of the Airport Wash, and tributaries with 100-year peak discharges greater than or equal to 500 cubic feet per second (cfs). A new rainfall-runoff model was developed for the entire Airport Wash watershed utilizing HEC-HMS. A LOMR was submitted to FEMA to update the floodplain in FEMA mapped watercourses. The final component of the scope was an alternatives analysis that evaluated problem areas and arrived at four recommended structural alternatives and one non-structural alternative in the study area and advanced them to a conceptual design and cost estimate stage.

2.1.3 Participation

Monthly project update meetings were held that included staff from the Pima County Regional Flood Control District (District), CMG Drainage Engineering, Kaneen, Kimley-Horn and Ashby. Input was also solicited from the City of Tucson Engineering staff at each stage of the project. Stakeholder meetings were held with public and private entities to update those interested and to gain outside perspectives on the project.

2.2 STUDY AREA

The limits of the AWBMS2 project area coincide with the Airport Wash Watershed boundaries and cross jurisdictional boundaries of Pima County (County) and City of Tucson (City). The study is bordered on the north by Wyoming, Rodeo, and Julian watersheds and on the south by Valencia Wash, El Vado Wash, Hughes Wash and Franco Wash Watersheds. All flow outfalls to the Santa Cruz River, which is the western boundary of the project. A location map for the project is provided on Figure 1.

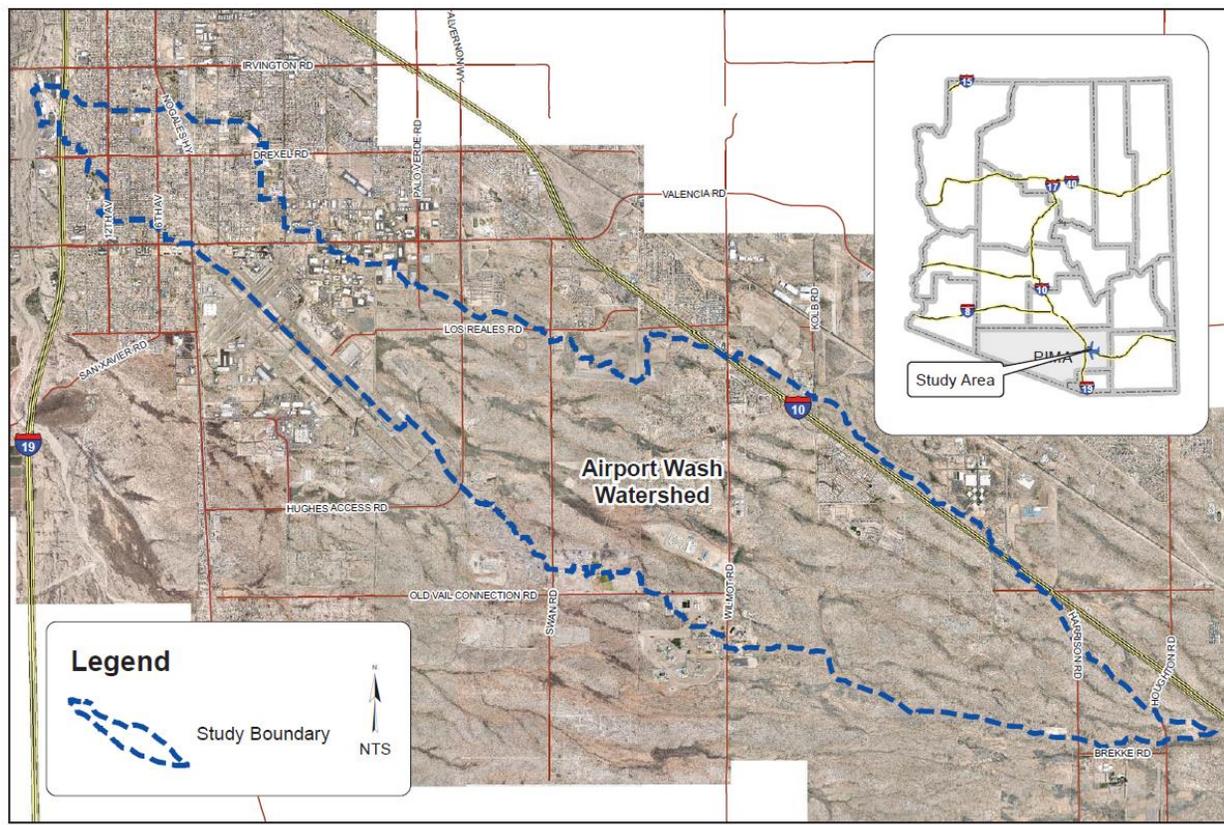


Figure 1 – Location Map

3 EXISTING CONDITIONS

3.1 DATA COLLECTION (Summarized from KHA 2016a)

3.1.1 Land Ownership

The regional study area is comprised of the Airport Wash watershed. The upper portion of the watershed primarily consists of state-owned undeveloped rangeland and transitions to privately held residential and commercial properties northwest of the Tucson International Airport (Airport). Both federal and state prisons are operated along the Wilmot Road corridor. The State of Arizona also owns the right-of-way along the I-19 corridor. Union Pacific operates its railroad adjacent and parallel to Nogales Highway in an adjoining 150-foot right-of-way.

3.1.2 Existing Land Use

Land use within the study area consists of residential, industrial, commercial, transportation, mining, and undeveloped desert rangeland. Much of the eastern portion of the watershed is undeveloped desert rangeland, with some residential and commercial developments along the major roadway corridors.

The City of Tucson actively operates the Los Reales Landfill near Swan Road. The eastern borrow pit for the Landfill acts as a regional retention basin, with sufficient storage capacity to fully contain all upstream flow in Old Rodeo Wash. The Tucson International Raceway is located west of Swan Road, along the Los Reales Road alignment. There are several surface mining operations east of Alvernon Way and north of Old Vail Connection Road.

The Airport occupies most of the land between Country Club Road and Valencia Road, with an Air National Guard facility situated on the northern side of the Airport. In addition, there are a variety of landside services and small commercial enterprises in this area. The Union Pacific Railroad runs north-south through the projects, along the eastern side of Nogales Highway.

Sunnyside School District also owns several parcels used to operate Sunnyside High School (at the intersection of Campbell Avenue and Bilby Road) and Apollo Middle School (at the intersection of Nebraska Street and Liberty Avenue). The remainder of the study area mainly consists of single family residential housing. Nogales Highway and Valencia Road serve as the main arterial roadways within the study limits.

3.1.3 Proposed Land Use

The 2015 Pima County Comprehensive Plan defines future land use and the 2013 City of Tucson General Plan (Plans) describes development criteria within the study area. The land use plans for the southeast sub-region contained within these larger planning documents show that the proposed land uses within the study area are primarily designated as Medium High Intensity Urban and Industrial with areas east of Swan Road classified as Multifunctional Corridors and Resource Conservation.

None of the projects recommended in the *Alternatives Report* require large scale land use changes.

3.1.4 Aerial Photography and Topography Data Sources

Aerial imagery and bare earth LIDAR generated for the 2008 Pima Association of Governments Ortho Project were provided by the District for the purposes of this study. LIDAR mass points consisting of 3D points with x, y, z coordinates were used to create TINs (digital land surfaces) for hydrologic & hydraulic modeling as well as for topographic mapping with 2-foot interval contours. LIDAR data was delivered on the NAD 83, Arizona State Plane Coordinate System – Central Zone, HARN92, International Feet.

3.1.5 Drainage Studies

Several drainage studies have been conducted within the project area, with many focusing on drainage conditions at Los Reales Landfill or the Airport. Parsons Brinckherhoff was commissioned to conduct an *Airport Wide Basin Study* in 1992. The objective was to establish a stormwater management plan for airside and landside facilities to coincide with the existing Airport Master Plan. A combination of two sub-regional detention basins and an individual retention basin were recommended based on a staged construction schedule agreement between Tucson Airport Authority (TAA), Pima County, and the City of Tucson.

Stantec performed an *Airport Wide Drainage Basin Update* in 2004, which used the hydrology completed for the 1992 Parsons Brinckherhoff study, and concluded that the recommendation of two sub-regional detention basins and one retention basin remained the optimum configuration for managing stormwater through the Airport. Neither study included basin designs or discrete basin locations.

EMCON/OWT completed a drainage report to support Los Reales Landfill onsite drainage management. This drainage report outlines concepts and designs to convey surface water runoff through the Landfill. Offsite flows generated in the Old Rodeo Wash watershed are collected in the East Retention Basin, which is designed to contain double the 100-yr storm events, for both onsite and offsite contributing areas.

In addition, there was a Letter of Map Revision (LOMR) in June 2011 to update FIRMs for a segment of Airport Wash near Nogales Highway. There are also several drainage reports to support residential/commercial developments within the study area.

3.1.6 Historical Drainage Complaints

Drainage complaints, compiled between 1983 and 2014 by the City of Tucson and Pima County, were reviewed to determine if the complaints correspond with existing issues. Drainage complaints that were reviewed include paper records and electronic databases, with paper complaints dated from 1983 to 2005 and electronic records dated from 1989 to 2014. Many of the complaints were maintenance related and were referred to the City Streets Division.

3.1.7 Historical Flooding Records

A severe thunderstorm hit the Tucson metro area on September 7, 2006 and the National Weather Service reported half an inch of rainfall during the initial ten minutes of the storm at the Airport. The storm prompted several road closures including a large segment of Wilmot Road near the state prison.

3.2 DRAINAGE FACILITIES INVENTORY

Drainage structures were initially inventoried using as-built plans collected from the City of Tucson Stormwater website. The size and condition of drainage infrastructure was further verified during a comprehensive field review, which supplemented the field survey component described in Section 3.3.

3.3 FIELD SURVEY

Ashby Surveying and Drafting was selected to provide field survey of drainage structures to supplement as-built data in support of hydraulic modeling as well as the development and feasibility of recommended alternatives. Survey data included size and material of structures, invert elevations, culvert geometries at the inlets and outlets, as well as upstream and downstream bounding cross sections of structures. Field survey operations included properties owned and/or operated by TAA. Results of the field surveys have been provided in the following separate project documents: 1) *Airport Wash Physical Map Revision Technical Data Book*, CMG Drainage Engineering, February 2016; and 2) *Hydrology & Hydraulics Report for Locally Regulated Watercourses in Airport Wash*, Kimley-Horn and Associates, January 2016b.

For additional information about project data collection including figures depicting various components, see the supporting project *Existing Conditions Report*, Kimley-Horn and Associates, Inc., March 2016a.

3.4 HYDROLOGIC AND HYDRAULIC ANALYSES

3.4.1 Hydrology (Summarized from CMG 2016)

A detailed hydrologic analysis for the entire Airport Wash watershed was performed using U.S. Army Corps of Engineers Hydrologic Modeling System 4.0 (HEC-HMS) in accordance with the District's *Technical Policy 015 Acceptable Methods for Determining Peak Discharges*. Rainfall-runoff parameters were selected according to District *Technical Policy 010 Rainfall Input for Hydrologic Modeling* and *Technical Policy 018 Acceptable Model Parameterization for Determining Peak Discharges*. Concentration points and their associated peak discharge rates were provided at existing Tucson Stormwater Management Study (TSMS) nodes, where applicable. In addition, concentration points were added at key locations, such as major roadway crossings and drainage structure locations, where there were no existing TSMS nodes. Hydrologic parameters selected as input for the HEC-HMS model are summarized in Table 1.

Table 1: HEC-HMS Parameters Summary Table

HEC-HMS Model Parameters	Description
Airport Wash Watershed Area	<ul style="list-style-type: none"> Approximately 22.87 square miles, with 80 sub-watersheds in total.
Topographic Data and Aerial Photos	<ul style="list-style-type: none"> 2008 PAG bare earth LIDAR data and 2008 1-ft aerial photos.
Storm Frequencies Evaluated	<ul style="list-style-type: none"> 100-year rainfall event for the entire watershed. 10-, 50-, and 500-year in effective FEMA Zone AE area.
Rainfall Data	<ul style="list-style-type: none"> NOAA 14 (upper 90%) rainfall depths for both 3-hour Type I and 24-hour Type II storms. Areal reduction factors were applied per Table 3.0 in Arizona State Standard [SS10-07]. An average areal reduction factor was applied to each of the following watershed size group: <=1 sq mi; 1~5 sq mi; 5~10; sq mi; 10~15 sq mi; 15~20 sq; and 20~25 sq mi.
Rainfall Loss Method	<ul style="list-style-type: none"> Used the SCS Curve Number method. SCS Curve Numbers were obtained from hydrologic soils (soil data from RFCD’s PC-Hydro) and vegetation covers. Impervious cover densities were estimated by utilizing PAG aerial photos and Google Maps aerial.
Transform	<ul style="list-style-type: none"> Used SCS Unit Hydrograph method. Times of Concentration (Tc) were computed by utilizing the method detailed in Chapter 3 of NRCS’s TR55. For the Channel segment in Tc computation, HEC-RAS was utilized to obtain channel velocities. Q100s from USGS Regional Regression Equation 13 by utilizing local watershed areas were used as the channel discharges in the HEC-RAS.
Channel Routing	<ul style="list-style-type: none"> Modified Puls method was applied to natural channels. Kinematic Wave method was applied to constructed channels.
Diversion Flow Verification	<ul style="list-style-type: none"> Verified that diversion flow at sub-watershed AW036, and AW440 are less than 100 cfs and thus is not necessary to be included in the HEC-HMS model. Verified that diversion flow at sub-watershed AW012 is over 100 cfs and thus included in the HEC-HMS model.
Retention Basin	<ul style="list-style-type: none"> Based on PAG’s 2008 bare earth LIDAR data, the East Basin on Los Reales Landfill provides 518.3 acre-feet retention volume at an elevation of 2737.0. The basin fully contains both 100-year and 500-year runoff from upstream watersheds.

The HEC-HMS model has multiple simulation runs to cover different storm durations and recurrence intervals as well as different rainfall aerial reduction factors. Microsoft Excel was

utilized to extract the appropriate peak discharge rates (higher discharges from either 3-hour or 24-hour storms with suitable rainfall aerial reduction factor) at each concentration point. At most concentration points, peak discharge rates from the 3-hour Type II storm were higher than those from the 24-hour Type II storm, with only couple of exceptions. **Table 2** summarizes the discharges at selected major roadway crossings.

Table 2: Summary Table for Airport Wash HEC-HMS Discharge at Selected Major Nodes

Concentration Point	Watershed Area (cumulative)	HEC-HMS Q (cfs)				Node Locations
	(sq mile)	10-yr	50-yr	100-yr	500-yr	
AW028&030	4.478	-	-	2476	-	Craycroft Rd
AW070	7.362	-	-	2558	-	End North Fork
AW206&212&224	4.474	-	-	2982	-	Kolb Rd
AW250	10.432	-	-	2887	-	End South Fork
AW070&250	17.794	1,566	3,182	3993	6,283	Combined North/South
AW416	20.966	1,786	3,217	3876	6,157	Nogales HWY
AW438	22.870	2,234	3,567	4267	6,160	Santa Cruz River

These HEC-HMS hydrologic results were compared to those obtained from USGS’s Regional Regression Equation for Southern Arizona Flood Region 5, the effective regulatory discharge rate in the Flood Insurance Study (FIS), and TSMS discharges obtained from the City of Tucson GIS website. The 100-year discharge rates from this study are within the standard error (42.6%) of those obtained from USGS’s Regional Regression Equation for Southern Arizona Flood Region 5. There is significant difference between the FIS discharge and the discharges in this study, which is likely due to differences in hydrology method and hydrologic parameters. Discharge rates from this study are generally in agreement with the TSMS discharges. TSMS discharges have been approved for use by FEMA, but not all areas with TSMS discharges have been re-mapped to reflect the accepted discharges. Therefore, the flood discharge rates generated by the HEC-HMS model in this study are considered reasonable. Additional information regarding hydrology can be found in the *Airport Wash Physical Map Revision Technical Data Notebook*, CMG Drainage Engineering, February 2016 and in *Hydrology & Hydraulics Report for Locally Regulated Watercourses in Airport Wash*, Kimley-Horn and Associates, January 2016.

3.4.2 Hydraulics (Summarized from CMG 2016 and KHA 2016)

3.4.2.a Hydraulic Modeling

HEC-RAS models were created for Airport Wash and all upstream tributaries with 100-year discharges exceeding 500 cfs. **Table 3** HEC-RAS Model Reach Summary lists the reaches of Airport Wash that were modeled and whether they were updated to FEMA standards or locally regulatory standards.

Table 3: HEC-RAS Model Reach Summary

HEC-RAS Reach Nomenclature	Mapping Standard
Airport Wash - Main Channel	FEMA
North Fork Airport Wash – DS of Craycroft	FEMA
South Fork Airport Wash – DS of Craycroft	FEMA
North Fork Airport Wash – US of Craycroft	Locally Regulatory
North Fork Airport Wash Split	Locally Regulatory
North Fork Airport Wash Breakout	Locally Regulatory
North Fork, North Tributary Airport Wash	Locally Regulatory
North Fork, South Tributary Airport Wash	Locally Regulatory
Old Rodeo Wash	Locally Regulatory
North Fork Airport Wash	Locally Regulatory

Models were developed using the HEC-GeoRAS tool within ArcGIS mapping software to extract cross sectional information from high resolution LIDAR data. Cross section locations were chosen based on guidance provided in the HEC-RAS User’s Guide, Hydraulic Reference Manual, and Arizona State Standard for Floodplain Hydraulic Modeling (SS 09-02). The cross sections were located considering changes in channel geometry, discharge, slope, roughness, and distance between cross sections for computational stability. In the effective Zone AE areas, cross sections on the FIRMs were duplicated if they were deemed to be appropriate in the HEC-RAS model for this study. However, many cross sections on the effective FIRMs are not being duplicated in the current HEC-RAS model because the locations or extents of those cross sections are not suitable to be coded into the HEC-RAS model. Additional cross sections, based on field survey conducted by Ashby Surveying and Drafting, Inc. were added as necessary to more accurately define the topography near culverts and bridges along the study reaches. Lateral structures were used to define the breakout flow in cases where existing floodplain geometry did not contain the flow events.

3.4.2.b Mapping Results

Mapping of the Airport Wash was conventional 1-D mapping west of Craycroft Road and upstream of the wash confluence with the Santa Cruz River. In these study limits, referred to hereafter as the FEMA study limits, the floodplain mapping follows FEMA standards and is further broken out by the effective FIRM Zone. In effective Zone AE, the floodplain mapping delineates the 1% chance event, 0.2% chance event and the Floodway limits. In the effective Zone A, the floodplain mapping delineates only the 1% chance event floodplain limits. Upstream of the FEMA study limits, hereafter referred to as the Non-FEMA limits, the mapping results reflect a hydraulic model that has natural split flow and lateral structures and optimized split flow hydraulic results.

The result of re-mapping the floodplain limits demonstrates that most of the Airport Wash main channel in the FEMA Study Limits contains the 1% chance flood event.

In the Non-FEMA limits, the Airport Wash and associated tributaries floodplains are wide and shallow, but riverine in nature.

Overall, in the FEMA Limits, the floodplains are deep and narrow and in the Non-FEMA limits they are wide and shallow. Floodplains are displayed on Figures 2 & 3 of this report (Appendix C), and Figure 2 of the *Alternatives Report* (Appendix B).

4 PUBLIC INVOLVEMENT

Kaneen Advertising & Public Relations was selected to implement and manage the public participation process. The objective of the process was to identify public and private stakeholders, seek input on existing flooding issues and conditions, and apprise the public of proposed and recommended projects resulting from the Study. Meetings with stakeholder groups provided important historical flooding information and a better understanding of current and future operations. These exchanges added valuable insight that assisted the technical team in developing effective recommended alternatives.

4.1 STAKEHOLDER OUTREACH

4.1.1 Private/Public Stakeholders

Emails were sent to each individual on the attached Stakeholder Meetings – Invited List with a brief overview of the AWBMS2 study with attached maps identifying the study area, floodplains and existing constraints and a request to attend a stakeholder meeting.

Eight (8) stakeholder meetings/telephone conferences/email exchanges were held with public agencies and property owners/tenants to obtain input on existing conditions and current and potential uses of the properties. Each meeting began with a project overview, review of various maps and modeling results, and general discussion with attendee(s). Contact was made or meetings held with the following stakeholder groups during February and March 2016:

- Arizona State Land Department
- Sierra Mining and Crushing LLC/Hughes Sand & Gravel
- Diamond Ventures
- Union Pacific Railroad (UPRR)
- Local Agencies (Pima County DOT, Arizona Department of Transportation, City of Tucson Engineering, and City of Tucson Development Services)
- City of Tucson Council Aides/Board of Supervisor Aides
- TAA, Raytheon Missile Systems, and Pima County
- Administrator’s Office (Aerospace and defense research park)
- Air National Guard

Agendas were developed for each of the above stakeholder meetings as well as sign-in forms to obtain contact information from all stakeholders. The following maps and informational materials were also provided:

- 5-map series of the Airport Wash study area, floodplains and existing constraints
- Map of infrastructure improvement alternatives and the priority matrix for those improvements

4.2 PROJECT WEBSITE

Pima County Regional Flood Control District developed and maintained a project website located at the following web address:

http://webcms.pima.gov/government/flood_control/reports/airport_wash_basin_management_study/.

The website included a project purpose and overview; data collection, inventory, and constraints maps; final Hydrology and Hydraulics Report; and final Existing Conditions Report.

Stakeholder meeting materials such as the invitation list, agendas and sign-in sheets, and map handouts are provided in Appendix A.

5 ALTERNATIVE IDENTIFICATION AND ANALYSIS (Summarized from KHA 2016c)

5.1 ALTERNATIVE DEVELOPMENT

The updated floodplain delineations were the major component in the development of the Existing Constraints Map which became the baseline for discussion and decision making for selecting the problem areas in the watershed to be evaluated. The planned future development within the study area was one of the driving factors in the development of proposed alternatives with the intent of establishing needs and prioritization to address problem areas prior to future development which could both exacerbate the conditions and potentially be an opportunity to address problems.

5.1.1 Identification of Preliminary Alternatives

Using information from the Data Collection task (i.e. drainage complaints, agency input, historical flooding accounts, newspaper articles, and previous studies in the area) and the existing conditions floodplain mapping, a preliminary list of alternatives was developed to address problem areas in the study area. The preliminary list was comprehensive in nature and needed to be reduced to a total of four (4) alternatives for the final recommendations.

Twenty-two locations for potential drainage improvements were initially identified based on flooding and all-weather access problems, as shown on the Existing Constraints Map, Figure 2 in **Appendix A**. To reduce the alternatives to a final four (4) projects, an Alternatives Matrix was developed consisting of multiple evaluation criteria that would help rank and prioritize the projects to aid the project team in selecting the final project list.

5.1.2 Evaluation Criteria

Preliminary alternatives were evaluated based on a set of 13 criteria, outlined below. Criteria were developed using mapping results, design experience, and knowledge of the study area. Alternatives that removed structures from the floodplain were weighted according to weighting, as shown in **Table 4: Habitable Structure Weights**.

- FEMA Mapped
- Habitable Structures Prevented from Flooding
- Improves Airport Drainage
- Addresses Erosion Issue
- Alternative Solves Existing Drainage Complaint
- Major Utility Conflicts
- Existing Right-of-Way
- Disruptions to Operations/Commerce During Construction
- All Weather Access

- Identified/Designed in Previous Study
- Arterial Traffic Counts
- Stand alone or dependent
- Cost

Table 4: Habitable Structure Weights

Designation	Structures Prevented from Flooding	Weight Factor
FEMA Mapped	>5	3
	3-5	2
	1-2	1
Non-FEMA Mapped	>10	3
	5-10	2
	1-4	1

5.1.3 Refinement of Alternatives

Individual alternatives were assessed separately based on their capacity to meet the objectives of the criteria developed for the Alternatives Matrix, defined in Section 5.1.2. As a result of this evaluation, each criterion was assigned a value which was weighted according to the procedure outlined above. The values for each alternative were summed to create a numeric score for the twenty-two alternatives. The four highest scoring alternatives, shown in

Table 5: Project Ranking, were selected for further analysis.

Table 5: Project Ranking

Project Rank	Project ID	Score
1	A	8.50
3*	J	7.80
4	D	7.75
5	B	7.50

* The second ranked project, Project G, was not included in top 4 due

to recent maintenance

5.2 RECOMMENDED ALTERNATIVES

5.2.1 Structural Alternatives Feasibility

Preliminary hydraulic modeling results show that the projects in the study area are hydraulically feasible. However, projects depend largely on the feasibility of right-of-way acquisition and construction funding availability.

5.2.1.a Alternatives Hydraulic Analysis

The final alternatives were conceptually designed using the existing conditions HEC-RAS models as baselines. Projects were developed using a combination of increased channel capacity, new culvert crossings, and new or upgraded erosion protection. Channels were sized to contain the 100-year peak discharge, with required freeboard. Roadway crossing were sized to provide all-weather access. If all-weather access was not feasible within reason, the roadway crossing was designed to provide a greater level of access than existing conditions. Erosion protection was designed per Pima County standards. See Appendix B.

5.2.2 Non-Structural Alternatives

Non-structural alternatives have historically focused on defining land use and development regulations to accommodate such things as preserved open spaces, dedicated flow corridors, or critical basin designations. Many of these regulatory tools are actively being used in the study area. The “Balanced Basin” designation has already been applied to the Airport Wash watershed and consideration to apply additional regulation would require changing that designation to “Critical Basin.”

Additionally, it was determined during the drainage inventory phase of the project that maintenance of drainage infrastructure can have a significant impact on the functionality of the study area’s drainage system. While channel maintenance has historically been difficult in the study area, it is anticipated that entities such as the City of Tucson, TAA Union Pacific, Pima County Department of Transportation, and ADOT would be able to coordinate a continuous, cross-jurisdictional maintenance program to maximize the capacity of existing drainage infrastructure.

The District also administers the Floodprone Land Acquisition Program (FLAP) which can be used to acquire floodprone properties from willing and participating property owners. In some cases, it may be more cost effective to acquire floodprone property than to construct a structural alternative and that cost analysis should be a consideration going forward.

It is recommended that either or both of the mentioned non-structural alternatives, FLAP or Maintenance Coordination, be pursued as the non-structural alternative.

5.2.3 Cost Estimates

Construction cost estimates, shown in **Table 6**, were generated with the understanding that significant contingency would be necessary to cover the unknown at this stage and would also account for design and construction administration costs.

Table 6: Construction Cost Estimates

Project Rank	Project Number	Total Estimated Project Cost [\$]
1	A	\$429,000
3*	J	\$68,000
4	D	\$1,401,000
5	B	\$700,000
	Total	\$2,598,000

* The second ranked project, Project G, was not included in top 4 due to recent maintenance

5.3 RECOMMENDED ALTERNATIVES SUMMARY

Twenty-two problem areas in the Airport Wash (North) watershed were identified and evaluated based on established criteria to determine the 4 structural projects to be advanced to the conceptual design and cost estimate stage. Projects selected for the 4 highest ranked locations include improvements to alleviate flooding and restore all-weather access. The final 4 recommended projects are shown on **Figure 3** in **Appendix A**. **Table 7** summarizes the hydraulic components required for each project.

Table 7: Proposed Structure Matrix

Project ID	Levee(s)	Bank Protection	Channelization	Culvert(s)	Culvert Outlet Protection	R/W Needed
A	X	X				
J					X	
D		X	X			X
B		X		X	X	X

Implementation of these projects will improve the drainage in the study area; however, additional development of vacant land in the watershed can exacerbate the already problematic drainage conditions. Therefore, it is highly recommended that in addition to programming projects for future completion that the non-structural alternatives are considered and implemented to ensure that all occupants of the watershed, both residential and business, can experience a system of drainage improvements that creates an improved quality of life.

6 REFERENCES

1. CMG Drainage Engineering, *Airport Wash Physical Map Revision Technical Data Book*, February 2016.
2. Kimley-Horn and Associates, Inc., *Existing Conditions Report*, March 2016a.
3. Kimley-Horn and Associates, Inc., *Hydrology & Hydraulics Report for Locally Regulated Watercourses in Airport Wash*, January 2016b.
4. Kimley-Horn and Associates, Inc., *Alternatives Report*, June 2016c.
5. U.S. Army Corps of Engineers, Hydrologic Engineering Center. *HEC-GeoRAS, version 10.0*.
6. U.S. Army Corps of Engineers, Hydrologic Engineering Center. *HEC-RAS River Analysis System, version 4.1.0*, January 2010.
7. U.S. Army Corps of Engineers, Hydrologic Engineering Center. *HEC-RAS, River Analysis System User's Manual*, January 2010.
8. U.S. Army Corps of Engineers, Hydrologic Engineering Center. *HEC-RAS Mapper, version 1.0*, January 2010.
9. U.S. Geological Survey, Water-Supply Paper 2339, *Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains*.
10. Pima County Regional Flood Control District, *PC-Hydro User Guide – Pima County Hydrology Procedures*, version 5, Arroyo Engineering, LLC, May 2011.
11. Pima Association of Governments, 2008, LIDAR.
<http://www.pagnet.org/RegionalData/Orthophotos/OrthoOrderForm/tabid/478/Default.aspx>
12. Pima County Regional Flood Control District, *Guidelines for Establishing Scour and Freeboard for Bridges in Pima County*, August 2012.
13. Pima County Regional Flood Control District, *Technical Policies*.
14. City of Tucson, *Standards Manual for Drainage Design & Floodplain Management*, December 1989, Revised July 1998.
15. U.S. Army Corps of Engineers, Hydrologic Engineering Center. *HEC-HMS, Hydrologic Modeling System, version 4.0*. December 2013.
16. U.S. Army Corps of Engineers, Hydrologic Engineering Center. *HEC-HMS, Hydrologic Modeling System, User's Manual*, December 2013.

Appendix A – Public Involvement Supporting Information

- A.1 Stakeholder Meetings – Invited List
- A.2 Stakeholder Meeting Agendas, Meeting Summaries and Sign-in Sheets
- A.3 Maps/Matrix

A.1 Stakeholder Meetings – Invited List

<u>Pima County Flood Control</u>				
Airport Wash Basin Management Study - Phase 2 - CMG Drainage				
Stakeholder Meetings - Invited List				
Contractors (Sand & Gravel) /State Land/UPRR: (Individual Meetings/Telephone Calls/Emails)				
<u>First Name</u>	<u>Last Name</u>	<u>Email Address</u>	<u>Phone #</u>	<u>Agency/Company</u>
Shane	Madsen	SierraMining@live.com	(520) 807-0558	Hughes Sand & Gravel
Manny	Patel	mpatel@azland.gov	(602) 364-1596	Arizona State Land Dept.
Alex	Popovici	apopovic@UP.com	(602) 322-2510	UPRR
Robert	Tucker	rtucker@diamondven.com	(520) 577-0200	Diamond Ventures
February 18, 2016 - Local Agencies:				
Rick	Ellis	rick.ellis@pima.gov	(520) 724-6385	PCDOT
Carmine	DeBonis	Carmine.DeBonis@pima.gov	(520) 724-6506	PC DSD
Carla	Blackwell	carla.blackwell@pima.gov	(520) 724-9516	PC DSD
Loren	Makus	loren.makus@tucsonaz.gov	(520) 837-4933	COT/PDSD
Emily	Dawson	edawson@azdot.gov	(520) 388-4907	ADOT
Steve	Tineo	estevan.tineo@tucsonaz.gov	(520) 791-5100	COT Engineering
Fred	Felix	Fred.Felix@tucsonaz.gov	(520) 837-6620	COT Engineering
Greg	Hitt	greg.hitt@pima.gov	(520) 724-6567	PC Wastewater
Steve	Anderson	steve.anderson@pima.gov	(520) 724-5000	PC Parks - linear park
David	Barraza	david.barraza@tucsonaz.gov		COT Environmental Services
Jim	DeGrood	jdegrood@pagregion.org	(520) 792-1093	PAG/RTA
Mead	Mier	mmier@pagregion.org	(520) 792-1093	PAG/RTA
Larry	Robison	larry.robison@pima.gov	(520)724-4600	PCRFCED Engineering

Elected Officials -City of Tucson/Pima County: (Letters mailed January 4, 2016)				
Regina	Romero	Letter from Bill Zimmerman	(520) 791-4040	City of Tucson - Ward 1
Shirley	Scott	Letter from Bill Zimmerman	(520) 791-3199	City of Tucson - Ward 4
Richard	Fimbres	Letter from Bill Zimmerman	(520) 791-4231	City of Tucson - Ward 5
Ramon	Valadez	Letter from Bill Zimmerman	(520) 740-8126	Supervisor, District 2
Ray	Carroll	Letter from Bill Zimmerman	(520) 740-8126	Supervisor, District 4
Richard	Elias	Letter from Bill Zimmerman	(520) 740-8126	Supervisor, District 5
NOTE: One-on-one briefing of Council Member Shirley Scott and staff - February 4, 2016				
March 14, 2016 - Aides for Elected Officials -City of Tucson/Pima County:				
Laura	Dent	laura.dent@tucsonaz.gov	(520) 791-4040	City of Tucson - Ward 1
Steve	Arnquist	steve.arnquist@tucsonaz.gov	(520) 791-4040	City of Tucson - Ward 1
Lannie	Patel	lannie.patel@tucsonaz.gov	(520) 791-3199	City of Tucson - Ward 4
Mark	Kerr	mark.kerr@tucsonaz.gov	(520) 791-4231	City of Tucson - Ward 5
Benny	Gomez	benny.gomez@pima.gov	(520) 724-8126	Supervisor, District 2
Jennifer	Wong	jennifer.wong@pima.gov	(520) 724-8126	Supervisor, District 4
Keith	Bagwell	keith.bagwell@pima.gov	(520) 724-8126	Supervisor, District 5
Katie	Gannon	Katie Gannon <Katie.Gannon@tucsonaz.gov>	(520) 791-3109	Tucson Clean & Beautiful
Beki	Quintero	Beki Quintero <gapitgirl@msn.com>	(520) 791-3109	Tucson Clean & Beautiful
March 7, 2016 - TAA/ANG/Raytheon/Pima County (Sonoran Corridor):				
Bill	Haldeman	bhaldeman@flytucson.com	(520) 573-5127	TAA
Jerry	Brasher	jbrasher@flytucson.com	(520) 573-8124	TAA
Mike	Smejkal	msmejkal@flytucson.com	(520) 573-4856	TAA
John	Moffatt	john.moffatt@pima.gov	(520) 724-4444	Pima County
Michael	Knutson	michael.knutson@ang.af.mil	(520) 295-6580	ANG
Rick	Ellis	rick.ellis@pima.gov	(520) 724-6385	PCDOT
Carol	Kenny	carol.kenny@ang.af.mil	(520) 295-6258	ANG
Paul	Kramkowski	paul_s_kramkowski@raytheon.com		Raytheon
NOTE: Telephone conference call with Brigadier General Phil Purcell (Air National Guard) - March 17, 2016				

A.2 Stakeholder Meeting Agendas, Meeting Summaries and Sign-in Sheets

EMAIL EXCHANGE WITH SIERRA MINING & CRUSHING LLC/HUGHES SAND & GRAVEL

Nanette Pageau

From: Nanette Pageau
Sent: Friday, February 12, 2016 4:49 PM
To: 'Sierra Mining and Crushing LLC'
Subject: RE: Airport Wash Basin Management Study – Phase 2

Follow Up Flag: Follow up
Flag Status: Flagged

Debbie, please share this response with Mr. Madsen. It is information directly from the Airport Wash Study Team. Also, we are available to meet individually on the dates listed below if you wish.

The flood limits have not been raised, the new floodplain mapping is just more realistic than the old FEMA floodplain limits. The old (effective) FEMA floodplain limits in the vicinity of the Hughes Sand & Gravel parcel apparently did not take the mining pit into consideration. In our Airport Wash Study, we utilized detailed topographic data and aerial photos from 2008 Pima Association Governments (PAG) to update the floodplain mapping. The earthen diversion channel along the northeast corner of the mining pit does not have enough capacity to convey 100-year runoff. The runoff overtops portions of the channel banks and spills into the pit. Therefore, the floodplain in the mining pit was mapped up to the 100-year water surface elevations along the diversion channel. More detail is now available and the revised map reflects that information. The discharges we are using are significantly lower than the existing maps utilized. Unfortunately in this case, the topography is also significantly different because of the mining activity on the parcel.

Thank you.

Nanette

From: Sierra Mining and Crushing LLC [<mailto:sierramining@live.com>]
Sent: Friday, February 12, 2016 12:29 PM
To: Nanette Pageau
Subject: Re: Airport Wash Basin Management Study - Phase 2

He would like to know why there is so much more in the flood plain now? Have you raised the limits for flood plain?

Thanks!

Debbie Baldwin
SIERRA MINING AND CRUSHING LLC
PO Box 22110
Tucson, AZ 85734
(520)807-0558 Phone
(520)807-0571 Fax

From: Nanette Pageau <nanette@kaneenpr.com>
Sent: Thursday, February 11, 2016 1:45 PM
To: SierraMining@live.com
Subject: RE: Airport Wash Basin Management Study - Phase 2

Mr. Madsen,

I'm following up with you regarding this Study.

Attached are a series of updated 11 x 17 maps showing the Airport Wash study area, floodplains and existing constraints. The maps have recently been updated with additional information and floodplain mapping in the upper (southeastern) portions of the watershed. Also attached is a map showing infrastructure improvement alternatives and the priority matrix for those improvements.

We would like to schedule a meeting to review the study area mapping and answer questions you might have. We have some options available to you in hopes that one of these will work with your schedule:

Thursday, February 18th, anytime between 11 am - Noon in the Lower Level of the Public Works Building, 201 N. Stone Avenue, Room C.

or

Monday, February 22nd, anytime between 2-4 pm in the Lower Level of the Main Library, 101 N. Stone Avenue

Is there a 30 minute window on either of those dates that might work for you?

Thank you very much.

The Airport Wash Basin Management Study Team

From: Nanette Pageau
Sent: Friday, December 18, 2015 2:58 PM
To: 'SierraMining@live.com'
Subject: Airport Wash Basin Management Study - Phase 2

Hello,

I am working with the Pima County Regional Flood Control District and CMG Drainage Engineering on the Airport Wash Basin Management Study – Phase 2.

The project team has primarily been tasked with remapping the floodplains within the Airport Wash watershed. Identifying storm water hazards and developing potential solutions to those hazards are also part of the study scope. The team has completed the initial data collection phase and has mapped the floodplains and identified known flooding constraints. I have attached a series of 11 x 17 maps showing the study area, watershed boundaries, floodplains and existing constraints. Please refer to the map Legend for more detailed information.

We will be notifying you soon of stakeholder meetings to be held after the first of the year. At that time, if desired, we can meet with you to share what we have learned, review the attached maps, and answer any questions you might have about the study. If you have questions in the interim, please do not hesitate to let me know.

If you are interested in the Phase 1 Airport Wash South Basin Management Study (Valencia, El Vado, Santa Clara and Hughes watersheds) documents completed earlier this year, please visit the Flood Control District website at <http://webcms.pima.gov/cms/one.aspx?portalId=169&pageId=69212>.



PIMA COUNTY

Airport Wash South Basin Management Study - Pima County

webcms.pima.gov

Project Purpose. Pima County Regional Flood Control District has completed the Airport Wash South Basin Management Study to identify the drainage and flooding hazards ...

Thank you very much.

Nanette

Nanette Pageau

Airport Wash Basin Management Study Outreach

110 South Church Avenue, Suite 3350

Tucson, AZ 85701

520-885-9009

EMAIL EXCHANGE WITH MANNY PATEL AT ARIZONA STATE LAND DEPARTMENT IN PHOENIX

Nanette Pageau

From: Nanette Pageau
Sent: Thursday, February 11, 2016 2:09 PM
To: 'mpatel@azland.gov'
Subject: RE: Airport Wash Basin Management Study – Phase 2
Attachments: Exiting Constraints_Ph2_2016-02-02_lowres.pdf; Alternative Overview 2-4-16.pdf; Alternatives_Ph2 2-4-16.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hello Manny,

Below is the email we are sending, as a follow-up, to our Airport Wash-Phase 2 stakeholders. I realize you will not be attending the meeting, but wanted you to know about our outreach.

Let me know if you need more information or have any questions.

Thanks.

Nanette

We are following up on the email previously sent regarding this Study.

Attached are a series of updated 11 x 17 maps showing the Airport Wash study area, floodplains and existing constraints. The maps have recently been updated with additional information and floodplain mapping in the upper (southeastern) portions of the watershed. Also attached is a map showing infrastructure improvement alternatives and the priority matrix for those improvements.

As promised, we have scheduled a meeting to review the study area mapping and answer questions you might have. Please join us on **Thursday, February 18th, at 9:00 am in the Lower Level of the Public Works Building, 201 N. Stone Avenue**. We have reserved the large meeting area, Room C.

Hope to see you there.

Thank you very much.

The Airport Wash Basin Management Study Team

From: Nanette Pageau
Sent: Friday, December 18, 2015 2:48 PM
To: 'mpatel@azland.gov'
Subject: Airport Wash Basin Management Study - Phase 2

Manny,

Nice talking with you on the phone about this project. Just to keep you in the know, this is the email that I am sending to the other stakeholders that have been identified. Thought you might want to give the maps a quick review. Thanks again for getting back to me and let me know if you want/need more information.

Have a wonderful Holiday Season.

Nanette

Hello,

I am working with the Pima County Regional Flood Control District and CMG Drainage Engineering on the Airport Wash Basin Management Study – Phase 2.

The project team has primarily been tasked with remapping the floodplains within the Airport Wash watershed. Identifying storm water hazards and developing potential solutions to those hazards are also part of the study scope. The team has completed the initial data collection phase and has mapped the floodplains and identified known flooding constraints. I have attached a series of 11 x 17 maps showing the study area, watershed boundaries, floodplains and existing constraints. Please refer to the map Legend for more detailed information.

We will be notifying you soon of stakeholder meetings to be held after the first of the year. At that time, if desired, we can meet with you to share what we have learned, review the attached maps, and answer any questions you might have about the study. If you have questions in the interim, please do not hesitate to let me know.

If you are interested in the Phase 1 Airport Wash South Basin Management Study (Valencia, El Vado, Santa Clara and Hughes watersheds) documents completed earlier this year, please visit the Flood Control District website at <http://webcms.pima.gov/cms/one.aspx?portalId=169&pageId=69212>.

Thank you very much.

Nanette

Nanette Pageau

Kaneen Advertising & Public Relations, Inc.
110 South Church Avenue, Suite 3350
Tucson, AZ 85701
520-885-9009
Kaneenpr.com





Airport Wash Basin Management Study – Phase 2

Stakeholder Meeting: **Union Pacific Rail Road (UPRR)**
Telephone Conference on February 22, 2016

Attending: Janice Hughes, Pima County Project Manager
Alexander Popovici, Manager Industry & Public Projects/UPRR
Nanette Pageau, Kaneen PR, Public Outreach

Materials Provided:

- 5-map series of the Airport Wash study area, floodplains and existing constraints
- Map of infrastructure improvement alternatives and the priority matrix for those improvements

Janice provided a brief overview of the Study and directed Alex to the map detailing the UPRR right-of-way and UPRR structure near Nogales Highway (Figure 7-Hydraulic Work Map attached). Janice explained that the Study determined the need for channelization upstream from the UPRR structure in order to protect properties along the Airport Wash. The Study is only in the concept phase and no funding is currently available, but this project is identified as the highest priority once funding becomes available.

Janice indicated that in order to complete the channelization effort, it might be necessary to tie into the UPRR structure abutment downstream. Alex understood the overall project need and indicated what steps would need to take place in order to coordinate and obtain approval from UPRR.

Once Pima County Flood Control is ready to begin the channelization work, the Project Manager must go to the UPRR website (www.up.com) and apply for an encroachment permit. The permit is then processed through the Real Estate Section in Omaha. Real Estate reviews the plans. If the plans meet the requirements, they are approved and a permit is issued. Although Alex is not involved in this process, he does not see any “fatal flaws” in what Pima County is trying to accomplish.

Contact Information for Submitting Permit Request:

For Guidelines & Specifications visit:

www.uprr.com/aboutup/operations/specs/index.shtml

For Utility Exhibits and Guidelines visit:

www.uprr.com/reus/pipeline/index.shtml

For Right of Entry Application visit:

http://www.up.com/real_estate/tempuse/procedures/index.htm

http://www.up.com/real_estate/tempuse/index.htm

For temporary use - no permanent utility installations under this type of permit; used for shoring, parking equipment, soil testing, etc.

<http://www.uprr.com/reus/pipeline/install.shtml>

For pipe or wire encroachments

<http://www.uprr.com/reus/pipeline/app/index.cfm>

To use the online form of application - just for utility crossings.

Contact Information for Alexander Popovici:

Alexander Popovici

Manager Industry & Public Projects - UPRR

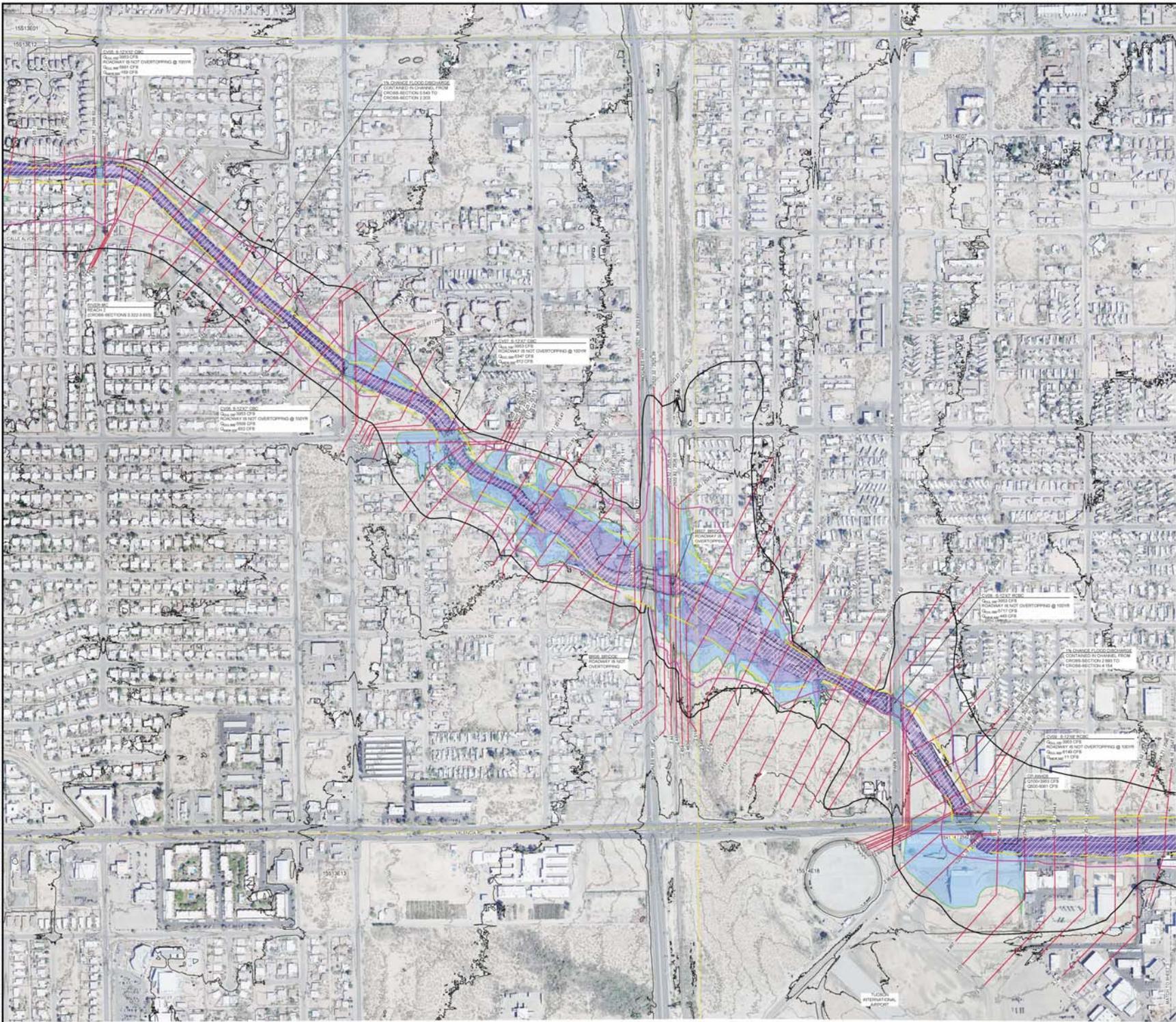
631 S. 7 St.

Phoenix AZ, 85034

Office 602 322 2510

APOPOVIC@UP.COM

www.up.com

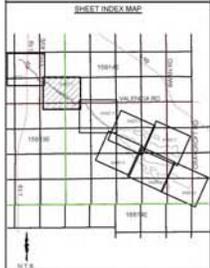


LEGEND

- FEMA EFFECTIVE FLOODPLAIN LIMITS
- FEMA EFFECTIVE FLOODWAY LIMITS
- SECTION LINE
- 100-YEAR
- 240-000541 TO
- STREAMLINE
- FLOW ARROW
- 1.0% ANNUAL CHANCE FLOOD HAZARD
- 0.5% ANNUAL CHANCE FLOOD HAZARD
- FLOODWAY

NOTES

1. HORIZONTAL PROJECTION IS ARIZONA CENTRAL STATE PLANE, NORTH AMERICAN DATUM OF 1983 ADJUSTED
2. WATER SURFACE ELEVATIONS ARE PROVIDED ON MAJOR VERTICAL DATUM
3. DIGITAL TERRAIN MAPS REFERENCE PAGES 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100
4. DATA SOURCE: AERIAL PHOTOGRAPHY, PIMA ASSOCIATION OF GOVERNMENTS (PAG) 2008 TOPOGRAPHY (PAG) 2008 LIDAR DATA, 2-FOOT INTERVAL, CONTOURS SHOWN ON THIS WORK MAP WERE GENERATED FROM PAGES 2008 LIDAR DATA

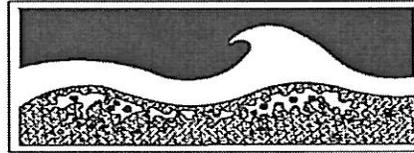




**Airport Wash Basin Management Study – Phase 2
Diamond Ventures Stakeholder Meeting
February 18, 2016**

AGENDA

1. Introductions/Background
2. Scope of Study
3. Results of Airport Wash, Phase 2 Study
 - Updated hydrology – entire watershed
 - Revised FEMA Floodplain Mapping
 - New local floodplain mapping in previously un-mapped areas
 - Existing Flooding Constraints Identified
4. Review Alternative Infrastructure Improvements and Matrix
5. Questions/Concerns for District and Project Team



CMG Drainage Engineering, Inc.

Airport Wash South Basin Management Study-Phase 2
 Study Briefing, Alternatives & Recommendations
 Thursday, February 18, 2016 - Diamond Ventures

	Name (Please Print)	Agency	Phone #	Email
1	ROBERT TUCKER	DVI	577-0200	RTUCKER@DIAMONDVEN.COM
2				
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18				

Completion of the sign-in sheet is completely voluntary, and helps the project team keep an accurate record of meeting attendees. Under State law, any identifying information provided above will become part of the public record, and as such, must be released to any individual upon request.



Airport Wash Basin Management Study – Phase 2

Stakeholder Meeting: **Diamond Ventures, Robert Tucker**
Meeting on February 18, 2016

Attending: Robert Tucker, Diamond Ventures
Janice Hughes, Pima County Project Manager
Bill Zimmerman, Pima County Flood Control, Deputy Director
Jerry Curless, CMG
Kevin Payne, Kimley-Horn
Nanette Pageau, Kaneen PR, Public Outreach

Materials Provided:

- 5-map series of the Airport Wash study area, floodplains and existing constraints
- Map of infrastructure improvement alternatives and the priority matrix for those improvements

Janice provided a brief overview of the Study and the alternatives listed for improvement. Janice indicated that this report has been forwarded to FEMA for preliminary review several weeks ago and it is anticipated that review would take 6 – 9 months.

Mr. Tucker discussed the various properties owned by Diamond Ventures within the study area and clarified what changes, if any, the study had on those properties. Bill indicated that standard drainage studies would be required with any development plan.

Contact Information for Robert Tucker/Diamond Ventures:

Robert Tucker
520-577-0200
RTucker@DiamondVen.com



**Airport Wash Basin Management Study – Phase 2
Local Agency Stakeholder Meeting
February 18, 2016**

AGENDA

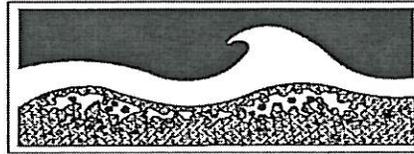
1. Introductions/Background

2. Scope of Study

3. Results of Airport Wash, Phase 2 Study
 - Updated hydrology – entire watershed
 - Revised FEMA Floodplain Mapping
 - New local floodplain mapping in previously un-mapped areas
 - Existing Flooding Constraints Identified

4. Review Alternative Infrastructure Improvements and Matrix

5. Questions/Concerns for District and Project Team



Airport Wash South Basin Management Study-Phase 2
 Study Briefing, Alternatives & Recommendations
 Thursday, February 18, 2016 - Local Agencies

	Name (Please Print)	Agency	Phone #	Email
1	Emily Dawson	ADOT	388-4209	Edawson@azdot.gov
2	Kathryn Skinner	PC DOT	724 6880	Kathryn.skinner@pima.gov
3	Arturo Burgos	COT-ES	837-3788	arturo.burgos@tucsonaz.gov
4	Jiankang Wang	CMG	882-4244	jwang@cmgdrainage.com
5	Carla Blackwell	DSD	724-9510	Carla.blackwell@pima.gov
6	GREG HITT	KWRD	724 6567	GHITT@PIMA.GOV
7	JERRY CURLESS	CMG	882-4244	
8	Larry Robison	PC RFCO	724-4660	larry.robison@pima.gov
9	Kevin Payne	Kimley-Horn	352-8624	Kevin.payne@kimley-horn.com
10	JOHN MOFFATT	Pima County	724-4944	JOHN.MOFFATT@PIMA.GOV
11	Steve Timm	TDOT	794 5100	Estevan.Timm@Tucson.gov
12	Nanette Pageau	Kanlen P.R.		
13	Jamie Hughes	PC F. Control		
14	Bill Zimmerman	" "		
15				
16				
17				
18				

Completion of the sign-in sheet is completely voluntary, and helps the project team keep an accurate record of meeting attendees. Under State law, any identifying information provided above will become part of the public record, and as such, must be released to any individual upon request.



Airport Wash Basin Management Study – Phase 2

Stakeholder Meeting: **Local Agencies**
Thursday, February 18, 2016

Attending: See attached sign-in sheet

Materials Provided:

- 5-map series of the Airport Wash study area, floodplains and existing constraints
- Map of infrastructure improvement alternatives and the priority matrix for those improvements
- Large roll-out map of entire study area on the table.

Janice provided a brief overview of the Study and Jerry Curless and Kevin Payne provided an explanation of the infrastructure improvement alternatives and priority matrix located on the large map. Janice indicated that the final report has been forwarded to FEMA for preliminary review.

It was pointed out that 144 properties were removed from the FEMA floodplain by this study and 4 properties were added to the FEMA floodplain.

Carla Blackwell/Pima County DSD indicated that this study area has maximum development potential with opportunities on both sides of the Sonoran Corridor. Carla asked if this mapping had changed anything. Bill Zimmerman indicated that the study has not created any additional restrictions.

John Moffatt shared with the group that ADOT would be initiating an Environmental Impact Study for the Sonoran Corridor area; that the Airport Authority is planning future development and that the Air National Guard is developing a new entrance to their facility.

Kevin Payne presented the Alternative Infrastructure Improvement overview and reviewed the top four projects in the matrix.

Kathryn Skinner/Pima County DOT shared that they are constructing a bike path along Alvernon near one of the projects in the matrix. Perhaps several projects could be accomplished at once – Flood Control, City of Tucson, Pima County all sharing the cost.

Discussions took place regarding detention basins, how they work and the potential for a regional basin somewhere upstream that could detain the water for up to 24 hours.

Emily Dawson/ADOT asked about the infrastructure improvement at the I-19 bridge abutment. She clarified with the team that the improvement would only tie in at the bridge abutment and that it would not be necessary to modify the I-19 bridge.

The question was asked whether or not Pima County Flood Control has jurisdiction over the airport. The team responded that TAA has its own Drainage Master Plan and that both the City and County participate in the approval of proposed developments on airport property.

Greg Hitt/PC Wastewater asked if the team had scour data on the site where the large wastewater line was exposed. This is listed as one of the infrastructure improvements on the matrix. The hydraulics data can be provided to Wastewater.

Steve Tineo/City of Tucson stayed after the meeting to review the map and discuss many of the City's issues with the team.



January 4, 2016

The Honorable Councilmember Regina Romero
Ward 1 Council Office
940 W. Alameda Street
Tucson, AZ 85745

Subject: Airport Wash Basin Management Study – Phase 2

Dear Councilmember Romero:

The purpose of this letter is to inform you that the Pima County Regional Flood Control District (District) has recently started the Airport Wash Basin Management Study – Phase 2. A portion of this watershed lies within Ward 1.

The project team has been tasked with remapping the Federal Emergency Management Agency's (FEMA) floodplains within the Airport Wash watershed. Identifying stormwater hazards and developing potential solutions to those hazards are also part of the study scope. The team has completed the initial data collection phase and has mapped the floodplains and identified known flooding constraints. I have enclosed a series of maps showing the study area, watershed boundaries, floodplains and existing constraints. In addition, the revised floodplains will be submitted to FEMA, which will remove many properties/structures from the floodplain and therefore will eliminate the requirement for flood insurance.

The Airport Wash South Basin Management Study – Phase 1 (Valencia, El Vado, Santa Clara and Hughes watersheds) was completed in 2015. Those documents can be reviewed by going to the District's website at: <http://webcms.pima.gov/cms/one.aspx?portalId=169&pageId=69212>.

In the near future, we will be inviting your staff to a briefing about what we have learned. We will review the enclosed maps, and answer any questions about the study.

In the interim, if you have questions, please do not hesitate to contact me at 724-4631 or you may contact me via email at: bill.zimmerman@pima.gov.

Sincerely,

A handwritten signature in blue ink that reads "Bill Zimmerman". The signature is written in a cursive style.

Bill Zimmerman
Deputy Director

BZ/tj

Enclosures

c: C. H. Huckelberry, County Administrator
John Bernal, Deputy County Administrator – Public Works
Suzanne Shields, P.E., Director and Chief Engineer – Regional Flood Control District

Suzanne Shields, P.E., Director

97 E. Congress, 3rd Floor, Tucson, Arizona 85701-1797 • Phone: 520-724-4600 • Fax: 520-724-4621



January 4, 2016

The Honorable Councilmember Shirley Scott
Ward 4 Council Office
8123 E. Poinciana
Tucson, AZ 85730

Subject: Airport Wash Basin Management Study – Phase 2

Dear Councilmember Scott:

The purpose of this letter is to inform you that the Pima County Regional Flood Control District (District) has recently started the Airport Wash Basin Management Study – Phase 2. A portion of this watershed lies within Ward 4.

The project team has been tasked with remapping the Federal Emergency Management Agency's (FEMA) floodplains within the Airport Wash watershed. Identifying stormwater hazards and developing potential solutions to those hazards are also part of the study scope. The team has completed the initial data collection phase and has mapped the floodplains and identified known flooding constraints. I have enclosed a series of maps showing the study area, watershed boundaries, floodplains and existing constraints. In addition, the revised floodplains will be submitted to FEMA, which will remove many properties/structures from the floodplain and therefore will eliminate the requirement for flood insurance.

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In the interim, if you have questions, please do not hesitate to contact me at 724-4631 or you may contact me via email at: bill.zimmerman@pima.gov.

Sincerely,

A handwritten signature in blue ink that reads "Bill Zimmerman". The signature is fluid and cursive, with a large loop at the end.

Bill Zimmerman
Deputy Director

BZ/tj

Enclosures

c: C. H. Huckelberry, County Administrator
John Bernal, Deputy County Administrator – Public Works
Suzanne Shields, P.E., Director and Chief Engineer – Regional Flood Control District

Suzanne Shields, P.E., Director

97 E. Congress, 3rd Floor, Tucson, Arizona 85701-1797 • Phone: 520-724-4600 • Fax: 520-724-4621



January 4, 2016

The Honorable Councilmember Richard Fimbres
Ward 5 Council Office
4300 S. Park Ave.
Tucson, AZ 85714

Subject: Airport Wash Basin Management Study – Phase 2

Dear Councilmember Fimbres:

The purpose of this letter is to inform you that the Pima County Regional Flood Control District (District) has recently started the Airport Wash Basin Management Study – Phase 2. A portion of this watershed lies within Ward 5.

The project team has been tasked with remapping the Federal Emergency Management Agency's (FEMA) floodplains within the Airport Wash watershed. Identifying stormwater hazards and developing potential solutions to those hazards are also part of the study scope. The team has completed the initial data collection phase and has mapped the floodplains and identified known flooding constraints. I have enclosed a series of maps showing the study area, watershed boundaries, floodplains and existing constraints. In addition, the revised floodplains will be submitted to FEMA, which will remove many properties/structures from the floodplain and therefore will eliminate the requirement for flood insurance.

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In the interim, if you have questions, please do not hesitate to contact me at 724-4631 or you may contact me via email at: bill.zimmerman@pima.gov.

Sincerely,

A handwritten signature in blue ink that reads "Bill Zimmerman". The signature is written in a cursive, flowing style.

Bill Zimmerman
Deputy Director

BZ/tj

Enclosures

c: C. H. Huckelberry, County Administrator
John Bernal, Deputy County Administrator – Public Works
Suzanne Shields, P.E., Director and Chief Engineer – Regional Flood Control District

Suzanne Shields, P.E., Director

97 E. Congress, 3rd Floor, Tucson, Arizona 85701-1797 • Phone: 520-724-4600 • Fax: 520-724-4621



January 4, 2016

The Honorable Ramón Valadez, District 2
Pima County Board of Supervisors
130 W. Congress Street, 11th Floor
Tucson, Arizona 85701

Subject: Airport Wash Basin Management Study – Phase 2

Dear Supervisor Valadez:

The purpose of this letter is to inform you that the Pima County Regional Flood Control District (District) has recently started the Airport Wash Basin Management Study – Phase 2. A portion of this watershed lies within District 2.

The project team has been tasked with remapping the Federal Emergency Management Agency's (FEMA) floodplains within the Airport Wash watershed. Identifying stormwater hazards and developing potential solutions to those hazards are also part of the study scope. The team has completed the initial data collection phase and has mapped the floodplains and identified known flooding constraints. I have enclosed a series of maps showing the study area, watershed boundaries, floodplains and existing constraints. In addition, the revised floodplains will be submitted to FEMA, which will remove many properties/structures from the floodplain and therefore will eliminate the requirement for flood insurance.

The Airport Wash South Basin Management Study – Phase 1 (Valencia, El Vado, Santa Clara and Hughes watersheds) was completed in 2015. Those documents can be reviewed by going to the District's website at: <http://webcms.pima.gov/cms/one.aspx?portalId=169&pageId=69212>.

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In the interim, if you have questions, please do not hesitate to contact me at 724-4631 or you may contact me via email at: bill.zimmerman@pima.gov.

Sincerely,

Bill Zimmerman
Deputy Director

BZ/tj

Enclosures

c: C. H. Huckelberry, County Administrator
John Bernal, Deputy County Administrator – Public Works
Suzanne Shields, P.E., Director and Chief Engineer – Regional Flood Control District

Suzanne Shields, P.E., Director

97 E. Congress, 3rd Floor, Tucson, Arizona 85701-1797 • Phone: 520-724-4600 • Fax: 520-724-4621



January 4, 2016

The Honorable Ray Carroll, District 4
Pima County Board of Supervisors
130 W. Congress Street, 11th Floor
Tucson, Arizona 85701

Subject: Airport Wash Basin Management Study – Phase 2

Dear Supervisor Carroll:

The purpose of this letter is to inform you that the Pima County Regional Flood Control District (District) has recently started the Airport Wash Basin Management Study – Phase 2. A portion of this watershed lies within District 4.

The project team has been tasked with remapping the Federal Emergency Management Agency's (FEMA) floodplains within the Airport Wash watershed. Identifying stormwater hazards and developing potential solutions to those hazards are also part of the study scope. The team has completed the initial data collection phase and has mapped the floodplains and identified known flooding constraints. I have enclosed a series of maps showing the study area, watershed boundaries, floodplains and existing constraints. In addition, the revised floodplains will be submitted to FEMA, which will remove many properties/structures from the floodplain and therefore will eliminate the requirement for flood insurance.

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In the interim, if you have questions, please do not hesitate to contact me at 724-4631 or you may contact me via email at: bill.zimmerman@pima.gov.

Sincerely,

A handwritten signature in blue ink that reads "Bill Zimmerman". The signature is fluid and cursive.

Bill Zimmerman
Deputy Director

BZ/tj

Enclosures

c: C. H. Huckelberry, County Administrator
John Bernal, Deputy County Administrator – Public Works
Suzanne Shields, P.E., Director and Chief Engineer – Regional Flood Control District

Suzanne Shields, P.E., Director

97 E. Congress, 3rd Floor, Tucson, Arizona 85701-1797 • Phone: 520-724-4600 • Fax: 520-724-4621



January 4, 2016

The Honorable Richard Elías, District 5
Pima County Board of Supervisors
130 W. Congress Street, 11th Floor
Tucson, Arizona 85701

Subject: Airport Wash Basin Management Study – Phase 2

Dear Supervisor Elías:

The purpose of this letter is to inform you that the Pima County Regional Flood Control District (District) has recently started the Airport Wash Basin Management Study – Phase 2. A portion of this watershed lies within District 5.

The project team has been tasked with remapping the Federal Emergency Management Agency's (FEMA) floodplains within the Airport Wash watershed. Identifying stormwater hazards and developing potential solutions to those hazards are also part of the study scope. The team has completed the initial data collection phase and has mapped the floodplains and identified known flooding constraints. I have enclosed a series of maps showing the study area, watershed boundaries, floodplains and existing constraints. In addition, the revised floodplains will be submitted to FEMA, which will remove many properties/structures from the floodplain and therefore will eliminate the requirement for flood insurance.

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In the near future, we will be inviting your staff to a briefing about what we have learned. We will review the enclosed maps, and answer any questions about the study.

In the interim, if you have questions, please do not hesitate to contact me at 724-4631 or you may contact me via email at: bill.zimmerman@pima.gov.

Sincerely,

A handwritten signature in blue ink that reads "Bill Zimmerman". The signature is fluid and cursive, with the first name "Bill" being particularly prominent.

Bill Zimmerman
Deputy Director

BZ/tj

Enclosures

c: C. H. Huckelberry, County Administrator
John Bernal, Deputy County Administrator – Public Works
Suzanne Shields, P.E., Director and Chief Engineer – Regional Flood Control District

Suzanne Shields, P.E., Director

97 E. Congress, 3rd Floor, Tucson, Arizona 85701-1797 • Phone: 520-724-4600 • Fax: 520-724-4621



**Airport Wash Basin Management Study – Phase 2
Elected Official Aides - Stakeholder Meeting
March 14, 2016**

AGENDA

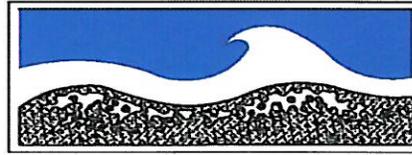
1. Introductions/Background

2. Scope of Study

3. Results of Airport Wash, Phase 2 Study
 - Updated hydrology – entire watershed
 - Revised FEMA Floodplain Mapping
 - New local floodplain mapping in previously un-mapped areas
 - Existing Flooding Constraints Identified

4. Review Alternative Infrastructure Improvements and Matrix

5. Questions/Concerns for District and Project Team



CMG Drainage Engineering, Inc.

Airport Wash South Basin Management Study-Phase 2
Study Briefing, Alternatives & Recommendations
Monday, March 14, 2016 - Elected Official Aides

	Name (Please Print)	Agency	Phone #	Email
1	Bill Zimmerman	RFCD	724-4600	bill.zimmerman@pima.gov
2	JERRY CURLESS	CMG DRAINAGE ENG.	882-4244	
3	Kevin Payne	Kimley-Horn	352-8624	
4	Janice Hughes	RFCD	724 4635	janice.hughes@pima.gov
5	Steve Arngvist	COT-ward I	837 4263	steve.arngvist@turson2.gov steve.arngvist@turson2.gov
6	Nanette Paganu	Kathleen P.R.	885-9009	
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Completion of the sign-in sheet is completely voluntary, and helps the project team keep an accurate record of meeting attendees. Under State law, any identifying information provided above will become part of the public record, and as such, must be released to any individual upon request.



Airport Wash Basin Management Study – Phase 2

Stakeholder Meeting: **Elected Official Aides**
Monday, March 14, 2016

Attending: Steve Arnquist, City of Tucson, Ward 1
See sign-in sheet for Team attendees

Materials Provided:

- 5-map series of the Airport Wash study area, floodplains and existing constraints
- Map of infrastructure improvement alternatives and the priority matrix for those improvements

Janice provided a brief overview of the Study and infrastructure improvement alternatives. . Janice indicated that this report has been forwarded to FEMA for preliminary review.

Janice pointed out to the Ward 1 Council Aide that 144 properties were removed from the FEMA floodplain by this study. Four (4) properties, however, would be newly identified as in the FEMA floodplain. These 4 properties are in Ward 1.

Bill Zimmerman indicated that because much of this study is in the City of Tucson, the City of Tucson Engineering Division would receive updates on the City-affected properties.

Steve Arnquist asked who would attend the meeting if the neighbors wanted to know more about the FEMA impacts,. Bill indicated that City Engineering staff would attend because only the City could make any commitments within the City.



**Airport Wash Basin Management Study – Phase 2
Stakeholder Meeting
March 7, 2016**

AGENDA

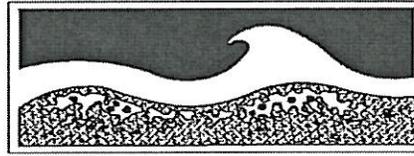
1. Introductions/Background

2. Scope of Study

3. Results of Airport Wash, Phase 2 Study
 - Updated hydrology – entire watershed
 - Revised FEMA Floodplain Mapping
 - New local floodplain mapping in previously un-mapped areas
 - Existing Flooding Constraints Identified

4. Review Alternative Infrastructure Improvements and Matrix

5. Questions/Concerns for District and Project Team



CMG Drainage Engineering, Inc.

Airport Wash South Basin Management Study-Phase 2
 Study Briefing, Alternatives & Recommendations
 Monday, March 7, 2016 - TAA/ANG/Raytheon/Pma County

	Name (Please Print)	Agency	Phone #	Email
1	Kevin Payne	Kimley-Horn	352-8624	Kevin.Payne@kimley-horn.com
2	Jiankang Wang	CMG Drainage	882-4244	jwang@cmgdrainage.com
3	Mike Smejkal	TAA	573-4856	msmejkal@flytucson.com
4	KELLI CASH	Raytheon	794-3641	kelli.cash@raytheon.com
5	CHRIS BOSTWICH	TAA	573-5149	cbostwisch@FLYtucson.com
6	JOHN MOFFATT	PIMA COUNTY	724-4444	JOHN.MOFFATT@PIMA.GOV
7	JERRY BRASHER	TAA	573-8124	jbrasher@flytucson.com
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Completion of the sign-in sheet is completely voluntary, and helps the project team keep an accurate record of meeting attendees. Under State law, any identifying information provided above will become part of the public record, and as such, must be released to any individual upon request.



Airport Wash Basin Management Study - Phase 2

Stakeholder Meeting: **Tucson Airport Authority, Raytheon, Pima County
Administrator's Office/Sonoran Corridor**
Monday, March 7, 2016

Attending: See attached sign-in sheet

Materials Provided:

- 5-map series of the Airport Wash study area, floodplains and existing constraints
- Map of infrastructure improvement alternatives and the priority matrix for those improvements
- Large roll-out map of entire study area on the table.

Janice provided a brief overview of the Study and Jerry Curless and Kevin Payne provided an explanation of the infrastructure improvement alternatives and priority matrix located on the large map. Janice indicated that the final report has been forwarded to FEMA for preliminary review.

Mike Smejkal/TAA asked if the repair work performed by TAA's maintenance people at Country Club Road & Airport Wash would last. Janice indicated probably 10 years unless there was a major event. One of the priority projects on the matrix was this work at Country Club.

John Moffatt/Pima County asked if as the County looks at long term road improvements for the Sonoran Corridor, is there something that can be done to retain/detain the flows? Jerry Curless indicated that the road design would solve those problems.

Mike Smejkal indicated that in the area between the taxiway and runway, TAA would like to do some bank protection to clean up their maintenance issues.

John Moffatt expressed concerns about some type of improvement for the flooding issues related to the Pima Community College site along Nogales Highway.



Airport Wash Basin Management Study – Phase 2

Stakeholder Meeting: **Air National Guard, Tucson**
Telephone Conference on March 17, 2016

Attending: Janice Hughes, Pima County Project Manager
Brigadier General Phil Purcell, ANG
Nanette Pageau, Kaneen PR, Public Outreach

Materials Provided:

- 5-map series of the Airport Wash study area, floodplains and existing constraints with a focus on Work Maps 2 & 3
- Map of infrastructure improvement alternatives and the priority matrix for those improvements

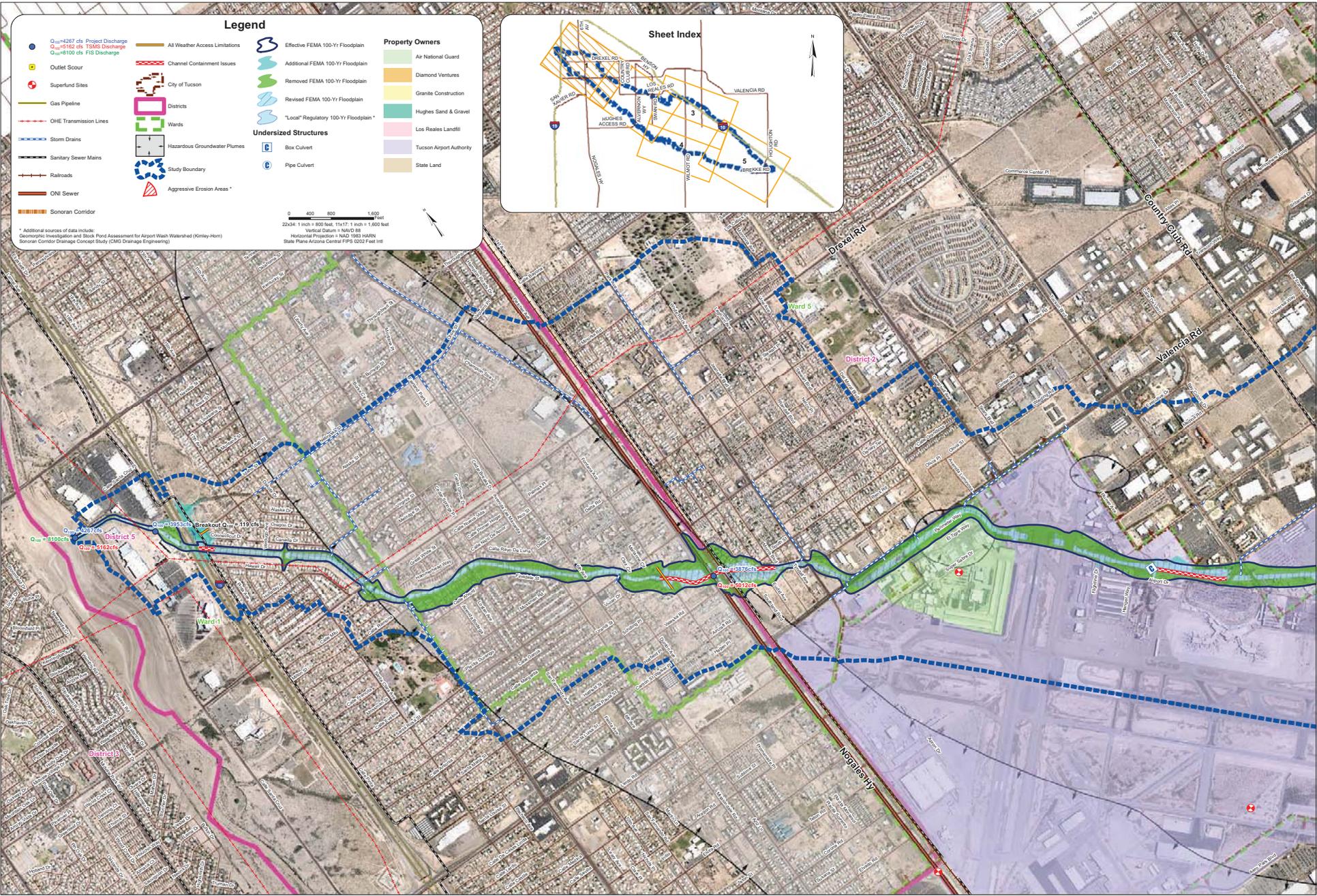
Janice provided a brief overview of the Study and directed General Purcell to the map detailing the Air National Guard (ANG) property/facility. Janice pointed out that the ANG property is not in the FEMA floodplain. General Purcell indicated that they are interested in improving the Park Avenue/Valencia Road entrance and this new information would be very helpful moving forward on that improvement.

No other issues or topics were discussed in any detail. Janice stated that the ANG would receive a postcard from Pima County notifying them that the property was no longer in the FEMA floodplain. General Purcell indicated he would provide a mailing address for that notification.

Contact Information for Brig. General Purcell and Mailing Address:

Brig Gen Phil Purcell
162 WG/CC
1650 E. Perimeter Way
Tucson, AZ 85706-6072
520-295-6100 (DSN 844)
Cell: 804-878-1316
howard.p.purcell.mil@mail.mil

A.3 Maps/Matrix



Legend

- $Q_{100}=4287$ cfs Project Discharge
- $Q_{100}=5162$ cfs 103MS Discharge
- $Q_{100}=8100$ cfs FIS Discharge
- Outlet Scour
- + Superfund Sites
- Gas Pipeline
- OHE Transmission Lines
- Storm Drains
- Sanitary Sewer Mains
- Railroads
- ONI Sewer
- Sonoran Corridor
- All Weather Access Limitations
- Channel Containment Issues
- City of Tucson
- Districts
- Wards
- Hazardous Groundwater Plumes
- Study Boundary
- Aggressive Erosion Areas *
- Effective FEMA 100-Yr Floodplain
- Additional FEMA 100-Yr Floodplain
- Removed FEMA 100-Yr Floodplain
- Revised FEMA 100-Yr Floodplain
- "Local" Regulatory 100-Yr Floodplain *
- Box Culvert
- Pipe Culvert

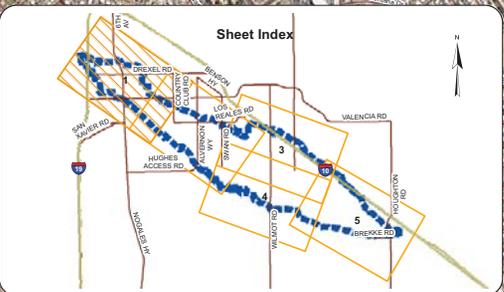
Property Owners

- Air National Guard
- Diamond Ventures
- Granite Construction
- Hughes Sand & Gravel
- Los Reales Landfill
- Tucson Airport Authority
- State Land

Undersized Structures

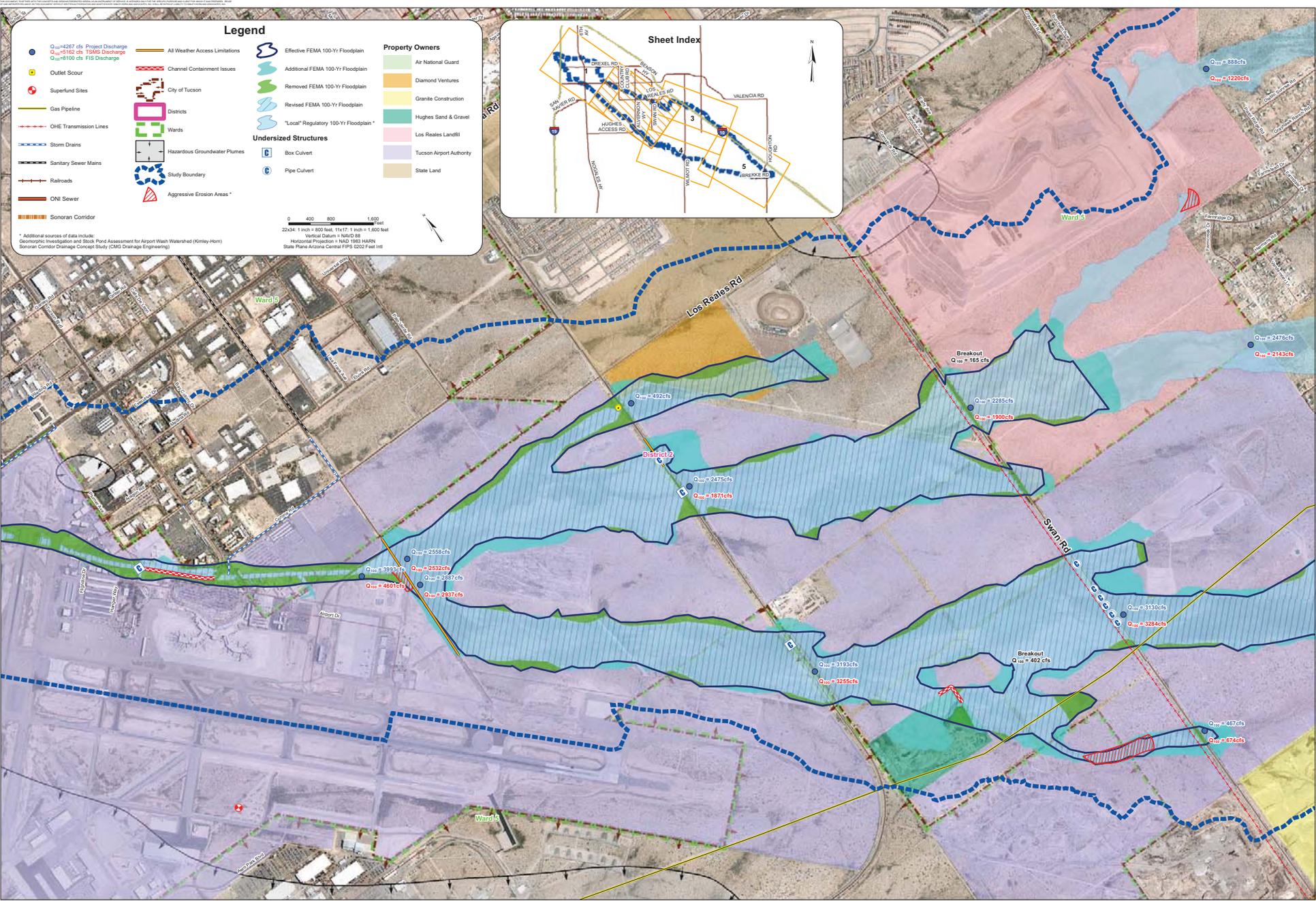
- Box Culvert
- Pipe Culvert

Sheet Index



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 22x34: 1 inch = 800 feet, 11x17: 1 inch = 1,600 feet
 Vertical Datum = NAVD 88
 Horizontal Projection = NAD 1983 HARN
 State Plane Arizona Central FIPS 5002 Feet US

* Additional sources of data include:
 Geomorphic Investigation and Block Point Assessment for Airport Wash Watershed (Kimley-Horn)
 Sonoran Corridor Drainage Concept Study (CMG Drainage Engineering)



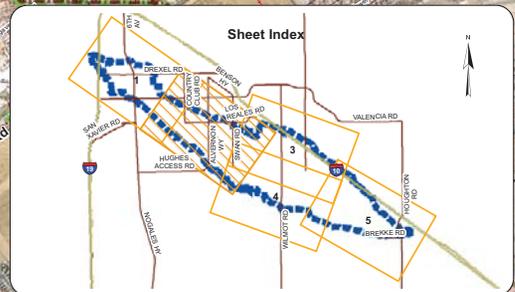
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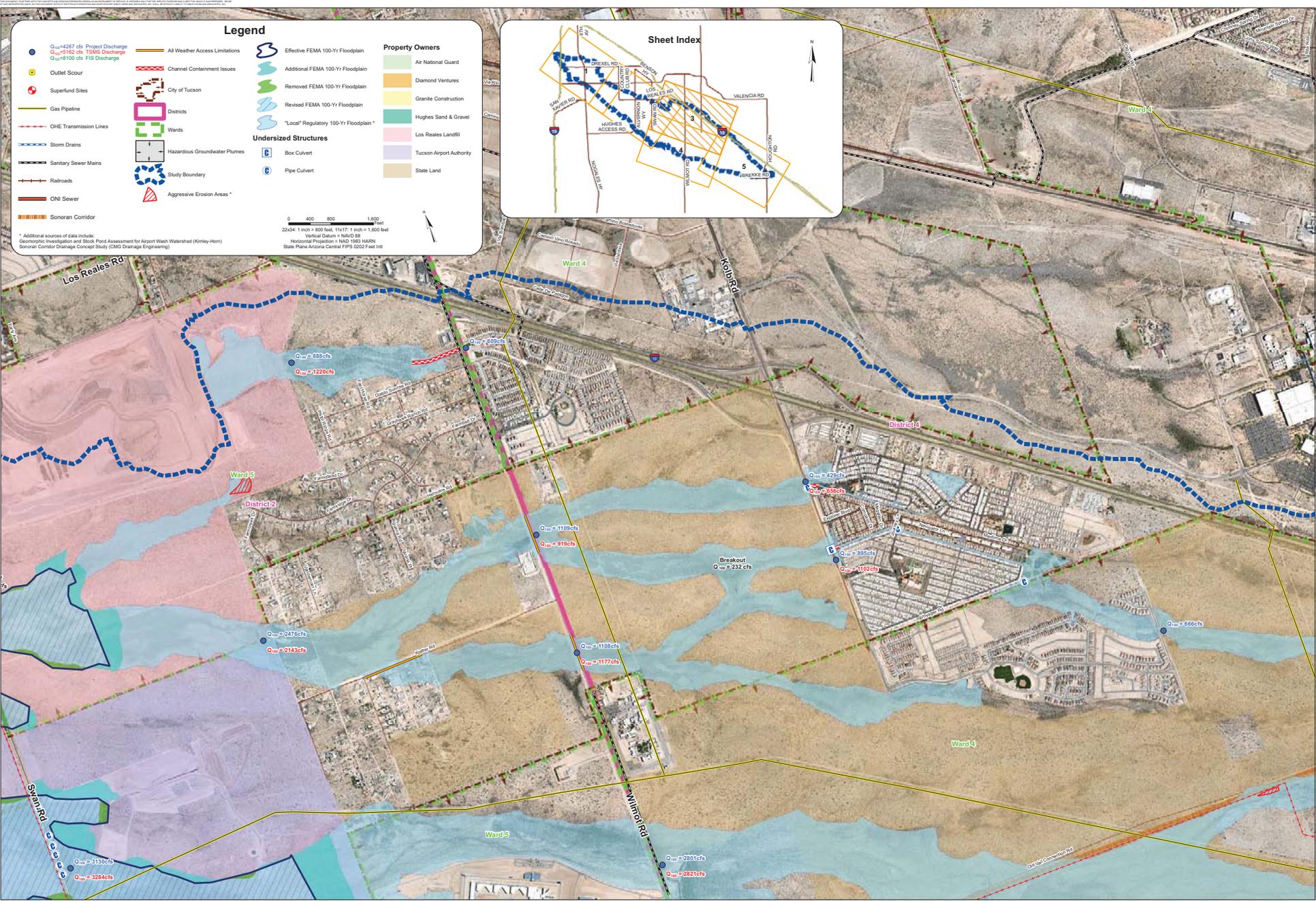
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- $Q_{100}=8100$ cfs FIS Discharge
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- Property Owners**
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 - Granite Construction
 - Hughes Sand & Gravel
 - Los Reales Landfill
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 - State Land

22434: 1 inch = 800 feet, 11x17: 1 inch = 1,600 feet
 Vertical Datum = NAVD 88
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 State Plane Arizona Central FIPS 5002 Feet Unit

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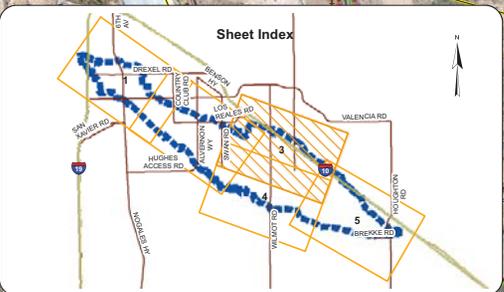




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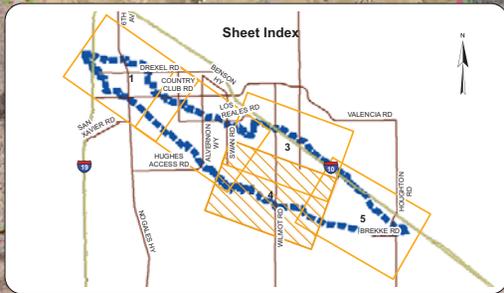
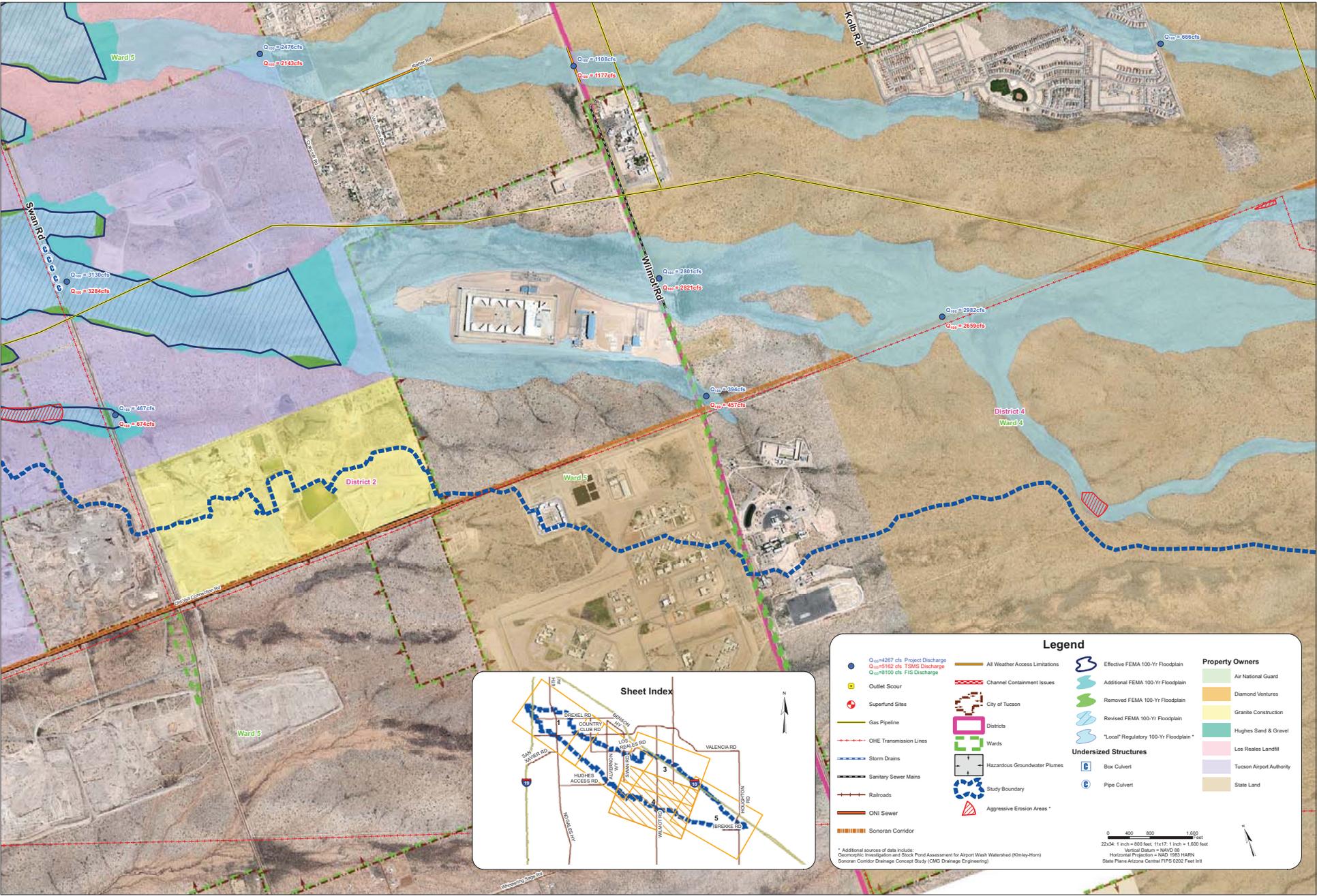
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- Q_{max} =3162 cfs TSM45 Discharge
- Q_{max} =8100 cfs FIS Discharge
- Outlet Scour
- + Superfund Sites
- Gas Pipeline
- OHE Transmission Lines
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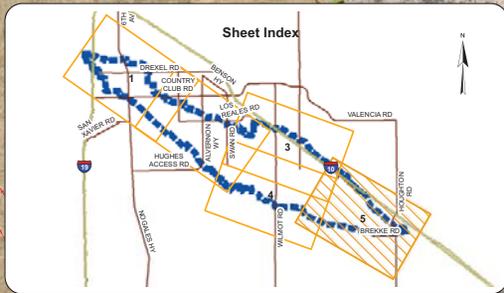
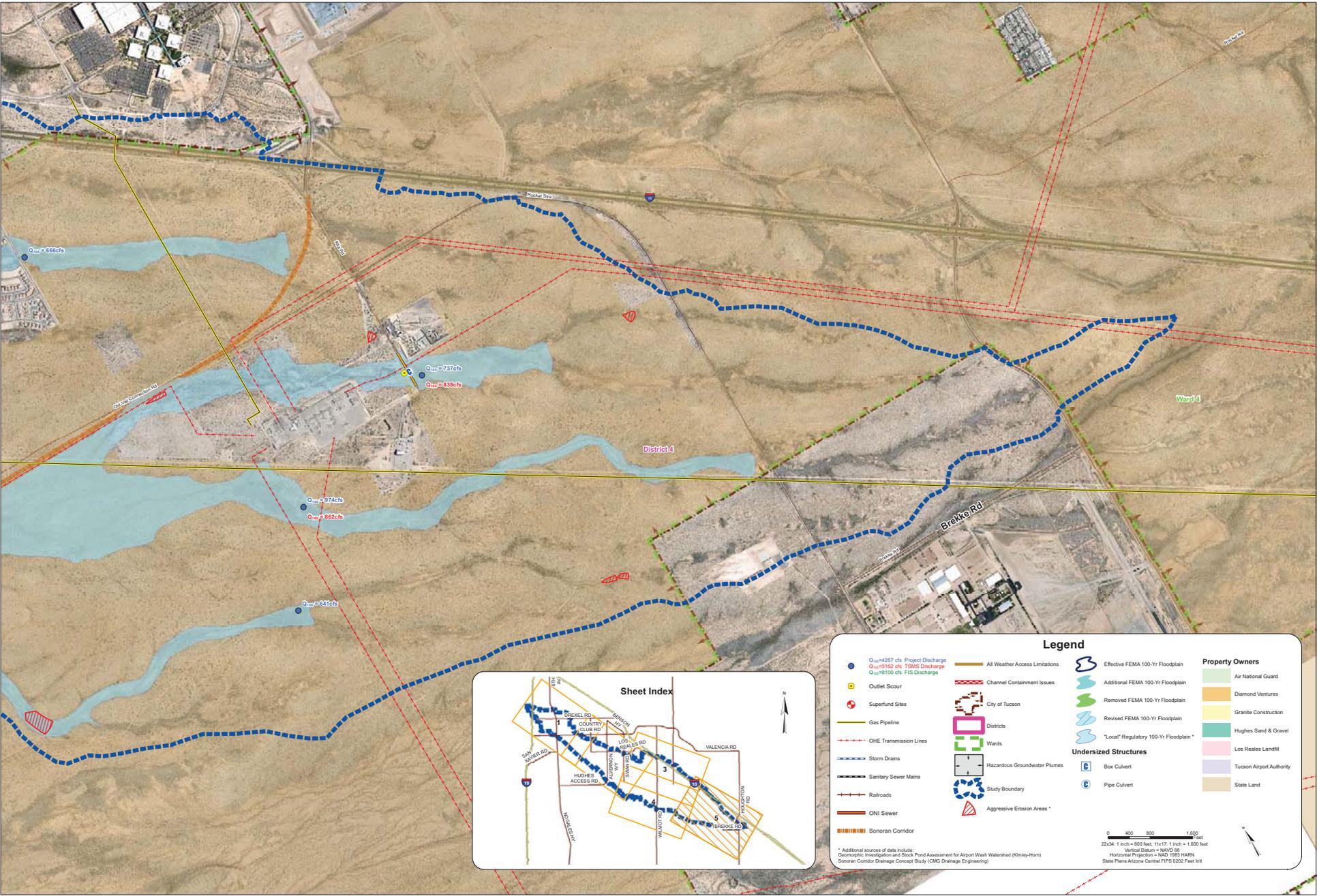


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 Geomorphic Investigation and Stock Pond Assessment for Airport Wash Watershed (Kimley-Horn)
 Sonoran Corridor Drainage Concept Study (CMG Drainage Engineering)

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● Q ₁₀₀ =4267 cfs Project Discharge	— All Weather Access Limitations	⬇ Effective FEMA 100-Yr Floodplain	Property Owners
● Q ₁₀₀ =4162 cfs 1984 Discharge	⚠ Channel Containment Issues	⬆ Additional FEMA 100-Yr Floodplain	🇺🇸 Air National Guard
● Q ₁₀₀ =8100 cfs FIS Discharge	🚧 Superfund Sites	⬇ Removed FEMA 100-Yr Floodplain	💎 Diamond Ventures
— Gas Pipeline	🏠 City of Tucson	⬆ Revised FEMA 100-Yr Floodplain	🏡 Granite Construction
— OHE Transmission Lines	🏘 Districts	⬆ "Local" Regulatory 100-Yr Floodplain *	🏗 Hughes Sand & Gravel
— Storm Drains	🏙 Wards	⬆ Hazardous Groundwater Plumes	🏢 Los Reales Landfill
— Sanitary Sewer Mains	🏠 Study Boundary	⬆ Aggressive Erosion Areas *	🏢 Tucson Airport Authority
— Railroads	🏠 Box Culvert		🏠 State Land
— ONI Sewer	🏠 Pipe Culvert		
— Sonoran Corridor			

* Additional sources of data include:
Geomorphic Investigation and Stock Pond Assessment for Airport Wash Watershed (Kimley-Horn)
Sonoran Corridor Drainage Concept Study (CMG Drainage Engineering)

22x34: 1 inch = 800 feet, 11x17: 1 inch = 1,600 feet
Vertical Datum = NAVD 83
Horizontal Projection = NAD 1983 HARN
State Plane Arizona Central FIPS 5002 Feet Int

Project Ranking	Project Description	Project Score	Project Number
1	Containment Structure upstream of I-19 Bridge	8.50	1
2	Install downstream erosion protection at Country Club Rd	8.00	7
3	Install outlet protection at RCBC under Alvernon, near Los Reales	7.80	10
4	Upgrade channel upstream of UPRR Bridge	7.75	4
5	Upgrade Fontana Ave Crossing	7.50	2
6	Lower Sanitary Sewer Main near UPRR Bridge	7.40	5
7	Install scour protection for HPNG Line near Old Vail Connection Rd	7.25	18
8	Install scour protection on Country Club Rd, North of Corona	7.15	9
9	Construct RCBC and collector channel at Country Club Rd dip crossing	7.00	8
10	Upgrade Alvernon Way pipe culvert	6.80	11
10	Upgrade Alvernon Way RCBC	6.80	12
12	Exposed Utility at Airport Wash and Morris Blvd	6.75	22
13	Upgrade Nogales Hwy Bridge	6.50	3
13	Reconstruct utility road near Rita Rd and install erosion protection	6.50	20
15	Klafter Rd drainage improvements	6.00	13
16	Construct RCBC at northern Wilmot Rd dip crossing	5.15	14
16	Construct RCBC at southern Wilmot Rd dip crossing	5.15	15
18	Upgrade Plumer Ave RCBC	5.00	6
18	Upgrade Kolb Rd pipe culvert	5.00	16
18	Upgrade Kolb Rd RCBC	5.00	17
21	Improve erosion protection on utility roads south of Old Vail Connection Rd	4.75	19
22	Upgrade Rita Rd pipe culvert and install erosion protection	4.50	21

Key		
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Project within FEMA Mapped reach	assign	Yes = 1, No = 0
Project prevents # of Habitable Structures from Flooding	if FEMA Mapped then assign if non-FEMA mapped then assign	# of Structures>5 = 3, # of Structures>2 = 2, # of Structures>1 = 1 # of Structures>10 = 3, # of Structures>4 = 2, # of Structures>2 = 1
Project addresses Erosion Issues	assign	Low = 0.5, Moderate = 1, High = 2
Project improves Airport Drainage	assign	Yes = 1, No = 0
Major Utility Conflicts anticipated	assign	Yes = 0, No = 1
R/W available (%)	normalized	100% = 1
Project Construction Disrupts Operation / Commerce	assign	Major = 0, Minor = 0.5, None = 1
Project provides All-Weather Access where currently none	if Yes then assign	Utility Road = 0, Local = 0.5, Collector = 1, Arterial = 2
Project Identified or Designed in Other Study	assign	N/A = 0, Identified = 0.5, Designed = 1
Project can be Stand Alone or Dependant on other Project	assign	Dependant = 0, Stand Alone = 1
Traffic Counts	used only for Arterials	Normalize with Highest = 0.5
Cost	assign	Low = 2, Medium = 1, High = 0

Maintenance at Project 7/8 recently completed, thus project not included in Top 4

Project Number	Project Description	W Road Classification Impacted	Y/N FEMA mapped	W Habitable Structures Prevented from Flooding	W Addresses Erosion Issue	Y/N Improves Airport Drainage	Y/N Major utility conflicts	W, % R/W available	Y/N Construction Disruptions to Operations/ Commerce	W Provides All Weather Access	W Identified/D esigned in other Study	Y/N Stand Alone or Dependent	W Arterial Traffic Counts	W Cost
1	Containment Structure upstream of I-19 Bridge	Local	Y	4	N	N	N	100	None	Y	N/A	Stand Alone		Medium
2	Upgrade Fontana Ave Crossing	Local	Y	2	High	N	N	100	Minor	N	N/A	Stand Alone		High
3	Upgrade Nogales Hwy Bridge	Arterial	Y	3	Moderate	N	Y	100	Major	N	N/A	Stand Alone	14065	High
4	Upgrade channel upstream of UPRR Bridge	Local	Y	3	N	N	N	75	None	Y	Identified	Stand Alone		High
5	Lower Sanitary Sewer Main near UPRR Bridge	Local	Y	0	High	N	N	90	None	N	Identified	Stand Alone		High
6	Upgrade Plumer Ave RCBC	Local	Y	0	N	Y	N	0	Major	N	N/A	Stand Alone		Medium
7	Install downstream erosion protection at Country Club Rd	Local	Y	0	High	Y	N	0	None	N	N/A	Stand Alone		Medium
8	Construct RCBC and collector channel at Country Club Rd dip crossing	Local	Y	0	High	Y	N	0	Minor	Y	N/A	Stand Alone		High
9	Install scour protection on Country Club Rd, North of Corona	Arterial	N	0	High	N	N	50	Minor	N	N/A	Stand Alone	4334	Low
10	Install outlet protection at RCBC under Alvernon, near Los Reales	Arterial	Y	0	Moderate	N	N	100	Minor	N	N/A	Stand Alone	8444	Low
11	Upgrade Alvernon Way pipe culvert	Arterial	Y	0	Low	N	N	100	Major	Y	N/A	Dependent	8444	Medium
12	Upgrade Alvernon Way RCBC	Arterial	Y	0	Low	N	N	100	Major	Y	N/A	Stand Alone	8444	High
13	Klafter Rd drainage improvements	Local	N	18	N	N	N	0	Minor	Y	N/A	Stand Alone		High
14	Construct RCBC at northern Wilmot Rd dip crossing	Arterial	N	0	N	N	N	100	Major	Y	N/A	Stand Alone	4147	High
15	Construct RCBC at southern Wilmot Rd dip crossing	Arterial	N	0	N	N	N	100	Major	Y	N/A	Stand Alone	4147	High
16	Upgrade Kolb Rd pipe culvert	Arterial	N	3	N	N	N	100	Major	N	N/A	Stand Alone		Medium
17	Upgrade Kolb Rd RCBC	Arterial	N	4	N	N	N	100	Major	N	N/A	Stand Alone		Medium
18	Install scour protection for HPNG Line near Old Vail Connection Rd	Utility	N	0	High	N	N	25	None	N	N/A	Stand Alone		Low
19	Improve erosion protection on utility roads south of Old Vail Connection Rd	Utility	N	0	Low	N	N	25	None	N	N/A	Stand Alone		Medium
20	Reconstruct utility road near Rita Rd and install erosion protection	Utility	N	0	Low	N	N	100	None	N	N/A	Stand Alone		Low
21	Upgrade Rita Rd pipe culvert and install erosion protection	Local	N	0	Low	N	N	0	Minor	Y	N/A	Stand Alone		Medium
22	Exposed Utility at Airport Wash and Morris Blvd	Local	Y	0	Moderate	N	N	75	None	N	N/A	Stand Alone		Medium

Project Number	Project Description	FEMA mapped	Habitable Structures Prevented from Flooding	Addresses Erosion Issue	Improves Airport Drainage	Major utility conflicts	R/W available	Construction Disruptions to Operations/ Commerce	Provides All Weather Access	Identified/ Designed in other Study	Stand Alone or Dependent	Arterial Traffic Counts	Cost	Project Score	Project Ranking
1	Containment Structure upstream of I-19 Bridge	1	2	0	0	1	1	1	0.5	0	1	0.00	1	8.50	1
2	Upgrade Fontana Ave Crossing	1	1	2	0	1	1	0.5	0	0	1	0.00	0	7.50	5
3	Upgrade Nogales Hwy Bridge	1	2	1	0	0	1	0	0	0	1	0.50	0	6.50	13
4	Upgrade channel upstream of UPRR Bridge	1	2	0	0	1	0.75	1	0.5	0.5	1	0.00	0	7.75	4
5	Lower Sanitary Sewer Main near UPRR Bridge	1	0	2	0	1	0.9	1	0	0.5	1	0.00	0	7.40	6
6	Upgrade Plumer Ave RCBC	1	0	0	1	1	0	0	0	0	1	0.00	1	5.00	18
7	Install downstream erosion protection at Country Club Rd	1	0	2	1	1	0	1	0	0	1	0.00	1	8.00	2
8	Construct RCBC and collector channel at Country Club Rd dip crossing	1	0	2	1	1	0	0.5	0.5	0	1	0.00	0	7.00	9
9	Install scour protection on Country Club Rd, North of Corona	0	0	2	0	1	0.5	0.5	0	0	1	0.15	2	7.15	8
10	Install outlet protection at RCBC under Alvernon, near Los Reales	1	0	1	0	1	1	0.5	0	0	1	0.30	2	7.80	3
11	Upgrade Alvernon Way pipe culvert	1	0	0.5	0	1	1	0	2	0	0	0.30	1	6.80	10
12	Upgrade Alvernon Way RCBC	1	0	0.5	0	1	1	0	2	0	1	0.30	0	6.80	10
13	Klafter Rd drainage improvements	0	3	0	0	1	0	0.5	0.5	0	1	0.00	0	6.00	15
14	Construct RCBC at northern Wilmot Rd dip crossing	0	0	0	0	1	1	0	2	0	1	0.15	0	5.15	16
15	Construct RCBC at southern Wilmot Rd dip crossing	0	0	0	0	1	1	0	2	0	1	0.15	0	5.15	16
16	Upgrade Kolb Rd pipe culvert	0	1	0	0	1	1	0	0	0	1	0.00	1	5.00	18
17	Upgrade Kolb Rd RCBC	0	1	0	0	1	1	0	0	0	1	0.00	1	5.00	18
18	Install scour protection for HPNG Line near Old Vail Connection Rd	0	0	2	0	1	0.25	1	0	0	1	0.00	2	7.25	7
19	Improve erosion protection on utility roads south of Old Vail Connection Rd	0	0	0.5	0	1	0.25	1	0	0	1	0.00	1	4.75	21
20	Reconstruct utility road near Rita Rd and install erosion protection	0	0	0.5	0	1	1	1	0	0	1	0.00	2	6.50	13
21	Upgrade Rita Rd pipe culvert and install erosion protection	0	0	0.5	0	1	0	0.5	0.5	0	1	0.00	1	4.50	22
22	Exposed Utility at Airport Wash and Morris Blvd	1	0	1	0	1	0.75	1	0	0	1	0.00	1	6.75	12

Appendix B – Alternatives Analysis

B.1 Alternatives Analysis Report

Appendix C – Project Figures

- C.1 Figure 2 – FEMA Study Limits Floodplain Map
- C.2 Figure 3 – Non-FEMA Limits Floodplain Map

C.1 Figure 2 – FEMA Study Limits Floodplain Map



Legend

- Study Streams
- 100yr Floodplain
- 500yr Floodplain
- Floodway

0 750 1,500 3,000 4,500 Feet

N

CMG DRAINAGE ENGINEERING, INC.

SCALE(H): SHOWN
SCALE(V): NONE
DESIGNED BY:
DRAWN BY: SA
CHECKED BY: SA
DATE: JUNE 2016

FIGURE 2: REVISED FLOODPLAIN
FEMA FLOODPLAIN LIMITS
AIRPORT WASH BASIN MANAGEMENT STUDY - PHASE 2

C.2 Figure 3 – Non-FEMA Limits Floodplain Map

Appendix D – Digital Files on Compact Disk

- D.1 Summary Report (Text, Appendices A, C & D in pdf format)
- D.2 Summary Report Appendix B - Alternative Analyses Report (Text & Appendices in pdf format)
- D.3 Summary Report Appendix B - Alternative Analyses Computer Models