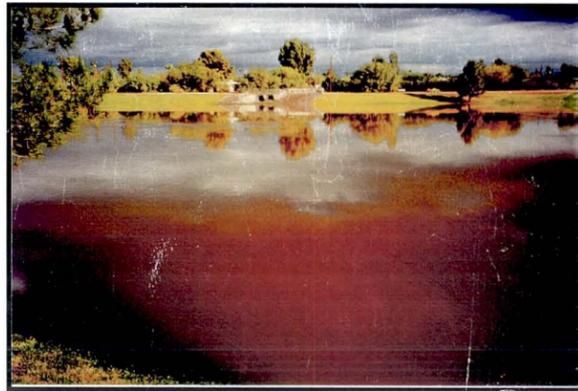
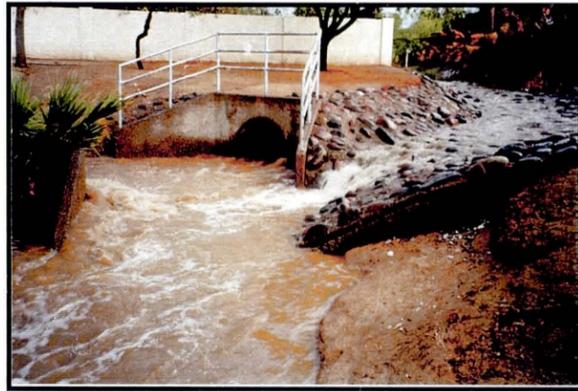


# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

**FINAL REPORT  
AND  
CONCEPT PLANS**

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**Prepared by:  
Stanley Consultants, Inc.**

**In Association With:  
Logan Simpson Design, Inc.**

**SCI # 15586**

**November 2002**





# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN



## FINAL REPORT AND CONCEPT PLANS

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## Appendices

Appendix A	– Concept Plans
Appendix B	– Contact List
Appendix C	– Data Collection Reference List



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

**Other Documentation:  
(Under Separate Cover)**

Executive Summary  
Technical Volume 1 – Hydrology Analysis  
Technical Volume 2 – Hydraulic Analysis  
Technical Volume 3 – Survey  
Existing Right-of-Way and Easement Data

Class I Cultural Resource Report  
Preliminary Initial Site Assessment Report (PISA Report)





# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 1.0 INTRODUCTION, PURPOSE AND NEED

The purpose of the Scottsdale Road Corridor Drainage Master Plan is to assess the magnitude, frequency and extent of regional flooding that occurs along Scottsdale Road, the 71<sup>st</sup> Street Channel and the Berneil Ditch and to develop a concept level plan to mitigate this flooding.

This study was originally requested by the City of Scottsdale to focus on flooding in the Scottsdale Road corridor within Scottsdale city limits. The original focus area of the study based on this request consisted of the area from a few blocks east to a few blocks west of Scottsdale Road from Thunderbird Road on the north to Mountain View Road on the south. This corridor included the 71<sup>st</sup> Street Channel.

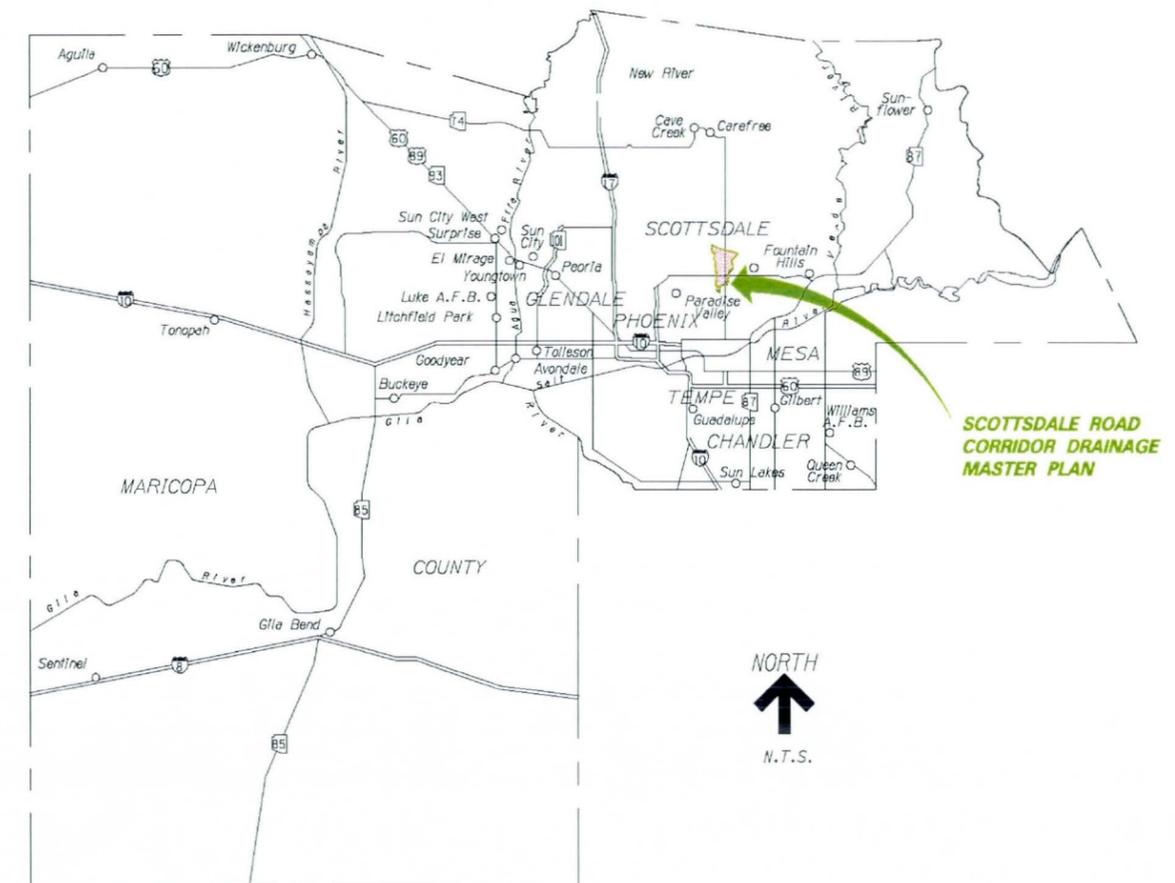
During the initial phases of the study, the original focus area was expanded to include the Berneil Ditch in the Town of Paradise Valley. The Berneil Ditch was added because it serves as the primary outfall for drainage from the Scottsdale Road Corridor and it was found early in the study that it too had the potential to overflow its banks and cause flooding of a regional nature. Figure 1 indicates the location of the Scottsdale Road Corridor Drainage Master Plan.

The City of Scottsdale has been an active proponent and participant in the planning and construction of both regional and local stormwater facilities in the study area. The City of Scottsdale has constructed and currently maintains both local and regional drainage facilities within their portion of the study area. The Flood Control District of Maricopa County has assisted the City of Scottsdale in the past by funding the construction of regional drainage facilities along portions of the 71<sup>st</sup> Street Channel, Scottsdale Road between Cholla Street and Thunderbird Road and at Cactus Park.

It has been perceived for some time by both Scottsdale and Flood Control District staff, however, that there are still a number of flood prone locations along the Scottsdale Road corridor despite past efforts to control flooding. There are still drainage facilities that represent “weak links” in the overall system, that are not up to par with adjacent drainage facilities upstream and downstream, that are

unsafe or that are not performing to their desired potential both from a drainage and multi-use standpoint.

**FIGURE 1 STUDY LOCATION MAP**





# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

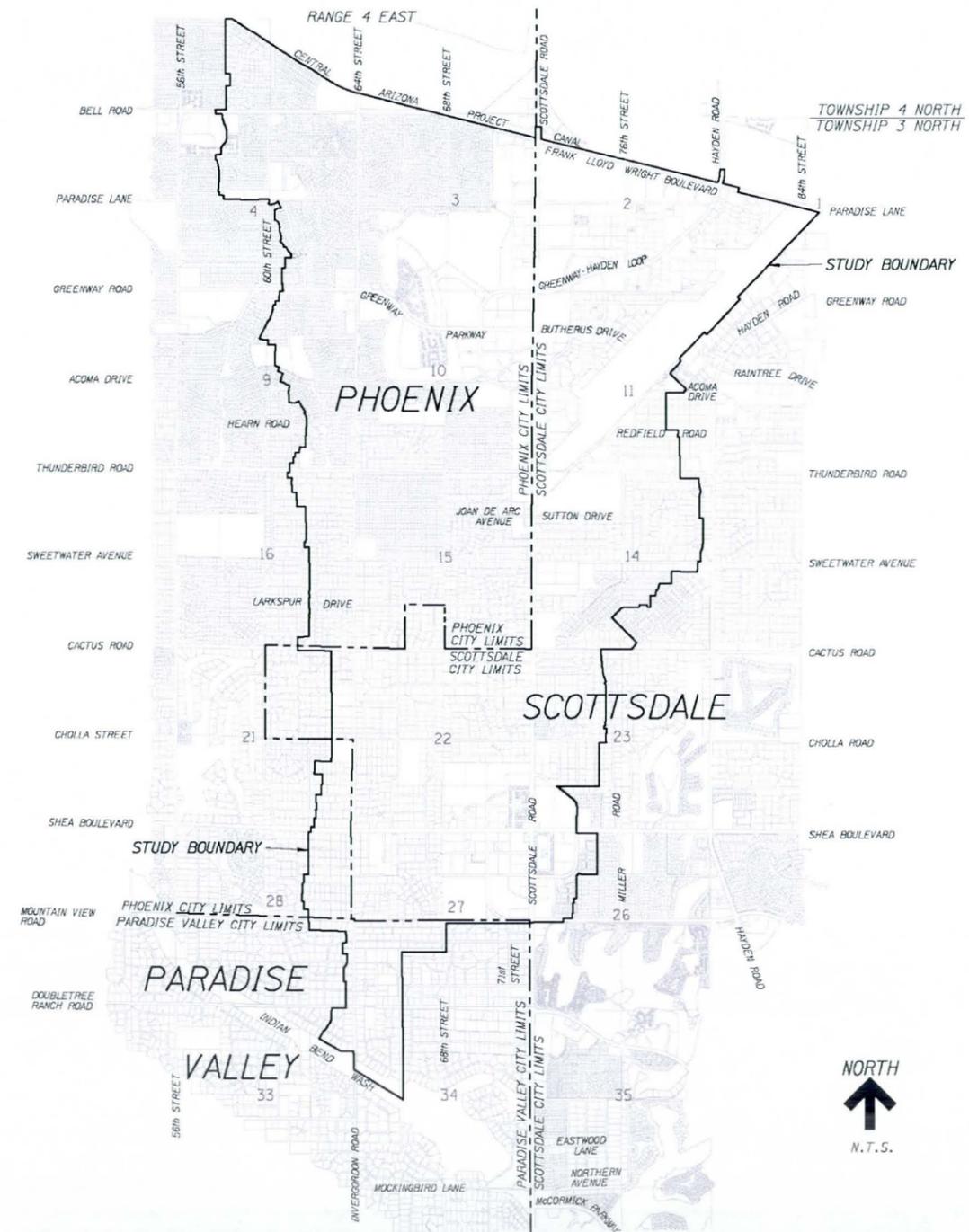
The City of Scottsdale and the Flood Control District have again formed a partnership in an attempt to address the remaining regional drainage and flooding issues along the Scottsdale Road corridor. The Scottsdale Road Corridor Drainage Master Plan is the result of that partnership.

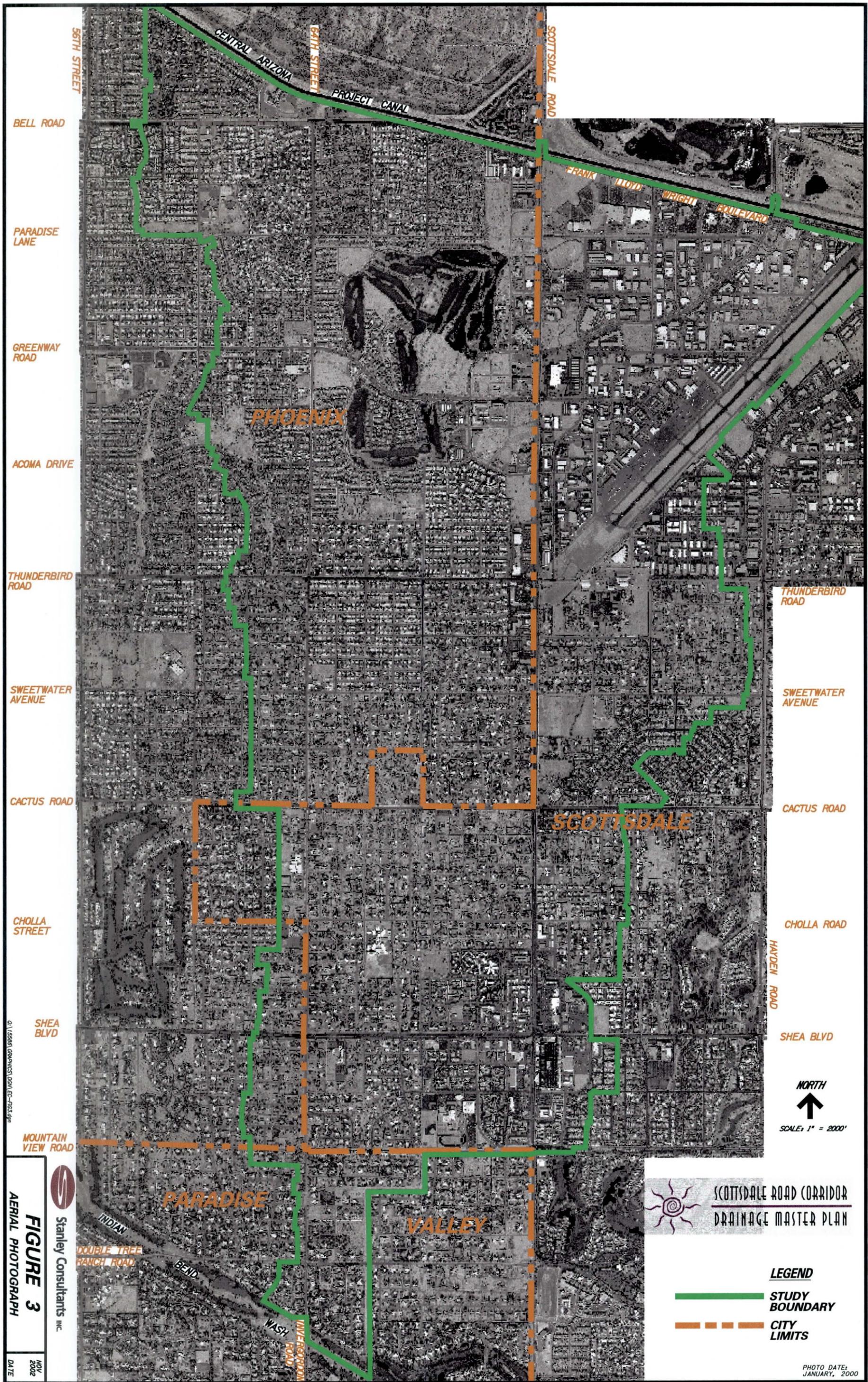
Early in the study, a number of alternative drainage improvements were envisioned for the Scottsdale Road corridor that would help complete and improve the area's regional drainage function. These alternatives were generally divided into one of two categories. The first category includes drainage facilities like storage basins that would reduce the downstream rate of discharge. The other category includes features like channel improvements and storm drains that would increase storm flow conveyance capacity. Generally, these two categories of future alternative drainage improvements both have the potential hydrologic "side effect" of changing the peak timing of runoff and increasing the magnitude, frequency and duration of low flow events. Because of this, the hydrologic and hydraulic analysis needed to encompass a wider area than just the Scottsdale Road corridor itself to ensure that there were no adverse impacts downstream from any of the future regional flood control alternatives.

The Berneil Ditch serves as the primary outfall for almost all of the drainage generated by the Scottsdale Road corridor. Its outfall is the Indian Bend Wash. One of the larger tributaries to the Berneil Ditch is the 64<sup>th</sup> Street Channel. It originates in the City of Phoenix to the west of the Scottsdale Road corridor. The study area boundary includes all of the drainage area tributary to the Berneil Ditch at its confluence with the Indian Bend Wash. This is because of the inter-connection of the Berneil Ditch and 64<sup>th</sup> Street Channels with the Scottsdale Road corridor drainage and because of the potential downstream hydrologic "side effects" of alternative flood control solutions.

Figure 2 on this page and Figure 3 (on Page 3) depict the study boundary and vicinity of the Scottsdale Road Corridor Drainage Master Plan. Figure 4 on page 4 shows the existing major drainage features associated with the Scottsdale Road drainage corridor and the Berneil Ditch system. The Scottsdale Road Corridor Drainage Master Plan study area comprises just under 10 square miles of area. The focus area within the study is just under one square mile in size.

**FIGURE 2 STUDY BOUNDARY AND VICINITY MAP**





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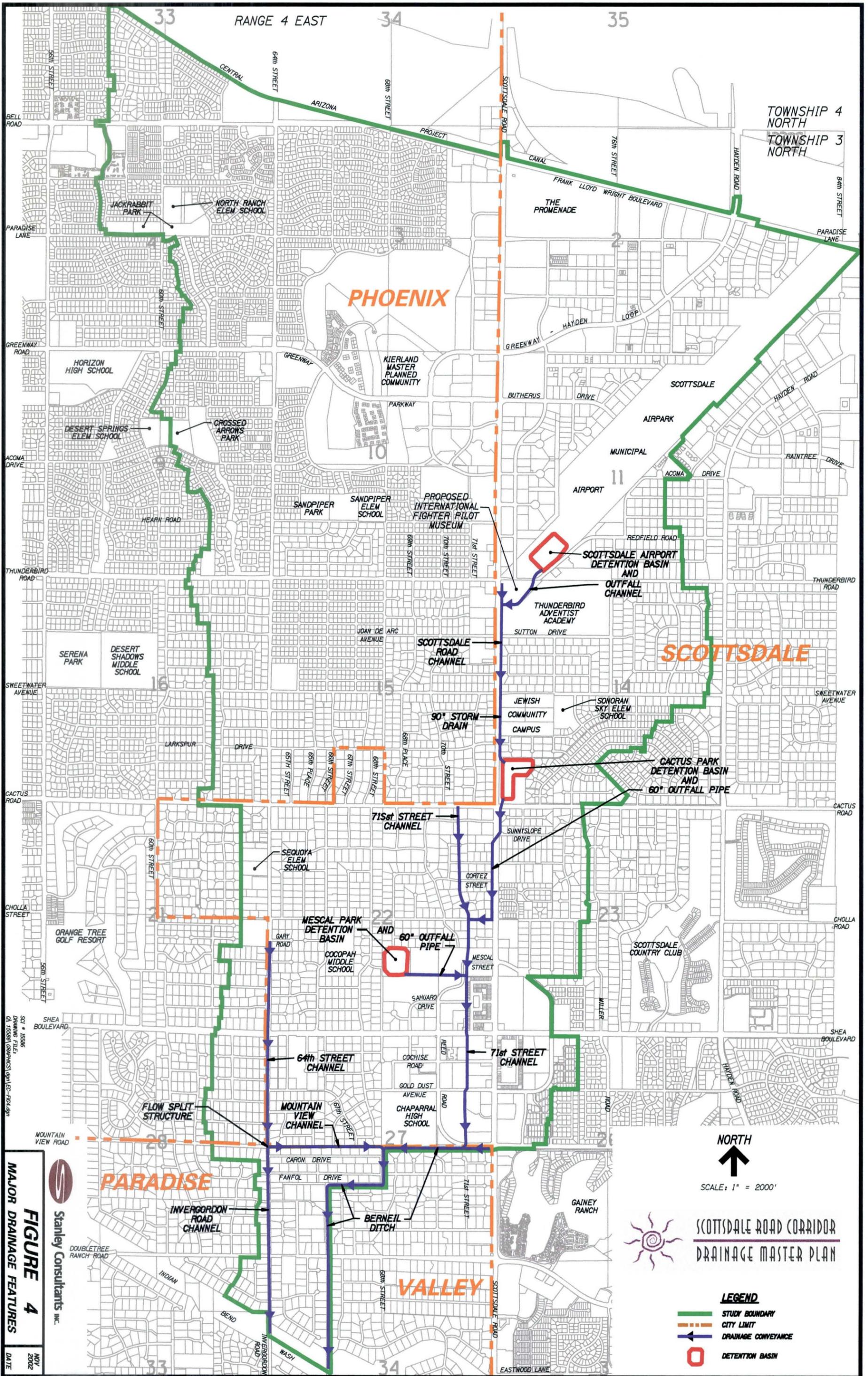
Stanley Consultants INC.  
**FIGURE 3**  
 AERIAL PHOTOGRAPH  
 DATE NOV 2002

SCOTTSDALE ROAD CORRIDOR  
 DRAINAGE MASTER PLAN

- LEGEND**
- STUDY BOUNDARY
  - CITY LIMITS

**NORTH**  
  
 SCALE: 1" = 2000'

PHOTO DATE:  
 JANUARY, 2000



**FIGURE 4**  
**MAJOR DRAINAGE FEATURES**  
 DATE: NOV 2002  
 Stanley Consultants INC.

**NORTH**  
 SCALE: 1" = 2000'

**SCOTTSDALE ROAD CORRIDOR  
 DRAINAGE MASTER PLAN**

- LEGEND**
- STUDY BOUNDARY
  - - - CITY LIMIT
  - DRAINAGE CONVEYANCE
  - DETENTION BASIN



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

The focus area within the Scottsdale Road Corridor Drainage Master Plan evolved as the study progressed. The study team refined this focus area over the course of the study's existing condition analysis and the alternative formulation and evaluation steps. The development of this focus area and its limits are explained in detail in Part 4 of this document. Essentially, this focus area consists of the Scottsdale Road drainage corridor from Thunderbird Road to Mountain View Road, the 71<sup>st</sup> Street Channel from Cactus Road to the Berneil Ditch and the Berneil Ditch from Scottsdale Road to Double Tree Ranch Road. Because of their integral nature and close proximity to these drainage features, the regional detention basins within Cactus and Mescal Parks were also included within the focus area.

The primary emphasis of the study within the focus area related to the size and function of the drainage facilities found within it. This study is intended to deal with drainage and flooding on a regional basis. It relates to the larger drainage facilities and stormwater conveyance corridors that impact and/or benefit larger more encompassing areas and multiple properties. The smaller more local drainage problems are typically addressed through municipal capital improvement projects. The larger more regional facilities serve as the "outfall" for the smaller systems and thus must be brought up to an acceptable level of service if the smaller local drainage systems that feed into them are to function properly.

The drainage facilities that exist in the focus area are both regional and local in nature. They generally include an interconnected system of streets, culverts, open channels, storm drains and stormwater detention basins. These drainage facilities have evolved in a time span of over 50 years based on a variety of design storm and hydraulic criteria. Their design and function have also been influenced significantly by budget considerations and numerous physical and jurisdictional constraints.

Some of these drainage facilities are publicly owned and maintained and some are on private land. Some were constructed as a single stand-alone feature and some were constructed as phased component in a larger system. Some were designed recently and would meet current design

standards and some were constructed long ago without any design documentation. Many of the stormwater detention basins and open channels incorporate multi-use features such as trails and parks. Each drainage feature seems to offer varying degrees of service and function. Sometimes this service and function is incomplete or discontinuous when compared to adjacent drainage features upstream and downstream.

There are literally hundreds of stormwater basins in the study area that have been constructed on individual privately developed parcels. In addition, there are about a dozen regional stormwater basins that have been constructed by the Flood Control District, City of Scottsdale and City of Phoenix. Collectively, these stormwater basins effectively control a major portion of the runoff generated within the study area. Most of the regional basins in the study area are capable of controlling a 10-year storm without surface overflow spilling from the basin. However, many of the regional basins cannot contain a 100-year storm.



Sandpiper Park Detention Basin, City of Phoenix



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

Existing drainage and flood control features in both the focus area and the overall study area that do not adequately control or convey storm flows have been recognized and documented for quite some time. Conclusions in this regard have been based on a variety of data including past drainage studies, historic accounts and drainage complaints received by drainage planners and engineers at the City of Scottsdale, Town of Paradise Valley and City of Phoenix.

The upper reach of the 71<sup>st</sup> Street Channel between Cortez Street and Sunnyside Drive is by far the most under-sized regional drainage facility in the focus area. Even minor runoff events are capable of exceeding the very limited capacity of the channel in this reach. The photos on this page were taken on August 30, 1997 by a resident who lives adjacent to the 71<sup>st</sup> Street Channel at Jenan Drive, between Cortez Street and Sunnyside Drive. According to records from the nearest rain gage, the rainfall that caused this flow was on the order of only one half to two thirds of an inch. Although the depth of flow in the 71<sup>st</sup> Street Channel where it crosses Jenan Drive was only about one foot during this event, it was enough for part of the flow to break out of the 71<sup>st</sup> Street corridor and flow laterally as far as 70<sup>th</sup> Street, two blocks to the west.



DATE 08-30-97 - 10:20AM +/- 71ST CHANNEL LOOKING SOUTH ACROSS E. JENAN DR.



DATE 08-30-97 - 10:20AM +/- LOOKING NORTH ACROSS INTERSECTION OF 71ST STREET & E. CORTEZ RD. OUTFALL OF 71ST CHANNEL.



DATE 08-30-97 - 10:30AM +/- LOOKING EAST ALONG 7104 E. JENAN DR.



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

In addition to documented overflows of the 71<sup>st</sup> Street Channel, the Berneil Ditch has overflowed its banks in at least two locations in the past 10 years. One of the two overflow locations is the upper reach of the Berneil Ditch along the Mountain View Road alignment near the confluence with the 71<sup>st</sup> Street Channel. The south bank of the Berneil Ditch actually decreases in elevation as it goes upstream from the 71<sup>st</sup> Street Channel to Scottsdale Road. The masonry fences along the rear yards of the residential lots in the Cypress Creek Subdivision south of the upper reach of the Berneil Ditch have been constructed with drainage openings at regular intervals along the base of the fence to accommodate potential overflow. Overflow along this reach occurred in the mid-1990's and resulted in the shallow flooding of several residences.

The other overflow location along the Berneil Ditch is at the south bank around the 2<sup>nd</sup> 90-degree bend near Fanfol Drive at the 68<sup>th</sup> Street alignment. Shallow overflow also occurred at this location according to the Town of Paradise Valley Engineering Department. Subsequently, the Town constructed a masonry block flood wall about 18" in height at this location to reduce the risk of overflow.

The existing Scottsdale Road Channel along the east side of Scottsdale Road from Sutton Drive to Sweetwater Avenue has long been considered both a safety hazard and a weak hydraulic link as well as a sub-optimized aesthetic and multi-use facility.



Drainage openings in masonry fence along Berneil Ditch



Flood wall constructed by Town of Paradise Valley along the Berneil Ditch



Scottsdale Road Channel looking south from Sutton Drive during a minor runoff event in October of 2001



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

Hydrologic conditions within the study area have varied significantly over time as land development and construction of drainage, flood control and transportation improvements progressed. The construction of the Central Arizona Project (CAP) Canal and its associated stormwater storage basins in the late 1970's was a significant milestone. The drainage area north of the CAP, which previously extended all the way up to the McDowell Mountains, was cut off and prevented from draining to the south. The CAP now forms the upper limit of the Scottsdale Road Corridor Drainage Master Plan study area. But there is still a significant drainage area below the CAP.

Development in the study area is now essentially complete. Various local storm drain projects are planned as part of the City of Scottsdale capital improvements program but there are no major drainage or flood control projects currently planned for either the focus or the study area. In a hydrologic sense, the area is now essentially "at rest" and can be studied as an existing condition instead of a future anticipated condition.

The comprehensive hydrologic and hydraulic analysis that is performed for this study will resolve years of speculation regarding the capacity and performance of the regional drainage facilities that are found in the study area. The analysis will also be detailed enough to evaluate many of the smaller local drainage facilities for future local drainage projects.



Cactus Park detention basin



Mescal Park detention basin



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 1.1 PROJECT PARTICIPATION

The Scottsdale Road Corridor Drainage Master Plan study has received participation from a diverse group of individuals and public agencies. The core of the study team is made up of representatives from the Flood Control District of Maricopa County, the City of Scottsdale, the City of Phoenix, the Town of Paradise Valley, primary consultant Stanley Consultants, and Stanley's sub-consultant Logan Simpson Design. Flood Control District departments that participated and contributed to the study include Planning and Project Management, Hydrology, Environmental, GIS, Public Involvement, Survey, and Right-of-way. City of Scottsdale participants included representatives from the Capital Improvements, Transportation Planning, Airport, Parks and Recreation and GIS departments. The Town of Paradise Valley was represented by their Public Works Department and the City of Phoenix was represented by their Floodplain Management and Parks and Recreation Departments.

Typically, the core members of the study team met monthly to coordinate and review the various study activities and make decisions regarding direction and approach. There were also a number of meetings organized to accomplish specific study objectives. For example, there were special advance meetings held to plan each of the public involvement meetings. There was also a facilitated, all day alternatives formulation meeting attended by about two dozen individuals representing almost all of the departments and agencies mentioned previously. The objective of this meeting was to brainstorm all of the potential structural solutions to the drainage and flooding problems in the

study area. The project also received participation from the public at each of the public involvement meetings (see Sections 1.4, 4.2 and 5.1).

Members of the study team made a 45-minute introductory presentation in November of 2001 to the Paradise Valley Town Council at the request of the Town Manager and Town Engineer. The results of the study were also presented to the Citizen's Flood Control Advisory Board on August 28, 2002 and to the Town of Paradise Valley Town Council in September of 2002.

## 1.2 INTERAGENCY COORDINATION

The Scottsdale Road Corridor Drainage Master Plan is a local study project that was requested by the City of Scottsdale and funded by the Flood Control District of Maricopa County. Most of the study's "interagency coordination" took place directly between City of Scottsdale and Flood Control District staff. There was no funding for this study from any public agency other than the Flood Control District and essentially no potential impact or benefit regarding any other agency or public entity besides the City of Scottsdale, Town of Paradise Valley and the City of Phoenix. Coordination with Paradise Valley and Phoenix was a continuous process throughout the duration of the study. There was no coordination necessary with the Arizona Department of Transportation (ADOT), the Bureau of Reclamation (Burec) or the Maricopa Association of Governments (MAG) because there were no impacts or benefits to their projects, lands or programs.

The Federal Aviation Administration (FAA) was contacted by the Scottsdale Airport to seek their acceptance, comment and design criteria for study alternatives that involved concept modifications to the airport's drainage system. The FAA, in turn, coordinates with the United States Department of Agriculture Wildlife Services Department to determine if there is any concern regarding flight safety and wildlife.

## 1.3 SPECIAL INTEREST GROUPS

The Scottsdale Road Corridor Drainage Master Plan study has included involvement regarding a number of special interest groups. Before the study even started, there was a development agreement in negotiation between the City of Scottsdale and the owner/sponsor of the (then) proposed Jewish Community Campus located at the southeast corner of Scottsdale Road and Sweetwater Avenue. The initial development agreement involved one particular feature that was included by the City in anticipation of the Scottsdale Road Corridor Drainage Master Plan study (that would soon start). This feature was a regional stormwater detention basin to be constructed as part of the Jewish Community Campus project. However, agreement could not be reached regarding this regional basin so it was eliminated and construction moved forward with detention being provided for onsite drainage only as is normally required by the City of Scottsdale. Construction of the Jewish Community Campus is nearing completion as of the conclusion of the Scottsdale Road Corridor Drainage Master Plan.



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

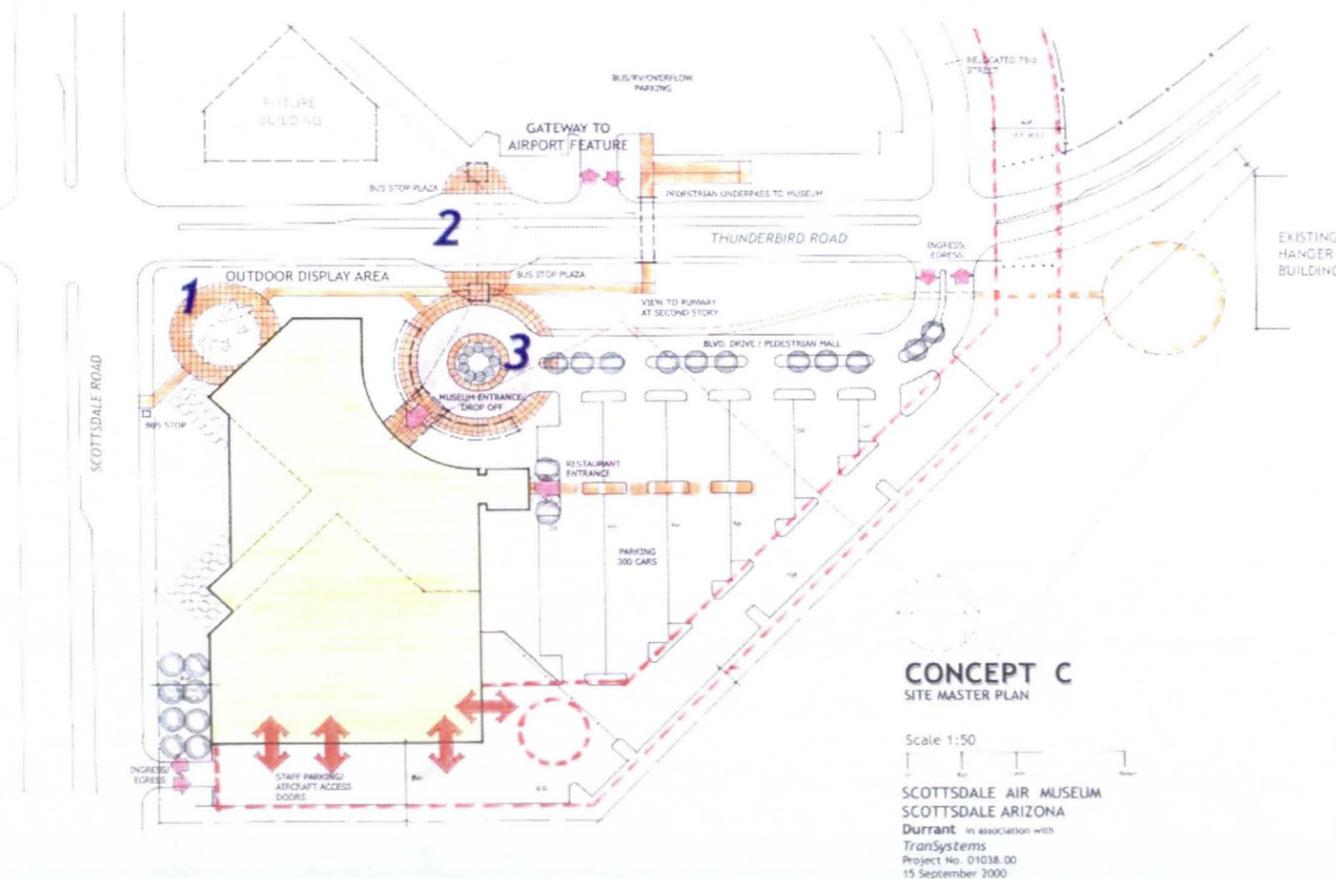
Early in the schedule, the study team received contact from a member of the San Thomas Subdivision Property Owner's Association Board of Directors regarding a drainage problem they were experiencing along Scottsdale Road. The San Thomas subdivision is located at the northeast corner of Scottsdale Road and McCormick Parkway. This subdivision is southeast of the study boundary. City of Scottsdale staff responded to the San Thomas drainage concern at the first public involvement meeting held in May of 2001. Aside from this, there has been no contact with any other property or homeowners group in the study area.

An aeronautical museum is planned for the vacant parcel of land at the southeast corner of Scottsdale and Thunderbird Roads. This will be the International Fighter Pilot Museum (IFPM) sponsored by The Arizona Aerospace Foundation (Figure 5). Construction is anticipated to begin in the year 2004. Planning for the IFPM project has been underway for quite some time. There was a lease agreement finalized in late 2001/early 2002 between the City of Scottsdale (lessor) and the IFPM sponsor (lessee).

This agreement obligates the City of Scottsdale to make certain infrastructure improvements including roadway improvements on Scottsdale and Thunderbird Roads and either removing, relocating, covering or landscaping of the two existing regional drainage channels that cross the southeast and west edges of the property. At the time of initial contact with the IFPM sponsors, improvements were also under consideration through

the Scottsdale Road Corridor Drainage Master Plan regarding both of these existing channels as well as improvements to the stormwater detention basin at the south end of the Scottsdale Airport runway. Coordination with the IFPM sponsor has taken place by telephone, email, meetings in person and sharing of electronic files. A complete contact list that was developed for this study is included in Appendix B of this report.

### FIGURE 5 INTERNATIONAL FIGHTER PILOT MUSEUM CONCEPTUAL PLAN





## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

### 1.4 PUBLIC INVOLVEMENT

Public involvement made up a significant part of the Scottsdale Road Corridor Drainage Master Plan study effort. There were three major public involvement steps that were incorporated into the study and the evaluation of alternatives. The first step involved an initial meeting to introduce the study to the public, to explain the study's objectives and to solicit comments from residents and landowners about their perspective on drainage and flooding. The second public involvement step came after the study team had formulated alternatives that potentially met the study objectives in dealing with the drainage and flooding problems. These alternatives were presented to the public for comment at the second meeting. The third and final meeting was to present the results of the alternative evaluation process and to introduce the recommended alternative to the public for comment.

Each of the public meetings was preceded by notification that took a variety of forms. First, there was a website for the study. The website included general background about the study, a progress report and a schedule of up-coming events and meetings. The website address was [www.scottsdaleroadcdmp.com](http://www.scottsdaleroadcdmp.com). Second, there was an advertisement placed in the Scottsdale Tribune newspaper and in the regional edition of the Arizona Republic newspaper specifically announcing the up-coming public meeting. Third, a flyer announcing the meeting was produced for distribution to the public. The primary distribution of the flyer was accomplished by door hanger service to all properties in the flood problem areas where drainage improvements were anticipated. Copies of the flyer were also distributed to various municipal and community service facilities that are frequented by the public.

Both the newspaper advertisements and the flyer provided reference to the website and provided phone numbers and email addresses for the Flood Control District's and Stanley Consultants' project managers. Fourth, the City of Scottsdale included a brief update about the study and a time, date and location for up-coming public meetings in their capital improvement projects (CIP) Newsletter for CIP Zone 2, in which this study is located.

The notification described above was typically conducted for each of the three public involvement meetings as a baseline minimum. Additional notification was conducted for the second and third meetings. For example, the meeting announcement flyer for the second public meeting was directly mailed to all persons who attended the study's first public meeting. And similarly, for the third public meeting, a direct mailer was sent to all attendees to the first and second meetings. Other additional notification efforts specific to the second and third public meetings are described in Parts 4.2 and 5.1 of this document.



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

Meetings were organized using a hosted open house format with refreshments provided and various study exhibits and maps displayed. Handouts were provided to attendees at the second and third public meetings to present them with alternatives and to summarize findings from previous study steps. Meetings typically started with a brief introduction by the Flood Control District's project manager followed by a general question and answer session. Attendees were then provided an opportunity to break down into smaller groups or individually meet with members of the study team. The first public meeting was held at the Sonoran Sky Elementary School in the multi-purpose room on Thursday evening, May 17, 2001. Figure 6 shows the meeting announcement flyer from the first public involvement meeting. The second and third public meetings are discussed in Sections 4.2 and 5.1 of this report.

## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN



Looking South Along Scottsdale Road  
From Sutton Drive - October 2000



### STUDY PURPOSE

The Flood Control District (District) of Maricopa County has coordinated with the Cities of Scottsdale, and Phoenix, and the Town of Paradise Valley to prepare a Drainage Master Plan (DMP) for the Scottsdale Road Corridor. The purpose of the Scottsdale Road Corridor DMP is to:

- identify the extent of flooding problems along the Scottsdale Road Corridor
- provide flood protection and public safety for the residents and property owners in this area and for Scottsdale Road's traveling public

This will be accomplished by identifying conceptual flood control features and/or measures within the study area to reduce potential damages to property or loss of life from storm runoff. The focus of the Scottsdale Road Corridor DMP study is the area that is subject to flooding along the 71<sup>st</sup> Street channel from Mountain View Road to Cactus Road and along Scottsdale Road from Mountain View Road to Thunderbird Road.

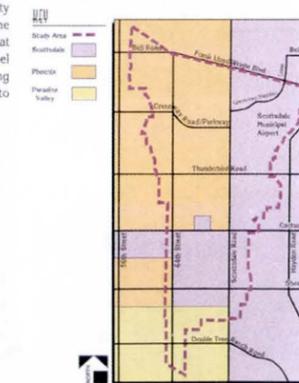
### STUDY GOALS

- \* Develop a comprehensive list of known flooding problems along the Scottsdale Road corridor.
- \* Develop a plan, including conceptual flood control features and/or measures, to eliminate the flooding from the 10-year storm and if possible eliminate the 100-year flooding within the Scottsdale Road corridor.

### STUDY BACKGROUND

The Scottsdale Road Corridor DMP study area has experienced significant development in recent years. The current drainage system is undersized to provide the required level of flood protection for the existing land uses. This study will identify conceptual flood control features that may be implemented based on scheduling, funding, and cost sharing.

### STUDY AREA



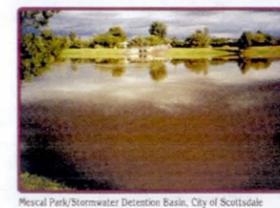
## FIGURE 6 PUBLIC INVOLVEMENT FLYER

### PUBLIC MEETING - MAY 17

Thursday, May 17, 2001  
6:30 p.m. - 8:00 p.m.  
Sonoran Sky Elementary School  
12990 North 75<sup>th</sup> Street  
Scottsdale, Arizona 85260



The first public meeting is scheduled for May 17th, 2001 at 6:30 p.m. A brief overview of the project will be presented at 6:45 p.m. The purpose of this meeting is to inform the community about the project and seek your input. We hope you can attend this initial meeting and give us your comments on the Scottsdale Road Corridor Drainage Master Plan.



Mescal Park Stormwater Detention Basin, City of Scottsdale

### GET INVOLVED

We invite you to get involved in the study process. There will be an opportunity to give your initial comments at the first public meeting. If you have questions about this study, please contact:

Afshin Ahourayan, Project Manager  
Flood Control District of Maricopa County  
Phone: (602) 506-1501  
E-mail: [afa@mail.maricopa.gov](mailto:afa@mail.maricopa.gov)

or  
Scott Buchanan  
Stanley Consultants Inc.  
Phone: (602) 912-4500  
E-mail: [buchananscott@stanleygroup.com](mailto:buchananscott@stanleygroup.com)

Para información en Español, comuníquense con:  
Ivonne Smith, Logan Simpson Design Inc.  
Phone: (480) 967-1343  
E-mail: [ismith@lsdz.com](mailto:ismith@lsdz.com)

The Flood Control District of Maricopa County has a web site with routinely updated project information. Please visit us at:  
[www.scottsdaleroadCDMP.com](http://www.scottsdaleroadCDMP.com)



71<sup>st</sup> Street Channel Near Mescal Street



71<sup>st</sup> Street Channel Near Cholla Street

STUDY SCHEDULE	2001												2002		
	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar		
Data Collection															
Environmental Considerations															
Alternatives Development															
Alternatives Evaluation															
Recommended Alternative(s)															
Implementation Plan															
Public Involvement															

● = Public Meetings



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 1.5 PROJECT OVERVIEW AND HISTORY

The City of Scottsdale submitted a request to the Flood Control District of Maricopa County for a capital improvement drainage project for the Scottsdale Road corridor. The District did not feel that this request included enough information so the District had a Candidate Assessment Report (CAR) conducted for the Scottsdale Road corridor. The purpose of the CAR was to evaluate the need for a study project that would focus on the drainage and flooding problems perceived to exist in the area along Scottsdale Road north of Mountain View Road. The Flood Control District contracted with consultant Willdan Associates to conduct the study. Willdan completed the CAR in December 1999 under Contract FCD 98-24, Assignment No. 2.

The CAR concluded that certain recommendations from a previous regional drainage study, the Paradise Valley, Scottsdale, Phoenix (PVSP) Study completed in 1978 had not been followed. As a result, there was a significant potential for drainage and flooding problems at certain locations in the study area. The CAR went on to conclude that flood relief appeared feasible if the PVSP routing plan was implemented with the addition of local neighborhood storm drains and recommended that a detailed hydrologic and hydraulic study should be conducted to verify the plan within the context of existing conditions prior to further planning and detailed design.

The original request by the City of Scottsdale was to provide 100-year flood protection to approximately 417 acres of developed residential and commercial properties along the Scottsdale Road

corridor from Thunderbird Road to the Berneil Ditch. Specific requests by the City of Scottsdale included the following:

- 1) Upgrading the conveyance on the east side of Scottsdale Road from Thunderbird Road to Gary Road.
- 2) Improvement of the 71<sup>st</sup> Street Channel to provide 100-year level of protection from Sunnyside Drive to the Berneil Ditch consisting of a storm drain and/or open channel system.
- 3) Prevent overtopping and stormwater migration west of Scottsdale Road toward the 71<sup>st</sup> Street Channel

The City also requested the integration of environmental quality and recreational enhancements into the project including recreational corridors such as bicycle, equestrian and multi-use trails, enhancements to existing parks, improvements to water quality, groundwater recharge and storage, and landscaping within the existing PVSP theme.

## 1.6 PROJECT AUTHORIZATION

The Scottsdale Road Corridor Drainage Master Plan study is authorized under Contract FCD 2000C030. This contract was accepted and approved by the Flood Control District of Maricopa County Board of Directors on February 21, 2001. The effective notice to proceed date for this contract was March 5, 2001. This study was conducted by Stanley Consultants, Inc. acting as prime consultant along with sub-consultant Logan Simpson Design.

## 1.7 DATA COLLECTION

Data for the Scottsdale Road Corridor Drainage Master Plan was gathered from many sources. Both Stanley Consultants and sub-consultant Logan Simpson Design participated in the data collection effort. Data that was collected typically came in both electronic files and hard copy format. The cities of Scottsdale and Phoenix and the Flood Control District of Maricopa County were primary sources of data. Data typically fell into one of the following categories:

- Contract, Guidelines, Manuals
- FEMA, USGS, NRCS
- Computer Software, GIS Data
- Hydrology and Hydraulics Studies, Design Documents
- Improvement Plans, As-Built
- Planning and Land Use

The data format varied greatly depending on the source and the type of information. Construction plans and as-built data were typically found in microfilm records at the Cities of Scottsdale and Phoenix. Electronic files that created the base maps used throughout the study were obtained from Scottsdale, Phoenix and Maricopa County GIS departments. Stanley Consultants' field operations staff also participated in data collection by conducting field surveys at many of the major drainage facilities found in the study area. Field survey data collected for this study is covered in Volume 3 of the technical documentation section. A reference list of the data collected for this study is summarized in Appendix C.



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 2.0 REGIONAL DRAINAGE FACILITIES IN THE FOCUS AREA

The following sub-sections briefly describe the primary physical attributes of the regional drainage facilities found in the focus area.

### 2.0.1 Berneil Ditch

The upstream end of the Berneil Ditch is at Scottsdale Road just south of Mountain View Road where drainage from east of Scottsdale Road discharges through an existing double 8' x 3' concrete box culvert. The total length of the Berneil Ditch is about 8,500 feet. It discharges into the Indian Bend Wash at the south end of the study area at about the 66<sup>th</sup> Street alignment. The ditch receives drainage from almost the entire 9.81 square mile study area. The major inflow tributaries to the Berneil Ditch are the 71<sup>st</sup> Street and the Mountain View Channels.

The Berneil Ditch has a trapezoidal cross section for its entire length. From Scottsdale Road to the southwest corner of Chaparral High School, the ditch has earth sides and bottom and has a relatively flat longitudinal slope (about 0.001 ft/ft). From that location to its downstream end, the Berneil Ditch is lined with concrete on its sides and bottom. Side slopes in the concrete lined reach average about 3 horizontal to 1 vertical and the bottom width averages about 30 to 35 feet. The ditch

ranges in depth from about 5 feet at its upstream end to about 8 feet at its downstream end. There is only one cross culvert consisting of a six-barrel 10' x 5' concrete box at Double Tree Ranch Road. Below Double Tree Ranch Road, the east bank of the ditch is built up above the adjacent grade about two to three feet.

The Berneil Ditch takes three rather short radius 90-degree bends in its alignment but the sub-reaches between these bends are typically straight and uniform. There is a gravel surfaced maintenance road along the south and east banks of the ditch for its entire length. This road also serves as a pedestrian and equestrian trail. There is a telemetered rain and stage gage located on the east bank of the Berneil Ditch a few hundred feet south of Double Tree Ranch Road that is part of the Flood Control District's alert flood warning system (Sensor ID #4685 and #4688, respectively). This gage has only been in operation for about 4 years.

The Berneil Ditch is perhaps 50 years old or older and may have originated as a combined irrigation tail water ditch and flood control levee back in time when the area was predominantly agricultural and range land. It evolved over time to its present form, essentially prior to any recent drainage planning. The ditch is situated in a separate tract of land approximately 100 feet in width. It is owned and maintained entirely by the Town of Paradise Valley.



Berneil Ditch (earth section)



Berneil Ditch (concrete lined reach)



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 2.0.2 71<sup>st</sup> Street Channel

The downstream limit of the 71<sup>st</sup> Street Channel is the Berneil Ditch just below Mountain View Road, approximately 600 feet west of Scottsdale Road. The channel essentially follows the 71<sup>st</sup> Street alignment for its entire length from that point upstream. For purposes of the Scottsdale Road Corridor Drainage Master Plan, the upstream limit of the 71<sup>st</sup> Street Channel is Cactus Road. The total length of the channel is approximately 8,000 feet.

The 71<sup>st</sup> Street Channel conveyance ranges widely in cross-section geometry, longitudinal slope and surface treatment. Sub-reach configurations include numerous concrete lined rectangular, trapezoidal and triangular shaped sections. There are also trapezoidal earth sections, ranging from modestly to nicely landscaped and an inverted crown street section. The level of condition and maintenance also varies widely.

From the Berneil Ditch north to Gold Dust Avenue, the 71<sup>st</sup> Street Channel is a fairly wide, nicely landscaped channel where it passes thru the Acacia Creek Apartment complex. Between Gold Dust Avenue and Shea Boulevard, it is a deep, steep-sided concrete lined channel designed for a relatively narrow corridor. From Shea Boulevard to Sahuaro Drive, the 71<sup>st</sup> Street Channel is conveyed by a 12' x 9' concrete box storm drain that is almost 800 feet long. From Sahuaro Drive

upstream to a point about 300 feet north of Mescal Street, the 71<sup>st</sup> Street Channel is a moderately landscaped, mostly earth channel with rip-rap lining portions of it. And from north of Mescal Street to Cholla Street, the channel is a shallow paved alley with the outfall pipe from the Cactus Park detention basin running underneath it.

Cholla Street at the 71<sup>st</sup> Street Channel is simply a dip crossing with no culvert. From Cholla Street north to Cortez Street, the 71<sup>st</sup> Street Channel actually consists of 71<sup>st</sup> Street itself, which is a residential street with an inverted crown. From Cortez Street to Sunnyside Drive, the channel is no more than a paved alley, very shallow and narrow in section. And from Sunnyside Drive north to Cactus Road, the channel is concrete lined with steep sides. This upper-most reach is one of the outfalls constructed in the early 1990's for the Cactus Road storm drain improvements. The channel takes a relatively tight bend around an existing single-family residence just south of Paradise Drive.

Generally, sub-reaches of the 71<sup>st</sup> Street Channel tend to be fairly straight and uniform in terms of horizontal alignment with occasional offset transitions in alignment to conform to property lines and avoid certain improvements that existed prior to the channel. The existing channel probably follows an historic, wide shallow flow path that gradually became more and more defined and confined as the adjacent land developed.

From an overall perspective, there appears to be very little continuity in the character, design and hydraulic performance of the 71<sup>st</sup> Street Channel. The form of each channel sub-reach seems to reflect the character of the adjacent land use, which ranges from commercial and office to single and multi-family residential. Each of the channel sub-reaches seems to vary significantly from its adjacent sub-reach as if the channel were really just a loose collection of very differing conveyances placed end-to-end.

The channel flows from north to south, which is the predominant direction of slope and drainage in the Scottsdale Road corridor area. Sub-reaches generally have a fairly uniform longitudinal slope. The overall slope from Cactus Road to the Berneil Ditch is about 0.6 percent. Side slopes range from near vertical to flatter than 4 horizontal to 1 vertical. The depth of the channel ranges from about one foot to over 8 feet. Bottom widths are as little as one foot and top widths range upward to over 50 feet.

For the most part, the 71<sup>st</sup> Street Channel is entirely below the adjacent grade except for a portion of the reach from Sunnyside Drive to Paradise Drive, which has hardened banks that are built up above ground. The overbank area adjacent to most of the 71<sup>st</sup> Street Channel is relatively flat. Along the channel just above Shea Boulevard, the west overbank falls away slightly from the



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

channel and Shea Boulevard actually has a longitudinal slope that falls from east to west where it crosses over the channel. These conditions present the potential for a very wide shallow overbank floodplain adjacent to the channel or even breakout to a parallel flow path if the 71<sup>st</sup> Street Channel or any of its culvert capacities are exceeded.

There are a total of eight culvert crossings on the 71<sup>st</sup> Street Channel. Most of these culverts are multi-barrel box configurations of varying size. All of the culverts, except the one at the Acacia Creek Apartment driveway, are situated in public right-of-way. Construction of the 71<sup>st</sup> Street Channel and its cross culverts has taken place in many phases over about the last 30 years. Some of the improvements are private and some public. Most of the channel is situated on private property. Drainage easements and drainage right-of-way only cover part of the channel. Maintenance, repairs and minor improvements have been performed by the City of Scottsdale at certain locations along the channel.

Storm runoff enters the 71<sup>st</sup> Street Channel at many locations from the north, east and west. The primary inflow points involve both surface flow and storm drains. Primary inflow occurs from the following:

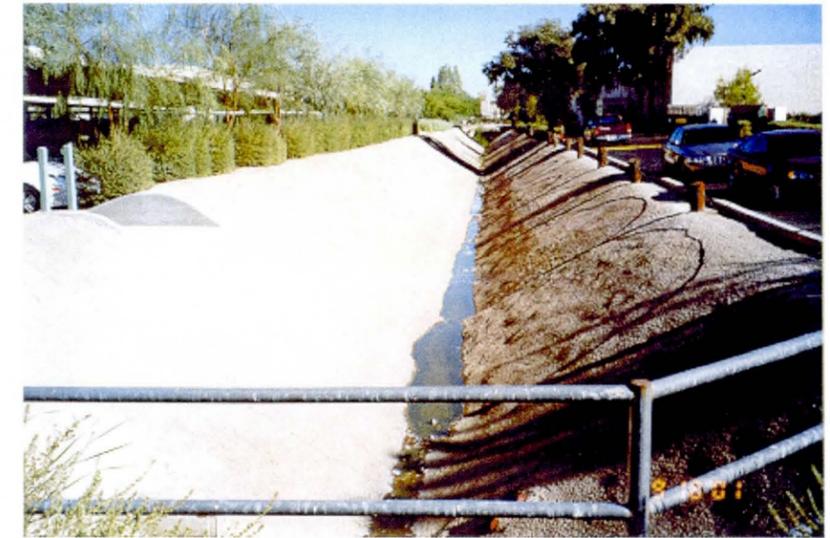
- the Cactus Road storm drain;
- 70<sup>th</sup> Street surface flow just south of Gary Road;

- the Cactus Park detention basin outfall pipe just north of Mescal Street;
- the Scottsdale Road storm drain at Mescal Street;
- the Mescal Park detention basin outfall pipe just below Mescal Street; and,
- storm drains in Shea Boulevard from both the east and west.

In addition, there are dozens of smaller more local inflow points consisting of small diameter storm drains serving adjacent private development and surface inflow from public streets and private driveways.



71<sup>st</sup> Street Channel just north of Mountain View Road



71<sup>st</sup> Street Channel between Cochise Road and Shea Boulevard



71<sup>st</sup> Street Channel at Sunnyside Drive



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 2.0.3 Scottsdale Road Channel

The upstream end of the Scottsdale Road Channel is just south of Thunderbird Road where an existing triple-barrel 6' x 4' concrete box culvert and an existing 42" storm drain pipe discharge their runoff from the north. The channel is situated entirely on the east side of Scottsdale Road and extends down to Sweetwater Avenue, a distance of about one half mile. The channel starts out at its upstream end with a concrete lined trapezoidal cross section about six feet in depth. The concrete channel flairs out and transitions to an earth channel with a depth of about 5 feet a few hundred feet south of Thunderbird Road.

Around six hundred feet south of Thunderbird Road, there is a major tributary channel that joins the Scottsdale Road Channel from the east. This channel carries the outflow discharge from the Scottsdale Airport detention basin and is really the only major tributary to the Scottsdale Road Channel below Thunderbird Road. The vacant parcel of land at the southeast corner of Scottsdale and Thunderbird Roads that the channel is situated on is owned by the City of Scottsdale. This parcel is anticipated to be the future home of the International Fighter Pilot Museum.

Just below the confluence with the Scottsdale Airport detention basin outfall channel, the Scottsdale Road Channel leaves the City of Scottsdale parcel and enters

the Thunderbird Adventist property. At that location, it transitions to a wide, shallow landscaped channel with a depth of about four feet. There are two paved driveway dip crossings of the channel within the Thunderbird Adventist property. There is an existing drainage easement totaling 70 feet in width along the east side of Scottsdale Road on the Thunderbird Adventist property.

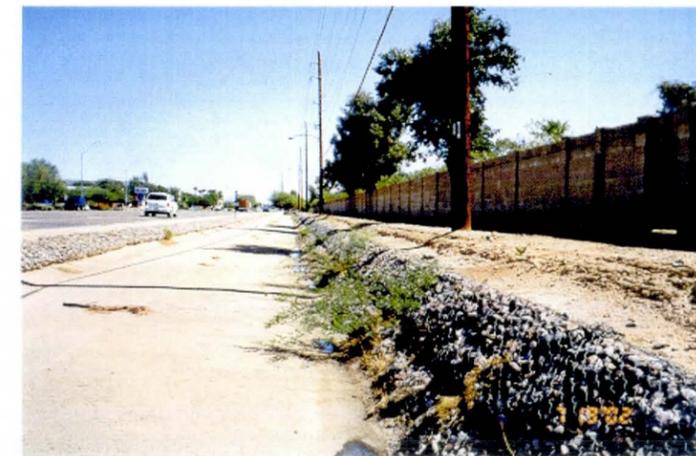
There is a four-barrel 8' x 3' concrete box culvert at Sutton Drive, which is a quarter mile south of Thunderbird Road. There are three catch basins on grade in Scottsdale Road that drain to the Scottsdale Road Channel near Sutton Drive. There are also three catch basins in sump just east of Scottsdale Road at Sutton Drive that drain into the channel via flap-gate inlet structures.

From Sutton Drive south to Sweetwater Avenue, a distance of about a quarter mile, the Scottsdale Road Channel has a hard surfaced trapezoidal cross section that averages about three to four feet in depth. The sides are lined with rock-filled wire gabion baskets and the bottom is lined with concrete. About eight feet of the concrete channel bottom serves as a sidewalk. The channel in this reach is situated partly within the Scottsdale Road right-of-way and partly within a 10-foot wide drainage easement on private property.

At Sweetwater Avenue, the Scottsdale Road Channel drops into the inlet of an existing 90-inch diameter storm drain which discharges into the Cactus Park detention basin to the south. The present improvements within the Scottsdale Road Channel date back to the mid 1970's and 1980's.



Scottsdale Road Channel above Sutton Drive



Scottsdale Road Channel below Sutton Drive



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

### 2.0.4 Cactus Park Detention Basin

The Cactus Park detention basin is an excellent example of a multi-use facility combining a major city park with a regional stormwater detention basin. The basin and the park were constructed together as a combined feature in the mid-1980's. The detention basin was originally planned as part of the Paradise Valley, Scottsdale, Phoenix (PVSP) Study, a regional drainage master plan from the mid-1970's. The Flood Control District of Maricopa County was involved in planning, funding and implementing some of the regional features from the PVSP Study along with the Cities of Scottsdale and Phoenix and the Town of Paradise Valley.

The hydrology model from the PVSP Study included a hydrograph analysis indirectly for the Cactus Park basin. This analysis indicated that there would be surface overflow in addition to outflow from the basin's primary outlet, a 60" diameter pipe that discharges to the 71<sup>st</sup> Street Channel south of Cholla Street. Apparently, the basin was sized on the basis of how much area and volume could reasonably be incorporated within the park site. The design was not based on achieving a specific discharge reduction or holding the runoff volume from a storm with a specific return frequency.

The Cactus Park detention basin has a surface area of approximately 12.5 acres. It has a depth that ranges from 7 to 15 feet and it holds a total of 92.2 acre-feet of runoff

at its overflow elevation. This is the largest single detention basin in the entire Scottsdale Road Corridor Drainage Master Plan study area. The bottom of the basin has large expanses of grass, basketball and volleyball courts, picnic ramadas and parking areas.

There are a total of six locations along the north, east and west sides of the basin where storm runoff enters. This includes the storm drain system for Scottsdale Road adjacent to the basin. Runoff enters the basin by both channel and storm drain. The largest of the inflow locations is the existing 90" diameter storm drain mentioned in Section 2.0.3 (Scottsdale Road Channel). The 90" storm drain was constructed at the same time from the same set of plans as the Cactus Park detention basin.

The Cactus Park basin incorporates a low-flow bypass system of underground pipe ranging in size from 48" to 60" in diameter. This system intercepts low-flows that enter the park at five of the six inflow locations and directs them to the primary outlet pipe. This helps keep the bottom of the basin dry for the smaller more frequent storms, thus maintaining a higher level of park use.

The Cactus Park detention basin's primary outlet is a single 60" diameter pipe that is over 4000 feet in length. The inlet for this pipe is at the basin's southwest corner (northeast corner of Scottsdale and Cactus Roads). For

storm events that exceed the basin's capacity, overflow would occur along the park's frontage on Cactus Road from Scottsdale Road to the park's driveway entrance/exit.



Cactus Park detention basin



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

### 2.0.5 Mescal Park Detention Basin

Like the Cactus Park detention basin, the Mescal Park detention basin was constructed as a planned feature recommended from the PVSP Study. It was constructed in the mid- to late-1980's. It is also an excellent example of a multi-purpose park and flood control facility. In contrast with Cactus Park, Mescal Park is smaller and accommodates primarily local equestrian use. It does not have onsite parking, hard surfaced recreational courts or restrooms.

The detention basin within the park has a turf-based landscape theme. The perimeter of the basin is rimmed with a 10' wide decomposed granite equestrian trail and there is an equestrian arena at the southwest corner of the park. The area between the basin perimeter and the park boundary is primarily desert landscaping. There is an 8' wide meandering asphalt pedestrian path around the park just inside of the park boundary.

The detention basin in Mescal Park has a surface area of approximately 5.2 acres. It has a depth that averages about 7 feet and it holds a total of 38.1 acre-feet of runoff at its overflow elevation. Its perimeter has a curvilinear configuration and its side slopes range from about 4 to 6 horizontal to 1 vertical.

Offsite drainage enters the Mescal Park detention basin at essentially only one location on its north side. That location is 68<sup>th</sup> Place where there is a double 78" diameter storm drain that serves as one of the outfalls for the Cactus Road storm drain system that was constructed in the early 1990's. There is also local surface drainage that enters the basin from 68<sup>th</sup> Place at the same location.

Unlike the Cactus Park detention basin, there is no low-flow bypass system at Mescal Park. Therefore, all flows, large and small, flood across the bottom of the basin. The primary outlet for the Mescal Park detention basin is a single 60" diameter storm drain pipe with its inlet located at the southeast corner of the basin. This pipe drains directly east just over 1300 feet and discharges to the 71<sup>st</sup> Street Channel just south of Mescal Street.

A portion of the storage volume in the Mescal Park basin is situated above ground unlike Cactus Park, which derives all of its storage below grade. Part of the Mescal basin volume is created by an earth levee along its south side. This levee ranges up to about three feet in height above the grade to the south. The levee does not appear to be protected by any hardened surface treatment or

cutoff wall that would prevent it from scour failure if it were to be overtopped.

In addition, the top of the Mescal basin is essentially a level elevation all the way around its perimeter. There is no apparent overflow spillway.



Mescal Park detention basin (south side)



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 2.1 EXISTING CONDITION HYDROLOGY INTRODUCTION AND BACKGROUND

The study area boundary for the Scottsdale Road Corridor Drainage Master Plan was established on the basis of contributing drainage area. The boundary comprises all of the area that contributes runoff to the Scottsdale Road corridor above Mountain View Road, and all of the contributing drainage area to the Berneil Ditch and the 64<sup>th</sup> Street Channel (Invergordon Road Channel) at their respective outfalls to the Indian Bend Wash. The total contributing drainage area corresponding to the study boundary is 9.81 square miles.

The upper boundary of the study is the Central Arizona Project Canal and the lower limit of the study is the Indian Bend Wash. The east and west limits of the study area were established on the basis of extensive field reconnaissance and the review of topography and as-built plans. There are a total of seven locations along the east and west boundaries of the study area where storm runoff leaves the Scottsdale Road Corridor Drainage Master Plan study and drains to the adjoining watersheds. The runoff that leaves the study at these locations does not return to the study area and ultimately flows south to the Indian Bend Wash. There is no drainage from outside of the study limit boundary that flows into the study area.

Development of private and municipal improvements within the Scottsdale Road Corridor Drainage Master Plan study area dates back more than 50 years. Early development in the 1950's and 1960's consisted primarily of single-family residential homes on

large parcels in the southern part of the study area. Over the years, development of residential, commercial and light industrial land uses along with the associated municipal, transportation and utility improvements steadily progressed, generally from the south to the north. Today, the study area is almost completely developed. The predominant slope and direction of flow is from north to south. Slopes range from about ½ percent in the south end of the study area to about 1½ percent in the north end. Elevations range from a low of just over 1,300 feet to a high of just over 1,500 feet.

A number of significant regional drainage improvements, both public and private, have been constructed over the years within the study area. Many of the more significant drainage studies that document the hydrologic design of these regional drainage improvements were collected and reviewed and the results were incorporated in the hydrology analysis for the Scottsdale Road Corridor Drainage Master Plan, as appropriate. The most important of these studies included the Paradise Valley, Scottsdale, Phoenix (PVSP) Study, the Shea-Scottsdale Master Plan, the Cactus Road Outfall Study, the Kierland Master Drainage Report and the Scottsdale Stormwater Master Plan and Management Program.

The primary objective of the hydrologic analysis in this study is to establish baseline hydrology for existing conditions within the study area for both the 10- and 100-year return frequency storms. This hydrology will be used in the hydraulic evaluation of existing major drainage facilities and will also be used as the

basis for the formulation and evaluation of proposed alternatives intended to address existing drainage and flooding problems in the study area.

## 2.2 HYDROLOGIC APPROACH AND METHODOLOGY

Hydrology for this study was modeled using the U.S. Army Corps of Engineers HEC-1 computer program. All of the HEC-1 models in this study assume a fully developed future land use condition. The Flood Control District of Maricopa County (FCDMC) Drainage Design Management System for Windows (DDMSW) computer program was used to calculate certain HEC-1 data. Both the 6-hour and 24-hour duration precipitation patterns were considered and incorporated in the initial hydrologic analysis. The 6-hour precipitation pattern(s) yielded slightly higher peak flows for both the 10- and 100-year storms compared to the 24-hour patterns. All final HEC-1 models utilize a 6-hour pattern.

The 10- and 100- year, 6-hour rainfall point depths are 2.03" and 3.20", respectively. Aerial reduction of rainfall was incorporated in all HEC-1 models in accordance with Section 2.3, Depth-Area Relation, Flood Control District of Maricopa County Hydrology Manual.

Other than the rainfall input, sub-basin times of concentration ( $T_c$ ), sub-basin storage coefficients ( $R$ ) and the cumulative drainage area, there is essentially no difference between the 10-year and 100-year HEC-1 models.



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

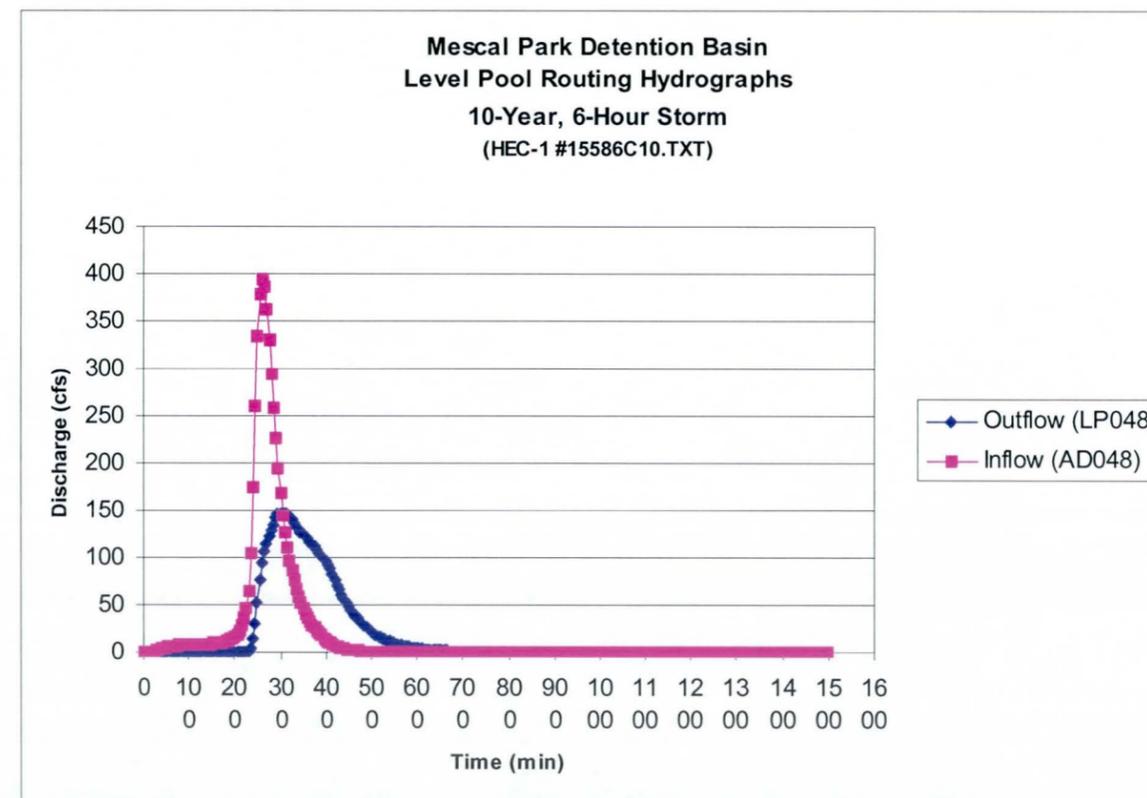
About 30 hydrograph diversion steps were necessary to account for surface flow splits, overflows, storm drain systems, cross drainage and detention basin inflow and outflow at certain locations. Figure 7 on the following page shows the overall study area and sub-basin boundaries, flow paths, routing reaches, detention basins and diversions.

## 2.3 HYDROLOGIC RESULTS

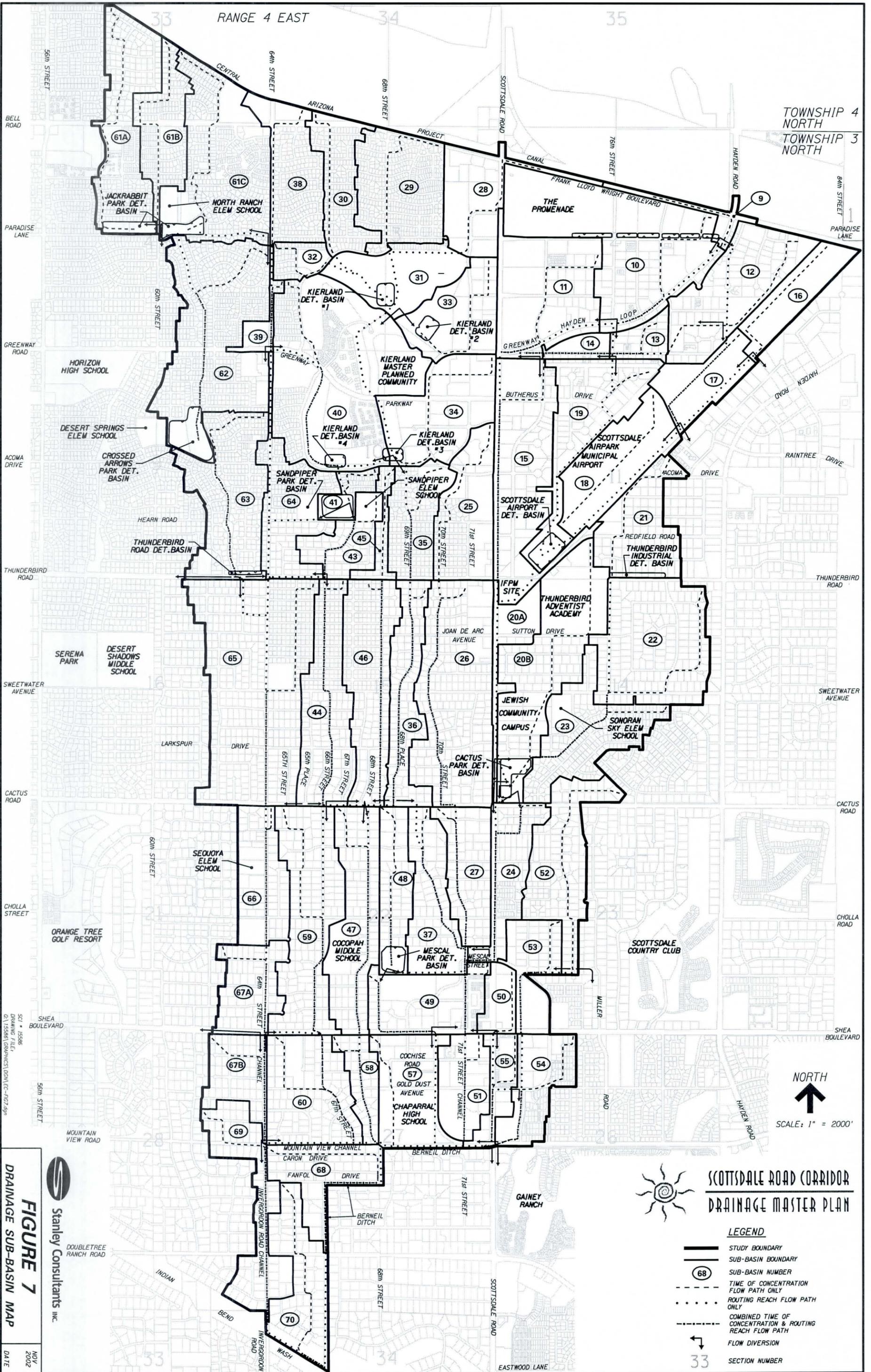
The 100-year, 6-hour HEC-1 unit discharges for the overall study area and for individual sub-basins within the study were compared with unit discharges from regional studies. The HEC-1 unit discharge for the overall project area is approximately 350 cfs/sq mi. This compares favorably with the Federal Emergency Management Agency (FEMA) unit discharge of 360 cfs/sq mi for the Indian Bend Wash watershed upstream from Scottsdale Road.

Sub-basin unit discharges from the HEC-1 model were then compared with sub-basin unit discharges calculated by the Arizona Department of Transportation (ADOT) Indirect Method No. 2 – USGS Data for Arizona. The average HEC-1 unit discharge for individual sub-basins is 2,079 cfs/sq mi. which compares favorably with the average ADOT Method individual sub-basin unit discharge of 2,303 cfs/sq mi. Figures 8 and 9 on pages 23 and 24 display HEC-1 peak discharges and peak times at various key locations throughout the study for the 10- and 100-year, 6-hour events, respectively. Also included with Figure 9 are the 100-year peak discharges estimated at various locations from the previous hydrologic studies mentioned earlier. Table 1 on page 25 summarizes key HEC-1 data related to the level pool detention basin routing steps in the study. Inflow and outflow hydrographs associated with the Mescal Park detention basin are displayed at right. This is a typical graphical representation of hydrologic data associated with Table 1.

Regional detention basins are modeled as level pool routing steps. Typically, private onsite detention/retention basins are not reflected in the HEC-1 models except for the larger basins just south of Frank Lloyd Wright Boulevard between Scottsdale Road and the Greenway-Hayden Loop. These basins are protected by recorded drainage easements. There are literally hundreds of small detention/retention basins on private property in the Scottsdale Airpark area. Based on preliminary HEC-1 models, it was found that discharges would be about 25% to 50% less in the area tributary to the Cactus Park detention basin if the smaller private basins were reflected in the hydrology. However, only about 1/3 of these private basins are situated in recorded drainage easements and the study team was concerned that they would not be maintained. Therefore, they are not reflected in final hydrology.



HEC-1 Level Pool Hydrographs

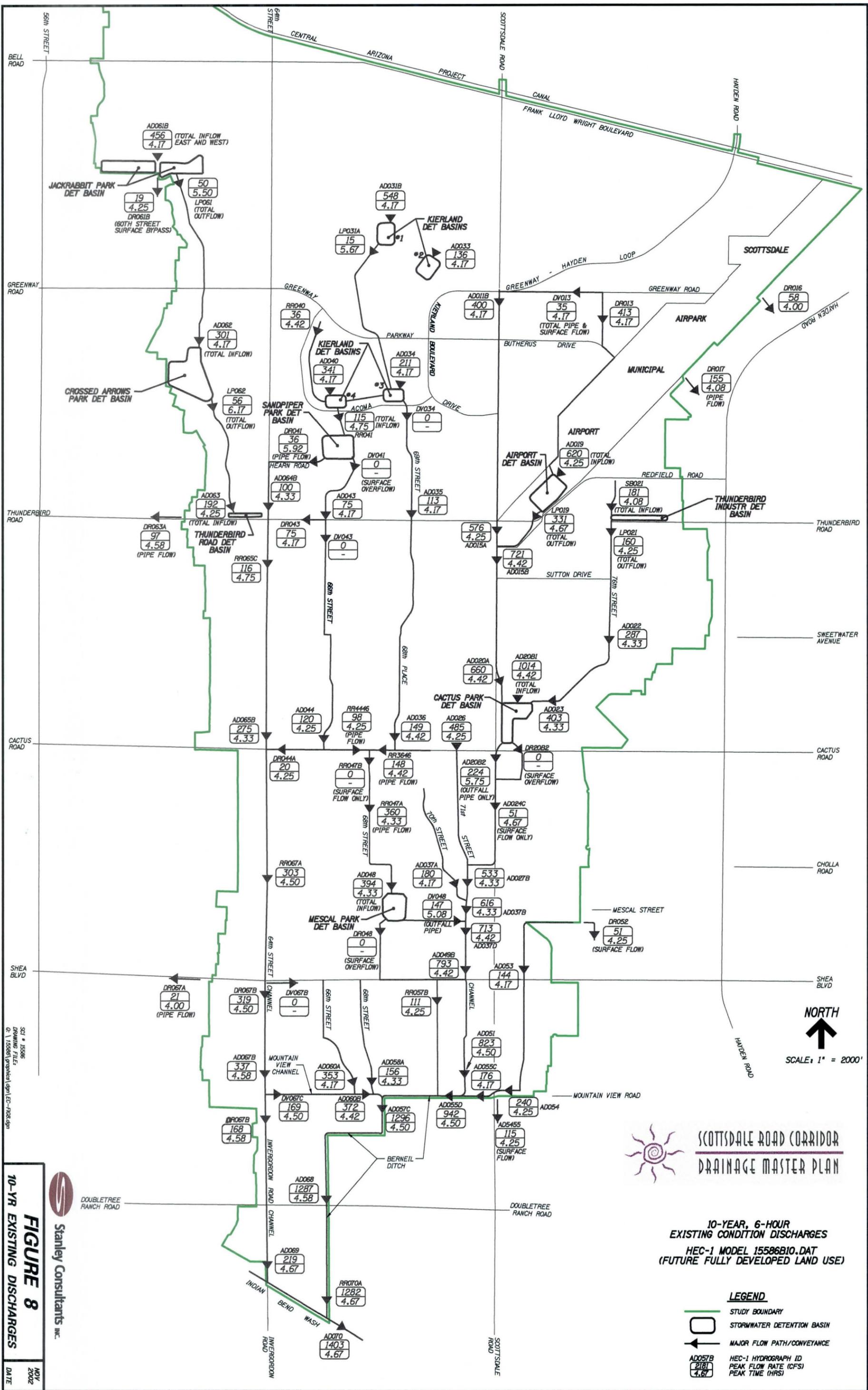


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 SHEA BOULEVARD  
 50' x 150'  
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**FIGURE 7**  
**DRAINAGE SUB-BASIN MAP**  
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**SCOTTSDALE ROAD CORRIDOR  
 DRAINAGE MASTER PLAN**

- LEGEND**
- STUDY BOUNDARY
  - - - SUB-BASIN BOUNDARY
  - (68) SUB-BASIN NUMBER
  - - - TIME OF CONCENTRATION FLOW PATH ONLY
  - ..... ROUTING REACH FLOW PATH ONLY
  - - - COMBINED TIME OF CONCENTRATION & ROUTING REACH FLOW PATH
  - ↘ FLOW DIVERSION
  - 33 SECTION NUMBER



**FIGURE 8**  
10-YR EXISTING DISCHARGES

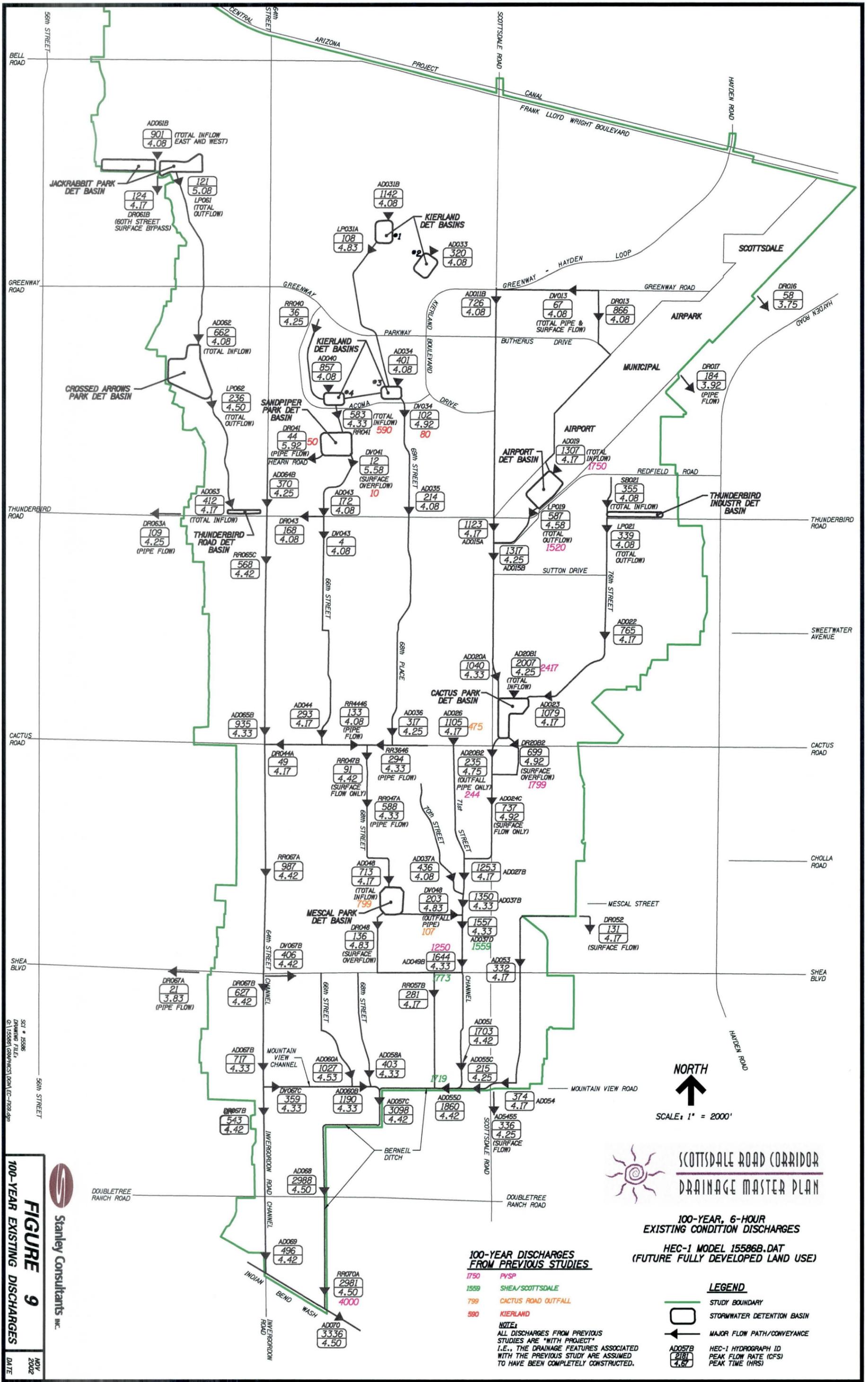
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**SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN**

10-YEAR, 6-HOUR  
EXISTING CONDITION DISCHARGES  
HEC-1 MODEL 15586B10.DAT  
(FUTURE FULLY DEVELOPED LAND USE)

- LEGEND**
- STUDY BOUNDARY
  - STORMWATER DETENTION BASIN
  - MAJOR FLOW PATH/CONVEYANCE
  - HEC-1 HYDROGRAPH ID  
PEAK FLOW RATE (CFS)  
PEAK TIME (HRS)

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DATE



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**FIGURE 9**

**100-YEAR EXISTING DISCHARGES**

NOV 2002 DATE

**100-YEAR DISCHARGES FROM PREVIOUS STUDIES**

- 1750 PVSP
- 1559 SHEA/SCOTTSDALE
- 799 CACTUS ROAD OUTFALL
- 590 KIERLAND

**NOTE:**  
ALL DISCHARGES FROM PREVIOUS STUDIES ARE "WITH PROJECT" I.E., THE DRAINAGE FEATURES ASSOCIATED WITH THE PREVIOUS STUDY ARE ASSUMED TO HAVE BEEN COMPLETELY CONSTRUCTED.

**SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN**

100-YEAR, 6-HOUR EXISTING CONDITION DISCHARGES  
HEC-1 MODEL 15586B.DAT  
(FUTURE FULLY DEVELOPED LAND USE)

**LEGEND**

- STUDY BOUNDARY
- STORMWATER DETENTION BASIN
- MAJOR FLOW PATH/CONVEYANCE
- HEC-1 HYDROGRAPH ID  
PEAK FLOW RATE (CFS)  
PEAK TIME (HRS)



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

**TABLE 1 HEC-1 SUMMARY DATA AT REGIONAL STORMWATER DETENTION BASINS**

HEC-1 ID	Basin Name	Low Elevation (ft)	Overflow Elevation (ft)	Storage Volume at Overflow Elevation (ac-ft)	Total 6-Hr Peak Inflow (cfs)		Total 6-Hr Peak Outflow (cfs)		Peak Stage (ft)		Volume in Storage at 6-Hr Peak Stage (ac-ft)	
					100-Yr	10-Yr	100-Yr	10-Yr	100-Yr	10-Yr	100-Yr	10-Yr
LP019*	Airport	1426.7	1432.0	33.6	1307	620	587	331	1432.1	1429.9	33.6	16.4
LP021^^	Thunderbird Industrial	1426.0	1430.0	4.4	355	181	339	160	1430.7	1430.3	5.6	4.9
LP020B*	Cactus	1370.0	1387.8	92.2	1823	830	749	40	1388.9	1385.9	92.2	69.7
LP031A	Kierland #1	54.5	76.0	57.9	1142	548	108	15	75.0	69.0	50.9	16.9
LP033	Kierland #2	35.0	65.0	230.0	320	136	**	**	42.5	40.5	25.6	17.3
LP034	Kierland #3	32.0	42.0	26.0	401	211	120	18	40.9	38.0	23.0	14.7
LP040	Kierland #4	31.0	40.0	20.6	857	341	578	116	39.7	38.1	19.1	12.1
LP041*	Sandpiper	25.0	33.5	29.4	583	119	56	36	33.6	29.6	29.4	6.2
LP048*	Mescal	1354.5	1363.5	38.1	713	394	338	147	1363.7	1360.6	38.1	21.3
LP061*	Jackrabbit	1463.0	1470.0	41.6	901	456	121	50	1470.7	1469.0	41.6	29.4
LP062*	Crossed Arrows	1432.0	1438.0	25.8	662	301	236	56	1438.3	1437.1	25.8	18.4
LP063^^	Thunderbird Road	1412.0	1417.0	5.1	412	192	386	137	1417.9	1417.1	5.1	5.4
				<b>604.7</b>							<b>390.0</b>	<b>232.7</b>

\*Basins that overflow for the 100-year, 6-hour event

^^Basins that overflow for the 10-year, 6-hour event

\*\*No outflow except by small diameter bleedoff pipe

Note: Approximate Total Volume of 100-yr, 6-hr Hydrograph at AD070 = 660 ac-ft  
 Approximate Total Volume of 10-yr, 6-hr Hydrograph at AD070 = 340 ac-ft  
 Hydrograph AD070 represents the total runoff from the entire study area contributing to the Indian Bend Wash.



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 2.4 EXISTING CONDITION HYDRAULIC ANALYSIS INTRODUCTION AND BACKGROUND

Hydraulic analysis was performed for the Scottsdale Road Corridor Drainage Master Plan at many locations to serve various aspects of the study objectives. The analysis covers hydraulic features such as open channels, culverts, storm drain systems and spillways. These features involve an extensive array of physical characteristics including configuration, size, lengths, slope, discharge and flow regime.

The objectives of the hydraulic analysis at each location in the study area essentially fall into two related categories:

- support for the hydrologic models; and,
- the evaluation of drainage and flooding problems.

A great deal of the hydraulic analysis for the Scottsdale Road Corridor Drainage Master Plan is contained in the Technical Section Volume 1 "Hydrology Analysis" prepared by Stanley Consultants under separate cover. The hydraulic analysis contained in Volume 1 hydrology was generally done in support of the HEC-1 models contained in that document. This included hydraulics involving channel routing reaches, diversion steps and level pool routing. Because of the limited data and simple approach typically used in the hydraulics that supports HEC-1 models, caution should be exercised when using it to evaluate features that exhibit complex hydraulic characteristics.

A much more detailed hydraulic analysis was performed along the major drainage corridors in Technical Section Volume 2

"Hydraulic Analysis", also prepared by Stanley Consultants under separate cover. Volume 2 is more of a pure hydraulic document that includes a HEC-RAS backwater model, normal depth channel hydraulics and culvert hydraulics. The normal depth hydraulic analysis contained in Volume 2 is typically based on more detailed cross section data than that used in the hydrology models. Volume 2 is aimed at assessing the hydraulic performance of the larger, more complex drainage features found in the Scottsdale Road Corridor Drainage Master Plan study area to determine their potential for drainage and flooding problems.

Discharges used in the Volume 2 hydraulic analysis were taken from Volume 1 hydrology. The hydraulic analysis documented in Volume 2 is intended to serve as a baseline existing condition evaluation. Existing condition hydraulic analyses are used as the basis for identifying drainage and flooding problems within the study area and to confirm the known historic drainage and flooding problem locations. The hydraulic analysis also serves as the basis for the evaluation of drainage alternatives that will be developed in the latter part of the study.

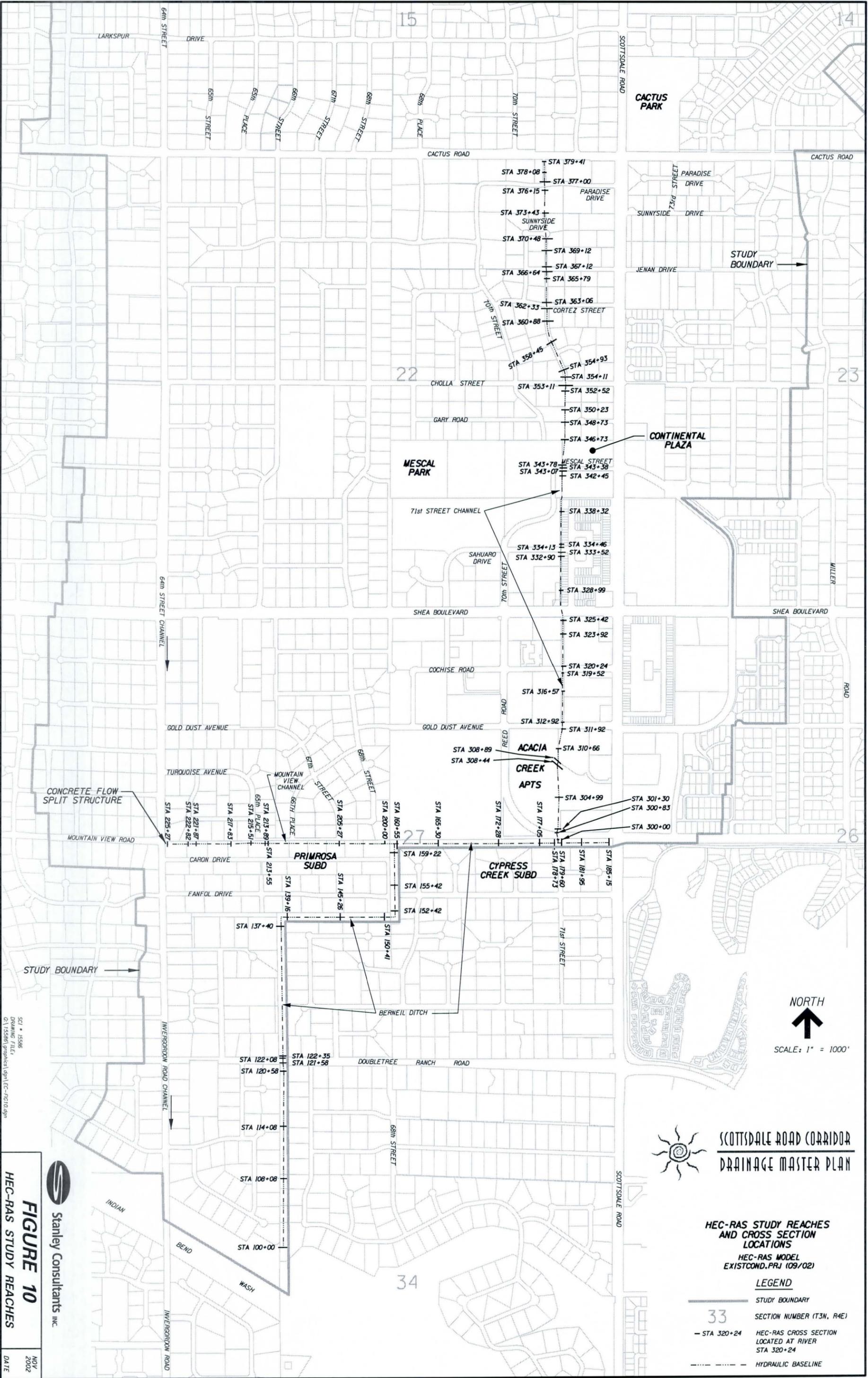
The overall objective of the Scottsdale Road Corridor Drainage Master Plan is to evaluate and alleviate drainage and flooding conditions in the study area. Originally, the focus area of the study was along the Scottsdale Road corridor from Mountain View Road on the south to Thunderbird Road on the north, including the 71<sup>st</sup> Street Channel. As mentioned in the introduction, the focus area was expanded to cover the Berneil Ditch, a major stormwater corridor in the Town of Paradise Valley.

## 2.5 HEC-RAS HYDRAULIC MODELING

Representative flow characteristics for the Berneil Ditch, Mountain View Channel and 71<sup>st</sup> Street Channel were modeled using the U.S. Army Corps of Engineers' HEC-RAS computer program Version 2.2. Input data for the HEC-RAS program includes channel cross-section geometry, downstream reach length, Manning's roughness coefficient "n" and ineffective flow areas. The model for this system uses the Berneil Ditch as the main channel with branches for the Mountain View Channel and the 71<sup>st</sup> Street Channel.

Two water surface profiles were modeled in HEC-RAS, one for the 10-year discharge and one for the 100-year discharge. The HEC-RAS model utilizes junction loss options to account for the confluence of the Mountain View Channel and 71<sup>st</sup> Street Channel branches. Hydraulic cross sections for the HEC-RAS model are based primarily on field survey data gathered by Stanley Consultants. This data was supplemented by as-built plans and field reconnaissance.

The hydraulic analyses found in previous studies for the Berneil Ditch, Mountain View Channel and 71<sup>st</sup> Street Channel are typically simple, normal depth hydraulics. No backwater analysis was found from any previous study for any of these drainage corridors. Figure 10 that follows is the schematic from the Technical Section Volume 2 Hydraulic Analysis showing HEC-RAS cross-sections along the Berneil Ditch, Mountain View Channel and 71<sup>st</sup> Street Channel. Figure 10 corresponds to Figure 7 in the Volume 2 Hydraulic Analysis.



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**FIGURE 10**

**HEC-RAS STUDY REACHES**

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**SCOTTSDALE ROAD CORRIDOR  
 DRAINAGE MASTER PLAN**

**HEC-RAS STUDY REACHES  
 AND CROSS SECTION  
 LOCATIONS**  
 HEC-RAS MODEL  
 EXISTCOND.PRJ (09/02)

**LEGEND**

- STUDY BOUNDARY
- 33** SECTION NUMBER (T3N, R4E)
- STA 320+24 HEC-RAS CROSS SECTION LOCATED AT RIVER STA 320+24
- HYDRAULIC BASELINE

Detailed accounts of the hydraulic characteristics of each HEC-RAS reach are found in the Volume 2 Hydraulic Analysis. A detailed discussion of the results of the HEC-RAS analysis is also found in the Volume 2 Hydraulic Analysis. A brief summary of the hydraulic analysis results is presented in Sections 2.5.1, 2.5.2 and 2.5.3.

### **2.5.1 HEC-RAS Results – Berneil Ditch**

According to the HEC-RAS results, the Berneil Ditch sub-reach along Mountain View Road between Scottsdale Road and the confluence with the 71<sup>st</sup> Street Channel will experience overtopping of both the north and south banks during both the 10- and 100-year flood events. The HEC-RAS results also indicate that the Berneil Ditch sub-reach from the confluence with the 71<sup>st</sup> Street Channel to the confluence with the Mountain View Channel will experience overtopping of both north and south banks for the 100-year event. The 10-year peak discharge is conveyed through this sub-reach without overtopping either the north or the south bank.

Overtopping of the above two sub-reaches of the Berneil Ditch seems to correlate, at least in location, with what was anticipated from previous studies and with historic flooding in the area. The PVSP Study, for example, makes numerous references to the potential for overflow along the Berneil Ditch, even with the recommended PVSP features in place. If overtopping of the south bank of the Berneil ditch occurs in the upper most reaches, the overflow would drain through the residential area to the south as shallow unconfined flow, eventually reaching the Indian Bend Wash.

The HEC-RAS results indicate that the entire sub-reach of the Berneil Ditch from its confluence with the Mountain

View Channel to the culvert at Double Tree Ranch Road has sufficient capacity to convey the 10-year peak discharge without overtopping. The culvert at Double Tree Ranch Road has at least a 10-year capacity. However, this reach cannot convey the 100-year peak discharge and overtopping of both banks will occur. This is apparently due to the backwater effect of the culvert at Double Tree Ranch Road during the 100-year event. If flow breaks out of the Berneil Ditch upstream from Double Tree Ranch Road, very little of it would return back to the channel south of Double Tree. The flow that does not make it back into the Berneil Ditch would make its way to the Indian Bend Wash through the adjacent residential area, generally as shallow, unconfined flow.

According to the HEC-RAS results, the Berneil Ditch sub-reach extending from Double Tree Ranch Road to the Indian Bend Wash has sufficient capacity to convey both the 10- and 100-year peak discharges without overtopping of either east or west channel bank. Historically, overflow of the Berneil Ditch has been documented along the upper-most reach between Scottsdale Road and the 68<sup>th</sup> Street alignment. Overflow of the south bank has also occurred at the 90-degree bend just south of Fanfol Drive and just west of the 68<sup>th</sup> Street alignment.

### **2.5.2 HEC-RAS Results - Mountain View Channel**

According to the HEC-RAS model, the entire reach of the Mountain View Channel has sufficient capacity to convey the 10-year peak discharge without overtopping of either the north or south channel bank. The north bank of the Mountain View Channel will experience overflow during the 100-year peak discharge throughout the entire length of the channel reach. This overflow would result in

shallow flooding along the north bank. The south bank of the Mountain View Channel essentially contains the 100-year discharge from Invergordon Road (64<sup>th</sup> Street) to about 67<sup>th</sup> Street. East of 67<sup>th</sup> Street, the south bank would be overtopped and the flow that leaves the channel would pass through the residential area to the south, eventually joining the Berneil Ditch downstream. There is no historic record of overtopping of the Mountain View Channel.

### **2.5.3 HEC-RAS Results - 71<sup>st</sup> Street Channel**

According to the HEC-RAS model, the 71<sup>st</sup> Street Channel does not have sufficient capacity anywhere along the study reach to convey the 100-year peak discharge without overtopping its banks. Overtopping of the channel banks also occurs for the 10-year peak discharge in several sub-reaches. These sub-reaches include Cactus Road to Mescal Street, a short reach just upstream from Sahuaro Drive, the reach from Cochise Road to Gold Dust Avenue, and the reach just upstream of the Mountain View Road culvert crossing for approximately 500 feet within the Acacia Creek Apartments. None of the culvert crossings along the 71<sup>st</sup> Street Channel are able to convey the 100-year peak discharge. This would result in overtopping of the roadways and significant overbank flooding. The 10-year peak discharge is apparently conveyed by all culvert crossings except for the Cochise Road crossing.

There are numerous HEC-RAS cross sections that indicate neither the 10- or 100-year flows are contained within the end points of the hydraulic section. Flows that are not contained within the channel proper or within close proximity to the channel may break away and find nearby parallel flow paths. During the 100-year event, it

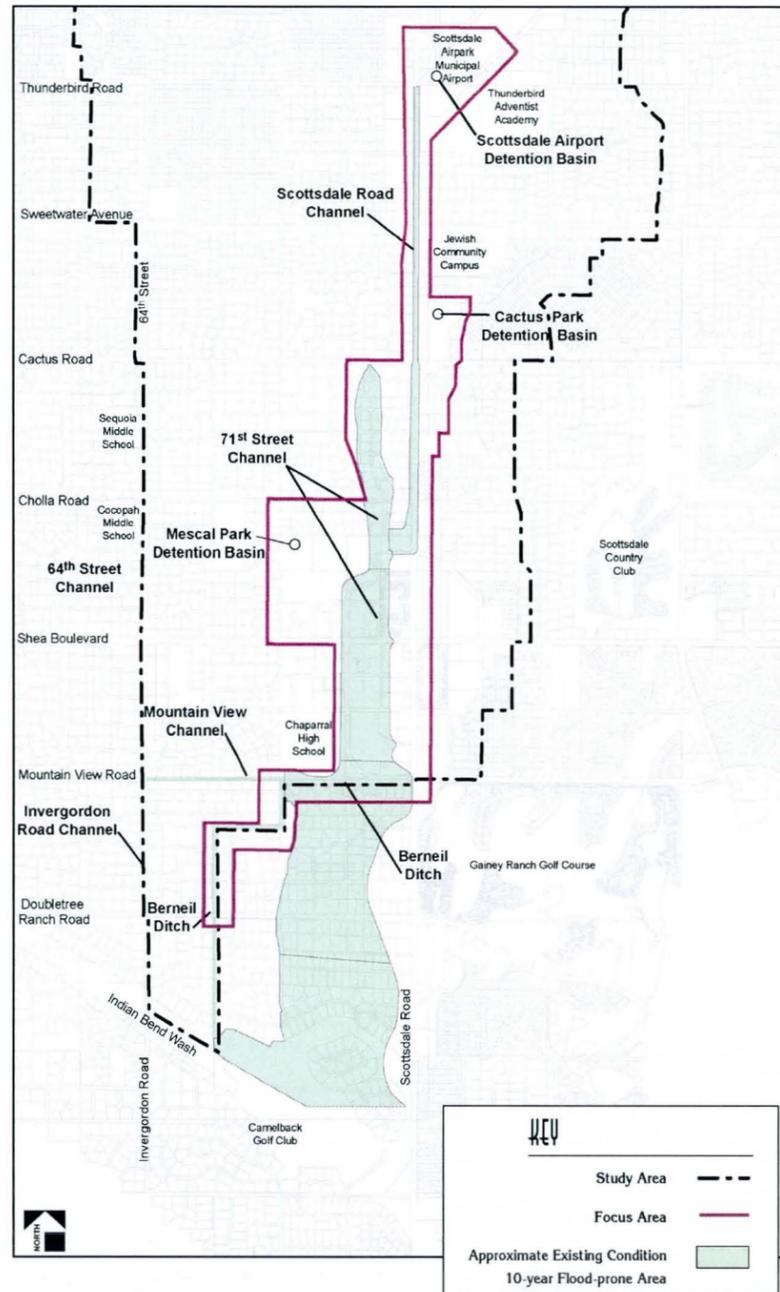


## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

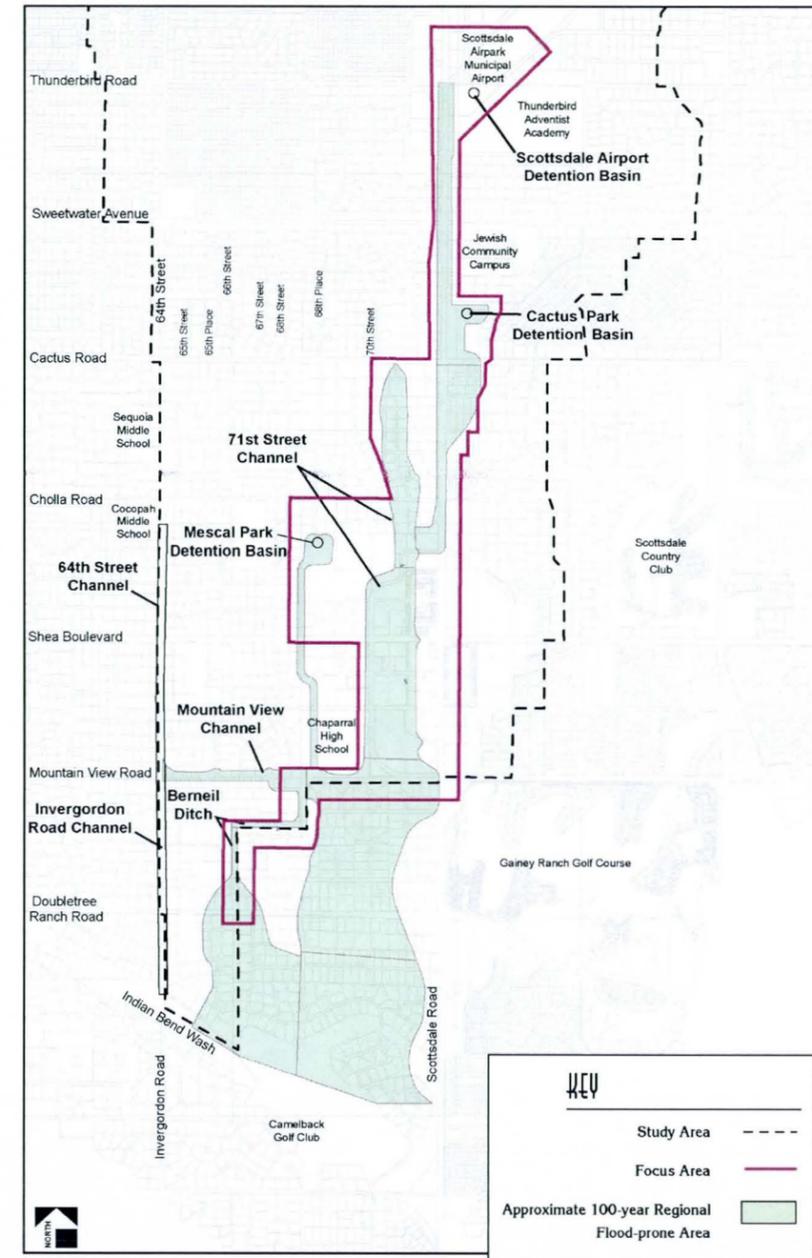
is possible that 70<sup>th</sup> Street from Sunnyside Drive to Cortez Street may carry a portion of the west overbank flow from the 71<sup>st</sup> Street Channel. It is also possible that flow overtopping the culverts at Sahuaro Drive and Shea Boulevard may flow west to 70<sup>th</sup> Street then south.

There are no specific historic accounts of flooding or overtopping of channel banks along the 71<sup>st</sup> Street Channel except as indicated by some of the attendees to the first public involvement meeting for the Scottsdale Road Corridor Drainage Master Plan in May of 2001. According to local residents, the upper part of the study reach north of about Cholla Road historically flooded on numerous occasions prior to construction of the Central Arizona Project Canal and its associated retention basins.

Figures 11 and 12 on the following page indicate the approximate 10-year and 100-year flood prone areas (respectively) associated with the Scottsdale Road Channel, 71<sup>st</sup> Street Channel, Berneil Ditch and Mountain View Channel. The flood prone areas indicated on Figures 11 and 12 are based on a compilation of historic flooding accounts, interpretation of HEC-RAS results and review of the Flood Insurance Rate Map for Maricopa County. There was no overall topographic survey available along the HEC-RAS channel reaches that would be suitable to delineate accurate limits of overflow. The backwater analysis was not intended to establish any floodplain limit for flood insurance or floodplain management purposes. Figures 11 and 12 are intended only to approximate the area that might be impacted by a severe flood so that the value of potential alternatives could be judged.



**FIGURE 11 APPROXIMATE EXISTING CONDITION  
10-YEAR FLOOD PRONE AREA**



**FIGURE 12 APPROXIMATE EXISTING CONDITION  
100-YEAR FLOOD PRONE AREA**



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

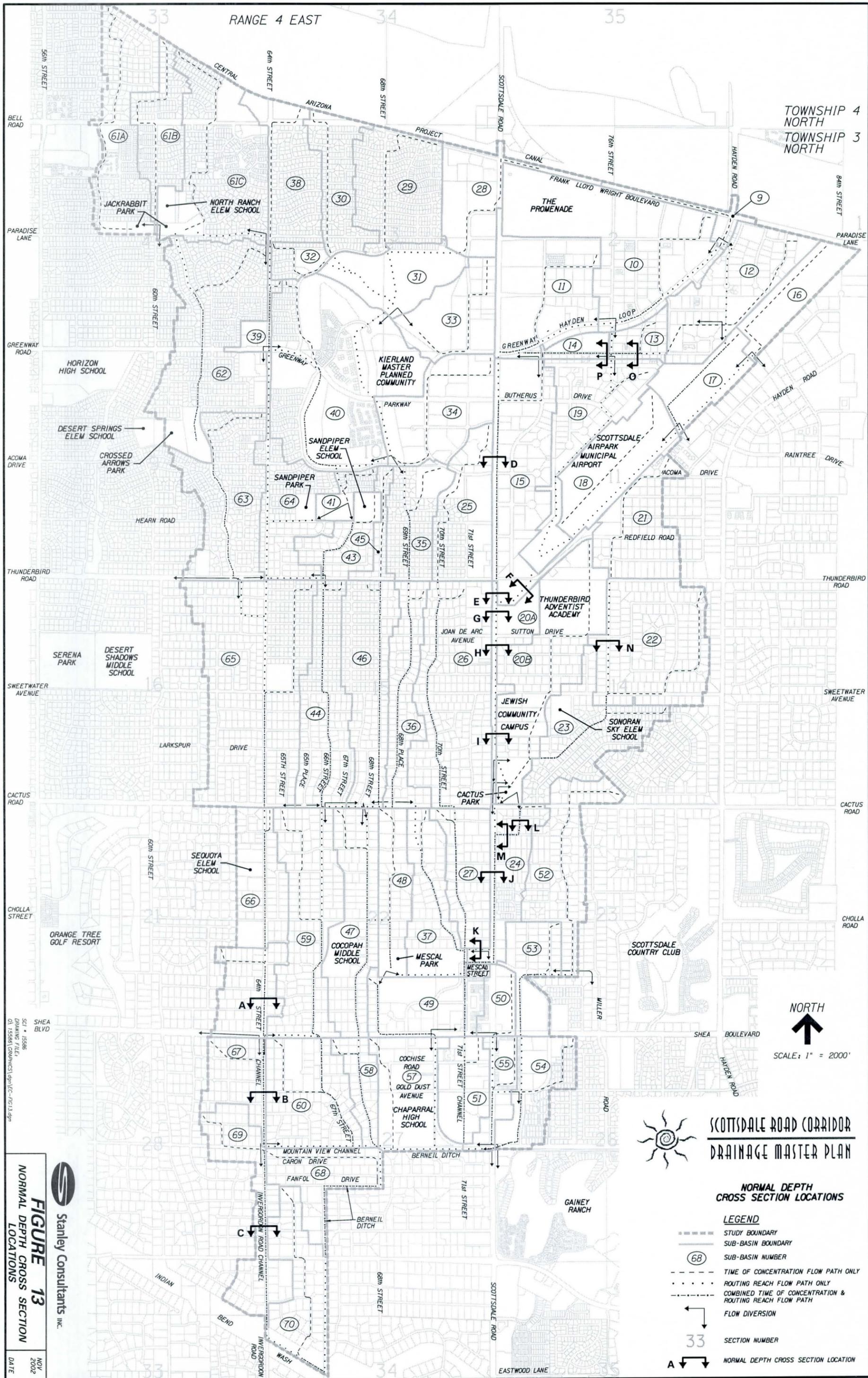
## 2.6 NORMAL DEPTH AND CULVERT HYDRAULICS

Many of the smaller drainage corridors in the Scottsdale Road Corridor Drainage Master Plan study area that are tributary to the Berneil Ditch, Mountain View Channel and 71<sup>st</sup> Street Channel were analyzed using simple normal depth and culvert hydraulics. These drainage corridors were typically broken up into sub-reaches, many of them corresponding to routing reaches in the HEC-1 hydrology model. The following sub-reaches (including associated culverts) were analyzed:

- 64<sup>th</sup> Street Channel from Gary Road to Shea Boulevard;
- 64<sup>th</sup> Street Channel from Shea Boulevard to the Mountain View Channel;
- Invergordon Road Channel from the Mountain View Channel to the Indian Bend Wash;
- Scottsdale Road from Greenway-Hayden Loop to Thunderbird Road;
- Scottsdale Road from Thunderbird Road to the confluence with the Scottsdale Airport Detention Basin Outfall Channel;
- The Scottsdale Airport Detention Basin Outfall Channel;
- Scottsdale Road from the Scottsdale Airport Detention Basin Outfall Channel to Sutton Drive;
- Scottsdale Road from Sutton Drive to Sweetwater Avenue;

- Scottsdale Road from Sweetwater Avenue to Cactus Road;
- Scottsdale Road from Cactus Road to Mescal Street;
- The Continental Plaza Channel;
- 73<sup>rd</sup> Street and Sunnyside Drive from Cactus Road to Scottsdale Road;
- 76<sup>th</sup> Street from Thunderbird Road to Sweetwater Avenue; and,
- Greenway Road between 73<sup>rd</sup> Street and 80<sup>th</sup> Street.

The normal depth hydraulic analysis is not as detailed or comprehensive as the HEC-RAS modeling but is a step above the analysis that is found in the HEC-1 hydrology. The results of the combined normal depth and culvert hydraulics for each sub-reach are discussed in detail in the Volume 2 Hydraulic Analysis. Figure 13 that follows indicates the locations of all of the normal depth hydraulic cross sections.



TOWNSHIP 4 NORTH  
TOWNSHIP 3 NORTH



SCALE: 1" = 2000'

**SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN**

**NORMAL DEPTH  
CROSS SECTION LOCATIONS**

- LEGEND**
- STUDY BOUNDARY
  - SUB-BASIN BOUNDARY
  - (68) SUB-BASIN NUMBER
  - - - - - TIME OF CONCENTRATION FLOW PATH ONLY
  - ..... ROUTING REACH FLOW PATH ONLY
  - . - . - COMBINED TIME OF CONCENTRATION & ROUTING REACH FLOW PATH
  - ↘ FLOW DIVERSION
  - 33 SECTION NUMBER
  - A ↘ NORMAL DEPTH CROSS SECTION LOCATION

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**FIGURE 13**

**NORMAL DEPTH CROSS SECTION LOCATIONS**

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## 2.7 MULTI USE INVENTORY AND ANALYSIS

### 2.7.1 Regional - Bikeways/Trails/Pathways

Maricopa Associated Governments (MAG) Regional Bicycle Plan (January 1999) routes were designed as a system of long, interconnected routes for use by the commuting, touring, recreational, or training user to travel within or through the Valley. The regional system forms a skeleton from which each jurisdiction can provide localized service to important destinations within their jurisdiction. The bikeways identified in both Scottsdale and Phoenix bicycle facilities plans are consistent with the bikeways identified in the MAG Regional Bicycle Plan. There are no facilities within the study area that are designated by the Maricopa County Parks and Recreation Department (MPRD) as part of the regional trail system. Immediately adjacent to the study area, the Maricopa County Regional Trail System has designated potential trail corridors along the Central Arizona Project (CAP) Canal and the Arizona Canal. The Indian Bend Wash Greenbelt is an existing pathway of regional importance immediately south of the study area. Additionally the Maricopa County Department of Transportation (MCDOT) has identified a planned Off-Road Bicycle facility linking to McDowell Mountain Regional Park with other proposed trail corridors. The regional bikeways, trails, and pathways within a five-mile area of the study area are illustrated in Figure 14.

### 2.7.2 Regional - Parks/Open Spaces

There are no parks or open spaces planned by the MPRD or any municipality to provide multi-use recreation for the greater metropolitan area within the study area. Parks and recreation areas that are within five miles of the study area which are important regional multi-use features include (refer to Figure 14): the Camelback Mountain Echo Canyon Recreation Area, Squaw Peak Recreation Area, Lookout Mountain Preserve, Shadow Mountain Preserve, Phoenix Mountains Preserve, McDowell Mountain Regional Park, Reach 11 Recreation Area, and the Indian Bend Wash Greenbelt. Additionally, areas of open space of regional importance located in the proximity of the study area



include Mummy Mountain and the McDowell Mountains.

### 2.7.3 Regional - Transportation Corridors

Roads of Regional Significance identified by MAG within the study area include Scottsdale Road, Shea Boulevard, and Bell Road/Frank Lloyd Wright Boulevard. Roads of Regional Significance include planned roadway improvements that include six travel lanes with bicycle lanes and raised medians as their typical cross section.

### 2.7.4 Local - Trails

As part of the circulation element of Scottsdale's General Plan, a trail system was developed that will be used to allow for local, loop, and long-distance hikers, mountain cyclists, and horseback riders the ability to travel with minimal interaction with motorized modes of transportation. Many of the goals and objectives in Scottsdale's Revised General Plan Circulation Element include provisions for non-motorized, multi-modal transportation such as using drainage easements, vista corridors, and public open spaces as an opportunity to expand non-motorized connections throughout the community.

Many of the arterial and collector streets, as well as some drainage features, within the study area in the city of Phoenix are proposed as trails to connect various neighborhood parks. These trails are pending official designation as a General Plan Amendment.

A major user group of trails within the study area are equestrians. Horse Privilege Areas contain neighborhoods that can accommodate corral facilities on each lot or at a common stable area. A swath of scattered properties that retain horse privileges transects the project area between Thunderbird Road and Shea Boulevard. As part of the City of Scottsdale's General Plan revision equestrian facilities, such as trailheads, are to be provided along major equestrian trails and at major destinations. Equestrian trails will also be aligned so as not to pass through areas without horse privileges. Trails within the study area are

generally unimproved multi-use paths, comprised of a compacted gravel surface. Refer to Figure 15 for illustration of existing local trails.



*Equestrian Trail at 68<sup>th</sup> Street and Cactus Road*

### 2.7.5 Local – Bikeways

Bikeways in the city of Scottsdale are designed to serve the needs of all cyclists including commuter, leisure, and competitive users. Scottsdale's Bicycle Facilities Plan was created in conjunction with the Street Plan. Four types of designated bicycle travel classifications exist in the city of Scottsdale's Bicycle Facilities Plan. A bicycle lane is a portion of the roadway designated for bicycle use by signing and striping for the exclusive use of bicyclists. These occur on parkways, minor arterials, and major collector streets. A bicycle route is a signed roadway that is not striped which runs through high demand corridors. Bicycle routes are found typically on minor collector streets and establish links to other types of bicycle facilities. Wide curb lanes are unstriped and unsigned on major arterials that are wider than normal traffic lanes. A bicycle path is an off-street facility that is separated from motorized traffic. Bicycle paths are typically located along open space corridors. Within the study area, Scottsdale Road, Shea Boulevard, and Frank Lloyd Wright Boulevard have only a wide curb

lane. Scottsdale Road does have a concrete sidewalk adjacent to the roadway as well. Other streets in the area have facilities classified as bicycle routes or bicycle lanes. There are no bike paths within the study area. One bicycle path exists on the north side of Frank Lloyd Wright Boulevard adjacent to, but just outside of, the study area.

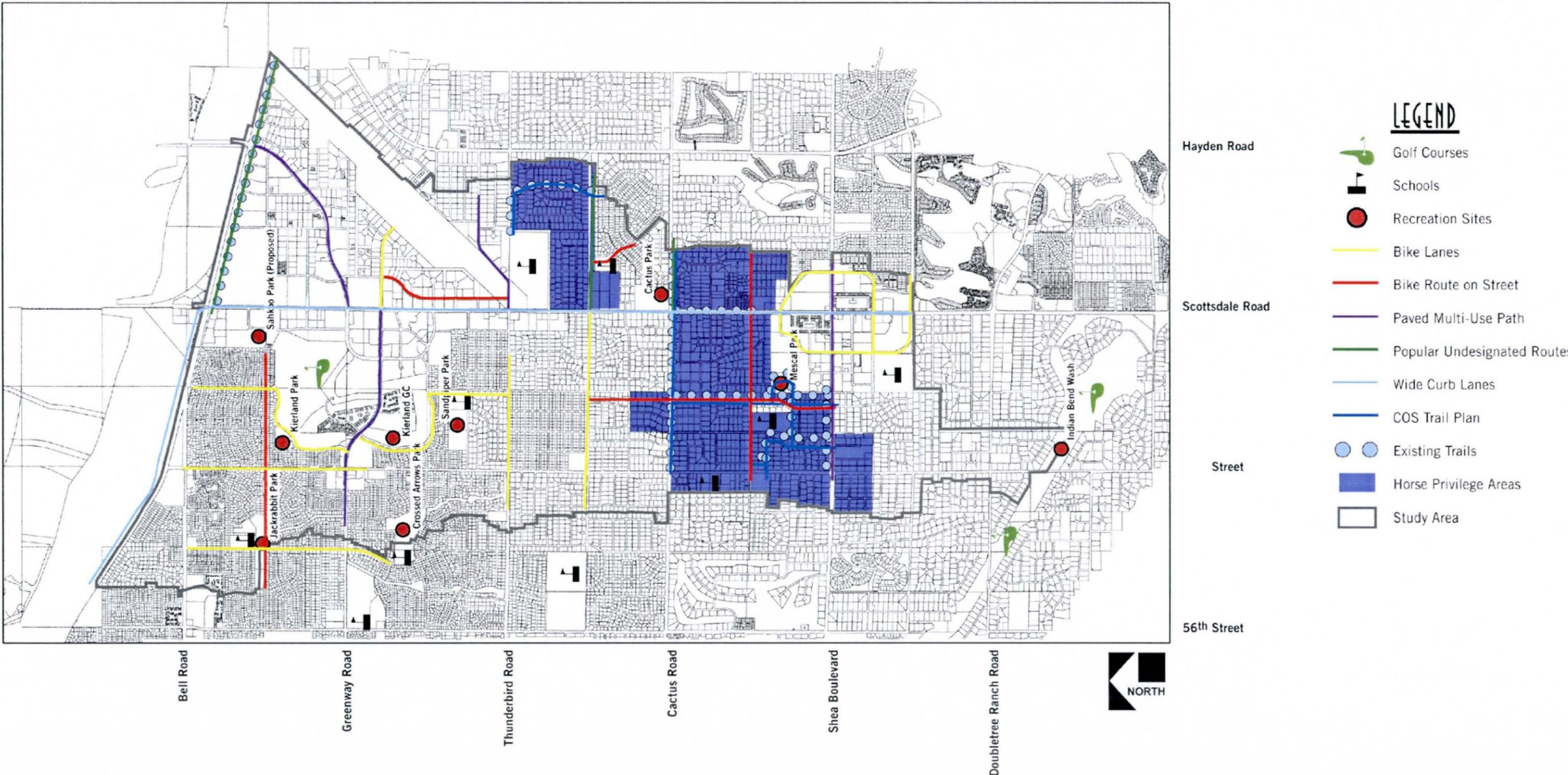
The City of Phoenix also recognizes bicycling as an effective means of transportation for short trips. Bicycling and other multi-modal means of transportation play an important role in reducing congestion of surface streets. By providing convenient access to a safe route, the city of Phoenix hopes to encourage use of non-motorized transportation for local trips. Phoenix's goals as stated in the proposed Revised General Plan include increasing bicycle access, increasing bicycle ridership, and improving bicycle safety. Many of the arterial and collector streets, as well as some drainage features, within the study area in the city of Phoenix are proposed as trails to connect the various neighborhood parks. These trails would also serve as bikeways. Figure 15 illustrates the local bikeway system within the study area.

### 2.7.6 Local – Parks

There are numerous neighborhood parks located within the study area in the Cities of Phoenix and Scottsdale. The purpose of neighborhood parks is to provide primary recreation services and facilities that are easily accessible and available to local residents. These parks are between 7 and 20 acres in size and serve a single neighborhood or several neighborhoods, depending on the location of the park.

The parks within the study area are all depressed, turf detention basins. All are landscaped with varying trees including both native and ornamental plant material. City of Phoenix parks include: Jackrabbit Park, Kierland Park, Crossed Arrows Park, Sandpiper Park, and Sahkoo Park (proposed). Jackrabbit Park offers playfields, a playground, a picnic area, and soccer fields. Kierland Park facilities include a playground and playfields. Crossed Arrows Park has a picnic

FIGURE 15. EXISTING LOCAL MULTI-USE INVENTORY



area, a playground, and soccer fields. Sandpiper Park has a ball field, a picnic area, playfields, soccer fields and tennis courts and is lit. Parks within the City of Scottsdale include Mescal Park and Cactus Park. Mescal Park facilities include playfields, a paved pedestrian path, and an earthen horse trail. Cactus park provides a playground, picnic areas, pedestrian paths, playfields, soccer fields, and a swimming and athletic complex. Figure 15 on the previous page indicates the location of the neighborhood parks within the study area.



*Mescal Park*

### 2.7.7 Local – Recreation Sites

The study area is located within portions of both the Scottsdale and Paradise Valley Unified School Districts. There are a number of schools within the study area that provide after-school use of facilities such as ballfields, playgrounds, etc. Several of these schools are located adjacent to neighborhood parks. Schools within the study area include: North Ranch Elementary School, Desert Springs Elementary School, Sandpiper Elementary School, Cocopah Middle School,

Chaparral High School, and Sonoran Sky Elementary School. These schools are located on Figure 15 on the previous page.

### 2.7.8 Local - Open Space

Common open spaces within the study area provide a number of functions. Recreation, aesthetics, and flood control are some uses that open spaces provide in the study area. Open spaces in the City of Scottsdale have been classified into various types. Within the study area open spaces are primarily classified as Developed Green. Developed Green open spaces include recreational sites, parks adjacent to schools, golf courses, and major developed channels such as Indian Bend Wash. The grass lining these open spaces serves both recreation requirements and erosion control. The Developed Green open spaces located within the study area inside the City of Scottsdale include areas at Cocopah Middle School, Mescal Park, and Cactus Park. Open spaces within the City of Phoenix would include the neighborhood parks discussed above.

The study area also has several public golf courses. Kierland Golf Course is open to the public, and has varying rates depending upon season. The Camelback Golf Club consists of two courses within Indian Bend Wash. The Camelback Golf Club is within the Town of Paradise Valley adjacent to Scottsdale. Both of the courses at the Camelback Golf Course are open to the public. The golf courses are indicated in Figure 15.

### 2.7.9 Local - Transportation Corridors

Surface streets, other than Roads of Regional Significance defined previously within the study area, include major streets or major arterials located along the section lines, major and minor collector roads, and local streets. Major streets include Scottsdale, Hayden, Cactus, Thunderbird, Doubletree Ranch, Greenway, and Bell Roads in addition

to Shea Boulevard and 64<sup>th</sup> Street. These major streets are noted in Figure 6.

### 2.7.10 Local - Public Transportation

Valley Metro provides public bus service along Shea Boulevard, Frank Lloyd Wright Boulevard/Bell Road, and Scottsdale Road. Service along Shea Boulevard includes both express service and local route service. Service for both Frank Lloyd Wright Boulevard/Bell Road and Scottsdale Road is local route service only. A Park-and-Ride location is within the study area at the Dial Tech Center on the northeast corner of Scottsdale Road and Butherus Drive.

Located within the study area is the Scottsdale Airport, which accommodates approximately 10,000 passengers a year. The airport is a general aviation reliever facility and is home to many corporate aircraft in the Valley. Scottsdale Airport is one of the busiest single runway facilities in the nation with more than 206,000 operations in 2000.



*Scottsdale Airport*

## 2.8 TITLE VI/ENVIRONMENTAL JUSTICE

Title VI of the Civil Rights Act of 1964 and Executive Order 12898 give guidance on identifying sensitive populations to prevent the exclusion of persons or populations from participation, denying persons or populations of the benefits of any proposed action/activity, or subjecting persons or populations to discrimination because of race, color, or national origin. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" reaffirms the principles of Title VI and related statutes. The Executive Order requires the consideration of minority, elderly, low-income, disabled, and female populations. A minority person means a person who is racially classified as African American, Asian American, Native American or Alaskan Native, or anyone who classifies himself or herself as in the racial category "Other". Hispanics are also considered minorities regardless of their racial affiliation. Elderly refers to individuals 60 years of age and over. Low-income persons include those 18 years of age and older who are below the poverty level established for the 1990 Census. Noninstitutionalized civilians who are 16 years of age and older are considered to be disabled if they report a mobility disability, a self-care limitation, or are work-disabled. Female heads of household are calculated from family households where there is a female with no spouse present, regardless of whether she has any children less than 18 years of age. In this overview, census-tract-level census data are compared and contrasted with the place-level census data for the City of Scottsdale and the county-level census data for Maricopa County in order to assess whether a distinct minority, elderly, low-income, disabled, or female head of household population is represented within the general study area.

Census tracts are small, relatively permanent statistical subdivisions of a county for tallying census information, and do not cross county boundaries. They are delineated with the intention of being maintained over a long time, allowing statistical comparisons from census to census. The size of census tracts varies widely depending on the

density of settlement. The statistics for the census tracts extend outside the study area, so the exact population and demographic characteristics of the study area may vary from these data. According to federal and state guidelines, for protected persons to be considered as a distinct population, they must comprise greater than 50% of the population of a census tract.

### 2.8.1 Race Population

The combined population of the nine census tracts comprises less than 2% of the total population of Maricopa County (Table 2 on the next page). All of the census tracts display a higher percentage of persons classified as White than the average for Maricopa County. There are a corresponding lower percentage of persons classified in any minority population than the Maricopa County average.

### 2.8.2 Age 60 Years and Over, Low-Income Population, Disabled Persons, and Female Head of Household

The tract average percentage of the nine census tracts for all protected populations is lower than both the percentages for the City of Scottsdale and Maricopa County. While the average of the nine tracts produces an average percentage of elderly persons lower than the Maricopa County average, there are several tracts (303.33, 1050.01, 2168.02, 2168.13), which display percentages of elderly that are higher than the county average. Additionally, one tract (2168.13) displays a percentage of elderly persons higher than the percentage for the City of Scottsdale. Census Tract 303.33 displays a percentage of persons below the poverty level that is higher than the percentage for the City of Scottsdale. Two census tracts (303.33 and 2168.02) display percentages of disabled person that are higher than the percentage (9.65%) for the City of Scottsdale. All census tracts display percentages of persons classified as minorities and households with a Female Head of Household that are lower than the percentage for the City of Scottsdale.

### 2.8.3 Title VI/Environmental Justice

Four census tracts within the study area for three population groups exceeded the city of Scottsdale average percentage. Four census tracts within the study area for one population group (Age 60 Years and Over) exceeded the average percentage for Maricopa County. None of the census tracts approach the 50% average needed for a population to be considered distinct under Title VI (Table 3 on the next page), and the Tract Average for all population groups was below both the city of Scottsdale, and the Maricopa County average percentage. Unless site-specific surveys are conducted, there would be no disproportionate impacts to populations identified by Executive Order 12898.



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

**Table 2. Population and Racial Demographics**

Area	Population	% White	% African American	% Native American	% Asian	% Other	% Hispanic
Tract 303.33	7,141	97.16	0.57	0.64	0.57	1.06	4.11
Tract 1032.06	2,845	97.40	0.48	0.17	1.10	0.86	3.08
Tract 1032.14	3,569	96.41	1.54	0.16	1.65	0.24	2.54
Tract 1032.17	4,585	95.58	1.13	0.19	2.67	0.44	3.59
Tract 1032.18	3,019	97.73	0.39	0.16	1.39	0.32	3.50
Tract 1050.01	6,663	97.57	0.28	0.29	1.38	0.48	1.99
Tract 2168.02	4,576	98.03	0.26	0.49	0.88	0.34	3.00
Tract 2168.13	3,025	97.17	0.45	0.13	1.90	0.35	1.93
Tract 2168.18	4,630	97.19	0.67	0.40	1.01	0.73	2.62
Tract Average	---	97.14	0.62	0.33	1.33	0.58	2.98
City of Scottsdale	129,384	96.01	0.77	0.62	1.23	1.38	4.78
Maricopa County	2,122,101	84.90	3.50	1.80	1.70	8.10	16.00

Source: U.S. Department of Commerce, Bureau of the Census. 1990 Census of Population and Housing, Summary Tape File 3A for Arizona and Utah. 1992.

**Table 3. Summary of Title VI/Environmental Justice**

Area	% Minority	% Age 60 Years and Over	% Below Poverty	% Disabled	% Female Head of Household
Tract 303.33	6.95	20.18	7.07	12.60	6.20
Tract 1032.06	5.68	6.64	5.82	7.36	4.40
Tract 1032.14	6.13	8.62	3.32	9.08	6.00
Tract 1032.17	8.01	6.48	2.21	4.10	7.49
Tract 1032.18	5.76	10.88	1.36	8.94	3.78
Tract 1050.01	4.42	18.11	3.59	6.83	3.50
Tract 2168.02	4.97	17.31	2.16	11.27	6.23
Tract 2168.13	4.75	23.03	2.28	8.18	4.76
Tract 2168.18	5.44	9.63	1.09	6.54	3.81
Tract Average	5.84	14.22	3.47	8.58	5.25
City of Scottsdale	8.77	22.11	5.90	9.65	7.97
Maricopa County	15.10	16.40	10.60	13.00	9.90

Source: U.S. Department of Commerce, Bureau of the Census. 1990 Census of Population and Housing, Summary Tape File 3A for Arizona and Utah. 1992.

## 2.9 CHARACTERISTICS OF THE VISUAL ENVIRONMENT

The purpose of the visual analysis of the Scottsdale Road Corridor Drainage Master Plan (CDMP) is to establish the existing visual resource of the landscape within the study area. This analysis can subsequently be used in consideration of flood control alternatives that protect and enhance the local community's character and create aesthetic value. The methodology, terms, and premises used in the evaluation of the visual resources are based on the USDA Forest Service's *National Forest Landscape Management Volumes 1 and 2* (1974), and *Landscape Aesthetics: A Handbook for Scenery Management* (1995), but have been modified for this study. The Forest Service's visual resource management process is used as the basis of this visual analysis because their process has been generally accepted throughout the United States as the standard in defining and managing landscape aesthetics. The Forest Service's methodology has been modified for this study in order to account for assessing an urban rather than a natural landscape.

### 2.9.1 Methodology and Definition of Terms

Visual resources of the study area were evaluated in terms of the existing visual conditions and landscape character. The visual conditions analysis included an identification of distinct features, relative scenic quality and visual intactness, visual sensitivity, and location of major viewpoints. Distinct features are those features comprising landscape elements and patterns that make a memorable visual impression. Scenic quality or attractiveness is a combination of attributes based on landforms, water characteristics, vegetation patterns, and architectural/cultural elements. Scenic quality was rated as very low, low, moderately low, moderate, moderately high, high, and very high, depending on the distinctiveness, unity, and intactness of the patterns and attributes of the area. Unity is the visual coherence and harmony of the landscape when considered as a whole. Visual intactness relates to the integrity of visual order in the natural and built

landscape, and the extent to which the landscape elements and patterns that they create are cohesive. The level of visual intactness was expressed as low, moderate, or high.

The general visual sensitivity of the study area has also been determined. Visual sensitivity is the measure of people's concern for the visual environment based on the viewer's activity and awareness as well as their values, opinions, and preconceptions. The general public or jurisdictional agencies were not sent questionnaires to determine their relative sensitivity to change in the landscape. The evaluation of visual sensitivity was therefore based on viewer activities related to existing land use rather than any visual preference evaluations. Visual sensitivity was rated as high for residential and recreation/open space areas, moderate for commercial, office, and flood control structures/canal areas, and low for heavy industrial and disturbed areas.

Major viewpoints within the study area were also identified. The viewpoints, as well as the other components of the existing visual conditions, are described based on publicly accessible locations within the study area. A major viewpoint is one where the distant view of distinct landforms/landmarks attracts attention away from the foreground area. The foreground is defined as the area within 0.25 miles of the viewer's position.

The second component of the visual resource evaluation for the Scottsdale Road CDMP is the delineation of landscape character units. Landscape character is the physical appearance of the landscape including the natural, physical, and architectural/cultural features that gives it an identity and "sense of place." The existing landscape character is based on defining areas of similar land use, vegetation, spatial enclosure, landform, or architectural/cultural patterns.

### 2.9.2 City of Scottsdale Character Areas

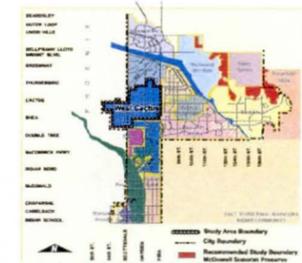
The visual character of Scottsdale has been used as an important tool in the planning of Scottsdale's future. The City of Scottsdale existing *General Plan*, *CityShape 2020* (a visioning process), and the *Revised*

*General Plan* (February 7, 2001) contain plan elements specifically addressing character. The 1994-96 *City Shape 2020* citizen-driven process concluded that character was one of the determinants that make Scottsdale a good place to live. The existing *General Plan* divides the city of Scottsdale into various Community Character Districts. As part of the CityShape 2020 visioning process, Character Plans were developed that delineate the city into 23 character areas. The Revised General Plan marks a union of these two planning efforts. Character Areas are areas of the community that have achieved a unique, recognizable character that is different from neighboring areas. These differences may be the result of topography, age and style of housing, built environment, land use patterns, landscaping, street patterns, open space, or streetscapes. "Character" can generally be thought of as the look or feel of a place that sets it apart from other areas. The visual character analysis for the Scottsdale Road CDMP used, as a basis, the community character areas, as defined by the City of Scottsdale.

#### Character Area Planning - Area Summary

### WEST CACTUS CHARACTER AREA

**General Description of the Area:**  
The area consists mostly of low density residential and is generally contained within the area of Thunderbird Road on the north, Pima Road on the east, Mountain View Road on the south, and 60th Street on the west. The area abuts the Town of Paradise Valley in the southwest corner, and the City of Phoenix for most of the western boundary. This area is in the Paradise Valley School District.



#### Overview of the Area:

The earliest development in this area included modest single family homes west of Scottsdale Road and around 84th Street and Shea Boulevard, with small businesses occurring around the areas of Sundown Plaza, Windmill Plaza, and Scottsdale County Club Golf Course in the early 1960's. Subsequent developments generally maintained the one acre lot, single family pattern with larger homes and more walls. From late the 1970's into the early 1990's, the intersection of Shea Boulevard with Scottsdale, Hayden, and Pima Roads, experienced significant development of multifamily, retail, and office uses.



CityShape 2020

City of Scottsdale's West Cactus Character Area

### 2.9.3 Existing Visual Conditions

The Scottsdale Road CDMP encompasses the urban/suburban areas of the cities of Scottsdale and Phoenix and the Town of Paradise Valley. The study area lies roughly between two Valley landmarks, Indian Bend Wash and the Central Arizona Project Canal (CAP Canal). Single family residential is the predominate land use within the study area with notable commercial areas located at Shea Boulevard and Scottsdale Road, and along Scottsdale Road near the Scottsdale Airport. Development of the study area began in the 1960s and as a result, much of the southern portion has informally planted mature vegetation and single-story stucco ranch style homes. The more newly developed and renovated areas such as in the northern portion are multiple storied with landscapes that are more manicured and formally organized. With the exception of the parks and golf courses, large turf areas are scarce. There are numerous existing drainage facilities within the study area. They range from facilities that are visually compatible and complement their surroundings to those drainage features that have very little positive aesthetic qualities.



*Typical Single Family Residential*

The terrain within the study area is relatively flat with very little noticeable change in elevation. The street system provides a strong linear framework that organizes the study area. However, the grid is notably interrupted by the presence of the Scottsdale Airport with its skewed northeast-southwest oriented runway. For the most part, there are few vacant lots, and views are generally contained to the foreground area by the massing of buildings. Distant views are visible along the major transportation corridors, from the open spaces associated with the public parks and golf courses, and along the Scottsdale Airport runway.

Overall, the Scottsdale Road CDMP is considered to have a moderate to high level of sensitivity because of the predominance of residential, commercial, and office land uses with limited disturbed areas and no heavy industrial uses. Scenic quality and the level of intactness range from low to high depending on the visual coherence and integrity of the landscape elements and patterns of a specific area. The existing visual conditions are described below and graphically represented in Figure 16 Visual Conditions Analysis.

### 2.9.4 Distinct Features

Distinct features located in the study area include the public parks and golf courses that contrast significantly from the surrounding built structures. Parks within the study area include Mescal, Jackrabbit, Crossed Arrow, Mescal, and Cactus previously described in the Multi-Use Section of this document. The parks contain large turfed areas, ringed with a variety of tree species that spatially define their boundaries. Kierland Golf Course and Camelback Golf Club's two golf courses are other features that are notable turfed open space in the study area. The Camelback Golf Club's two private golf courses lie within a portion of Indian Bend Wash.

Scottsdale Municipal Airport is a distinct built feature within the study area. The long, paved runway, presence of the propeller-driven and jet airplanes, and the control tower create a collection of features that are

unique within the study area. Another collection of buildings that form a distinct feature is the Kierland Commons retail and office complex. The complex is still under construction, but the architectural character, materials, and hardscape and softscape elements are designed to create a cohesive urban commerce center.

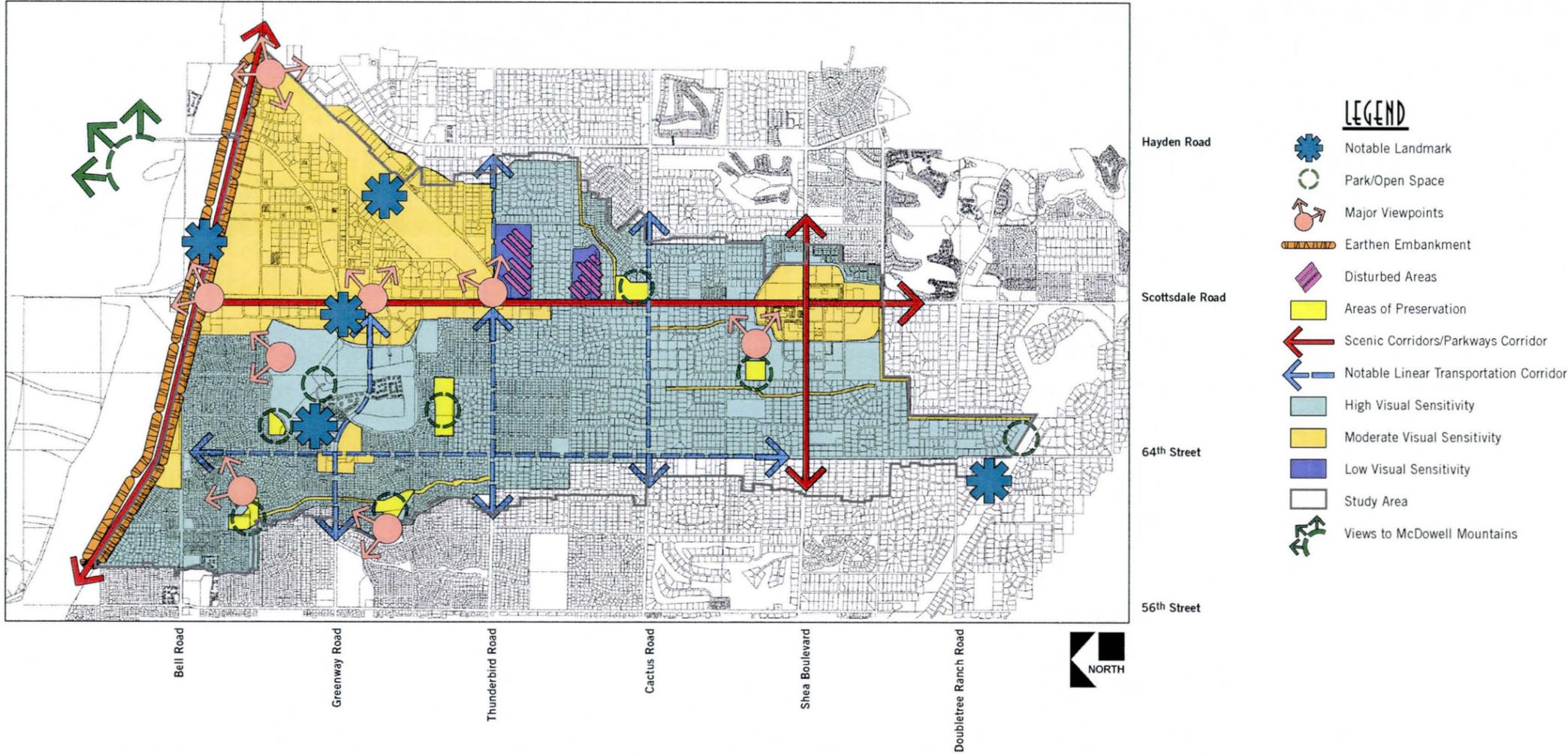
The CAP Canal's earthen embankment forms a strong linear feature that acts as a visual boundary along the north side of Frank Lloyd Wright Boulevard. The approximately 35-foot high embankment that protects the CAP Canal is a prominent landscape element whose constant form and height creates a memorable feature in the study area.



*Central Arizona Canal Embankment*

There are no natural landform features within the study area. Distant views from the study area include Camelback Mountain and Mummy Mountain to the southwest and the McDowell Mountains to the northeast. The McDowell Mountains are the most striking natural feature visible from the study area.

FIGURE 16. VISUAL CONDITION ANALYSIS



- LEGEND**
- Notable Landmark
  - Park/Open Space
  - Major Viewpoints
  - Earthen Embankment
  - Disturbed Areas
  - Areas of Preservation
  - Scenic Corridors/Parkways Corridor
  - Notable Linear Transportation Corridor
  - High Visual Sensitivity
  - Moderate Visual Sensitivity
  - Low Visual Sensitivity
  - Study Area
  - Views to McDowell Mountains

 **SCOTTSDALE ROAD CORRIDOR**  
**DRAINAGE MASTER PLAN**

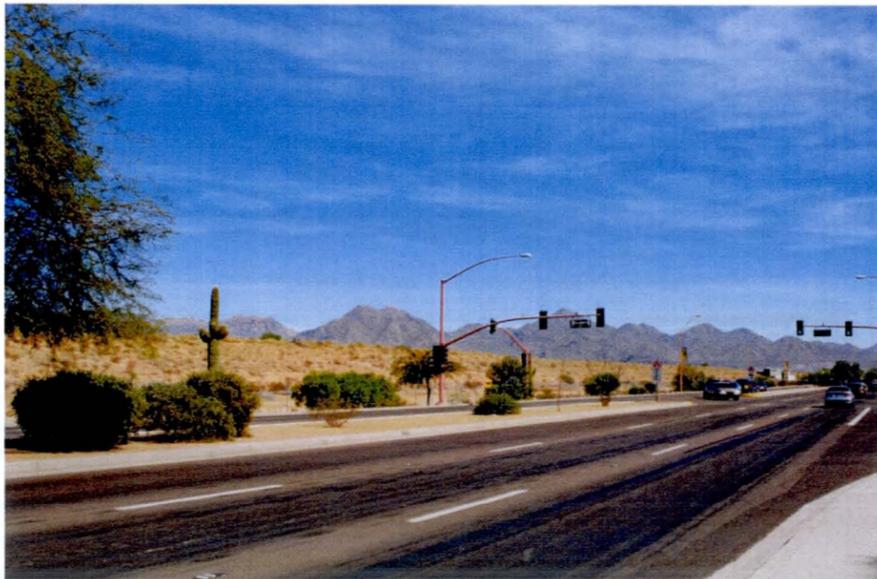


### 2.9.5 Scenic Corridors and Parkways

Scottsdale Road and Shea Boulevard are classified as Visually Important Roadways by the city of Scottsdale. Visually Important Roadways are thoroughfares that exhibit the character of Scottsdale along their corridor. They are well-traveled streets that provide views and a unique image to the city. Shea Boulevard is also classified as a Scenic Corridor. A Scenic Corridor designation meets the following guidelines:

1. A landscaped buffer between streets and adjacent land-uses
2. An enhanced streetscape
3. Enhanced views to natural and man-made features

Frank Lloyd Wright Boulevard, adjacent to the northern boundary of the study area is designated as a parkway. Parkway are high-volume, high-capacity facilities for regional rather than local traffic. Parkway have scenic easements, which provide the added attraction of desert landscaping.



*Frank Lloyd Wright Boulevard*

### 2.9.6 Disturbed Areas

Areas of disturbance generally have low scenic quality, depending on their magnitude of visual contrast in terms of color, scale, dominance, form, line, and texture. Disturbed areas within the study area include areas under construction, and vacant or unoccupied parcels. A large disturbed area exists on the parcel of the future Jewish Community Center that is currently under construction. This disturbance is only temporary and will be alleviated upon completion of the construction. A vacant parcel exists immediately north of Cactus Park along the east side of Scottsdale Road. The Scottsdale Airport Detention Basin Outfall Channel transects an abandoned parcel on the southeast corner of Scottsdale Road and Thunderbird Road. These two parcels contrast markedly with the surrounding landscaped parcels and have low scenic quality.



*Scottsdale Airport Basin*

### 2.9.7 Views and Viewpoints

As previously discussed, views are generally limited to the foreground area by the massing of buildings. Distant views are visible along the major transportation corridors, from the open spaces associated with the public parks and golf courses, and along the Scottsdale Airport

runway. The major viewpoints from the major transportation corridors, open spaces, and airport runway are illustrated on Figure 7 Visual Condition Analysis. The public parks are identified as areas of landscape preservation. The most prominent views are to the McDowell Mountains, northeast of the study area. These views are virtually unobstructed in the northern portion of the study area, specifically around the airport runway, the intersection of Greenway and Scottsdale Roads, and along Frank Lloyd Wright Boulevard. Less distinct are the southern views to Camelback Mountain and Mummy Mountain.



*Views of the McDowell Mountains from Jackrabbit Park*

### 2.9.8 Scenic Quality

The scenic quality or attractiveness of the landscape is discussed in the sub-sections that follow and in Section 2.10, Drainage Features Aesthetic Inventory.

### 2.9.9 Visual Sensitivity

Visual sensitivity was rated as high for residential and recreation/open space, moderate for commercial, office, and flood control structures/canal areas, and low for heavy industrial and disturbed areas. The majority of the study area is considered to have high visual sensitivity because of the predominance of residential and recreation/open space land uses. Moderate levels of sensitivity are associated with commercial areas such as the Shea Boulevard/Scottsdale Road retail centers, the office and retail centers at the airport, and the newly constructed Kierland development. The lack of heavy industrial land uses and disturbed areas result in minimal areas considered to have low visual sensitivity.

### 2.9.10 Visual Character

The Scottsdale Road CDMP was divided into 12 different visual character units. These units include:

- Turfed Open Space
- Estate Residential
- West Cactus Horse Properties
- West Cactus Ranch Style Residential
- West Cactus Ranchettes Residential
- Traditional Residential
- Contemporary Residential
- Shea Shops
- Kierland Commercial/Office

- Scottsdale Airpark
- Scottsdale Airport Runway
- FLW Auto Row/Commercial Promenade

These landscape character units are described in detail below and are graphically represented on Figure 17. Landscape Character Units.

#### 2.9.10A Turfed Open Space Character Unit

This unit reflects a single land-use within the study area focusing on developed recreational facilities. The Turfed Open Space Character Unit includes the various public parks in addition to the Kierland and Camelback Golf Courses. Typically these areas contain large spans of turf, lighting, fences, parking areas, sports fields, and support facilities common to urban parks. The turf open spaces contrast with the surrounding built development because of their informal organization of features, expansive quantity of grass, dominance of vegetation, and relatively few building structures. Trees of a variety of native and non-native species create the visual boundaries of the parks, encircling the large areas of turf.

Views within the unit are predominately of the McDowell Mountains. The major viewing platforms are from the recreation facilities themselves. There are no notable natural features within the unit.

The scenic quality and level of intactness are considered to range from moderately high to high. The high level of scenic quality is based on the presence of turf and canopied trees, which provides a unifying color, texture, and form among the visual elements. Facilities that have high-mast lighting, fencing, and large parking lots would have lower scenic quality (moderately high) relatively to the areas without built

elements. The level of sensitivity of the unit is considered to be high because of the recreational use within the unit.

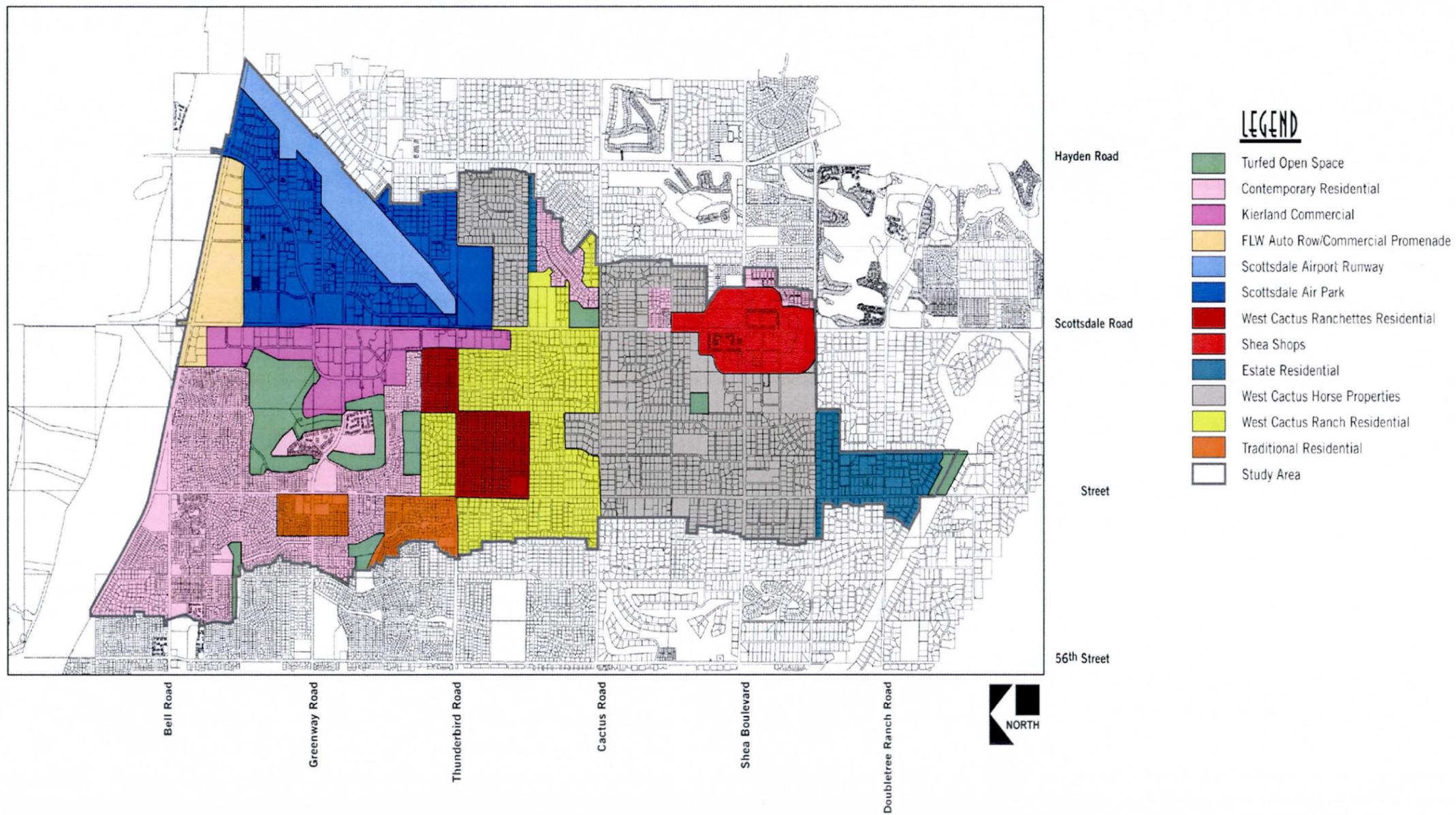


*Camelback Golf Course*



*Cactus Park*

**FIGURE 17. LANDSCAPE CHARACTER UNITS**



### 2.9.10B Estate Residential Character Unit

Large, custom residences and dense landscape material typify the exclusive neighborhood character within this unit. The height and density of the vegetation complements the scale and mass of the residential structures. Rolled curbs and large residential lots reduce the scale of the streets and create a less intrusive, more subordinate infrastructure. The residential structures are of a variety of architectural styles; however the most common building material is stucco. Many of the residences have large portico entries, circular driveways, and ornamental gates and fencing of various styles of wrought iron. The landscape elements have been combined in such a way that patterns and features create a notable impression. The majority of the landscape areas have some turf with ornamental plant material specimens such as date and Canary Island palms.

The general visual quality of the unit is high in terms of the vividness and intactness of the visual resources of the landscape. Views within the unit are predominately of Mummy Mountain and Camelback Mountain. The major viewing platforms are from the local streets or second story of the residences.



*Estate Residential Character Unit*  
Scottsdale Road Corridor DMP FCD 2000 C030  
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### 2.9.10C West Cactus Horse Properties Character Unit

The West Cactus Horse Properties Character Unit is part of the West Cactus Character Area designated by the City of Scottsdale. The residential development in this area consists of one-acre single-family residences with a mixture of native and non-native plant material. The residences typically have stucco, Mediterranean architectural style that is complemented by the mature vegetation. The vegetation creates a notable pattern in terms of texture, form, and color. A variety of plant material is found ranging from prickly pear cactus to columnar-shaped eucalyptus trees. Many of the residential properties include horses and corral, giving the unit a notable character and diversity of visual elements.

Overall, the visual quality of the unit is moderately high in terms of the vividness and high in terms of the intactness of the visual resources of the landscape. Spatial enclosure is relatively high with infrequent opportunities to view distant landforms. The major viewing platforms are from the local streets.



*West Cactus Horse Properties Character Unit*



*West Cactus Horse Properties Character Unit*

**2.9.10D West Cactus Ranch Residential Character Unit**

The West Cactus Ranch Residential Character Unit consists mostly of single-family residential land uses and is also part of the West Cactus Character Area designated by the City of Scottsdale. The residential development in this area consists of a stucco, Mediterranean architectural style with a mixture of native and non-native plant material. The visual character of this unit is very similar to the West Cactus Horse Properties Character Unit except that the residential lots are smaller and horses are not permitted. The street is becoming a more dominant element in the landscape, as the scale of the residences is smaller than compared to the horse properties. The majority of the residences are single-story. The smaller lot sizes are beginning to create a more uniform organization to the landscape and the diversity and memorableness of the patterns and elements of the landscape features are diminishing. The landscape features are more common relative to the surrounding community.

The general visual quality of the unit is moderate to moderately high in terms of the vividness and intactness of the visual resources of the landscape. Spatial enclosure is relatively high with infrequent opportunities to view distant landforms. The major viewing platforms are from the local streets.



*West Cactus Ranch Residential Character Unit*

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*West Cactus Ranch Residential Character Unit*

**2.9.10E West Cactus Ranchettes Residential Character Area**

The West Cactus Ranchettes Residential Character Unit consists primarily of single-family residential development in this area consists of a stucco, Mediterranean architectural style with a mixture of native and non-native plant material. The visual character of this unit is very similar to the West Cactus Horse Ranch Residential Character Unit except that the residential lots are smaller. The dominant elements in the setting are the residential buildings and the local street. The street creates a unifying linear form. The smaller lot sizes are beginning to create a more uniform organization to the landscape and the diversity and distinctiveness of the patterns and elements of the landscape features are diminishing. Very little space exists between residences. Vegetation provides some color, texture, and diversity, and is primarily native plant material.

The general visual quality of the unit is moderate to moderately low in terms of the vividness and intactness of the visual resources of the landscape. The major viewing platforms are from the local streets. Spatial enclosure is not as well defined and there are more opportunities to view distant landforms.



*West Cactus Ranchettes Residential Character Unit*



*West Cactus Ranchettes Residential Character Unit*

**2.9.10F Traditional Residential Character Unit**

Relatively small lots with single-story, tract housing in a variety of materials and colors and a mixture of mature ornamental and desert vegetation are typical in this unit. In general, the appearance and character of this unit is one of a mature, well-established neighborhood established in the 1970s. Ornamental tree species within the yards include eucalyptus, palms, mesquite, and pine. Turf is common in the neighborhood. The infrastructure and building structures are dominant in the setting.

The landscape elements have been combined in such a way that patterns and features do not create a memorable pattern. The scenic quality of the unit is moderate to low in terms of vividness and intactness of the visual resources of the landscape. The diversity within the unit is low because the area is dominated by infrastructure and building structures commonly associated with typical suburban development.



*Traditional Residential Character Unit*



*Traditional Residential Character Unit*



*Contemporary Residential Character Unit*

**2.9.10G Contemporary Residential Character Unit**

The Contemporary Residential Character Unit has similar architectural elements, narrow lots, mixed ornamental and desert landscaping, masonry block walls, and streetlights typical of a subdivision setting. These modern residential developments have similar materials and colors, typical of the stucco, tiled-roof, suburban architectural genre. Residences within the unit include one and two-story buildings. The building, driveways, and wall structures dominate the setting. The vegetation is also consistently manicured and pruned to create a sense of organization and formality.

Overall, the scenic quality of the unit is considered to be moderately high to high because of the overall unity and intactness of the patterns created by the visual elements (harmonious architectural style of the building, extensive use of plant material throughout development to add interest and color, roadway structures, and walls) in the landscape. The Contemporary Residential Character Unit has a high level of intactness because the landscape elements form a pattern that creates a visually consistent and uniform environment.



*Contemporary Residential Character Unit*

### 2.9.10H Shea Shops Character Unit

The Shea Shop area is a commercial retail area, suburban in character, with a variety of shops, restaurants, and service related businesses. Parking lots are dominant features in the landscape with minimal landscape material to disrupt the scale and dominance of the asphalt. The majority of the businesses are single-story, red-tiled roof, stucco buildings. The building architecture, although relatively uniform in height and scale, provides some interest with the varying rooflines and materials. The shopping area lacks unifying elements and presents a somewhat chaotic setting.

Organization of pedestrian circulation and landscaped areas are needed to improve the overall attractiveness of the area. The overall level of scenic quality and level of intactness is considered moderately low in the Shea Shops Character Unit.



*Shea Shops Character Unit*



*Shea Shops Character Unit*



*Kierland Commercial Character Unit*

### 2.9.10I Kierland Commercial Character Unit

The character of this unit is a mixture of development including office, retail, service-oriented, and restaurant uses common to new suburban development along major arterial roadways. Building signs, overhead utilities, and street signage and lighting are built features that dominate and are readily visible in the landscape. The existing structures create high visual enclosure because of the presence of numerous two-story buildings, signs, and other built features. Vegetation is subordinate to the built features except along the street. The architectural style of the Kierland commercial development consists of a palette of cohesive materials, textures, or colors.

In terms of vividness and intactness of the visual resources of the landscape, the visual quality of the Kierland Commercial Character Unit is moderately high to high. The streetscape and landscaped areas adjacent to buildings create a particular pattern that combine to make a memorable impression in the landscape.



*Kierland Commercial Character Unit*

**2.9.10J Scottsdale Airpark Character Unit**

Commercial, light industrial, and office activities characterize this unit. Large multi-story buildings are the prominent visual elements within the unit. These structures create strong vertical and horizontal elements and contrast in color and material with their surroundings. Older buildings in the industrial park have turf and traditional landscaping species, while modern buildings tend to use arid and native species for landscaping.

The visual quality of the Scottsdale Airpark Character Unit is moderate to moderately low in terms of intactness of the visual resources of the landscape. The landscape elements have been modified in such a way that no particular cohesive patterns or forms blend to create a particularly memorable impression in the setting.



*Scottsdale Airpark Character Unit*



*Scottsdale Airpark Character Unit*

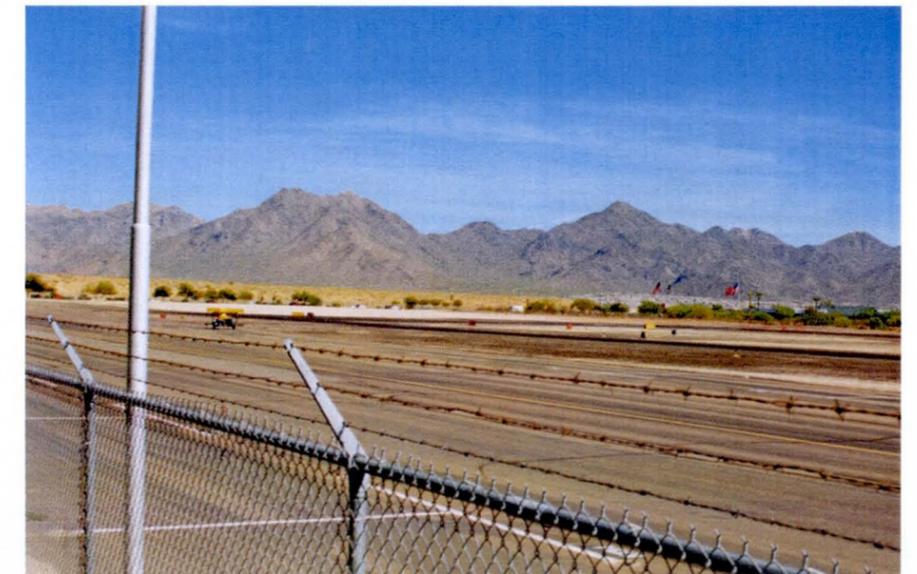
**2.9.10K Scottsdale Airport Runway Character Unit**

The Scottsdale Airport Runway Character Unit is part of the City of Scottsdale's Airpark Core Character Area. The airfield is one of the visual landmarks in this character area. The strong linear form of the runway dominates the setting and provides open views to the surrounding landforms, particularly the McDowell Mountains. Vegetation adjacent to the runway is prohibitive because of the safety concerns associated with the air traffic.

Overall, the scenic quality of the unit is considered to be moderately low to low because of the lack of visual interest and diversity in terms of the landscape character. The Scottsdale Airport Runway Unit has a high level of intactness because the landscape elements form a pattern that creates a visually consistent and uniform environment.



*Scottsdale Airport Runway Character Unit*



*Scottsdale Airport Runway Character Unit*

### 2.9.10L Frank Lloyd Wright Auto Row/Commercial Promenade Character Unit

The FLW Auto Row/Commercial Promenade Character Unit is a predominately auto sales and commercial strip along Frank Lloyd Wright Boulevard. Parking lots are prominent features that have substantial landscape material to help minimize the scale and dominance of the asphalt. The native and non-native plant material is organized in defined landscape areas and the landscaped areas are well maintained. The majority of the businesses are single-story buildings, but the mass and scale of the buildings dominate the setting. The building architecture varies and provides some interest, but is subordinate to the parking areas and lighting.

As previously mentioned, the approximately 35-foot high CAP Canal's earthen embankment forms a strong linear feature that acts as a visual boundary along the north side of Frank Lloyd Wright Boulevard. The embankment is a prominent landscape element whose constant form and height creates a memorable feature in this character unit as well as the study area. The overall level of scenic quality and level of intactness of the FLW Auto Row/Commercial Promenade Character Unit is considered moderately low.



*FLW Auto Row/Commercial Promenade Character Unit*



*FLW Auto Row/Commercial Promenade Character Unit*

### 2.10 DRAINAGE FEATURES AESTHETIC INVENTORY

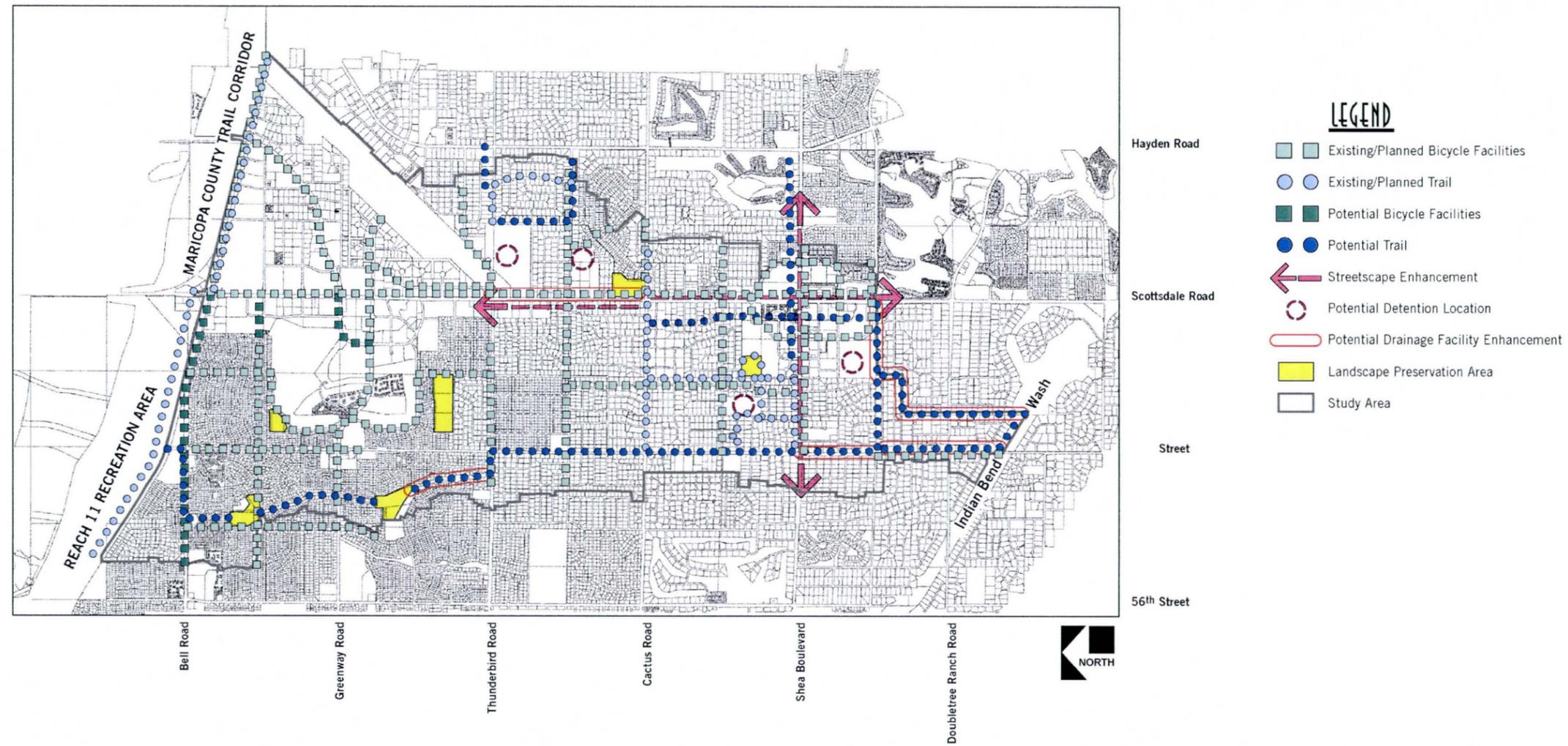
The District's Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects provides general guidance for incorporating aesthetic features as an integral part of the planning, design and construction of flood control projects. The District's Policy promotes consideration of aesthetics in the design of new structures and alterations to existing structures developed by the District. According to the Policy, aesthetic features of flood control projects should be designed in consideration of function of the facility, public safety, maintenance requirements, minimal costs to the District, and not increasing the District's liability. In addition, any aesthetic treatment should also be compatible with the prevailing features in the surrounding area.

An aesthetic inventory of the 35 existing drainage facilities within the study was evaluated based on a reconnaissance level field investigation (refer to Figure 18). The existing drainage facilities in the study area include concrete lined and earthen channels, roadway storm

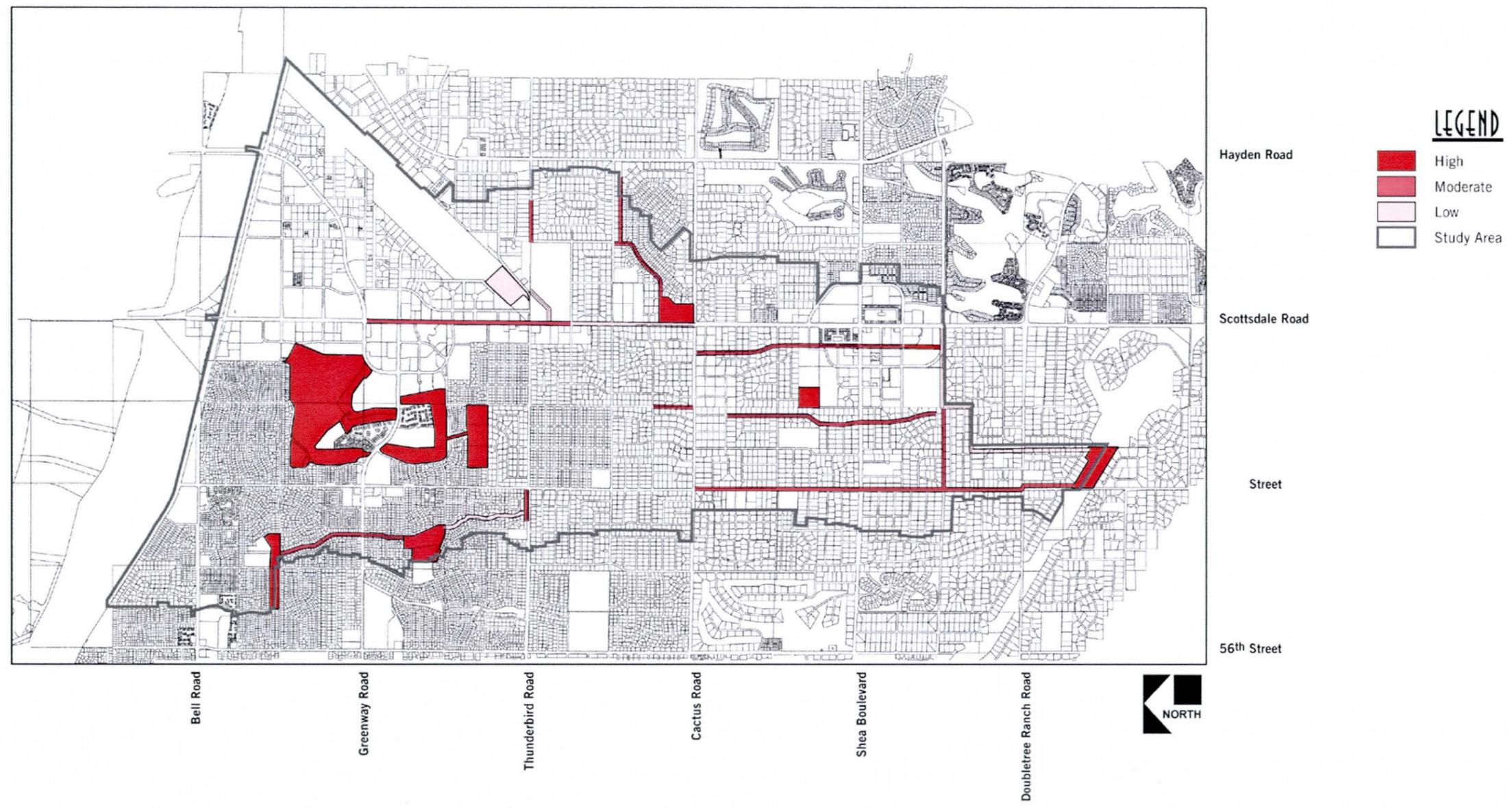
drains, detention basins, and outfall channels. A photographic documentation of each drainage facilities was also prepared.

The aesthetic inventory evaluated the level of visual intactness of each drainage facility and includes the influence of the area immediately adjacent to the facilities. The level of visual intactness relates to the integrity of visual order in the natural and built landscape, and the extent to which the landscape elements (plant material, structures, landforms, etc.) and patterns that they create are cohesive. The level of visual intactness was evaluated as high, moderate, or low. A drainage feature with a high level of visual intactness means that the landscape elements are well organized, visually interesting, complementary in form, line, color, material, and texture, and compatible with the surrounding setting. These features need minimal improvements or renovations to increase the level of visual intactness. Features with a moderate level of intactness have landscape elements that are primarily well organized and cohesive, but some areas that could be improved to increase the overall visual resources of the feature. Features with a low level of visual intactness have landscape elements that are disorganized, lack visual interest, and need substantial improvements, renovation, or redesign to increase the level of visual intactness of the feature in its current setting. The level of visual intactness for each existing drainage feature can be found on Figure 19 Existing Drainage Facilities Level of Intactness Location Map.

FIGURE 18. MULTI-USE/AESTHETIC OPPORTUNITIES



**FIGURE 19. EXISTING DRAINAGE FACILITIES LEVEL OF INTACTNESS**



### #1 Indian Bend Wash

Within the portion of Indian Bend Wash that intersects the study area, the drainage feature consists of the Camelback Golf Course. The area consists of a highly manicured landscape with water features typical of an urban golf course. The well maintained golf course has turf throughout and is landscaped with pine, eucalyptus, willow, and palm trees. Single-family detached residences of varying architectural styles and materials border Indian Bend Wash and the golf course. These features of the study area had a high level of visual intactness. The color, line, textures, and form of the golf course create a cohesive and harmonious landscape.



*Indian Bend Wash*

### #2 Berneil Ditch (concrete lined channel)

This portion of Berneil Ditch is a wide, concrete lined channel bordered by a small earth strip on the crest on either side of the channel. Sporadic trees and shrubs exist in the earthen strip. On both sides of the ditch are backyard fences of single-family detached residences. The fence varies in design, height, and material for each individual residence. Because of the size of the ditch and its incompatibility with the line, texture, and form of its surroundings, the level of visual intactness for the ditch was rated as low to moderate. Improvements such as coloring and texturing the hard surface and landscaping along the banks would improve the visual intactness.



*Berneil Ditch (concrete lined channel)*

### #3 Berneil Ditch (concrete lined channel)

This east-west portion of Berneil Ditch is the same as the previous description of the ditch. The land use, landscape materials, spatial definition, visual quality, visual character, and level of visual intactness is the same as #2 Berneil Ditch,



*Berneil Ditch (concrete lined channel)*

#### #4 Berneil Ditch (concrete lined channel)

This portion of Berneil Ditch is a wide, concrete lined channel bordered by a small earth strip on the crest on either side of the channel. Sporadic trees and shrubs exist in the earthen strip. On both sides of the ditch are backyard fences of single-family detached residences. The fence varies in construction and appearance for each individual residence. The northern end of the channel in this location marks the convergence of two other channels. The Berneil Ditch continues to the east as an earth-lined channel and the Mountain View Channel continues to the west. Because of the size of the ditch and its incompatibility with the line, texture, and form of its surroundings, the ditch was rated as having a low to moderate level of visual intactness.



*Berneil Ditch (concrete lined channel)*

#### # 5 Berneil Ditch (earth channel)

This portion of the Berneil Ditch is an earth-lined channel. The bottom of the channel is lined with vegetation, but the banks are sparsely vegetated. To the south of the channel is a wall marking the back of a residential neighborhood. Chaparral High School is located on the north side of the channel in this area. The ditch provides no particular visual interest, but it does not have features that disrupt the cohesiveness of the landscape. The level of visual intactness of this portion of the ditch was rated as moderate.



*Berneil Ditch (earth channel)*

#### #6 64th Street Channel (Invergordon Road)

The 64th Street Channel is an earth-lined channel paralleling 64th Street/Invergordon Road. The channel banks are lined with gabioned cobbles. The channel bottom consists of sand and cobbles. Single-family detached residences border the eastern side of the channel. Between the property line and the crest of the bank is an earth strip that includes landscaped vegetation of saguaro's, palo verde trees and other species. The channel is crossed multiple times by concrete box culvert (CBC) bridge structures where neighborhood side streets intersect 64th Street/Invergordon Road. Because of the landscaping adjacent to the eastern edge of the channel and the natural material used for the gabions, the level of visual intactness of this drainage feature was rated as moderate. Aesthetic improvements to the channel bottom could enhance the feature.



*64th Street Channel (Invergordon Road)*

### #7 64th Street Storm Drain/Channel

The 64th Street Storm Drain Channel is an earth-lined channel paralleling 64th Street/Invergordon Road. The channel is shallower than the gabion-lined channel farther to the south. Single-family detached residences border the eastern side of the channel. Between the property line and the crest of the bank is an earth-lined strip that includes landscaped vegetation of Mexican palo verde, blue palo verde trees, and other native species. The vegetation along the eastern side of the channel is denser than the vegetation located farther south along 64th Street/Invergordon Road. The channel is crossed several times by corrugated metal pipe (CMP) bridge structures where neighborhood streets intersect 64th Street/Invergordon Road. The eastern side of the channel is lined with utility poles and associated lines. A sidewalk and streetlights exist on the western side of the channel between the channel and 64th Street/Invergordon Road. The level of visual intactness of this drainage feature was rated as moderate.



64th Street Storm Drain/Channel

### #8 Mountain View Channel (concrete lined)

This portion of the ditch is a wide, concrete lined channel bordered by a small earth strip on the crest on either side of the channel. Vegetation along the channel includes Mexican palo verde, blue palo verde, prickly pear, and palm species in the earthen strip. On both sides of the ditch are backyard fences of single-family detached residences. The fence varies in construction and appearance for each individual residence. While the adjacent banks have a variety of vegetation that provides visual interest the monotonous channel detracts from the visual interest and cohesiveness of the landscape. The level of visual intactness of this feature was considered to be moderate.



Mountain View Channel (concrete lined)

### #9 71st Street Channel (landscaped)

The 71st Street channel is a cobbled bottom channel whose west banks are grass-lined and landscaped and bordered by multi-family residences. Pines and Mexican palo verde trees line the western bank of the channel. The eastern bank is earthen and bordered by a 6-foot high metal fence. A gravel strip is located just east of this fence and is landscaped with mesquite trees. The landscaping and even cobbles of the channel created a high level of visual intactness. Some aesthetic improvements could be added at the Mountain View CBC structure.



71st Street Channel (landscaped)

### #10 71st Street Channel (concrete lined)

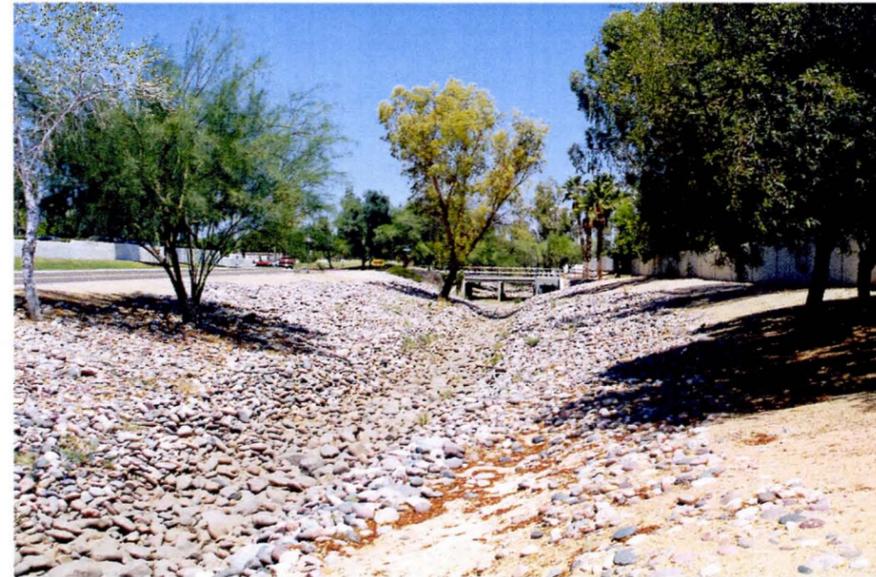
The 71st Street channel in this segment is a v-shaped channel with steep banks. The channel is concrete lined and not vegetated. The channel is bordered to the east by the backside of a shopping center. The west side of the channel is bordered by a covered parking lot masked by a strip of landscaping including hedges and Mexican palo verde trees. Although the channel does not provide any particular visual interest, it does not detract significantly from the cohesiveness of the landscape; therefore, the level of visual intactness was rated as moderate.



71st Street Channel (concrete lined)

### #11 71st Street Channel (landscaped)

The 71st Street channel in this segment is a broad cobble lined channel sporadically landscaped with various tree species. The landscape elements in this drainage feature are relatively well organized and provide some visual interest. The level of visual intactness of this feature was considered to be moderate to high, as some improvements could enhance the features condition.



71st Street Channel (landscaped)

### #12 71st Street Channel (residential)

The 71st Street channel in this segment is a narrow, shallow, concrete-lined channel. The channel is bordered and masked by large tree species including blue palo verde, Mexican palo verde, and cottonwood. These trees block the view of the channel from the intersecting roadway and provide shading along the channel's length. Large trees provide some visual interest in this drainage feature. The channel is cracked and in disrepair in sections. The level of visual intactness of this feature was rated as moderate. Because the large trees largely block the views of the channel, the structure does not contrast with its surrounding landscape.



71st Street Channel (residential)

### #13 68th Street (inverted crown)

68th Street is a wide, unstriped residential street with a curb and gutter. The roadway is inverted to allow water to flow down the center of the street during a rain event. On either side of the roadway are single-family detached residences of varying materials and architectural style. These homes are landscaped primarily with gravel lawns and native species although there is much variation in the type of materials used. The overall level of visual intactness of this drainage feature was considered to be moderate. The elements that make up the landscape are well arranged and cohesive, but there is little to provide visual interest.



68th Street (inverted crown)

### #14 Mescal Park Detention Basin

Mescal Park is a large, depressed, turf detention basin. The banks are sporadically landscaped with pine trees. Around the perimeter of the park is a gravel-lined path for equestrian use. On the northwest and southeast corners of the park are large concrete inflow and outfall structures. Although the inflow and outfall channels are elements of this feature that contrast with other elements such as landscaping and the turf bottom, the overall level of visual intactness of this drainage feature was determined to be high.



Mescal Park Detention Basin

### #15 Cactus Park Detention Basin

Cactus Park is a large, recessed, turfed park that serves as a detention basin. The perimeter of the park is landscaped with trees, and also has sidewalks and associated lighting. The south part of the park contains picnic benches and ramadas, as well as a gravel-lined playground area. Most of the elements of the landscape are coherent in their organization and all are well maintained. The large inflow structure in the northwest corner of the park contrasts with the surrounding elements. Overall the level of visual intactness of the park was rated as high.



Cactus Park Detention Basin

**#16 Cactus Park Detention Basin Inflow Channel (concrete lined)**

The Cactus Park Detention Basin Inflow Channel is a narrow, concrete-lined channel running through a residential neighborhood. On either side of the channel are block walls rising directly from the crest of the concrete banks. The only vegetation present is overhanging from the backyards of adjacent single-family detached residences. The uniform block walls create coherence of the landscape. While the landscape elements are coherent, they do not possess qualities that create visual interest. The level of visual intactness was rated as moderate.



*Cactus Park Detention Basin Inflow Channel (concrete lined)*

**#17 Cactus Park Detention Basin Inflow Channel (concrete lined)**

The Cactus Park Detention Basin Inflow Channel is a narrow and shallow, concrete-lined channel running through a residential neighborhood. The feature is largely not visible and blends well into its surroundings except for the guardrail structure paralleling the sidewalks. The overall level of visual intactness of the feature is moderate.



*Cactus Park Detention Basin Inflow Channel (concrete lined)*

**#18 Scottsdale Road Storm Drain (east side of road, south of Sweetwater Avenue)**

The storm drain in this location is underground, and the only visible features associated with this structure are storm drain inlets along the curb and gutter along Scottsdale Road and manhole covers along the roadway. The visual intactness of the feature was rated as low. The landscape elements provide no visual interest and are not cohesive. There is an existing sidewalk adjacent to Scottsdale Road. The bicycle facility in this location consists of a wide curb lane along Scottsdale Road. Landscaping and improved facilities along the sidewalk would improve the visual intactness of this feature.



*Scottsdale Road Storm Drain (east side of road, south of Sweetwater Ave.)*

**#19A Scottsdale Road Channel (gabion/concrete lined)**

The channel paralleling the east side of Scottsdale Road in this area is a shallow, concrete-lined channel immediately adjacent to the curb of Scottsdale Road. The banks of this channel are lined with gabions. Utility lines and street lighting, as well as some landscaping (oleander), border the eastern bank. The channel here also serves as a sidewalk. The elements making up the landscape surrounding this feature are not well organized or visually interesting. The guardrail at the Sutton Drive intersection is mangled. The overall level of visual intactness was determined to be low. Landscaping and improved facilities along the sidewalk would improve the visual intactness of this feature.



*Scottsdale Road Channel (gabion/concrete lined)*

**#19B Scottsdale Road Channel (landscaped)**

The Scottsdale Road Channel in this area is much more heavily landscaped than the area immediately south of Sutton Drive. The channel here opens to become broader and earth-lined. Trees of various species line the channel and its banks. The utility line shifts to run adjacent to the west side of the channel, immediately adjacent to Scottsdale Road. The sidewalk, which was previously located in the channel, climbs to run along the western bank. The elements of this drainage feature are cohesive and provide some visual interest compared to the surrounding landscape. The level of visual intactness was rated moderate to high.



*Scottsdale Road Channel (landscaped)*

**#20 Scottsdale Road Storm Drain (west side of road, north of Thunderbird Road)**

The storm drain in this location is underground, and the only visible features associated with this structure are storm drain inlets along the curb and gutter along Scottsdale Road, and manhole covers along the roadway. The elements of this drainage feature are cohesive and provide some visual interest compared to the surrounding landscape. The level of visual intactness was rated moderate to high.



*Scottsdale Road Storm Drain (west side, north of Thunderbird Road)*

### #21 Scottsdale Airport Detention Basin Outfall Channel

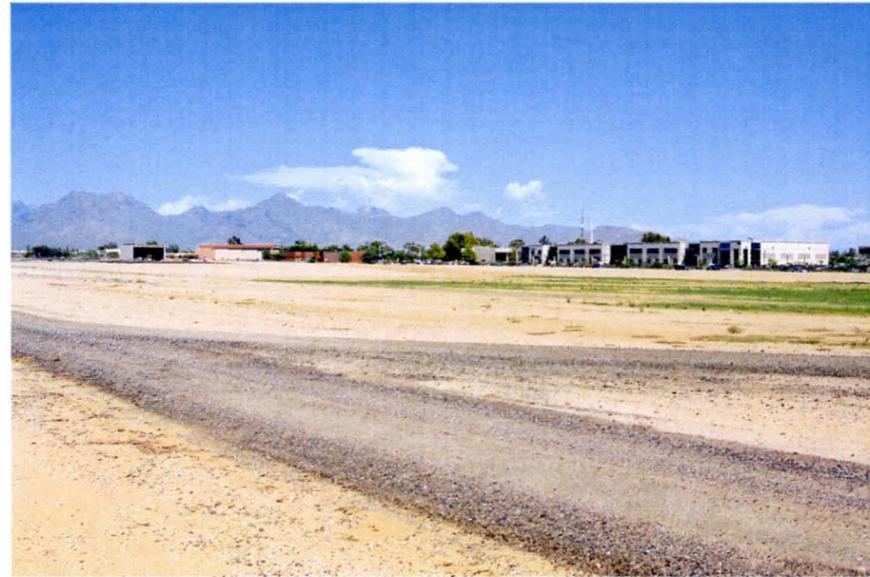
The detention basin is a broad, shallow, v-shaped channel that is heavily disturbed and sporadically vegetated with annual weed and perennial weed and bunch grass species. The soil appears to have been cleared and tilled. The disturbed conditions, lack of cohesive elements, and no notable visually interesting elements yielded a low level of visual intactness.



*Scottsdale Airport Detention Basin Outfall Channel*

### #22 Scottsdale Airport Detention Basin

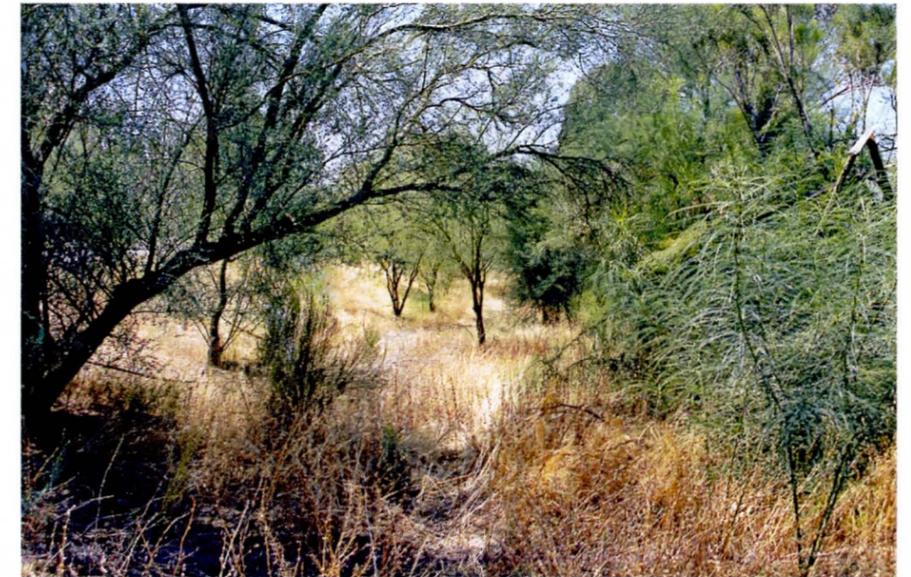
The detention basin at the Scottsdale Airport is a large, shallow, earthen basin. The basin is sporadically covered by grass and ringed by a gravel roadway. The lack of cohesive elements and minimal plant material do not form a visually interesting pattern and results in a low level of visual intactness. Improvements such as a hardscaped pattern and landscaping could improve this feature.



*Scottsdale Airport Detention Basin*

### #23 Thunderbird Industrial Detention Basin (Scottsdale Airpark)

The Thunderbird Detention Basin is a heavily vegetated, recessed channel bordered on the north by a block fence separating the channel from a shopping center. The channel is covered with dense Mexican palo verde, blue palo verde, and mesquite trees, forming a relatively well-established canopy. The ground is covered by grass and forbs. The dense canopy of trees creates a landscape that contrasts with the surrounding area. The basin was considered to have a moderate to high level of visual intactness.



*Thunderbird Industrial Detention Basin (Scottsdale Airpark)*

**#24 68th Street Channel (grass lined)**

The 68th Street Channel is a grass-lined channel that also serves as a utility corridor for overhead power and telephone transmission lines. Single-family detached residences of varying color and architectural style border the channel, and are blocked from view by fencing of varying construction. Much of the fencing along the sides of the channel is vegetated with ornamental shrub species. The channel's level of visual intactness was determined to be moderate, due to a lack of elements with significant visual interest. The channel does not significantly differ in line, texture, color, or form from the surrounding elements in the landscape.



*68th Street Channel (grass lined)*

**#25 Sandpiper Park Detention Basin**

Sandpiper Park is a large, turfed basin with a baseball field and a fenced tennis court. The park is vegetated with pine, mesquite, and African sumac trees. Views to the east from the park yield the McDowell Mountains rising above the landscaped trees. The park and its landscaping are well maintained. The elements that make up the park are well organized, and form a cohesive blend of visually interesting features. The level of visual intactness of the park was rated as high.



*Sandpiper Park Detention Basin*

**#26 Kierland Outfall Channel (landscaped)**

The Kierland Outfall Channel is gravel-lined, heavily landscaped, and well manicured with primarily native species. A wide sidewalk runs down the middle of the channel. The channel and its extensive landscaping are well maintained. The elements that make up the feature are well organized, and form a cohesive blend of visually interesting features. The level of visual intactness of the channel was considered to be high.



*Kierland Outfall Channel (landscaped)*

### #27 Kierland Golf Course Detention Basins

Kierland Golf Course is a predominately turfed golf course that has heavily contoured topography, recessed from the surroundings. Views to the east providing scenic vistas of the McDowell Mountains are plentiful along the meandering course. The golf course is very well maintained, and the elements that make up the golf course are well organized and form a cohesive blend of visually interesting features. The level of visual intactness of the course was rated as high.



*Kierland Golf Course Detention Basins*

### #28 Kierland Park Detention Basin

Kierland Park is a large neighborhood park that is minimally depressed. The park has large turf areas and is heavily landscaped around the perimeter. Meandering, curvilinear, gravel-lined landscaped areas ring the turfed interior of the park. The park and its landscaping are well maintained. The elements that make up the park are well organized and visually cohesive. The level of visual intactness of the park was determined to be high.



*Kierland Park Detention Basin*

### #29 Thunderbird Detention Basin (at 64th Street)

The channel here is broad and relatively shallow. The earth-lined basin is vegetated with grass and trees of varying species. Thunderbird Road exists directly to the south of the basin. Although the elements of this drainage feature are cohesive, they do not possess qualities that create visual interest. The level of visual intactness of this feature is moderate.



*Thunderbird Detention Basin (at 64th Street)*

**#30 Crossed Arrows Park Detention Basin Outfall Channel (earth channel)**

The outfall channel is earth-lined, and bounded on either side by a wide earthen swath. On the eastern edge of the earthen swath a block fence marks the boundary with residences. The channel itself is vegetated with primary, hydrophilic vegetation. Trees are located dotted throughout the swath and along the block fence. There is little in the setting that creates visual interest and the elements of the landscape are not cohesive. The level of visual intactness of this feature was rated as low. Improved landscaping would improve the visual intactness of this feature.



*Crossed Arrows Park Detention Basin Outfall Channel (earth channel)*

**#31 Crossed Arrows Park Detention Basin**

Crossed Arrows Park is a large recessed turf-lined detention basin. The banks are sporadically planted with trees. The east side of the park is generally open and dominated by the turf. Trees increase in density toward the west end of the park. Although the inflow and outfall channels are elements of this feature that contrast with other elements, such as landscaping and the turf bottom, the overall level of visual intactness of this drainage feature was rated as high.



*Crossed Arrows Park Detention Basin*

**#32 Jackrabbit Park Detention Basin Outfall Channel (south of Greenway Pkwy, earth channel)**

The Jackrabbit Park Detention Basin Outfall Channel is a grass-lined earth channel. Single-family detached residences of varying color and architectural style border the channel. Block walls rise on either side of the narrow channel constricting views to those parallel to the channel. The only trees present are overhanging from the backyards of adjacent residences. In areas where heavy vegetation overhangs the block wall, the channel has a high level of visual intactness. In areas without overhanging vegetation, the feature does not form a cohesive landscape with its surroundings. The overall level of visual intactness was determined to be moderate.



*Jackrabbit Park Detention Basin Outfall Channel (south of Greenway Pkwy, earth channel)*

**#33 Jackrabbit Park Detention Basin Outfall Channel (North of Greenway Parkway, earth channel)**

The outfall channel for Jackrabbit Park is an earth-lined channel that is very heavily vegetated with mature trees. The trees form a dense mass of vegetation running along the length of the channel. Trees include blue palo verde, Mexican palo verde, and cottonwood. On either side of the channel is a wide earthen swath free from vegetation. Block fences of adjacent single-family detached residences are on the edge of this swath. The large trees block the view of the channel from the intersecting roadway and provide shading along the channels length. Large trees provide some visual interest in this drainage feature. Overall the level of visual intactness of the feature is considered to be high.



*Jackrabbit Park Detention Basin Outfall Channel (North of Greenway Parkway, earth channel)*

**#34 Jackrabbit Park Detention Basin (East)**

The eastern part of Jackrabbit Park is a recessed, turfed basin with earthen/cobbled banks. The gravelly banks and perimeter of the grass are dotted with landscaped trees. The landscape of this feature is characteristic of other parks in the area. A more uniform layer of cobbles could enhance the cobble/earth border around the basin. The overall the level of visual intactness is moderate.



*Jackrabbit Park Detention Basin (East)*

**#35 Jackrabbit Park Detention Basin (West)**

The western part of Jackrabbit Park is a recessed, turfed basin with a portion of the banks being earth/gravel lined, and other areas having turfed banks. The banks are lined with various tree species. Along the foot of the southern bank is a cobbled channel. Views to the east from the park yield the McDowell Mountains rising above the landscaped trees. The park and its landscaping are well maintained. The elements that make up the park are well organized, and form a cohesive blend of visually interesting features. The level of visual intactness of the park was rated as high.



*Jackrabbit Park Detention Basin (West)*

## 2.11 ECOLOGICAL PLANNING CONSIDERATIONS

### 2.11.1 Purpose

In project planning and development, the planning team must be aware of the potential environmental issues within the project area. Ultimately, this knowledge can help avoid delays, reduce unforeseen costs, and ensure compliance with regulations in the project planning and implementation phase. Potential environmental issues that can affect the project planning and implementation include hazardous material contamination, archeological resources, socioeconomic factors, and ecological resources. This report documents an ecological assessment for the Scottsdale Road Corridor Drainage Master Plan (CDMP), focusing on natural vegetation and wildlife, as well as threatened, endangered, and sensitive plant and animal species.

Ecological issues are important to consider in the planning process for several reasons. Documenting the habitat types and vegetative communities can indicate the potential for protected species (e.g., threatened and endangered species) to occupy the study area. To obtain certain types of environmental permits, trying to avoid or minimize impacts to unique and sensitive habitats is essential. In addition, one of the project's objectives may include habitat enhancement, restoration, or creation.

### 2.11.2 Methods

The natural vegetation, observed wildlife, and the sensitive and unique habitats were identified by conducting a reconnaissance survey of the project area. Theresa Pinto, an Environmental Planner, and Afshin Ahouraiyan, the Project Manager, with the Flood Control District of Maricopa County (District), conducted the survey on February 22, 2001. The area was surveyed primarily by vehicle, making stops for pedestrian inspections as necessary to examine some habitats in more detail. Survey observations and large-scale aerial photographs, dated January 2000, were used to identify the natural vegetative communities and general land use. The vegetation resources of the project area

were assessed, and plant and wildlife species observed in the field were recorded. A comprehensive plant and wildlife survey was not completed because it was beyond the scope for this study. Lists of potentially occurring plants, mammals, birds, and herpetofauna were generated from the existing literature on the distribution and habitat requirements of Arizona flora and fauna (Tables 4, 5, 6, and 7) beginning on this page.

### 2.11.3 Vegetation Communities and Habitat

The study area is 100% urbanized, and the native vegetation communities and habitat within most of the study area has been drastically altered or completely removed by human activities. Historically, two vegetation communities, the Lower Colorado River and the Arizona Upland subdivisions of the Sonoran Desert Biome, most likely dominated the native vegetation within the study area (Turner and Brown 1994). Within these vegetation communities, xeroriparian vegetation grew along the washes, and tended to be more dense and diverse with respect to the types and structure of vegetation compared to the upland areas; therefore, xeroriparian habitat usually supports a more diverse wildlife community as well.

The most significant amount of continuous or intact vegetation and, therefore, potential habitat in the study area occurs along the drainage channels. Of these drainage channels, the most notable ones were:

- a. The north-south aligned drainage (Photograph 1) between 60<sup>th</sup> and 64<sup>th</sup> Streets (east-west boundary) and Paradise Lane and Thunderbird Roads (north-south boundary);
- b. The drainage along Thunderbird Road between 76<sup>th</sup> Street and Hayden Road (east-west boundary);
- c. The north-south aligned drainage between 70<sup>th</sup> Street and Scottsdale Road (east-west boundary) and Cholla Street and Mountain View Road (north-south boundary).

Table 4. Plants within the Study Area and Types of Habitat

Common Name	Scientific Name	Xero-Riparian Washes or Drainages	Urban Areas
Narrowleaf cattail	<i>Typha angustifolia</i>		
Three-awn grass	<i>Aristida spp.</i>	✓	✓
Buffelgrass	<i>Cenchrus ciliaris</i>	✓	✓
Bermuda grass	<i>Cynodon dactylon</i>	✓	✓
Fluffgrass	<i>Erioneuron pulchellum</i>	✓	✓
Reed	<i>Phragmites communis</i>		
Johnson grass	<i>Sorghum halapense</i>	✓	
California fan palm	<i>Washingtonia filifera</i>		✓
Horsetail casuarina	<i>Casuarina equisetifolia</i>		
Fremont cottonwood	<i>Populus fremontii</i>		
Willow	<i>Salix spp.</i>		
Mistletoe	<i>Phoradendron spp.</i>	✓	✓
Curly-leaf dock	<i>Rumex crispus</i>		
Four-wing saltbush	<i>Atriplex canescens</i>	✓	
All scale	<i>Atriplex polycarpa</i>	✓	
Russian thistle	<i>Salsola iberica</i>	✓	✓
Palmer's amaranth	<i>Amaranthus palmeri</i>	✓	✓
Woolly tidestromia	<i>Tidestromia lanuginosa</i>	✓	✓
Mustard	<i>Brassica tournefortii</i>	✓	✓
White-thorn acacia	<i>Acacia constricta</i>	✓	
Catclaw acacia	<i>Acacia greggii</i>	✓	
Blue paloverde	<i>Cercidium floridum</i>	✓	
Foothill paloverde	<i>Cercidium microphyllum</i>	✓	
Mexican paloverde	<i>Parkinsonia aculeata</i>	✓	✓
Western honey mesquite	<i>Prosopis glandulosa var. torreyana</i>	✓	✓
Ironwood	<i>Olneya tesota</i>	✓	
Eucalyptus	<i>Eucalyptus spp.</i>		✓
Creosote bush	<i>Larrea tridentata</i>	✓	✓
Spurge	<i>Euphorbia spp.</i>	✓	✓
Jojoba	<i>Simmondsia chinensis</i>		
Greythorn	<i>Zizyphus obtusifolia</i>	✓	
Globemallow	<i>Sphaeralcea ambigua</i>	✓	✓
Tamarisk, Salt Cedar	<i>Tamarix spp.</i>	✓	
Saguaro	<i>Carnegiea gigantea</i>	✓	✓
Fishhook barrel cactus	<i>Ferocactus wislizenii</i>		
Teddy-bear cholla	<i>Opuntia bigelovii</i>		
Buckhorn cholla	<i>Opuntia acanthocarpa</i>		
Ocotillo	<i>Fouquieria splendens</i>		
Rambling milkweed	<i>Sarcostemma hirtellum</i>	✓	
Yellow tree tobacco	<i>Nicotiana glauca</i>		
Desert willow	<i>Chilopsis linearis</i>		
Wolfberry	<i>Lycium spp.</i>	✓	
Canyon ragweed	<i>Ambrosia ambrosoides</i>	✓	
Triangle-leaf bursage	<i>Ambrosia deltoidea</i>	✓	
Desert broom	<i>Baccharis sarothroides</i>	✓	
Brittlebush	<i>Encelia farinosa</i>	✓	
Jimmyweed	<i>Haplopappus heterophyllus</i>	✓	✓
Burro brush	<i>Hymenoclea spp.</i>	✓	

SOURCES: Kearney and Peebles 1960; Lehr 1978

**Table 5. Mammal Species that Potentially Occur in the Study Area**

Common Name	Scientific Name	Xero-riparian Washes	Urban Areas
Cave myotis	<i>Myotis velifer</i>	✓	✓
California myotis	<i>Myotis californicus</i>	✓	✓
Western pipistrelle	<i>Pipistrellus hesperus</i>	✓	✓
Big brown bat	<i>Eptesicus fuscus</i>	✓	✓
Southern yellow bat	<i>Lasiurus ega</i>	✓	✓
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	✓	✓
Pallid bat	<i>Antrozous pallidus</i>	✓	✓
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>	✓	✓
Pocketed free-tailed bat	<i>Nyctinomops femorosaccus</i>	✓	✓
Big free-tailed bat	<i>Nyctinomops macrotis</i>	✓	✓
Western mastiff bat	<i>Eumops perotis</i>	✓	✓
Desert cottontail *	<i>Sylvilagus audubonii</i>	✓	✓
Black-tailed jackrabbit *	<i>Lepus californicus</i>	✓	✓
Harris' antelope squirrel	<i>Ammospermophilus harrisi</i>	✓	✓
Rock squirrel	<i>Spermophilus variegatus</i>	✓	
Round-tailed ground squirrel	<i>Spermophilus tereticaudus</i>	✓	✓
Botta's pocket gopher	<i>Thomomys bottae</i>	✓	✓
Desert pocket mouse	<i>Chaetodipus penicillatus</i>	✓	
Bailey's pocket mouse	<i>Chaetodipus baileyi</i>	✓	
Desert kangaroo rat	<i>Dipodomys deserti</i>	✓	
Western harvest mouse	<i>Reithrodontomys megalotis</i>	✓	
Cactus mouse	<i>Peromyscus eremicus</i>	✓	
Southern grasshopper mouse	<i>Onychomys torridus</i>	✓	
Arizona cotton rat	<i>Sigmodon arizonae</i>	✓	
White-throated wood rat	<i>Neotoma albigula</i>	✓	
Desert wood rat *	<i>Neotoma lepida</i>	✓	
House mouse	<i>Mus musculus</i>		
Coyote *	<i>Canis latrans</i>	✓	✓
Kit fox	<i>Vulpes macrotis</i>	✓	
Gray fox	<i>Urocyon cinereoargenteus</i>	✓	
Ringtail	<i>Bassariscus astutus</i>	✓	
Raccoon	<i>Procyon lotor</i>		✓
Badger	<i>Taxidea taxus</i>	✓	
Spotted skunk	<i>Spilogale gracilis</i>	✓	
Bobcat	<i>Felis rufus</i>	✓	
Collared peccary	<i>Tayassu tajacu</i>	✓	
Mule deer	<i>Odocoileus hemionus</i>	✓	

SOURCES: Hoffmeister 1986, Jones et al. 1992

**Table 6. Bird Species that Potentially Occur in the Study Area**

Common Name	Scientific Name	Xero-riparian washes	Urban Areas
Mallard	<i>A. platyrhynchos</i>		✓
Cliff swallow	<i>Petrochelidon pyrrhonota</i>		✓
Barn swallow	<i>Hirundo rustica</i>		✓
Common raven	<i>Corvus corax</i>	✓	
Verdin*	<i>Auriparus flaviceps</i>	✓	✓
Cactus wren*	<i>Campylorhynchus brunneicapillus</i>	✓	✓
Rock wren	<i>Salpinctes obsoletus</i>	✓	
Bewick's wren	<i>Thryomanes bewickii</i>	✓	✓
House wren	<i>Troglodytes aedon</i>	✓	
Ruby-crowned kinglet	<i>Regulus calendula</i>	✓	✓
Black-tailed gnatcatcher	<i>Poliophtila melanura</i>	✓	
Western bluebird	<i>Sialia mexicana</i>	✓	
American robin	<i>Turdus migratorius</i>		✓
Northern mockingbird*	<i>Mimus polyglottos</i>	✓	✓
Bendire's thrasher	<i>Toxostoma bendirei</i>	✓	
Curve-billed thrasher*	<i>T. curvirostre</i>	✓	✓
Crissal thrasher	<i>T. crissale</i>	✓	
American pipit	<i>Anthus rubescens</i>		✓
Cedar waxwing	<i>Bombycilla cedrorum</i>		✓
Phainopepla*	<i>Phainopepla nitens</i>	✓	
Loggerhead shrike*	<i>Lanius ludovicianus</i>	✓	
European starling*	<i>Sturnus vulgaris</i>	✓	✓
Bell's vireo	<i>Vireo bellii</i>	✓	
Plumbeous vireo	<i>V. plumbeus</i>	✓	
Cassin's vireo	<i>V. cassinii</i>	✓	
Warbling vireo	<i>V. gilvus</i>	✓	
Orange-crowned warbler	<i>Vermivora celata</i>		✓
Nashville warbler	<i>V. ruficapilla</i>		✓
Lucy's warbler	<i>V. luciae</i>	✓	
Yellow warbler	<i>Dendroica petechia</i>		✓
Yellow-rumped warbler*	<i>Dendroica coronata</i>	✓	✓
Black-throated gray warbler	<i>D. nigriscens</i>		✓
Townsend's warbler	<i>D. townsendi</i>		✓
MacGillivray's warbler	<i>Oporornis tolmiei</i>		✓
Common yellowthroat	<i>Geothlypis trichas</i>		✓
Wilson's warbler	<i>Wilsonia pusilla</i>	✓	✓
Western tanager	<i>P. ludoviciana</i>	✓	
Northern cardinal	<i>Cardinalis cardinalis</i>	✓	
Pyrrhuloxia	<i>C. sinuatus</i>	✓	
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>	✓	
Blue grosbeak	<i>Guiraca caerulea</i>	✓	
Lazuli bunting	<i>Passerina amoena</i>	✓	✓
Green-tailed towhee	<i>Pipilo chlorurus</i>	✓	✓
Canyon towhee*	<i>P. fuscus</i>	✓	
Abert's towhee*	<i>P. aberti</i>	✓	✓
Chipping sparrow	<i>Spizella passerina</i>	✓	✓
Brewer's sparrow	<i>S. breweri</i>		✓

**Table 6 (continued)**

Common Name	Scientific Name	Xero-riparian washes	Urban Areas
Lark sparrow	<i>Chondestes grammacus</i>	✓	
Black-throated sparrow*	<i>Amphospiza bilineata</i>	✓	
White-crowned sparrow*	<i>Zonotrichia leucophrys</i>	✓	✓
Dark-eyed junco	<i>Junco hyemalis</i>	✓	✓
Red-winged blackbird	<i>Agelaius phoeniceus</i>		✓
Great-tailed grackle*	<i>Quiscalus mexicanus</i>		✓
Brown-headed cowbird*	<i>Molothrus ater</i>	✓	
Hooded oriole	<i>Icterus cucullatus</i>	✓	
House finch*	<i>Carpodacus mexicanus</i>	✓	✓
Lesser goldfinch	<i>Carduelis psaltria</i>	✓	✓
House sparrow*	<i>Passer domesticus</i>		✓

SOURCES: American Ornithologists' Union 1998; National Geographic Society 1999; Peterson 1990; Witzeman et al. 1997



A Drainage Channel with Significant Vegetation along the Banks

**Table 7. Amphibian and Reptile Species that Potentially Occur in the Study Area**

Common Name	Scientific Name	Xero-riparian washes	Urban Areas
Couch spadefoot	<i>Scaphiopus couchi</i>	✓	
Western spadefoot	<i>S. hammondi</i>	✓	
Woodhouse toad	<i>Bufo woodhousei</i>	✓	✓
Red-spotted toad	<i>B. punctatus</i>		
Great Plains toad	<i>B. cognatus</i>	✓	
Sonoran Desert toad	<i>B. alvarius</i>		✓
Lowland leopard frog	<i>Rana yavapaiensis</i>		
Bullfrog	<i>R. catesbiana</i>		
Desert tortoise	<i>Gopherus agassizi</i>	✓	
Banded gecko	<i>Coleonyx variegatus</i>	✓	
Desert iguana	<i>Dipsosaurus dorsalis</i>		
Chuckwalla	<i>Sauromalus obesus</i>		
Zebratail lizard	<i>Callisaurus draconoides</i>		
Fringe-toed lizard	<i>Uma notata</i>		
Collared lizard	<i>Crotophytus collaris</i>	✓	
Long-nosed leopard lizard	<i>C. wislizenii</i>		
Desert spiny lizard	<i>Sceloporus magister</i>	✓	
Clark's spiny lizard	<i>S. clarki</i>		
Brush lizard	<i>Urosaurus graciosus</i>		
Tree Lizard	<i>U. ornatus</i>	✓	✓
Side-blotched lizard	<i>Uta stansburiana</i>	✓	
Desert horned lizard	<i>Phrynosoma platyrhinos</i>	✓	
Regal horned lizard	<i>P. solare</i>		
Western whiptail	<i>Cnemidophorus tigris</i>	✓	
Gila monster	<i>Heloderma suspectum</i>	✓	
Rosy boa	<i>Lichanura trivirgata</i>	✓	
Western blind snake	<i>Leptotyphlops humilis</i>	✓	
Spotted leaf-nosed snake	<i>Phyllorhynchus decurtatus</i>	✓	
Saddled leaf-nosed snake	<i>P. browni</i>	✓	
Coachwhip	<i>Masticophis flagellum</i>	✓	
Sonoran whipsnake	<i>M. bilineatus</i>	✓	
Western patch-nosed snake	<i>Salvadora hexalepsis</i>	✓	
Glossy snake	<i>Arizona elegans</i>	✓	
Gopher snake	<i>Pituophis melanoleucus</i>	✓	
Common kingsnake	<i>Lampropeltis getulus</i>	✓	
Long-nosed snake	<i>Rhinocheilus lecontei</i>	✓	
Checkered garter snake	<i>Thamnophis marcianus</i>		✓
Western ground snake	<i>Sonora semiannulata</i>	✓	
Western shovel-nosed snake	<i>Chionactis occipitalis</i>	✓	
Banded sand snake	<i>Chilomeniscus cinctus</i>	✓	
Night snake	<i>Hypsiglena toquata</i>		
Arizona coral snake	<i>Micruroides euryxanthus</i>	✓	
Western diamondback rattlesnake	<i>Crotalus atrox</i>	✓	
Sidewinder	<i>C. cerastes</i>	✓	
Tiger rattlesnake	<i>C. tigris</i>	✓	
Mohave rattlesnake	<i>C. scutulatus</i>	✓	

**Table 7 (continued)**

Common Name	Scientific Name	Xero-riparian washes	Urban Areas
Saddled leaf-nosed snake	<i>P. browni</i>	✓	
Coachwhip	<i>Masticophis flagellum</i>	✓	
Sonoran whipsnake	<i>M. bilineatus</i>	✓	
Western patch-nosed snake	<i>Salvadora hexalepsis</i>	✓	
Glossy snake	<i>Arizona elegans</i>	✓	
Gopher snake	<i>Pituophis melanoleucus</i>	✓	
Common kingsnake	<i>Lampropeltis getulus</i>	✓	
Long-nosed snake	<i>Rhinocheilus lecontei</i>	✓	
Checkered garter snake	<i>Thamnophis marcianus</i>		✓
Western ground snake	<i>Sonora semiannulata</i>	✓	
Western shovel-nosed snake	<i>Chionactis occipitalis</i>	✓	
Banded sand snake	<i>Chilomeniscus cinctus</i>	✓	
Night snake	<i>Hypsiglena toquata</i>		
Arizona coral snake	<i>Micruroides euryxanthus</i>	✓	
Western diamondback rattlesnake	<i>Crotalus atrox</i>	✓	
Sidewinder	<i>C. cerastes</i>	✓	
Tiger rattlesnake	<i>C. tigris</i>	✓	
Mohave rattlesnake	<i>C. scutulatus</i>	✓	

SOURCES: Sredl et al. 1997; Stebbins 1985

The vegetation along these drainages include non-native and native vegetation. The vegetation included species such as mesquite (*Prosopis velutina*), blue palo verde (*Cercidium floridum*), Mexican palo verde (*Parkinsonia aculeata*), tamarisk (*Tamarix spp.*), canyon ragweed (*Ambrosia ambrosioides*), desert broom (*Baccharis sarathroides*), and acacia (*Acacia spp.*). One wash that appeared to be natural was observed on the vacant land at the southeast corner of Sweetwater Avenue and Scottsdale Road. Development is planned for this vacant parcel in the near future.

In spite of the urbanized nature, most of the project area contains some vegetation. However, the amount and type of vegetation varies greatly, from turf covered golf courses and parks, to landscaped residences, to dirt fields containing weedy and disturbance related vegetation.

Residential areas, in particular the low-density residential areas, may support significant amounts of vegetation, but the amount and type of wildlife the vegetation supports depend on the vegetation species, structure, and proximity to other types of habitat as well.

**2.11.4 Wildlife**

The urban areas in this study area consist of a variety of land uses, including low-density residential areas, high-density residential subdivisions, golf courses and parks, commercial and industrial sites, and the Scottsdale Airport. The number of wildlife species present in an urban environment is dependent on the extent of removal of native vegetation and the intensity of human activities. Low-density residential areas with significant amounts of native vegetation will support many of the species present in the Arizona Upland or Lower Colorado River subdivisions of the Sonoran Desert. High-density residential areas and commercial and industrial properties will support very few species.

Mammals that are able to adapt to high levels of human activity include the desert cottontail (*Sylvilagus audubonii*), house mouse (*Mus musculus*), and coyote (*Canis latrans*). Several species of bats could forage for insects in urban areas. Bird species common in urban environments include Rock Dove (*Columba livia*), European Starling (*Sturnus vulgaris*), Great-tailed Grackle (*Quiscalus mexicanus*), House Finch (*Carpodacus mexicanus*), and House Sparrow (*Passer domesticus*). Reptiles and amphibians, other than the introduced Mediterranean gecko (*Hemidactylus turcicus*), are generally poorly represented in urban environments. Other wildlife that are likely to be present within the study area are listed in Tables 5, 6 and 7.

Most of the wildlife observed during the reconnaissance were birds, which is expected since most birds are active and visible during daylight hours and are the most likely group of vertebrates to be encountered during a brief survey. The specific bird species observed

included the Rock Dove, Northern Mocking Bird (*Mimus polyglottos*), Great-tailed Grackle (*Quiscalda major*), Inca Dove (*Columbina inca*), European Starling, and a Pyrrhuloxia (*Cardinalis sinuatus*). The only mammal observed was a desert cottontail. Amphibians, reptiles, or fish were not observed during the reconnaissance; however, a detailed search was not conducted in suitable habitats.

#### 2.11.5 Threatened, Endangered, and Sensitive Species

A list of threatened, endangered, or otherwise sensitive plants and animals known from Maricopa County was compiled from information obtained through publications and web sites from the U.S. Fish and Wildlife Service (USFWS 4/01) and the Arizona Game and Fish Department (AGFD 4/01) (Table 8). USFWS lists species as candidate, threatened or endangered. AGFD lists species whose occurrence in Arizona is or may become in jeopardy. The Arizona Department of Agriculture (ADA) lists species as highly safeguarded if their prospect for survival in Arizona is in jeopardy or if the species is in danger of extinction. ADA also places plant species into four other categories (salvage restricted, export restricted, salvage assessed, and harvest restricted) requiring various permits prior to destruction of the plants. These other categories are not addressed in this report. Of the 33 special status species listed in Table 8 (on the next page), only one species, the crested saguaro, can be reasonably expected to occur within the study area.

Crested or fan-top saguaros are a rare growth form caused by freezing or mechanical injury to the saguaro's apical meristem (Steenbergh and Lowe 1983). The crested saguaro is listed as highly safeguarded in Arizona. This growth form could be present wherever saguaros are found. In the study area, saguaros are mostly located in residential areas. No crested saguaros were observed during the reconnaissance survey, but a complete inventory was not attempted. It is expected that most construction for the flood control structures in this project will be along the existing roads where there are few, if any, saguaros.

However, when specific sites are selected, they should be surveyed in detail for the possible presence of crested saguaros.

#### 2.11.6 Other Ecological Considerations

Several other ecological issues that may affect the implementation of a project should be considered in the planning process. One issue that must be considered when developing alternatives for this project is to avoid creating or enhancing wildlife habitat near the Scottsdale Airport. If a project feature, such as a detention basin or a channel, must be constructed within 10,000 feet of the airport, the amount of vegetation within that feature should be limited. In addition, if native plants are going to be impacted during project construction, the ADA should be notified in accordance with the Arizona Native Plant Law. There are many other environmental regulations and permits, however, two federal regulations that have the most potential to affect a project in this area are the Clean Water Act (CWA) Section 404 permit issued by the U.S. Army Corps of Engineers and the Migratory Bird Treaty Act (MBTA) which is administered through the U.S. Fish and Wildlife Service.

If a CWA Section 404 permit is required to implement any of the proposed alternatives in the Scottsdale Road CDMP, the amount of required habitat mitigation for each alternative should be evaluated and considered as a ranking criterion. Habitat creation and mitigation can be expensive, and a long-term operations and maintenance obligation under the 404 permitting process. Subsequently, when it is practicable, impacts to habitat within designated waters of the United States (WUS) should first be avoided or at least minimized. WUS have not yet been identified for this study area. When the alternatives are developed for the Scottsdale Road CDMP, the potential impacts from the alternatives to WUS will be evaluated at that time.

The MBTA protects most of the birds and their nesting activities in Arizona. Actually, only four bird species in Arizona are not protected

under the MBTA. If construction activities impact the nesting activities of a protected bird species, it could be a violation of the MBTA. When the preferred alternative is chosen for this study, the area of impact should be surveyed during the general nesting season for this region to determine if a large number of birds nest in the area.

#### 2.11.7 Conclusions

The study area within the Scottsdale Road CDMP is completely urbanized. As a result, the natural vegetative communities and habitats have been significantly altered or removed as a result. The crested saguaro, which is classified as a highly safeguarded species by the ADA, is the only special status species likely to be present in the study area. Generally, the ecological issues for this study area are not significant and should not affect the project implementation. If a CWA Section 404 permit is required for project implementation, additional site specific surveys may be necessary.

Table 8. Special Status Wildlife and Plant Species Known from Maricopa County

Common Name	Scientific Name	Habitat	Federal Status	State Status	Habitat Present in Project Area
<b>MAMMALS</b>					
California leaf-nosed bat	<i>Macrotus californicus</i>	Primarily cave and mine dwellers, mostly in Sonoran desertscrub		SC	No
Lesser long-nosed bat	<i>Leptonycteris curasoae yerbabuena</i>	Desertscrub with agave and columnar cacti present as food plants	E	SC	No
Red bat	<i>Lasiurus borealis blossevillii</i>	Over ponds, along waterways, among oaks, sycamores, walnuts, cottonwoods, and pine-fir forest		SC	No
Sonoran pronghorn	<i>Antilocapra americana sonoriensis</i>	Broad, intermountain alluvial valleys with creosote-bursage and paloverde-mixed cacti	E	SC	No, outside of normal range
<b>BIRDS</b>					
Least bittern	<i>Ixobrychus exilis</i>	Cattail marshes		SC	No
Great egret	<i>Ardea alba</i>	Ponds, streams, and marshes		SC	Limited
Snowy egret	<i>Egretta thula</i>	Ponds, streams, and marshes		SC	Limited
Black-bellied whistling duck	<i>Dendrocygna autumnalis</i>	Ponds		SC	Limited
Mississippi kite	<i>Ictinia mississippiensis</i>	Riparian areas of upper Gila and San Pedro Rivers		SC	No, outside of normal range
Bald eagle	<i>Haliaeetus leucocephalus</i>	Large trees or cliffs near water (reservoirs, rivers and streams) with abundant prey	T	SC	No, outside of normal range
Common black-hawk	<i>Buteogallus anthracinus</i>	Riparian areas in Sonoran zones		SC	No, outside of normal range
Peregrine falcon	<i>Falco peregrinus</i>	Cliffs near Salt River reservoir, generally distributed, tops of tall urban buildings		SC	No
Yuma clapper rail	<i>Rallus longirostris yumanensis</i>	Fresh water and brackish marshes	E	SC	No
Snowy plover	<i>Charadrius alexandrinus nivosus</i>	Ponds		SC	No
Western yellow-billed cuckoo	<i>Coccyzus americanus</i>	Riparian areas of lower Sonoran zone		SC	No
Cactus ferruginous pygmy-owl	<i>Glaucidium brasilianum cactorum</i>	Mature cottonwood/willow, mesquite bosques, and Sonoran desertscrub	E	SC	No
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Nests in canyons and dense forests with multi-layered foliage structure	T	SC	No
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Cottonwood/willow and tamarisk vegetation communities along rivers and streams	E	SC	No
<b>REPTILES AND AMPHIBIANS</b>					
Lowland leopard frog	<i>Rana yavapaiensis</i>	Restricted to permanent waters: pools of foothill streams, overflow ponds below 4,800 ft. elevation		SC	No
Great plains narrow-mouthed toad	<i>Gastrophryne olivacea</i>	Ranges from mesquite grassland to oak woodland in southern Arizona		SC	No, outside of normal range
<b>REPTILES AND AMPHIBIANS</b>					
Desert tortoise	<i>Gopherus agassizii</i>	Riverbanks, washes, dunes, and rocky slopes		SC	No
Arizona skink	<i>Eumeces gilberti arizonensis</i>	Pinyon-juniper woodland and yellow pine forest		SC	No

Common Name	Scientific Name	Habitat	Federal Status	State Status	Habitat Present in Project Area
Mexican garter snake	<i>Thamnophis eques</i>	Canyons of pine-oak and pinyon-juniper woodlands down to mesquite grasslands in southern Arizona, near water		SC	No, outside of normal range
<b>FISH</b>					
Bonytail chub	<i>Gila elegans</i>	Eddies and pools, not in swift currents	E	SC	No
Roundtail chub	<i>Gila robusta</i>	Eddies and pools, often in swift currents below rapids		SC	No
Razorback sucker	<i>Xyrauchen texanus</i>	Riverine and lacustrine areas, generally not in fast-moving water and may use backwaters	E	SC	No, outside of normal range
Desert pupfish	<i>Cyprinodon macularius macularius</i>	Shallow springs, small streams, and marshes. Tolerates saline and warm water.	E	SC	No
Gila topminnow	<i>Poeciliopsis occidentalis occidentalis</i>	Concentrates in shallow water, especially where aquatic vegetation or debris is present	E	SC	No, outside of normal range
<b>PLANTS</b>					
Arizona agave	<i>Agave arizonica</i>	Transition zone between oak-juniper woodland and mountain mahogany oak scrub	E	HS	No
Hohokam agave	<i>Agave murpheyi</i>	In Maricopa County, found in Paradise Valley		HS	Potential
Arizona cliffrose	<i>Purshia subintegra</i>	Characteristic white soils or tertiary limestone lakebed deposits	E	HS	No
Crested or Fan-top saguaro	<i>Carnegiea gigantea</i>	Rocky hillsides and outwash slopes		HS	Yes
Arizona hedgehog cactus	<i>Echinocereus triglochidiatus arizonicus</i>	Ecotone between interior chaparral and madrean evergreen woodland	E	HS	No
Key to Table: Federal Status: E = Endangered T = Threatened C = Candidate State Status: SC = Special Concern HS = Highly Safeguarded					



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 2.12 MULTI-USE OPPORTUNITIES

### 2.12.1 Regional Opportunities

Opportunities to link local multi-use paths and trails to either existing or proposed parts of the regional system exist in several locations. The Trail Corridor proposed by the MPRD along the CAP Canal is adjacent to the study area. This MPRD trail could be linked to the proposed local trails that connect the City of Phoenix neighborhood parks via the planned expansion of 64<sup>th</sup> Street. The 64<sup>th</sup> Street expansion traverses across the Reach 11 Recreation Area, a regional recreational facility located on the north side of the CAP Canal. Access to Reach II will be provided at the 64<sup>th</sup> Street crossing, thereby creating the potential for connecting the study area to this regional recreation facility.

The Indian Bend Wash Greenbelt is located south and east of the study area. The portion of Indian Bend Wash adjacent to the study area is privately owned. If an easement along this property could be established, then the proposed trails along Berneil Ditch could be linked to the regional system.

### 2.12.2 Local Opportunities

Local trail opportunities to link and increase connectivity between neighborhoods and facilities exist primarily along existing drainage features within the study area. Specifically, these include areas along Berneil Ditch, 64<sup>th</sup> Street, and the Crossed Arrows Park Detention Basin Outfall Channel (Figure 20). The existing drainage features between the City of Phoenix parks are a prime opportunity for use because elementary schools are located adjacent to these parks. These drainage features offer the opportunity for non-motorized travel between residences in the area and both schools and parks. Trail design should consist of a compacted surface material suitable for multiple uses such as pedestrian, equestrian, and bicycle.

The 71<sup>st</sup> Street Channel is located parallel to the backs of commercial areas along the west side of Shea Boulevard. This alignment would provide a good opportunity to create a pathway that pedestrians could use to move from shop to shop and between shopping centers. Additionally this pathway could link to other potential paths within the study area to create a local loop system for users within the study area.

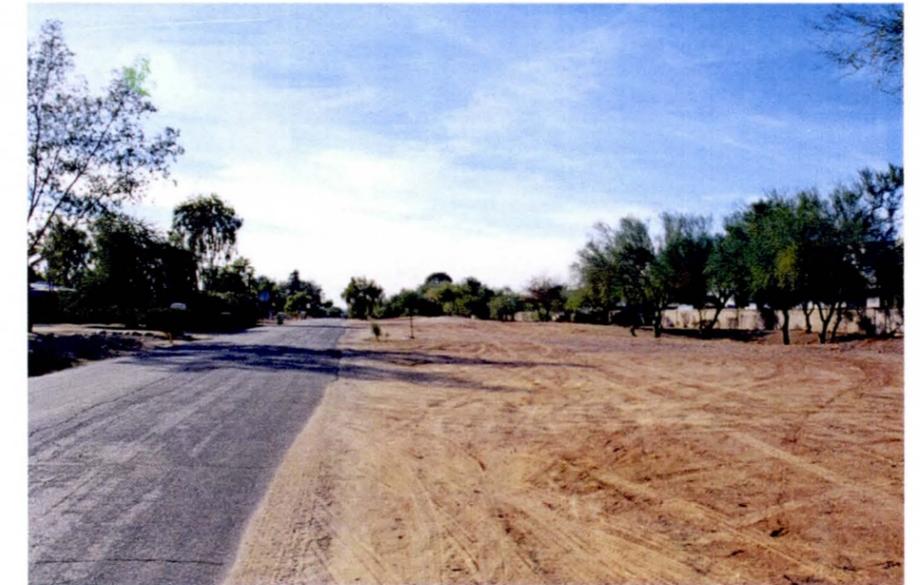
Berneil Ditch provides a wide corridor that has the potential to be a local trail corridor for use by residents. An informal path currently exists that connects across the channel. A trail could be linked to proposed trails along the 71<sup>st</sup> Street Channel and proposed trails along 64<sup>th</sup> Street to provide a local loop system. This local loop could also be connected to the paths connecting the various city parks, and even link into the regional trail along the CAP Canal. Berneil Ditch also has the potential to be expanded to a linear, open space multi-use facility because of its size. The possibility exists to enhance the neighborhood and create a multi-use amenity, as well as improve the aesthetics to complement the adjacent residential development.



*Berneil Ditch*

The drainage basin located adjacent to Thunderbird Road, between 76<sup>th</sup> Street and Hayden Road, is currently used by local residents. It is

a shallow earthen basin, void of vegetation, except for a dense planting of mesquites at the west end and north edge. This feature could be developed into a recreational resource for local residents. An improved pathway and amenities such as benches would increase the quality of this resource for all users.



*Thunderbird Industrial Detention Basin*

The existing trail segment along Shea Boulevard, which ends at 68<sup>th</sup> Street, could be extended to meet other existing local trail-ways, by extending the trail along Shea Boulevard to Hayden Road. By connecting to existing trails east of Hayden Road along Shea Boulevard, the local trails within the study area could be linked to a larger trail system. This larger trail system has connections to regional trails.

The existing bicycle facility network within the study area provides for good access between locations. Opportunities for improvement of bicycle facilities within the study area consist primarily of additions of smaller segments. These segments would further enhance the connectivity between local destinations. At the conclusion of this project these opportunities will be presented to the municipalities for

use in future planning efforts regarding multi-use and recreation improvements.

### 2.13 AESTHETIC OPPORTUNITIES

Improvements to existing, or construction of new, drainage facilities can provide opportunities to increase the aesthetic quality of an area and also can increase opportunities for the public to view the surrounding landscape based on the Visual Character Analysis. Information from the Visual Character Analyses should be used to provide the framework for aesthetic improvements and the landscape design themes associated with each proposed drainage feature. In areas where existing drainage features have been rated as having a low or moderate visual intactness rating, aesthetic improvements can be made in conjunction with functional improvements to the drainage feature. For instance, if the underground pipe along Scottsdale Road between Cactus Road and Sutton Road were to be improved, aboveground aesthetic improvements including hardscape elements such as sidewalks and benches as well as landscape treatments could significantly improve the visual condition of the area. Berneil Ditch is a large structure that does not blend with the visual character of the area because of the size of the ditch and its incompatibility with the line, texture, and form of its surroundings. The Crossed Arrows Park Detention Basin Outfall Channel is bordered on either side by block

fencing, and consists of scattered trees and bare earth. There is little in the setting that creates visual interest and the elements of the landscape are not cohesive. Drainage improvements to this channel could be designed to incorporate multi-use and aesthetic improvements. Selection, density, and organization of plant material would reflect the specific character area.



*Cross Arrows Park Detention Basin Outfall Channel*

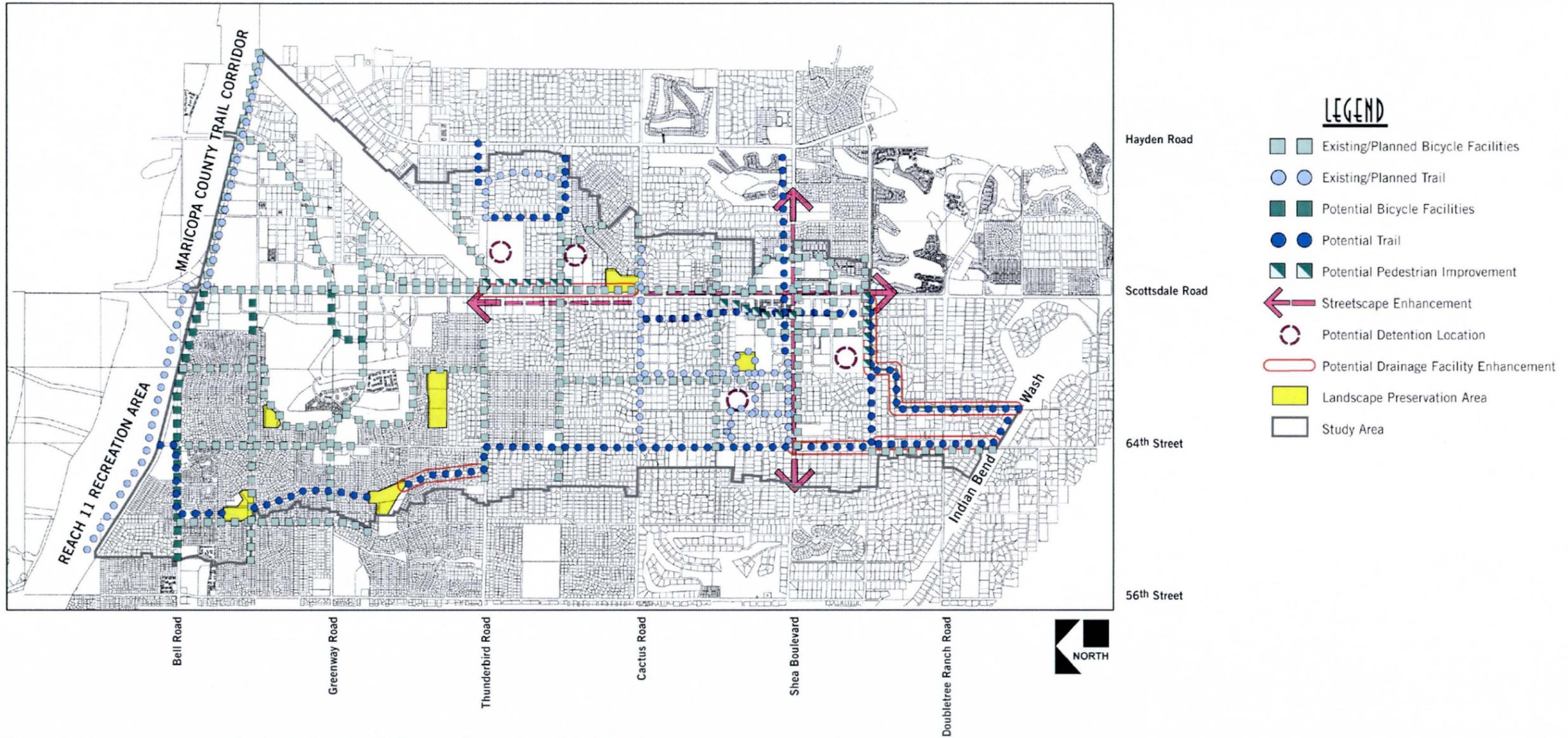
There are landscape areas within the study area that should be preserved or, if impacted, should be reconstructed back to its original conditions. These areas of preservation include the numerous parks

and open space facilities within the study area identified in the Turfed Open Space Character Unit. These facilities provide scarce amenities within a suburban environment. Any new drainage facilities should be designed to blend with the existing turf and canopied trees.



*Mescal Park*

**FIGURE 20. MULTI-USE/AESTHETIC OPPORTUNITIES**





# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 3.0 ALTERNATIVES FORMULATION

### 3.1 OVERVIEW

The alternative formulation process was conducted in three steps referred to in this report as Levels I, II and III. The Level I step involved the identification of regional drainage and flood problem locations within the study area and formulating initial alternatives that would address the specific problem at each location. The Level II step consisted of the development and expanded analysis of each initial alternative. And the Level III step was the assembly of location-specific initial alternatives into groups of system-wide regional solutions.

### 3.2 LEVEL I: ALTERNATIVE FORMULATION

The Level I alternative formulation involved input from a wide cross section of individuals, stakeholders and agencies that each had specific interest in the identification and development of Scottsdale Road Corridor Drainage Master Plan alternatives. All suggested Level I alternatives were documented in text format as presented later in this section. Preliminary hydrology and hydraulics for the overall study area were available for the Level I step but generally, no specific hydrologic or hydraulic computations were conducted in support of any initial alternative formulation.

#### 3.2.1 Alternatives Formulation Meeting

An entire day was devoted to a "brainstorming" session to formally initiate the alternatives formulation process for



the Scottsdale Road Corridor Drainage Master Plan. The meeting was held at the Flood Control District of Maricopa County on September 24, 2001. Meeting invitations were extended to almost 30 individuals representing the study team, stakeholders, private engineering consultants and the Scottsdale and Paradise Valley School Districts. The stakeholders included staff from the Flood Control District of Maricopa County, the City of Scottsdale, the City of Phoenix and the Town of Paradise Valley.

Two private engineering consultants were invited that had significant prior experience with drainage in the study area. Because many of the existing regional drainage facilities were located within city parks, invitations to Scottsdale, Phoenix and Paradise Valley included staff from their parks and recreation departments. Parks and

recreation invitees included operations, planning and maintenance staff. Scottsdale Airport representatives were also invited because of the regional detention basin located within the Scottsdale Airport near the south end of the runway.

Altogether, nearly 25 participants attended the alternatives formulation meeting including study team staff from Stanley Consultants and Logan Simpson Design. The attendees represented a wide array of backgrounds, technical expertise, perspective and level of familiarity with the study area. The various disciplines and backgrounds that were represented at the Alternatives Formulation Meeting included:

- Hydrology, hydraulics, drainage and civil engineering;
- Recreation and land use planning;
- Landscape architecture and aesthetics;
- Biology, archaeology, environmental planning and permitting;
- Drainage planning and floodplain administration;
- Capital improvements programs; and
- Maintenance and operations.

Because of the large amount of material to be covered, the high level of participation that was desired from the attendees and the need to focus on the study objectives, the meeting was conducted using a sequestered, facilitated format. The meeting was held in the New River



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conference room at the offices of Flood Control District of Maricopa County with refreshments and lunch brought in. Diane Simpson-Colebank of Logan Simpson Design served as the meeting facilitator.

A planning and strategy meeting was held prior to the Alternatives Formulation Meeting to organize the material that would be presented, to develop the roles of each of the meeting presenters and to work out meeting logistics. Another meeting was held prior to the Alternatives Formulation Meeting with staff from the Flood Control District, Stanley Consultants and Logan Simpson Design that was focused specifically on the study area's visual character, aesthetic inventory and recreational and multi-use facilities and opportunities. This meeting was intended to present the preliminary results of the visual, aesthetic and multi-use related existing conditions analysis to District landscape architect and land planning staff so that they would have a better understanding of the study area and be better prepared to participate in the Alternatives Formulation Meeting.

Based on the study's preliminary hydrology, a number of seed concept ideas had been suggested and discussed by various members of the study team prior to the Alternatives Formulation Meeting. These seed ideas were discussed informally at regular monthly coordination meetings and in other meetings and telephone conversations with various stakeholders. The hydrologic and hydraulic basis for the preliminary seed ideas

generally followed one of two primary themes. The first theme involved the concept of reducing storm discharges and volumes through storage in regional detention basins.

The second theme involved the concept of increasing the conveyance capacity of existing regional drainage channels and storm drains. In addition, there were also two seed alternatives that involved diverting storm flows from one corridor to another.

Subsequent to the first public involvement meeting in May of 2001, the Town of Paradise Valley expressed their preference for the regional storage theme over the increase in conveyance theme through a letter written by Bill Mead, the Town's public works director. Mr. Mead pointed out that virtually all of the drainage that passes through the Town of Paradise Valley in the Berneil Ditch and the Invergordon Road Channel originates in the Cities of Phoenix and Scottsdale. Therefore, he felt that the most accountable approach would involve reducing the flows generated in the watershed area outside of the Town of Paradise Valley.

Afshin Ahouriyayan, the Flood Control District's project manager for the study initiated the brainstorming meeting by presenting background and some brief history for the study including its origin, purpose and need, previous milestones and up-coming events. Next, Scott Buchanan, Stanley Consultant's project manager for the

study, presented a power point slide show "virtual tour" of the study area focusing on primary regional drainage features followed by a review of preliminary hydrology and hydraulics. Justin Hoppmann and Diane Simpson-Colebank then presented the results of their preliminary environmental analysis including a summary of visual character, an inventory of multi-modal facilities and a discussion of related opportunities and constraints.

Scott Buchanan then followed by presenting the group with a location-by-location description of the drainage and flooding problems within the study area. Some of the problem areas had been identified to the study team by area residents that attended the first public involvement meeting held the previous May. Other problem areas had come to the attention of the study team after the May meeting, either by historical accounts and drainage complaints relayed to them by city staff or problem areas documented in previous studies discovered through the data collection process.

It was suggested by Ken Lewis, a hydrology consultant for the City of Scottsdale, that the study team should exercise discretion in delineating between those problem locations that were small and isolated and those problem areas that were larger, more severe and more regional in nature. Mr. Lewis felt that trying to solve too many of the smaller problems could significantly dilute the effectiveness of a drainage master plan. Smaller drainage problems could more appropriately be



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addressed by capital improvement projects initiated locally by each city or town.

From the discussion that followed, the general consensus of the group seemed to be that the focus of a drainage master plan should be the larger infrastructure that addresses more wide spread problems and problems that potentially cross local jurisdictional boundaries. It was generally agreed that the original focus of the study was based on the old Paradise Valley, Phoenix, Scottsdale (PVSP) drainage infrastructure along the Scottsdale Road corridor including Scottsdale Road itself and the 71<sup>st</sup> Street Channel.

Each of the identified problem areas was then categorized into one of three classifications: significant, minor and possible but unconfirmed. The primary drainage features and stormwater conveyance corridors within the study area were then broken into four basic focus areas. These four focus areas had been established prior to the brainstorming meeting on the basis of preliminary hydrology and hydraulics, prior studies and historical accounts of significant flooding problems. Each of the four areas was then assigned to one of the four tables that attendees had been grouped at. Each table formed a team that was asked to brainstorm potential alternatives along each of the four focus areas. Individuals on each of the four teams had been purposely grouped to represent a diverse background and perspective within each team.

The four focus areas were as follows:

- The Berneil Ditch;
- The Lower 71<sup>st</sup> Street Channel – Mountain View Road to approximately 300 feet north of Mescal Street;
- The Upper 71<sup>st</sup> Street Channel – from approximately 300 feet north of Mescal Street to Cactus Road; and
- Scottsdale Road from Mescal Street to the Greenway-Hayden Loop.

Based on preliminary hydrology and hydraulics, it appeared at the time of the Alternatives Formulation Meeting that the regional stormwater detention basins at the Scottsdale Airport and at Cactus and Mescal Parks were capable of containing the 100-year, 6-hour storm event. Consequently, none of these locations were included in any of the initial alternatives formulation process as a problem location. However, each of these locations did represent opportunities to address downstream drainage and flooding problems through physical improvements because they were an integral part of the existing regional system.

Existing regional stormwater detention basins located in the City of Phoenix were generally performing at a 100-year level according to preliminary hydrology that had been completed at the time of the brainstorming meeting. At that time, the Phoenix basins were not considered to be in need of remediation to address flooding problems

either at or downstream from them. They were viewed more as having a limited opportunity, through potential physical improvements, to reduce the discharges that drain to the Scottsdale Road Corridor focus area.

Each team was then presented with a verbal summary of opportunities and constraints for each focus area and at each major drainage facility. Opportunities included, among other things, the potential optimization of stormwater conveyance and storage and the potential incorporation of multi-modal trails into the alternatives. Constraints covered such things as utilities, physical limitations, environmental conditions and regulatory restrictions.

Each team was provided with base maps and other resource data and asked to come up with as many initial alternatives as they could think of within each of their four respective focus areas. The basic objectives of each initial alternative were to either reduce discharge or increase conveyance. Diversion of flow from one corridor to another corridor was also under consideration, if the consequences of increasing flow along the receiving corridor could adequately be addressed.

Although each team had their own focus area consisting of a major drainage corridor, they were each encouraged to consider alternative features that might be outside of their respective focus areas, especially if it might provide additional opportunities to address other more localized



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drainage problems in the future. At the end of this process, each team was asked to select a spokesperson to summarize the results of their initial alternatives.

### 3.2.2 Initial Alternatives

The following is a summary of the initial location-specific alternatives that were proposed from the Alternatives Formulation Meeting. The locations of Initial Alternatives 1 through 15 are illustrated on Figure 21 on the following page.

#### Initial Alternative 1:

Reduce existing discharges in Scottsdale Road south of Thunderbird Road by intercepting drainage from around the Scottsdale Airport and diverting it into the Airport Detention Basin via new storm drain system(s). This alternative consisted of constructing a storm drain system under Greenway Road from 78<sup>th</sup> Street to 73<sup>rd</sup> Street and extending it south, down 73<sup>rd</sup> Street. New catch basins would be constructed in the east gutter of Scottsdale Road at Redfield Road, Evans Road and Acoma Drive and new storm drain laterals would connect these catch basins with the new 73<sup>rd</sup> Street storm drain trunk line. This new storm drain would turn east just north of Thunderbird Road and discharge into the Airport Detention Basin. Based on preliminary hydrology, the Airport Detention Basin appeared to be significantly sub-optimized and could take additional inflow. If there was enough capacity in the basin, another storm drain system could be constructed under Redfield Road from 76<sup>th</sup>

Street, draining into the Airport Detention Basin from the east. This would reduce the discharge going south on 76<sup>th</sup> Street that eventually flows into the Cactus Park Detention Basin.

#### Initial Alternative 2:

Reduce existing discharges in Scottsdale Road south of Thunderbird Road by optimizing the operation of the Scottsdale Airport Detention Basin. This alternative consisted of expanding and deepening the basin as much as possible, without violating Federal Aviation Administration (FAA) guidelines or interfering with airport operations, in order to increase storage capacity; constructing a low-flow bypass system in order to improve basin performance and offset additional flows that may discharge into basin via new storm drain system(s); and reducing the existing basin outlet to an optimal size while maintaining the existing basin freeboard. This alternative had limited multi-use and aesthetic opportunities because of its location within the airport.

#### Initial Alternative 3:

Increase the conveyance capacity of the Scottsdale Road corridor between Thunderbird Road and Sweetwater Avenue. This alternative consisted of extending the existing storm drain under Scottsdale Road north from Sweetwater Avenue to Thunderbird Road while maintaining the existing surface channel conveyance. A second option was to construct a storm drain system from Thunderbird Road to Sweetwater Avenue large enough to

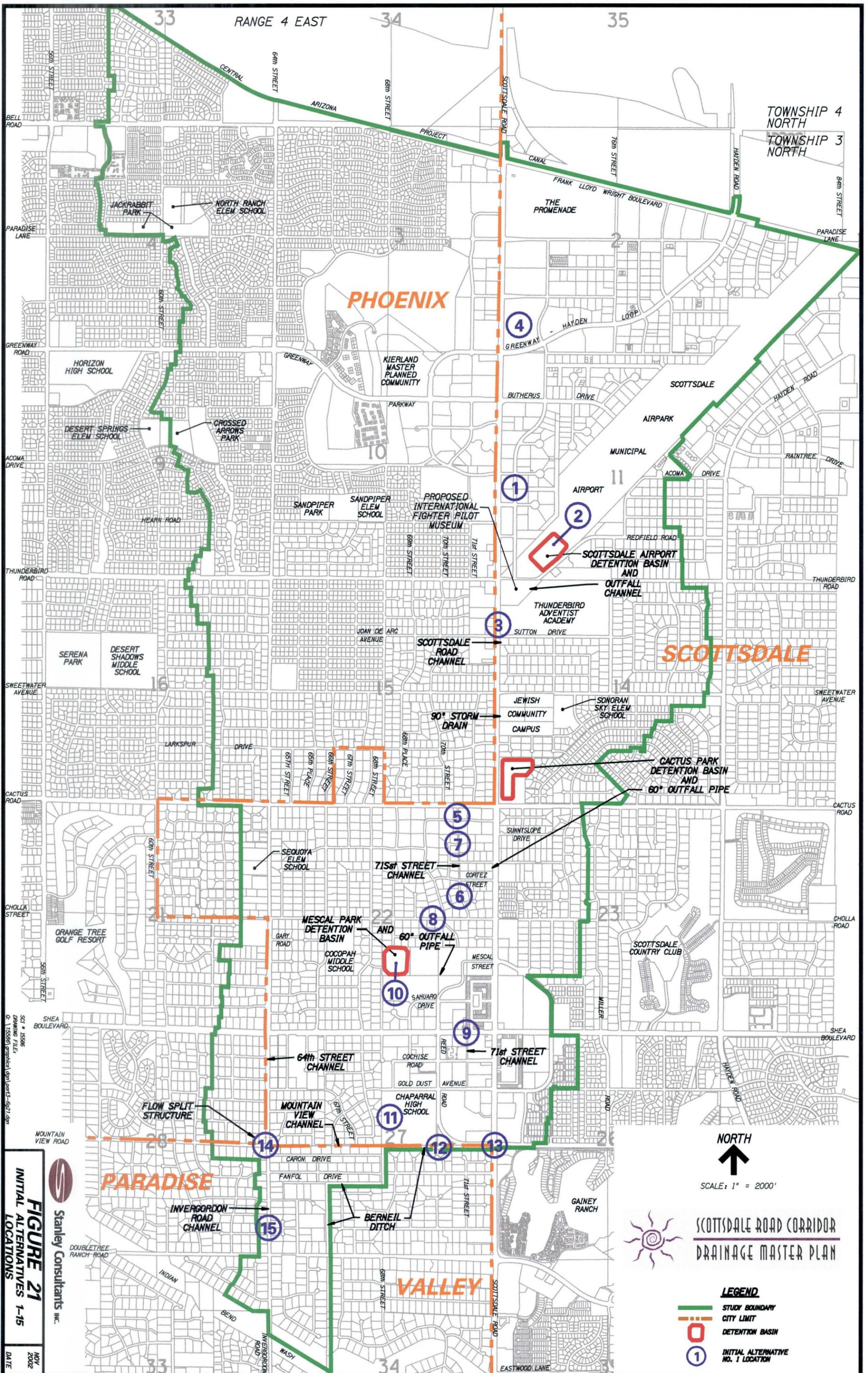
convey a 100-year discharge and fill in the existing surface channel conveyance. Catch basins would be constructed to collect local runoff on Scottsdale Road and direct it to the new storm drain system. The second option would lend itself to improved multi-use and aesthetic opportunities.

#### Initial Alternative 4:

Reduce existing discharges in Scottsdale Road by providing additional stormwater detention storage in the upper (northeastern) part of the study area. This alternative consisted of constructing new detention basins where potentially compatible open space land use exists. Two sites that were mentioned were the Cracker Jax golf driving range on Scottsdale Road north of the Greenway-Hayden Loop and the Thunderbird Adventist Academy property north of Sutton Drive east of Scottsdale Road. Local drainage would be collected and discharged into the new basins via new storm drain systems and the basin storage would be bled off into existing regional storm drains and/or channels.

#### Initial Alternative 5:

Reduce existing discharges in the upper 71<sup>st</sup> Street Channel by constructing a detention basin between Cactus Road and Paradise Drive. This alternative consisted of acquiring residential property and constructing a detention basin that would reduce discharges flowing down the 71<sup>st</sup> Street Channel in order to prevent overtopping during a 10- or 100-year design



**Stanley Consultants Inc.**

**FIGURE 21**  
INITIAL ALTERNATIVES 1-15

NOV 2002

DATE

**LEGEND**

- STUDY BOUNDARY
- CITY LIMIT
- DETENTION BASIN
- INITIAL ALTERNATIVE NO. 1 LOCATION

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## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

storm. Stormwater from the new detention basin could be bled off either into the existing 71<sup>st</sup> Street Channel or possibly into the existing Scottsdale Road storm drain (or both). The new detention basin would be landscaped and would have multi-use potential.

### Initial Alternative 6:

Increase the conveyance capacity of the upper 71<sup>st</sup> Street Channel by constructing a storm drain system. This alternative consisted of a new storm drain system under the existing channel in order to increase the combined conveyance. The storm drain would extend from Cactus Road to a point about 300 feet north of Mescal Street. A second related option that was considered was to construct a large enough storm drain to convey all local and regional flow and minimize or eliminate the surface conveyance from Cactus Road to the same location north of Mescal Street. Catch basins would be constructed to collect local runoff and divert it to the storm drain system. The second option would lend itself to improved multi-use and aesthetic opportunities.

### Initial Alternative 7:

Increase the conveyance capacity of the upper 71<sup>st</sup> Street Channel by replacing the existing channel with a larger one. This alternative consisted of replacing channel reaches that were not capable of conveying a 10- or 100-year design storm flow. This alternative did not involve constructing any new storm drain as in Initial Alternative 6. The upper part of the 71<sup>st</sup> Street Channel currently

does not have the capacity to convey even the 10-year peak discharge.

### Initial Alternative 8:

Reduce existing discharges in the 71<sup>st</sup> Street Channel below Cholla Road by re-directing some or all of the Cactus Park Detention Basin outfall discharge through the Mescal Park Detention Basin. Currently, the Cactus Park discharge outfalls, via a 60-inch diameter storm drain, into the 71<sup>st</sup> Street Channel just north of Mescal Street. Routing this discharge through the Mescal Park detention basin prior to discharging into the 71<sup>st</sup> Street Channel may decrease peak flows if there is enough capacity in Mescal Park to handle the diverted flow. Apparently, the Candidate Assessment Report for the Scottsdale Road Corridor Drainage Master Plan had interpreted this routing concept as being part of the original PVSP plan.

### Initial Alternative 9:

Increase the conveyance capacity of the lower 71<sup>st</sup> Street Channel by constructing a continuous closed concrete box structure in place of the existing channel. This alternative consisted of constructing a large box structure capable of carrying a 100-year design storm peak discharge. The box structure would extend from just north of Mescal Street to the Berneil Ditch. Surface conveyance over the new box storm drain would be needed only to handle local runoff. Catch basins would be constructed to drain the local runoff into the box

structure. The corridor over the new box storm drain could be re-landscaped and a multi-use path could be constructed.

### Initial Alternative 10:

Reduce existing discharges downstream from the Mescal Park Detention Basin by optimizing the efficiency of the basin. This alternative consisted of several enhancements to the basin including increasing its volume, re-designing the primary outlet pipe, incorporating a low-flow bypass system and intercepting and diverting local drainage into the basin. These enhancements could increase the amount of flow routed through the basin and decrease the rate at which the flow leaves the basin. There would be significant impact to Mescal Park during construction but this is not a heavily used park and all of the landscaping and multi-use trails and paths could be re-established after construction.

### Initial Alternative 11:

Reduce the existing discharges in the Berneil Ditch downstream from the Mountain View Channel confluence by constructing a new detention basin at Chaparral High School. Utilizing a portion of the Chaparral High School property in order to construct a detention basin could better regulate the flow entering the Berneil Ditch. The Chaparral High School athletic field is adjacent to the north side of the Berneil Ditch, immediately upstream from the Mountain View Channel confluence. The original PVSP plan included constructing a new regional



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stormwater detention basin at Chaparral High School at the far west side of the athletic fields. That basin was never constructed.

### Initial Alternative 12:

Increase the conveyance capacity of the upper Berneil Ditch by increasing the cross sectional area and hydraulic efficiency within the reach along the Mountain View Road alignment. This alternative consisted of widening, deepening and lining the upper Berneil Ditch with a hard surface. This option could entail relocating the existing access/maintenance road from the south bank to the bottom of the channel to widen it. Currently, the majority of this reach is not capable of conveying the 10-year peak discharge.

### Initial Alternative 13:

Reduce the discharge in the Berneil Ditch by diverting drainage that enters it. Flow that concentrates at the intersection of Scottsdale and Mountain View Roads would be diverted south along Scottsdale Road all the way to the Indian Bend Wash. All or a portion of the flow that concentrates at this location could be collected and diverted by constructing catch basins and a storm drain system under Scottsdale Road.

### Initial Alternative 14:

Reduce the discharge in the Berneil Ditch by diverting drainage at the 64<sup>th</sup> Street (Invergordon Road) Channel and Mountain View Road Channel concrete flow split

structure. This alternative consisted of removing the existing concrete flow bifurcation structure at this location and taking all the flow south directly to the Indian Bend Wash. Although no hydraulic analysis could be found for the structure, from a visual inspection it appears as if the structure were intended to split the flow 50/50 with half the flow continuing south down the Invergordon Road Channel and the other half of the flow being diverted east down the Mountain View Channel. By removing the structure, all the flow would continue south, decreasing discharge in the Mountain View Channel and Berneil Ditch. The diverted flow would outfall into the Indian Bend Wash at Invergordon Road. The channel and culverts along Invergordon Road south of the Mountain View Road alignment would have to be enlarged to carry the added flow.

### Initial Alternative 15:

Increase the conveyance capacity of the Invergordon Road Channel south of the Mountain View Road alignment by constructing a continuous closed box structure. This alternative consisted of replacing the existing open channel and culverts with a closed system. The system would be a large box structure capable of conveying the 10- or 100-year design storm peak discharge. Inlets would also be constructed to collect and divert local runoff into the new storm drain system. The new storm drain system would outfall into the Indian Bend Wash. This system would need to be constructed in conjunction with Initial Alternative 14. Potential side

benefits to this initial alternative would be to create multi-use, aesthetic and improved traffic safety opportunities along Invergordon Road in conjunction with plans that the Town of Paradise Valley was considering to widen or improve the adjacent roadway.

### **3.2.3 Alternatives Formulation Meeting Conclusion**

After identifying the initial alternatives, the next step at the Alternatives Formulation Meeting was to re-assemble each of the teams and ask them to brainstorm a complete set of initial alternatives that would address the drainage problems on a study wide (system wide) basis. The study wide initial alternatives consisted primarily of different combinations of the area-specific initial alternatives described previously.

The next task was for attendees to establish and prioritize preliminary criteria for evaluating the alternatives. Three categories of evaluation criteria were developed in order to group the preliminary criteria. These groups were Economic, Environmental and Social. The following is a list of preliminary criteria within each of the three categories:

- Economic – implementation cost, maintenance cost, construction cost, design life and funding;
- Environmental – permitting, aesthetic, urban wildlife habitat and cultural/hazmat impacts; and



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- Social – agency acceptance, community acceptance, perceived benefit, multi-use opportunities, land acquisition, access during flooding and impacts to circulation during construction.

Each attendee ranked the preliminary criteria within each category, and the sum of the total ranking for each criterion was calculated. Preliminary criteria within each category were then normalized and weighted against each other based on the total ranking summation for each criterion and the total possible ranking points for each category. This step was used to evaluate the relative importance of each preliminary criterion.

Shortly after the Alternatives Formulation Meeting, Bill Meade with the Town of Paradise Valley wrote a letter to the study team documenting the Town's preference for alternatives that would reduce discharges in the Berneil Ditch over alternatives that would increase conveyance.

### 3.3 LEVEL II: ALTERNATIVE DEVELOPMENT

The purpose of the Level II analysis was to develop the initial alternatives identified in the Level I Alternative Formulation step and explore the strengths and weaknesses of each. Preliminary existing condition hydrology and hydraulic modeling that was available at the time of the Alternatives Formulation Meeting was finalized in Level II. Initial alternatives were reviewed in light of the final hydrology and hydraulics. As a result, new drainage and flooding problem locations were identified, initial alternatives from

Level I were modified as necessary and a few new initial alternatives were added.

The amended set of initial alternatives was screened on a multi-level basis and a few of these alternatives with obvious technical flaws or very marginal benefit were eliminated. Each of the remaining individual location-specific alternatives was then further analyzed and conceptually developed with a preliminary level of hydrology, hydraulics, aesthetics, utility and easement investigations and construction cost estimates.

Multi-use and aesthetic opportunities and constraints were also considered at each location in the development of initial alternatives. Multi-use and aesthetic features were typically reflected in the preliminary cost estimates at each location where they were identified. Wherever possible, the development of alternative solutions considered the aesthetic character of the surrounding area and the multi-use recreational needs of the community.

Based on both the quantitative and qualitative results of the Level II development step, the remaining initial alternatives that did not appear to meet at least a majority of study objectives were eliminated from further consideration. The remaining initial alternatives were then assembled for the next step in the formulation process, Level III. This involved organizing the location-specific alternatives into sets of system-wide groups.

#### 3.3.1 Final Existing Condition Hydrology and Hydraulics

The first step in the Level II analysis involved completing and finalizing of the preliminary existing condition hydrology and hydraulic analysis. The initial alternatives from the Alternatives Formulation Meeting were then reviewed to confirm whether the drainage and flooding problems and associated alternative opportunities originally envisioned in Level I were still valid. Generally, most of the discharges from the preliminary existing condition hydrology, both from individual sub-basins and the summed hydrographs at larger concentration points, increased in the final hydrology. This was mainly due to a change in the rainfall from a single to a multi-storm option in HEC-1 to more properly account for higher rainfall intensities associated with smaller storm cells.

As a result, unit discharges for individual sub-basins increased significantly. Increases in discharge also occurred at the larger concentration points but these increases were generally moderate. Typically, the larger the contributing area, the smaller the increase in both discharge and in unit discharge. Some of the revised discharges increased the perceived severity of previously identified drainage problem areas. This in itself did not significantly change the initial set of location-specific alternatives developed at the Alternatives Formulation Meeting. It did, however, bring to light new drainage and flooding problem locations.



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Other more significant changes that were made in the final hydrology included the addition of new hydrograph diversion steps at concentration points corresponding to the intersection of 64<sup>th</sup> Street and Shea Boulevard, along Greenway Road near 78<sup>th</sup> Street and at Gold Dust Avenue near the southeast corner of the Windmill Plaza. The diversion step at the intersection of Scottsdale and Mountain View Roads was revised. New diversion steps and corresponding downstream reach routing steps were also added to account for the overflow conditions found at the Cactus and Mescal Park detention basins. And finally, other hydrograph diversion and reach routing steps that had been based on preliminary field information were refined and concluded.

The preliminary hydraulic analysis was also completed along with the conclusion of preliminary hydrology. This consisted primarily of re-running the preliminary HEC-RAS model, normal depth hydraulic sections and culvert hydraulic models with revised discharges. There were also more normal depth cross sections added along the upper Scottsdale Road Channel and a new normal depth reach was added for the Continental Plaza Channel.

### 3.3.2 Amended Initial Alternatives

Final hydrology and hydraulics for the Scottsdale Road Corridor Drainage Master Plan are documented in the Technical Section Volumes 1 and 2 under separate cover. The finalization of hydrology and hydraulics resulted in an amended set of initial alternatives to

investigate for Level II. Initial alternatives that were added are described as follows. The locations of Initial Alternatives 16 through 19 are illustrated on Figure 22 on the following page.

#### Initial Alternative 16:

Modify the Cactus Park detention basin to prevent overflow during the 100-year event. According to preliminary hydrology, the Cactus Park Detention Basin could handle the 100-year storm without overflowing. But according to the final hydrology, this was not the case and a surface overflow of over 800 cfs could occur. This overflow would pass through the residential area south of Cactus Road east of Scottsdale Road. Improvements under consideration included the addition of storage volume by acquiring residential parcels to the north of the Park and expanding it laterally or raising the emergency overflow section along Cactus Road. Also under consideration was to increase the capacity of the primary outlet pipe by replacing it with a larger pipe or by adding a second pipe. The basin already incorporates a low flow bypass system that appears to be operating optimally.

#### Initial Alternative 17:

Improve the function of the existing Thunderbird Industrial Detention Basin to prevent its overflow for at least a 10-year storm. Potential improvements included increasing the volume of the basin by expanding it laterally into the Thunderbird Adventist Academy. This would necessitate acquiring about one to three acres of land from the

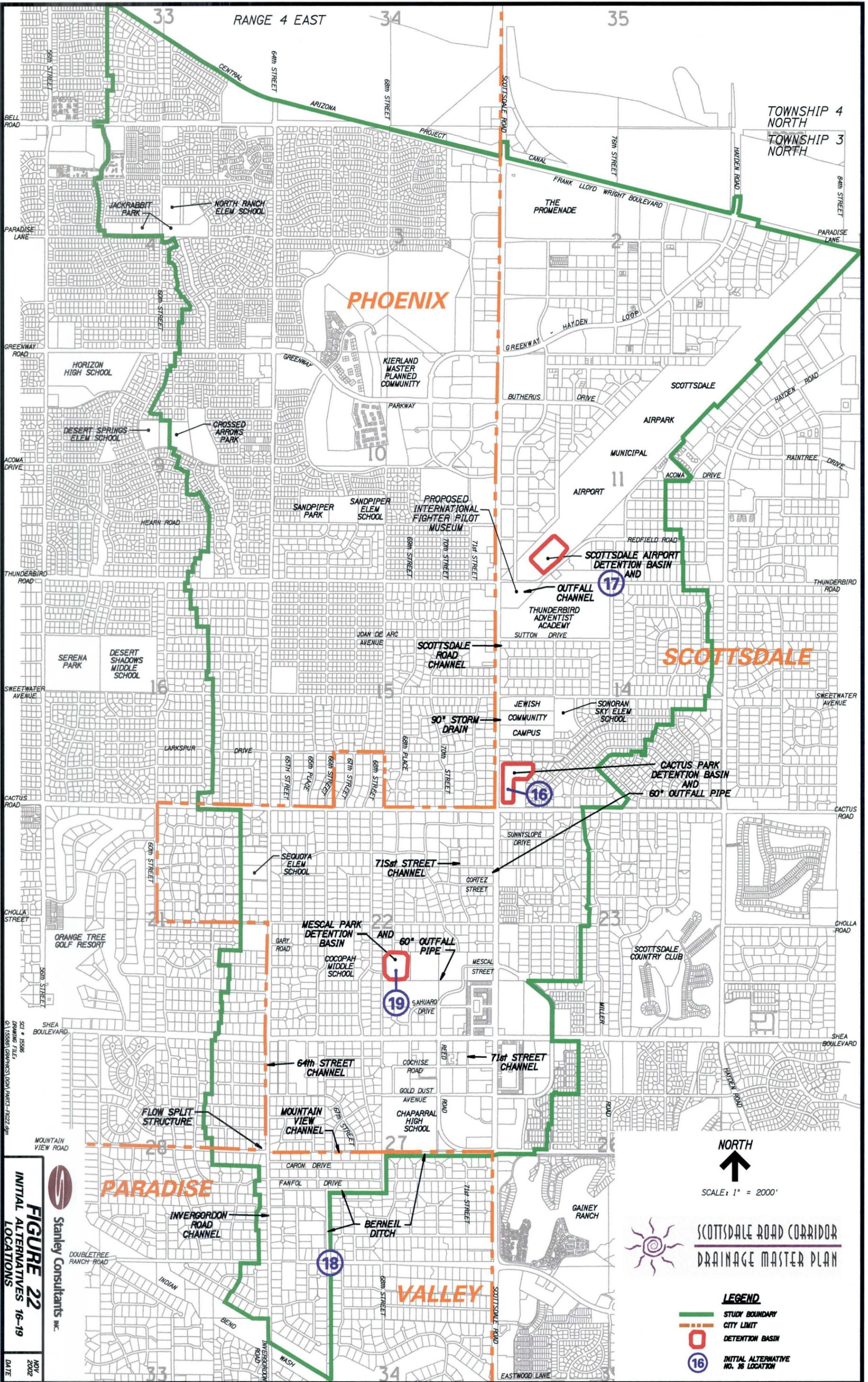
Adventist Academy. Another option considered was increasing the capacity of the primary outlet pipe running south in 76<sup>th</sup> Street. These improvements could be combined with each other or with Initial Alternative 1 that would potentially divert a portion of the drainage that contributes to the Thunderbird Industrial Basin to the Airport Detention Basin. Flooding along 76<sup>th</sup> Street south of Thunderbird Road would potentially be alleviated.

#### Initial Alternative 18:

Improve the capacity of the existing multi-cell box culvert under Double Tree Ranch Road at the Berneil Ditch so that it would convey the 100-year discharge. This would be necessary if upstream improvements on the Berneil Ditch under Initial Alternative 12 would contain and convey the entire 100-year discharge in the reach upstream from the culvert. The culvert is currently capable of handling a 10-year discharge but not a 100-year discharge. If the capacity of the culvert is exceeded, overflow will break away and not re-join the Berneil Ditch downstream. Increasing the culvert capacity would be accomplished by either adding a new cell (or cells) or by reconstructing existing cells to a deeper configuration.

#### Initial Alternative 19:

Improve the Mescal Park Detention Basin as suggested in Initial Alternative 10 but not so much to decrease discharges to the 71<sup>st</sup> Street Channel and to the south, but to prevent the basin from overflowing during a 100-



33 RANGE 4 EAST 34 35

TOWNSHIP 4 NORTH  
TOWNSHIP 3 NORTH

PHOENIX

SCOTTSDALE

PARADISE

VALLEY

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DRAINAGE MASTER PLAN**

**LEGEND**

- STUDY BOUNDARY
- CITY LIMIT
- DETENTION BASIN
- INITIAL ALTERNATIVE NO. 16 LOCATION

NOV 15 2002  
DATE

Stanley Consultants Inc.

FIGURE 22  
INITIAL ALTERNATIVES 16-19



SCALE: 1" = 2000'



NOV 15 2002  
DATE

Stanley Consultants Inc.

FIGURE 22  
INITIAL ALTERNATIVES 16-19

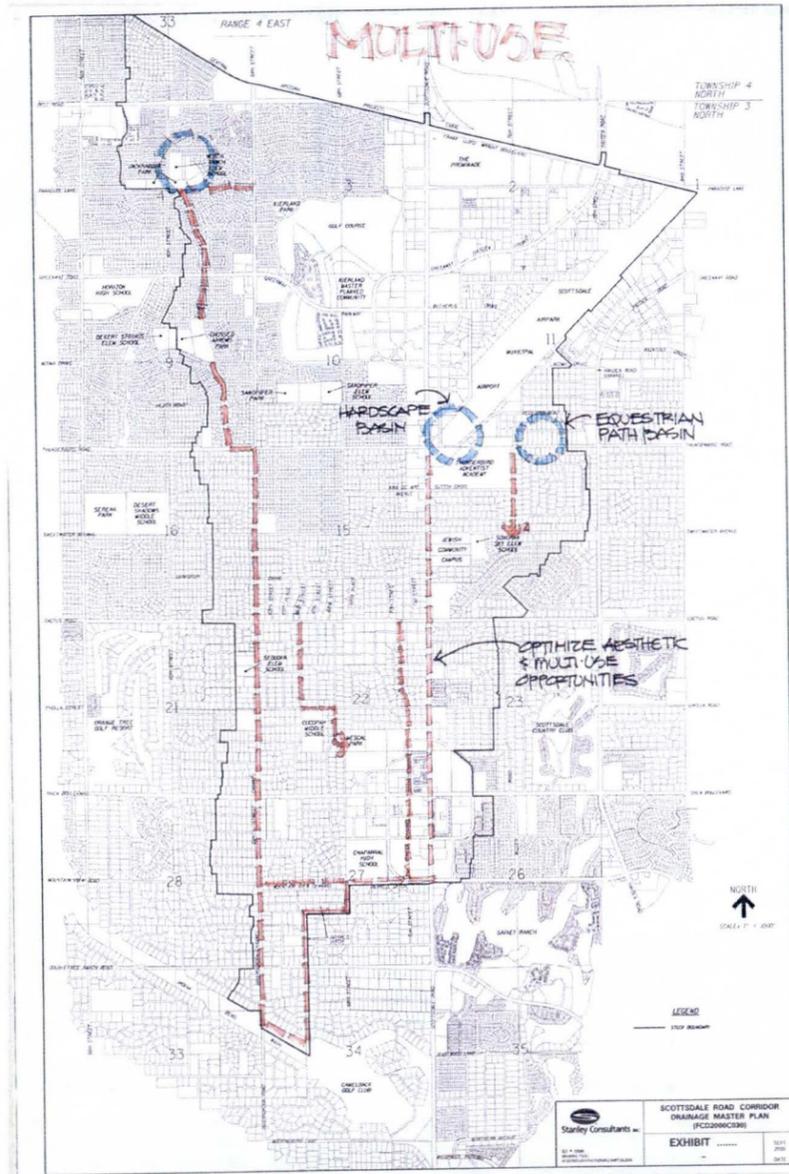


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year event. According to preliminary existing condition hydrology, the Mescal Park Detention Basin could handle the 100-year storm without overflowing. But according to the final hydrology, this was not the case and a surface overflow of about 100 cfs could occur through the residential area south of the park. Surface overflow at Mescal Park is of particular concern because there is no defined, hardened spillway. An additional concern is that part of the basin's storage volume is formed by an earth dike that is between two and three feet in height above the adjacent ground.

### Initial Alternative 20.

This alternative was developed to maximize the multi-use recreational and aesthetic improvements within the study area. The proposed improvements included aesthetic improvements to Jackrabbit Park, aesthetic improvements and construction of a multi-use path along 64<sup>th</sup> Street, construction of a multi-use path along the Mountain View Channel and 71<sup>st</sup> Street Channel, the construction of a linear park in the Berneil Ditch, the construction of a park-like detention basin at the Thunderbird Basin, replacing the open channel along Scottsdale Road with an underground culvert with a multi-use path and landscaping at the surface, and improving the Scottsdale Airpark detention basin by constructing a hard-scaped surface pattern within the basin. Initial Alternative 20 is illustrated in Figure 23.



**FIGURE 23 INITIAL ALTERNATIVE 20**

### **3.3.3 Preliminary Screening and Elimination of Initial Alternatives**

Initial alternatives were screened on the basis of both quantitative and qualitative considerations. The primary criterion used in this initial screening process included hydrologic and hydraulic performance (technical feasibility) but also included cost issues, property acquisition needs, public safety, and community and agency (stakeholder) support. Alternatives that required acquisition of property, especially whole residential parcels, were not considered desirable but were not completely eliminated from consideration, at least initially. Initial location-specific alternatives having more of a local drainage benefit and not significantly helping to reduce regional flooding in the Scottsdale Road Corridor were also under consideration to be eliminated.

The first significant step in this stage of the study involved a preliminary hydrologic screening of the existing regional detention basins in the City of Phoenix portion of the study area. These included the basins in Jackrabbit, Crossed Arrows and Sandpiper Parks, the Thunderbird Road basin at the northwest corner of 64<sup>th</sup> Street and Thunderbird Road and all of the Kierland detention and retention basins.

Regional drainage facilities in the City of Phoenix were originally included in the study area primarily to understand their hydrologic function relative to the Scottsdale Road Corridor. But it was also originally



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envisioned that regional detention basins in the City of Phoenix could be optimized to potentially provide a beneficial reduction in discharge to the Scottsdale Road Corridor. The results of the final existing condition HEC-1 analysis were reviewed at each of the level pool routing steps associated with the Phoenix basins. Hypothetical improvements such as additional storage volume, low flow bypass features and primary outlet optimization were then made to the existing condition HEC-1 model.

The regional drainage facilities in the City of Phoenix are generally very effective both individually and as a system. Most of the basins and channels included in the HEC-1 analysis for this study are capable of handling at least a 10-year storm and many can handle a 100-year storm without overtopping. Although there appeared to be opportunities to optimize the operation of some of the regional basins, the benefits in discharge reduction were generally very localized. The cost and other impacts associated with these opportunities were significantly out of balance with the marginal hydrologic benefit that would be provided to the Scottsdale Road Corridor. In addition, the multi-use and aesthetic opportunities involving the City of Phoenix regional drainage facilities that were initially envisioned from the Alternatives Formulation Meeting did not, on their own, support the pursuit of alternatives in the City of Phoenix. Therefore, it was decided by the project team that there would be no further investigation into alternatives involving regional drainage facilities in the City of Phoenix portion of the study area.

Next, Initial Alternative 4 was reviewed. This alternative involved the proposed construction of new regional detention basins on two parcels that currently had land uses involving sizable open space tracts. The two parcels in question were the Cracker Jax golf driving range on Scottsdale Road north of the Greenway-Hayden Loop and the Thunderbird Adventist Academy on the north side of Sutton Drive between Scottsdale Road and 76<sup>th</sup> Street. The study team decided not to pursue this initial alternative for two reasons. First, although the large open space aspect of each parcel might appear compatible with a regional stormwater detention basin function, the cost of acquiring a permanent easement to accomplish this concept was anticipated to be as much or almost as much as the full fee title cost of the land. And second, neither of the two parcels appeared to be in a very strategic location that would achieve more than a local benefit in discharge reduction.

The next alternative considered was Initial Alternative 8, involving re-routing some or all of the Cactus Park Detention basin outfall discharge through the Mescal Park basin. Although it is physically possible to do this, it was not considered desirable for a number of reasons. First, the outlet pipe for the Cactus Park Basin is only 60 inches in diameter and is relatively long (about 4,000 feet). It operates under outlet control with a large friction loss component. Re-routing all of the flow from Cactus Basin to the Mescal Basin would involve a much longer routing length and would necessitate a significantly larger

conveyance than a 60-inch diameter pipe. The larger conveyance would be required to overcome the additional hydraulic losses associated with the longer routing length in order to not impact the existing primary outlet capacity of the Cactus Basin. Re-routing part of the flow instead of the total flow would be possible but Mescal Basin is already in an overflow condition for a 100-year storm and would not have capacity to take any additional inflow. And last, the 100-year outflow conveyed by the Cactus Basin primary outlet pipe is only between 200 and 250 cfs so there is not a great potential for discharge reduction to begin with.

Initial Alternative 11 involving construction of a new detention basin at Chaparral High School was considered next. Although this was part of the original PVSP plan, the location of this basin was poor from a hydrologic standpoint. It would not help reduce flows in the 71<sup>st</sup> Street Channel and is really too far downstream in the overall study area watershed. Without an extensive collection and inflow system, it would not receive much local runoff and would only provide a marginal benefit in discharge reduction to the Berneil Ditch. There were potential multi-use and aesthetic benefits associated with this alternative but there were also significant impacts to the Chaparral High School athletic fields. The Chaparral High School detention basin concept was therefore dropped from further consideration by the study team.



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### 3.3.4 Level II Analysis

Generally, those alternatives involving an increase in stormwater conveyance, such as channel improvements or the addition of storm drain trunk lines, had little or no effect on the hydrology of the overall system in either an upstream or downstream direction. Therefore, that set of initial alternatives was essentially independent from each other in a hydrologic sense. On the other hand, the initial location-specific alternatives that involved re-directing discharges, improving existing regional detention basins and constructing new regional detention basins had a real potential for improving hydrology by reducing discharges downstream from the proposed improvement.

To evaluate this, the HEC-1 model from the Parts 1 and 2 existing condition analyses was modified to reflect the proposed improvements. This re-modeling process was conducted for each of the alternative scenarios where a reduction in discharge was anticipated. HEC-1 models corresponding to these scenarios are included in the Technical Section Volume 3 (under separate cover).

From a hydrologic and hydraulic standpoint, all potential alternatives were initially considered to be hydrologically independent from one another. This assumption generally held true but as the development and analysis process advanced and location-specific alternatives evolved into groups of system-wide alternatives, the initial assumption gave way to hydrologic models that did

recognize and reflect proposed alternative conditions on both a location-specific and system-wide basis.

One of the more significant hydrologic conclusions from the Level II analysis was observed from one of the proposed "with project" HEC-1 models. Existing condition 100-year discharges at major concentration points were compared with discharges under one of the proposed "with project" HEC-1 models that included conceptual storage and optimization improvements to the existing regional detention basins at the Scottsdale Airport, Cactus Park and Mescal Park. The proposed concept improvements resulted in a wide range of discharge reductions immediately downstream from each of those three regional basins. Some of the discharge reductions provided excellent local benefit. However, at the Berneil Ditch, the reduction in discharge from these combined proposed improvements amounted to only about a five percent reduction in the 100-year discharge.

A preliminary utility location investigation was conducted for all of the Initial Alternatives that remained after the preliminary screening process. This investigation utilized the City of Scottsdale GIS database, as-built drawings that had been collected in the initial phase of the study and field reconnaissance. The primary objective of this investigation was to identify utilities that would have a significant conflict with the proposed alternatives and prohibit construction. Water and sewer lines were

identified using Scottsdale's GIS database and as-built drawings. In addition, as-built drawings for various prior roadway and drainage projects were used to locate natural gas, electric and telephone lines that were depicted in plan and profile adjacent to Scottsdale Road. Through site visits and field reconnaissance, utilities such as the overhead power lines located along the channel adjacent to Scottsdale Road from Thunderbird Road to Sweetwater Avenue were identified.

A preliminary drainage easement and property ownership investigation was conducted for each remaining Initial Alternative along the Scottsdale Road Channel, the 71<sup>st</sup> Street Channel and the Berneil Ditch. The City of Scottsdale GIS database was used to identify drainage easements along the Scottsdale Road and 71<sup>st</sup> Street Channels. Once drainage easements were identified, a list of adjacent parcels was provided to the City of Scottsdale and City staff was able to provide recorded documents for most, but not all of the easements.

The drainage easement documents typically described right-of-way purpose, included a legal description of the location and boundaries and identified the grantor and grantee. The Berneil Ditch is situated entirely within the Town of Paradise Valley in a tract of land that is owned and maintained by the Town. The width and length of the Berneil Ditch tract was estimated from County Assessor maps and the Stanley Consultants field survey conducted



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early in the study. Initial Alternative improvements under consideration at Cactus and Mescal Parks would be completely contained within each park on land owned by the City of Scottsdale.

Preliminary unit construction costs were obtained from Flood Control District of Maricopa County (FCDMC) bid tabulations that covered a wide range of projects. Unit construction costs for items not present in the FCDMC bid tabulations were developed from previous Stanley Consultants projects for the Arizona Department of Transportation (ADOT), the City of Scottsdale and the City of Phoenix. Many of the construction quantity estimates for drainage facilities were calculated utilizing the ADOT standard drawings. An additional mark-up cost was added to the construction cost of each initial alternative. The mark-up cost was typically 35 percent of the construction costs and was intended to account for the following:

- 5% for construction cost contingency;
- 5% for utility relocation;
- 5% for mobilization, permitting and traffic control;
- 15% for design, and construction survey; and
- 5% for inflation.

In addition to the cost of construction, there was also an estimate made for the cost of right-of-way and easements, where anticipated. The cost of fee title right-of-way was typically based on a unit cost of \$15 per

square foot and the cost of temporary construction or permanent drainage easements was typically based on a unit cost of \$5 per square foot. The total preliminary cost for each alternative was the summation of construction and right-of-way/easement costs and the 35 percent mark-up.

Typically, the operations and maintenance costs associated with the Level II alternatives were not considered significant or significantly different from one another to play a role in the evaluation process. Therefore, these costs were not estimated at this step.

Each of the remaining alternatives was evaluated on the potential for the drainage improvements to provide new multi-use opportunities. Additionally, these improvements were evaluated to determine if they could incorporate features to increase accessibility to, or linkage between existing facilities. This evaluation was based on the initial inventory and analysis of multi-use facilities and opportunities, completed as part of the Part 2 documentation. In addition to determining the potential for multi-use improvements, each alternative was evaluated to determine the potential for proposed drainage improvements to enhance or improve the aesthetics within the study area. Drainage features were evaluated in the Part 2 documentation on the basis of their aesthetic qualities. The development of each alternative attempted to increase the aesthetic quality of the area by increasing the visual interest or cohesiveness

of the drainage feature with the surrounding landscape character through design and/or landscaping.

After the Level II development of Initial Alternatives, several of the location-specific alternatives were deleted from further consideration by the study team based on essentially the same criteria that was considered in the initial screening.

Initial Alternatives 1 and 2 involving the Scottsdale Airport regional detention basin were extensively developed and expanded on a technical level and coordinated closely with a number of individuals, groups and agencies. However, after careful deliberation, the related set of initial Scottsdale Airport alternatives was deleted from further consideration, primarily on the basis of cost in relation to the benefit of reduced discharge that would have resulted.

In the process of developing Initial Alternatives 1 and 2, a new proposed regional detention basin had been added to the system at the northeast corner of Greenway Road and 78<sup>th</sup> Street to control the storm discharge that would overtop Greenway Road and flow through the Scottsdale Airport and adjacent industrial airpark properties. This new basin would also reduce the size of the storm drain conveyance from Greenway Road to the Airport basin that was initially proposed.



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The study team held a number of meetings with the Scottsdale Airport operations and administrative staff and their engineering consultant to introduce and explain the concepts of the initial alternatives involving the Airport basin. Other meetings and coordination were conducted with the sponsor for the proposed International Fighter Pilot Museum (IFPM) that was planned for construction on Scottsdale Airport property south of Thunderbird Road. In addition, Scottsdale Airport staff introduced the regional drainage concepts involving the Airport basin to the Federal Aviation Administration (FAA) using exhibits and correspondence developed by Stanley Consultants.

The new regional basin north of Greenway Road would have required the acquisition of about five acres of land. This would have been very expensive and condemnation was undesirable even though the property was vacant. Construction of the new regional basin would have alleviated a documented historical overflow condition but this was considered to be both a local condition and outside of the Scottsdale Road Corridor focus area.

According to existing condition hydrology, the Scottsdale Airport detention basin is already capable of controlling a 100-year storm without overtopping. There was also concern from the Scottsdale Airport operations staff regarding environmental hazards that might be introduced into the Airport basin by proposed offsite storm drains. There were very few potential benefits related to any of the proposed Airport Detention basin features from an

aesthetic and multi-use standpoint. And finally, there were concerns expressed by the FAA that proposed improvements would not meet their design criteria and that the added inflow to the basin may potentially make the basin more attractive to birds, thus increasing the risk to aircraft.

Initial Alternative 5 involving the construction of a new regional detention basin along the 71<sup>st</sup> Street Channel between Cactus Road and Paradise Drive was also dropped from further consideration after the Level II analysis. There were a number of depth-volume-outfall configurations developed at this location, all of which were constructible and had a locally positive discharge reduction benefit downstream on the 71<sup>st</sup> Street Channel. However, this alternative would have required the acquisition of three occupied residential properties and this was considered extremely undesirable.

Initial Alternatives 13, 14 and 15 were also eliminated from further consideration. These alternatives involved deflecting storm flows contributing to the Berneil Ditch to other drainage corridors. The cost to up-size the storm drain under Scottsdale Road proposed as part of a future City of Scottsdale roadway improvement project was too large to justify in terms of the discharge reduction benefit to the Berneil Ditch. Elimination of the existing flow split structure at 64<sup>th</sup> Street (Invergordon Road) and the Mountain View Road alignment would have reduced the flow to the Berneil Ditch by a few hundred cubic feet per

second. But the cost of accommodating the extra flow going south in the Invergordon Road channel was far in excess of the cost of structural conveyance alternatives for the Berneil Ditch that would be necessary to deal with existing condition discharges.

The need to acquire property and relocate residents also played a part in dropping two other Initial Alternatives from further consideration. The alternative at Cactus Park detention basin that involved increasing the storage volume by acquiring four residential parcels of land on the north side of the basin was dropped. Improvements to the Thunderbird Industrial detention basin were dropped in part because of the need to acquire land from the Thunderbird Adventist Academy and in part because it was considered to be a local drainage improvement that would not significantly benefit the Scottsdale Road Corridor focus area.



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### 3.3.5 Level III System-Wide Solutions

The next step in the development of alternatives was a challenging one. That step was to develop system-wide groups of alternatives from the location-specific alternatives that remained after the Level II development and analysis was complete. The term "system-wide" relates to the primary focus area of the Scottsdale Road Corridor Drainage Master Plan. The primary focus area was established by the study team as being along the Scottsdale Road drainage corridor, the 71<sup>st</sup> Street Channel and the upper reaches of the Berneil Ditch in the Town of Paradise Valley. The focus area includes the Cactus Park and Mescal Park detention basins.

That part of the focus area in the City of Scottsdale roughly corresponds to the area of concern originally identified by Scottsdale in their request for the capital improvement project. That part of the focus area in the Town of Paradise Valley was established after the study began as mentioned in Section 1.0. Identifying the focus area was an important step since there was such an extensive interconnection of drainage infrastructure in the study area. The focus area and its relationship to the overall study area is illustrated on Figure 24.

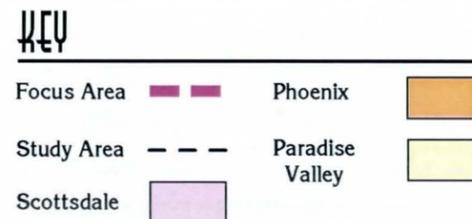
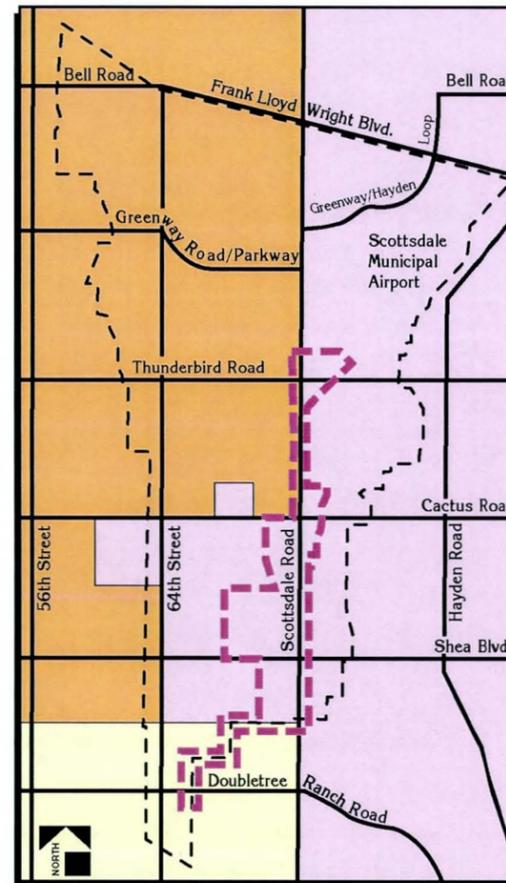


FIGURE 24 STUDY AREA AND FOCUS AREA

The study team also reaffirmed that this study is intended to deal with drainage and flooding on a regional basis. It relates to the larger drainage facilities and stormwater conveyance corridors that benefit and/or impact large areas of land. Cities and towns usually address the smaller, more localized drainage problems independently through municipal capital improvement projects without assistance from FCDMC. The development of location-specific alternatives that ensued in Level III would involve only regional facilities located in the focus area.

Based on final hydrology and the HEC-1 models that were created to reflect the location specific alternatives, two conclusions became apparent:

- The Level II improvements at each of the primary alternative locations were essentially independent from one another in a hydrologic sense.
- The reduction in discharge resulting from proposed regional detention basin improvements was not as significant as originally envisioned and would only provide local or minor benefit to the primary drainage corridors.

Improvements to the Cactus and Mescal Park detention basins, while providing local downstream benefits, did not significantly reduce discharges to the 71<sup>st</sup> Street Channel and the Berneil Ditch. Therefore, it was not imperative to perform improvements to the Cactus and Mescal basins from a system-wide hydrologic standpoint. However, the



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proposed Level II improvements at those detention basins had merit that was independent from Level II conveyance improvements because the overflow at each basin had potentially very hazardous consequences, however local.

Soon, it became evident that system-wide alternatives were going to involve various combinations of conveyance improvements along each of the primary drainage corridors. Conceivably, the remaining location-specific alternative conveyance features could be combined in many, many different system-wide solutions.

Both the study area and the Scottsdale Road corridor are highly urbanized and generally have well-established drainage infrastructure. Because of this, it was difficult to apply overall basic conveyance themes in the development of system-wide alternatives. The Berneil Ditch and 71<sup>st</sup> Street Channel conveyance is predominantly open channel. But the form of this channel conveyance varies significantly by location. The same is true for the open channel conveyance along Scottsdale Road.

Existing channel lining material includes concrete (ranging in finish from pneumatically placed, patterned, broomed and colored), asphalt, riprap (both grouted and plain), earth, grass and desert landscaping. Channels also varied greatly in size, depth, configuration, discharge and adjoining improvements. Therefore, it was difficult to find any consistent open channel theme that could be

applied universally in the promotion of system-wide alternatives.

It was also apparent that regional detention basins alone would not form a viable system-wide solution. And finally, it did not appear appropriate to establish sets of system-wide alternatives solely on the basis of any multi-use or aesthetic themes.

Areas defined in the Part 2 documentation as having the greatest potential for enhancing and creating multi-use opportunities occurred primarily in the northwest portions of the study area within the City of Phoenix. Unfortunately these opportunities exist in areas where the current drainage structures are generally adequate. Improvement in these areas would not accomplish the purpose of the study and it would not reduce flooding potentials within the focus area.

Aesthetic improvement opportunities were dispersed throughout the study area. Some features which could benefit from aesthetic enhancement are currently performing adequately. Improvements to these features would not reduce flooding potentials within the focus area. Other areas where aesthetic enhancement is warranted occurred where drainage improvements are proposed as part of the system wide alternatives. Aesthetic enhancement to these features was included as part of the alternative.

After a great deal of consideration and discussion, it was decided by the study team to form system-wide alternatives from the location-specific alternatives using two primary approaches:

- level of flood protection; and,
- best fit system.

The “level of flood protection” approach would use the 100- and 10-year storms as the basis for design, essentially without regard to cost, impact and available right-of-way. The 100- and 10-year system-wide alternatives target only those regional facilities that do not presently provide the 100- and 10-year levels of protection. If the selection process concluded that the 100-year alternative was too costly, had excessive impact or was not supported by the stakeholders or community, then the lesser 10-year level of protection could be considered as the basis of design. The 100- and 10-year return frequencies are the normal, widely accepted basis of design for regional flood control facilities. Only isolated portions of the focus area’s present regional drainage system are capable of containing a 100-year runoff event, whereas a significant portion of the present system is capable of containing a 10-year event (or close to it).

Since the regional detention basins in Cactus and Mescal Parks can both handle a 10-year storm, neither was included in a 10-year system-wide alternative. The same is true for certain reaches of the primary conveyance corridors. The lower reach of the Berneil Ditch, for



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

example, can carry a 10-year storm. Therefore, it was not included in the 10-year system-wide alternative. The system-wide alternative solution was made up of features the study team considered to be the best location-specific alternatives from the Level II analysis.

During the development of the preliminary alternatives, significant existing constraints in certain locations made even a 10-year level of protection difficult to achieve. Consequently, two additional alternatives were formulated with the simple goal of improving the existing regional drainage system to reduce the most significant flood hazards.

The “best fit” approach had no specific storm return frequency associated with it and was made up of location-specific alternatives that typically represented lesser cost, impact and right-of-way needs than the 100- and 10-year system-wide alternative solutions. The “best fit” system-wide alternatives were also referred to as the “no frequency” alternatives during the Level III development step. The level of flood protection provided by “best fit” alternatives was, in some locations, less than the 10-year event.

There were two “best fit” system-wide alternatives developed. These two alternatives were similar in nature but differed in extent, cost and impact. One of these two alternatives included minimal improvements to the

regional detention basins at Cactus and Mescal Parks. The lesser of the two “best fit” alternatives was based on a minimum standard of design for regional flood control facilities with the least amount of property acquisitions or drainage easements required.

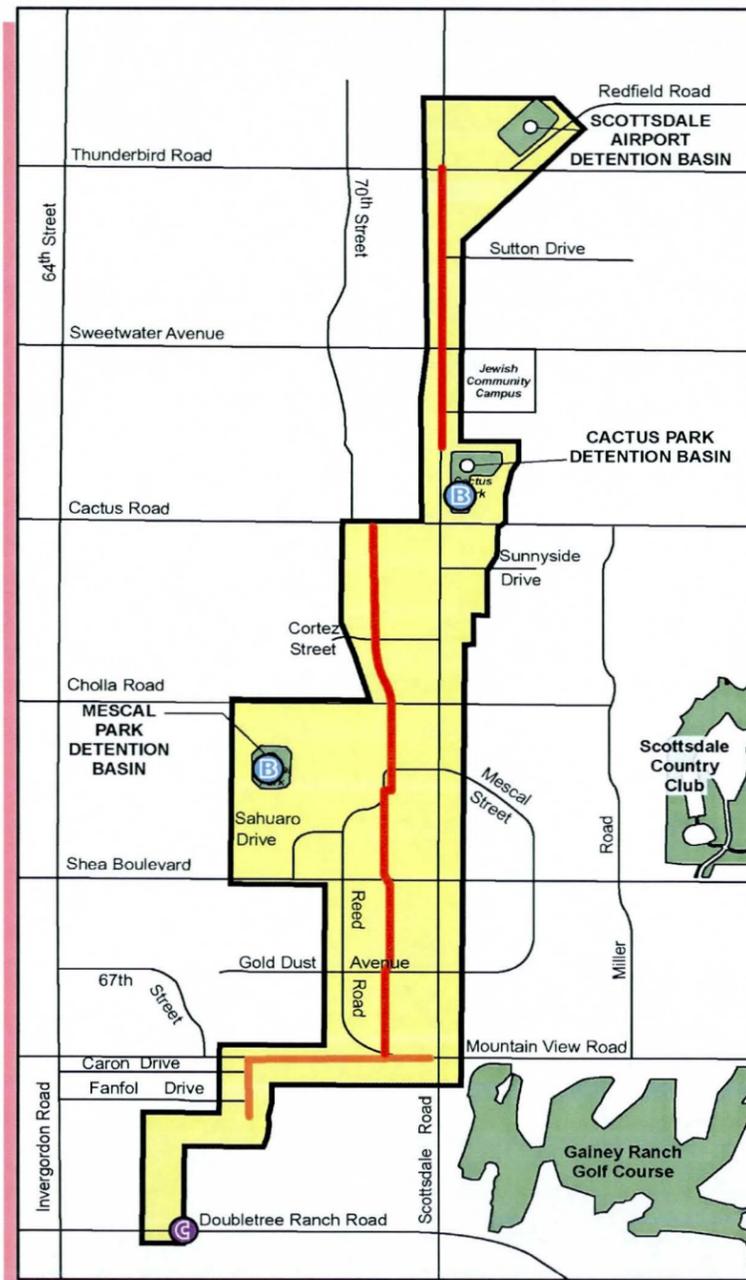
In summary, there were a total of four structural system-wide alternatives developed in Level III. The term “structural” means they would each require construction of regional facilities such as drainage channels and detention basins. Many of the structural alternatives require some amount of land acquisition at certain locations, as well as permanent drainage and temporary constructions easements. Temporary traffic impacts occur for all construction involving streets. In addition, there are also temporary noise impacts during construction of any of the structural alternatives.

While the four structural alternatives just described represent a traditional approach to flood control, a non-structural alternative was also considered. A non-structural solution addresses drainage concerns without any physical modifications/improvements within the study area. Examples of non-structural implementation include public education, flood insurance and flood warning systems. If less than a 100-year structural system-wide alternative solution were chosen from this study, it is possible that the regional flood prone areas may be

mapped in the future and that flood insurance may be required within these flood prone areas.

The four structural alternatives and the one non-structural alternative combined to make up the set of alternatives derived from the Level III development and analysis step that would be presented to the public at the second of three public involvement meetings. Instead of numbering these alternatives 1 through 5, the study team decided to name each one for a primary color (red, orange, yellow, green, blue). Color names were chosen instead of numbering the alternatives to avoid any public misperception that numbering represented a pre-disposed order of preference by the study team.

Each of the five system-wide alternatives from Level III was illustrated on oversized color exhibit boards for the second public involvement meeting. The information from these exhibits consisted of a physical description of the proposed features, a map showing the proposed structural improvements, a list of benefits and constraints, and preliminary construction costs. The same information was also incorporated into the study’s web site. Reduced copies of the exhibit boards are included as Figures 25 through 29 on the following pages. These figures are followed by Figure 30, a summary table comparing the system-wide alternatives that had been included in the information handout from the second public involvement meeting.



**KEY**

- Focus Area
- Parks/Recreation
- Proposed Basin Improvement
- Proposed Channel Improvement
- Proposed Pipe/Box
- Proposed Culvert Improvement

**FIGURE 25 RED ALTERNATIVE -  
100-YEAR STRUCTURAL SOLUTION**

**Benefits**

- Provides 100-year flood protection.
- Reduces the volume of storm water discharge downstream from Cactus and Mescal Park detention basin improvements.
- Optimizes overall multi-use and aesthetic enhancement opportunities compared to all other alternatives.
- Provides a complete, continuous regional outfall system.
- Improves the opportunity for smaller, local storm drain and drainage improvements to be constructed in the future.
- Covers the existing open channel along Scottsdale Road from Thunderbird Road to Sweetwater Avenue and reduces the present pedestrian and vehicular safety hazards.
- Reduces flooding in Scottsdale Road from Sutton Drive to Sweetwater Avenue.
- Improves the driving safety of Scottsdale Road and all of the roadways that cross the 71st Street Channel.
- Reduces the frequency of low-flow ponding in Mescal Park detention basin from smaller storm events, thereby increasing the availability for recreation use.
- Provides an opportunity to improve the aesthetic condition of a portion of the Berneil Ditch.

**Constraints**

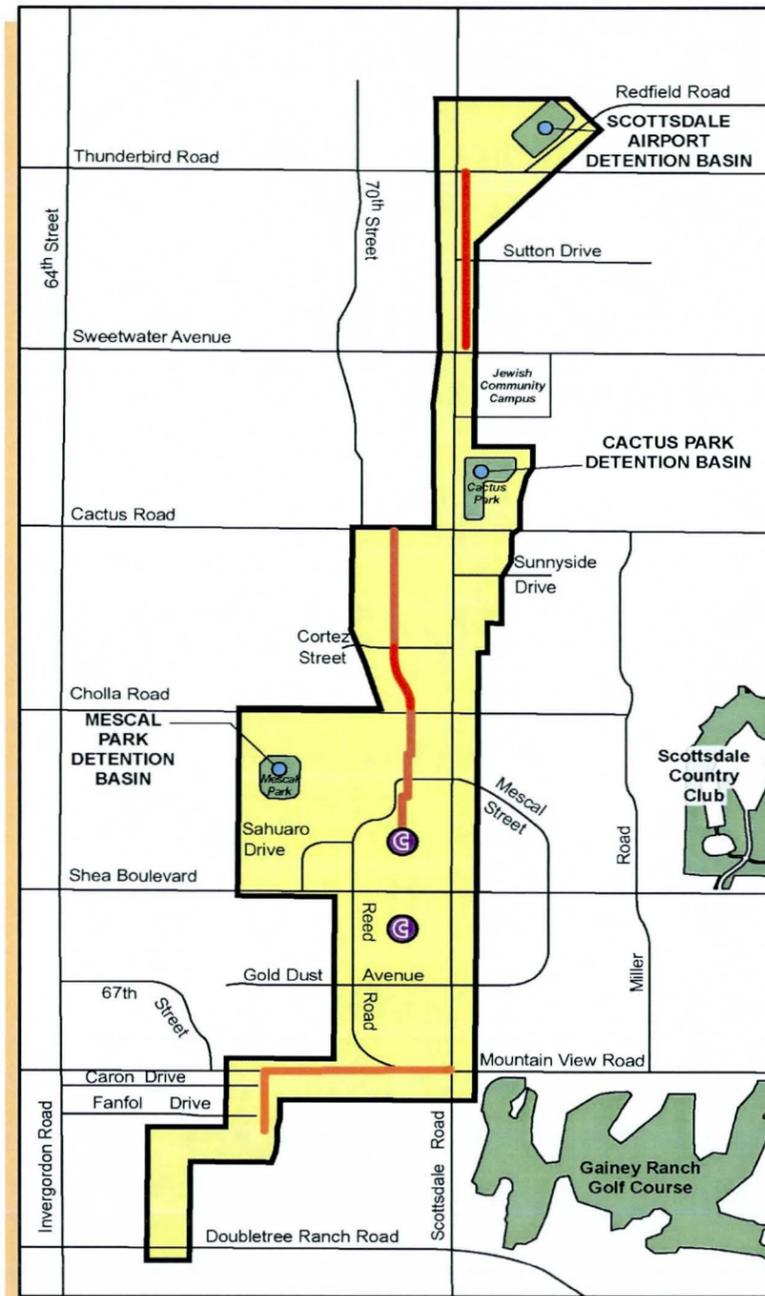
- Highest total estimated cost of all of the alternatives.
- Highest right-of-way/easement acquisition requirements of all the structural alternatives.
- Highest construction noise and traffic impacts of all the structural alternatives. Construction along the 71st Street Channel impacts 1.5 miles on both sides of the channel and eight culvert crossings at major streets. Significant construction impacts along Scottsdale Road in terms of traffic disruption.
- Longest implementation schedule of all of the structural alternatives.
- Minor construction impacts at Cactus Park and major construction impacts at Mescal Park that temporarily reduces or eliminates use of recreation facilities.
- Construction impacts temporarily limit the use of the multi-use trail along the Berneil Ditch. Relocation of the trail down near the bottom of the channel restricts views and potentially lowers the recreation experience for the users.

**Description:**

**1. Scottsdale Road Channel**

- Replaces the existing surface channel along the east side of Scottsdale Road with an underground concrete box storm drain from Thunderbird Road to Sweetwater Avenue to provide additional stormwater flow capacity.
- Constructs a shallow landscaped channel over the new underground concrete box storm drain to carry local stormwater flow.

- Constructs additional storm drain catch basins in Scottsdale Road from Thunderbird Road to Sweetwater Avenue to drain stormwater from Scottsdale Road.
  - Adds another large (90-inch) diameter storm drain pipe under Scottsdale Road from Sweetwater Avenue to the Cactus Park detention basin to provide additional stormwater flow capacity.
- 2. Cactus Park Detention Basin**
- Raises the emergency overflow spillway along Cactus Road approximately two feet to provide additional stormwater storage volume and to eliminate the existing potentially hazardous overflow condition.
  - Adds a second primary outlet pipe that discharges to the existing Scottsdale Road storm drain to provide additional stormwater flow capacity.
- 3. Mescal Park Detention Basin**
- Enlarges the size of the existing basin to increase the stormwater storage volume.
  - Reconstructs the emergency overflow spillway to eliminate the existing condition.
- 4. 71<sup>st</sup> Street Channel**
- Replaces the existing surface channel with a new underground concrete box storm drain from Cactus Road to the Berneil Ditch to carry regional stormwater flow.
  - Constructs a shallow landscaped channel over the new underground concrete box storm drain to convey local stormwater runoff.
- 5. Berneil Ditch**
- Increases the size of the existing channel from Scottsdale Road west to the southwest corner of Chaparral High School to provide additional stormwater flow capacity. The enlarged channel would be hard surfaced.
  - Lowers the existing access/multi-use road to approximately two feet above the channel bottom to provide additional stormwater flow capacity.
  - Constructs a one to two foot high floodwall along the south bank of the channel from Scottsdale Road west to the southwest corner of Chaparral High School to provide additional stormwater flow capacity.
  - Reconstructs the bottom of the existing concrete channel south for several hundred feet from the southwest corner of Chaparral High School and lengthens the existing floodwall at the second bend of Berneil Ditch.
  - Adds concrete culvert barrels/deepens existing barrels to provide additional stormwater flow capacity of the existing concrete culvert at Doubletree Ranch Road.



**KEY**

- Focus Area
- Parks/Recreation
- Proposed Pipe/Box
- Proposed Channel Improvement
- C Proposed Culvert Improvement

**FIGURE 26 ORANGE ALTERNATIVE -  
10-YEAR STRUCTURAL SOLUTION**

**Benefits:**

- Provides 10-year flood protection.
- Provides a complete, continuous regional outfall system that controls up to a 10-year storm.
- Improves the opportunity for smaller, local storm drain and drainage improvements to be constructed in the future.
- Covers the existing open channel along Scottsdale Road from Thunderbird Road to Sweetwater Avenue and reduces the present pedestrian and vehicular safety hazards.
- Provides opportunities for landscape aesthetics and multi-use trail enhancements along the 71st Street Channel improvements.
- Provides an opportunity to improve the aesthetic condition of a portion of the Berneil Ditch.
- Reduces flooding in Scottsdale Road from Sutton Drive to Sweetwater Avenue.
- No disruption of recreation use at Mescal or Cactus Parks.

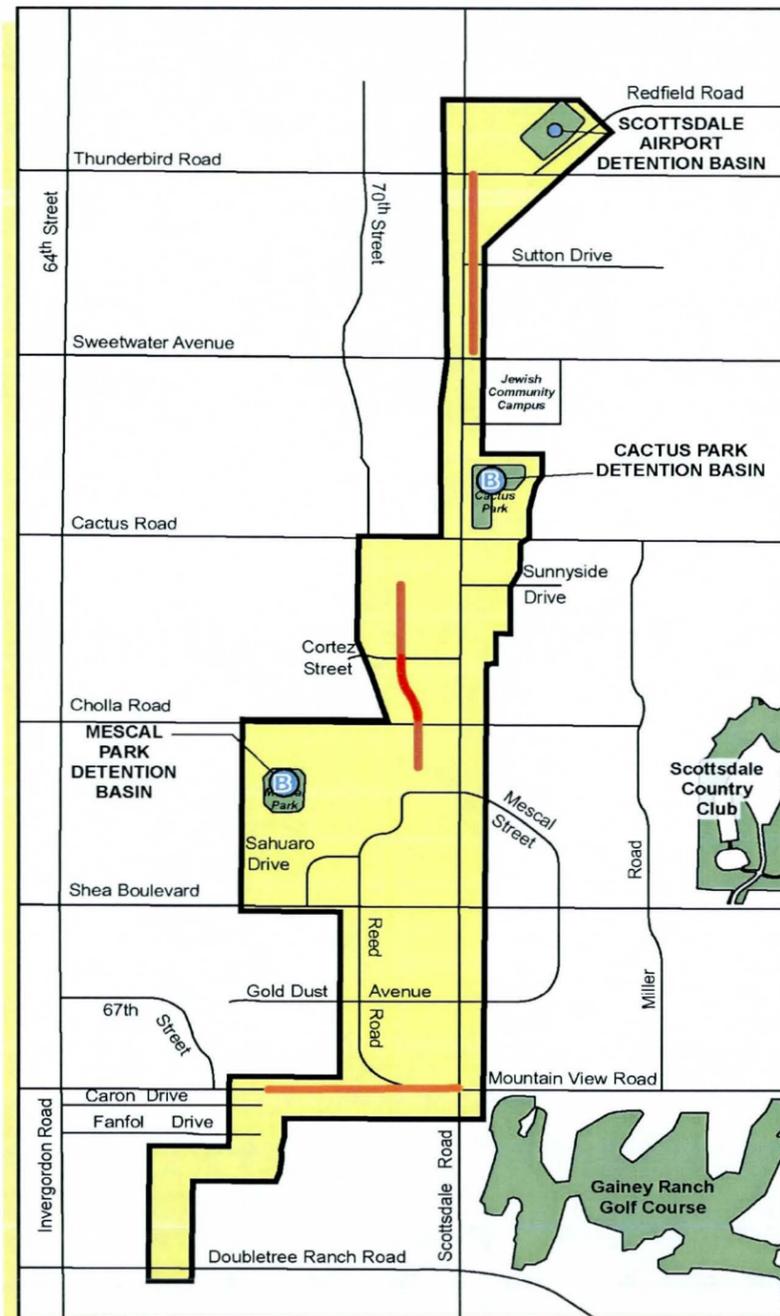
**Constraints:**

- Second highest total estimated cost of all of the alternatives.
- Significant right-of-way/easement acquisition requirements along the upper portion of 71st Street Channel.
- Significant construction impacts along the Berneil Ditch, upper 71st Street Channel, and Scottsdale Road.
- Construction impacts temporarily limit the use of the multi-use trail along the Berneil Ditch. Relocation of the trail down near the bottom of the channel restricts views and potentially lowers the recreation experience for the users.
- Recreational use of Mescal Park continues to be disrupted when stormwater pond in the bottom of the basin.

**Description:**

1. Scottsdale Road Channel
  - Extends the existing large diameter storm drain pipe north from Sweetwater Avenue to Thunderbird Road and replaces the existing surface channel to provide additional stormwater flow capacity.
  - Constructs a shallow landscaped channel over the extended storm drain pipe to increase local stormwater flow.

- Constructs additional storm drain catch basins in Scottsdale Road from Thunderbird Road to Sweetwater Avenue to drain stormwater from the road into the pipe.
2. Cactus Park Detention Basin
    - No improvements are needed.
  3. Mescal Park Detention Basin
    - No improvements are needed.
  4. 71<sup>st</sup> Street Channel
    - Replaces the existing surface channel with a new underground concrete box storm drain from Cactus Road to about 600 feet south of Cholla Road.
    - Constructs a shallow landscaped channel over the new underground concrete box storm drain to convey local stormwater runoff.
    - Enlarges the existing surface channel from Sahuaro Drive to Mescal Street to increase stormwater flow capacity.
    - Adds concrete culvert barrels/reconstructs existing barrels at Cochise Road and Sahuaro Drive to provide additional stormwater flow capacity.
  5. Berneil Ditch
    - Increases the size of the existing channel from Scottsdale Road west to the southwest corner of Chaparral High School to provide additional stormwater flow capacity. The enlarged channel could either be earth or hard surfaced.
    - Reconstructs the existing access/multi-use road approximately two feet above the channel bottom to provide additional stormwater flow capacity.
    - Constructs a one to two foot high floodwall along the south bank of the channel from Scottsdale Road west to the southwest corner of Chaparral High School to provide additional stormwater flow capacity.
    - Reconstructs the bottom of the existing concrete channel south from the southwest corner of Chaparral High School for several hundred feet and lengthens the existing floodwall at the second bend of Berneil Ditch.



KEY

Focus Area Proposed Pipe & Channel

**FIGURE 27 YELLOW ALTERNATIVE -  
LOW-IMPACT STRUCTURAL SOLUTION**

**Benefits:**

- Improves the existing regional flood protection to almost a 10-year flood protection.
- Reduces the present emergency overflow hazards at Cactus and Mescal Parks.
- Minimizes construction costs, disturbance during construction, and right-of-way/easement acquisition compared to the Red (100-year) and Orange (10-year) Alternatives.
- Reduces flooding in Scottsdale Road from Sutton Drive to Sweetwater Avenue.
- Covers the existing open channel along Scottsdale Road from Thunderbird Road to Sweetwater Avenue and reduces the present pedestrian and vehicular safety hazards.
- Provides an opportunity to improve the aesthetic condition of a portion of the Berneil Ditch.

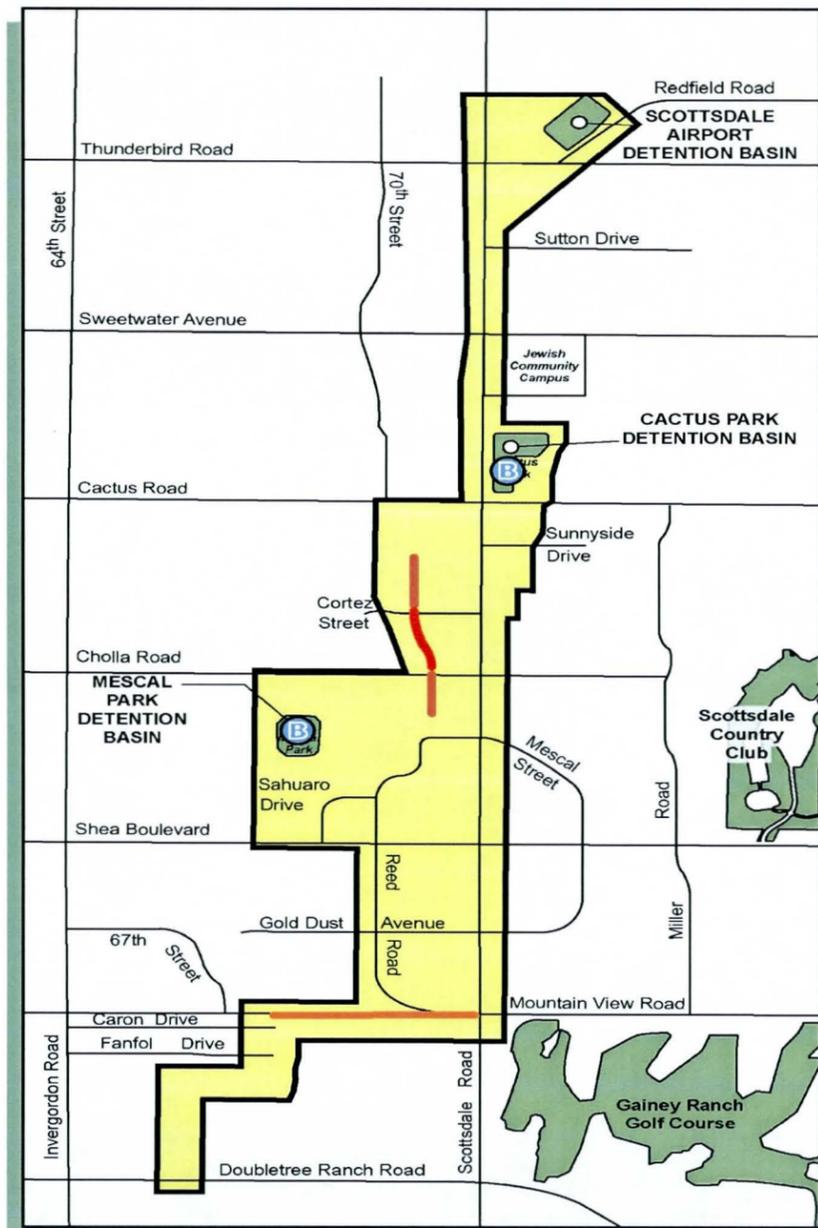
**Constraints:**

- Does not provide comprehensive 10-year flood protection.
- Improvements to the 71st Street Channel do not provide an opportunity for multi-use connection at Cactus Road.
- Creates temporary disruption of recreation use at Cactus and Mescal Parks.
- Provides opportunity to improve aesthetic condition of only a small segment of Berneil Ditch.

**Description:**

1. Scottsdale Road Channel
  - Extends the existing large diameter storm drain pipe north from Sweetwater Avenue to Thunderbird Road and replaces the existing surface channel to provide additional stormwater flow capacity.
  - Constructs a shallow landscaped channel over the extended storm drain pipe to carry local stormwater flow.
  - Constructs additional storm drain catch basins in Scottsdale Road from Thunderbird Road to Sweetwater Avenue to drain stormwater from Scottsdale Road.
2. Cactus Park Detention Basin
  - Raises the emergency overflow spillway along Cactus Road approximately 2 feet to provide additional stormwater storage volume and to eliminate the existing potentially hazardous overflow condition.
  - Adds a second primary outlet pipe that discharges to the existing Scottsdale Road storm drain to provide additional stormwater flow capacity.

3. Mescal Park Detention Basin
  - Reconstructs the emergency overflow spillway to eliminate the existing potentially hazardous overflow condition.
4. 71<sup>st</sup> Street Channel
  - Replaces the existing surface channel with a new underground storm drain pipe from Sunnyside Drive to about 600 feet south of Cholla Road to provide additional stormwater flow capacity.
  - Constructs a shallow hard-surfaced channel over the new storm drain pipe from Sunnyside Drive to Cortez Street and from Cholla Road to about 600 feet south of Cholla Road to carry local stormwater flow.
5. Berneil Ditch
  - Increases the size of the earth channel from Scottsdale Road west to the southwest corner of Chaparral High School to provide additional stormwater flow capacity.
  - Reconstructs the existing access/multi-use road down to approximately two feet above the channel bottom to provide additional stormwater flow capacity.



**KEY**

- Focus Area
- Parks/Recreation
- Proposed Basin Improvement
- Proposed Pipe
- Proposed Channel Improvement

**FIGURE 28 GREEN ALTERNATIVE -  
MINIMAL STRUCTURAL SOLUTION**

**Benefits:**

- Improves existing regional flood protection over the present condition.
- Reduces the present emergency overflow hazards at Cactus and Mescal Parks.
- Represents the lowest construction costs, least disturbance during construction, and least right-of-way/easement acquisition compared to all other structural alternatives.

**Constraints:**

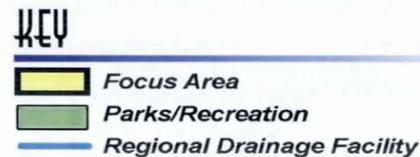
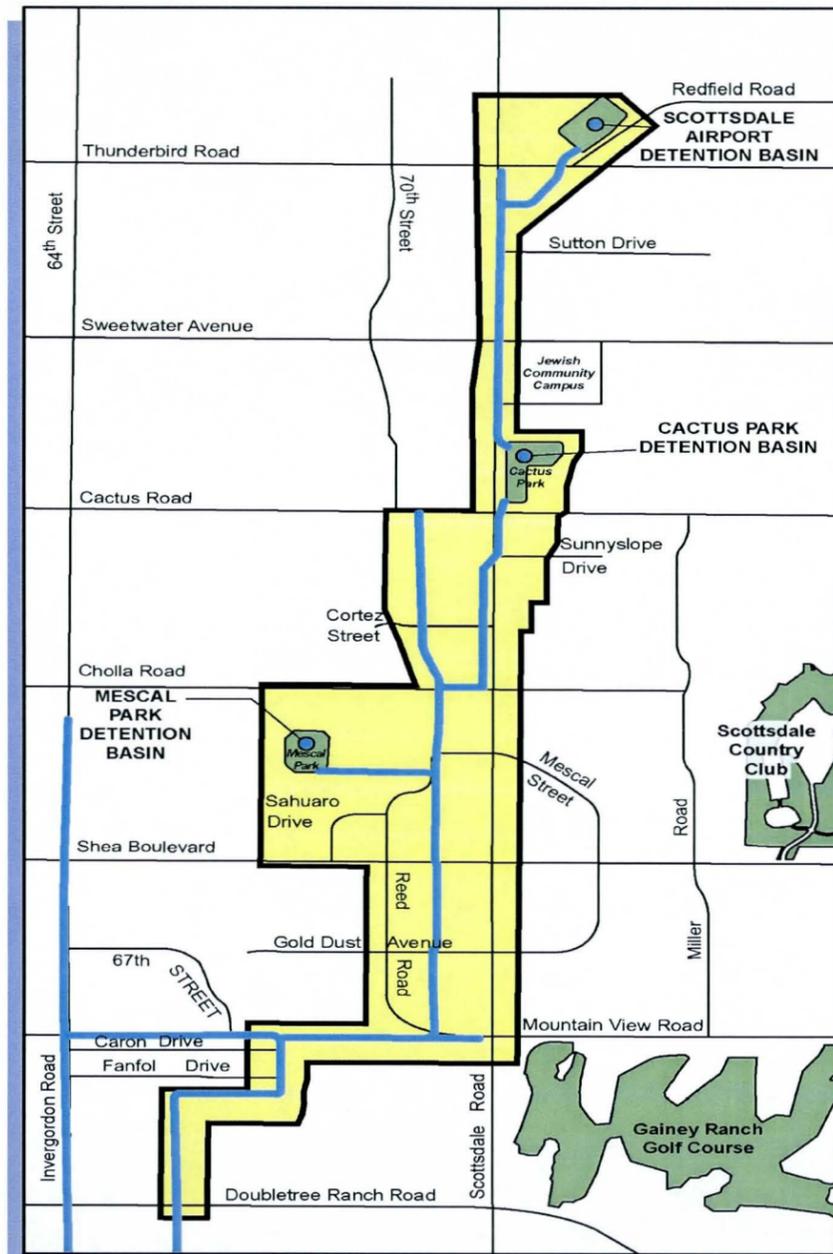
- Provides minimal flood protection.
- Provides minimal enhancement opportunities for landscape aesthetics and multi-use trail systems.
- Temporarily disrupts recreation use at Mescal and Cactus Parks.
- Provides no opportunities for improvement to pedestrian and aesthetic conditions along Scottsdale Road between Sweetwater Avenue and Cactus Park as compared to the other structural alternatives.
- Improvements to the 71st Street Channel do not extend far enough to the north to provide an opportunity for multi-use connection at Cactus Road.

**Description:**

1. Scottsdale Road Channel
  - No improvements proposed.
2. Cactus Park Detention Basin
  - Raises the emergency overflow spillway along Cactus Road approximately 2 feet to provide additional stormwater storage volume and to eliminate the existing potentially hazardous overflow condition.
3. Mescal Park Detention Basin
  - Reconstructs the emergency overflow spillway to eliminate potentially hazardous overflow condition.
4. 71<sup>st</sup> Street Channel
  - Replaces the existing surface channel with a new underground storm drain pipe from Sunnyside Drive to about 600 feet south of Cholla Road.
  - Constructs a shallow hard-surfaced channel over the new storm drain pipe from Sunnyside Drive to Cortez Street and from Cholla Road to about 600 feet south of Cholla Road to convey local stormwater runoff.

5. Berneil Ditch

- Enlarges channel but retains essentially the same configuration as present to provide slight increase in stormwater flow capacity.



**FIGURE 29 BLUE ALTERNATIVE -  
NON-STRUCTURAL SOLUTION**

**Benefits:**

- No disturbance to traffic, noise levels, or use of existing recreation facilities during construction.
- No right-of-way or easement acquisition required for construction.
- No cost incurred related to construction of flood control facilities.
- Less cost to the general tax paying public of delineating flood hazard zones and performing the other non-structural tasks than the construction of structural flood control alternatives.

**Constraints:**

- Existing flood prone areas not protected from potential flood damage.
- Known flooding problems are not addressed.
- No increase in flood protection provided for current and future property owners.
- It is generally more difficult to construct drainage facilities and obtain right-of-way if needed in the future.
- Future development in identified flood hazard areas may either not be permitted or may be required to elevate or flood-proof to protect from flooding.
- Flood insurance may become mandatory as a condition of financing construction or purchase of residence in identified flood hazard areas.
- The cost of flood insurance represents a financial impact to property owners in flood hazard areas.
- No opportunities to provide multi-use or aesthetic enhancements within the study area unless parcels are purchased in flood hazard areas.

**Description:**

1. Mitigates or reduces flood damage without any physical improvements.
2. May require floodplains to be delineated.
3. Enforces effective stormwater retention/detention policies within the Cities of Scottsdale and Phoenix and Town of Paradise Valley.
4. Develops a program to inform property owners at risk of flooding about flood insurance and its cost and benefits.
5. Evaluates flood-prone areas with respect to public safety.

6. Identifies areas that would benefit from early local flood warnings.
7. Develops a local community awareness program to educate the public on both general and specific flood hazards in the area.
8. Promotes the purchases of tone-activated weather radios for local residents and businesses.

## COMPARISON OF PRELIMINARY ALTERNATIVES

Description	Red Alternative	Orange Alternative	Yellow Alternative	Green Alternative	Blue Alternative
Level of Protection	<ul style="list-style-type: none"> <li>100- year.</li> </ul>	<ul style="list-style-type: none"> <li>10-year.</li> </ul>	<ul style="list-style-type: none"> <li>Nearly 10-year.</li> </ul>	<ul style="list-style-type: none"> <li>Higher level than existing.</li> </ul>	<ul style="list-style-type: none"> <li>No added protection.</li> </ul>
Scottsdale Road Channel	<ul style="list-style-type: none"> <li>Construct an additional underground storm drain south of Sweetwater Avenue.</li> <li>Extend existing underground storm drain north of Sweetwater Avenue.</li> </ul>	<ul style="list-style-type: none"> <li>Extends existing underground storm drain north of Sweetwater Avenue.</li> </ul>	<ul style="list-style-type: none"> <li>Extends existing underground storm drain north of Sweetwater Avenue.</li> </ul>	<ul style="list-style-type: none"> <li>No improvements proposed.</li> </ul>	<ul style="list-style-type: none"> <li>No improvements.</li> </ul>
71 <sup>st</sup> Street Channel	<ul style="list-style-type: none"> <li>Constructs new underground storm drain from Cactus Road to the Berneil Ditch.</li> </ul>	<ul style="list-style-type: none"> <li>Constructs new underground storm drain from Cactus Road to Cholla Road.</li> <li>Enlarges existing surface channel between Sahara Drive and Mescal Street.</li> <li>Reconstructs culvert crossings at Cochise Road and Sahara Drive.</li> </ul>	<ul style="list-style-type: none"> <li>Constructs new underground storm drain from Sunnyside Drive to a section of Cholla Road.</li> </ul>	<ul style="list-style-type: none"> <li>Constructs new underground storm drain from Sunnyside Drive to south of Cholla Road.</li> </ul>	<ul style="list-style-type: none"> <li>No improvements.</li> </ul>
Cactus Park Detention Basin	<ul style="list-style-type: none"> <li>Raises existing emergency spillway.</li> <li>Adds additional outlet pipe.</li> </ul>	<ul style="list-style-type: none"> <li>No improvements proposed.</li> </ul>	<ul style="list-style-type: none"> <li>Raises existing emergency spillway.</li> <li>Adds additional outlet pipe.</li> </ul>	<ul style="list-style-type: none"> <li>Raises existing emergency spillway.</li> </ul>	<ul style="list-style-type: none"> <li>No improvements.</li> </ul>
Mescal Park Detention Basin	<ul style="list-style-type: none"> <li>Constructs new emergency spillway.</li> <li>Enlarges basin capacity.</li> </ul>	<ul style="list-style-type: none"> <li>No improvements proposed.</li> </ul>	<ul style="list-style-type: none"> <li>Constructs new emergency spillway.</li> </ul>	<ul style="list-style-type: none"> <li>Constructs new emergency spillway.</li> </ul>	<ul style="list-style-type: none"> <li>No improvements.</li> </ul>
Berneil Ditch	<ul style="list-style-type: none"> <li>Enlarges existing channel for 0.75 mile.</li> <li>Moves access/multi-use road to channel bottom.</li> <li>Constructs 1-to-2-foot-high flood wall.</li> <li>Increases capacity at Doubletree Ranch Road culvert crossing.</li> </ul>	<ul style="list-style-type: none"> <li>Enlarges existing channel for 0.75 mile.</li> <li>Moves access/multi-use road to channel bottom.</li> <li>Constructs 1-to-2-foot-high flood wall.</li> </ul>	<ul style="list-style-type: none"> <li>Enlarges existing channel for 0.5 mile.</li> <li>Moves access/multi-use road to channel bottom.</li> </ul>	<ul style="list-style-type: none"> <li>Enlarges existing channel for 0.5 mile.</li> </ul>	<ul style="list-style-type: none"> <li>No improvements.</li> </ul>
Properties Directly Impacted	<ul style="list-style-type: none"> <li>84 parcels.</li> </ul>	<ul style="list-style-type: none"> <li>56 parcels.</li> </ul>	<ul style="list-style-type: none"> <li>26 parcels.</li> </ul>	<ul style="list-style-type: none"> <li>25 parcels.</li> </ul>	<ul style="list-style-type: none"> <li>None.</li> </ul>
Stormwater Contained Within Scottsdale Road Right-of-way	<ul style="list-style-type: none"> <li>Yes.</li> </ul>	<ul style="list-style-type: none"> <li>Yes.</li> </ul>	<ul style="list-style-type: none"> <li>No.</li> </ul>	<ul style="list-style-type: none"> <li>No.</li> </ul>	<ul style="list-style-type: none"> <li>No.</li> </ul>
Improves Driver Safety Along Scottsdale Road	<ul style="list-style-type: none"> <li>Yes.</li> </ul>	<ul style="list-style-type: none"> <li>Yes.</li> </ul>	<ul style="list-style-type: none"> <li>Yes.</li> </ul>	<ul style="list-style-type: none"> <li>No.</li> </ul>	<ul style="list-style-type: none"> <li>No.</li> </ul>
Construction Impacts to Parks	<ul style="list-style-type: none"> <li>Minimal at Cactus Park.</li> <li>May require temporary closure of Mescal Park.</li> </ul>	<ul style="list-style-type: none"> <li>None.</li> </ul>	<ul style="list-style-type: none"> <li>Minimal at both Cactus and Mescal Parks.</li> </ul>	<ul style="list-style-type: none"> <li>Minimal at both Cactus and Mescal Parks.</li> </ul>	<ul style="list-style-type: none"> <li>None.</li> </ul>
Permanent Impacts to Multi-use Facilities	<ul style="list-style-type: none"> <li>Trail at Mescal Park moves to bottom of basin.</li> <li>Trail along Berneil Ditch moves to bottom of channel.</li> </ul>	<ul style="list-style-type: none"> <li>Trail along Berneil Ditch moves to bottom of channel.</li> </ul>	<ul style="list-style-type: none"> <li>Trail along Berneil Ditch moves to bottom of channel.</li> </ul>	<ul style="list-style-type: none"> <li>None.</li> </ul>	<ul style="list-style-type: none"> <li>None.</li> </ul>
Reduces Ponding in Parks	<ul style="list-style-type: none"> <li>Yes.</li> </ul>	<ul style="list-style-type: none"> <li>No.</li> </ul>	<ul style="list-style-type: none"> <li>Yes.</li> </ul>	<ul style="list-style-type: none"> <li>No.</li> </ul>	<ul style="list-style-type: none"> <li>No.</li> </ul>
Multi-use Opportunities	<ul style="list-style-type: none"> <li>High.</li> </ul>	<ul style="list-style-type: none"> <li>Moderate.</li> </ul>	<ul style="list-style-type: none"> <li>Low.</li> </ul>	<ul style="list-style-type: none"> <li>Low.</li> </ul>	<ul style="list-style-type: none"> <li>None.</li> </ul>
Aesthetic Improvement Opportunities	<ul style="list-style-type: none"> <li>High.</li> </ul>	<ul style="list-style-type: none"> <li>Moderate.</li> </ul>	<ul style="list-style-type: none"> <li>Low.</li> </ul>	<ul style="list-style-type: none"> <li>Low.</li> </ul>	<ul style="list-style-type: none"> <li>None.</li> </ul>
Traffic Impacts During Construction	<ul style="list-style-type: none"> <li>High.</li> </ul>	<ul style="list-style-type: none"> <li>Moderate.</li> </ul>	<ul style="list-style-type: none"> <li>Moderate.</li> </ul>	<ul style="list-style-type: none"> <li>Low.</li> </ul>	<ul style="list-style-type: none"> <li>None.</li> </ul>
Cost	\$41.05 - 45.16 million	\$10.36 - 11.40 million	\$6.54 - 7.20 million	\$3.89 - 4.29 million	No structural costs

FIGURE 30

## COMPARISON OF PRELIMINARY ALTERNATIVES



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 4.0 ALTERNATIVE SELECTION

### 4.1 OVERVIEW

The foundation for the alternative selection process was established in the Level II alternatives analysis and the Level III system-wide alternatives formulation described in Section 3.0. One of the keys to successful alternative selection is to have an adequate group of distinct, well developed, clearly displayed alternatives from which to choose. Ideally, these alternatives should represent a diversity of approach, theme and level of protection. They should minimize impacts and maximize benefits. They should be presented in a way that can be easily understood by a diverse cross section of people. The consequences of not selecting an alternative should be understood as thoroughly as the benefits associated with selecting it.

The alternative selection process for the Scottsdale Road Corridor Drainage Master Plan began with planning and conducting the second of three public involvement meetings. Once this meeting was held, the public feedback it generated was reviewed and incorporated into a matrix evaluation process that was developed by the study team. The matrix evaluation served as the primary basis for the selection of the recommended alternative. Once selected, the recommended alternative was then further refined and adjusted. The final recommended alternative was developed as a combination of the most desirable location-specific features from two of the four

system-wide structural solutions. The final recommended alternative is covered in Part 5 of this report.

### 4.2 SECOND PUBLIC INVOLVEMENT MEETING

The goal of the second public involvement meeting was to involve the public in the selection of a system-wide solution to resolve the drainage and flooding problems that had been identified in the study area. The second public involvement meeting was held on March 19, 2002. The objective of the second meeting was different from that of the first public involvement meeting. The first meeting was held shortly after the study was initiated and its purpose was simply to introduce the project, its objectives and the study team to the public.

The notification procedure for the second public involvement meeting included all of the basic elements from the first meeting including the door hang flyers and newspaper announcements. For a description of the first public meeting and its associated notification process, please refer to Section 1.4. For the second meeting, the study team made a few adjustments to the notification process. Also, because of the low turnout to the first meeting (fewer than 20 individuals) the study team added some new notification elements.

One of the added notification elements for the second meeting involved a letter that was mailed directly to property owners. Approximately 100 direct mailers were sent to residents and businesses adjacent to locations where construction would occur for any and all of the alternatives under consideration. This extra

notification included a cover letter explaining that the alternatives may affect the individual's property. A copy of the door hang flyer meeting announcement was attached to the letter. The letter was printed on Flood Control District of Maricopa County letterhead and signed by the District's project manager.

The recipients of the notification letter included property owners along both sides of the 71<sup>st</sup> Street Channel, four residents adjacent to the Berneil Ditch culvert crossing at Double Tree Ranch Road, the Seventh Day Adventist Church on Scottsdale Road north of Sutton Drive, the Jewish Community Campus on Scottsdale Road south of Sweetwater Avenue and the Scottsdale Unified School District. The mailing list for all of the properties located in the City of Scottsdale was based on the City's current utility billing records. All other mailing addresses were derived from Maricopa County Assessor's records. All notification letters were mailed via USPS "mail certificate". The mail certificate option ensures that each letter reached the address to which it was mailed. In addition to the direct mail notification, door hang flyer meeting announcements were mailed by regular US mail to the individuals who attended the first public meeting.

The announcement distribution area for the second public meeting was based on a reduced version of the one used for the first public meeting that concentrated more around the focus area where drainage improvements were anticipated. The distribution area for the second meeting extended from just north of Thunderbird Road south along the Scottsdale Road drainage corridor to just south of Mountain View Road. Then, it jogged over to the west along the Berneil Ditch down just south of



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

Double Tree Ranch Road. It includes the 71<sup>st</sup> Street Channel and the areas immediately surrounding Cactus and Mescal Parks.

**SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN**

**Public Meeting**  
**Tuesday, March 19, 2002**  
**6:30 p.m. - 8:00 p.m.**  
**Presentation at 6:45 p.m.**  
**Sonoran Sky Elementary School Media Center Room**  
**12990 North 75<sup>th</sup> Street**  
**Scottsdale, Arizona**

**Meeting Location**

The Flood Control District of Maricopa County is conducting a public meeting for the Scottsdale Road Corridor Drainage Master Plan. The purpose of this Master Plan is to identify the extent of regional flooding problems in the study area and provide solutions for regional flood protection and public safety.

The Study Team has identified a focus area within the study area. It is located along the Scottsdale Road Corridor and the Upper Bernell Ditch. Preliminary alternatives have been developed to improve the drainage and alleviate flooding in this focus area.

The purpose of the meeting is to present these alternatives to the public and obtain input and feedback.

Alternative solutions will be presented at the meeting that may involve construction of drainage and flood control improvements.

We hope that you can attend this meeting and share your ideas and suggestions as we advance through the planning process. If you are unable to attend the meeting, you can view the alternatives online at [www.scottsdaleroadCDMP.com](http://www.scottsdaleroadCDMP.com) and forward your comments to the Flood Control District.

If you have questions on the Scottsdale Road Corridor Drainage Master Plan, please call the study's project manager, Afshin Aboulayyan with the Flood Control District of Maricopa County at 602-506-1501 or e-mail: [af@mail.maricopa.gov](mailto:af@mail.maricopa.gov).

Persons with a disability may request accommodations, such as a sign language interpreter, by contacting Mike Beak, Logan Simpson Design, 31 West Third Street, Suite 404, Tempe, AZ 85281, Phone: 480-967-7343, Fax: 480-969-6232. Requests should be made as early as possible to allow time to arrange the accommodations. This notice is available in alternative formats by contacting Mike Beak at the address/phone number referenced above.

**Key**  
 Focus Area  
 Study Area  
 Scottsdale  
 Phoenix  
 Paradise Valley

The study's website was updated prior to the second public involvement meeting. The website included an announcement of the upcoming meeting. The website was also updated to include a description of the project's progress since the first meeting, a list of glossary terms and their definitions and an image of each of the five alternatives including a description of proposed structural features along with a list of benefits and constraints. The study's website was referenced in all forms of notification.

**Town of Paradise Valley INDEPENDENT**

Vol. 17 - No. 13  
 Contents: News on the Town of Paradise Valley  
 Week of March 27, 2002

**At a Glance**  
 Council approves final election numbers  
 H<sub>2</sub>O, what can we do?  
 Pilates teachers stretch clients to new levels  
 MLS Statistics: Huge Agents Lead All Other Agents in PV Sales

**PLAN**

**TOWN NEWS**

Team meet here on the proposed Scottsdale Road Corridor Drainage Master Plan...  
 The Scottsdale Road Corridor Drainage Master Plan is a...  
 The study team has identified a focus area...  
 The purpose of the meeting is to present these alternatives...  
 Alternative solutions will be presented at the meeting...  
 We hope that you can attend this meeting and share your ideas...

As with the first public meeting, newspaper advertisements were run in the East Valley Tribune and the Arizona Republic -

Community Section, Zones 7 & 8. In addition, an announcement of the public meeting was made in the City of Scottsdale's CIP Public Meetings Bulletin for Zones 2 and 4.

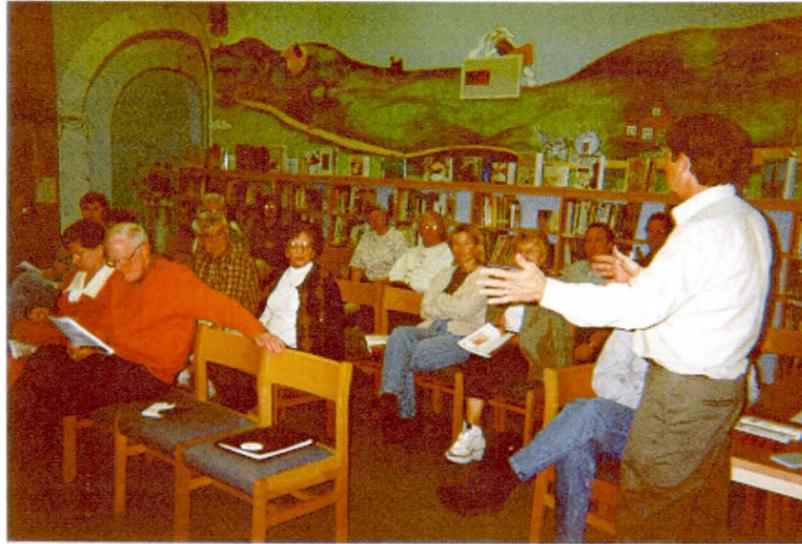
The Northeast Phoenix Independent Newspapers was contacted prior to the meeting to solicit their running an article about the study and to mention the up-coming meeting. The paper was unable to accommodate this request prior to the meeting but was able to send a reporter, Mr. Tom Barry, to the meeting. Mr. Barry wrote an article about the study that was carried in subsequent issues of the Town of Paradise Valley Independent Newspaper and the Northeast Valley Independent Newspaper. The article included an account of the second public involvement meeting.

The second public involvement meeting was held at the Sonoran Sky Elementary School in the multi-media room. Attendees began assembling at about 6:15. A sign-in sheet was provided and attendees were encouraged to register. Despite a comprehensive effort by the study team to advertise, notify, invite and encourage attendance, there were only about 20 members of the public that attended the second meeting. The majority of these residents lived in the vicinity of the 71<sup>st</sup> Street Channel.

Prior to the meeting, several over-sized exhibits had been set up around the multi-media room showing the study area, focus area, approximate drainage problem and flood prone areas, the four structural alternatives (Red, Orange, Yellow and Green) and the one non-structural (Blue) alternative. Handouts were provided to everyone summarizing the project objectives, history, flood prone area, preliminary alternatives and schedule.



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN



Second Public Involvement Meeting

The meeting was brought to order at around 6:45 with a brief introduction of the study team and overview of the purpose and objectives of the study provided by the Flood Control District's project manager, Mr. Afshin Ahouraiyan. After the introduction, Mr. Ahouraiyan gave a Power Point presentation lasting about 30 minutes consisting of photographs, study background, a description of drainage problem and flood prone areas and a brief summary of the preliminary alternatives.



Second Public Involvement Meeting

Mr. Ahouraiyan then fielded questions and listened to comments from the attendees. These questions generally related to specific flood prone areas and drainage problems and their potential solutions as well as general scope issues, study objectives and issues related to the process of identifying and evaluating alternatives, funding, etc. Mr. Ahouraiyan responded to questions with assistance from project team members Bob Johnson, Joe Rumann and Scott Buchanan.

Each person in attendance had the opportunity to comment and participate in an open discussion format. This stage of the meeting lasted approximately one hour until around 8:00. After the open discussion, questions and answers continued in a smaller group or individual format for about another 15 or 20 minutes. The meeting concluded shortly before 8:30. A

complete accounting of the questions and answers from the second meeting was subsequently posted at the study's website. The handout for the second public involvement meeting included a public opinion survey asking attendees to rank ten different alternative evaluation criteria and to cast their vote for one of the alternatives. The ranking criteria was as follows:

- Reduce Flooding,
- Maximize Public Safety,
- Eliminate Potential Need for Flood Insurance,
- Maximize Vehicular Access/Circulation,
- Minimize Property Acquisition,
- Minimize Easement Acquisition,
- Minimize Construction Impacts,
- Optimize Multi-Use Systems,
- Aesthetics, and
- Costs.

The ranking criteria from the second public involvement meeting would be combined with the evaluation criteria developed at the end of the Alternatives Formulation Meeting (see Section 3.2.1) to form the alternatives comparison matrices in the next step of the selection process.



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 4.3 ALTERNATIVE SELECTION MATRIX

The study team conducted a number of meetings subsequent to the second public involvement meeting to discuss and develop a means by which the five alternatives could be appropriately evaluated. This evaluation was intended to result in the selection of an alternative that would adequately address the needs of the study area.

The first step in the process was to develop the evaluation criteria. The second step was to develop a matrix format. A draft matrix of evaluation criteria and alternatives was developed and distributed to the study team/stakeholders for comment. Across the top of the matrix were the criteria that had been developed at the Alternatives Formulation Meeting (brainstorming meeting) held September 24, 2001 (see Section 3.2.1).

There were three primary groups of criteria that were developed at the brainstorming meeting. These groups included Economic, Environmental and Social groups. Within each of these groups, various specific criteria had been established as listed in Table 9.

Each of the specific criteria had been ranked at the Alternatives formulation Meeting within each respective group. However, the relative weighting between groups had not been established at that meeting. For the initial draft of the matrix, Stanley Consultants normalized the results of the ranking for each of the specific criterion from the Alternatives Formulation Meeting within each criteria group. Then, the study team assigned group

weightings with consideration to the public comments and questions presented at the second public involvement meeting.

Table 9, Evaluation Criteria Groups

Economic Criteria Group	Environmental Criteria Group	Social Criteria Group
Implementation cost	Permitting	Agency acceptance
Maintenance cost	Aesthetics	Community acceptance
Construction impacts	Urban Wildlife	Perceived benefit
Design life	habitat	Multi-use opportunities
Funding	Cultural/Hazmat impacts	Land acquisition
		Access during flooding
		Circulation construction impacts

Next, the study team unanimously agreed to drop two of the specific environmental criteria that did not seem to be applicable or relevant to the Scottsdale Road Corridor Drainage Master Plan. These criteria were “urban wildlife habitat” and “cultural/hazmat impacts”. The numerical weighting of the two remaining environmental specific criteria were then re-normalized. The remaining 14 specific criteria, their numerical weights and the groups and group weights were arranged across the top of the draft matrix.

Down the side of the draft matrix, unique alternatives were arranged in groups by location. At Scottsdale Road, for example, there was the “Red” (100-year) alternative and the

“Orange/Yellow” (10-year) alternative. The proposed “Orange” and Yellow alternative features at Scottsdale Road are identical so they were combined as one feature that would be compared, or ranked in relation to the “Red” alternative at that location. The Berneil Ditch location has a total of five unique alternatives proposed, including both an earth and hard surfaced version of the Orange alternative.

Thus, the draft matrix was designed to compare or rank each unique alternative feature by location for each of the specific criterion. The most desirable feature was to receive the highest numerical ranking for each criterion. The score for each alternative was calculated by multiplying the group criteria weight by the specific criterion weight by the rank number. The resulting scores would then be totaled across all criteria for each location alternative. The highest score would indicate the most desirable alternative at each location (at least numerically) according to the criteria. The first draft matrix was called the “Location-Specific Matrix”.

Since there were no structural improvements associated with the “Blue” alternative, it could not be included in the location-specific alternative evaluation matrix. For this reason, the draft location-specific matrix was further evolved and an additional matrix was drafted that would compare each whole system-wide alternative (Red, Orange, Yellow, Green, Blue). The second matrix was referred to as the “System-Wide Matrix”.



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

The results of the public survey from the second public involvement meeting were then tabulated and reviewed. Out of about 20 individuals from the public that attended the second meeting, only seven survey and comment sheets had been filled out and returned to the study team. The rankings of the 10 criteria that had been presented in the survey were tabulated. The results of that tabulation are presented in Table 10.

Note: Of the seven surveys returned, only five were completely ranked. Two of the surveys only had three or four criterion out of ten ranked. The scores in Table 10 represent only the results of the five completely ranked surveys. The individual rankings were simply added to obtain the score.

Table 10, Public Survey Criteria Ranking

Score*	Criteria
14	Reduce flooding
18	Maximize public safety during flood events
20	Eliminate the potential need for flood insurance
25	Maximize vehicular access/circulation during flood events
32	Minimize property acquisition
35	Minimize easement acquisition
41	Minimize disruption to community during construction
29	Optimize pedestrian/equestrian/bicycle systems
21	Optimize appearance (i.e., aesthetics, landscaping)
40	Cost of project

\*Lowest total score = highest importance

In addition to the rankings of the 10 criteria from the public survey, the results of the vote where the public chose one of the five system-wide alternatives was reviewed. The addresses of all the public meeting attendees and survey respondents and those individuals providing comments by email were reviewed on a map of the study area. The majority of the attendees and those responding to the survey lived within the study's focus area.

The strongest public feedback seemed to be in favor of the "Red" (100-year) alternative. There were a total of only six votes cast. Four votes were cast for the "Red" alternative and two votes for the "Yellow" alternative. The "Orange", "Green" and "Blue" alternatives did not receive any votes.

The criteria from the draft location-specific matrix were then reviewed and re-weighted. Based on input from the City of Scottsdale, a number of adjustments were made to the criteria. The "design life" and "permitting" criteria were dropped as not being relevant to the study. The "funding" criterion was combined with the "implementation cost" criterion. The "perceived benefit" criterion was changed to "level of protection". And the "circulation construction impacts" (traffic impacts during construction) criterion was combined with the "construction impacts" criterion.

This left a total of 10 specific criteria. The original environmental group had been pared down to only one specific criterion "aesthetic opportunities" and this was considered by many to really be a social group criterion. It was then mutually decided to



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

simply drop the group criteria altogether and re-weight the remaining 10 specific criteria. The re-weighting was done as a group process at the April 11<sup>th</sup> monthly coordination meeting with significant consideration to the results of the public survey criteria from the second public involvement meeting. The result is tabulated in Table 11.

Criterion	Weight
Implementation cost/funding	0.19
Maintenance cost	0.01
Construction impacts	0.03
Aesthetic opportunities	0.11
Agency acceptance	0.09
Community acceptance	0.17
Level of protection	0.24
Multi-use opportunities	0.04
Right-of-way issues	0.05
Access during flooding	0.07

Table 11, Final Weighted Alternatives Evaluation Criteria

At this point, both the location-specific and system-wide matrices had evolved to their final form. Both matrices would use the same criteria and criteria weights. The revised matrices were then redistributed to the study team/stakeholders to be completed and returned by Monday, April 15<sup>th</sup> for final tabulation. Each member of the study team was provided the opportunity to complete both matrices. There were a total of 12 individual respondents, each having the same weight in the final tabulation.

That is, no one stakeholder entity, city, town or agency was given any special weight beyond the number of individual respondents representing each.

Following the completion of the alternatives evaluation matrices, the results of the rankings were reviewed and extensively discussed by the study team. The team now had two different ways to evaluate the proposed alternatives. The results of the matrix rankings were broken down and reviewed in a number of different ways. To ensure that there was no inappropriate skew to the results, numerical scores were grouped as follows and reviewed by the study team:

- Composite total score by all 12 respondents.
- Composite scores by respondents representing both engineering and non-engineering discipline groups.
- Composite scores by city, town and agency stakeholder groups.
- Composite scores of consultant/sub-consultant.

Tables 12 and 13 on the following pages represent the final matrices.

Significant input regarding the selection was provided from two of the primary stakeholders, the City of Scottsdale and the Town of Paradise Valley. Paradise Valley expressed a strong preference for the "Orange" alternative regarding the Berneil Ditch. For ease and economy of maintenance, the Town's desire was for the hard surfaced version of this alternative.

As stated previously, the Town of Paradise Valley's preference was actually for alternatives that would reduce the discharge entering the Town. However, based on the hydrologic analysis and considering the construction costs and other impacts associated with stormwater detention basin alternatives, a reduction in discharge for the Berneil Ditch is not likely to be achieved. Despite the improvements considered for Cactus and Mescal Park detention basins, the post-project discharges in the Berneil Ditch will essentially be the same as pre-project discharges.

Study team representatives from the City of Scottsdale drainage and capital improvements departments were doubtful that the City would ever be able to afford the construction of a full system-wide, 100-year flood control alternative. 100-year protection might be achievable at certain locations, like below the Cactus Park overflow spillway, for example. Scottsdale staff was also concerned over the potential condemnation of land necessary to accomplish the "Red" alternative.

If the City of Scottsdale had to choose one system-wide alternative at this point in the selection process, their preference would be the "Yellow" alternative. To the City of Scottsdale, the "Yellow" alternative appeared to be the best combination of performance and affordability. From a budget standpoint, that alternative would need to be constructed in phases over several years. In addition, the City of Scottsdale did not have a problem with constructing a mix-and-match alternative that would combine the best alternative features at each location.

TABLE 12. LOCATION-SPECIFIC MATRIX

Location Alternatives		Individual Criteria Weight	Evaluation Criteria*										Total Weighted Score
			Implementation Cost/Funding	Maintenance Cost	Construction Impacts	Aesthetic Opportunities	Agency Acceptance	Community Acceptance	Level of Protection	Multi-Use Opportunities	R.O.W. Issues	Access During Flooding	
			0.19	0.01	0.03	0.11	0.09	0.17	0.24	0.04	0.05	0.07	
Scottsdale Rd	Scottsdale Rd Red	Rank	12	16	12	21	13	21	23	20	12	23	18.38
		Weighted Score	2.28	0.16	0.36	2.31	1.17	3.57	5.52	0.80	0.60	1.61	
Scottsdale Rd	Scottsdale Rd Orange/Yellow	Rank	24	19	23	15	23	15	13	16	24	13	17.58
		Weighted Score	4.56	0.19	0.69	1.65	2.07	2.55	3.12	0.64	1.20	0.91	
Cactus Park	Cactus Park Red/Yellow	Rank	13	16	13	18	18	22	24	19	15	23	19.24
		Weighted Score	2.47	0.16	0.39	1.98	1.62	3.74	5.76	0.76	0.75	1.61	
Cactus Park	Cactus Park Green	Rank	23	20	23	18	18	14	12	17	21	13	16.76
		Weighted Score	4.37	0.20	0.69	1.98	1.62	2.38	2.88	0.68	1.05	0.91	
Mescal Park	Mescal Park Red	Rank	15	19	15	25	17	31	33	27	17	35	25.34
		Weighted Score	2.85	0.19	0.45	2.75	1.53	5.27	7.92	1.08	0.85	2.45	
	Mescal Park Yellow	Rank	26	26	27	25	32	25	25	26	25	24	25.86
	Weighted Score	4.94	0.26	0.81	2.75	2.88	4.25	6.00	1.04	1.25	1.68		
Mescal Park	Mescal Park Green	Rank	31	27	30	22	23	16	14	19	30	13	20.80
		Weighted Score	5.89	0.27	0.90	2.42	2.07	2.72	3.36	0.76	1.50	0.91	
71st Street Channel	71st Street Channel Red	Rank	20	26	16	30	14	29	32	28	16	36	26.15
		Weighted Score	3.80	0.26	0.48	3.30	1.26	4.93	7.68	1.12	0.80	2.52	
	71st Street Channel Orange	Rank	24	24	25	24	31	26	24	25	24	24	25.04
	Weighted Score	4.56	0.24	0.75	2.64	2.79	4.42	5.76	1.00	1.20	1.68		
71st Street Channel	71st Street Channel Yellow/Green	Rank	28	22	31	18	27	17	16	19	32	12	20.81
		Weighted Score	5.32	0.22	0.93	1.98	2.43	2.89	3.84	0.76	1.60	0.84	
Berneil Ditch	Berneil Ditch Red	Rank	12	36	12	29	33	44	56	33	12	56	35.92
		Weighted Score	2.28	0.36	0.36	3.19	2.97	7.48	13.44	1.32	0.60	3.92	
	Berneil Ditch Orange (Concrete)	Rank	27	50	27	25	50	42	47	36	29	49	38.43
		Weighted Score	5.13	0.50	0.81	2.75	4.50	7.14	11.28	1.44	1.45	3.43	
	Berneil Ditch Orange (Earth)	Rank	35	23	36	50	43	41	37	49	34	35	39.29
		Weighted Score	6.65	0.23	1.08	5.50	3.87	6.97	8.88	1.96	1.70	2.45	
Berneil Ditch Yellow	Rank	48	33	46	42	35	29	26	39	47	26	35.50	
	Weighted Score	9.12	0.33	1.38	4.62	3.15	4.93	6.24	1.56	2.35	1.82		
Berneil Ditch Green	Rank	53	38	58	34	19	21	14	23	58	14	29.37	
	Weighted Score	10.07	0.38	1.74	3.74	1.71	3.57	3.36	0.92	2.90	0.98		

Engineering Weighted Score	Non-Eng. Weighted Score	PV Weighted Score	Sdale Weighted Score	FCD Weighted Score	LSD Weighted Score	Stanley Weighted Score	Location Alternatives
8.87	8.08	1.43	2.64	7.96	3.09	3.26	Scottsdale Rd Red
9.13	6.88	1.57	3.36	7.00	2.91	2.74	Scottsdale Rd Orange/Yellow
9.91	7.90	1.43	3.47	7.76	3.32	3.26	Cactus Park Red/Yellow
8.09	7.10	1.57	2.53	7.24	2.68	2.74	Cactus Park Green
13.66	9.82	1.86	4.28	10.68	3.94	4.58	Mescal Park Red
12.97	10.59	2.30	5.09	10.03	4.35	4.09	Mescal Park Yellow
9.37	9.59	1.84	2.63	9.29	3.71	3.33	Mescal Park Green
13.56	10.73	1.86	4.32	11.16	4.29	4.52	71st Street Channel Red
12.18	10.56	2.30	4.00	10.27	4.38	4.09	71st Street Channel Orange
10.26	8.71	1.84	3.68	8.57	3.33	3.39	71st Street Channel Yellow/Green
17.65	15.43	2.84	4.73	16.95	5.49	5.91	Berneil Ditch Red
21.47	13.75	3.21	8.56	14.50	5.65	6.51	Berneil Ditch Orange (Concrete)
17.85	18.16	3.28	4.91	17.24	7.11	6.75	Berneil Ditch Orange (Earth)
17.94	14.72	2.84	6.72	13.99	6.23	5.72	Berneil Ditch Yellow
15.09	11.96	2.32	5.08	11.37	5.49	5.11	Berneil Ditch Green

\*Evaluation Criteria development based on Scottsdale Road Corridor DMP Brainstorming Meeting held 09/24/01, later finalized 4/11/02.

Total Weighted Score - From all participants  
 Engineering Weighted Score - Schalk, Buchanan, Johnson, Lund, Ahouraiyan, Ruman, Mead  
 Non-Engineering Weighted Score - Simpson, de Cordre, Fowler, Hoppmann  
 Shaded Cell - Indicates preferred alternative

Matrix Participants: Ruman Hoppmann  
 Lund de Cordre  
 Pinto Ahouraiyan  
 Johnson Schalk  
 Fowler Buchanan  
 Simpson Mead

Not Responding: Mushtaq

TABLE 13. SYSTEM-WIDE MATRIX

		Evaluation Criteria*										Total Weighted Score	
		Implementation Cost/Funding	Maintenance Cost	Construction Impacts	Aesthetic Opportunities	Agency Acceptance	Community Acceptance	Level of Protection	Multi-Use Opportunities	R.O.W. Issues	Access During Flooding		
		0.19	0.01	0.03	0.11	0.09	0.17	0.24	0.04	0.05	0.07		
System-Wide Alternatives	Red Alternative	Rank	16	22	16	54	21	51	52	56	12	56	39.48
		Weighted Score	3.04	0.22	0.48	5.94	1.89	8.67	12.48	2.24	0.60	3.92	
	Orange Alternative	Rank	31	31	30	44	49	46	45	42	27	48	41.36
		Weighted Score	5.89	0.31	0.90	4.84	4.41	7.82	10.80	1.68	1.35	3.36	
	Yellow Alternative	Rank	37	35	34	41	52	43	39	41	37	38	40.41
		Weighted Score	7.03	0.35	1.02	4.51	4.68	7.31	9.36	1.64	1.85	2.66	
	Green Alternative	Rank	44	40	47	28	39	27	27	28	47	25	33.05
		Weighted Score	8.36	0.40	1.41	3.08	3.51	4.59	6.48	1.12	2.35	1.75	
	Blue Alternative	Rank	52	52	53	13	19	13	17	13	57	13	25.70
		Weighted Score	9.88	0.52	1.59	1.43	1.71	2.21	4.08	0.52	2.85	0.91	

\*Evaluation Criteria development based on Scottsdale Road Corridor DMP Brainstorming Meeting held 09/24/01, later finalized 4/11/02.

Total Weighted Score - From all participants  
 Engineering Weighted Score - Schalk, Buchanan, Johnson, Lund, Ahouraiyan, Ruman, Mead  
 Non-Engineering Weighted Score - Simpson, de Cordre, Fowler, Hoppmann  
 Shaded Cell - Indicates preferred alternative

Matrix Participants: Ruman Hoppmann  
 Lund de Cordre  
 Pinto Ahouraiyan  
 Johnson Schalk  
 Fowler Buchanan  
 Simpson Mead

Not Responding: Mushtaq

Engineering Weighted Score	Non-Eng. Weighted Score	PV Weighted Score	Sdale Weighted Score	FCD Weighted Score	LSD Weighted Score	Stanley Weighted Score	System-Wide Alternatives	
18.66	17.57	3.25	4.48	17.63	6.87	7.25		Red Alternative
20.19	16.90	4.27	7.29	16.59	6.91	6.30		Orange Alternative
21.59	16.01	2.81	8.52	15.78	6.41	6.89		Yellow Alternative
16.44	13.75	2.86	5.63	13.84	5.40	5.32		Green Alternative
13.12	10.77	1.81	4.08	11.16	4.41	4.24		Blue Alternative



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

Next, a field review meeting was held on April 23, 2002. Eight members of the study team attended the field review meeting including representatives from the Flood Control District of Maricopa County, the City of Scottsdale and consultants Stanley Consultants and Logan Simpson Design. The purpose of the meeting was for the study team to visit each of the specific locations as a group and review each of the concept measures that had been considered prior to making a final alternative selection. The field review took approximately four hours and included stops at the Berneil Ditch, Cactus and Mescal Parks and Scottsdale Road and several locations along the 71<sup>st</sup> Street Channel.



Field review team at Mescal Park

Left to right: Diane Simpson-Colebank, Brian Schalk, Lucia de Cordre, Adina Lund (seated), Bob Johnson, Joe Rumann, Afshin Ahouraiyan, Scott Buchanan.

The selection of the recommended alternative was tentatively made in the final week of April 2002. This tentative selection was based primarily on the results of the alternative evaluation matrices, feedback from the public and observations made during the field review meeting. Public feedback was considered not only through its reflection in the alternative matrix criteria but also based on the comments, questions and surveys from the second public involvement meeting. Selecting the recommended alternative was not an easy or clear-cut decision.

After considerable evaluation and discussion, the study team tentatively concluded that the most appropriate selection was the "Orange" (10-year) structural alternative for channel and storm drain conveyance measures along Scottsdale Road, the 71<sup>st</sup> Street Channel and the Berneil Ditch. This selection was combined with those structural features from the "Yellow" alternative at Cactus and Mescal Parks that would provide 100-year capacity for the detention basins at those two locations.

The "Orange" alternative was the overall point winner in the system-wide alternative selection matrix. However, the "Orange" alternative was followed very closely in points by the "Yellow" alternative, which was followed very closely by the "Red" alternative. There was only about a five percent spread in points between the "Orange" and "Red" system-wide alternatives. The "Green" and "Blue" alternatives came in a distant fourth and fifth place in the system-wide matrix.

In the location-specific alternative selection matrix, all of the top point winners involved either the "Red", "Orange" or "Yellow"

alternatives. The "Green" alternatives did not carry the vote at any location in the location-specific matrix. From these results, it had become apparent that there was no clear-cut winner among the "Red", "Orange" and "Yellow" structural alternatives. It also became clear that the "Green" structural alternative and the "Blue" non-structural alternative were clearly not desirable. The "Green" and "Blue" alternatives were essentially dropped from further consideration after reaching this conclusion.

The costs and right-of-way impacts associated with the "Red" alternative were far greater than with either the "Orange" or "Yellow" alternatives. Therefore the "Red" alternative did not receive much stakeholder support. Although the "Orange" alternative was not a clear choice based on matrix points and public opinion, it did seem to provide the best balance of flood protection versus cost and impacts. In the end, the "Orange" alternative received the strongest overall stakeholder support. The "Orange" alternative also presented some moderate aesthetic and multi-use opportunities.

The Orange Alternative would provide the opportunity to improve the aesthetic conditions and intactness of several drainage features that rated low or moderate. Specifically, major portions of the channel along Scottsdale Road from Sweetwater Avenue to Thunderbird Road currently are not a visually interesting feature in the landscape and do not form a cohesive pattern with other visual elements. Also, several reaches along the 71<sup>st</sup> Street Channel and Berneil Ditch currently provide no particular visual interest and do not form a cohesive pattern in the landscape.



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

The Orange Alternative provides opportunities to improve existing facilities to make them more accessible/pleasant to use by residents. The existing sidewalk along Scottsdale Road will be improved and will provide a more pleasant experience for users of this facility. A pathway between Scottsdale Road and Chaparral High School is proposed along the Berniel Ditch. Several sections of the 71<sup>st</sup> Street Channel will be improved which will provide for local multi-use but will not form linkages with other regional opportunities.

The proposed conveyance improvements associated with the "Orange" alternative also seemed to provide the best system-wide balance. The level of protection provided by the proposed "Orange" features would correct the weak links in the overall system in a way that matched very closely with the level of protection provided by existing features upstream and downstream from the proposed improvements.

The preliminary inclusion of the Cactus and Mescal Park detention basin improvements in the recommended alternative was based on the following considerations:

- Neither of the two detention basins had any discernable provisions to handle emergency overflows.
- The proposed improvements had a relatively small cost and construction impact.
- The potential flood hazard and failure risk was relatively high if overflow occurred.
- The improvements had a relatively large local benefit, especially at Cactus Park.
- The study team perceived that the public placed a relatively large value on providing a 100-year solution.
- The inclusion of these two locations would provide a more comprehensive regional solution.



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

### 5.0 RECOMMENDED SYSTEM-WIDE ALTERNATIVE

The study team concluded the selection process for the recommended alternative the first week in May 2002. The recommended system-wide alternative would consist of the following primary sets of features:

- Channel improvements along the upper Berneil Ditch and regional storm drain improvements for the upper 71<sup>st</sup> Street Channel and the Scottsdale Road Channel that would provide for a continuous, comprehensive regional system capable of conveying at least a 10-year storm.
- Improvements to the regional detention basins at Cactus and Mescal Parks that would contain a 100-year storm without overflow and that would establish formal overflow spillways that were capable of passing a design storm in excess of a 100-year event without the basin containment failing.

Shortly after the recommended system-wide alternative was selected, Stanley Consultants began the initial step in preparing final hydrologic and hydraulic analysis and refining a few of the specific improvements that would be applied at each of the locations. Based on the discussions at the field review meeting and the May 2, 2002 monthly coordination meeting, there were a few minor adjustments and clarifications made to the "Orange" alternative. These adjustments needed to be made prior to presenting the recommended plan to the public at the third and

final public involvement meeting set for June of 2002. The adjustments were as follows:

- The existing 90-inch diameter Scottsdale Road storm drain pipe would be extended from Sweetwater Avenue to the confluence with the Scottsdale Airport detention basin outfall channel (just north of the Seventh Day Adventist property). The pipe could potentially be reduced in size from that location to Thunderbird Road because the design discharge is smaller upstream from the confluence with the airport basin outfall channel.

A complete regional storm drain system adjacent to Scottsdale Road will be reflected in 15% design plans including the reach within the International Fighter Pilot Museum (IFPM) site. If the existing outfall channel from the Scottsdale Airport detention basin needed to be replaced by a large storm drain as part of the improvements for the IFPM site, that would be done by the City of Scottsdale independent from the Scottsdale Road Corridor Drainage Master Plan.

- Proposed improvements at the Cactus Park detention basin would consist of raising and armoring the emergency overflow spillway only. There will be no secondary outfall pipe at Cactus Park as in the "Red/Yellow" alternatives. The overflow spillway would need to be raised to an elevation that is about one foot below the finished floor of the Cactus Park recreation

administration building (about two feet above the top of curb along Cactus Road).

- The 71<sup>st</sup> Street Channel system will utilize the existing concrete lined channel north of Sunnyside Drive essentially as-is. The underground portion of the 71<sup>st</sup> Street Channel improvements can incorporate a pipe instead of a box if hydraulically feasible. The open channel above the new storm drain between Sunnyside Drive and Cortez Street will be a hard surfaced channel instead of a landscaped channel and it will be contained within the existing 30-foot wide drainage right-of-way.

The existing 71<sup>st</sup> Street surface channel that extends about 600 feet south of Cholla Street will essentially remain in its present configuration. It serves as access to adjacent properties. The channel from Mescal Road to Sahuaro Drive and the culvert at Sahuaro Drive will be enlarged to carry a 10-year flow. The existing culvert for the 71<sup>st</sup> Street Channel at Cochise Road will not be modified.

- Improvements at Mescal Park will involve adding volume to the existing basin without raising the existing emergency overflow elevation. A formal hardened overflow spillway will be constructed at the southwest corner of the park. Use of a low flow bypass system will be avoided if possible.



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

- Berneil Ditch channel improvements will consist of the hardened lining alternative, not the earth section. The use of floodwalls will only be included where absolutely necessary. Reconstruction of the concrete lined channel downstream from the Mountain View Road alignment will be avoided if possible. The existing gravel road along the south bank of the channel will remain as-is if possible instead of being lowered down inside the channel. The bottom of the channel will be lowered about one foot at Scottsdale Road and a uniform grade will be established from there downstream to match the existing concrete channel lining near the southwest corner of Chaparral High School.

### 5.1 THIRD PUBLIC INVOLVEMENT MEETING

The next step in the study process was preparation for the third and final public involvement meeting. Wednesday, June 19<sup>th</sup> was chosen as the date for the meeting. Because of summer recess, it was not possible to conduct the meeting at the Sonoran Sky Elementary School where the first and second meetings were held. Instead, the meeting was held at the Scottsdale Airport passenger terminal.

The goal of the third public involvement meeting was to present the recommended system-wide plan to the public and to obtain their feedback regarding specific features and considerations that could be incorporated into the concept plans and reflected in preliminary cost estimates.



Third Public Involvement Meeting



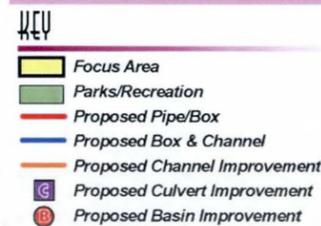
The notification procedure for the third public involvement meeting included all of the basic elements from the first and second meetings including the door hang flyers and newspaper announcements. In addition to the direct mailer meeting notifications that were sent for the second public involvement meeting, additional mailers were sent to those property owners along the Scottsdale Road Channel between Sweetwater Avenue and Sutton Drive.

As was previously done, the study's website was updated prior to the third public involvement meeting. Updates included an announcement of the upcoming meeting, a description of the project's progress since the first meeting and an image of the recommended alternative including a description of proposed structural features.

Figure 31 on the following page illustrates the recommended system-wide alternative as presented in the handout for the third public involvement meeting.

The format for the third public involvement meeting was very similar to the first two meetings. Exhibits depicting the recommended alternative and conceptual landscape and aesthetic treatment themes were set up in the meeting area prior to the start of the meeting. Color handouts were provided. There were about 30 attendees to the meeting (not counting the project team). The meeting began with an introduction of the project team and brief description of the recommended alternative and associated selection process by the Flood Control District's project manager.

# RECOMMENDED DRAINAGE ALTERNATIVE (10-YEAR REGIONAL PROTECTION)



## DESCRIPTION

### 1. Scottsdale Road Channel

- Extends the existing large-diameter storm drain pipe north from Sweetwater Avenue to Thunderbird Road, replacing the existing surface channel and the culvert at Sutton Drive and providing a 10-year capacity.
- Constructs a shallow landscaped channel over the extended storm drain pipe to carry local stormwater.
- Constructs additional storm drain catch basins in Scottsdale Road from Thunderbird Road to Sweetwater Avenue to drain stormwater from the road into the new storm drain pipe.

### 2. Cactus Park Detention Basin

- Raises the overflow spillway along Cactus Road approximately two feet to provide additional storage volume and prevent the overflow from a 100-year storm.

### 3. 71st Street Channel

- Constructs an underground storm drain from just north of Sunnyside Drive to a point about 600 feet south of Cholla Road.
- Replaces the existing surface channel from Sunnyside Drive to Cortez Street with a slightly deeper hard-surfaced channel to convey local stormwater. 71st Street from Cortez Street to Cholla Road and the existing 71st Street Channel for a distance of about 600 feet south of Cholla Road will remain essentially unchanged. The combined surface conveyance and storm drain will have a 10-year flow capacity.
- Replaces the existing surface channel from just south of Mescal Street to Sahuaro Drive with a slightly deeper hard-surfaced channel to increase its capacity.
- Improves the capacity of the existing culvert at Sahuaro Drive by adding or reconstructing existing culvert barrels.

### 4. Mescal Park Detention Basin

- Enlarges the size of the existing basin to increase the stormwater storage volume and prevent the overflow from a 100-year storm.
- Reconstructs the emergency overflow spillway to eliminate the existing potentially hazardous overflow condition.

### 5. Berneil Ditch

- Reconstructs the existing earth channel from Scottsdale Road west to the southwest corner of Chaparral High School to provide greater capacity. The new channel would be about one foot deeper and have a hardened surface with a uniform bottom and sides. The existing dirt road along the south side of the channel would essentially remain as-is and there would be no modifications to the channel south of Chaparral High School.
- Constructs a floodwall about one foot in height along the south bank of the Berneil Ditch opposite where the 71st Street Channel

## BENEFITS

- Increases stormwater conveyance where necessary to at least a 10-year capacity, thus providing improved regional flood protection.
- Provides a more complete and continuous regional outfall system and creates a better opportunity for smaller, local storm drain and drainage improvements to be constructed in the future.
- Covers the existing open channel along Scottsdale Road from Thunderbird Road to Sweetwater Avenue and reduces the present motorist and pedestrian safety hazards.
- Provides an opportunity to construct catch basins in Scottsdale Road where presently there are none from Thunderbird Road to Sweetwater Avenue, reduces flooding in Scottsdale Road from Sutton Drive to Sweetwater Avenue, and improves the wet-weather driving safety of Scottsdale Road.
- Provides opportunity for landscape aesthetics and multi-use path enhancements along Scottsdale Road.
- Significantly improves the capacity of the 71st Street Channel from Sunnyside Drive to just south of Cholla Road while essentially containing the structural improvements within the existing drainage corridor.
- Provides an opportunity to improve the aesthetic condition of a portion of the Berneil Ditch.
- Eliminates the potentially hazardous overflow condition at the Cactus and Mescal Park detention basins by improving their capacity to handle up to a 100-year event.

## CONSTRAINTS

- This alternative has a significant total cost but it is much less than the cost of the system-wide 100-year alternative.
- This alternative may have some drainage easement and/or temporary construction easement acquisition requirements along the upper 71st Street Channel.
- Construction impacts, while not as severe or extensive as the system-wide 100-year alternative, are still significant along the Berneil Ditch, upper 71st Street Channel, Scottsdale Road, and Cactus and Mescal Parks.
- Construction impacts would temporarily restrict use of the multi-use paths and sidewalks along Scottsdale Road and the Berneil Ditch and at Cactus and Mescal Parks.

## PRELIMINARY COST ESTIMATE

- Scottsdale Road Channel from Thunderbird Road to Sweetwater Avenue: \$1,300,000 - \$1,600,000
- Cactus Park Detention Basin: \$100,000 - \$125,000
- 71st Street Channel from north of Mescal Street to Sunnyside Drive: \$2,000,000 - \$2,500,000
- Mescal Park Detention Basin: \$175,000 - \$225,000
- Berneil Ditch from Scottsdale Road to south of Chaparral High School: \$1,300,000 - \$1,625,000

TOTAL ESTIMATED COST RANGE: \$4,875,000 - \$6,075,000

**Channel** - An open conveyance of surface stormwater having a bottom and sides in a linear configuration. Channels can be natural or man made. Channels can have levees or dikes along their sides to build up their depth. Constructed channels can be plain earth, landscaped, or lined with concrete, stone, or other hard surface to resist erosion and scour.

**10-year Level of Protection** - Protects against the size of storm that has a 10 percent chance of occurring each year.

**Culvert** - A relatively short conduit that conveys surface stormwater through a raised embankment or under a roadway from one side to the other. Culverts can have single or multiple barrels and can consist of concrete, metal or plastic pipe, or reinforced concrete box structures.

**Spillway** - A grate or mesh, usually metal, located at the primary outlet of a detention basin, at a culvert, or at the entrance to a storm drain that is designed to prevent blockage of the structure by debris.

**Storm Drain** - A closed underground conduit that conveys stormwater for some distance.

**Floodwall** - An above-ground man made structure usually situated along the bank of a channel to provide extra conveyance capacity. Floodwalls can be of varying height and length and are usually made of reinforced concrete or masonry block in such a way as to resist the force of the stormwater they are designed to

FIGURE 31 RECOMMENDED SYSTEM-WIDE ALTERNATIVE



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

The introduction was followed by a question and answer session that lasted 30 to 45 minutes. Subsequently, the study's website was updated (again) to incorporate the minutes from the third meeting including the questions and answers.

## 5.2 FINAL RECOMMENDED ALTERNATIVE AND CONCEPT PLANS

After the third public involvement meeting, the proposed "with recommended alternative" condition hydrologic and hydraulic models were finalized. These models were added as new sections to Technical Sections Volumes 1 and 2, Hydrology and Hydraulics reports, respectively, (under separate cover). The updated models included HEC-1 for hydrology, HEC-RAS for open channels and hydraulic grade line analysis for closed storm drain systems. These models each reflect conditions as if all of the recommended alternative features were constructed in a single phase.

Figures 32 and 33 on the following pages illustrates a comparison of the 10-year and 100-year existing condition discharges to the final proposed "with recommended alternative" condition discharges at key locations. Immediately following Figure 33 is Figure 34 which depicts the approximate flood prone area for the "with recommended alternative" condition compared to the existing condition 10-year flood prone area.

## 5.3 TEMPORARY CONSTRUCTION EASEMENTS

Table 14 that immediately follows summarizes the temporary construction easements that are anticipated for the recommended alternative. These easements are depicted in plan view and in cross-section details in the concept plans. There is no permanent fee title right-of-way acquisition anticipated for the recommended alternative.

## 5.4 CONCEPT COST ESTIMATES

Tables 15 through 20 that follow are cost estimates that were derived from the concept design. These estimates include the cost of temporary construction easements. The total estimated cost of the recommended system-wide alternative is \$6,071,795.

**Town of Paradise Valley**  
**INDEPENDENT**  
25 CENTS  
VOL. 17 • No. 27 COVERING THE NEWS OF THE TOWN OF PARADISE VALLEY WEEK OF JULY 3, 2002

**CLOSE UP**  
**Price tag may be \$6 million for area flood-control plan**  
By Tom Barry  
Independent Newspapers

The Flood Control District of Maricopa County has approved a regional flood-control plan to help mitigate damage from heavy storm runoff in portions of Paradise Valley, North Scottsdale and Northeast Phoenix.

The Scottsdale Road Corridor Drainage Master Plan was the outgrowth of nearly two years of study and public hearings jointly undertaken by the Flood Control District and the three municipalities.

Under the plan, improvements to existing flood-control and drainage systems will cost between \$4.8 million and \$6 million, said Afshin Ahouraiyan, project manager.

It should provide protection from at least a 10-year storm, he said.

The plan is a modest one in comparison to other alternatives that were considered.

Estimates for a comprehensive flood-control plan ranged as high as \$42 million for one that would have protected the area from a 100-year storm.

From a practical standpoint, however, officials said available funding would have precluded such an ambitious plan.

Mr. Ahouraiyan said implementation is still contingent on funding, which may include bond financing, property taxes, municipal contributions, or a combination of them.

See Flood — Page 6

**Submitted artwork**  
The Scottsdale Road Corridor Drainage Master Plan will cost between \$4.8 million and \$6 million to implement and will offer protection from heavy runoff in the event of a 10-year storm.

**Flood**  
Continued From Page 1  
Over the years, Paradise Valley, Scottsdale and Phoenix have constructed storm drainage facilities of their own, including detention basins, drainage channels and storm drains. Some were built as part of private or commercial development projects.

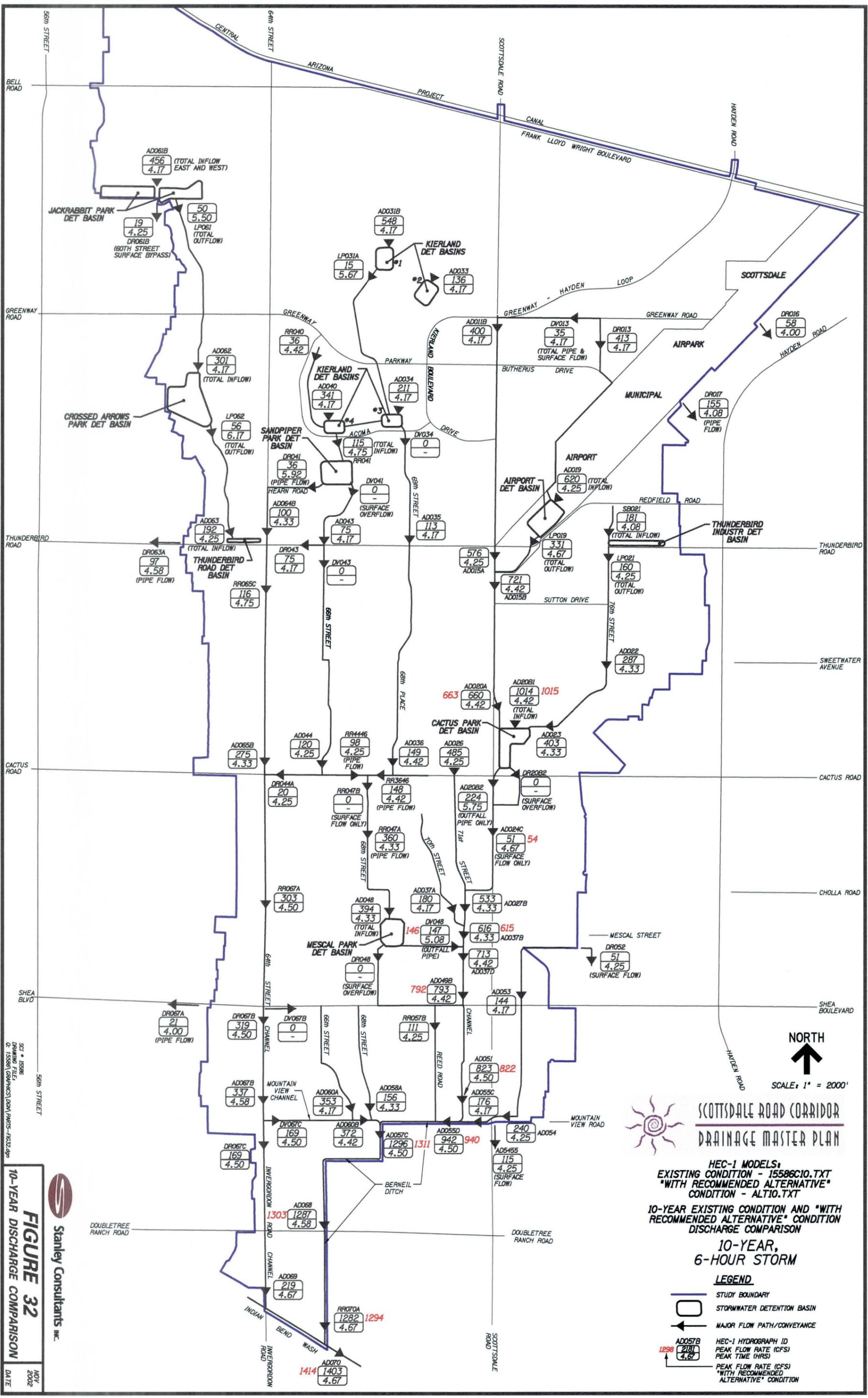
They were never developed as part of a cohesive regional flood-control system," Mr. Ahouraiyan said. "As a result, there are limitations in the system that leaves certain areas vulnerable to flooding."

A primary feature of the new plan will be to enlarge water detention basins at Cactus Park, near Cactus and Scottsdale roads, and Mesquite Park, near Mesquite and Scottsdale roads, and Mesquite Park, near Mesquite and Scottsdale roads.

The existing open drainage channel along Scottsdale Road, from Thunderbird Road to Sweetwater Avenue, would also be covered to reduce the hazard to motorists and pedestrians during a storm runoff.

Officials said enlarging the detention basins would help prevent overflow, particularly near Cactus and Scottsdale roads, and help to avert a possible closure of Scottsdale Road in the event of a 100-year storm.

Newspaper article focusing on project cost



SCI 15586  
 DRAWING FILE: 02-15586A (004/H/ST/DM/PA/RTS-PA02.dwg)  
 10-YEAR DISCHARGE COMPARISON  
 DATE: NOV 2002



**FIGURE 32**

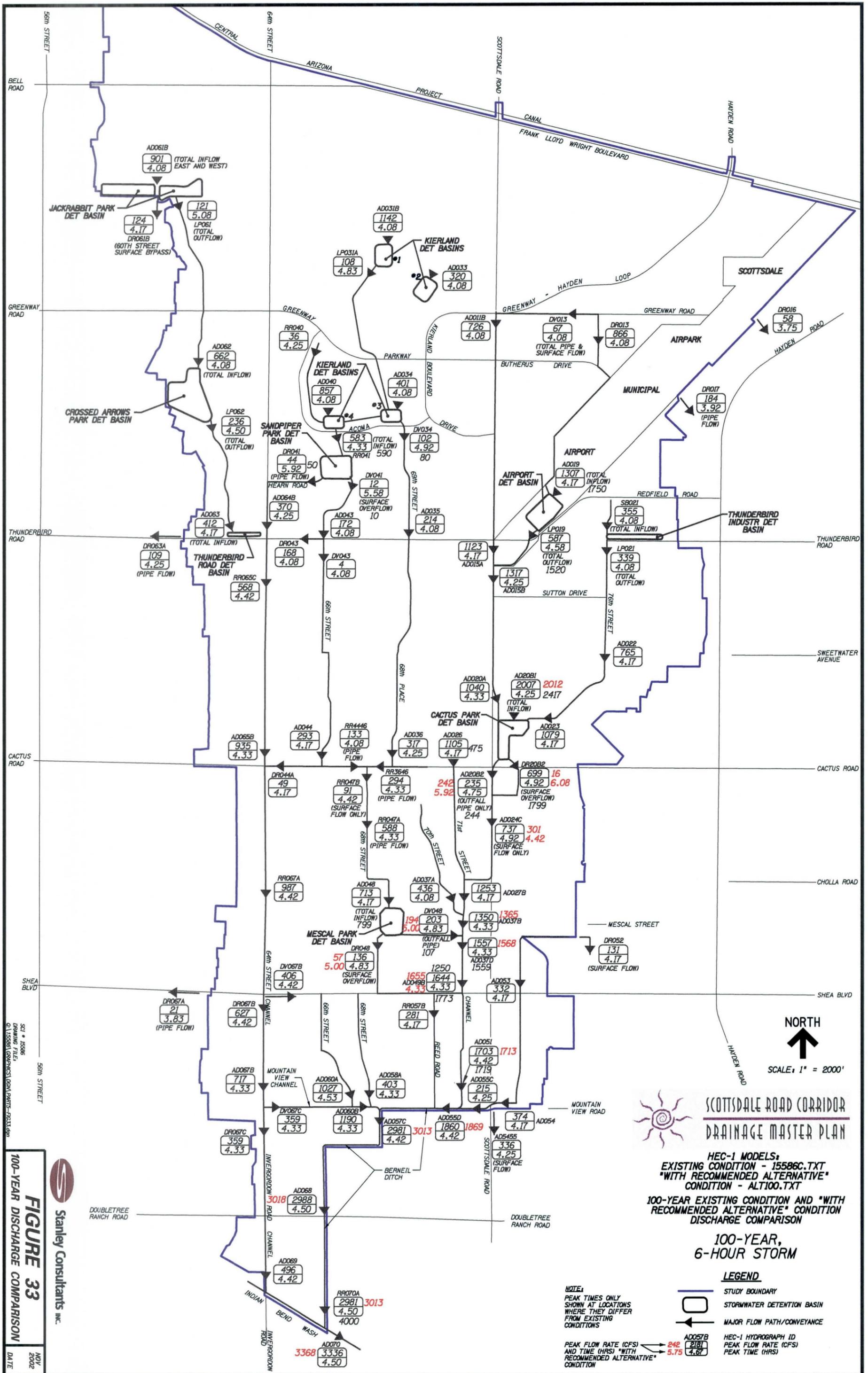
**SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN**

HEC-1 MODELS:  
 EXISTING CONDITION - 15586C10.TXT  
 \*WITH RECOMMENDED ALTERNATIVE\*  
 CONDITION - ALT10.TXT  
 10-YEAR EXISTING CONDITION AND \*WITH  
 RECOMMENDED ALTERNATIVE\* CONDITION  
 DISCHARGE COMPARISON

**10-YEAR,  
6-HOUR STORM**

**LEGEND**

- STUDY BOUNDARY
- STORMWATER DETENTION BASIN
- MAJOR FLOW PATH/CONVEYANCE
- HEC-1 HYDROGRAPH ID  
PEAK FLOW RATE (CFS)  
PEAK TIME (HRS)
- PEAK FLOW RATE (CFS)  
\*WITH RECOMMENDED  
ALTERNATIVE\* CONDITION



**FIGURE 33**  
**100-YEAR DISCHARGE COMPARISON**  
 DATE: NOV 2002



**SCOTTSDALE ROAD CORRIDOR  
 DRAINAGE MASTER PLAN**

HEC-1 MODELS:  
 EXISTING CONDITION - 15586C.TXT  
 \*WITH RECOMMENDED ALTERNATIVE\*  
 CONDITION - ALT100.TXT  
 100-YEAR EXISTING CONDITION AND \*WITH  
 RECOMMENDED ALTERNATIVE\* CONDITION  
 DISCHARGE COMPARISON

**100-YEAR,  
 6-HOUR STORM**

- LEGEND**
- STUDY BOUNDARY
  - STORMWATER DETENTION BASIN
  - MAJOR FLOW PATH/CONVEYANCE
  - HEC-1 HYDROGRAPH ID
  - PEAK FLOW RATE (CFS)
  - PEAK TIME (HRS)

**NOTE:**  
 PEAK TIMES ONLY  
 SHOWN AT LOCATIONS  
 WHERE THEY DIFFER  
 FROM EXISTING  
 CONDITIONS

PEAK FLOW RATE (CFS) → 242  
 AND TIME (HRS) \*WITH  
 RECOMMENDED ALTERNATIVE\*  
 CONDITION → 5.75

**APPROXIMATE 10-YEAR FLOOD PRONE AREA COMPARISON FOR THE "WITH RECOMMENDED ALTERNATIVE" CONDITION AND THE EXISTING CONDITION**

**FIGURE 24**

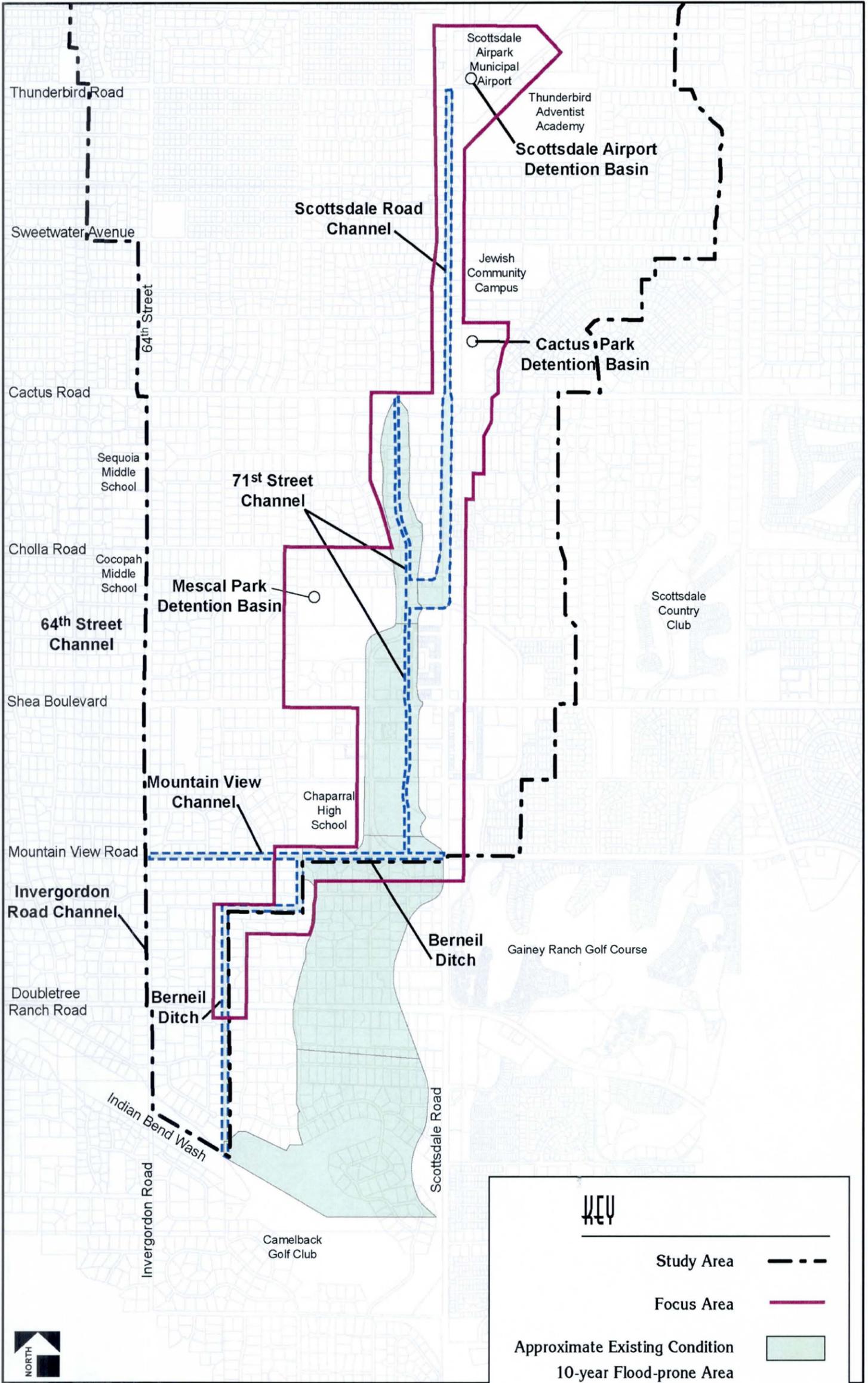


TABLE 14. RECOMMENDED ALTERNATIVE TEMPORARY CONSTRUCTION EASEMENTS

Berneil Ditch				
Location	Length (ft)	Width (ft)	Description	Area (sq ft)
Station 163+00 to Station 163+65	65	10	For reconstruction of existing hard surface drainage apron within Chaparral High School	650
Station 170+15 to Station 170+60	45	10	For reconstruction of existing hard surface drainage apron within Chaparral High School	450
71st Street Channel				
Location	Length (ft)	Width (ft)	Description	Area (sq ft)
Station 346+70 to Station 352+70	600	4	East side of exist 30' drainage easement from approx 300' north of Mescal Street to just south of Cholla Street (from property line to exist fence line)	2400
Station 363+05 to Station 370+65	760	4	2' each side of exist 30' drainage R/W from Cortez Street to Sunnyside Drive (from R/W line to exist fence line)	3040
Scottsdale Road Channel				
Location	Length (ft)	Width (ft)	Description	Area (sq ft)
Station 516+35 to Station 520+17	382	Varies 17' to 56'	At Seventh Day Adventist Church from south of south driveway to north of north driveway, outside of existing drainage easement to reconstruct driveways and perform grading and landscaping.	8100
Station 500+38 to Station 512+90	1252	10	From east side of 10' drainage easement to rear yard fences from Sweetwater Avenue to Sutton Drive	12520

TOTAL AREA (sq ft)	27160
\$ PER SQ FT	\$5.00
TOTAL COST	\$135,800

Notes:

1. Refer to concept plans in Appendix A for stations and locations.
2. No temporary construction easements are anticipated at Cactus and Mescal Parks.
3. The temporary construction easement along the Scottsdale Road channel from Sweetwater Avenue to Sutton Drive is currently a 10' wide utility and sidewalk easement and may require acquisition as a landscape easement to construct the aesthetic improvements that are part of the recommended alternative.



SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

TABLE 15. TOTAL CONCEPT COST ESTIMATE

Recommended Alternative Location	Concept Cost Estimate
Berneil Ditch	\$1,655,066
71st Street Channel	\$1,693,913
Scottsdale Road Channel	*\$2,255,040
Cactus Park Detention Basin	\$155,318
Mescal Park Detention Basin	\$312,458
<b>Total</b>	<b>\$6,071,795</b>

\*Note: To meet future FCDMC hydraulic design criteria, the Scottsdale Road Channel cost and total cost would increase to \$2,623,200 and \$6,411,605, respectively. See Table 7 and discussion in Section 6.1.



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

TABLE 16. 71<sup>st</sup> STREET CHANNEL CONCEPT COST ESTIMATE

71 <sup>st</sup> Street Channel from Sta 334+08 to 339+80					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	Channel Earthwork	CY	950	\$10	\$9,500
2	Hard Surfaced Channel Lining	CY	400	\$300	\$120,000
3	Reconstruct Exist 18" Diam SD Outlet	LS	1	\$1,500	\$1,500
4	Landscaping	SF	10500	\$1	\$10,500
71 <sup>st</sup> Street Channel from Sta 343+39 to 346+25					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	Channel Grading	CY	200	\$10	\$2,000
2	Landscaping	SF	25000	\$2	\$50,000
71 <sup>st</sup> Street Channel from Sta 346+25 to 352+70					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	Reconstruct Access Barrier	LS	1	\$5,000	\$1,000
2	Reconstruct Energy Dissipator	CY	5	\$400	\$2,000
3	Reconstruct Headwall and Wingwalls	CY	10	\$400	\$4,000
4	Remove Exist Channel Lining	SF	13100	\$1	\$13,100
5	New Hard Surface Channel Lining	CY	250	\$300	\$75,000
6	Reconstruct Existing Driveway	EA	2	\$1,000	\$2,000
7	72" Diam Storm Drain Pipe	LF	645	\$200	\$129,000
8	Temporary Construction Easement	SF	2400	\$5	\$12,000
71 <sup>st</sup> Street Channel from Sta 352+70 to Sta 352+90					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	Remove 25 LF of Existing 60" Diam Pipe	LS	1	\$2,000	\$2,000
2	Remove Exist Channel Lining	SF	2700	\$1	\$2,700
3	New Hard Surface Channel Lining	CY	50	\$300	\$15,000
4	Reinforced Concrete Junction Structure	CY	45	\$450	\$20,250
71 <sup>st</sup> Street Channel from Sta 352+90 to Sta 371+53					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	84" Diam Storm Drain Pipe	LF	1863	\$300	\$558,900
2	Pavement Replacement	SY	2200	\$20	\$44,000
3	Remove Existing Slotted Drain and Lateral Pipe	LS	1	\$2,000	\$2,000
4	Catch Basin and Lateral Pipe	EA	1	\$3,000	\$3,000
5	Grated Inlet and Lateral Pipe	EA	2	\$3,000	\$6,000
6	Remove Exist Channel Lining	SF	11100	\$1	\$11,100
7	New Hard Surface Channel Lining	CY	350	\$300	\$105,000
8	Temporary Construction Easement	SF	3040	\$5	\$15,200
9	Landscaping	SF	5000	\$1	\$5,000

TABLE 16 CONTINUED

71 <sup>st</sup> Street Channel from Sta 371+53 to 371+80					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	Sawcut/Remove 27 LF Exist Concrete Channel	LS	1	\$10,000	\$10,000
2	Reinforced Concrete Inlet Structure	CY	40	\$450	\$18,000
3	Inlet Grate	EA	1	\$5,000	\$5,000
<b>Subtotal</b>					<b>\$1,254,750</b>
Mark-up @ 35%					\$439,163
<b>Total</b>					<b>\$1,693,913</b>

Mark-up:

- 5% Contingency Costs
- 5% Utility Relocation
- 5% Permit/Partner/Mobilize/Traffic
- 15% Design/Construction Survey
- 5% Inflation
- 35% TOTAL



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

TABLE 17. SCOTTSDALE ROAD CHANNEL CONCEPT COST ESTIMATE

Scottsdale Road Channel from Sta 500+38 to Sta 512+89					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	Remove Exist Headwall, Wingwalls and Inlet	LS	1	\$10,000	\$10,000
2	Remove Exist Conc/Gabion Channel	SF	32500	\$1	\$32,500
3	90" Diam Storm Drain Pipe	LF	1241	\$400	\$496,400
* 3A	114" Diam Storm Drain Pipe	LF	1241	\$600	\$744,600
4	Grated Inlet	EA	2	\$3,000	\$6,000
5	Catch Basin	EA	8	\$3,000	\$24,000
6	24" Diam SD Pipe Lateral (incl pvmt replace)	LF	404	\$100	\$40,400
7	Fill and Finish Grading	CY	3200	\$10	\$32,000
8	Landscaping	SF	34000	\$2	\$68,000
9	8 ft Wide Meandering Sidewalk	SF	10000	\$2	\$20,000
10	Temporary Construction Easement	SF	12500	\$5	\$62,500
11	Reinforced Concrete Transition Structure	EA	1	\$10,000	\$10,000
Scottsdale Road Channel from Sta 512+89 to Sta 520+69					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	Remove 4 - 8' x 3' RCB, Head and Wingwalls	LS	1	\$15,000	\$15,000
2	12' x 5' RCB	CY	1150	\$350	\$402,500
3	Extend Exist SD Lateral Pipes	EA	4	\$1,000	\$4,000
4	Grated Inlet	EA	3	\$3,000	\$9,000
5	Catch Basin	EA	2	\$3,000	\$6,000
6	24" Diam SD Pipe Lateral (incl pvmt replace)	LF	160	\$100	\$16,000
7	Fill and Finish Grading	CY	3000	\$10	\$30,000
8	Landscaping	SF	40000	\$2	\$80,000
9	Remove Exist 5' Sidewalk	SF	3900	\$1	\$3,900
10	8 ft Wide Meandering Sidewalk	SF	6300	\$2	\$12,600
11	Remove Exist Private Driveway	SF	6200	\$1	\$6,200
12	New Pavement @ Private Driveway	SF	6200	\$2	\$12,400
13	Temporary Construction Easement	SF	8100	\$5	\$40,500

TABLE 17 CONTINUED

Scottsdale Road Channel from Sta 520+69 to Sta 525+44					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	Remove Exist Headwall and Wingwalls	LS	1	\$5,000	\$5,000
3	Remove Exist Concrete Channel Lining	CY	300	\$10	\$3,000
2	8' x 5' RCB	CY	510	\$350	\$178,500
*2A	10' x 5' RCB	CY	580	\$350	\$203,000
4	Fill and Finish Grading	CY	1200	\$10	\$12,000
5	Catch Basin	EA	2	\$3,000	\$6,000
6	24" Diam SD Pipe Lateral (incl pvmt replace)	LF	160	\$100	\$16,000
7	Reinforced Concrete Transition Structure	EA	1	\$10,000	\$10,000
<b>Subtotal</b>				<b>\$1,670,400</b>	<b>*\$1,943,100</b>
Mark-up @ 35%				\$584,640	*\$680,100
<b>Total</b>				<b>\$2,255,040</b>	<b>*\$2,623,200</b>

Note: It is assumed that sidewalk and landscaping will be constructed with the International Fighter Pilot Museum from Sta 520+69 to Sta 525+44.

\*Note: Revised quantity and cost to meet future FCDMC hydraulic design criteria. (See discussion in Section 6.1).

Mark-up:

- 5% Contingency Costs
- 5% Utility Relocation
- 5% Permit/Partner/Mobilize/Traffic
- 15% Design/Construction Survey
- 5% Inflation
- 35% TOTAL



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

**TABLE 18. BERNEIL DITCH CONCEPT COST ESTIMATE**

Berneil Ditch from Sta 161+20 to Sta 185+70					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	Sawcut/Remove Channel Lining/Spillway	SF	14000	\$1	\$14,000
2	Channel Earthwork	CY	7950	\$10	\$79,500
3	Hard Surfaced Channel Lining	CY	3550	\$300	\$1,065,000
4	Temporary Construction Easement	SF	1100	\$5	\$5,500
5	Reconstruct Exist 36" Diam SD Outlet	LS	1	\$2,000	\$2,000
6	Reconstruct Exist 18" Diam SD Outlet	LS	1	\$1,500	\$1,500
7	Flood Wall	CY	18.5	\$350	\$6,475
8	Landscaping	SF	52000	\$1	\$52,000
<b>Subtotal</b>					<b>\$1,225,975</b>
Mark-up @ 35%					\$429,091
<b>Total</b>					<b>\$1,655,066</b>

**TABLE 20. CACTUS PARK DETENTION BASIN CONCEPT COST ESTIMATE**

Cactus Park Detention Basin					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	Remove Exist Masonary Wall	LS	1	\$10,000	\$10,000
2	Reinforced Concrete Retaining Wall	CY	110	\$350	\$38,500
3	Excavation for Riprap Splash Apron	CY	610	\$5	\$3,050
4	Riprap Splash Apron, D(50) = 12"	CY	500	\$80	\$40,000
5	Fill and Finish Grade Above Riprap	CY	300	\$5	\$1,500
6	Landscaping	SF	11000	\$2	\$22,000
<b>Subtotal</b>					<b>\$115,050</b>
Mark-up @ 35%					\$40,268
<b>Total</b>					<b>\$155,318</b>

Mark-up:	
5%	Contingency Costs
5%	Utility Relocation
5%	Permit/Partner/Mobilize/Traffic
15%	Design/Construction Survey
5%	Inflation
35%	<b>TOTAL</b>

**TABLE 19. MESCAL PARK DETENTION BASIN CONCEPT COST ESTIMATE**

Mescal Park Detention Basin					
Item No.	Description	Unit	Quantity	Unit Price	Cost
1	Reinforced Concrete Spillway	CY	40	\$350	\$14,000
2	Hardened Slope Protection	CY	75	\$300	\$22,500
3	1/4" Minus Granite Backfill	CY	30	\$80	\$2,400
4	Basin Excavation - Includes Clearing and Finish Grading	CY	1775	\$5	\$8,875
5	Basin Perimeter Fill	CY	1775	\$5	\$8,875
6	Inlet Access Barrier/Trash Rack	LS	1	\$5,000	\$5,000
7	Reconstruct Equestrian Trail	SF	17300	\$1	\$17,300
8	Reconstruct Asphalt Path	SF	2500	\$1	\$2,500
9	Landscaping	SF	75000	\$2	\$150,000
<b>Subtotal</b>					<b>\$231,450</b>
Mark-up @ 35%					\$81,008
<b>Total</b>					<b>\$312,458</b>



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 5.5 ENVIRONMENTAL CONSIDERATIONS

The Recommended Drainage Alternative consists of three general types of flood control structures, underground culverts, open collector channels, and modifications to the existing detention basins. Between Sweetwater Avenue and Thunderbird Road the existing open channel along Scottsdale Road would be replaced with an underground culvert. A shallow, landscaped channel would be placed above the pipe culverts within the existing City of Scottsdale right-of-way. The existing sidewalk would be reconstructed within this landscaped channel. Proposed improvements at Cactus Park would be limited to raising the existing emergency overflow spillway and construction of a small floodwall where the existing block wall is located on the south side of the park. The 71<sup>st</sup> Street Channel would consist of the reconstruction of the existing open channel and construction of underground pipe or box culverts with associated hard-surfaced, shallow channels. Mescal Park Detention Basin would be enlarged and a hard-surfaced overflow spillway added. The existing earth-lined section of Berneil Ditch between Scottsdale Road and Chaparral High School would be reconstructed as a hard-surfaced channel.

### 5.5.1 Social Considerations

The recommended flood control improvements would occur at existing drainage facilities within the study area. Acquisition of new right-of-way is not anticipated. During final design, it would be determined if the recommended improvements would require drainage easements and/or temporary construction easements at some locations along the 71<sup>st</sup> Street Channel. Construction activities adjacent to roadways would slow traffic movement and inconvenience motorists. Motorists would most likely take alternative routes to avoid the construction zone, which may result in an increase in cut-through traffic on residential streets. Construction of the portion of the proposed storm drain underneath 71<sup>st</sup> Street between Cortez Street and Cholla Street would disrupt local traffic patterns. Access to properties must be provided at all times, and roads and driveways would remain open to traffic during construction except during brief periods of time to move equipment or large construction material. The

contractor should place signs prior to the start of construction along Scottsdale Road, and at Cactus and Mescal Parks according to current agency standards to notify motorists and park users so that they are not surprised by the potential delays and inconveniences. The equestrian and pedestrian paths at Mescal Park would not be accessible at all times. Portions of the paths may be closed while work is being done at that specific location of the basin. Property owners adjacent to the Scottsdale Road Channel, the 71<sup>st</sup> Street Channel and the Berneil Ditch should be individually notified by the contractor in addition to the placement of signs prior to the start of construction.

### 5.5.2 Wildlife and Vegetation Considerations

Impacts to habitat would be negligible since the study area is urbanized and the native vegetation communities and natural habitat within the study area has been drastically altered or completely removed by human activities. Existing protected native plants such as mesquite and palo verde trees that are present along portions of the 71<sup>st</sup> Channel would be salvaged with the implementation of the recommended system-wide alternative. Prior to construction, the District would have to notify the Arizona Department of Agriculture at least 60 days prior to the start of construction to afford commercial salvagers the opportunity to remove and salvage these plants that would not be used for the project. In addition, the District would have to comply with the City of Scottsdale's "Native Plant Ordinance" (Ordinance Number 2262 Section 7.500).

### 5.5.3 Cultural Resource Considerations

A class I cultural resource report was prepared for the focus area within the study and is provided as a separate document. The Arizona State Museum (ASM), the Pueblo Grande Museum (PGM), the Bureau of Land Management (BLM), the National Register of Historic Places (NRHP), the Scottsdale Historic Register, and the State Historic Preservation Office (SHPO) were consulted for cultural resource inventory data for the recommended system-wide alternative. Cultural resource inventory data outside, but within one mile of, the recommended system-wide alternative are included in this study to provide additional context. Inventory data gathered includes

documentation of cultural resource surveys, historic properties, and districts comprised of multiple historic properties. Historic properties are buildings, structures, objects, and sites that are at least fifty-years old.

Nine surveys for historic properties have been conducted in, or within one mile of, the recommended system-wide alternative (Figure 35). Only one of these projects, a 500-acre survey performed for the expansion of the Scottsdale/Municipal Airport, identified two historic properties, neither of which is located within one mile of the recommended system-wide alternative.

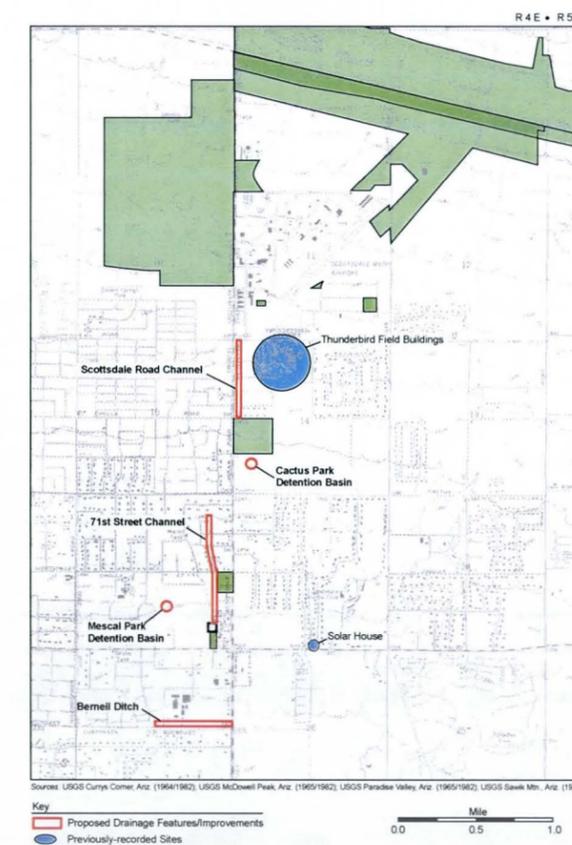


FIGURE 35

SURVEYS OF HISTORIC PROPERTIES



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

Two historic properties have been recorded; both appear on the Scottsdale Historic Resources List but are not listed on the NRHP. The Thunderbird Field Buildings, now comprising the Thunderbird Adventist Academy Boarding School, were constructed in 1939 for the purpose of training pilots during World War II. Solar House was the winning entry in a solar residence design competition sponsored by G. Robert Herberger. The house, located at 10601 North Sundown Drive, was built in 1957.

No NRHP properties would be affected by the recommended system-wide alternative because none were identified immediately adjacent to the existing drainage structures. The areas that would be affected by the proposed drainage features have not been surveyed for cultural resources. These areas would require intensive pedestrian survey prior to the proposed undertakings sufficient to comply with the City of Scottsdale's "Archaeological Resource Protection Ordinance" (Chapter 46 of Scottsdale Revised Code, 4-TA-99, New Article VI, Section 46). If cultural resources are encountered during construction, work would stop at that location and the District would contact the respective agencies to arrange for the proper assessment or treatment of those resources.

#### 5.5.4 Hazardous Materials Considerations

A Preliminary Initial Site Assessment has been completed for the Recommended Drainage Alternative and is provided as a separate document. A review of current records at the Arizona Department of Environmental Quality (ADEQ), and Environmental Protection Agency (EPA) indicate that there are no known hazardous materials concerns within the Recommended Drainage Alternative. There are 6 potential hazardous materials facilities of concern adjacent to the proposed improvements. Two of these sites are dry cleaning businesses that are classified as Small Quantity Generators. One site identified in the Hazardous Materials Incident Report has been remediated. Three facilities, with a total of 12 drywells, were identified as being adjacent to the proposed improvements. A Phase I Environmental Site

Assessment (ESA) should be completed prior to construction activities to reduce the potential for unidentified hazardous materials to be encountered during construction. If hazardous materials are encountered during construction, work would stop at that location and the District would contact the respective agencies to arrange for the proper assessment or treatment of those materials.

#### 5.5.5 Section 404 Permit Considerations

Impacts to "waters" of the United States may require permit(s) from the U.S. Army Corps Engineers and mitigation as part of the requirements of Sections 404 and 401 of the Clean Water Act. A jurisdictional delineation would need to be completed during final design to determine the type, if any, of permit required by the U.S. Army Corps of Engineers. The need for 401 Water Quality Certification would also be determined during final design.

#### 5.5.6 Air Quality Considerations

The study area is in an area where the State Implementation Plan (SIP) contains transportation control measures and the National Ambient Air Quality Standards (NAAQS) are not being met for carbon monoxide, ozone, and particulate matter less than 10 microns (PM<sub>10</sub>). Some deterioration of air quality may be expected during construction due to the operation of construction equipment combined with the slower traffic speeds associated with construction zones. This localized condition would be discontinued when the project is completed. Dust generated from construction activities will be controlled and minimized. The contractor would have to observe and comply with all air pollution ordinances, regulations, orders, etc., from those agencies having expertise and/or jurisdiction. Maricopa County Rule 310, Open Fugitive Dust Services would be enforced by the Maricopa County Environmental Services Department. The proposed flood control improvements would not cause or contribute to a violation or increase the frequency or severity of an existing PM<sub>10</sub> violation once construction is completed. Therefore, there would be no substantial impact to air quality with the implementation of the recommended system-wide alternative.

#### 5.5.7 Recommended Mitigation Measures

Measures to reduce environmental impacts would include:

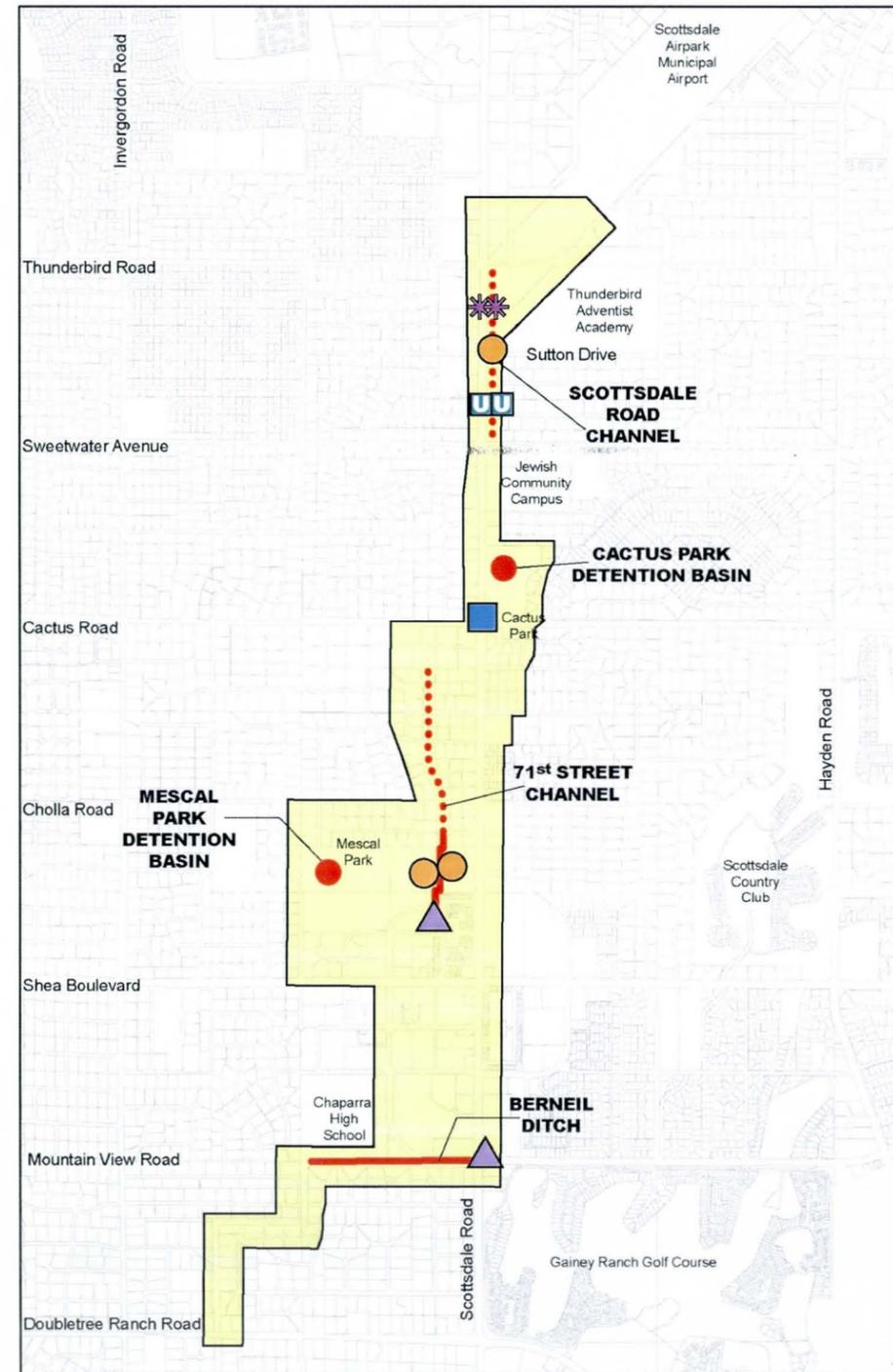
- a. The contractor should place signs prior to the start of construction along Scottsdale Road, and at Cactus and Mescal Park according to current agency standards to notify motorists and park users so that they are not surprised by the potential delays and inconveniences. Property owners adjacent to the 71<sup>st</sup> Street Channel and the Berneil Ditch should be individually notified by the contractor in addition to the placement of signs prior to the start of construction.
- b. Prior to construction, the District would have to notify the Arizona Department of Agriculture at least 60 days prior to the start of construction to afford commercial salvagers the opportunity to remove and salvage native plants not used for the project. In addition, the District would have to comply with the City of Scottsdale's "Native Plant Ordinance" (Ordinance Number 2262 Section 7.500).
- c. The completion of a Phase I ESA during the design phase is recommended to identify any recognized environmental concerns.
- d. If hazardous materials or cultural resources are encountered during construction, work would stop at that location, and the District would contact the respective agencies to arrange for the proper assessment or treatment of those materials and resources.
- e. The contractor would have to observe and comply with all air pollution ordinances, regulations, orders, etc., from those agencies having expertise and/or jurisdiction to be followed. Maricopa County Rule 310, Open Fugitive Dust Services, which would be enforced by the Maricopa County Environmental Services Department.



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

f. Intensive pedestrian cultural resource surveys would need to be undertaken prior to construction to comply with the City of Scottsdale's "Archaeological Resource Protection Ordinance" (Chapter 46 of Scottsdale Revised Code, 4-TA-99, New Article VI, Section 46).

**FIGURE 3C**  
**HAZARDOUS MATERIALS FACILITIES OF CONCERN**



**Key**

- |                                  |            |
|----------------------------------|------------|
| Focus Area                       | HMIT Sites |
| Proposed Underground Storm Drain | Finds      |
| Proposed Channel Improvement     | Drywells   |
| Proposed Basin Improvement       | RCRIS-SQG  |
|                                  | UST Site   |





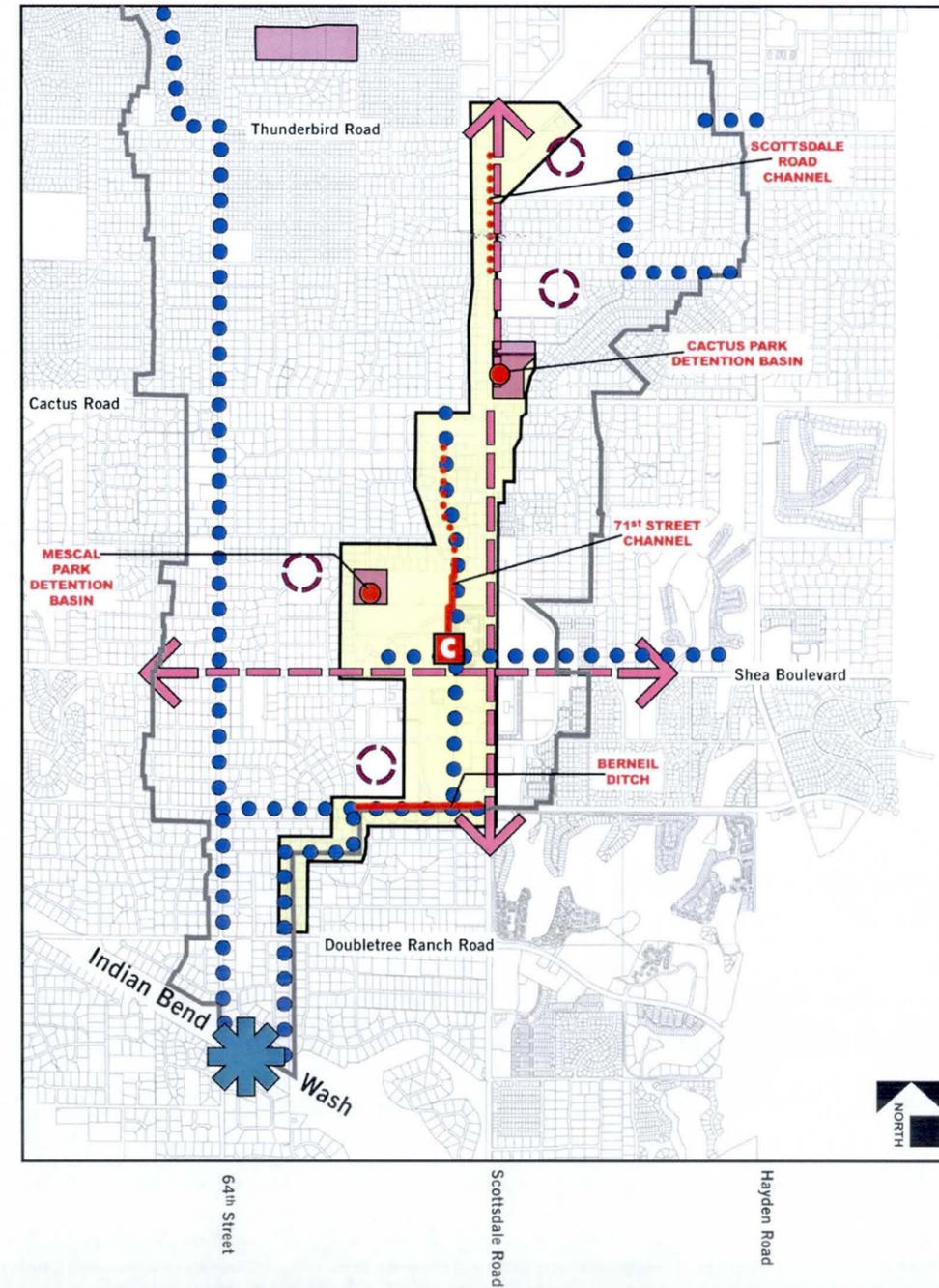
# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 5.6 MULTI-USE/RECREATION CONSIDERATION

The drainage improvements in the recommended system-wide alternative provide minimal opportunity to create new local or regional multi-use opportunities because they are discontinuous and do not create linkages to existing or planned recreational and multi-use facilities. The recommended system-wide alternative does, however, provide opportunities to improve existing facilities to make them more accessible/pleasant to use by residents. Figure 37 illustrates the locations of potential multi-use opportunities.

- LEGEND**
- Potential Regional Recreation Connection
  - Potential Trail
  - Streetscape Enhancement
  - Potential Detention Location
  - Landscape Preservation Area
  - Study Area
  - Focus Area
  - Proposed Basin Improvement
  - Proposed Channel Improvement
  - Proposed Underground Storm Drain
  - Proposed Culvert Improvement

**FIGURE 37  
MULTI-USE OPPORTUNITIES**





# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 5.6.1 Scottsdale Road Channel

There is currently a sidewalk along the east side of Scottsdale Road that is located at the bottom of the existing open channel. As part of the proposed improvements, the sidewalk would be reconstructed within a shallow landscaped channel over a new underground culvert. According to the City of Scottsdale's General Plan, the streetscape along Scottsdale Road should promote the city's visual quality and character through landscaping and sidewalk design. By reconstructing the sidewalk within a more pedestrian friendly environment, the proposed improvement would enhance the character of the surrounding area while providing a multi-use opportunity to the community. Scottsdale Road would be improved due to increase visibility for both motorists and pedestrians.



Existing channel along Scottsdale Road

## 5.6.2 Cactus Park Detention Basin

The improvements to Cactus Park would have minimal impacts to users of this facility. During construction, a small portion of the park would be temporarily closed to public use. However, there are no park facilities at the southern end of the basin where the improvements would be constructed except for an existing sidewalk and granite path. These improvements would also

protect the main recreation building during large flooding events. No additional multi-use opportunities would be provided with the implementation of the Recommended Drainage Alternative.



Existing primary outlet at Cactus Park

## 5.6.3 71<sup>st</sup> Street Channel

Portions of the 71<sup>st</sup> Street Channel would provide an informal pedestrian path and increase the multi-use opportunities of the recommended system-wide alternative. Specifically, the portion of the open channel between Sunnyside Drive and Cortez Street would be designed to provide for a path along the bottom of the open channel. For a distance of 600 feet south of Cholla Street, area residents would be able to continue to use the channel as a secondary access point to their property. The reconstruction of this section would not impair the use of this channel for access to adjacent properties. Between Cortez Street and Cholla Street, the improvements consist of constructing an underground culvert beneath 71<sup>st</sup> Street. The recommended system-wide alternative does not offer any improved access or multi-use opportunities along the street. From Mescal Street to Saguaro Drive, the existing landscaped, earth and cobble-lined open channel would be replaced with a hard-surfaced channel. The hard-surfaced channel would offer some informal use for pedestrians. However

its connectivity to other pedestrian/multi-use facilities is limited and the channel bottom is only eight feet in width.

## 5.6.4 Mescal Park Detention Basin

Improvements at Mescal Park would consist of expanding the size of the basin and constructing a hard-surfaced overflow emergency spillway. The improvements would be designed to have minimal impact to the pedestrian and equestrian paths located at the basin. The enlargement of the basin would not affect the use of or access to the park by users except for brief periods during construction. A small portion of the equestrian trail would be realigned near the northern end of the park. The existing equestrian arena would not be disturbed. The recommended system-wide alternative does not provide the opportunity for improvements of this facility or the opportunity to increase the connectivity of this facility to others in the area.



Equestrian use at Mescal Park



## SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

### 5.6.5 Berneil Ditch

Berneil Ditch currently provides the opportunity for recreation use by pedestrians, equestrians, and other trail users. The channel is currently earth-lined in the section of Berneil Ditch that is going to be improved. An informal pedestrian path would be provided along the north side of the channel, connecting Chaparral High School with Scottsdale Road. The Recommended Drainage Alternative does not prohibit future development of Berneil Ditch as a linear pedestrian park. The proposed improvements would enhance the multi-use opportunities along the northern portion of the ditch. The maintenance road along the south side of Berneil Ditch would continue to provide for local use of the facility.



*Upper Reach of Berneil Ditch*

### 5.7 AESTHETIC CONSIDERATIONS

The Recommended Alternative provides the opportunity to improve the visual quality and intactness of several drainage features that rated low or moderate. The open channels with the project area currently are not a visually interesting feature in the landscape and do not form a cohesive pattern with other visual elements. The two detention basin park facilities are considered areas to be preserved and would not be notably modified from the current conditions.

#### 5.7.1 Scottsdale Road

Under grounding the existing open channel adjacent to Scottsdale Road provides the opportunity to increase the visual quality of the streetscape as well as substantially improve the pedestrian environment. This area is a pedestrian/multi-use corridor and is identified as having low visual intactness because of the lack of cohesive landscape elements and patterns. The proposed improvements would replace the open channel with an underground culvert with a shallow landscaped swale and new pedestrian facility or path over it. The improvements along Scottsdale Road fall within the Suburban classification of streetscape design as defined by the City of Scottsdale. Streetscape design in the Suburban classification should "create compatibility between pedestrians and motorists". Pedestrians and motorists would be separated by a detached sidewalk alignment. Landscaping would include native or desert adapted trees that would create a broad, dense canopy.

This portion of Scottsdale Road is designated as one of Scottsdale's scenic corridors. Plant material would be selected based on Scottsdale recommended plant list (refer to Table 21) and the city's general guidelines would be followed during final design.



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 5.7.2 Cactus Park

Cactus Park was identified in Section 2 of this document as an area of preservation. These areas have a high level of scenic quality, level of intactness, and high viewer sensitivity. Cactus Park exhibits an attractive combination of form and vegetation and creates a cohesive pattern of visual elements. The proposed improvements at Cactus Park would include the construction of a hardened emergency spillway at the current overflow location using a small floodwall where the existing block wall is located on the south side of the park. The floodwall would be similar to the existing block wall in terms of form, scale, and dominance. The floodwall should be designed with aesthetic treatments such as texture and coloration to match other features within the area.

## 5.7.3 71<sup>st</sup> Street Channel

The existing physical and visual conditions of the 71<sup>st</sup> Street Channel vary between Sunnyside Drive and Sahuaro Drive (refer to Figure 38). The 71<sup>st</sup> Street Channel between Sunnyside Drive and Cortez Street would consist of a shallow hard-surfaced channel over an underground culvert. This portion of the 71<sup>st</sup> street channel is within the West Cactus Horse Properties landscape character unit defined in Section 2 of this document. One-acre single-family residences, landscaped with a mixture of native and non-native plant material, characterize this area. The existing shallow channel is cracked and in disrepair reducing the already low visual intactness of this feature. By reconstructing the shallow channel with aesthetic treatments such as surface texturing and colored concrete, the new channel would be constructed to increase the visual interest and increase the cohesiveness with the surrounding suburban neighborhood character.

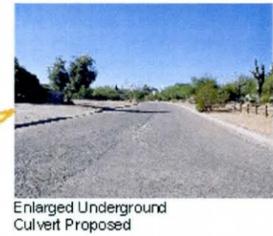
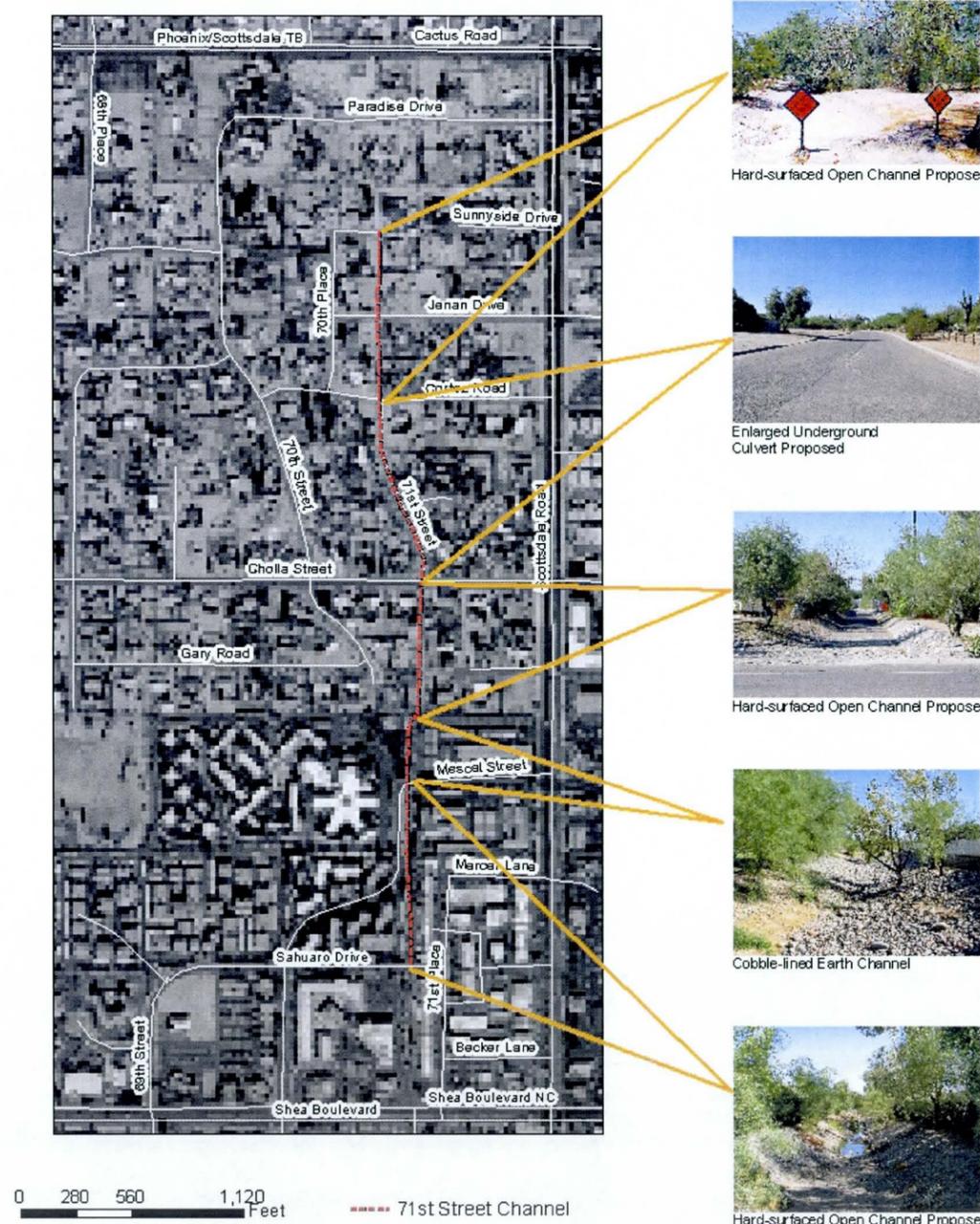
Between Cortez Street and Cholla Street the drainage improvements would consist of enlarging the existing culvert underneath 71<sup>st</sup> Street. The culvert improvements would not provide the opportunity to improve the aesthetics of the area because it occurs beneath 71<sup>st</sup> Street and is not visible from the surrounding neighborhood.

Table 21  
City of Scottsdale's Suburban Character Area Plant List

TREES	
ACACIA ABYSSINICA	ABYSSINIAN ACACIA
ACACIA ANEURA	MULGA
ACACIA STENOPHYLLA	SWEET ACACIA
BAUHINIA CONGESTA	ANACAHUITA
CERCIDIUM SPP.	PALO VERDE
CHILOPSIS LINEARIS	DESERT WILLOW
DALBERGIA SISSOO	SISSOO
EUCALYPTUS CITIODORA	LEMON SCENTED GUM
EUCALYPTUS PAPUANA	GHOST GUM
EUCALYPTUS SPATHULATA	NARROW LEAF GIMLET
EUCALYPTUS TORQUATA	RED CAP GUM
EUCALYPTUS WOODWARDII	LEMON FLOWERED GUM
FRAXINUS UHDEI	SHAMEL ASH
GEIJERA PARVIFLORA	AUSTRALIAN WILLOW
PITHECELLOBIUM FLEXICAULE	TEXAS EBONY
PROSOPIS SPP.	MESQUITES
ULMUS PARVIFLORA	EVERGREEN ELM
SHRUBS	
BACCHARIS 'CENTENNIAL'	
CAESALPINIA SPP.	BIRD OF PARADISE
CALLIANDRA CALIFORNICA	BAJA FAIRY DUSTER
CALLIANDRA ERIOPHYLLA	FAIRY DUSTER
DALEA SPP.	DALEAS
DASYLIRION SPP.	
HESPERALOE SPP.	
LEUCOPHYLLUM SPP.	RANGERS/SAGES
NOLINA SPP.	
RUPELLIA PENINSULARIS	DESERT RUELLIA
SALVIA CLEVELANDII	CHAPARRAL SAGE
SOPHORA SECUNDIFLORA	TEXAS MOUNTAIN LAUREL
YUCCA SPP.	



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN



From Cholla Street, 600 feet south, the 71<sup>st</sup> Street Channel would consist of an underground pipe storm drain with a combination hard surfaced channel/access alley on the surface. The surface above this storm drain would remain hard-surfaced because it provides access to properties. The surface treatment of the alley should be stained or exposed aggregate to improve the aesthetics of the area.

From the end of the 600-foot section to Mescal Street, the 71<sup>st</sup> Street Channel is an earth and cobble-lined channel that could remain in this theme. The level of visual intactness of this feature was considered to be moderate to high, as some improvements could enhance the features condition. Improvement in this section would include removal of emergent vegetation, cleaning, and regrading of the existing channel.

From a few hundred feet south of Mescal Street to Saguaro Drive, the existing earthen channel would be replaced with a hard-surfaced channel. This portion of the channel is currently overgrown with vegetation. Construction of a hard-surfaced channel, which is stained or has a textured surface, could create a feature in the landscape that has visual interest and complement the surrounding commercial land use. This portion of the channel is situated between a shopping center on one side and a multi-family residential complex on the other.

#### 5.7.4 Mescal Park Detention Basin

Mescal Park was identified in Section 2 of this document as an area of preservation. These areas have a high level of scenic quality and level of intactness. Mescal Park exhibits an attractive combination of form and vegetation and creates a cohesive pattern of visual elements. Additionally, due to the recreational use of this facility, Mescal Park was identified as having high viewer sensitivity. The proposed improvements at Mescal Park include the construction of a hardened emergency spillway, a new trash rack/access barrier, and expansion of the basin area. The hardened emergency spillway would be covered with grass and would not be visually-evident. The new trash rack/access barrier will be painted to maintain the high level of intactness and character of the basin. The basin would be expanded in a curvilinear design and would not impact the existing trails above the banks of the basin. The expansion of the basin would make the footprint of the basin less linear which would increase the visual interest of this drainage feature.

#### 5.7.5 Berneil Ditch

The upper reach of the Berneil Ditch is currently an earth-lined channel. The vegetation growing within this channel softens the impact the structure has on the landscape. The ditch currently provides no particular visual interest and does not have features that disrupt the cohesiveness of the landscape. The construction of a hard-surfaced channel would create a structure that has a higher visibility and dominance within the landscape because the line, form, and texture of the new structure would be more prominent within the landscape and have a greater contrast with the surrounding

**FIGURE 30**  
**71<sup>ST</sup> STREET CHANNEL CONDITIONS**



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

landscape. The design of the channel should include aesthetic treatments to create a structure that complements the surrounding land use and is cohesive with the landscape.

## **5.8 Landscape Design Themes and Aesthetic Design Guidelines and Criteria**

The landscape design themes illustrated on the following pages vary for each of the drainage structures proposed in the recommended system-wide alternative. Scottsdale Road Channel would provide an opportunity to provide a comfortable pedestrian environment as well as complying with Scottsdale's vision for one of the designated scenic corridors in the city. The existing character of the two detention basin parks would be preserved and disturbance to these facilities minimized. The 71<sup>st</sup> Street Channel and Berneil Ditch provide opportunities for multi-use/multi-modal paths in addition to creating a neighborhood spine as the unifying element that would create a visually interesting pattern of elements. The aesthetic design guidelines and criteria for each landscape design theme associated with each of the drainage facilities are illustrated on the pages that follow in Section 5.8 and in the concept plans.

### 5.8.1 Scottsdale Road Channel Landscape Design Theme

Landscape Design Theme: to create a comfortable suburban pedestrian environment with a meandering path and appropriately scaled indigenous plant material that is visually and physically separated from Scottsdale Road.

Channel Criteria:

#### 1. Configuration

- Create an overall channel form that is more organic and less geometric.
- Meander channel alignment in an irregular pattern.
- Vary channel sides slope ratios asymmetrically from 4:1 to 8:1 along the length of the channel.
- Low landscaped berm adjacent to street.
- Round channel banks at the top.
- Pathway should be placed at least 15 feet from edge of roadway curb.

#### 2. Vegetation

- Select plant material from the plant list in the City of Scottsdale's Suburban Character Area plant palette.
- Prune trees to allow for pedestrians to pass underneath their canopies. Use trees as accents in order to not block panoramic views of surrounding mountains. Use no more than three different species of tree along any one street venue. Select specific 'street tree(s)' that fits with the adjacent landscape in terms of form, color, and texture for each street.
- Place shrubs, ground covers, rocks, and boulders in an irregular pattern along the sides and top of the banks.
- Install irrigation system to maintain and establish plant material.
- Select plant material to provide seasonal color and interest in either form or texture. Avoid using plant material with notable thorns or those plants considered hazardous to pedestrians.

#### 3. Materials

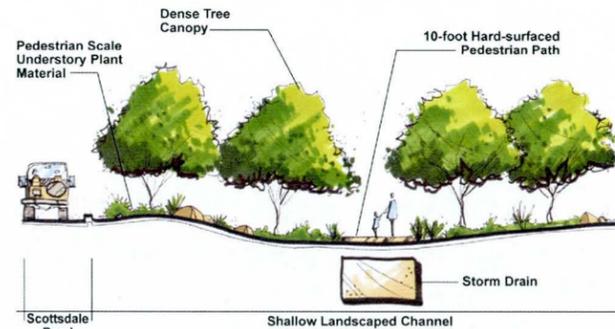
- Use a hard-surfaced material for the pedestrian path with texture surface, integral color, or other visual interesting treatment of the path surface.
- Railings and poles should use a consistent desert sensitive color palette.



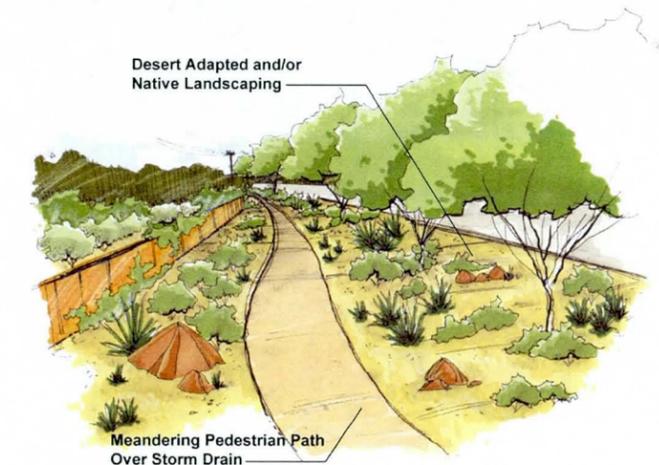
Section South of Sutton Drive



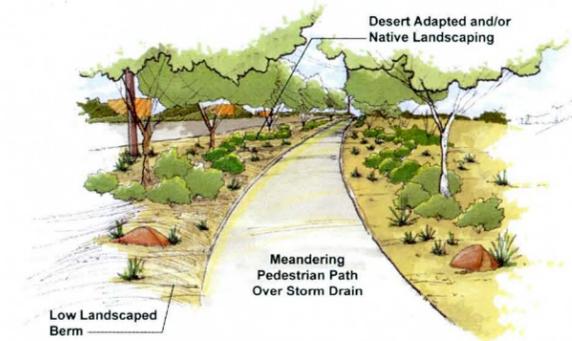
Existing Conditions South of Sutton Drive



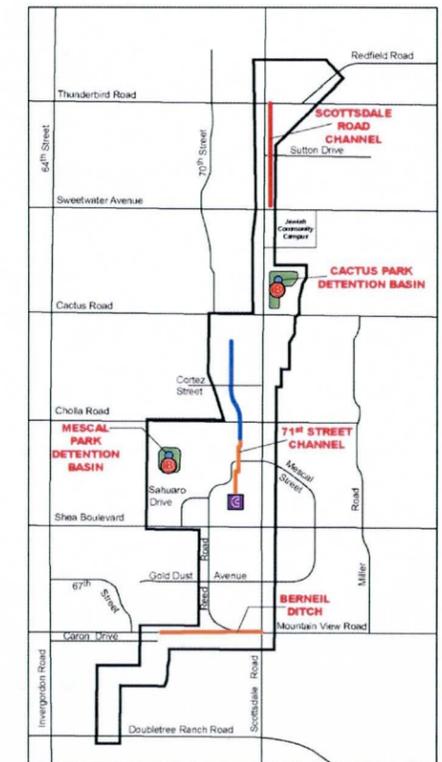
Section North of Sutton Drive



Conceptual Sketch South of Sutton Drive



Conceptual Sketch North of Sutton Drive



Location Map



Existing Conditions North of Sutton Drive

## 5.8.2 71<sup>st</sup> Street Channel Landscape Design Theme

Landscape Design Theme: to create an informal pattern of unifying elements that incorporates an informal pedestrian path where feasible and low-density indigenous plant material to integrate the drainage facility with the surrounding commercial and residential neighborhood.

### Channel Criteria:

#### 1. Configuration

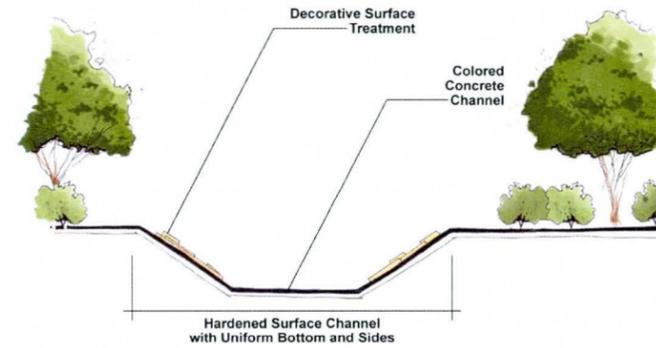
- Create an overall channel form that is more informal in character rather than rectangular and uniform.
- Meander channel alignment in an irregular pattern.
- Vary channel sides slope ratios asymmetrically from 2:1 to 4:1 along the length of the channel.
- Round channel banks at the top.

#### 2. Vegetation

- Select plant material from the plant list in the City of Scottsdale's Suburban Character Area plant palette.
- Place shrubs and trees in an irregular pattern along top of the banks.
- Use vegetation to fill-in voids and complement the adjacent landscape.
- Plant trees in a pattern to mimic the form, line, and density of trees associated with the project vicinity.
- Install irrigation system to maintain and establish plant material.
- Select plant material to provide seasonal color and interest in either form or texture. Avoid using plant material with notable thorns or those plants considered hazardous to pedestrians.

#### 3. Materials

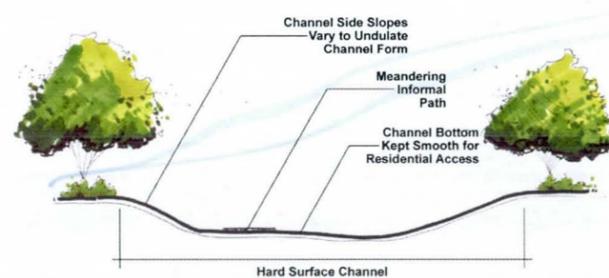
- Use a hard-surfaced material for the informal meandering pedestrian path with texture surface, integral color, or other visual interesting treatment of the path surface.
- Use pattern concrete or other textured material for channel side slopes.
- Channel bottom kept smooth for residential access to property.



Section North of Shea Boulevard



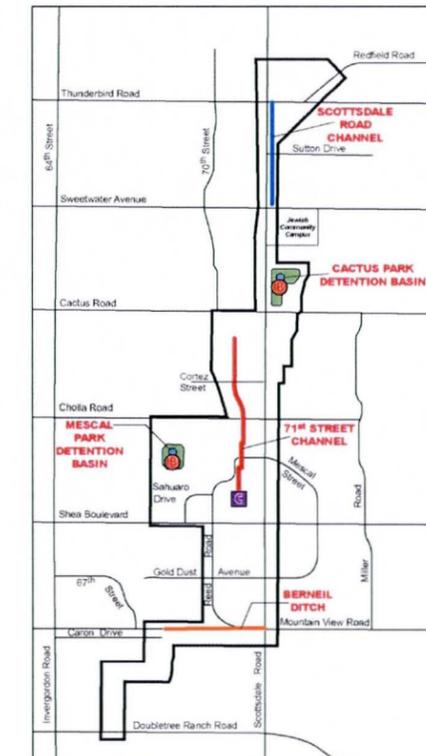
Existing Conditions North of Shea Boulevard



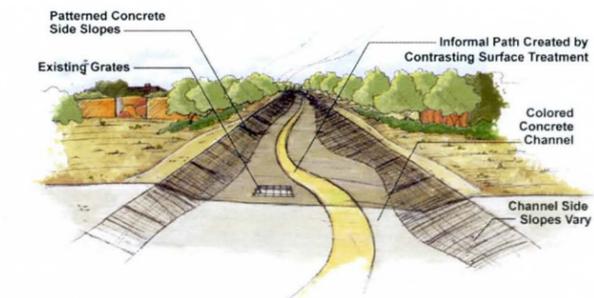
Section North of Cortez Street



Existing Conditions North of Cortez Street



Location Map



Conceptual Sketch North of Cortez Street

### 5.8.3 Detention Basin Landscape Design Theme

Landscape Design Theme: to minimize any disturbance to the turfed open space and perimeter trees and maintain the character and use of the public park.

Applicable to: Cactus and Mescal Parks

Basin Criteria:

#### 1. Configuration

- Enhance an overall basin form that is more informal in character rather than rectangular and uniform.
- Vary sides slope ratios asymmetrically throughout the basin.
- Round top of basin side slopes.
- Maintain a separation of pedestrian and equestrian paths.

#### 2. Vegetation

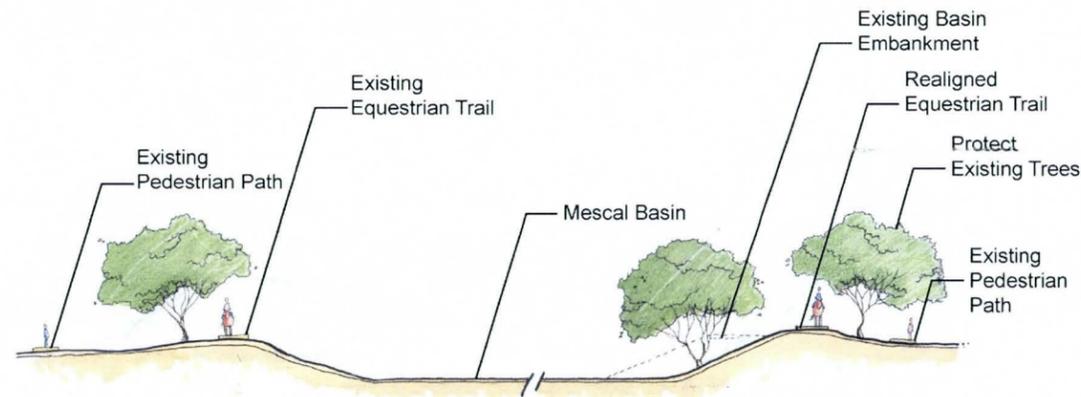
- Plant new trees in a pattern to mimic the form, line, and density of trees associated with the existing basin.
- Protect-in-place existing trees.
- Turf basin slopes to match existing conditions at Mescal Park.

#### 3. Structural Components

- Use materials, shapes, and colors to blend in with the surroundings for the spillways and outlets. Paint structural features in keeping with character of the basin.
- New emergency spillway at Mescal Park will be covered with grass to maintain the character of the park. Exposed concrete surfaces should be textured or stained.



Cactus Park looking south



Section of Mescal Park



Cactus Park along Cactus Road



Mescal Park and Outlet Structure looking south



Mescal Park and Inlet Structure looking north



Mescal Park Plan

### 5.8.4 Berneil Ditch Landscape Design Theme

Landscape Design Theme: to create a hard-surface channel as a sculptural land graphic that relates to the character of the setting.

Applicable to: Berneil Ditch

Channel Criteria:

#### 1. Configuration

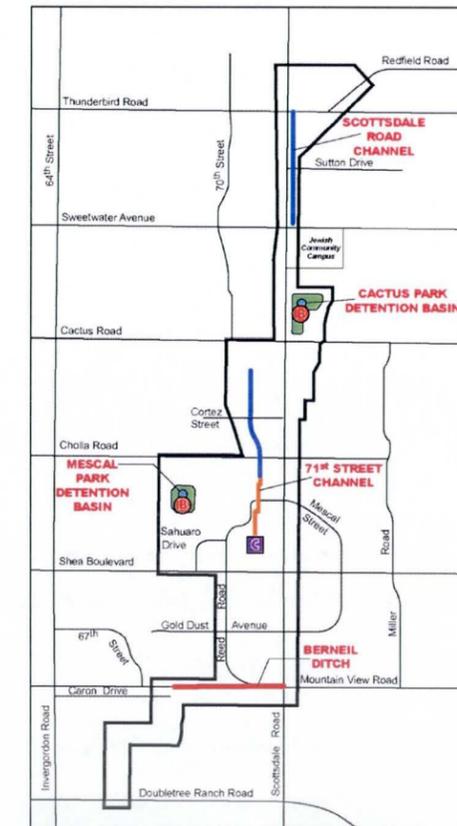
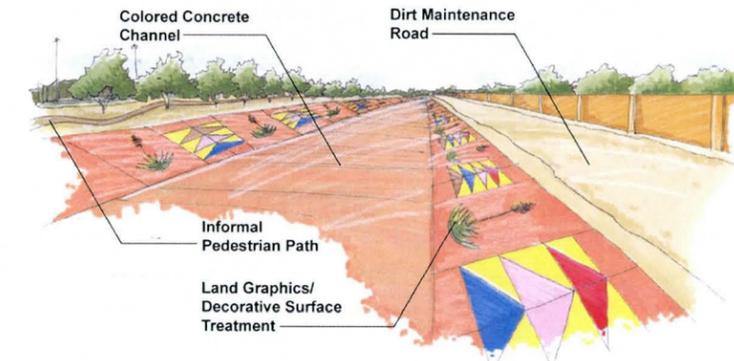
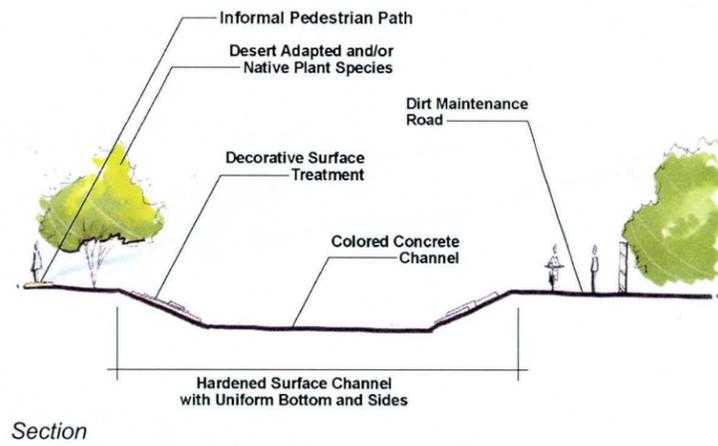
- Use integral colored material and surface treatments that would create a sculptural land graphic.
- Place landscape area with informal pedestrian path between the channel and Chaparral High School.

#### 2. Vegetation

- Select plant material from the plant list in the City of Scottsdale's Suburban Character Area plant palette.
- Plant trees in a pattern to mimic the form, line, and density of trees associated with natural washes in the project vicinity.
- Install irrigation system to maintain and establish plant material.
- Existing trees will be protected or salvaged for transplant.

#### 3. Materials

- Use surface material that complements the character of the adjacent land use.





# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

## 6.0 Implementation, Phasing and Maintenance

### 6.1 Implementation

With the completion of the final hydrology and hydraulics, there were a number of design and phasing issues that came to light and further adjustments were made to the recommended system-wide alternative. Many of these design and phasing issues were resolved and reflected in the concept plans for the recommended alternative that are included in Appendix A of this report. The following sub-sections describe further design, phasing and implementation issues that are recommended for consideration in final design.

#### 6.1.1 Berneil Ditch

The Berneil Ditch concept design involves a hard surfaced channel with a typical 40-foot wide bottom, side slopes of 2-horizontal to 1-vertical, a uniform longitudinal slope, reconstruction of four inflow facilities for local drainage and construction of a low floodwall opposite the inflow point of the 71<sup>st</sup> Street Channel. It was assumed that the existing wing walls and apron at the outlet end of the 71<sup>st</sup> Street Channel culvert and the existing headwall at the Scottsdale Road culvert would remain in place.

Transitions in bottom width will be necessary at both the upstream and downstream limits of construction. Transitions in side slope will also be necessary at the above locations as well as at the confluence with the 71<sup>st</sup> Street Channel.

Typical side slopes of 2-horizontal to 1-vertical were chosen to maximize the hydraulic capacity of the improved channel reach in

order to meet the 10-year conveyance objective and include some freeboard. This side slope is generally considered the maximum slope for a trapezoidal concrete lined channel. A flatter side slope would be desirable, primarily from a safety standpoint. The side slope used in final design should be as flat as possible while still able to convey a 10-year discharge and provide freeboard.

It may be possible to reduce the typical bottom width of 40 feet in final design upstream from the confluence with the 71<sup>st</sup> Street Channel if it is concluded that no freeboard is needed in that sub-reach. If future roadway improvements planned by the City of Scottsdale for Scottsdale Road are constructed prior to the Berneil Ditch improvements, the upper construction limit will be shortened slightly due to the proposed extension of the existing box culvert under Scottsdale Road.

The length, upstream and downstream limit of the concept floodwall approximate the position of the existing concrete lining along the channel's south side at that location. The height of the concept floodwall is 18 inches which approximates the height of the existing floodwall that was constructed by the Town of Paradise Valley at the middle bend of the Berneil Ditch.

Two additional features for the Berneil Ditch that might be considered in final design would be to incorporate a maintenance access ramp into the channel and a cross slope on the channel bottom. The maintenance access ramp could be located on the south side of the channel near Scottsdale Road. No cross slope was included in the concept plans because the existing concrete

lined channel downstream has no cross slope. Bottom cross slope improves low flow characteristics, sediment movement and therefore maintenance, and could be applied to the entire improved reach. Neither of these features was envisioned as adding any significant cost to the project.

#### 6.1.2 Mescal Park Detention Basin

The material needed to raise the perimeter of the basin will be excavated laterally from the basin's northeast corner. It is assumed that the material at this location will be suitable for that purpose. The area of excavation depicted in plan view should be large enough to generate the required volume of fill.

The typical section for the overflow spillway in the concept plans is, as implied, conceptual. The hardened surface at the overflow spillway can be accomplished in a number of different ways such as soil cement, concrete or riprap. Because of the significant equestrian use in the park, it would be desirable to cover the hardened surface with soil or turf. In final design, every effort should be made to position the overflow spillway so that it does not impact the larger existing established trees.

The recommended trash rack / access barrier at the basin outlet should be designed with sloping bars that are out and away from the existing headwall. There should be enough net open area with consideration to debris loading so there is no hydraulic restriction.



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### 6.1.3 71<sup>st</sup> Street Channel

An extension of the existing 12' x 9' concrete box culvert from Shea Boulevard to Sahuaro Drive was recently completed as part of the improvements in the Scottsdale Promenade 7000 retail center for the new Claim Jumper restaurant. This feature did not exist until after the alternatives evaluation and recommended alternative steps in this study.



Box culvert under construction in 71<sup>st</sup> Street Channel  
north of Shea Boulevard

Stanley Consultants added the extended box culvert to the existing condition hydraulic model. It was found that this condition improved the outlet hydraulics and performance of the existing culvert at Sahuaro Drive. This allowed the deletion of the proposed improvements to (or replacement of) the existing culvert at Sahuaro Drive from the recommended system-wide alternative.

In the final hydraulic grade line and inlet analysis for the new storm drain under the upper reach of the 71<sup>st</sup> Street Channel, it was found necessary to maintain a pipe diameter of 84" for the entire length north of Cholla Street instead of being able to drop the upper reach to a 78" diameter pipe. The objective of the storm drain features in the recommended alternative was clarified. The completed storm drain system is intended to convey the entire 10-year discharge below ground.

Manholes for the new storm drain are not depicted in plan or profile on the concept plans. Access for maintenance should be incorporated in final design at the new structures just south of Cholla Street and just north of Sunnyside Drive and at the inlets near Cortez Street and Jenan Drive. This, and any additional manholes or access were considered an incidental cost of construction already reflected in the cost estimate markup.

In the residential area north of Cholla Street, relocations of existing water lines will be required. This is reflected indirectly in the cost estimate through the markup. This entire area is currently served by septic tanks and not by sewer. If sewer were constructed to serve this area in the future, the existing sewer trunk line in Scottsdale Road should provide a deep enough outfall to avoid profile conflicts with the new 84" diameter storm drain.

The new storm drain under 71<sup>st</sup> Street from Cholla to Cortez Street was aligned on the west side of the road because this provided the best line up with existing drainage right-of-way and easements to the north and south. City of Scottsdale staff had

no preference on which side of the street it was aligned. The pavement removal that is anticipated for this reach of pipe would be from the centerline of the street to the lip of the west gutter, thus leaving the east side of the street open for traffic. Access to homes during construction of this reach is critical.

South of Cholla Street, there are three primary issues that will need to be considered in final design. First, the existing channel doubles as a paved alley that provides access to at least two adjacent properties. Final design must accommodate this access.

Second, to construct the new storm drain, it may only be necessary to remove the bottom and east side slope of the existing channel lining. However, to achieve a desirable aesthetic design for the new surface channel, it is anticipated that the entire lining will need to be replaced. This is what has been assumed in the quantity and cost estimate.

And third, the overhead utility poles along the east side of the easement may crowd the available space for the new pipe. Based on the original construction plans for the existing 60" diameter pipe and on field observations of existing surface conditions, there is enough lateral room for the new 72" diameter pipe per the typical section in the concept drawings. This conclusion and the exact position of the easement limit should be confirmed through survey, as-built and/or pothole prior to final design. There should also be caution exercised during construction due to the overhead electric lines.



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In final design, it may be advisable to consider incorporating a maintenance access ramp into the 71<sup>st</sup> Street Channel somewhere near the Mescal Park detention basin outfall pipe. Another maintenance access ramp could also be considered just north of Mescal Street. These features can be accomplished in ways that do not add significant cost to the project.

## 6.1.4 Cactus Park Detention Basin

The improvements proposed to the overflow spillway at the Cactus Park detention basin may need to be modified slightly if future roadway improvements planned by the City of Scottsdale to Cactus Road and its intersection with Scottsdale Road are constructed first. These future roadway improvements may expand the number of lanes and push the existing curb and sidewalk on the north side of Cactus Road further north toward the new overflow spillway.

It may be desirable to combine the future roadway and overflow spillway improvements in one construction package. If constructed in combination, however, there may be some utility re-locations necessary that are not reflected directly in the quantity and cost estimate.

The typical section for the overflow spillway in the concept plans is, as implied, conceptual. There are other ways to accomplish the desired objectives at Cactus Park. It may be possible to modify or add to the existing wall along the north side of Cactus Road or this wall may need to be removed entirely, depending on how it was originally designed and constructed. Instead of a retaining wall, the objective of a raised, hardened overflow

section could be achieved with fill material and a buried concrete sill or with soil cement or with rock filled wire mattresses, etc.

## 6.1.5 Scottsdale Road Channel

In order to keep the 10-year hydraulic grade line below the gutter in Scottsdale Road and to avoid the existing 8" sewer at Sutton Drive, the extended 90" diameter storm drain proposed in the recommended alternative will transition to a 12' x 5' concrete box storm drain just south of Sutton. The 12' x 5' box will extend north just into the (future) International Fighter Pilot Museum (IFPM) site. The horizontal alignment of the storm drain box north of Sutton Drive was chosen in an attempt to minimize conflict with existing native trees on the Thunderbird Adventist property.

When the IFPM site is developed, it is anticipated that a concrete box storm drain will replace the existing outfall channel from the Scottsdale Airport detention basin to Scottsdale Road. This future box has been tentatively sized by the study team at 12' x 5'. The hydraulic grade line analysis that supports this is contained in the Technical Section Volume 2 Hydraulics report. It has been assumed that the cost to design and construct the 12' x 5' replacement box will be carried by the IFPM project. North of the Scottsdale Airport detention basin outfall channel along Scottsdale Road, the new concrete box can be reduced in cross-section from 12' x 5' to 8' x 5' and still maintain the hydraulic grade line for the 10-year storm below the gutter in Scottsdale Road.

There are two potential sewer conflicts with the new storm drain proposed along Scottsdale Road, an 8" main at Sutton Drive and a 4" service from the old fire station building on the IFPM site. Both feed the regional 24" sewer trunk line in Scottsdale Road that is roughly 20 feet below pavement. This depth may afford the potential to lower both the 8" and 4" sewer lines below the new storm drain. In fact, this is what is assumed for the 4" line (or any new service that would be needed for the future IFPM improvements). Since the IFPM improvements are imminent, no cost has been included for relocation of the existing 4" line on the assumption that this cost will be carried as part of the IFPM infrastructure costs.

Although it may be feasible to lower the 8" sewer main at Sutton Drive, a worst-case approach was chosen at this location as if the 8" line must remain in place and conflict with the new storm drain must be avoided. This would result in a more conservative design and cost estimate. In final design, it is recommended that this approach be re-visited including consideration of any future regional needs to sewer additional areas to the east that are presently serviced by septic tanks. If the 8" line at Sutton Drive can be lowered, it would be desirable to continue the storm drain extension to the north with 90" diameter pipe instead of a concrete box. This would reduce cost as well as shorten construction duration.

Near the end of the Scottsdale Road Corridor Study, after the concept plans had been developed, the study team became aware that the Flood Control District might be amending its design criteria related to storm drains. The new criteria may



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place an upper limit of 15 feet per second on storm drains and also require that the energy grade line be contained below the gutter grade in cases where the flow is supercritical. Although this may exceed the City of Scottsdale's design criteria and the limitation of the existing 90" storm drain downstream notwithstanding, an increase in the size of the new storm drain extension may need to be considered in final design to meet the new criteria.

To address this, the study team mutually agreed to leave the concept plans as they were but investigate and document an increase in size for the new storm drain extension to meet future design criteria. In addition, the quantity and cost estimate would be amended to reflect the larger conveyance. Based on preliminary hydraulic analysis, a 114" diameter pipe from Sweetwater Avenue to Sutton Drive would be adequate to meet the new criteria. The new 12' x 5' concrete box proposed from Sutton Drive to the Scottsdale Airport detention basin outfall channel would be adequate to meet the future design criteria without any change. However, the new 8' x 5' concrete box from that location north to Thunderbird Road would need to be increased to a 10' x 5' box.

With the currently anticipated IFPM development schedule, it is possible that both of the box storm drains on the IFPM site may be constructed in advance of the recommended alternative storm drain improvements downstream. If this happens, the downstream end of the new storm drain will more than likely be well below grade and a temporary daylight drain would need to

be constructed south through the Thunderbird Adventist property. No cost has been included for any temporary daylight drain.

The pending development agreement between the IFPM sponsor and the City of Scottsdale may result in adjacent landscaping and sidewalk improvements being done along Scottsdale Road. The cost for these items has not been included in the concept cost estimates for the Scottsdale Road Corridor Drainage Master Plan.

Proposed catch basins and laterals in Scottsdale Road reflected in the concept plans are sized and spaced similar to the existing storm drain system in Scottsdale Road south of Sweetwater Avenue. For concept design and cost, catch basins of equal length are assumed on either side of Scottsdale Road although at many locations, existing catch basins on the west side of the street are longer than their counterpart on the east side of the street. The catch basins on the west side of Scottsdale Road will physically be located in the City of Phoenix.

Maintenance access into the recommended storm drain along Scottsdale Road can be accomplished through the surface grate inlets that are reflected in the concept plans. If these inlets are located over the proposed pipe / box, they can double as a manhole. The need for any additional access should be evaluated in final design. No direct costs were included for maintenance access because this was considered to be incidental to the cost of such a large storm drain system.

Another improvement that might be considered in final design would be to replace the existing 3' catch basins in sump on Sutton Drive just east of Scottsdale Road with larger catch basins (and laterals). Final design should carefully consider the local runoff that approaches this existing sump from the east, its outfall overflow elevation out to the Scottsdale Road drainage corridor, the reconstructed Sutton Road profile and the finished floor elevation of the existing residence at the southeast corner of Sutton and Scottsdale Roads. This is a critical location because this residence has nearly been flooded in the past.

### 6.2 Phasing and Feature Prioritization

Because of the overall cost of construction, budget constraints, timing of other planned projects in the City of Scottsdale, etc., it is anticipated that the five primary recommended alternative features will need to be constructed in several phases. In addition, phased construction of the conveyance improvements along Scottsdale Road and at the 71<sup>st</sup> Street Channel is anticipated within those recommended alternative features. To minimize traffic congestion during construction and to take advantage of construction and budget optimization opportunities, the timing of construction with the following projects in the City of Scottsdale and Town of Paradise Valley should be considered:

- International Fighter Pilot Museum (IFPM) and associated drainage and roadway improvements at the southeast corner of Scottsdale and Thunderbird Roads;
- Future roadway widening improvements on Thunderbird Road / Redfield Road between Scottsdale Road and Hayden Road;



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- Future drainage channel and roadway improvements along Hayden Road from Redfield Road to Cactus Road;
- Future turn lane additions at the intersection of Scottsdale and Cactus Roads;
- Future roadway widening and storm drain improvements in Scottsdale Road from Gold Dust Avenue to Indian Bend Road;
- Future roadway and drainage channel improvements along Invergordon Road in the Town of Paradise Valley.

One form of phasing that could be employed to defer the cost of construction involves building the flood control features in one fiscal budget year and following in subsequent years with the landscaping and multi-use features associated with the particular project and location. This approach would lend itself better to the linear conveyance features that make up the recommended alternative and may not be desirable at Cactus and Mescal Parks.

There is a significant range in cost among the five primary features of the recommended alternative. Although each feature is part of an overall plan, there is no physical need for all features to be constructed at once or in any particular order. The flood hazard that is mitigated by each of the primary features also varies significantly, both in extent and nature. These factors should also be considered when prioritizing budgets, schedules and construction.

Typically, construction of drainage and flood control improvements should be phased from the downstream end to the

upstream end of the project. From a hydrologic standpoint, however, there is very little connection or inter-dependence between the primary features of the recommended alternative. For example, none of the conveyance-related improvements (Scottsdale Road Channel, 71<sup>st</sup> Street Channel, Berneil Ditch) require the prior construction of any of the storage basin improvements (Cactus and Mescal Park detention basins). Any of the five primary features could be constructed in any order from a hydrologic standpoint.

With each of the primary features more or less independent from each other on the basis of hydrology, one of the most significant considerations in feature prioritization should be given to the flood hazard that each feature will mitigate. Comparing each of the five primary locations that make up the recommended alternative, the one feature that has by far the worst existing drainage function is the upper reach of the 71<sup>st</sup> Street Channel above the downstream end of the Cactus Park detention basin outlet pipe. Whereas the existing facilities associated with the other recommended alternative locations have nearly 10-year capacity or better, the upper 71<sup>st</sup> Street Channel probably has only a 1- or 2-year capacity. It is recommended that this location receive a high priority.

The recommended improvements to the 71<sup>st</sup> Street Channel between Mescal Street and Sahuaro Drive rate a much lower priority. That reach of channel is somewhat critical because flow that overtops either bank has the potential to spread laterally for several blocks and follow parallel flow paths. Presently, it is just able to carry a 10-year flow to the top of bank but has little or no

freeboard. Recommended alternative improvements for the Sahuaro to Mescal reach of the 71<sup>st</sup> Street Channel are independent from the upper reach on the basis of both hydrology and hydraulics.

Recommended alternative improvements at the Cactus Park detention basin are relatively inexpensive and provide a tremendous but very localized benefit for a 100-year storm. However, the recommended improvements at Cactus Park could probably be considered one of the lower priorities since the detention basin there has greater than 10-year capacity, has never been overtopped since it was constructed and if it were overtopped, has little or no risk of catastrophic failure. It is probably most efficient to perform the recommended detention basin improvements at the same time as future City of Scottsdale improvements at the intersection of Scottsdale and Cactus Roads.

The existing Mescal Park detention basin also has more than a 10-year capacity and has never been overtopped since it was originally constructed. It has similar performance, level of function and downstream benefit when compared to the existing Cactus Park detention basin, but on a smaller scale. In contrast to the Cactus Park detention basin, the downstream perimeter of the Mescal Park basin is built up on earth fill. There is a risk of sudden failure for about the upper three feet of storage if the Mescal basin is overtopped. Because of this, it is recommended that the improvements at Mescal Park receive a higher priority than at Cactus Park, even though the improvements are more extensive and the construction costs are greater.



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The upper reach of the Berneil Ditch has overflowed its south bank at more than one location in the past 10 years causing shallow flooding in several homes. The upper reach of the Berneil Ditch has less than a 10-year capacity. The study team recommends that the Berneil Ditch improvements be considered a high priority.

And last, along Scottsdale Road, there is the potential to exceed the capacity of existing drainage facilities but there is a fairly high level of performance that already exists there. No homes or businesses have been flooded along Scottsdale Road, to the Study Team's knowledge. The recommended Scottsdale Road improvements rate a moderate priority compared to the other recommended features. As mentioned earlier, development of the IFPM site could result in the upper portion of the recommended features being constructed prior to the lower improvements.

### 6.3 Maintenance Considerations

Maintenance responsibilities for the completed flood control improvements will need to be established through intergovernmental agreements between the Flood Control District of Maricopa County and the City of Scottsdale and the Town of Paradise Valley. Maintenance may also include other arrangements involving private parties. Currently, it is anticipated that the completed improvements will not be maintained by the Flood Control District but will be turned over for maintenance by local jurisdictions and / or private entities.

The Berneil Ditch is essentially situated entirely in the Town of Paradise Valley on a tract of land owned by the Town. Paradise Valley currently performs all of the maintenance for the ditch or the Town hires an outside service company to perform the necessary maintenance. All of the proposed Berneil Ditch improvements in the recommended alternative are contained within the present tract of land. No new right-of-way will need to be acquired. Currently, it is anticipated that the Town of Paradise Valley will continue with their maintenance responsibility for the completed Berneil Ditch improvements.

City of Scottsdale Parks and Recreation staff currently maintains all of the flood control, drainage, landscape and multi use improvements in Cactus and Mescal Parks. The completed improvements for the recommended alternative within these two parks will be very minor and very low in maintenance. It is anticipated that the City of Scottsdale will continue to perform maintenance for the new flood control improvements.

The recommended alternative improvements for the 71<sup>st</sup> Street Channel between Sahuaro Drive and Cholla Street are situated in recorded drainage easements on private property. Maintenance of landscaping in this reach is currently being performed by the underlying private property owner(s). The recorded drainage easements provide for the City of Scottsdale to maintain drainage and flood control improvements within the easements. Maintenance of hard drainage improvements like the Mescal and Cactus Park detention basin outfall pipes is typically performed by the City of Scottsdale. The study team envisions this arrangement continuing. New storm drain and hard surface

channel improvements in this reach of the 71<sup>st</sup> Street Channel would be maintained by the City of Scottsdale while landscape improvements would continue to be maintained by the private property owners.

The recommended alternative improvements for the 71<sup>st</sup> Street Channel from Cholla Street to Sunnyside Drive are all contained within street or drainage right-of-way that is owned by the City of Scottsdale. It is anticipated by the study team that the City of Scottsdale will continue to have maintenance responsibility to all of the recommended alternative improvements in that reach, when completed.

The recommended storm drain extension along Scottsdale Road from Sweetwater Avenue to Thunderbird Road will be entirely contained within City of Scottsdale street right-of-way, recorded drainage easements or on the International Fighter Pilot Museum (IFPM) site, which the City owns. The study team anticipates that the City of Scottsdale will continue their current maintenance practices related to all hard improvements when the recommended alternative is constructed. It is anticipated that landscape improvements will be maintained as follows:

- Sweetwater Avenue to Sutton Drive – City of Scottsdale
- Sutton Drive to the IFPM site – Thunderbird Adventist property owner
- IFPM site – IFPM sponsor through agreement with City of Scottsdale

The cost of maintaining the recommended alternative improvements is assumed by the study team to be born by the



# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

entity performing the maintenance. Table 21 presents the annual maintenance costs anticipated for the drainage and flood control aspect of the recommended alternative improvements. The unit cost (cost per 1000 feet) used in Table 21 to maintain open channels is based on recent maintenance and operations data from the Flood Control District of Maricopa County for their representative projects with similar size and function. This maintenance cost covers the time, materials, vehicles and equipment used to perform removal of vegetation, sediment and debris and to do minor repairs and remove graffiti. The cost does not include any major replacements, reconstruction or reconditioning.

There were no representative costs in the District's database related to the maintenance of representative closed storm drain systems similar to the recommended alternative. The unit cost to maintain storm drains used in Table 22 was simply estimated to be half that of the open channel maintenance cost. Again, this would cover routine maintenance. It includes the cost of maintaining incidental items such as catch basins, inlets, lateral pipes, grates and access barriers associated with the storm drain and is estimated on a per 1000 feet of trunk line basis.

The cost of maintaining landscaping in Table 22 was estimated to be 5 percent of the cost of the original landscape construction per square foot per year. There is no maintenance cost included in Table 22 for the recommended improvements in Cactus and Mescal Parks because this cost would be minor and incidental to the cost of maintenance already covered by the City of Scottsdale.

**Table 22 Estimated Annual Maintenance Costs for the Recommended Alternative**

Feature	Unit Cost	Quantity	Annual Cost
<b>Berneil Ditch</b>			
• Open channel	\$560/1000'	2.45	\$1,370
• Storm drain	N/A	N/A	N/A
• Landscape	\$0.05/sq ft	52,000	\$2,600
<b>71<sup>st</sup> Street Channel</b>			
• Open channel	\$560/1000'	1.90	\$1,060
• Storm drain	\$280/1000'	2.55	\$710
• Landscape	\$0.10/sq ft	25,000	\$2,500
• Landscape	\$0.05/sq ft	15,500	\$780
<b>Scottsdale Road</b>			
• Open channel	N/A	N/A	N/A
• Storm drain	\$280/1000'	2.5	\$700
• Landscape	\$0.10/sq ft	85,000	\$8,500
<b>Total Cost</b>			<b>\$18,220</b>



SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

**Appendix A**

**Concept Plans**



# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

## CONCEPTUAL PLANS FOR THE SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

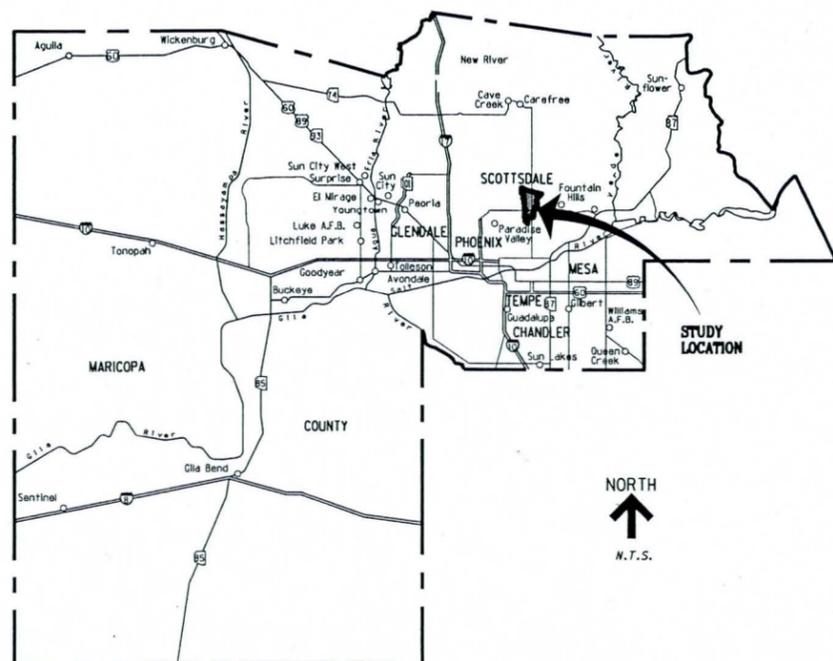
FCD 2000C030  
NOVEMBER, 2002

### SHEET/DRAWING INDEX

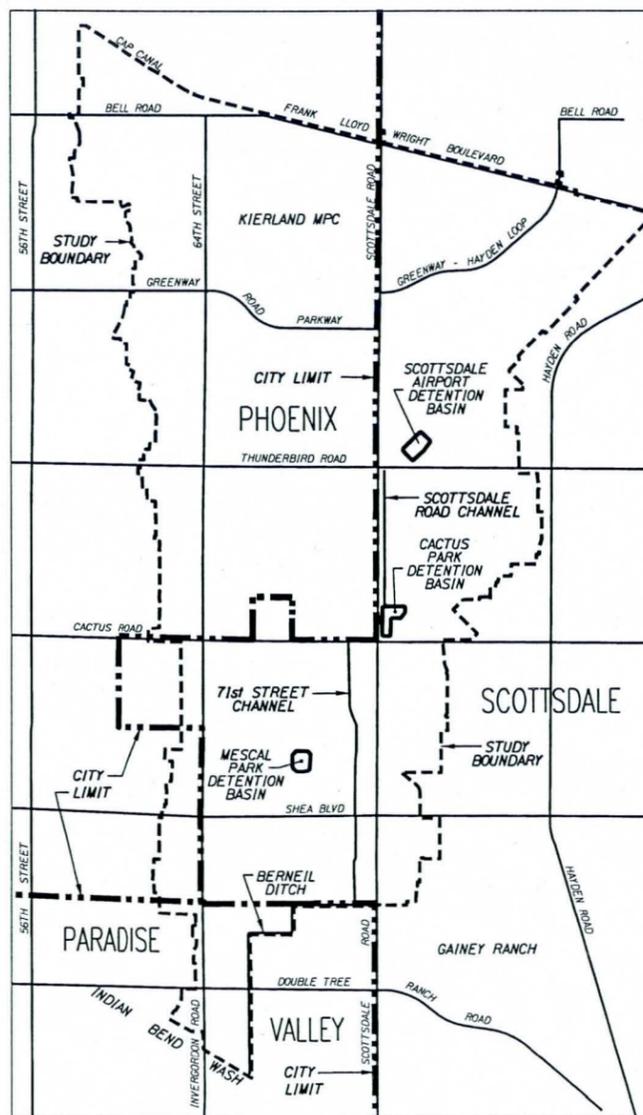
SHEET	DRAWING	
1	-	COVER SHEET
2	G1	SHEET LOCATION AND RECOMMENDED PLAN
3-11	D1-D9	CROSS SECTION DETAILS
12-15	P1-P4	BERNEIL DITCH
16-17	P5-P6	MESCAL PARK DETENTION BASIN
18-23	P7-P12	71ST STREET CHANNEL
24	P13	CACTUS PARK DETENTION BASIN
25-28	P14-P17	SCOTTSDALE ROAD CHANNEL
29-32	L1-L4	LANDSCAPE DESIGN THEMES

### LEGEND

- P - PROPERTY LINE
- C - CENTER LINE
- M - MONUMENT LINE
- R/W - RIGHT-OF-WAY LINE
- - DIRECTION OF FLOW
- ℓ - FLOW LINE
- (A/3) - CROSS SECTION OR DETAIL LOCATED ON SHEET NUMBER
- |— - TOP OF EXISTING SLOPE
- |— - TOE OF EXISTING SLOPE



MARICOPA COUNTY  
NOT TO SCALE



STUDY BOUNDARY  
AND VICINITY MAP  
NOT TO SCALE

### BENCHMARKS:

- CITY OF SCOTTSDALE GPS POINT 3272  
SHEA BOULEVARD AND SCOTTSDALE ROAD  
COS BC IN HH, DOWN 0.4'  
NORTHING (FT) 939336.42568  
EASTING (FT) 697149.923  
NAVD 88 ELEV (FT) 1351.261
- CITY OF SCOTTSDALE GPS POINT 3212  
CACTUS ROAD AND 64TH STREET  
COS BC IN HH, DOWN 0.66'  
NORTHING (FT) 944658.74817  
EASTING (FT) 691881.76024  
NAVD 88 ELEV (FT) 1383.561

### NOTES:

- PROPERTY, EASEMENT AND RIGHT-OF-WAY LINES DEPICTED HEREIN ARE APPROXIMATE. THEY ARE BASED ON GIS ELECTRONIC DATA FILES FROM MARICOPA COUNTY AND THE CITY OF SCOTTSDALE AND WERE NOT ESTABLISHED FROM BOUNDARY SURVEY.
- THE SOURCE OF AERIAL PHOTOGRAPHY DEPICTED IN PLAN VIEW FOR ALL PROJECT FEATURES IN THE CITY OF SCOTTSDALE IS FROM THE CITY OF SCOTTSDALE'S GIS DATA BASE. THE AERIAL PHOTO FOR BERNEIL DITCH IS FROM THE MARICOPA COUNTY GIS DATA BASE AND IS DATED JANUARY, 2000.
- ALL 10-YEAR AND 100-YEAR DISCHARGES SHOWN ON THESE PLAN SHEETS (INDICATED  $Q_{10} =$ ,  $Q_{100} =$ ) ARE BASED ON 6-HOUR DURATION STORMS AND REPRESENT "WITH RECOMMENDED ALTERNATIVE" CONDITIONS.

SHEET 1

### COUNTY BOARD OF DIRECTORS

DON STAPLEY - CHAIRMAN

- |            |                  |
|------------|------------------|
| DISTRICT 1 | FULTON BROCK     |
| DISTRICT 2 | DON STAPLEY      |
| DISTRICT 3 | ANDY KUNASEK     |
| DISTRICT 4 | MAX WILSON       |
| DISTRICT 5 | MARY ROSE WILCOX |

PREPARED BY:



CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCI \* 15586  
DRAWING FILE:  
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### SCOTTSDALE ROAD CHANNEL RECOMMENDED PLAN

1. EXTEND EXISTING STORM DRAIN NORTH FROM SWEETWATER AVENUE TO THUNDERBIRD ROAD.
2. CONSTRUCT SHALLOW LANDSCAPED CHANNEL OVER EXTENDED STORM DRAIN.
3. CONSTRUCT ADDITIONAL CATCH BASINS IN SCOTTSDALE ROAD.

### CACTUS PARK RECOMMENDED PLAN

1. RAISE THE SIDE OF THE DETENTION BASIN ALONG CACTUS ROAD APPROXIMATELY TWO FEET AND CONSTRUCT A HARDENED EMERGENCY OVERFLOW SPILLWAY AT THAT LOCATION.

### MESCAL PARK RECOMMENDED PLAN

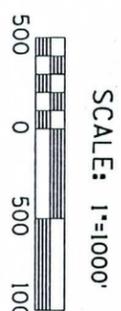
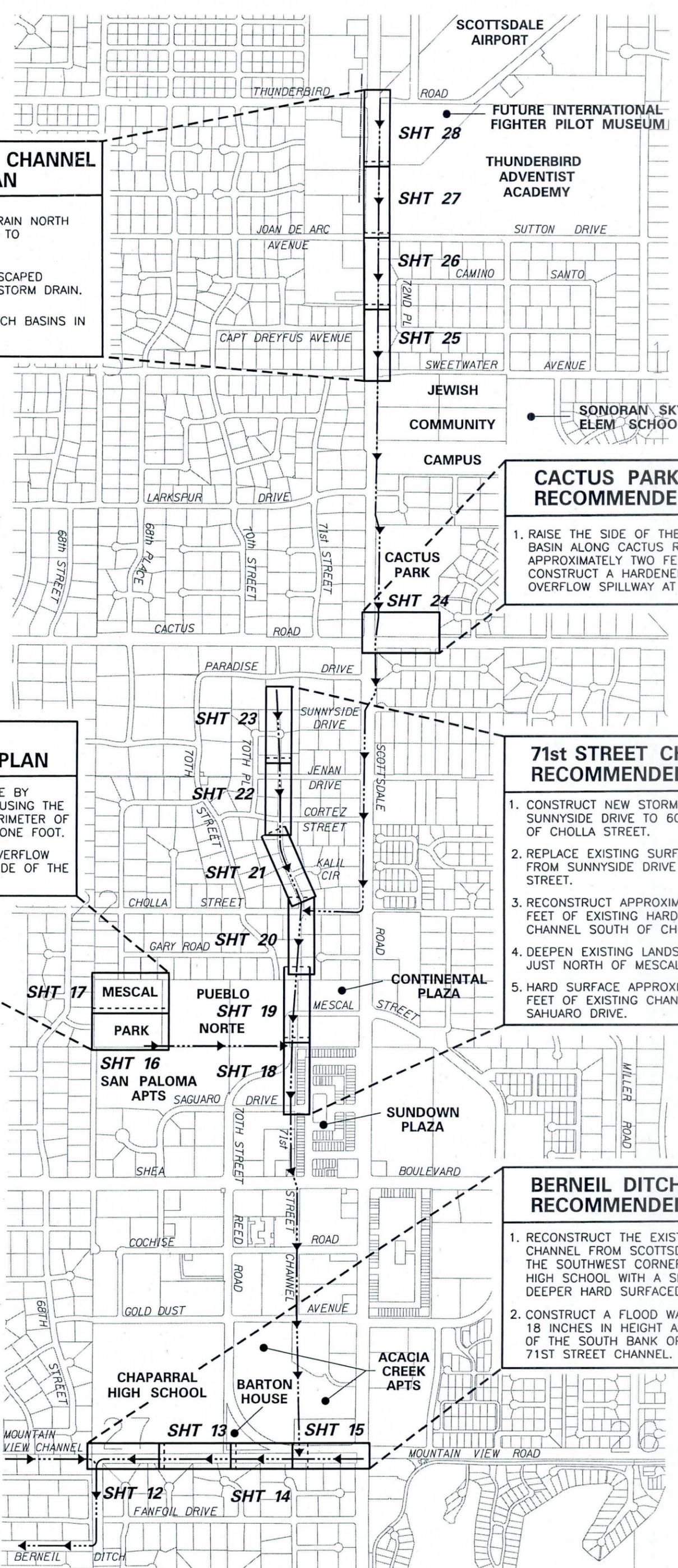
1. ENLARGE THE BASIN VOLUME BY EXCAVATING THE SIDE AND USING THE MATERIAL TO RAISE THE PERIMETER OF THE BASIN APPROXIMATELY ONE FOOT.
2. CONSTRUCT A HARDENED OVERFLOW SPILLWAY ON THE SOUTH SIDE OF THE BASIN.

### 71st STREET CHANNEL RECOMMENDED PLAN

1. CONSTRUCT NEW STORM DRAIN FROM SUNNYSIDE DRIVE TO 600 FEET SOUTH OF CHOLLA STREET.
2. REPLACE EXISTING SURFACE CHANNEL FROM SUNNYSIDE DRIVE TO CORTEZ STREET.
3. RECONSTRUCT APPROXIMATELY 600 FEET OF EXISTING HARD SURFACED CHANNEL SOUTH OF CHOLLA STREET.
4. DEEPEN EXISTING LANDSCAPED CHANNEL JUST NORTH OF MESCAL STREET.
5. HARD SURFACE APPROXIMATELY 600 FEET OF EXISTING CHANNEL NORTH OF SAHUARO DRIVE.

### BERNEIL DITCH RECOMMENDED PLAN

1. RECONSTRUCT THE EXISTING EARTH CHANNEL FROM SCOTTSDALE ROAD TO THE SOUTHWEST CORNER OF CHAPARRAL HIGH SCHOOL WITH A SLIGHTLY DEEPER HARD SURFACED CHANNEL.
2. CONSTRUCT A FLOOD WALL ABOUT 18 INCHES IN HEIGHT ALONG THE TOP OF THE SOUTH BANK OPPOSITE THE 71ST STREET CHANNEL.



PREPARED BY:  
**Stanley Consultants**  
 2929 EAST CAMDEN ROAD  
 SUITE 120  
 GILBERT, ARIZONA 85016  
 (602) 917-5500

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DESIGN	BNS
DRAWN	LRJ
CHECKED	GSB



NOVEMBER, 2002

SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

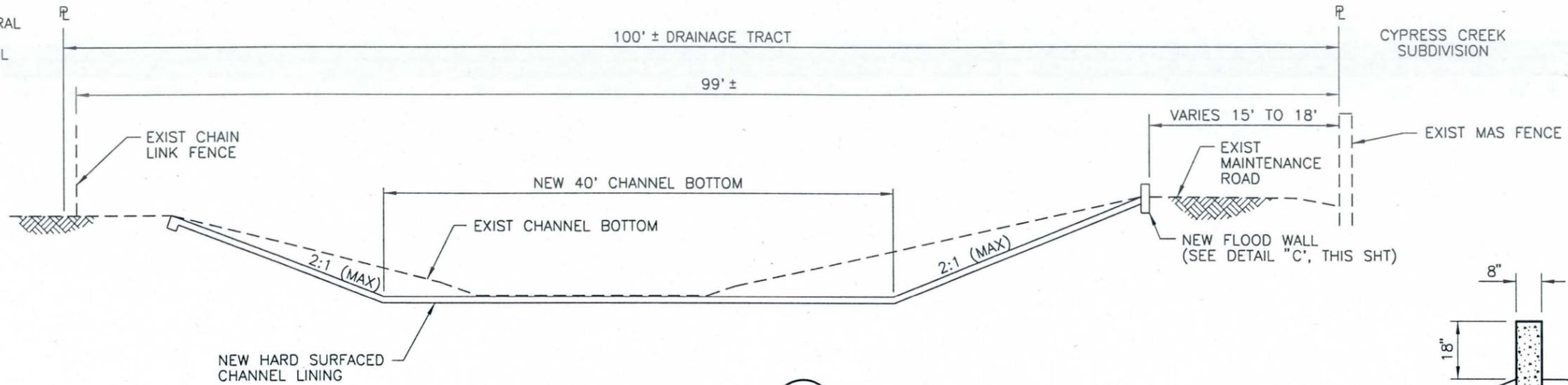
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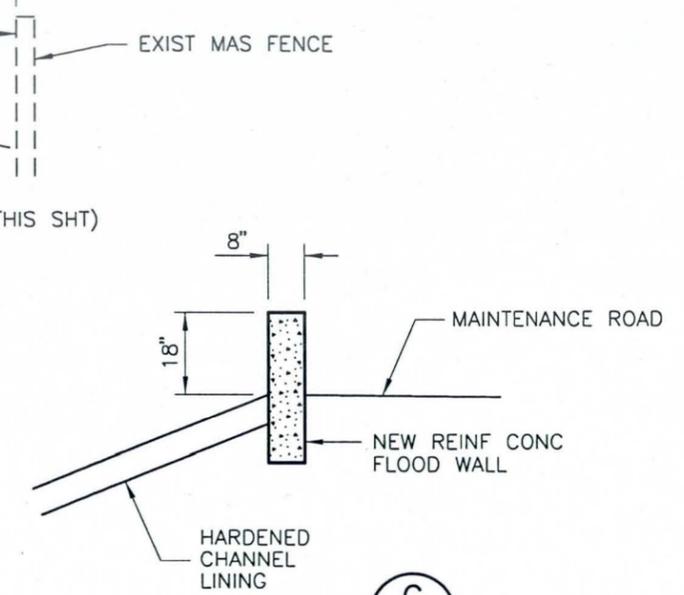
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CITY OF SCOTTSDALE ← TOWN OF PARADISE VALLEY

CHAPARRAL HIGH SCHOOL



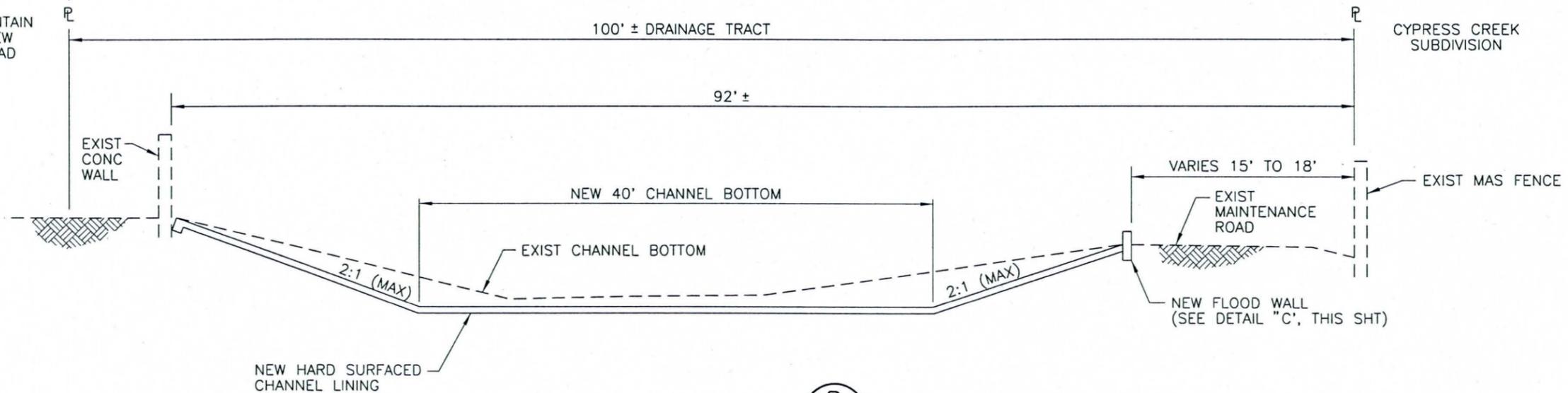
**CROSS SECTION DETAIL** A  
13  
BERNEIL DITCH  
STA 161+20 TO STA 179+20  
DOWNSTREAM FROM 71st STREET CHANNEL  
N.T.S.



**DETAIL** C  
3  
BERNEIL DITCH FLOOD WALL  
STA 177+25 TO STA 179+75  
(SOUTH BANK ONLY)  
N.T.S.

CITY OF SCOTTSDALE ← TOWN OF PARADISE VALLEY

MOUNTAIN VIEW ROAD



**CROSS SECTION DETAIL** B  
15  
BERNEIL DITCH  
STA 179+20 TO STA 185+70  
UPSTREAM FROM 71st STREET CHANNEL  
N.T.S.

CONCEPT PLANS  
NOT FOR CONSTRUCTION

SC1 • 15586  
DRAWING FILE:  
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PREPARED BY:

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2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

DESIGN	BNS
DRAWN	LRJ
CHECKED	GSB

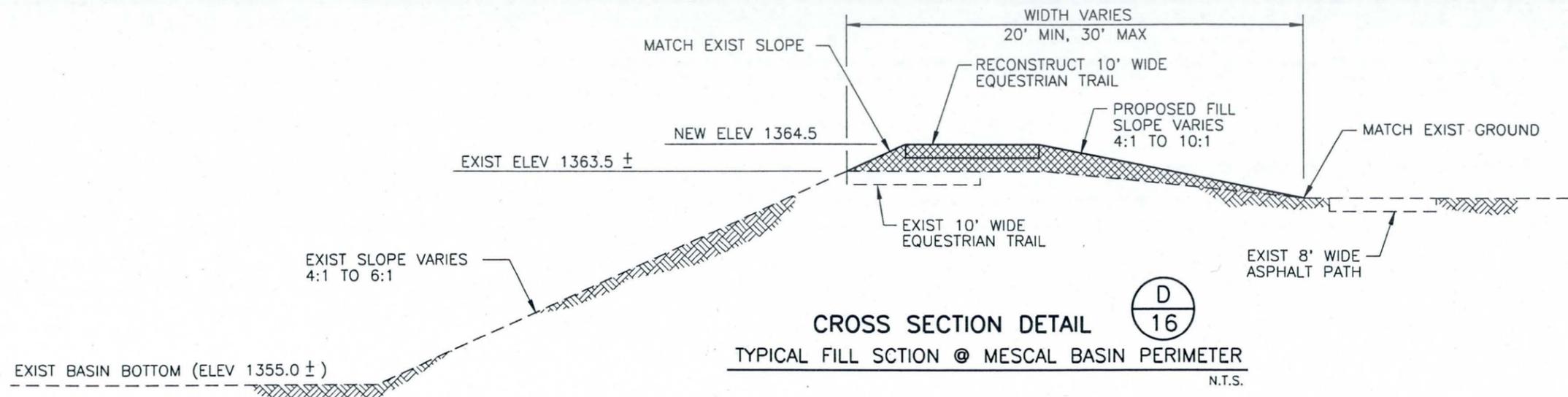


SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

**BERNEIL DITCH  
DETAILS**

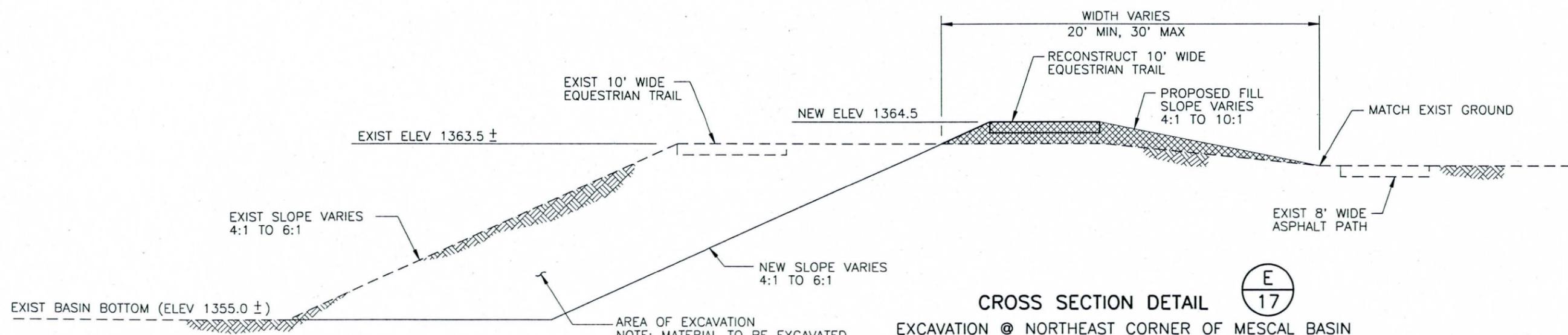
NOVEMBER, 2002

DRAWING NUMBER  
**D1**  
SHEET NUMBER  
**3**



**CROSS SECTION DETAIL** D  
16  
**TYPICAL FILL SECTION @ MESCAL BASIN PERIMETER**  
 N.T.S.

NOTE: MATERIAL FOR PROPOSED FILL AT PERIMETER OF DETENTION BASIN TO BE EXCAVATED FROM NORTHEAST CORNER OF BASIN AS DEPICTED IN SECTION "E" THIS SHEET.



**CROSS SECTION DETAIL** E  
17  
**EXCAVATION @ NORTHEAST CORNER OF MESCAL BASIN**  
 N.T.S.

AREA OF EXCAVATION  
 NOTE: MATERIAL TO BE EXCAVATED LATERALLY FROM SIDE OF EXISTING DETENTION BASIN IN SUFFICIENT QUANTITY TO BE USED FOR PERIMETER FILL.

NOVEMBER, 2002

CONCEPT PLANS  
 NOT FOR CONSTRUCTION

SC1 • 15586  
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 SUITE 130  
 PHOENIX, ARIZONA 85016  
 (602) 912-6500

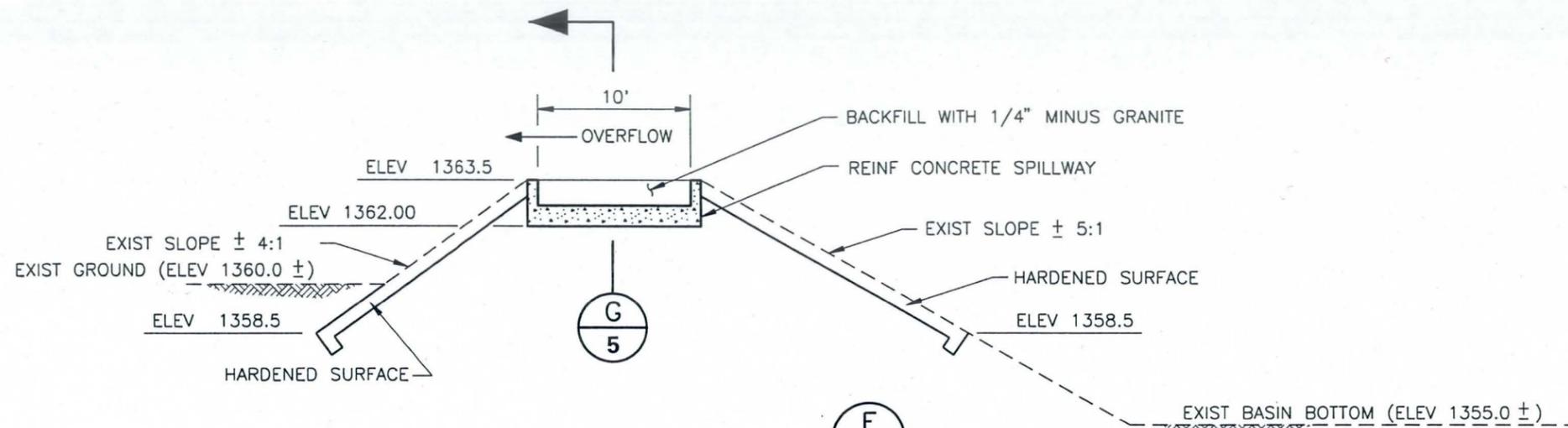
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CHECKED	GSB



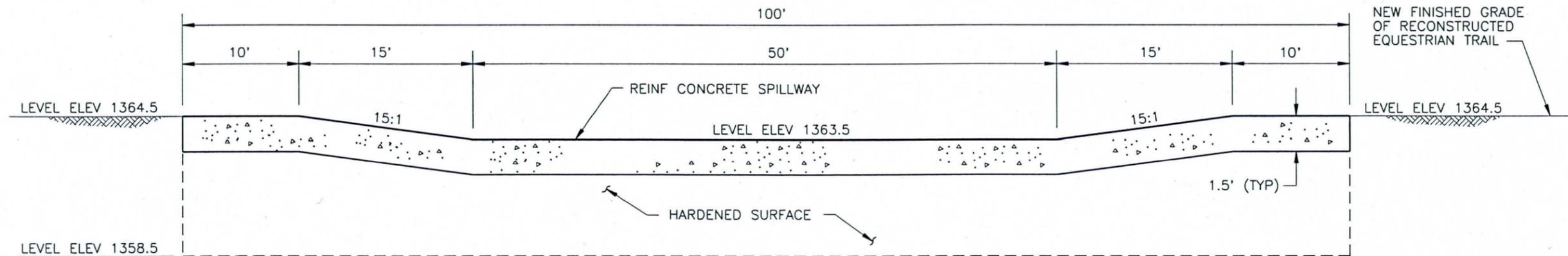
SCOTTSDALE ROAD CORRIDOR  
 DRAINAGE MASTER PLAN

**MESCAL PARK  
 DETAILS**

DRAWING NUMBER	<b>D2</b>
SHEET NUMBER	<b>4</b>



**CROSS SECTION DETAIL** F  
16  
**HARDENED OVERFLOW SPILLWAY @ MESCAL BASIN**  
 N.T.S.



**PROFILE DETAIL** G  
5  
**HARDENED OVERFLOW SPILLWAY @ MESCAL BASIN**  
 N.T.S.

NOVEMBER, 2002

CONCEPT PLANS  
NOT FOR CONSTRUCTION

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SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-8500

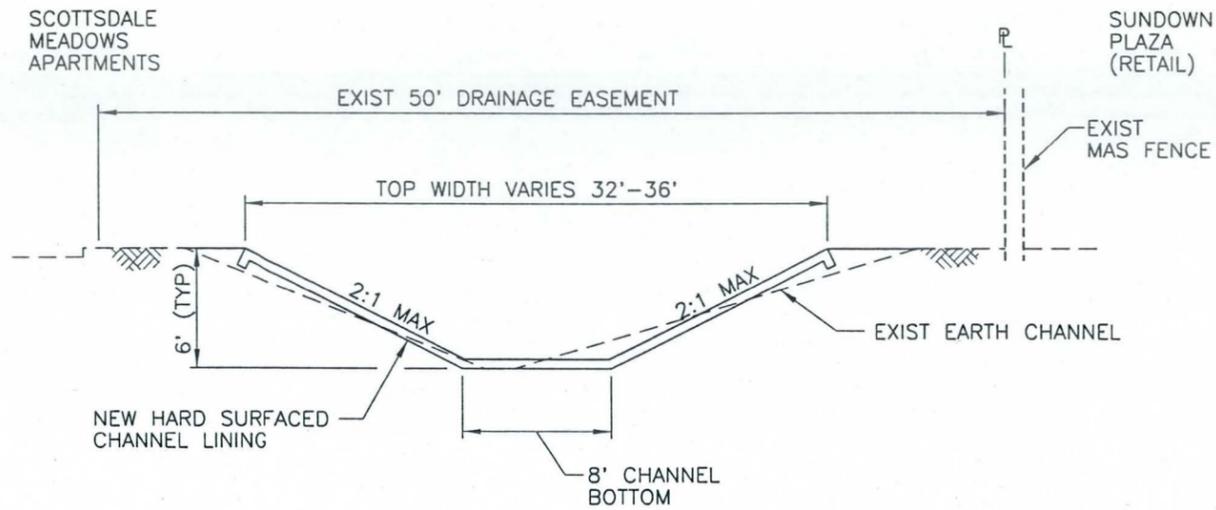
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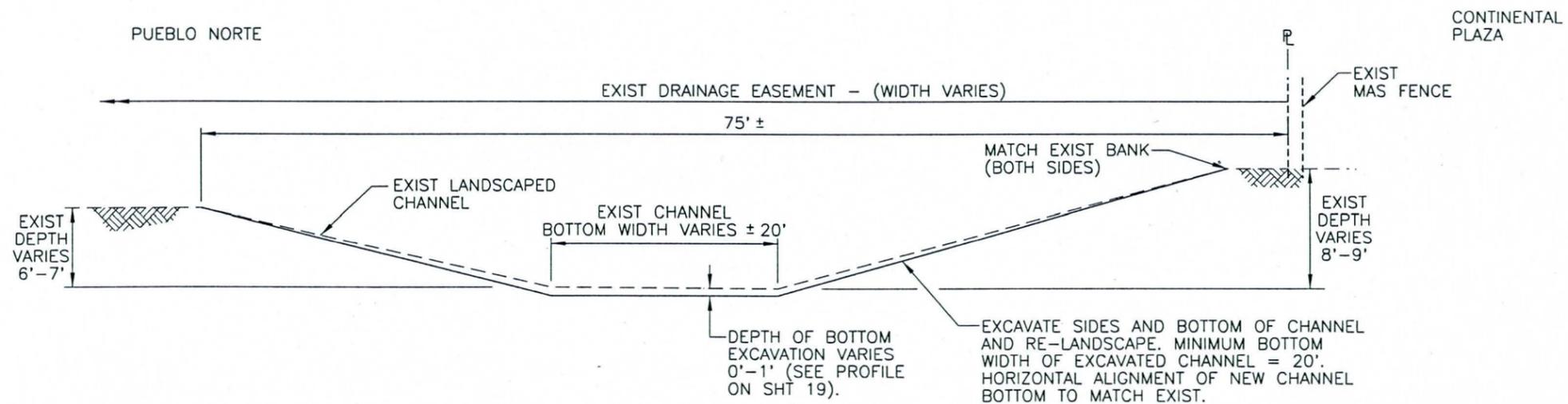
SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

**MESCAL PARK  
DETAILS**

DRAWING NUMBER	<b>D3</b>
SHEET NUMBER	<b>5</b>



H  
**CROSS SECTION DETAIL 18**  
 71ST STREET CHANNEL  
 STA 334+08 TO STA 339+80 (NORTH OF SAHUARO DRIVE)  
 N.T.S.



J  
**CROSS SECTION DETAIL 19**  
 71ST STREET CHANNEL  
 STA 343+39 TO STA 346+25 (NORTH OF MESCAL STREET)  
 N.T.S.

NOVEMBER, 2002

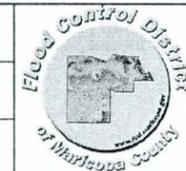
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 (602) 912-8500

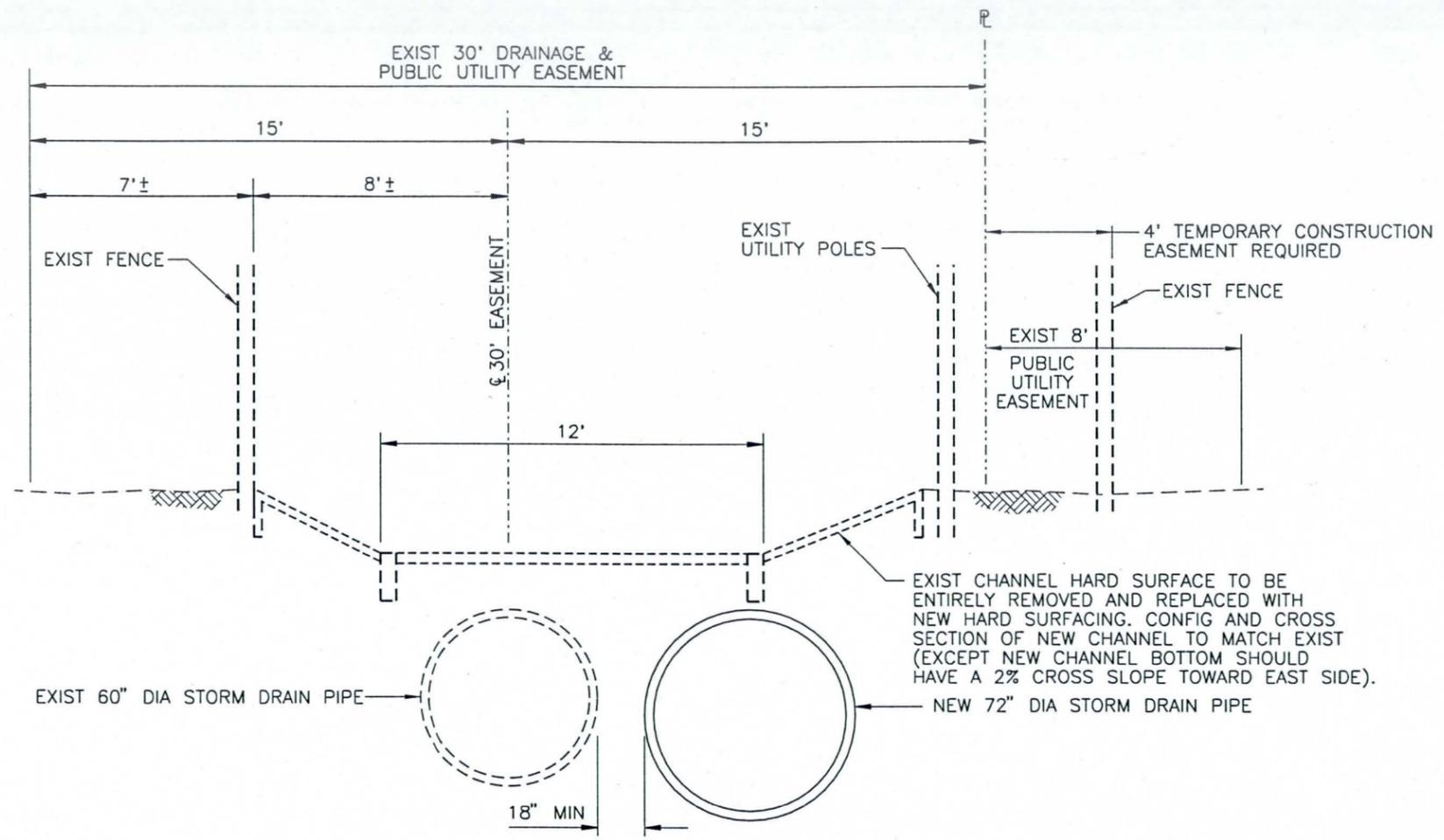
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DRAWN	LRJ
CHECKED	
GSB	



SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

**71ST STREET CHANNEL  
DETAILS**

DRAWING NUMBER  
**D4**  
SHEET NUMBER  
**6**



K  
20  
**CROSS SECTION DETAIL**  
 71ST STREET CHANNEL  
 STA 346+75 TO STA 352+70 (SOUTH OF CHOLLA STREET)  
 N.T.S.

NOVEMBER, 2002

CONCEPT PLANS  
NOT FOR CONSTRUCTION

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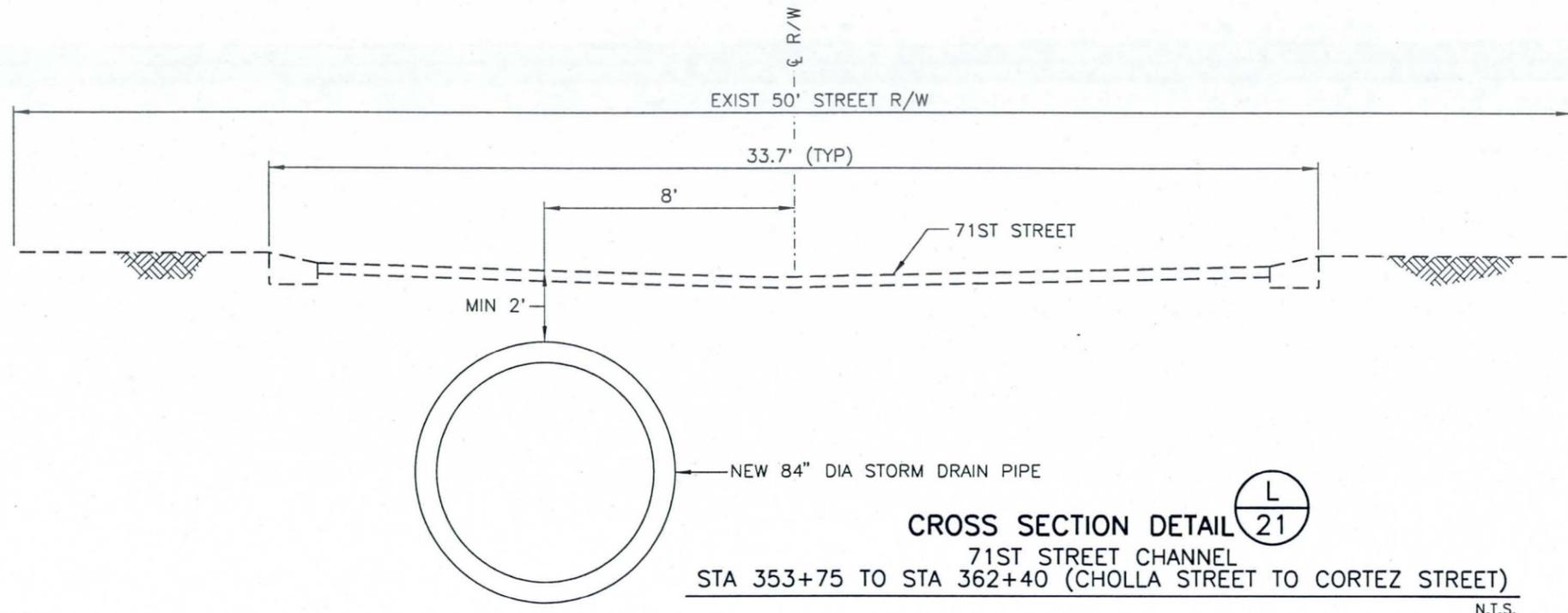
**Stanley Consultants inc.**  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

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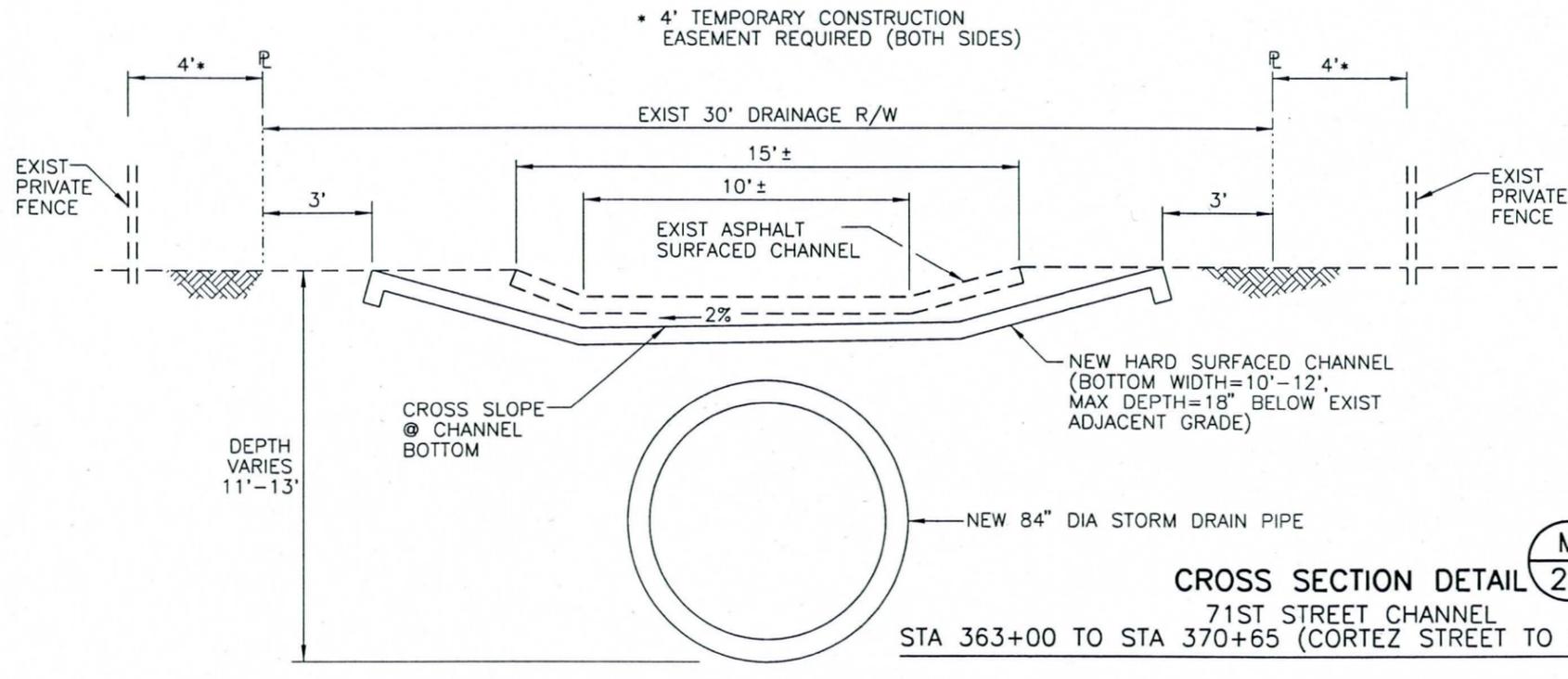
SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN  
  
71ST STREET CHANNEL  
DETAILS

DRAWING NUMBER	D5
SHEET NUMBER	7



**CROSS SECTION DETAIL** L  
21

71ST STREET CHANNEL  
 STA 353+75 TO STA 362+40 (CHOLLA STREET TO CORTEZ STREET)  
 N.T.S.



**CROSS SECTION DETAIL** M  
23

71ST STREET CHANNEL  
 STA 363+00 TO STA 370+65 (CORTEZ STREET TO SUNNYSIDE DRIVE)  
 N.T.S.

NOVEMBER, 2002

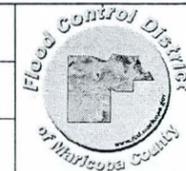
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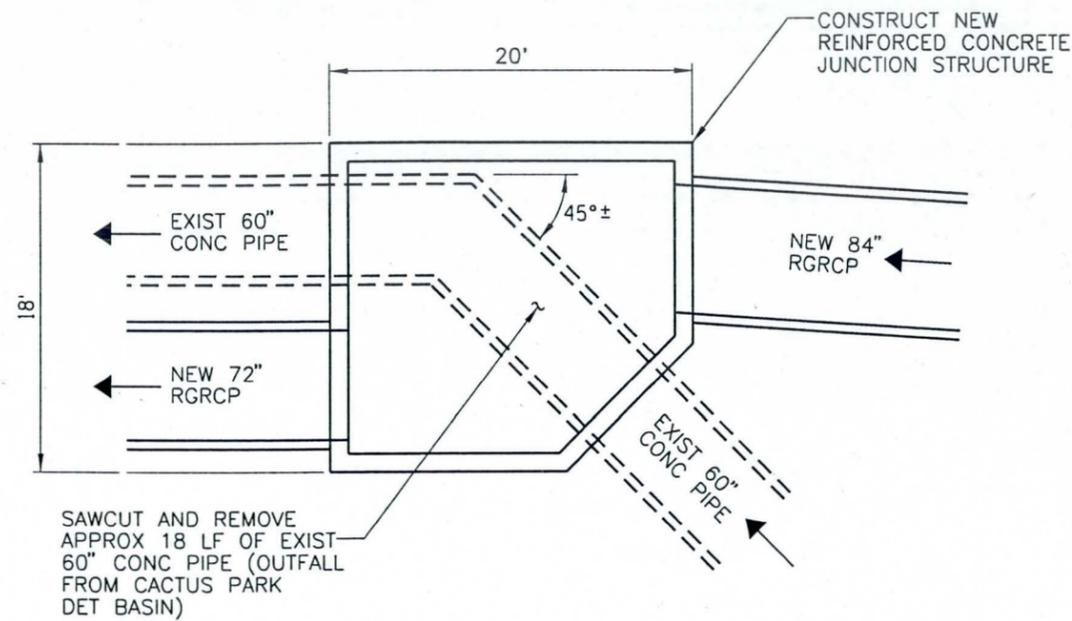
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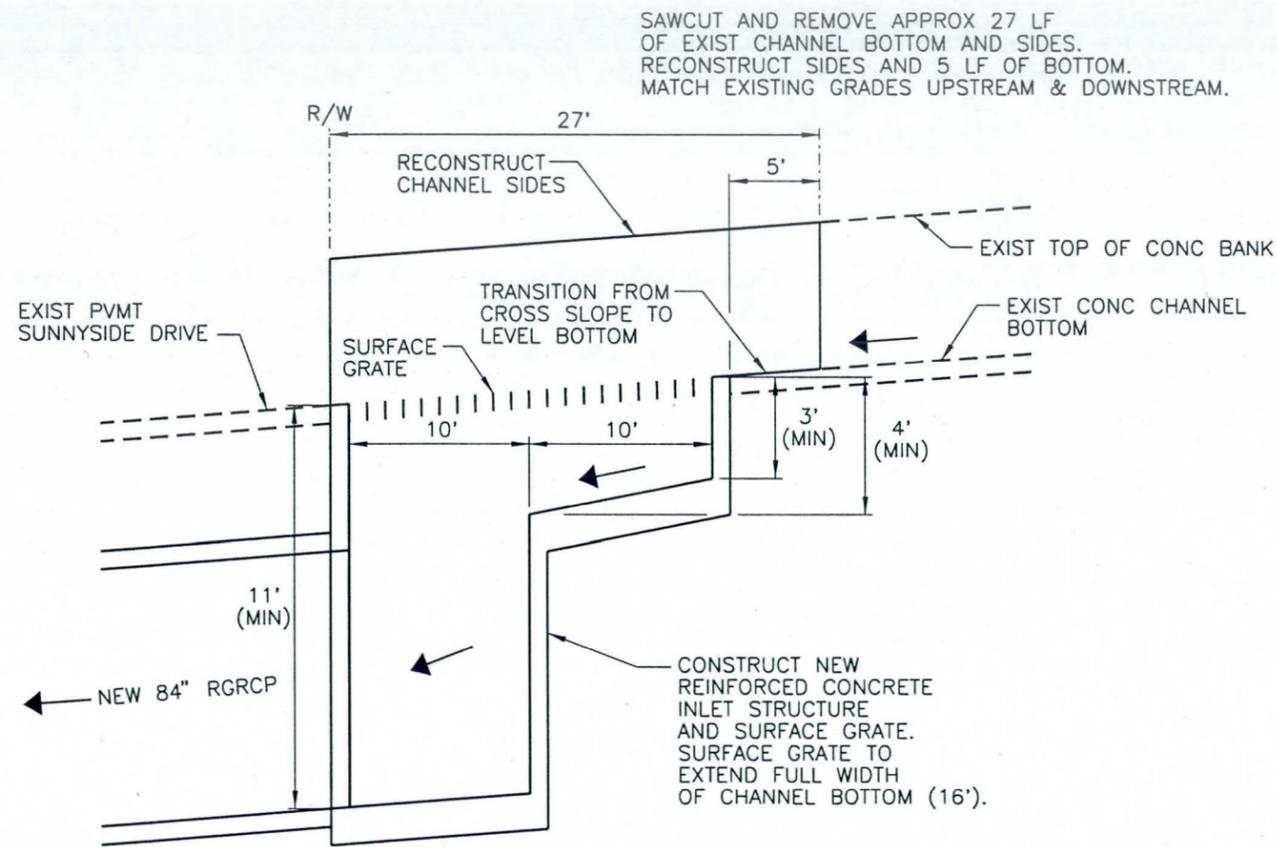
SCOTTSDALE ROAD CORRIDOR  
 DRAINAGE MASTER PLAN

**71ST STREET CHANNEL  
 DETAILS**

DRAWING NUMBER  
**D6**  
 SHEET NUMBER  
**8**



**PLAN VIEW DETAIL** N  
20  
 71ST STREET CHANNEL  
 STORM DRAIN JUNCTION STRUCTURE  
 @ CHOLLA STREET  
 N.T.S.



**PROFILE DETAIL** P  
23  
 71ST STREET CHANNEL  
 INLET STRUCTURE @ SUNNYSIDE DRIVE  
 N.T.S.

NOVEMBER, 2002

CONCEPT PLANS  
 NOT FOR CONSTRUCTION

SC1 • 15586  
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 SUITE 130  
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 (602) 912-6500

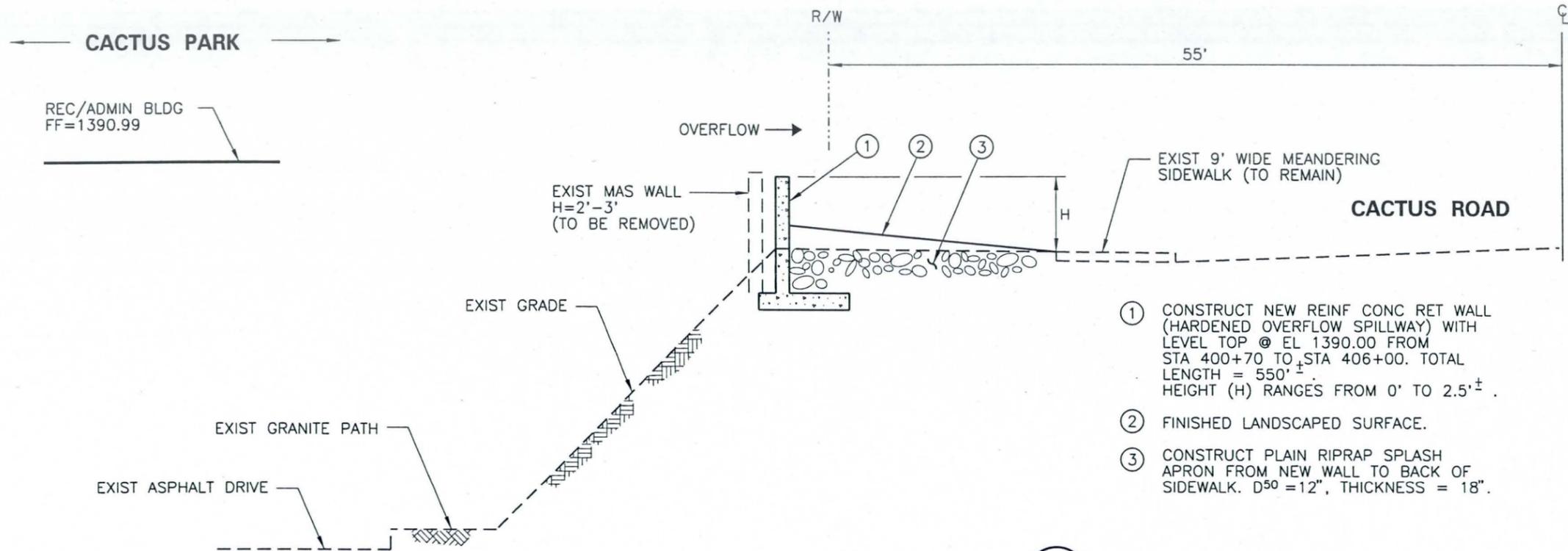
DESIGN	BNS
DRAWN	LRJ
CHECKED	GSB



SCOTTSDALE ROAD CORRIDOR  
 DRAINAGE MASTER PLAN

**71ST STREET CHANNEL  
 DETAILS**

DRAWING NUMBER  
**D7**  
 SHEET NUMBER  
**9**



- ① CONSTRUCT NEW REINF CONC RET WALL (HARDENED OVERFLOW SPILLWAY) WITH LEVEL TOP @ EL 1390.00 FROM STA 400+70 TO STA 406+00. TOTAL LENGTH = 550' ±. HEIGHT (H) RANGES FROM 0' TO 2.5' ±.
- ② FINISHED LANDSCAPED SURFACE.
- ③ CONSTRUCT PLAIN RIPRAP SPLASH APRON FROM NEW WALL TO BACK OF SIDEWALK. D<sup>50</sup> = 12", THICKNESS = 18".

CROSS SECTION DETAIL Q  
24

HARDENED OVERFLOW SPILLWAY @ CACTUS PARK BASIN  
N.T.S.

NOVEMBER, 2002

CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCI • 15586  
DRAWING FILE:  
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PREPARED BY:

  
Stanley Consultants  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

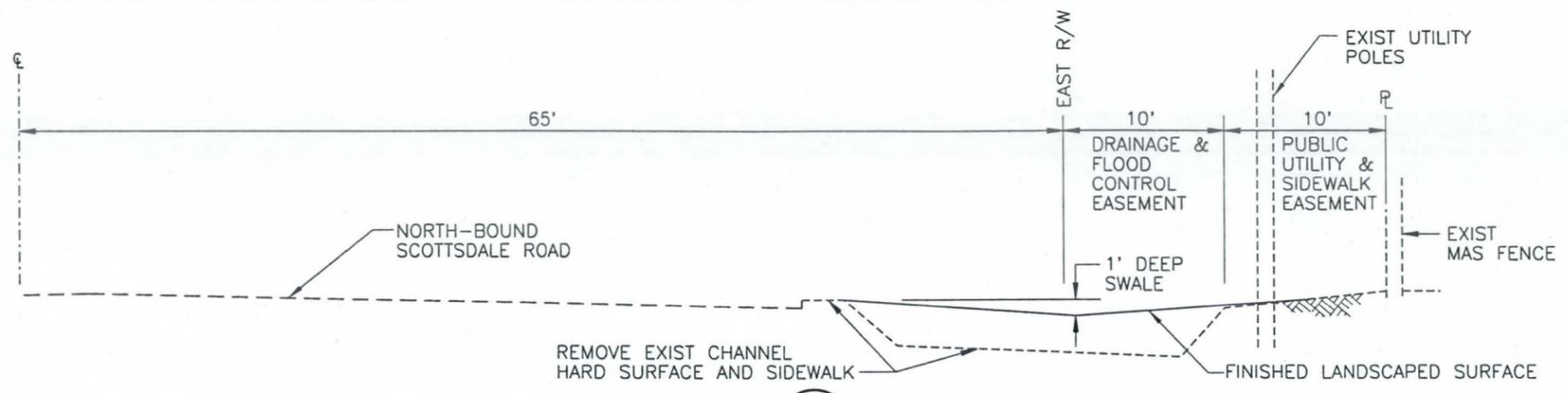
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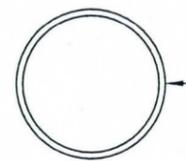
SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

**CACTUS PARK  
DETAILS**

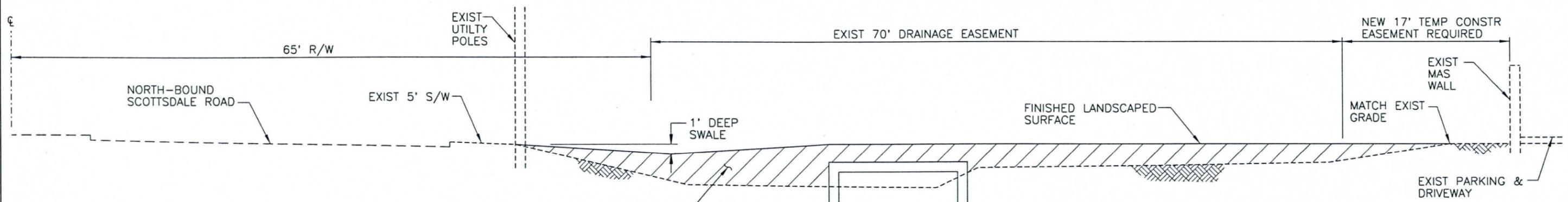
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SHEET NUMBER	<b>10</b>



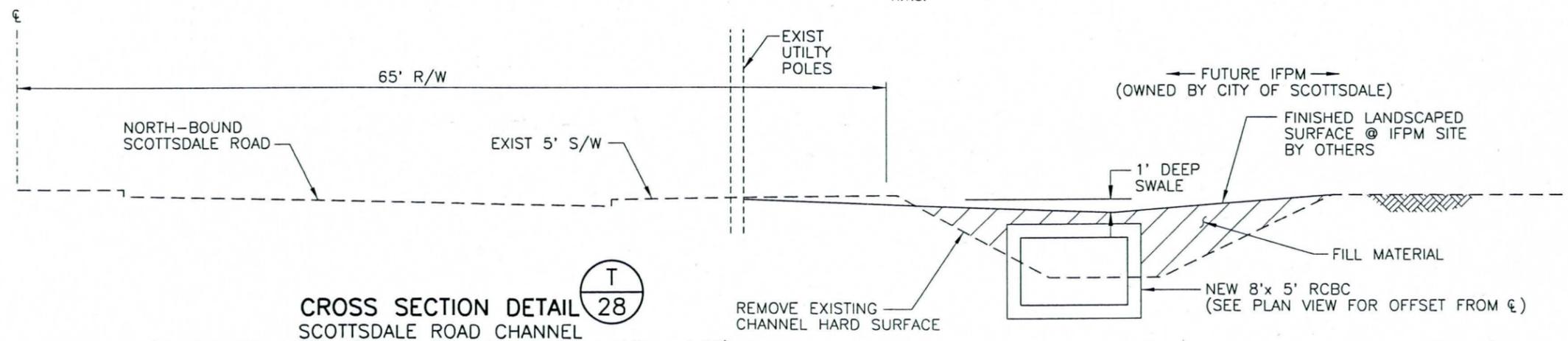
**CROSS SECTION DETAIL R/25**  
 SCOTTSDALE ROAD CHANNEL  
 (SWEETWATER AVENUE TO SUTTON DRIVE)  
 N.T.S.



NEW 90" DIA STORM DRAIN PIPE  
 (SEE PLAN VIEW FOR OFFSET FROM  $\epsilon$ )



**CROSS SECTION DETAIL S/27**  
 SCOTTSDALE ROAD CHANNEL  
 (@ SEVENTH DAY ADVENTIST PROPERTY)  
 N.T.S.



**CROSS SECTION DETAIL T/28**  
 SCOTTSDALE ROAD CHANNEL  
 (@ FUTURE INTERNATIONAL FIGHTER PILOT MUSEUM SITE)  
 N.T.S.

NOVEMBER, 2002

CONCEPT PLANS  
 NOT FOR CONSTRUCTION

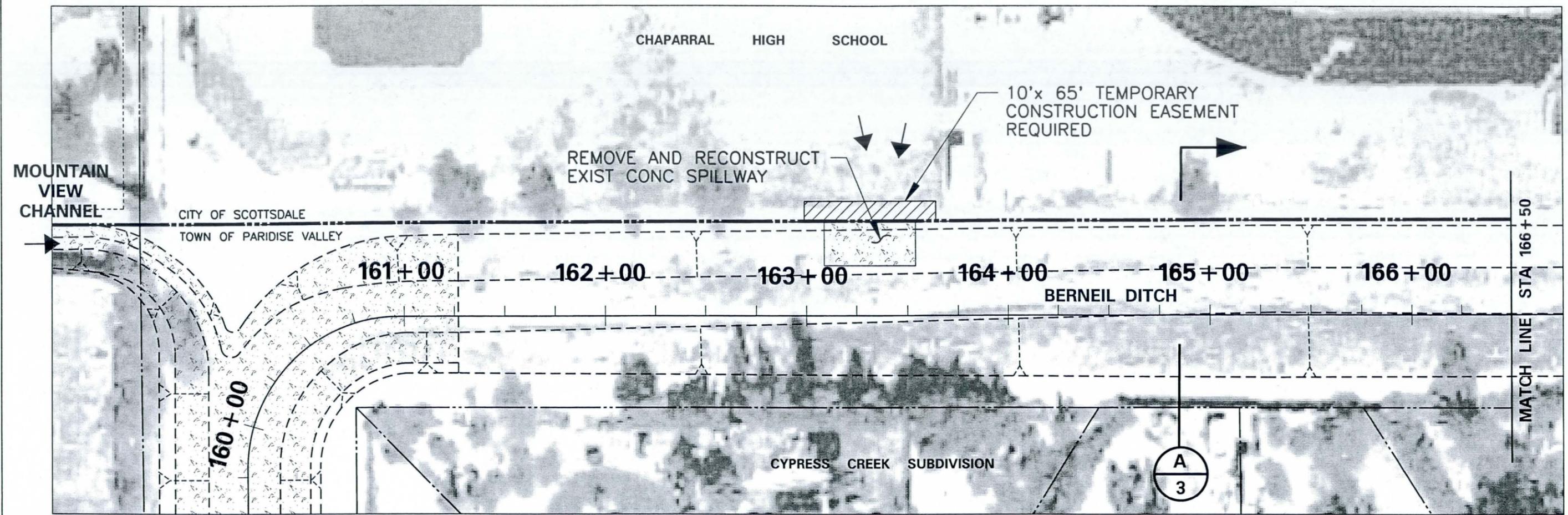
SCI • 15586  
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PREPARED BY:  
  
 Stanley Consultants INC.  
 2929 EAST CAMELBACK ROAD,  
 SUITE 130  
 PHOENIX, ARIZONA 85016  
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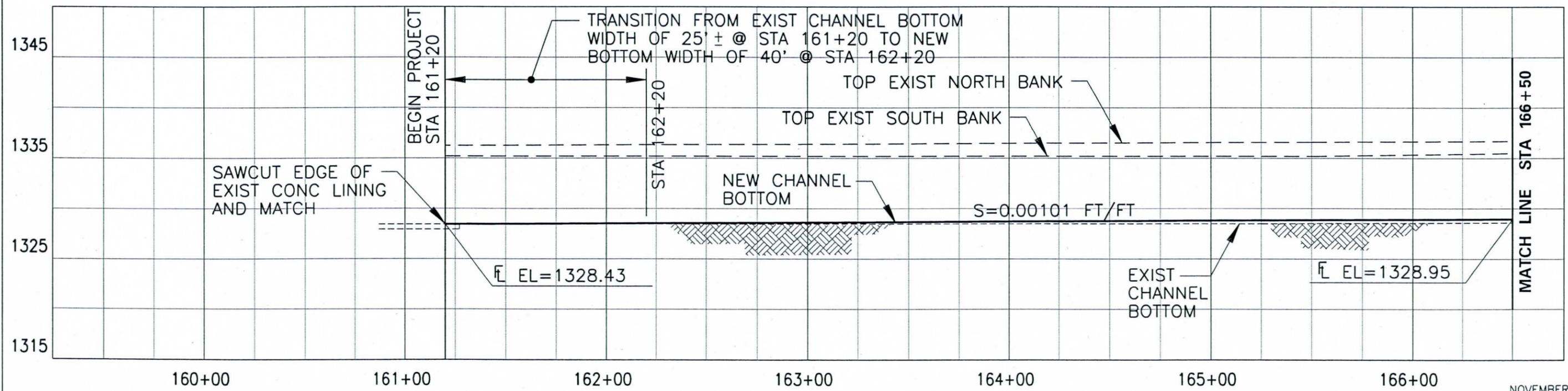
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CHECKED	GSB



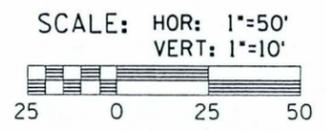
SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN	DRAWING NUMBER <b>D9</b>
<b>SCOTTSDALE ROAD CHANNEL DETAILS</b>	SHEET NUMBER <b>11</b>



(SEE SHT 13)



NOTE:  
BERNEIL DITCH STA 100+00 IS @ CONFLUENCE  
WITH APPROX Q OF INDIAN BEND WASH



CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCI • 15586  
DRAWING FILE:  
Q:\15586\GRAPHICS\DCM\PP14.dgn

PREPARED BY:  
  
Stanley Consultants  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

DESIGN	BNS
DRAWN	LRJ
CHECKED	GSB

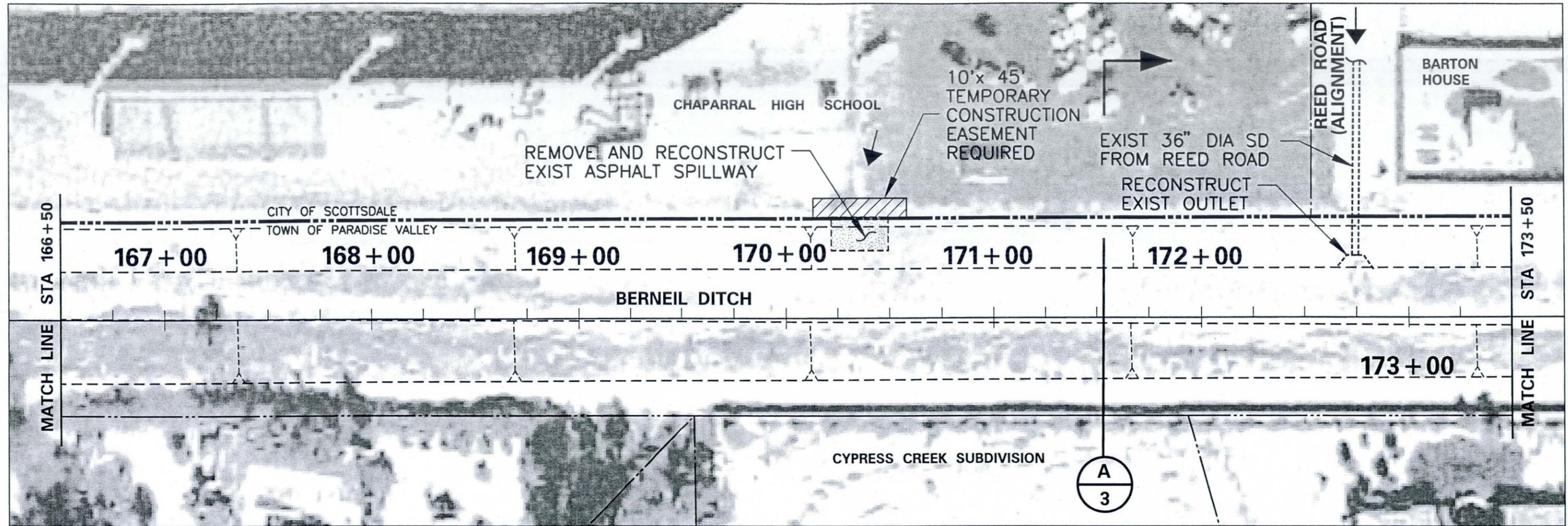


SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

BERNEIL DITCH

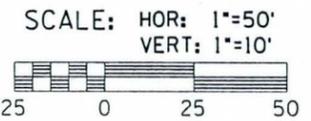
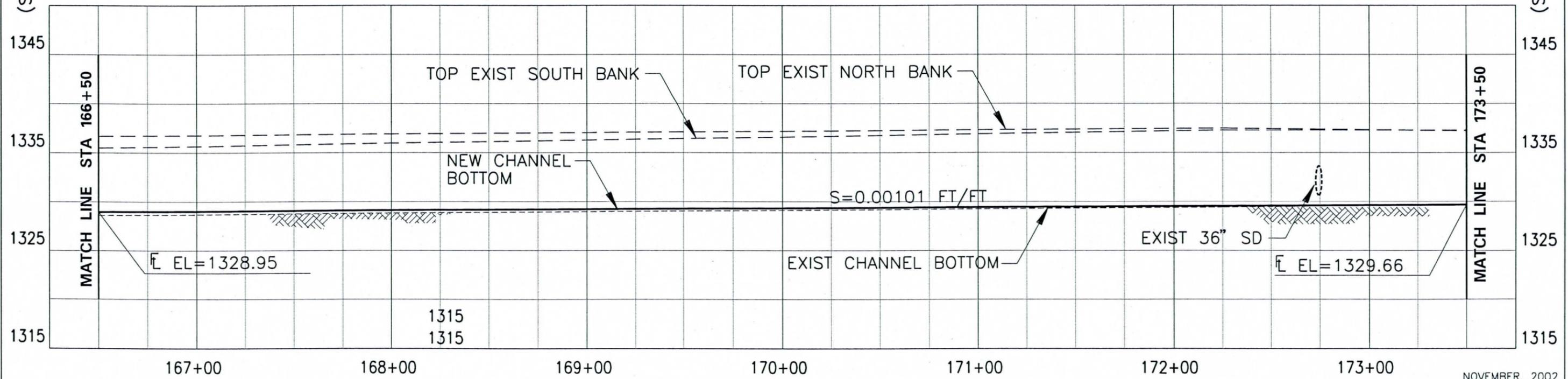
NOVEMBER, 2002

DRAWING NUMBER	P1
SHEET NUMBER	12



(SEE SHT 12)

(SEE SHT 14)



CONCEPT PLANS  
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SC1 • 15586  
DRAWING FILE:  
D:\15586\GRAPHICS\OGN\PP15.dgn

PREPARED BY:

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2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-8500

DESIGN	BNS
DRAWN	LRJ
CHECKED	GSB

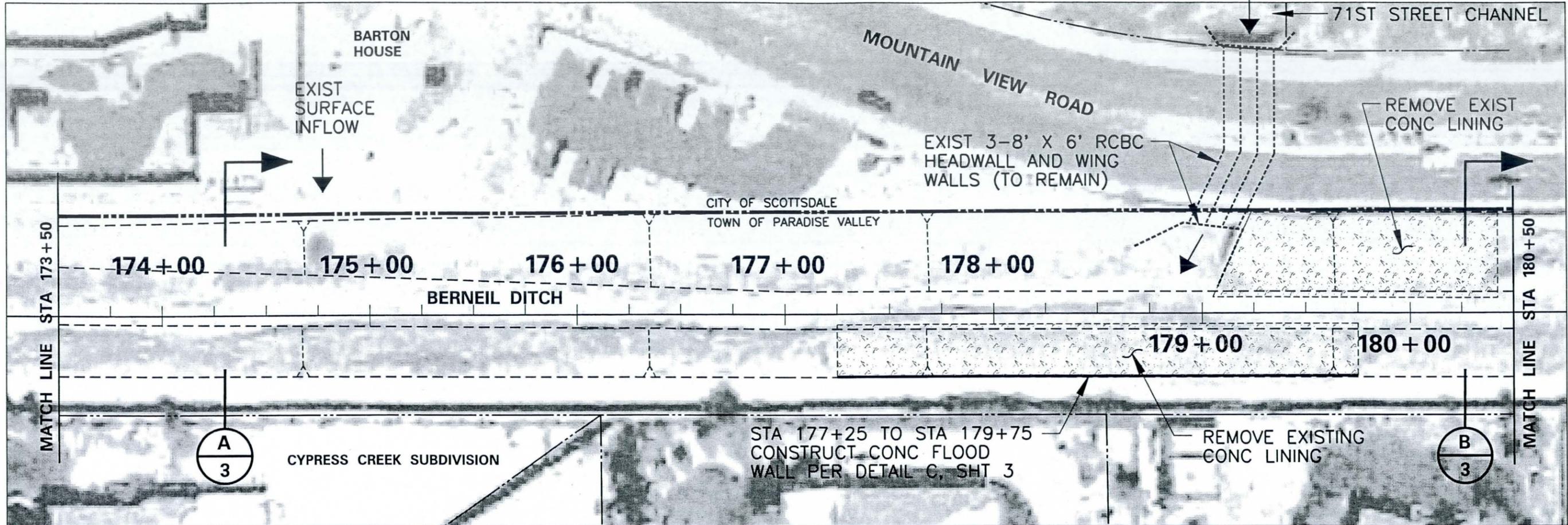


SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

BERNEIL DITCH

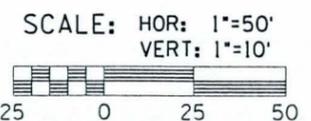
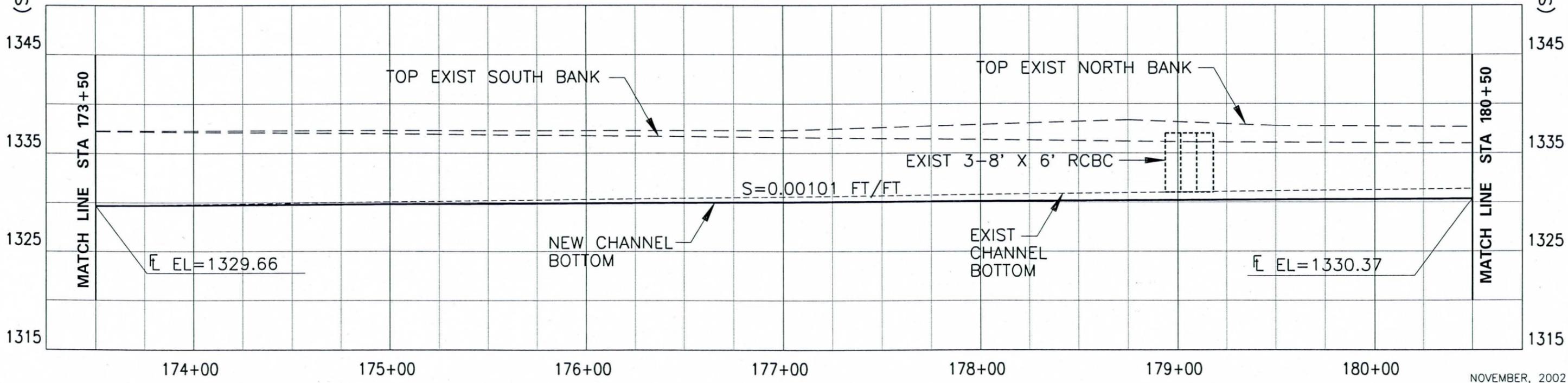
NOVEMBER, 2002

DRAWING NUMBER	P2
SHEET NUMBER	13



(SEE SHT 13)

(SEE SHT 15)



CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCJ \* 15586  
DRAWING FILE:  
Q:\15586\GRAPHICS\DM\PP16.dgn

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SUITE 130  
PHOENIX, ARIZONA 85018  
(602) 912-6500

DESIGN	BNS
DRAWN	LRj
CHECKED	GSB



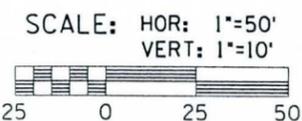
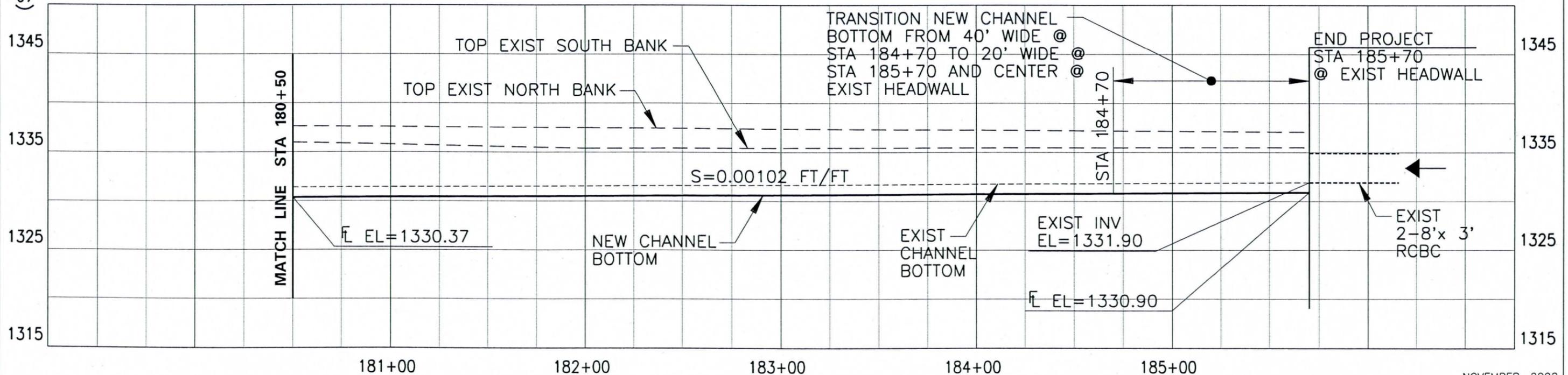
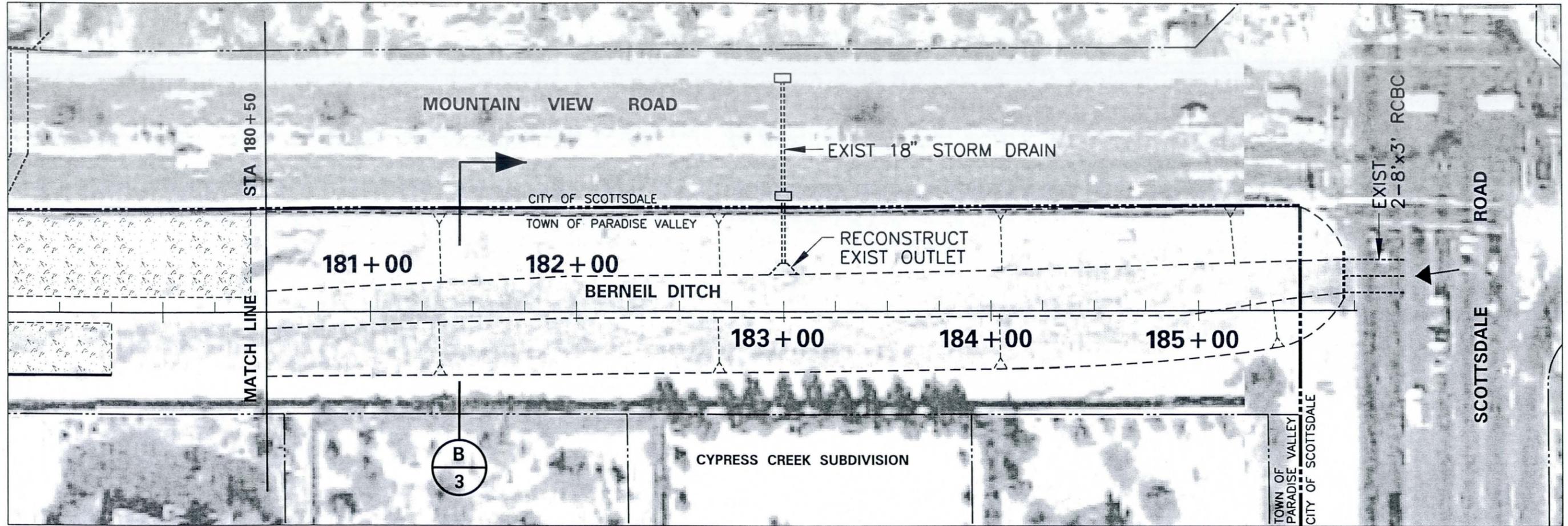
SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

**BERNEIL DITCH**

DRAWING NUMBER	P3
SHEET NUMBER	14

NOVEMBER, 2002

(SEE SHT 14)



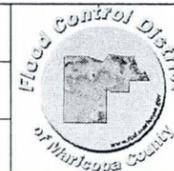
CONCEPT PLANS  
NOT FOR CONSTRUCTION

SC1 15586  
DRAWING FILE:  
Q:\15586\GRAPHICS\DWG\PP17.dgn

PREPARED BY:

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SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-8500

DESIGN	BNS
DRAWN	LRj
CHECKED	GSB



SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

BERNEIL DITCH

NOVEMBER, 2002

DRAWING NUMBER  
**P4**  
SHEET NUMBER  
**15**

MATCH LINE (SEE SHEET 17)

# MESCAL PARK

APPROX TOE OF SLOPE

D  
4

E  
5

CONSTRUCT HARDENED OVERFLOW SPILLWAY

CONSTRUCT NEW INLET ACCESS BARRIER AND TRASH RACK

SURFACE OVERFLOW

EXIST EQUESTRIAN ARENA

GATE

GATE

EXIST 60" OUTLET PIPE

PIPE OUTFLOW

TO 71ST STREET CHANNEL

MESCAL STREET

PARK BDY

68TH PLACE

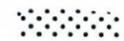
PUEBLO NORTE

SAN PALOMA APARTMENTS

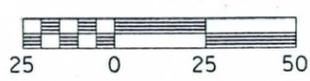
SURFACE OUTFALL TO 68TH PLACE



## LEGEND

- |   |                                    |   |                            |
|---|------------------------------------|---|----------------------------|
|  | EXISTING 8' WIDE ASPHALT PATH      |  | AREA OF PROPOSED FILL      |
|  | EXISTING 10' WIDE EQUESTRIAN TRAIL |  | HARDENED OVERFLOW SPILLWAY |

SCALE: 1"=50'



CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCI • 15586  
DRAWING FILE:  
q: 15586\graphics\dgn\pp12.dgn

PREPARED BY:

  
Stanley Consultants Inc.  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

DESIGN	BNS
DRAWN	LRJ
CHECKED	GSB

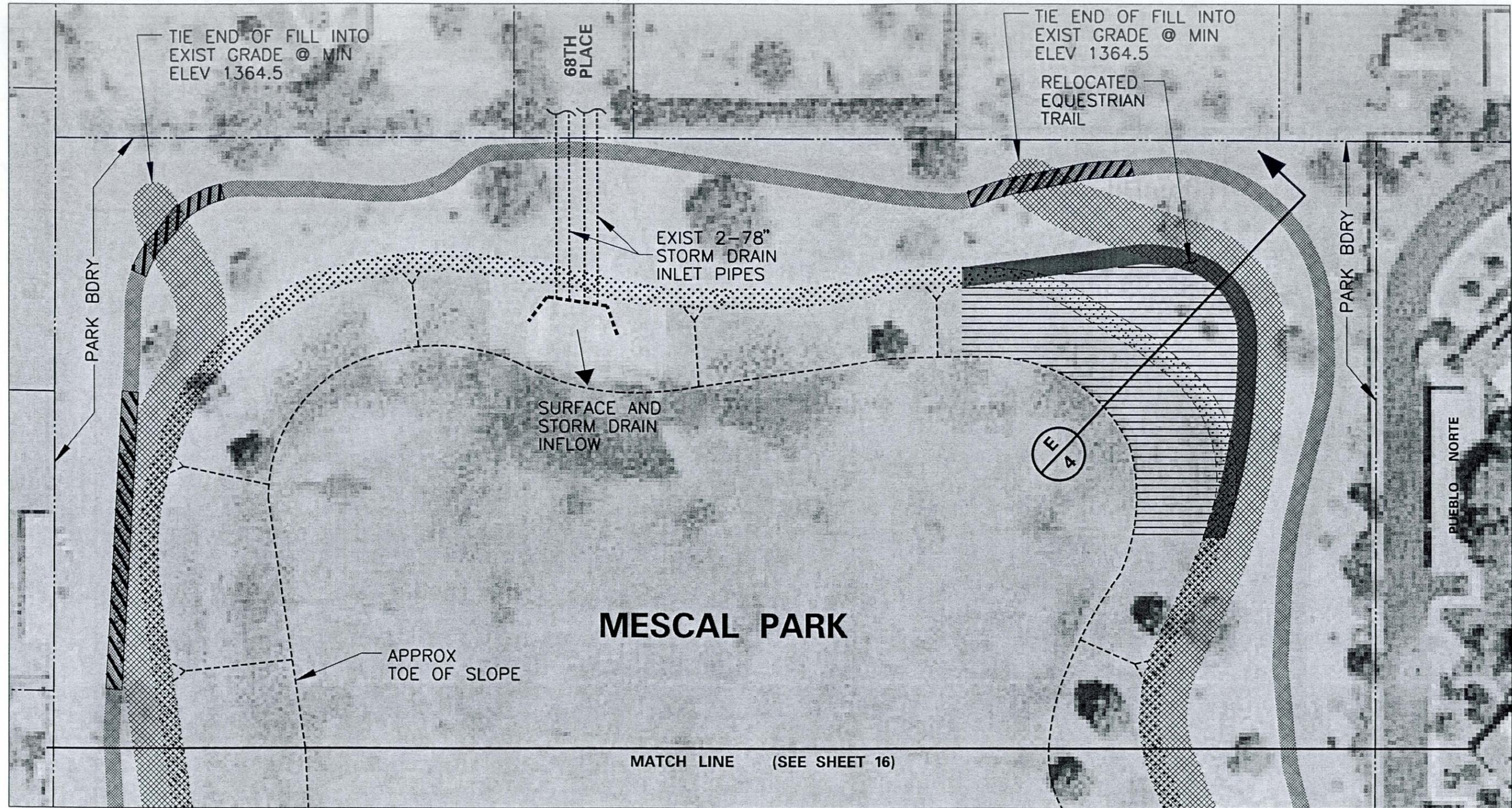


SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

MESCAL PARK

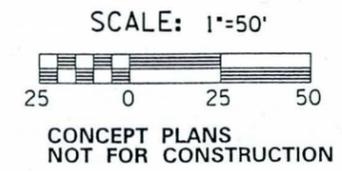
NOVEMBER, 2002

DRAWING NUMBER	P5
SHEET NUMBER	16



**LEGEND**

- EXISTING 8' WIDE ASPHALT PATH
- AREA OF PROPOSED BORROW EXCAVATION
- RECONSTRUCTED ASPHALT PATH AT PROPOSED FILL
- EXISTING 10' WIDE EQUESTRIAN TRAIL
- EXISTING EQUESTRIAN TRAIL TO BE RELOCATED
- RELOCATED EQUESTRIAN TRAIL
- AREA OF PROPOSED FILL



SCI • 15586  
DRAWING FILE:  
a:\15586\graphics\dgn\pp13.dgn

PREPARED BY:  
  
Stanley Consultants INC.  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85018  
(602) 912-6500

DESIGN	BNS
DRAWN	LRJ
CHECKED	GSB



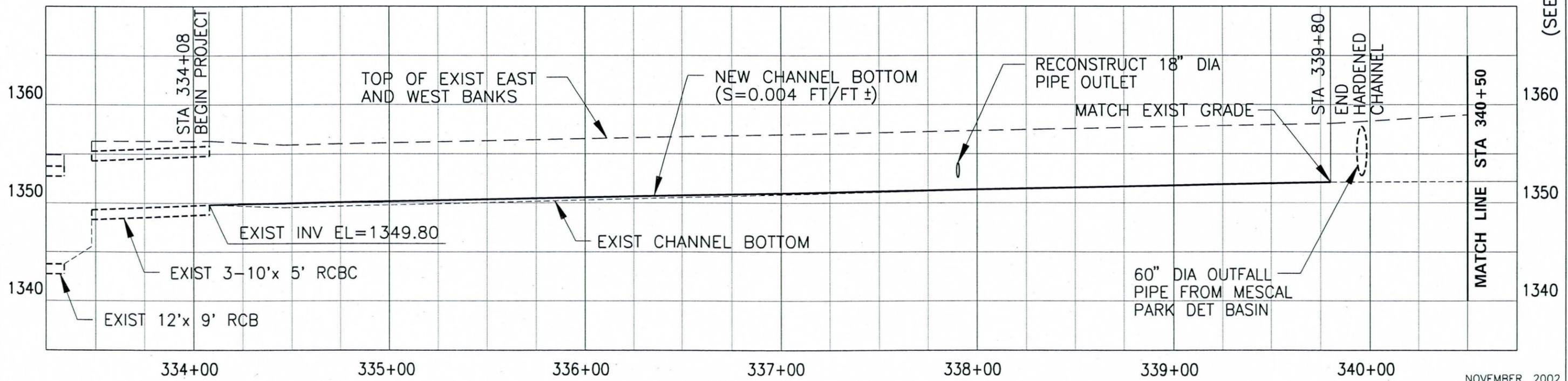
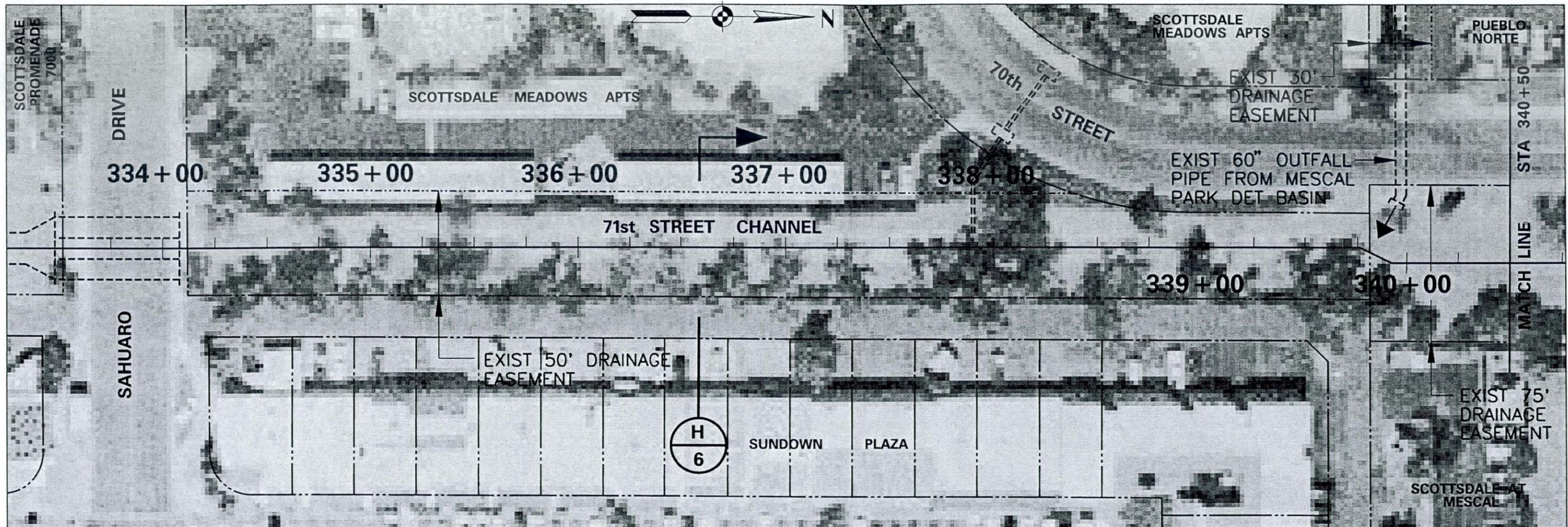
NOVEMBER, 2002

SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

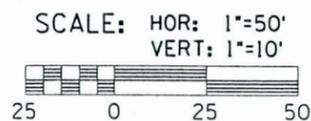
MESCAL PARK

DRAWING NUMBER  
**P6**

SHEET NUMBER  
**17**



**NOTE:**  
71st CHANNEL STA 300+00 IS @  
CONFLUENCE WITH C<sub>L</sub> OF BERNEIL DITCH.



CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCJ • 15586  
DRAWING FILE:  
q:\15586\graphics\dgn\pp06.dgn

PREPARED BY:

**Stanley Consultants** inc.  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-8500

DESIGN	BNS
DRAWN	LRJ
CHECKED	GSB



SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

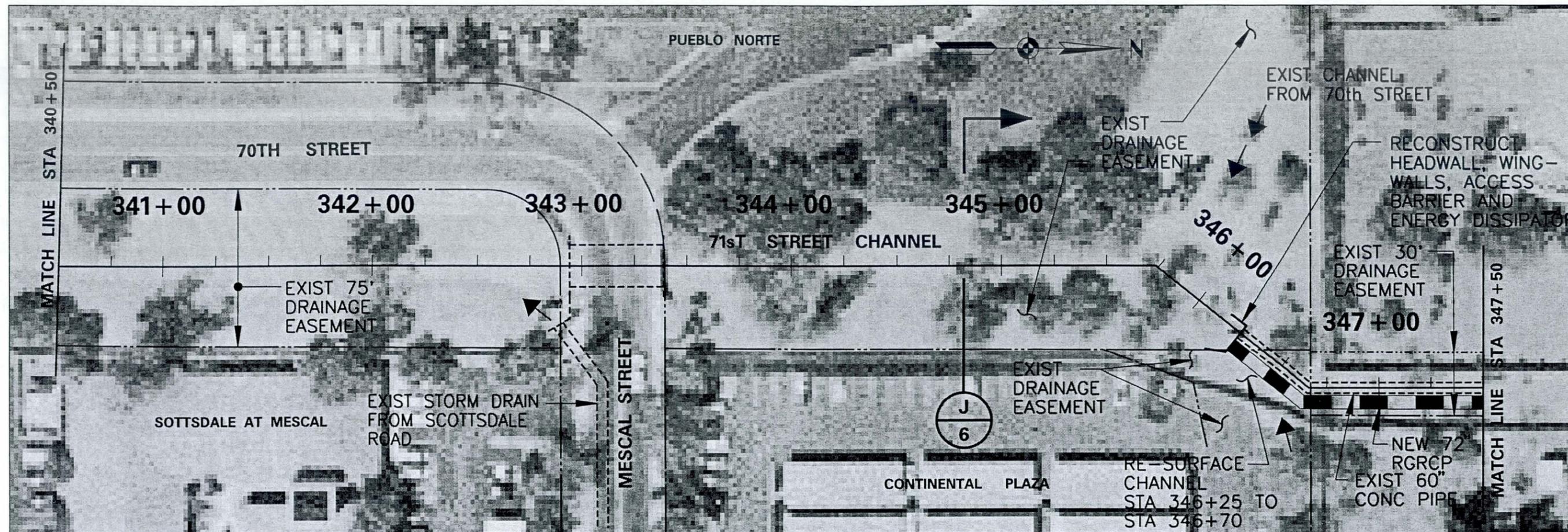
**71ST STREET CHANNEL**

NOVEMBER, 2002

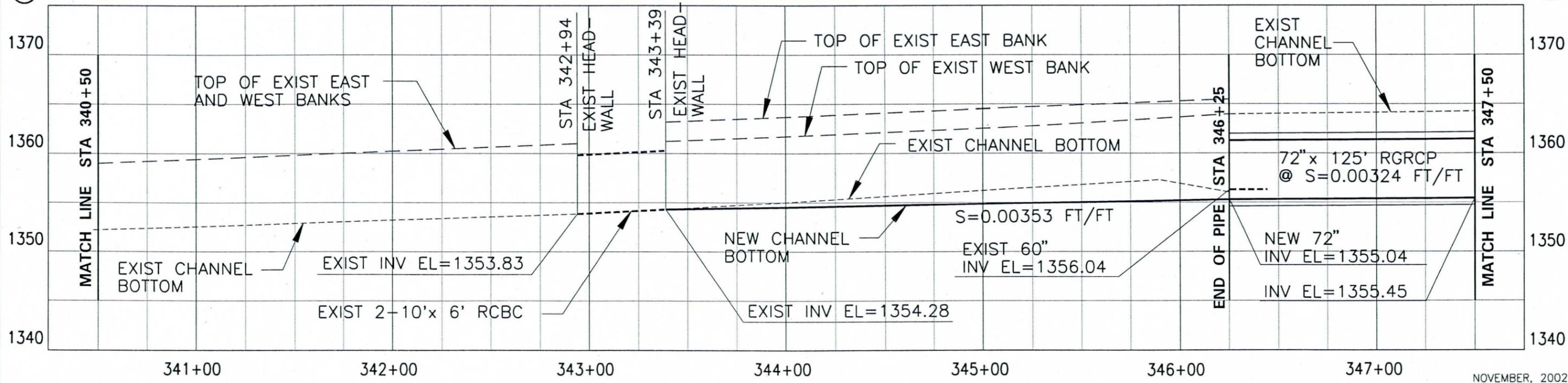
DRAWING NUMBER  
**P7**  
SHEET NUMBER  
**18**

(SEE SHT 19)

(SEE SHT 18)



(SEE SHT 20)



CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCJ - 15586  
DRAWING FILE:  
q:\15586\graphics\dgn\pp07.dgn

PREPARED BY:

Stanley Consultants, Inc.  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

DESIGN	BNS
DRAWN	LRj
CHECKED	GSB

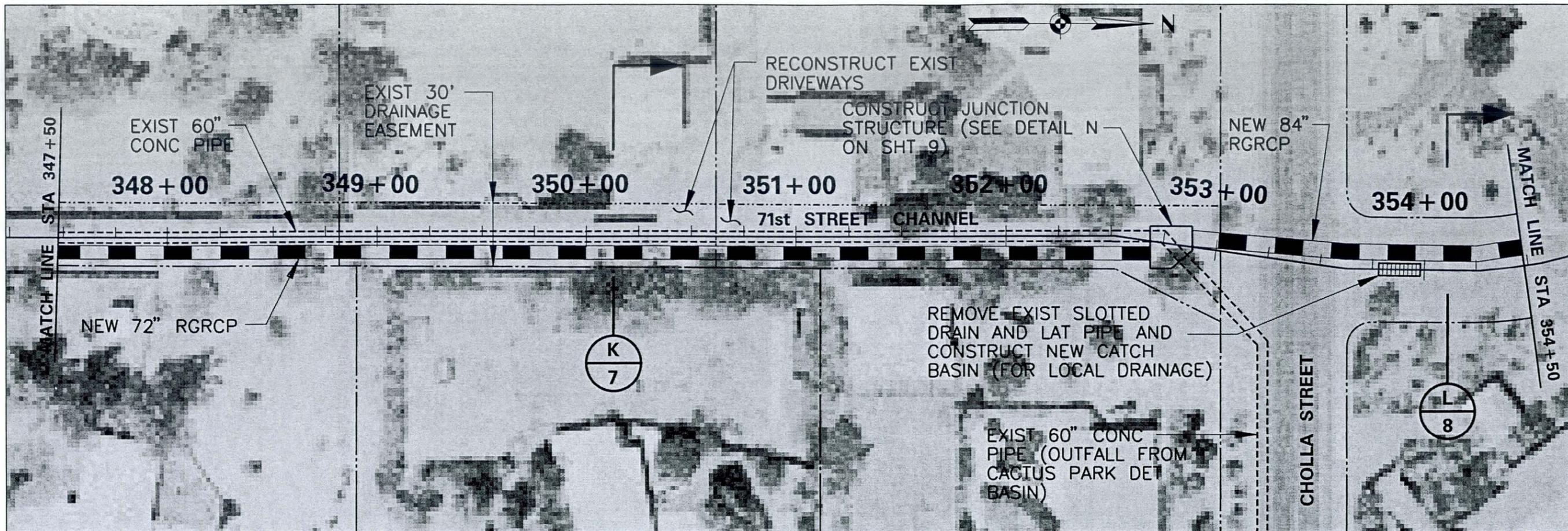


SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

71ST STREET CHANNEL

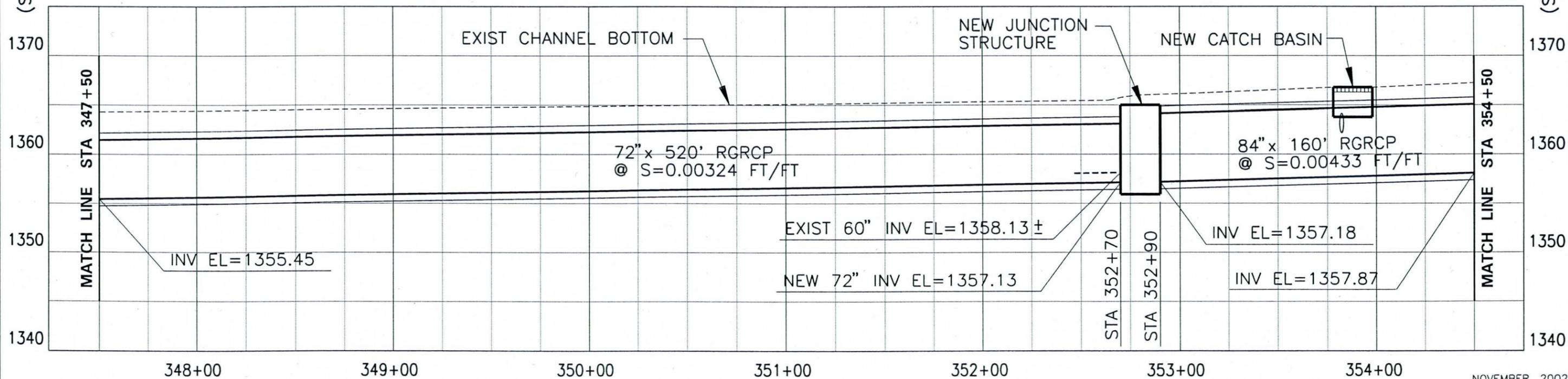
NOVEMBER, 2002

DRAWING NUMBER	P8
SHEET NUMBER	19



(SEE SHT 19)

(SEE SHT 21)



CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCI \* 15586  
DRAWING FILE:  
q:\15586\graphics\dgn\pp08.dgn

PREPARED BY:

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SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

DESIGN	BNS
DRAWN	LRJ
CHECKED	GSB

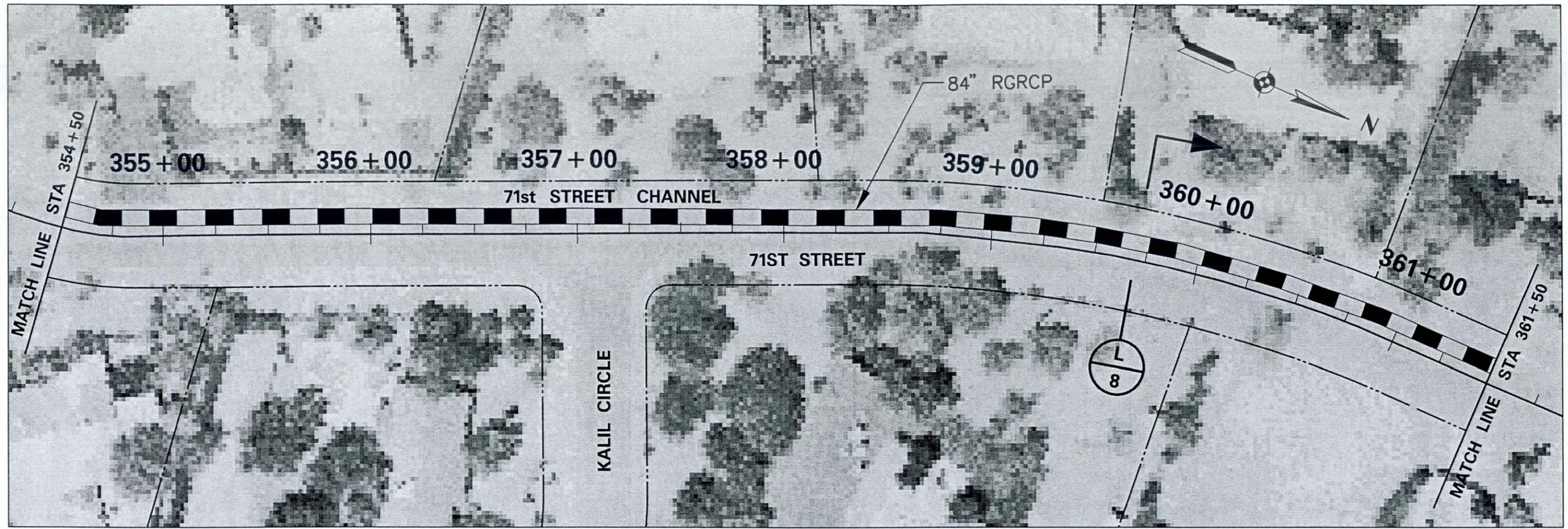


SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

71ST STREET CHANNEL

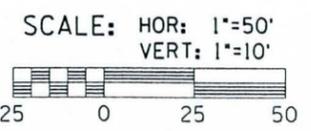
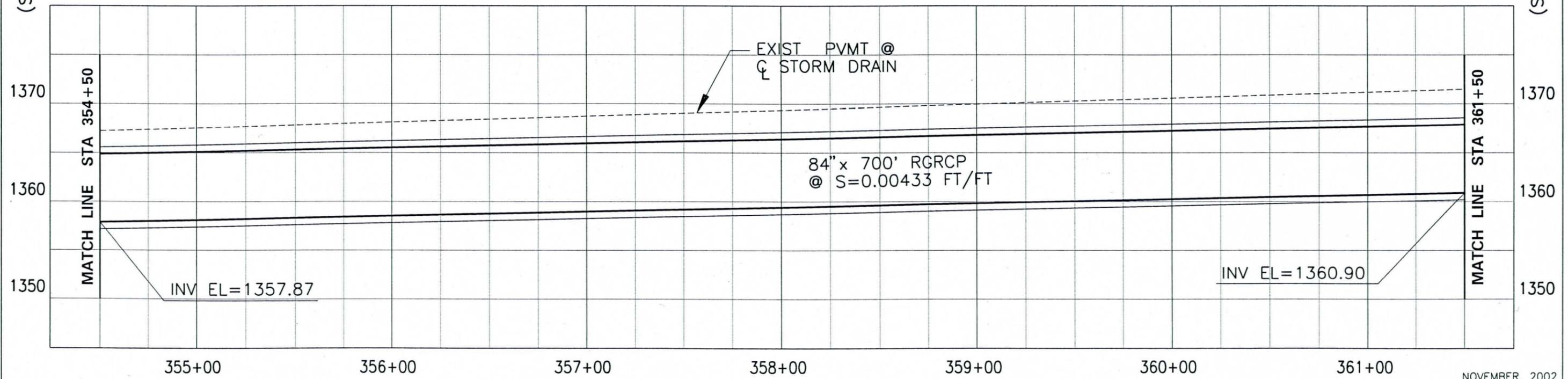
DRAWING NUMBER	P9
SHEET NUMBER	20

NOVEMBER, 2002



(SEE SHT 20)

(SEE SHT 22)



CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCI - 15586  
DRAWING FILE:  
a:\15586\graphics\dgn\pp09.dgn

PREPARED BY:

**Stanley Consultants** INC.  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

DESIGN	BNS
DRAWN	LRJ
CHECKED	GSB



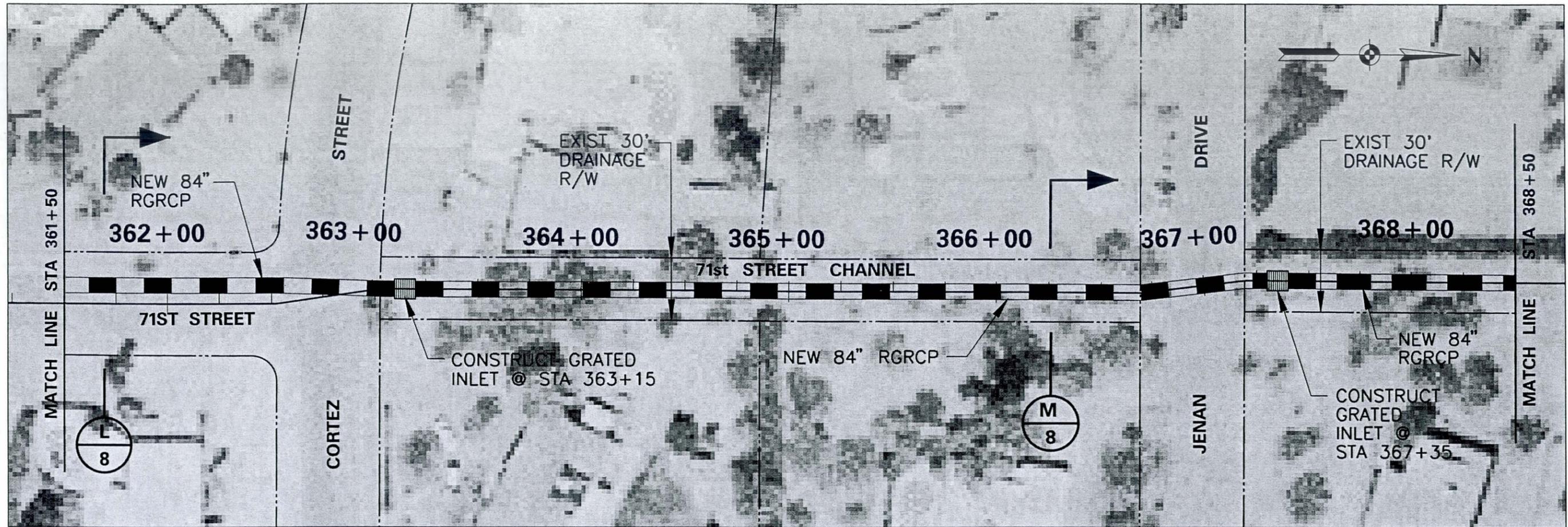
SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

**71ST STREET CHANNEL**

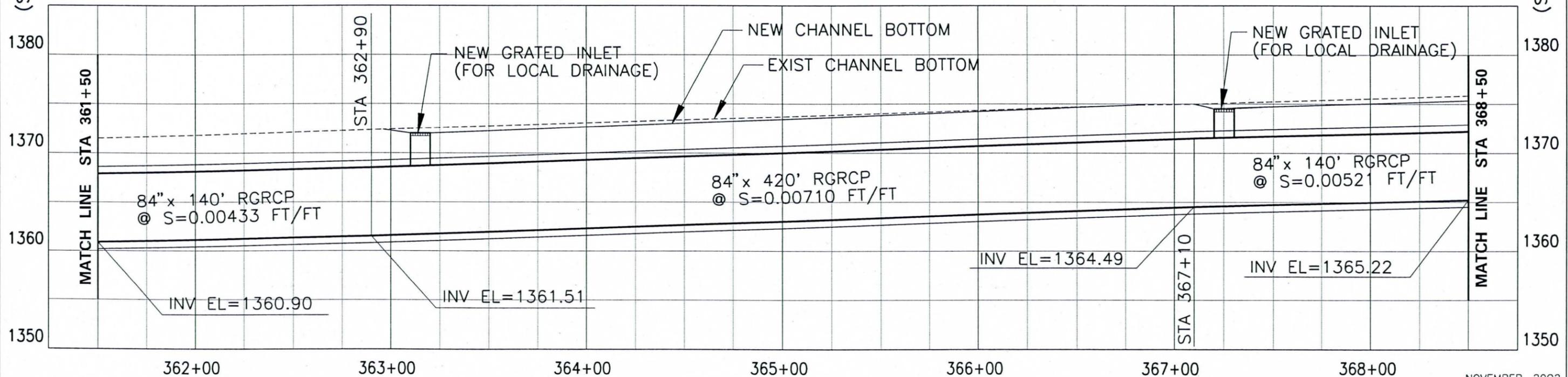
NOVEMBER, 2002

DRAWING NUMBER	P10
SHEET NUMBER	21

(SEE SHT 21)



(SEE SHT 23)



CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCJ • 15586  
DRAWING FILE:  
q:\15586\graphics\dgn\pp10.dgn

PREPARED BY:

Stanley Consultants inc.  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-8500

DESIGN	BNS
DRAWN	LRj
CHECKED	GSB



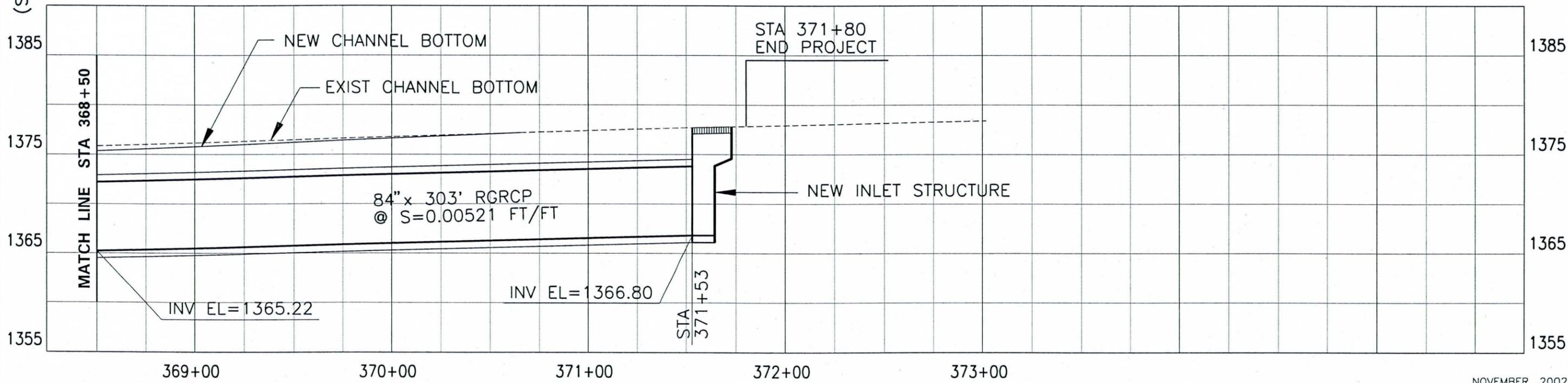
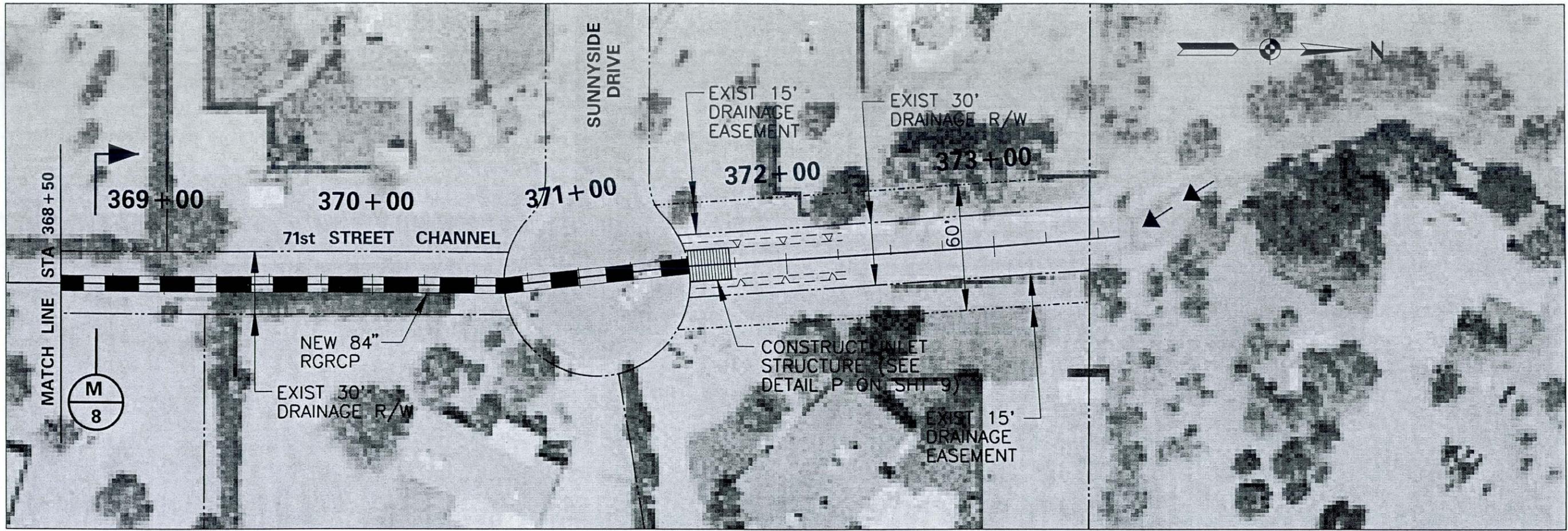
SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

71ST STREET CHANNEL

NOVEMBER, 2002

DRAWING NUMBER  
**P11**  
SHEET NUMBER  
**22**

(SEE SHT 22)



CONCEPT PLANS  
 NOT FOR CONSTRUCTION

SCI \* 15586  
 DRAWING FILE:  
 q:\15586\graphics\dgn\pp11.dgn

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 SUITE 130  
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DESIGN	BNS
DRAWN	LRJ
CHECKED	GSB

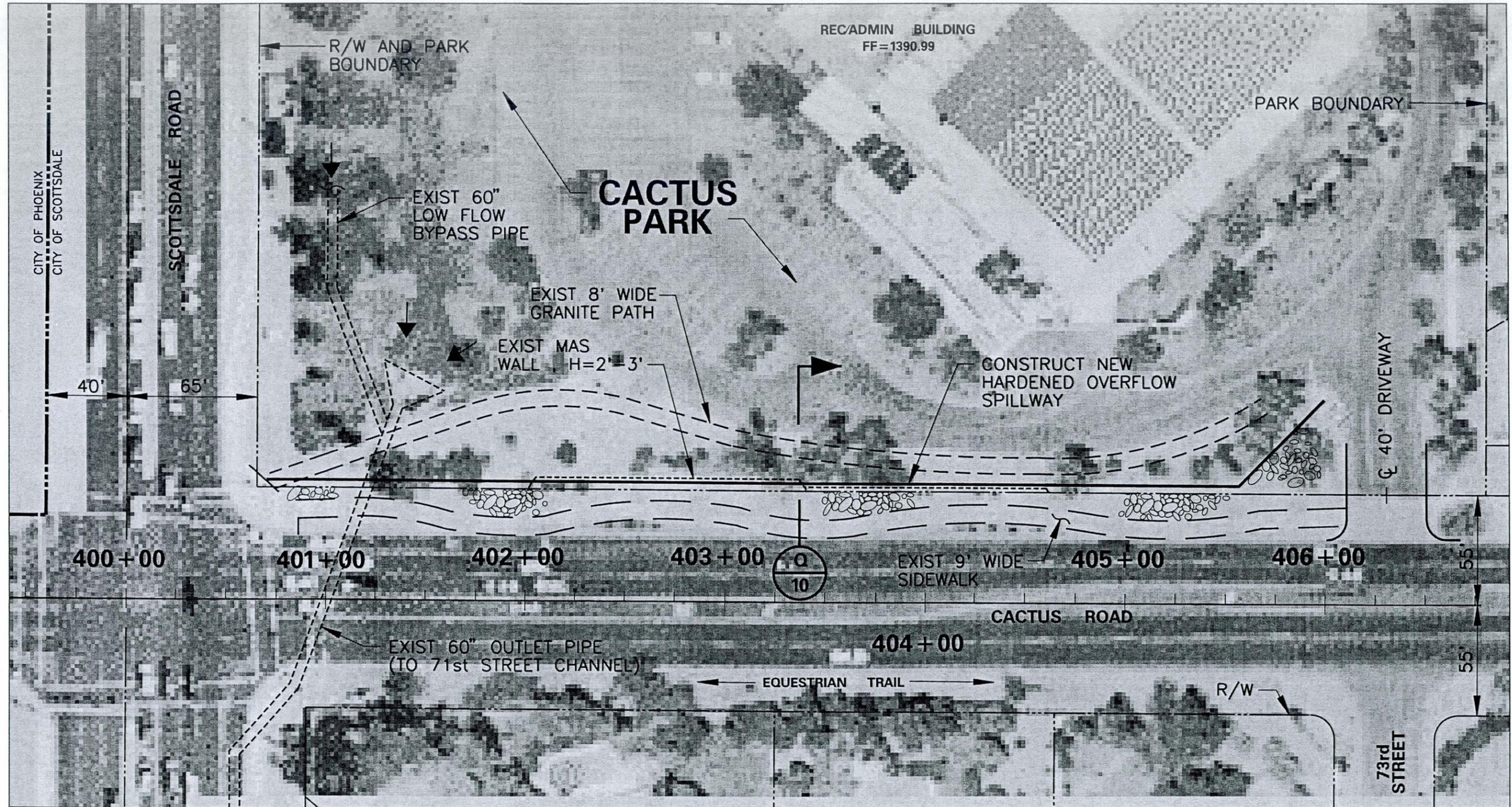


SCOTTSDALE ROAD CORRIDOR  
 DRAINAGE MASTER PLAN

**71ST STREET CHANNEL**

NOVEMBER, 2002

DRAWING NUMBER  
**P12**  
 SHEET NUMBER  
**23**



SCALE: 1"=50'



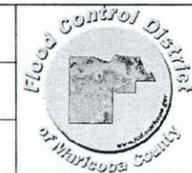
CONCEPT PLANS  
NOT FOR CONSTRUCTION

SC1 • 15586  
DRAWING FILE:  
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PREPARED BY:

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SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

DESIGN	BNS
DRAWN	LRj
CHECKED	GSB

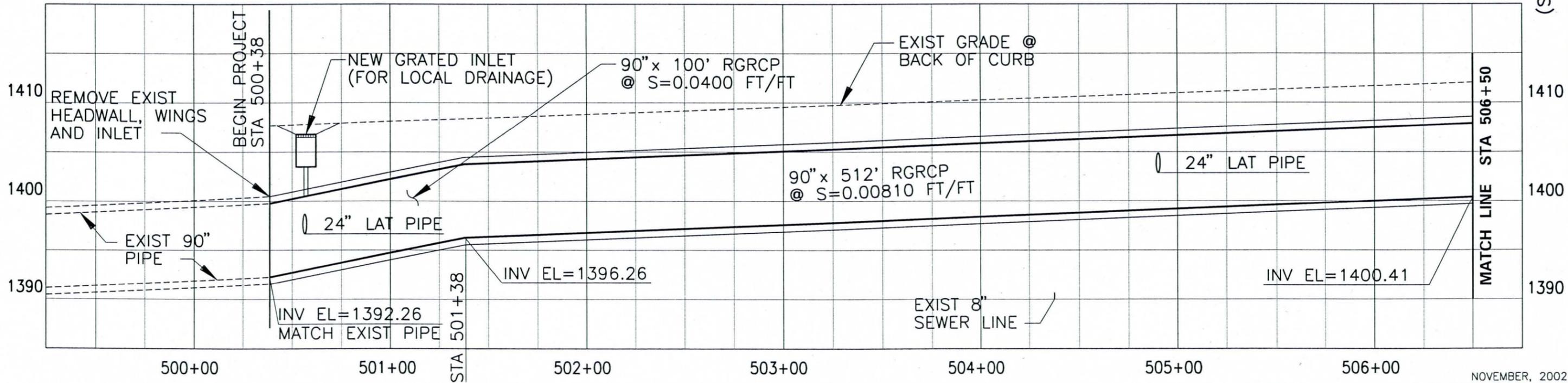
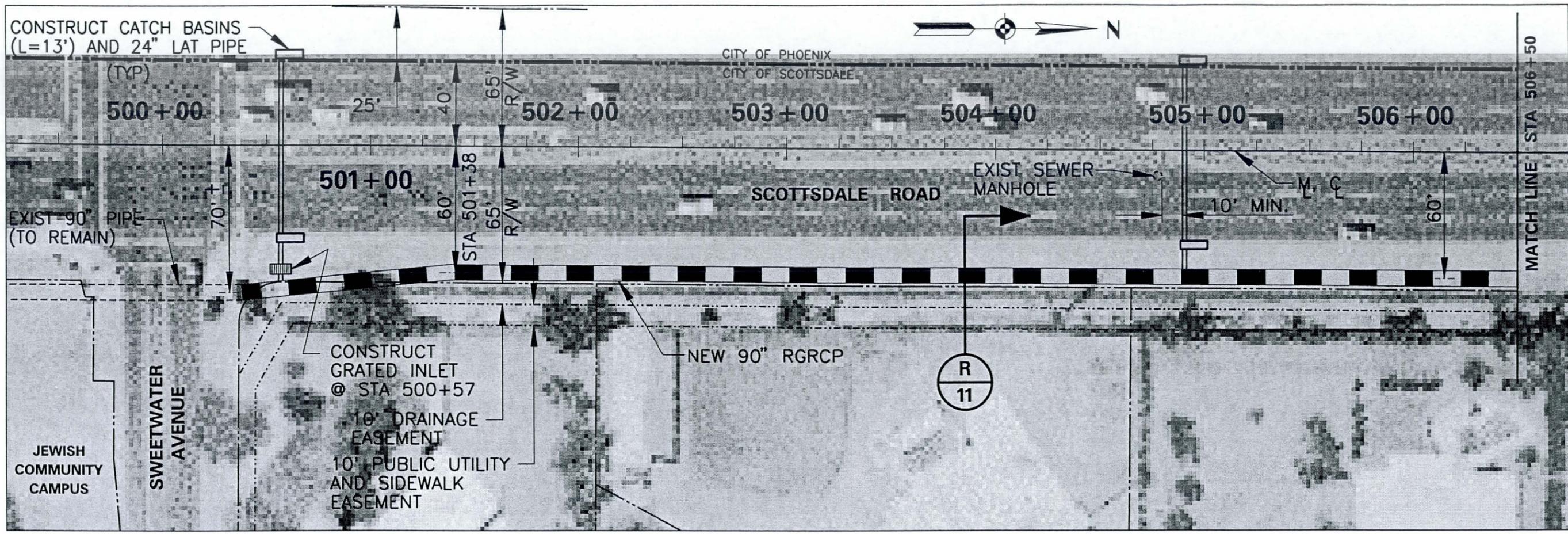


SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

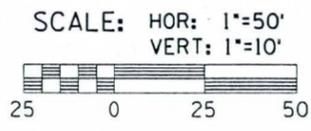
**CACTUS PARK**

NOVEMBER, 2002

DRAWING NUMBER	<b>P13</b>
SHEET NUMBER	<b>24</b>



NOTE:  
SCOTTSDALE ROAD CHANNEL STA 500+00  
IS @ APPROX  $\frac{1}{2}$  OF SWEETWATER AVENUE.



CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCI \* 15586  
DRAWING FILE:  
q:\15586\graphics\dgn\pp1.dgn

PREPARED BY:

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SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

DESIGN	BNS
DRAWN	LRj
CHECKED	GSB



SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

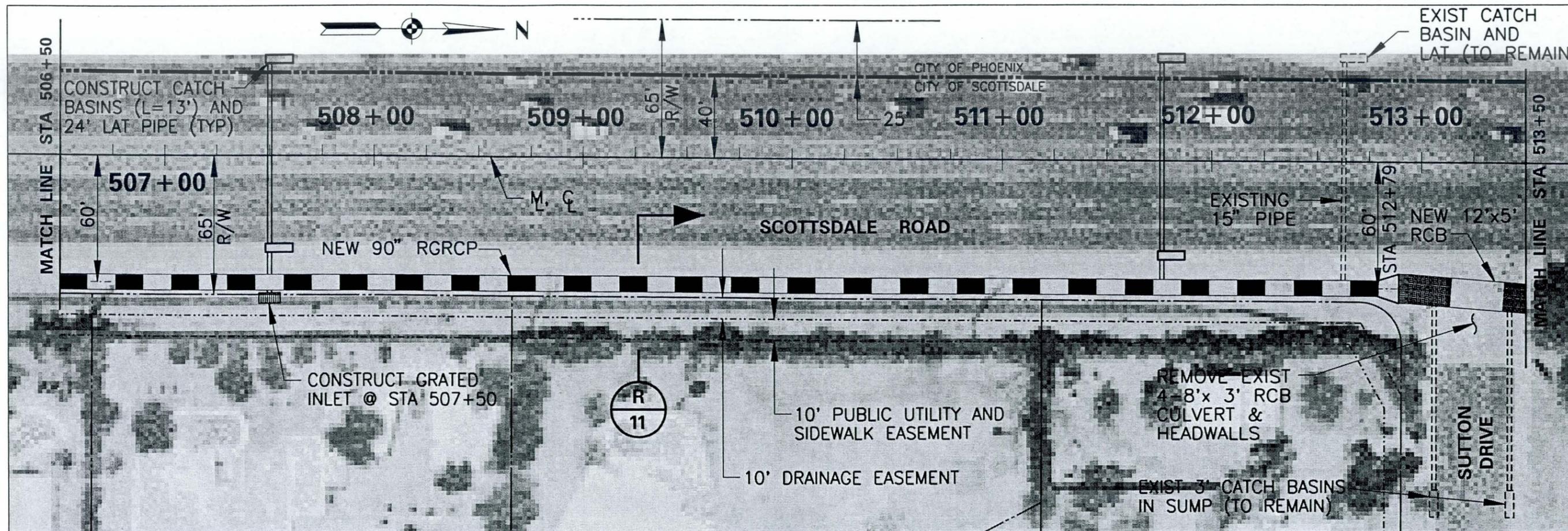
SCOTTSDALE ROAD CHANNEL

DRAWING NUMBER	P14
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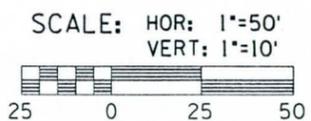
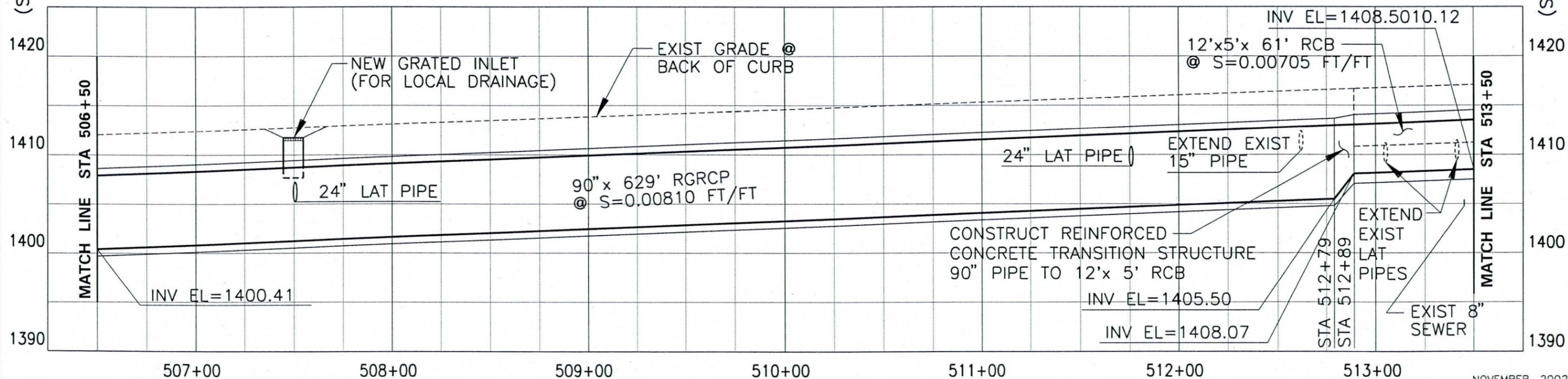
(SEE SHT 26)

NOVEMBER, 2002

(SEE SHT 25)



(SEE SHT 27)



CONCEPT PLANS NOT FOR CONSTRUCTION

SCI - 15586  
DRAWING FILE:  
q:\15586\graphics\dgn\pp2.dgn

PREPARED BY:

Stanley Consultants  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

DESIGN	BNS
DRAWN	LRj
CHECKED	GSB

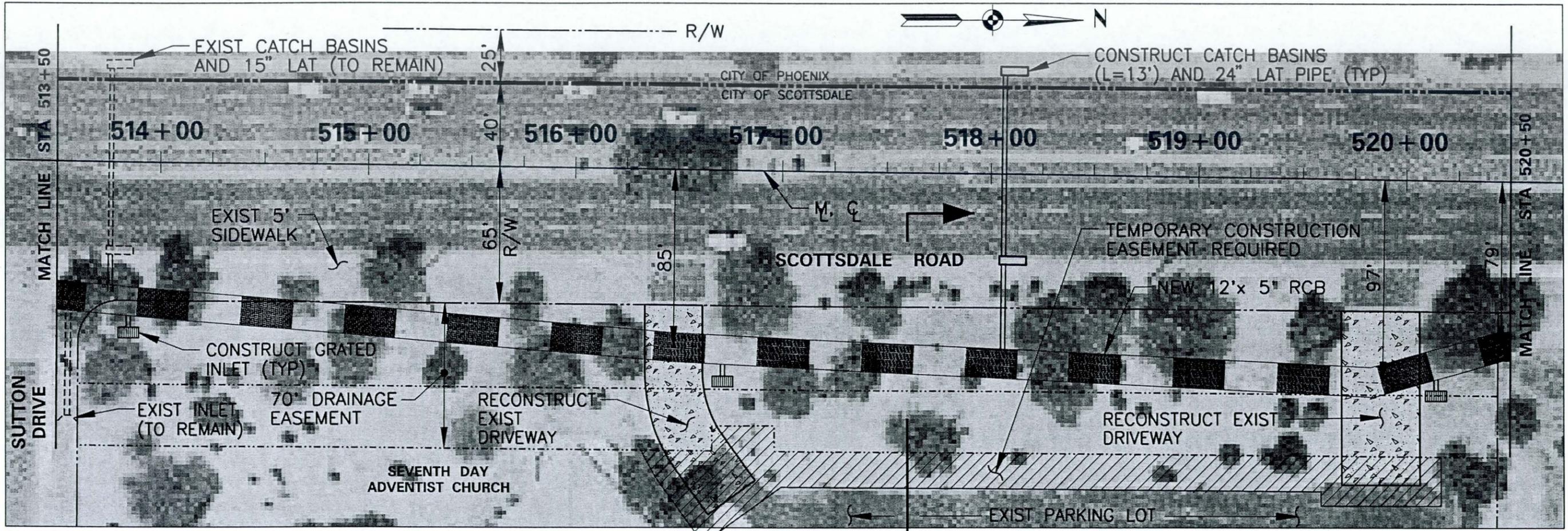


SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

SCOTTSDALE ROAD CHANNEL

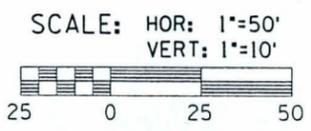
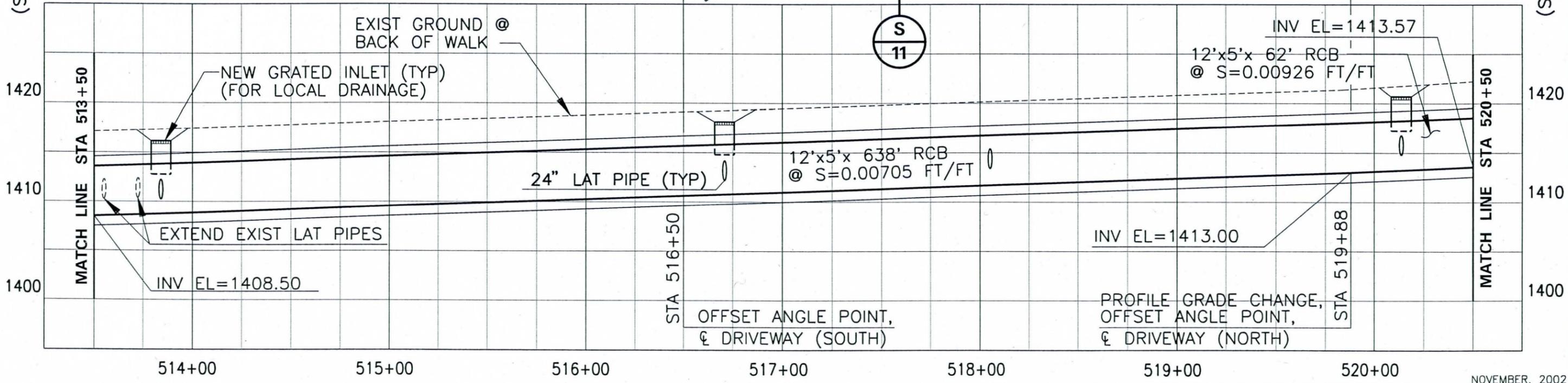
DRAWING NUMBER	P15
SHEET NUMBER	26

NOVEMBER, 2002



(SEE SHT 26)

(SEE SHT 28)



CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCI • 15586  
DRAWING FILE:  
q:\15586\graphics\dgn\pp3.dgn

PREPARED BY:

Stanley Consultants Inc.  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

DESIGN	BNS
DRAWN	LRJ
CHECKED	GSB



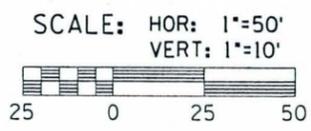
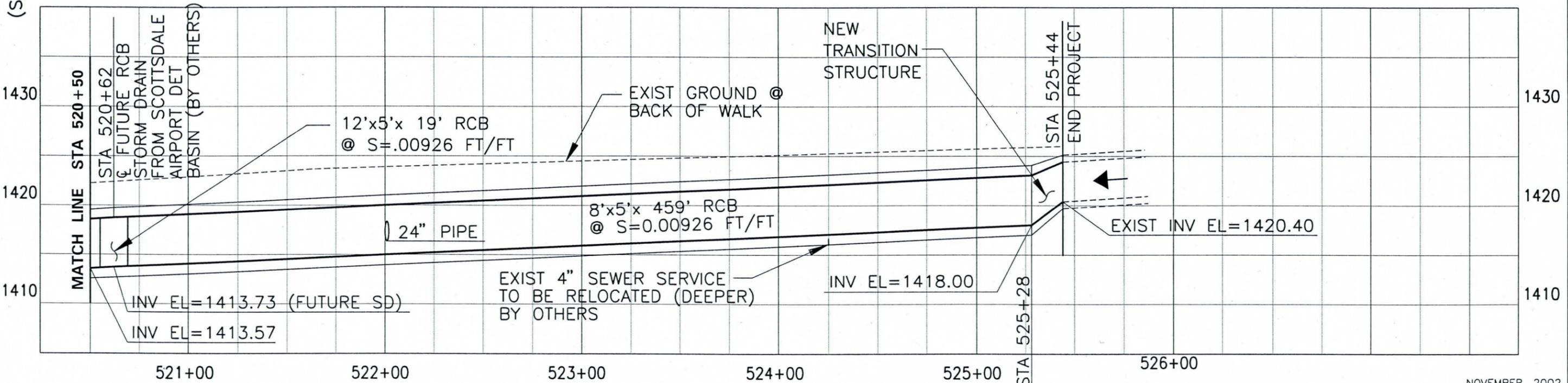
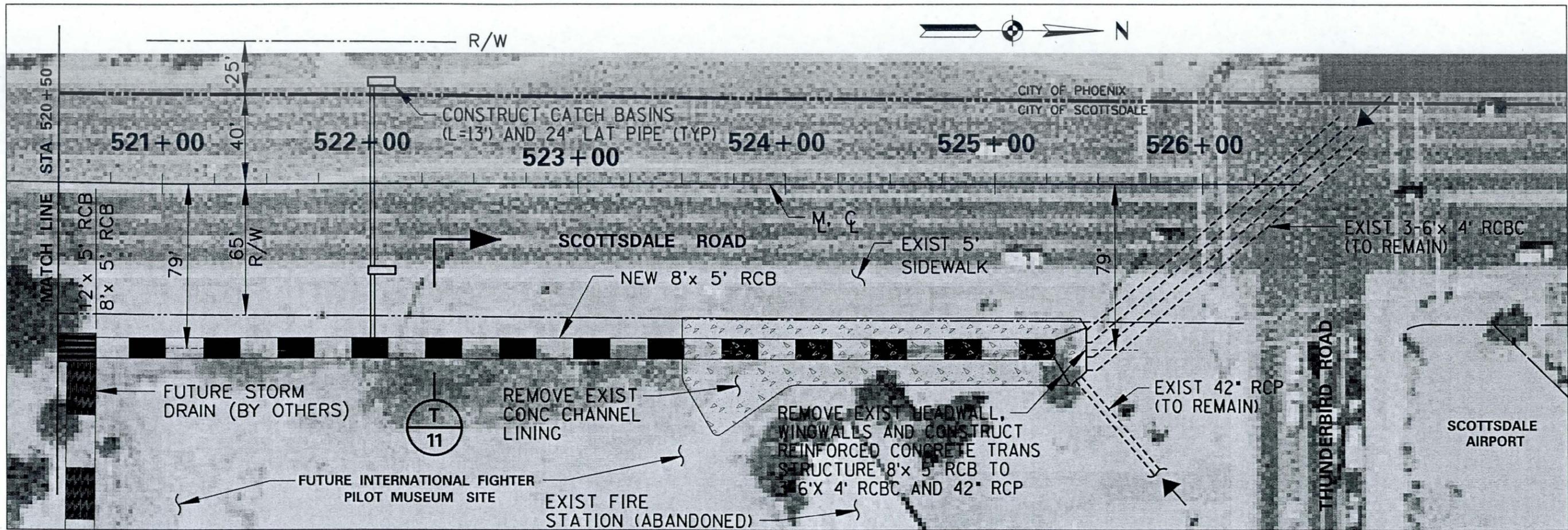
NOVEMBER, 2002

SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

**SCOTTSDALE ROAD CHANNEL**

DRAWING NUMBER  
**P16**  
SHEET NUMBER  
**27**

(SEE SHT 27)



CONCEPT PLANS  
NOT FOR CONSTRUCTION

SC1 • 15596  
DRAWING FILE:  
q:\15596\graphics\dgn\pp4.dgn

PREPARED BY:



DESIGN	BNS
DRAWN	LRj
CHECKED	GSB



NOVEMBER, 2002

SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

SCOTTSDALE ROAD CHANNEL

DRAWING NUMBER  
**P17**

SHEET NUMBER  
**28**

## Berneil Ditch Landscape Design Theme

Landscape Design Theme: to create a hard-surface channel as a sculptural land graphic that relates to the character of the setting.

Applicable to: Berneil Ditch

Channel Criteria:

### 1. Configuration

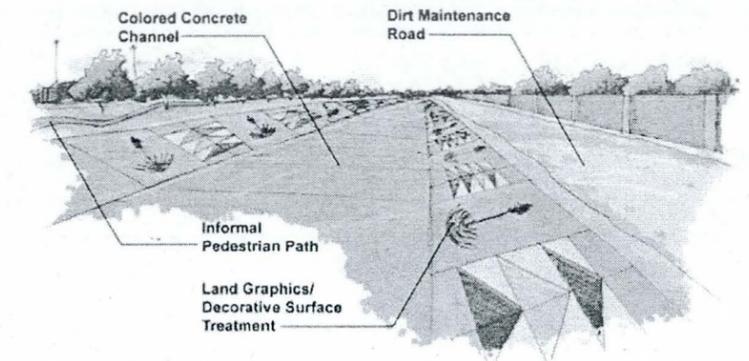
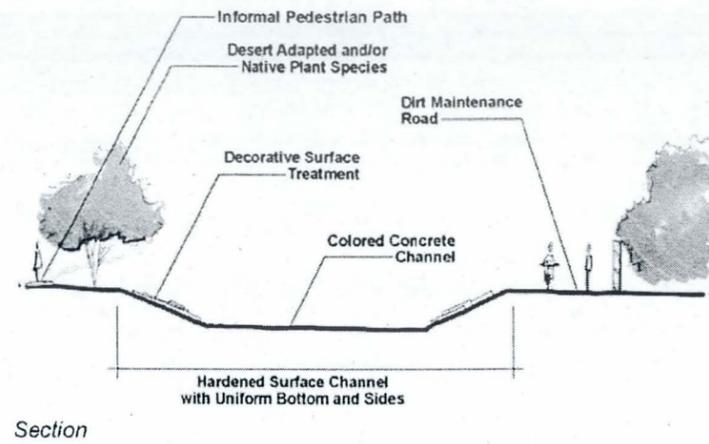
- Use integral colored material and surface treatments that would create a sculptural land graphic.
- Place landscape area with informal pedestrian path between the channel and Chaparral High School.

### 2. Vegetation

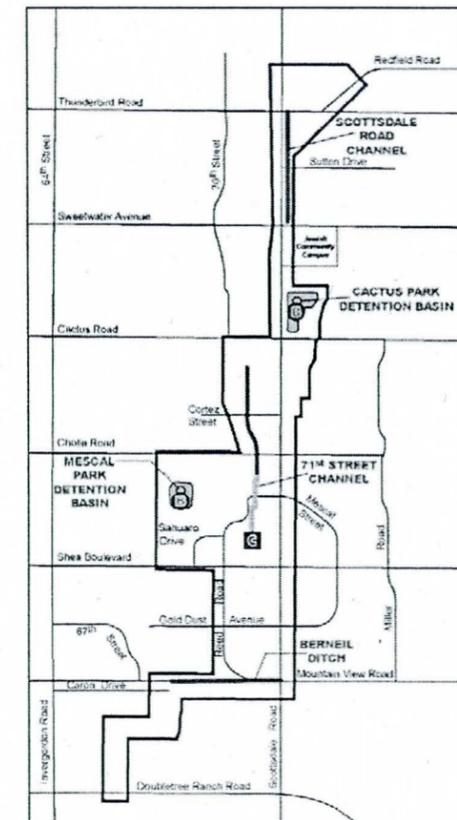
- Select plant material from the plant list in the City of Scottsdale's Suburban Character Area plant palette.
- Plant trees in a pattern to mimic the form, line, and density of trees associated with natural washes in the project vicinity.
- Install irrigation system to maintain and establish plant material.
- Existing trees will be protected or salvaged for transplant.

### 3. Materials

- Use surface material that complements the character of the adjacent land use.



Existing Conditions



Location Map

NOVEMBER, 2002

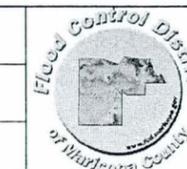
CONCEPT PLANS  
NOT FOR CONSTRUCTION

SCI • 15586  
DRAWING FILE:  
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Stanley Consultants Inc.  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

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CHECKED	GSB



SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

**BERNEIL DITCH  
LANDSCAPE DESIGN THEME**

DRAWING NUMBER	L1
SHEET NUMBER	29

# 71<sup>st</sup> Street Channel Landscape Design Theme

Landscape Design Theme: to create an informal pattern of unifying elements that incorporates an informal pedestrian path where feasible and low-density indigenous plant material to integrate the drainage facility with the surrounding commercial and residential neighborhood.

### Channel Criteria:

#### 1. Configuration

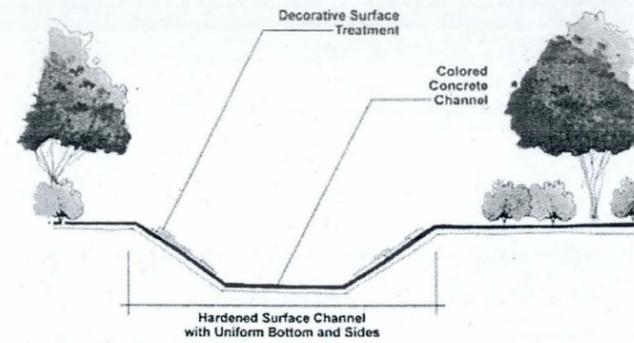
- Create an overall channel form that is more informal in character rather than rectangular and uniform.
- Meander channel alignment in an irregular pattern.
- Vary channel sides slope ratios asymmetrically from 2:1 to 4:1 along the length of the channel.
- Round channel banks at the top.

#### 2. Vegetation

- Select plant material from the plant list in the City of Scottsdale's Suburban Character Area plant palette.
- Place shrubs and trees in an irregular pattern along top of the banks.
- Use vegetation to fill-in voids and complement the adjacent landscape.
- Plant trees in a pattern to mimic the form, line, and density of trees associated with the project vicinity.
- Install irrigation system to maintain and establish plant material.
- Select plant material to provide seasonal color and interest in either form or texture. Avoid using plant material with notable thorns or those plants considered hazardous to pedestrians.

#### 3. Materials

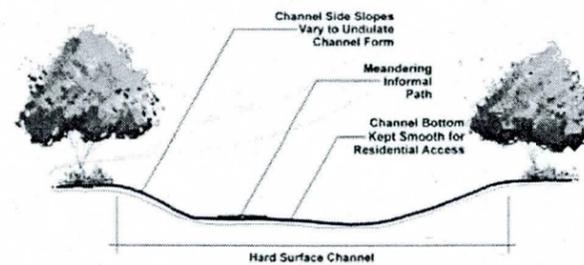
- Use a hard-surfaced material for the informal meandering pedestrian path with texture surface, integral color, or other visual interesting treatment of the path surface.
- Use pattern concrete or other textured material for channel side slopes.
- Channel bottom kept smooth for residential access to property.



Section North of Shea Boulevard



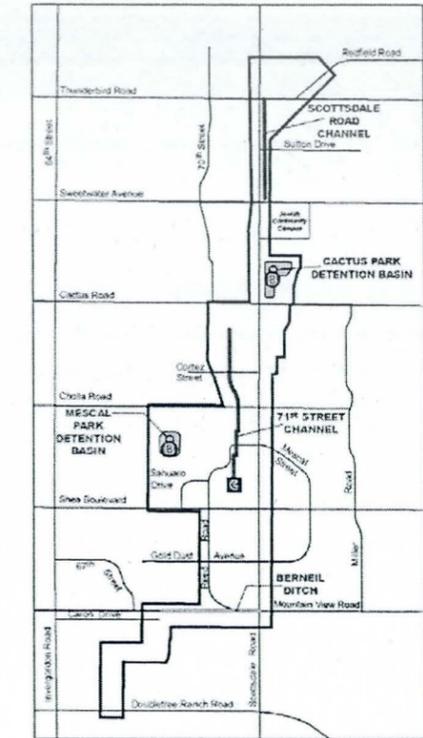
Existing Conditions North of Shea Boulevard



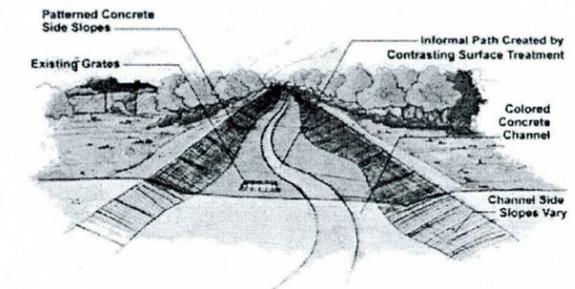
Section North of Cortez Street



Existing Conditions North of Cortez Street



Location Map



Conceptual Sketch North of Cortez Street

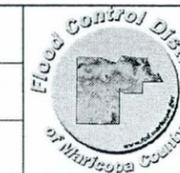
CONCEPT PLANS  
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DRAWING FILE:  
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PREPARED BY:

Stanley Consultants  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

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SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN  
**71ST STREET CHANNEL  
LANDSCAPE DESIGN THEME**

NOVEMBER, 2002  
DRAWING NUMBER  
**L2**  
SHEET NUMBER  
**30**

## Scottsdale Road Channel Landscape Design Theme

Landscape Design Theme: to create a comfortable suburban pedestrian environment with a meandering path and appropriately scaled indigenous plant material that is visually and physically separated from Scottsdale Road.

### Channel Criteria:

#### 1. Configuration

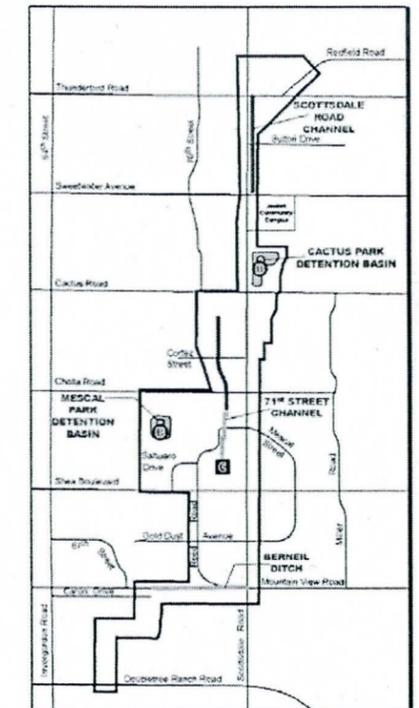
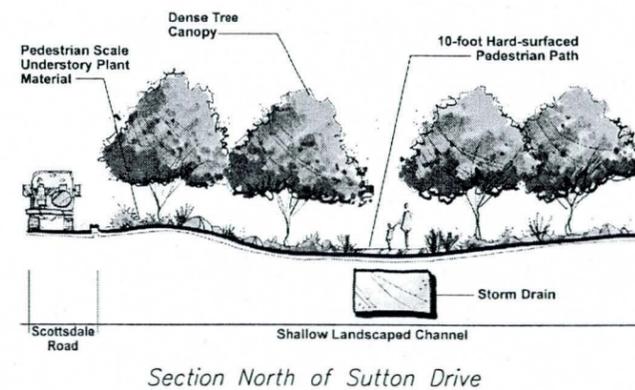
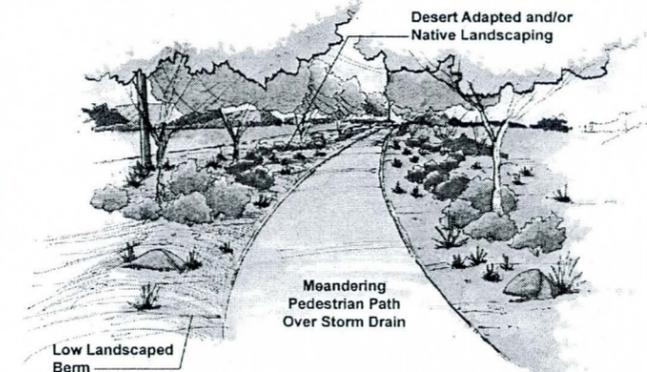
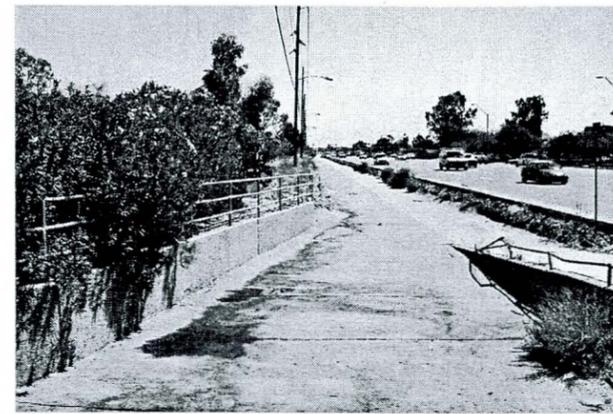
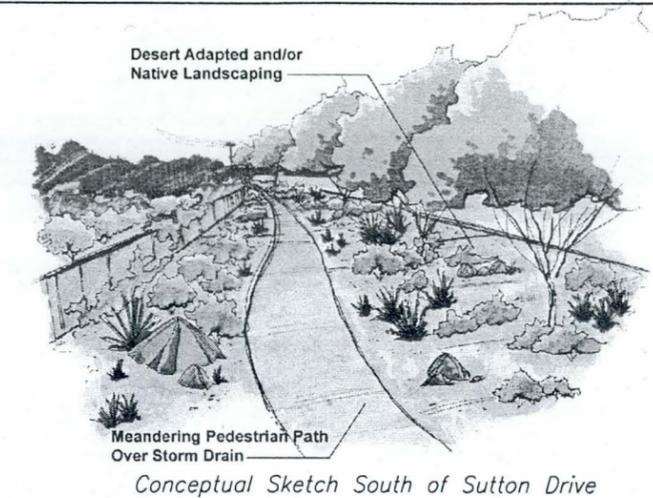
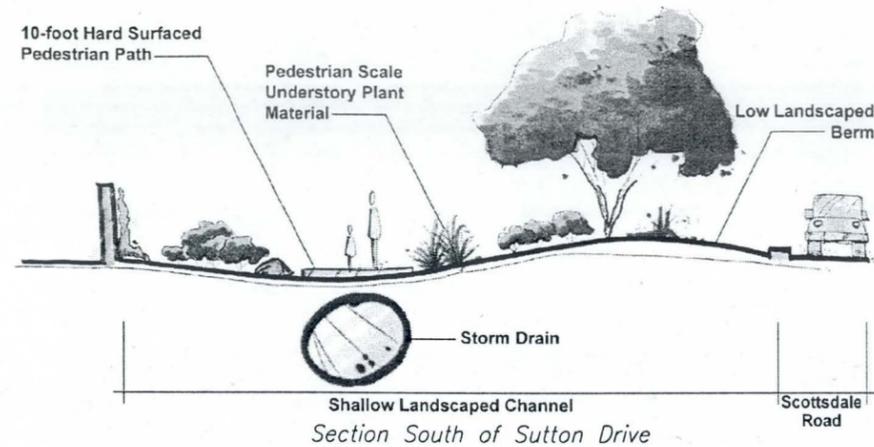
- Create an overall channel form that is more organic and less geometric.
- Meander channel alignment in an irregular pattern.
- Vary channel sides slope ratios asymmetrically from 4:1 to 8:1 along the length of the channel.
- Low landscaped berm adjacent to street.
- Round channel banks at the top.
- Pathway should be placed at least 15 feet from edge of roadway curb.

#### 2. Vegetation

- Select plant material from the plant list in the City of Scottsdale's Suburban Character Area plant palette.
- Prune trees to allow for pedestrians to pass underneath their canopies. Use trees as accents in order to not block panoramic views of surrounding mountains. Use no more than three different species of tree along any one street venue. Select specific 'street tree(s)' that fits with the adjacent landscape in terms of form, color, and texture for each street.
- Place shrubs, ground covers, rocks, and boulders in an irregular pattern along the sides and top of the banks.
- Install irrigation system to maintain and establish plant material.
- Select plant material to provide seasonal color and interest in either form or texture. Avoid using plant material with notable thorns or those plants considered hazardous to pedestrians.

#### 3. Materials

- Use a hard-surfaced material for the pedestrian path with texture surface, integral color, or other visual interesting treatment of the path surface.
- Railings and poles should use a consistent desert sensitive color palette.



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PREPARED BY:

Stanley Consultants inc.  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-6500

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CHECKED	GSB



SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

SCOTTSDALE ROAD CHANNEL  
LANDSCAPE DESIGN THEME

NOVEMBER, 2002

DRAWING NUMBER  
**L3**  
SHEET NUMBER  
**31**

## Detention Basin Landscape Design Theme

Landscape Design Theme: to minimize any disturbance to the turfed open space and perimeter trees and maintain the character and use of the public park.

Applicable to: Cactus and Mescal Parks

Basin Criteria:

### 1. Configuration

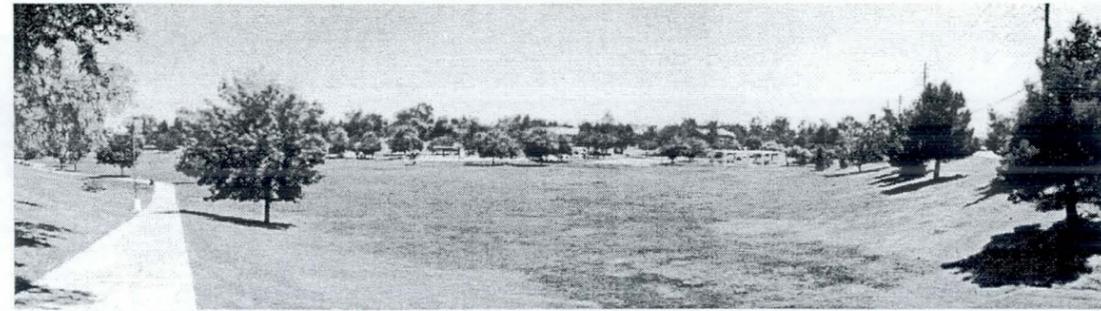
- Enhance an overall basin form that is more informal in character rather than rectangular and uniform.
- Vary sides slope ratios asymmetrically throughout the basin.
- Round top of basin side slopes.
- Maintain a separation of pedestrian and equestrian paths.

### 2. Vegetation

- Plant new trees in a pattern to mimic the form, line, and density of trees associated with the existing basin.
- Protect-in-place existing trees.
- Turf basin slopes to match existing conditions at Mescal Park.

### 3. Structural Components

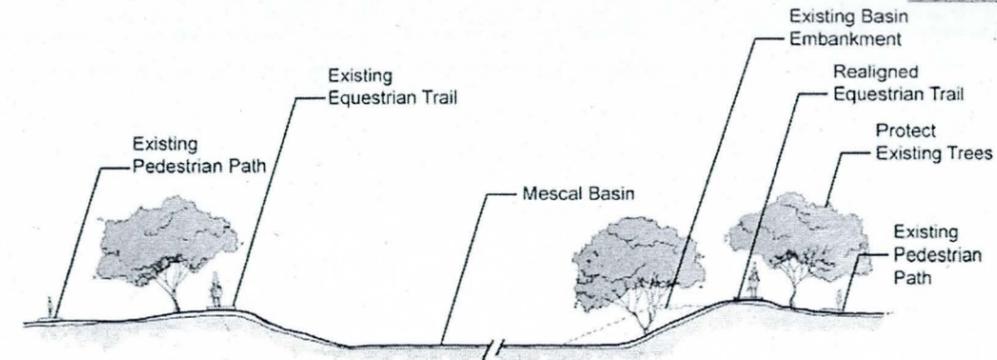
- Use materials, shapes, and colors to blend in with the surroundings for the spillways and outlets. Paint structural features in keeping with character of the basin.
- New emergency spillway at Mescal Park will be covered with grass to maintain the character of the park. Exposed concrete surfaces should be textured or stained.



Cactus Park looking south



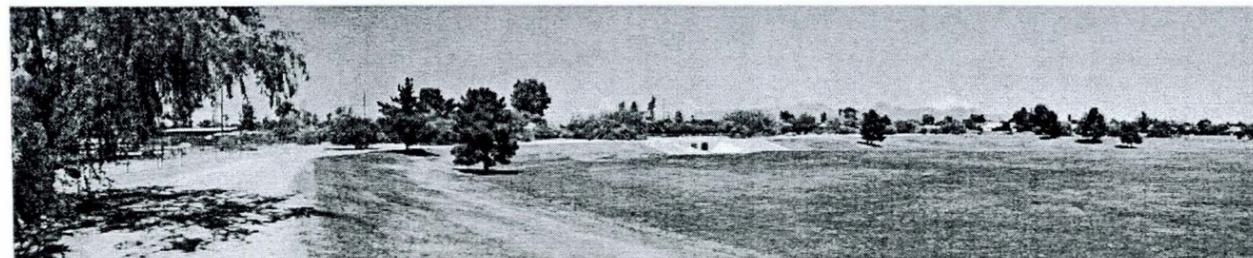
Cactus Park along Cactus Road



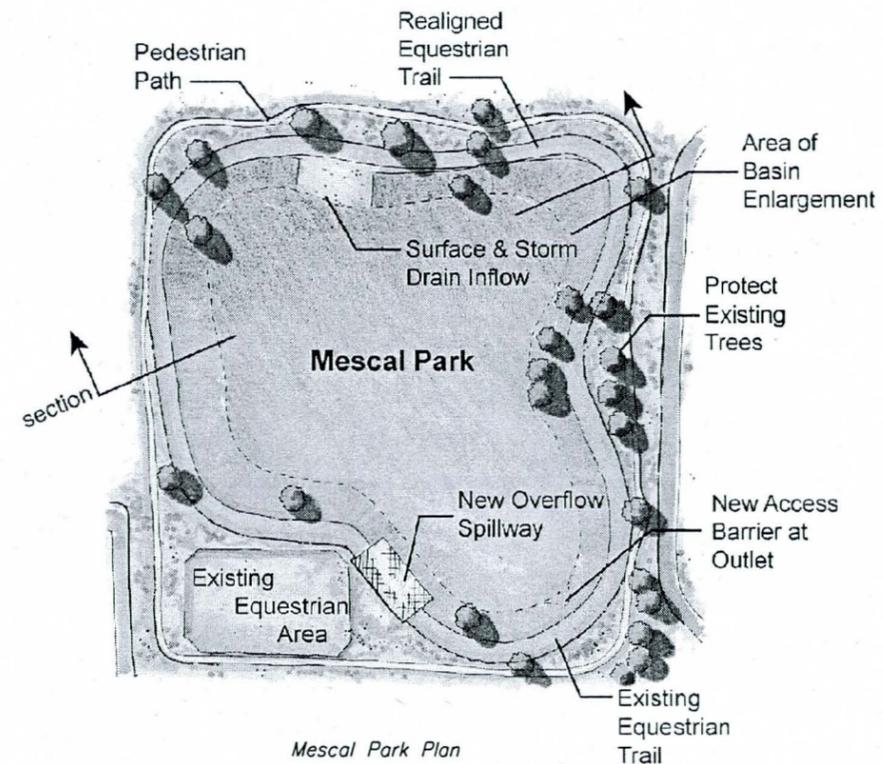
Section of Mescal Park



Mescal Park Outlet Structure looking south



Mescal Park and Inlet Structure looking north



Mescal Park Plan

NOVEMBER, 2002

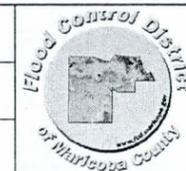
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PREPARED BY:

Stanley Consultants inc.  
2929 EAST CAMELBACK ROAD,  
SUITE 130  
PHOENIX, ARIZONA 85016  
(602) 912-8500

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SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

DETENTION BASINS  
LANDSCAPE DESIGN THEME

DRAWING NUMBER  
**L4**  
SHEET NUMBER  
**32**



SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

**Appendix B**

**Contact List**

**a****Ahouraiyan, Afshin**

Full Name: Afshin Ahouraiyan  
 Job Title: Project Manager  
 Company: Flood Control District of Maricopa County  
 2801 West Durango Street  
 Phoenix, Arizona 85009  
 Bus: (602) 506-4519  
 Bus Fax: (602) 506-4601  
 E-mail: afa@mail.maricopa.gov

**b****Book, Mike**

Full Name: Mike Book  
 Job Title: Public Involvement Specialist  
 Company: Logan Simpson Design  
 51 West Third Street, Suite 450  
 Tempe, Arizona 85281  
 Bus: (480) 967-1343  
 Bus Fax: (480) 966-9232  
 E-mail: mbook@lsdaz.com

**Buchanan, Scott**

Full Name: Scott Buchanan, P. E.  
 Job Title: Project Manager  
 Company: Stanley Consultants, Inc.  
 2929 East Camelback Road, Suite 130  
 Phoenix, Arizona 85016  
 Bus: (602) 912-6520  
 Mobile: (602) 292-2478  
 Bus Fax: (602) 912-6599  
 E-mail: buchananscott@stanleygroup.com

**Bushee, Eric**

Full Name: Eric Bushee  
 Job Title: Graphic Production Designer  
 Company: Logan Simpson Design  
 51 West Third Street, Suite 450  
 Tempe, Arizona 85281  
 Bus: (480) 967-1343  
 Bus Fax: (480) 966-9232  
 E-mail: ebushee@lsdaz.com

**c****Cordre, Lucia Vasak de**

Full Name: Lucia Vasak de Cordre  
 Job Title: Planning and Project Management Division  
 Company: Flood Control District of Maricopa County  
 2801 West Durango Street  
 Phoenix, Arizona 85009  
 Bus: (602) 506-2956  
 Bus Fax: (602) 506-8561  
 E-mail: lvd@mail.maricopa.gov

**Curtis, Dean**

Full Name: Dean Curtis P. E.  
 Company: Brooks Hersey Assoc.  
 4602 East Elwood, Suite 16  
 Phoenix, Arizona 85040  
 Bus: (602) 437-3733  
 Bus Fax: (480) 858-0204  
 E-mail: dcurtis@brookshersey.com

**e****Eldridge, Tom**

Full Name: Tom Eldridge  
 Job Title: Project Manager  
 Company: Gilbertson Associates, Inc.  
 15974 North 77th Street  
 Scottsdale, Arizona 85260-1761  
 Bus: (480) 607-2244  
 Bus Fax: (480) 607-2299  
 E-mail: tomel@glbrtsn.com

**Erickson, Bill**

Full Name: Bill Erickson, P. E.  
 Job Title: Public Works Planner  
 Company: City of Scottsdale  
 7447 East Indian School Road  
 Suite 205  
 Scottsdale, Arizona 85251  
 Bus: (480) 312-7652  
 Bus Fax: (480) 312-7971  
 E-mail: berickson@ci.scottsdale.az.us  
 notify before meetings

**f****Flack, Jim**

Full Name: Flack, Jim R. L. S.  
 Company: Stanley Consultants, Inc.  
 2929 East Camelback Road, Suite 130  
 Phoenix, Arizona 85016  
 Bus: (602) 912-6500  
 Bus Fax: (602) 912-6599  
 E-mail: Flack, James

**Fowler, Angeline**

Full Name: Angeline Fowler  
 Job Title: Public Information Officer  
 Company: Flood Control District of Maricopa County  
 2801 West Durango Street  
 Phoenix, Arizona 85009  
 Bus: (602) 506-6762  
 Mobile: (602) 506-6829  
 Bus Fax: (602) 506-4601  
 E-mail: ajf@mail.maricopa.gov

**g****Gilbertson, Dave**

Full Name: Dave Gilbertson P. E.  
 Job Title: President  
 Company: Gilbertson Associates, Inc.  
 15974 N. 77th Street  
 Scottsdale, Arizona 85260  
 Bus: (480) 607-2244  
 Bus Fax: (480) 607-2299  
 E-mail: davegi@glbrtsn.com

**Goodwin, Scott**

Full Name: Scott Goodwin  
 Job Title: Chief Information Technology  
 Company: Arizona Aerospace Foundation  
 Pima Air & Space Museum  
 6000 E. Valencia Road  
 Tucson, Arizona 85706  
 Bus: (520) 574-0462  
 Bus Fax: (520) 574-9238  
 E-mail: sgoodwin@pimaair.org

**Gray, Scott**

Full Name: Scott Gray  
 Job Title: Scottsdale Airport Director  
 Company: City of Scottsdale  
 15000 N. Airport Drive  
 Suite 200  
 Scottsdale, Arizona 85260  
 Bus: (480) 312-7735  
 Bus Fax: (480) 312-8480  
 E-mail: sgray@ci.scottsdale.az.us

**Gray, Tom**

Full Name: Tom Gray  
 Job Title: Director of Golf  
 Company: Camelback Golf Club  
 7847 N. Mockingbird Lane  
 Scottsdale, AZ 85253  
 Bus: (480) 905-7985

**Gu, Frank**

Full Name: Frank Gu, P. E.  
 Job Title: Civil Engineer  
 Company: Stanley Consultants, Inc.  
 2929 East Camelback Road, Suite 130  
 Phoenix, Arizona 85016  
 Bus: (602) 912-6500  
 Bus Fax: (602) 912-6599  
 E-mail: Gu, Frank

**h****Hanson, Bob**

Full Name: Bob Hanson  
 Job Title: Deputy Director of Operations  
 Company: Pima Air & Space Museum  
 6000 E. Valencia Road  
 Tucson, Arizona 85706  
 Bus: (520) 574-0462  
 Bus Fax: (520) 574-9238  
 E-mail: bhanson@pimaair.org

**Harrow, Ed**

Full Name: Ed Harrow  
 Job Title: Executive Director of Arizona Aerospace Foundation  
 Company: Arizona Aerospace Foundation  
 Pima Air & Space Museum  
 6000 E. Valencia Road  
 Tucson, Arizona 85706  
 Bus: (520) 574-0462  
 Bus Fax: (520) 574-9238  
 E-mail: eharrow@pimaair.org

**Holcomb, Dennis**

Full Name: Dennis Holcomb  
 Job Title: Landscape Architect  
 Company: Flood Control District of Maricopa County  
 2801 West Durango Street  
 Phoenix, Arizona 85009  
 Bus: (602) 506-4074  
 Bus Fax: (602) 506-4601  
 E-mail: dbh@mail.maricopa.gov

**Hoppmann, Justin**

Full Name: Justin Hoppmann  
 Job Title: Environmental Planner  
 Company: Logan Simpson Design  
 51 West Third Street, Suite 450  
 Tempe, Arizona 85281  
 Bus: (480) 967-1343  
 Bus Fax: (480) 966-9232  
 E-mail: jhoppmann@lsdaz.com

**Hunzinger, Mike**

Full Name: Mike Hunzinger P. E.  
 Job Title: Project Principal  
 Company: Stanley Consultants, Inc.  
 2929 East Camelback Road, Suite 130  
 Phoenix, Arizona 85016  
 Bus: (602) 912-6500  
 Bus Fax: (602) 912-6599  
 E-mail: Hunzinger, Mike

**j****Johnson, Bob**

Full Name: Bob Johnson  
 Job Title: Public Works Planner  
 Company: City of Scottsdale  
 7447 E. Indian School Rd., Suite 205  
 Scottsdale AZ 85251  
 Bus: (480) 312-7054  
 Bus Fax: (480) 312-4000  
 E-mail: rmjohnson@ci.scottsdale.az.us  
 notify before meetings

**k****Keith, Kim**

Full Name: Kim Keith  
 Job Title: Park Manager, Reach 11 Recreation Area  
 Company: City of Phoenix Parks and Recreation  
 17642 North 40th Street  
 Phoenix, AZ 85032  
 Bus: (602) 534-1968  
 Bus Fax: (602) 495-5845  
 E-mail: kim.keith@phoenix.gov

**l****Lempke, Melissa**

Full Name: Melissa Lempke  
 Job Title: Public Involvement Coordinator  
 Company: Flood Control District of Maricopa County  
 2801 West Durango Street  
 Phoenix, Arizona 85009  
 Bus: (602) 506-0612  
 Mobile: (602) 525-5061  
 E-mail: mgl@mail.maricopa.gov

**Lewis, Ken**

Full Name: Ken Lewis P. E.  
 Job Title: President  
 Company: KVL Consultants, Inc.  
 11026 E. Verbena Lane  
 Scottsdale, Arizona 85259  
 Bus: (480) 563-4605  
 E-mail: kvlewis@kvlinc.com

**Lockhart, Karen**

Full Name: Karen Lockhart  
 Job Title: Systems Coordinator  
 Company: City of Scottsdale/GIS  
 3629 N. Drinkwater Blvd.  
 Scottsdale, AZ 85251  
 Bus: (480) 312-2440  
 Bus Fax: (480) 312-4129  
 E-mail: klockhart@ci.scottsdale.az.us

**Lund, Adina**

Full Name: Adina Lund, P. E.  
 Job Title: Stormwater Planner  
 Company: City of Scottsdale  
 7447 East Indian School Road  
 Suite 205  
 Scottsdale, Arizona 85251  
 Bus: (480) 312-7759  
 Bus Fax: (480) 312-4000  
 E-mail: agreen@ci.scottsdale.az.us  
 notify before meetings

**m****McGuire, Sharon**

Full Name: Sharon McGuire  
 Job Title: Contracts Specialist  
 Company: Flood Control District of Maricopa County  
 2801 West Durango Street  
 Phoenix, Arizona 85009  
 Bus: (602) 506-8378  
 Bus Fax: (602) 506-2903  
 E-mail: shm@mail.maricopa.gov

**Mead, Bill**

Full Name: Bill Mead P. E.  
 Job Title: Town Engineer  
 Company: Town of Paradise Valley  
 6401 East Lincoln Drive  
 Paradise Valley, Arizona 85253-4399  
 Bus: (480) 348-3529  
 Bus Fax: (480) 951-3715  
 E-mail: bmead@ci.paradise-valley.az.us

**Meinhart, David**

Full Name: David Meinhart AICP  
 Job Title: CIP Planning Manager  
 Company: City of Scottsdale  
 7447 E. Indian School Road, Suite 205  
 Scottsdale, Arizona 85251  
 Bus: (480) 312-7010  
 Mobile: (602) 571-4626  
 Bus Fax: (480) 312-4000  
 E-mail: dmeinhart@ci.scottsdale.az.us

**Meyer, Gary**

Full Name: Gary Meyer  
 Company: City of Scottsdale Parks and Recreation  
 7340 Scottsdale Mall  
 Scottsdale, Arizona 85251  
 Bus: (480) 312-2357  
 E-mail: gmeyer@ci.scottsdale.az.us

**Miller, Wendy**

Full Name: Wendy Miller  
 Job Title: Editor  
 Company: Independent Newspapers Inc.  
 11000 N. Scottsdale, Suite 210  
 Scottsdale, AZ 85254  
 Bus: (480) 483-0977  
 Bus Fax: (480) 948-0496  
 E-mail: TPVnewseditor@aol.com

**Mushtaq, Hasan**

Full Name: Hasan Mushtaq P. E.  
 Job Title: Floodplain Manager  
 Company: City of Phoenix  
 200 West Washington Street, 5th Floor  
 Phoenix, Arizona 85003-1611  
 Bus: (602) 262-4026  
 Bus Fax: (602) 262-7322  
 E-mail: hasan.mushtaq@phoenix.gov

**p****Phillips, Tim**

Full Name: Tim Phillips  
 Job Title: Regional Area Manager N.E. Valley  
 Company: Flood Control District of Maricopa County  
 2801 West Durango Street  
 Phoenix, Arizona 85009  
 Bus: (602) 506-4718  
 Bus Fax: (602) 506-4601  
 E-mail: tsp@mail.maricopa.gov

**Pinto, Theresa**

Full Name: Theresa Pinto  
 Job Title: Environmental Planner  
 Company: FCDMC  
 2801 West Durango  
 Phoenix, Arizona 85009  
 Bus: (602) 506-8127  
 Bus Fax: (602) 506-8561  
 E-mail: tmh@mail.maricopa.gov

**Potter, Gina**

Full Name: Gina Potter  
 Job Title: Accountant  
 Company: Stanley Consultants, Inc.  
 2929 East Camelback Road, Suite 130  
 Phoenix, Arizona 85016  
 Bus: (602) 912-6500  
 Bus Fax: (602) 912-6599  
 E-mail: Potter, Gina

**r****Ramos, Rod**

Full Name: Rod Ramos  
 Company: City of Scottsdale  
 9191 E. San Salvador Drive  
 Scottsdale, Arizona  
 Bus: (480) 312-5641  
 E-mail: rramos@ci.scottsdale.az.us

**Read, Chris**

Full Name: Chris Read  
 Job Title: Airport Operations Coordinator  
 Company: City of Scottsdale  
 15000 N. Airport Drive  
 Scottsdale, AZ 85260  
 Bus: (480) 312-2674  
 Bus Fax: (480) 312-8480  
 E-mail: cread@ci.scottsdale.az.us

**Reyes, Leandro**

Full Name: Leandro Reyes Jr.  
 Job Title: Graphics Technician  
 Company: Stanley Consultants, Inc.  
 2929 East Camelback Road, Suite 130  
 Phoenix, Arizona 85016  
 Bus: (602) 912-6500  
 Bus Fax: (602) 912-6599  
 E-mail: Reyes, Leandro

**Ricci, George**

Full Name: George Ricci  
 Company: Paradise Valley School District  
 20621 N. 32nd Street  
 Phoenix, Arizona 85050  
 Bus: (602) 493-6250  
 E-mail: gricci@pvusd.k12.az.us

**Rumann, Joe**

Full Name: Joe Rumann  
 Job Title: Senior Hydrologist  
 Company: FCDMC  
 2801 West Durango  
 Phoenix, Arizona 85009  
 Bus: (602) 506-1501  
 Bus Fax: (602) 506-4601  
 E-mail: jmr@mail.maricopa.gov

**s****Schalk, Brian**

Full Name: Brian Schalk  
 Company: Stanley Consultants, Inc.  
 2929 E. Camelback Rd., Suite 130  
 Phoenix, Arizona 85016  
 Bus: (602) 508-3036  
 Bus Fax: (602) 912-6599  
 E-mail: Schalk, Brian

**Shirer, Kevin K.**

Full Name: Kevin K. Shirer A. A. E.  
 Job Title: Planning & Environmental Coordinator  
 Company: City of Scottsdale  
 15000 N. Airport Dr.  
 Scottsdale, Arizona 85260  
 Bus: (480) 312-7609  
 Bus Fax: (480) 312-8480  
 E-mail: kshirer@ci.scottsdale.az.us  
 Web Page: <http://www.ci.scottsdale.az.us>

**Simpson-Colebank, Diane**

Full Name: Simpson-Colebank, Diane R. L. A.  
 Job Title: Project Landscape Architect  
 Company: Logan Simpson Design  
 51 West Third Street, Suite 450  
 Tempe, Arizona 85281  
 Bus: (480) 967-1343  
 Bus Fax: (480) 966-9232  
 E-mail: dsimpson@lsdaz.com

**Stevens, Bob**

Full Name: Bob Stevens  
 Job Title: Environmental Planner  
 Company: FCDMC  
 2801 West Durango  
 Phoenix, Arizona 85009-6399  
 Bus: (602) 506-4073  
 Bus Fax: (602) 506-4601  
 E-mail: rbs@mail.maricopa.gov

S

**Stock, John**

Full Name: John Stock R. L. S.  
Job Title: Mapping & Survey Manager  
Company: Flood Control District of Maricopa County  
2801 West Durango Street  
Phoenix, Arizona 85009  
Bus: (602) 506-5460  
Bus Fax: (602) 506-4601  
E-mail: jrs@mail.maricopa.gov

W

**Wagner, Scott**

Full Name: Scott Wagner, P. E.  
Job Title: Civil Engineer  
Company: Stanley Consultants, Inc.  
2929 East Camelback Road, Suite 130  
Phoenix, Arizona 85016  
Bus: (602) 912-6531  
Mobile: (602) 526-9207  
Bus Fax: (602) 912-6599  
E-mail: wagnerscott@stanleygroup.com



SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN

**Appendix C**

**Data Collection Reference List**

## DATA COLLECTION REFERENCE LIST

### Contract, Guidelines, Manuals, Text

1. Contract for Consultant Services (Contract FCD 2000C030) approved by FCD Board of Directors February 28, 2001; Effective starting date March 5, 2001; Scottsdale Road Corridor Drainage Master Plan.
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