FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
PHOENIX, ARIZONA

SUNNYSLOPE
CANDIDATE ASSESSMENT REPORT
FCD 2003C052

(Task No. 1)

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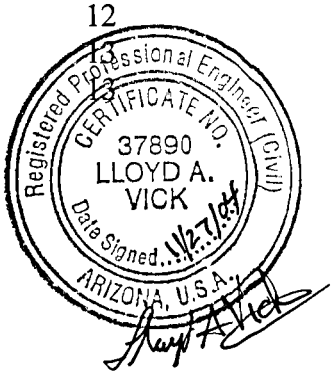

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SECTION 1: INTRODUCTION

1.1 Project Purpose/Project Tasks

The purpose of the Sunnyslope Candidate Assessment Report (CAR) is to develop alternatives to solve the flooding problems in the Sunnyslope area and to determine the necessity for conducting an Area Drainage Master Plan (ADMP) for the watershed. The City of Phoenix has received a number of drainage/flooding complaints from homeowners and business owners within the Sunnyslope area. In response to the City's concern for these property owners, the Flood Control District has undertaken the CAR to investigate the flooding problems within the area and develop alternative solutions.

The project tasks include 1) coordination with the DISTRICT, and the City of Phoenix; 2) collection and analysis of existing data (i.e., flooding complaints, drainage studies, flood studies, etc); 3) determination of approximate peak discharges utilizing existing hydrologic studies; 4) identification of other flooding problems by performing field investigations and inspecting contour maps; 5) producing an inventory of existing flooding problems and existing drainage infrastructure; 6) developing conceptual ideas for solving the existing flooding problems; 7) preparing concept level cost estimates for the drainage improvement alternatives; 8) conducting a public meeting, if necessary; 9) developing a scope of work for the subsequent ADMP, if necessary; and 10) documentation of the CAR in a final report.

1.2 Background Information

The City of Phoenix requested the Flood Control District to prepare this Candidate Assessment Report. The City has received 16 flooding complaints within the watershed, which are documented herein. In addition to the flooding complaints, the City recognizes that there are several other undesirable drainage elements within the watershed and that the storm drain system is incomplete.

A number of locations within the Sunnyslope area are subject to flooding due to quick mountain runoff and an inadequate drainage system. Development within the study area is relatively old, most of it built prior to the City's grading and drainage ordinance. Consequently, there is very little onsite storm water retention and the storm drain system, in several locations, is undersized, disjointed and appears to have been added onto haphazardly. In fact, there are a number of locations where storm water is collected in channels and conveyed under houses, via piped culverts only to discharge in the resident's backyard. Overland flow between homes and businesses is also prevalent within the watershed, until the runoff reaches streets where newer, City owned storm drains collect and convey the flow to the Arizona Canal Diversion Channel (ACDC) or Cave Creek Wash.

1.3 Description of Study Area

The boundaries for the study area are the Arizona Canal Diversion Channel (ACDC) on the south, 19th Avenue on the west, the ridgeline of the North Mountain Preserve on the north, and 10th Street Wash on the east. The study area is depicted on the following location map (Figure 1.3).

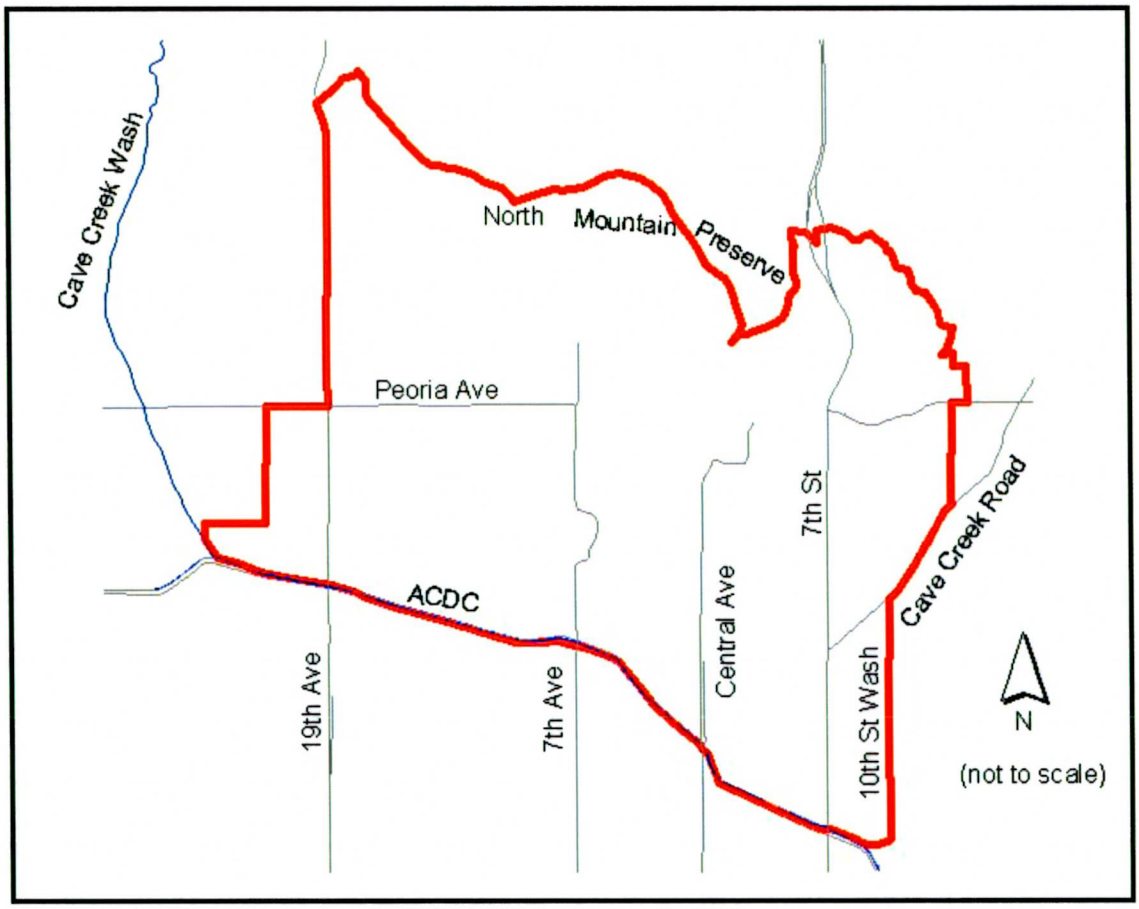


Figure 1.3 Location Map

SECTION 2: EXISTING CONDITIONS

2.1 Citizen Flooding Complaints (See Exhibit 1)

The City of Phoenix has received a number of flooding complaints from residents within the study area. The complaints were ranked by severity by the City's *Project Status Report (March, 2004)*. The City provided documentation for each complaint. The City's documentation in association with field visits was used to determine the extent of the flooding problem. Photographs and summaries for each complaint are located in Appendix A. Possible solutions, as noted during the field visits, are included with each photograph. Exhibit 1 gives a description and shows the location of each flooding complaint.

2.2 Other Flooding Problems (See Exhibit 1)

In addition to the flooding complaints, a number of other flooding problems were identified through field visits, inspection of the District's contour mapping, discussions with the City's street maintenance staff, and analysis of the existing hydrologic model. The following is a list of these other flooding problems.

a. Runoff ponds along the inside edge of the curve in 7th Avenue at the southwest corner of Mountain View Park (7th Avenue about ½ mile south of Peoria Ave), causing long standing nuisance and maintenance problems. The watershed for this runoff reaches up into the North Mountain Preserve and includes the discharge from the upstream flood control dam.

b. The discharge from the northwest flood control dam at Peoria and 7th Avenues is conveyed through private property in a series of culverts and short channel segments that decrease in size in the downstream direction. Eventually the channel drains into 11th Avenue and is collected in the existing 11th Avenue storm drain. This channel also creates undesirable dip sections in the street crossings at North Lane and at Cochise Drive.

c. Overflow from the detention basin at the middle school at 9th Avenue and Cheryl discharges across private property, through a 60-inch culvert, then into a channel that eventually discharges downstream into Cinnabar Avenue.

d. The 7th Avenue storm drain, upstream of Cheryl Avenue, discharges across private property through a series of culverts and short channel sections, eventually spilling out into 9th Avenue.

e. The discharge from the southeast flood control dam (combined with substantial downstream local runoff) discharges through Mountain View Park, across private

property and down 9th Avenue to the ACDC, creating a significant flooding potential.

f. The channel upstream of Mountain View Road, just east of 5th Street, discharges across Mountain View in a southerly direction between existing homes where no drainage easements exists.

g. The channel upstream of Brown Street, at 11th Street, discharges into 11th Street and follows an overland flow path, draining through streets, private property and parking lots until it is eventually collected in the Hatcher Road storm drain at 7th Street.

h. The channel at Mountain View Road, just west of the intersection with Cave Creek Road, discharges to a woefully inadequate, 18-inch storm drain. The upstream watershed is significant, being about 160 acres. At Mountain View, the channel simply ends at a small storm drain inlet that drains to 10th Street Wash. The remainder of the discharge spills over the sidewalk, into Mountain View Road, and flows overland down Cave Creek Road.

2.3 Existing Hydrology (See Exhibit 1)

No new hydrologic modeling was done with this study. Estimates of peak discharge were developed using the ACDC ADMS hydrology report prepared by Kaminski-Hubbard Engineering, Inc. entitled, *Arizona Canal Diversion Channel Area Drainage Master Study - 10th Street Wash to Cave Creek Watershed* (Reference 1).

The sub-watersheds in the Kaminski-Hubbard study are relatively large, lacking adequate concentration points to determine peak discharges for many of the critical points of interest within the watershed. Therefore, unit discharge rates were developed from the Kaminski-Hubbard results to estimate peak discharges at points of interest with smaller sub-basins within the watershed.

Using the Kaminski-Hubbard study, unit discharges (cfs/acre) for the 2-year, 10-year, and 100-year floods were developed for each sub-watershed. Then, using aerial mapping and 2-foot contours, drainage areas were drawn for each point of interest and the unit discharges were applied to estimate the peak discharge for any given point.

Due to this simplistic hydrologic approach, the final design of each of the recommended projects included in this CAR will require a new, detailed hydrologic model in order to accurately design the required capacity of the inlet and conveyance structures.

Another report, developed by Entellus (Reference 4), entitled *Drainage Design Memorandum – Peoria Avenue, 15th Avenue to 19th Avenue*, was employed to estimate flows for the recommended Peoria Avenue/17th Avenue storm drain. The Entellus report used the rational equation and was developed for the design of the existing storm drain in

Peoria Avenue between 15th and 19th Avenue. The existing storm drain was designed for the 2-year storm, whereas the new, recommended storm drain is to be designed for the 10-year event. To determine the difference between the two, the 10-year intensity was multiplied by the runoff coefficient and contributing area in the Entellus report. The difference between the 10-year and 2-year events is the required discharge to be collected in the 17th Avenue storm drain.

2.4 Existing Drainage Infrastructure (See Exhibit 1)

The City of Phoenix storm drain maps were used to determine size and location of the existing storm drain system. In addition, as-built plans were obtained for those storm drain facilities constructed since the last update to the storm drain maps. These recent storm drain additions include the Peoria Avenue storm drain from 15th Avenue to 9th Avenue and the 7th Avenue storm drain from Cheryl Drive to Peoria Avenue. Conversations with City staff revealed that there is only one additional new drainage project planned for the study area; the proposed 7th Avenue and Hatcher Road storm drain, which is currently under design by EEC. Exhibit 1 shows the location, size and approximate capacity of the existing and planned drainage infrastructure.

There are two City of Phoenix dams/detention basins within the project boundaries. The first is the Shaw Buttes Dam located adjacent to the intersection of 7th Avenue and Peoria Avenue. The second is located in the foothills upstream of Mountain View Park. Both basins meter out floodwater through 27-inch discharge pipes. The metered discharge from each dam was treated as base flow and added directly to the downstream concentration points.

2.5 Data Gathered

The following is a list of data collected for this project.

1. City of Phoenix Flooding Complaints from their prioritization program. Sixteen flooding complaints are on record within the study boundaries.

2. City of Phoenix Storm Drain Maps.

3. City of Phoenix Right-of-Way Maps.

4. The *Arizona Canal Diversion Channel, Area Drainage Master Study – 10th Street Wash to Cave Creek Watershed, Volume 1.6* from the Flood Control District of Maricopa County.

5. Drainage Improvements for 7th Avenue and Peoria were found in *Final Drainage Report - Bridge and Paving Project for 7th Avenue – Cheryl Drive to Peoria Avenue and Peoria Avenue, 7th Avenue to 15th Avenue* prepared by Sverdrup Civil, Inc.

6. Drainage improvements for Peoria Avenue were found in *Drainage Design Memorandum – Peoria Avenue, 15th Avenue to 19th Avenue* prepared by Entellus.

7. Peoria Avenue drainage improvements were also found in *Drainage Design Report – 19th Avenue, Peoria Avenue to Cactus Road and Peoria Avenue, Cave Creek Wash to 18th Avenue* prepared by Dibble and Associates.

8. Drainage improvements for 7th Avenue and Hatcher Road were found in *Drainage Report - Storm Drain Improvements – 7th Avenue and Hatcher Road* prepared by EEC.

SECTION 3: RECOMMENDED PROJECTS

A review of the drainage problems prevalent within the study area indicates that the flooding problems are less regional and more local in nature. The drainage complaints were separated into groups based upon similar location and flooding source. During the development of alternatives it was determined that all of the City's flooding complaints could be solved by the implementation of six main projects. These projects are identified as follows. Exhibit 2 shows an overview of the watershed, the existing storm drain system and the proposed projects.

a. 17th Avenue Storm Drain
b. 9th Avenue Storm Drain
c. 2nd Drive Storm Drain
d. 5th Street Storm Drain
e. Mountain View Storm Drain
f. Combined small drainage improvements

The first five projects listed above would solve the majority of the drainage problems. The remaining flooding complaints tend to be in isolated locations. Resolution for these isolated drainage problems are grouped together into a combined project (project f) of local drainage improvements that include short storm drain laterals, installation of valley gutters, and construction of floodwalls.

With the exception of the ACDC, which is designed to convey the100-year flood, the remainder of the existing drainage infrastructure found in the Sunnyslope area will only convey the 2-year flood or less. The 2-year frequency is the standard design flood for the City's storm drain system while the Flood Control District is interested in protecting against a 10-year or greater frequency event. It was this criteria which became the basis for design such that any new projects should be designed for the 2-year storm (at a minimum), but preferably for the 10-year event. Solutions for the 100-year event would require much larger storm drains and detention basins as well as extensive new easements/right-of-way since the area is so heavily developed. Therefore it was determined that improvements necessary to convey the 100-year flood would be cost prohibitive and as such they were omitted from this report.

3.1 17th Avenue Storm Drain (See Exhibit 3)

3.1.1 Project Description

This project includes a new storm drain that would collect and convey the 10-year flood from Peoria Avenue downstream to the ACDC. It would begin at the ACDC and extend north in 17th Avenue to Peoria Avenue and then "tee" both east and west in the southern frontage road adjacent to Peoria Avenue. The east branch extends to about 400 feet west of 15th Avenue and the west branch extends to about 200 feet west of 18th Avenue. The frontage road portion of the new storm drain would parallel the existing Peoria Avenue,

2-year storm drain; collecting the overflow from the 10-year flood. See Exhibit 3 for a graphical representation of the new 17th Avenue storm drain.

This project also includes the construction of a new lateral in 15th Avenue from the existing 60-inch stub in Peoria Avenue north to Shangri-La Road to collect the 2-year runoff coming off the west side of the North Mountain Preserve.

3.1.2 Hydrology/Level of Protection

The 17th Avenue storm drain project will provide a 2-year level of protection upstream of Peoria Avenue and a 10-year level of protection downstream of Peoria. There are multiple complaints south of Peoria Avenue between 11th and 19th Avenue. Storm water comes off the mountains to the north and flows south/southwest through a series of natural channels, down streets and in some cases sheet flows though private property. The entirety of the watershed is within a FEMA Zone X (shaded). The Peoria Avenue section of the new storm drain would be designed to convey the difference between the 2-year and the 10-year storm; the existing Peoria Avenue storm drain already collects the 2-year flood. The mainline in 17th Avenue would be designed to convey the 10-year storm. The lateral in 15th Avenue, upstream of Peoria, should be designed for the 2-year storm since it outfalls into the existing 2-year storm drain in Peoria Avenue.

3.1.3 Area Protected

The area protected by this project is west of 15th Avenue to approximately 19th Avenue and south of Peoria to the ACDC. The number of structures in the protected area is approximately 420.

3.1.4 Maintenance Responsibility

The City would be responsible for maintenance for the new storm drain.

3.1.5 Estimated Construction Costs

The estimated construction cost of the 17th Avenue storm drain project, which includes the new storm drain lateral in 15th Avenue, is $2,760,000.

3.2 9th Avenue Storm Drain (See Exhibit 4)

3.2.1 Project Description

The 9th Avenue storm drain would collect and convey the 10-year flood from Peoria Avenue downstream to the ACDC. The watershed includes a significant amount of mountain runoff as well as the outflows from two upstream flood control dams. (see Exhibit 3).

The new storm drain would include four laterals. The first is a short run in North Lane, west of 9th Avenue, which will collect the flow that currently flows through private property in an undersized culvert. The North Lane lateral will allow the downstream privately owned culvert to be abandoned. The second is in Cheryl Drive from 9th Avenue to 7th Avenue; collecting flow from the existing channel outfall at 7th Avenue and Cheryl. The Cheryl lateral would also collect flow from the intersection at 8th Avenue; allowing the downstream private culvert to be abandoned. The third lateral is in Cinnabar Avenue from 9th Avenue to 7th Avenue. This lateral will collect a significant concentration of runoff at the southwest corner of Mountain View Park, which includes the discharge from the upstream flood control dam. This lateral will also collect the discharge from the middle school detention basin at 9th Avenue; allowing the downstream, privately owned 60-inch culvert to be abandoned. The fourth lateral, in Cochise Street, will actually connect to the existing 11th Avenue storm drain. It will drain the low spot in Cochise Street and allow the downstream, privately owned culvert to be abandoned.

All four of these laterals will include a significant amount of re-paving to remove the existing dip sections and abandon the downstream, privately owned culverts. In the case of 7th Avenue, adjacent to the park, the roadway will be raised to create a sump in the park to concentrate storm water and prevent 7th Avenue from being overtopped during times of flooding.

3.2.2 Hydrology/Level of Protection

The 9th Avenue storm drain will provide a 10-year level of flood protection. The contributing watershed for the storm drain includes mountain runoff between the southwest corner of Mountain View Park and Peoria Avenue along the east side of 7th Avenue. Currently, runoff from much of the upper watershed is captured in one of two upstream flood control dams, however, the outflow from these dams is uncontained; flowing through a series of channels, privately owned culverts, and through the streets. The 9th Avenue storm drain will collect and convey the dam outflows to the ACDC which will allow the privately owned culverts to be abandoned.

The entirety of the watershed is within a FEMA Zone X (shaded). The storm drain for this proposed project should be designed to convey runoff from the 10-year storm. Peak discharges at concentration points of interest are displayed on Exhibit 3.

3.2.3 Area Protected

The area protected by this project is inclusive of all properties between 7th Avenue and 11th Avenue from Peoria Avenue down to Mountain View Road (see Exhibit 4). This project will also protect properties between 9th Avenue and 11th Avenue, from Mountain View Road down to the ACDC. The number of structures in the protected area is approximately 480.

An added benefit of the 9th Avenue storm drain is that it increases the level of protection provided by the existing storm drain in 11th Avenue by reducing its contributing drainage

area. The result is that the 11th Avenue storm drain will provide approximately a 10-year level of protection after the 9th Avenue storm drain is installed.

3.2.4 Maintenance Responsibility
The City would be responsible for maintenance for the new storm drain.

3.2.5 Estimated Construction Costs
The estimated cost of the 9th Avenue storm drain, including the laterals and street re-paving, is $1,530,000.

3.2.6 Alternatives
Consideration was given to constructing a new detention basin at the southwest corner of Mountain View Park. The estimated volume of local runoff (not including the dam outflow) is 4.1 acre-feet for the 2-year storm and 14 acre-feet for the 10-year storm. Based upon the size of the existing landscaped, passive recreation area in the southwest corner of the Park, adjacent to 7th Avenue, a detention basin could be constructed by partially lowering the park 2-4 feet and raising 7th Avenue about four feet to provide the 4.1 acre-feet necessary to detain runoff from the 2-year storm. The outfall pipe would be located in the detention basin and connect to the proposed 9th Avenue Storm Drain. This outfall pipe would be sized to convey the base flow from the upstream dam, thereby detaining local inflow while allowing the dam outflow to pass through the basin to the 9th Avenue storm drain.

In a meeting with the City's Parks Department, their staff expressed several concerns with the idea of a detention basin within the Park. Their primary concern was that the proposed basin would limit land use within that portion of the park. In addition to limiting the use of the land, they were also concerned with the removal of the existing mature trees and the safety issue related to creating a relative deep pond during times of flooding. While the City Parks staff made it clear that they consider it undesirable to add a floodwater basin to the existing Park, they did not say no to the idea and remain open to drainage improvements for the area. Therefore, the advantages of a detention should be considered in the final design of the 9th Avenue storm drain. If it is economically advantageous to construct a basin, and downsize the storm drain system, the Parks Department should be approached with a proposed design. Benefits to the park include the improvement to 7th Avenue, providing better access to the park during flood events and the elimination of maintenance issues with the ponded water that frequently occurs at the southwest corner of the Park.

3.3 2nd Drive Storm Drain (See Exhibit 5)

3.3.1 Project Description
The 2nd Drive storm drain would collect and convey the 10-year flood from the channel outlet at 1st Avenue and Vogel downstream to the ACDC. An existing open channel discharges into Vogel Avenue at 1st Avenue. The 2nd Drive storm drain storm drain would collect the discharge from this channel and convey it to the ACDC. The watershed

includes a significant amount of mountain runoff and has contributed to some of the worst flooding problems that exist within the Sunnyslope area (see Exhibit 4).

The primary problem in this part of Sunnyslope is flooding along Hatcher Road. Hatcher Road, between 3rd Drive and 7th Avenue, has experienced extensive flooding, even during small storms. Several businesses located on the south side of Hatcher Road have finished floor elevations lower than the street elevation and the street has limited conveyance capacity. Mountain runoff concentrates in a channel at the corner of Central Avenue and Mountain View Road which continues southwesterly until it outlets into Vogel Avenue at 1st Avenue. Flow from this channel outlet continues in a southwesterly direction through a series of channels and streets until it reaches Hatcher Road.

In order to alleviate the flooding along Hatcher Road, the City of Phoenix already has a new storm drain under design. The new Hatcher Road storm drain will begin in 7th Avenue at the existing 54-inch pipe stub-out into the ACDC. It will extend north in 7th Avenue to Hatcher Road, east in Hatcher Road to 3rd Avenue and north in 3rd Avenue to the outlet of an existing open channel. The new Hatcher Road storm drain, however, will only convey the 2-year flood.

The proposed 2nd drive storm drain will compliment the new Hatcher Road storm drain that is currently under design by diverting a large portion of the upstream contributing drainage area. The result will be a significant increase in the level of protection provided by the Hatcher Road storm drain; providing approximately a 10-year level of protection for the businesses along Hatcher Road. The inlet capacity along Hatcher Road, however, will have to be re-evaluated to make sure that the inlets as designed can collect the 10-year flows. If not, then new inlets will have to be added to the Hatcher Road storm drain as part of the 2nd Drive storm drain project.

3.3.2 Hydrology/Level of Protection

The 2nd Drive storm drain will provide a 10-year level of flood protection. Moreover, since it will cutoff much of the contributing area to the new Hatcher Road storm drain, it will result in an increase in the level of protection provided by the Hatcher Road storm drain from its current 2-year design flood up to the 10-year level of protection, or better.

The entirety of the watershed is within a FEMA Zone X (shaded).

3.3.3 Area Protected

The area protected by the 2nd Drive storm drain (see Exhibit 5) includes approximately 216 properties. This protected area includes the area downstream of the new Hatcher Road storm drain. As explained above, the proposed storm drain would improve the performance of the storm drain under design in Hatcher Road by removing a substantial portion of the contributing drainage area and thereby increasing the conveyance of that system to that of a 10-year level, or better.

3.3.4 Maintenance Responsibility
The City would be responsible for maintenance of the new storm drain.

3.3.5 Estimated Construction Costs
The estimated construction cost of the proposed project is $867,000.

3.4 5th Street Storm Drain (See Exhibit 6)

3.4.1 Project Description
The 5th Street storm drain will collect and convey the 2-year flood from Mountain View Road downstream to the existing 54-inch storm drain in Hatcher Road. This new lateral will collect the outlet flow from the existing apartment complex that discharges into Mountain View Road just east of 5th Street (see Exhibit 6).

The City street maintenance staff have received complaints from homeowners located on the south side of Mountain View Road between 3rd Street and 7th Street. The apartment complex on the north side of Mountain View captures upstream mountain runoff and discharges it into Mountain View Road. The flow crosses Mountain View Road in a dip section and continues in a southerly direction, flowing in between homes. The homeowners would like to have the flow collected in Mountain View Road before it flows through their properties.

3.4.2 Hydrology/Level of Protection
The 5th Street storm drain would be designed for the 2-year design flood to be consistent with the design of its outfall; that is the downstream 2-year storm drain in Hatcher Road.

3.4.3 Area Protected
The area protected would include the area between Mountain View Road and Hatcher Road which includes about 33 properties (see Exhibit 6).

3.4.4 Maintenance Responsibility
The City would be responsible for providing maintenance of this proposed storm drain.

3.4.5 Estimated Construction Cost
The estimated construction cost of the proposed storm drain is $163,000.

3.5 Mountain View Storm Drain (See Exhibit 7)

3.5.1 Project Description
The Mountain View storm drain will collect and convey the 10-year flood and convey it to the outlet of an existing drainage channel at the intersection of 11th Street and Brown, downstream to 10th Street Wash. The storm drain will also intercept the discharge from a second open channel at Mountain View Road, just west of Cave Creek Road.

It was discovered through field visits and inspection of the existing contour mapping that there are two significant open channels upstream of Mountain View Road that simply terminate by spilling out into the roadway and flowing overland down streets and through parking lots until they are collected in downstream storm drains. In the case of the open channel just west of Cave Creek Road, it is collected in a storm drain that discharges to 10th Street Wash. However, the storm drain is only 18-inches in diameter, which is woefully inadequate for the size of the contributing watershed. The other open channel discharges into 11th Street at Brown, flows down 11th Street, until it reaches Mountain View Road where it is collected and conveyed in a channel around an electrical power sub-station before being released into the Fry's grocery store parking lot (see Exhibit 7).

3.5.2 Hydrology/Level of Protection

The proposed storm drain will provide a 10-year level of protection.

3.5.3 Area Protected

The area protected would include roughly 113 properties, including the Fry's grocery store.

3.5.4 Maintenance Responsibility

The City would be responsible for maintaining the storm drain and inlets proposed with this project.

3.5.5 Estimated Construction Cost

The estimated construction cost of this storm drain project is $ 508,000.

3.5.6 Diversion to 10th Street Wash

This project would represent a significant diversion into 10th Street Wash. The contributing drainage area is approximately 245 acres. Currently the vast majority of flow from this 245-acre area is conveyed overland through the study area and eventually discharges to the ACDC. Prior to moving forward with this project, a hydrologic analysis will have to be done to determine if it is possible to divert this additional watershed area without negatively impacting 10th Street Wash.

3.5.7 Alternative

A detention basin alternative was also considered for this flooding problem, but it was found to be significantly more expensive, costing about $3.7 million versus $543,000 for the storm drain alternative. The location that was considered is along the east side of 11th Street, between Cinnabar Avenue and the alley south of Cheryl Drive. The estimated cost is based on providing about 20 acre-feet of storage on 5 acres, enough to store the runoff from the 10-year, 24-hour storm. This would require buying 21 properties at a cost of about $2 million. It would also require relocation costs of about $250,000, $350,000 for demolition and earthwork, $500,000 for landscaping, $100,000 for the

outlet pipe to 10th Street Wash, and another $500,000 for contingencies for a total of $3.7 million.

3.6 Combined Small Drainage Improvement Projects

This combined project consists of twelve small individual drainage improvements. Each designed for the 2-year storm.

3.6.1 Project Description

Ironwood Drive Lateral
There is a complaint at 1929 W. Ironwood Drive describing parking lot flooding. The parking lot sits lower than street elevation so once the roll curb is overtopped, the parking lot floods. There is an existing 42-inch storm in 19th Avenue. This project is the addition of a new lateral in Ironwood Drive that would connect to the 19th Avenue storm drain with new inlets to help convey floodwaters down Ironwood and away from the parking lot.

Shangri La Lateral
The complaint is from 11033 N. 18th Drive stating that the drainage easement has been altered and there is no drainage system currently in place. This is a common problem in cul-du-sacs when there isn't a dedicated outfall. Storm water flows to the southwest between two homes. A review of the right-of-way maps shows that there isn't an available drainage easement to work within. The proposed solution is to run a new lateral from the existing storm drain located in 19th Avenue east on Shangri-La Road to 18th Drive then connect to a new inlet at the low point of the cul-du-sac.

Mountain View Lateral
This complaint is from an apartment complex on the south side of Mountain View Road at approximately 18th Avenue. Storm water runoff comes south on 18th Ave and has to turn and go west on Mountain View but Mountain View doesn't have sufficient capacity to convey the flow. Resulting in overtopping of the curb on the south side of Mountain View. The apartment complex has built a berm along its north side to prevent flooding. It appears, however, that runoff is able to flow around the berm and flood the property. If constructed, the proposed 17th Avenue storm drain would reduce the flooding potential, but the lateral would still be necessary to collect all of the local runoff accumulating in 18th Avenue. The new lateral would help alleviate this flooding problem, which would be constructed in Mountain View and connect to the existing 42" storm drain running south in 19th Avenue.

Carol Drive Lateral
Two homeowners along Carol Drive have complained about flow overtopping the roll curb and flooding the houses between 17th and 19th Avenues. These residences have finished floor elevations only slightly above street elevation, so once the roll curb is

overtopped, flooding is an issue. There is an existing 24-inch lateral in the west end of Carol Drive. Extending this lateral further to the east and adding new inlets along Carol is the proposed solution to the problem. It does not appear that the Carol Drive lateral would be necessary if the 17th Avenue storm is constructed, therefore it should be thought of as an interim solution, prior to the construction of the 17th Avenue storm drain.

Cinnabar and 11th Avenue Lateral

There is a flooding problem along Cinnabar between 10th Avenue and 11th Avenue. During a storm on April 2, 2004, extensive flooding along Cinnabar was observed. This situation would be significantly improved by the construction of the 9th Avenue storm drain that would intercept and route mountain runoff before it entered the residential neighborhoods. As an interim solution, prior to the construction of the 9th Avenue storm drain, a new lateral could be constructed in Cinnabar that connects to the existing 36-inch storm drain is located in 11th Avenue. This would help alleviate the flooding problem on Cinnabar.

8th Street Lateral

The homeowner at 8514 N. 8th Street has complained of flooding. Runoff currently flows west down Seldon Lane and overtops the roll curb in front of the home. There is also runoff being conveyed south in 8th Street. The proposed solution is to construct a new lateral from the existing storm drain in 7th Street east along Butler Drive then north along 8th Street to Seldon Lane where new inlets would be located.

6th Street Valley Gutter

The homeowner at 8305 N. 6th Street has complained of yard flooding. There is an existing grated inlet at the intersection of Las Palmaritas Drive and the alley behind the home. The inlet is frequently clogged with debris causing a pond that spreads into the homeowners yard. Las Palmaritas Drive is currently crowned which does not allow the water to flow over the road and into the ACDC. The proposed solution is to construct a new valley gutter across Las Palaritas Drive to the existing surface flow, spillway into the ACDC.

Vertical Curb at 11th Avenue and Vogel Avenue

The homeowner at 9442 N. 11th Avenue has complained about yard flooding. The property is located on the southwest corner of 11th and Vogel Avenues and receives runoff from the north and the east. There is roll curb on both street fronts and the lot lies slightly lower than the curb although the house itself appears to be slightly higher than the curb. The 9th Avenue storm drain should solve this flooding issue. An interim solution, prior to construction of the 9th Avenue storm drain, is to replace the roll curb with vertical curb on both street fronts to increase the flow capacity within the street.

Floodwall at 15th Avenue and Beryl Avenue

The resident at 10210 N. 15th Avenue has complained that storm water overtops the curb and floods the property. This property is located between Cheryl and Beryl Avenues on 15th Avenue. There is an existing vertical curb and gutter fronting the property but once runoff overtops the curb the yard will flood. This flooding problem can be solved by

elevating the driveway and constructing a new floodwall at the property line to prevent storm water runoff from entering.

Vertical Curb at 15th Avenue and Desert Cove

The residence at 1519 W. Desert Cove Avenue sits directly in line of the outfall of a small local wash. Desert Cove Avenue has a relatively flat grade so the runoff crosses the street and overtops the gutter flooding the yard and house. The proposed lateral in 15th Avenue will eventually solve this problem. In the interim, the existing roll curb can be replaced with vertical curb improving the capacity of the roadway.

Floodwall at 15th and Peoria Avenue

The property at 10648 N. 15th Avenue experiences flooding due to runoff that enters the property from the driveway and by overtopping the vertical curb. This problem will ultimately be solved by the construction of the 15th Avenue lateral storm drain. In the interim, the problem can be solved by raising the driveway and constructing a floodwall along the frontage of the property.

Repave 3rd Drive and Mountain View Road

The hillside residence at 9638 N. 3rd Drive experiences flooding due to mountain runoff that passes through the subdivision to the north and spills out into 3rd Drive. Runoff enters the property via the driveway and by overtopping the vertical curb. The yard and house sit significantly below the curb elevation. A paving solution can be used to solve this problem. By removing the crown in 3rd Drive, along the frontage of the property, the conveyance capacity of the street will be increased reducing the flood hazard to the property.

3.6.2 Level of Protection

The proposed improvements for all of the local drainage problems are for the 2-year storm.

3.6.3 Area Protected

All of the projects listed within Section 3.5 are typically protecting a single property or the originating and one or two adjacent properties.

3.6.4 Maintenance Responsibility

The City would be responsible for maintaining the inlets, laterals and valley gutters proposed with this project.

3.6.5 Estimated Construction Costs

The cost of the proposed projects is estimated at $ 425,000.

3.6.6 Alternatives

Carol Drive Lateral

An alternative to the new storm drain lateral would be to replace the roll curb with vertical curb, which may be enough for a 2-year solution. This is an area that will benefit from proposed upstream improvements to the 17th Avenue storm drain. Any other improvements should be considered as an interim solution since the preferred alternative is the storm drain lateral.

8th Street Lateral

An alternative solution to the new storm drain lateral is to increase the street flow capacity by replacing the roll curb with vertical curb. The storm drain lateral is the preferred alternative.

SECTION 4: SUMMARY

4.1 Summary of Proposed Drainage Solutions

The flooding problems identified with this study are generally in areas where storm drains have not been installed or where the existing storm drain system is either incomplete or discontinuous. Without adequate storm drains, many of the homes and businesses are subject to flooding, particularly the older development in the area, much of which was constructed prior to the City's grading and drainage ordinance. These structures are built too low relative to the street elevation. The flooding problems are exasperated by the fact that much of the runoff originates in the mountains, resulting in relatively high peak discharges. The mountain runoff, coupled with the prevalence of low floor elevations, makes much of the Sunnyslope area subject to flooding. However, where the City has installed storm drains, there are relatively few drainage complaints.

The proposed solution to flooding in the Sunnyslope area is to construct new storm drains where none currently exist and to complete storm systems that currently end at inadequate outfalls. The following is a brief summary of each proposed projects.

- *17th Avenue Storm Drain* – The 17th Avenue storm drain will collect significant amount of runoff from the North Mountain Preserve that accumulates along Peoria Avenue between 19th Avenue and 15th Avenue. There is an existing 2-year storm drain in Peoria that conveys the runoff to Cave Creek Wash, but runoff in excess of the 2-year flood will flow overland through the neighborhoods to the south. The 17th Avenue storm drain will collect the 10-year overflow, plus local runoff south of Peoria Avenue, and discharge it to the ACDC.
- *9th Avenue Storm Drain* – The 9th Avenue, 10-year storm drain will collect substantial mountain runoff, provide an outflow from the two upstream flood control dams, allow the abandonment of a number of inadequate, privately owned drainage culverts, provide an outfall for the 7th Avenue storm drain, and will alleviate a number of the local drainage problems identified with this study.
- *2nd Drive Storm Drain* – The 2nd Drive storm drain will collect the 10-year discharge from the outlet of an existing, mountain runoff open channel and convey it to the ACDC. The discharge from this channel has historically caused considerable flooding downstream along Hatcher Road. The City is currently designing a 2-year storm drain along Hatcher Road. The addition of the 2nd Drive storm drain will cutoff much of the upstream watershed, enabling the Hatcher Road storm drain to provide a higher level of protection, exceeding the 10-year design flood.
- *5th Street Storm Drain* – The 5th Street storm drain will collect storm water that currently flows across Mountain View Road and floods southerly through private properties. It will connect to the existing 2-year storm drain in Hatcher Road and, consequently, will be designed for the 2-year flood to match the design criteria of its outfall.

- *Mountain View Storm Drain* – The Mountain View storm drain will collect the outflow from two separate open channels and convey them to 10th Street Wash. These channels convey a significant amount of mountain runoff and, under current conditions, they discharge into local streets resulting in considerable overland, uncontained flood waters. No specific drainage complaints were discovered relative to these discontinuous channels, but they clearly present a significant flooding risk.

- *Combined Small Projects* – This project is a combination of a number of small drainage projects that will solve many of the more isolated, local drainage problems within the Sunnyslope area. They include new storm drain laterals, new valley gutters, new curb and gutter, and re-paving to increase street flow capacity.

4.2 Need for Further Study

One of the purposes of this study was to assess the need for an area drainage master plan of the Sunnyslope area. It is the opinion of EEC that an ADMP is not necessary. The flooding problems in Sunnyslope tend to be associated with smaller, localized watersheds and can be solved with stand-alone drainage projects. However, the five major recommended storm drain projects identified in this report will require more study. The concepts presented herein are based on very approximate estimates of runoff. A detailed hydrologic analysis of the contributing watershed for each individual project will be required for the final design of each.

In the case of the Mountain View Storm Drain, a new hydrologic analysis is required, not only to properly size the storm drain, but to also make sure that 10th Street Wash can accommodate the outflow. Installation of the Mountain View storm drain would divert runoff from about 245 acres into 10th Street Wash. The impact this would have on the wash was not considered in this study. Therefore, a hydrologic investigation to quantify the effect on 10th Street Wash should be done prior to final design to make sure that the wash can accommodate the increase in flow.

4.3 Summary of Project Costs

The following table contains the estimated cost of each of the recommended projects. Individual cost estimate sheets can be found in Appendix D.

Table 4.3 Recommended Projects Cost Summary Table

Project Description	Level of Protection	Project Cost
Peoria Ave./17th Ave. Storm Drain	10-year	**$2,760,000**
9th Avenue Storm Drain	10-year	**$1,530,000**
2nd Drive Storm Drain	10-year	**$867,000**
5th Street Storm Drain	2-year	**$163,000**
Mountain View Road Storm Drain	10-year	**$508,000**
Combined Small Drainage Projects	2-year	**$425,000**

SECTION 5.0 REFERENCES

1. "Arizona Canal Diversion Channel, Area Drainage Master Study – 10th Street Wash to Cave Creek Watershed, Volume 1.6". Kaminski Hubbard Engineering, Inc. November 29, 1994.

2. "Final Drainage Report - Bridge and Paving Project for 7th Avenue – Cheryl Drive to Peoria Avenue and Peoria Avenue, 7th Avenue to 15th Avenue". Sverdrup Civil, Inc. June 2003.

3. "Drainage Design Report – 19th Avenue, Peoria Avenue to Cactus Road and Peoria Avenue, Cave Creek Wash to 18th Avenue". Dibble and Associates. September 1978.

4. "Drainage Design Memorandum – Peoria Avenue, 15th Avenue to 19th Avenue". Entellus. September 2000.

5. "Drainage Report - Storm Drain Improvements – 7th Avenue and Hatcher Road". EEC, Inc. June 2004.

6. City of Phoenix Engineering and Architectural Services Storm Drain Maps – Map No's 3N3E30, 3N3E19, 3N3E24, 3N3E21, 3N3E25, 3N3E29, 3N3E20, 3N3E33, 3N3E32, 3N3E28.

7. City of Phoenix Right of Way Maps – Map No's 26-(23, 24, 25, 26, 27, 28, 29, 30); 27-(23, 24, 25, 26, 27, 28, 29, 30); 28-(23, 24, 25, 26, 27, 28, 29, 30); 29-(23, 24, 25, 26, 27, 28, 29, 30); 30-(23, 24, 25, 26, 27, 28, 29, 30).

Appendix A

PHOTOGRPAHS AT LOCATIONS OF FLOODING COMPLAINTS AND AT OBSERVED FLOODING PROBLEMS

Appendix A.1

PHOTOS OF CITY OF PHOENIX FLOODING COMPLAINTS

ADDRESS: 10210 N. 15TH AVENUE

COMPLAINT: Water overtops curb and floods house.

COMMENTS: This segment of 15th Avenue is built on a relatively flat slope which limits conveyance in the street. Elevating the driveway and installing a relatively short length of floodwall on the property line would force flow down Beryl Avenue and prevent the curb from being overtopped.

ADDRESS: 1725 W CAROL DRIVE

COMPLAINT: Water overtops roll curb and floods yard

COMMENTS: Carol Drive is a flat road with rollcurb on both sides of the road. At the west end of the street, adjacent to 19th Ave., there is an existing storm drain lateral which connects to the 19th Avenue Storm Drain. Extending this 24" lateral further to the west would solve this problem. A temporary solution would be the addition of vertical curb providing greater capacity in the street before runoff overtopped into the yard.

ADDRESS: 1802 W CAROL DRIVE

COMPLAINT: Water overtops roll curb and floods yard

COMMENTS: Carol Drive is a flat road with rollcurb on both sides of the road. At the west end of the street, adjacent to 19th Ave., there is an existing storm drain lateral which connects to the 19th Avenue Storm Drain. Extending this 24" lateral further to the west would solve this problem. A temporary solution would be the addition of vertical curb providing greater capacity in the street before runoff overtopped into the yard.

ADDRESS: 10648 N. 15TH AVENUE

COMPLAINT: Runoff overtops driveway and floods lot. House below gutter Elev.

COMMENTS: Water flows from the north to the south down 15th Avenue. Once flow overtops the driveway, the lot has a lower elevation than the street. The lot has a wall protecting the structure however the driveway needs to be elevated to prevent runoff from running adjacent to the wall and flooding the structure from the rear. The ultimate solution is a lateral up 15th Avenue which ties into the existing Peoria Avenue S.D.

ADDRESS: 7TH AVENUE: DUNLAP AVE - HATCHER RD

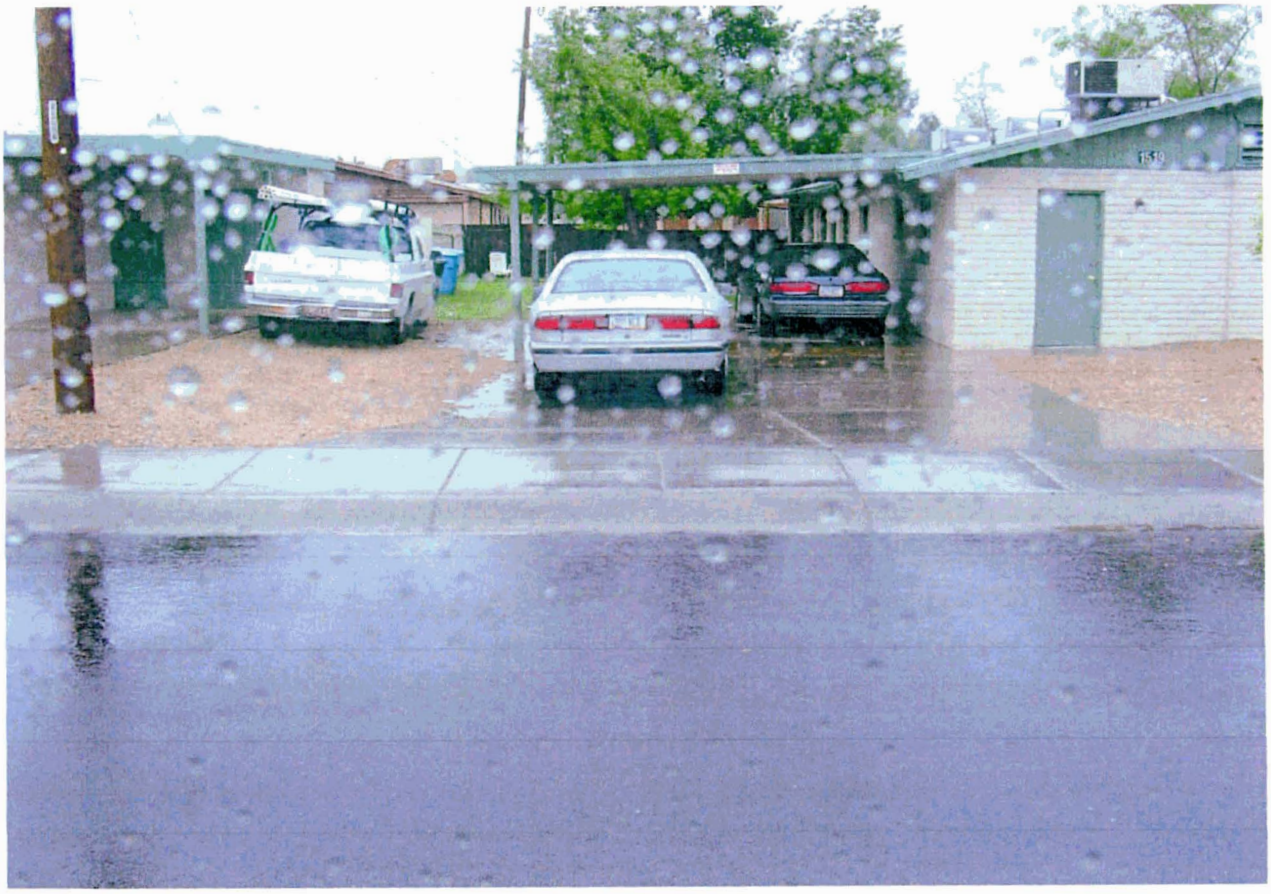
COMPLAINT: Flooding along Hatcher Road.

COMMENTS: Storm water runoff exceeds the capacity of the street and overtops the sidewalk. There is a 2-year storm drain currently under design by EEC. To provide protection for a 10-year event, a storm drain down 2nd Drive would be necessary. This would provide 10-year protection to the business along Hatcher Road.

ADDRESS: 7TH AVENUE: DUNLAP AVE - HATCHER RD

COMPLAINT: Flooding along Hatcher Road.

COMMENTS: Storm water runoff exceeds the capacity of the street and overtops the sidewalk. There is a 2-year storm drain currently under design by EEC. To provide protection for a 10-year event, a storm drain down 2nd Drive would be necessary. This would provide 10-year protection to the business along Hatcher Road.



ADDRESS: 1519 W. DESERT COVE AVENUE

COMPLAINT: Property located in flow line. No easement.

COMMENTS: This house sits in a low point along Desert Cove Road. A low flow path seperates the two residences and conveys storm water into the back yards. A temporary solution would be to add a vertical curb to increase the conveyance in the street. Another solution is to construct a storm drain lateral from the low point to the existing main in 15th Ave.

ADDRESS: 1929 W. IRONWOOD DRIVE

COMPLAINT: Water flows over driveway and into parking lot.

COMMENTS: The parking lot sits lower than the street elevation so once flow overtops the curb, the parking lot floods. The 2-year solution would be a lateral that ties into the 19th Avenue storm drain.

ADDRESS: 1801 W. MOUNTAIN VIEW ROAD

COMPLAINT: Rain overtopped curb and berm to flood apartments.

COMMENTS: Several east-west streets to the north of Mountain View collect runoff and force the flow to the west. The flow is then forced south down 18th Avenue until it reaches Mountain View. The flow then splits to the west and to the south causing the flooding of the apartments. The possible solutions include building a higher berm to protect the apartments and/or the additon of a lateral to the 19th Avenue S.D.

ADDRESS: 1801 W. MOUNTAIN VIEW ROAD

COMPLAINT: Rain overtopped curb and berm to flood apartments.

COMMENTS: The east-west streets to the north of Mountain View collect runoff and force the flow to the west. The flow is then forced south down 18th Avenue until it reaches Mountain View. The flow then splits to the west and to the south causing the flooding of the apartments. The possible solutions include building a higher berm to protect the apartments and/or the additon of a lateral to the 19th Avenue S.D.

ADDRESS: 8305 N. 6TH STREET

COMPLAINT: Catch basin too small. Changes to area may be at fault.

COMMENTS: Water flows south down the alley picking up debris which clogs the catch basin. The road is is crowned so flow does not easily overtop the road. The residential lot adjecent to this alley is flooded. The solution to this flooding problem is to construct a new valley gutter to outfall at the ACDC spillway.

ADDRESS: 11033 N. 18TH DRIVE

COMPLAINT: Easement has been altered and there is no drainage system.

COMMENTS: Flow from the north is forced between the 2 houses at the end of the cul-de-sac. There is not a drainage easement between the 2 houses. The solution is to construct a lateral from the low point in the cul-du-sac to the existing 19th Avenue S.D.

ADDRESS: 9442 N. 11TH AVENUE

COMPLAINT: Flow overtops roll curb and into driveway.

COMMENTS: The finished floor elevation of the house is below grade so any water which is able to overtop the roll curb floods the house. The problem will be lessened by the completion of other projects. An interim solution would be to construct vertical curb along the frontage of the house to increase the street capacity.

ADDRESS: 9638 N. 3RD DRIVE

COMPLAINT: Flow overtops vertical curb and floods frontyard.

COMMENTS: The mountain runoff comes down 3rd Drive. The flow continues south for the most part but flow is able to overtop the driveway and continue into the house. A paving solution would be to remove the crown from the roadway providing additional capacity in the street.

ADDRESS: 9638 N. 3RD DRIVE

COMPLAINT: Flow overtops vertical curb and floods frontyard.

COMMENTS: The mountain runoff comes down 3rd Drive. The flow continues south for the most part but flow is able to overtop the driveway and continue into the house. A paving solution would be to remove the crown from the roadway providing additional capacity in the street.

ADDRESS: 316 E. PURDUE AVENUE

COMPLAINT: Reported flooding. City evaluation showed no problem.

COMMENTS: Flow is coming from the north to the south across the yards of 316 and 314 E. Purdue Avenue. There is an issue between neighbors because there is not a drainage easment between houses. This problem would be solved for the 2-year storm by the proposed 5th Street Storm Drain.

ADDRESS: 8514 N. 8TH STREET

COMPLAINT: Overtopping of roll curb, flooding occurred in last 2 years.

COMMENTS: Flow goes west down Seldon Lane and there is also flow going south down 8th Street. The finished floor elevation is not much higher than curb height. A temporary solution would be the addition of vertical curb. The 2-year solution would be a lateral to the 7th Street S.D.

ADDRESS: 9210 N. 7TH AVENUE

COMPLAINT: Overtopping of driveway and sidewalk.

COMMENTS: The flooding problem start with mountain runoff which is then carried in a channel south to Vogel where it then continues to the west. Once the flow reaches 3rd Drive, it continues south to Hatcher and then west along Hatcher until 7th Avenue. Large amounts of flow reach the intersection of 7th and Hatcher. There is currently a 2-year S.D. under design by EEC. The 10-year solution is the 2nd Drive S.D.

ADDRESS: 314 E. PURDUE AVENUE

COMPLAINT: Involves P.U.E. and issue with neighbor.

COMMENTS: Flow is coming from the north to the south across the yards of 316 and 314 E. Purdue Avenue. There is an issue between neighbors because there is not a drainage easment between houses. This problem would be solved for the 2-year storm by the proposed 5th Street Storm Drain.

ADDRESS: Mountain View Road S.D.: 3rd St.-5th St.

COMPLAINT: Dip section causes roadway flooding and potential d/s flooding

COMMENTS: The City constructed a new storm drain with an inlet located at the low point in the dip section. The storm drain inlet picks up the flow in Mountain View Road and conveys it west to 3rd Street then south to Hatcher Road where it connects to an existing storm drain.

ADDRESS: 401 W. HATCHER ROAD

COMPLAINT: Storm water overtops driveway/sidewalk and floods p-lot

COMMENTS: The structure at this address is located below the curb and gutter elevation. Storm water overtops the driveway and floods the parking lot and building. There is currently a 2-year Storm Drain under design by EEC. The 10-year solution is the 2nd Drive S.D.

Appendix A.2

PHOTOS OF OBSERVED FLOODING PROBLEMS

ADDRESS: 8th Avenue and Cinnabar

COMPLAINT: Storm water crosses roadway dip section, possible flooding of apartments.

COMMENTS: There is a dip section along Cinnabar between 7th Avenue and 8th Avenue. Once flow reaches this location, it has no where to go. There is a ditch between the apartments but it is insufficient. The problem will be helped by the addition of the 9th Avenue S.D.

ADDRESS: 3rd Avenue, channel between residences

COMPLAINT: Flooding along Hatcher Road.

COMMENTS: Mountain runoff finds its way into this residential neighborhood. Runoff flows in this channel between structures on its way to Hatcher Road. There is a 2-year storm drain under design by EEC.

ADDRESS: 7th Avenue

COMPLAINT: Deep ponding around bend, s-w corner of Mountain Veiw Park

COMMENTS: There is mountain runoff collected in the dam to the northeast of the park which is metered through a 27" pipe into the park. The local discharge is added to this flow and it all reaches the bend in 7th Avenue.
The 10-year solution to this problem is the 9th Avenue S.D. This includes a lateral to the area of the bend and a raising of the roadway.

ADDRESS: 11th Avenue and Cinnabar

COMPLAINT: Local Ponding

COMMENTS: There is dense vegetation on the south side which hinders the drainage. There is also a small dip section in the road which doesn't not allow flow to continue to the west. A solution to the problem is a lateral to the storm drain running south down 11th Avenue.

Appendix B

CITY OF PHOENIX FLOODING COMPLAINTS

City of Phoenix
Flooding Complaints

Complaint #	Complaint Location	Complaint Synopsis
1	10210 N. 15th Ave.	Water overtops curb and floods house.
2	10648 N. 15th Ave.	Houses sit several feet below street level.
3	7th Ave.: Dunlap Ave. - Hatcher	Flooding along Hatcher. SD under design.
4	1519 W. Desert Cove Ave.	Property located in a flow line. No easement.***
5	1929 W. Ironwood Dr.	Water flows over driveway and into parking lot.
6	1801 W. Mountain View Rd.	Rains overtopped curb and berm to flood apartments
7	8305 N. 6th St.	Catch basin to small. Changes to area may be at fault.
8	11033 N. 18th Dr.	Easement has been altered and no drainage system.
9	9442 N. 11th Ave.	Flow overtops roll curb and into driveway.
10	9638 N. 3rd Dr.	Flow overtops vert. curb and floods frontyard.
11	316 E. Purdue Ave.	Reported flooding. Evaluation showed no problem.
12	314 E. Purdue Ave.	Involves P.U.E. and issue w/ neighbor.
13	8514 N. 8th St.	Flooding occurred in last 2 years. Possible c.b.
14	9210 N. 7th Ave.	Flooding on private property. Not city responsibility.
15	Mountain View Rd. SD: 3rd St. - 5th St.	Prioritization score of 54. Construction completed.
16	401 W. Hatcher	Newly installed s.w. causing p.l. to get flooded.

(1)

Record ID	11
Project Description	10210 N 15 Av
Initiator	Wm. Guerra Jr.
Initiator's Phone #	767-6718
Council District	4
Maintenance District	C
Evaluation Date	
Project Engineer	
Project Index	
RFS #	9819757
Work Order #	
Quarter Section	12-25
Consultant Name	

HM Score		2	HM Evaluator	ART - FROM STUDY
Safety Score		3	Safety Evaluator	11
Severity Score		4	Severity Evaluator	
Frequency Score		2	Frequency Evaluator	
Cost Score	5		Cost Evaluator	ART
Ease of Solution Score	34		Ease of Solution Evaluator	11
Potential Partners Score	2		Potential Partners Evaluator	11

Remarks: See R.F.S.
Site #19 by Primatech Engineers in 1996
Recommended alternative #2

BERM INSTALLED - MONITOR SITUAT

(1)

Request For Service (ROAD)
UPDATE

RFS #: 9584843
DATE: 21595
TIME: 143315

LOCATION
BLOCK: 10214 NSEW: N STREET: 15 TYPE: AV
BLOCK: NSEW: STREET: TYPE: INT:
PROBLEM: 38 FLOODING PRIV G NAME (T/F/L): Richard Conway
ADDRESS: same CITY: STATE: ZIP:
HOME#: WORK#: 395-9029 CONTACT (Y/N): Y
DETAILS: Experiences flooding, water comes over d/w into house. Contacted Chavez LETTER (Y/N): N
CAO: CAO PHONE: REFTO SECT: CE
PERSON: CHAVEZ

==========F I E L D I N S P E C T I O N==========
A PROB: 38 FLOODING PRIV G ES SIZE: area ES MAN HRS: 25
ES CREW: 2 REPORT: Sandbag area /divert water up stream
DATE SC: 21995 MCLA: C DATE CHECKED: 21594 CONTACT MADE (Y/N/T): Y
CHK BY: MONTERO CDIST: 4 LETTER SENT (Y/N): N

==========A C T I O N T A K E N==========
ACTION: Same as report above
A.SIZE: area A.MAN HRS: 3 A.CREW: 2 DONE DATE: 21595
FOREMAN: MONTERO INITIAL OPERATOR: LEODRA
DUP: N COMMENTS (1-YES): 0
CMD7-END CMD3-SELECT CMD5-PROB DESC ACCEPT (1-YES): 0

19. Site 19 — 10210 N. 15th Avenue

19.1 Location and Site Description

Site 19 is between Cheryl Drive and Beryl Drive on 15th Avenue in Township 3 North, Range 3 East, Section 30 of the Gila and Salt River Base Meridian. The street address of the local drainage problem is 10210 N. 15th Avenue. This is located on the west side of 15th Avenue, approximately 1,100 feet south of Peoria Avenue and 4,100 feet north of Dunlap Avenue. (See Site 19 - Vicinity Map, Figure 1.)

The area surrounding the site is developed except for mountainous outcroppings and foothills. The development includes single-family residences, apartments, and commercial businesses.

19.2 Problem Identification

Local storm water flows into the streets in the area around the site until it discharges into earthen washes. Located south of Site 19 is a mountainous outcropping that creates a high point in 15th Avenue immediately southwest of the tee intersection of Cheryl Drive with 15th Avenue. Therefore, flows conveyed west in Cheryl Drive are directed north at 15th Avenue. 15th Avenue has a superelevated street section beginning north of Cheryl Drive that directs the flow to the west at Beryl Drive.

15th Avenue does not have the capacity to convey the flow which concentrates at this site. The property owner at 10210 N. 15th Avenue has complained that his garage often becomes flooded, and that the water has been three to five inches deep. Because the contributing drainage area is almost completely developed, runoff concentrates quickly. The owner has observed that it takes about 10 minutes from the start of the rainfall for storm water to overtop the curb and run down his driveway. (See Site 19 - Problem Identification, Figure 2.)

19.3 History

Previously, an asphalt mound was constructed at the centerline of 15th Avenue in an attempt to prevent all the flow from concentrating at the west curb. However, this has not corrected the flooding problem.

19.4 Site Specific Data Acquisition

The following documentation was acquired from various sources for use in evaluating this site:

- City of Phoenix Right-of-Way Quarter Section Map Numbers: 28-26, revised May 23, 1991; 28-27, Revised October 7, 1993; 29-26, revised April 22, 1993; 29-27, revised August 22, 1990; and 28-25, revised December 7, 1990.
- City of Phoenix Topographic Quarter Section Map Numbers: 28-26, flown October 24, 1967; 28-27, flown October 24, 1967; 29-26, flown October 24, 1967; 29-27, flown October 24,

19.7 Hydrology

The local drainage concentrating in 15th Avenue at the problem site has a watershed area of 60 acres. The flow rates for the 2-, 5-, 10-, 25-, 50-, and 100-year storms are 59, 83, 98, 118, 138, and 155 cfs, respectively.

Break-out from a wash located east of the site on Cheryl Drive was considered as contributory to the local drainage runoff. However, upon field reconnaissance, it was determined that this wash does not contribute to the flooding of this site.

19.8 Alternative Solutions

Site 19 is located in a fully developed area of Phoenix. Existing topographic maps were used to assess the areas to recommend the alternative solutions. It should be noted, however, that there have been observable changes in existing roadway grades and finished pad elevations from the data represented on City quarter section maps. A detailed survey of 15th Avenue between Cheryl and Beryl Drives will be required prior to implementing any of the proposed alternatives.

Alternative 1 - Construct a Ridge to Contain Flow in Roadway

This alternative involves constructing a ridge along the west edge of 15th Avenue to prevent flows from flooding the property at Site 19 and the neighboring property to the north. The ridge will begin at the southern edge of Site 19 and extend to Beryl Drive. The ridge can be created by either raising the curb and sidewalk or by regrading the existing ground behind the sidewalk to form a hump. With both options, the driveways on both properties will have to be regraded to match the ridge elevation.

Assuming that the existing cross slope of 15th Avenue is 1.5 percent, an 11-inch curb on the west side will contain the 100- and 50-year flows provided this does not exceed the existing east curb elevation. Similarly, a 10-inch curb will contain the 25-year flow and a 9-inch curb will contain the 10-year and smaller storms.

Alternative 2 - Increase Conveyance Capacity of 15th Avenue by Constructing Inverted Crown

This alternative requires that a new street section be designed with an inverted crown for 15th Avenue to increase the conveyance capacity of 15th Avenue between these two streets. The 100-year flow can be conveyed in an inverted crown section with a 6-inch curb and equal gutter elevations. If the gutter elevations of the inverted crown section are not equal, a combination of an inverted crown and a raised west curb similar to Alternative 1 may be required.

This inverted crown section will begin just north of Cheryl Drive and end just north of Beryl Drive to allow a transition of 15th Avenue back to a superelevated street section so that existing flow paths are not altered.

19.9 Recommended Alternative

Alternative 2 is the recommended solution. This alternative is preferred by City maintenance staff as it will eliminate the need to maintain a berm constructed on private property. (See Site 19 - Preferred Alternative, Figure 3.)

As previously mentioned, detailed survey and design will be required to implement this alternative. The curb elevations must be verified to ensure that an inverted crown section will convey the flow within the roadway without break-out to Lot 163.

The construction of this alternative will be by contracted forces.

19.10 Cost Estimate

Alternative 1

Description	*Quantity*	*Unit Cost*	*Cost*
Concrete Curb - 9 Inches	135 LF	$6/LF	$ 800
Concrete Sidewalk - 5 Foot	675 SF	$2/SF	1,400
Mounding	25 YD^3	$3/$YD^3$	100
Revegetation	75 SY	$3/SY	200
Driveway Entrance	2 Each	$180/Each	400
Remove Curb & Sidewalk	1 LS	$540/LS	500
Subtotal			$3,400
20% Contingency			700
Total			$4,100.00

295

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District: #3	Evaluation Date
10648 N. 15ave	Milena Aguirre	602 534-7105	Quarter Section: #29-25	9-12-03

SAP #:	Project Engineer	Work Order Request #	Maintenance District	Consultant Name	Evaluator's Name
			Central		Fyffe

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	1	5	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water in Houses)	7	4	28	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	4	28	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	5	20	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	5	15	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	

Note: Criteria Elements I – IV to be filled out by Maintenance District.

Prioritization Ranking Score: 110

Comments: This property needs a drainage systems. House sets several feet below the street. We have no other flooding issue on 15ave Peoria to Cholla.

(2)

(2)

Susan Fitch

Susan Fitch
09/02/2003 12:17 PM

To: Milena Aguirre/STR/PHX@PHXENT
cc: Thomas Callow/STR/PHX@PHXENT, Manny Gonzalez/HOU/PHX@PHXENT
Subject: 15th Ave. North of Peoria

Milena:

A woman by the name of Noel Thomas phoned the office this morning complaining about the flooding on her property 10648 N. 15th Ave (rental property). She would like to discuss options (if any) for relieving flooding. Her number is 602-938-7004- she indicated that she was at the last meeting about flooding in the area. I think 7th Ave and Hatcher was discussed. If I remember right though, you mentioned in the meeting with the Councilwoman, Mr. Callow and myself that nothing much could be done west of 9th Ave? Also, she had some concerns about the Marion Properties, the city just purchased to remodel. When we remodel is something going to be done to help with flooding on those properties?

Thanks,
Susan

(2)

Lorena Quintana
09/05/2003 11:46 AM

To: Milena Aguirre/STR/PHX@PHXENT
cc: Susan Fitch/PCC/PHX@PHXENT
Subject: Re: 15th Ave. North of Peoria

Milena,

I received an update on this concern. Per Roger Fyffe, the property sits lower than the street. The property owners need to install a drainage system such as a sump system to prevent flooding.

In City Serve, we have 3 reports for this area from 1999 to now. I will give you a copy of the work requests so you can read them. All three basically say the same thing.

Thanks,

Lorena
Milena Aguirre

Milena Aguirre
09/03/2003 06:50 AM

To: Lorena Quintana/STR/PHX@PHXENT
cc:
Subject: Re: 15th Ave. North of Peoria

Great. Thanks Lorena.
Milena

Lorena Quintana

Lorena Quintana
09/02/2003 03:25 PM

To: Milena Aguirre/STR/PHX@PHXENT
cc: Susan Fitch/PCC/PHX@PHXENT
Subject: Re: 15th Ave. North of Peoria

Milena and Susan,

Work request C-0318949 was generated and referred to Central General Maintenance Yard.

Thanks,

Lorena
Milena Aguirre

Milena Aguirre
09/02/2003 03:13 PM

To: Lorena Quintana/STR/PHX@PHXENT
cc:
Subject: Re: 15th Ave. North of Peoria

Lorena;
Please log in the address below and follow up with the crews. Thanks! Milena

p.s. the address and number are: Noel Thomas flooding at 10648 N. 15th Ave. Tel #: 602-938-7004

----- Forwarded by Milena Aguirre/STR/PHX on 09/02/2003 03:11 PM -----

(2)

Closed
Street Transportation Department
Maintenance
Work Request

Print Date: 09-05-2003
Work Request Date: 09-02-2003
Created By: Quintana, Lorena

Work Request# : **C0318949**
Closed Date: 09-05-2003

Section: Central GM ***Quarter Section:*** Q29-25

Description: Per CAO, citizen concerned about the flooding at 10648 N 15th Ave. Please check area.

Location:

10648N
15TH AVE
Approx. Location:

Block 1: 10648N
Block 2: 1500W

Customers

Request By: SUSAN. FITCH - Council Office
Address:

Home Ph: (602) -
Work Ph: (602) -

WorkFlow

Action	Due Date	Scheduled	Complete	User/Crew	Assigned By
Route for Assignm	09-03-2003	00-00-0000	09-03-2003	Diaz, Carlos	Quintana, Lorena
Comments: Per CAO, citizen concerned about the flooding at 10648 N 15th Ave. Please check area.					
CAO Update	09-04-2003	00-00-0000	09-03-2003	Diaz, Carlos	Quintana, Lorena
Comments:					
Contact CAO	09-05-2003	00-00-0000	09-05-2003	Quintana, Lorena	Quintana, Lorena
Comments: Updated CAO.					
Inspect and Schedu	09-10-2003	00-00-0000	09-03-2003	Fyffe, Roger	Diaz, Carlos
Comments: Property flooding. See coments.					
Complete the Work	09-16-2003	09-16-2003	09-03-2003	Fyffe, Roger	Diaz, Carlos
Comments: See comments.					
Close CAO/RiskMg	09-08-2003	00-00-0000	09-05-2003	Quintana, Lorena	Quintana, Lorena
Comments:					

Categories

Category: Drainage

Subject: Drainage Question

Comments

Date	Comments	User
09-03-2003	This property sets low and dous not have any drainage system. Property owners need to install a drainage system on property to prevent flooding.	Fyffe, Roger

Emails

Issues

Links

Complete by: 09-16-2003
Posted Date: 00-00-0000

Crew: email
Priority: 2 WEEKS

SAP:

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District:	Evaluation Date
7th Avenue: Dunlap to Hatcher	Wm. Camarena	262-6717	Quarter Section: 28-26	8-25-99

SAP #:	Project Engineer	Work Order Request #	Maintenance District	Consultant Name	Evaluator's Name
			Central		

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	2	10	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	3	30	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water in Houses)	7	1	7	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	5	35	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	3	12	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	3	9	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	
Note: Criteria Elements I – IV to be filled out by Maintenance District.							Prioritization Ranking Score		107	

Comments:

RECORD ID [redacted]

Call Dennis Martin / Monica?

(3)

PROJECT DESCRIPTION: 7 Ave Dunlap to Hatcher
Hatcher 3 Ave to 7 Ave

INITIATOR'S NAME: Wm. Camarena

INITIATOR'S PHONE #: 262-6717

COUNCIL DISTRICT: 4

MAINTENANCE DISTRICT: CE

EVALUATION DATE: 8/25/99

PROJECT ENGINEER:

PROJECT INDEX:

RFS / CITY SERV #:

WORK ORDER #:

QUARTER SECTION: 28-26

CONSULTANT NAME:

HM SCORE	2	x5	HM EVALUATOR 10	
SAFETY SCORE	3	x10	SAFETY EVALUATOR 30	
SEVERITY SCORE	1	x7	SEVERITY EVALUATOR 7	
FREQUENCY SCORE	5	x7	FREQUENCY EVALUATOR 35	
COST SCORE	~~0~~ 3	x4	COST EVALUATOR 12	
EASE OF SOLUTION SCORE	3	x3	EASE OF SOLUTION EVALUATOR 9	
POTENTIAL PARTNERS SCORE	2	x2	POTENTIAL PARTNERS EVALUATOR 4	

107

REMARKS

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District:	Evaluation Date
1519 W. Desert Cove	Loren Kalina	602 380-6040	Quarter Section:	2-20-03

SAP #:	Project Engineer	Work Order Request #	Maintenance District 4	Consultant Name	Evaluator's Name Roger Fyffe

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	4	20	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water in Houses)	7	1	7	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	5	35	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	~~5~~ 2	20	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	3	9	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	
Note: Criteria Elements I – IV to be filled out by Maintenance District.								Prioritization Ranking Score	105	

Comments: Property is Located in a flow line. Maps dont show an Easement, but water runs through property like it's a drainage Easement. Street is inverted as if an Easement should be here. Need To study.

(4)

288

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District	Evaluation Date
1929 W. Ironwood Dr	Bill Maley	602 678-7097	#3	2-28-03
			Quarter Section: 28-24	

SAP #:	Project Engineer	Work Order Request #	Maintenance District	Consultant Name	Evaluator's Name
			Central		Roger Fyffe

Criteria Elements		Evaluation Scoring 1	2	3	4	5	A Weight Of Importance	B Evaluator's Score (1-5)	A X B Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain X	Always Needs Maintenance (During and After Rains)	5	1	5	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastrucure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water in Houses)	7	2	14	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	4	28	
V.	Cost ($)	Cost > 1M	400K – 1M	250K – 400K	50K – 250K	0 – 50K	4	5	20	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor - Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	3	9	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	

Note: Criteria Elements I – IV to be filled out by Maintenance District. Prioritization Ranking Score: 90

Comments: The street Turns at his property. The water is slow To get around Corner + water Flows over driveway Entrance and into parking lot. Part of property sets Lower than Street.
We have 4 basins at 19dr. + 19ave Ironwood These should Carry the water.

(5)

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District:	Evaluation Date
1801 W. Mountain View.	Eric Stevens	602-434-8325	4 Quarter Section: 27-25	7-29-00

SAP #:	Project Engineer	Work Order Request #	Maintenance District	Consultant Name	Evaluator's Name Roger Fyffe
			C		

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	1	5	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water in Houses)	7	5	35	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	1	7	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	3	12	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	3	9	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	

Note: Criteria Elements I – IV to be filled out by Maintenance District.

Prioritization Ranking Score: 82

Comments: July 14th Heavy rain. Water runs north to his property. water went over v/curb and flooded 5 apt. units. He has a sump in parking lot, but not enough to handle all the water during Heavy rain off leave. 1807 W. Vogel

3, #4, 5, 6 MARTIN GALLO 480 231-8246

(6)

1 INTRODUCTION

As part of an on-call contract with the City of Phoenix (COP), Stanley Consultants was asked to evaluate a local drainage problem occurring at 1801 W. Mountain View Rd. The scope of work involves investigating the probable causes of the drainage problem and making recommendations based on the collection of data and corresponding analysis. In doing so, relevant documentation to support the analysis and conclusions will be provided.

1.1 Project Location

The property impacted by the drainage problem is located on the south side of Mountain View Road opposite the intersection of 18th Avenue. This property and its contributing drainage areas are located in the City of Phoenix within Section 30 of Township 3 North, Range 3 East. A vicinity map of the project location is provided as Figure 1.

1.2 Description of Drainage Problem

An apartment complex located at 1801 W. Mountain View Road was most recently flooded in July of 2002 following heavy rains. The flooding occurred when street flows on Mountain View Road overtopped the south curb and berm on the north side of the property. The resulting stormwater collected and ponded in the courtyard in the front of the building and the parking lot south of the building. Flows entered the courtyard in the front and having no outlet, eventually rose above the floor elevations to cause the flooding. A grate inlet exists in the parking lot south of the building, but acts as a drywell with no significant capacity or outlet for the stormwater. The parking lot has essentially no outlet under these conditions and the water is forced to remain onsite for an extended period of time before percolating out or evaporating. Immediately south and adjacent to this property, a second apartment complex was flooded by the same storm conditions in July of 2002. Fronted by Vogel Road to the south, these apartments experienced similar flooding conditions in the buildings and on the surrounding areas.

1.3 Reference Reports and Studies

No previous drainage reports were available for the project area.

1.4 FEMA Flood Insurance Zone:

According to FEMA Flood Insurance Rate Map (FIRM) Panel 04013C1655 J, the project site is located in flood insurance Zone X. See Figure 2 for the FEMA FIRM panel of the study area. A flood insurance Zone A floodplain is defined within the channel banks of the Arizona Canal Diversion Channel to the south of the project site. This project is not impacted by the floodplain nor does this project affect the delineated limits along the ACDC. Zone X is defined as follows:

Areas of 500-year flood; areas of 100-year flood with average depths of less than one foot or with drainage areas less than one square mile; and areas protected by levees from 100-year flood.

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District: 4	Evaluation Date
8305 N Lost.	Martin	602-395-0138	Quarter Section: 26-28	7-29-02

SAP #:	Project Engineer	Work Order Request #	Maintenance District	Consultant Name	Evaluator's Name
			C		Roger Fuffe

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	1	5	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water in Houses)	7	3	21	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	3	21	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	3	12	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	3	9	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	

Note: Criteria Elements I – IV to be filled out by Maintenance District. Prioritization Ranking Score: 87

Comments: Catch Basin at the S/E Corner of property in gutter Line is small. Heavy rain To Much water For C/bs To Take all at once. Some Construction Changes in Area may be Causing more water To Converge here.

(1)

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District: 3	Evaluation Date
11033 N. 18 dr.	Linda Jimenez	602-228-2225	Quarter Section: 29-25	12-26-00

SAP #:	Project Engineer	Work Order Request #	Maintenance District C	Consultant Name	Evaluator's Name Roger Fyffe

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	1	5	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water in Houses)	7	4	28	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	1	7	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	4	16	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	4	12	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	
Note: Criteria Elements I – IV to be filled out by Maintenance District.								Prioritization Ranking Score		82

Comments: This Flooding occured after the July 14th 2000 Rain. The drainage Easement Behind 11035 N. 19ave has been Altered. See ATTached Email From MR. Farnsworth. Inside Coldesac We have no drainage system + in alley. Easement has been altered. May need Consultant To Investigate.

Roger #40243

(8)

(8)

October 29, 2002

Milena Aguirre
200 W. Washington Street
5th. Floor
Phoenix, Arizona 85003

Subject:
Flooding problem along south side of Shangri-La Road from 17th. Drive to 18th. Drive.

My property is at 11034 N. 18th. Drive. This letter is in response after talking to city employee, Bryan Butler, as sidewalks were being put in along Shangri-La.

My property has been flooded several times in the past few years as have been other properties in this area.

Our problem is of water coming into streets south of Shangri-La and not going west to storm drain at 19th. Avenue. I am requesting that the city find a solution to this problem and make the necessary correction(s).

(8)

Heavy rains in mid July 2002 caused latest damage of flooding to addresses listed below:

18th. Drive Addresses:

11033
11034
11038
11046

18th. Avenue Addresses:

11032
11033
11037
11038

17th. Drive Addresses:

11033
11034
11037
11038

I can be reached at:
3102 W. Charter Oak Rd.
Phoenix, AZ 85029
Phone: 602-942-5154.

Sincerely,
Bob S. Garner

P.S.
We want to thank the city for the sidewalks in this area.

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District:	Evaluation Date
9442 n. 11ave	Florence Saltsman	602-997-2906	Quarter Section: 27-26	7-26-02

SAP #:	Project Engineer	Work Order Request #	Maintenance District	Consultant Name	Evaluator's Name
			C		Roger Fyffe

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	1	5	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water In Houses)	7	3	21	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	2	14	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	3	12	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	3	9	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	

Note: Criteria Elements I – IV to be filled out by Maintenance District.

Prioritization Ranking Score: 75

Comments: Too much water at one time. water flow went over roll curb into dirt driveway. This is probably only a problem after rain. (Heavy rain)

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District:	Evaluation Date
9638 n. 3dr.	Disp. 19	602 262-6441	Quarter Section: 27-27	7-29-02

SAP #:	Project Engineer	Work Order Request #	Maintenance District	Consultant Name	Evaluator's Name
			C		Roger Fyffe

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	1	5	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water in Houses)	7	4	28	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	1	7	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	3	12	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	3	9	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	

Note: Criteria Elements I – IV to be filled out by Maintenance District.

Prioritization Ranking Score: 75

Comments: Citizen stated when subdivision above his property was built the Contractor didn't have a grade permit. He thinks the street above him is to steep. When it rains water comes down hill Jumps V/curb and Floods Front yard. July 14th The Heavy Rain went into bedroom.

(01)

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District: 4	Evaluation Date
316 E PURDUE AVE			Quarter Section: 27-28	1-18-02

SAP #:	Project Engineer	Work Order Request #	Maintenance District	Consultant Name	Evaluator's Name
			CENTRAL		S. Miller

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	1	5	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water in Houses)	7	1	7	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	1	7	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	5	20	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	5	15	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	5	10	
Note: Criteria Elements I – IV to be filled out by Maintenance District.								Prioritization Ranking Score	74	

Comments: No issue at this location

11

Closed

Street Transportation Department

Maintenance

Work Request

Print Date: 09-23-1999

Work Request Date: 07-15-1999

Work Request# : **C9915421**

Created By: Dingfield, Robert

Closed Date: 07-23-1999

Description: Citizen reports flooding when it rains , Pls contact.

Section: Central GM ***Quarter Section:*** Q27-28

Location:

316E Block 1: 316E

PURDUE AVE Block 2: 9700N

Approx. Location: 316 E. Purdue

Customers

Request By: Mr. ROBERT ZEAMAN - *Home Phone:* (602) 678-5835

Address: *Work Phone:* (602) -

WorkFlow

Action	Due Date	Scheduled	Complete	User/Crew	Assigned By
Route for Assignment	07-21-1999	00-00-0000	07-21-1999	Maran, Corrinne	Dingfield, Robert
Comments: Citizen reports flooding when it rains , Pls contact.					
Contact Customer	07-27-1999	07-22-1999	07-22-1999	Venturini, Tony	Dingfield, Robert
Comments: Pls contact Robert Zeaman at 678-5835					
Inspect and Schedule	07-28-1999	07-23-1999	07-23-1999	Venturini, Tony	Maran, Corrinne
Comments: p,u.e running behind property.					
Complete the Work	08-05-1999	07-23-1999	07-23-1999	Venturini, Tony	Maran, Corrinne
Comments: wii explain this to resident.					

ategories/Subject

Category: Storm Subject: Flood Streets/ROW

Category: Drainage Subject: Clogged Inlet/Basin

Comments

Emails

Issues

Links

Complete by: 08-05-1999 Crew: SAP:

Posted Date: 00-00-0000 Priority: 3 WEEKS

(12)

RECORD ID

PROJECT DESCRIPTION: 314 E. Purdue

INITIATOR'S NAME: Wm. Camarena

INITIATOR'S PHONE #: 262-6717

COUNCIL DISTRICT: 4

MAINTENANCE DISTRICT: CE

EVALUATION DATE: 8-24-99

PROJECT ENGINEER:

PROJECT INDEX:

RFS / CITY SERV #: C9915421

WORK ORDER #:

QUARTER SECTION: 27-28

CONSULTANT NAME:

HM SCORE	1	x5	HM EVALUATOR 5	
SAFETY SCORE	1	x 10	SAFETY EVALUATOR 10	
SEVERITY SCORE	2	x7	SEVERITY EVALUATOR 14	
FREQUENCY SCORE	1	x7	FREQUENCY EVALUATOR 7	
COST SCORE	4	x4	COST EVALUATOR 16	
EASE OF SOLUTION SCORE	3	x3	EASE OF SOLUTION EVALUATOR 9	
POTENTIAL PARTNERS SCORE	2	x2	POTENTIAL PARTNERS EVALUATOR 4	

65

REMARKS: This deals with a P.U.E. & his next door neighbors. No City Responsibility from Streets Dept.' A workshop had some water inside. This is a seperate structure from house. Resident states his neighbors changed the flow of water.

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District:	Evaluation Date
314 E. Purdue	Wm Camarena	262-6717	4	8-24-99
			Quarter Section: 27-28	

SAP #:	Project Engineer	Work Order Request #	Maintenance District	Consultant Name	Evaluator's Name
			Central		

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	1	5	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water in Houses)	7	2	14	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	1	7	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	4	16	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	3	9	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	

Note: Criteria Elements I – IV to be filled out by Maintenance District.

Prioritization Ranking Score: 65

Comments: This deals with a P.U.E. & his next door neighbors. No City Responsibility from Street Department. A workshop had some water inside. This is a seperate structure from house. Resident states his neighbors changed the flow of water.

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District:	Evaluation Date
8514 N. 8st	Yvonne Hubbard.	602-997-5793	4 Quarter Section: 26-29	7-31-02

SAP #:	Project Engineer	Work Order Request #	Maintenance District	Consultant Name	Evaluator's Name
			CENTRAL		Roger Fyffe.

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	1	5	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water In Houses)	7	1	7	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	1	7	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	4	16	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	3	9	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	

Note: Criteria Elements I – IV to be filled out by Maintenance District. Prioritization Ranking Score: 68

Comments: Property owners Have lived Here 25+s. never had any Flooding until these Past Two Rains July 2002. they think that a Catch Basin should be installed To Catch Some of the water during heavy rains. alot of water Flows North on 8st. orchid To Butler.

13

(14)

Record ID	151
Project Description	9210 N 7 Av
Initiator	WM. CONTRERAS JR.
Initiator's Phone #	962-6718
Council District	4
Maintenance District	C
Evaluation Date	
Project Engineer	
Project Index	
RFS #	9717964
Work Order #	
Quarter Section	27-26
Consultant Name	

HM Score	0	HM Evaluator	
Safety Score	0	Safety Evaluator	
Severity Score	0	Severity Evaluator	
Frequency Score	0	Frequency Evaluator	
Cost Score	0	Cost Evaluator	Act
Ease of Solution Score	0	Ease of Solution Evaluator	"
Potential Partners Score	0	Potential Partners Evaluator	"

Remarks: WATER ON PRIVETE PROPERTY TRAILER COURT. NOT CITY RESPONSIBILITY

(14)

Request For Service (ROAD) RFS #: 9717964
UPDATE DATE: 122297
TIME: 95718

LOCATION
BLOCK: 9210 NSEW: N STREET: 7 TYPE: AV
BLOCK: NSEW: STREET: TYPE: INT:
PROBLEM: 37 FLOODING PRIV S NAME (T/F/L): Mr Glenn Dietel
ADDRESS: Mayor's Office CITY: STATE: ZIP:
HOME#: WORK#: 944-9869 CONTACT (Y/N):
DETAILS: Please contact Ray Acuma, concerning W/S of 7 Av. LETTER (Y/N):
citizens backyard & driveway floods druing rains. REFTO SECT:
CAO: Kevin CAO PHONE: 1-8624 PERSON: CAMARENA

==========F I E L D I N S P E C T I O N==========

A PROB: 00 NO PROBLEM/NOT ES SIZE: ES MAN HRS:
ES CREW: REPORT: Private property/ Not from water off of 7 Av..
DATE SC: 122397 MCLA: M DATE CHECKED: 122397 CONTACT MADE (Y/N/T):
CHK BY: MARAN CDIST: 4 LETTER SENT (Y/N):

==========A C T I O N T A K E N==========

ACTION: Referred resident to manager or property owner
A.SIZE: A.MAN HRS: A.CREW: DONE DATE: 122
FOREMAN: MARAN INITIAL OPERATOR: TERI
DUP: N COMMENTS (1-YES):
ACCEPT (1-YES):

CMD7-END CMD3-SELECT CMD5-PROB DESC

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District: 4	Evaluation Date
MOUNTAIN VIEW SD: 3rd ST - 5th ST			Quarter Section: 27-28 28-28	1-8-02

SAP #:	Project Engineer	Work Order Request #	Maintenance District	Consultant Name	Evaluator's Name
			CENTRAL		S. Miller

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	1	5	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water in Houses)	7	1	7	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	1	7	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	3	12	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	3	9	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	

Note: Criteria Elements I – IV to be filled out by Maintenance District.

Prioritization Ranking Score: 54

Comments:

Construction completed

11-Feb-99 F:\IDS\Forms\LOCAL FLOODING PRIORITIZATION INPUT CODING FORM.doc

(57)

LOCAL FLOODING PRIORITIZATION INPUT CODING FORM

Project Description	Initiator	Initiator's Phone	Council District:	Evaluation Date
401 W. Hatcher	Nancy	480-997-9977	Quarter Section: 27-27	7-26-02

SAP #:	Project Engineer	Work Order Request #	Maintenance District	Consultant Name	Evaluator's Name
			C		Roger Tyffe

Criteria Elements		Evaluation Scoring					A	B	A x B	
		1	2	3	4	5	Weight Of Importance	Evaluator's Score (1-5)	Weighted Criteria Score	
I.	High Maintenance	Never or Unknown	Occasional	Routine	After Rain	Always Needs Maintenance (During and After Rains)	5	1	5	
II.	Safety	None or Minimal	Health Concerns	Traffic Impedance	Emergency Vehicle Access	Life Threatening	10	1	10	
III.	Severity	Nuisance	Minor Infrastructure Damage	Property Loss (Landscaping/ Exterior)	Single Structure (Water In House)	Multiple Structures (Water in Houses)	7	1	7	
IV.	Frequency	Seldom	Inconsistent	Occasional Reports	Consistent (During Heavy Rains)	Every Time It Rains	7	1	7	
V.	Cost ($)	Cost > 1M	400K – 1M	250K- 400K	50K-250K	0-50K	4	2	8	
VI.	Ease of Solution	Beyond Local Draining Funding	Needs Design and Contractor – Not under City Control	Need Design and Contractor	No Design Needed but Contractor Needed	No Design or Contractor Needed	3	3	9	
VII.	Potential Partners	Unavailable	Low Potential	High Potential	Planned but Not Funded	Committed Partner Or Not Needed	2	2	4	

Note: Criteria Elements I – IV to be filled out by Maintenance District. Prioritization Ranking Score: 50

Comments: Citizen stated every since Contractor installed new sidewalks the parking LOT gets Flooded. The TOP of the sidewalk is Higher then the parking LOT. They said the Property drains to the street. This is a Commercial Property.

Appendix C

HYDROLOGY/HYDRAULIC CALCULATIONS

Sunnyslope CAR
EEC Job No. 3030013.01
Contract No. FCD2003C052

The followng table summarizes peak discharge (cfs)/acre for the Sunnyslope subbasins contained in the ACDC ADMS.

Based on Kaminski-Hubbard 1994 (ACDC ADMS)

BASIN ID[1]	2-YEAR 6-HOUR	10-YEAR 6-HOUR	100-YEAR 6HOUR
150	0.49	1.54	2.89
151	0.47	1.53	2.88
152	0.44	1.67	3.12
153	0.62	2.16	3.57
154	0.35	1.71	3.13
156	0.56	1.86	3.42
157	0.36	1.26	2.60
158	0.35	1.24	2.59
159	0.45	1.58	2.96
160	0.57	1.70	3.13
161	0.40	1.42	2.55
162	0.49	1.36	2.50

Note 1: Refer to the ACDC ADMS for subbasin map.

Hydrologic Calculations for locations of
Flooding Complaints and Observed Flooding Problems

Location Description	AREA (ACRES)	ADMS SUBBASIN ID	2-YEAR CFS PER ACRE*	10-YEAR CFS PER ACRE*	100-YEAR CFS PER ACRE*	2-YEAR PEAK Q (CFS)	10-YEAR PEAK Q (CFS)	100-YEAR PEAK Q (CFS)
Complaint 6	27.873	162	0.49	1.36	2.50	14	38	70
Complaint 2	74.28	161	0.40	1.42	2.55	29	105	189
Complaint 7	57.733	161	0.40	1.42	2.55	23	82	147
Complaint 9	18.805	160	0.57	1.70	3.13	11	32	59
Complaint 5	27.348	160	0.57	1.70	3.13	15	47	86
Complaint 3	24.839	160	0.57	1.70	3.13	14	42	78
Peoria S.D.	224.621	160	0.57	1.70	3.13	127	383	704
Complaint 1	33.573	161	0.40	1.42	2.55	13	48	86
9th and Cheryl	16.452	159	0.45	1.58	2.96	7	26	49
7th and Cheryl	44.069	159	0.45	1.58	2.96	20	69	130
Complaint 13	54.908	159	0.45	1.58	2.96	25	87	162
CP Complaint 13	152.545					64	224	431
NW Dam (inflow)	358.361	158	0.35	1.24	2.59	125	443	928
NW Dam (outflow)						42	42	42
SE Dam (inflow)	53.568	157	0.36	1.26	2.60	19	68	139
SE Dam (outflow)						19	42	42
Complaint 11	11.471	156	0.56	1.86	3.42	6	21	39
Wash outlet	86.552	156	0.56	1.86	3.42	48	161	296
Complaint 17	24.118	153	0.62	2.16	3.57	15	52	86
Complaint 14	5.791	152	0.44	1.67	3.12	3	10	18

Culvert Calculator Report
Dam Outlet Pipe Capacity

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	1,355.00	ft	Headwater Depth/Height	3.11	
Computed Headwater Elev	1,355.00	ft	Discharge	42.33	cfs
Inlet Control HW Elev.	1,353.79	ft	Tailwater Elevation	1,342.00	ft
Outlet Control HW Elev.	1,355.00	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	1,348.00	ft	Downstream Invert	1,340.00	ft
Length	160.00	ft	Constructed Slope	0.050000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	2.12	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	2.12	ft
Velocity Downstream	10.90	ft/s	Critical Slope	0.055039	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.25	ft
Section Size	27 inch		Rise	2.25	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	1,355.00	ft	Upstream Velocity Head	1.76	ft
Ke	0.50		Entrance Loss	0.88	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,353.79	ft	Flow Control	N/A	
Inlet Type	Headwall		Area Full	4.0	ft²
K	0.00780		HDS 5 Chart	2	
M	2.00000		HDS 5 Scale	1	
C	0.03790		Equation Form	1	
Y	0.69000				

Appendix C.1

17TH AVENUE STORM DRAIN

Sunnyslope CAR
Contract No. FCD 2003C052
EEC Job No. 303013.01

Summary of Peak Discharges for
17th Avenue Storm Drain

Location Description	ACCUMULATIVE AREA (ACRES)	ADMS SUBBASIN ID	2-YEAR CFS PER ACRE	10-YEAR CFS PER ACRE	2-YEAR PEAK Q (CFS)	Entellus C factor	10-year Intensity (in/hr)	10-YEAR PEAK Q (CFS)	PEAK Q minus Peoria S.D. (CFS)
CP1	60	160	0.57	1.70	34			102	102
CP2[1,2]	85	160	n/a	n/a	n/a	0.58	2.9	143	31
CP3[1,2]	180	160	n/a	n/a	n/a	0.59	2.3	244	184
CP4[1,2]	420	160	n/a	n/a	n/a	0.58	2.3	560	388
CP5[3]	489	161	0.40	1.42	193			693	521
CP6[3]	529	161	0.40	1.42	209			749	577
CP7[3]	567	161	0.40	1.42	224			803	631
CP8	54	160	0.57	1.70	23			70	70
CP9[4]	13	160	0.57	1.70	7			64	70

1. Q = Q10(calculated using method from Entellus report and intensity based upon appropriate design storm) - Q2(taken from Entellus)
2. From Entellus Report Tc for CP2 = 20 min, for CP3 = 30 min and for CP4 = 30 min
3. Q = Q10(calculated by cfs/acre) - Q2(from Entellus report, flow provided in Peoria Ave. S.D.)
4. Base flow from the dam is 42 cfs.

Pipe Capacity, Peoria SD, 15th Avenue to 17th Avenue
Worksheet for Circular Channel

Project Description	
Worksheet	Project 1 - Peoria SD,15th Ave to 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	006700	ft/ft
Discharge	53.00	cfs

Results		
Depth	2.97	ft
Diameter	36	in
Flow Area	6.9	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	2.37	ft
Percent Full	100.0	%
Critical Slope	007031	ft/ft
Velocity	7.67	ft/s
Velocity Head	0.91	ft
Specific Energ	3.88	ft
Froude Numbe	0.00	
Maximum Disc	57.01	cfs
Discharge Full	53.00	cfs
Slope Full	006700	ft/ft
Flow Type	N/A	

Notes: Discharge equal to difference between Q10 (calculated by EEC using Q=cia) and Q2 (taken from Entellus)

Pipe Capacity, Peoria SD, 18th Avenue to 17th Avenue
Worksheet for Circular Channel

Project Description	
Worksheet	Project 1 - Peoria SD, 18th Ave to 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	005000	ft/ft
Discharge	184.00	cfs

Results		
Depth	5.00	ft
Diameter	60	in
Flow Area	19.6	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	3.88	ft
Percent Full	100.0	%
Critical Slope	005556	ft/ft
Velocity	9.38	ft/s
Velocity Head	1.37	ft
Specific Energ	6.36	ft
Froude Numbe	0.00	
Maximum Disc	197.93	cfs
Discharge Full	184.00	cfs
Slope Full	005000	ft/ft
Flow Type	N/A	

Notes: Discharge equal to difference between Q10 (calculated by EEC using Q=cia) and Q2 (taken from Entellus)

Pipe Capacity, 17th Ave. SD, Peoria to Cheryl
Worksheet for Circular Channel

Project Description	
Worksheet	Project 1 - 17th Av - Peoria to C
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	005200	ft/ft
Discharge	521.00	cfs

Results		
Depth	7.33	ft
Diameter	88	in
Flow Area	42.2	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	5.92	ft
Percent Full	100.0	%
Critical Slope	005342	ft/ft
Velocity	12.34	ft/s
Velocity Head	2.37	ft
Specific Energ	9.70	ft
Froude Numbe	0.00	
Maximum Disc	560.44	cfs
Discharge Full	521.00	cfs
Slope Full	005200	ft/ft
Flow Type	N/A	

Notes: Discharge calculated by cfs/acre minus Q2 from Entellus

Pipe Capacity, 17th Ave SD, Cheryl to Mountain View
Worksheet for Circular Channel

Project Description	
Worksheet	Project 1 - 17th Av - Cheryl to Mt.
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	005800	ft/ft
Discharge	577.00	cfs

Results		
Depth	7.46	ft
Diameter	90	in
Flow Area	43.7	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	6.18	ft
Percent Full	100.0	%
Critical Slope	005690	ft/ft
Velocity	13.19	ft/s
Velocity Head	2.70	ft
Specific Energ	10.17	ft
Froude Numbe	0.00	
Maximum Disc	620.68	cfs
Discharge Full	577.00	cfs
Slope Full	005800	ft/ft
Flow Type	N/A	

Notes: Discharge calculated by cfs/acre minus Q2 from Entellus

Pipe Capacity, 17th Ave SD, Mountain View to ACDC
Worksheet for Circular Channel

Project Description	
Worksheet	Project 1 - 17th Av - Mt. View to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	004300	ft/ft
Discharge	631.00	cfs

Results		
Depth	8.16	ft
Diameter	98	in
Flow Area	52.3	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	6.36	ft
Percent Full	100.0	%
Critical Slope	004748	ft/ft
Velocity	12.06	ft/s
Velocity Head	2.26	ft
Specific Energ	10.42	ft
Froude Numbe	0.00	
Maximum Disc	678.77	cfs
Discharge Full	631.00	cfs
Slope Full	004300	ft/ft
Flow Type	N/A	

Notes: Discharge calculated by cfs/acre minus Q2 from Entellus

Pipe Capacity, 11th Ave SD, Peoria to Desert Cove
Worksheet for Circular Channel

Project Description	
Worksheet	Project 1 - 15th Av - Desert Cove to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data		
Mannings Coeffic	0.013	
Slope	005000	ft/ft
Diameter	42	in

Results		
Depth	3.50	ft
Discharge	71.14	cfs
Flow Area	9.6	ft²
Wetted Perime	11.00	ft
Top Width	0.00	ft
Critical Depth	2.64	ft
Percent Full	100.0	%
Critical Slope	005920	ft/ft
Velocity	7.39	ft/s
Velocity Head	0.85	ft
Specific Energ	4.35	ft
Froude Numbe	0.00	
Maximum Disc	76.52	cfs
Discharge Full	71.14	cfs
Slope Full	005000	ft/ft
Flow Type	N/A	

Appendix C.2

9TH AVENUE STORM DRAIN

Sunnyslope CAR
Contract No. FCD 2003C052
EEC Job No. 303013.01

Summary of Peak Discharges for
9th Avenue Storm Drain

Location Description	ACCUMULATIVE AREA (ACRES)	ADMS SUBBASIN ID	2-YEAR CFS PER ACRE*	10-YEAR CFS PER ACRE*	2-YEAR PEAK Q (CFS)	10-YEAR PEAK Q (CFS)	10-YEAR plus Baseflow (CFS)
CP 1[1]	25	158	0.35	1.24	9	31	73
CP2A	44	159	0.45	1.58	20	69	69
CP 2[1]	93	159	0.45	1.58	42	147	189
CP3A[1]	55	159	0.45	1.58	25	87	129
CP 3[2]	157	159	0.45	1.58	71	248	332
CP 4[2]	174	159	0.45	1.58	79	274	358
CP 5[2]	185	159	0.45	1.58	84	292	376

1. Includes 42 cfs base flow from upstream dam

2. Includes 84 cfs base flow from two upstream dams

Pipe Capacity, 9th Avenue, Peoria to Cheryl
Worksheet for Circular Channel

Project Description	
Worksheet	Project 2 - 9th Av - Peoria to C
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	012800	ft/ft
Discharge	73.00	cfs

Results		
Depth	2.96	ft
Diameter	36	in
Flow Area	6.9	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	2.69	ft
Percent Full	100.0	%
Critical Slope	011198	ft/ft
Velocity	10.59	ft/s
Velocity Head	1.74	ft
Specific Energ	4.70	ft
Froude Numbe	0.00	
Maximum Disc	78.53	cfs
Discharge Full	73.00	cfs
Slope Full	012800	ft/ft
Flow Type	N/A	

Notes: Existing 36" pipe. Use 36" to match existing.

Pipe Capacity, 9th Ave SD, Cheryl Lateral
Worksheet for Circular Channel

Project Description	
Worksheet	Project 2 - Cheryl Late
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	005000	ft/ft
Discharge	69.00	cfs

Results		
Depth	3.46	ft
Diameter	42	in
Flow Area	9.4	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	2.61	ft
Percent Full	100.0	%
Critical Slope	005933	ft/ft
Velocity	7.34	ft/s
Velocity Head	0.84	ft
Specific Energ	4.30	ft
Froude Numbe	0.00	
Maximum Disc	74.22	cfs
Discharge Full	69.00	cfs
Slope Full	005000	ft/ft
Flow Type	N/A	

Pipe Capacity, 9th Ave SD, Cheryl to Cinnabar
Worksheet for Circular Channel

Project Description	
Worksheet	Project 2 - 9th Av - Cheryl to Cin
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	017100	ft/ft
Discharge	189.00	cfs

Results		
Depth	4.01	ft
Diameter	48	in
Flow Area	12.6	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	3.82	ft
Percent Full	100.0	%
Critical Slope	014821	ft/ft
Velocity	14.97	ft/s
Velocity Head	3.48	ft
Specific Energ	7.49	ft
Froude Numbe	0.00	
Maximum Disc	203.31	cfs
Discharge Full	189.00	cfs
Slope Full	017100	ft/ft
Flow Type	N/A	

Pipe Capacity, 9th Ave SD, Cinnabar Lateral
Worksheet for Circular Channel

Project Description	
Worksheet	Project 2 - Cinnabar Lat
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	005000	ft/ft
Discharge	129.00	cfs

Results		
Depth	4.38	ft
Diameter	53	in
Flow Area	15.0	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	3.36	ft
Percent Full	100.0	%
Critical Slope	005685	ft/ft
Velocity	8.58	ft/s
Velocity Head	1.14	ft
Specific Energ	5.52	ft
Froude Numbe	0.00	
Maximum Disc	138.77	cfs
Discharge Full	129.00	cfs
Slope Full	005000	ft/ft
Flow Type	N/A	

Pipe Capacity, 9th Ave SD, Cinnabar to Vogel
Worksheet for Circular Channel

Project Description	
Worksheet	Project 2 - 9th Av - Cinnabar to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	013300	ft/ft
Discharge	358.00	cfs

Results		
Depth	5.34	ft
Diameter	64	in
Flow Area	22.4	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	5.00	ft
Percent Full	100.0	%
Critical Slope	011494	ft/ft
Velocity	15.98	ft/s
Velocity Head	3.97	ft
Specific Energ	9.31	ft
Froude Numbe	0.00	
Maximum Disc	385.10	cfs
Discharge Full	358.00	cfs
Slope Full	013300	ft/ft
Flow Type	N/A	

Pipe Capacity, 9th Ave SD, Vogel to ACDC
Worksheet for Circular Channel

Project Description	
Worksheet	Project 2 - 9th Av - Vogel to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	010000	ft/ft
Discharge	376.00	cfs

Results		
Depth	5.74	ft
Diameter	69	in
Flow Area	25.9	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	5.19	ft
Percent Full	100.0	%
Critical Slope	008774	ft/ft
Velocity	14.54	ft/s
Velocity Head	3.28	ft
Specific Energ	9.02	ft
Froude Numbe	0.00	
Maximum Disc	404.47	cfs
Discharge Full	376.00	cfs
Slope Full	010000	ft/ft
Flow Type	N/A	

Appendix C.3
2ND DRIVE STORM DRAIN

Sunnyslope CAR
Contract No. FCD 2003C052
EEC Job No. 303013.01

Summary of Peak Discharges for
2nd Drive Storm Drain

Location Description	ACCUMULATIVE AREA (ACRES)	ADMS SUBBASIN ID	2-YEAR CFS PER ACRE	10-YEAR CFS PER ACRE	2-YEAR PEAK Q (CFS)	10-YEAR PEAK Q (CFS)
CP 1	87	156	0.56	1.86	48	161
CP 2	105	156	0.56	1.86	58	195
CP 3	134	156	0.56	1.86	75	251

Pipe Capacity, 2nd Drive SD, Vogel - 1st to 2nd
Worksheet for Circular Channel

Project Description	
Worksheet	Project 3 - Vogel - 1st to :
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	014500	ft/ft
Discharge	161.00	cfs

Results		
Depth	3.89	ft
Diameter	47	in
Flow Area	11.9	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	3.64	ft
Percent Full	100.0	%
Critical Slope	012533	ft/ft
Velocity	13.52	ft/s
Velocity Head	2.84	ft
Specific Energ	6.73	ft
Froude Numbe	0.00	
Maximum Disc	173.19	cfs
Discharge Full	161.00	cfs
Slope Full	014500	ft/ft
Flow Type	N/A	

Pipe Capacity, 2nd Drive SD, Vogel to Mission
Worksheet for Circular Channel

Project Description	
Worksheet	Project 3 - 2nd - Vogel to Mi:
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	009400	ft/ft
Discharge	195.00	cfs

Results		
Depth	4.54	ft
Diameter	54	in
Flow Area	16.2	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	4.01	ft
Percent Full	100.0	%
Critical Slope	008430	ft/ft
Velocity	12.06	ft/s
Velocity Head	2.26	ft
Specific Energ	6.80	ft
Froude Numbe	0.00	
Maximum Disc	209.76	cfs
Discharge Full	195.00	cfs
Slope Full	009400	ft/ft
Flow Type	N/A	

Pipe Capacity, 2nd Drive SD, Mission to Dunlap
Worksheet for Circular Channel

Project Description	
Worksheet	Project 3 - 2nd - Mission to D
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	009400	ft/ft
Discharge	251.00	cfs

Results		
Depth	4.99	ft
Diameter	60	in
Flow Area	19.5	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	4.43	ft
Percent Full	100.0	%
Critical Slope	008381	ft/ft
Velocity	12.84	ft/s
Velocity Head	2.56	ft
Specific Energ	7.55	ft
Froude Numbe	0.00	
Maximum Disc	270.00	cfs
Discharge Full	251.00	cfs
Slope Full	009400	ft/ft
Flow Type	N/A	

Pipe Capacity, 2nd Drive SD, Dunlap - 2nd to ACDC
Worksheet for Circular Channel

Project Description	
Worksheet	Project 3 - Dunlap - 2nd to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	006300	ft/ft
Discharge	251.00	cfs

Results		
Depth	5.38	ft
Diameter	65	in
Flow Area	22.7	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	4.43	ft
Percent Full	100.0	%
Critical Slope	006242	ft/ft
Velocity	11.05	ft/s
Velocity Head	1.90	ft
Specific Energ	7.28	ft
Froude Numbe	0.00	
Maximum Disc	270.00	cfs
Discharge Full	251.00	cfs
Slope Full	006300	ft/ft
Flow Type	N/A	

Appendix C.4

5TH STREET STORM DRAIN

Sunnyslope CAR
Contract No. FCD 2003C052
EEC Job No. 303013.01

Summary of Peak Discharges for
5th Street Storm Drain

Location Description	AREA (ACRES)	ADMS SUBBASIN ID	2-YEAR CFS PER ACRE*	10-YEAR CFS PER ACRE*	2-YEAR PEAK Q (CFS)	10-YEAR PEAK Q (CFS)
CP 1	24	153	0.62	2.16	15	52
CP 2	38	152	0.62	2.16	23	81

Pipe Capacity, 5th St. SD, Mountain View to Hatcher
Worksheet for Circular Channel

Project Description	
Worksheet	Project 4 - 5th St - Mt. View to Ha
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coeffic	0.013	
Slope	013300	ft/ft
Discharge	23.00	cfs

Results		
Depth	1.91	ft
Diameter	23	in
Flow Area	2.9	ft²
Wetted Perime	21.99	ft
Top Width	0.00	ft
Critical Depth	1.70	ft
Percent Full	100.0	%
Critical Slope	011803	ft/ft
Velocity	8.05	ft/s
Velocity Head	1.01	ft
Specific Energ	2.91	ft
Froude Numbe	0.00	
Maximum Disc	24.74	cfs
Discharge Full	23.00	cfs
Slope Full	013300	ft/ft
Flow Type	N/A	

Appendix C.5

MOUNTAIN VIEW ROAD STORM DRAIN

Sunnyslope CAR
Contract No. FCD 2003C052
EEC Job No. 303013.01

Summary of Peak Discharges for
Mountain Veiw Storm Drain

Location Description	AREA (ACRES)	ADMS SUBBASIN ID	2-YEAR CFS PER ACRE*	10-YEAR CFS PER ACRE*	2-YEAR PEAK Q (CFS)	10-YEAR PEAK Q (CFS)
CP 1*	131	151	0.47	1.53	61	201
CP 2	245	152	0.47	1.53	114	376

*Note - Q capacity of down stream channel is 72 cfs. Excess is diverted to CP-2.

Mt. View S.D., Split at CP-1
Worksheet for Irregular Channel

Project Description	
Worksheet	Project 5 - Capacity of Cross S
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	015000	ft/ft
Water Surface Elev	,313.00	ft

Options	
Current Roughness Metho	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coeffic	0.030	
Elevation Range	12.50 to 1,315.00	
Discharge	72.22	cfs
Flow Area	30.0	ft²
Wetted Perimeter	120.00	ft
Top Width	120.00	ft
Actual Depth	0.50	ft
Critical Elevation	1,312.97	ft
Critical Slope	0.021279	ft/ft
Velocity	2.41	ft/s
Velocity Head	0.09	ft
Specific Energy	1,313.09	ft
Froude Number	0.85	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	2+75	0.030

Natural Channel Points

Station (ft)	Elevation (ft)
0+00	1,315.00
0+95	1,314.00
1+55	1,313.00
2+20	1,312.50
2+75	1,313.00

Mt View S.D., CP-2 to 10th St. Wash
Worksheet for Rectangular Channel

Project Description	
Worksheet	Project 5 - Mt. View - 11th St. to 10th St
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Slope	003500	ft/ft
Bottom Width	12.00	ft
Discharge	376.00	cfs

Results		
Depth	2.94	ft
Flow Area	35.3	ft²
Wetted Perim	17.89	ft
Top Width	12.00	ft
Critical Depth	3.12	ft
Critical Slope	0.002946	ft/ft
Velocity	10.64	ft/s
Velocity Head	1.76	ft
Specific Ener	4.70	ft
Froude Numb	1.09	
Flow Type	Supercritical	

11th Street S.D., Mountain View to Brown
Worksheet for Circular Channel

Project Description	
Worksheet	Project 5 - 11th St - Mt. View to Brown
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Discharge	72.00	cfs

Results		
Depth	3.09	ft
Diameter	37	in
Flow Area	7.5	ft²
Wetted Perimeter	15.71	ft
Top Width	0.00	ft
Critical Depth	2.69	ft
Percent Full	100.0	%
Critical Slope	0.009095	ft/ft
Velocity	9.62	ft/s
Velocity Head	1.44	ft
Specific Energy	4.52	ft
Froude Number	0.00	
Maximum Discharg	77.45	cfs
Discharge Full	72.00	cfs
Slope Full	0.010000	ft/ft
Flow Type	N/A	

Appendix C.6

COMBINED SMALL DRAINGE IMPROVEMENT PROJECTS

Sunnyslope CAR
Contract No. FCD 2003C052
EEC Job No. 303013.01

Summary of Peak Discharges for
Individual Projects

Location Description	AREA (ACRES)	2-YEAR PEAK Q (CFS)	10-YEAR PEAK Q (CFS)
Ironwood Lateral	27	14	38
Mt. View Lateral	58	23	82
Carol Dr. Lateral	74	29	105
Shangri La Lateral	19	11	32
8th St. Lateral	6	3	10
Cochise Lateral	6	3	9
Cinnabar Lateral	6	3	10

Lateral - Ironwood
Worksheet for Circular Channel

Project Description	
Worksheet	Lateral - Ironwood
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.013	
Slope	0.010000	ft/ft
Discharge	14.00	cfs

Results		
Depth	1.67	ft
Diameter	20	in
Flow Area	2.2	ft²
Wetted Perimeter	15.71	ft
Top Width	0.00	ft
Critical Depth	1.40	ft
Percent Full	100.0	%
Critical Slope	0.009651	ft/ft
Velocity	6.39	ft/s
Velocity Head	0.63	ft
Specific Energy	2.30	ft
Froude Number	0.00	
Maximum Discharg	15.06	cfs
Discharge Full	14.00	cfs
Slope Full	0.010000	ft/ft
Flow Type	N/A	

Lateral - Mt. View
Worksheet for Circular Channel

Project Description	
Worksheet	Lateral - Mt. View
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.013	
Slope	0.005000	ft/ft
Discharge	23.00	cfs

Results		
Depth	2.29	ft
Diameter	28	in
Flow Area	4.1	ft²
Wetted Perimeter	15.71	ft
Top Width	0.00	ft
Critical Depth	1.67	ft
Percent Full	100.0	%
Critical Slope	0.006429	ft/ft
Velocity	5.58	ft/s
Velocity Head	0.48	ft
Specific Energy	2.77	ft
Froude Number	0.00	
Maximum Discharg	24.74	cfs
Discharge Full	23.00	cfs
Slope Full	0.005000	ft/ft
Flow Type	N/A	

Lateral - Carol
Worksheet for Circular Channel

Project Description	
Worksheet	Lateral - Carol
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.013	
Slope	0.005000	ft/ft
Discharge	29.00	cfs

Results		
Depth	2.50	ft
Diameter	30	in
Flow Area	4.9	ft²
Wetted Perimeter	15.71	ft
Top Width	0.00	ft
Critical Depth	1.84	ft
Percent Full	100.0	%
Critical Slope	0.006319	ft/ft
Velocity	5.91	ft/s
Velocity Head	0.54	ft
Specific Energy	3.04	ft
Froude Number	0.00	
Maximum Discharg	31.20	cfs
Discharge Full	29.00	cfs
Slope Full	0.005000	ft/ft
Flow Type	N/A	

Lateral - Shangri La
Worksheet for Circular Channel

Project Description	
Worksheet	Lateral - Shangri La
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.013	
Slope	0.005000	ft/ft
Discharge	11.00	cfs

Results		
Depth	1.74	ft
Diameter	21	in
Flow Area	2.4	ft²
Wetted Perimeter	15.71	ft
Top Width	0.00	ft
Critical Depth	1.24	ft
Percent Full	100.0	%
Critical Slope	0.006812	ft/ft
Velocity	4.64	ft/s
Velocity Head	0.33	ft
Specific Energy	2.07	ft
Froude Number	0.00	
Maximum Discharg	11.83	cfs
Discharge Full	11.00	cfs
Slope Full	0.005000	ft/ft
Flow Type	N/A	

Lateral - 8th St.
Worksheet for Circular Channel

Project Description	
Worksheet	Lateral - 8th St.
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.013	
Slope	0.005000	ft/ft
Discharge	3.00	cfs

Results		
Depth	1.07	ft
Diameter	13	in
Flow Area	0.9	ft²
Wetted Perimeter	15.71	ft
Top Width	0.00	ft
Critical Depth	0.73	ft
Percent Full	100.0	%
Critical Slope	0.007594	ft/ft
Velocity	3.35	ft/s
Velocity Head	0.17	ft
Specific Energy	1.24	ft
Froude Number	0.00	
Maximum Discharg	3.23	cfs
Discharge Full	3.00	cfs
Slope Full	0.005000	ft/ft
Flow Type	N/A	

Lateral - Cochise
Worksheet for Circular Channel

Project Description	
Worksheet	Lateral - Cochise
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.013	
Slope	0.005000	ft/ft
Discharge	3.00	cfs

Results		
Depth	1.07	ft
Diameter	13	in
Flow Area	0.9	ft²
Wetted Perimeter	15.71	ft
Top Width	0.00	ft
Critical Depth	0.73	ft
Percent Full	100.0	%
Critical Slope	0.007594	ft/ft
Velocity	3.35	ft/s
Velocity Head	0.17	ft
Specific Energy	1.24	ft
Froude Number	0.00	
Maximum Discharg	3.23	cfs
Discharge Full	3.00	cfs
Slope Full	0.005000	ft/ft
Flow Type	N/A	

Lateral - Cinnabar
Worksheet for Circular Channel

Project Description	
Worksheet	Lateral - Cinnabar
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Diameter

Input Data		
Mannings Coefficient	0.013	
Slope	0.005000	ft/ft
Discharge	3.00	cfs

Results		
Depth	1.07	ft
Diameter	13	in
Flow Area	0.9	ft²
Wetted Perimeter	15.71	ft
Top Width	0.00	ft
Critical Depth	0.73	ft
Percent Full	100.0	%
Critical Slope	0.007594	ft/ft
Velocity	3.35	ft/s
Velocity Head	0.17	ft
Specific Energy	1.24	ft
Froude Number	0.00	
Maximum Discharg	3.23	cfs
Discharge Full	3.00	cfs
Slope Full	0.005000	ft/ft
Flow Type	N/A	

Appendix D
COST ESTIMATES

Sunnyslope CAR
EEC Job No. 303013.01

Project Cost Summary Sheet

Project Description	Level of Protection	Project Cost
Peoria Ave./17th Ave. Storm Drain	10-year	**$2,761,800**
9th Avenue Storm Drain	10-year	**$1,530,700**
2nd Drive Storm Drain	10-year	**$866,700**
5th Street Storm Drain	2-year	**$163,125**
Mountain View Road Storm Drain	10-year	**$508,350**
Combined Small Drainage Projects	2-year	**$424,800**

PRELIMINARY CONSTRUCTION COST ESTIMATE
Project No.: 303013.01
Project Name: Sunnyslope C.A.R.

17th Avenue Storm Drain (10-year)

Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	36" Pipe	LF	$100.00	2500	$ 250,000.00
2	60" Pipe	LF	$160.00	670	$ 107,200.00
3	90" Pipe	LF	$340.00	2600	$ 884,000.00
4	96" Pipe	LF	$400.00	1500	$ 600,000.00

Sub Total	$	1,841,200.00
Appurtenances -manholes, inlets, pavement etc. (35%)	$	644,420.00
Contingencies (15%)	$	276,180.00
TOTAL	**$**	**2,761,800**

PRELIMINARY CONSTRUCTION COST ESTIMATE
Project No.: 303013.01
Project Name: Sunnyslope C.A.R.

9th Avenue Storm Drain (10-year)

Item No.	Item Description	Unit	Unit Price	Quantity		Amount
1	24" Pipe	LF	$75.00	440	$	33,000.00
2	36" Pipe	LF	$100.00	1250	$	125,000.00
3	42" Pipe	LF	$112.00	700	$	78,400.00
4	48" Pipe	LF	$141.00	650	$	91,650.00
5	54" Pipe	LF	$170.00	1000	$	170,000.00
6	66" Pipe	LF	$180.00	1340	$	241,200.00
7	72" Pipe	LF	$190.00	1480	$	281,200.00
					$	-
					$	-
					$	-

Sub Total	$	1,020,450.00
Appurtenances -manholes, inlets, pavement etc. (35%)	$	357,157.50
Contingencies (15%)	$	153,067.50
TOTAL	**$**	**1,530,700**

PRELIMINARY CONSTRUCTION COST ESTIMATE
Project No.: 303013.01
Project Name: Sunnyslope C.A.R.

2nd Drive Storm Drain (10-year)

Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	48" Pipe		$141.00	550	$ 77,550.00
2	54" Pipe		$170.00	650	$ 110,500.00
3	60" Pipe		$160.00	1100	$ 176,000.00
4	66" Pipe		$225.00	950	$ 213,750.00
					$ -
					$ -
					$ -
					$ -
					$ -
					$ -

Sub Total	$	577,800.00
Appurtenances- manholes, inlets, pavement etc. (35%)	$	202,230.00
Contingencies (15%)	$	86,670.00
TOTAL	**$**	**866,700.00**

PRELIMINARY CONSTRUCTION COST ESTIMATE
Project No.: 303013.01
Project Name: Sunnyslope C.A.R.

5th Street Storm Drain (2-year)

Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	24" Pipe		$75.00	1450	$ 108,750.00

Sub Total	$	108,750.00
Appurtenances -manholes, inlets, pavement etc. (35%)	$	38,062.50
Contingencies (15%)	$	16,312.50
TOTAL	**$**	**163,125.00**

PRELIMINARY CONSTRUCTION COST ESTIMATE
Project No.: 303013.01
Project Name: Sunnyslope C.A.R.

Mountain View Road Storm Drain (10-year)

Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	42" Pipe	LF	$112.00	1250	$ 140,000.00
2	2-6'x3' Concrete Box Culvert	LF	$585.00	340	$ 198,900.00

Sub Total	$ 338,900.00
Appurtenances -manholes, inlets, pavement etc. (35%)	$ 118,615.00
Contingencies (15%)	$ 50,835.00
TOTAL	**$ 508,350.00**

PRELIMINARY CONSTRUCTION COST ESTIMATE
Project No.: 303013.01
Project Name: Sunnyslope C.A.R.

Combined Small Projects (2-year)

Item No.	Item Description	Unit	Unit Price	Quantity	Amount
	Ironwood Lateral				
1	24" Pipe	LF	$75.00	200	$ 15,000.00
	Shangri La Lateral				
2	24" Pipe	LF	$75.00	600	$ 45,000.00
	Mountain View Lateral				
3	30" Pipe	LF	$85.00	600	$ 51,000.00
	Carol Drive Lateral				
4	30" Pipe	LF	$85.00	600	$ 51,000.00
	Cinnabar and 11th Avenue Lateral				
5	24" Pipe	LF	$75.00	250	$ 18,750.00
	8th Street Lateral				
6	24" Pipe	LF	$75.00	700	$ 52,500.00
	6th Street Valley Gutter				
7	Concrete Valley Gutter, Modified to 6' Wide	SF	$10.00	200	$ 2,000.00
	11th Avenue and Vogel				
8	Replace roll curb with veritcal curb	LF	$13.50	150	$ 2,025.00
	15th Avenue N/of Cheryl				
9	Flood wall	SQ. FT.	$30.00	500	$ 15,000.00
	15th Avenue N/of Peoria				
10	Flood wall	SQ. FT.	$30.00	200	$ 6,000.00
	Desert Cove W/of 15th Avenue				
11	Replace roll curb with vertical curb	LF	$13.50	150	$ 2,025.00
	Sidewalk replacement	SQ. FT.	$3.25	600	$ 1,950.00
	3rd Drive				
12	Remove crown	SQ. YD.	$31.00	675	$ 20,925.00
	Sub Total				$ 283,175.00
	Appurtenances -manholes, inlets, pavement etc. (35%)				$ 99,111.25
	Contingencies (15%)				$ 42,476.25
	TOTAL				**$ 424,800.00**

Sunnyslope Candidate Assessment Report

Known Flooding Problems and Existing / Planned Drainage Infrastructure

EEC Job Number 303013.01
FCD Job Number 2003C052

Exhibit 1. Existing Conditions

N

1" = 500'

500 0 500 1000 Feet

Drainage Complaints / Flooding Problems / Undesirable Drainage Elements

1	10210 N. 15th Ave.	Water overtops curb and floods house.
2	1725, 1802 W. Carol Dr.	Storm water overtops roll curb and floods yard.
3	10648 N. 15th Ave.	Houses sit several feet below street level.
4	7th Ave.: Dunlap Ave. - Hatcher	Flooding along Hatcher. SD under design.
5	1519 W. Desert Cove Ave.	Property located in a low flow line. No drainage easement.
6	1929 W. Ironwood Dr.	Water flows over driveway and into parking lot.
7	1801 W. Mountain View Rd.	Runoff overtopped curb and berm to flood apartments.
8	8305 N. 6th St.	Catch basin too small. Water overtops curb and floods street.
9	11033 N. 18th Dr.	Easement has been altered and no drainage system for cul-de-sac.
10	9442 N. 11th Ave.	Flow overtops roll curb and into driveway.
11	9638 N. 3rd Dr.	Flow overtops vert. curb and floods frontyard.
12	316 E. Purdue Ave.	Reported flooding. City evaluation showed no problem.
13	7th Ave	Ponding on inside of roadway bend.
14	8514 N. 8th St.	Storm water overtops curb and floods yard.
15	9210 N. 7th Ave.	Flooding reported on private property.
16	314 E. Purdue Ave.	Involves P.U.E. and issue w/ neighbor.
18	401 W. Hatcher	Newly installed sidewalk causing parking lot to get flooded.
19	12 Ave & Cinnabar	Local ponding
20	8th Ave & Cinnabar	Possible flooding of apartments
21	9th Ave Area	Inadequate drainage system / pipes through private property
22	Mt. View & Cave Creek Rd	Channel outfall into street
23	Mt. View between 5th St & 7th St	Channel outfall across private property, south of Mt. View

Approximate Peak Discharges

Location Description	AREA (ACRES)	2-YEAR PEAK Q (CFS)	10-YEAR PEAK Q (CFS)	100-YEAR PEAK Q (CFS)
Complaint 6	27.873	14	38	70
Complaint 2	74.28	29	105	189
Complaint 7	57.733	23	82	147
Complaint 9	18.805	11	32	59
Complaint 5	27.348	15	47	86
Complaint 3	24.839	14	42	78
Peoria @ 19th Ave	224.621	127	383	704
Complaint 1	33.573	13	48	86
9th and Cheryl	16.452	7	26	49
7th and Cheryl	44.069	20	69	130
Complaint 13	54.908	25	87	162
NW Dam inflow	358.361	125	443	928
NW Dam outflow		42	42	42
SE Dam inflow	53.568	19	68	139
SE Dam outflow		19	42	42
Complaint 11	11.471	6	21	39
Wash outlet	86.552	48	161	296
Complaint 17	24.118	15	52	86
Complaint 14	5.791	3	10	18
Mt. View & Cave Creek	245.6	116	382	717

Legend

- 10' Elevation Contour
- Existing Storm Drain
- Planned Storm Drain
- Wash / Channel
- Culvert / Pipe
- Existing Flood Control Dam
- Street Flow / Overland Flow
- Flooding Problem Location
- Study Area
- Q_{cap} Existing Capacity
- Flow Direction
- Existing Detention Basin

Sunnyslope Candidate Assessment Report

EEC Job Number 303013.01
FCD Job Number 2003C052

Exhibit 2. Overview of Recommended Projects

N

1" = 500'

500 0 500 1000 Feet

Cortez
Shangri La
Mescal
Desert Cove
Mercer
Christy
Sahuaro
Becker
Peoria
North
Cochise
Cheryl
Brown
Cinnabar
Ironwood
Vogel Ave
Mission
Purdue
Carol
Mountain View
Dunlap
Arizona Canal Diversion Channel
Cave Creek Wash
10th St Wash
7th Av
9th Av
17th Av
3RD St
7th St
8th St
6th St

Shangri La Lateral
24"
Interim Solution (prior to 17th Ave S.D.) replace existing rollcurb with new vertical curb
36"
Interim Solution (prior to 17th Ave S.D.) Construct Floodwall on Property Line and elevate Driveway entrance
60"
36"
Part of 9th Av. S.D. Repave Street Remove Dip and cap existing culvert
36"
24"
24"
36"
15th Av. and Beryl Av. Construct Floodwall on Property Line and elevate Driveway entrance
90"
17th Avenue Storm Drain
Part of 9th Av. S.D. Cap and abandon existing culvert
42"
48"
Part of 9th Av. S.D. Repave Street Remove Dip and cap existing culvert
Interim Solution (prior to 9th Ave S.D.) extend lateral up Cinnabar to pick up overland flow
24"
54"
66"
3rd Dr. and Mt. View Rd. Repave Street Remove Crown
Ironwood Lateral
Ironwood Dr
24"
30"
Mt. View Lateral
17th Av
96"
Interim Solution (prior to 9th Ave S.D.) replace existing rollcurb with new vertical curb
9th Av
72"
9th Avenue Storm Drain
48"
36"
54"
48"
54"
72"
54"
60"
2nd Drive Storm Drain
66"
Carol Dr
24"
Interim Solution (prior to 17th Ave S.D.) extend storm drain up Carol Drive
Cinnabar
42"
Mt. View Rd Storm Drain
12' x 3' CBC
Purdue
24"
Vogel
Carol
5th Street Storm Drain
24"
8th St. Lateral
6th St. Valley Gutter

Legend

- 10' Elevation Contour
- Existing Storm Drain
- New Storm Drain (under design)
- Existing Wash / Channel
- Existing Culvert / Pipe
- Study Area
- Recommended Storm Drain
- New Valley Gutter
- Combined Small Drainage Improvements
- Interim Solution

Cortez
Shangri La
Sahuaro
Peoria
North
Cochise
Cheryl
Brown
Cinnabar
Ironwood
Mission
7th Av
17th Av
9th Av
3RD St
Arizona Canal Diversion Channel

A = 180 acres
A = 60 acres
A = 82 acres
A = 85 acres
A = 13 acres
A = 69 acres
A = 41 acres
A = 40 acres
A = 38 acres

Q_2 = 34 cfs
CP-1
D_2 = 36"
CP-3
$Q_\triangle$ = 184 cfs
CP-2
$Q_\triangle$ = 31 cfs
CP-9
Q_{10} = 64 cfs
CP-4
Q_{10} = 184 cfs
CP-5
Q_{10} = 521 cfs
CP-6
Q_{10} = 577 cfs
CP-7
Q_{10} = 631 cfs
CP-8
Q_{cap} = 71 cfs
Q_{10} = 134 cfs
Q_{cap} = 103 cfs
Q_{cap} = 176 cfs

D_{10} = 60"
D_{10} = 36"
D_{10} = 90"
D_{10} = 90"
D_{10} = 96"

Legend

- 2' Elevation Contour
- Existing Storm Drain
- Proposed Storm Drain
- Storm Drain (under design)
- Wash / Channel
- Culvert / Pipe
- Q_2 — 2-year Discharge
- D_2 — Proposed Diameter for 2-year S.D.
- Q_{cap} — Existing Capacity
- $Q_\triangle$ — Difference between 2 and 10-year
- Flow Direction
- Drainage Boundary
- Area Protected by Drainage Improvements

Sunnyslope Candidate Assessment Report

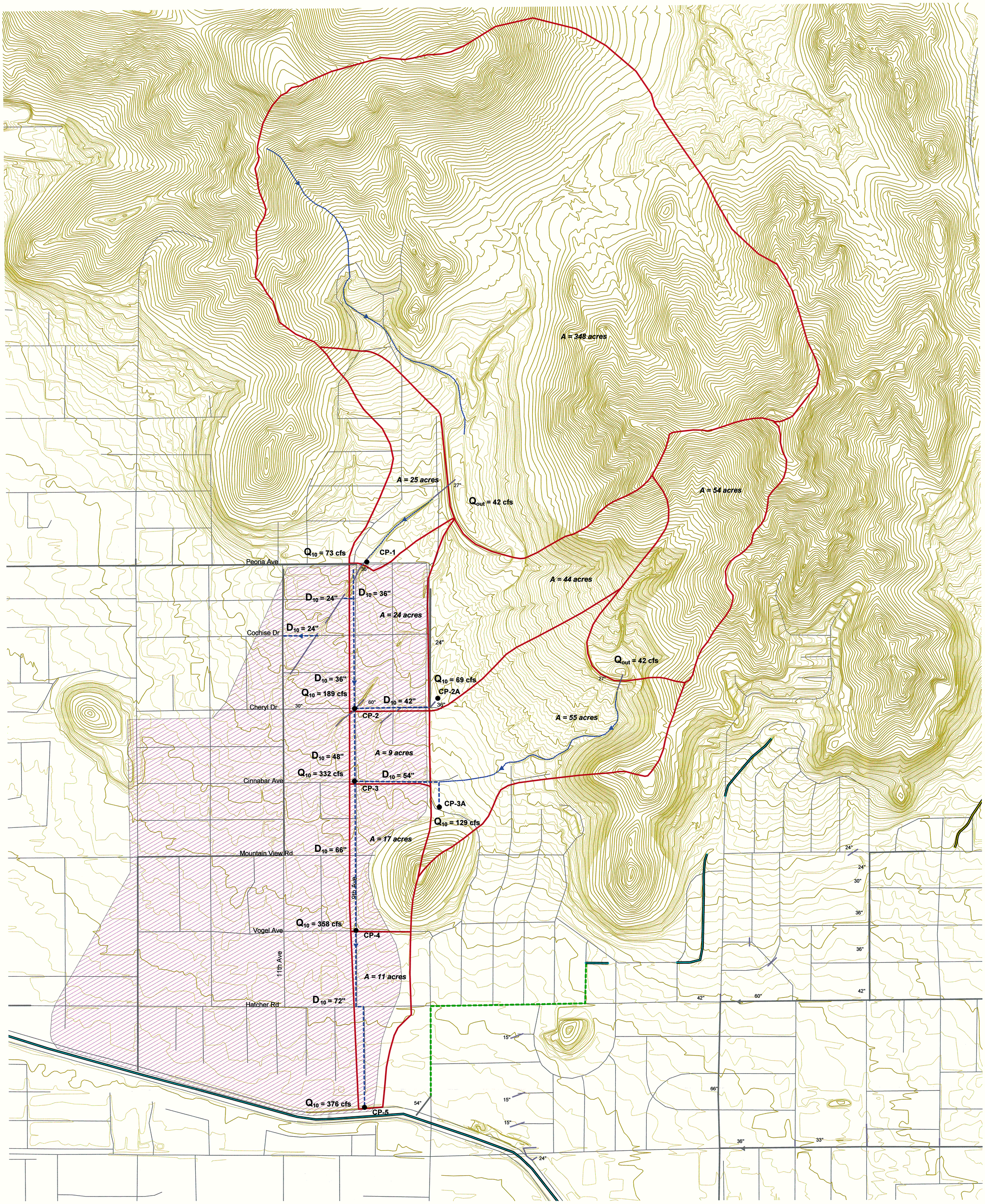
EEC Job Number 303013.01
Contract Number FCD2003C052

Exhibit 3. 17th Ave. Storm Drain

N

1" = 300'

300 0 300 600 Feet



Legend

- 2' Elevation Contour
- Existing Storm Drain
- Storm Drain (under design)
- Wash / Channel
- Culvert / Pipe
- Proposed Storm Drain
- Q_2 2-year Discharge
- D_2 Prposed Diameter for 2-year S.D.
- Q_{cap} Existing Capacity
- Flow Direction
- Drainage Boundary
- Area Protected by Drainage Improvements

Sunnyslope Candidate Assessment Report

EEC Job Number 303013.01
Contract Number FCD2003C052

Exhibit 4. 9th Ave Storm Drain

N

1" = 300'

300 0 300 600 Feet

Sunnyslope Candidate Assessment Report

EEC Job Number 303013.01
Contract Number FCD2003C052

Exhibit 5. 2nd Drive Storm Drain

Legend

- 2' Elevation Contour
- Existing Storm Drain
- Storm Drain (under design)
- Wash / Channel
- Culvert / Pipe
- Drainage Boundary
- Q_{cap} Existing Capacity
- Flow Direction
- Q_{10} 10-year Discharge
- D_{10} Proposed Diameter for 10-year S.D.
- Detention Basin
- Proposed Storm Drain
- Area Protected by Drainage Improvements

N

1" = 200'

200 0 200 400 Feet

27"

A = 87 acres

A = 18 acres

Mountain View Rd 24"

24"

30"

36"

Vogel Ave

36"

Carol Dr

Q_{10} = 195 cfs
CP-2
D_{10} = 48"

CP-1
Q_{10} = 161 cfs

7th Ave

42"

60"

Hatcher Rd

42"

D_{10} = 54"

A = 30 acres

15"

Mission

D_{10} = 60"

15"

15"

2nd Dr

66"

Central Ave

3rd St

Q_{10} = 251 cfs

D_{10} = 66"

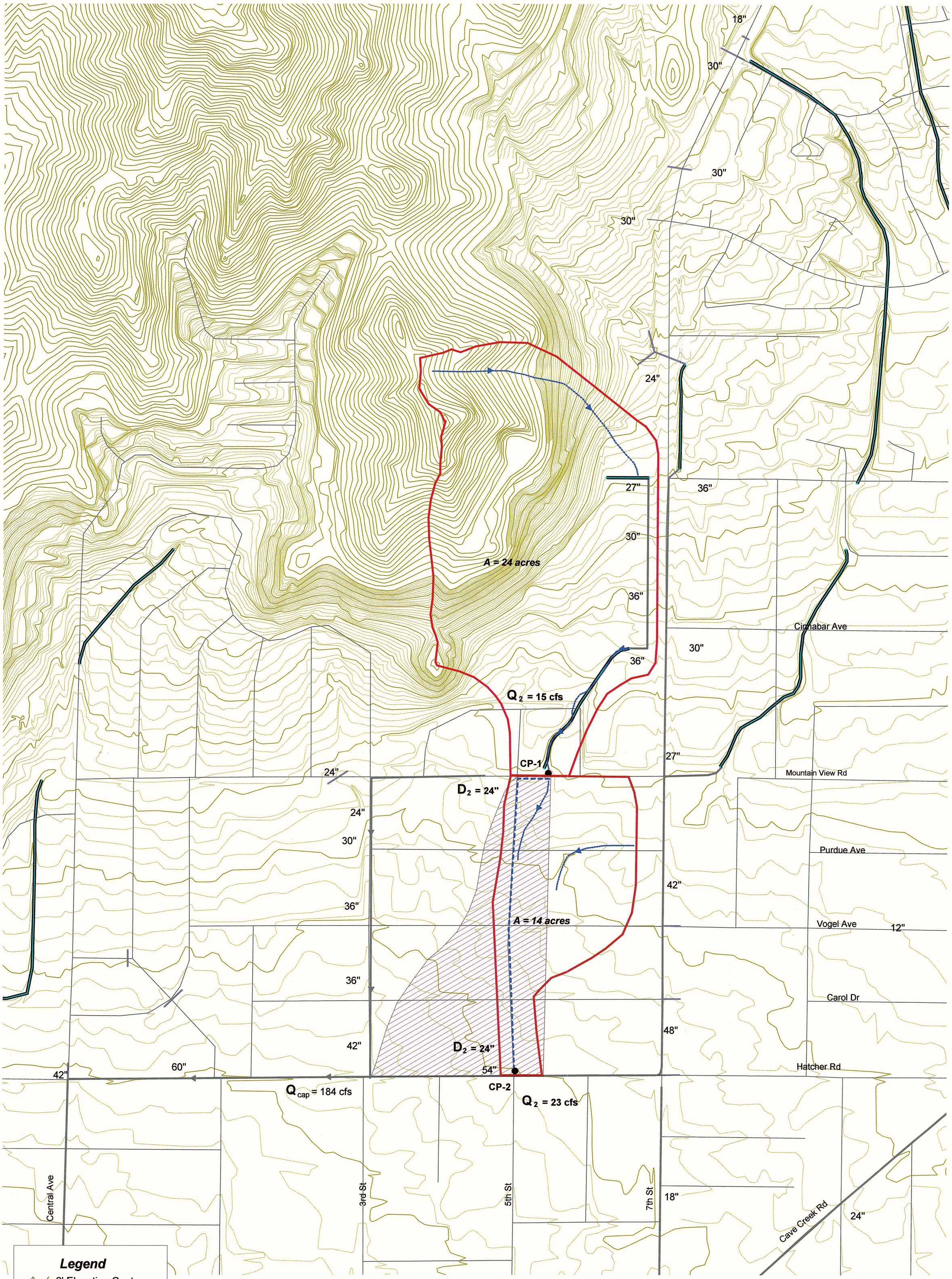
Dunlap Ave

36"

33"

CP-3

24"



Legend

- 2' Elevation Contour
- Existing Storm Drain
- Proposed Storm Drain
- Wash / Channel
- Culvert / Pipe
- Q_2 — 2-year Discharge
- D_2 — Proposed Diameter for 2-year S.D.
- Q_{cap} — Existing Capacity
- Flow Direction
- Drainage Boundary
- Area Protected by Drainage Improvements

Sunnyslope Candidate Assessment Report

EEC Job Number 303013.01
Contract Number FCD2003C052

Exhibit 6. 5th Street Storm Drain

N

1" = 200'

200 0 200 400 Feet

Sunnyslope Candidate Assessment Report

EEC Job Number 303013.01
Contract Number FCD2003C052

Exhibit 7. Mountain View Road Storm Drain

Legend

- 2' Elevation Contour
- Existing Storm Drain
- Storm Drain (under design)
- Wash / Channel
- Culvert / Pipe
- Drainage Boundary
- Q_{cap} Existing Capacity
- Flow Direction
- Q_{10} 10-year Discharge
- D_{10} Proposed Diameter for 10-year S.D.
- Detention Basin
- Proposed Storm Drain
- Area Protected by Drainage Improvements

N

1" = 300'

300 0 300 600 Feet

A = 131 acres

A = 114 acres

Desert Cove Ave

Peoria Ave

Peoria Ave

Cheryl Dr

Brown St

Cinnabar Ave

Mountain View Rd

Vogel Ave

Hatcher Rd

7th St

9th St

10th St

11th St

10th Street Wash

Cave Creek Rd

Q_{10} = 201 cfs
CP-1
129 cfs
72 cfs

D_{10} = 42"

Q_{10} = 376 cfs
CP-2

D_{10} = 42"

D_{10} = 12' x 3' CBC

10th Street Wash

Dunlap