



**Community & Economic Development Division
Planning, Neighborhood & Transportation**

7447 East Indian School Road
Scottsdale, Arizona 85251

May 28, 2013

Scott Lorentzen
Scott Lorentzen, PE
Po Box 17201
Fountain Hills, AZ 85269

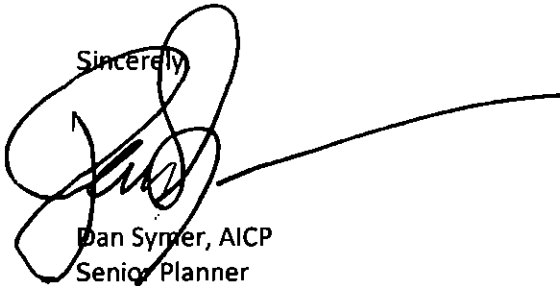
RE: Administrative Completeness Determination (Case Drainage Report).

Dear Mr. Lorentzen:

It has been determined that your Development Application 149-SA-2013, Estates at Cochise is administratively complete, and City Staff has begun their substantive review of the application material. Your Development Application is being reviewed under the City's Standard Application Review Methodology.

Upon completion of the Staff's review of the application material, I will inform you in writing or electronically either: 1) the steps necessary to submit additional information; or City Staff will issue a written or electronic determination pertaining to this application. If you have any questions, or need further assistance please contact Brad Carr at 480-312-7713 or at bcarr@ScottsdaleAZ.gov.

Sincerely



Dan Symer, AICP
Senior Planner

C: Case File

Resubmittal of a Staff Approval (All Types) Track

Coordinator: BOARR

Date of application submittal: 5-29-2013 3/0 -PA- Zpk

TAKEN BY DAN SJMER

Please check the appropriate box of the Type(s) of Application(s)

Land Divisions	Development Review	Exemption to the Zoning Ordinance
<input type="checkbox"/> Subdivisions (Minor) (MD)	<input checked="" type="checkbox"/> Development Review (Minor) (SA)	<input type="checkbox"/> Special Exception (SX)
<input type="checkbox"/> Perimeter Exceptions	<input type="checkbox"/> Wash Modification (WM)	<input type="checkbox"/> Minor Amendment (MA)
	<input type="checkbox"/> Master Sign Program (MS)	Other :
	<input type="checkbox"/> Community Sign District (MS)	<input type="checkbox"/> In-Lieu Parking (IP) (5 space or less)

Expedited Application

The coordinator must complete the following:

1. Is this a resubmittal of the Administrative Review, Yes or No (circle one)?
Yes. Coordinator, please indicate the review time frame in the table below.

No, this is a resubmittal of the Substantive Review. (complete 2)

2

2. Substantive Review. Is this a second submittal of the Substantive Review, Yes or No (circle one)?

Yes, this is a second submittal. Please indicate the review time frame in the table below. (maximum 14 days) 6-11-2012

No, this is a third submittal. Coordinator, indicate due date in the table below. The due for the review and stipulations shall not exceed 7 days date that the application was resubmitted.

Insert Date Below

<input type="checkbox"/>	Administrative Review Due Date ^{1,2} (If the Administrative Review was not completed by the Coordinator), or The Coordinator has determined the application to be Administratively Complete. (check the box)
	DIRT Review Date (Indicate date if required)
	Review Meeting Date (Technical review) (Indicate date if required)
	First Substantive Review Date ^{1,2}

Coordinator, please complete the following:

1. Upon receipt of post card please review for accuracy and return to PA area.

Worked By D. SJMER

Review Team	Memo	Narrative	Site Plan	G & D Plan	Drainage Report	Trip gen, Traffic Study, TIMA	Water and/or Wastewater Basis of Design	Archeologically Report	Others	Add other item(s) below
Steve Venker (Design Review)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	
Jeri Pulkinen (Engineering)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	
Phil Kercher (Traffic Engineering & Planning)	<input type="checkbox"/>	<input type="checkbox"/> qty 2	<input type="checkbox"/> qty 2	<input type="checkbox"/>		<input type="checkbox"/>			<input type="checkbox"/>	
Doug Mann (Water and Wastewater)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>	
David Groves (Fire)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> qty 3	<input type="checkbox"/>					<input type="checkbox"/>	
Storm water group	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<u>Pulkinen 2-revised projects</u>
Adam Yaron (Long Range Planning)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	
Tanya Hazlehurst (Street Names) (PP Cases)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	
Sarah Ferrara (within 20,000 ft. of a runway) (Short form or Long Form)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	
Greg Williams (Maps) (PP & AB Cases)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	
Don Meserve (Historic Property and Archeological)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	
Other:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	

**MEMORANDUM
CURRENT PLANNING**

DATE: May 28, 2013
TO: The Review Team –Don Gerkin
FROM: Tim Curtis, AICP
Current Planning Director
C. Brad Carr
RE: Development Review (Minor) (SA)

Case application#	Project Name and Location	Coordinator	Submitted
149-SA-2013	Case Drainage Report for Case 30-PP-2012	B.Carr	05/28/2013

The Project Coordinator will contact you if there will be a different due date for your review than what is indicated on this sheet.

Substantive Review Due Date (Tract: Not Applicable):

If approve for Substantive Review on at the Administrative Review meeting indicated above, please input your comments into the CDS project tracking sheet for substantive reviews by **June 11, 2013**. Please return the Case Drainage Report to Karen Fitzpatrick.

*Tr. 15 IS A RE SUBMITTAL
OF 5209-12*

September 19, 2012



Improvement Plan Application Review

Resubmittal Checklist

This form plus redlines from the previous submittal(s) must accompany all resubmittals and be separated by discipline. Incomplete application resubmittals will not be accepted

Date: 10/25/2012		Review No.: <input checked="" type="checkbox"/> 1 st <input type="checkbox"/> 2 nd <input type="checkbox"/> 3 rd <input type="checkbox"/> 4 th or greater	
Plan Check/Project No.: 5209-12	Case No.: 331-PA-2012	Project Location: 13102 E COCHISE RD	
Civil Plan Reviewer:	_____	Email:	_____
Planning Plan Reviewer:	_____	Email:	_____
Fire Plan Reviewer:	_____	Email:	_____

Stormwater Plan Reviewer: **Don Gerkin**

Email: dgerkin@scottsdaleaz.gov

ALL ITEMS INDICATED SHALL BE INCLUDED WITHIN THE APPLICATION RESUBMITTAL PACKETS. EACH REVIEWER (CIVIL, PLANNING, AND FIRE) REQUIRES SEPARATE COMPLETE SET OF IMPROVEMENT PLANS. EACH IMPROVEMENT PLAN PACKET SHALL INCLUDE ALL REQUIRED PLANS INDICATED BY EACH REVIEWER. EASEMENTS AND REPORTS SHALL ONLY BE INCLUDED WITH THE REQUESTED REVIEWERS IMPROVEMENT PLAN PACKET. PACKETS THAT ARE INCOMPLETE WILL NOT BE ACCEPTED. (e.g. SUBMITTALS THAT HAVE SEPARATE PACKETS FOR LANDSCAPE PLANS, AND CIVIL PLANS WILL NOT BE ACCEPTED.)

Improvement Plan Mylars

<input type="checkbox"/> Submit Civil, Landscape, etc. mylars	<input type="checkbox"/> Submit Civil, etc. mylars
Mylars may only be submitted when requested	

Planning Civil and Planning Landscape Review Resubmittal Requirements:

<input type="checkbox"/> Planning Review is complete; see other reviewer's comments and requirements.	<input type="checkbox"/> Title Insurance policy - dated within 30 days (Commercial, multi-family, and industrial only).
<input type="checkbox"/> Complete set of revised Improvement Plans. (Civil, Planning, Fire requirements)	<input type="checkbox"/> Original Legal and graphic description and dedication for Natural Area Open Space Easement
<input type="checkbox"/> Landscape and Irrigation Plans (Shall be included in all Improvement plan sets (Civil, Planning, and Fire))	<input type="checkbox"/> Original Lien holder consent form for the NAOS dedication
	<input type="checkbox"/> M.O.D. Plan (for reference only)
	<input type="checkbox"/> Final Plat Plan or Condominium Plat Plan (for reference only)
<input type="checkbox"/> 3 copies of the revised N.A.O.S. Exhibit (N.A.O.S. lot information shall be provide on the plan if applicable).	
<input type="checkbox"/> Native plant plan (This is separate submittal approval, and permit.) The Native Plant Application shall be submitted prior to the () submittal of the Improvement Application plans.	



Improvement Plan Application Review

Resubmittal Checklist

Other Required Information: THE RESUBMITTAL CHECKLIST IS TO BE COMPLETED BY ALL REVIEWERS. ONLY THE LAST REVIEWER TO COMPLETE HIS/HER REVIEW IS TO PRINT OUT THE RESUBMITTAL CHECKLIST AND RETURN IT WITH THE PLANS. OTHERWISE DO NOT PRINT IT OUT. DELETE THIS COMMENT BEFORE PRINTING

Fire Civil and Fire Landscape Review Resubmittal Requirements:

<input type="checkbox"/>	Fire Review is complete; see other reviewer's comments and requirements.	<input type="checkbox"/>	Final Plat Plan or Condominium Plat Plan (for reference only)
		<input type="checkbox"/>	Alta Survey Plan (no older than one year - for reference only)
<input type="checkbox"/>	Complete set of revised Improvement Plans. (Civil, Planning, Fire requirements)	<input type="checkbox"/>	M.O.D. Plan (for reference only)
		<input type="checkbox"/>	Fire Hydrant Flow Report (test results)

Other Required Information: THE RESUBMITTAL CHECKLIST IS TO BE COMPLETED BY ALL REVIEWERS. ONLY THE LAST REVIEWER TO COMPLETE HIS/HER REVIEW IS TO PRINT OUT THE RESUBMITTAL CHECKLIST AND RETURN IT WITH THE PLANS. OTHERWISE DO NOT PRINT IT OUT. DELETE THIS COMMENT BEFORE PRINTING

Civil Plan and Civil Landscape Plan Review Resubmittal Requirements

<input type="checkbox"/>	Civil Review is complete; see other reviewer's comments and requirements	<input type="checkbox"/>	Title Insurance policy -dated within 30 days (Commercial, multi-family, and industrial only).
<input type="checkbox"/>	Complete set of revised Improvement Plans. (Civil, Planning, Fire plan requirements)	<input type="checkbox"/>	Original Lien holder consent form for each separate dedication
		<input type="checkbox"/>	Original Legal and graphic description and dedication for:
		<input type="checkbox"/>	Grading and Drainage plan(s)
		<input type="checkbox"/>	Right-of-way
		<input type="checkbox"/>	Paving Plan(s)
		<input type="checkbox"/>	Drainage Easement
		<input type="checkbox"/>	Water Plan(s)
		<input type="checkbox"/>	Water Easement
		<input type="checkbox"/>	Sewer Plan(s)
		<input type="checkbox"/>	Sewer Easement
<input type="checkbox"/>	Structural Plan(s)	<input type="checkbox"/>	Multi-use Public Trail Easement
<input type="checkbox"/>	Horizontal Control Plan	<input type="checkbox"/>	Multi-use Public Path Easement
<input type="checkbox"/>	Traffic Plan	<input type="checkbox"/>	Multi-use Public Path and Trail Easement
<input type="checkbox"/>	Structural / Wall Plans and Calculations	<input type="checkbox"/>	Sight Distance Easement
<input checked="" type="checkbox"/>	Revised Drainage Report & redline copy	<input type="checkbox"/>	Public Access Easement
<input type="checkbox"/>	Soils and Pavement Design Report	<input type="checkbox"/>	Emergency and Service Vehicle Access Easement
<input type="checkbox"/>	Water Basis of Design Report	<input type="checkbox"/>	M.O.D. Plan (for reference only)
<input type="checkbox"/>	Sewer Basis of Design Report	<input type="checkbox"/>	Final Plat Plan or Condominium Plat Plan (for reference only)
<input type="checkbox"/>	Flow test results	<input type="checkbox"/>	Alta Survey Plan (no older than one year for reference only)
<input type="checkbox"/>	Water and / or Sewer Service Agreement	<input type="checkbox"/>	NOI form/permit
<input type="checkbox"/>	County Health Approval	<input type="checkbox"/>	401 permit Certificate of Approval
<input type="checkbox"/>	404 permit Certificate of Approval	<input type="checkbox"/>	404 C.O.S. Certification Form



Improvement Plan Application Review

Resubmittal Checklist



Other Required Information: THE RESUBMITTAL CHECKLIST IS TO BE COMPLETED BY ALL REVIEWERS. ONLY THE LAST REVIEWER TO COMPLETE HIS/HER REVIEW IS TO PRINT OUT THE RESUBMITTAL CHECKLIST AND RETURN IT WITH THE PLANS. OTHERWISE DO NOT PRINT IT OUT. DELETE THIS COMMENT BEFORE PRINTING

Planning, Neighborhood and Transportation

7447 E Indian School Road, Suite 125, Scottsdale, AZ 85251 • Phone: 480-312-7080 • Fax: 480-312-7781

FINAL DRAINAGE REPORT

FOR

COCHISE MANOR

(30-PP-2012)

(PARCEL 217-31-010)

Plan # 30-pp-2012
Case # _____
Q-S # _____
 Accepted
 Corrections
D Gerkin
Reviewed By _____ Date 6-5-13

SCOTTSDALE, ARIZONA

Prepared for:

INTRAVEST DEVELOPMENT, LLC
5830 West Thunderbird Road, Suite B8
Glendale, AZ 85306

Prepared by:

SOUTHWEST LAND CONSULTING, P.C.
PMB 132

8711 East Pinnacle Peak Road, Suite F-211

Scottsdale, Arizona 85255

(480) 585-7521

Stormwater Review By: Don Gerkin
Phone 480-312-7903
FAX 480-312-9103
E-MAIL dgerkin@ScottsdaleAZ.gov
Review Cycle 2 Date 6/5/13



May 2013

SLC Project No. 1603

City of Scottsdale
Stormwater Management Division

Memorandum

To: **Scott Lorentzen**
Southwest Land Consulting
480-585-7521

From Don Gerkin, P.E., CFM
City of Scottsdale Sr. Civil Engineer
480-312-7903, dgerkin@scottsdaleaz.gov

Re: Drainage review comments for the case drainage report for Cochise Manor, 131st
and Cochise prepared by Southwest Land Consultants, sealed on 24MAY2013. COS
case no. 30-PP-2012 6/5/2013 DG

DRAINAGE REPORT RESUBMITTAL INFORMATION: The drainage report is not approved. Please address the following issues. Provide a written response to each item listed below. State how the issue was addressed/solved and provide the section and page number in the report where the answers are located. Submit two copies of the revised drainage report, the previous drainage report and a response letter. If a response letter is not provided the drainage report will be returned without a review.

1. **DRAINAGE REPORT STANDARD: DSPM CHAPTER 4, Section 4-1.800** Prepare a drainage report per the city's DSPM CHAPTER 4, Chapter 4.
2. **PRE DEVELOPMENT DRAINAGE SITE PLAN: DSPM CHAPTER 4, Section 4-1.800 and 4-1.900** Please provide a full size, 24"x30" pre development site plan. Show and label the contours to at least 100 ft beyond the property lines. Show and label all the basic elements of a drainage plan including flowrates, flowlines, existing storm drainage infrastructure and all existing easements. Use the dashed line to show the flowline of the wash bottom. Show and label the onsite drainage basins and within each basin show the pre development Q10 and Q100 for each historical runoff entry and exit location, show and label concentration points. Show the limits of inundation for the Q100, 6 hr storm event for all washes with a flowrate greater than 50 cfs.
3. **POST DEVELOPMENT DRAINAGE SITE PLAN: DSPM CHAPTER 4, Section 4-1.800 and 4-1.900** Please provide a full size, 24"x30" pre development site plan. Show and label the contours to at least 100 ft beyond the property lines. Show and label all the basic elements of a drainage plan including flowrates, flowlines, existing storm drainage infrastructure and all existing easements. Use the dashed line to show the flowline of the wash bottom. Show and label the onsite drainage basins and within each basin show the pre development Q10 and Q100 for each historical runoff entry and exit location, show and label concentration points, show the storage detention basins, high water limits and label drainage easements or tracts. Show the limits of inundation for the Q100, 6 hr storm event for all washes with a flowrate greater than 50 cfs.
4. **STORMWATER STORAGE WAIVER: DSPM CHAPTER 4, Chapter 4, Section 4-1.800**

The waiver is not approved because the pre and post Q10 and Q100 were not provided. Show and label on the plans the pre and post Q10 and Q100 and each entry and exit runoff concentration point for each on site drainage basin. In the report provide all the detailed calculations, including a discussion on the method used and the detailed breakdown of the weighted runoff coefficients.

5. **STORMWATER POLLUTION PREVENTION PLAN (SWPP) Trigger:** DSPM CHAPTER 4, Section 4-1.300 Provide detailed drawings and calculations showing the total disturbed areas for these projects. A SWPP is required if the disturbed area, in aggregate, is 1 acre or more. (Note to city staff: check the 2 boxes under ADD ISSUES in the final plan review tab. "Disturbed area greater than 0.9 acres in aggregate.")
6. **CONSTRUCTION GENERAL PERMIT AND AUTHORIZATION TO DISCHARGE:** DSPM CHAPTER 4, Section 4-1.300 For projects where the disturbed area (in aggregate) is one acre or more, you must acquire an Authorization To Discharge (ATD) permit from ADEQ prior to the City of Scottsdale approving the improvement plans. Please include the NOI and the ATD in the bound report.
7. **DRAINAGE SUB AREAS:** DSPM CHAPTER 4, Section 4-1.800 Demonstrate how onsite runoff will get to the detention basins/pervious areas. Use bold lines to delineate the drainage sub areas and show all grade breaks on the G&D plan. Calculate the volume required and volume provided in each drainage sub area. Demonstrate that on-site stormwater runoff from each drainage sub area is accounted for in specific drainage detention basin. Calculate and show the percentage runoff that is contributed from each drainage sub area to a specific drainage basin. Use a table or spreadsheet format to show the results in the report.
8. **DETENTION BASINS:** DSPM CHAPTER 4, Section 4-1.401 For detention basin design: Provide bleed off rates for each basin. Show all calculations. The minimum pipe diameter of the bleed off pipe should not be less than 6 inches due to clogging. For detention basins, the runoff storage time should not be less than 12 to 24 hours and should not exceed 36 hours, unless it's a very small basin, then only the 6 inch bleed off pipe will be the controlling item and not the bleed off time.
9. **Warning and Disclaimer of Liability" form:** DSPM CHAPTER 4, Section 4-1.803 Provide a completed, signed, and dated "Warning and Disclaimer of Liability" form, located in appendix 4-1C in the City's Design Standards and Policy Manual.
10. **DRAINAGE EASEMENTS:** DSPM CHAPTER 4, Section 4-1.401 Because basin no. 1 provides storage for more than one lot, this basin needs to be in a tract.
11. **ELECTRONIC DATA SUBMITTAL REQUIREMENTS:** DSPM CHAPTER 4, Appendix 4-1A The drainage report will not be approved until the engineer provides a copy of the drainage report on a compact disk (CD). The drainage report text, graphics, pictures, exhibits, plates and figures, etc., shall be in a PDF file format. The compact disk shall be labeled and include the firm's name, project title, date, and City of Scottsdale Plan Check Number. The disk shall be in a case and placed in the separate folder in the report.
12. **Input Data Files:** DSPM CHAPTER 4, Appendix 4-1A Input data files shall be provided for all HEC-1, HEC-HMS, and HEC-2 or HEC-RAS, Flowmaster, HY-8, Culvert Master and DDMSW. These input data files must be executable or the drainage report will not be approved.

**FINAL DRAINAGE REPORT
FOR
COCHISE MANOR**

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- A. Figures
- B. Excerpts from Preliminary Drainage Report Mayo Clinic by Kimley-Horn & Assoc.
- C. Hydrologic Calculations
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- E. 404 Certification Form and Warning & Disclaimer of Liability
- F. NOI Form

FIGURES

- 1. Vicinity Map Appendix A
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- 3. Aerial Topo
- 4. FEMA Map
- 5. Existing Drainage Map..... Appendix A
- 5. Proposed Drainage Map..... Appendix A
- 6. Grading & Drainage Plans Pocket Folder

I. INTRODUCTION

This project is an undeveloped 4.51-acre parcel in North Scottsdale near the intersection of Shea Boulevard and 130th Street (see Vicinity Map, Figure 1). An existing single-family residence lies to the southeast (Lot 5 Boulder Wash), Shea Boulevard forms the north boundary, Cochise Road is situated to the south, an existing APS sub-station to the southwest and undeveloped natural desert makes up the remaining sides. Analysis of existing conditions and recommendations for improvements are specified within this report.

The region consists of low-density, single-family residential and office medical development surrounded by Sonoran Desert rangeland with typical vegetation densities and meandering ephemeral washes sloping to the southwest at a gradient of approximately 3.88%. Soils in the region are "B", per the Aguila-Carefree Area, Parts of Maricopa and Pinal Counties Soil Survey (Reference 1), which have high percolation rates resulting in lesser runoff during storm events. Based on a field walk, an aerial photo and current topography (see Figures 2 and 3) one defined conveyance corridor will be affected by the proposed onsite development.

All onsite modifications have been designed to comply with the Drainage Regulations for the Flood Control District of Maricopa County (FCDMC) and the City of Scottsdale's Design Standards and Policies Manual (References 2, 3 and 4) while maintaining the existing drainage patterns in the region.

II. FLOOD PLAIN DESIGNATION

The site is located within a region where flood studies have been adopted and FEMA Flood Insurance Rate Maps (FIRM) have been printed. This project falls within Zone "X" (shaded) as shown on FEMA Flood Insurance Rate Map 04013C1710F dated 9/30/05 (see FEMA Map, Figure 4). Flood Zone "X" is defined as follows:

"Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood."

III. OFFSITE DRAINAGE

Multiple drainage reports previously completed for properties in the region were reviewed and used as a basis for the preliminary drainage design presented within this report (see References 5 and 6). Historically, washes in the area originate in the foothills of the McDowell Mountains and meander southwest towards the Central Arizona Project (CAP) canal. Drainage improvements have been constructed in the upstream contributing area as part of the Mayo Clinic Collaborative Research Community and Shea Boulevard Infrastructure. Runoff generated from impervious areas such as office buildings, parking and hardscape within the developments are intercepted by a combination of curb catch basin inlets, storm drain grates, curb openings and natural washes. Shea Boulevard is a crowned roadway consisting of 3 lanes for both east and west

bound travel separated by a landscape median. Vertical curb and gutter on both sides of the main arterial direct storm water towards numerous curb inlets strategically placed along the street. Storm drains beneath Shea Boulevard convey runoff from north of the roadway along with discharge from the aforementioned curb inlets. Current drainage patterns impacting Cochise Manor are depicted on Figure 5. Contributing watersheds were delineated based on City of Scottsdale ¼ Section Flown Aerial Topography, Mayo Clinic drainage studies/plans (Reference 5 and Appendix B – Figures 4 and 5) and a field walk. Cochise Manor has four curb inlets (one 3-cell to the west and one 4-cell to the east located on each side of the street) along Shea Boulevard and two 30" CMP storm drains (CP19 and CP20) that direct offsite flow onto or towards the project. Curb inlets will be described in greater detail within the following section. Concentration Point CP19 is conveyed through the Boulder Wash Subdivision within a defined wash and into Cochise Manor along the east boundary. Concentration Point 20 discharges onto the northwest corner of the site via a 30" CMP (smooth lined) storm drain beneath Shea Boulevard and exists soon after along the west property line. The remaining offsite flow enters the site as sheet flow originating less than 200' east of the property. Due to the multiple culvert crossings, mixed use developments, street curb inlets, and necessary routing the Rational Method cannot be used to determine peak discharges. Therefore, 100-year, 6-hour peak discharges for all drainage areas impacting the site were calculated using a HEC-1 Model analysis in conjunction with the Drainage Design Management System (DDMS) software provided by the Flood Control District of Maricopa County (see Appendix C). The Flood Control District of Maricopa County recently adopted NOAA14 for determination of rainfall depths and this data has resulted in roughly 15% runoff reduction from previous studies using NOAA2. At a minimum each development was represented as a separate sub-basin so altered drainage patterns could be accounted for. Neither storm water storage facilities within the upstream developed areas nor attenuate at culvert inlets were considered as part of this analysis. However, further refinement of the HEC-1 model will continue during the Final Drainage Report preparation corresponding with construction documents. The upstream contributing areas for this project are R1-43 single-family residential and C-O SC commercial surrounded by Sonoran Desert hill slopes. However, the area does not exhibit the usual characteristics of residential zoning types in other portions of the Phoenix Metro region. Lots average 1.0 acres, roads consist of a narrow rural paved section and natural desert has been abundantly maintained on each lot throughout the subdivision. Selection of a Runoff Coefficient and kb factor for this development density and type of terrain does not equate to the default values within the DDMS program. Therefore Land Use 13 (1-2 dwelling units per acre) and a low kb factor were selected to demonstrate the limited watershed development and to indicate an elevated resistance to flow.

IV. PRE-DEVELOPMENT ONSITE CONDITIONS

The land consists of natural Sonoran Desert with typical vegetation except two dirt trails crossing the northwest corner and roughly parallel with the eastern boundary. When the east trail was constructed 2-18" culverts were installed beneath the trail for conveyance of offsite Wash 19A. Improvements for Cochise Avenue included 2-30" storm drains beneath the roadway for the same

watercourse. A field walk was conducted to verify the drainage information revealed by an aerial photo and recently completed as-built survey (see Figures 2 and 3). It was confirmed the two main washes will be left in their natural condition and unaffected by the future onsite development as depicted in the Grading and Drainage Plans (see Figure 6). A drainage easement for Wash 20A was dedicated under previous instrument and there are no plans to alter recorded limits. The approved Preliminary Plat (30-PP-2012) presents a drainage easement for Wash 19A based on the drainage report prepared by Pinnacle Engineering, Inc. during the original case submittal. However, rainfall depth reductions (NOAA14) described in the previous section have lowered the Wash 19A peak discharge well below the 50 cubic foot per second (cfs) threshold requirement for drainage easements in ESLO designated areas. The Final Plat prepared by Bellis Land Services does not include an easement for this watercourse.

A. Existing Hydraulic Modeling

Several curb inlets along Shea Boulevard contribute to both washes crossing the subject parcel. Capacities and flow spread for both 3 and 4 cell inlets were analyzed utilizing FlowMaster v8.0 (see Appendix D). The results demonstrate each curb inlet has sufficient capacity to intercept the calculated 100-year peak discharge for each upstream watershed while maintaining more than one free lane for travel in each direction.

A cross section (located halfway between existing culvert crossings) sampled from recent survey field data was analyzed using FlowMaster v8.0 to determine the Wash 19A onsite high water elevation and corresponding velocity (see Appendix D "Irregular Section Wash 19A" and Figure 6). Manning's Coefficient values were formulated as described in Drainage Design Manual for Maricopa County, Hydraulics - Chapter 7 (Reference 3) and Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona publication (Reference 8) based on pictures taken during the site walk as follows:

Wash 19A

Channel Bottom

All sections are assumed unstable due to moderate levels of sediment transport and lateral migration in the region.

Base Value = 0.025 (median bed material 1.1 mm)

Degree of Irregularity = 0.005 (channel with moderate scour or eroded slopes)

Variation in Channel Cross Section = 0.005 (main wash shifts occasionally from side to side and wash cross sections size changes across site)

Effects of Obstruction = 0.000 (wash bottom has no debris)

Amount of Vegetation = 0.000 (no vegetation present in wash bottom)

Degree of Meandering = 1.00 (minor meandering present)

Total Main Channel Bottom Manning's Coefficient = $0.035 \times 1.00 = 0.035$

Overbank

The overbank for each section was assumed to begin at the transition from the active wash bottom to channel side slopes, which are reflected in the provided hydraulic section.

Base Value = 0.025 (median bed material 1.6 mm)

Degree of Irregularity = 0.005 (channel with moderate scour or eroded slopes)

Variation in Channel Cross Section = 0.005 (main wash shifts occasionally from side to side resulting in changes to slopes in the overbank and wash cross sections size changes across site)

Effects of Obstruction = 0.005 (overbank contains small exposed boulders or rocks)

Amount of Vegetation = 0.010 (significant grasses, shrubs and trees are present within the overbank high water limits)

Degree of Meandering = 1.00 (minor meandering present)

Total Overbank Manning's Coefficient = $0.050 \times 1.00 = 0.050$

V. POST-DEVELOPED ONSITE CONDITIONS

The future improvements will consist of grading, sewer and water mains, streets, curb and gutter, scuppers, detention basin and bleed-off pipe. A single detention basin has been situated to capture runoff from the several natural meandering flowlines crossing the site. As each single-family residence is constructed individual grading and drainage plans will be required to demonstrate historic drainage patterns for the subdivision and region are maintained. All onsite development has been designed to comply with the Drainage Regulations for the Flood Control District of Maricopa County (FCDMC) and the City of Scottsdale Design Standards and Policy Manual (Reference 4).

A. Drainage Structures

Roll curb and gutter will be provided along 131st Street to direct runoff south towards Detention Basin 1 located within Lot 1 (see Figure 6). The approved Preliminary Plat (30-PP-2012) consisted of three basins located in Tracts which have subsequently been eliminated. Limited outfall options, final grade elevations necessary to create 3' deep basins and development impacts on Cochise Manor made the two northern most basins unfeasible. New storm water storage calculations were prepared utilizing a NOAA14 100-year, 2-hour rainfall depth of 2.381 inches (see Appendix C) which is roughly 15% lower than the previously used NOAA2 depths. The provided detention basin on Lot 1 meets 59% of the required

100-year, 2-hour storm water storage volume and the developer is applying for a partial storm water storage waiver. Limited site development and a large NAOS dedication reduced the amount of impervious area typical for a small subdivision. The proposed HEC-1 Model (Appendix C) demonstrates Detention Basin 1 maintains post-development discharges equal or less than pre-development. A 12" HDPE bleed of with a 1.5" diameter orifice plate on the inlet were provided to ensure the basin drains within 36 hours. Percolation test results contained with the Epsilon Engineering & Materials Soils Report dated 5/9/13 show infiltration into the ground will drain the basin regardless of a bleed off pipe. Runoff in excess of the storm water storage volume will exit the detention basin via a riprap lined spillway into Wash 19A prior to the existing 2-30" CMP's beneath Cochise Avenue. Angular native stone riprap has been specified at all scuppers and retention basin emergency overflows to prevent scour and undermining of adjacent improvements.

B. Army Corps of Engineers

The property consists of mostly natural Sonoran desert with two dirt trails crossing the site. A well-defined 6' sandy bottom wash (20A) enters the site along the north boundary as discharge from a 30" storm drain beneath Shea Boulevard. The southeast corner of the site is crossed by a moderately-defined 2.5' wide bottom wash (19A). Several onsite meandering flowlines exist on the project but have limited contributing areas. Neither ordinary high water marks nor clearly defined wash thalwegs are present for all watercourses except Wash 20A. Wash 20A has been modified significantly upstream and downstream from this project, thus no longer resulting in a contiguous wildlife corridor. Based on these factors we believe none of the onsite washes meet the criteria to be defined as "waters of the United States". However, both Washes 19A and 20A will be left in their current state unaltered by future site development. A 404 Certification form has been provided in Appendix E.

C. Storm Water Pollution Prevention Plan

A Storm Water Pollution Prevention Plan was created to define how the onsite washes will be protected from pollutants during site development. This plan will be submitted to ADEQ along with an NOI form (see Appendix F) upon approval of the construction documents and will remain onsite during construction.

VI. CONCLUSIONS

The proposed development is in compliance with the City of Scottsdale design criteria and other required drainage laws. No adverse drainage impacts are expected to either downstream existing properties or drainage ways from the site. The study has determined that:

- All runoff will enter and exit the site in the same manner and location as in pre-development conditions, thereby preserving natural drainage patterns.
- Water surface elevations and velocities were determined for existing conditions using FlowMaster v8.
- USACOE section 404 jurisdictional washes have been determined not to exist on the property and therefore preservation of onsite watercourses will be unnecessary.

VII. REFERENCES

1. United States Department of Agriculture Soil Conservation Service, 1986. Aguila-Carefree Area, Parts of Maricopa and Pinal Counties Soil Survey. Phoenix, Arizona.
2. Flood Control District of Maricopa County, 2009. Drainage Design Manual for Maricopa County, Arizona, Volume 1. Phoenix, Arizona.
3. Flood Control District of Maricopa County, 2009. Drainage Design Manual for Maricopa County, Arizona, Volume 2. Phoenix, Arizona.
4. City of Scottsdale, 2009. City of Scottsdale Design Standards and Policy Manual. Scottsdale, Arizona.
5. Kimley-Horn and Associates, Inc., 2005. Preliminary Drainage Report Mayo Clinic Collaborative Research Community. Phoenix, Arizona.
6. Rick Engineering Company, 2000. Boulder Wash Drainage Report. Phoenix, Arizona.
7. Bentley Systems, 2008. FlowMaster v8.0. USA.
8. United States Geological Survey, 1991. Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona. Phoenix, Arizona.

APPENDIX A

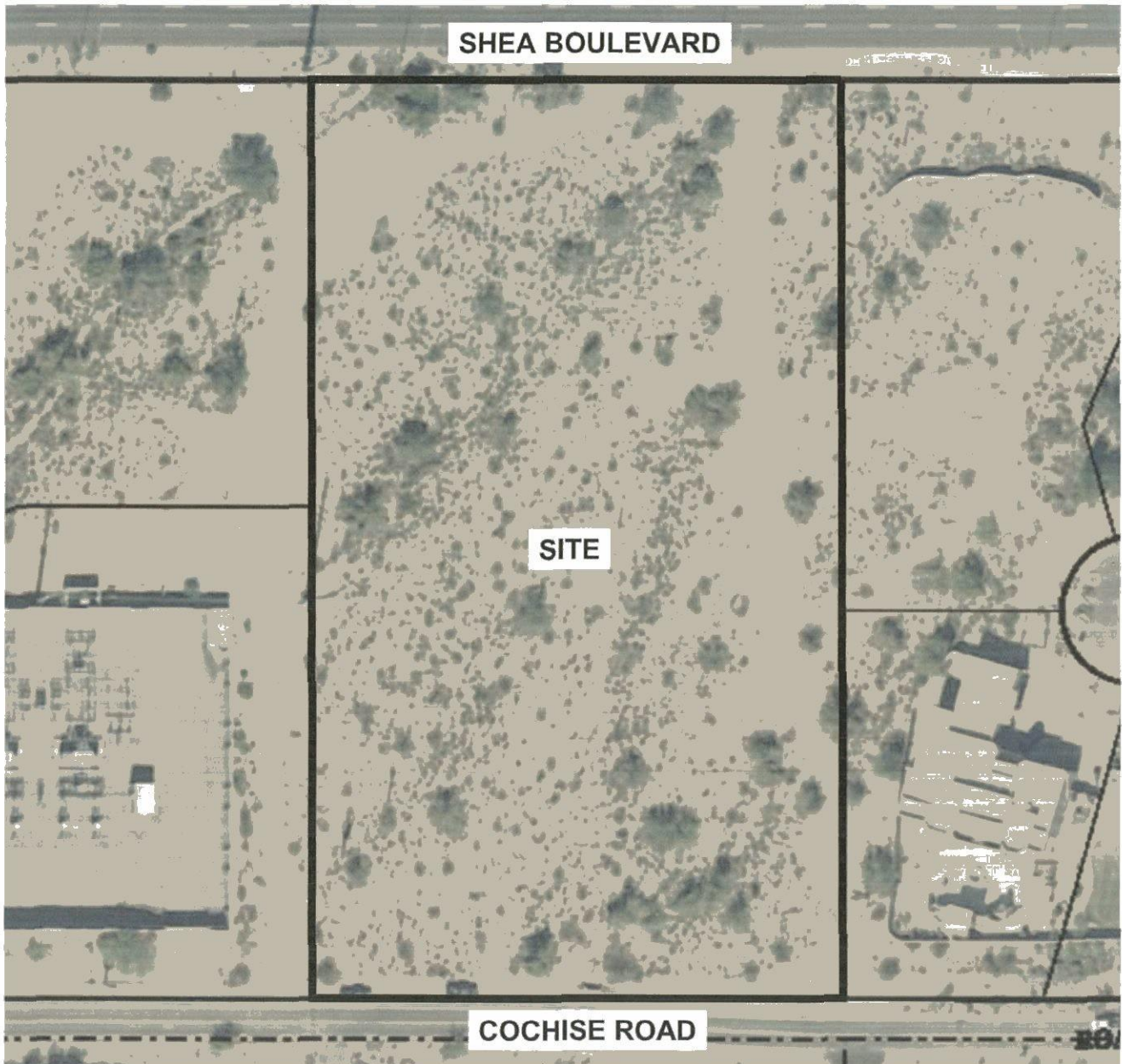
FIGURES

COCHISE MANOR
 13102 E. COCHISE RD - SCOTTSDALE, AZ 85259
 12-PP-2006



SOUTHWEST LAND CONSULTING, P.C. CIVIL ENGINEERING • PLANNING	PMB 132 8711 E PINNACLE PEAK RD SUITE F-211 SCOTTSDALE, AZ 85255	WORK: (480) 585-7521 FAX: (480) 585-7523 WWW.AZSLC.COM	FIGURE 1: VICINITY MAP		
			DATE: 5/24/13	SCALE: 1"=500'	DRAWN BY: RMH

COCHISE MANOR
 13102 E. COCHISE RD - SCOTTSDALE, AZ 85259
 12-PP-2006



SOUTHWEST LAND CONSULTING, P.C.
 CIVIL ENGINEERING • PLANNING

PMB 132
 8711 E PINNACLE PEAK RD
 SUITE F-211
 SCOTTSDALE, AZ 85255
 WORK: [480] 585-7521
 FAX: [480] 585-7523
 WWW.AZSLC.COM

DATE:
5/24/13

FIGURE 2: AERIAL PHOTO

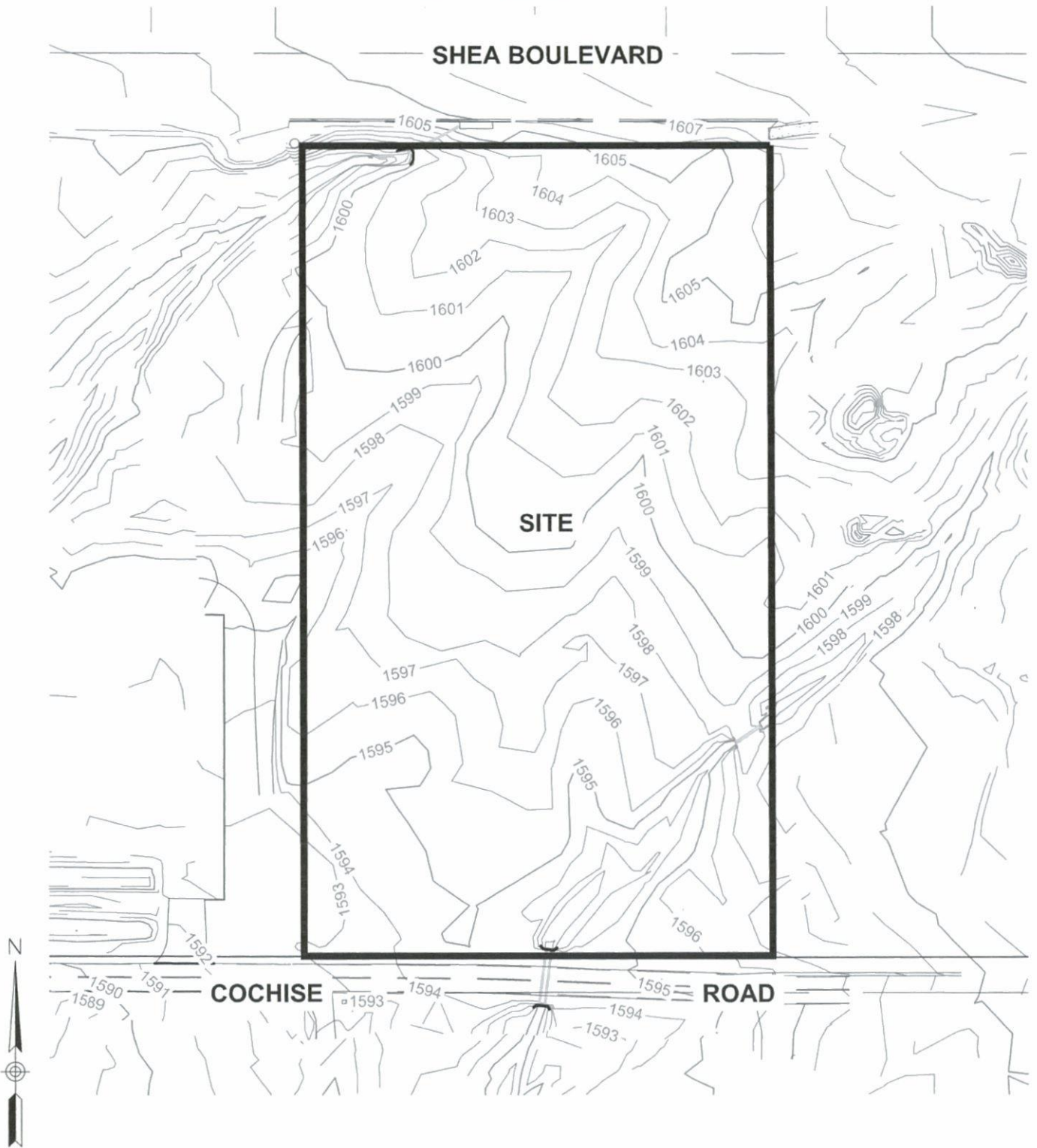
SCALE:
1"=100'

DRAWN BY:
RMH

CHECKED BY:
SAL

JOB NO.
1603

COCHISE MANOR
13102 E. COCHISE RD - SCOTTSDALE, AZ 85259
12-PP-2006



SOUTHWEST LAND CONSULTING, P.C.
 CIVIL ENGINEERING • PLANNING

PMB 132
 8711 E PINNACLE PEAK RD
 SUITE F-211
 SCOTTSDALE, AZ 85255

WORK: (480) 585-7521
 FAX: (480) 585-7523
 WWW.AZSLC.COM

DATE:
 5/24/13

FIGURE 3: FIELD TOPO

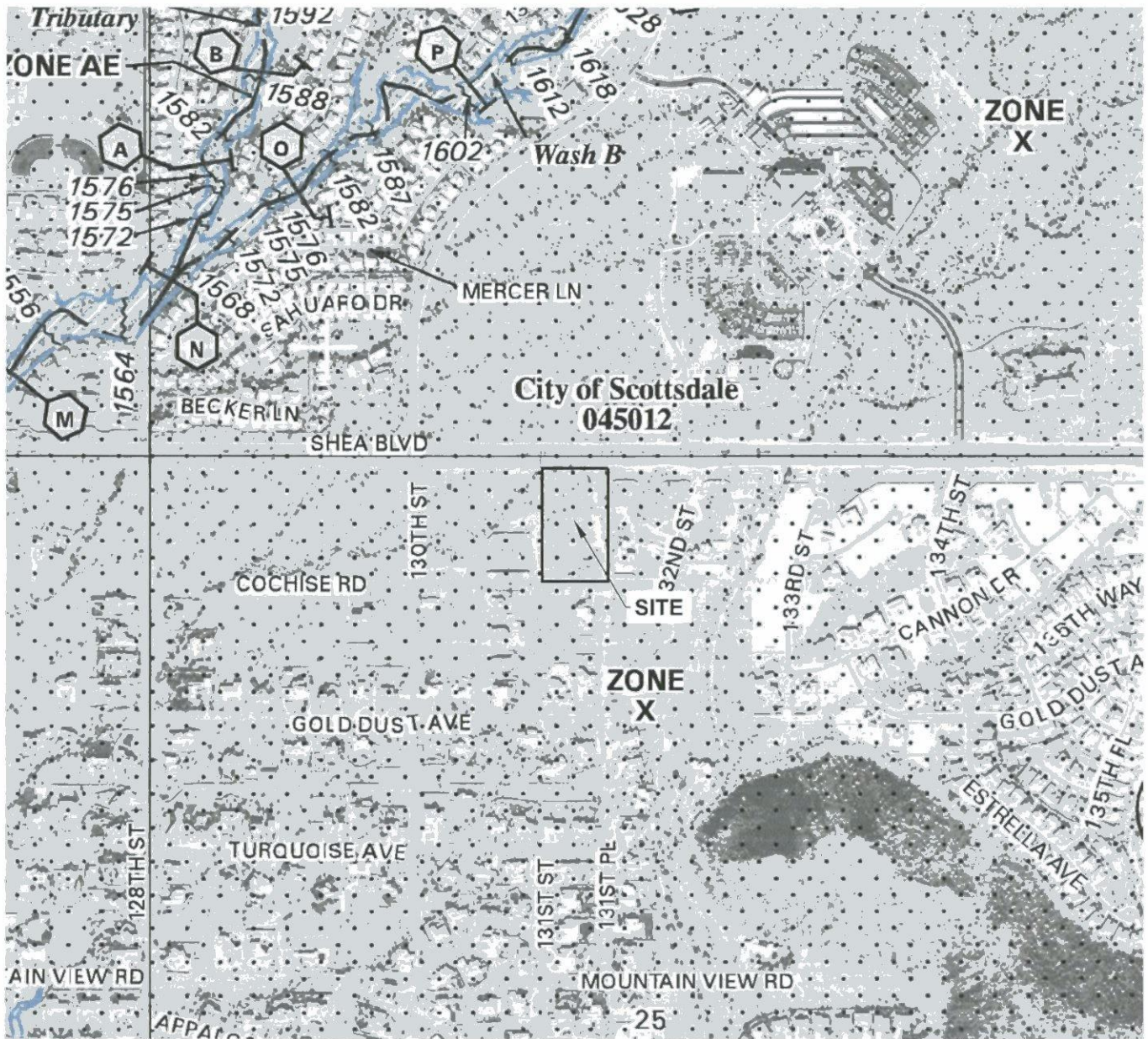
SCALE:
 1"=100'

DRAWN BY:
 RMH

CHECKED BY:
 SAL

JOB NO.
 1603

COCHISE MANOR
13102 E. COCHISE RD - SCOTTSDALE, AZ 85259
12-PP-2006



SOUTHWEST LAND CONSULTING, P.C.
 CIVIL ENGINEERING • PLANNING

PMB 132
 8711 E PINNACLE PEAK RD
 SUITE F-211
 SCOTTSDALE, AZ 85255

WORK: [480] 585-7521
 FAX: [480] 585-7523
 WWW.AZSLC.COM

DATE:
 5/24/13

FIGURE 4: FEMA MAP

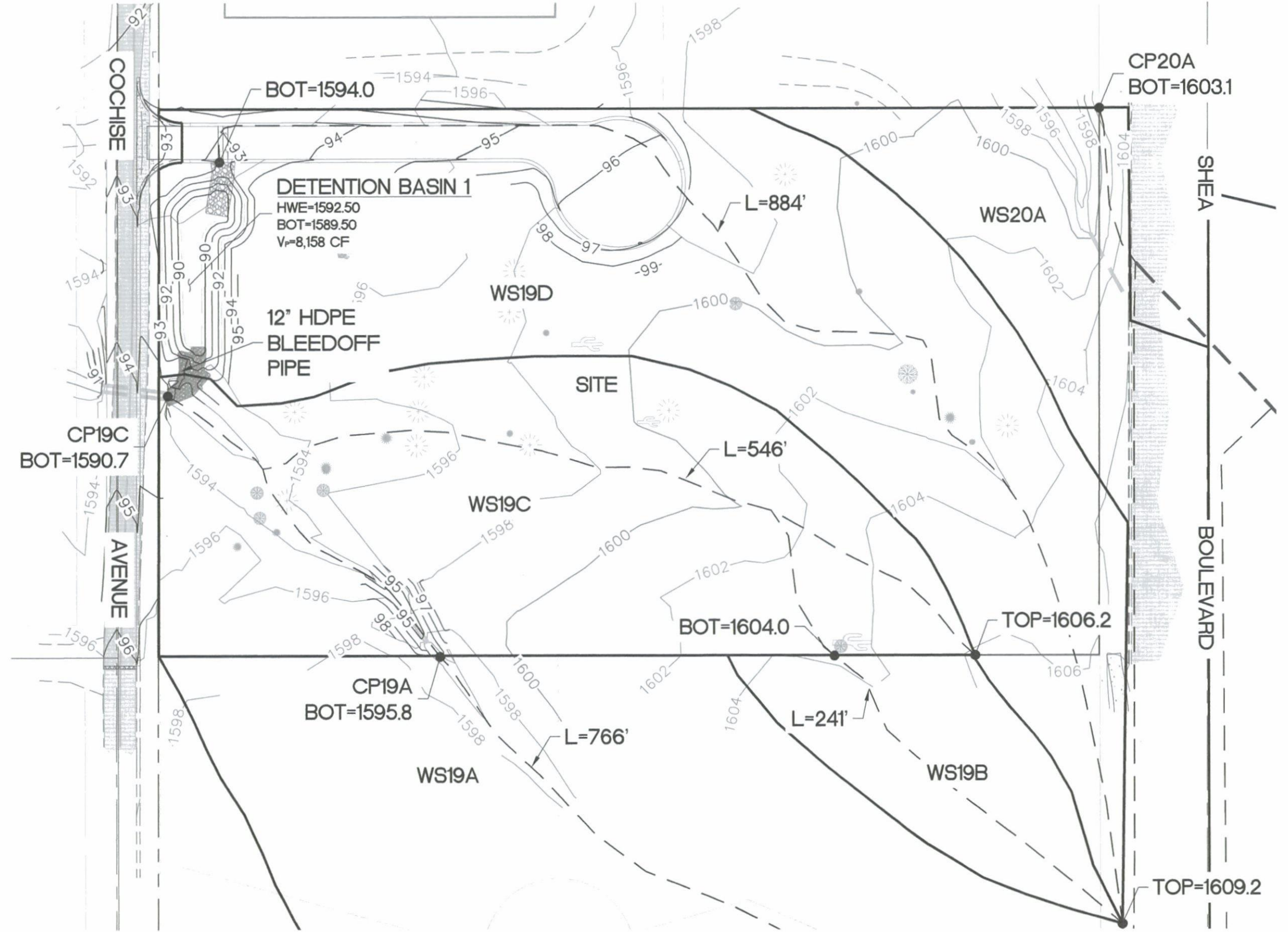
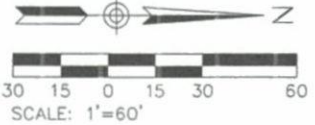
SCALE:
 1"=800'

DRAWN BY:
 RMH

CHECKED BY:
 SAL

JOB NO.
 1603

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DWG. NO.	S/LC PROJ	DATE	SCALE
DM02	1603	5/23/13	1"=60'
SHT. 2 OF 2	DESIGNED: SAL	DRAWN: SAL	APPROVED: SAL
	REV.		

COCHISE MANOR
 COCHISE AVENUE & 131ST STREET
 SCOTTSDALE, AZ 85259
 FIGURE 6: PROPOSED DRAINAGE MAP

SOUTHWEST LAND CONSULTING, P.C.
 CIVIL ENGINEERING • PLANNING

14711 E. FRENCHLE FERN RD
 SUITE 1-311
 SCOTTSDALE, AZ 85258
 PHONE: (480) 985-7923
 FAX: (480) 985-7923
 WWW.SWLAND.COM

APPENDIX B

**EXCERPTS FROM PRELIMINARY DRAINAGE REPORT MAYO
CLINIC BY KIMLEY-HORN & ASSOCIATES, INC.**

APPENDIX C

HYDROLOGIC CALCULATIONS

Proposed Retention Basin Volume							
Basin ID	Top Area (sf)	Top Elev (ft)	Bot Area (sf)	Bot Elev (ft)	Depth (ft)	Volume Provided (cf)	Volume Provided (ac-ft)
1	4,385	1592.50	3,229	1591.5	1	3,792	0.09
	3,229	1591.5	3,448	1591.2	0.3	1,001	0.02
	3,448	1591.2	2,173	1590.5	0.7	1,950	0.04
	2,173	1590.5	1,235	1589.5	1	1,682	0.04
Total						8,426	0.19

***Perc Rate (cf/hr/sf)= 0.430
 Basin bottom area (sf)= 1,235
 ****Basin drain time (hr)= 16

All volumes calculated using the cone frustrum method: $(h/3) \cdot (a1+a2+(a1 \cdot a2)^{0.5})$
 h=depth
 a1=minimum bottom surface area
 a2=maximum top surface area

- * Weighted runoff coefficient assuming partially developed to reflect future conditions
- ** 100-Year, 2-hour rainfall depth based on Maricopa County Drainage Design Manual, Hydrology.
- *** The perc rate is based on data obtained from a Epsilon Engineering & Materials, LLC. dated 5/9/2013.
- **** Basin drain time shown is strictly based on percolation into the ground.

Safety Factor= 1
 Cw= 0.56
 **D= 2.38
 Parcel Area= 128,575 Does not include NAOS area
 Vr= 14,213

Land Use
 Pervious Area (sf) 112,252 0.5
 Impervious Area (sf) 16,324 0.95
 128,575 0.56

EXISTING CONDITIONS HEC-1 MODEL

CITY OF SCOTTSDALE
Drainage Design Management System
RAINFALL DATA
Project Reference: 1603EX

ID	Method	Duration	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
DEFAULT	NOAA14	5 MIN	0.268	0.361	0.433	0.528	0.601	0.675
	NOAA14	10 MIN	0.407	0.550	0.659	0.804	0.915	1.028
	NOAA14	15 MIN	0.505	0.682	0.817	0.996	1.134	1.274
	NOAA14	30 MIN	0.680	0.918	1.099	1.342	1.527	1.715
	NOAA14	1 HOUR	0.841	1.136	1.361	1.660	1.890	2.123
	NOAA14	2 HOUR	0.972	1.293	1.537	1.869	2.121	2.381
	NOAA14	3 HOUR	1.041	1.361	1.614	1.967	2.245	2.536
	NOAA14	6 HOUR	1.236	1.576	1.846	2.216	2.504	2.804
	NOAA14	12 HOUR	1.427	1.798	2.090	2.488	2.793	3.106
	NOAA14	24 HOUR	1.748	2.260	2.670	3.238	3.686	4.154

CITY OF SCOTTSDALE
 Drainage Design Management System
 LAND USE
 Project Reference: 1603EX

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kb
Major Basin ID: 01								
WS19	44	0.009	78.0	0.10	85	75.0	NORMAL	0.034
	UNDEVELOPED	0.003	22.0	0.30	1	30.0	NORMAL	0.068 *
		0.012	100.0					
WS19A	13	0.005	100.0	0.25	24	50.0	NORMAL	0.073 *
			0.005	100.0				
WS19B	13	0.001	100.0	0.25	24	50.0	NORMAL	0.083 *
			0.001	100.0				
WS19C	UNDEVELOPED	0.003	100.0	0.30	1	30.0	NORMAL	0.076 *
			0.003	100.0				
WS19D	UNDEVELOPED	0.002	100.0	0.30	1	30.0	NORMAL	0.079 *
			0.002	100.0				
WS19E	13	0.000	10.0	0.25	24	50.0	NORMAL	0.079 *
	UNDEVELOPED	0.002	90.0	0.30	1	30.0	NORMAL	0.079 *
		0.002	100.0					
WS20	22	0.002	8.8	0.10	85	75.0	NORMAL	0.032
	44	0.012	45.8	0.10	85	75.0	NORMAL	0.032
	UNDEVELOPED	0.011	45.4	0.30	1	30.0	NORMAL	0.063 *
		0.025	100.0					
WS20A	22	0.002	70.0	0.10	85	75.0	NORMAL	0.038
	UNDEVELOPED	0.001	30.0	0.30	1	30.0	NORMAL	0.076 *
		0.003	100.0					

* Non default value

CITY OF SCOTTSDALE
 Drainage Design Management System
 SOILS
 Project Reference: 1603EX

Area ID	Book Number	Map Unit	Soil ID	Area (sq mi)	Area (%)	XKSAT	Rock Percent (%)	Effective Rock (%)
Major Basin ID: 01								
WS19	645	68	64568	0.012	50.00	0.63	-	100
	645	68	64568	0.012	50.00	0.63	-	100
WS19A	645	68	64568	0.005	100.00	0.63	-	100
WS19B	645	68	64568	0.001	100.00	0.63	-	100
WS19C	645	68	64568	0.003	100.00	0.63	-	100
WS19D	645	68	64568	0.002	100.00	0.63	-	100
WS19E	645	68	64568	0.002	100.00	0.63	-	100
WS20	645	68	64568	0.025	100.00	0.63	-	100
WS20A	645	68	64568	0.003	100.00	0.63	-	100

CITY OF SCOTTSDALE
 Drainage Design Management System
 HEC-1 FLOW SUMMARY
 Project Reference: 1603EX

ID	Type	Area (sq mi)	Discharge cfs					
			2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin 01								
WS19	Hydrograph	0.010	7	10	13	17	20	23
RCP19	Routed	0.010	7	10	13	17	20	23
RRCP19	Routed	0.010	7	10	12	16	20	23
WS19A	Hydrograph		1	2	3	4	5	7
CP19A	Combined	0.020	8	11	15	20	25	29
RCP19A	Routed	0.020	8	11	15	20	24	29
WS19B	Hydrograph				1	1	1	2
RWS19	Routed				1	1	1	2
WS19C	Hydrograph			1	1	2	3	3
CP19C	Combined	0.020	8	12	16	23	28	34
WS19D	Hydrograph				1	1	2	2
WS19E	Hydrograph				1	1	1	2
WS20	Hydrograph	0.030	9	13	18	25	31	37
RCP20	Routed	0.030	9	13	18	25	31	37
WS20A	Hydrograph		1	1	1	2	2	3
CP20A	Combined	0.030	9	14	19	27	33	40

PROPOSED CONDITIONS HEC-1 MODEL

CITY OF SCOTTSDALE
 Drainage Design Management System
 LAND USE
 Project Reference: 1603PR

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kb
Major Basin ID: 01								
WS19	44	0.009	78.0	0.10	85	75.0	NORMAL	0.034
	UNDEVELOPED	0.003	22.0	0.30	1	30.0	NORMAL	0.068 *
		0.012	100.0					
WS19A	13	0.005	100.0	0.25	24	50.0	NORMAL	0.073 *
		0.005	100.0					
WS19B	13	0.001	100.0	0.25	24	50.0	NORMAL	0.083 *
		0.001	100.0					
WS19C	13	0.002	61.5	0.25	24	50.0	NORMAL	0.076 *
	UNDEVELOPED	0.001	38.5	0.30	1	30.0	NORMAL	0.076 *
		0.003	100.0					
WS19D	13	0.002	64.9	0.25	24	50.0	NORMAL	0.074 *
	22	0.000	10.8	0.10	85	75.0	NORMAL	0.037
	UNDEVELOPED	0.001	24.3	0.30	1	30.0	NORMAL	0.074 *
		0.004	100.0					
WS20	22	0.002	8.8	0.10	85	75.0	NORMAL	0.032
	44	0.012	45.8	0.10	85	75.0	NORMAL	0.032
	UNDEVELOPED	0.011	45.4	0.30	1	30.0	NORMAL	0.063 *
		0.025	100.0					
WS20A	13	0.000	10.3	0.25	24	50.0	NORMAL	0.076 *
	22	0.002	72.4	0.10	85	75.0	NORMAL	0.038
	UNDEVELOPED	0.001	17.2	0.30	1	30.0	NORMAL	0.076 *
		0.003	99.9					

* Non default value

CITY OF SCOTTSDALE
 Drainage Design Management System
 SOILS

Area ID	Book Number	Map Unit	Soil ID	Area (sq mi)	Area (%)	XKSAT	Rock Percent (%)	Effective Rock (%)
Major Basin ID: 01								
WS19	645	68	64568	0.012	100.00	0.63	-	100
WS19A	645	68	64568	0.005	100.00	0.63	-	100
WS19B	645	68	64568	0.001	100.00	0.63	-	100
WS19C	645	68	64568	0.003	100.00	0.63	-	100
WS19D	645	68	64568	0.004	100.00	0.63	-	100
WS20	645	68	64568	0.025	100.00	0.63	-	100
WS20A	645	68	64568	0.003	100.00	0.63	-	100

CITY OF SCOTTSDALE
 Drainage Design Management System
 HEC-1 STORAGE FACILITIES
 Project Reference: 1603PR

Storage Basin ID: RET19D		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Elevation Top of Dam:	-NA-	Volume (ac-ft)	0.04	0.08	0.10	0.19	0.28				
Length of Dam:	-NA-	Discharge (cfs)			-	-	9				
Discharge Coefficient:	-NA-	Elevation (ft)	1,589.5	1,590.5	1,591.2	1,591.5	1,592.5	1,593.2	-	-	-
Weir Coefficient:	-NA-										
		<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>
		Volume (ac-ft)	-	-	-	-	-	-	-	-	-
		Discharge (cfs)	-	-	-	-	-	-	-	-	-
		Elevation (ft)	-	-	-	-	-	-	-	-	-
		<u>2 Year</u>	<u>5 Year</u>	<u>10 Year</u>	<u>25 Year</u>	<u>50 Year</u>	<u>100 Year</u>				
		Peak Volume (ac-ft)	0.07	0.11	0.15	0.20	0.20	0.20			
		Peak Stage (ft)	1,591.03	1,591.61	1,592.06	1,592.58	1,592.57	1,592.57			

CITY OF SCOTTSDALE
 Drainage Design Management System
 HEC-1 FLOW SUMMARY
 Project Reference: 1603PR

ID	Type	Area (sq mi)	Discharge cfs					
			2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin 01								
WS19	Hydrograph	0.010	7	10	13	17	20	23
RCP19	Routed	0.010	7	10	13	17	20	23
RRCP19	Routed	0.010	7	10	12	16	20	23
WS19A	Hydrograph		1	2	3	4	5	7
CP19A	Combined	0.020	8	11	15	20	25	29
RCP19A	Routed	0.020	8	11	15	20	24	29
WS19B	Hydrograph				1	1	1	2
RW19B	Routed				1	1	1	2
WS19C	Hydrograph			1	2	3	3	4
WS19D	Hydrograph		1	1	2	3	3	4
RET19D	Routed						1	1
CP19C	Combined	0.030	8	12	17	24	29	35
WS20	Hydrograph	0.030	9	13	18	25	31	37
RCP20	Routed	0.030	9	13	18	25	31	37
WS20A	Hydrograph		1	1	2	2	2	3
CP20A	Combined	0.030	10	14	19	27	33	40

APPENDIX D

HYDRAULIC CALCULATIONS

Shea Gutter Capacity (1603.fm8) Report

Label	Solve For	Channel Slope (ft/ft)	Discharge (ft ³ /s)	Gutter Width (ft)	Gutter Cross Slope (ft/ft)
Shea Gutter Capacity	Discharge	0.01100	16.53	1.41	0.06

Road Cross Slope (ft/ft)	Spread (ft)	Manning Coefficient	Flow Area (ft ²)	Depth (ft)	Gutter Depression (ft)	Velocity (ft/s)
0.03	16.50	0.016	3.77	0.50	0.04	4.38

Southwest Land Consulting, P.C.

Bentley Systems, Inc. Haestad Methods Solution Center

Bentley FlowMaster V8i (SELECTseries 1) [08.11.01.03]

9/17/2012 11:23:58 PM

27 Silmons Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666

Page 1 of 1

Shea Curb Inlets In Sag (1603.fm8) Report

Label	Solve For	Discharge (ft ³ /s)	Spread (ft)	Gutter Width (ft)	Gutter Cross Slope (ft/ft)
Shea 4-Cell Curb Inlet	Spread	45.00	12.49	1.41	0.06
Shea 3-Cell Curb Inlet	Spread	35.30	12.04	1.41	0.06

Road Cross Slope (ft/ft)	Curb Opening Length (ft)	Opening Height (ft)	Curb Throat Type	Local Depression (in)	Local Depression Width (ft)	Throat Incline Angle (degrees)
0.03	25.50	0.42	Horizontal	2.00	22.00	90.00
0.03	20.00	0.42	Horizontal	2.00	16.50	90.00

Depth (ft)	Gutter Depression (ft)	Total Depression (ft)
0.66	0.04	0.21
0.66	0.04	0.21

Irregular Section Wash 19A (1603.fm8) Report

Label	Solve For	Friction Method	Roughness Coefficient	Channel Slope (ft/ft)	Water Surface Elevation (ft)
Wash 19A	Normal Depth	Manning Formula	0.047	0.02610	1594.69

Elevation Range	Discharge (ft ³ /s)	Flow Area (ft ²)	Wetted Perimeter (ft)	Hydraulic Radius (ft)	Top Width (ft)	Normal Depth (ft)
1593.71 to 1595.00 ft	31.00	9.86	20.70	0.48	20.57	0.98

Critical Depth (ft)	Critical Slope (ft/ft)	Velocity (ft/s)	Velocity Head (ft)	Specific Energy (ft)	Froude Number	Flow Type
0.89	0.04174	3.14	0.15	1.13	0.80	Subcritical

Southwest Land Consulting, P.C.

Bentley Systems, Inc. Haestad Methods Solution Center

Bentley FlowMaster V8i (SELECTseries 1) [08.11.01.03]

9/17/2012 11:31:22 PM

27 Siemons Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666

Page 1 of 1

APPENDIX E

**404 CERTIFICATION FORM
WARNING & DISCLAIMER OF LIABILITY**



Section 404 Certification

Before the City issues development permits for a project, the developer's Engineer or the property owner must certify that it complies with, or is exempt from, Section 404 of the Clean Water Act of the United States. Section 404, administered by the U.S. Army Corps of Engineers (COE), regulates the discharge of dredged or fill material into a wetland, lake, (including dry lakes), river, stream (including intermittent streams, ephemeral washes, and arroyos), or other waters of the United States.

Prior to submittal of improvement plans to Project Review the form below must be completed (and submitted with the improvement plans) as evidence of compliance

Certification of Section 404 Permit Status

Owner's Name: Intravest Development, LLC Phone No. (623) 521-6899

Project Name/Description: Cochise Manor Case No. _____

Project Location/Address: 13102 East Cochise Avenue, Scottsdale, AZ

A registered Engineer or the property Owner must check the applicable condition and certify by signing below that:

1. Section 404 does apply to the project because there will be a discharge of dredged or fill material to waters of the U.S., and:

- A Section 404 Permit has already been obtained for this project.
- or-
- This project qualifies for a "Nationwide Permit," and this project will meet all terms and conditions of the applicable nationwide permit.

2. Section 404 does not apply to the project because:

- No watercourses or other waters of the U.S. exist on the property.
- No jurisdictional waters of the U.S. exist on the property. Attached is a copy of the COE's Jurisdictional Determination.
- Watercourses or other waters of the U.S. do exist on the property, but the project will not involve the discharge of dredged or fill material into any of these waters.

I certify that the above statement is true.

Engineer's Signature and Seal, or Owner's Signature
President - Southwest Land Consulting, P.C.

Title Company



Planning & Development Services Department

7447 E Indian School Road, Suite 100, Scottsdale, AZ 85251 • Phone: 480-312-2500 • Fax: 480-312-7088



WARNING & DISCLAIMER OF LIABILITY

The Drainage and Floodplain Regulations and Ordinances of the City of Scottsdale are intended to "minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding caused by the surface runoff of rainfall" (Scottsdale Revised Code §37-16).

As defined in S.R.C. §37-17, a flood plain or "*Special flood hazard* area means an area having flood and/or flood related erosion hazards as shown on a FHBM or FIRM as zone A, AO, A1-30, AE, A99, AH, or E, and those areas identified as such by the floodplain administrator, delineated in accordance with subsection 37-18(b) and adopted by the floodplain board." It is possible that a property could be inundated by greater frequency flood events or by a flood greater in magnitude than a 100-year flood. Additionally, much of the Scottsdale area is a dynamic flood area; that is, the floodplains may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY PURSUANT TO S.R.C §37-22

"The degree of flood protection provided by the requirements in this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by man-made or natural causes. This article (Chapter 37, Article II) shall not create liability on the part of the city, any officer or employee thereof, or the federal government for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder."

Compliance with Drainage and Floodplain Regulations and Ordinances does not insure complete protection from flooding. The Floodplain Regulations and Ordinances meet established local and federal standards for floodplain management, but neither this review nor the Regulations and Ordinances take into account such flood related problems as natural erosion, streambed meander or man-made obstructions and diversions, all of which may have an adverse affect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

I have read and understand the above. If I am an agent for an owner I have made the owner aware of and explained this disclaimer.

Plan Check No.

Owner or Agent

Date

APPENDIX F

NOI FORM



NOTICE OF INTENT (NOI)

for Construction Activity Discharges

to Waters of the United States under the
AZPDES Stormwater Construction General Permit
(AZG2008-001)

FOR COVERAGE, A COMPLETE AND ACCURATE NOI (INCLUDING REQUIRED FEE) MUST BE SUBMITTED TO:
Arizona Department of Environmental Quality, Surface Water Section / Stormwater and General Permits Unit
1110 West Washington Street, 5415A-1, Phoenix, Arizona 85007

Is this NOI a revision to a project filed under the 2008 AZPDES Stormwater Construction
General Permit? YES NO If Yes, complete the following:

- > Provide your current authorization number: AZCON - _____
- > Provide the name of the project / site in Part II below. You do not need to complete the entire form. Provide only the information that is being changed from the original NOI.
- > Complete the certification in Part VI (including signature of authorized signer).

Is the site located on Indian
Country Lands?

YES NO

I. OPERATOR (Applicant) INFORMATION:

- > Contact Name: Mason Cave
- > Phone Number: (623) 521-6899 Fax Number: _____
- > Operator's Business Name: Intravest Development, L.L.C.
- > Operator's Mailing Address: 5830 W. Thunderbird Rd., Suite 88
- > City: Glendale State: AZ Zip Code: 85036
- > Business Status: Federal: State: Other Public: Private:

II. CONSTRUCTION SITE INFORMATION:

- > Project/Site Name: Cochise Manor
- > County Parcel No. (at main entrance): 217-31-010 Phone Number: _____
- > Type of Project (subdivision, commercial, road, pipeline, utility, ADOT project, etc.): Subdivision
If a subdivision, has state or local subdivision approval been obtained? YES NO
If yes, provide the Subdivision Certificate of Approval Number: _____
- > Is the project part of a larger common plan of development? YES NO

II. CONSTRUCTION SITE INFORMATION (continued)

- Does the project have/need other environmental permits or approvals? If so, list them and provide the permit/approval number for each: No

- Site physical location (Provide address. If no address, provide driving directions from nearest municipality):
13102 E. Cochise Ave.

- City: Scottsdale State: AZ Zip Code: 85259 County: Maricopa

- Estimated Project Start Date: 10/01/2013 Estimated Project Completion Date: 01/01/2014
Month/Day/Year Month/Day/Year

- Estimate of total acres (to nearest whole acre) to be disturbed by the entire construction activity: 1

- Estimate of total acres (to nearest whole acre, round up if < 1) to be disturbed by your operations: 1

➤ **Select the non-stormwater discharges expected to be associated with your construction-related activities:**

- None
- Discharges from emergency fire-fighting activities
- Fire hydrant flushing – ephemeral receiving waters only
- Waters used to control dust – no reclaimed or other wastewaters
- Potable waterline flushing – ephemeral receiving waters only
- Routine external building wash down (no detergents)
- Pavement wash waters – no spills or leaks of toxic or hazardous materials and no detergents
- Uncontaminated air conditioning or compressor condensate
- Uncontaminated groundwater

- Foundation or footing drains – uncontaminated
- Potable water well flushing – ephemeral receiving waters only
- Waters used for compacting soil – no reclaimed or other wastewaters
- Water used for drilling and coring (e.g., for evaluation of foundation materials) uncontaminated
- Uncontaminated water from dewatering operations or foundations
- Other (specify) _____
- _____
- _____

V. FEES

I confirm that the correct fee payment is included with the NOI:

Less than or equal to 1 acre: \$250.00 *

Greater than 1 acre, but less than or equal to 50 acres: \$350.00

Greater than 50 acres: \$500.00

Review of SWPPP by ADEQ, if required (see section IV above): add \$1,000.00

Total fee payment included: \$ 350.00

No fee is required. The signer below represents an Arizona state agency (exempt from AZPDES fees).

No fee is required. This is an amendment of an NOI previously filed under the 2008 Stormwater Construction General Permit, for which the fee was paid or not required.

* (If the project will disturb less than one acre, Stormwater Construction General Permit coverage is required only if the project is part of a larger common plan of development or sale that will ultimately disturb one acre or more.)

VI. CERTIFICATION BY AUTHORIZED SIGNATORY (see Part VIII.J.1 of the General Permit for requirements)

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision, in accordance with a system designed to ensure that qualified personnel gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or those persons directly responsible for gathering the information, I believe the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. In addition, as the operator, I certify that I have reviewed and will comply with all the terms and conditions stipulated in the Stormwater Construction General Permit (AZG2008-001)."

➤ Printed Name: _____ Title: _____

➤ Signature: _____ Date: _____

➤ Business Name: _____

➤ Address: _____

➤ City: _____ State: _____ Zip Code: _____ Phone: _____

FINAL DRAINAGE REPORT

FOR

COCHISE MANOR

(30-PP-2012, COS #5209-12)

(PARCEL 217-31-010)

SCOTTSDALE, ARIZONA

Prepared for:
INTRAVEST DEVELOPMENT, LLC
5830 West Thunderbird Road, Suite B8
Glendale, AZ 85306

Prepared by:
SOUTHWEST LAND CONSULTING, P.C.
8701 East Vista Bonita Drive, Suite 210
Scottsdale, Arizona 85255
(480) 585-7521



July 2013
SLC Project No. 1603

149-SA-2013
2nd submittal
7-19-2013



8701 E. Vista Bonita Drive
Suite 210
Scottsdale, AZ 85255

Ph: (480) 585-7521
Fax: (480) 585-7523
Website: www.azslc.com

July 18, 2013

City of Scottsdale Stormwater Management Division
7447 East Indian School Road, Suite 125
Scottsdale, AZ 85251

Attn: Don Gerkin, P.E., CFM

Re: Drainage review comments for the case drainage report for Cochise Manor, 131st and Cochise prepared by Southwest Land Consulting, sealed on 24MAY2013. COS case no. 30-PP-2012 6/5/2013 DG

Dear Mr. Gerkin:

This correspondence is a written response to your drainage review comments dated 6/5/13. The content to follow describes how each comment was addressed.

1. The drainage report now contains all of the elements required by the city's DSPM Chapter 4 but not necessarily in the exact structure.
2. The pre-development drainage exhibit has been modified to a full size, 24"x36" drawing as requested. Five foot contours were labeled 100 feet beyond the property lines on the previous submittal. Pre-development Q10 and Q100 flow rates were added to Figure 5 for each historical runoff entry and exit location. Existing drainage structures (curb inlets, culverts, etc.) and onsite easements are presented on drainage map and labeled. Flow lines for all wash bottoms and concentration points were present on the previous submittal. The 100-year, 6-hour limits of inundation are not shown because none of the site's washes have a flow rate greater than 50 cfs. See the revised pre-development drainage map (DM01) located in the first pocket folder of the Drainage Report.
3. The post-development drainage exhibit has been modified to a full size, 24"x36" drawing as requested. Five foot contours were labeled 100 feet beyond the property lines on the previous submittal. Pre and Post-development Q10 and Q100 flow rates were added to Figure 5 for each historical runoff entry and exit location. Existing/proposed drainage structures (curb inlets, culverts, etc.) and onsite easements are presented on drainage map and labeled. Flow lines for all wash bottoms, concentration points with labels and storm water storage detention basin with high water limits were shown on the previous submittal. Limits of inundation for the 100-year, 6-hour are not shown because none of the site's washes have a flow rate greater than 50 cfs. See the revised post-development drainage map (DM02) located in the first pocket folder of the Drainage Report.
4. The pre and post Q10 and Q100 are now provided at each entry/exit runoff concentration point for all drainage basins on both G&D sheets (GD04 and GD05). Additionally, these

8701 E. Vista Bonita Drive
Suite 210
Scottsdale, AZ 85255

Ph: (480) 585-7521
Fax: (480) 585-7523
Website: www.azslc.com

- peak discharges have been added to both pre and post-development drainage maps (DM01 and DM02). See all sheets in the pocket folders at the back of the Drainage Report.
5. A SWPPP was created to address total disturbed area listed on the cover sheet and limits shown on sheet SWP02. Half sized copies of the SWPPP can be found in Appendix F of the Drainage Report.
 6. A Notice of Intent (NOI) has been prepared and a Stormwater Pollution Prevention Plan (SWPPP) has created as described above. Once a contractor has been selected to perform the work the NOI will be signed. The final NOI will be submitted to ADEQ to obtain an Authorization To Discharge permit (ADT) and 2 copies of the NOI and SWPPP will be included with the Improvement Plans submittal to the City of Scottsdale. Copies of both the NOI and SWPPP can be found in Appendix F of the Drainage Report.
 7. Arrows have been added to supplement flow lines shown on the first submittal post-development drainage map (DM02) for demonstrating how onsite runoff will get to the detention basin/pervious areas. Drainage sub areas boundaries were thickened to stand out more on both drainage maps. All grade breaks have been provided on the G&D plans (GD04 and GD05) as a dashed line with diamond symbol. A table containing required/provided storm water storage volume in each drainage sub area, ultimate catchment, which detention basin the runoff from each sub area drains to and the percentage runoff contributed from each drainage sub area to a specific detention basin was added to the top of the post-development drainage map. Runoff from sub basins WS19C and WS20A are not stored in basins thus watershed WS19D is the only sub area draining to a storm water storage facility. Revised pre and post-development drainage maps (DM01 and DM02) along with Grading and Drainage Plans (GD04 and GD05) can be found in the pocket folders of the drainage report.
 8. FlowMaster was utilized to calculate bleed off rates for the detention basin at various elevations up to and including high water elevation. A 12" diameter bleed off pipe (6" orifice plate inserted into inlet) along with percolation into the ground ensures the basin drains in 12 hours. Drain time calculations can be in the Proposed Detention Basin Volume spreadsheet found in Appendix C of the Drainage Report and FlowMaster Orifice Output is located in Appendix D of the Drainage Report. Discharge through the slotted, broad crested weir per elevation was calculated using a spreadsheet which can be found in Appendix D of the Drainage Report.
 9. The "Warning and Disclaimer of Liability" form has been completed, signed and dated and can be found in Appendix E of the Drainage Report.
 10. Ashley Couch authorized Detention Basin 1 to be placed in a drainage easement instead of a tract since the subdivision consists of less than 6 lots.
 11. Copies of the Drainage Report, Preliminary Plat, Landscape Plans, Native Plant Salvage Inventory and SWPPP/NOI in PDF format with the firm's name, project title, date, and City of Scottsdale Plan Check Number has been provided on a compact disk (CD) in pocket folder.
 12. Executable files for DDMSW HEC-1 (pre and post-development), Culvert Master, and Flowmaster have been placed on a CD and provided with the report in a pocket folder.

SOUTHWEST LAND CONSULTING, P.C.
CIVIL ENGINEERING ◦ PLANNING

8701 E. Vista Bonita Drive
Suite 210
Scottsdale, AZ 85255

Ph: (480) 585-7521
Fax: (480) 585-7523
Website: www.azslc.com

I trust the revised plans along with this correspondence are more than sufficient to address your comments and/or concerns. If you have any questions you may reach me at (480) 585-7521 or slorentzen@azslc.com.

Sincerely,

Scott Lorentzen, P.E.



**FINAL DRAINAGE REPORT
FOR
COCHISE MANOR**

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I. INTRODUCTION

This project is an undeveloped 4.51-acre parcel in North Scottsdale near the intersection of Shea Boulevard and 130th Street (see Vicinity Map, Figure 1). An existing single-family residence lies to the southeast (Lot 5 Boulder Wash), Shea Boulevard forms the north boundary, Cochise Road is situated to the south, an existing APS sub-station to the southwest and undeveloped natural desert makes up the remaining sides. Analysis of existing conditions and recommendations for improvements are specified within this report.

The region consists of low-density, single-family residential and office medical development surrounded by Sonoran Desert rangeland with typical vegetation densities and meandering ephemeral washes sloping to the southwest at a gradient of approximately 3.88%. Soils in the region are "B", per the Aguila-Carefree Area, Parts of Maricopa and Pinal Counties Soil Survey (Reference 1), which have high percolation rates resulting in lesser runoff during storm events. Based on a field walk, an aerial photo and current topography (see Figures 2 and 3) one defined conveyance corridor will be affected by the proposed onsite development.

All onsite modifications have been designed to comply with the Drainage Regulations for the Flood Control District of Maricopa County (FCDMC) and the City of Scottsdale's Design Standards and Policies Manual (References 2, 3 and 4) while maintaining the existing drainage patterns in the region.

II. FLOOD PLAIN DESIGNATION

The site is located within a region where flood studies have been adopted and FEMA Flood Insurance Rate Maps (FIRM) have been printed. This project falls within Zone "X" (shaded) as shown on FEMA Flood Insurance Rate Map 04013C1710F dated 9/30/05 (see FEMA Map, Figure 4). Flood Zone "X" is defined as follows:

"Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood."

III. OFFSITE DRAINAGE

Multiple drainage reports previously completed for properties in the region were reviewed and used as a basis for the preliminary drainage design presented within this report (see References 5 and 6). Historically, washes in the area originate in the foothills of the McDowell Mountains and meander southwest towards the Central Arizona Project (CAP) canal. Drainage improvements have been constructed in the upstream contributing area as part of the Mayo Clinic Collaborative Research Community and Shea Boulevard Infrastructure. Runoff generated from impervious areas such as office buildings, parking and hardscape within the developments are intercepted by a combination of curb catch basin inlets, storm drain grates, curb openings and natural washes. Shea Boulevard is a crowned roadway consisting of 3 lanes for both east and west

bound travel separated by a landscape median. Vertical curb and gutter on both sides of the main arterial direct storm water towards numerous curb inlets strategically placed along the street. Storm drains beneath Shea Boulevard convey runoff from north of the roadway along with discharge from the aforementioned curb inlets. Current drainage patterns impacting Cochise Manor are depicted on Figure 5. Contributing watersheds were delineated based on City of Scottsdale ¼ Section Flown Aerial Topography, Mayo Clinic drainage studies/plans (Reference 5 and Appendix B – Figures 4 and 5) and a field walk. Cochise Manor has four curb inlets (one 3-cell adjacent to project and one 4-cell to the east located on each side of the street) along Shea Boulevard and two 30" CMP storm drains (CP19 and CP20) that direct offsite flow onto or towards the project. Curb inlets will be described in greater detail within the following section. Concentration Point CP19 is conveyed through the Boulder Wash Subdivision within a defined wash and into Cochise Manor along the east boundary. Concentration Point 20 discharges onto the northwest corner of the site via a 30" CMP (smooth lined) storm drain beneath Shea Boulevard and exits soon after along the west property line. The remaining offsite flow enters the site as sheet flow originating less than 200' east of the property. Due to the multiple culvert crossings, mixed use developments, street curb inlets and necessary routing the Rational Method cannot be used to determine peak discharges. Therefore, 100-year, 6-hour peak discharges for all drainage areas impacting the site were calculated using a HEC-1 Model analysis in conjunction with the Drainage Design Management System (DDMS) software provided by the Flood Control District of Maricopa County (see Appendix C). The Flood Control District of Maricopa County recently adopted NOAA14 for determination of rainfall depths and this data resulted in roughly 15% runoff reduction from previous studies using NOAA2. At a minimum each development was represented as a separate sub-basin so altered drainage patterns could be accounted for. Neither storm water storage facilities within the upstream developed areas nor attenuate at culvert inlets were considered as part of this analysis. However, further refinement of the HEC-1 model will continue during the Final Drainage Report preparation corresponding with construction documents. The upstream contributing areas for this project are R1-43 single-family residential and C-O SC commercial surrounded by Sonoran Desert hill slopes. However, the area does not exhibit the usual characteristics of residential zoning types in other portions of the Phoenix Metro region. Lots average 1.0 acres, roads consist of a narrow rural paved section and natural desert has been abundantly maintained on each lot. Selection of a Runoff Coefficient and kb factor for this development density and type of terrain does not equate to the default values within the DDMS program. Therefore Land Uses 13 (1-2 dwelling units per acre) and UNDEVELOPED (natural desert for NAOS areas) with low kb factors were selected to demonstrate the limited watershed development, and to indicate an elevated resistance to flow. Commercial and paved areas in the contributing watersheds were represented by Land Uses 22 (General Commercial) and 44 (Cultural/Institutional), respectively with minimum kb factors indicating limited resistance to flow. Weighted runoff coefficients were calculated utilizing DDMS based on the land use contained in each watershed (see Land Use worksheets for existing and proposed HEC-1 models in Appendix C).

IV. PRE-DEVELOPMENT ONSITE CONDITIONS

The land consists of natural Sonoran Desert with typical vegetation except two dirt trails crossing the northwest corner and roughly parallel with the eastern boundary. When the east trail was constructed 2-18" culverts were installed beneath the trail for conveyance of offsite Wash 19A. Improvements for Cochise Avenue included 2-30" storm drains beneath the roadway for the same watercourse. A field walk was conducted to verify the drainage information revealed by an aerial photo and recently completed as-built survey (see Figures 2 and 3). It was confirmed the two main washes will be left in their natural condition and unaffected by the future onsite development as depicted in the Grading and Drainage Plans (see Figure 6). A drainage easement for Wash 20A was dedicated under previous instrument and there are no plans to alter recorded limits. The approved Preliminary Plat (30-PP-2012) presents a drainage easement for Wash 19A based on the drainage report prepared by Pinnacle Engineering, Inc. during the original case submittal. However, rainfall depth reductions (NOAA14) described in the previous section have lowered the Wash 19A peak discharge well below the 50 cubic foot per second (cfs) threshold requirement for drainage easements in ESLO designated areas. The Final Plat prepared by Bellis Land Services does not include an easement for this watercourse.

A. Existing Hydraulic Modeling

Several curb inlets along Shea Boulevard contribute to both washes crossing the subject parcel. Capacities and flow spread for both 3 and 4 cell inlets were analyzed utilizing FlowMaster v8.0 (see Appendix D). The results demonstrate each curb inlet has sufficient capacity to intercept the calculated 100-year peak discharge for each upstream watershed while maintaining more than one free lane for travel in each direction.

A cross section (located halfway between existing culvert crossings) sampled from recent survey field data was analyzed using FlowMaster v8.0 to determine the Wash 19A onsite high water elevation and corresponding velocity (see Appendix D "Irregular Section Wash 19A" and Figure 6). Manning's Coefficient values were formulated as described in Drainage Design Manual for Maricopa County, Hydraulics - Chapter 7 (Reference 3) and Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona publication (Reference 8) based on pictures taken during the site walk as follows:

Wash 19A

Channel Bottom

All sections are assumed unstable due to moderate levels of sediment transport and lateral migration in the region.

Base Value = 0.025 (median bed material 1.1 mm)

Degree of Irregularity = 0.005 (channel with moderate scour or eroded slopes)

Variation in Channel Cross Section = 0.005 (main wash shifts occasionally from side to side and wash cross sections size changes across site)

Effects of Obstruction = 0.000 (wash bottom has no debris)

Amount of Vegetation = 0.000 (no vegetation present in wash bottom)

Degree of Meandering = 1.00 (minor meandering present)

Total Main Channel Bottom Manning's Coefficient = $0.035 \times 1.00 = 0.035$

Overbank

The overbank for each section was assumed to begin at the transition from the active wash bottom to channel side slopes, which are reflected in the provided hydraulic section.

Base Value = 0.025 (median bed material 1.6 mm)

Degree of Irregularity = 0.005 (channel with moderate scour or eroded slopes)

Variation in Channel Cross Section = 0.005 (main wash shifts occasionally from side to side resulting in changes to slopes in the overbank and wash cross sections size changes across site)

Effects of Obstruction = 0.005 (overbank contains small exposed boulders or rocks)

Amount of Vegetation = 0.010 (significant grasses, shrubs and trees are present within the overbank high water limits)

Degree of Meandering = 1.00 (minor meandering present)

Total Overbank Manning's Coefficient = $0.050 \times 1.00 = 0.050$

V. POST-DEVELOPED ONSITE CONDITIONS

The future improvements will consist of grading, sewer and water mains, streets, curb and gutter, scuppers and detention basin with bleed-off pipe. A single detention basin has been situated to capture runoff from several natural meandering flowlines crossing the site (see Grading & Drainage Plans in pocket folder. As each single-family residence is constructed individual grading and drainage plans will be required to demonstrate historic drainage patterns for the subdivision and region are maintained. All onsite development has been designed to comply with the Drainage Regulations for the Flood Control District of Maricopa County (FCDMC) and the City of Scottsdale Design Standards and Policy Manual (Reference 4).

A. Drainage Structures

Roll curb and gutter will be provided on both sides of 131st Street to direct runoff south towards Detention Basin 1 located within Lot 1 (see Figure 6). The approved Preliminary Plat (30-PP-2012) consisted of three basins located in Tracts which have subsequently been eliminated. Limited outfall options, final grade elevations necessary to create 3' deep basins and development impacts on Cochise Manor made the two

northern most basins unfeasible. New storm water storage calculations were prepared utilizing a NOAA14 100-year, 2-hour rainfall depth of 2.381 inches (see Appendix C – Proposed Detention Basin Volume) which is roughly 15% lower than the previously used NOAA2 depths and runoff coefficients as shown below (NAOS area was excluded from calculations presented in Appendix C).

Land Use Category	2-25 yr Runoff Coeff.	100 yr Runoff Coeff.
Paved Streets	0.90	0.95
R1-43ESL	0.38	0.61

The provided detention basin on Lot 1 meets 62% of the required 100-year, 2-hour storm water storage volume and the developer is applying for a partial storm water storage waiver. Limited site development and a large NAOS dedication reduced the amount of impervious area typical for a small subdivision. A weir with a 12" wide low flow notch will be provided upstream of the existing 2-30" CMP's beneath Cochise Avenue (see Figure 6 and Weir Calculations in Appendix D). The weir was modeled as a broad crested type due to limited flow over the hydraulic structure. The proposed HEC-1 Model (Appendix C) demonstrates Detention Basin 1 maintains post-development discharges equal or less than pre-development. The HEC-1 Model output shows errors warnings for both Detention Basin 1 and the attenuation due to the proposed broad crested weir during routing as described below:

"FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT"

This warning typically is associated with low flows during routing at the beginning of computations or as a result of limited contributing area upstream. No action was taken to remove the warning as it has minimal effects on the final discharges. A 12" HDPE bleed off with a 6" diameter orifice plate on the inlet were specified to ensure the basin drains within 36 hours (see Proposed Detention Basin Volume). Percolation test results contained within the Epsilon Engineering & Materials Soils Report dated 5/9/13 show infiltration into the ground will drain the basin regardless of a bleed off pipe. Runoff in excess of the storm water storage volume will exit the detention basin via a riprap lined spillway into Wash 19A prior to the existing 2-30" CMP's beneath Cochise Avenue. Angular native stone riprap has been specified at all scuppers and detention basin emergency overflows to prevent scour and undermining of adjacent improvements.

B. Army Corps of Engineers

The property consists of mostly natural Sonoran desert with two dirt trails crossing the site. A well-defined 6' sandy bottom wash (20A) enters the site along the north boundary as discharge from a 30" CMP storm drain beneath Shea Boulevard. The southeast corner of the site is crossed by a moderately-defined 2.5' wide bottom wash (19A). Several onsite

meandering flowlines exist on the project but have limited contributing areas. Neither ordinary high water marks nor clearly defined wash thalwegs are present for all watercourses except Wash 20A. Wash 20A has been modified significantly upstream and downstream from this project, thus no longer resulting in a contiguous wildlife corridor. Based on these factors we believe none of the onsite washes meet the criteria to be defined as "waters of the United States". However, both Washes 19A and 20A will be left in their current state unaltered by future site development. A 404 Certification form has been provided in Appendix E.

C. Storm Water Pollution Prevention Plan

A Storm Water Pollution Prevention Plan was created to define how the onsite washes will be protected from pollutants during site development (see 11"x17" copies in Appendix F). This plan will be submitted to ADEQ along with an NOI form (see Appendix F) prior to approval of the construction documents and will remain onsite during construction.

VI. CONCLUSIONS

The proposed development is in compliance with the City of Scottsdale design criteria and other required drainage laws. No adverse drainage impacts are expected to either downstream existing properties or drainage ways from the site. The study has determined that:

- All runoff will enter and exit the site in the same manner and location as in pre-development conditions, thereby preserving natural drainage patterns.
- Water surface elevations and velocities were determined for existing conditions using FlowMaster v8.
- USACOE section 404 jurisdictional washes have been determined not to exist on the property and therefore preservation of onsite watercourses will be unnecessary.

VII. REFERENCES

1. United States Department of Agriculture Soil Conservation Service, 1986. Aguila-Carefree Area, Parts of Maricopa and Pinal Counties Soil Survey. Phoenix, Arizona.
2. Flood Control District of Maricopa County, 2009. Drainage Design Manual for Maricopa County, Arizona, Volume 1. Phoenix, Arizona.
3. Flood Control District of Maricopa County, 2009. Drainage Design Manual for Maricopa County, Arizona, Volume 2. Phoenix, Arizona.
4. City of Scottsdale, 2009. City of Scottsdale Design Standards and Policy Manual. Scottsdale, Arizona.

5. Kimley-Horn and Associates, Inc., 2005. Preliminary Drainage Report Mayo Clinic Collaborative Research Community. Phoenix, Arizona.
6. Rick Engineering Company, 2000. Boulder Wash Drainage Report. Phoenix, Arizona.
7. Bentley Systems, 2008. FlowMaster v8.0. USA.
8. United States Geological Survey, 1991. Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona. Phoenix, Arizona.

APPENDIX A

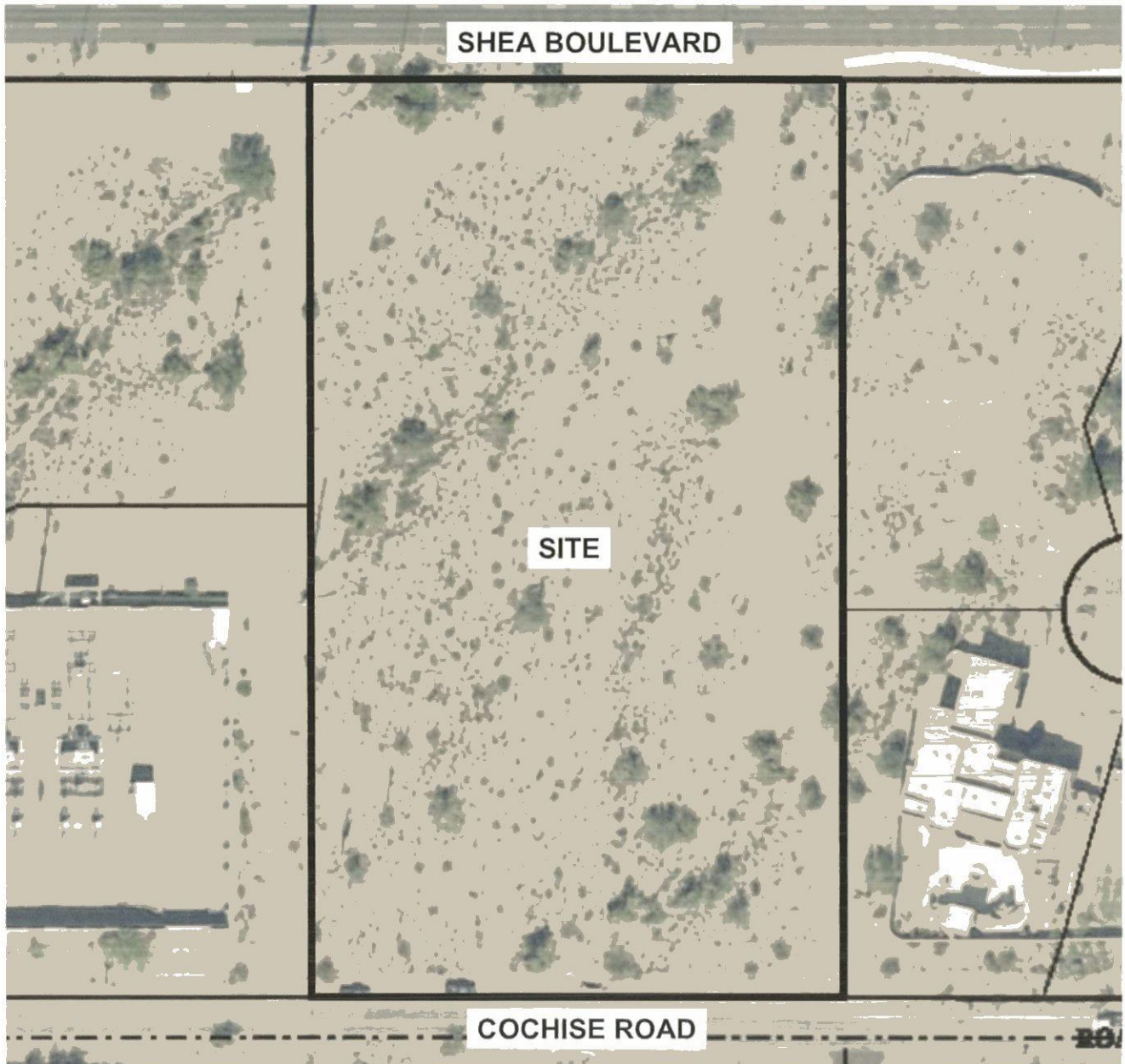
FIGURES

COCHISE MANOR
 13102 E. COCHISE RD - SCOTTSDALE, AZ 85259
 12-PP-2006



SOUTHWEST LAND CONSULTING, P.C. CIVIL ENGINEERING • PLANNING	PMB 132 8711 E PINNACLE PEAK RD SUITE F-211 SCOTTSDALE, AZ 85255	WORK: [480] 585-7521 FAX: [480] 585-7523 WWW.AZSLC.COM	FIGURE 1: VICINITY MAP		
			DATE: 5/24/13	SCALE: 1"=500'	DRAWN BY: RMH

COCHISE MANOR
 13102 E. COCHISE RD - SCOTTSDALE, AZ 85259
 12-PP-2006



SOUTHWEST LAND CONSULTING, P.C.
 CIVIL ENGINEERING • PLANNING

PMB 132
 8711 E PINNACLE PEAK RD
 SUITE F-211
 SCOTTSDALE, AZ 85255

WORK: [480] 585-7521
 FAX: [480] 585-7523
 WWW.AZSLC.COM

DATE:
 5/24/13

FIGURE 2: AERIAL PHOTO

SCALE:
 1"=100'

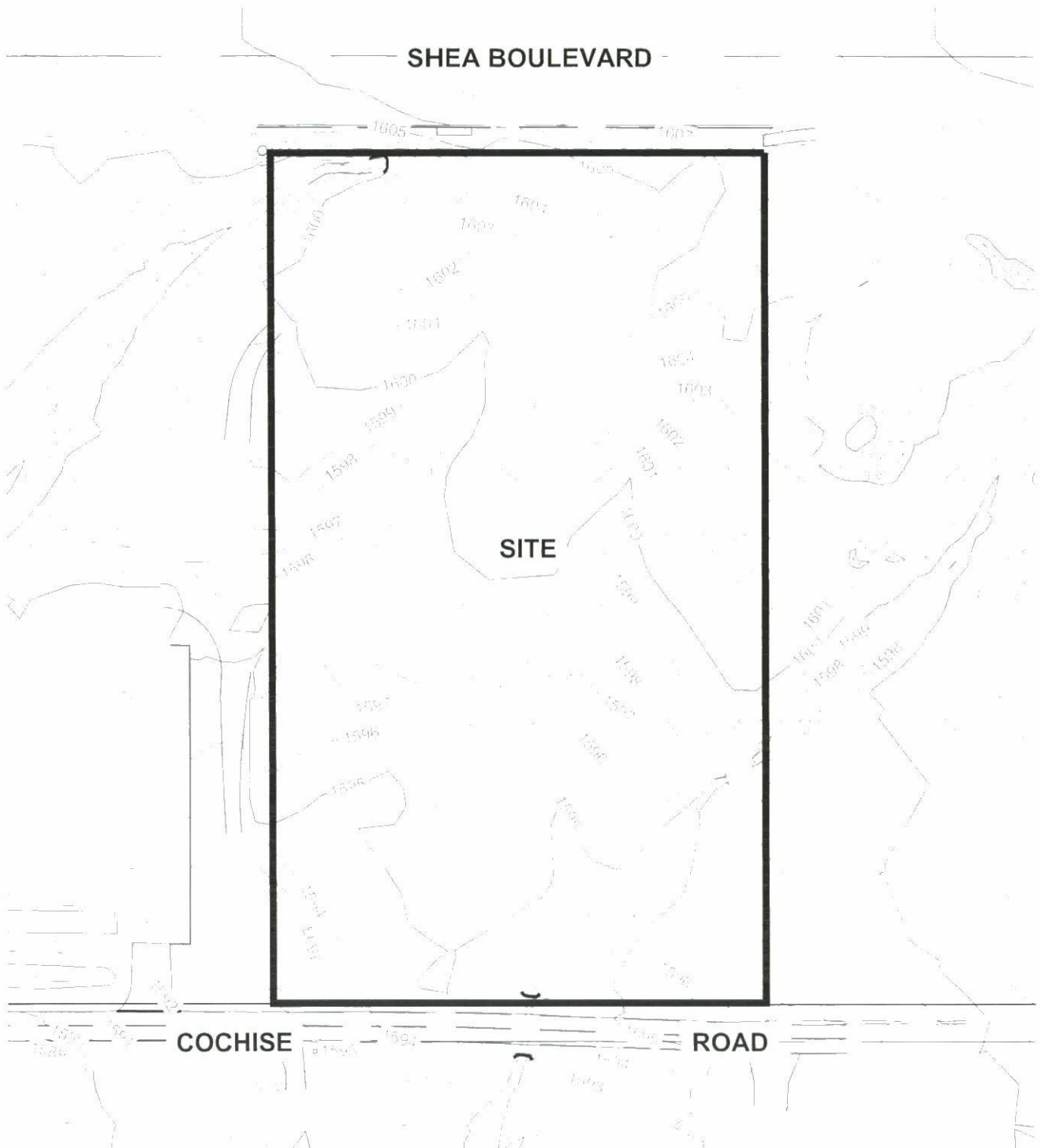
DRAWN BY:
 RMH

CHECKED BY:
 SAL

JOB NO.
 1603

COCHISE MANOR
 13102 E. COCHISE RD - SCOTTSDALE, AZ 85259
 12-PP-2006

SHEA BOULEVARD



SOUTHWEST LAND CONSULTING, P.C.
 CIVIL ENGINEERING • PLANNING

PMB 132
 8711 E PINNACLE PEAK RD
 SUITE F-211
 SCOTTSDALE, AZ 85255
 WORK: (480) 585-7521
 FAX: (480) 585-7523
 WWW.LAZSLC.COM

DATE:
 5/24/13

FIGURE 3: FIELD TOPO

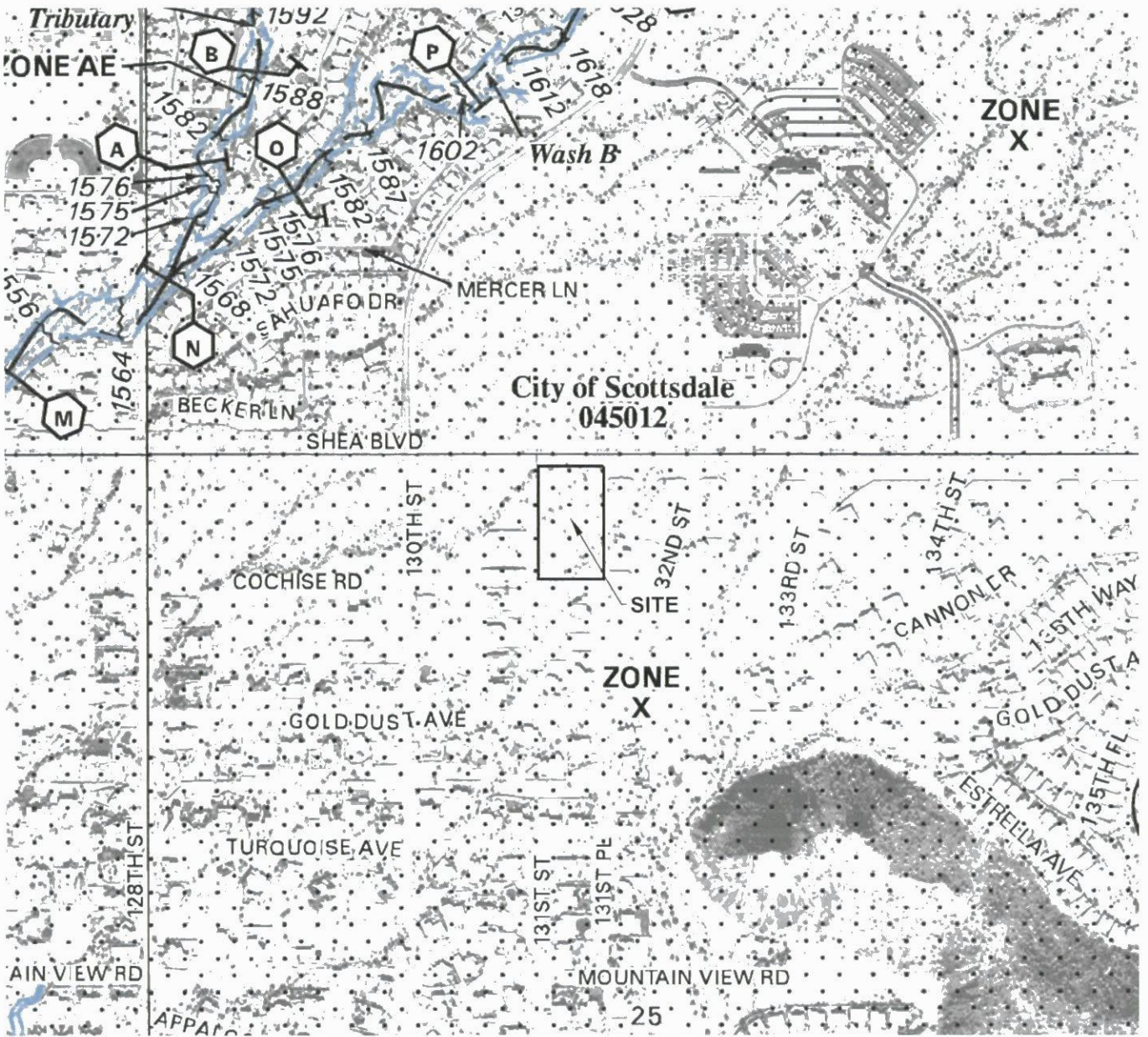
SCALE:
 1"=100'

DRAWN BY:
 RMH

CHECKED BY:
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JOB NO.
 1603

COCHISE MANOR
 13102 E. COCHISE RD - SCOTTSDALE, AZ 85259
 12-PP-2006



SOUTHWEST LAND CONSULTING, P.C.
 CIVIL ENGINEERING • PLANNING

PMB 132
 8711 E PINNACLE PEAK RD
 SUITE F-211
 SCOTTSDALE, AZ 85255
 WORK: [480] 585-7521
 FAX: [480] 585-7523
 WWW.AZSLC.COM

DATE:
 5/24/13

FIGURE 4: FEMA MAP

SCALE:
 1"=800'

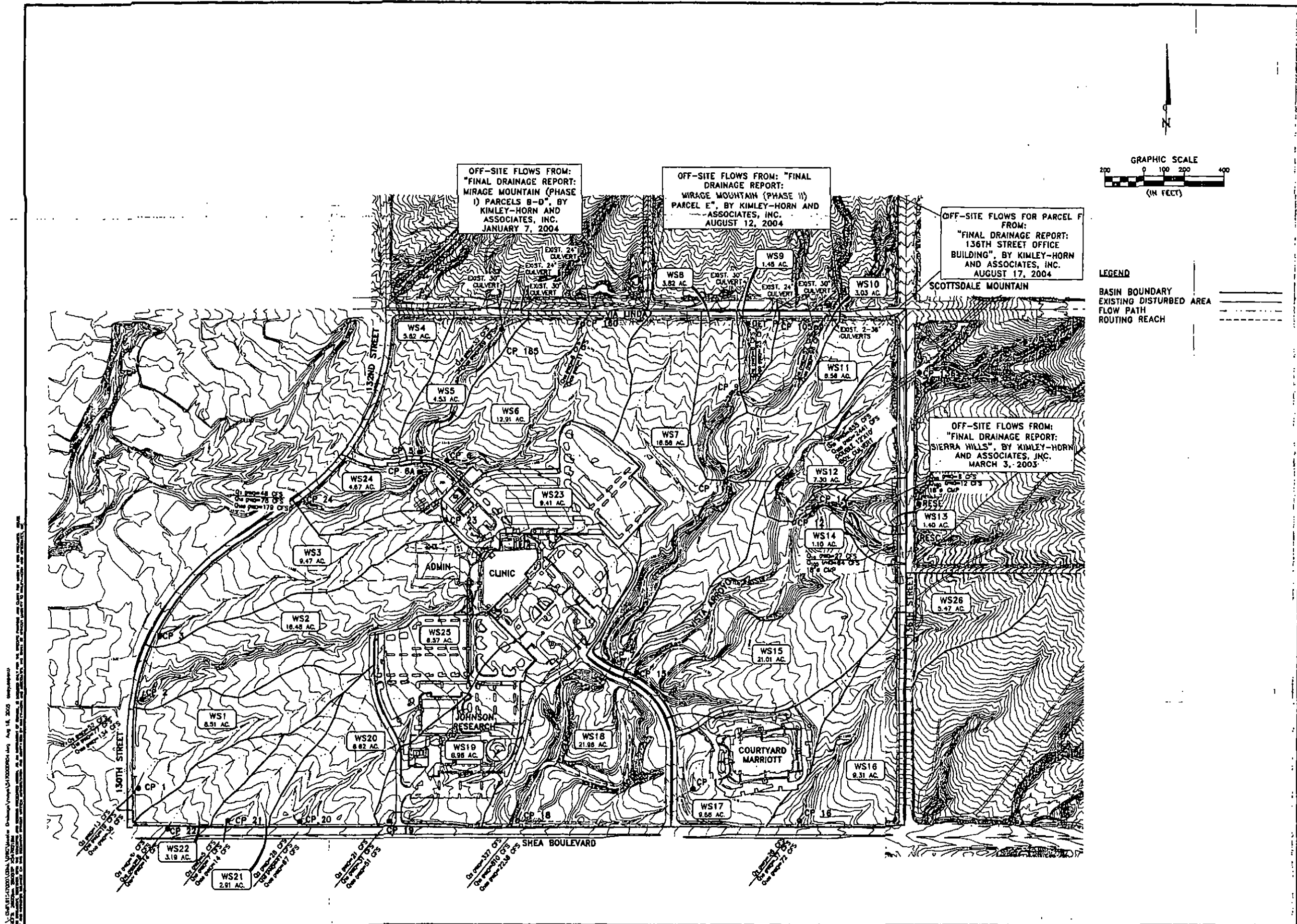
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CHECKED BY:
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JOB NO.
 1603

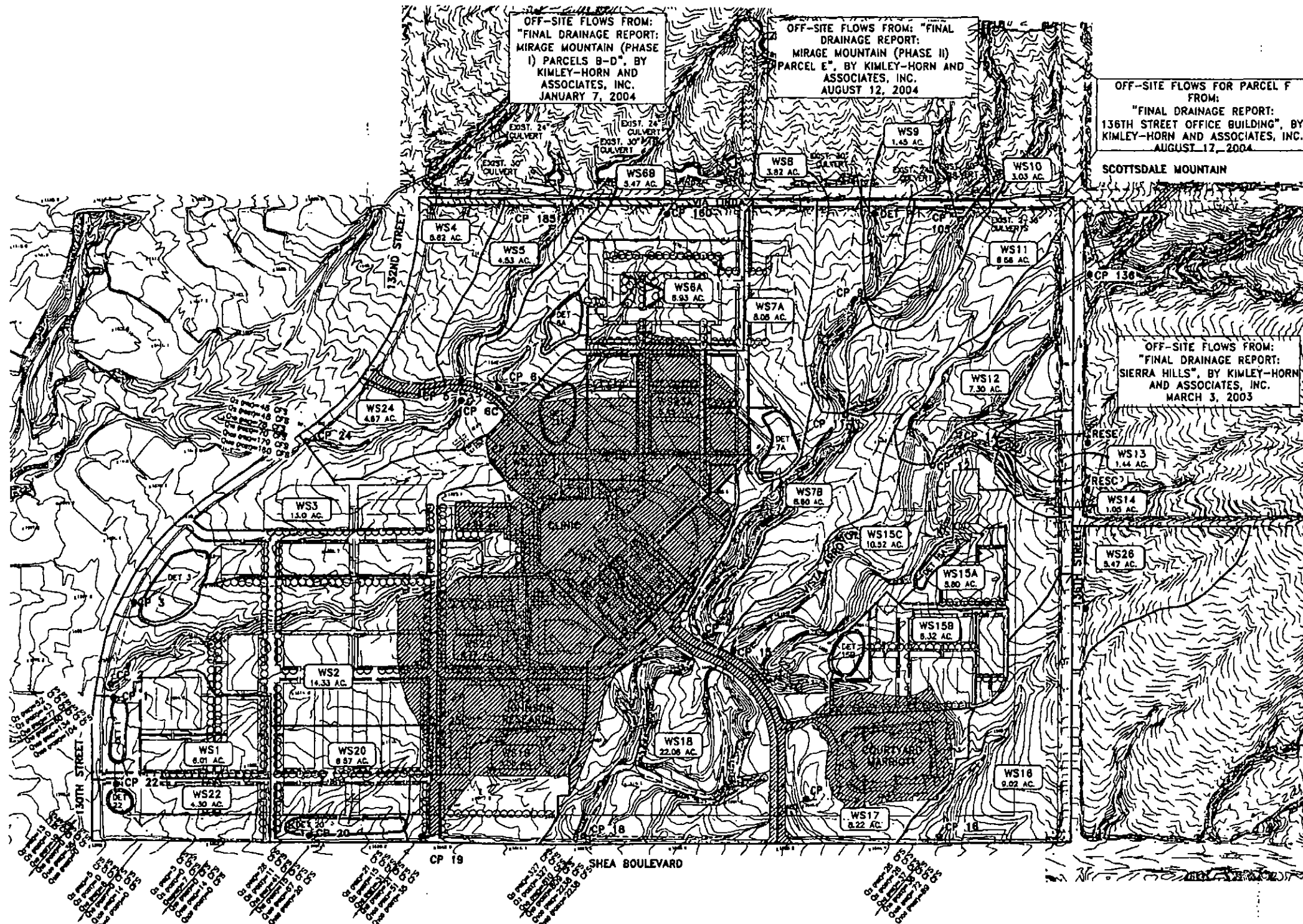
APPENDIX B

**EXCERPTS FROM PRELIMINARY DRAINAGE REPORT MAYO
CLINIC BY KIMLEY-HORN & ASSOCIATES, INC.**



1. DATE: 07/25/03
 2. DRAWING NO.: 5470000R04
 3. PROJECT NO.: 091547000
 4. SCALE: 1" = 200'
 5. DATE: 07/25/03
 6. DRAWN BY: PAC
 7. CHECKED BY: LM
 8. DESIGNED BY: FOR
 9. SCALE (1" = 200')
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<p>Kimley-Horn and Associates, Inc. 7075 North 16th Street, Suite 300 Phoenix, Arizona 85022 (602) 944-5600 Fax: (602) 944-5601</p>	<p>SCALE (1" = 200')</p> <p>SCALE (1" = 200')</p> <p>DESIGNED BY: FOR</p> <p>DRAWN BY: PAC</p> <p>CHECKED BY: LM</p> <p>DATE: 07/25/03</p>
<p>MAYO CLINIC</p> <p>EXISTING CONDITIONS</p> <p>DRAINAGE MAP</p> <p>FIGURE 4</p>	
<p>PROJECT NO. 091547000</p> <p>DRAWING NAME 5470000R04</p> <p>1 of 1</p>	



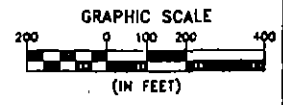
OFF-SITE FLOWS FROM:
"FINAL DRAINAGE REPORT:
MIRAGE MOUNTAIN (PHASE I)
PARCELS B-D", BY
KIMLEY-HORN AND
ASSOCIATES, INC.
JANUARY 7, 2004

OFF-SITE FLOWS FROM: "FINAL
DRAINAGE REPORT:
MIRAGE MOUNTAIN (PHASE II)
PARCEL E", BY KIMLEY-HORN AND
ASSOCIATES, INC.
AUGUST 12, 2004

OFF-SITE FLOWS FOR PARCEL F
FROM:
"FINAL DRAINAGE REPORT:
136TH STREET OFFICE BUILDING", BY
KIMLEY-HORN AND ASSOCIATES, INC.
AUGUST 17, 2004

SCOTTSDALE MOUNTAIN

OFF-SITE FLOWS FROM:
"FINAL DRAINAGE REPORT:
SIERRA HILLS", BY KIMLEY-HORN
AND ASSOCIATES, INC.
MARCH 3, 2003



- LEGEND**
- SUBBASIN BOUNDARY
 - DRAINAGE FLOW PATH
 - ROUTING REACH
 - EXISTING FEATURES
 - FUTURE DEVELOPMENT
 - EXISTING DISTURBED AREA

- Detention Required per City of Scottsdale
 Drainage Design Standards and Policies, December 1998
 100-Year 24-hour Storm Event for Detention Basin (ft³)
- B [ft] 2.82 From City of Scottsdale Drainage Design Standards and Policies Manual, Chapter 2, pg 60
 - C [ft] 0.88 From 2.9.17 Runoff Coefficient; pavement (0.88), from City of Scottsdale Drainage Design Standards and Policies Manual, Future Disturbed Area
 - A [ft] 43.61

Mayo Clinic Proposed Conditions Proposed Detention

Basin	Volume Proposed (ac-ft)
WS1	0.8
WS2	0.8
WS3	1.1
WS4	1.1
WS5	1.1
WS6	1.1
WS7	1.1
WS8	1.1
WS9	1.1
WS10	1.1
WS11	1.1
WS12	1.1
WS13	1.1
WS14	1.1
WS15	1.1
WS16	1.1
WS17	1.1
WS18	1.1
WS19	1.1
WS20	1.1
WS21	1.1
WS22	1.1
WS23	1.1
WS24	1.1
WS25	1.1
WS26	1.1
WS27	1.1
WS28	1.1
Total	13.1

REVISED

DATE

KIMLEY-HORN AND ASSOCIATES, INC.
7878 North 18th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5000

MAYO CLINIC
PROPOSED CONDITIONS
DRAINAGE MAP
FIGURE 5

SCALE: 0"=1"=200'
SCALE (N): NONE
DESIGNED BY: KOB
DRAWN BY: PAC
CHECKED BY: LJM
DATE: 01/25/05

PROJECT NO.
091547000
DRAWING NAME
PR OFF-SITE
1 of 1

APPENDIX C

HYDROLOGIC CALCULATIONS

Proposed Detention Basin Volume							
Basin ID	Top Area (sf)	Top Elev (ft)	Bot Area (sf)	Bot Elev (ft)	Depth (ft)	Volume Provided (cf)	Volume Provided (ac-ft)
DET-1	4,858	1592.5	3,658	1591.5	1	4,244	0.10
	3,658	1591.5	3,330	1591.2	0.3	1,048	0.02
	3,330	1591.2	2,590	1590.5	0.7	2,066	0.05
	2,590	1590.5	1,636	1589.5	1	2,095	0.05
Total						9,453	0.22

***Perc Rate (cf/hr/sf)= 0.430
 Basin bottom area (sf)= 1,636
 ****Basin drain time (hr)= 13
 *****Basin drain time (hr)= 12

All volumes calculated using the cone frustrum method: $(h/3)*(a1+a2+(a1*a2)^{0.5})$
 h=depth
 a1=minimum bottom surface area
 a2=maximum top surface area

- * Weighted runoff coefficient assuming partially developed to reflect future conditions
- ** 100-Year, 2-hour rainfall depth based on Maricopa County Drainage Design Manual, Hydrology.
- *** The perc rate is based on data obtained from a Epsilon Engineering & Materials, LLC. dated 5/9/2013.
- **** Basin drain time shown is strictly based on percolation into the ground. The 6" bleed off pipe will drain the top 1.3' faster than water will percolate into the ground
- ***** Basin drain time includes percolation into ground plus discharge of 0.97 cfs from 6" bleed off pipe

Safety Factor= 1
 Cw= 0.64
 **D= 2.38
 Parcel Area= 120,244 Does not include NAOS area
Vr= 15,318

Land Use	Area (sf)	Cw
R1-43ESL Area (sf)	108,915	0.61
Impervious Area (sf)	11,329	0.95
Total	120,244	0.64

EXISTING CONDITIONS HEC-1 MODEL

CITY OF SCOTTSDALE
 Drainage Design Management System
 RAINFALL DATA
 Project Reference: 1603EX

ID	Method	Duration	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
DEFAULT	NOAA14	5 MIN	0.268	0.361	0.433	0.528	0.601	0.675
	NOAA14	10 MIN	0.407	0.550	0.659	0.804	0.915	1.028
	NOAA14	15 MIN	0.505	0.682	0.817	0.996	1.134	1.274
	NOAA14	30 MIN	0.680	0.918	1.099	1.342	1.527	1.715
	NOAA14	1 HOUR	0.841	1.136	1.361	1.660	1.890	2.123
	NOAA14	2 HOUR	0.972	1.293	1.537	1.869	2.121	2.381
	NOAA14	3 HOUR	1.041	1.361	1.614	1.967	2.245	2.536
	NOAA14	6 HOUR	1.236	1.576	1.846	2.216	2.504	2.804
	NOAA14	12 HOUR	1.427	1.798	2.090	2.488	2.793	3.106
	NOAA14	24 HOUR	1.748	2.260	2.670	3.238	3.686	4.154

CITY OF SCOTTSDALE
 Drainage Design Management System
 Agency: SCOTTSDALE - LAND USE DEFAULTS
 Project Reference: 1603PR

Code	Description	Initial Abstraction IA	Percent Impervious RTIMP	Vegetation Cover	Moisture Deficit DTHETA	Resistance Coefficient Kb
Commercial						
21	Neighborhood Commercial	0.10	85	75.0	ORMAL	MIN
22	General Commercial	0.10	85	75.0	ORMAL	MIN
31	Minor Office	0.10	85	75.0	ORMAL	MIN
32	Major Office	0.10	85	75.0	ORMAL	MIN
33	Minor Employment	0.10	85	75.0	ORMAL	MIN
34	General Employment	0.10	85	75.0	ORMAL	MIN
Institutional						
36	Research and Development	0.10	72	75.0	ORMAL	MIN
44	Cultural/Institutional	0.10	85	75.0	ORMAL	MIN
45	Utilities	0.30	72	30.0	ORMAL	MIN
Open Space						
41	Natural Open Space	0.30	1	30.0	ORMAL	MIN
42	Limited Use Area	0.30	1	30.0	ORMAL	MIN
43	Developed Open Space	0.30	80	50.0	ORMAL	MIN
GC	Golf Courses	0.35	1	85.0	ORMAL	MIN
PRESERVE	Natural Open Space	0.30	1	30.0	ORMAL	MIN
UNDEVELOPED	Natural Open Space	0.30	1	30.0	ORMAL	MIN
Other						
INDIAN	Indian Land	0.35	10	85.0	ORMAL	MIN
Residential						
10	1/5 Dwelling Units per Acre	0.30	7	30.0	ORMAL	MIN
11	1/3-1/2 Dwelling Units per Acre	0.30	15	30.0	ORMAL	MIN
12	1/2-1 Dwelling Units per Acre	0.30	15	50.0	ORMAL	MIN
13	1-2 Dwelling Units per Acre	0.25	24	50.0	ORMAL	MIN
14	2-4 Dwelling Units per Acre	0.25	35	50.0	ORMAL	MIN
15	4-8 Dwelling Units per Acre	0.25	54	50.0	ORMAL	MIN
16	8-12 Dwelling Units per Acre	0.25	74	50.0	ORMAL	MIN
17	12-22 Dwelling Units per Acre	0.25	94	50.0	ORMAL	MIN
RETAINED	Retained areas	2.66	1	50.0	ORMAL	MIN
Tourist						
18	Tourist Accommodations	0.25	85	50.0	ORMAL	MIN
19	Low Intensity Resort	0.30	85	50.0	ORMAL	MIN

CITY OF SCOTTSDALE
 Drainage Design Management System
 LAND USE
 Project Reference: 1603EX

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kb
Major Basin ID: 01								
WS19	44	0.009	78.0	0.10	85	75.0	NORMAL	0.034
	UNDEVELOPED	0.003	22.0	0.30	1	30.0	NORMAL	0.068 *
		0.012	100.0					
WS19A	13	0.005	100.0	0.25	24	50.0	NORMAL	0.073 *
		0.005	100.0					
WS19B	13	0.001	100.0	0.25	24	50.0	NORMAL	0.083 *
		0.001	100.0					
WS19C	UNDEVELOPED	0.003	100.0	0.30	1	30.0	NORMAL	0.076 *
		0.003	100.0					
WS19D	UNDEVELOPED	0.002	100.0	0.30	1	30.0	NORMAL	0.079 *
		0.002	100.0					
WS19E	13	0.000	10.0	0.25	24	50.0	NORMAL	0.079 *
	UNDEVELOPED	0.002	90.0	0.30	1	30.0	NORMAL	0.079 *
		0.002	100.0					
WS20	22	0.002	8.8	0.10	85	75.0	NORMAL	0.032
	44	0.012	45.8	0.10	85	75.0	NORMAL	0.032
	UNDEVELOPED	0.011	45.4	0.30	1	30.0	NORMAL	0.063 *
		0.025	100.0					
WS20A	22	0.002	70.0	0.10	85	75.0	NORMAL	0.038
	UNDEVELOPED	0.001	30.0	0.30	1	30.0	NORMAL	0.076 *
		0.003	100.0					

* Non default value

CITY OF SCOTTSDALE
 Drainage Design Management System
 SOILS

Area ID	Book Number	Map Unit	Soil ID	Area (sq mi)	Area (%)	XKSAT	Rock Percent (%)	Effective Rock (%)
Major Basin ID: 01								
WS19	645	68	64568	0.012	100.00	0.63	-	100
WS19A	645	68	64568	0.005	100.00	0.63	-	100
WS19B	645	68	64568	0.001	100.00	0.63	-	100
WS19C	645	68	64568	0.003	100.00	0.63	-	100
WS19D	645	68	64568	0.002	100.00	0.63	-	100
WS19E	645	68	64568	0.002	100.00	0.63	-	100
WS20	645	68	64568	0.025	100.00	0.63	-	100
WS20A	645	68	64568	0.003	100.00	0.63	-	100

CITY OF SCOTTSDALE
 Drainage Design Management System
 HEC-1 FLOW SUMMARY
 Project Reference: 1603EX

ID	Type	Area (sq mi)	Discharge cfs					
			2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin 01								
WS19	Hydrograph	0.010	7	10	13	17	20	23
RCP19	Routed	0.010	7	10	13	17	20	23
RRCP19	Routed	0.010	7	10	12	16	20	23
WS19A	Hydrograph		1	2	3	4	5	7
CP19A	Combined	0.020	8	11	15	20	25	29
RCP19A	Routed	0.020	8	11	15	20	24	29
WS19B	Hydrograph				1	1	1	2
RWS19	Routed				1	1	1	2
WS19C	Hydrograph			1	1	2	3	3
CP19C	Combined	0.020	8	12	16	23	28	34
DCP19C	Routed	0.020	8	12	16	23	28	34
WS19D	Hydrograph				1	1	2	2
WS19E	Hydrograph				1	1	1	2
WS20	Hydrograph	0.030	9	13	18	25	31	37
RCP20	Routed	0.030	9	13	18	25	31	37
WS20A	Hydrograph		1	1	2	2	3	3
CP20A	Combined	0.030	10	14	19	27	33	40

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*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 17JUL13 TIME 17:56:33 *
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*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*****

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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK, OUTFLOW, SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL, LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

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LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID CITY OF SCOTTSDALE
2 ID 1603EX - COCHISE MANOR
3 ID 100 YEAR
4 ID 6 Hour Storm
5 ID Unit Hydrograph: Clark
6 ID 07/17/2013
7 IT 2 0 0 2000
8 IN 15
9 IO 3
*DIAGRAM
*
10 KK WS19 BASIN
11 BA 0.012
12 PB 2.802
13 PC 0.000 0.008 0.016 0.025 0.033 0.041 0.050 0.058 0.066 0.074
14 PC 0.087 0.099 0.118 0.138 0.216 0.377 0.834 0.911 0.931 0.950
15 PC 0.962 0.972 0.983 0.991 1.000
16 LG 0.14 0.27 3.29 1.01 67
17 UC 0.198 0.235
18 UA 0 5.0 16.0 30.0 65.0 77.0 84.0 90.0 94.0 97.0
19 UA 100
*
20 KK RCP19 ROUTE
21 RK 123 0.0100 0.012 CIRC 3.000
*
22 KK RRCP19 ROUTE
23 RS 1 FLOW
24 RC 0.055 0.040 0.055 496 0.0262 0.00
25 RX 0.00 10.00 20.00 24.00 28.00 32.00 42.00 52.00
26 RY 10.00 9.00 8.00 7.00 7.00 8.00 9.00 10.00
*
27 KK WS19A BASIN
28 BA 0.005
29 LG 0.25 0.27 3.29 0.91 24
30 UC 0.225 0.317
31 UA 0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
32 UA 100
*
33 KK CP19A COMBINE
34 WC 2 .0172
*
35 KK RCP19A ROUTE
36 RS 1 FLOW
37 RC 0.055 0.040 0.055 237 0.0169 0.00
38 RX 0.00 10.00 20.00 24.00 26.00 30.00 40.00 50.00
39 RY 10.00 9.00 8.00 7.00 7.00 8.00 9.00 10.00
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LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
40 KK WS19B BASIN
41 BA 0.001
42 LG 0.25 0.27 3.29 0.91 24
43 UC 0.144 0.200
44 UA 0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
45 UA 100
*
46 KK RWS19B ROUTE

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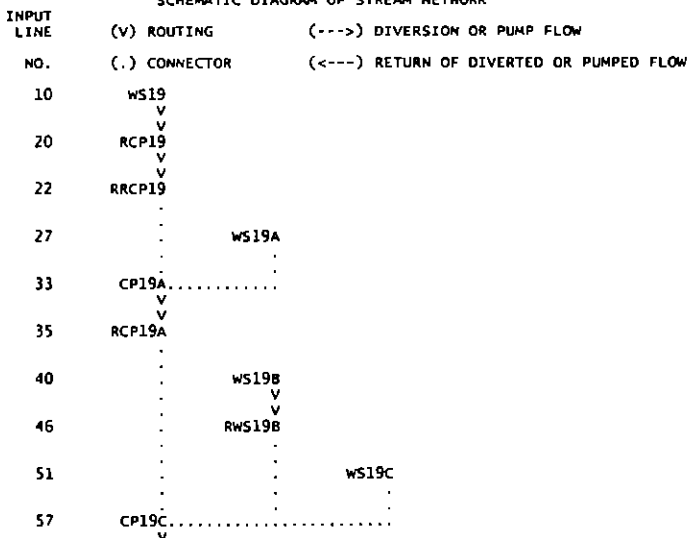
01-100.out											
47	RS	2	FLOW								
48	RC	0.055	0.040	0.055	507	0.0237	0.00				
49	RX	0.00	10.00	20.00	24.00	26.00	30.00	40.00	50.00		
50	RY	10.00	9.00	8.00	7.00	7.00	8.00	9.00	10.00		
	*										
51	KK	WS19C	BASIN								
52	BA	0.003									
53	LG	0.30	0.27	3.29	0.77	1					
54	UC	0.226	0.333								
55	UA	0	3.0	5.0	8.0	12.0	20.0	43.0	75.0	90.0	96.0
56	UA	100									
	*										
57	KK	CP19C	COMBINE								
58	HC	3	.0205								
	*										
59	KK	DCP19C	STORAGE								
60	KO										
61	RS	1	STOR								
62	SV			0.01	0.02	0.04	0.05	0.07	0.11	0.14	
63	SQ			4.89	12.25	22.67	34.00	34.00	34.00	34.00	34.00
64	SE	1591.0	1591.50	1592.00	1592.50	1593.00	1593.20	1593.50	1594.00	1594.20	
	*										
65	KK	WS19D	BASIN								
66	BA	0.002									
67	LG	0.30	0.27	3.29	0.77	1					
68	UC	0.215	0.368								
69	UA	0	3.0	5.0	8.0	12.0	20.0	43.0	75.0	90.0	96.0
70	UA	100									
	*										
71	KK	WS19E	BASIN								
72	BA	0.002									
73	LG	0.30	0.27	3.29	0.78	3					
74	UC	0.234	0.468								
75	UA	0	3.0	5.0	8.0	12.0	20.0	43.0	75.0	90.0	96.0
76	UA	100									
	*										

HEC-1 INPUT

PAGE 3

LINE	ID	1	2	3	4	5	6	7	8	9	10
77	KK	WS20	BASIN								
78	BA	0.025									
79	LG	0.19	0.27	3.29	0.95	47					
80	UC	0.272	0.316								
81	UA	0	5.0	16.0	30.0	65.0	77.0	84.0	90.0	94.0	97.0
82	UA	100									
	*										
83	KK	RCP20	ROUTE								
84	RK	123	0.0100	0.012		CIRC	3.000				
	*										
85	KK	WS20A	BASIN								
86	BA	0.003									
87	LG	0.16	0.27	3.29	0.99	60					
88	UC	0.233	0.666								
89	UA	0	5.0	16.0	30.0	65.0	77.0	84.0	90.0	94.0	97.0
90	UA	100									
	*										
91	KK	CP20A	COMBINE								
92	HC	2	.0282								
	*										
93	ZZ										

SCHEMATIC DIAGRAM OF STREAM NETWORK



```

59      V
      DCP19C
65      .
      WS19D
71      .
      WS19E
77      .
      WS20
      V
83      .
      RCP20
      V
85      .
      WS20A
91      .
      CP20A.....
  
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 17JUL13 TIME 17:56:33 *
*****
  
```

```

*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*****
  
```

CITY OF SCOTTSDALE
 1603EX - COCHISE MANOR
 100 YEAR
 6 Hour Storm
 Unit Hydrograph: Clark
 07/17/2013

```

9 IO      OUTPUT CONTROL VARIABLES
          IPRNT      3      PRINT CONTROL
          IPLOT      0      PLOT CONTROL
          QSCAL      0.     HYDROGRAPH PLOT SCALE

IT        HYDROGRAPH TIME DATA
          NMIN      2      MINUTES IN COMPUTATION INTERVAL
          IDATE     1 0     STARTING DATE
          ITIME     0000   STARTING TIME
          NQ        2000   NUMBER OF HYDROGRAPH ORDINATES
          NODATE    3 0     ENDING DATE
          NODTIME   1838   ENDING TIME
          ICENT     19     CENTURY MARK

          COMPUTATION INTERVAL 0.03 HOURS
          TOTAL TIME BASE     66.63 HOURS
  
```

ENGLISH UNITS
 DRAINAGE AREA SQUARE MILES
 PRECIPITATION DEPTH INCHES
 LENGTH, ELEVATION FEET
 FLOW CUBIC FEET PER SECOND
 STORAGE VOLUME ACRE-Feet
 SURFACE AREA ACRES
 TEMPERATURE DEGREES FAHRENHEIT

```

*****
*      *
10 KK * WS19 * BASIN
*      *
*****
  
```

```

8 IN      TIME DATA FOR INPUT TIME SERIES
          JXMIN     15     TIME INTERVAL IN MINUTES
          JXDATE    1 0     STARTING DATE
          JXTIME    0     STARTING TIME
  
```

SUBBASIN RUNOFF DATA

```

11 BA     SUBBASIN CHARACTERISTICS
          TAREA     0.01   SUBBASIN AREA
  
```

PRECIPITATION DATA

```

12 PB     STORM      2.80   BASIN TOTAL PRECIPITATION
  
```

```

13 PI     INCREMENTAL PRECIPITATION PATTERN
          0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
          0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
          0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
          0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
          0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
          0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
          0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
          0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
          0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
          0.01  0.01  0.01  0.01  0.01  0.01  0.02  0.02  0.02  0.02
  
```

0.02	0.02	0.04	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

16 LG GREEN AND AMPT LOSS RATE
 STRTL 0.14 STARTING LOSS
 DTH 0.27 MOISTURE DEFICIT
 PSIF 3.29 WETTING FRONT SUCTION
 XKSAT 1.01 HYDRAULIC CONDUCTIVITY
 RTIMP 67.00 PERCENT IMPERVIOUS AREA

17 UC CLARK UNITGRAPH
 TC 0.20 TIME OF CONCENTRATION
 R 0.23 STORAGE COEFFICIENT

18 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
 0.0 5.0 16.0 30.0 65.0 77.0 84.0 90.0 94.0 97.0
 100.0

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.20 HR, R= 0.23 HR
 SNYDER YP= 0.13 HR, CP= 0.38

UNIT HYDROGRAPH 40 END-OF-PERIOD ORDINATES									
2.	8.	17.	22.	22.	21.	19.	16.	14.	12.
11.	9.	8.	7.	6.	5.	5.	4.	3.	3.
3.	2.	2.	2.	1.	1.	1.	1.	1.	1.
1.	1.	0.	0.	0.	0.	0.	0.	0.	0.

HYDROGRAPH AT STATION WS19

TOTAL RAINFALL = 2.80, TOTAL LOSS = 0.65, TOTAL EXCESS = 2.15
 PEAK FLOW TIME 6-HR MAXIMUM AVERAGE FLOW 66.63-HR
 (CFS) (HR) (CFS) 24-HR 72-HR
 + 23. 4.07 3. 1. 0. 0
 (INCHES) 2.130 2.140 2.140 2.140
 (AC-FT) 1. 1. 1. 1.
 CUMULATIVE AREA = 0.01 SQ MI

20 KK *****
 * RCP19 * ROUTE

HYDROGRAPH ROUTING DATA

21 RK KINEMATIC WAVE STREAM ROUTING
 L 123 CHANNEL LENGTH
 S 0.0100 SLOPE
 N 0.012 CHANNEL ROUGHNESS COEFFICIENT
 CA 0.00 CONTRIBUTING AREA
 SHAPE CIRC CHANNEL SHAPE
 WD 3.00 BOTTOM WIDTH OR DIAMETER
 Z 0.00 SIDE SLOPE
 NDXMIN 2 MINIMUM NUMBER OF DX INTERVALS

*** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

COMPUTED KINEMATIC PARAMETERS
 VARIABLE TIME STEP
 (DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	N	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	8.05	1.25	0.10	41.00	23.45	244.13	2.14	12.46

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1370E+01 EXCESS=0.0000E+00 OUTFLOW=0.1370E+01 BASIN STORAGE=0.5540E-18 PERCENT ERROR= 0.0

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	8.05	1.25	2.00	23.44	244.00	2.14
------	------	------	------	-------	--------	------

HYDROGRAPH AT STATION RCP19

PEAK FLOW TIME 6-HR MAXIMUM AVERAGE FLOW 66.63-HR
 24-HR 72-HR
 Page 4

01-100.out

+ (CFS) (HR) (CFS)
 + 23. 4.07 3. 1. 0. 0.
 (INCHES) 2.130 2.140 2.140 2.140
 (AC-FT) 1. 1. 1. 1.
 CUMULATIVE AREA = 0.01 SQ MI

22 KK *****
 * RRCP19 * ROUTE

HYDROGRAPH ROUTING DATA

23 RS STORAGE ROUTING
 NSTPS 1 NUMBER OF SUBREACHES
 ITYP FLOW TYPE OF INITIAL CONDITION
 RSVRIC 0.00 INITIAL CONDITION
 X 0.00 WORKING R AND D COEFFICIENT

24 RC NORMAL DEPTH CHANNEL
 ANL 0.055 LEFT OVERBANK N-VALUE
 ANCH 0.040 MAIN CHANNEL N-VALUE
 ANR 0.055 RIGHT OVERBANK N-VALUE
 RLNTH 496 REACH LENGTH
 SEL 0.0262 ENERGY SLOPE
 ELMAX 0.0 MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

CROSS-SECTION DATA

26 RY ELEVATION --- LEFT OVERBANK --- + --- MAIN CHANNEL --- + --- RIGHT OVERBANK ---
 25 RX DISTANCE 10.00 9.00 8.00 7.00 7.00 8.00 9.00 10.00
 0.00 10.00 20.00 24.00 28.00 32.00 42.00 52.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.01	0.02	0.03	0.05	0.06	0.08	0.11	0.13	0.17
OUTFLOW	0.00	1.18	3.99	8.41	14.54	22.53	32.52	46.43	64.01	84.86
ELEVATION	7.00	7.16	7.32	7.47	7.63	7.79	7.95	8.11	8.26	8.42
STORAGE	0.21	0.25	0.30	0.36	0.42	0.49	0.56	0.64	0.73	0.82
OUTFLOW	109.34	137.78	170.47	207.70	249.73	296.83	349.25	407.24	471.03	540.86
ELEVATION	8.58	8.74	8.89	9.05	9.21	9.37	9.53	9.68	9.84	10.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 349. TO 541.
 THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
 THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

*** **

HYDROGRAPH AT STATION RRCP19

PEAK FLOW TIME MAXIMUM AVERAGE FLOW
 + (CFS) (HR) 6-HR 24-HR 72-HR 66.63-HR
 + 23. 4.10 (CFS) 3. 1. 0. 0.
 (INCHES) 2.129 2.140 2.140 2.140
 (AC-FT) 1. 1. 1. 1.
 PEAK STORAGE TIME MAXIMUM AVERAGE STORAGE
 + (AC-FT) (HR) 6-HR 24-HR 72-HR 66.63-HR
 0. 4.07 0. 0. 0. 0.
 PEAK STAGE TIME MAXIMUM AVERAGE STAGE
 + (FEET) (HR) 6-HR 24-HR 72-HR 66.63-HR
 7.80 4.10 7.18 7.04 7.02 7.02
 CUMULATIVE AREA = 0.01 SQ MI

27 KK *****
 * WS19A * BASIN

SUBBASIN RUNOFF DATA

28 BA SUBBASIN CHARACTERISTICS
 TAREA 0.00 SUBBASIN AREA

PRECIPITATION DATA

12 PB STORM 2.80 BASIN TOTAL PRECIPITATION

13 PI INCREMENTAL PRECIPITATION PATTERN
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

01-100.out										
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01
0.02	0.02	0.04	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

29 LG GREEN AND AMPT LOSS RATE
 STRTL 0.25 STARTING LOSS
 DTH 0.27 MOISTURE DEFICIT
 PSIF 3.29 WETTING FRONT SUCTION
 XKSAT 0.91 HYDRAULIC CONDUCTIVITY
 RTIMP 24.00 PERCENT IMPERVIOUS AREA

30 UC CLARK UNITGRAPH
 TC 0.22 TIME OF CONCENTRATION
 R 0.32 STORAGE COEFFICIENT

31 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
 0.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
 100.0

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.22 HR, R= 0.32 HR
 SNYDER TP= 0.21 HR, CP= 0.49

UNIT HYDROGRAPH										
55 END-OF-PERIOD ORDINATES										
0.	1.	1.	3.	5.	8.	8.	7.	6.	6.	
5.	5.	4.	4.	3.	3.	3.	3.	2.	2.	
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.	
1.	1.	1.	0.	0.	0.	0.	0.	0.	0.	
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	

*** **

HYDROGRAPH AT STATION WS19A

TOTAL RAINFALL = 2.80, TOTAL LOSS = 1.48, TOTAL EXCESS = 1.32

PEAK FLOW	TIME	6-HR	24-HR	72-HR	66.63-HR
(CFS)	(HR)	(CFS)			
7.	4.13	1.	0.	0.	0.
(INCHES)		1.308	1.313	1.313	1.313
(AC-FT)		0.	0.	0.	0.

CUMULATIVE AREA = 0.00 SQ MI

33 KK *****
 * CP19A * COMBINE

34 HC HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

HYDROGRAPH AT STATION CP19A

PEAK FLOW	TIME	6-HR	24-HR	72-HR	66.63-HR
(CFS)	(HR)	(CFS)			
29.	4.10	3.	1.	0.	0.
(INCHES)		1.887	1.897	1.897	1.897
(AC-FT)		2.	2.	2.	2.

CUMULATIVE AREA = 0.02 SQ MI

35 KK *****
 * RCP19A * ROUTE

PSIF 3.29 WETTING FRONT SUCTION
 XKSAT 0.91 HYDRAULIC CONDUCTIVITY
 RTIMP 24.00 PERCENT IMPERVIOUS AREA

43 UC CLARK UNITGRAPH
 TC 0.14 TIME OF CONCENTRATION
 R 0.20 STORAGE COEFFICIENT

44 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
 0.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
 100.0

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.14 HR. R= 0.20 HR
 SHYDER TP= 0.13 HR. CP= 0.49

UNIT HYDROGRAPH
 35 END-OF-PERIOD ORDINATES
 0. 0. 1. 2. 2. 2. 1. 1. 1.
 1. 1. 1. 1. 0. 0. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0.

*** *** *** ***

HYDROGRAPH AT STATION WS19B

TOTAL RAINFALL = 2.80, TOTAL LOSS = 1.48, TOTAL EXCESS = 1.32

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR MAXIMUM AVERAGE FLOW	72-HR MAXIMUM AVERAGE FLOW	66.63-HR MAXIMUM AVERAGE FLOW
2.	4.07	0.	0.	0.	0.
		(INCHES) 1.311	1.314	1.314	1.314
		(AC-FT) 0.	0.	0.	0.

CUMULATIVE AREA = 0.00 SQ MI

46 KK *****
 * RWS19B * ROUTE
 * * *

HYDROGRAPH ROUTING DATA

47 RS STORAGE ROUTING
 NSTPS 2 NUMBER OF SUBREACHES
 ITYP FLOW TYPE OF INITIAL CONDITION
 RSVRIC 0.00 INITIAL CONDITION
 X 0.00 WORKING R AND D COEFFICIENT

48 RC NORMAL DEPTH CHANNEL
 ANL 0.055 LEFT OVERBANK N-VALUE
 ANCH 0.040 MAIN CHANNEL N-VALUE
 ANR 0.055 RIGHT OVERBANK N-VALUE
 RLNTH 507. REACH LENGTH
 SEL 0.0237 ENERGY SLOPE
 ELMAX 0.0 MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

CROSS-SECTION DATA

	--- LEFT OVERBANK ---	+	----- MAIN CHANNEL -----	+	--- RIGHT OVERBANK ---
50 RY ELEVATION	10.00		9.00 8.00 7.00 7.00 8.00		9.00 10.00
49 RX DISTANCE	0.00		10.00 20.00 24.00 26.00 30.00		40.00 50.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

	0.00	0.60	2.18	4.87	8.85	14.29	21.34	31.59	44.90	61.02
STORAGE	0.00	0.00	0.01	0.02	0.03	0.05	0.06	0.08	0.11	0.14
OUTFLOW	0.00	0.60	2.18	4.87	8.85	14.29	21.34	31.59	44.90	61.02
ELEVATION	7.00	7.16	7.32	7.47	7.63	7.79	7.95	8.11	8.26	8.42
STORAGE	0.18	0.22	0.27	0.32	0.38	0.45	0.52	0.60	0.68	0.77
OUTFLOW	80.33	103.13	129.72	160.37	195.34	234.88	279.25	328.69	383.41	443.66
ELEVATION	8.58	8.74	8.89	9.05	9.21	9.37	9.53	9.68	9.84	10.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 9. TO 444.
 THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
 THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

*** *** *** ***

HYDROGRAPH AT STATION RWS19B

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR MAXIMUM AVERAGE FLOW	72-HR MAXIMUM AVERAGE FLOW	66.63-HR MAXIMUM AVERAGE FLOW
2.	4.13	0.	0.	0.	0.
		(INCHES) 1.310	1.314	1.314	1.314
		(AC-FT) 0.	0	0.	0.

PEAK STORAGE (AC-FT)	TIME (HR)	6-HR	24-HR MAXIMUM AVERAGE STORAGE	72-HR MAXIMUM AVERAGE STORAGE	66.63-HR MAXIMUM AVERAGE STORAGE

0. 4.03 0. 0. 0. 01-100.out 0.
 PEAK STAGE TIME 6-HR MAXIMUM AVERAGE STAGE
 + (FEET) (HR) 24-HR 72-HR 66.63-HR
 7.26 4.13 7.03 7.01 7.00 7.00
 CUMULATIVE AREA = 0.00 SQ MI

51 KK *****
 * WS19C * BASIN
 * *****

SUBBASIN RUNOFF DATA

52 BA SUBBASIN CHARACTERISTICS
 TAREA 0.00 SUBBASIN AREA

PRECIPITATION DATA

12 PB STORM 2.80 BASIN TOTAL PRECIPITATION

13 PI INCREMENTAL PRECIPITATION PATTERN
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.01 0.01 0.01 0.01 0.01 0.01 0.02 0.02 0.02 0.02
 0.02 0.02 0.04 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

53 LG GREEN AND AMPT LOSS RATE
 STRTL 0.30 STARTING LOSS
 DTH 0.27 MOISTURE DEFICIT
 PSIF 3.29 WETTING FRONT SUCTION
 XKSAT 0.77 HYDRAULIC CONDUCTIVITY
 RTIMP 1.00 PERCENT IMPERVIOUS AREA

54 UC CLARK UNITGRAPH
 TC 0.23 TIME OF CONCENTRATION
 R 0.33 STORAGE COEFFICIENT

55 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
 0.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
 100.0

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.23 HR, R= 0.33 HR
 SNYDER TP= 0.21 HR, CP= 0.48

UNIT HYDROGRAPH
 58 END-OF-PERIOD ORDINATES
 0. 0. 1. 1. 3. 4. 4. 4. 3.
 3. 3. 3. 2. 2. 2. 2. 1. 1.
 1. 1. 1. 1. 1. 1. 1. 1. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0.

*** *** *** *** ***

HYDROGRAPH AT STATION WS19C

TOTAL RAINFALL = 2.80, TOTAL LOSS = 1.87, TOTAL EXCESS = 0.93

PEAK FLOW TIME 6-HR MAXIMUM AVERAGE FLOW
 + (CFS) (HR) 24-HR 72-HR 66.63-HR
 + 3. 4.13 (CFS) 0. 0. 0. 0.
 (INCHES) 0.923 0.923 0.923 0.923
 (AC-FT) 0. 0. 0. 0.
 CUMULATIVE AREA = 0.00 SQ MI

57 KK *****
 * CP19C * COMBINE
 * *****

58 HC HYDROGRAPH COMBINATION ICOMP 3 NUMBER OF HYDROGRAPHS TO COMBINE

PEAK FLOW (CFS)	TIME (HR)	HYDROGRAPH AT STATION (CFS) (INCHES) (AC-FT)	6-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	66.63-HR
34.	4.13	4. 1.722 2.	1. 1.730 2.	0. 1.730 2.	0. 1.730 2.	0. 1.730 2.
CUMULATIVE AREA = 0.02 SQ MI						

59 KK DCP19C STORAGE

60 KO OUTPUT CONTROL VARIABLES IPRT 3 PRINT CONTROL IPLOT 0 PLOT CONTROL QSCAL 0. HYDROGRAPH PLOT SCALE

61 RS HYDROGRAPH ROUTING DATA STORAGE ROUTING NSTPS 1 NUMBER OF SUBREACHES ITYP STOR TYPE OF INITIAL CONDITION RSVRIC 0.00 INITIAL CONDITION X 0.00 WORKING R AND D COEFFICIENT

62 SV	STORAGE	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
63 SQ	DISCHARGE	0.	5.	12.	23.	34.	34.	34.	34.	34.
64 SE	ELEVATION	1591.00	1591.50	1592.00	1592.50	1593.00	1593.20	1593.50	1594.00	1594.20

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 5. TO 23. THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS. THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

PEAK FLOW (CFS)	TIME (HR)	HYDROGRAPH AT STATION (CFS) (INCHES) (AC-FT)	6-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	66.63-HR
34.	4.13	4. 1.722 2.	1. 1.736 2.	0. 1.736 2.	0. 1.736 2.	0. 1.736 2.
PEAK STORAGE (AC-FT)	TIME (HR)	6-HR	MAXIMUM AVERAGE STORAGE 24-HR	72-HR	66.63-HR	
0.	4.13	0.	0.	0.	0.	
PEAK STAGE (FEET)	TIME (HR)	6-HR	MAXIMUM AVERAGE STAGE 24-HR	72-HR	66.63-HR	
1592.99	4.13	1591.30	1591.08	1591.03	1591.03	
CUMULATIVE AREA = 0.02 SQ MI						

65 KK WS19D BASIN

66 BA SUBBASIN RUNOFF DATA SUBBASIN CHARACTERISTICS TAREA 0.00 SUBBASIN AREA

12 PB STORM 2.80 BASIN TOTAL PRECIPITATION

13 PI	INCREMENTAL PRECIPITATION PATTERN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

STRTL 0.30 STARTING LOSS
 DTH 0.27 MOISTURE DEFICIT
 PSIF 3.29 WETTING FRONT SUCTION
 XKSAT 0.78 HYDRAULIC CONDUCTIVITY
 RTIMP 3.00 PERCENT IMPERVIOUS AREA

74 UC CLARK UNITGRAPH
 TC 0.23 TIME OF CONCENTRATION
 R 0.47 STORAGE COEFFICIENT

75 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
 0.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
 100.0

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.23 HR, R= 0.47 HR
 SNYDER TP= 0.23 HR, CP= 0.40

UNIT HYDROGRAPH
 79 END-OF-PERIOD ORDINATES
 0. 0. 0. 1. 1. 2. 2. 2. 2.
 2. 2. 2. 1. 1. 1. 1. 1. 1.
 1. 1. 1. 1. 1. 1. 1. 1. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0.

*** *** *** *** ***

HYDROGRAPH AT STATION WS19E

TOTAL RAINFALL = 2.80, TOTAL LOSS = 1.84, TOTAL EXCESS = 0.96

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR (INCHES)	72-HR (AC-FT)	MAXIMUM AVERAGE FLOW 66.63-HR
2.	4.17	0.	0.954	0.	0.955
		0.	0.	0.	0.

CUMULATIVE AREA = 0.00 SQ MI

77 KK *****
 * WS20 * BASIN

SUBBASIN RUNOFF DATA

78 BA SUBBASIN CHARACTERISTICS
 TAREA 0.03 SUBBASIN AREA

PRECIPITATION DATA

12 PB STORM 2.80 BASIN TOTAL PRECIPITATION

13 PI INCREMENTAL PRECIPITATION PATTERN
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.01 0.01 0.01 0.01 0.01 0.01 0.02 0.02 0.02 0.02
 0.02 0.02 0.04 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

79 LG GREEN AND AMPT LOSS RATE
 STRTL 0.19 STARTING LOSS
 DTH 0.27 MOISTURE DEFICIT
 PSIF 3.29 WETTING FRONT SUCTION
 XKSAT 0.95 HYDRAULIC CONDUCTIVITY
 RTIMP 47.00 PERCENT IMPERVIOUS AREA

80 UC CLARK UNITGRAPH
 TC 0.27 TIME OF CONCENTRATION
 R 0.32 STORAGE COEFFICIENT

81 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
 0.0 5.0 16.0 30.0 65.0 77.0 84.0 90.0 94.0 97.0
 100.0

01-100.out
 CLARK TC= 0.27 HR, R= 0.32 HR
 SNYDER TP= 0.18 HR, CP= 0.37

UNIT HYDROGRAPH
 54 END-OF-PERIOD ORDINATES

2.	7.	18.	29.	33.	34.	33.	32.	30.	27.
24.	22.	20.	18.	16.	14.	13.	12.	10.	9.
8.	8.	7.	6.	5.	5.	4.	4.	4.	3.
3.	3.	2.	2.	2.	2.	2.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	0.	0.	0.
0.	0.	0.	0.						

*** **

HYDROGRAPH AT STATION WS20

TOTAL RAINFALL = 2.80, TOTAL LOSS = 1.04, TOTAL EXCESS = 1.76

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	MAXIMUM 24-HR	AVERAGE FLOW 72-HR	66.63-HR
37.	4.10	5.	1.	0.	0.
		(INCHES) 1.746	1.756	1.756	1.756
		(AC-FT) 2.	2.	2.	2.

CUMULATIVE AREA = 0.03 SQ MI

83 KK *****
 * RCP20 * ROUTE
 * * *

HYDROGRAPH ROUTING DATA

84 RK KINEMATIC WAVE STREAM ROUTING
 L 123 CHANNEL LENGTH
 S 0.0100 SLOPE
 N 0.012 CHANNEL ROUGHNESS COEFFICIENT
 CA 0.00 CONTRIBUTING AREA
 SHAPE CIRC CHANNEL SHAPE
 WD 3.00 BOTTOM WIDTH OR DIAMETER
 Z 0.00 SIDE SLOPE
 NDXMIN 2 MINIMUM NUMBER OF DX INTERVALS

*** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

COMPUTED KINEMATIC PARAMETERS
 VARIABLE TIME STEP
 (DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	8.05	1.25	0.11	41.00	36.90	246.08	1.76	13.64

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2342E+01 EXCESS=0.0000E+00 OUTFLOW=0.2342E+01 BASIN STORAGE=0.5707E-18 PERCENT ERROR= 0.0

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	8.05	1.25	2.00	36.88	246.00	1.76
------	------	------	------	-------	--------	------

*** **

HYDROGRAPH AT STATION RCP20

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	MAXIMUM 24-HR	AVERAGE FLOW 72-HR	66.63-HR
37.	4.10	5.	1.	0.	0.
		(INCHES) 1.746	1.756	1.756	1.756
		(AC-FT) 2.	2.	2.	2.

CUMULATIVE AREA = 0.03 SQ MI

85 KK *****
 * WS20A * BASIN
 * * *

SUBBASIN RUNOFF DATA

86 BA SUBBASIN CHARACTERISTICS
 TAREA 0.00 SUBBASIN AREA

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	WS19	23.	4.07	3.	1.	0.	0.01		
ROUTED TO	RCP19	23.	4.07	3.	1.	0.	0.01		
ROUTED TO	RRCP19	23.	4.10	3.	1.	0.	0.01	7.80 4.10	
HYDROGRAPH AT	WS19A	7.	4.13	1.	0.	0.	0.00		
2 COMBINED AT	CP19A	29.	4.10	3.	1.	0.	0.02		
ROUTED TO	RCP19A	29.	4.10	3.	1.	0.	0.02	8.14 4.10	
HYDROGRAPH AT	WS19B	2.	4.07	0.	0.	0.	0.00		
ROUTED TO	RWS19B	2.	4.13	0.	0.	0.	0.00	7.26 4.13	
HYDROGRAPH AT	WS19C	3.	4.13	0.	0.	0.	0.00		
3 COMBINED AT	CP19C	34.	4.13	4.	1.	0.	0.02		
ROUTED TO	DCP19C	34.	4.13	4.	1.	0.	0.02	1592.99 4.13	
HYDROGRAPH AT	WS19D	2.	4.13	0.	0.	0.	0.00		
HYDROGRAPH AT	WS19E	2.	4.17	0.	0.	0.	0.00		
HYDROGRAPH AT	WS20	37.	4.10	5.	1.	0.	0.03		
ROUTED TO	RCP20	37.	4.10	5.	1.	0.	0.03		
HYDROGRAPH AT	WS20A	3.	4.10	1.	0.	0.	0.00		
2 COMBINED AT	CP20A	40.	4.10	5.	1.	0.	0.03		

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL		VOLUME
							PEAK	TIME TO PEAK	
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
RCP19	MANE	0.10	23.45	244.13	2.14	2.00	23.44	244.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1370E+01 EXCESS=0.0000E+00 OUTFLOW=0.1370E+01 BASIN STORAGE=0.5540E-18 PERCENT ERROR= 0.0

RCP20 MANE 0.11 36.90 246.08 1.76 2.00 36.88 246.00 1.76

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2342E+01 EXCESS=0.0000E+00 OUTFLOW=0.2342E+01 BASIN STORAGE=0.5707E-18 PERCENT ERROR= 0.0

*** NORMAL END OF HEC-1 ***

PROPOSED CONDITIONS HEC-1 MODEL

CITY OF SCOTTSDALE
 Drainage Design Management System
 LAND USE
 Project Reference: 1603PR

Sub Basin	Land Use Code	Area (sq mi)	Area (%)	Initial Loss (IA)	Percent Impervious (RTIMP)	Vegetation Cover (%)	DTHETA	Kb
Major Basin ID: 01								
WS19	44	0.009	78.0	0.10	85	75.0	NORMAL	0.034
	UNDEVELOPED	0.003	22.0	0.30	1	30.0	NORMAL	0.068 *
		0.012	100.0					
WS19A	13	0.005	100.0	0.25	24	50.0	NORMAL	0.073 *
		0.005	100.0					
WS19B	13	0.001	100.0	0.25	24	50.0	NORMAL	0.083 *
		0.001	100.0					
WS19C	13	0.002	61.5	0.25	24	50.0	NORMAL	0.076 *
	UNDEVELOPED	0.001	38.5	0.30	1	30.0	NORMAL	0.076 *
		0.003	100.0					
WS19D	13	0.002	64.9	0.25	24	50.0	NORMAL	0.074 *
	22	0.000	10.8	0.10	85	75.0	NORMAL	0.037
	UNDEVELOPED	0.001	24.3	0.30	1	30.0	NORMAL	0.074 *
		0.004	100.0					
WS20	22	0.002	8.8	0.10	85	75.0	NORMAL	0.032
	44	0.012	45.8	0.10	85	75.0	NORMAL	0.032
	UNDEVELOPED	0.011	45.4	0.30	1	30.0	NORMAL	0.063 *
		0.025	100.0					
WS20A	13	0.000	10.3	0.25	24	50.0	NORMAL	0.076 *
	22	0.002	72.4	0.10	85	75.0	NORMAL	0.038
	UNDEVELOPED	0.001	17.2	0.30	1	30.0	NORMAL	0.076 *
		0.003	99.9					

* Non default value

CITY OF SCOTTSDALE
 Drainage Design Management System
 SOILS

Area ID	Book Number	Map Unit	Soil ID	Area (sq mi)	Area (%)	XKSAT	Rock Percent (%)	Effective Rock (%)
Major Basin ID: 01								
WS19	645	68	64568	0.012	100.00	0.63	-	100
WS19A	645	68	64568	0.005	100.00	0.63	-	100
WS19B	645	68	64568	0.001	100.00	0.63	-	100
WS19C	645	68	64568	0.003	100.00	0.63	-	100
WS19D	645	68	64568	0.004	100.00	0.63	-	100
WS20	645	68	64568	0.025	100.00	0.63	-	100
WS20A	645	68	64568	0.003	100.00	0.63	-	100

CITY OF SCOTTSDALE
 Drainage Design Management System
 HEC-1 FLOW SUMMARY
 Project Reference: 1603PR

ID	Type	Area (sq mi)	Discharge cfs					
			2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin 01								
WS19	Hydrograph	0.010	7	10	13	17	20	23
RCP19	Routed	0.010	7	10	13	17	20	23
RRCP19	Routed	0.010	7	10	12	16	20	23
WS19A	Hydrograph		1	2	3	4	5	7
CP19A	Combined	0.020	8	11	15	20	25	29
RCP19A	Routed	0.020	8	11	15	20	24	29
WS19B	Hydrograph				1	1	1	2
RW19B	Routed				1	1	1	2
WS19C	Hydrograph			1	2	3	3	4
WS19D	Hydrograph		1	1	2	3	3	4
DT19D	Routed						1	1
CP19C	Combined	0.030	8	12	17	24	29	35
DCP19C	Routed	0.030	7	9	13	21	27	33
WS20	Hydrograph	0.030	9	13	18	25	31	37
RCP20	Routed	0.030	9	13	18	25	31	37
WS20A	Hydrograph		1	1	2	2	3	3
CP20A	Combined	0.030	10	14	19	27	33	40

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 17JUL13 TIME 18:27:47 *
*****
    
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*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
*****
    
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION. NEW OPTIONS: DAMBREAK, OUTFLOW, SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL, LOSS RATE:GREEN AND AMPT INFILTRATION, KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM.

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID CITY OF SCOTTSDALE
2 ID 1603PR - COCHISE MANOR
3 ID 100 YEAR
4 ID 6 Hour Storm
5 ID Unit Hydrograph: Clark
6 ID 07/17/2013
7 IT 2 0 0 1000
8 IN 15
9 ID 3
*DIAGRAM
*
10 KK WS19 BASIN
11 BA 0.012
12 PB 2.802
13 PC 0.000 0.008 0.016 0.025 0.033 0.041 0.050 0.058 0.066 0.074
14 PC 0.087 0.099 0.118 0.138 0.216 0.377 0.834 0.911 0.931 0.950
15 PC 0.962 0.972 0.983 0.991 1.000
16 LG 0.14 0.27 3.29 1.01 67
17 UC 0.198 0.235
18 UA 0 5.0 16.0 30.0 65.0 77.0 84.0 90.0 94.0 97.0
19 UA 100
*
20 KK RCP19 ROUTE
21 RK 123 0.0100 0.012 CIRC 3.000
*
22 KK RRCP19 ROUTE
23 RS I FLOW
24 RC 0.055 0.040 0.055 496 0.0262 0.00
25 RK 0.00 10.00 20.00 24.00 28.00 32.00 42.00 52.00
26 RY 10.00 9.00 8.00 7.00 7.00 8.00 9.00 10.00
*
27 KK WS19A BASIN
28 BA 0.005
29 LG 0.25 0.27 3.29 0.91 24
30 UC 0.225 0.317
31 UA 0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
32 UA 100
*
33 KK CP19A COMBINE
34 HC 2 .0172
*
35 KK RCP19A ROUTE
36 RS 1 FLOW
37 RC 0.055 0.040 0.055 233 0.0169 0.00
38 RK 0.00 10.00 20.00 24.00 26.00 30.00 40.00 50.00
39 RY 10.00 9.00 8.00 7.00 7.00 8.00 9.00 10.00
    
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```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
40 KK WS19B BASIN
41 BA 0.001
42 LG 0.25 0.27 3.29 0.91 24
43 UC 0.144 0.200
44 UA 0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
45 UA 100
*
46 KK RW19B ROUTE
    
```

01-100.out											
47	RS	2	FLOW								
48	RC	0.055	0.040	0.055	492	0.0237	0.00				
49	RX	0.00	10.00	20.00	24.00	26.00	30.00	40.00	50.00		
50	RY	10.00	9.00	8.00	7.00	7.00	8.00	9.00	10.00		
51	KK	WS19C	BASIN								
52	BA	0.003									
53	LG	0.27	0.27	3.29	0.86	15					
54	UC	0.183	0.244								
55	UA	0	3.0	5.0	8.0	12.0	20.0	43.0	75.0	90.0	96.0
56	UA	100									
57	KK	WS19D	BASIN								
58	BA	0.004									
59	LG	0.25	0.27	3.29	0.89	25					
60	UC	0.251	0.449								
61	UA	0	3.0	5.0	8.0	12.0	20.0	43.0	75.0	90.0	96.0
62	UA	100									
63	KK	DT19D	STORAGE								
64	KO										
65	RS	1	STOR								
66	SV		0.05	0.10	0.12	0.22	0.31				
67	SO				0.21	0.97	10.70				
68	SE	1589.5	1590.50	1591.20	1591.50	1592.50	1593.20				
69	ST	1592.5	6.0	3.0	1.5						
70	KK	CP19C	COMBINE								
71	HC	4	.0243								
72	KK	DCP19C	STORAGE								
73	KO										
74	RS	1	STOR								
75	SV			0.01	0.02	0.10	0.14	0.21	0.34	0.40	0.40
76	SO		1.10	3.00	5.50	8.50	9.80	15.30	33.80	43.40	59.60
77	SE	1591.0	1591.50	1592.00	1592.50	1593.00	1593.20	1593.50	1594.00	1594.20	1594.50
78	ST	1593.3	15.0	3.0	1.5						

1

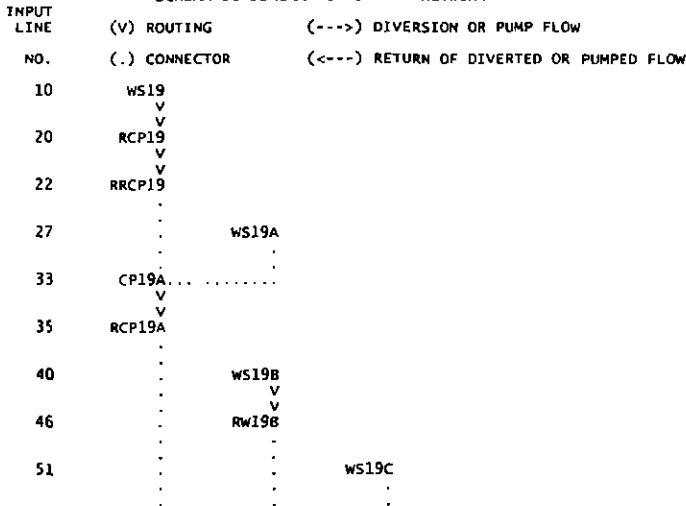
HEC-1 INPUT

PAGE 3

LINE	ID	1	2	3	4	5	6	7	8	9	10
79	KK	WS20	BASIN								
80	BA	0.025									
81	LG	0.19	0.27	3.29	0.95	47					
82	UC	0.272	0.316								
83	UA	0	5.0	16.0	30.0	65.0	77.0	84.0	90.0	94.0	97.0
84	UA	100									
85	KK	RCP20	ROUTE								
86	RK	123	0.0100	0.012		CIRC	3.000				
87	KK	WS20A	BASIN								
88	BA	0.003									
89	LG	0.15	0.27	3.29	1.01	64					
90	UC	0.229	0.650								
91	UA	0	5.0	16.0	30.0	65.0	77.0	84.0	90.0	94.0	97.0
92	UA	100									
93	KK	CP20A	COMBINE								
94	HC	2	.0281								
95	ZZ										

1

SCHEMATIC DIAGRAM OF STREAM NETWORK



0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
0.02	0.02	0.04	0.05	0.06	0.06	0.06	0.06	0.06	0.06
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

16 LG GREEN AND AMPT LOSS RATE
 STRTL 0.14 STARTING LOSS
 DTH 0.27 MOISTURE DEFICIT
 PSIF 3.29 WETTING FRONT SUCTION
 XKSAT 1.01 HYDRAULIC CONDUCTIVITY
 RTIMP 67.00 PERCENT IMPERVIOUS AREA

17 UC CLARK UNITGRAPH
 TC 0.20 TIME OF CONCENTRATION
 R 0.23 STORAGE COEFFICIENT

18 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
 0.0 5.0 16.0 30.0 65.0 77.0 84.0 90.0 94.0 97.0
 100.0

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.20 HR, R= 0.23 HR
 SNYDER TP= 0.13 HR, CP= 0.38

UNIT HYDROGRAPH
 40 END-OF-PERIOD ORDINATES

2.	8.	17.	22.	22.	21.	19.	16.	14.	12.
11.	9.	8.	7.	6.	5.	5.	4.	3.	3.
3.	2.	2.	2.	1.	1.	1.	1.	1.	1.
1.	1.	0.	0.	0.	0.	0.	0.	0.	0.

HYDROGRAPH AT STATION WS19

TOTAL RAINFALL = 2.80, TOTAL LOSS = 0.65, TOTAL EXCESS = 2.15

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR MAXIMUM AVERAGE FLOW	72-HR MAXIMUM AVERAGE FLOW	33.30-HR MAXIMUM AVERAGE FLOW
23.	4.07	3.	1.	0.	0.
		(INCHES) 2.130	2.140	2.140	2.140
		(AC-FT) 1.	1.	1.	1.

CUMULATIVE AREA = 0.01 SQ MI

20 KK *****
 * RCP19 * ROUTE
 * *

HYDROGRAPH ROUTING DATA

21 RK KINEMATIC WAVE STREAM ROUTING
 L 123. CHANNEL LENGTH
 S 0.0100 SLOPE
 N 0.012 CHANNEL ROUGHNESS COEFFICIENT
 CA 0.00 CONTRIBUTING AREA
 SHAPE CIRC CHANNEL SHAPE
 WD 3.00 BOTTOM WIDTH OR DIAMETER
 Z 0.00 SIDE SLOPE
 NDXMIN 2 MINIMUM NUMBER OF DX INTERVALS

*** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

COMPUTED KINEMATIC PARAMETERS
 VARIABLE TIME STEP
 (DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	8.05	1.25	0.10	41.00	23.45	244.13	2.14	12.46

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1370E+01 EXCESS=0.0000E+00 OUTFLOW=0.1370E+01 BASIN STORAGE=0.1433E-16 PERCENT ERROR= 0.0

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	8.05	1.25	2.00	23.44	244.00	2.14
------	------	------	------	-------	--------	------

HYDROGRAPH AT STATION RCP19

01-100.out

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	MAXIMUM 24-HR (INCHES)	AVERAGE FLOW 72-HR (AC-FT)	33.30-HR (CFS)
23.	4.07	3.	2.130	1.	0.
		1.	1.	2.140	2.140
				1.	1.

CUMULATIVE AREA = 0.01 SQ MI

22 KK *****
 * RRCP19 *
 * ROUTE *

HYDROGRAPH ROUTING DATA

23 RS STORAGE ROUTING
 MSTPS 1 NUMBER OF SUBREACHES
 ITYP FLOW TYPE OF INITIAL CONDITION
 RSVRIC 0.00 INITIAL CONDITION
 X 0.00 WORKING R AND D COEFFICIENT

24 RC NORMAL DEPTH CHANNEL
 ANL 0.055 LEFT OVERBANK N-VALUE
 ANCH 0.040 MAIN CHANNEL N-VALUE
 ANR 0.055 RIGHT OVERBANK N-VALUE
 RLNTH 496. REACH LENGTH
 SEL 0.0262 ENERGY SLOPE
 ELMAX 0.0 MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

CROSS-SECTION DATA

	--- LEFT OVERBANK ---	--- + ---	----- MAIN CHANNEL -----	+ ---	--- RIGHT OVERBANK ---
26 RY ELEVATION	10.00	9.00	8.00	7.00	7.00
25 RX DISTANCE	0.00	10.00	20.00	24.00	28.00
				32.00	42.00
					52.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.01	0.02	0.03	0.05	0.06	0.08	0.11	0.13	0.17
OUTFLOW	0.00	1.18	3.99	8.41	14.54	22.53	32.52	46.43	64.01	84.86
ELEVATION	7.00	7.16	7.32	7.47	7.63	7.79	7.95	8.11	8.26	8.42
STORAGE	0.21	0.25	0.30	0.36	0.42	0.49	0.56	0.64	0.73	0.82
OUTFLOW	109.34	137.78	170.47	207.70	249.73	296.83	349.25	407.24	471.03	540.86
ELEVATION	8.58	8.74	8.89	9.05	9.21	9.37	9.53	9.68	9.84	10.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 349. TO 541.
 THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
 THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

HYDROGRAPH AT STATION RRCP19

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	MAXIMUM 24-HR (INCHES)	AVERAGE FLOW 72-HR (AC-FT)	33.30-HR (CFS)
23.	4.10	3.	2.129	1.	0.
		1.	1.	2.140	2.140
				1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)	6-HR	MAXIMUM 24-HR	AVERAGE STORAGE 72-HR	33.30-HR
0.	4.07	0.	0.	0.	0.

PEAK STAGE (FEET)	TIME (HR)	6-HR	MAXIMUM 24-HR	AVERAGE STAGE 72-HR	33.30-HR
7.80	4.10	7.18	7.04	7.03	7.03

CUMULATIVE AREA = 0.01 SQ MI

27 KK *****
 * WS19A *
 * BASIN *

SUBBASIN RUNOFF DATA

28 BA SUBBASIN CHARACTERISTICS
 TAREA 0.00 SUBBASIN AREA

PRECIPITATION DATA

12 PB STORM 2.80 BASIN TOTAL PRECIPITATION

13 PI INCREMENTAL PRECIPITATION PATTERN

01-100.out

STRTL 0.25 STARTING LOSS
DTH 0.27 MOISTURE DEFICIT
PSIF 3.29 WETTING FRONT SUCTION
XKSAT 0.91 HYDRAULIC CONDUCTIVITY
RTIMP 24.00 PERCENT IMPERVIOUS AREA

43 UC CLARK UNITGRAPH
TC 0.14 TIME OF CONCENTRATION
R 0.20 STORAGE COEFFICIENT

44 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
0.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
100.0

UNIT HYDROGRAPH PARAMETERS
CLARK TC= 0.14 HR, R= 0.20 HR
SNYDER TP= 0.13 HR, CP= 0.49

UNIT HYDROGRAPH
35 END-OF-PERIOD ORDINATES
0. 0. 1. 2. 2. 2. 1. 1. 1.
1. 1. 1. 1. 0. 0. 0. 0. 0.
0. 0. 0. 0. 0. 0. 0. 0. 0.
0. 0. 0. 0. 0. 0. 0. 0. 0.

*** *** *** *** ***

HYDROGRAPH AT STATION WS19B

TOTAL RAINFALL = 2.80, TOTAL LOSS = 1.48, TOTAL EXCESS = 1.32

PEAK FLOW TIME MAXIMUM AVERAGE FLOW
(CFS) (HR) 6-HR 24-HR 72-HR 33.30-HR
+ 2. 4.07 (CFS) 0. 0. 0. 0.
(INCHES) 1.311 1.314 1.314 1.314
(AC-FT) 0. 0. 0. 0.

CUMULATIVE AREA = 0.00 SQ MI

46 KK *****
* RW19B * ROUTE
* *

HYDROGRAPH ROUTING DATA

47 RS STORAGE ROUTING
NSTPS 2 NUMBER OF SUBREACHES
ITYP FLOW TYPE OF INITIAL CONDITION
RSVRIC 0.00 INITIAL CONDITION
X 0.00 WORKING R AND D COEFFICIENT

48 RC NORMAL DEPTH CHANNEL
ANL 0.055 LEFT OVERBANK N-VALUE
ANCH 0.040 MAIN CHANNEL N-VALUE
ANR 0.055 RIGHT OVERBANK N-VALUE
RLNTH 492. REACH LENGTH
SEL 0.0237 ENERGY SLOPE
ELMAX 0.0 MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

CROSS-SECTION DATA

--- LEFT OVERBANK --- + --- MAIN CHANNEL --- + --- RIGHT OVERBANK ---
50 RY ELEVATION 10.00 9.00 8.00 7.00 7.00 8.00 9.00 10.00
49 RX DISTANCE 0.00 10.00 20.00 24.00 26.00 30.00 40.00 50.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.00	0.01	0.02	0.03	0.05	0.06	0.08	0.11	0.14
OUTFLOW	0.00	0.60	2.18	4.87	8.85	14.29	21.34	31.59	44.90	61.02
ELEVATION	7.00	7.16	7.32	7.47	7.63	7.79	7.95	8.11	8.26	8.42
STORAGE	0.17	0.21	0.26	0.31	0.37	0.43	0.50	0.58	0.66	0.75
OUTFLOW	80.33	103.13	129.72	160.37	195.34	234.88	279.25	328.69	383.41	443.66
ELEVATION	8.58	8.74	8.89	9.05	9.21	9.37	9.53	9.68	9.84	10.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 9. TO 444.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

*** *** *** *** ***

HYDROGRAPH AT STATION RW19B

PEAK FLOW TIME MAXIMUM AVERAGE FLOW
(CFS) (HR) 6-HR 24-HR 72-HR 33.30-HR
+ 2. 4.13 (CFS) 0. 0. 0. 0.
(INCHES) 1.310 1.314 1.314 1.314
(AC-FT) 0. 0. 0. 0.

PEAK STORAGE TIME MAXIMUM AVERAGE STORAGE

			6-HR	24-HR	72-HR	01-100 out 33.30-HR
+ (AC-FT)	(HR)					
0.	4.03		0.	0.	0.	0.
PEAK STAGE	TIME		6-HR	MAXIMUM AVERAGE	STAGE	33.30-HR
+ (FEET)	(HR)			24-HR	72-HR	
7.26	4.13		7.03	7.01	7.01	7.01

CUMULATIVE AREA = 0.00 SQ MI

51 KK *****
 * WS19C * BASIN
 * *

SUBBASIN RUNOFF DATA
 52 BA SUBBASIN CHARACTERISTICS
 TAREA 0.00 SUBBASIN AREA

PRECIPITATION DATA
 12 PB STORM 2.80 BASIN TOTAL PRECIPITATION

13 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01
0.02	0.02	0.04	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

53 LG GREEN AND AMPT LOSS RATE
 STRTL 0.27 STARTING LOSS
 DTH 0.27 MOISTURE DEFICIT
 PSIF 3.29 WETTING FRONT SUCTION
 XKSAT 0.86 HYDRAULIC CONDUCTIVITY
 RTIMP 15.00 PERCENT IMPERVIOUS AREA

54 UC CLARK UNITGRAPH
 TC 0.18 TIME OF CONCENTRATION
 R 0.24 STORAGE COEFFICIENT

55 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
 0.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
 100.0

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.18 HR, R= 0.24 HR
 SNYDER TP= 0.17 HR, CP= 0.50

UNIT HYDROGRAPH
 43 END-OF-PERIOD ORDINATES

0.	1.	1.	4.	6.	6.	5.	5.	4.	3.
3.	3.	2.	2.	2.	2.	1.	1.	1.	1.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

*** **

HYDROGRAPH AT STATION WS19C

TOTAL RAINFALL = 2.80, TOTAL LOSS = 1.64, TOTAL EXCESS = 1.16

			6-HR	MAXIMUM AVERAGE	STAGE	33.30-HR
PEAK FLOW	TIME			24-HR	72-HR	
+ (CFS)	(HR)					
4.	4.10	(CFS)	0.	0.	0.	0.
		(INCHES)	1.153	1.155	1.155	1.155
		(AC-FT)	0.	0.	0.	0.

CUMULATIVE AREA = 0.00 SQ MI

57 KK *****
 * WS19D * BASIN

SUBBASIN RUNOFF DATA

58 BA SUBBASIN CHARACTERISTICS
TAREA 0.00 SUBBASIN AREA

PRECIPITATION DATA

12 PB STORM 2.80 BASIN TOTAL PRECIPITATION

13 PI INCREMENTAL PRECIPITATION PATTERN
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.01 0.01 0.01 0.01 0.01 0.01 0.02 0.02 0.02 0.02
 0.02 0.02 0.04 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

59 LG GREEN AND AMPT LOSS RATE
 STRL 0.25 STARTING LOSS
 DTH 0.27 MOISTURE DEFICIT
 PSIF 3.29 WETTING FRONT SUCTION
 XKSAT 0.89 HYDRAULIC CONDUCTIVITY
 RTIMP 25.00 PERCENT IMPERVIOUS AREA

60 UC CLARK UNITGRAPH
 TC 0.25 TIME OF CONCENTRATION
 R 0.45 STORAGE COEFFICIENT

61 UA ACCUMULATED-AREA VS. TIME, 11 ORDINATES
 0.0 3.0 5.0 8.0 12.0 20.0 43.0 75.0 90.0 96.0
 100.0

UNIT HYDROGRAPH PARAMETERS
 CLARK TC= 0.25 HR. R= 0.45 HR
 SNYDER TP= 0.23 HR. CP= 0.41

UNIT HYDROGRAPH
 76 END-OF-PERIOD ORDINATES
 0. 0. 0. 1. 2. 4. 5. 5. 4. 4.
 4. 3. 3. 3. 3. 3. 2. 2. 2. 2.
 2. 2. 2. 1. 1. 1. 1. 1. 1. 1.
 1. 1. 1. 1. 1. 1. 1. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

*** **

HYDROGRAPH AT STATION WS19D

TOTAL RAINFALL = 2.80, TOTAL LOSS = 1.46, TOTAL EXCESS = 1.35

PEAK FLOW TIME MAXIMUM AVERAGE FLOW
 (CFS) (HR) 6-HR 24-HR 72-HR 33.30-HR
 + 4. 4.17 (CFS) 1. 0. 0. 0.
 (INCHES) 1.332 1.339 1.339 1.339
 (AC-FT) 0. 0. 0. 0.

CUMULATIVE AREA = 0.00 SQ MI

63 KK *****
 * DT19D * STORAGE

64 KO OUTPUT CONTROL VARIABLES
 IPRINT 3 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

65 RS STORAGE ROUTING
 NSTPS 1 NUMBER OF SUBREACHES
 ITYP STOR TYPE OF INITIAL CONDITION
 RSVRIC 0.00 INITIAL CONDITION
 X 0.00 WORKING R AND D COEFFICIENT

66 SV STORAGE 0.0 0.1 0.1 0.1 0.2 0.3

67 SQ DISCHARGE 0. 0. 0. 0. 1. 11.
 68 SE ELEVATION 1589.50 1590.50 1591.20 1591.50 1592.50 1593.20
 69 ST TOP OF DAM
 TOPEL 1592.50 ELEVATION AT TOP OF DAM
 DAMWTD 6.00 DAM WIDTH
 COOD 3.00 WEIR COEFFICIENT
 EXPD 1.50 EXPONENT OF HEAD

*** **

HYDROGRAPH AT STATION DT19D

PEAK OUTFLOW IS 1. AT TIME 5.03 HOURS

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR MAXIMUM AVERAGE FLOW	72-HR MAXIMUM AVERAGE FLOW	33.30-HR MAXIMUM AVERAGE FLOW
1.	5.00	0.	0.	0.	0.
		0.863 (INCHES)	0.897 (INCHES)	0.901 (INCHES)	0.901 (INCHES)
		0. (AC-FT)	0. (AC-FT)	0. (AC-FT)	0. (AC-FT)

PEAK STORAGE (AC-FT)	TIME (HR)	6-HR	24-HR MAXIMUM AVERAGE STORAGE	72-HR MAXIMUM AVERAGE STORAGE	33.30-HR MAXIMUM AVERAGE STORAGE
0.	4.93	0.	0.	0.	0.

PEAK STAGE (FEET)	TIME (HR)	6-HR	24-HR MAXIMUM AVERAGE STAGE	72-HR MAXIMUM AVERAGE STAGE	33.30-HR MAXIMUM AVERAGE STAGE
1592.29	5.03	1591.71	1591.34	1591.12	1591.12

CUMULATIVE AREA = 0.00 SQ MI

70 KK *****
 * * * * *
 * * C P 1 9 C * * * * *
 * * * * *
 * * * * *
 * * * * *
 * * * * *
 * * * * *

71 HC HYDROGRAPH COMBINATION
 ICOMP 4 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

HYDROGRAPH AT STATION CP19C

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	24-HR MAXIMUM AVERAGE FLOW	72-HR MAXIMUM AVERAGE FLOW	33.30-HR MAXIMUM AVERAGE FLOW
35.	4.10	4.	1.	1.	1.
		1.569 (INCHES)	1.624 (INCHES)	1.625 (INCHES)	1.625 (INCHES)
		2. (AC-FT)	2. (AC-FT)	2. (AC-FT)	2. (AC-FT)

CUMULATIVE AREA = 0.03 SQ MI

72 KK *****
 * * * * *
 * * D C P 1 9 C * * * * *
 * * * * *
 * * * * *

73 KO OUTPUT CONTROL VARIABLES
 IPRNT 3 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

74 RS STORAGE ROUTING
 MSTPS 1 NUMBER OF SUBREACHES
 ITYP STOR TYPE OF INITIAL CONDITION
 RSVRIC 0.00 INITIAL CONDITION
 X 0.00 WORKING R AND D COEFFICIENT

75 SV STORAGE 0.0 0.0 0.0 0.0 0.1 0.1 0.2 0.3 0.4 0.4

76 SQ DISCHARGE 0. 1. 3. 6. 9. 10. 15. 34. 43. 60.

77 SE ELEVATION 1591.00 1591.50 1592.00 1592.50 1593.00 1593.20 1593.50 1594.00 1594.20 1594.50

78 ST TOP OF DAM

HYDROGRAPH AT STATION WS20

TOTAL RAINFALL = 2.80, TOTAL LOSS = 1.04, TOTAL EXCESS = 1.76

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	33.30-HR
37.	4.10	5.	1.	1.	1.
		1.746	1.756	1.756	1.756
		2.	2.	2.	2.

(INCHES)
(AC-FT)

CUMULATIVE AREA = 0.03 SQ MI

*** **

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*****
*                               *
* 85 KK   RCP20   ROUTE         *
*                               *
*****

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HYDROGRAPH ROUTING DATA

86 RK KINEMATIC WAVE STREAM ROUTING

L	123.	CHANNEL LENGTH
S	0.0100	SLOPE
N	0.012	CHANNEL ROUGHNESS COEFFICIENT
CA	0.00	CONTRIBUTING AREA
SHAPE	CIRC	CHANNEL SHAPE
WD	3.00	BOTTOM WIDTH OR DIAMETER
Z	0.00	SIDE SLOPE
NDXMIN	2	MINIMUM NUMBER OF DX INTERVALS

*** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

*** FDKRUT - NEWTON RAPHSON FAILED FIXED POINT ITERATION USED - ITERATION= 1

*** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

COMPUTED KINEMATIC PARAMETERS VARIABLE TIME STEP (DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	8.05	1.25	0.11	41.00	36.90	246.08	1.76	13.64

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2342E+01 EXCESS=0.0000E+00 OUTFLOW=0.2342E+01 BASIN STORAGE=0.1533E-16 PERCENT ERROR= 0.0

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	8.05	1.25	2.00	36.88	246.00	1.76
------	------	------	------	-------	--------	------

*** **

HYDROGRAPH AT STATION RCP20

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	33.30-HR
37.	4.10	5.	1.	1.	1.
		1.746	1.756	1.756	1.756
		2.	2.	2.	2.

(INCHES)
(AC-FT)

CUMULATIVE AREA = 0.03 SQ MI

*** **

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*****
*                               *
* 87 KK   WS20A   BASIN        *
*                               *
*****

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SUBBASIN RUNOFF DATA

88 BA SUBBASIN CHARACTERISTICS

TAREA	0.00	SUBBASIN AREA
-------	------	---------------

PRECIPITATION DATA

12 PB STORM 2.80 BASIN TOTAL PRECIPITATION

01-100.out
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	WS19	23.	4.07	3.	1.	0.	0.01		
ROUTED TO	RCP19	23.	4.07	3.	1.	0.	0.01		
ROUTED TO	RRCP19	23.	4.10	3.	1.	0.	0.01	7.80 4.10	
HYDROGRAPH AT	WS19A	7.	4.13	1.	0.	0.	0.00		
2 COMBINED AT	CP19A	29.	4.10	3.	1.	1.	0.02		
ROUTED TO	RCP19A	29.	4.10	3.	1.	1.	0.02	8.14 4.10	
HYDROGRAPH AT	WS19B	2.	4.07	0.	0.	0.	0.00		
ROUTED TO	RW19B	2.	4.13	0.	0.	0.	0.00	7.26 4.13	
HYDROGRAPH AT	WS19C	4.	4.10	0.	0.	0.	0.00		
HYDROGRAPH AT	WS19D	4.	4.17	1.	0.	0.	0.00		
ROUTED TO	DT19D	1.	5.00	0.	0.	0.	0.00	1592.29 5.03	
4 COMBINED AT	CP19C	35.	4.10	4.	1.	1.	0.03		
ROUTED TO	DCP19C	33.	4.17	4.	1.	1.	0.03	1593.69 4.17	
HYDROGRAPH AT	WS20	37.	4.10	5.	1.	1.	0.03		
ROUTED TO	RCP20	37.	4.10	5.	1.	1.	0.03		
HYDROGRAPH AT	WS20A	3.	4.10	1.	0.	0.	0.00		
2 COMBINED AT	CP20A	40.	4.10	5.	1.	1.	0.03		

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL		VOLUME
							PEAK	TIME TO PEAK	
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
RCP19	MANE	0.10	23.45	244.13	2.14	2.00	23.44	244.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1370E+01 EXCESS=0.0000E+00 OUTFLOW=0.1370E+01 BASIN STORAGE=0.1433E-16 PERCENT ERROR= 0.0

RCP20 MANE 0.11 36.90 246.08 1.76 2.00 36.88 246.00 1.76

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2342E+01 EXCESS=0.0000E+00 OUTFLOW=0.2342E+01 BASIN STORAGE=0.1533E-16 PERCENT ERROR= 0.0

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION DT19D
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1	ELEVATION STORAGE OUTFLOW	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
		0.	0.	0.	1.00	1592.29	0.00	0.	1.	0.00	5.03	0.00

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION DCP19C
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1	ELEVATION STORAGE OUTFLOW	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
		0.	0.	0.
		1.	12.	12.

01-100.out

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1593.69	0.39	0.	33.	0.60	4.17	0.00

*** NORMAL END OF HEC-1 ***

APPENDIX D

HYDRAULIC CALCULATIONS

Shea Gutter Capacity (1603.fm8) Report

Label	Solve For	Channel Slope (ft/ft)	Discharge (ft ³ /s)	Gutter Width (ft)	Gutter Cross Slope (ft/ft)
Shea Gutter Capacity	Discharge	0.01100	16.53	1.41	0.06

Road Cross Slope (ft/ft)	Spread (ft)	Manning Coefficient	Flow Area (ft ²)	Depth (ft)	Gutter Depression (ft)	Velocity (ft/s)
0.03	16.50	0.016	3.77	0.50	0.04	4.38

Southwest Land Consulting, P.C.

9/17/2012 11:23:58 PM

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemens Company Drive Suite 200 W Watertown, CT 06796 USA +1-203-765-1666

Bentley FlowMaster V8i (SELECTseries 1) [08.11.01.03]

Page 1 of 1

Shea Curb Inlets In Sag (1603.fm8) Report

Label	Solve For	Discharge (ft ³ /s)	Spread (ft)	Gutter Width (ft)	Gutter Cross Slope (ft/ft)
Shea 4-Cell Curb Inlet	Spread	45.00	12.49	1.41	0.06
Shea 3-Cell Curb Inlet	Spread	35.30	12.04	1.41	0.06

Road Cross Slope (ft/ft)	Curb Opening Length (ft)	Opening Height (ft)	Curb Throat Type	Local Depression (in)	Local Depression Width (ft)	Throat Incline Angle (degrees)
0.03	25.50	0.42	Horizontal	2.00	22.00	90.00
0.03	20.00	0.42	Horizontal	2.00	16.50	90.00

Depth (ft)	Gutter Depression (ft)	Total Depression (ft)
0.66	0.04	0.21
0.66	0.04	0.21

Southwest Land Consulting, P.C.

9/17/2012 11:26:06 PM

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemens Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-766-1686

Bentley FlowMaster V8i (SELECTseries 1) [08.11.01.03]

Page 1 of 1

Irregular Section Wash 19A (1603.fm8) Report

Label	Solve For	Friction Method	Roughness Coefficient	Channel Slope (ft/ft)	Water Surface Elevation (ft)	
Wash 19A	Normal Depth	Manning Formula	0.047	0.02610	1594.69	
Elevation Range	Discharge (ft ³ /s)	Flow Area (ft ²)	Wetted Perimeter (ft)	Hydraulic Radius (ft)	Top Width (ft)	Normal Depth (ft)
1593.71 to 1595.00 ft	31.00	9.86	20.70	0.48	20.57	0.98
Critical Depth (ft)	Critical Slope (ft/ft)	Velocity (ft/s)	Velocity Head (ft)	Specific Energy (ft)	Froude Number	Flow Type
0.89	0.04174	3.14	0.15	1.13	0.80	Subcritical

Southwest Land Consulting, P.C.

9/17/2012 11:31:22 PM

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemens Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666

Bentley FlowMaster V8i (SELECTseries 1) [08.11.01.03]

Page 1 of 1

Detention Bleed Off Circular Orifice (1603_Rev.fm8) Report

Label	Solve For	Discharge (ft ³ /s)	Headwater Elevation (ft)
Bleed Off - High Water-Basin	Discharge	0.97	1592.50
Bleed Off - High Water Weir	Discharge	1.25	1593.20

Centroid Elevation (ft)	Tailwater Elevation (ft)	Discharge Coefficient	Diameter (ft)
1591.45	1591.00	0.60	0.50
1591.45	1591.00	0.60	0.50

Headwater Height Above Centroid (ft)	Tailwater Height Above Centroid (ft)	Flow Area (ft ²)	Velocity (ft/s)
1.05	-0.45	0.20	4.93
1.75	-0.45	0.20	6.37

Notes	Messages
-------	----------

Slotted Weir Discharges - Cochise Ave

Discharge from Opening and Weir are directed towards 2-30" CMP

$Q = C \cdot L \cdot H^{1.5}$, C=coefficient; L=length; H=head				
Weir Coefficient (C) =				3.0
WSEL (ft)	Opening #1 (1'x2.2') & Overflow Weir #1			Total Discharge Opening #1 & Weir #1
	L (in) =	12	134.4	
	Crest Elev (ft)=	1591.00	1593.20	
	H_{open1} (ft)	$Q_{\text{Open1_WSEL}}$ (cfs)	$Q_{\text{weir1_overflow}}$ (cfs)	
1591.00	0.00	0.0	0.0	0.0
1591.50	0.50	1.1	0.0	1.1
1592.00	1.00	3.0	0.0	3.0
1592.50	1.50	5.5	0.0	5.5
1592.96	1.96	8.2	0.0	8.2
1593.00	2.00	8.5	0.0	8.5
1593.20	2.20	9.8	0.0	9.8
1593.50	2.50	9.8	5.5	15.3
1593.70	2.70	9.8	11.9	21.7
1594.00	3.00	9.8	24.0	33.8
1594.20	3.20	9.8	33.6	43.4
1594.25	3.25	9.8	36.2	45.9
1594.50	3.50	9.8	49.8	59.6

Notes:

1. A maximum discharge of 9.8 cts is directed toward Opening #1. After 2.2' ft depth of flow through the opening, excess flow overtops as a weir (Weir #1, crest elev=1593.20 ft) and enters the 2-30" CMP's.

APPENDIX E

**404 CERTIFICATION FORM
WARNING & DISCLAIMER OF LIABILITY**



Section 404 Certification

Before the City issues development permits for a project, the developer's Engineer or the property owner must certify that it complies with, or is exempt from, Section 404 of the Clean Water Act of the United States. Section 404, administered by the U.S. Army Corps of Engineers (COE), regulates the discharge of dredged or fill material into a wetland, lake, (including dry lakes), river, stream (including intermittent streams, ephemeral washes, and arroyos), or other waters of the United States.

Prior to submittal of improvement plans to Project Review the form below must be completed (and submitted with the improvement plans) as evidence of compliance

Certification of Section 404 Permit Status

Owner's Name: Intravest Development, LLC Phone No. (623) 521-6899
Project Name/Description: Cochise Manor Case No. _____
Project Location/Address: 13102 East Cochise Avenue, Scottsdale, AZ

A registered Engineer or the property Owner must check the applicable condition and certify by signing below that:

1. Section 404 does apply to the project because there will be a discharge of dredged or fill material to waters of the U.S., and:

A Section 404 Permit has already been obtained for this project.

-or-

This project qualifies for a "Nationwide Permit," and this project will meet all terms and conditions of the applicable nationwide permit.

2. Section 404 does not apply to the project because:

No watercourses or other waters of the U.S. exist on the property.

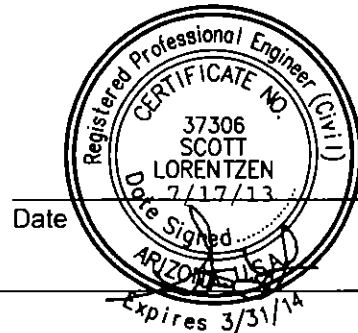
No jurisdictional waters of the U.S. exist on the property. Attached is a copy of the COE's Jurisdictional Determination.

Watercourses or other waters of the U.S. do exist on the property, but the project will not involve the discharge of dredged or fill material into any of these waters.

I certify that the above statement is true.

Engineer's Signature and Seal, or Owner's Signature
President - Southwest Land Consulting, P.C.

Title Company



Date

Planning & Development Services Department

7447 E Indian School Road, Suite 100, Scottsdale, AZ 85251 • Phone: 480-312-2500 • Fax: 480-312-7088



WARNING & DISCLAIMER OF LIABILITY

The Drainage and Floodplain Regulations and Ordinances of the City of Scottsdale are intended to "minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding caused by the surface runoff of rainfall" (Scottsdale Revised Code §37-16).

As defined in S.R.C. §37-17, a flood plain or "Special flood hazard area means an area having flood and/or flood related erosion hazards as shown on a FHBM or FIRM as zone A, AO, A1-30, AE, A99, AH, or E, and those areas identified as such by the floodplain administrator, delineated in accordance with subsection 37-18(b) and adopted by the floodplain board." It is possible that a property could be inundated by greater frequency flood events or by a flood greater in magnitude than a 100-year flood. Additionally, much of the Scottsdale area is a dynamic flood area; that is, the floodplains may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY PURSUANT TO S.R.C §37-22

"The degree of flood protection provided by the requirements in this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by man-made or natural causes. This article (Chapter 37, Article II) shall not create liability on the part of the city, any officer or employee thereof, or the federal government for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder."

Compliance with Drainage and Floodplain Regulations and Ordinances does not insure complete protection from flooding. The Floodplain Regulations and Ordinances meet established local and federal standards for floodplain management, but neither this review nor the Regulations and Ordinances take into account such flood related problems as natural erosion, streambed meander or man-made obstructions and diversions, all of which may have an adverse affect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

I have read and understand the above. If I am an agent for an owner I have made the owner aware of and explained this disclaimer.

30-PP-2012

Plan Check No.

Owner or Agent

7/8/13

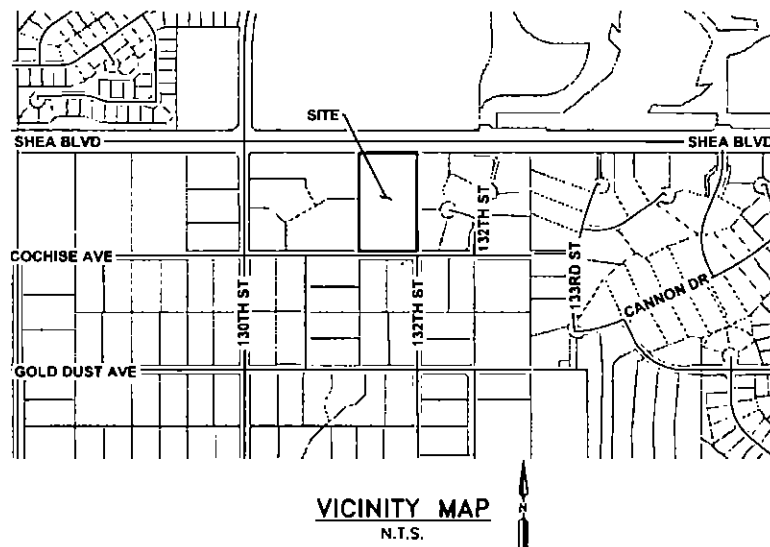
Date

APPENDIX F

SWPPP & NOI FORM

COCHISE MANOR STORMWATER POLLUTION PREVENTION PLAN SCOTTSDALE, ARIZONA

LOCATED IN A PORTION OF SECTION 25, TOWNSHIP 3 NORTH, RANGE 5 EAST
OF THE SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA



SHEET INDEX		CIVIL SHEET SHEET	
COVER SHEET.....	SWP01	1	
STORM WATER POLLUTION PREVENTION PLAN.....	SWP02	2	
BMP DETAIL SHEET.....	SPW03	3	

LEGEND:

- DIRECTION OF SURFACE DRAINAGE
- STRAW WATTLE BARRIER
- STABILIZED CONSTRUCTION ENTRANCE
- TEMPORARY DIVERSION DIKE
- SILT FENCE
- DESIGNATED WASHOUT AREA
- PROPOSED CONTOUR AND ELEVATION
- EXISTING CONTOUR AND ELEVATION

NOTES FOR STORMWATER POLLUTION PREVENTION PLAN:

- A COPY OF THE APPROVED GRADING AND DRAINAGE PLAN FOR THIS PROJECT, TOGETHER WITH A COPY OF THE NOTICE OF INTENT (N.O.I.) AND THIS STORMWATER MANAGEMENT PLAN (SWMP), SHALL BE MAINTAINED ON THE SITE DURING CONSTRUCTION AND BE AVAILABLE FOR REVIEW. THOSE ELEMENTS OF GRADING AND DRAINAGE PLAN PERTINENT TO OR REFERENCED ON THE SWMP SHALL BE CONSIDERED AS PART OF THE SWMP.
- PLANNING AND DEVELOPMENT DEPARTMENT'S CIVIL/SITE INSPECTION GROUP SHALL BE NOTIFIED 48 HOURS BEFORE ANY ON-SITE AND/OR OFF-SITE CONSTRUCTION BEGINS, AT (602) 262-7811.
- ALL WORK SHALL CONFORM TO THE MOST CURRENT UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION PUBLISHED BY THE MARICOPA ASSOCIATION OF GOVERNMENTS (MAG), TOGETHER WITH THE MCDOT SUPPLEMENT TO THE MAG STANDARD SPECIFICATIONS AND THE PROJECT SPECIAL PROVISIONS. ALL WORK MUST ALSO COMPLY WITH RESOLUTION 2001-01 MARICOPA COUNTY RESOLUTION FOR PERMITS TO WORK IN DEDICATED RIGHT-OF-WAY AND RESOLUTION 2001-02 MARICOPA COUNTY RESOLUTION FOR STREET IMPROVEMENTS, INSTALLATION OF UTILITIES AND TRAFFIC CONTROL. ANY EXCEPTIONS MUST RECEIVE EXPLICIT APPROVAL FROM MCDOT AND SHALL BE IDENTIFIED ON THE PLANS AS HAVING EXPLICIT APPROVAL FROM MCDOT.
- THE OPERATOR SHALL OBTAIN A DUST CONTROL PERMIT FROM MARICOPA COUNTY HEALTH DEPARTMENT AND PERFORM MEASURES AS REQUIRED BY THE PERMIT TO PREVENT EXCESS DUST.
- PRIOR TO MOVING OR DESTROYING PROTECTED NATIVE PLANT SPECIES, THE CONTRACTOR SHALL FILE A FORMAL NOTICE OF INTENT WITH THE ARIZONA DEPARTMENT OF AGRICULTURE NATIVE PLANTS (602) 542-6408.
- THE OPERATOR SHALL PERFORM, AT A MINIMUM, A VISUAL INSPECTION OF THE CONSTRUCTION SITE ONCE EVERY WEEK AND WITHIN 24 HOURS OF RAINFALL GREATER THAN OR EQUAL TO A HALF OF AN INCH OR MORE. THE OPERATOR SHALL PREPARE A REPORT DOCUMENTING HIS/HER FINDINGS ON THE CONDITIONS OF THE SWMP CONTROLS AND NOTE ANY EROSION PROBLEM AREAS. THE OPERATOR'S REPORT IS TO BE SUBMITTED TO THE PLANNING AND DEVELOPMENT DEPARTMENT CIVIL/SITE INSPECTOR FOR REVIEW AND APPROVAL. FACILITIES SHALL BE MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING. IN ADDITION, ALL TEMPORARY SITUATION CONTROLS SHALL BE MAINTAINED IN A SATISFACTORY CONDITION UNTIL SUCH TIME THAT CLEARING AND/OR CONSTRUCTION IS COMPLETED. PERMANENT DRAINAGE FACILITIES ARE OPERATIONAL, AND THE POTENTIAL FOR EROSION HAS PASSED.
- THE OPERATOR SHALL AMEND THIS PLAN AS NECESSARY DURING THE COURSE OF CONSTRUCTION TO RESOLVE ANY PROBLEM AREAS, WHICH BECOME EVIDENT DURING THE CONSTRUCTION AND/OR DURING RAINFALLS.
- THE PERMITTEE SHALL FILE A NOTICE OF TERMINATION (N.O.T) AFTER COMPLETION OF CONSTRUCTION AND PLACEMENT OF FINAL LANDSCAPE MATERIALS. THE N.O.T IS TO BE SUBMITTED TO THE PLANNING AND DEVELOPMENT DEPARTMENT CIVIL/SITE INSPECTOR TO FINAL THE SWMP PERMIT.
- THE PERMITTEE SHALL SAVE ALL RECORDS, INCLUDING THE N.O.I., SWMP, N.O.T, AND INSPECTION REPORTS, ON FILE FOR A MINIMUM OF THREE YEARS FROM THE DATE OF FILING THE N.O.T.
- THE IMPLEMENTATION OF THESE PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE FACILITIES IS THE RESPONSIBILITY OF THE PERMITTEE/CONTRACTOR UNTIL ALL CONSTRUCTION IS APPROVED AND THE N.O.T SUBMITTED TO THE PLANNING AND DEVELOPMENT DEPARTMENT CIVIL/SITE INSPECTOR.
- THE FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES IN SUCH A MANNER AS TO INSURE THAT SEDIMENT-LADEN WATER DOES NOT ENTER THE DRAINAGE SYSTEM OR VIOLATE APPLICABLE WATER STANDARDS, AND MUST BE INSTALLED AND IN OPERATION PRIOR TO ANY GRADING OR LAND CLEARING. WHENEVER POSSIBLE, MAINTAIN NATURAL VEGETATION FOR SILT CONTROL.
- THE CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS WITHIN THE RIGHT-OF-WAY TO A CONDITION EQUAL TO OR BETTER THAN EXISTING IMPROVEMENTS PER MAG 107.9. DISPOSAL OF ALL WASTE MATERIAL WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- THE CONTRACTOR'S N.O.I. MUST BE RECEIVED PRIOR TO THE SWMP PERMIT BEING ISSUED. THE CONTRACTOR THAT WILL BE PULLING THE GRADING AND DRAINAGE PERMIT MUST HAVE THE SWMP PERMIT ISSUED IN THEIR NAME.
- PLAN APPROVAL IS VALID FOR 180 DAYS. PRIOR TO PLAN APPROVAL EXPIRATION, ALL ASSOCIATED PERMITS SHALL BE PURCHASED OR THE PLANS SHALL BE RESUBMITTED FOR EXTENSION OF PLAN APPROVAL. THE EXPIRATION, EXTENSION, AND REINSTATEMENT OF CIVIL ENGINEERING PLANS AND PERMITS SHALL FOLLOW THE SAME GUIDELINES AS THOSE INDICATED IN THE PHOENIX BUILDING CONSTRUCTION CODE ADMINISTRATIVE PROVISIONS SECTION 105.3 FOR BUILDING PERMITS.

OWNER/BUILDER:

INTRAVEST DEVELOPMENT, L.L.C.
5630 WEST THUNDERBIRD ROAD, SUITE 88
GLENDALE, AZ 85038
PHONE: (623) 521-6899
CONTACT: MASON CAVE
EMAIL: mason@masoncave.com

ENGINEER:

SOUTHWEST LAND CONSULTING, P.C.
PMB 132
8711 E. PINNACLE PEAK RD. STE F-211
SCOTTSDALE, AZ 85255
PHONE: (480) 565-7521
FAX: (480) 565-7523
EMAIL: slorntzen@swlcl.com
CONTACT: SCOTT LORENTZEN, P.E.

BENCHMARK:

BRASS CAP FLUSH AT THE INTERSECTION OF 136TH STREET AND SHEA BOULEVARD
ELEV. = 1588.48 (CITY OF SCOTTSDALE, NAVD 88 DATUM)

I HEREBY CERTIFY THAT ALL ELEVATIONS REPRESENTED ON THIS PLAN ARE BASED ON THE ELEVATION DATUM FOR THE CITY OF SCOTTSDALE BENCHMARK PROVIDED ABOVE.

LEGAL DESCRIPTION:

QLO LOT 6, THE WEST HALF OF THE NORTHEAST QUARTER OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 25, TOWNSHIP 3 NORTH, RANGE 5 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA

FLOOD INFORMATION:

ALL AREAS OF SUBJECT PARCEL LIE IN ZONE "X" (SHADED) WHICH IS DEFINED TO BE OUTSIDE THE 100 YEAR FLOOD, ACCORDING TO CURRENT FLOOD INSURANCE RATE MAP NUMBER 04013C1710F, ENCOMPASSING COMMUNITY NUMBER 045012, PANEL 1710 OF 4350, DATED SEPTEMBER 30, 2005.

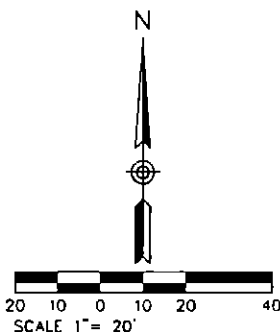
UNDERGROUND UTILITY NOTE:

THE UTILITIES DEPICTED HEREON ARE BASED UPON AVAILABLE ASBUILT INFORMATION. CONTRACTOR TO CONTACT BLUE STAKE 48 HOURS PRIOR TO ANY ON-SITE CONSTRUCTION AND FIELD VERIFY EXACT LOCATIONS OF ALL UTILITIES. IF DISCREPANCIES EXIST CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY.

SITE DATA:

APN:	217-31-010
GROSS AREA:	217,990 SF OR 5.00 ACRES
NET AREA:	188,294 SF OR 4.32 ACRES
DISTURBED AREA:	56,876 SF OR 1.31 ACRES
MAOS REQUIRED:	48,355 SF OR 1.11 ACRES
MAOS PROVIDED (NATURAL):	44,712 SF OR 1.03 ACRES
MAOS PROVIDED (REVEG):	17,853 SF OR 0.41 ACRES
MAOS PROVIDED (TOTAL):	66,032 SF OR 1.56 ACRES
ZONING:	R1-43
O.S.:	28-90

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1-800-STAKE-IT

SLC PROJ: 1603 DATE: 7/17/13 SCALE: NTS
DESIGNED: DSH DRAWN: DSH APPROVED: SAL
REV.:

DWG. NO. SWP01
SHT. 1 OF 3

COCHISE MANOR
13102 EAST COCHISE ROAD
SCOTTSDALE, ARIZONA

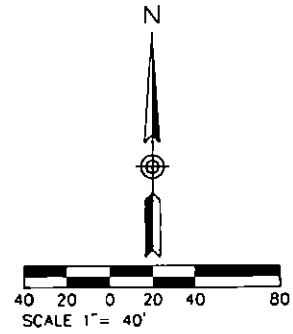
SOUTHWEST LAND CONSULTING, P.C.
CIVIL ENGINEERING & PLANNING

PMB 132
8711 E PINNACLE PEAK RD
SUITE F-211
SCOTTSDALE, AZ 85255
PHONE: (480) 565-7521
FAX: (480) 565-7523
WWW.SWLC.COM

COVER SHEET

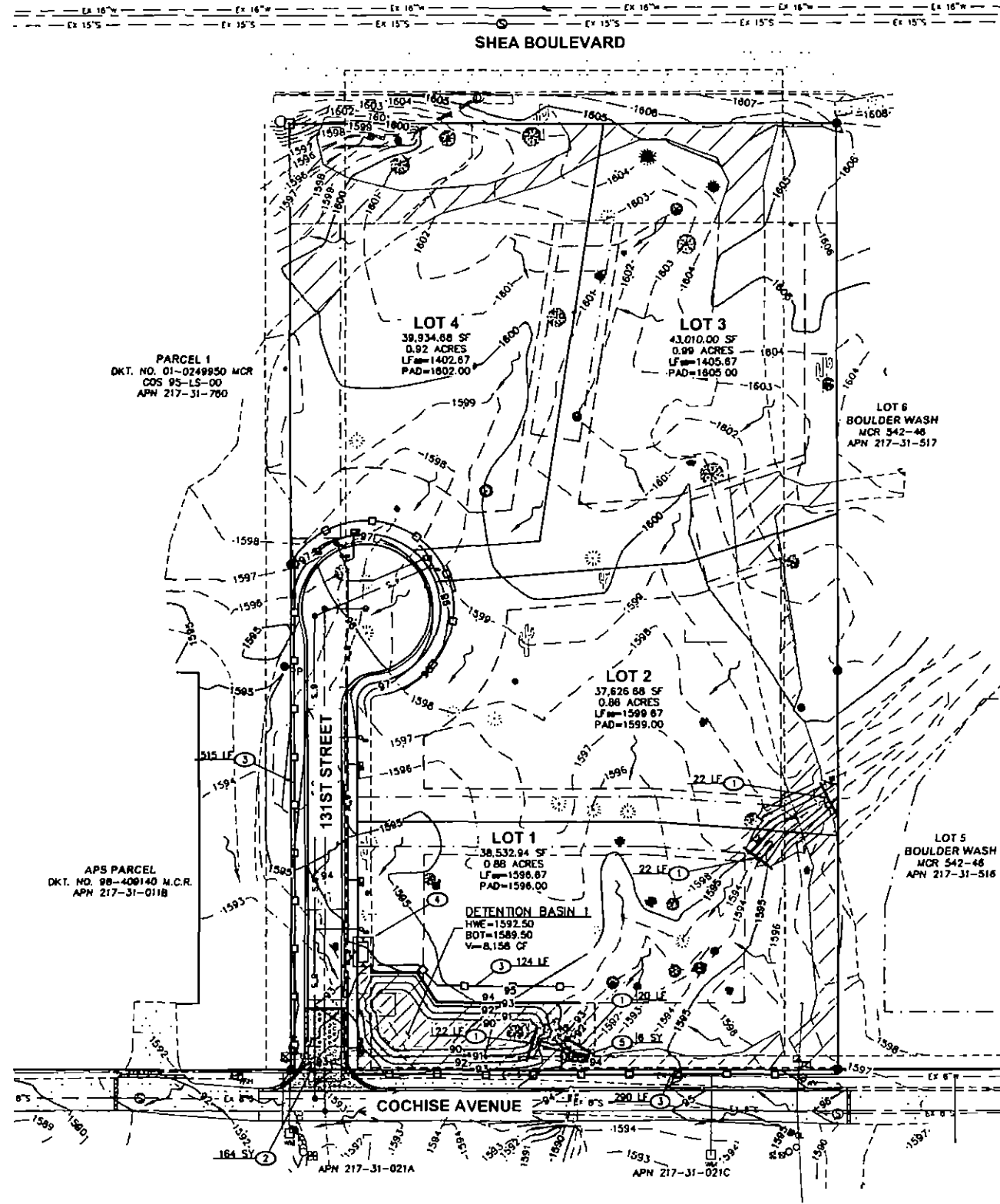
30-PP-2012 5209-12

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LEGEND:

- DIRECTION OF SURFACE DRAINAGE
- STRAW WATTLE BARRIER
- STABILIZED CONSTRUCTION ENTRANCE
- TEMPORARY DIVERSION DIKE
- SILT FENCE
- DESIGNATED WASHOUT AREA
- PROPOSED CONTOUR AND ELEVATION
- EXISTING CONTOUR AND ELEVATION



- STORM WATER POLLUTION PROTECTION PLAN CONSTRUCTION NOTES**
- ① INSTALL 9" DIA. STRAW WATTLE BARRIER PER BMP DETAIL ON SHT. SWMP-03, AND SECTION SPC-1 OF THE EROSION CONTROL VOLUME OF THE DRAINAGE DESIGN MANUAL FOR MARICOPA COUNTY DATED NOVEMBER 2012. 86 LF
 - ② CONSTRUCT STABILIZED CONSTRUCTION ENTRANCE PER BMP DETAIL ON SHT SWMP-03, AND SECTION EC-5 OF THE EROSION CONTROL VOLUME OF THE DRAINAGE DESIGN MANUAL FOR MARICOPA COUNTY DATED NOVEMBER 2012. 164 SY
 - ③ INSTALL SILT FENCE PER BMP DETAIL ON SHT. SWMP-03, AND SECTION SPC-5 OF THE EROSION CONTROL VOLUME OF THE DRAINAGE DESIGN MANUAL FOR MARICOPA COUNTY DATED NOVEMBER 2012. 928 LF
 - ④ CONSTRUCT DESIGNATED WASHOUT AREA PER BMP DETAIL ON SHT. SWMP-03, AND SECTION CH-4 OF THE EROSION CONTROL VOLUME OF THE DRAINAGE DESIGN MANUAL FOR MARICOPA COUNTY DATED NOVEMBER 2012. 1 EA
 - ⑤ INSTALL ROCK OUTLET PROTECTION PER BMP DETAIL ON SHT. SWMP-03, AND SECTION EC-11 OF THE EROSION CONTROL VOLUME OF THE DRAINAGE DESIGN MANUAL FOR MARICOPA COUNTY DATED NOVEMBER 2012. 6 SY

<p>SWP02</p> <p>SHT. 2 OF 3</p>		<p>1-800-STAKE-IT</p> <p>CALL COLLECT</p>
<p>DWG. NO. SWP02</p> <p>SHT. 2 OF 3</p>	<p>S/LC PROJ: 1603 DATE: 7/17/13 SCALE: 1"=40'</p> <p>DESIGNED: DSH DRAWN: DSH APPROVED: SAL</p> <p>REV.</p>	<p>SWP02</p> <p>APR 2011</p> <p>LORENZELM</p> <p>7/17/13</p> <p>3750N</p> <p>SCOTTSDALE, ARIZONA, USA</p> <p>Capitol 3/31/14</p>
<p>COCHISE MANOR</p> <p>13102 EAST COCHISE ROAD</p> <p>SCOTTSDALE, ARIZONA</p>		
<p>STORMWATER POLLUTION PREVENTION PLAN</p>		
<p>SOUTHWEST LAND CONSULTING, P.C.</p> <p>CIVIL ENGINEERING & PLANNING</p>		
<p>PROJ 132</p> <p>8711 E SPRINGWELL ROAD</p> <p>SUITE 2-211</p> <p>SCOTTSDALE, AZ 85258</p> <p>PHONE (480) 586-7521</p> <p>FAX (480) 586-7523</p> <p>WWW.SLCL.COM</p>		

30-PP-2012 5209-12



NOTICE OF INTENT (NOI)

for Construction Activity Discharges

to Waters of the United States under the
AZPDES Stormwater Construction General Permit
(AZG2008-001)

FOR COVERAGE, A COMPLETE AND ACCURATE NOI (INCLUDING REQUIRED FEE) MUST BE SUBMITTED TO:
Arizona Department of Environmental Quality, Surface Water Section / Stormwater and General Permits Unit
1110 West Washington Street, 5415A-1, Phoenix, Arizona 85007

Is this NOI a revision to a project filed under the 2008 AZPDES Stormwater Construction General Permit? YES NO If Yes, complete the following:

Is the site located on Indian Country Lands?

YES NO

- Provide your current authorization number: AZCON - _____
- Provide the name of the project / site in Part II below. You do not need to complete the entire form. Provide only the information that is being changed from the original NOI.
- Complete the certification in Part VI (including signature of authorized signer).

I. OPERATOR (Applicant) INFORMATION:

- Contact Name: Mason Cave
- Phone Number: (623) 521-6899 Fax Number: _____
- Operator's Business Name: Intravest Development, L.L.C.
- Operator's Mailing Address: 5830 W. Thunderbird Rd., Suite 88
- City: Glendale State: AZ Zip Code: 85036
- Business Status: Federal: State: Other Public: Private:

II. CONSTRUCTION SITE INFORMATION:

- Project/Site Name: Cochise Manor
- County Parcel No. (at main entrance): 217-31-010 Phone Number: _____
- Type of Project (subdivision, commercial, road, pipeline, utility, ADOT project, etc.): Subdivision
 If a subdivision, has state or local subdivision approval been obtained? YES NO
 If yes, provide the Subdivision Certificate of Approval Number: _____
- Is the project part of a larger common plan of development? YES NO

Name of Project: Cochise Manor

II. CONSTRUCTION SITE INFORMATION (continued)

- Does the project have/need other environmental permits or approvals? If so, list them and provide the permit/approval number for each: No

- Site physical location (Provide address. If no address, provide driving directions from nearest municipality):
13102 E. Cochise Ave.

- City: Scottsdale State: AZ Zip Code: 85259 County: Maricopa

- Estimated Project Start Date: 10/01/2013 Estimated Project Completion Date: 01/01/2014
Month/Day/Year Month/Day/Year

- Estimate of total acres (to nearest whole acre) to be disturbed by the entire construction activity: 1

- Estimate of total acres (to nearest whole acre, round up if < 1) to be disturbed by your operations: 1

➤ **Select the non-stormwater discharges expected to be associated with your construction-related activities:**

<input type="checkbox"/> None	<input type="checkbox"/> Foundation or footing drains – uncontaminated
<input type="checkbox"/> Discharges from emergency fire-fighting activities	<input type="checkbox"/> Potable water well flushing – ephemeral receiving waters only
<input checked="" type="checkbox"/> Fire hydrant flushing – ephemeral receiving waters only	<input checked="" type="checkbox"/> Waters used for compacting soil – no reclaimed or other wastewaters
<input checked="" type="checkbox"/> Waters used to control dust – no reclaimed or other wastewaters	<input type="checkbox"/> Water used for drilling and coring (e.g., for evaluation of foundation materials) uncontaminated
<input checked="" type="checkbox"/> Potable waterline flushing – ephemeral receiving waters only	<input type="checkbox"/> Uncontaminated water from dewatering operations or foundations
<input type="checkbox"/> Routine external building wash down (no detergents)	<input type="checkbox"/> Other (specify) _____
<input checked="" type="checkbox"/> Pavement wash waters – no spills or leaks of toxic or hazardous materials and no detergents	_____
<input type="checkbox"/> Uncontaminated air conditioning or compressor condensate	_____
<input checked="" type="checkbox"/> Uncontaminated groundwater	

III. DISCHARGE LOCATION

- Provide the latitude and longitude of the construction site at the point nearest the receiving water (natural water course):

Latitude: 3 3° 3 4' 5 6" 14 " Longitude: 1 1 1° 4 8' 1 2" 1 "
(Degrees, minutes, seconds) (Degrees, minutes, seconds)

- Identify the closest receiving water to the construction site (e.g., dry washes, named and unnamed waterbodies, etc.):

Salt River

- Is there a potential for any discharges from the site to enter a municipal separate storm sewer system (MS4), canal, or a privately owned conveyance? YES NO

If yes, enter the name of the MS4, canal, or conveyance owner: _____

IV. STORMWATER POLLUTION PREVENTION PLAN (SWPPP) – A SWPPP must be developed in accordance with the terms of the general permit before completing and submitting this NOI.

- I confirm that a SWPPP meeting the requirements of the Stormwater Construction General Permit (No. AZG2008-001) has been developed and will be implemented prior to commencing construction activities at this site. The SWPPP will be located at the site during construction activities. If this is a late NOI, a SWPPP has been developed and implemented prior to submitting this NOI. NOTE: ADEQ retains the authority to take enforcement action(s) for any unpermitted discharge or other non-compliance that occurs between the time construction commenced and discharge authorization is issued.

- When construction activities are not actively underway, the SWPPP will be available at the following location:
5830 W. Thunderbird Rd., Suite 88

- Name of SWPPP Contact Person: Mason Cave

- Telephone Number of SWPPP Contact Person: (623) 521-6899

- This project may discharge within 1/4 mile of an Impaired or Outstanding Arizona Water: YES NO

If yes, a copy of my SWPPP is included with this NOI for review by ADEQ.

V. FEES

I confirm that the correct fee payment is included with the NOI:

Less than or equal to 1 acre: \$250.00 *

Greater than 1 acre, but less than or equal to 50 acres: \$350.00

Greater than 50 acres: \$500.00

Review of SWPPP by ADEQ, if required (see section IV above): add \$1,000.00

Total fee payment included: \$ 350.00

No fee is required. The signer below represents an Arizona state agency (exempt from AZPDES fees).

No fee is required. This is an amendment of an NOI previously filed under the 2008 Stormwater Construction General Permit, for which the fee was paid or not required.

* (If the project will disturb less than one acre, Stormwater Construction General Permit coverage is required only if the project is part of a larger common plan of development or sale that will ultimately disturb one acre or more.)

VI. CERTIFICATION BY AUTHORIZED SIGNATORY (see Part VIII.J.1 of the General Permit for requirements)

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision, in accordance with a system designed to ensure that qualified personnel gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or those persons directly responsible for gathering the information, I believe the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. In addition, as the operator, I certify that I have reviewed and will comply with all the terms and conditions stipulated in the Stormwater Construction General Permit (AZG2008-001)."

➤ Printed Name: _____ Title: _____

➤ Signature: _____ Date: _____

➤ Business Name: _____

➤ Address: _____

➤ City: _____ State: _____ Zip Code: _____ Phone: _____