

ADDENDA

Hydrology Report
Archaeological Survey

Hydrology Report

**Existing Conditions Floodplain Modeling Report for
Pima County Parcels 108-26-015D, 108-26-016A & 108-26-015B**

Submitted:
May 2014

Location:
The site is located within a portion of the southwest
quarter of Section 21, Township 13 South, Range 14 East
Gila and Salt River Meridian,
Pima County, Arizona

Prepared For:
Saint Demetrios Greek Orthodox Church Inc
Attn: Dr. Angela Zerdavis
1145 E Fort Lowell Rd.
Tucson AZ 85719-2116

Prepare By:
JE Fuller Hydrology & Geomorphology Inc.
40 East Helen Street
Tucson, Arizona 85705
520-623-3112
<http://www.jefuller.com>
Contact: Ian P. Sharp, P.E., CFM
ian@jefuller.com



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May 28, 2014

TEMPE

Jon Fuller, PE, RG, PH, CFM, DWRE
Jeff Despain, PE, CFM
Annette Griffin, AAS
Brian Iseman, PE, CFM
Mike Kellogg, RG, CFM
Ted Lehman, PE
Robert Lyons, PE, CFM
W. Scott Ogden, PE, CFM
Patricia Quinn, PE, RLS, AVS
Tyler Azelline, BA
Ethan Rode
Peter Acton, EIT

Saint Demetrios Greek Orthodox Church Inc
Attn: Dr. Angela Zerdavis
1145 E Fort Lowell Rd.
Tucson AZ 85719-2116

RE: Project Summary Report for Task 1

Dr. Zerdavis:

JE Fuller/Hydrology & Geomorphology, Inc., (JEF) has prepared this report to document floodplain modeling for your properties along River Road. We discussed the preliminary findings with representatives from Saint Demetrios in a meeting on May 22nd. This letter memorializes our findings and the methods used to determine the extent of flooding on your property.

TUCSON

John Wallace, PE, CFM
Cyrus Miller, PE, CFM
Chris Rod, PE
Ian Sharp, PE, CFM
Robert Shand, PE

The work we performed included modeling the 100-year, regulatory flood across the property with flooding coming primarily from the Finger Rock Wash and secondarily from several smaller watercourses from the north of the wash. This model defined the flow depths and velocities across the property as well as the discharge, or rate of flow across the property. We have used the model results to prepare the maps included within the report to show the extent of flooding within the area and the subject property.

FLAGSTAFF

Cory Helton, PE, MS

PHOENIX

Brian Fry, PE, CFM
Jon Ahern, PE, CFM
Nathan Logan, PE, CFM

PRESCOTT

Nate Vaughan, PE

The regulatory discharge for the Finger Rock Wash is 5,590 cfs at Alvernon Way, upstream of the site. This flow disperses as it flows west and south towards the Rillito Creek. With the addition of some inflow from the north, the discharge across your property is reported by the model to be 1,400 cubic feet per second (cfs). For reference, this is equivalent to about 630,000 gallons per minute, or over 400 fully open residential fire hydrants. The depths reported by the model vary across the site but are around 2 feet deep on average, up to 2.5 feet in the middle of the site.

8400 S Kyrene Road, Ste 201
Tempe Arizona 85284
480.752.2124

40 E Helen Street
Tucson, Arizona 85705
520.623.3112

500 N Beaver Street
Flagstaff, Arizona 86001
928.214.0887

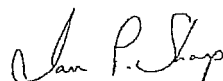
1 W Deer Valley Road, Ste 101
Phoenix, Arizona 85027
623.889.0166

1042 Willow Creek Rd - A101
#415
Prescott, Arizona, 86301
928.640.0778

This letter concludes our effort under Task 1 of our current agreement. We will not proceed with Task 2 unless otherwise directed by your organization.

Sincerely,

JE Fuller/Hydrology & Geomorphology, Inc.



Ian P. Sharp, P.E., CFM
Project Engineer

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1 INTRODUCTION

1.1 Project Overview

Saint Demetrios Greek Orthodox Church currently owns a mostly vacant but previously disturbed property within the Finger Rock Wash floodplain, between River Road and the Rillito Creek. Due to the complexity of the floodplain, JE Fuller/Hydrology & Geomorphology, Inc., (JEF) was retained to prepare a two-dimensional flood routing model to determine the extent and magnitude of flooding within the subject property.

The project site, shown on Figure 1, is composed of 3 contiguous properties that are within a FEMA Zone A floodplain, see Figure 2. JEF prepared a FLO-2D model for the Finger Rock Wash using an inflow hydrograph obtained from the Finger Rock Wash Letter of Map Revision (LOMR). Additional direct rainfall runoff was modeled for the tributaries entering the Finger Rock Wash complex from the north, between Alvernon Way and the Rillito Creek. This report summarizes the results of the analysis.

1.2 Project Location

The project site is located along the south side of River Road, just east of the Rillito Creek. The project includes Parcels 108-26-015D, 108-26-016A & 108-26-015B. These parcels are located within Section 21, Township 13 South, Range 14 East of the Gila and Salt River Meridian, and within unincorporated Pima County, Arizona.

1.3 Objectives

The objectives of this task were to model the flow depths and velocities at the project site due to flooding from the Finger Rock Wash.

1.4 Model

One model has been prepared for this project to model the 100-year, 3-hour storm for the Finger Rock Wash through the project site. A copy of this model has been retained by JEF and can be provided to the client if requested.

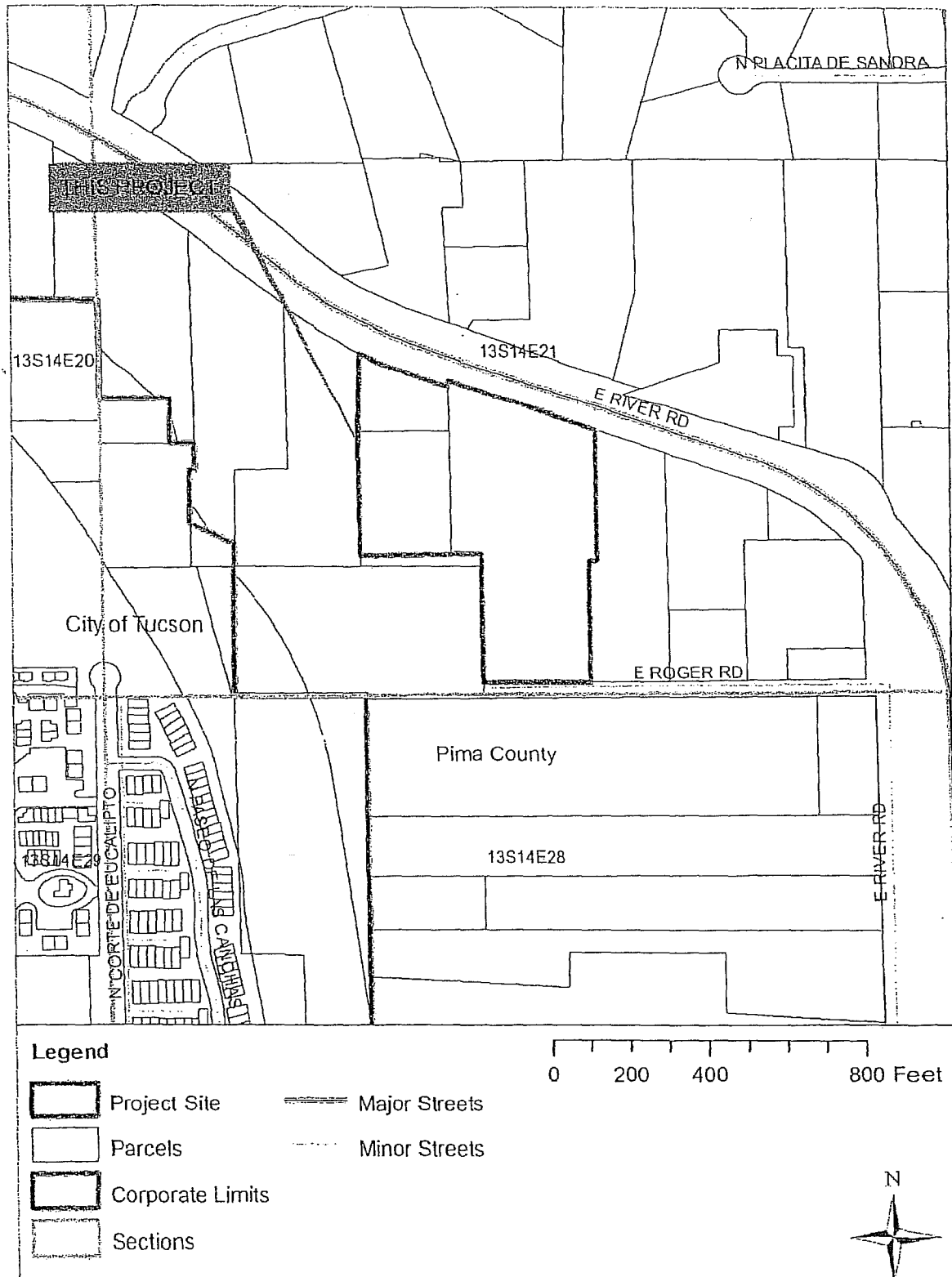


Figure 1. Project location map.

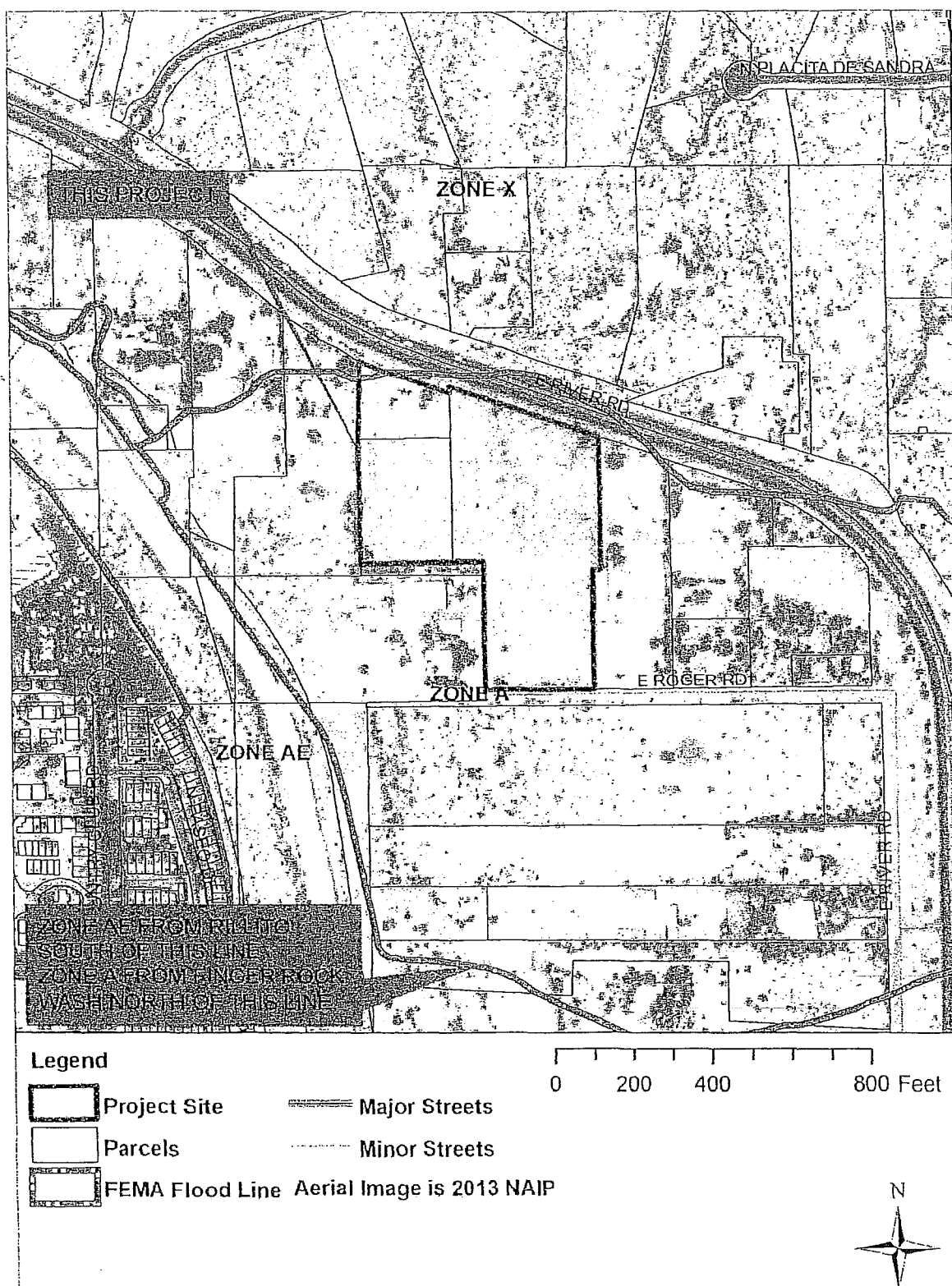


Figure 2. FEMA flood zones and aerial overlay.

2 Reconnaissance and Data Gathering

A field visit was performed on May 14, 2014 to document conditions around the site. Some of the photographs from that visit are included within Appendix 2. In addition to conducting a field visit, the following information has been gathered for this project.

- Flood Insurance Rate Map (FIRM) panels were obtained from the Pima County Regional Flood Control District (District). These panels show that the site is within a Zone A floodplain which designates it as an area determined by approximate methods (no detailed model) to be subject to inundation (flooding) by the 1-percent-annual-chance (100-year) flood.
- The as-built plans for River Road were obtained from Pima County. These show the drainage structures that have an impact upon the site, and these structures have been included in the model prepared for this project.
- The Letter of Map Revision (LOMR) for the Finger Rock Wash and its hydrology model were obtained from the District.
- Rainfall data was obtained from the National Oceanic and Atmospheric Administration (NOAA).
- Elevation data was obtained in digital format from the Pima Association of Governments (PAG).

3 Floodplain Model

A flood routing model was prepared using the FLO-2D Flood Routing Model. This program is a numeric model which models a flood wave across a floodplain, in this case the hydrograph of the Finger Rock Wash from Alvernon Road to the Rillito Creek. In addition, the FLO-2D model can simulate direct runoff, or the runoff that occurs within a given watershed. For this project, direct runoff was modeled for several tributary watersheds that enter into the Finger Rock Wash floodplain downstream of Alvernon Road and which impact the subject property.

3.1 Model Methodology

A FLO-2D model was prepared using the following steps.

1. The model domain was determined by inspection of the watershed on aerial and topographic maps and from identification of the location of the Finger Rock Wash hydrograph in the Finger Rock Wash LOMR. The model domain is roughly bounded on the east by the Alvernon Way alignment, on the west and south by the Rillito, and on the north by the watershed limit.
2. Digital Elevation Data (DEM) was obtained from the Pima Association of Governments (PAG). The 2008 DEM was used in conjunction with 2008 and 2011 PAG aerial maps and 2013 NAIP aerial mapping.
3. A FLO-2D grid was developed with a 20 foot grid spacing and a total of 102,076 grid elements modeling an area of 937 acres.
4. The Finger Rock Wash LOMR HEC-1 model was obtained from the District in digital format. This model has a concentration point labeled CO-1 related to the limit of sub-basin FR-1. This is the most downstream point in the model and combines all flow in the watershed at Alvernon Way. The 100-year, 3-hour storm produces a discharge of 5,590 cfs with a peak at 1.33 hours. This hydrograph was extracted from the HEC-1 model and imported into the FLO-2D model.
5. Direct rainfall runoff was modeled for the entire FLO-2D model to determine inflow from the northern tributary watersheds. The 100-year, 3-hour rainfall depth was obtained from NOAA (Atlas 14, Volume 1, Version 5) for the upper bound of the 90% confidence interval. The depth at the watershed centroid is 3.22 inches for the 100-year, 3-hour storm event. No other return intervals were modeled because the Finger Rock Wash LOMR used only the 100-year, 3-hour interval.
6. Infiltration parameters were obtained and/or developed to compute the SCS curve number for each grid element. The soils data was obtained from Pima County while the impervious area and land use data were developed for this project using normal parameters.
7. Significant buildings located within the valley were identified and included in the model as obstructions. In addition, the existing wall along the River Road frontage, south of Roger Road, was modeled using an assume width reduction (blockage to flow) of 95%.
8. The as-builts for River Road were used to model the culverts along River Road within the model domain. In addition, the elevations for the hydraulically important channels and basins were modified in the model to reflect as-built conditions.
9. Models were run with the FLO-2D Pro Model, Build 14.03.07.

3.2 Overview of Finger Rock Wash and Tributary Watersheds

The flooding of the Finger Rock Wash was modeled from Alvernon Way to the Rillito Creek. The model shows that the Finger Rock Wash floodplain is contained within a narrow valley east of Alvernon Way. At this location, the 5,590 cfs regulatory discharge quickly disperses into a broad, distributary floodplain that drains into the Rillito Creek at various locations. The LOMR for the Finger Rock Wash limited modeling of hydrology to upstream of Alvernon Way, therefore rainfall runoff for the area downstream of Alvernon Way was modeled within the FLO-2D model. This additional watershed area extends over 3 miles north of Roger Road and includes approximately 500 acres of drainage area from a handful of sub-watersheds. These sub-watersheds drain into the Finger Rock Wash Floodplain near the River Road and Roger Road alignments and impact the flow into the subject property.

3.3 Overview of Flooding Near the Site

While the peak discharge associated with the entire Finger Rock Wash floodplain is 5,590 cfs, attenuation and distribution of flow yields a discharge of about 1,600 cfs within the main thread of the Finger Rock Wash (the Roger Road alignment). This flow crosses partly under River Road but mostly over the road as shallow flooding and enters the basins (the depressed area) between River Road and the River Road frontage. The basins discharge a small portion of the total flow, roughly 40 cfs, through a storm drain to the Rillito. The remaining flow exits the basins as sheet flow and continues onto the Rillito.

3.4 Flooding on the Project Site

Flow directions on the property are generally to the west and northwest. Approximately 1,000 cfs enters the property from the east. Additional flow leaves the Roger Road alignment and enters the southern portion of the site, draining northwest. The total flow exiting the site at the west boundary is 1,400 cfs. This discharge represents a combination of flood flow from the Finger Rock Wash, the tributaries north of the Finger Rock Wash, and direct runoff from the project area. Flow patterns and discharges are shown on Figure 3.

3.4.1 Flood Depths

Flood depths on the site are shown on Exhibit 2 and Figure 4. The depths range from 0.5 feet along River Road to 2 feet within most of the property. There is a small area with a depth of 2.5 feet within the west side of the property.

3.4.2 Flood Directions and Velocities

Flow velocities are relatively low due to the flat terrain. Velocities, shown on Figure 5, are less than 2 feet per second for most of the property; however the southwest corner exhibits velocities over 3 feet per second as a result of flow moving around existing structures nearby. Velocities less than 3 feet per second are generally considered to be non-erosive.

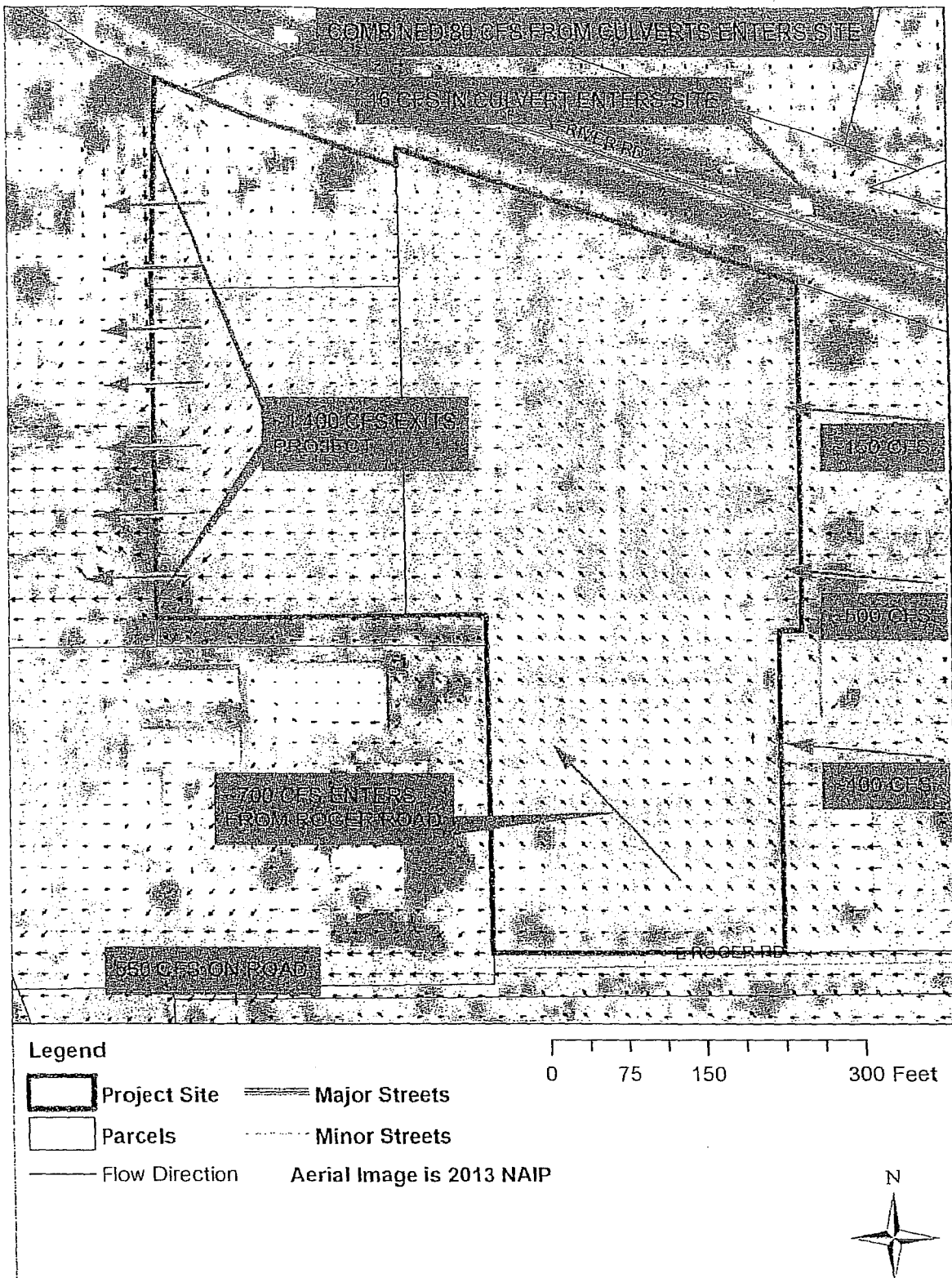


Figure 3. Flow directions and discharges at the project.

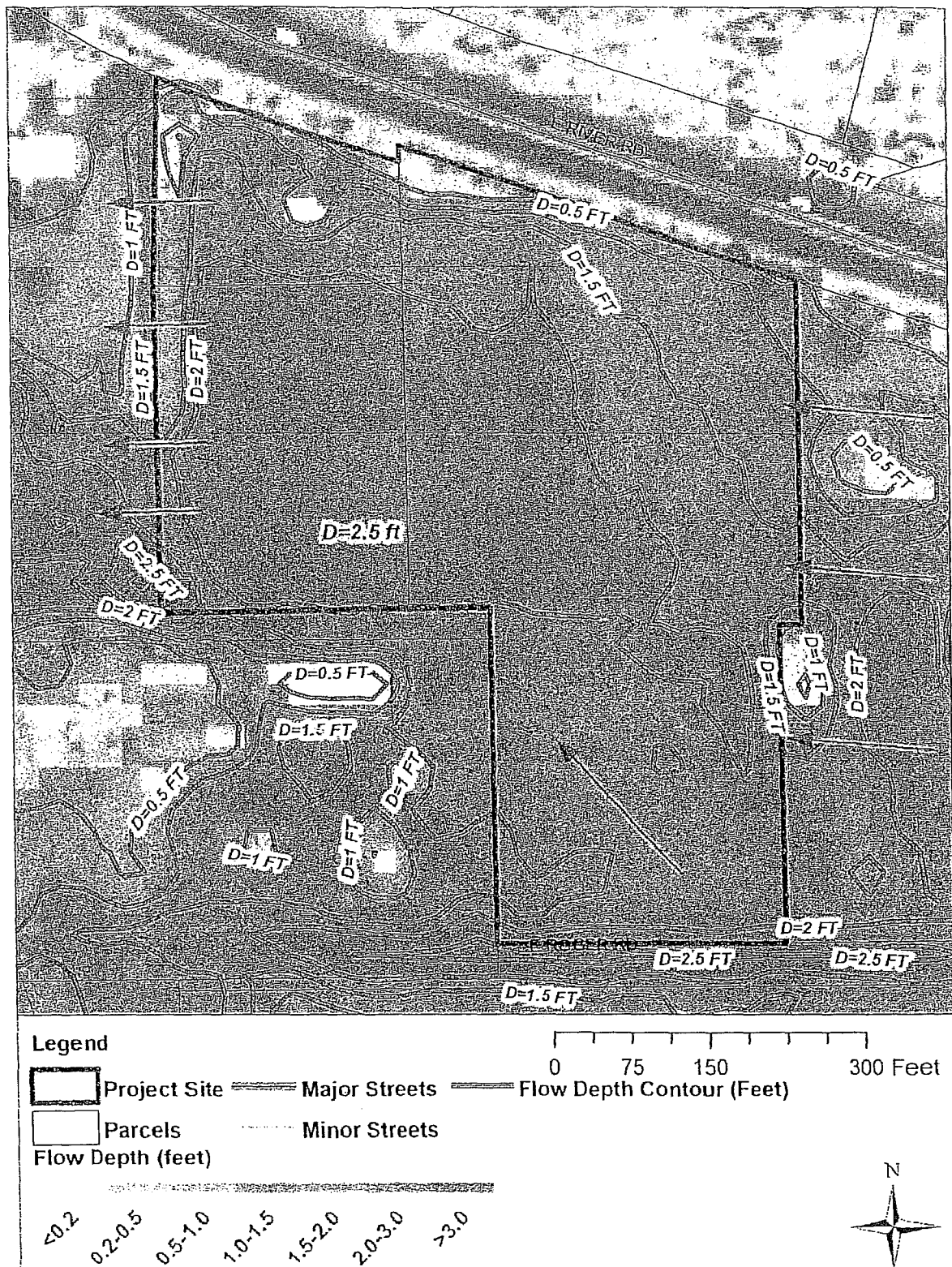


Figure 4. Flow depths at the project.

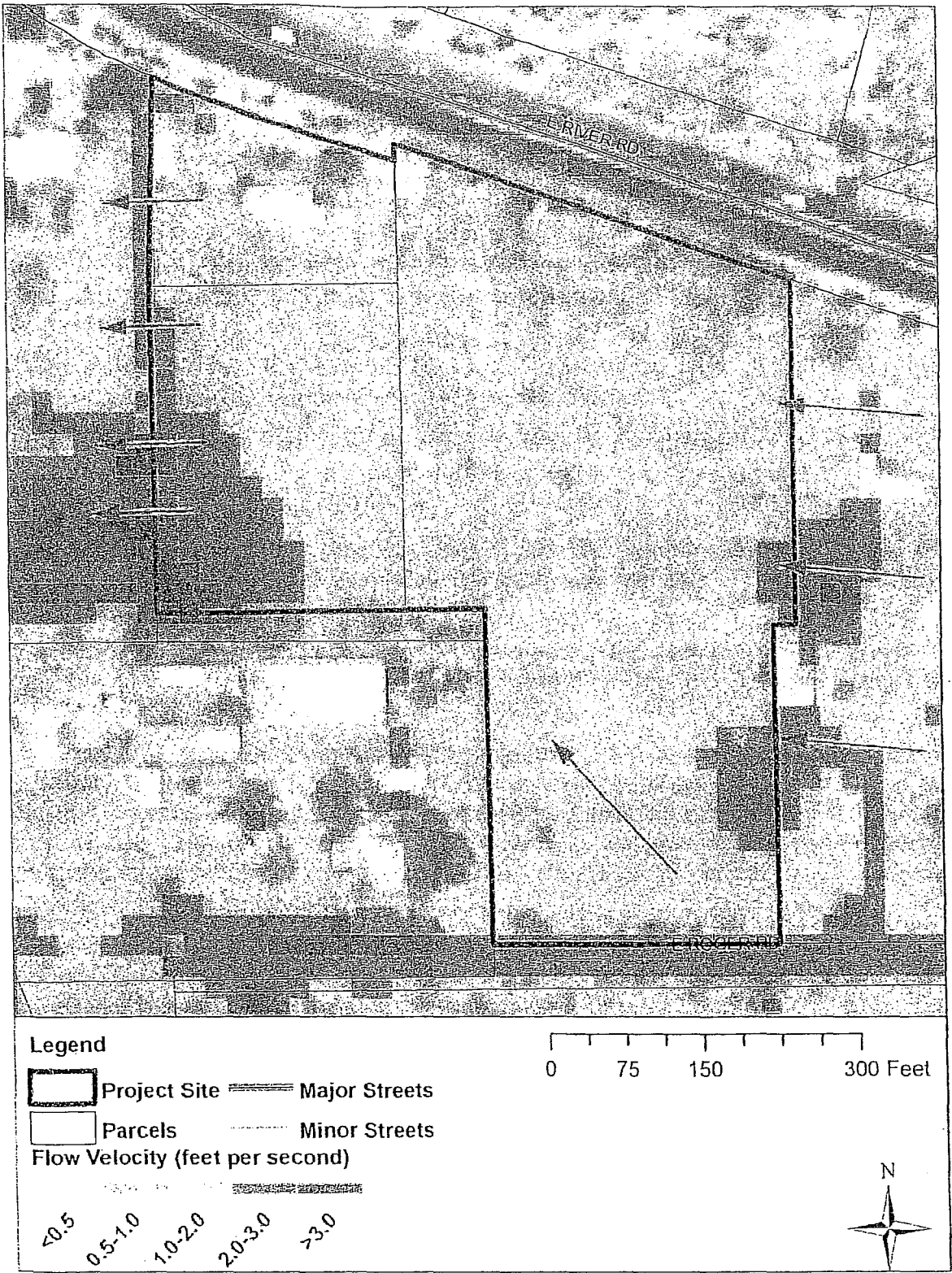


Figure 5. Flow velocities at the project.

4 Conclusions and Recommendations

The project site is situated within an area prone to flooding from the Finger Rock Wash and to a smaller extent from smaller drainage areas north of the site. FEMA has delineated a regulatory Zone A flood zone which encompasses the property but gives little detail about actual flood risks. A FLO-2D model was prepared to better define the flood risks on the site. This model gives the following information:

Discharges: The 100-year, regulatory discharge exiting the site is 1,400 cfs. Shallow, broad, flood flow enters the site from the east and from along Roger Road. Additional but less significant concentrated flow impacts the site at culvert outlets located at both the northwest and northeast corners of the project.

Flood Depths: The 100-year flood depths are generally between 1.5 and 2 feet, but depths greater than 2 feet exist near the west side of the site.

Flood Velocities: Flow velocities are relatively slow at around 2 feet per second for most of the site. It is probable that the flow will drop sediment at this location resulting in the need for sediment removal following a flood.

Pima County regulates any discharge above 100 cfs, therefore this property is subject to requirements set forth in the Pima County Floodplain Ordinance. The rules set forth in this ordinance impact this site as follows:

Elevation: Habitable structures must be elevated 1.0 feet above the regulatory flood. Any structure on this site would therefore have a finished floor elevation of around 3.0 feet above the natural grade.

Adverse Impacts: Development on this site encroaches into the floodplain and must not adversely impact adjacent properties. Like an object displaces water in a tub of water, an elevated structure will force flow onto adjacent lots. Pima County requires that development not increase the depth of flooding by more than 0.1 feet (1.2 inches) at the property line. Furthermore, velocities cannot be increased by more than 10 percent or 1.0 feet per second (whichever is more stringent).

The task performed by JEF excluded analysis of proposed conditions. The following comments are included based upon previous experience, however they are not conclusive and may be superseded by more detailed analysis of design alternatives.

- Complying with the encroachment standards set forth by Pima County generally requires construction of drainage improvements to compensate for the loss of flow conveyance caused by the development. For example, a channel may need to be constructed to capture flow at the property line, convey it through the site, and release it at the project limit, or possibly some point downstream.
- Development within a broad, shallow flow system such as this is quite often limited to a fraction of the total site.
- Considering the discharges present on the site, any fill and any channelization would require slope protection such as rock rip-rap which extends at least 3 feet below grade.

5 References

Federal Emergency Management Agency, *Flood Insurance Rate Map Panels 04019C1693L and 1695L*, 2011

FLO-2D Software, Inc., *FLO-2D Pro Model Build No. 13.07.05*, 2013.

NOAA ATLAS 14 Precipitation-Frequency Atlas Volume 1 Version 5.0: Semiarid Southwest,, 2011, <<http://hdsc.nws.noaa.gov/hdsc/pfds/index.html>>

Pima county Regional Flood Control District, *Finger Rock Wash Letter of Map Revision, Technical Data Notebook*, Prepared by CMG Drainage Engineering, Inc., 2010

Pima County Department of Transportation, As Built Plans: River Road, Campbell Avenue to Alvernon Way, 2011 (as-built).

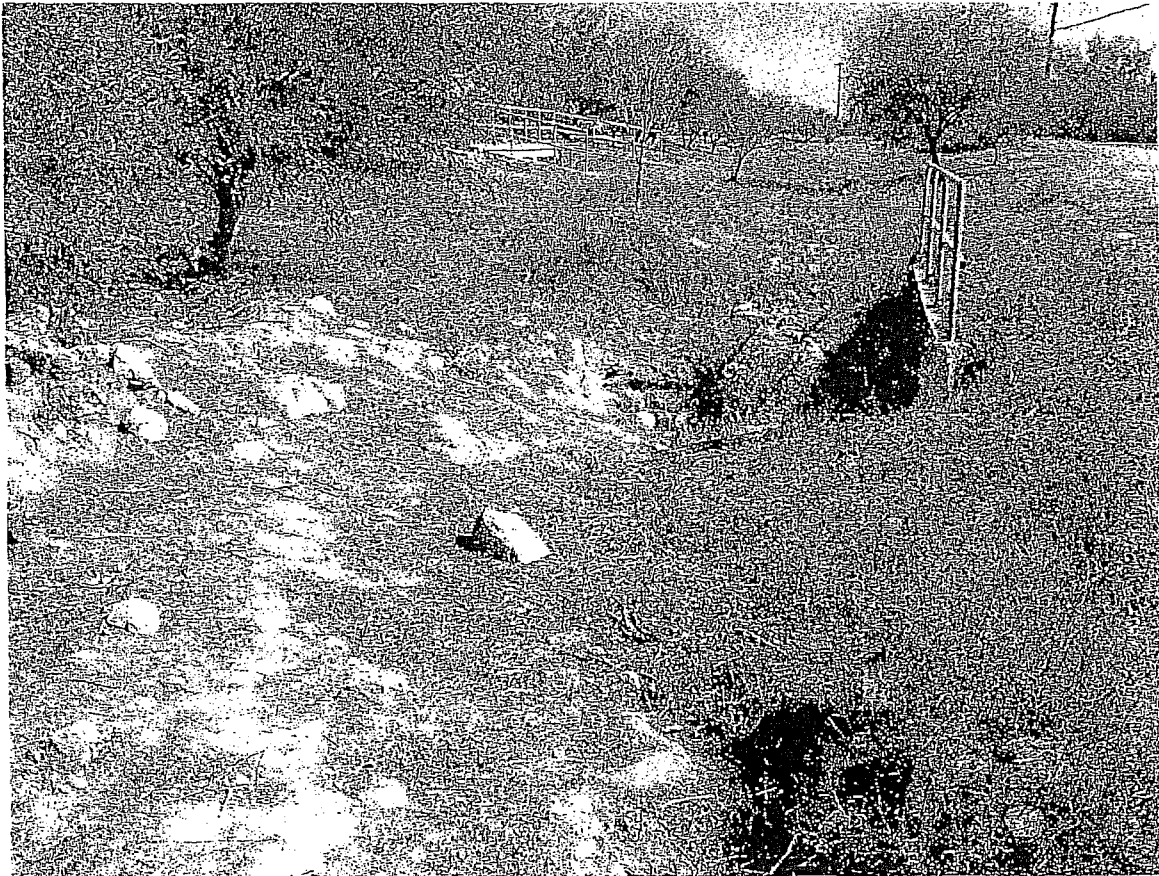
Appendix 1. Exhibits

Two exhibits are submitted with this report.

- Exhibit 1 shows the total area included in the floodplain model (left view frame) along with the velocities developed during the 100-year event, thus showing overall drainage patterns.
- Exhibit 1 also shows flood depths and flood discharges in the vicinity of the project site (right view frame). Because direct rainfall runoff is modeled, nearly all of the modeled area is flooded or wet to some extent, therefore depths below 0.2 feet are excluded from the reported flood depth symbology.
- Exhibit 2 displays flood depth contours and flow directions within the subject property.

Appendix 2. Field Photos

Some of the field photographs which influenced the modeling effort are shown below.



Facing south within the River Road Basins. Inlet to the Roger Road storm drain is in the middle right and the outlet of the main Finger Rock Wash culverts is in the top center.



The photos above show walls along the west side of the River Road frontage. These walls were included in the model.



Photo faces west, upstream of River Road. This is the channel that drains the Finger Rock Wash towards River Road along Roger Road.



Photos show the site from Roger Road.

Archaeological Report

**AN 8.02-ACRE ARCHAEOLOGICAL SURVEY OF
ST. DEMETRIOS GREEK ORTHODOX CHURCH PROPERTY AT
3232 EAST RIVER ROAD, TUCSON, PIMA COUNTY, ARIZONA**

Prepared for

St. Demetrios Greek Orthodox Church

1145 East Fort Lowell Road

Tucson, Arizona 85719

Attn: Father Earl Cantos, Priest

Ken Murch, Parish President

Angela Zerdavis, Chair Planning Design and Strategy Committee

Phil Lamantia, Co-chair Planning Design and Strategy Committee

Prepared by

Paul M. Rawson

Principal Investigator

S. Jerome Hesse

SWCA Environmental Consultants

343 West Franklin Street

Tucson, Arizona 85701

(520) 325-9194

www.swca.com

SWCA Project No. 28665

SWCA Cultural Resources Report No. 14-110

March 2014

PROJECT ABSTRACT

Report Title. An 8.02-Acre Archaeological Survey of St. Demetrios Greek Orthodox Church Property at 3232 East River Road, Tucson, Pima County, Arizona

Report Date. March 2014

Agencies. Pima County

Project Description. St. Demetrios Greek Orthodox Church (the Church) proposes development of 8.02 acres of Church property located south of River Road, in unincorporated Pima County. The property currently comprises three parcels of private land with Pima County Assessor's Numbers 108-26-015B, 108-26-015D, and 108-26-016A, and the street address 3232 East River Road, Tucson. In order to develop the property, these three parcels would be combined. The property is located within the boundaries of the National Register of Historic Places (NRHP)—listed Binghampton Rural Historic Landscape, and the development plans will be subject to review by the Pima County Office of Sustainability and Conservation, Cultural Resources and Historic Preservation Division; and the State Historic Preservation Office. The Church contracted SWCA Environmental Consultants (SWCA) to conduct a Class I records search and Class III archaeological survey of the project area in order to evaluate the known cultural resources within the project area, identify any previously unrecorded cultural resources within the project area, and to assist them in meeting Pima County cultural resources review requirements.

Land Status. Private

Project Location. The project area is located in the SW ¼ of the SW ¼ of Section 21, Township 13 South, Range 14 East, Pima County, Arizona, Gila and Salt River Baseline and Meridian, U.S. Geological Survey Tucson North, Arizona, 7.5-minute quadrangle

Number of Acres Surveyed. 8.02 acres of private land

Dates of Field Survey. March 4, 2014

Number of Cultural Resources. Two

NRHP-Listed Properties. Binghampton Rural Historic Landscape

NRHP-Eligible Properties. One: AZ BB:9:238(ASM)—Binghampton site

NRHP-Ineligible Properties. None

Recommendations. The project area is within the NRHP-listed Binghampton Rural Historic Landscape and the NRHP-eligible Binghampton archaeological site AZ BB:9:238(ASM). These two historic properties are essentially the same entity; however the Binghampton Rural Historic Landscape has a specific period of significance (A.D. 1898–1953), while the archaeological site AZ BB:9:238(ASM) includes prehistoric artifacts—and specifically a Hohokam Classic Period component—which are not identified as contributing to the NRHP-listed property.

There are two previously recorded contributing properties of the NRHP-listed Binghampton Rural Historic Landscape within the project area, identified on the NRHP Nomination Form as Parcel 12—the Spessard Pecan Orchard and Torsell Well; and Parcel 13—3232 East River Road. These properties currently exhibit qualities which contribute to the eligibility of the Landscape. Development of the parcel

Binghampton Rural Historic Landscape Properties

The project area is located in the northwest corner of the Binghampton Rural Historic Landscape. The NRHP nomination inventory completed in 2003 (Parkhurst 2003) identifies two parcels which jointly constitute the project area (Figure 5). These are Parcel 12, characterized as a Landscape Unit/field; and Parcel 13 characterized as a Field plus residence. NRHP Parcel 12 comprises the Pima County Assessor's parcels 108-26-015B and 108-26-015D. NRHP Parcel 13 is the Pima County Assessor's parcel 108-26-016A (see Figure 3).

NRHP Parcel 12—Spessard Pecan Orchard; Torsell Well

The NRHP nomination form describes Parcel 12 as follows (Parkhurst 2003:7.11):

This shaded, 7.8-acre property along the south side of River Road is known for its horticulture, a pecan orchard set out by the Spessard family in 1936. On pastures to the east and south of the grove, the current owners also graze horses. The orchard contains several varieties of pecan trees, some original, and is flood-irrigated in rows of trenches from a well. A historic well in concrete casing, drilled in 1950 when the Torsell family owned the orchard, has an old pump, tank and pipes and is located near River Road on the upper northwest corner of the property.

The previously described features are all present, although not all in good condition. The parcel is divided into several fields by recently built fences composed on metal T-posts, rail road ties, and metal pipe. The pecan grove has been cleared; no trees remain, although the stumps are in situ (Figure 6). Regressing the historical imagery available on Google Earth suggests the pecans were felled 2007-2008. As a result of this, the parcel is no longer shaded. The abandoned irrigation system is also in poor condition, although it is possible to trace partially filled segments of the ditches. The best-preserved segments are along the north edge of the parcel south of Parcel 13 (see Figure 5; Figure 7), and along the eastern edge of the pasture in the south of Parcel 12 (see Figure 5; Figure 8). Concrete and metal pipe control gates from the irrigation system are visible throughout the parcel. The Torsell Well can also be found, but is currently visible as a metal well-cap marked SNOW MFG CO LA CAL / 11/8B / PAT NO 1287127 / IDEAL ALFALFA VALVE (Figure 9). Any associated tanks, pumps, or pipes have been removed.

NRHP Parcel 13—3232 East River Road

The NRHP nomination form describes Parcel 13 as follows (Parkhurst 2003:7.15):

This 1.15 acre parcel includes a Contemporary style, burnt adobe house built in 1953 and probably designed by owner/architect, Torsell (first name unknown). The house features both flat and gabled roofed sections. The parcel lies in the flat, floodplain area south of River Road and is the residential zone for the pecan orchard next door, under the same ownership. The current owner engages in horse culture as well as the seasonal sale of pecans. Included on this site are an early frame tack room, a recent pecan processing shed, horse shelters and corrals with pipe fencing. The designed landscape is green and lush, including a lawn, mature trees and other plantings. Natural vegetation with mesquites can be seen along River Road.

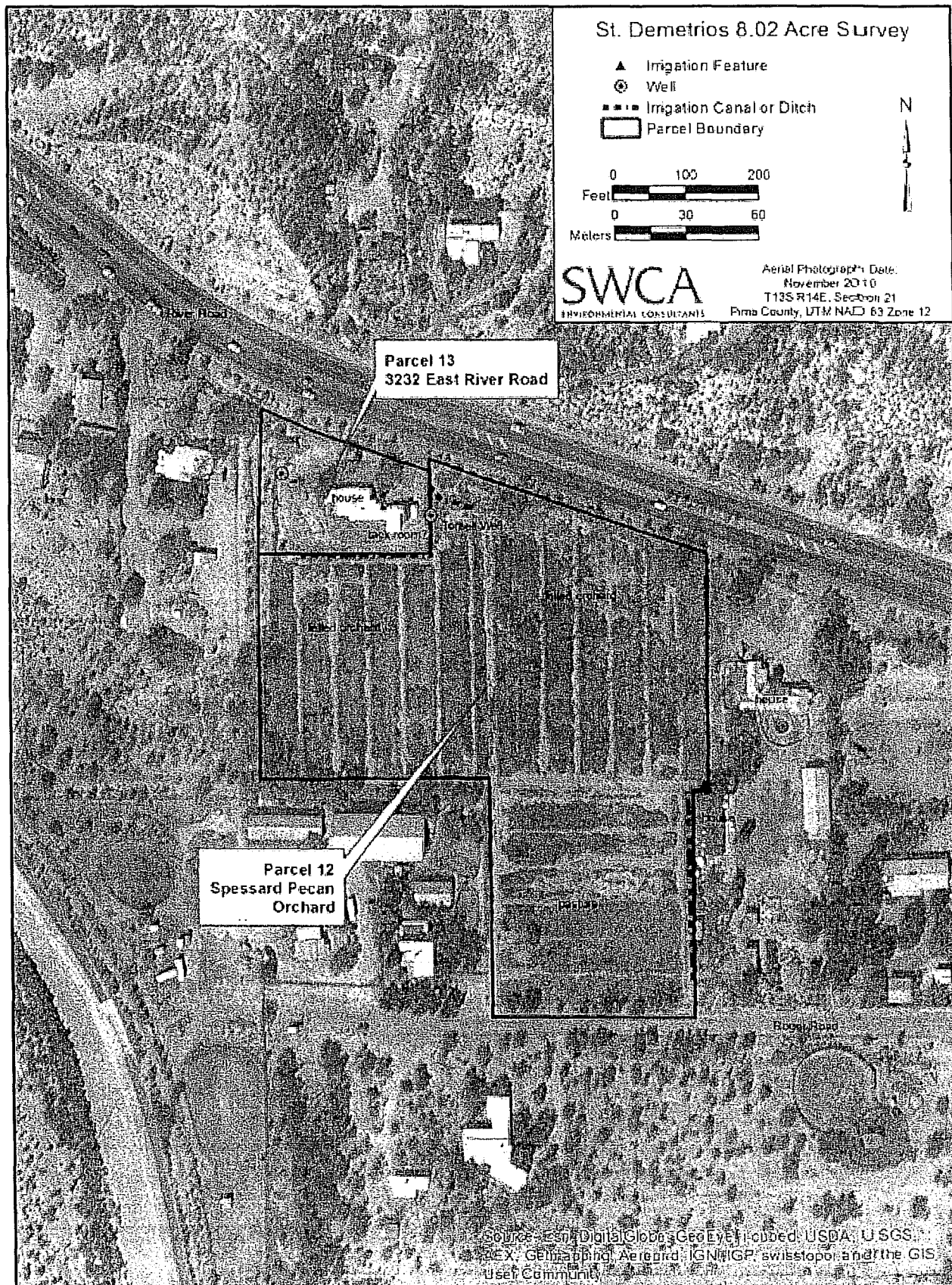


Figure 5. Project results.

Evaluation of Survey Results

The survey results conformed to pre-survey expectations. The cultural resources recorded were previously inventoried as contributing properties of the Binghampton Rural Historic Landscape. Some of these features are in poor condition—the pecan grove has been cleared and the irrigation system is in disrepair. However the surveyed parcels do generally retain the “rural” feeling which characterizes the Historic Landscape.

SUMMARY AND RECOMMENDATIONS

The project area is within the NRHP-listed Binghampton Rural Historic Landscape and the NRHP-eligible Binghampton archaeological site AZ BB:9:238(ASM). These two historic properties are essentially the same entity; however the Binghampton Rural Historic Landscape has a specific period of significance (A.D. 1898–1953), while the archaeological site AZ BB:9:238(ASM) includes prehistoric artifacts—and specifically a Hohokam Classic Period component—which are not identified as contributing to the NRHP-listed property.

There are two previously recorded contributing properties of the NRHP-listed Binghampton Rural Historic Landscape within the project area, identified on the NRHP Nomination Form as Parcel 12—the Spessard Pecan Orchard and Torsell Well; and Parcel 13—3232 East River Road. These properties currently exhibit qualities which contribute to the eligibility of the Landscape. Development of the parcel has the potential to adversely affect these properties. No additional resources were discovered during the archaeological survey, and there is no evidence of prehistoric archaeological material within the project area. SWCA recommends that development plans include measures such as landscaping, preservation, or re-use of existing properties consistent with the qualities of the Binghampton Rural Historic Landscape.

In the event that human remains and/or ceremonial objects and funerary objects are found during development of this property, ground-disturbing activities must cease in the immediate vicinity of the discovery. Arizona Revised Statutes §41-865 applies to the discovery of human remains and associated funerary objects on private land. The law requires that the Arizona State Museum be notified of the discovery so that cultural groups who claim cultural or religious affinity to them can make appropriate arrangements for the repatriation and reburial of the remains.