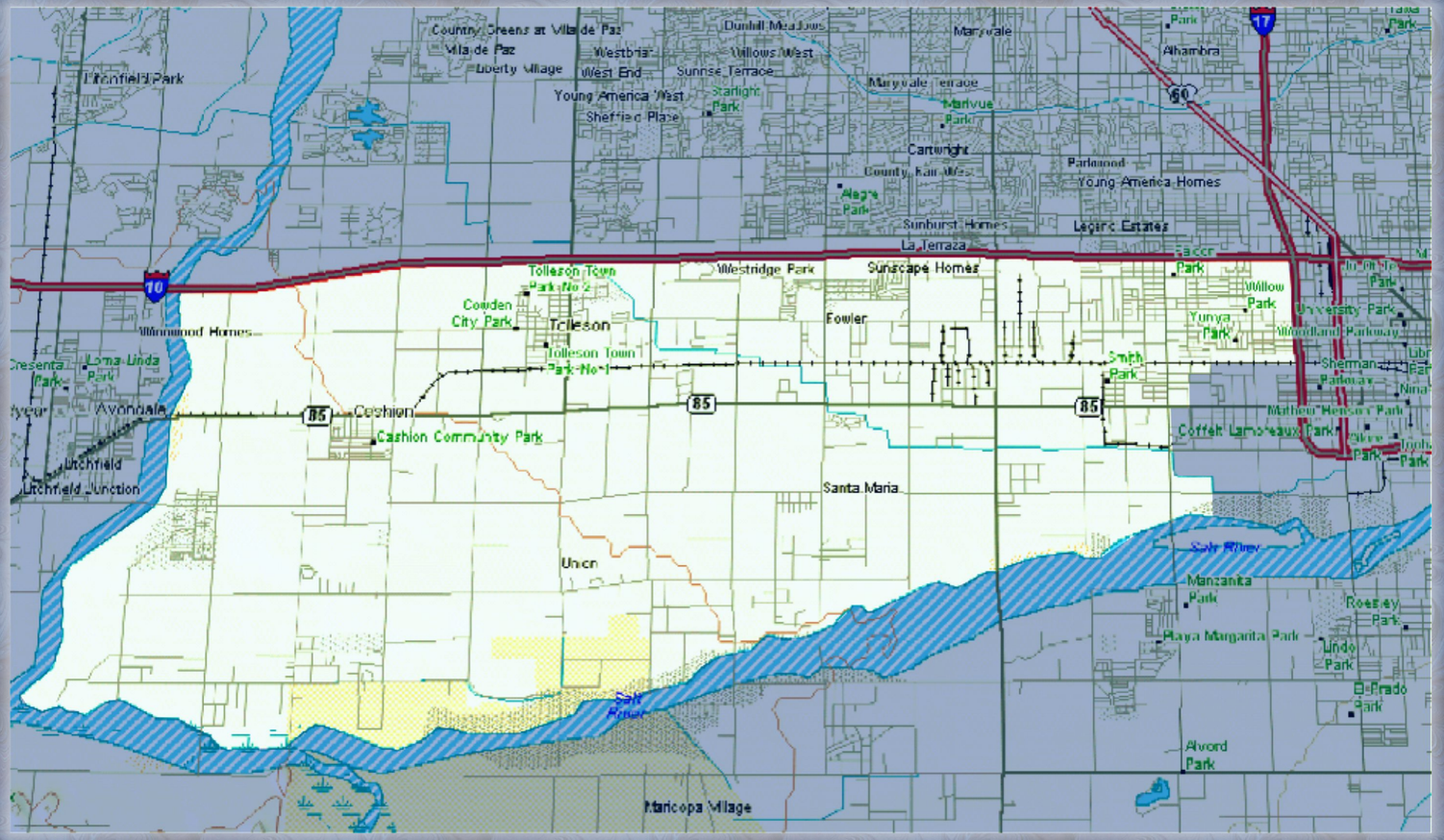
Durango Area Drainage Master Plan
Data Collection Report
FCD #99-41

Prepared for:

Flood Control District of Maricopa County



Prepared by:

DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
Since 1962

In Cooperation With:

McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS

SWCA Inc. Environmental Consultants

March, 2000

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Durango Area Drainage Master Plan
Data Collection Report

I. INTRODUCTION

This Data Collection Report has been prepared for the Flood Control District of Maricopa County (FCDMC) as part of the Durango Area Drainage Master Plan (ADMP). The study location is shown on **Figure I-1**.

A. Purpose

The purpose of the Durango ADMP is to evaluate the existing drainage studies conducted in the *Floodplain Delineation of the Tolleson Area - Hydrology Report*, dated March 24, 1999 which defined the Durango watershed by quantifying the extent of flooding problems. There are two major objectives of the study. The first is to develop a plan to control runoff to prevent flood damage in the watershed. The second is to develop an implementation plan to manage the interim conditions due to discontinuous development in order to preserve the ability to provide protection to lands downstream from 100-year flood events. The plan will develop and identify preliminary costs, alignments, typical sections, right-of-way requirements, utility conflicts, and potential project participants for the preferred alternatives. The study area encompasses approximately 68 square miles which includes the cities of Avondale, Tolleson, and Phoenix, as well as unincorporated Maricopa County as shown on **Figure I-2**. The study area is bounded by the Salt, Gila, and Agua Fria rivers and extends northward to I-10 and eastward to I-17.

The Data Collection Phase of the ADMP includes identifying known flooding locations and collecting data regarding existing and proposed drainage facilities, major natural washes, and existing utilities. The data collection effort also includes identification of planned residential developments, recreational facilities, and environmental issues and opportunities within the study area. The purpose of this Data Collection Report is to describe the data gathering process and to present the findings. Results from this report will be used in later phases of the study.

B. Scope of Project

The scope of work includes professional engineering services necessary for developing an area drainage master plan (ADMP) to identify drainage problems and develop cost effective solutions for a storm water collection and disposal system. The scope of work includes public coordination, document/data review and research, survey and mapping, hydrology, hydraulics, floodplain delineation, identification of drainage problems, development of alternative solutions, cost estimates, and preparation of preliminary design plans based on a preferred alternative.

The project consists of five phases resulting in an implementation plan with estimated costs for a recommended plan to address the drainage issues within the study area. The five project phases are summarized as follows:

Phase	Products
1. Data Collection	Data Collection Report Survey & Mapping
2. Level I Analysis	Potential Alternatives Submittal
3. Level II Analysis	Alternatives Analysis Report
4. Level III Analysis	Recommended Design Report Preliminary Design Plans
5. Implementation	Final Submittal Maintenance Plan

This Data Collection Report is the final product for Phase I of the project.

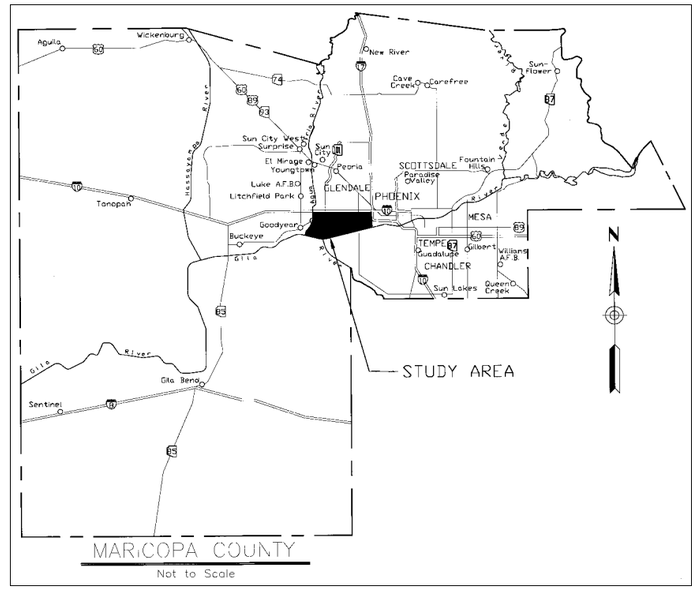


Figure I-1. Study Location

C. Study Area

The study area encompasses approximately 68 square miles bounded by I-10 on the north, I-17 on the east, the Salt and Gila Rivers on the south, and the Agua Fria River on the west. The project area can be generally analyzed in three geographic areas. The study areas are shown on **Figure I-2.**

The ***Northern Study Area*** extends the full width of the study area from the Agua Fria River eastward to I-17 and from I-10 southward to the Southern Pacific Railroad at approximately Buckeye Road. The ***Southwest Study Area*** extends from the Agua Fria River eastward to approximately 83rd Avenue and from the Southern Pacific Railroad southward to the Gila River. The ***Southeast Study Area*** extends from approximately 83rd Avenue eastward to I-17 and from the Southern Pacific Railroad southward to the Salt River.

Dysart Rd
El Mirage Rd
115th Ave
107th Ave
99th Ave
91st Ave
83rd Ave
75th Ave
67th Ave
59 Ave
51st Ave
43rd Ave
35th Ave
27th Ave
I-17 Freeway
I-10 Freeway

NORTH STUDY AREA
Van Buren St
UPRR/SPRR
Buckeye Rd
RID Canal
POWER STATION
NORTH STUDY AREA
RID Canal
PROPOSED SOUTH MOUNTAIN FREEWAY
POWER SUB-STATION

SOUTHWEST STUDY AREA
TOLLESON WWTP
Lower Buckeye Rd
SOUTHEAST STUDY AREA
Buckeye Feeder Canal
Broadway Rd
AVONDALE WWTP
Buckeye Feeder Canal
91ST AVENUE WWTP
Salt River
Southern Ave
Agua Fria River
Gila River

LEGEND
- Phoenix
- Maricopa County
- Tolleson
- Avondale
- Avondale Annexation Limits
- Phoenix Annexation Limits
- Tolleson Annexation Limits
- Geographic Areas

N

2500 0 2500 5000 7500
SCALE IN FEET

FIGURE I-2

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99-41

CONSULTANT:
DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
Since 1962

EXHIBIT TITLE:
JURISDICTIONAL BOUNDARIES

II. DATA COLLECTION RESULTS

A. Existing and Planned Drainage Facilities

Few drainage facilities exist within the study area. The drainage pattern is predominantly overland in a northeast to southwest direction accumulating along the Roosevelt Irrigation District (RID) Canal and along the Southern Pacific Railroad and eventually reaching the Salt and Gila Rivers on the south and the Agua Fria River on the west.

Papago Diversion Channel

The ADOT Papago Diversion Channel runs to the west along the north side of Interstate 10 and defines the north limit of the study area. This channel captures flow from the north and diverts it west to the Agua Fria River. Most of the storm drains from the north tie into the channel, although some pass to the south unintercepted.

Other facilities receive and convey runoff by virtue of the fact that they are within the path of the runoff even though they are not designed for drainage. Existing features that receive runoff are the Buckeye Feeder Canal, and several small Salt River Project (SRP) irrigation ditches along agricultural properties. All of the canals in the project area are designed for irrigation delivery rather than storm drainage. This results in flooding when runoff exceeds the capacity of the canals. Runoff that is intercepted by the railroad embankment makes its way westerly along the face of the embankment. Runoff flowing west along the embankment ponds behind section line roads that have raised profiles to pass over the railroad. The flow breaks out to the south when the ponding elevation exceeds the height of the embankment. None of the cross-roads have culverts of a significant enough size to drain nuisance flows through the roadway embankment.

Agua Fria Levee

The Agua Fria Levee extends from north of Interstate 10 south to Buckeye Road near the Southern Pacific Railroad. The levee is designed to convey the 100 year storm flow in the river without overtopping the banks. Consideration will be given to new outlets for any new drainage improvements planned to discharge into the Agua Fria river.

Holly Acres Levee

The Holly Acres Levee is an existing bank protection project on the Gila River, extending from 113th Avenue downstream to El Mirage Road. The levee was designed to accommodate a flow of 115,000 cubic feet per second (cfs) with three feet of freeboard, however at approximately 100,000 cfs, the river flows over the north bank at 99th Ave and around the Holly Acres Levee. The levee is not in danger of being overtopped since it is outflanked before the river level rises high enough. The outflanking is not likely to cause damage to the levee, as it is armored with stones on both sides.

Tres Rios project

The Tres Rios project is an ongoing project in the Salt/Gila River with an effort to restore critical riparian and wetland habitats that have been lost in the region as a result of water resources development in the Phoenix metropolitan area. The project extends from the 91st Ave wastewater treatment plant to just downstream of the confluence with the Agua Fria River. The project is currently in a feasibility study phase and will identify potential benefits for flood control, including bank protection levees.

All of the existing culverts in the study area are considered insignificant due to their small size and incapacity to convey storm flows during the design event. Therefore the capacities of the existing culverts are not analyzed.

South Mountain Freeway (Loop 202)

The possibility exists for a future Loop 202 Freeway extension to the south, approximately along the 59th Ave alignment, which may block westerly drainage within the study area. It is anticipated that the design for the freeway will include collector channels and basins to intercept the runoff, retain the flows, and drain south to the Salt River. The potential may exist to cooperate with ADOT in developing a new drainage outfall for the area.

B. Areas of Flooding

Areas of flooding within the study area have been delineated as FEMA floodplains along the Salt, Gila, and Agua Fria Rivers, along the upstream embankment of the RID Canal and along the SPRR. Existing FEMA floodplains are shown on **Figure II-1**. Additionally local flooding problems have been reported and are known to exist along the Buckeye Feeder Canal, along 91st Avenue between Interstate 10 and the SPRR, and along Van Buren Street in the vicinity of 95th and 96th Avenues.

Buckeye Feeder Canal

The Buckeye Feeder Canal along 115th Ave is a known flooding area due to the limited capacity of the canal to convey storm water and features within the canal such as culverts which restrict the flow. The Buckeye Feeder Canal floodplain is being delineated as part of this project from the Gila River to 91st Avenue.

91st Avenue

The intersection of 91st Avenue and Van Buren is a known flooding problem due to the inadequate conveyance capacity of 91st Avenue between Van Buren Street and the SPRR. There is an existing SRP irrigation ditch along the east side of 91st Avenue which historically intercepts storm water flows generated east of 91st Avenue. This ditch is not designed for storm flows and the culvert and pipe downstream of Van Buren Street restrict the flow, resulting in ponding and flooding in the direct vicinity of the intersection.

Van Buren Street

In the vicinity of 95th and 96th Avenues, Van Buren Street is a known flooding problem due to ponding in the area. Runoff that accumulates in this area comes from the east on Van Buren Street, from 91st Avenue, and from the subdivisions north of the street. A lack of an existing storm drain system in the street and inadequate roadway slope result in the poor conveyance of storm flows through the area.

C. Existing Studies

Several other studies of this area have been conducted. They include:

1) Floodplain Delineation of the Tolleson Area,

2) Tolleson - SPRR and Van Buren Street at 91st Ave, Candidate Assessment Report,

3) Drainage Concept Report, 115th Ave - Gila River Bridge to MC 85

4) City of Phoenix - Estrella Village Plan,

5) Salt-Gila River Floodplain Delineation Restudy

6) Agua Fria River Floodplain Delineation Restudy

D. Planned Developments

Staff from the various cities have provided information regarding developments, within their respective boundaries, which are currently in the site planning, engineering, or review stages. Planned major developments are illustrated on **Figure II-2 and Figure II-3**. The size and number of these developments are indicators of the pace at which this area is developing.

E. Existing and Planned Major Utilities

The locations of existing and proposed utilities are indicated on the Utility Constraints Map, **Figure II-4 and Figure II-5**. The existing and proposed water and sewer lines information was collected from the Cities of Phoenix, Tolleson, and Avondale. The map also shows the locations of overhead high-voltage transmission lines (115 kV, 230kV, and 500kV), and high-pressure petroleum pipe-line. Additionally a 114" Effluent Line is shown, which delivers treated wastewater from the 91st Avenue wastewater treatment plant to the Palo Verde Nuclear Generating Station to the west of the study area. Fiber Optic facilities are not shown on the utility maps due to the inability to obtain information from sources such as US West Communications, who are unwilling to release the information until the final design stage of a project.

The abundance of wastewater treatment plants and large diameter sewer and water lines in the study area is of particular importance and will be carefully considered along with the other existing and proposed utilities during the design and development of the final alternative drainage solution.

The locations of existing drainage facilities, including major storm drain pipes are indicated on the Existing Drainage Facilities Map, **Figure II-6**. The locations of the major irrigation ditches and canals are indicated on the Existing Irrigation Map, **Figure II-7**.

F. Agency Contacts

The following agencies have jurisdiction within the project limits and have been invited to participate in the study process as part of a Review Committee:

- City of Phoenix (COP)
- City of Tolleson
- City of Avondale
- Maricopa County Department of Transportation (MCDOT)
- Maricopa County Recreation Services Department
- Maricopa County Planning and Development Department
- Salt River Project (SRP)
- Roosevelt Irrigation District (RID)

Each of the agencies was contacted during the data collection phase of the project to inform them of the project and obtain pertinent information regarding flooding problems, existing and planned projects, planning constraints, and recreational and environmental opportunities within the project limits. One of the project goals is to identify project participants for cost sharing and environmental enhancement to provide an "environmentally friendly" approach to flood control that provides

multiple use benefits to the community. The results of the agency meetings are summarized in the following sections.

City of Phoenix (COP)

The City of Phoenix occupies the east half of the study area. There is more existing development in this part of the study area than in any other portion. Due to the extent of the development near the Interstate 17 and Interstate 10 freeway interchange, there is little opportunity for drainage improvements in this urbanized area. There are many new subdivisions in the planning and/or construction phase throughout the rest of the City of Phoenix portion of the study area, which are replacing existing agricultural lands, however the major portion of the City of Phoenix in the study area remains agricultural.

The Tres Rios wetlands project resides at the City of Phoenix 91st Ave wastewater treatment plant and may affect the outfall locations of drainage improvements in the vicinity. The City is receptive to recreational projects such as trails and parks in conjunction with a flood control project.

City of Tolleson

The City of Tolleson is familiar with the objectives of the study, based on the outcome of the previous study *Floodplain Delineation of the Tolleson Area* and the *Candidate Assessment Report for Tolleson - SPRR, Van Buren Street at 91st Ave*, which identified local drainage problems and potential solutions. The City does not have an existing storm drainage system although there are some catch basins which have drain connections into the Salt River Project irrigation system. New developments in the City of Tolleson are required to retain the 100 year, 6 hour storm runoff, and are also required to accept the runoff from existing adjacent properties. There is currently no city wide drainage master plan. The city is receptive to drainage improvements and combined recreation opportunities, although funding for projects has been an issue with residents in the past.

There are several known flooding problems in the downtown area of Tolleson, along the railroad, along the Roosevelt Irrigation District canal and northwest of 91st Ave and the railroad in a vegetable processing area. There are only a few public works projects currently planned in the City of Tolleson. The widening of 91st Ave is a street improvement project which also includes putting one of the main SRP irrigation ditches into a pipe, and possibly building a regional retention basin to handle storm runoff.

City of Avondale

The City of Avondale occupies or will soon be annexing the west third of the study area, and is quickly developing with new residential and commercial projects. More than 37 projects are currently in the planning, permit, or construction phase. The only major drainage structures in the City of Avondale are the levee pipes into the Agua Fria River. Some of the known flooding problems in the City are along 115th Ave north of the railroad, 115th Ave between Broadway and Southern, and the Rio Vista and Las Ligas neighborhoods which are at low points behind the levee, and along Van Buren Street. The City indicated that approximately 200 cfs flows in the vicinity of the east bridge approach of Van Buren Street out to the Agua Fria River.

The City of Avondale is actively participating in the Tres Rios Greenway and desires to have a blanket agreement to improve and landscape the areas behind the levee on the Agua Fria River. The City is receptive to cooperating on opportunities to provide recreation facilities in conjunction with flood control projects. There are some large existing easements in the City for the major overhead power transmission lines which cross through the study area. Some of the easements are not used and will be considered for trails and recreation opportunities as part of a flood control project.

Maricopa County Department of Transportation (MCDOT)

The Maricopa County Department of Transportation is mainly involved in the study area as far as transportation improvements are concerned and how they relate to or affect any drainage improvements. Currently there are five projects in the planning or construction phase, none of which will have any major impacts on drainage in the study area. Two of these projects include the 59th Ave crossing of the Salt River and the improvements of 115th Ave. The 115th Ave improvements include a culvert under the roadway at the Southern Pacific Railroad crossing.

The County is also preparing to construct two small bridges over the Buckeye Feeder Canal on Chamber and Rosier Streets off of 115th Ave. These bridges will be considered in selecting the preferred alternative for the Buckeye Feeder Canal.

Maricopa County Recreation Services Department

The Maricopa County Recreation Services Department is responsible for preserving and maintaining parks on Maricopa County lands. Most of the County parks are several thousand acres in size, as they do not participate much in the development of local and regional parks. The County is receptive to participating in the “El Rio” project, which is a downstream continuation of the Tres Rios project, and includes river restoration, flood control, and recreational opportunities. A County trail

system, called the Sun Circle Trail, has been under development for several years along with a more recent proposal for a larger trail preliminarily called the Maricopa County Trail. Consideration will be given to combining parts of the proposed trail systems to new flood control projects as much as is feasible.

Maricopa County Planning and Development Department

The Maricopa County Planning and Development Department is associated with lands not yet annexed by one of the three cities in the study area. All development, rezoning, industrial expansion, and special use permits in these non-annexed areas, are reviewed by the County. The County Planning and Development Department is not active in pursuing a partnership for future drainage improvements and recreational opportunities or cost-sharing opportunities for a flood control project.

Salt River Project (SRP)

Salt River Project owns and operates the majority of the canals and irrigation ditches in the study area. The Buckeye Feeder Canal is a tailwater ditch that delivers a minimum of 40 cubic feet per second (cfs) of flow to the Buckeye Irrigation district west of the Agua Fria River. The Buckeye Feeder Canal is highly susceptible to overtopping and flooding the surrounding area during storm conditions, especially along 115th Ave, due to it's alignment in a natural drainage flow path, and the constrictions in the canal such as culverts and bends in alignment. Transferring the irrigation water in the Buckeye Feeder Canal to a piped delivery system is one possible solution according to SRP, however silt and mud entering the pipe from agricultural fields will have to be considered.

Other known flooding problems that SRP has encountered include 91st Ave between Interstate 10 and the SPRR and the areas of 99th Ave and Southern Ave, 107th Ave and Lower Buckeye Road, and the overtopping of irrigation laterals at 67th Ave and the Salt River.

SRP generally prefers not to share their maintenance access roads for use as a public trail due to liability and daily maintenance access concerns. Another study area issue for SRP is that local on-site retention doesn't always work, and storm water ends up in the irrigation ditches which overtop and cause downstream flooding.

Roosevelt Irrigation District (RID)

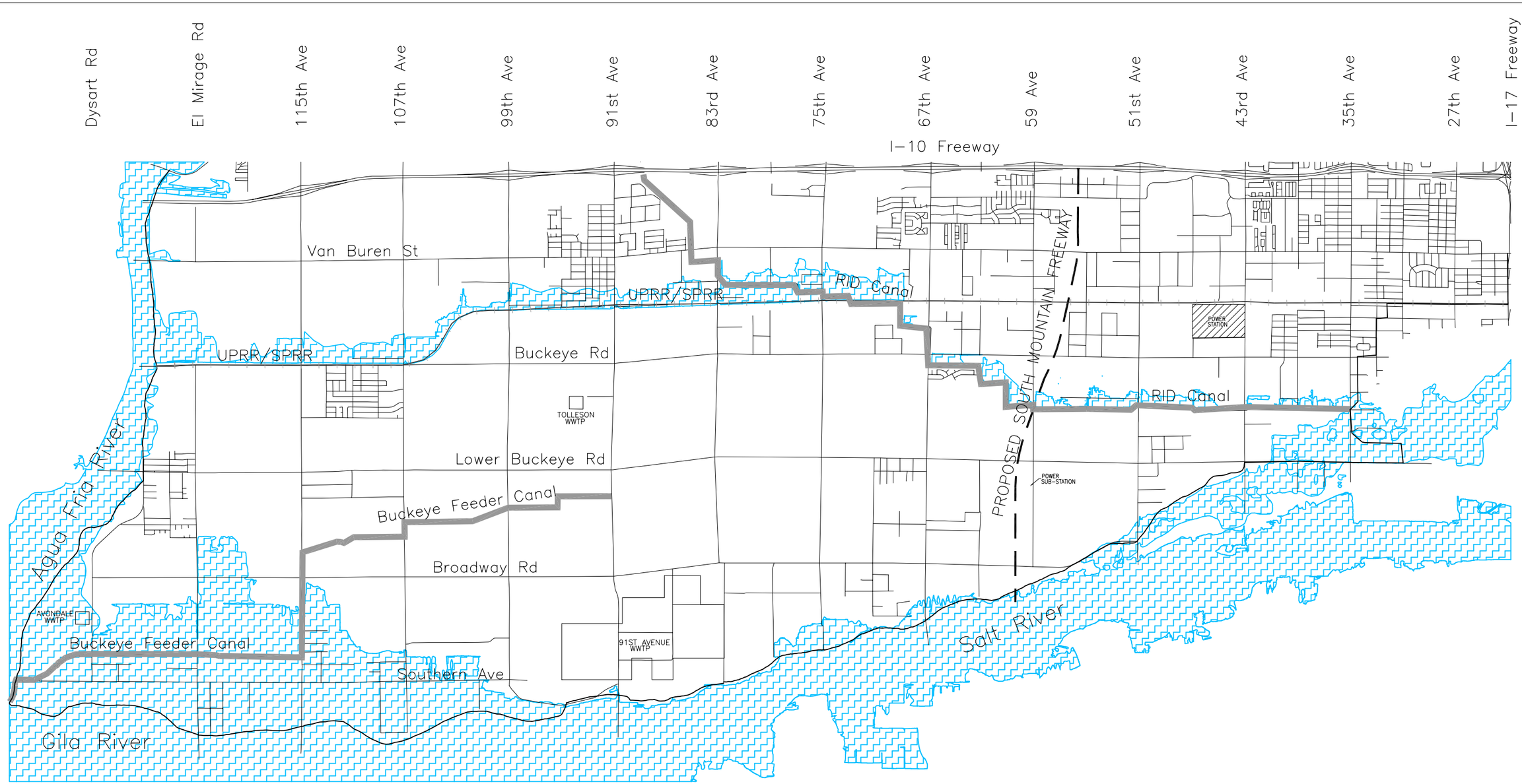
The Roosevelt Irrigation District owns and operates the main Roosevelt Irrigation District canal which is an open cut canal, and several smaller lateral canals such as the Salt Canal which are mostly piped underground and deliver groundwater from well-pump fields within the study area. The main concern and emphasis of the RID for the study, will be coordination so as not to conflict with existing pipes and canals. The RID generally does not favor multi-use opportunities such as trails on their maintenance access roads, due to liability and operational maintenance concerns. All of the RID access roads are marked as "No Trespassing" because the canals are stocked with fish for weed and algae control and fishing in the canals is not permitted. Specific concerns and agreements with the RID will need to be addressed during the alternatives analysis.

The RID also does not favor using their canals to dispose of excess storm water, as they receive no benefit from it and there may be pollutants in the storm water causing issues further downstream.

The only flooding problems known to the RID are the areas of 67th Ave and 75th Ave at the main canal, which is due to the elevated embankment of the canal.

G. Survey and Mapping

The Flood Control District has had aerial photography flown for this project in January 1999. The study area has been reflown in January 2000 for the purpose of developing a new color aerial photograph. Previous aerial mapping was performed in the study area as part of the Maryvale Area Drainage Master Study, flown April 21, 1994. There is existing ground survey of certain features of the study area, such as the Buckeye Feeder Canal, which was prepared by SRP. The existing survey data will be correlated to the project datum and used as part of this study. Additionally, new survey has been performed for this project on the Buckeye Feeder Canal and the Southern Pacific Railroad.



LEGEND

EXISTING FEMA FLOODPLAIN

N

2500 0 2500 5000 7500

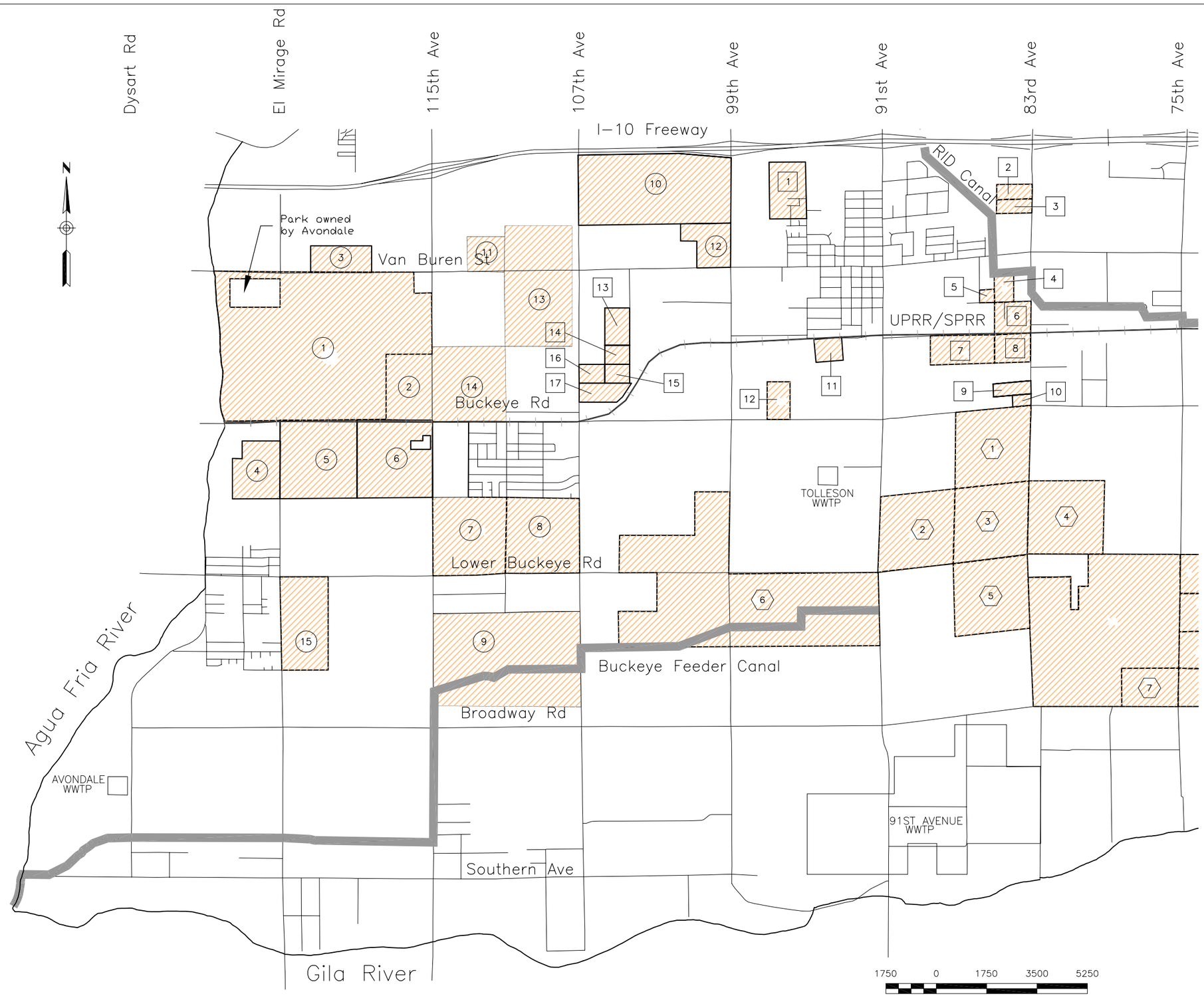
SCALE IN FEET

FIGURE II-1

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99-41

CONSULTANT:
DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
Since 1962

EXHIBIT TITLE:
EXISTING FEMA FLOODPLAINS



Planned Developments

PHOENIX

1. 83rd & Buckeye
2. 91st Ave. & Lower Buckeye
3. Heritage Point
4. Sundance Ranch
5. 83rd & Lower Buckeye
6. Country Place
7. Estrella Village Manor

AVONDALE

1. Coldwater Springs/Golf Course
2. Coldwater Ranch
3. Highland Ranch
4. Diamond Ridge
5. Cambridge Estates
6. Coldwater Springs Phase II
7. Durango Park
8. The Sanctuary at Avondale
9. Shadow Ridge
10. Avondale Crossing-Auto Mall
11. Waterford Square
12. Fiesta Travel Plaza
13. Anderson 300 acres
14. CW Ranch
15. 73 EL Mirage Properties

TOLLESON

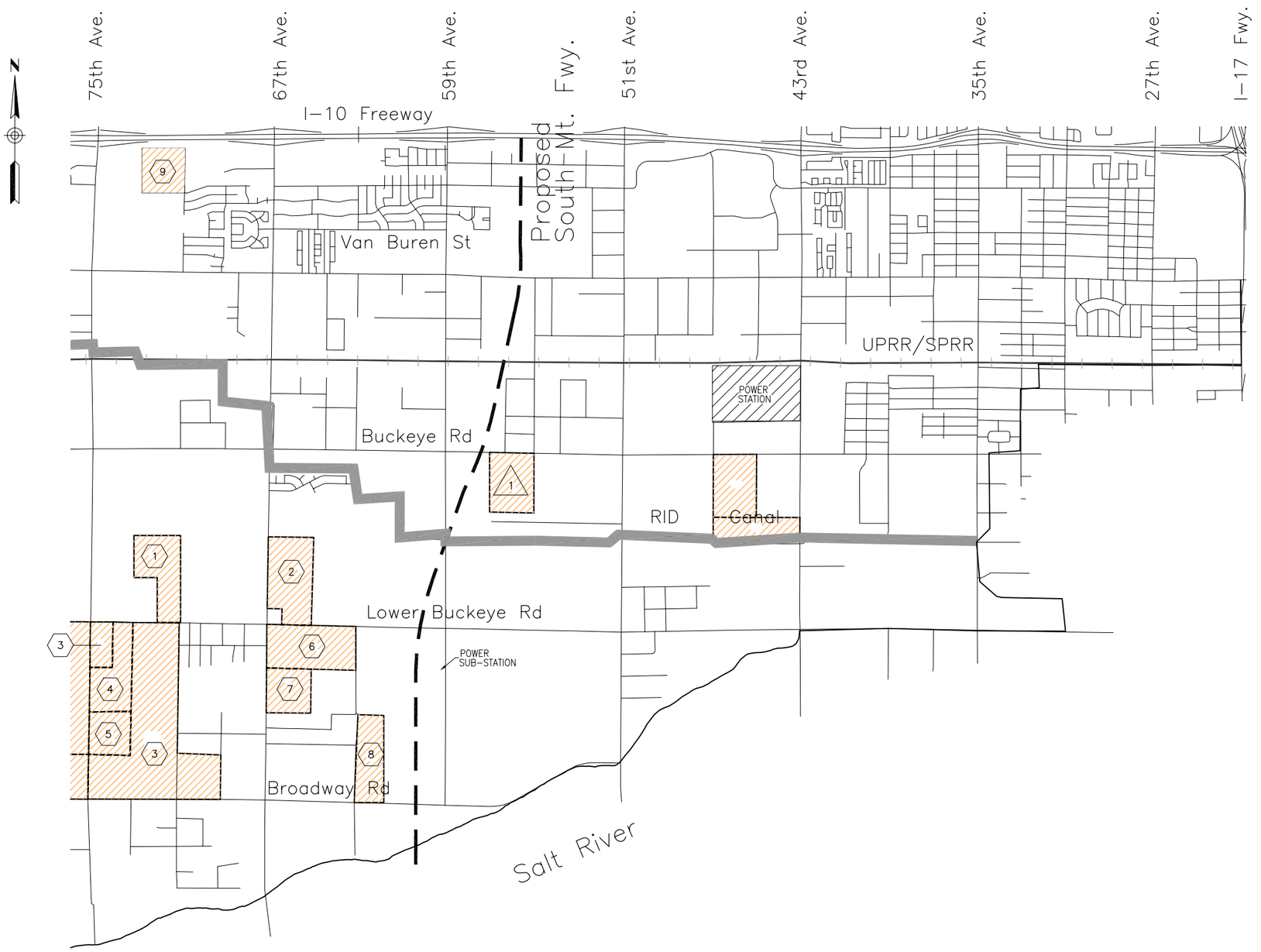
1. Freightlines of Az.
2. Ryan West Bldg.
3. Cardinal Health Distributor
4. Landis Plastics
5. Barlow Distributing
6. Opus Phase I & II
7. Costco Warehouse
8. Willamette Industries
9. Transpacific Dist. Center
10. Convenience Store
11. MBCI/DBCI Expansion
12. Mesa Cold Storage
13. Quaker Oats Warehouse
14. States Logistics Warehouse
15. Elm Manufacturing
16. Utility Trailer Sales
17. Roads West Truck Depot

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99-41

CONSULTANT:
DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
Since 1962

EXHIBIT TITLE:
PLANNED DEVELOPMENTS
Sheet 1 of 2

FIGURE II-2



1750 0 1750 3500 5250

SCALE IN FEET

Planned Developments

PHOENIX

1. Mountain View West
2. 67TH & Lower Buckeye
3. Sienna Vista
4. Suncrest
5. Marbella
6. Meadow
7. Estrella Manor
8. Rio Del Ray
9. Arnon Distribution Center

MARICOPA COUNTY

1. Knight Transportation

FIGURE II-3

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99-41

CONSULTANT:
DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
Since 1962

EXHIBIT TITLE:
PLANNED DEVELOPMENTS
Sheet 2 of 2

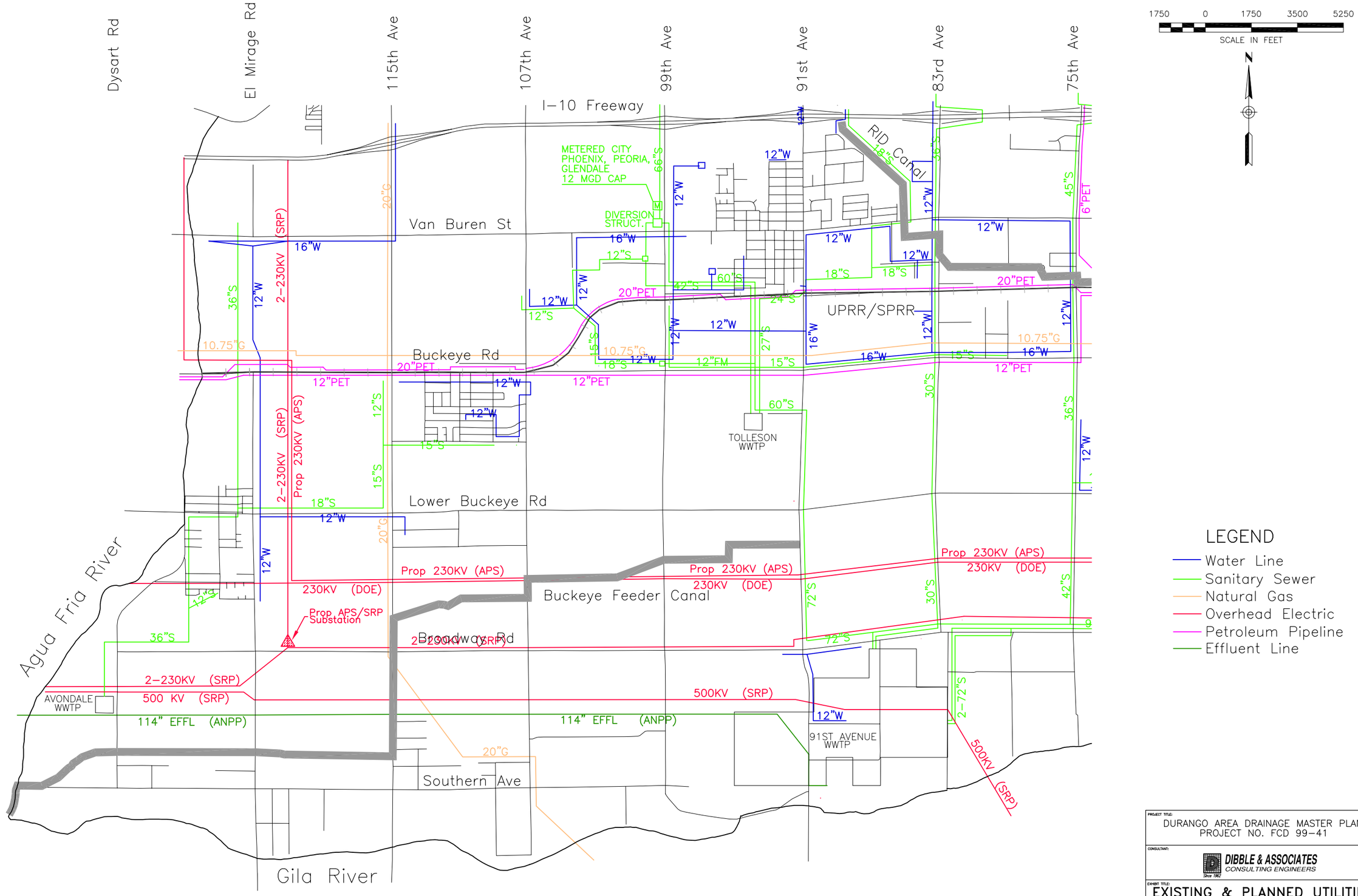
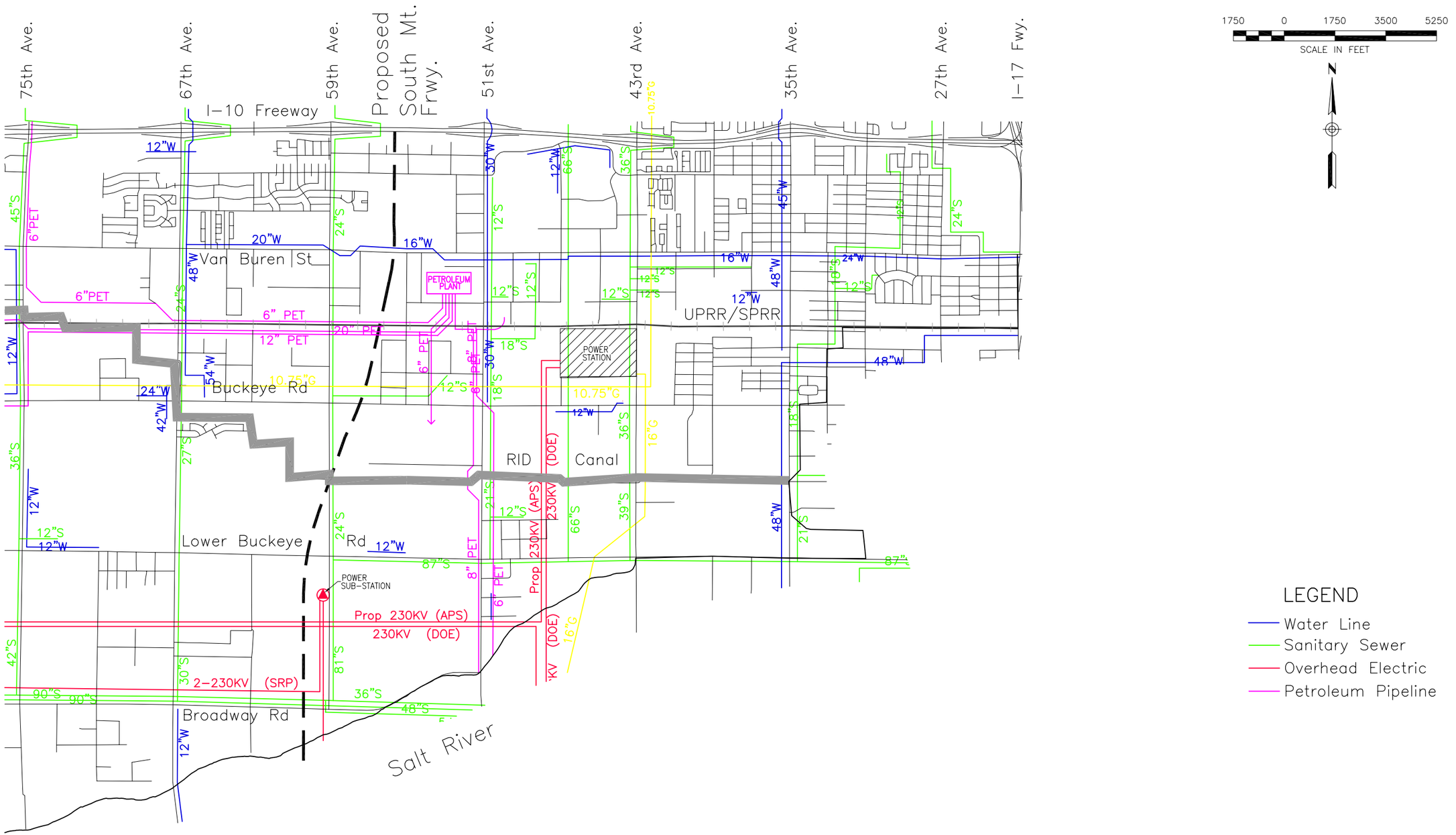


FIGURE II-4

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99-41

CONSULTANT:
DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
Since 1967

EXHIBIT TITLE:
EXISTING & PLANNED UTILITIES
Sheet 1 of 2



LEGEND

- Water Line
- Sanitary Sewer
- Overhead Electric
- Petroleum Pipeline

FIGURE II-5

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99-41

CONSULTANT:
DIBBLE & ASSOCIATES
CONSULTING ENGINEERS

EXHIBIT TITLE:
EXISTING & PLANNED UTILITIES
Sheet 2 of 2

Dysart Rd
El Mirage Rd
115th Ave
107th Ave
99th Ave
91st Ave
83rd Ave
75th Ave
67th Ave
59 Ave
51st Ave
43rd Ave
35th Ave
27th Ave
I-17 Freeway

Papago Diversion Channel
2-15'x10' CBC
I-10 Freeway
Van Buren St
UPRR/SPRR
UPRR/SPRR
RID Canal
Buckeye Rd
TOLLESON WWTP
PROPOSED SOUTH MOUNTAIN FREEWAY
POWER STATION
RID Canal
Lower Buckeye Rd
POWER SUB-STATION
Agua Fria River
Buckeye Feeder Canal
Broadway Rd
AVONDALE WWTP
Buckeye Feeder Canal
91ST AVENUE WWTP
Salt River
Southern Ave
Gila River

LEGEND
36" Storm Drain
Flow Direction
Papago Diversion Channel

N
2500 0 2500 5000 7500
SCALE IN FEET

FIGURE II-6

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99-41

CONSULTANT:
DIBBLE & ASSOCIATES
CONSULTING ENGINEERS

EXHIBIT TITLE:
EXISTING DRAINAGE FACILITIES

Dysart Rd
El Mirage Rd
115th Ave
107th Ave
99th Ave
91st Ave
83rd Ave
75th Ave
67th Ave
59 Ave
51st Ave
43rd Ave
35th Ave
27th Ave
I-17 Freeway
I-10 Freeway
Van Buren St
UPRR/SPRR
Buckeye Rd
Lower Buckeye Rd
Salt Canal
RID Canal
PROPOSED SOUTH MOUNTAIN FREEWAY
POWER STATION
POWER SUB-STATION
TOLLESON WWTP
Agua Fria River
Buckeye Feeder Canal
Broadway Rd
AVONDALE WWTP
91ST AVENUE WWTP
Southern Ave
Salt River
Gila River
40 MINIMUM

LEGEND

25 CFS — Irrigation Laterals

N

2500 0 2500 5000 7500
SCALE IN FEET

FIGURE II-7

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99-41

CONSULTANT:
DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
Since 1962

EXHIBIT TITLE:
IRRIGATION MAP

III. INITIAL HYDROLOGY REPORT

A. Introduction

The hydrology for this study was developed based on hydrology from the *Floodplain Delineation of the Tolleson Area* (Project FCD 95-26) and modified to reflect changes in land-use and routing which have occurred since the original study. The reader is encouraged to read the above mentioned Hydrology Report to become familiar with the development of the model.

The watershed limits have remained unchanged since the original study. The approximate watershed limits are Interstate 10 on the north, the Salt & Gila Rivers on the south, Interstate 17 on the east and the Agua Fria River on the west. The direction of runoff is generally from the northeast to the southwest. The watershed is characterized by a large amount of agricultural land with increasing amounts of residential and industrial development continuing to take place. As a result, overland flow is the predominant flow condition.

B. Hydrology Model Update

The U.S. Army Corps of Engineers, *HEC-1 Flood Hydrograph Package* (HEC-1) computer program was used to develop this model. Guidance is given in the *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology* (DDM1) for application of the HEC-1 program within Maricopa County. Additionally, the computer program *Drainage Design Menu System* (DDMS), developed by the District, was used to modify land use parameters which have changed due to development. Features within the DDMS used for this study include *Computation of Precipitation Frequency-Duration Values in the Western United States* (PREFRE) and *Maricopa County Unit Hydrograph Procedure 2* (MCUHP2).

Point precipitation rainfall values are taken from NOAA Atlas II, Volume VIII. The PREFRE program included with the DDMS was used in conjunction with the precipitation isopluvial maps contained in the DDM1. Four storm events were evaluated for this study. They include the 10 and 100-year events each having a 6- and 24-hour duration. The rainfall values for each is given as:

10-yr, 6-hr	10-yr, 24-hr	100-yr, 6-hr	100-yr, 24-hr
2.06"	2.47"	3.23"	3.99"

Rainfall losses due to soil types have remained unchanged since the original study. However, because of rapid development, losses due to land use must be revised. For the purpose of this study, the land use was modified based on aerial photographs and field reconnaissance. The current land use is shown on **Figure III-1**. Any revisions noted for a given subbasin were coded into the DDMS and new loss parameters generated. Printouts of these revised subbasins can be found in the **Appendix**.

C. Modeling Results, Discrepancies, & Concerns

Results from the modeling effort are summarized in the **Appendix** as a Storm Comparison Table which shows peak flows and the time of peak, at each HEC-1 step, for the four storm events. The sub-basin boundaries and schematic routing diagram are shown on **Exhibit 1** and **2** in an envelope also in the Appendix.

Two of the revised sub-basins had significant changes in peak discharge as a result of the update. Sub-basins VB and JC produced peak discharges that are approximately one-half the previous values. The change is due to a large percentage of the drainage area changing from a “Crops” land use designation with a “wet” moisture condition to “Light Industrial” and “Low Density Residential” with a “Normal” moisture condition. The remaining 26 revised sub-basins had changes in peak discharge within 10% of the original peak discharge. The cause of the significant change in peak discharge resulting from changing “Crops” to other land uses should be investigated. The change could have a significant impact on fully developed condition peak discharges within the study area.

Proposed South Mountain Freeway

At this time the effects on drainage of the South Mountain Freeway are not considered in the hydrology model. According to the *Drainage Design Concept Report for the Southwest Loop Highway* (September, 1988), construction of this Freeway will require several modifications and improvements to the drainage features in the area. These improvements include channels, storm drains and detention basins – none of which are included in the model.

Stage Storage routing at Holly Acres

Currently, the hydrology model ignores the effects of the Holly Acres Levee. Runoff generated from subbasins AB, AC, and AD is routed

directly into the Gila River without any concern for ponding behind the Levee. Additionally, ponded water is likely to reach a point where it would overtop El Mirage Road, 107th and, 115th Avenues and continue toward the west.

Retention

While the landuse parameters have been changed to account for rainfall losses, the question arises as to the issue of on-site retention. Has retention been adequately addressed for these new developments, both commercial and residential? While DDMS does adjust parameters for percent impervious area (RTIMP), no consideration is provided for losses due to retention.

Planned Model Revisions

This *Initial Drainage Report* is the starting point for a "living" document that will evolve over the course of the project resulting in a *Final Drainage Report* at the end of the project. The issues just presented were reviewed in a meeting with the FCDMC on March 15, 2000. The following modifications will be made to the model during the next project phase:

1. The existing conditions land use will be reviewed in more detail using color aerial photography taken February 15, 2000. For purposes of this study, the February 15 photography will be the basis of "existing conditions."

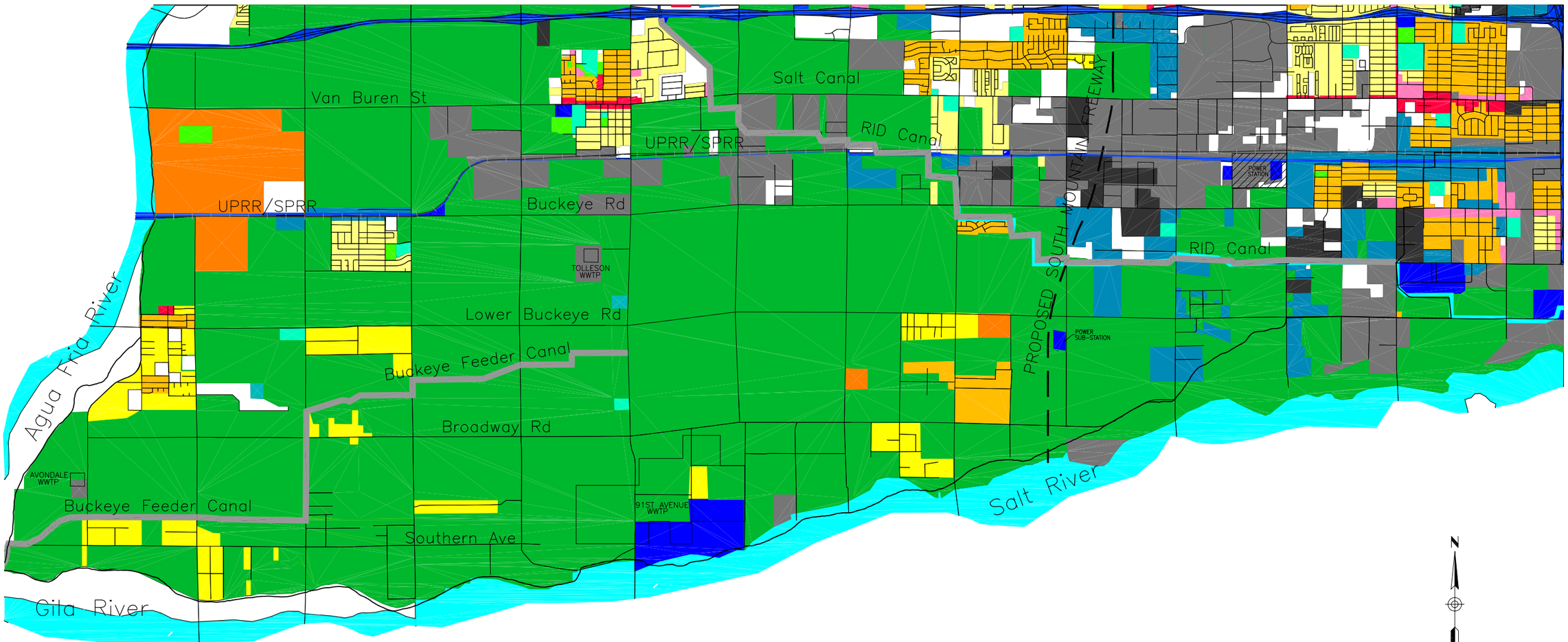
2. Based on the land use review, sub-basin boundaries may be revised to accurately model differences in land use and to more accurately model certain areas within the watershed for master plan purposes.

3. The hydrologic routing parameters will be revised along the Buckeye Feeder Canal to more accurately depict the channelized flow conditions within the Canal.

4. Large area retention basins constructed with recent development will be incorporated into the model to the extent that their existence and volume can be verified.

5. Ponding of runoff behind the Holly Acres levee will be added to the model by preparing a stage-storage relationship from the project mapping.

Dysart Rd
El Mirage Rd
115th Ave
107th Ave
99th Ave
91st Ave
83rd Ave
75th Ave
67th Ave
59 Ave
51st Ave
43rd Ave
35th Ave
27th Ave
I–17 Freeway
I–10 Freeway



LANDUSE LEGEND

- Agriculture
- Commercial Warehouse
- Developing Residential
- Freeway or Canal
- General Industrial
- Light Industrial
- High Density Residential
- Medium Density Residential
- Low Density Residential
- Institutional – Public Facility
- Institutional – Religious
- Institutional – School
- Low Intensity Commercial
- Medium Intensity Commercial
- Mobile Home or RV Park
- Park
- Power Station
- Railroads or Railyard
- River
- Vacant

N

2500 0 2500 5000 7500

SCALE IN FEET

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99–41

CONSULTANT:
DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
Since 1962

EXHIBIT TITLE:
EXISTING LAND USE

FIGURE III–1

IV. LANDSCAPE AESTHETICS & MULTI-USE OPPORTUNITIES

A. Introduction

As an integral part of the Data Collection phase for the Durango Area Drainage Master Plan, the Landscape Aesthetic and Multi-Use Analysis will form the basis for the development of flood control alternatives which will best integrate, enhance, and preserve the community character of the Durango Study Area as well as maximize multiple use opportunities.

B. Purpose

The purpose of the Landscape Aesthetics and Multi-Use Opportunities Assessment is to:

- Research, identify, describe, document, and evaluate the existing and desired future features and characteristics of the study area.
- Identify potential opportunities for flood control facility layouts and design themes which may either preserve, enhance, or create a desired community character.
- Identify potential opportunities to maximize multi-use opportunities.
- Develop specific rating criteria by which proposed flood control facility alternatives for this area can be evaluated and compared. Alternatives will be evaluated and rated with regards to consistency with desired future character, and the extent to which opportunities to improve landscape aesthetics are captured, and valued aesthetic features are protected and or enhanced.

C. Methodology

The methodology used to compile data pertinent to the landscape aesthetics and multi-use opportunities assessment has involved a combination of collecting and review of existing plans, reports, aerial photographs, and mapping; meetings with agencies and stakeholders, and field reconnaissance of the study area.

The data collection effort has consisted of the following tasks to date:

1. Review and analysis of the existing black and white aerial photography of the study area provided by the Flood Control District
2. Review of G.I.S. land use information provided by the Flood Control District
3. Review of topographic information of the study area provided by the Flood Control District
4. Review of existing plans, maps, and reports provided by agencies and the Flood Control District
   - The Estrella Village Plan
   - The Estrella Village Multi-Purpose Trail Plan
   - The Estrella Village Arterial Street Landscaping Program
   - Site plans for proposed developments within the City of Phoenix
   - Draft South Mountain Parkway Specific Plan - June 1999
   - Maricopa County Flood Control Structures Map - November 1998
   - Tolleson General Plan - 1996
   - Candidate Assessment Report - Tolleson - SPRR and Van Buren Street at 91st Avenue - August 1999
   - West Valley Recreation Corridor Design Concept Report - June 1999
   - Sun Circle Trail Map
   - Tres Rios River Management Plan - Steering Committee Summary Report and Consensus Plan - September 1998
   - City of Avondale Proposed/Planned Developments Exhibit
   - City of Avondale Tres Rios Greenway Specific Plan - November 1996, June 1997
   - City of Avondale General Plan - Gruen Associates
5. Meetings and consultation with agencies including Maricopa County Recreation Services(James Host), Maricopa County Department of Planning and Development Department (Neil Urban), City of Phoenix (Cindy White and Christine Hood), 91st Avenue WWTP / Tres Rios (Roland Wass), City of Avondale (Scott Ziprich), City of Tolleson (Woodrow Scoutten), Salt River Project (Steven Tanis), Roosevelt Irrigation District (Stan Ashby), and Maricopa County Department of Transportation (Mike Smith)
6. Site visits. Our field inventory was conducted by means of a “windshield survey” of the study area as viewed from major streets. The information presented herein represents a reconnaissance level inventory and general assessment of the

study area. More detailed information for specific areas will be collected as alternatives are developed and refined.

In addition to the Data Collection which has already taken place, public sensing via Public (Neighborhood), Committee and Agency (Project Stakeholders and Special Interest Groups) meetings will be an ongoing process through the course of the study. There are two Public Neighborhood Meetings each at two different locations within the study area and three Review Committee Meetings scheduled over the course of the study. An Aesthetic Advisory Committee consisting of landscape architects, a developer, engineers, and other planning and design professionals has also been assembled to offer ideas and provide aesthetic input at each phase of the project. The Aesthetic Advisory Committee is scheduled to meet just prior to each of the Review Committee meetings. Questionaires will be developed for Public Meetings and meeting notes prepared from Committee and Agency Workshops and Meetings to document input. Input received will be used to generate ideas, designate and refine desired future community goals and character as well as to document feedback and response regarding proposed alternatives and themes.

Information derived from the above tasks has formed the basis for the narrative and graphic depictions included herein.

D. Data Collection and Existing Conditions Analysis

Regional Context

The Durango Study Area is located in the southwest portion of the Phoenix metropolitan area. (**Figure IV-1**). The area is physically bounded by the I-10 Papago Freeway to the north, the I-17 Black Canyon Freeway to the east, the Salt and Gila Rivers to the south, and the Agua Fria River to the west. The study area encompasses portions of unincorporated Maricopa County as well as the Cities of Phoenix, Tolleson, and Avondale. All three cities extend beyond the boundaries of the study area - Tolleson to the north, Avondale to the west and northwest and Phoenix to the north, east, and southeast. Other adjacent communities include the Gila River Indian Community and Town of Laveen immediately to the south of the Salt River and somewhat more distant is Goodyear to the west and Litchfield Park to the northwest.

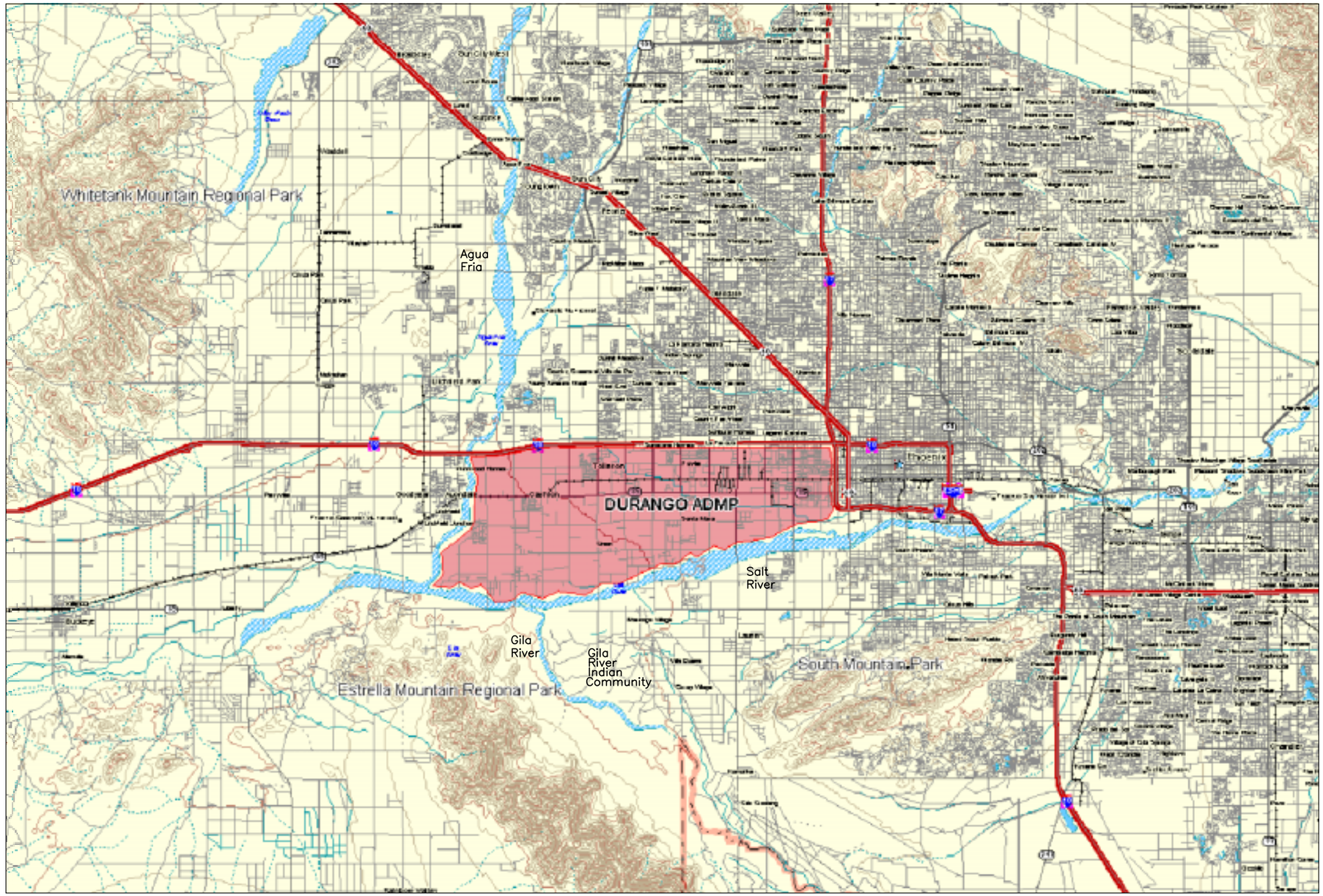
Within the region, views of three mountain ranges strongly influence the character of the Durango Area. They include the White Tank Mountains to the northwest, the Estrella Mountains to the south and southwest, and South Mountain to the southeast. Views of the White Tank Mountains and South Mountain are more distant while the views of the Estrellas which span the south side of the study area are relatively close up and form a dominant presence in the Durango Study Area.

Study Area Overview

Land Use

The north and east portions of the Durango Study Area represent the majority of existing development with primary land uses consisting of industrial, residential, and some commercial uses, schools, and parks. The southwest two thirds of the area is currently agriculture and includes both cultivated crops and livestock areas. The area is rapidly being developed with industrial development filling in open areas to the north and along the railroad corridor and residential development presently occurring and planned for the agricultural areas in the southwest area.

One unique feature of the study area relating to land use is the existence of major municipal public works facilities within and adjacent to the Study Area. There are three waste water treatment plants witin the bounds of the study area including the Avondale Water Treatment Plant, the Tolleson Water Treatment Plant, and the City of Phoenix's 91st Avenue Water Treatment Plant. Just outside the bounds of the study area but certainly a visible presence along the southeast boundary is the 27th Avenue Landfill**.** Also nearby to the east of the study area limits is Phoenix's 23rd Avenue Wastewater Treatment Facility, and Maricpa County's Durango Complex.



0 3 MILE

NORTH

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99-41

CONSULTANT:
McCloskey ♦ Peltz, Inc.
LANDSCAPE ARCHITECTS

EXHIBIT TITLE:
REGIONAL CONTEXT

FIGURE IV-1

Transportation

The I-10 Papago Freeway and the I-17 Black Canyon Freeway are both limited access highways which form the boundaries of the study area. The I-17 Black Canyon Freeway, the east boundary is a depressed freeway section with interchanges in the vicinity of Grant Street and Adams Street. The I-10 transitions from an elevated freeway section at the east side of the study area at 27th Avenue to a depressed section from 35th Avenue to 91st Avenue and then west of 91st Avenue the freeway transitions back to an elevated section. Exits to the study area occur at 35th, 43rd, 51st, 59th, 67th, 75th, 83rd, 91st, 99th, and 115th Avenues. In addition there is a Park'n'Ride Lot located at the 79th Avenue off ramp.

Other major roadways within the study area tie into the regional and metropolitan roadway system with their general layout being on a one mile grid. Major east-west routes are Southern, Broadway, Lower Buckeye, Buckeye (State Route 85 - regional connector to California) and Van Buren. Major north south routes are 27th, 35th, 43rd, 51st, 59th, 67th, 75th, 83rd, 91st, 99th, 107th, 115th, and El Mirage Roads.

There is also a proposed South Mountain Freeway alignment which traverses the Durango Study Area in the vicinity of 59th and 51st Avenues. This planned Freeway section incorporates parkway enhancement, landscape enhancement, and multi-use recreational trails into the design. This freeway section is currently unfunded.

The Southern Pacific Railroad forms an east west corridor. The railroad line is located between Buckeye Road and Van Buren Street from the east boundary of the study area to approximately one half mile west of 99th Avenue where the line turns to the south and follows the north side of the Buckeye Road alignment to a bridge over the Agua Fria on the west boundary of the study area. The existence of the railroad line and its spurs has been a major factor in the development and growth of industrial land use in this area.

Topography / Land Form

The Durango Study Area is relatively flat with a general slope towards the south and west. There is no significant land form within the study area itself however subtle changes of grade are evident in some locations. A low area exists in the southwest corner of the study area. The flat terrain of the Durango area itself provides a sharp contrast to the dramatic topography of the adjacent Estrella Mountains.

Some specific features within the study area display a grade differential from surrounding lands. The Southern Pacific Railroad and Buckeye Feeder Canal are both elevated linear features and are typically approximately three to four feet above adjacent areas.

Vegetation

The majority of the Durango Study Area represents a landscape which has been heavily modified by man. Very little of the natural vegetation is in evidence. In many areas such as along the Salt and Gila Rivers the Salt Cedar has become established and is dominant. Some pockets of the native Cottonwood Willow plant association can be seen in the flood plain and low areas of the Salt and Gila Rivers and adjacent areas. Similarly, there are only a few remote upland areas with characteristic Desert Scrub landscapes - Mesquite, Palo Verde, Saltbush, and Bursage.

The agricultural areas are sparsely vegetated if at all other than the various crops themselves. Concentrations of larger trees of mixed varieties are typically found only at the homestead locations. There are however a few instances such as the area around 91st Avenue and Lower Buckeye where formal continuous wind rows of Pecan Trees edge the crop areas. These large mature canopy trees form a very distinctive landcape treatment for this area.

Pecan Trees - 91st Avenue and Lower Buckeye

Landscapes in the developed areas are mixed and varied. There is no single dominant theme. Plant palettes include both a "Sonoran Desert Theme" which utilizes more indigenous and arid region, desert variety plant materials such as Mesquite, Palo Verde, and Acacia and a "Mediterranean Theme" which features species such as Bougainvillea, Palms, Oleander, and Ash. Many of the older areas within the study area appear to represent the "Mediterranean theme" while the newer developments typically feature more of a "Sonoran Desert Theme"

History

The prehistory and history of the Durango Study area is rich and varied. With its proximity to the rivers and relatively flat topography, the area has proven to be conducive to the development of early townships which eventually has led to a number of significant historical innovations. The area has featured Hohokam civilizations, early agriculture, early canals, irrigation and water companies, homesteaders, early surveyors,

construction of early railways and highways, WWI era cotton production and WWII era defense plants. See Section V of this report for a more detailed prehistorical and historical overview of the Study area. The history of the area has the potential to influence the design in a number of ways including the layout of the facilities; the type, design, and theme of proposed amenities; design details and materials; and by offering numerous subject material for potential public education opportunities.

E. Visual Resources Assessment

The Visual Resources Assessment is based on the evaluation of existing landscape character, scenic quality, visual integrity, and future desired landscape character for the study area.

Definitions

Landscape Character is expressed in terms of Landscape Character Units. A Landscape Character Unit is an area of land that has common distinguishing visual characteristics. Distinguishing visual characteristics may be natural features such as landform, rock formations, water forms, vegetative patterns or man made / cultural features such as land use, building or structure types, scale and / or density. (**Figure IV-2**)

Scenic quality is defined as the distinctiveness, visual dominance (scale, color, form), or variety of features within an area. Features of high scenic quality are distinctive or unique and should be protected. Opportunities to improve scenic quality represents opportunities to increase variety or enhance landscapes low in diversity. Scenic quality for the project areas is evaluated in relative terms. In analyzing the scenic quality, natural and cultural features are studied taking into consideration the degree of variety or uniqueness of landscape features. (**Figure IV-3).**

Visual integrity is defined as the degree of harmony among the features of an area with regards to line, color, form, texture, landform, vegetation, architectural features, and streetscape. Opportunities to increase visual integrity represents opportunities to harmonize discordant features.

General Assessment

Generally older developed areas within the study area are low in scenic quality and visual integrity. There is low visual interest, little continuity or harmony of elements and no strong unifying elements. These areas are characterized by sparse or no landscaping, large amounts of hardscape, chain link fencing, and lack of screening of objectionable views.

Newer developments with more restrictive landscape requirements have much improved scenic quality and visual integrity, however are not particularly distinctive. Newer developments incorporate a larger percentage of landscape area and typically feature perimeter landscape buffers, screen walls, a unified palette of materials.

Overall agricultural areas are generally medium to high in scenic quality. The open feel of this area is unique and views of the adjacent Estrella Mountains and South Mountains to the south and White Tank Mountains to the north are distinctive and impressive.

River areas have the highest potential for scenic quality as they feature an environment relatively unique to the Sonoran Desert.

Existing Landscape Character Units

Approximately 90-95% of the Durango area represents a landscape which has been modified by operations of man. Other than the rivers, there are generally no distinguishing existing natural features, landforms, or vegetation. Distinguishing characteristics which differentiate one character unit from another in this study area are therefore typically related to the various land uses and related man made elements such as the type, size, density, layout, and scale of buildings and other pavements and structures. The Existing Landscape Character map (**Figure IV-2**) generally delineates the Landscape Character Units within the Durango Study area.

Approximately two thirds of the existing study area is agricultural. The other primary land uses are residential, and industrial. There is also a small amount of commercial, schools, and parks.

Agricultural Character Unit

Description

The Agricultural Character Unit is characterized by large scale wide open spaces, with generally flat topography and a very low density of buildings and structures. Few vertical obstructions allow for very dramatic relatively close up views of the Estrella Mountains and South Mountains to the south and White Tank Mountains to the northwest. The land is geometrically patterned and plots are defined by a grid system of roadways and irrigation canals. Trees are sparse and are typically concentrated around the existing homesteads. The Agricultural character unit includes both areas with cultivated crops and areas with farms which specialize in raising livestock (Dairy farms, horse farms and chicken ranches). The areas are similar however the farms which specialize in raising livestock typically include hay/feed storage and are characterized by more structures, fencing, and railings.

Scenic Quality

The existing scenic quality of the Agricultural Character Unit is medium to high due primarily to the relatively open feeling of these lands and the opportunities it presents to observe the dramatic mountain views. As development rapidly encroaches and more physical obstructions are introduced, viewing opportunities will decrease. Open space is a valuable community resource which contributes to the quality of life. The open feel of these lands is unique and should be preserved. There are however opportunities to improve the scenic quality. Visual elements/features within this character unit reflect a minimal amount of variety or visual interest and may be perceived as monotonous. Preservation of large setbacks and open areas as well as the selective placement of features or landscaping which increases variety will improve the scenic quality.

Visual Integrity

Visual integrity of the Agricultural Character Unit is medium. Generally the character unit is composed of elements which are consistent and harmonious however there are major discordant features consisting of the various overhead power lines which are quite abundant throughout the area as well as some deteriorated irrigation ditches.

Agricultural Character Unit

Residential Character Unit

The Residential Character Unit consists of three subunits designated as Rural Residential, Residential, and Residential Planned Area Development (P.A.D.).

Rural Residential Character Unit

Description

The Rural Residential Character Unit is indicative of low density residential developments within the agricultural lands of the study area. These residences are typically positioned on large relatively spacious flood irrigated lots with adjacent fenced areas containing shade structures or shelters and a variety of livestock and small farm animals. The streetscapes are defined by various styles of fencing and rails, some clusters of vegetation, irrigation ditches and mailboxes. Existing enclosures consist of medium height wood or metal rails or fences. The homes are primarily single story ranch style dwellings of various sizes, styles, and materials - wood frame, block, brick, and stucco. Lot landscaping is also varied and mixed and but often includes turfed areas and trees.

Rural Residential

Scenic Quality

Scenic quality for the Rural Residential Character Unit is rated as medium. In general, form, line, color, texture, and scale of elements represent an average level of variety however the characteristics of this unit are not particularly unique.

Visual Integrity

Visual integrity for the Rural Residential Character Unit is rated as medium. The visual elements/features represent an average level of harmony amongst the parts. Some discordant elements include overhead power lines, chain link fencing in some locations, outdoor unenclosed storage of equipment, materials, and other debris**,** and other elements resulting from lack of property maintenance.

Residential Character Unit

Description

The Residential Character Unit describes the older residential neighborhoods within the study area. Oldest neighborhoods occur east of 43rd Avenue and north of Buckeye. There are also concentrations around 67th Avenue and at 91st Avenue in Tolleson. In many areas, adjacent noncompatible commercial and industrial land uses have intruded upon and negatively impacted these older residential developments. Neighborhoods are typically characterized by a relatively high density of small single family detached WWII era block and wood frame tract homes. There are also trailer parks and manufactured homes in some areas as well. Tract homes and other visual elements within these neighborhoods feature a very plain, simple functional design with little or no architectural detail. The fact that yards are small and there is very little community recreational open space within these neighborhoods has resulted in much of the regular outdoor activity appearing oriented to the street. In an effort to create a sense of security and separation from the street, many lots feature low wall enclosures or chain link fences. Lack of property maintenance has also detracted from the neighborhood image. Landscaping is sparse to medium. There is no consistent streetscape or landscape theme. Visual elements are mixed. There is no consistency in materials or colors.

Residential

Scenic Quality

Scenic quality for the Residential Character Unit is rated as low to medium. The combination of form, line, color and scale of visual elements represents a low level of visual interest. Architectural elements, landscape elements, and streetscape elements do not create a strong neighborhood character.

Visual Integrity

Visual integrity for the Residential Character Unit is also rated as low to medium. Neighborhoods lack a strong unifying element. Features such as chain link fencing lend an institutional feel. Other discordant visual elements have resulted from lack of property maintenance and lack of enclosed storage areas for vehicles and other equipment.

Residential P.A.D. Unit

Description

The Residential P.A.D. Character Unit represents the newer residential developments which reflect more restrictive municipal landscape requirements. These developments are typically walled communities with small to medium sized lots and detached single family dwellings. Plans also feature landscaped frontages and common open space areas many of which also include recreational amenities. Colors and materials consist of variations of earth tone colored/textured block, stucco, and tile. Colors, materials and design details are generally consistent throughout a development and support a particular architectural and landscape theme.

Residential P.A.D.

Residential P.A.D.
Common area open space

Scenic Quality

Scenic quality for the Residential P.A.D. Character Unit is rated as medium. This unit represents an average level of visual element variety however there is nothing that is especially distinctive or unique.

Visual Integrity

Visual Integrity of the Residential P.A.D. Character Unit is inherently medium to high. These areas are typically designed to incorporate colors, textures, materials, and forms which are generally consistent and support a theme. In the new developments commonly overhead power lines have been placed underground to remove them from view.

Industrial Character Unit

The Industrial Character Unit is generally located in the east portion of the Durango study area and along the railroad corridor. This character unit is characterized in general by industrial land uses with relatively large scale building and development. The Industrial Character Unit is comprised of two sub-units designated as Heavy Industrial and Industrial Commerce Park. Although the sub-units may feature a similar land use, character is very different.

Heavy Industrial Unit

Description

The Heavy Industrial Character Unit tends to be associated with the older developed industrial areas east of 51st Avenue. Types of facilities include recycling, manufacturing, sand and gravel operations, a petroleum tank farm, and a power facility. The older heavy industrial developments typically feature extensive outdoor activities and storage. Many of these older facilities have occurred on relatively small parcels and require either large buildings, large areas for maneuvering of vehicles, or large areas for storage of materials leaving minimal areas for landscape buffering or open spaces. Existing open space, landscape buffering and streetscape treatments are minimal or non existant. There is little or no screening of objectionable views such as parking areas, loading docks, or outdoor unenclosed materials. Visually, areas are dominated by overhead power and utility lines, poles**,** chain link fencing with razor wire, dirt, asphalt and other pavements. There is little or no consistency of colors or materials. These areas typically take on quite a gray, drab, appearance with little visual interest.

Heavy Industrial

Scenic Quality

Scenic quality in Heavy Industrial areas is low. There is little variety or visual interest.

Visual Integrity

Visual integrity of Heavy Industrial areas is low. These areas are a collection of discordant elements.

Industrial / Commerce Park Unit

Description

The Industrial / Commerce Park Unit is typified by the newer industrial developments west of 51st Avenue. Like the newer residential developments, the Industrial / Commerce Park Character Unit is reflective of newer more restrictive municipal landscape requirements. Zoning ordinances and municipal landscape and design guidelines place requirements on percentage of landscape area, quantity of plantings, density of vegetative cover, buffering, screening, and architectural features. The new warehouse / distribution center is typical of these developments with large box buildings, landscaped buffers and site perimeter areas, and block wall screening of outdoor activities or storage. Buildings are typically feature light pastel colored bodies with color, texture or architectural feature accents. Colors and materials are generally consistent throughout a development and support a particular theme.

Industrial / Commerce Park

Scenic Quality

Scenic Quality in the Industrial / Commerce Park Unit is rated medium. This unit represents an average level of visual element variety however there is nothing that is especially distinctive or unique.

Visual Integrity

Visual integrity of the Industrial / Commerce Park Character Unit is inherently medium to high. These areas are typically designed to incorporate colors, textures, materials, and forms which are generally consistent and support a theme. In the new developments it is more common for overhead power lines have been placed underground to remove them from view.

Commercial Character Unit

Description

The Commercial Character Unit comprises a relatively small portion of the study area. Individual commercial sites and strip commercial areas are found primarily in Phoenix along Van Buren between 27th Avenue and 43rd Avenue and in Tolleson from 91st to 99th Avenue. This unit is a mixture of office, retail, service, , and restaurant / fast food establishments. The degree of streetscape elements and landscape buffering varies. In most cases landscape buffers and vegetation is minimal. There is no consistency to design, materials, or colors. Areas represent a collage of unrelated, non unified visual elements.

Scenic Quality

Scenic quality in the Commercial Character Unit is low to medium. There are few elements which create desirable visual interest.

Visual Integrity

Visual integrity of the Commercial Character Unit is low to medium. These areas represent a collection of non unified, non harmonious building and hardscape elements, signage and billboards.

Commercial

Desert Scrub Character Unit

Description

Desert scrub is descriptive of the few existing areas within the project upland area which are relatively natural. The largest area which fits this description is in the area referred to as Cashion. It is located in the area adjacent to the Agua Fria River south of the Southern Pacific Railroad. An overview indicates there are scattered Mesquite trees with saltbush as the predominant shrub. Refer to the ecological assessment for a detailed description of plants found in this vegetation type.

Desert Scrub

Scenic Quality

Scenic quality of the Desert Scrub Character Unit is rated as medium to low. Natural landform and indigenous materials do not reflect a high degree of variety, color, or texture interest.

Visual Integrity

Visual integrity of the Desert Scrub Character Unit is rated as medium. Visual elements are relatively harmonious and consistent.

River Landscape Character Unit

The major natural features which influence the Durango Study Area are the rivers. The river areas offer the greatest opportunities to restore / create distinctive natural environments and desirable animal habitat as has been done in the Tres Rios Constructed Wetland Demonstration Area. Because of modifications made by man such as channelization, levees, introduction of water sources, constructed wetlands, etc. visual conditions and the character of the river areas varies. The River Character Unit is therefore divided into two sub-units - the Salt/Gila River Character Unit and the Agua Fria Character Unit.

Salt / Gila River Character Unit

Description

With the regular source of water from the 91st Avenue WWTP, the Salt / Gila River area is heavily vegetated. Salt cedar has become established and has become dominant in most areas. The native Cottonwood and Willow plant association can be seen in pockets primarily at the confluence of the rivers. As evidenced by the Tres Rios Constructed Wetland Demonstration Area, a desire for this corridor is to clear the Salt Cedar and reestablish the native plant varieties associated with the Willow and Cottonwood association.

Salt River

Tres Rios Constructed Wetland Demonstration Area

Scenic Quality

Scenic quality for the Salt / Gila River Character Unit is rated medium to high. With the presence of water and opportunity to feature river / riparian habitat this represents a natural feature unique to the Sonoran Desert environment. These areas have the greatest potential for high visual quality if modified to open up views and restore natural vegetation and animal habitat.

Visual Integrity

Visual integrity for the Salt / Gila River Character Unit is rated medium**.** Existing debris, the Holly Acres levee, and the dominance of the single species of vegetation (Salt Cedar) represent discordant visual elements.

Agua Fria Character Unit

Description

With no regular source of water, and the effects and form of the FCD river channelization and levee, the existing vegetation along the Agua Fria is sparse and consists of Desert Scrub plant varieties and grasses. The engineered rip rap levee, maintenance access road, and concrete bank stabilization although functional have significantly altered the natural appearance of the river. There does not appear to have been any landscape mitigation done in conjuction with these manmade facilities. As a planned regional trail corridor, visual enhancement of the Agua Fria corridor should be a priority.

(Note: See photo of typical Agua Fria character unit in evaluation of existing Flood Control Facilities)

Scenic Quality

Scenic quality of the Agua Fria Character Unit is rated low to medium. Existing visual conditions do not reflect a high degree of variety, color, or texture interest.

Visual Integrity

Visual integrity of the Agua Fria Character Unit is rated low to medium. The river channelization and levee are discordant visual elements.

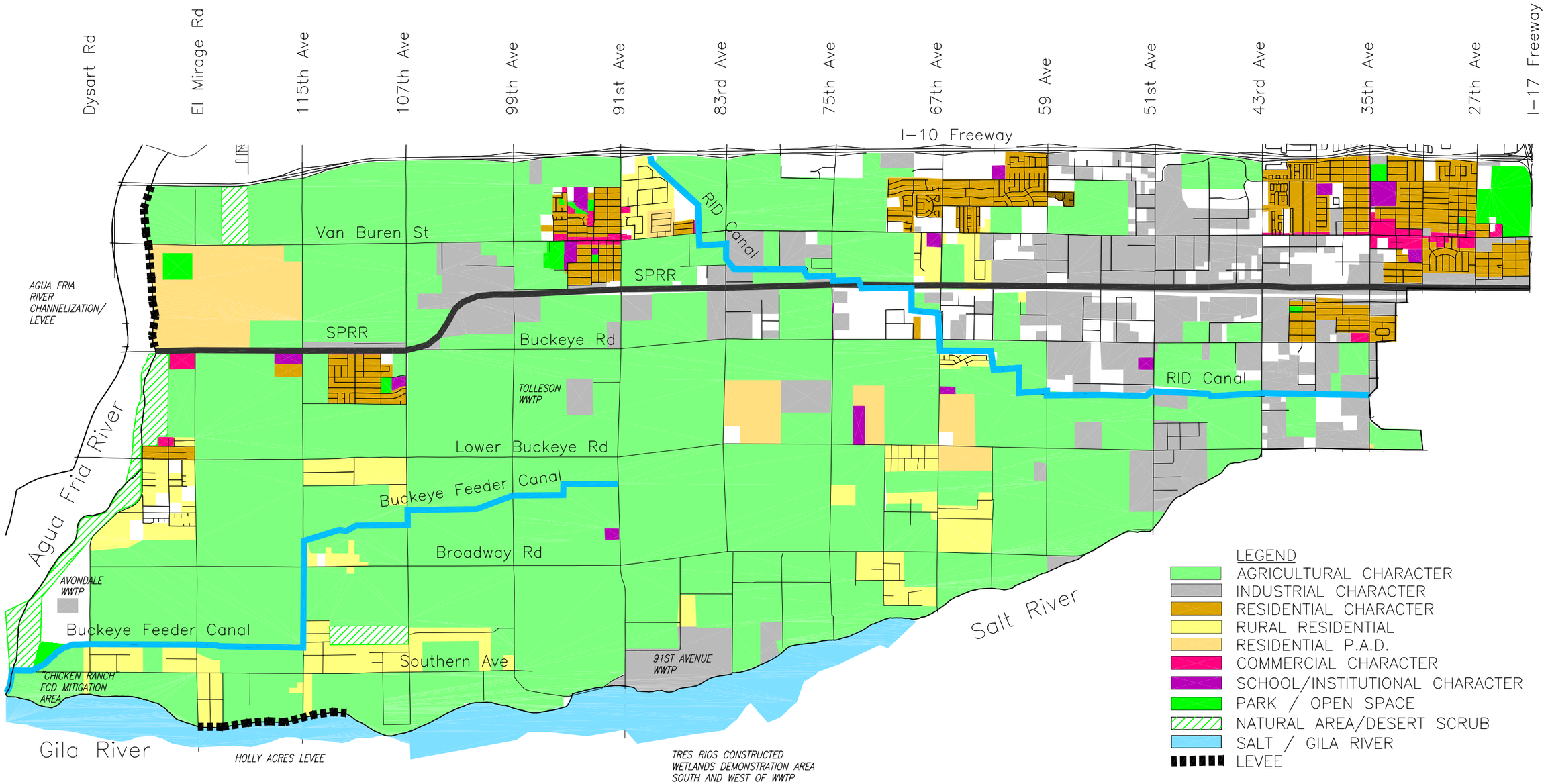


FIGURE IV-2

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99-41

CONSULTANT:
McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS

EXHIBIT TITLE:
EXISTING LANDSCAPE CHARACTER

Dysart Rd
El Mirage Rd
115th Ave
107th Ave
99th Ave
91st Ave
83rd Ave
75th Ave
67th Ave
59 Ave
51st Ave
43rd Ave
35th Ave
27th Ave
I–17 Freeway
I–10 Freeway
Van Buren St
SPRR
SPRR
RID Canal
RID Canal
AGUA FRIA RIVER CHANNELIZATION/ LEVEE
Buckeye Rd
TOLLESON WWTP
Lower Buckeye Rd
Buckeye Feeder Canal
Broadway Rd
Agua Fria River
AVONDALE WWTP
Buckeye Feeder Canal
Southern Ave
91ST AVENUE WWTP
Salt River
"CHICKEN RANCH" FCD MITIGATION AREA
Gila River
HOLLY ACRES LEVEE
TRES RIOS CONSTRUCTED WETLANDS DEMONSTRATION AREA SOUTH AND WEST OF WWTP

LEGEND
LOW SCENIC QUALITY
LOW–MEDIUM SCENIC QUALITY
MEDIUM SCENIC QUALITY
MEDIUM–HIGH SCENIC QUALITY

NORTH

SCALE IN FEET
0 2500 5000

FIGURE IV–3

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99–41

CONSULTANT:
McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS

EXHIBIT TITLE:
SCENIC QUALITY

Assessment of Existing Flood Control District Facilities

Existing Flood Control facilities within the study area include the Agua Fria River Channelization and Levee, the Holly Acres Bank Stabilization and Levee, and the "Chicken Ranch" New River Mitigation Area. No trespassing signs, locked gates, and fencing prohibit public access to the FCD facilities. All three offer potential opportunities for both visual enhancement and multiple uses. As they are all located along or adjacent to the river areas, all are extremely valuable lands and present multi use opportunities for trails and public information / educational displays.

Restricted Public Access

Agua Fria Channelization and Levee - opportunity for needed visual enhancement and multiple uses

Holly Acres Bank Stabilization and Levee - opportunity for needed visual enhancement and multiple uses

"Chicken Ranch" New River Migitation Area - Lack of variety of understory vegetation

Viewing Analysis

There are opportunities for views both into and out of the study area. Mountain views are a dominant visual element in the Durango area. A combination of the Estrella Mountains and South Mountain spans the entire south boundary of the Durango area. The relatively close up view of these mountains can be described as a panoramic view of the entire mountain range as opposed to being directed or focused on a specific object or form. The more distant views of the White Tank Mountains are directed to the northwest. With its flat topography, few vertical obstructions and open character of the agricultural lands in the southwest portion of the study area present the greatest opportunities for unobstructed mountain views. In developed areas, there are vertical obstructions which direct and impact views. Mountain views are either channeled along the north-south roadway corridors or occur over building rooftops.

Estrella Mountain Views

Other viewing opportunities are afforded by elevated structures including the elevated freeway, elevated bridges across the rivers, and elevated canals and river levee areas. There is also one small hill immediately south of the Salt River east of the 115th Avenue Bridge which presents opportunities for views of the Tres Rios area in the foreground with the entire Durango Study area as background.. Selective clearing of heavily vegetated areas along the Salt and Gila Rivers will open up additional viewing opportunities.

Dysart Rd
El Mirage Rd
115th Ave
107th Ave
99th Ave
91st Ave
83rd Ave
75th Ave
67th Ave
59 Ave
51st Ave
43rd Ave
35th Ave
27th Ave
I–17 Freeway
I–10 Freeway
RECHARGE SITE
KAIZU PARK
VIEWS FROM BRIDGES AND TOP OF LEVEE TYP.
AGUA FRIA CHANNELIZATION AND LEVEE
Agua Fria River
Van Buren St
WHITE TANK MOUNTAINS VIEWS
SPRR
RID Canal
Buckeye Rd
TOLLESON WWTP
PECAN TREES
Lower Buckeye Rd
MARICOPA COUNTY DURANGO COMPLEX
LANDFILL
ESTRELLA MOUNTAINS VIEWS
SOUTH MOUNTAINS VIEWS
Broadway Rd
AVONDALE WWTP
"CHICKEN RANCH"
Buckeye Feeder Canal
NATURAL AREA
FCD MITIGATION AREA
Southern Ave
91ST AVENUE WWTP
VIEW FROM BRIDGE
HOLLY ACRES LEVEE AND BANK STABILIZATION
Salt River
TRES RIOS CONSTRUCTED WETLANDS DEMONSTRATION AREA
Gila River
PIR
ESTRELLA REGIONAL PARK
VIEW FROM OFFSITE HILL AND 115TH AVENUE BRIDGE
VIEW FROM BRIDGE

LEGEND

- URBANIZED / DEVELOPED AREA
- RIVER
- SIGNIFICANT VEGETATION
- LEVEE
- MITIGATION AREA
- VIEWING OPPORTUNITY

NORTH

SCALE IN FEET
0 2500 5000

FIGURE IV–4

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99–41

CONSULTANTS:
McCloskey ♦ Peltz, Inc.
LANDSCAPE ARCHITECTS

EXHIBIT TITLE:
VISUAL RESOURCE INVENTORY

Future Desired Landscape Character

A large portion of this study area is designated by the City of Phoenix as the Estrella Village Planning Area. As such, the City has presented a vision for it's development. Primary goals include orderly growth, identifiable community character, strong residential neighborhoods, a variety of homes and employment opportunities, and consistent streetscape and trail linkages. The Estrella Village Plan also features a Village Core which is proposed along the proposed South Mountain Parkway in the vicinity of 59th Avenue. The Village Core is intended to be a "unifying, identifiable" place representative of the Estrella Village character and which features a concentration of services, business, and community facilities. Also associated with the Estrella Village planning area is an arterial street landscaping program which includes a recommended plant list for major streets, designated landscaped village gateways, and a suggested multi use trail plan. This information has been incorporated into **Figures IV-5 and IV-6**

The Future Desired Landscape Character figure depicts the expansion and infill of the two primary land uses - industrial and residential. The industrial character generally expanding and infilling in a corridor along the north side of the study area. The new industrial facilities should exhibit the characteristics of the Industrial / Commerce Park character unit. New residential areas have started to move into agricultural areas and will likely continue to do so. The residential areas will consist of rural residential and P.A. D. Residential. New residential areas will include supporting uses such as schools, parks / open space areas and neighborhood commercial centers. Older residential areas in the northrern portions of the study area are designated for neighborhood revitalization and preservation.

F. Multi-Use Opportunities Assessment

Numerous multi use opportunities exist within this study area and include potential park sites, designated multi use trail corridors, river corridor, the FCD facilities, canals, and transmission corridors. See **Figure IV-6**. Most previous efforts and regional trail systems focusing on this general area have concentrated on developing concepts for the river corridors. This project presents great opportunities to provide not only for the river corridors but to also designate local links to these regional systems as well an opportunity to designate areas for neighborhood, community, and district recreational open spaces / parks to serve existing and future development.

Dysart Rd
El Mirage Rd
115th Ave
107th Ave
99th Ave
91st Ave
83rd Ave
75th Ave
67th Ave
59 Ave
51st Ave
43rd Ave
35th Ave
27th Ave
I–17 Freeway
I–10 Freeway
Van Buren St
SPRR
RID Canal
Buckeye Rd
Lower Buckeye Rd
Buckeye Feeder Canal
Broadway Rd
Southern Ave
Agua Fria River
Gila River
Salt River
c
D

LEGEND
- INDUSTRIAL CHARACTER
- RESIDENTIAL (PRESERVE/RESTORE)
- RURAL/LOW DENSITY RESIDENTIAL
- RESIDENTIAL P.A.D.
- SCHOOL/INSTITUTIONAL CHARACTER
- COMMERCIAL
- PARK / OPEN SPACE
- RIVER
- ESTRELLA VILLAGE PARKWAY THEME – 67TH AVENUE AND LOWER BUCKEYE
- LANDSCAPED ESTRELLA VILLAGE GATEWAY
- PROPOSED SOUTH MOUNTAIN FREEWAY

NORTH

SCALE IN FEET
0 2500 5000

FIGURE IV–5

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99–41

CONSULTANT:
McCloskey ♦ Peltz, Inc.
LANDSCAPE ARCHITECTS

EXHIBIT TITLE:
FUTURE DESIRED LANDSCAPE CHARACTER

Dysart Rd
El Mirage Rd
115th Ave
107th Ave
99th Ave
91st Ave
83rd Ave
75th Ave
67th Ave
59 Ave
51st Ave
43rd Ave
35th Ave
27th Ave
I-17 Freeway

I-10 Freeway

RECHARGE SITE
KAIZU PARK
COLDWATER PARK
Van Buren St
RID Canal
SPRR
SPRR
Buckeye Rd
TOLLESON WWTP
COMMUNITY PARK
RID Canal
MARICOPA COUNTY DURANGO COMPLEX
Agua Fria River
Lower Buckeye Rd
DISTRICT PARK
LANDFILL
FUTURE REGIONAL NODE
Broadway Rd
AVONDALE WWTP
Buckeye Feeder Canal
FCD SITE
Southern Ave
STATE LAND SITE
COMMUNITY PARK
91ST AVENUE WWTP
Salt River
Gila River
PIR
ESTRELLA REGIONAL PARK

PLAN KEY

1. MULTI USE TRAIL ADJACENT TO AGUA FRIA LEVEE
2. EQUESTRIAN TRAIL IN RIVER BOTTOM
3. MULTI USE TRAIL ALIGNMENT PROPOSED BY TOLLESON C.A.R.
4. MULTI USE TRAIL ALIGNMENT PER AVONDALE TRES RIOS REGIONAL OPEN SPACE PLAN
5. LOWER BUCKEYE ROAD / RESIDENTIAL PARKWAY – 8' WIDE BOTH SIDES OF STREET
6. ELWOOD STREET ALIGNMENT (WAPA CORRIDOR) – 10' WIDE
7. BROADWAY ROAD SRP CORRIDOR – 10' WIDE
8. COLLECTOR STREETS – 8' WIDE ONE SIDE OF STREET
9. ROOSEVELT IRRIGATION SYSTEM CANAL – 10' WIDE SOUTH CANAL BANK
10. 67TH AVENUE RESIDENTIAL PARKWAY – 8'-10' WIDE ON EAST SIDE OF STREET
11. SOUTH MOUNTAIN PARKWAY – 10' WIDE TO BE INCORPORATED INTO DESIGN BASED ON SOUTH MOUNTAIN PARKWAY SPECIFIC PLAN
12. 51ST AVENUE – 10' WIDE WEST SIDE OF STREET
13. RIO SALADO TRAIL / SUN CIRCLE REGIONAL TRAIL SYSTEM – WITHIN 50' WIDE CORRIDOR FROM EDGE OF FLOOD PLAIN

LEGEND

POTENTIAL MULTI USE TRAIL

POTENTIAL PARK SITE

NORTH

SCALE IN FEET
0 2500 5000

FIGURE IV-6

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99-41

CONSULTANT:
McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS

EXHIBIT TITLE:
MULTIPLE USE OPPORTUNITIES

V. ENVIRONMENTAL OVERVIEW

A. Ecological Assessment

Introduction

The objectives of this ecological assessment are to identify, evaluate, and map vegetation communities in the Durango drainage area, to determine whether such vegetation communities may support special interest species, and to identify sensitive biological resources. A special interest species is any species of interest to any regulatory or management agency of the federal, state or local government. The list of special interest species considered in this assessment was developed from lists provided by the U.S. Fish and Wildlife Service (FWS) and the Arizona Game and Fish Department (AGFD), included in the **Appendix**.

A reconnaissance survey of vegetation communities in the project area, except for extremely disturbed, industrial, and urbanized portions, was conducted between 20 and 23 December, 1999. The survey was conducted from a vehicle along major roads in the project area, and on foot in and adjacent to the Agua Fria, Gila, and Salt rivers. This ecological assessment is general and does not include comprehensive lists of plant and animal species that may occur in or near, or be affected by the proposed project.

Historical Ecological Conditions

Prehistoric Hohokam inhabited and farmed central Arizona until the 1400s. The Hohokam built an extensive network of hundreds of miles of canals to convey water from the Salt and Gila rivers and delivered it to fields up to 20 miles into the surrounding desert for crop irrigation. The canals measured up to 30 feet wide and 10 feet deep, and were abandoned by the time Father Kino arrived in the late 1600s. Little large-scale irrigation was built until Camp McDowell was established northeast of Phoenix in 1865.

Soon after, the potential for reconstructing the Hohokam irrigation system was recognized and prompted the settlement of Phoenix (Rogge, Keane and McWatters 1994). Rainfall in the Sonoran Desert is unpredictable, and the reliable water source from reservoirs and diversions attracted farmers and ranchers to the area. During the period from 1867 to 1877, eleven or more irrigation canal companies operated while some twenty-one new companies formed (Rogge et al. 1994).

By 1885, the Arizona Diversion Dam was built on the Salt River, and the Arizona Canal was under construction some 25 miles east of Phoenix - representing the first extension of the Hohokam canal network. The Arizona Diversion Dam was replaced with the Granite Reef Diversion, constructed from 1906 to 1908 in conjunction with the Roosevelt Dam. The Lake Pleasant Dam on the Agua Fria River was complete by 1920, and the reservoir was full by 1941. By 1950, 14 dams and diversions were built upstream of the Durango drainage area on the Gila, Agua Fria, Salt, and Verde rivers to reclaim the arid lands of Arizona (Rogge et al. 1994). Such a magnitude of water diversion reduces the natural water table and subsequently changes the composition of vegetation and animal communities.

Local channeling of the Gila, Salt, and Agua Fria rivers predominantly for agricultural purposes likely represents the first major fragmentation of the cottonwood-willow gallery forests along these floodplains. Construction of fences to contain livestock obstructed travel by native wildlife, and diversion of water for mining, livestock, and crops impacted native fish populations (Minckley1991).

Existing Ecological Conditions

Vegetation Communities

Approximately ninety to ninety-five percent of the Durango drainage area has been disturbed as a result of past and current activities related to industrial, urban, and agricultural development. The project area contains three types of communities: highly disturbed, agriculture fields, and Sonoran Desert (**Figure V-1**). The highly disturbed areas in the east portion of the project area have been industrially, commercially, or residentially developed. Agricultural areas are fairly contiguous throughout the central and west portions (**Photo V-1**), while relatively undisturbed areas are chiefly in and adjacent to riverine floodplains (**Photo V-2**). Vegetation in highly disturbed areas, and areas adjacent to agricultural fields, is often dominated by invading species such as Russian thistle (*Salsola kali*) and desert broom (*Baccharis sarothroides*). Urban and industrial areas have relatively little biological resource value for species other than pigeons (*Columba livia*), pests, and vermin, while agricultural areas provide more resources for rodents, granivorous birds, and raptors.

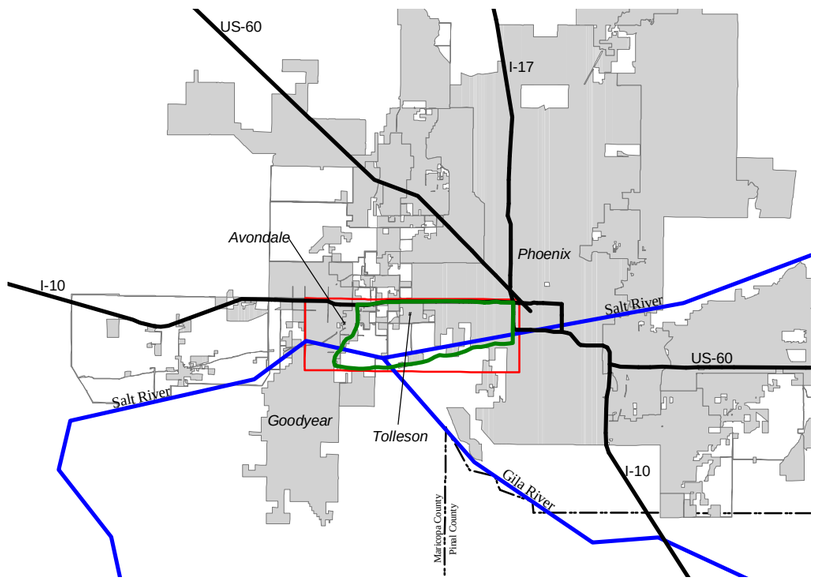
R1W R1E R1E R2E

T1N

A B C D

PROJECT DETAIL

Initial Monument



PROJECT LOCATION

Project Boundary

T1N-R1W
T1N-R1E
T1N-R2E

KEY

- Detention Basin
- Open Channel/Pipe
- D Potential Jurisdictional Area
- Project Boundary
- Floodway/Sonoran Desert
- Agriculture
- Developed (Residential and Industrial)
- # Survey Locations

0 1 2
Miles

N

AZ State Plane Central NAD83
Source: Marciopa County FCD Photography

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99 - 41

CONSULTANT:
SWCA Environmental Consultants

EXHIBIT TITLE:
VEGETATION COMMUNITIES

FIGURE V - 1

Photo V-1. Wetland vegetation and riparian woodland at 115th Avenue and the confluence of the Gila and Salt rivers. Such areas may provide breeding or foraging habitat for special interest species such as Yuma clapper rail, southwester willow flycatcher, western yellow-billed cuckoo, and western least bittern.

Photo V-2. North-northeast view from Van Buren Street and the Agua Fria River. The banks are channelized, and utility structures are located in the riverbed.

Photo V-3. Stabilized banks of the Agua Fria River near Van Buren Street.

The Durango drainage area includes portions of the Agua Fria, Gila, and Salt rivers, as well as the confluences of the Salt and Gila rivers, and the Gila and Agua Fria rivers. Much of the Agua Fria River has been channelized for flood control (**Photo V-3**). Permanent surface water exists along portions of the Gila and Salt rivers. Late succession riparian gallery forest exists in the project area near the confluence of the Gila and Salt rivers and provides potential habitat for several special interest species, and attracts many birds of prey. The Tres Rios constructed wetlands exist along the Salt River beginning at the City of Phoenix 91st Ave Wastewater Treatment Plant, and contain a variety of native and introduced plant and animal species. The effluent is conveyed and recharged to the Salt River. The Tres Rios project supports a diverse array of shore birds, song birds, and raptors, as well as muskrat and beaver. However, native fishes are not likely to occur in the aquatic community at and downstream of Tres Rios, because introduced species such as tilapia (*Tilapia* sp.), mosquitofish (*Gambusia affinis*), sailfin molly (*Poecilia latipinna*), common carp (*Cyprinus carpio*), largemouth bass (*Micropterus salmoides*), and bullfrogs (*Rana catesbiana*) are so abundant that they presumably prey on or outcompete native species (Minckely 1991).

Existing, natural vegetation in the Durango drainage area is characteristic of the Lower Colorado River Valley subdivision of the Sonoran Desertscrub biome (Brown 1994), with various subdivisions and plant associations described below.

Upland Vegetation Types

Sonoran Desertscrub, Lower Colorado River Valley Subdivision. Honey mesquite (*Prosopis glandulosa*), creosote bush (*Larrea tridentata*), and foothill palo verde (*Cercidium microphyllum*) are characteristic species of the Sonoran Desertscrub biome existing in the Durango drainage area. Other common plants include burrobush (*Hymenoclea salsola*), snakeweed (*Gutierrezia sarothrae*), burro weed (*Isocoma acradenia*), various saltbush species (*Atriplex* spp.), brittlebush (*Encelia farinosa*), desert broom (*Baccharis sarothroides*), buckhorn cholla (*Opuntia acanthocarpa*), white bursage (*Ambrosia dumosa*), mallows (*Sphaeralcea* spp.), and desert milkweed (*Asclepias subulata*).

The Lower Colorado River subdivision is drier and hotter than the Arizona Upland subdivision that lies chiefly to the south. Consequently, plant growth is relatively less complex and dense in the Lower Colorado River subdivision. However, the composition of animal species differs little - reptile species are relatively more abundant while bird species are less so.

Aquatic and Riparian Vegetation Types

Aquatic Communities and Wetlands. Both permanent and intermittent aquatic communities exist within the project area along the Salt, Gila, and Agua Fria rivers. Such communities include natural and constructed wetlands. Apparently natural wetland communities exist at,

upstream, and downstream of the confluence of the Gila and Salt rivers at 115th Avenue, and along the Agua Fria River near Highway 85 south to its confluence with the Gila River. The Tres Rios constructed wetlands is located adjacent to the Salt River floodplain at 91st Avenue wastewater treatment plant. Wetland vegetation in and downstream of Tres Rios is patchily distributed and fairly diverse, containing submerged, emergent, and floating vegetation such as cattail (*Typha latifola*), bulrush (*Scirpus* sp.), rushes (*Juncus* spp.), sedges (*Carex* spp.), and reed (*Phragmites* sp.). The artificial wetland contains native and exotic aquatic and riparian vegetation and animals, and is supported by reclaimed wastewater from effluent.

Special interest species that may occur in or use the natural aquatic community within the project area are Yuma clapper rail, great egret, snowy egret, and western least bittern.

Sonoran Riparian Woodland. This community occurs near the edge of the floodplain of the Agua Fria, Salt, and Gila rivers. It is characterized by dense, tall trees and shrubs growing along perennial or intermittent water courses. Typical plants include: Fremont cottonwood (*Populus fremonti*), Goodding willow (*Salix gooddingii*), tree tobacco (*Nicotiana glauca*), seep willow (*Baccharis salicifolia*), and salt cedar (*Tamarix* sp.).

Special interest species that may occur in this vegetation community within the project area are southwestern willow flycatcher, great egret, and western yellow-billed cuckoo.

Sonoran Riparian Scrub. Known also as Xeroriparian[1] Mixed Scrub, this community typically occurs as a linear corridor of sparse to dense shrubs and trees lining washes and growing in floodplains. It often occurs adjacent to Sonoran Interior Strand. Typical plant species include: mesquite, blue palo verde (*Cercidium floridium*), catclaw acacia (*Acacia greggii*), desert willow (*Chilopsis linearis*), tree tobacco, canyon ragweed (*Ambrosia ambrosioides*), desert broom, globe mallow, wolfberry (*Lycium berlandieri*), desert hackberry (*Celtis pallida*), and smoke tree (*Psorothamnus spinosus*). The greater abundance of resources provided by the vegetation increases the value of this and other riparian communities over the adjacent upland community for many species.

Special interest species that may occur in this vegetation community within the project area are Sonoran desert tortoise.

Sonoran Interior Strand. Strand communities are often adjacent to xeroriparian communities and are narrow, but may occasionally be greater than 100 feet wide. Strand communities are typically lined with small trees found in Sonoran Riparian Scrub. Common plants growing in the strand community include burrobrush, desert broom, snakeweed, Russian thistle (*Salsola* sp.), burroweed, canyon ragweed, cocklebur (*Xanthium strumarium*), fluff grass, cheat grass (*Bromus tectorum*), and many other short-lived perennial and annual species.

No special interest species are expected to exclusively occur in this vegetation community within the project area.

[1]Associated with an ephemoral water supply and typically contain plant species also found in upland habitat, although riparian plants are commonly larger and occur at higher densities than those in adjacent uplands.

Special Status Species

Eighteen species are evaluated herein. Thirteen of these species (ten animals and three plants) are listed by the FWS as threatened or endangered in Maricopa County. The remaining five animals are listed by AGFD. While plants protected only by the state of Arizona are also listed by AGFD, the Arizona Department of Agriculture is responsible for administering the Arizona Native Plant Law. A description of regulatory status and protection for each applicable agency follows.

- Federal Threatened and Endangered Species. Species listed or proposed to be listed for protection under the Endangered Species Act (ESA) as endangered, threatened, or candidate. The ESA specifically prohibits the "take" of a listed species. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to engage in any such conduct."[2] The FWS maintains a designation of proposed and listed species known to occur in each Arizona county.

- Wildlife of Special Concern in Arizona. The AGFD formerly listed 116 species as extinct, endangered, threatened, and candidate in Arizona (AGFD 1988). While the terminology used was identical to that used by FWS, the AGFD categories were advisory and provided no legal protection for take of such species or modification of their habitat. The latter points contrasts the FWS list. To avoid confusion, AGFD is currently revising and reissuing their list as "Wildlife of Special Concern in Arizona" without using the terms endangered or threatened. The

[2]Endangered Species Act, Section 3, paragraph 19. Further, 50 CFR § 17.3 defines "harm" as "an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering."

revised list has not yet been officially adopted, but has been published in draft form (AGFD 1996).

- Arizona Native Plant Law species. The Arizona Department of Agriculture (ADA) administers the Arizona Native Plant Law, and AGFD lists the native plants protected under legislation. It is unlawful to collect, transport, or kill native plants without a permit or without following specific regulatory procedures. Projects that disturb native plants on state land must coordinate with ADA and Arizona State Land Department, while projects that disturb native plants on private land must submit a notice of intent to ADA. Exceptions exist for maintenance of existing developed properties less than ten acres, maintenance of existing utilities and their associated rights-of-way,[3] and emergencies.

The following list of special interest species includes a brief life history account, identification of requisite habitat components, and an evaluation of potential for occurrence in the project area. The potential for each special interest species to occur in the project area was based on available literature, direct field observations, and the experience of biologists conducting this assessment. Evaluations of habitat suitability were based on qualitative comparison between the habitat requirements of each species and vegetation communities and other habitat attributes found in the project area, and on available information on the distribution of each species. Biotic communities are described according to Brown (1994).

Federal Threatened and Endangered Species

[3]Telephone conversation with Fred Logan, Arizona Department of Agriculture Native Plant Law officer on 09 December 1998.

Lesser Long-nosed Bat (*Leptonycteris curasoae yurbabuenae*)

Status: Listed endangered without designated critical habitat.

Habitat: Plant communities include palo verde-saguaro associations within desert scrub, semidesert grassland, and oak woodland with nearby caves and abandoned mines, and occasionally buildings for roost sites at elevations below 3,500 feet from April to July, and up to 5,500 feet from July to October (FWS 1998, AGFD 1998a).

Diet: Feeds on pollen and nectar chiefly from agaves and saguaros (AGFD 1996), organ pipe cactus (FWS 1998), and occasionally insects (AGFD 1998a).

Range: Southeastern Arizona, and possibly extreme western Arizona (FWS 1998), chiefly from the Picacho Mountains to the Agua Dulce Mountains and beyond to the southwest, and southeast to the Galiuro and Chiricahua mountains and beyond south into Mexico (AGFD 1998a). Two late summer records of immature individuals exist from the Phoenix area (AGFD 1998a).

Residence: Migratory, arrives in Arizona as early as mid-April, and departs by October. Its temporal association with vegetation communities appears to depend on the flowering periods of preferred food plants.

Assessment: Lesser long-nosed bat may occur occasionally in the project area. Visits would most likely be accidental, represented by individual bats straying up riverine floodplains in the project area during insect foraging bouts.

Sonoran Pronghorn (*Antilocapra americana sonoriensis*)

Status: Listed endangered without designated critical habitat.

Habitat: Occurs chiefly in expansive alluvial basins within Sonoran desert grassland communities in southwestern Arizona (FWS 1998).

Diet: Grasses, cacti, succulents, and bushes (Hoffmeister 1986).

Range: Southwestern Arizona, including western Pima County, southeastern Yuma County, and southwestern Maricopa County (FWS 1998).

Residence: Permanent.

Assessment: Extremely unlikely to occur in the project area. The range of Sonoran pronghorn is far outside the Durango drainage area, which does not contain habitat known to be used by this species.

Bald Eagle (*Haliaeetus leucocephalus*)

Status: Listed threatened without designated critical habitat.

Habitat: Large trees, snags, or cliffs near water for nesting and near major rivers or reservoirs during winter (FWS 1998, AGFD 1997d). Bald eagle has been observed in Arizona at elevations ranging from 460 to 8,000 feet (AGFD 1997d).

Diet: Primarily fish (usually less than six inches long), but waterfowl, small mammals, turtles, snakes, and carrion are also eaten (FWS 1998, AGFD 1997d).

Range: Wintering populations occur in central and northern Arizona at Stoneman Lake, Mormon Lake, and Lake Mary, and a small resident population exists in central Arizona. Territories and nest locations have recently been observed along the Bill Williams River drainage, the

upper and lower Salt and Verde rivers, Roosevelt Lake, the Colorado River, and lakes and reservoirs along the Mogollon Rim and in the White Mountains (AGFD 1997d).

Residence: Occurs in Arizona primarily as a migrant and winter resident, but known nesting sites exist along the Salt, Verde, Gila, Bill Williams, Agua Fria, and San Pedro rivers (FWS 1998).

Assessment: Bald eagle is unlikely to occur in the project area, which does not contain suitable habitat.

Mexican Spotted Owl (*Strix occidentalis lucida*)

Status: Listed threatened without designated critical habitat.

Habitat: Mature and old growth montane forest and woodland, and steep, shady, wooded canyons from 4,500 to 10,000 feet elevation. Populations do not occur in the arid, southwestern portion of Arizona (FWS 1998, AGFD 1998c).

Diet: Chiefly wood rats, but birds, rabbits, and insects are also eaten (AGFD 1998c).

Range: Wide but patchy distribution in montane forests throughout Arizona, except the southwestern portion of the state (FWS 1998, AGFD 1998c).

Residence: Permanent.

Assessment: Mexican spotted owl is extremely unlikely to occur in the Durango drainage area, which at approximately 1,000 feet elevation, does not contain montane forests and is far below the altitudinal range of this owl.

Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*)

Status: Listed endangered with critical habitat designated in Maricopa County along Saguaro and Canyon lakes.

Habitat: Sonoran desertscrub and semidesert grassland communities, sometimes within riparian zones, and nests in saguaro cavities (FWS 1998). Larger native trees also appear to be an important habitat component, especially mature mesquite bosques that are adjacent to broadleaf riparian woodlands or saguaro stands at elevations from 1,300 to 4,000 feet (AGFD 1998d).

Diet: Lizards, invertebrates, and small birds and mammals (AGFD 1998d).

Range: South-central Arizona, chiefly from the Tortolita Mountains south and southeast into Mexico, along the San Pedro River near Dudleyville, and along the Gila and San Francisco rivers in eastern Arizona in Graham and Greenlee counties (AGFD 1998d).

Residence: Permanent.

Assessment: Cactus ferruginous pygmy owl may inhabit the project area, most likely in riparian woodland and xeroriparian communities, including mesquite bosques. Surveys are recommended in areas containing suitable habitat south of Broadway Road and west of 83rd Avenue to determine presence or absence prior to development activities within such communities.

Yuma Clapper Rail (*Rallus longirostris yumaensis*)

Status: Listed endangered without critical habitat.

Habitat: Appears to prefer habitats with wet substrates and dense vegetation greater than 15 inches tall (FWS 1998), including cattail, bulrush, common reed, and tamarisk (AGFD 1997a).

Diet: Crustaceans, insects, frogs, small fish, bird eggs, and plant seeds (AGFD 1997a).

Range: Occurs along the Colorado River from Topock Marsh south into Mexico, along the Bill Williams River drainage, the Gila and Salt rivers upstream to the Verde River confluence (FWS 1998), the Gila River to the Colorado River confluence, and Picacho Reservoir (AGFD 1997a).

Residence: Approximately 70% of Arizona's breeding population is permanent, and the remainder migrates to wintering grounds along the lower Colorado River (AGFD 1997a).

Assessment: Yuma clapper rail may occur regularly in wetland and marsh communities within the project area. Surveys are recommended to determine presence or absence prior to development activities within such communities.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

Status: Listed endangered with critical habitat designated in Maricopa County at Horseshoe Lake.

Habitat: Riparian vegetation along streams, rivers, or other wetlands (Johnson, Haight and Simpson 1987). Pure and mixed stands native and exotic riparian shrubs or trees including willow, cottonwood, box elder, ash, tamarisk (Arizona Partners in Flight 1996), and Russian olive at elevations from 90 to 8,240 feet (AGFD 1997e).

Diet: Chiefly insects, and occasionally berries and seeds (AGFD 1997e).

Range: Breeds locally along the Colorado River's confluence with the Little Colorado River, the headwaters of the Little Colorado River near Greer and Eager, south of Yuma, the middle Gila, Salt, and Verde rivers, the middle to lower San Pedro River, and the upper San Francisco River near Alpine (AGFD 1997e).

Residence: Arrive in late April and begins to nest in late May (Phillips, Marshall and Monson 1964, Unitt 1987). Migrates south in August and September (AGFD 1997e).

Assessment: Southwestern willow flycatcher may occur regularly in suitable habitat (dense riparian woodland) within the project area along the Salt and Agua Fria rivers. Surveys are recommended to determine presence or absence prior to development activities within such communities.

Razorback Sucker (*Xyrauchen texanus*)

Status: Listed endangered with critical habitat designated in Maricopa County at Horseshoe Lake.

Habitat: Slow backwaters of medium and large streams and rivers, and impoundments at least 1 m deep over sand, mud, or gravel substrates at low to intermediate elevations (AGFD 1995a).

Diet: Insect larvae, plankton, algae, and detritus (AGFD 1995a).

Range: Small, isolated populations exist in the lower Colorado River south of Lake Havasu (FWS 1998), and in Horseshoe Reservoir in Maricopa County (See **Appendix**).

Residence: Permanent.

Assessment: Razorback sucker is extremely unlikely to occur in the project area, chiefly because the species is rare, and the adverse impacts known to exist by exotic fishes on native fishes. Reintroductions into the Gila and Salt rivers have apparently failed and are currently ongoing only in the Verde River. Populations are known to occur only in the Verde and Colorado rivers.

Gila Topminnow (*Poeciliopsis occidentalis occidentalis*)

Status: Listed endangered without designated critical habitat.

Habitat: Springs, cienegas, and streams below 4,500 to 5,000 feet in elevation (FWS 1998, AGFD 1995b).

Diet: Crustaceans, insect larvae, and detritus (AGFD 1995b).

Range: Historically found throughout the Gila River drainage, but now restricted to the Santa Cruz River and its tributaries (FWS 1998). Within the Gila River basin, Gila topminnow occurred in the Gila, Salt, Santa Cruz, San Pedro, and San Carlos rivers, and their tributaries. They were never documented to occur in the Verde, Hassayampa, or Agua Fria rivers. Ten locations within the Gila River drainage are currently known to support Gila topminnow. However, this species has not been recently observed in the Gila, Hassayampa, or Colorado rivers (Weedman and Young 1997, AGFD 1995b). No natural populations exist in Maricopa County (FWS 1998).

Residence: Permanent.

Assessment: Gila topminnow is extremely unlikely to occur in the project area, which is outside the existing known range. However, a possible reintroduction site has been identified at the Tres Rios project (personal communication, Roland Wass, City of Phoenix Water Services Department, 12-20-99). This potential reintroduction should be monitored prior to commencing any construction activities at or downstream of this site.

Desert Pupfish (*Cyprinodon macularius*)

Status: Listed endangered with critical habitat designated at Quitobaquito Spring in Pima County.

Habitat: Historically occurred in springs, marshes, backwaters, and tributaries from sea level to approximately 5,000 feet elevation (FWS 1998, AGFD 1994).

Diet: Insects, crustaceans, and plants (AGFD 1994).

Range: Historically occurred in the San Pedro, Santa Cruz, and lower Gila rivers, and lower Colorado River drainages in Arizona (FWS 1998). Currently, one natural population of *C. m. eremus* exists at Quitobaquito Spring in Organ Pipe National Monument, and no natural populations of *C. m. macularius* exist in Arizona (Weedman and Young 1997, AGFD 1994). Recent and current reintroductions of the latter subspecies occurred in Pima, Pinal, Maricopa, La Paz, Graham, Cochise, and Yavapai counties (FWS 1998), but only one population at Cold Springs remains extant (Weedman and Young 1997). The reintroductions may have contained a mixture of various subspecies, which potentially invalidates the genetic integrity of either natural subspecies, and obscures the reintroduction history of this species in Arizona (Weedman and Young 1997). No natural or

introduced populations exist in Maricopa County (FWS 1998).

Residence: Permanent.

Assessment: Desert pupfish is extremely unlikely to occur in the project area, from which this species is considered extirpated.

Arizona Agave (*Agave arizonica*)

Status: Listed endangered without designated critical habitat.

Habitat: Occurs at the oak-juniper woodland and mountain mahogany-scrub oak transition zone at 3,000 to 6,000 feet elevation, usually on steep rocky slopes but occasionally on gentle slopes and drainage bottoms (FWS 1998).

Range: New River Mountains in Maricopa and Yavapai counties, and in the Sierra Ancha in Gila County. Potential habitat exists in the Mazatal Mountains in Gila and Maricopa counties (FWS 1992), and where the ranges of *Agave toumeyana* var. *bella* and *Agave chrystantha* overlap (See **Appendix**), in eastern Maricopa County and Pinal County (Kearney and Peebles 1960).

Assessment: Arizona agave is extremely unlikely to occur in the project area, which is outside the altitudinal range of this species and does not support the vegetation communities with which this plant is associated.

Arizona Cliffrose (*Purshia [Cowania] subintegra*)

Status: Listed endangered without designated critical habitat.

Habitat: Grows only on white limestone deposits at approximately 2,500 to 3,500 feet elevation (FWS 1998, Kearney and Peebles 1960).

Substrate: Limestone deposits and associated white soils (FWS 1998).

Range: Mohave, Yavapai, and Graham counties, and the Horseshoe Lake area in northern Maricopa County (FWS 1998, 1992).

Assessment: Arizona cliffrose is extremely unlikely to occur in the project area, which is outside the altitudinal range of this species and does not support the vegetation communities with which this plant is associated.

Arizona Hedgehog Cactus (*Echinocereus triglochidiatus* var. *arizonicus*)

Status: Listed endangered without designated critical habitat.

Habitat: Madrean Evergreen Woodland and Interior Chaparral ecotone, and grassland at 3,400 to 5,300 feet elevation (FWS 1998, AGFD 1997c). Usually rugged terrain in steep canyons, growing from cracks in boulders and under shrubs on rocky substrates (AGFD 1997c).

Substrate: Granite rich in Orthoclase, volcanic tuft, dacite, and possibly rhyolite (AGFD 1997c).

Range: Maricopa, Gila, and Pinal counties (FWS 1998, 1992).

Assessment: Arizona hedgehog cactus is extremely unlikely to occur in the project area, which is outside the altitudinal range of this species and does not support the vegetation communities with which this plant is associated.

Wildlife of Special Concern in Arizona

Western Least Bittern (*Ixobrachus exilis hesperis*)

Status: Wildlife species of special concern.

Habitat: Breed in dense, tall cattail marshes (AGFD 1996, DeGraaf and Rappole 1995).

Diet: Food habits unavailable for this subspecies. However, in New Mexico, *Ixobrachus exilis exilis* feeds on a variety of invertebrates (worms, molluscs, crustaceans, and insects) , and vertebrates (small birds and eggs, fishes, amphibians, and small rodents) (BISON-M 1998).

Range: Along the lower Colorado River, a few locations along the Gila River below the Salt River confluence, Picacho Reservoir, and Dankworth Ponds south of Safford (BISON-M 1998, AGFD 1996).

Residence: Permanent.

Assessment: Western least bittern has been observed in the project area. Flood control activities such as clearing, dredging, and channelization are thought to adversely affect western least bittern (BISON-M 1998, AGFD 1988). Project planners should compare the potential impacts of construction activities in habitat for this species to the benefits gained from project goals and objectives.

Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)

Status: Wildlife species of special concern.

Habitat: Mature cottonwood and willow stands, and mesquite bosques (AGFD 1998b, 1996), where moisture is sufficient to sustain emergent aquatic vegetation or deciduous interior strands (BISON-M 1998).

Diet: Chiefly insects, and also bird eggs and fruit (AGFD 1998b, 1996).

Range: Southern, central, and extreme northeast Arizona (AGFD 1998b, 1996).

Residence: Migratory. Breeds in much of North America and winters in South America (AGFD 1998b).

Assessment: Western yellow-billed cuckoo has been observed in the project area. Project planners should consider management of riparian areas known to support yellow-billed cuckoo (AGFD 1998b).

Great Egret (*Ardea alba*)

Status: Wildlife species of special concern.

Habitat: Desert riparian deciduous woodland and marshes where desert streams provide sufficient moisture to sustain riparian scrub and/or interior strand communities (BISON M 1998). Requires concealment provided by tall vegetation and is usually found away from human disturbance (DeGraaf and Rappole 1995).

Diet: Food habits unavailable for this subspecies, but are assumed to be similar to that of snowy egret, which include plant tissue, invertebrates (worms, molluscs, crustaceans, and insects), and vertebrates (small birds and eggs, fishes, amphibians, and small rodents).

Range: Breeding colonies are very local, chiefly restricted to the Colorado River in Mohave County, below Bullhead City (AGFD 1988), although individuals occur in Coronado National Forest and at Picacho Reservoir (BISON M 1998).

Residence: Permanent.

Assessment: Great egret has been observed in the project area. Project planners should compare the potential impacts of construction activities in habitat for this species to the benefits gained from project goals and objectives.

Snowy Egret (*Egretta thula*)

Status: Wildlife species of special concern.

Habitat: Marsh habitats (AGFD 1999).

Diet: Feeds on a variety of plant material, invertebrates (worms, molluscs, crustaceans, and insects), and vertebrates (small birds and eggs, fishes, amphibians, and small rodents) (BISON-M 1998).

Range: Along the Gila River from Phoenix to the Colorado River, including near Yuma. Winter breeding colonies exist near Yuma and below Painted Rock Dam (AGFD 1999).

Residence: Year-round resident (AGFD 1999).

Assessment: Snowy egret has been observed in the project area. Project planners should compare the potential impacts of construction activities in habitat for this species to the benefits gained from project goals and objectives.

Sonoran Desert Tortoise (*Gopherus agassizii*)

Status: Wildlife species of special concern.

Habitat: Rocky slopes and bajadas in Sonoran Desertscrub communities to elevations of approximately 5,300 feet (AGFD 1997b).

Diet: Grasses, cacti, flowers, forbs, succulents, trees, and shrubs (AGFD 1997b).

Range: The Sonoran population occurs from south and east of the Colorado River to southeast Arizona (AGFD 1997b).

Residence: Permanent.

Assessment: A desert tortoise carcass was observed in the project area. Project planners should consider habitat destruction and population fragmentation prior to implementing construction activities. Fragmentation may result from urbanization, mining, and off-road vehicle activity (AGFD 1997b).

Conclusions

Four of the thirteen federally-listed species, and all five state-listed species may occur in the project area. All such species are most likely to occur in aquatic communities or the adjacent riparian communities. If possible, activities associated with the Durango Area Drainage Master Plan (e.g. diversion discharge points) within floodplains should avoid areas in and within 300 meters of mature riparian woodland, and rather be located farther away from such valuable biological resources.

B. Historical and Pre-Historical Themes Evaluation

The archaeological site files were examined at the State Historic Preservation Office, the Arizona State Museum, Arizona State University, and Pueblo Grande Museum. The archeological assessment included the documentation of known cultural resources for the project area. Every known archaeological site, it's location, and all other specific information are available in an electronic format. In this section, an overview of the prehistoric cultural resources is presented. The overview is followed by a discussion of the specific resources in the project area. Finally, important themes in prehistory as they pertain to the cultural resources in the Durango ADMP are summarized.

Cultural Resources Overview

The Durango ADMP project area is within an area that was occupied by the prehistoric Hohokam culture. This prehistoric culture inhabited southern Arizona between about A.D. 500 and 1450. This stone-age culture maintained an extensive system of irrigation canals and large villages in the Phoenix metropolitan area. The Hohokam successfully grew crops of corn and cotton in the Phoenix area through more than a hundred miles of irrigation ditches, the alignments of which are followed even today. Due to the unique hydrologic and topographic setting of the Phoenix area, many of the irrigation canals begin near Papago Buttes and continue as far west as the community of Tolleson.

The Hohokam occupation is generally divided by researchers into four distinct periods, which have been further subdivided into phases. The beginnings of Hohokam culture are initially seen in the Pioneer Period, whose inception date is currently under debate by archaeologists. An early Red Mountain Phase has been suggested as beginning around A.D. 1 and continuing until circa A.D. 400, and is followed by the more traditionally accepted Vahki, Estrella, Sweetwater, and Snaketown phases, that together make up the Pioneer Period. During this period, the traditions of canal irrigation, crop domestication, and the distinctive red-on-buff pottery begin to develop. Formal site structure that includes toward the end of the period, large plaza, mounds, and ballcourts, becomes established. Burial ceremonialism is pronounced and a distinctive figurine complex occurs. Burial methods are dominated by cremation and the architectural styles include pithouses.

During the subsequent Colonial Period, the attributes that were developing toward the end of the Pioneer period, flourish. While the figurine complex disappears, an active religious complex can be seen in the elaborate carved censers and palettes found with cremation burials. The economic and exchange spheres of influence become more pronounced through an extensive ball court network, and the establishment of settlements throughout southern and parts of central Arizona. The period dated between 700 A.D. and continued to approximately 900 A.D., containing the Gila Butte and Santa Cruz Phases. The Sedentary Period, consisting of the Sacaton phase, lasted from circa A.D. 900 to 1150. The patterns seen in the preceding Colonial period continued. Climatological data suggest that water for irrigation was abundant, allowing the extensive networks of villages and irrigation canals in the core areas along the lower Salt River valley and the middle Gila River valley. Most of the large villages in the Durango ADMP project area were inhabited during this time.

Extensive changes mark the transition to the Classic Period, which dates from approximately A.D. 1150 to 1450. The Soho and Civano Phases occur within the Classic Period. This period is marked by a shift in burial methods, architectural styles, pottery types, and monumental architecture. Cremation burial gives way to inhumation burial, pithouses are replaced by aboveground adobe rooms surrounded by compound walls, red-on-buff pottery is abandoned in favor of redware pottery, and ballcourts give way to large platform mounds. These many changes had their beginnings toward the end of the pre-Classic era. The Classic period lasted for three centuries. The large village of Las Colinas, at the eastern edge of the Durango study area, was occupied at this time. By the mid-1400s, the Hohokam culture quickly disintegrated and by the 1500s, the culture is completely gone from the archaeological record. The demise of the Hohokam is probably related to pan-southwestern dynamics during the 14th and 15th centuries. In the Phoenix area specifically, researchers have argued that dramatically unpredictable rainfall patterns caused series of major floods that proved too destructive for the extensive irrigation systems in the valley.

Following the end of the Hohokam culture the Phoenix Basin underwent a period of sparse habitation. People living in southern Arizona appear to have adopted a dispersed, farming, hunting and gathering lifestyle, occupying small rancherias along the rivers. In later times, the probable descendants of the Hohokam, the Pima, were reported by Spanish chroniclers to inhabit the area as farmers. Little direct evidence exists for habitation of the Durango ADMP during the period from A.D. 1450 until the arrival of Spanish, Mexican, and Anglo factions that began in appreciable numbers in the 18th century. The ensuing period of historic exploitation was marked by mining, ranching, and homesteading interests. These historic pursuits included the construction of canals, as well as re-utilization of prehistoric ones (Details of this historic period are outlined in the Historic Themes section of this study).

In addition to the large habitation sites in the vicinity of the project area, the Hohokam were also responsible for the construction of a large system of irrigation canals throughout the Salt River Valley. One of the largest networks within this system was first identified by Omar Turney in the 1920's as a group of large canals that he designated as “the second canal system” (he recorded the first canal system in the Tempe-Chandler area). From their head at the Salt River immediately south of Pueblo Grande the canals flow in a west to northwesterly direction away from the river. Later studies of the canals indicate the main channels in the second canals system were as long as 16 miles, and may have irrigated up to 20,000 acres during the Colonial period. Maps of the canals forming the second canal system from both Omar Turney, Frank Midvale, and other researchers show segments running through the Durango ADMP project area. **Figure V-2** shows the major sites and canals recorded in the Durango ADMP project area.

Cultural Resources In the Project Area

Thirty-five sites have been recorded in the Durango ADMP project area. Five of the sites are historic and include the St. Johns canal, an unnamed canal segment, a farmhouse, and two well sites (see the Historic Section for a discussion of the history of this area). The remaining thirty sites are prehistoric. These sites include large, primary villages, smaller villages, and artifact scatters. Little is known about most of these sites except what was recorded several decades ago. Based on the sites that have been identified in the Durango ADMP, the eastern half of the project area contains abundant evidence for prehistoric irrigation canals, large villages, and smaller sites. In the western half of the project area, comparatively few archaeological remains have been identified. Two large villages have been recorded in the western half of the project area near the confluence of the Salt, Gila, and Agua Fria Rivers, the Cashion Ruin and the La Cienega Ruin. Although this region has been disturbed by modern agricultural activities, there are undoubtedly significant subsurface remains at the sites.

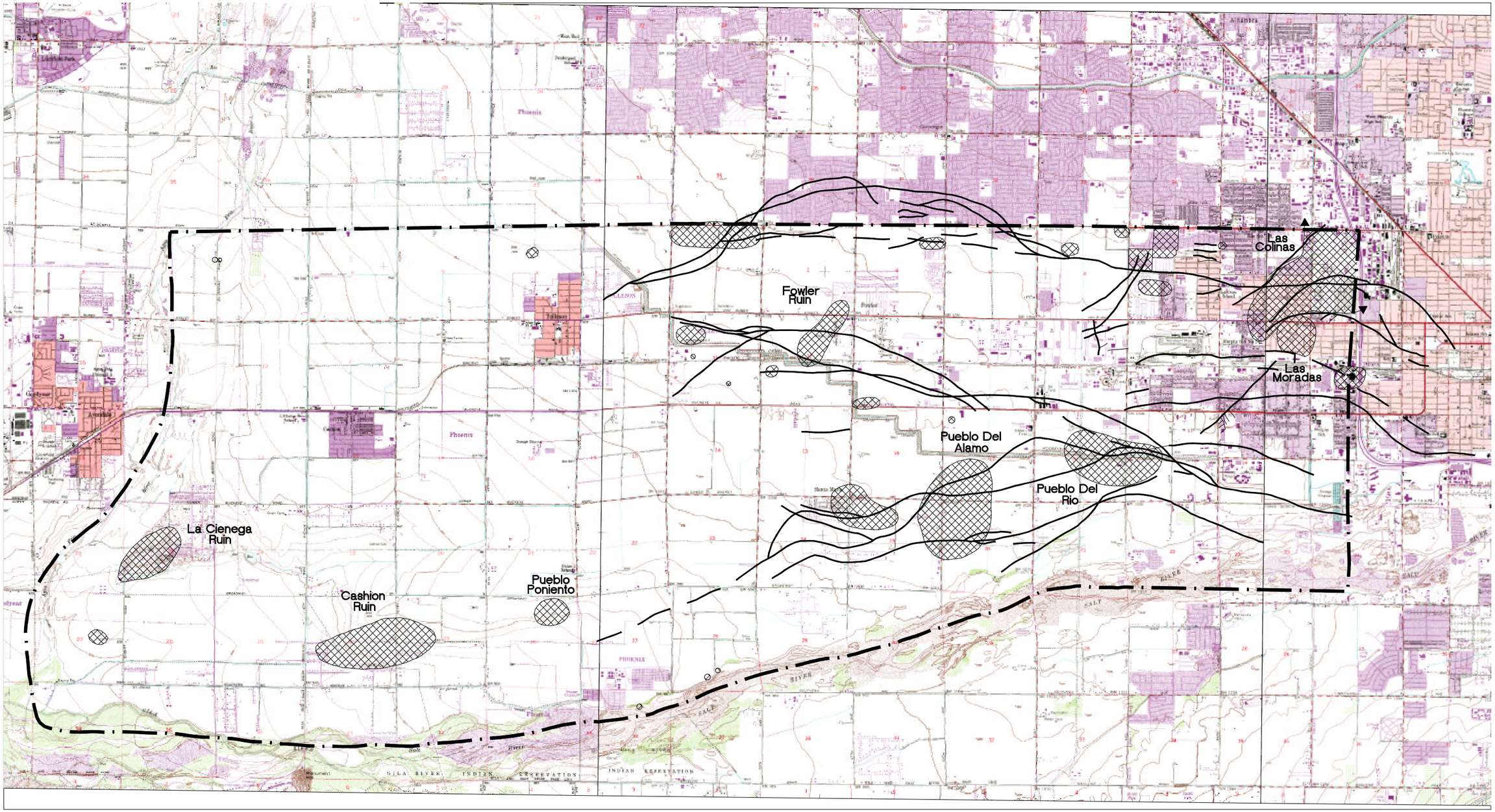
Five large primary villages have been recorded in the project area. These villages represent some of the most significant prehistoric resources in the Phoenix metropolitan area. From east to west, these sites include Las Colinas, Pueblo del Rio, Pueblo del Alamo, the Cashion Ruin, and the La Cienega Ruin. These sites were recorded by early researchers, in the 1920's through the 1940's. Las Colinas was reported to have at least four platform mounds (and possibly as many as ten), a ballcourt, and many buildings that covered an area of 2 to 3 square miles. Excavations at this site were carried out by the Arizona State Museum between 1982 and 1984, in advance of freeway construction. The part of the site that was excavated yielded the remains of a platform mound, a ball court, irrigation canals, a reservoir, and hundreds of other features that included houses, burials, cooking pits, and trash pits. The site was inhabited during the Sedentary and Classic period, between about A.D. 900 and 1400. The Sedentary period occupations include several house areas and associated cemeteries. Much of the Classic period habitation evidence had been stripped away by historic development and agriculture and the excavations concentrated on the platform mound, associated houses, and scattered burials.

The Cashion Ruin was investigated in 1978 and 1979 by the Museum of Northen Arizona for a pipeline related to the Palo Verde Nuclear plant. This site is on the northern edge of the Salt River, at its confluence with the Gila River. The site was mapped by Omar Turney and later by Frank Midvale, who reported that it contained many trash mounds, houses, and three ball courts. It was associated with a canal or series of canals that were several miles in length. The excavations there recovered evidence of houses, burials, cooking pits, and many other pit types. Agricultural plowing had leveled the mounds but many of the subsurface features were found to be intact. Dozens of cremations burials excavated by the Museum revealed numerous red-on-buff pottery vessels, stone censers, palettes, and other mortuary accompaniments. The occupation appears to have been primarily during the late Colonial and Sedentary periods, between A.D. 800 and 1100. Frank Midvale mapped two other sites east of the Cashion Ruin. Near the east edge of the Cashion Ruin, in the center of Section 29, he mapped the Hacha Piedra Ruin. In the northern part of Section 28, he mapped a site he referred to as Pueblo Poniente. Little is known about these sites except that Pueblo Poneinte may date to the Classic period, based on Midvale’s notation that polychrome pottery was present.

Maps of features at other important sites, Pueblo del Rio, Pueblo del Alamo, and the La Cienega Ruin, were drawn by the early investigators but no formal excavations have been done in recent times. These sites all appear to have been most intensively occupied between about A.D. 700 and 1200. Development of this region in the 1940's for agriculture has resulted in the leveling of most of the surface features at these villages. Nonetheless, it is very likely that subsurface features are abundant at these sites.

Prehistoric Themes Evaluation

Important themes for prehistoric sites in the Durango ADMP project area are many, but major topics include: 1) Settlement Patterns and Site Development, 2) Canal Irrigation Systems, and 3) Ceramic Exchange and Interaction, and 4) Public Education relating to Prehistoric Land Use and Agriculture.



PREHISTORIC SITES

PROJECT BOUNDARY

PREHISTORIC CANAL

UNMAPPED PREHISTORIC CANAL SEGMENT

N

0 1000 2000

Meters

ARIZONA

USGS 7.5' QUADRANGLES:
PHOENIX, FOWLER, & TOLLESON
UTM Zone 12 NAD27

FIGURE V–2

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99–41

CONSULTANT:
SWCA Inc. Environmental Consultants

EXHIBIT TITLE:
PREHISTORIC ARCHAEOLOGICAL SITES

Settlement Patterns and Site Development

The Durango ADMP project area includes a significant portion of the Hohokam culture's core area. Within the lower Salt River valley, the Hohokam developed one of the largest continuous settlement systems in southern Arizona. Due to the unique physical setting and their technological ingenuity, the Hohokam were able to turn the arid desert into a veritable bread basket through canal irrigation. Some of the largest sites in the Phoenix metropolitan area occur in the Durango ADMP. An important theme for these cultural resources includes the pattern and history of their development. While the sites were certainly autonomous villages, their inhabitants were connected through their use of the irrigation canals.

The studies of Hohokam site structure and social organization have been important topics for nearly two decades. Studies of village organization have been productively advanced through the careful examination of both small and large sites. Such studies are important in helping to describe the internal structure of villages in order to try and understand the manner in which Hohokam society was organized. The existence of different site types within east-central Phoenix also allows archaeologists to get a more complete view of the settlements patterns within the Hohokam core area. This is important in trying to understand the hierarchical structure of Hohokam settlement and its role in the organization of their society. Also important is the nature of village placement along the river and associated irrigation canals. Understanding these patterns also can be helpful in understanding about Hohokam culture.

Canal Irrigation Systems and Prehistoric Land Use

The irrigation canals located in the Phoenix area were the life lines for the Hohokam. Studying these features can inform about the nature of economic organization. Study of the technical aspects of canals has enhanced our knowledge of their overall distribution and amount of water that could potentially be moved to prehistoric crops. This information then, can be used to discuss the overall organization of the Hohokam villages in this area, for example, how the villages interacted, who controlled the allocation of water, and how much organization was required to maintain such an extensive canal system.

The Arizona Historic Preservation Plan has identified prehistoric irrigation as one of its components. According to the report "Prehistoric Irrigation in Arizona: A Context for Canals and Related Cultural Resources," several specific criteria have been identified for evaluating the importance of these prehistoric features. These questions include the following: 1) how big were the canal systems? 2) How well did these canals work? How old are these canals? 4) How did irrigation systems change over the years? Based on a conservative estimate for the Durango ADMP project area, there could easily be more than 25 miles of prehistoric canals below the modern surface. Identifying these canals, different canal types, and different periods of use would be very important. Why are these important? The Prehistoric Irrigation Context report goes on to say that prehistoric irrigation works are important for their research potential, for education and recreation, and for economic development.

Prehistoric Ceramic Exchange and Interaction

One of the most abundant artifact types at Hohokam prehistoric sites are pieces of broken pottery. The Hohokam used ceramic containers for carrying water, cooking food, storing grain, and other activities. Archaeologists study prehistoric ceramics because the way that pots were made and painted changed through time and differed between groups. Ceramics provide abundant information about the movement of people and pots throughout an area. Studies in the Phoenix Basin have shown that clay collected from certain parts of the valley contains distinctive minerals. When these clays are used to make pottery, archaeologists can trace the origin of the pots and by extension, reconstruct the social networks of the villagers and their kin.

Studies of ceramics can be used to interpret the community organization for the prehistoric villagers in the Durango ADMP project area, and their relationship with other villagers throughout the Phoenix Basin.

Public Education: Prehistoric Land

A theme important to the Durango ADMP project area is the manner in which this region has been used by people for the last 1000 years, up through the present day. The earliest Hohokam settlers in this part of the valley were farmers who grew their crops with the aid of canal irrigation. This same agricultural tradition can be seen in the area today, although on a much larger scale. Opportunities are abundant in this area to combine elements of prehistoric archaeology, history, and education. The Prehistoric Irrigation Context report notes that

> The recreational value of prehistoric irrigation sites and features is indicated by Arizona's many recreational facilities and annual events catering to a vibrant public interest in archaeology . . . The establishment of two local parks that focus primarily on prehistoric irrigation themes show that prehistoric irrigation systems have recreational potential. The Park of Four Waters in Phoenix was set aside specifically to protect some of the best remaining examples of prehistoric Hohokam canals along the lower Salt River . . . [F]ormal education campaigns can make the general public more aware of Arizona's unique heritage of more than a millennium of ancient irrigation works.

C. Archaeological Assessment

At first glance, the study area appears to be a quiet, mostly rural section of Phoenix, located west of the hustle-bustle of downtown and the intensity of suburban areas to the north and east. Its seeming quietness, however, belies the many facets of Arizona history that have passed through the area. The roughly 68-square mile area witnessed the earliest American surveyors to visit the area, delivered water for irrigated farms both large and small, sheltered homesteaders, provided flat terrain to promote the construction of railways and highways, and hosted both World War I-era cotton production and World War II-era defense plants (**Figure V-3**). Today, the agricultural fields are dotted with developers' signs announcing new housing construction.

Surveying the Land

The study area stretches across three townships in the western half of the Salt River Valley, Township 1 North, Range 1 East, Range 1 West, and Township 1 North, Range 2 East. Those names and numbers by themselves indicate the first Anglo history of the area.

After the end of the Civil War in the spring of 1865, John Clark, surveyor general for the territories of Arizona and New Mexico, suggested to the General Land Office that it conduct surveys of suitable agricultural lands in the river valleys of Arizona. That year, however, the Army sent soldiers rather than surveyors and established military posts to confront Apache hostilities against settlers.

By January 1867, Clark had been successful in his requests and hired surveyor William Pierce to do a preliminary survey of the Salt River Valley beginning at the initial monument located on a hillside just south of the confluence of the Salt and Gila Rivers (today, 115th Avenue). In his notes, Pierce remarked on the appropriateness of the land for agriculture noting its rich soil, generally level surface, lack of heavy vegetation, and availability of water for irrigation. He went so far as to suggest that the land was "some of the best agricultural land I have yet seen in the Territory and would recommend that it be subdivided at an early day" (as quoted in Zarbin 1997:6).

The subdividing of the townships laid out by Pierce was completed by Deputy Surveyor Wilfred Ingalls in the spring of 1868. The map accompanying the 1869 Annual report for the General Land Office indicates that the territory surveyed from the initial monument at the confluence of the Salt and Gila Rivers was the first land to be formally surveyed in the Arizona Territory (General Land Office 1869).

The work of Clark, Pierce, and Ingalls determined much of the look of the landscape of the study area today. The segmented, straight-line boundaries of individual properties and fields set the pattern for the straight roads aligned to the cardinal points of the compass. The design laid out by the surveyors' chains can still be seen in the grid system visible on the ground today (Hecht and Reeves 1981)

The First Ditches

Agriculture was the first, and for many decades the most important, economic activity in the Phoenix area. Soon after the Civil War, the first American settlers noticed the possibilities for irrigated agriculture in the expansive, flat valley created by the Salt River flood plain. The notorious Jack Swilling and his cohorts first dug canals (or rather, re-dug prehistoric canals first constructed by Hohokam farmers) in the eastern portions of the Salt River Valley in 1867 (Township 1 North, Range 3 East). They were soon joined by other canal entrepreneurs all along both banks of the Salt River. From the late 1860s through the 1870s, many groups of farmers diverted water from the Salt River for irrigated crops, from the Mormon farmers in Lehi and Mesa to the agricultural entrepreneurs in the western stretches of the valley, in the study area.

The several agricultural entrepreneurs in the Salt River Valley organized to establish the desert settlement of Phoenix in 1870. The next year, the new town was named the county seat of the newly created Maricopa County, and by 1872, the valley hosted more than 1,000 residents about half Mexicans (Sargent 1988:26).

A handful of enterprising farmers oversaw the digging of the first canal in the study area as early as 1869, just two years after Swilling's first ventures in the Salt River Valley. In 1870, a group of four investors completed a ditch that had been begun the previous year. The new ditch headed off from the river near present-day Fourth Street (extended) and Buckeye Road and extended northwest (into the project area) to water the investors' homesteads, located to the southwest of the future settlement of Phoenix. Identified as the Griffin Ditch on the 189- map, the canal was also referred to as the Juan Chiviri Ditch, perhaps reflecting the employment of Maricopa Indians in the ditch digging or their settlement at head of the Griffin Ditch in 1880 (Zarbin 1997:23). At an estimated cost of $10,000, the Griffin Ditch carried about 2,000 inches of water (Zarbin 1997:35).

In 1871 two companies announced plans to divert water from the north bank of the Salt River between present-day 27th and 35th avenues. The Salt River Farming Ditch Company and the Monterey Ditch Company included experienced irrigators from earlier ventures in the valley, and claimed a total of 25,000 miner's inches of water(just over 600 cubic feet

R1W R1E R1E R2E

TOLLESON

See DETAIL A

Fowler Station

Fowler Depot

Cowden Station

Jean Station

Campo Station

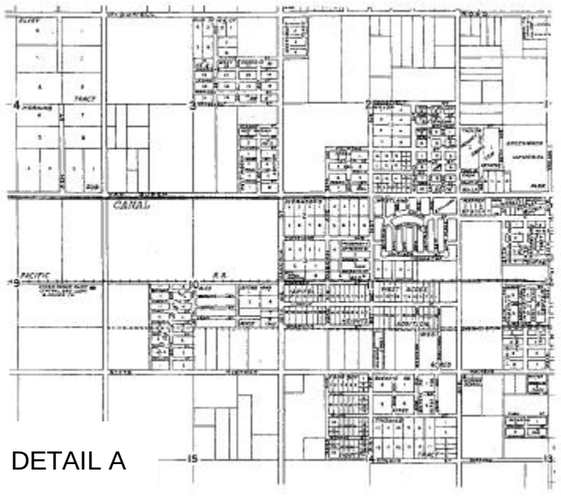
Cashion Station

Agua Fria River

unmapped

Salt River

Initial Monument



DETAIL A

PROJECT LOCATION

T1N-R1W
T1N-R1E
T1N-R2E
Gila and Salt River Meridian

KEY

- Project Boundary
- Salt River Project Boundary
- Steam Power Plant (Central Arizona Light and Power)
- County Poor Farm
- Arizona Eastern Railroad (Southern Pacific Railroad)
- U.S. Highway 80
- St. John's Canal
- Salt River Valley Canal
- Meridian Canal (unmapped in R2E)
- Farmers' Canal
- Griffin Ditch

N

0 2000 4000 6000 8000 Feet

AZ State Plane Central NAD83

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99 - 41

CONSULTANT:
SWCA Environmental Consultants

EXHIBIT TITLE:
HISTORICAL FEATURES

FIGURE V - 3

per second)[4]. The Salt River Farming Ditch Company built a canal downstream from the Griffin Ditch in 1872, and with a bottom width of 25 feet, it was much larger than the earlier canal. At a cost of approximately $22,000, the ditch was planned to extend all the way west to the Agua Fria River (Zarbin 1997:35)

By the spring of 1872, six ditches diverted water from the north bank of the Salt River within the project area. From east to west, the list included the Swilling Canal, the Wilson Canal, the Juan Chiviri/Griffin Ditch, the Salt River Valley Canal, the Monterey Canal, and the Mexican Canal. In one observer's opinion, farmers cultivated about 8,000 acres in the spring of 1872, about half in barley, one-third in wheat, and the rest in vegetables, alfalfa, vineyards, and orchards (Zarbin 1997:35).

The Arizona desert climate cycles between wet spells and dry years. In the first years of the 1870s, abundant floods washed out both canals and brush diversion dams across the valley. By 1879, however, a dry year brought new concerns and accusations. The worried Salt River Valley farmers talked about building a unified irrigation system with a single watertight dam on bedrock to divert the Salt River water into their canals. In 1881, Territorial Governor John C. Fremont urged the Territorial Assembly to "seek federal aid to develop water-storage projects that would enable vast wastelands to be occupied by settlers" (Waggoner 1970:174). The discussions eventually led to the formation of the Salt River Valley Water Users' Association and the construction of Roosevelt dam in the first decade of the new century.

"Full of Push and Enterprise"

Worries about insufficient river flows did not prevent new groups from forming irrigation companies. In the early months of 1887, W. H. St. John and three other men dug a new ditch on the north bank of the Salt River. Intending to irrigate forty sections of land, they appropriated 5,000 miner's inches of water into the St. John Canal from a canal head at 83rd Avenue. In 1892, the small canal company sold the seven-mile long St. John Canal to the Orange Belt Land and Canal Company (Zarbin 1997:109). The St. John Canal extended northwest from the Salt River almost to the Agua Fria River and persisted on maps into the 1930s (Heard 1915;Maricopa County 189-; U.S. Reclamation Service 1914; Salt River Project 1934).

Also completed prior to 1891 was the Farmers Canal between the St. John Canal and the Griffin Ditch (Maricopa County 189-; Schultz & Franklin 1891). Although one source suggests that the Farmers Canal may have been constructed as early as 1868, it is likely that this canal through the study area flowed only intermittently in the 1870s and 1880s. As was typical of simple diversion dams, the brush dam in the Salt River in the general area of today's 27th Avenue and Lower Buckeye Road washed out frequently. When investors in the newly formed Farmers Irrigation Company inspected the Farmers Canal in the summer of 1890, they described it as in poor repair, with less than 5,000 acres of farmland contracted to receive water [out of a possible 24,000 acres that might have been served by the length of the canal]. In October 1890, crews worked to re-dig a 12-mile segment of the canal, but the revitalization of the Farmers Canal system was short-lived. Perhaps due to damage caused by wide-spread flooding in 1891, the Farmers Irrigation Company dissolved within the decade amid a flurry of legal documents as the board members of the company sued each other (Rogge and others 1991:170-172).

By the early 1890s, more than one hundred miles of canals had been constructed across the valley to irrigate more than 100,000 acres of farmland. Optimism for the future of the desert settlement ran high. Promoters such as Theodore Schultz and William Franklin, self-styled "immigration solicitors," touted the agricultural potential of the Valley with promotional literature including maps, brochures, and even poetry. The following verses were inscribed on Schultz and Franklin's 1891 map of the Salt River Valley,

> The branch here bends beneath the weight pear,
> And verdant olives flourish round the year;
> The balmy spirit of the western gale
> Eternal breathes on fruits untaught to fail.
> The same mild season gives the blooms to blow,
> The buds to harden, and the fruits to grow
> (Schultz & Franklin 1891).

In the same spirit of optimism, the publishers of the first city directory described Phoenix as the most important commercial town in the Territory, "thoroughly American, and its citizens are live and go-ahead people full of push and enterprise" (Bensel Directory Company 1892).

Fields, Towns, and Homes

Drought followed flood, and the drought years of the late 1890s again spurred discussions of a major storage dam on the Salt River. Tied with national sentiment for reclamation, these discussions culminated in the formation of the Salt River Valley Waters Users Association in 1903, a group that worked with the federal government under the 1902 Newlands Act to begin construction of the Theodore Roosevelt Dam in 1905. Completed in 1911, the masonry dam assured a water supply to

[4] The term "miner's inch" is a measurement of small amounts of flowing water, and the exact amount of water included in a miner's inch is determined by individual state statute. In Arizona, a miner's inch of is equal to 1 /40 cubic foot of water per second, or 11.22 gallons per minute.

the Salt River valley and filled the several irrigation canal systems. Most of the farmers in the study area, and thus most of the land, joined the Salt River Valley Waters Users Association which in later years became known as the Salt River Project (Rogge and others 1995; Smith 1986; Zarbin 1986). In the first years of the new decade, alfalfa was the dominant crop in the area, used primarily to feed thousands of dairy cattle.

The hostilities of World War I cut off Egyptian supplies of long-staple cotton from the American market, and defense contractors looked to domestic farms to provide cotton for tires and airplane fabric. The war-time demand made long-staple cotton into a boom crop in the Salt River Valley, and in 1916, cotton fields outnumbered the previously dominant alfalfa fields. By 1920, cotton plants filled three-fourths of the irrigated farm fields across the valley, a total of 190,000 acres (Luckingham 1993:86).

Predictably, the dependence on a single crop back-fired when cotton prices collapsed in 1920, and in 1921 local banks offered low-interest loans to valley farmers planning to return their acreage to crops other than cotton. All over the valley, farmers returned almost 50,000 acres to alfalfa, used primarily as feed for dairy cattle. In addition, farmers planted wheat, barley, sorghum and corn to supply local cattle feedlots and poultry ranches, expanded citrus groves, and experimented with olive and date crops. Farmers also took advantage of new railroad connections to ship more fragile crops such as melons, grapes, lettuce, and winter vegetables to national markets. Adjacent to the railroad sidings, industrial and warehouse facilities flourished (Kotlanger 1993:92-96).

By 1940, long and short staple cotton remained an important cash crop, occupying over 117,000 acres in Maricopa County, about one-third the acres under cultivation (Horton 1941:79). Alfalfa remained the second most important crop, occupying more than 100,000 acres. Other important crops included lettuce, cantaloupe, and citrus, as well as dairy and beef cattle (Horton 1941:87-88).

The combination of fertile, alluvial fields and the availability of river water delivered by canal systems encouraged homesteaders to settle the study area (General Land Office 1914a,1914b). A map of Maricopa County compiled in the 1930s illustrates rural houses as hundreds of tiny squares scattered all across the study area. For the most part, these houses, presumably farmhouses and homestead houses, were concentrated along the major east-west roadways, and distributed equally along these roads throughout the project area. A rough estimate of the number of squares on the map indicates that a total of approximately 60 houses were built along Van Buren, and a similar number were built along Buckeye and Lower Buckeye roads. The shorter, unpaved north-south roads along section lines, such as 115th and 91st avenues, contained approximately 20 houses (Maricopa County 193-). In some locations across the study area, these houses built in the early years of the century still stand. In other locations, only stands of Arizona cedars and piles of rubble indicate the location of a vanished farm home.

Schools were located on the southwest corner of Van Buren and 67th Avenue, on the southeast corner of Buckeye Road and 27th Avenue, on the west side of 51st Avenue south of Buckeye Road, on the west side of 75th Avenue south of Lower Buckeye Road, on the west side of 91st Avenue south of Lower Buckeye Road, and on the southwest corner of Buckeye and 115th Avenue (Becker 1941; General Land Office 1914a and 1914b; Heard 1915; Salt River Project 1934).

Several locales in the study area acquired name designations over the years, most of them along the railroad line. Cashion, near 111th Avenue and Buckeye Road, took the name of the Cashion family that homesteaded four sections of land (General Land Office 1914a). The Cashion Post Office was established in 1911 and named after Angus Cashion, “prominent farmer and stockman” (Barnes 1988:30). In 1941, Cashion was home to what was reputed to be one of the largest beet seed storage sheds in the world (Horton 1941:202).

To the northwest of Cashion, the settlement of Tolleson grew up around 91st Avenue and Van Buren Road. The station on the Buckeye branch of the Arizona-Eastern Railroad was named for W. G. Tolleson (Barnes 1988:446). Mr. Tolleson, founder of Tolleson Farms, bought 160 acres of land at the southwest intersection of Lateral 22 and the Yuma Road in 1910.

By 1941, Tolleson claimed to be the “largest cantaloupe producing center in the United States” with between 15-20 sheds to house the cantaloupe and lettuce harvests (Horton 1941:202). In addition, a large ice plant outside town produced the ice to cool the produce as it was shipped to market. The influence of automobile travel through the area is evidenced in the eight cottage courts, four service stations, and two garages. Tolleson also included seven grocery stores, a dry goods store, five restaurants, a theater, a lumberyard, a barber and beauty shop, two drug stores, and a clinic. The varied ethnic make-up of the town is hinted at by one observer’s comments about the Japanese and Hindu farmers, and the “prevalence of the Mexican and Spanish population” causing

Catholicism to be the "dominant religion" (Horton 1941:202). (Horton 1941:202-203). Just to the south of Tolleson were the railroad sidings designated Cowden and Jean (Maricopa County 193-; Maricopa County Highway Commssion 1919).

Further east along the rail line, the Fowler station and depot were presumably named for Lincoln Fowler, a land owner in the area and director of a canal company. Mr. Fowler ran unsuccessfully for the Territorial House of Representatives in 1883, including in his campaign the suggestion that "the legislature petition Congress to finance hydrographic surveys of all streams in Arizona to improve the system of irrigation and to identify suitable sites for building water storage reservoirs" (Zarbin 1997:101, 124). The Fowler community included a Baptist church on the southeast corner of Van Buren and 67th Avenue, as well as two creameries on the north side of the Salt River Valley canal between 59th and 67th avenues (Heard 1915).

To the east of Fowler, the small settlement of Campo appeared only on a 1916 map describing ranching activities in central Arizona (Holmquist 1916). Curiously, Campo does not appear on a contemporary map detailing landowners and settlements (General Land Office 1914b). Unmentioned in any other sources, the site of Campo became the site of the World War II Alcoa plant.

A quarter section of land listed on the 1914 General Land Office maps as belonging to Maricopa County became the site of the County Poor Farm in the 1930s. A portion of the southwest quarter section of Section 14, Township 1 North, Range 2 East is labeled "Poor Farm" on a 1934 map and "County Farm" on a 1941 map (Becker Engineering Company 1941; Maricopa County 1934). The map dates may indicate that this enterprise was a product of the make-work legislation in the Depression years.

Railways and Highways

The major east-west travel corridor from Phoenix to Yuma has passed through the study area since Territorial days. The same flat terrain that encouraged farmers to settle here has also encouraged railroad engineers and highway engineers to use the area for transportation. Early trails and stagecoach lines across Arizona followed the Gila River east to the great bend, and then took a chance on the forty miles of desert between today's towns of Gila Bend and Casa Grande before following the Santa Cruz River south to Tucson . After people began settling in the valley in the 1860s, east-west transportation routes swerved north to follow the Gila River's great bend into the Salt River Valley and the desert settlements around Phoenix

The railroad line that extends from west to east across the study area has been owned by a succession of companies since its construction about 1910 (Walker and Bufkin 1989:46-47). Built as the Phoenix and Buckeye line, the small railroad known as the Maricopa and Phoenix Railroad Company joined the Arizona Eastern Railroad in 1911 (Irvin 1987:256-257; U.S. Reclamation Service 1914). The Arizona Eastern Railroad was envisioned by its investors to extend from Phoenix to the mining towns in east-central Arizona and then south along the San Pedro to connect with the Southern Pacific line at Benson. By 1911, rails had been laid only as far as Winkelman and Christmas, about half the distance to Benson. In 1926, the Southern Pacific Railroad built a new main line from Yuma directly to Phoenix, incorporating the tracks of the old Phoenix and Buckeye line (Salt River Project 1934; Walker and Bufkin 1989:47).

In 1919, the Arizona Eastern railroad siding in Tolleson had a capacity of 8 railroad cars. Just to the east, the siding at Jean could hold 13 cars, while the Fowler siding had a capacity of 30 cars. Larger than all of these taken together were the facilities at Cashion which could accommodate 68 rail cars[5] (Maricopa County Highway Commission 1919).

The very first book of Arizona road maps, published just as the Model T was beginning to appear on American roads, illustrates the Phoenix to Yuma route and indicated it as a "good road [with] some stretches of sand." Although not labeled as such on the small-scale map in the 1913 tour book, the dirt road from Phoenix to Yuma utilized Van Buren Road west 1.6 miles west from downtown Phoenix to approximately 107th Avenue [the map illustrates an ostrich farm at the southeast corner of Van Buren and 107th Avenue]. At that point, the route turned south for one mile, and at today's Buckeye Road, the route turned west again. On the east side of the Agua Fria River, the tour book map notes a "slough" before the "ford" of the river (Arizona Good Roads Association 1913:50).

The first highway paving programs began across the United States in the 1920s as federal highway money became available, and the importance of the Phoenix-Yuma road is underscored by the fact that it was among the first roads to be paved in Arizona. The Phoenix Chamber of Commerce touted the new Maricopa County highway program on a 1922 map illustrating the few miles of paved roads in the valley. On this early road map, the "Yuma Road"(Van Buren) is shown as being paved from Phoenix west to today's 107th Avenue, which is also shown as paved between the Yuma Road south to Buckeye Road. Also on the

[5] The largest railroad sidings in the valley in 1919 were located to the west in Avondale where a total of 106 rail cars could be parked (Maricopa County Highway Commission 1919).

1922 map, Buckeye Road is shown as paved west from Phoenix to the banks of Agua Fria River. After crossing the river, the road is again shown as being paved all the way west to Buckeye (Phoenix Chamber of Commerce 1922).

By 1926, more than $1 million of federal aid had been spent to construct the Phoenix to Yuma highway (State Engineer 1926:29-30). The Arizona Highway Department contracted with an El Paso firm to build the highway bridge over the Agua Fria River in 1924. The concrete girder bridge measured 32 feet long (FraserDesign 1987:44).

A few years later, highway engineers instituted the use of highway numbers to replace the myriad of highway names that had designated often over-lapping routes. In Arizona, the east-west route that had been called the Bankhead Highway, the Atlantic-Pacific Highway, the Lee Highway, the Old Spanish Trail, and the Borderland Route became "U.S. Highway 80" by 1926 (State Engineer 1926:22). The federally funded highway followed Buckeye Road, rather than Van Buren, on its Phoenix to Yuma route, and was paved from just west of Palo Verde into downtown Phoenix and east to Mesa; the remainder of the highway remained ungravelled, ungraded dirt (The CMC Company 1923).

Defense Plants and New Housing

In addition to the several air fields built in the Phoenix area in the early years of World War II, the businessmen of Phoenix worked with federal officials to secure defense plants for their area. Goodyear Aircraft announced its plans to construct a plant at Litchfield Park west of Phoenix in July 1941, and opened the $500,000 airplane parts plant in November that same year. At its peak, the plant employed 7,500 workers. The next year, the Aluminum Company of America (ALCOA) built a plant on a 300-acre site at 35th Avenue and Van Buren Street which employed 3,500 workers.

The influx of new workers into the Phoenix area caused a housing shortage and strained the already inadequate public transportation system. To increase the number of homes available and to decrease the dependency on city buses, federal agencies built public housing projects adjacent to the plants to house the defense workers, such as "Alzona Park," built across from the Alcoa plant (Luckingham 1989:141).

A map of 1946 Phoenix subdivisions illustrates just two subdivisions west of 35th Avenue and south of Van Buren in that year, adjacent to each other just south of the Alcoa Plant (Valley National Bank 1946). Alco Acres, platted in 1942, extended from the railroad tracks south to Sherman Street, and from 37th Avenue west to 39th Avenue. The plat map does not indicate whether public or private monies financed the housing in Alco Acres. Interestingly, the Alco Acres subdivision was made up of large lots measuring 150 feet across and more than 300 feet deep, perhaps in an attempt to maintain the rural feel of the area or to encourage residents to plant Victory Gardens. The second subdivision illustrated on the 1946 map, Homedale, extended from the railroad tracks on the north to Buckeye Road on the south (U.S. Highway 80), and from 39th Avenue on the east to 41st Avenue on the west. Platted in 1945, the Homedale subdivision lots were much smaller than lots in the neighboring Alco Acres.[6]

[6] Although one source notes the creation of Alzona Park "across from Alcoa," the name does not appear on the 1946 Phoenix subdivisions map. Two possibilities exist. Either the Alzona Park subdivision was built after 1946, after the influx of wartime defense workers, or the "Alco Acres" indicated on the 1946 map is another name for Alzona Park (Luckingham 1989:141; Valley National Bank of Arizona 1946).

Recommendations on Treatment of Historical Resources Within the Study Area

Remnants of the area's history continue to dot the landscape today. Roads follow the section lines laid out more than 130 years ago. In the rural sections, tree-lined lateral canals trace the boundaries of agricultural fields just as they have for more than a hundred years, and remnants of the earliest Anglo-constructed canals may still be extant. Modest, sometimes dilapidated, farm houses hint at the hundreds of families who made their homes here in the first half of the twentieth century, while larger-scale agricultural facilities tell of the importance of agricultural production. Roadside businesses follow the route of U.S. Highway 80. The subdivisions platted in the 1940s demonstrate the attempts to house a huge influx of World War II defense plant workers.

Two surveys to determine the presence of historical properties within the area have been completed. The first survey, conducted in the mid-1970's prior to the compilation of the Environmental Impact Statement for the section of Interstate 10 known as the Papago Freeway, identified eleven historic properties within the ADMP project area. Of the eleven, the researchers noted three (two homes and one barn) as having the potential to be listed on the National register of Historic Places. Built in 1897, the Ivy House at 75th Avenue and McDowell served as home to the first woman in the Arizona Territorial Legislature; it has since been demolished. The Evans Barn on 67th Avenue between McDowell and Van Buren was determined to be eligible under criterion C as an early model of barn construction in Phoenix, of which few examples remain. In 1977, the Brooks House, at 334B North 75th Avenue, a Bungalow-farmhouse, was also determined to be eligible for the National Register of Historic Places.

The Historic Preservation Office of the City of Phoenix Planning Department conducted a valley-wide survey of historic rural and estate architecture in 1991. The Woodward Architectural Group identified a total of eight historic rural agricultural properties within the boundaries of the ADMP. Six of the eight were recommended as eligible (including the Brooks House but not the Evans Barn nor the Ivy House). Three of the siz were built prior to 1911 and three were built between 1911-1942, as listed below:

Inventory No.	Address	Date
703	2500 N. 83rd Ave.	Before 1911
721	334 N. 75th Ave.	1911-1942
722	335 N. 75th Ave.	Before 1911
723	7301 W. Van Buren St.	1911-1942
724	6701 W. Van Buren St.	1911-1942
726	6529 W. Van Buren St.	Before 1911

Due to the possibility of encountering historical properties throughout the study area, a survey is recommended to ascertain the presence/absence of such properties on a site-specific basis. As a part of determining alternatives, specific historical properties should be identified, and then evaluated as to their eligibility for the National Register of Historic Places.

D. Social and Economic Assessment

This section of the data collection report briefly describes minority groups and low-income populations within the project area. This report was completed with guidance provided by Executive Order 12898 regarding Environmental Justice. The Environmental Protection Agency's Office of Environmental Justice offers the following definition:

> "The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local and tribal programs and policies."

Methodology

The effort described in this section outlines available "Census Block Group" data so that these Environmental Justice goals can be met by identifying the areas within the project area, where low income and ethnic minority groups are present in significantly higher proportions than exhibited by the United States as a whole. Also, areas (block groups) that have a significant proportion of minors (17 years and under) and elderly (65 years or older) are identified. By identifying block groups (hereafter referred to as "significant block groups") within the project area which have low median household incomes and high percentages of ethnic minorities, minors and elderly people, this study serves as a planning tool for avoiding adverse impacts to these groups.

In order to identify the sensitive block groups within the project area, a Geographic Information System (GIS) was used. Electronic spatial and database files were obtained from the U.S. Census Bureau and the Arizona Department of Economic Security, pertaining to the project area. "Tiger File" maps were obtained from the U.S. Census Bureau, in an electronic, CD ROM format. These map coverages were incorporated into a GIS, and show the boundaries of the Census block groups as well as roads, streams and other geographic features. Also, U.S. Census Bureau - STF3A database files were obtained from the Arizona Department of Economic Security. The STF3A files include that data collected during the 1990 Census and provide a variety of socioeconomic data on each block group within the project area. The Tiger Maps were tied to the STF3A files within the GIS, to serve as a tool for socioeconomic analysis.

Significance Criteria

In order to determine the significant block groups within the project area, or those meeting Environmental Justice criteria, a set of significance criteria were developed specifically for use during the ADMP evaluation. The ADMP review committee may choose to change these criteria to meet the needs of this project as the Environmental Justice executive order does not outline specific criteria to be used for this type of project. Therefore, in this study, for a block group to be considered a low income block group (or "significant" by definition in this document), it must have a 1990 median household income of $15,000 (the official 1990 poverty rate) or less. In order for a block group to be considered a "significant" ethnic minority block group, it must have proportions of ethnic minority groups that are at least 10% greater than that tabulated for the United States in the 1990 decennial census. Using this formula, the following are the specific ethnic minority thresholds used during this evaluation; 1) African American - 22.1% or greater, 2) American Indian, Eskimo, Aleut - 10.8% or greater, 3) Asian, Pacific Islander - 12.9% or greater, 4) Persons of Hispanic Origin - 19.0% or greater, and 5) Other race - 13.9% or greater. Finally, in determining block groups that are significant in terms of age, "significance" criteria for age cohorts of 17 years or younger and 65 years or older were developed. A block group is considered to be significant for age if the percentage of these age cohorts is at least 10% greater than that tabulated for the United States in the 1990 decennial census. The following are the specific age cohort thresholds; Ages 0 - 5 = 18.9% or greater, Ages 5 - 17 = 26.7% or greater and Ages 65 + = 22.6% or greater.

In the first section of this analysis, entitled "Community Profiles", the communities which make up the project area are described in terms of population growth, land area, median household income and ethnic diversity. These socioeconomic attributes for these communities are compared to those of the State of Arizona and for the United States. This section is intended as background material, and to establish a better understanding of the socioeconomic context within which the project area. In the second section of this analysis, entitled "Low Income and Ethnic Minority Populations", significant Census block groups are identified and discussed.

Community Profiles

The project area consists of portions of south-western Phoenix and the cities of Tolleson, Avondale and Goodyear, a small portion of the northern section of the Gila River Indian Community and some unincorporated areas of Maricopa county. **Table V-1** summarizes the population growth and land areas for these communities.

Table V-1. Project Area Population And Land Area

	Maricopa County	Phoenix	Tolleson	Avondale	Goodyear
1999 population	2,913,475	1,240,775	4,685	32,270	17,085
1990 population	2,122,101	983,403	4,434	16,169	6,258
Population Growth Rate 1990 - 1999	37.3%	26.17%	5.7%	99.6%	173.0%
1996 Land Area (Sq. Mi.)	9,226.0	419.9	5.0	22.1	117.57

Sources: 1999 population estimates and 1996 Land Area - Maricopa Association of Governments. 1990 population - U.S. Census Bureau.

Table V-2. Median Household Income And Ethnic Diversity

	United States	Arizona	Maricopa County	Phoenix	Tolleson	Avondale	Goodyear
Median Household Income	$30,056	$27,540	$30,797	$29,291	$25,496	$24,292	$32,708
# and % White	199,686,070 80.3%	2,967,682 81.0%	1,801,570 84.9%	803,691 81.7%	1,728 39.0%	9,468 58.6%	4,477 71.5%
# and % Black	29,986,060 12.1%	110,062 3.0%	74,295 3.5%	51,237 5.2%	4 0.1%	777 4.8%	452 7.2%
# and % American Indian, Eskimo or Aleut	1,959,234 0.8%	204,589 5.6%	38,309 1.8%	18,337 1.9%	22 0.5%	228 1.4%	163 2.6%
# and % Asian or Pacific Islander	7,273,662 2.9%	54,127 1.5%	35,208 1.7%	15,990 1.6%	0 0.0%	236 1.5%	85 1.4%
# and % Persons of Hispanic Origin*	22,354,059 9.0%	680,628 18.6%	340,117 16.0%	194,118 19.7%	3,393 76.5%	8,287 51.3%	4,708 75.2%
# and % Other Race	9,804,847 3.9%	328,768 8.9%	172,719 8.1%	94,148 9.6%	2,680 60.4%	5,460 33.8%	1,081 17.3%

Source: US Census Bureau - STF3A files, 1990

*Persons of Hispanic Origin accounts for Hispanic people of all races (e.g. White, Black, Asian, etc.). Therefore, this category represents a double count and is the reason that a summation of all the races is greater than 100% of the population.

According to the U.S. Census Bureau, Maricopa county had a median household income in 1990 that was greater than that of the United States and the State of Arizona (See **Table V-2**). Considering the communities included in this analysis, Tolleson and Avondale had median household income levels in 1990, that were significantly less than the United States, Arizona and Maricopa county. The city of Goodyear had a median household income in 1990 that was greater than that of the United States, Arizona and Maricopa county. Finally, the city of Phoenix had a median household income in 1990 that was very close to the average for the United States, Arizona and Maricopa county.

In terms of ethnic diversity, Maricopa county was less diverse in 1990 than both the United States and Arizona (see **Table V-2**). In 1990, Maricopa county had a greater percentage of Native Americans than the United States, but a smaller percentage than Arizona. Also, Maricopa county had a much greater percentage of people of Hispanic origin than the United States, but a slightly smaller percentage than that for Arizona. Similarly, Maricopa county had a greater percentage of people in the "other race" category than the United States, but a slightly smaller percentage than for Arizona. In 1990, Phoenix was about average in ethnic diversity relative to the United States, Arizona and Maricopa county. There was a greater percentage of African Americans than in Maricopa county, but a lesser percentage than in the United States as a whole. There was a greater percentage of American Indian, Eskimo, Aleut than for the United States, but a smaller percentage of this group than the state of Arizona as a whole. The cities of Tolleson, Avondale and Goodyear are significantly more ethnically diverse (to varying degrees) than the United States, Arizona, Maricopa county or Phoenix. Tolleson is by far the most ethnically diverse, with white people representing only 39.0%. of the population. The most significant ethnic group in Tolleson is persons of Hispanic origin and "other" race. Avondale is between Tolleson and Goodyear in terms of ethnic diversity, with white people representing 58.6% of the population. The most significant ethnic minority groups are persons of Hispanic origin and "other" race. Goodyear, has a relatively high degree of ethnic diversity, but is less diverse than both Tolleson and Avondale. White people represent 71.5% of the population. Persons of Hispanic Origin are a very significant group in Goodyear.

Low Income and Ethnic Minority Populations

Block groups within the project area are shown in **Figure 18**. This figure provides the location and block group ID numbers for all of the block groups. The first six digits of each ID number refers to the Census Tract number and the last digit of the ID refers to the block group number.

Significant Block Groups - Low Median Household Income

There were twelve (17.6% of all block groups) Census Block Groups within the project area that were found to be significant for low median household income (see **Table V-3**). **Figure V-4** shows the geographical distribution of these block groups within the project area. Twelve of the sixty-eight block groups within the project area met the significance criteria; having a 1990 median household income of $15,000 or less. These significant block groups are mostly located in the north-eastern corner of the project area, or south-western Phoenix, south of Interstate 10 and adjacent to Interstate 17. The exceptions are Census Tract/Block Group ID number 0614001, which is located in Avondale and Census Tract/Block Group ID number 6232001, which is located along the south-central edge of the project area, within the Gila River Indian Community.

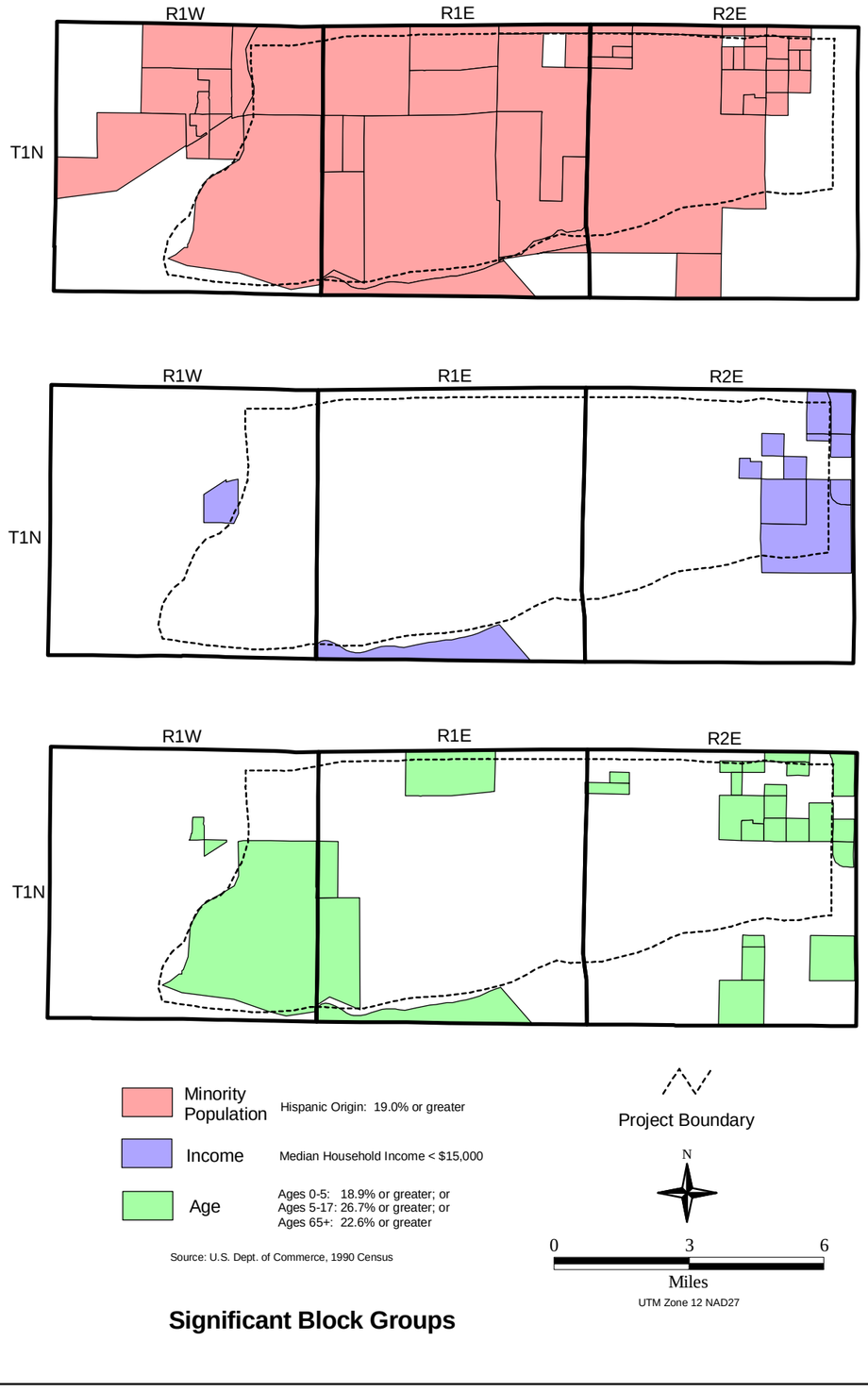
Table V-3. Block Groups Significant For Low Median Household Income

Block Group ID Number	1990 Population	Median Household Income
0614001	1818	$8,561
6232001	2806	$8,572
1146002	429	$14,861
1145002	1573	$14,091
1145003	965	$10,000
1128002	104	$6,581
1128001	631	$11,705
1144004	488	$12,312
1144001	1189	$12,428
1147003	2957	$13,333
1147001	860	$12,368
1147002	998	$4,999

Source: U.S. Census Bureau - STF3A files, 1990

Significant Block Groups - High Proportions of Ethnic Minorities

There were sixty-one (89.7% of all block groups) Census Block Groups within the project area that were found to be significant for high proportions of ethnic minorities (see **Table V-4**). These block groups had ethnic minority populations that were at least 10% greater than the percentages tabulated for the Nation in 1990 in the decennial Census (see "significance criteria" section). **Figure V-4** shows the geographical distribution of these block groups within the project area. About half of the block groups that do not have high proportions of ethnic minorities are found along the western edge of the project area, or north-central Goodyear. The significant block groups are scattered throughout the project area. The most significant ethnic minority groups are "other" (with 80.8% of all block groups) and Persons of Hispanic Origin (with 85.3% of all block groups). High proportions of American Indian, Eskimo, Aleut are found only within the Gila River Indian Community (or Census Tract/Block Group ID number 6232001) on the south-central edge of the project area. There were no block groups within the project area with significant populations of African Americans or Asian, Pacific Islanders.



Significant Block Groups

Project Boundary

N

0 3 6

Miles

UTM Zone 12 NAD27

Block Group Numbers

PROJECT LOCATION

FIGURE V - 4

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99 - 41

CONSULTANT:
SWCA Environmental Consultants

EXHIBIT TITLE:
BLOCK GROUP NUMBERS/
SIGNIFICANT BLOCK GROUPS

Table V-4. Block Groups With Significant* Percentage of Ethnic Minorities

Block Group ID	# White	% White	# Black	% Black	# N.A.**	% N.A.	# Asian	% Asian	# Other	% Other	# Hisp***	% Hisp.
0610043	295	72%	0	0%	0	0%	42	10%	75	18%	89	22%
0610034	725	79%	34	4%	23	3%	30	3%	102	11%	183	20%
0613001	1511	71%	51	2%	56	3%	13	1%	492	23%	669	32%
0612004	684	75%	26	3%	0	0%	29	3%	174	19%	279	31%
0612003	1606	54%	288	10%	85	3%	60	2%	949	32%	1354	45%
0614003	571	62%	0	0%	39	4%	0	0%	309	34%	726	79%
0614002	1580	65%	231	9%	55	2%	5	0%	569	23%	941	39%
0614001	661	36%	139	8%	31	2%		0%	987	54%	1382	76%
0612001	1103	63%	14	1%	0	0%	0	0%	622	36%	931	54%
0820062	1710	77%	195	9%	25	1%	85	4%	216	10%	457	20%
0822022	576	41%	11	1%	0	0%	0	0%	822	58%	1030	73%
0822021	610	41%	0	0%	0	0%	7	0%	878	59%	1369	92%
0822011	1627	60%	97	4%	0	0%	0	0%	1001	37%	1500	55%
0821001	1171	39%	4	0%	22	1%	0	0%	1828	60%	2292	76%
0821002	503	37%	0	0%	0	0%	0	0%	852	63%	1044	77%
0822012	627	83%	0	0%	11	1%	0	0%	116	15%	125	17%
6232001	89	3%	13	0%	2594	92%	13	0%	97	3%	327	12%
1125062	641	74%	72	8%	26	3%	0	0%	132	15%	187	21%
1125066	1134	72%	40	3%	26	2%	37	2%	347	22%	525	33%
1125065	1180	74%	127	8%	8	0%	0	0%	289	18%	293	18%
1125051	940	68%	134	10%	7	1%	43	3%	261	19%	317	23%
1125052	970	80%	70	6%	0	0%	9	1%	170	14%	358	29%
1125053	546	59%	89	10%	8	1%		0%	349	38%	464	50%
1125054	711	77%	4	0%	47	5%	0	0%	158	17%	300	33%
1125063	1012	55%	290	16%	60	3%	10	1%	477	26%	580	31%
1125067	315	50%	0	0%	22	4%	48	8%	241	38%	241	38%
1166015	774	82%	0	0%	17	2%	0	0%	153	16%	210	22%
1126004	1045	70%	134	9%	28	2%	38	3%	252	17%	707	47%
1126006	562	72%	15	2%	66	8%	0	0%	138	18%	176	23%
1126003	488	47%	141	14%	0	0%	0	0%	407	39%	678	65%
1146001	569	77%	0	0%	0	0%	19	3%	153	21%	495	67%
1146002	366	85%	0	0%	0	0%	0	0%	63	15%	329	77%
1126005	691	75%	44	5%	0	0%	24	3%	164	18%	512	55%
1126001	273	24%	0	0%	51	5%	0	0%	801	71%	991	88%
1126002	1239	90%	0	0%	11	1%	0	0%	131	9%	1117	81%
1127005	569	81%	0	0%	10	1%	0	0%	126	18%	556	79%
1127004	719	75%	0	0%	70	7%	9	1%	165	17%	696	72%
1127003	721	64%	89	8%	26	2%	0	0%	289	26%	886	79%
1145002	918	58%	0	0%	40	3%	0	0%	615	39%	1259	80%
1145004	494	51%	34	4%	41	4%	0	0%	402	41%	661	68%
1127001	634	61%	27	3%	0	0%	11	1%	359	35%	787	76%
1127006	797	65%	67	5%	3	0%	0	0%	366	30%	875	71%
1127002	855	75%	11	1%	13	1%	0	0%	267	23%	933	81%
1145001	412	30%	153	11%	6	0%	0	0%	822	59%	1019	73%

Source: U.S. Census Bureau - 1990 Census - STF3A files

*The following is the criteria for a block group to be considered significant for ethnic minorities: 1) African American - 22.1% or greater, 2) American Indian, Eskimo, Aleut - 10.8% or greater, 3) Asian, Pacific Islander - 12.9% or greater, 4) Persons of Hispanic Origin - 19.0% or greater, and 5) Other race - 13.9% or greater.

**N.A. = Native American - Includes American Indian, Eskimo or Aleut

***Hisp. = Persons of Hispanic Origin - This accounts for Hispanic people of all races (e.g. White, Black, Asian, etc.). Therefore, this category represents a double count and is the reason that a summation of all the races is greater than 100% of the population.

Significant Block Groups - High Proportions of Minors and Elderly

There were twenty-seven (39.7% of all block groups) Census Block Groups within the project area that were found to be significant for high proportions of minors (ages 17 and under) and elderly (ages 65 and over) people (see **Table V-5**). These block groups had minor and elderly populations that were at least 10% greater than the percentages tabulated for the Nation in 1990 in the decennial Census (see significance criteria above). **Figure V-4** shows the geographical distribution of these block groups within the project area. Of the block groups that were found to be significant for age, only two of the block groups were significant for the ages 0-5 cohort; Census Tract/Block Group ID numbers 1127005 and 1147002. Of the significant block groups (for age), all but one of the block groups was significant for the age 5 - 17 cohort. Only one block group was found to be significant for elderly population, which is Census Tract/Block Group ID number 1126007.

Table V-5. Significant Block Groups, Significant Proportion of Minors And Elderly*

Block Group ID	Population 1990	# Age 0-5	% Age 0-5	# Age 5-17	% Age 5-17	# Age 65+	% Age 65+
0612004	913	76	8%	282	31%	117	13%
0614003	919	76	8%	295	32%	29	3%
0822022	1409	113	8%	512	36%	92	7%
0822011	2725	234	9%	771	28%	139	5%
0821001	3025	298	10%	819	27%	175	6%
6232001	2806	317	11%	827	29%	251	9%
1125053	922	98	11%	364	39%	137	15%
1125054	920	128	14%	267	29%	33	4%
1126007	910	65	7%	119	13%	214	24%
1146002	1036	137	13%	337	33%	53	5%
1146001	741	105	14%	219	30%	65	9%
1126003	429	24	6%	162	38%	25	6%
1126001	1125	128	11%	373	33%	79	7%
1127005	705	136	19%	178	25%	13	2%
1127003	1125	156	14%	390	35%	51	5%
1145002	1573	221	14%	443	28%	83	5%
1145004	971	129	13%	299	31%	31	3%
1127001	1031	75	7%	277	27%	143	14%
1145003	965	163	17%	290	30%	43	4%
1128001	631	91	14%	235	37%	32	5%
1144003	1214	123	10%	329	27%	97	8%
1144002	954	122	13%	258	27%	73	8%
1147002	998	222	22%	366	37%	33	3%
1155001	1015	98	10%	306	30%	46	5%
1155002	2152	280	13%	647	30%	125	6%
1166014	1180	143	12%	374	32%	30	3%
1156001	2182	264	12%	640	29%	71	3%

Source: U.S. Census Bureau, 1990 Census, STF3A files.

*The following are the specific age cohort thresholds; Ages 0 - 5 = 18.9% or greater, Ages 5 - 17 = 26.7% or greater and Ages 65 + = 22.6% or greater.

E. Hazardous Waste Inventory

The effort described in this section of the data collection report briefly describes currently available environmental records, with regards to environmental and toxic waste categories, within the project area. This section of the report was completed by Environmental Data Resources, Inc. (EDR), a vendor specializing in the maintenance of a variety of databases designed specifically for inventorying hazardous and toxic waste sites. The sole purpose of this summary of data is to provide a planning tool for use during the Durango ADMP alternative analysis process.

Methodology

A search of available environmental records was conducted by EDR on 12-28-99. The area of the subject property for which the search was completed was described to EDR as the Durango Area Drainage Master Plan (ADMP) study area, Phoenix, Arizona. The environmental record search conducted by EDR consisted of searching 24 electronic environmental databases, which they regularly update. All of these databases and the search results for the project area are discussed below. Summaries of the results of the database search are also presented in **Table V-6**.

This database search documented 405 different hazardous waste sites within the Durango ADMP area. Many of these hazardous waste sites appeared in several databases and the same address often had more than one hazardous waste "microsite" present. This was particularly true for those businesses and facilities that have multiple underground and/or above ground storage tanks.

Every hazardous waste source, its address, and all other specific information provided by EDR are available in an electronic format. A condensed version of this database is available both in the **Appendix** and in the electronic format. An index to the codes used in these hazardous materials inventory tables is available both in the **Appendix** and in the electronic format. Since there were over 1,000 different hazardous waste sources identified within the Durango ADMP area, they are not listed individually in this summary. However, maps of the Durango ADMP area that do identify every hazardous waste site in the project area are presented in this report (**Figures V-5 and V-6**).

The maps of the Durango ADMP area were reviewed in an attempt to create more "user friendly" maps with less clutter of hazardous waste sites. However, even after removing 13 of the less serious types of sites, the number of sites on the modified maps was only 25 fewer than on the original maps. Therefore, the attempt to create less cluttered maps was subsequently abandoned. The site listings that were eliminated during the attempt to create these from the modified maps included AST, AIRS, HMIRS, CERCLIS-NFRAP, RCRIS-SQG, MINES, FINDS, AZ_SPILL, RCRIS-LQG, UST, WWFAC, TSCA, and DRY WELL.

The following are brief descriptions of each of the database listings identified in the EDR review:

WQARF: Water Quality Assurance Revolving Fund Sites. Source: Arizona Department of Environmental Quality. These are sites which may have an actual or potential impact on the waters of the state, caused by hazardous substances. The state of Arizona has established a program under A.R.S. 49-22 to remedy these sites . In the WQARF program, the state takes actions to identify the extent and impact of the contamination and to identify the parties responsible for remediation of the site. The WQARF program provides matching funds to political subdivisions and other state agencies for clean-up activities. A review of the AZ WQARF list, as provided by EDR, and dated 12-28-99 has revealed that there is 1 AZ WQARF site within the Durango ADMP area. This site is referred to as the West Van Buren WQARF site.

AIRS: Arizona Airs Database. Source: Arizona Department of Environmental Quality. This database contains air pollution point sources in Arizona that are monitored by the U. S. Environmental Protection Agency and/or state and local air regulatory agencies. A review of the AZ AIRS list, as provided by EDR, and dated 12-28-99 has revealed that there are 4 AZ AIRS sites within the Durango ADMP area.

AZ AQUIFER: Arizona Aquifers Database. Source: Arizona Department of Environmental Quality. This database contains waste water treatment facilities in Arizona that have Aquifer Protection Permits. A review of the AZ AQUIFER list, as provided by EDR, and dated 12-28-99 has revealed that there are 4 AZ AQUIFER sites within the Durango ADMP area.

CORRACTS: Corrective Action Report Database. Source: U.S. Environmental Protection Agency. This database identifies hazardous waste handlers with RCRA corrective action activity. A review of the CORRACTS list, as provided by EDR, and dated 12-28-99 has revealed that there are 3 CORRACTS sites within the Durango ADMP area.

PADS: PCB Activity Database System. Source: U.S. Environmental Protection Agency. PADS identifies generators, transporters,

commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities. A review of the PADS list, as provided by EDR, and dated 12-28-99 has revealed that there are 3 PADS sites within the Durango ADMP area.

AST: List of Aboveground Storage Tanks. This database contains all of the aboveground storage tanks in Arizona. A review of the AST list, as provided by EDR, and dated 12-28-99 has revealed that there are 10 sites within the Durango ADMP area.

CERCLIS: Comprehensive Environmental Response, Compensation, & Liability Information System. Source: U.S. Environmental Protection Agency. CERCLIS contains data on potentially hazardous waste sites that have been reported to the U.S. EPA by states, municipalities, private companies, and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to occur or actually do occur on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL. A review of the CERCLIS list, as provided by EDR, and dated 12-28-99 has revealed that there is 1 CERCLIS site within the Durango ADMP area. This is Reynolds Metal Company, located at 3501 W. Van Buren.

CERCLIS - NFRAP: No Further Remedial Action Planned - Comprehensive Environmental Response, Compensation, and Liability System. Source: U.S. Environmental Protection Agency. These are former CERCLIS sites. As of February 1995, CERCLIS sites designated "No Further Remedial Action Planned" (NFRAP) have been removed from CERCLIS. NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund action or NPL consideration. The EPA has removed approximately 25,000 NFRAP sites to lift the unintended barriers to the redevelopment of these properties and has archived them as historical records so the EPA does not needlessly repeat the investigations in the future. A review of the CERCLIS - NFRAP list, as provided by EDR, and dated 12-28-99 has revealed that there are 24 CERCLIS - NFRAP sites within the Durango ADMP area.

HMIRS: Hazardous Materials Information Reporting System. Source: U.S. Department of Transportation. HMIRS contains hazardous material spill incidents reported to the DOT. A review of the HMIRS list, as provided by EDR, and dated 12-28-99 has revealed that there are 198 HMIRS sites within the Durango ADMP area.

ERNS: Emergency Response Notification System. Source: U.S. Environmental Protection Agency/NTIS. ERNS records and stores information on reported releases of oil and hazardous substances. A review of the ERNS list, as provided by EDR, and dated 12-28-99 has revealed that there are 56 ERNS sites within the Durango ADMP area.

RCRIS-SQG: Resource Conservation and Recovery Information System. Source: U.S. Environmental Protection Agency/NTIS. RCRIS contains information on hazardous waste handlers regulated by the Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act. It tracks events and activities related to facilities which generate, transport, and treat, store, or dispose of hazardous waste. All hazardous waste handlers are required to notify EPA of their existence by submitting the Federal Notification of Regulated Activity Form (EPA Form 8700-12) or a State equivalent form. Treatment, storage, and disposal facilities are further required to submit Part A (EPA Form 8700-23) and Part B of their Hazardous Waste Permit Application. A review of the RCRIS-SQG list, as provided by EDR, and dated 12-28-99 has revealed that there are 156 RCRIS-SQG sites within the Durango ADMP area.

HWS: ZipAcids List. Source: Arizona Department of Environmental Quality. This database contains locations subject to investigations concerning possible contamination of soil, surface water, or groundwater. Inclusion of any facility or site on this list does not mean that the location is contaminated, is causing contamination, or is in violation of State or Federal statutes or regulations. A review of the HWS list, as provided by EDR, and dated 12-28-99 has revealed that there are 85 HWS sites within the Durango ADMP area.

MINES: Mines Master Index File. This database contains locations of mines, gravel pits, etc.
A review of the MINES list, as provided by EDR, and dated 12-28-99 has revealed that there are 3 MINES sites within the Durango ADMP area.

FINDS: Facility Index System/Facility Indentification Initiative Program Summary Report. Source: U.S. Environmental Protection Agency/NTIS. FINDS contains both facility information and "pointers" to other sources that contain more detail. These include RCRIS, PCS, AIRS, FATES/SSTS, FATES/FTTS, CERCLIS, DOCKET, FURS (Federal Underground Injection Control), FRDS, SIA (Surface Impoundments), CICIS (TSCA Chemicals in Commerce Information

System), PADS, RCRA-J (medical waste transporters/disposers), TRIS, & TSCA. A review of the FINDS list, as provided by EDR, and dated 12-28-99 has revealed that there are 190 FINDS sites within the Durango ADMP area.

LUST: Leaking Tank Listing. Source: Arizona Department of Environmental Quality. Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state. A review of the LUST list, as provided by EDR, and dated 12-28-99 has revealed that there are 136 LUST sites within the Durango ADMP area.

DRYCLEANERS: Drycleaning Facilities. This database contains locations for drycleaning facilities. A review of the DRYCLEANERS list, as provided by EDR, and dated 12-28-99 has revealed that there are 15 DRYCLEANERS sites within the Durango ADMP area.

LF: Directory of Solid Waste Facilities. Source: Arizona Department of Environmental Quality. Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites. A review of the LF list, as provided by EDR, and dated 12-28-99 has revealed that there are 2 LF sites within the Durango ADMP area. These are the Riverside Elementary District landfill located at 1414 S. 51st Avenue and the Glenn Weinberger Rainbow Valley landfill located 3 blocks south of Lower Buckeye Road on 39th Avenue.

AZ_SPILL: Hazardous Material Logbook. Source: Arizona Department of Environmental Quality (ADEQ). ADEQ Emergency Response Unit. The ADEQ Emergency Response Unit documents chemical spills and incidents which are referred to the Unit. The logbook for 1984-1986 consists of handwritten entries of the date, incident number, and name of facility if known. Current logbooks are computerized and can be sorted by date, incident number, name, city, county, chemical, and quantity. A review of the AZ_SPILL list, as provided by EDR, and dated 12-28-99 has revealed that there are 125 AZ_SPILL sites within the Durango ADMP area.

RCRIS-LQG: Resource Conservation and Recovery Information System. Source: U.S. Environmental Protection Agency/NTIS. RCRIS contains information on hazardous waste handlers regulated by the Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act (RCRA). It tracks events and activities related to facilities which generate, transport, and treat, store or dispose of hazardous waste. All hazardous waste handlers are required to notify EPA of their existence by submitting the Federal Notification of Regulated Activity Form (EPA Form 8700-12) or a State equivalent form. Treatment, storage, and disposal facilities are further required to submit Part A (EPA Form 8700-23) and Part B of their Hazardous Waste Permit Application. A review of the RCRIS-LQG list, as provided by EDR, and dated 12-28-99 has revealed that there are 28 RCRIS-LQG sites within the Durango ADMP area.

TRIS: Toxic Chemical Release Inventory System. Source: U.S. Environmental Protection Agency/NTIS. TRIS identifies facilities which release toxic chemicals to the air, water, and land in reportable quantities under SARA title III section 303. A review of the TRIS list, as provided by EDR, and dated 12-28-99 has revealed that there are 23 TRIS sites within the Durango ADMP area.

UST: Underground Storage Tank Listing. Source: Arizona Department of Environmental Quality. A review of the UST list, as provided by EDR, and dated 12-28-99 has revealed that there are 226 UST sites within the Durango ADMP area.

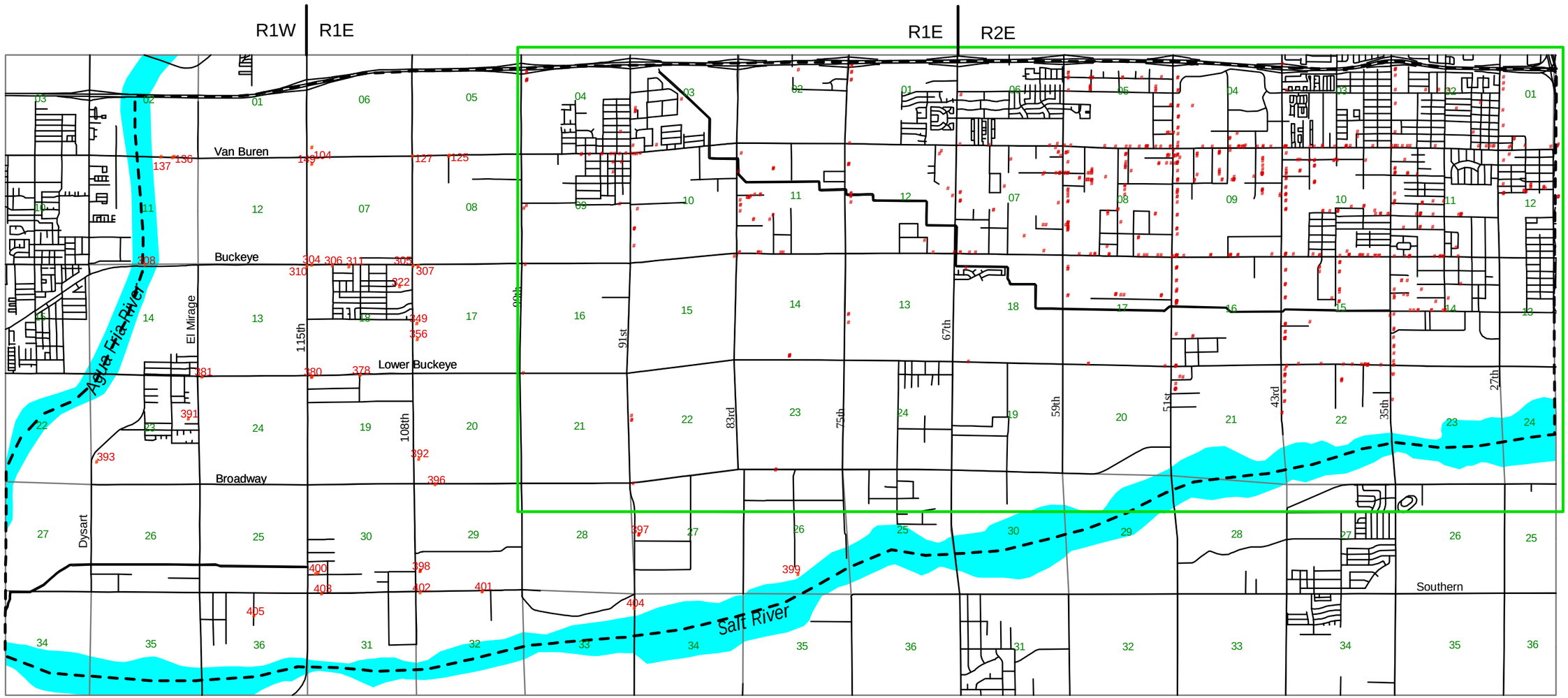
WWFAC: Waste Water Treatment Facilities. Source: Arizona Department of Environmental Quality. A review of the WWFAC list, as provided by EDR, and dated 12-28-99 has revealed that there are 31 WWFAC sites within the Durango ADMP area.

TSCA: Toxic Substances Control Act. Source: U.S. Environmental Protection Agency. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory List. It includes data on the production volume of these substances by plant site. A review of the TSCA list, as provided by EDR, and dated 12-28-99 has revealed that there are 4 TSCA sites within the Durango ADMP area.

DRY WELL: Arizona Dry Wells List. Source: Arizona Department of Environmental Quality. Constructed solely for the disposal of storm water, more than 3,400 dry wells have been registered with the state under A.R.S 49-331 through 336. A review of the DRY WELL list, as provided by EDR, and dated 12-28-99 has revealed that there are 146 DRY WELL sites within the Durango ADMP area.

Table V-6. Summary Results Of Hazardous Materials Database Search

Database	Full Name	Total Number
WQARF	Water Quality Assurance Revolving Fund Sites	1
AIRS	Arizona Airs Database	4
AZ AQUIFER	Waste Water Treatment Facilities	4
CORRACTS	Corrective Action Report	3
PADS	PCB Activity Database System	3
AST	List of Aboveground Storage Tanks	10
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Info. System	1
CERCLIS-NFRAP	CERCLIS - No Further Remedial Action Planned	24
HMIRS	Hazardous Materials Info. Reporting System	198
ERNS	Emergency Response Notification System	56
RCRIS-SQG	Resource Conservation and Recovery Information System	156
HWS	Zipacids	85
MINES	Mines Master Index File	3
FINDS	Facility Index System/Facility Identification Initiative Program Summary Report	190
LUST	Leaking Tank Listing	136
DRYCLEANERS	Drycleaning Facilities	15
LF	Directory of Solid Waste Facilities	2
AZ_SPILL	Hazardous Material Logbook	125
RCRIS-LQG	Resource Conservation and Recovery Info. System	28
TRIS	Toxic Chemical Release Inventory System	23
UST	Underground Storage Tank Listing	226
WWFAC	Waste Water Treatment Facilities	31
TSCA	Toxic Substances Control Act	4
DRY WELL	Drywell Registration	146



For Detail of Unlabeled Sites See Sheet 2

PROJECT LOCATION

T1N-R1W
T1N-R1E
T1N-R2E
Gila and Salt River Meridian

KEY

369 Hazardous Material Site

21 Section Number

Project Boundary

Area of Detail in Sheet 2

N

0 1000 2000 3000 4000 5000 Feet

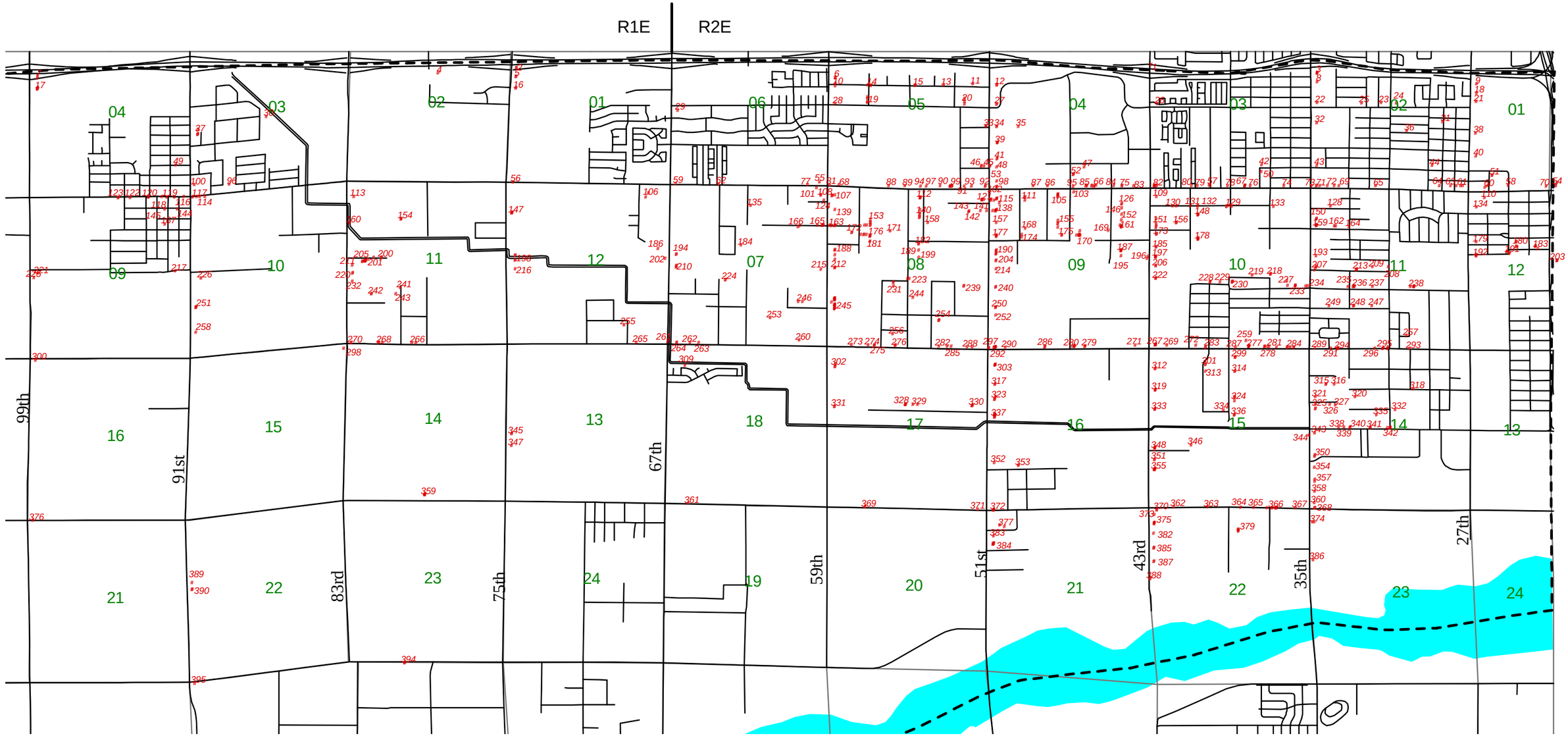
Arizona State Plane Central NAD83

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99 - 41

CONSULTANT:
SWCA Environmental Consultants

EXHIBIT TITLE:
HAZARDOUS MATERIAL SITES
(Sheet 1 of 2)

FIGURE V - 5



KEY

369 Hazardous Material Site

21 Section Number

Project Boundary

0 1000 2000 3000 4000 5000 Feet

N

Arizona State Plane Central NAD83

PROJECT TITLE:
DURANGO AREA DRAINAGE MASTER PLAN
PROJECT NO. FCD 99 - 41

CONSULTANT:
SWCA Environmental Consultants

EXHIBIT TITLE:
HAZARDOUS MATERIAL SITES
(Sheet 2 of 2)

FIGURE V - 6

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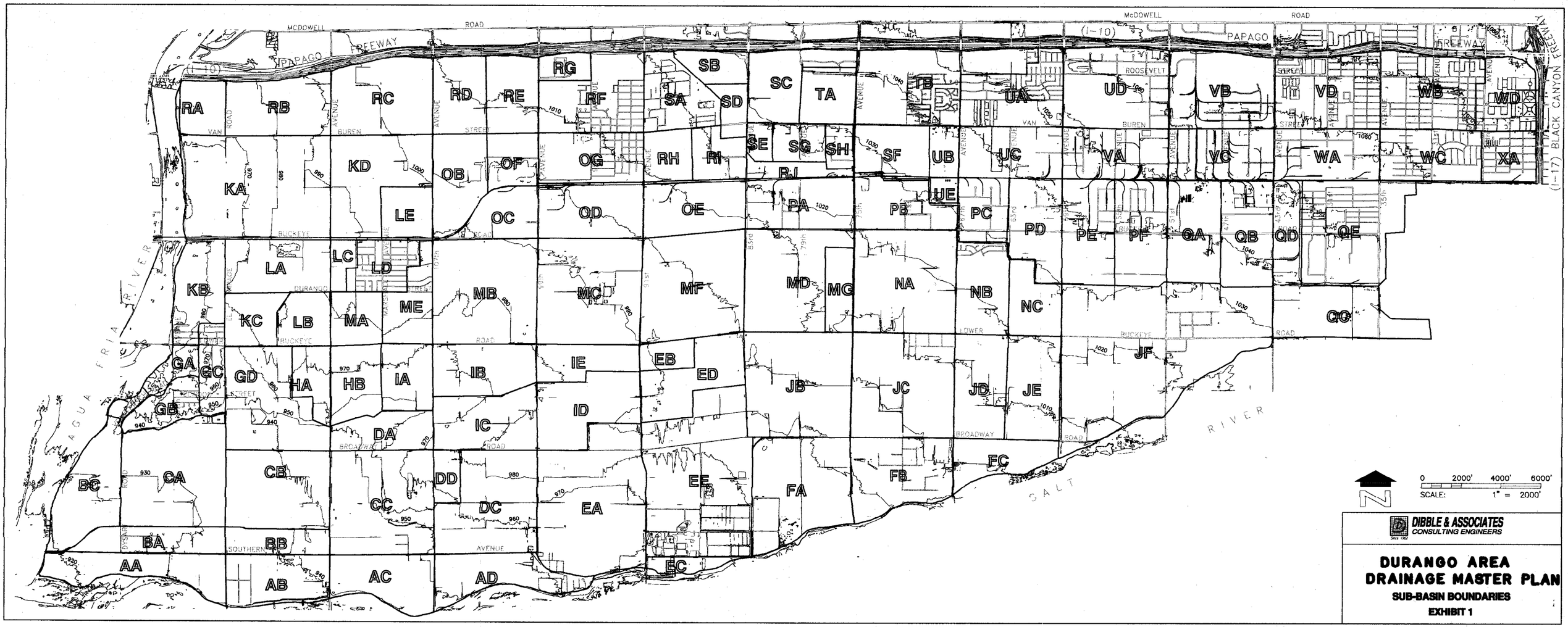
Appendices

CURRENT AND PROPOSED DEVELOPMENTS

Development Name	Engineering Consultant	Principle Contact	Phone Number	Developer	Drainage Report Received?
Sundance Ranch	RBF	Bruce Larson, P.E.	(623)582-0260	Stardust Development	Yes
Estrella Manor	Infinity Engineering	Bob Mitchell, P.E.	(480)902-0571	Recop Investment Inc.	
Meadow	Infinity Engineering	Bob Mitchell, P.E.	(480)902-0571	Carson/Tyler Communities	
Suncrest	Dan Tobar	Dan Tobar, P.E.	(623)972-0467	The Dehaven Co.	
Estrella Village Manor	Terra Consulting	Dave Gue, P.E.	(602)426-1600	DPP Development	
Mountain View West	RBF	Bruce Larson, P.E.	(623)582-0260	Centex Homes, Inc.	
Marbella	Landmark Engineering, Inc.	Thomas Granillo, P.E.	(602)861-2005	Richmond American Homes	Yes
Rio Del Rey	Sage Engineering Corp.	Gary Hoodzow, P.E.	(602)966-9971	Newport Development	Yes
67th & Lower Buckeye Rd.		Doug Oberg, P.E.	(602)306-1000	Kaufman & Broad	
83rd & Buckeye	Coe & Van Loo	Timothy Kelly, P.E.	(602)264-6831	Lennar Community Development	
Sienna Vista		Todd Weber	(480)970-6000	Maracay Homes	
Country Place	Coe & Van Loo	Timothy Kelly, P.E.	(602)264-6831	Communities Southwest	Yes
83rd & Lower Buckeye Rd.	RBF	Ken Tarr, P.E.	(623)582-0260	Hacienda Builders	
Heritage Point	RBF	Joseph E. Cable, P.E.	(623)582-0260	Ryland Homes	Yes
91st Ave. & Lower Buckeye Rd.	Coe & Van Loo	Timothy Kelly, P.E.	(602)264-6831		Yes
Coldwater Springs	CMX Group Inc.	Curtis Krausman, P.E.	(602)279-8436	Elliot Pollack	
Coldwater Ranch	Stantec Consulting Inc.	Jack Reeves, P.E.	(602)438-2200	Beazer Homes	Yes
Diamond Ridge	David Evans and Assoc.	Burke Lokey, P.E.	(602)678-5151	CHPV Holdings, LLC	
Cambridge Estates	RBF	Bruce Larson, P.E.	(623)582-0260	Trend Homes	Yes
Coldwater Springs Phase II	Stantec Consulting Inc.	Mike Samer, P.E.	(602)438-2200	Elliot Pollack	
Durango Park	RBF	Bruce Larson, P.E.	(623)582-0260	Aread, Inc.	
Fieldcrest	RBF	Bruce Larson, P.E.	(623)582-0260	Aread, Inc.	Yes
Shadow Ridge	David Evans and Assoc.	Burke Lokey, P.E.	(602)678-5151	CHPV Holdings, LLC	
Avondale Crossing-Auto Mall	RBF	Marc Allen, P.E.	(623)582-0260	AZVT, LLC	
Fiesta Travel Plaza	Fleet-Fisher Engineering, Inc.	Fred Fleet, P.E.	(602)264-3335	Interstate Commerse Center, LLC	
The Sanctuary at Avondale	Clouse Engineering Inc.	Jayme Chapin, P.E.	(602)395-9300	The Empire Group, LLC	Yes
Arnon Distribution Center	Evans Kuhn & Assoc. Inc.	John Gray, P.E.	(602)241-0782	Fourdy, LLC	
Highland Ranch	Infinity Engineering	Bob Mitchell, P.E.	(480)902-0571	Capital Pacific Homes	
Waterford Square	Martin Peltyn & Gorden Inc.	Jim Murpy	(602)224-3790	Cavalier Companies	
Anderson 300 acres	David Evans and Assoc.	Burke Lokey, P.E.	(602)678-5151		
CW Ranch		Rich Merit	(480)423-5900	Phoenix Southwest Associates	
73 El Mirage Properties	CMX Group Inc.	John Svechovsky, P.E., R.L.S.	(602)279-8436	Jeff Proper	
Knight Transportation	Morea Hall Engineering	Claudia Morea, P.E.	(602)258-4428	Knight Transportation	
Quaker Oats Warehouse		Scott Cupp	(623)907-2447	Quaker Oats	
States Logistics					
Elm Manufacturing		Ed Forst		Sun State Builders	
Utility Trailer Sales	ASL	Paul Gilmore	(602)244-2624	Utility Trailer Sales	
Roads West Depot	Lemme Engineering	Mark Sidler	(602)841-6904	Roads West	
Freightliner of Arizona	Keith W. Hubbard Pro. Engr.	Keith Hubbard, P.E.	(480)892-3313	Robert Cunningham	Yes
MBCI/DBCI	RBF		(623)582-0260	MBCI/DBCI	
Mesa Cold Storage	Haskell Company	Mike Wheel	(904)791-4500		
Nabisco	ASL	Matt Jaramilla	(602)244-2624		
Building B Warehouse	Evans Kuhn & Assoc. Inc.	Eric Sorensen	(602)241-0782	Ryan West	
Cardinal Health Distribution	Evans Kuhn & Assoc. Inc.	Eric Sorensen	(602)241-0782	Ryan West	
Barlow Distribution	Evans Kuhn & Assoc. Inc.	Eric Sorensen	(602)241-0782		
Landis Plastics	BRW	Bernie Duetsch (architect)	(602)840-2929		
Opus West Phase I & II	DEI Professional Services	Jeff Erickson	(602)954-0038	Bose	
Willamette Industries	Dibble & Associates	Ken Snyder, P.E.	(602)957-1155	Willamette Industries	
Transpacific Distribution Center, Site 4	Wood/Patel	Jim Campbell	(602)234-1344	Vincent Curci	
Shopping Center	Brady Auerlich	Don Andrews (architect)	(480)894-3344	Rick Black	
Costco Distribution Center	DEI Professional Services	Jeff Erickson	(602)954-0038	Costco	

HYDROLOGY EXHIBITS 1 AND 2


MCDOWELL ROAD
(I-10) PAPAGO FREEWAY
(I-17) BLACK CANYON FREEWAY
VAN BUREN STREET
BUCKEYE ROAD
DURANGO AVENUE
SOUTHERN AVENUE
BROADWAY ROAD
ROOSEVELT STREET
LOWER BUCKEYE ROAD
AGUA FRIA RIVER
SALT RIVER
RA RB RC RD RE RF RG SA SB SC SD TA TB UA UB UC UD UE VA VB VC VD WA WB WC WD XA
KA KB KC KD LA LB LC LD LE MA MB MC MD ME MF MG NA NB NC OA OB OC OD OE OF OG PA PB PC PD PE PF QA QB QC QD QE RH RI RJ SE SF SG SH
GA GB GC GD HA HB IA IB IC ID IE EA EB EC ED EE FA FB FC JA JB JC JD JE JF
BA BB BC CA CB CC DA DB DC DD
AA AB AC AD
0 2000' 4000' 6000'
SCALE: 1" = 2000'
DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
DURANGO AREA
DRAINAGE MASTER PLAN
SUB-BASIN BOUNDARIES
EXHIBIT 1

(I-10) FREEWAY

(I-17) FREEWAY

AGUA FRIA RIVER

GILA RIVER

SALT RIVER

BUCKEYE RD.

LOWER BUCKEYE RD

VAN BUREN ST.

BROADWAY RD.

SOUTHERN AVE.

EL MIRAGE RD

27TH AVE

35TH AVE

43RD AVE

51ST AVE

59TH AVE

67TH AVE

75TH AVE

83RD AVE

91ST AVE

99TH AVE

107TH AVE

115TH AVE

SUB-BASIN RUNOFF.

FLOW ROUTING.

DIVERT ROUTING.

HYDROGRAPH COMBINE POINT.

FLOW DIVERSION.

HYDROGRAPH COMBINE & DIVERSION POINT.

RESERVOIR

(100) / 75 — 24 hr / 6 hr

0 2000' 4000' 6000'

SCALE: 1" = 2000'

DIBBLE & ASSOCIATES
CONSULTING ENGINEERS

DURANGO AREA DRAINAGE MASTER PLAN

SUB-BASIN ROUTING

EXHIBIT 2

100-YR FLOWS

STORM COMPARISON TABLES

	10-6 i=2.06"		10-24 i=2.47"		100-6 i=3.23"		100-24 i=3.99"	
STATION	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK
SUBWD	239	4.50	163	12.42	455	4.50	329	12.50
RTWDXA	220	4.75	145	12.83	431	4.75	310	12.75
SUBXA	331	4.17	235	12.17	538	4.17	395	12.17
CPXA1	340	4.25	247	12.25	642	4.42	452	12.50
RSXA	319	4.42	227	12.33	631	4.50	445	12.58
DIZZ1	0	0.00	0	0.00	0	0.00	0	0.00
CPZZ1	319	4.42	227	12.33	631	4.50	445	12.58
RTXAWC	291	5.25	199	13.33	596	5.00	424	13.17
SUBWB	629	4.42	460	12.42	1046	4.42	791	12.42
RTWBWC	606	4.58	442	12.58	1018	4.50	764	12.58
SUBWC	509	4.33	359	12.33	836	4.33	609	12.33
CPWC	920	4.50	751	12.50	1606	4.58	1325	12.50
RSWC	707	5.00	534	12.92	1442	4.92	1126	12.83
DIQE	0	0.00	0	0.00	0	0.00	0	0.00
CPWC2	707	5.00	534	12.92	1442	4.92	1126	12.83
RTWCWA	670	5.58	510	13.58	1394	5.42	1091	13.33
SUBVD	653	4.42	480	12.33	1087	4.33	826	12.33
RTVDWA	568	4.75	406	12.75	980	4.67	730	12.67
SUBWA	726	4.17	515	12.17	1186	4.17	868	12.17
CPWA	849	5.50	672	13.50	1838	5.25	1540	13.17
RSWA	835	5.58	662	13.58	1818	5.33	1520	13.25
DIQD	0	0.00	0	0.00	0	0.00	0	0.00
CPWA2	835	5.58	662	13.58	1818	5.33	1520	13.25
RTWAVC	810	6.00	645	14.00	1788	5.67	1494	13.58
SUBVB	548	4.58	402	12.58	914	4.58	694	12.58
RTVBVC	465	5.08	333	13.17	803	5.00	604	13.08
SUBVC	673	4.17	473	12.17	1107	4.17	808	12.17
CPVC	1066	5.00	837	13.08	2273	5.50	1971	13.50

STATION	10-6 i=2.06" PEAK FLOW	10-6 i=2.06" TIME OF PEAK	10-24 i=2.47" PEAK FLOW	10-24 i=2.47" TIME OF PEAK	100-6 i=3.23" PEAK FLOW	100-6 i=3.23" TIME OF PEAK	100-24 i=3.99" PEAK FLOW	100-24 i=3.99" TIME OF PEAK
RSVC	962	6.08	782	14.08	2209	5.67	1912	13.67
DIVA	291	6.08	246	14.08	601	5.67	527	13.67
CPVC2	672	6.08	536	14.08	1609	5.67	1385	13.67
RTVCQA	654	6.33	523	14.42	1575	5.92	1356	13.92
SUBQA	411	4.50	299	12.50	699	4.50	517	12.50
CPQA2	659	6.33	535	14.42	1621	5.92	1423	13.83
RSQA	654	6.50	530	14.50	1620	5.92	1422	13.92
DIPF	272	6.50	223	14.50	543	5.92	510	13.92
DIPF	382	6.50	307	14.50	1077	5.92	912	13.92
RTQAJF	294	9.00	233	17.25	834	7.92	695	16.08
SUBQE	832	4.42	634	12.42	1362	4.42	1065	12.42
CPQE	0	0.00	0	0.00	0	0.00	0	0.00
RTDIQE	0	0.00	0	0.00	0	0.00	0	0.00
CPQE2	832	4.42	634	12.42	1362	4.42	1065	12.42
RSQE	711	4.58	528	12.58	1279	4.50	969	12.58
RTQEQC	688	4.83	515	12.83	1239	4.75	948	12.75
SUBQD	451	4.17	320	12.17	713	4.17	521	12.17
CPQD	0	0.00	0	0.00	0	0.00	0	0.00
RTDIQD	0	0.00	0	0.00	0	0.00	0	0.00
CPQD1	451	4.17	320	12.17	713	4.17	521	12.17
RSQD	398	4.25	282	12.25	686	4.17	482	12.17
DIQB	75	4.25	50	12.25	201	4.17	112	12.17
CPQD2	322	4.25	232	12.25	485	4.17	370	12.17
RTQDQC	215	4.67	151	12.67	364	4.58	280	12.58
SUBQC	508	4.42	375	12.42	860	4.42	647	12.42
CPQC	1156	4.75	933	12.75	2102	4.67	1741	12.67
DISR	924	4.75	747	12.75	1682	4.67	1393	12.67

STATION	10-6 i=2.06" PEAK FLOW	10-6 i=2.06" TIME OF PEAK	10-24 i=2.47" PEAK FLOW	10-24 i=2.47" TIME OF PEAK	100-6 i=3.23" PEAK FLOW	100-6 i=3.23" TIME OF PEAK	100-24 i=3.99" PEAK FLOW	100-24 i=3.99" TIME OF PEAK
CPQC2	231	4.75	187	12.75	420	4.67	348	12.67
RTQCJF	77	9.58	60	18.00	174	8.67	149	16.75
SUBJF	701	5.42	578	13.42	1278	5.58	1075	13.42
CPJF1	670	5.58	574	13.42	1231	5.58	1069	13.42
SUBQB	489	4.42	355	12.42	813	4.42	599	12.42
CPQB	75	4.25	50	12.25	201	4.17	112	12.17
RTDIQB	26	5.25	17	13.33	74	5.00	41	13.08
CPQB1	489	4.42	355	12.42	813	4.42	600	12.42
RSQB	292	4.83	199	12.83	655	4.67	495	12.67
RTQBJF	100	9.00	72	17.58	279	8.00	223	16.17
SUBPF	560	4.33	390	12.33	914	4.33	662	12.33
CPPF	272	6.50	223	14.50	543	5.92	510	13.92
RTDIPF	266	6.83	217	14.92	538	6.25	505	14.17
CPPF1	560	4.33	394	12.33	914	4.42	679	12.33
RSPF	251	7.17	219	15.33	566	6.25	537	14.25
DIPE	0	0.00	0	0.00	0	0.00	0	0.00
CPPF2	251	7.17	219	15.33	566	6.25	537	14.25
RTPFJF	247	7.92	216	16.08	561	6.83	532	14.92
SUBPE	687	4.17	477	12.17	1127	4.17	817	12.17
CPPE	546	4.50	363	12.50	931	4.42	657	12.50
CPPE2	352	4.50	351	12.50	615	4.50	640	12.50
RSPE	246	8.08	228	16.25	584	6.92	562	15.08
DIPD	0	0.00	0	0.00	0	0.00	0	0.00
CPPE3	246	8.08	228	16.25	584	6.92	562	15.08
RTPEJF	232	9.75	215	18.00	566	8.17	542	16.42
CPJF2	660	9.42	577	17.75	1794	8.25	1700	16.25
SUBPC	373	4.17	266	12.17	627	4.17	463	12.17
RSPC	5	0.00	5	0.00	43	5.00	7	14.33

	10-6 i=2.06"		10-24 i=2.47"		100-6 i=3.23"		100-24 i=3.99"	
STATION	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK
RTPCNB	5	0.00	5	0.00	27	7.33	6	17.25
SUBNB	249	4.67	174	12.67	469	4.67	345	12.67
CPNB1	241	4.67	178	12.67	455	4.67	348	12.67
DINA	157	4.67	116	12.67	293	4.67	225	12.67
CPNB2	85	4.67	62	12.67	162	4.67	123	12.67
RTNBJD	53	6.17	37	14.33	115	5.83	83	14.00
SUBJD	259	4.75	193	12.83	474	4.75	358	12.83
CPJD	241	4.83	193	12.83	446	4.83	359	12.83
DIJC	89	4.83	72	12.83	162	4.83	131	12.83
CPJD1	152	4.83	122	12.83	283	4.83	228	12.83
RTJDFC	131	5.58	101	13.58	263	5.42	207	13.42
SUBPD	318	4.58	224	12.58	558	4.58	410	12.58
CPPD	0	0.00	0	0.00	0	0.00	0	0.00
CPPD2	318	4.58	224	12.58	558	4.58	410	12.58
RSPD	2	7.58	1	24.92	77	5.75	37	14.17
RTPDNC	2	9.50	1	26.58	74	6.42	34	15.00
SUBNC	197	4.50	136	12.42	380	4.50	269	12.50
CPNC	183	4.50	134	12.50	358	4.50	266	12.50
RTNCJE	123	5.50	85	13.58	287	5.25	200	13.33
SUBJE	288	4.75	219	12.75	521	4.75	391	12.75
CPJE	281	5.25	217	12.75	656	5.08	491	13.17
RTJEFC	278	5.42	213	13.00	649	5.25	482	13.33
SUBFC	213	4.67	160	12.67	386	4.67	287	12.67
CPFC	458	5.25	371	13.00	1054	5.25	822	13.25
CPFC1	970	5.42	903	13.42	1962	5.42	1831	13.33
SUBUD	615	4.50	462	12.50	1043	4.50	803	12.50
DIUA	150	4.50	113	12.50	252	4.50	195	12.50
CPUD	466	4.50	349	12.50	791	4.50	608	12.50

STATION	10-6 i=2.06" PEAK FLOW	10-6 i=2.06" TIME OF PEAK	10-24 i=2.47" PEAK FLOW	10-24 i=2.47" TIME OF PEAK	100-6 i=3.23" PEAK FLOW	100-6 i=3.23" TIME OF PEAK	100-24 i=3.99" PEAK FLOW	100-24 i=3.99" TIME OF PEAK
RTUDVA	369	5.08	266	13.17	668	5.00	503	13.08
SUBVA	688	4.17	483	12.17	1112	4.17	809	12.17
CPVA	291	6.08	246	14.08	601	5.67	527	13.67
RTDIVA	282	6.67	239	14.83	588	6.17	515	14.17
CPVA2	688	4.17	495	12.17	1091	4.17	840	12.17
RSVA	470	4.42	409	12.33	934	5.67	775	13.83
RTVAUC	404	5.33	326	13.17	912	6.25	761	14.42
SUBUA	511	4.42	368	12.42	871	4.42	648	12.42
CPUA	150	4.50	113	12.50	252	4.50	195	12.50
RTDIUA	62	6.83	45	15.08	128	6.25	94	14.50
CPUA1	511	4.42	368	12.42	870	4.42	648	12.42
DITB	90	4.42	73	12.42	154	4.42	129	12.42
CPUA2	359	4.42	292	12.42	618	4.42	517	12.42
RTUAUC	268	5.00	200	13.08	507	4.92	404	12.92
SUBUC	510	4.33	363	12.25	865	4.25	636	12.25
CPUC	594	5.25	565	13.08	1314	4.92	1198	12.92
RSUC	570	5.42	534	13.25	1285	5.08	1162	13.00
RTUCUB	566	5.50	529	13.33	1279	5.17	1156	13.08
SUBUB	145	4.33	104	12.25	245	4.25	182	12.25
CPUB	573	5.50	536	13.33	1318	5.17	1190	13.08
RSUB	491	6.00	423	13.92	1235	5.42	1109	13.33
DIUE	3	5.92	0	0.00	62	5.42	51	13.33
CPUB1	488	6.00	423	13.92	1173	5.42	1058	13.33
RTUBSF	476	6.50	416	14.42	1143	5.75	1026	13.67
SUBTB	446	4.83	339	12.83	806	4.83	634	12.83
CPTB	90	4.42	73	12.42	154	4.42	129	12.42
RTDITB	69	5.33	53	13.33	130	5.08	103	13.17

	10-6 i=2.06"		10-24 i=2.47"		100-6 i=3.23"		100-24 i=3.99"	
STATION	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK
CPTB1	446	4.92	351	12.92	852	4.92	696	12.92
DITA	108	4.92	86	12.92	206	4.92	169	12.92
CPTB2	333	4.92	265	12.92	646	4.92	527	12.92
RTTBSF	313	5.42	247	13.42	610	5.33	498	13.33
SUBSF	215	4.75	170	12.75	387	4.75	297	12.75
CPSF1	641	6.25	576	14.17	1750	5.67	1616	13.58
RSSF	623	6.50	558	14.42	1687	5.83	1556	13.75
DIRJ1	187	6.50	168	14.42	506	5.83	467	13.75
CPSF2	436	6.50	391	14.42	1181	5.83	1090	13.75
RTSFSH	401	6.83	358	14.83	1066	6.17	979	14.08
SUBSH	105	4.42	75	12.42	172	4.42	126	12.42
CPSH	402	6.83	361	14.83	1073	6.17	989	14.08
RSSH	368	7.42	326	15.33	1060	6.25	975	14.25
DIRJ2	284	7.42	249	15.33	887	6.25	813	14.25
CPSH1	84	7.42	78	15.33	173	6.25	162	14.25
RTSHSG	82	7.75	75	15.83	168	6.58	158	14.58
SUBTA	150	4.67	109	12.67	286	4.67	211	12.67
CPTA	108	4.92	86	12.92	206	4.92	169	12.92
RTDITA	95	5.58	75	13.67	188	5.42	154	13.50
CPTA1	150	5.08	116	12.67	332	5.08	261	13.08
RTTASG	146	5.25	114	13.08	331	5.17	258	13.25
SUBSG	144	4.50	103	12.42	253	4.42	186	12.42
CPSG	181	4.75	181	12.67	384	4.83	363	12.75
RSSG	144	5.50	127	13.42	384	4.92	359	12.83
DIRJ4	94	5.50	80	13.42	287	4.92	267	12.83
CPSG1	50	5.50	47	13.42	97	4.92	92	12.83
RTSGSE	48	5.75	45	13.67	96	5.17	88	13.08
SUBSC	151	4.83	103	12.83	321	4.83	229	12.83

	10-6 i=2.06"		10-24 i=2.47"		100-6 i=3.23"		100-24 i=3.99"	
STATION	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK
DISD	81	4.83	56	12.83	173	4.83	124	12.83
CPSC	69	4.83	47	12.83	148	4.83	105	12.83
RTSCSE	51	5.67	34	13.75	124	5.42	84	13.50
SUBSE	147	4.08	100	12.08	247	4.08	179	12.08
CPSE	76	5.75	95	12.08	175	5.42	170	12.08
RSSE	41	8.50	45	16.00	168	5.67	157	13.75
DIRJ5	41	8.50	45	16.00	168	5.67	157	13.75
CPSE2	0	0.00	0	0.00	0	0.00	0	0.00
RTSERI	0	0.00	0	0.00	0	0.00	0	0.00
SUBRJ	145	4.33	103	12.25	252	4.25	186	12.25
CPRJ1	187	6.50	168	14.42	506	5.83	467	13.75
RTSFRJ	186	6.67	167	14.58	504	5.92	465	13.92
CPRJ2	284	7.42	249	15.33	887	6.25	813	14.25
RTSHRJ	283	7.50	249	15.50	886	6.33	813	14.33
CPRJ3	433	7.42	380	15.42	1348	6.25	1236	14.17
RTRJ3	420	7.92	367	15.92	1327	6.58	1214	14.50
CPRJ4A	94	5.50	80	13.42	287	4.92	267	12.83
CPRJ4B	483	7.92	425	15.92	1537	6.58	1411	14.50
RTSGRJ	475	8.17	420	16.25	1520	6.75	1394	14.75
CPRJ5	41	8.50	45	16.00	168	5.67	157	13.75
RTSERJ	34	9.83	36	17.33	135	6.58	124	14.67
CPRJ6	485	8.25	439	16.33	1633	6.75	1518	14.75
RSRJ	454	8.58	414	16.83	1532	7.08	1418	15.08
DIPA2	12	8.33	5	16.83	445	7.08	392	15.08
CPRJ7	444	8.67	409	16.83	1087	7.08	1026	15.08
RTRJRI	444	8.83	409	16.92	1086	7.17	1025	15.17
DIOE3	69	8.83	58	16.92	273	7.17	253	15.17
CPRI1	375	8.83	351	16.92	813	7.17	772	15.17

STATION	10-6 i=2.06" PEAK FLOW	10-6 i=2.06" TIME OF PEAK	10-24 i=2.47" PEAK FLOW	10-24 i=2.47" TIME OF PEAK	100-6 i=3.23" PEAK FLOW	100-6 i=3.23" TIME OF PEAK	100-24 i=3.99" PEAK FLOW	100-24 i=3.99" TIME OF PEAK
RTRI	375	9.00	351	17.08	811	7.33	771	15.25
SUBUE	108	4.17	79	12.08	177	4.17	132	12.08
CPUE	3	5.92	0	0.00	62	5.42	51	13.33
CPUE2	108	4.17	79	12.08	177	4.17	132	12.08
RSUE	0	6.42	0	23.17	3	8.25	3	16.42
RTUEPB	0	9.25	0	24.25	3	10.67	3	18.83
SUBPB	342	4.42	246	12.42	598	4.42	442	12.42
CPPB1	342	4.42	245	12.42	598	4.42	441	12.42
DIPA	64	4.42	46	12.42	110	4.42	81	12.42
CPPB2	279	4.42	199	12.42	488	4.42	360	12.42
RTPBNA	159	5.75	107	14.00	341	5.42	243	13.58
SUBNA	401	5.08	315	12.92	748	5.00	594	13.00
CPNA1	157	4.67	116	12.67	293	4.67	225	12.67
RTDINA	71	7.08	50	15.25	166	6.33	118	14.58
CPNA2	432	5.50	325	13.08	962	5.42	755	13.42
RTNAJC	404	6.33	304	14.33	886	6.08	690	14.17
SUBJC	401	5.00	303	12.92	759	5.00	591	13.00
CPJC1	89	4.83	72	12.83	162	4.83	131	12.83
RTDIJC	54	7.17	41	15.25	116	6.67	92	14.83
CPJC2	514	6.17	399	14.08	1203	6.00	939	14.08
DIJB	236	6.17	184	14.08	553	6.00	432	14.08
CPJC3	277	6.17	216	14.08	650	6.00	507	14.08
RTJCFB	265	7.00	203	15.08	629	6.58	492	14.67
SUBFB	299	4.75	216	12.67	597	4.67	449	12.67
CPFB	265	6.92	215	12.67	654	6.50	515	14.58
DISRX	264	6.92	215	12.67	654	6.50	515	14.58
CPFB1	0	0.00	0	0.00	0	0.00	0	0.00

STATION	10-6 i=2.06" PEAK FLOW	10-6 i=2.06" TIME OF PEAK	10-24 i=2.47" PEAK FLOW	10-24 i=2.47" TIME OF PEAK	100-6 i=3.23" PEAK FLOW	100-6 i=3.23" TIME OF PEAK	100-24 i=3.99" PEAK FLOW	100-24 i=3.99" TIME OF PEAK
SUBPA	354	4.50	250	12.50	630	4.50	461	12.50
DIOE	64	4.50	45	12.50	113	4.50	83	12.50
CPPA	290	4.50	205	12.50	517	4.50	378	12.50
RTDIPA	183	5.75	118	14.00	383	5.50	270	13.58
CPPA2	12	8.33	5	16.83	445	7.08	392	15.08
RTRJPA	6	9.50	4	18.83	419	7.58	369	15.50
CPPA3	194	5.83	118	14.00	573	7.33	440	15.50
RTPAMD	78	8.75	65	16.92	474	8.75	356	17.00
SUBMD	350	5.00	262	13.00	626	5.00	486	13.00
CPMD	299	5.08	257	13.00	550	5.08	477	13.00
DIJB1	62	5.08	53	13.00	112	5.08	97	13.00
CPMD1	237	5.08	203	13.00	438	5.08	380	13.00
DIMFX	237	5.08	203	13.00	438	5.08	380	13.00
CPMD2	0	0.00	0	0.00	0	0.00	0	0.00
CPMD3	375	9.00	351	17.08	811	7.33	771	15.25
SUBMG	137	4.67	96	12.67	235	4.67	173	12.67
RTMGJB	63	7.33	45	15.67	134	6.83	97	15.00
SUBJB	399	5.00	288	12.92	743	4.92	531	12.92
CPJB	391	5.00	289	12.92	732	5.00	533	12.92
CPJB1	236	6.17	184	14.08	553	6.00	432	14.08
RTDIJB	216	7.67	164	15.83	514	7.17	403	15.25
CPJB2	62	5.08	53	13.00	112	5.08	97	13.00
RDIJB1	43	7.25	35	15.33	86	6.83	71	14.92
CPJB3	394	5.00	294	12.92	828	6.83	620	15.00
DIEE	142	5.00	106	12.92	298	6.83	223	15.00
CPJB4	252	5.00	188	12.92	530	6.83	397	15.00
RTJBFA	200	9.50	142	17.92	479	8.58	354	16.92
SUBFA	222	5.33	165	13.25	460	5.25	341	13.25

	10-6 i=2.06"		10-24 i=2.47"		100-6 i=3.23"		100-24 i=3.99"	
STATION	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK
CPFA	199	5.33	165	13.25	493	8.50	366	16.67
DISRX2	197	5.33	165	13.25	493	8.50	366	16.67
CPFA1	0	0.00	0	0.00	0	0.00	0	0.00
CPRI3	375	9.00	351	17.08	811	7.33	771	15.25
SUBRI	260	4.25	187	12.25	446	4.25	328	12.25
SUBSB	174	4.33	132	12.33	306	4.33	229	12.33
RSSB	118	4.67	80	12.75	262	4.58	195	12.58
SUBSD	102	4.50	74	12.50	187	4.50	137	12.50
CPSD1	81	4.83	56	12.83	173	4.83	124	12.83
CPSD2	268	4.67	193	12.67	563	4.58	429	12.58
RSSD	268	4.67	193	12.67	564	4.58	429	12.58
RTSDRI	254	4.92	182	13.00	550	4.83	417	12.83
CPRI5	1182	5.33	1105	13.17	2592	8.08	2443	16.17
RSRI	1180	5.33	1104	13.17	2592	8.08	2442	16.17
RTRIRH	1160	5.67	1086	13.58	2583	8.33	2432	16.42
SUBSA	501	4.25	356	12.25	844	4.25	620	12.25
DIRF	250	4.25	178	12.25	422	4.25	310	12.25
CPSA	250	4.25	178	12.25	422	4.25	310	12.25
RTSARH	113	5.08	73	13.25	244	4.92	169	13.00
SUBRH	177	4.50	134	12.50	307	4.50	225	12.50
CPRH	1253	5.58	1172	13.50	2576	8.33	2432	16.42
RSRH	1253	5.67	1172	13.58	2576	8.42	2428	16.50
DIOE2	0	0.00	0	0.00	0	0.00	0	0.00
CPRH2	1253	5.67	1172	13.58	2576	8.42	2428	16.50
RTRHOG	1253	5.75	1172	13.67	2575	8.50	2428	16.58
DIOD1	0	0.00	0	0.00	0	0.00	0	0.00
CPOG1	1253	5.75	1172	13.67	2575	8.50	2428	16.58
RTOG1	1245	6.08	1165	14.00	2572	8.75	2424	16.83

	10-6 i=2.06"		10-24 i=2.47"		100-6 i=3.23"		100-24 i=3.99"	
STATION	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK
SUBRG	109	4.42	81	12.42	189	4.42	141	12.42
RTRGRF	62	5.58	45	13.67	125	5.25	93	13.42
SUBRF	412	4.67	304	12.67	714	4.67	542	12.67
CPRF	250	4.25	178	12.25	422	4.25	310	12.25
RTDIRF	62	6.83	42	15.17	141	6.17	102	14.33
CPRF1	412	4.67	305	12.67	712	4.67	555	12.67
DIRE	78	4.67	61	12.67	138	4.67	111	12.67
CPRF2	311	4.67	244	12.67	553	4.67	444	12.67
RTRFOG	273	5.42	205	13.42	514	5.25	406	13.33
SUBOG	376	4.50	269	12.50	643	4.50	475	12.50
CPOG	1433	5.92	1339	13.83	2951	5.75	2733	13.75
RSOG	1424	6.08	1330	14.00	2937	5.92	2718	13.83
DIOD2	441	6.08	405	14.00	1018	5.92	935	13.83
CPOG2	983	6.08	924	14.00	1918	5.92	1784	13.83
RTOGOF	980	6.17	921	14.17	1915	6.00	1780	14.00
SUBOF	207	4.50	149	12.50	354	4.42	261	12.50
SUBRE	184	4.92	137	12.92	330	4.92	242	12.92
CPRE	78	4.67	61	12.67	138	4.67	111	12.67
RTDIRE	43	6.50	32	14.67	94	6.08	71	14.25
CPRE1	184	5.00	138	13.00	330	5.00	250	13.00
RTREOF	158	5.67	123	13.67	302	5.67	234	13.67
CPOF1	1105	6.17	1031	14.08	2172	6.00	2018	13.92
RSOF	1025	6.58	945	14.58	2192	5.92	2015	14.00
RTOFOB	990	7.00	913	15.00	2151	6.33	1987	14.33
SUBOB	190	4.83	129	12.83	362	4.83	259	12.83
SUBRD	195	4.83	134	12.83	351	4.83	245	12.83
DIOB	78	4.83	54	12.83	141	4.83	98	12.83

	10-6 i=2.06"		10-24 i=2.47"		100-6 i=3.23"		100-24 i=3.99"	
STATION	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK
CPRD	117	4.83	80	12.83	211	4.83	147	12.83
RTRDRC	66	7.00	42	15.25	140	6.42	90	14.83
SUBRC	281	4.92	208	12.92	532	4.92	394	12.92
CPRC	268	5.00	207	12.92	514	5.00	392	12.92
RTRCRB	227	6.08	161	14.25	470	5.83	350	13.92
SUBRB	228	4.75	160	12.67	478	4.75	350	12.67
CPRB	244	6.08	176	14.17	577	5.67	418	13.75
DIKA3	122	6.08	88	14.17	289	5.67	209	13.75
CPRB1	122	6.08	88	14.17	289	5.67	209	13.75
RTRBRA	71	8.58	51	16.75	189	7.67	132	15.83
SUBRA	128	4.67	84	12.67	238	4.67	158	12.67
CPRA	105	4.67	82	12.67	202	4.67	154	12.67
DIKA4	81	4.67	60	12.67	176	4.67	130	12.67
CPRA1	25	10.33	25	13.17	26	4.67	25	12.67
DIAFX	25	10.33	25	13.17	26	4.67	25	12.67
CPRA2	0	0.00	0	0.00	0	0.00	0	0.00
CPOB2	78	4.83	54	12.83	141	4.83	98	12.83
RTDIOB	24	9.33	15	18.00	52	8.42	33	16.92
CPOB3	994	7.00	922	15.00	2192	6.33	2027	14.33
RSOB	700	11.75	662	20.00	1792	7.17	1675	17.67
RTOBLE	698	12.08	661	20.33	1777	7.50	1672	17.92
SUBLE	152	4.50	105	12.50	299	4.50	212	12.42
CPLE	697	12.08	660	20.33	1775	7.50	1671	17.92
RSLE	695	12.17	658	20.42	1768	7.58	1670	18.00
DILD	218	12.17	201	20.42	779	7.58	727	18.00
CPLE1	477	12.17	458	20.42	989	7.58	943	18.00
RTLEKD	475	12.58	457	20.83	979	7.92	941	18.25
SUBKD	231	5.00	166	13.00	462	5.00	330	13.00

	10-6 i=2.06"		10-24 i=2.47"		100-6 i=3.23"		100-24 i=3.99"	
STATION	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK
CPKD	475	12.58	456	20.83	988	7.83	941	18.17
RSKD	472	12.75	454	21.00	976	8.08	939	18.33
RTKDKA	472	12.92	454	21.17	975	8.25	939	18.42
RSKA1	366	15.50	362	23.75	943	11.00	907	19.17
DILA	142	15.50	139	23.75	613	11.00	584	19.17
CPKA2	223	15.50	222	23.83	330	11.00	323	19.17
RTKAKA	223	16.33	222	24.67	329	11.67	322	19.92
SUBKA	314	5.17	250	13.08	689	5.17	547	13.08
CPKA3	122	6.08	88	14.17	289	5.67	209	13.75
RTDIKA	113	6.83	80	15.17	275	6.33	197	14.50
CPKA4	81	4.67	60	12.67	176	4.67	130	12.67
CPKA5	311	5.42	275	13.33	689	5.33	707	13.25
DIKB	0	0.00	0	0.00	286	5.33	319	13.25
CPKA6	227	16.17	275	13.33	388	5.08	388	13.08
SUBEC	38	4.83	25	12.92	74	4.83	54	12.83
SUBAD	174	4.92	121	12.83	348	4.92	245	12.83
SUBAC	164	4.92	113	12.92	332	4.92	235	12.92
SUBAB	169	4.83	115	12.83	349	4.83	250	12.83
CPSR7	476	4.92	604	12.92	1075	5.00	1117	12.92
SUBOE	253	4.67	176	12.67	489	4.67	356	12.67
CPOE1	64	4.50	45	12.50	113	4.50	83	12.50
RTDIOE	41	5.58	28	13.58	81	5.42	58	13.42
CPOE2	0	0.00	0	0.00	0	0.00	0	0.00
CPOE3	69	8.83	58	16.92	273	7.17	253	15.17
CPOE4	256	4.67	179	12.67	507	4.67	365	12.67
DIOD	43	4.67	31	12.67	83	4.67	60	12.67
CP0E5	213	4.67	148	12.67	424	4.67	305	12.67
RTOEMF	134	6.42	88	14.75	329	6.00	222	14.17

	10-6 i=2.06"		10-24 i=2.47"		100-6 i=3.23"		100-24 i=3.99"	
STATION	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK
SUBMF	388	5.08	316	13.08	719	5.08	578	13.08
CPMF	237	5.08	203	13.00	438	5.08	380	13.00
RTMDMF	182	6.75	147	14.83	374	6.42	316	14.42
CPMF1	434	6.42	321	13.08	1057	6.00	807	14.17
DIEB	202	6.42	150	13.08	488	6.00	373	14.17
CPMF2	233	6.42	171	13.08	569	6.00	434	14.17
RTMFMC	207	7.67	152	15.92	508	7.17	393	15.33
SUBOD	352	4.67	253	12.67	600	4.67	447	12.67
CPOD1	43	4.67	31	12.67	83	4.67	60	12.67
RTDIOD	16	11.92	10	17.08	50	9.25	39	18.25
CPOD2	0	0.00	0	0.00	0	0.00	0	0.00
CPOD3	441	6.08	405	14.00	1018	5.92	935	13.83
CPOD4	411	5.92	422	13.92	1019	5.67	1012	13.67
DIOC	74	5.92	76	13.92	183	5.67	182	13.67
CPOD5	337	5.92	346	13.92	836	5.67	830	13.67
RTODMC	312	7.08	312	15.08	800	6.67	790	14.58
SUBMC	446	5.08	360	13.00	806	5.00	643	13.00
CPMC1	457	7.08	466	15.08	1243	6.58	1221	14.58
DIMB	176	7.08	179	15.08	474	6.58	466	14.58
CPMC2	281	7.08	287	15.08	768	6.58	755	14.58
RTMCIE	275	7.50	280	15.50	760	7.00	747	14.92
SUBEB	111	4.50	78	12.42	195	4.42	137	12.42
CPEB1	202	6.42	150	13.08	488	6.00	373	14.17
SUBED	199	5.00	135	13.00	363	5.00	250	13.00
CPEB2	430	4.83	321	12.83	792	4.83	590	12.83
RTEBIE	309	6.33	218	14.42	683	6.33	495	14.42
SUBIE	172	4.83	134	12.83	302	4.83	228	12.83

	10-6 i=2.06"		10-24 i=2.47"		100-6 i=3.23"		100-24 i=3.99"	
STATION	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK
SUBID	230	4.83	164	12.83	460	4.83	340	12.83
CPIE	384	5.75	305	12.92	912	5.50	679	13.50
RTIEIB	376	6.67	279	14.67	874	6.42	654	14.42
SUBOC	356	4.25	253	12.25	588	4.25	430	12.25
CPOC1	74	5.92	76	13.92	183	5.67	182	13.67
RTDIOC	56	8.25	56	16.17	159	7.25	157	15.25
CPOC2	356	4.25	254	12.25	588	4.25	432	12.25
RTOCMB	202	5.42	132	13.67	398	5.17	280	13.33
SUBMB	426	5.08	348	13.08	789	5.00	631	12.92
CPMB	176	7.08	179	15.08	474	6.58	466	14.58
RTDIMB	164	8.50	167	16.42	457	7.67	450	15.67
CPMB1	554	5.42	417	13.42	1122	5.17	875	13.17
RTMBIB	500	5.92	382	13.92	1012	5.67	805	13.75
SUBIB	246	4.92	189	12.92	436	4.83	326	12.92
SUBIC	162	5.08	114	13.00	338	5.00	244	13.00
CPIB	870	6.08	721	14.08	1999	5.83	1648	13.83
RTIBIA	869	6.08	721	14.08	1996	5.83	1645	13.92
SUBME	154	4.67	105	12.67	311	4.67	218	12.67
RTMEIA	106	5.67	68	13.83	251	5.33	165	13.50
SUBIA	201	4.50	140	12.50	386	4.50	281	12.50
CPIA	921	6.08	783	14.08	2146	5.75	1795	13.83
RTIAHB	917	6.25	779	14.25	2144	5.92	1794	13.92
SUBLD	237	4.33	157	12.33	439	4.33	314	12.25
CPLD	913	6.25	779	14.25	2143	5.92	1794	13.92
RTDILD	775	6.58	746	14.50	1889	6.17	1742	14.08
RTLDMA	771	6.75	743	14.67	1884	6.25	1737	14.25
SUBMA	149	4.58	97	12.50	278	4.50	185	12.50
CPMA	771	6.75	743	14.67	1887	6.25	1740	14.25

	10-6 i=2.06"		10-24 i=2.47"		100-6 i=3.23"		100-24 i=3.99"	
STATION	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK
RTMAHB	759	7.17	731	15.08	1866	6.67	1716	14.58
SUBHB	190	4.50	130	12.50	384	4.50	271	12.50
CPHB	802	7.42	889	15.25	2189	6.83	2258	14.75
RTHBDA	800	7.50	887	15.33	2185	6.92	2254	14.83
SUBDA	185	4.58	131	12.58	361	4.58	267	12.58
CPDA	805	7.50	973	15.25	2371	6.83	2585	14.75
RTDACC	757	9.00	921	16.67	2257	8.08	2445	15.92
SUBEE	415	5.00	336	12.92	902	5.00	724	12.92
CPEE1	142	5.00	106	12.92	298	6.83	223	15.00
RTDIEE	129	6.08	92	14.25	293	7.58	215	15.92
CPEC	416	5.00	337	12.92	905	5.00	726	12.92
RTEEEA	400	5.50	321	13.50	892	5.50	705	13.42
SUBEA	395	5.08	309	13.00	811	5.08	616	13.00
CPEA	669	5.33	576	13.33	1533	5.33	1260	13.25
RTEADC	571	6.75	483	14.75	1395	6.50	1107	14.50
SUBDC	360	4.75	272	12.75	718	4.75	545	12.75
CPDC	570	6.67	496	14.75	1421	6.42	1155	14.42
RTDCCC	501	8.00	436	16.00	1321	7.42	1058	15.50
SUBDD	79	4.42	54	12.42	164	4.33	118	12.33
RTDDCC	51	5.42	32	13.58	125	5.17	84	13.33
SUBCC	434	4.67	333	12.67	893	4.67	701	12.67
CPCC	929	9.00	1251	16.42	2924	8.00	3299	15.83
RTCCCB	908	10.08	1231	17.42	2873	8.83	3237	16.58
SUBLB	139	4.67	91	12.67	258	4.67	171	12.67
RTLBHA	99	5.67	60	13.83	210	5.42	130	13.58
SUBHA	136	4.50	94	12.42	268	4.42	189	12.42
CPHA	136	4.50	93	12.42	267	4.42	188	12.42
RTHAGD	91	6.92	53	15.42	220	6.42	129	14.58

	10-6 i=2.06"		10-24 i=2.47"		100-6 i=3.23"		100-24 i=3.99"	
STATION	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK	PEAK FLOW	TIME OF PEAK
SUBKC	146	4.58	99	12.58	284	4.58	195	12.58
RTKCGD	75	6.42	48	14.58	178	5.83	111	14.17
SUBGD	394	4.67	307	12.67	758	4.67	592	12.67
SUBGC	175	4.25	115	12.25	344	4.25	247	12.25
RTGCGD	74	5.17	45	13.33	196	4.92	126	13.00
CPGD	393	4.75	316	12.67	821	4.83	664	12.75
RTGDCB	266	6.25	204	14.25	651	6.00	508	14.00
SUBCB	379	4.92	306	12.92	683	4.92	540	12.92
CPCB	940	10.08	1302	17.42	2993	8.75	3408	16.58
RTCBCA	908	11.42	1270	18.67	2912	9.83	3313	17.58
SUBGB	165	4.33	108	12.33	332	4.33	237	12.25
RTGBCA	47	6.83	28	15.08	122	6.08	81	14.42
SUBCA	417	5.17	341	13.08	743	5.17	587	13.08
CPCA	905	11.42	1276	18.58	2919	9.83	3331	17.58
RTCABC	898	11.83	1268	19.00	2903	10.17	3314	17.92
SUBBC	147	5.25	104	13.17	322	5.17	235	13.17
CPBC	895	11.83	1269	19.00	2900	10.17	3315	17.92
SUBLC	83	4.33	58	12.33	155	4.33	109	12.33
RTLCLA	37	5.50	24	13.58	86	5.25	55	13.42
SUBLA	194	4.83	133	12.83	385	4.83	266	12.83
CPLA	893	11.92	1269	19.00	2897	10.17	3315	17.92
RTDILA	891	12.08	1267	19.17	2890	10.33	3311	18.08
RTLAKB	888	12.33	1265	19.42	2884	10.58	3304	18.25
SUBKB	213	4.50	145	12.50	448	4.50	322	12.50
CPKB	0	0.00	0	0.00	286	5.33	319	13.25
RTDIKB	0	0.00	0	0.00	242	6.17	266	14.08
CPKB1	887	12.33	1265	19.42	2881	10.58	3305	18.25

Storm Comparison

STATION	10-6 i=2.06" PEAK FLOW	10-6 i=2.06" TIME OF PEAK	10-24 i=2.47" PEAK FLOW	10-24 i=2.47" TIME OF PEAK	100-6 i=3.23" PEAK FLOW	100-6 i=3.23" TIME OF PEAK	100-24 i=3.99" PEAK FLOW	100-24 i=3.99" TIME OF PEAK
SUBGA	188	4.08	122	12.08	356	4.08	254	12.08
SUBBB	122	4.75	91	12.75	234	4.75	179	12.75
RTBBBA	64	6.92	45	15.17	150	6.33	108	14.58
SUBBA	108	5.00	74	13.00	224	5.00	161	12.92
CPBA	105	5.00	73	13.00	220	5.00	160	12.92
RTBAAA	73	6.67	48	16.08	197	6.92	132	15.33
SUBAA	90	5.50	60	13.50	198	5.58	139	13.58
CPAA	130	6.42	95	14.42	325	6.42	239	14.42

RESPONSE LETTERS FROM ARIZONA GAME AND FISH DEPARTMENT (AGFD) AND U.S. FISH AND WILDLIFE SERVICE (FWS)

THE STATE OF ARIZONA

RECEIVED JAN 1 0

GAME & FISH DEPARTMENT

2221 West Greenway Road, Phoenix, Arizona 85023-4399 (602) 942-3000
www.gf.state.az.us

January 6, 2000

Mr. Bruce Pavlick
SWCA Environmental Consultants
343 South Scott Avenue
Tucson, Arizona 85701

Re: Special Status Species; Durango Drainage Area - Township 1 North, Range 1 West, 1 East and 2 East

Dear Mr. Pavlick:

The Arizona Game and Fish Department (Department) has received your letter, dated December 21, 1999, regarding special status species in the above-referenced area, and the following information is provided.

The Department's Heritage Data Management System has been accessed and current records show that the special status species listed below have been documented as occurring within the townships indicated above.

COMMON NAME	SCIENTIFIC NAME	STATUS
Western least bittern	*Ixobrychus exilis hesperis*	WC
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	WC,S

STATUS DEFINITIONS

WC - **Wildlife of Special Concern in Arizona.** Species whose occurrence in Arizona is or may be in jeopardy, or with known or perceived threats or population declines, as described by the Department's listing of **Wildlife of Special Concern in Arizona** (WSCA, in prep.). Species included in WSCA are currently the same as those in **Threatened Native Wildlife in Arizona** (1988).

S - **Sensitive.** Species classified as "**sensitive**" by the Regional Forester when occurring on lands managed by the U.S.D.A. Forest Service.

At this time, the Department's comments are limited to the special status species information provided above. This correspondence does not represent the Department's evaluation of impacts to wildlife or wildlife habitat associated with activities occurring in the subject area. If the Department has specific comments or concerns regarding this project, they will be provided to you by January 20, 2000. Please contact me at (602) 789-3606, if you have any questions regarding this letter.

Sincerely,

Nancy Olson
Project Evaluation Specialist
Habitat Branch

NLO:no

cc: Russ Haughey, Habitat Program Manager, Region VI, Mesa

AGFD# 12-22-99(08)

United States Department of the Interior
U.S. Fish and Wildlife Service
2321 W. Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
(602)640-2720 FAX (602)640-2730

In Reply Refer To:
AESO/SE
2-21-00-I-081

December 22, 1999

Mr. Bruce Pavlick
SWCA Inc. Environmental Consultants
343 South Scott Avenue
Tucson, Arizona 85701

RE: BE for Durango Drainage Area in Maricopa County

Dear Mr. Pavlick:

This letter responds to your December 21, 1999, request for an inventory of threatened or endangered species, or those that are proposed to be listed as such under the Endangered Species Act of 1973, as amended (Act), which may potentially occur in your project area (Maricopa County). The enclosed list may include candidate species as well. We hope the enclosed county list of species will be helpful. In addition to a species list for Pima County, we are enclosing a list which incorporates the entire State of Arizona. In future communications regarding this project, please refer to consultation number 2-21-00-I-081.

The enclosed list of the endangered, threatened, proposed, and candidate species includes all those potentially occurring anywhere in the county, or counties, where your project occurs. Please note that your project area may not necessarily include all or any of these species. The information provided includes general descriptions, habitat requirements, and other information for each species on the list. Also on the enclosed list is the Code of Federal Regulations (CFR) citation for each list and is available at most public libraries. This information should assist you in determining which species may or may not occur within your project area. Site-specific surveys could also be helpful and may be needed to verify the presence or absence of a species or its habitat as required for the evaluation of proposed project-related impacts.

Endangered and threatened species are protected by Federal law and must be considered prior to project development. If the action agency determines that listed species or critical habitat may be adversely affected by a federally funded, permitted, or authorized activity, the action agency must request formal consultation with the Service. If the action agency determines that the planned action may jeopardize a proposed species or destroy or adversely modify proposed critical habitat, the action agency must enter into a section 7 conference with the Service. Candidate species are those which are being considered for addition to the list of threatened or endangered species. Candidate species are those for which there is sufficient information to support a

proposal for listing. Although candidate species have no legal protection under the Act, we recommend that they be considered in the planning process in the event that they become listed or proposed for listing prior to project completion.

If any proposed action occurs in or near areas with trees and shrubs growing along watercourses, known as riparian habitat, the Service recommends the protection of these areas. Riparian areas are critical to biological community diversity and provide linear corridors important to migratory species. In addition, if the project will result in the deposition of dredged or fill materials into waterways or excavation in waterways, we recommend you contact the Army Corps of Engineers which regulates these activities under Section 404 of the Clean Water Act.

The State of Arizona protects some plant and animal species not protected by Federal law. We recommend you contact the Arizona Game and Fish Department and the Arizona Department of Agriculture for State-listed or sensitive species in your project area.

The Service appreciates your efforts to identify and avoid impacts to listed and sensitive species in your project area. If we may be of further assistance, please feel free to contact Tom Gatz.

Sincerely,

David L. Harlow
Field Supervisor

Enclosure

cc: John Kennedy, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: MARICOPA

08/26/1999

1) LISTED

TOTAL= 13

NAME: ARIZONA AGAVE *AGAVE ARIZONICA*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 49 FR 21055, 05-18-1984

DESCRIPTION: HAS ATTRACTIVE ROSETTES OF BRIGHT GREEN LEAVES WITH DARK MAHOGANY MARGINS. FLOWER: BORNE ON SUB-UMBELLATE INFLORESCENCES.

ELEVATION RANGE: 3000-6000 FT.

COUNTIES: GILA, YAVAPAI, MARICOPA

HABITAT: TRANSITION ZONE BETWEEN OAK-JUNIPER WOODLAND & MOUNTAIN MAHOGANY-OAK SCRUB

SCATTERED CLONES IN NEW RIVER MOUNTAINS AND SIERRA ANCHA. USUALLY FOUND ON STEEP, ROCKY SLOPES. POSSIBLY MAZATAL MOUNTAINS. SHOULD BE LOOKED FOR WHEREVER THE RANGES OF Agave toumeyana var. bella AND Agave chrystantha OVERLAP.

NAME: ARIZONA CLIFFROSE *PURSHIA SUBINTEGRA*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 49 FR 22326 5-29-84

DESCRIPTION: EVERGREEN SHRUB OF THE ROSE FAMILY (ROSEACEAE). BARK PALE SHREDDY. YOUNG TWIGS WITH DENSE HAIRS. LEAVES 1-5 LOBES AND EDGES CURL DOWNWARD (REVOLUTE). FLOWERS: 5 WHITE OR YELLOW PETALS <0.5 INCH LONG.

ELEVATION RANGE: <4000 FT.

COUNTIES: GRAHAM YAVAPAI MARICOPA MOHAVE

HABITAT: CHARACTERISTIC WHITE SOILS OF TERTIARY LIMESTONE LAKEBED DEPOSITS.

WHITE SOILS OF TERITIARY LIMESTONE LAKEBED DEPOSITS CAN BE SEEN FROM A DISTANCE.

NAME: ARIZONA HEDGEHOG CACTUS *ECHINOCEREUS TRIGLOCHIDIATUS ARIZONICUS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 44 FR 61556,10-15-1979

DESCRIPTION: DARK GREEN CYLINDROID 2.5-12 INCHES TALL, 2-10 INCHES IN DIAMETER, SINGLE OR IN CLUSTERS. 1-3 GRAY OR PINKISH CENTRAL SPINES LARGEST DEFLEXED AND 5-11 SHORTER RADIAL SPINES. FLOWER: BRILLIANT RED, SIDE OF STEM IN APRIL- MAY

ELEVATION RANGE: 3700-5200 FT.

COUNTIES: MARICOPA, GILA, PINAL

HABITAT: ECOTONE BETWEEN INTERIOR CHAPPARAL AND MADREAN EVERGREEN WOODLAND

OPEN SLOPES, IN NARROW CRACKS BETWEEN BOULDERS, AND IN UNDERSTORY OF SHRUBS. THIS VARIETY IS BELIEVED TO INTERGRADE AT THE EDGES OF ITS DISTRIBUTION WITH VARIETIES MELANCANTHUS AND NEOMEXICANUS CAUSING SOME CONFUSION IN IDENTIFICATION.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: MARICOPA

08/26/1999

NAME: LESSER LONG-NOSED BAT *LEPTONYCTERIS CURASOAE YERBABUENAE*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 53 FR 38456, 09-30-88

DESCRIPTION: ELONGATED MUZZLE, SMALL LEAF NOSE, AND LONG TONGUE. YELLOWISH BROWN OR GRAY ABOVE AND CINNAMON BROWN BELOW. TAIL MINUTE AND APPEARS TO BE LACKING. EASILY DISTURBED.

ELEVATION RANGE: <6000 FT.

COUNTIES: COCHISE, PIMA, SANTA CRUZ, GRAHAM, PINAL, MARICOPA

HABITAT: DESERT SCRUB HABITAT WITH AGAVE AND COLUNMNAR CACTI PRESENT AS FOOD PLANTS

DAY ROOSTS IN CAVES AND ABANDONED TUNNELS. FORAGES AT NIGHT ON NECTAR, POLLEN, AND FRUIT OF PANICULATE AGAVES AND COLUMNAR CACTI. THIS SPECIES IS MIGRATORY AND IS PRESENT IN ARIZONA, USUALLY FROM APRIL TO SEPTMBER AND SOUTH OF THE BORDER THE REMAINDER OF THE YEAR.

NAME: SONORAN PRONGHORN *ANTILOCAPRA AMERICANA SONORIENSIS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67

DESCRIPTION: BUFF ON BACK AND WHITE BELOW, HOOFED WITH SLIGHTLY CURVED BLACK HORNS HAVING A SINGLE PRONG. SMALLEST AND PALEST OF THE PRONGHORN SUBSPECIES.

ELEVATION RANGE: 2000-4000 FT.

COUNTIES: PIMA, YUMA, MARICOPA.

HABITAT: BROAD, INTERMOUNTAIN ALLUVIAL VALLEYS WITH CREOSOTE-BURSAGE & PALO VERDE-MIXED CACTI ASSOCIATIONS

TYPICALLY, BAJADAS ARE USED AS FAWNING AREAS AND SANDY DUNE AREAS PROVIDE FOOD SEASONALLY. HISTORIC RANGE WAS PROBABLY LARGER THAN EXISTS TODAY. THIS SUBSPECIES ALSO OCCURS IN MEXICO.

NAME: DESERT PUPFISH *CYPRINODON MACULARIUS*

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 51 FR 10842, 03-31-1988

DESCRIPTION: SMALL (2 INCHES) SMOOTHLY ROUNDED BODY SHAPE WITH NARROW VERTICAL BARS ON THE SIDES. BREEDING MALES BLUE ON HEAD AND SIDES WITH YELLOW ON TAIL. FEMALES & JUVENILES TAN TO OLIVE COLORED BACK AND SILVERY SIDES.

ELEVATION RANGE: <5000 FT.

COUNTIES: LA PAZ, PIMA, GRAHAM, MARICOPA, PINAL, YAVAPAI, SANTA CRUZ

HABITAT: SHALLOW SPRINGS, SMALL STREAMS, AND MARSHES. TOLERATES SALINE & WARM WATER

CRITICAL HABITAT INCLUDES QUITOBAQUITO SPRING, PIMA COUNTY, PORTIONS OF SAN FELIPE CREEK, CARRIZO WASH, AND FISH CREEK WASH, IMPERIAL COUNTY, CALIFORNIA. TWO SUBSPECIES ARE RECOGNIZED: DESERT PUPFISH (C. m. macularis) AND QUITOBAQUITO PUPFISH (C. m. eremus).

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: MARICOPA

08/26/1999

NAME: GILA TOPMINNOW *POECILIOPSIS OCCIDENTALIS OCCIDENTALIS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-1967

DESCRIPTION: SMALL (2 INCHES), GUPPY-LIKE, LIVE BEARING, LACKS DARK SPOTS ON ITS FINS. BREEDING MALES ARE JET BLACK WITH YELLOW FINS.

ELEVATION RANGE: <4500 FT.

COUNTIES: GILA, PINAL, GRAHAM, YAVAPAI, SANTA CRUZ, PIMA, MARICOPA, LA PAZ

HABITAT: SMALL STREAMS, SPRINGS, AND CIENEGAS VEGETATED SHALLOWS

SPECIES HISTORICALLY OCCURRED IN BACKWATERS OF LARGE RIVERS BUT IS CURRENTLY ISOLATED TO SMALL STREAMS AND SPRINGS

NAME: RAZORBACK SUCKER *XYRAUCHEN TEXANUS*

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 55 FR 21154, 05-22-1990; 59 FR 13374, 03-21-1994

DESCRIPTION: LARGE (UP TO 3 FEET AND UP TO 16 POUNDS) LONG, HIGH SHARP-EDGED KEEL-LIKE HUMP BEHIND THE HEAD. HEAD FLATTENED ON TOP. OLIVE-BROWN ABOVE TO YELLOWISH BELOW.

ELEVATION RANGE: <8000 FT.

COUNTIES: GREENLEE, MOHAVE, PINAL, YAVAPAI, YUMA, LA PAZ, MARICOPA (REFUGIA), GILA, COCONINO, GRAHAM

HABITAT: RIVERINE & LACUSTRINE AREAS, GENERALLY NOT IN FAST MOVING WATER AND MAY USE BACKWATERS

SPECIES IS ALSO FOUND IN HORSESHOE RESERVOIR (MARICOPA COUNTY).CRITICAL HABITAT INCLUDES THE 100-YEAR FLOODPLAIN OF THE RIVER THROUGH GRAND CANYON FROM CONFLUENCE WITH PARIA RIVER TO HOOVER DAM; HOOVER DAM TO DAVIS DAM; PARKER DAM TO IMPERIAL DAM. ALSO GILA RIVER FROM AZ/NM BORDER TO COOLIDGE DAM; AND SALT RIVER FROM HWY 60/SR 77 BRIDGE TO ROOSEVELT DAM; VERDE RIVER FROM FS BOUNDARY TO HORSESHOE LAKE.

NAME: BALD EAGLE *HALIAEETUS LEUCOCEPHALUS*

STATUS: THREATENED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 60 FR 35999, 07-12-95

DESCRIPTION: LARGE, ADULTS HAVE WHITE HEAD AND TAIL. HEIGHT 28 - 38"; WINGSPAN 66 - 96". 1-4 YRS DARK WITH VARYING DEGREES OF MOTTLED BROWN PLUMAGE. FEET BARE OF FEATHERS.

ELEVATION RANGE: VARIES FT.

COUNTIES: YUMA, LA PAZ, MOHAVE, YAVAPAI, MARICOPA, PINAL, COCONINO, NAVAJO, APACHE, SANTA CRUZ, PIMA, GILA, GRAHAM, COCHISE

HABITAT: LARGE TREES OR CLIFFS NEAR WATER (RESERVOIRS, RIVERS AND STREAMS) WITH ABUNDANT PREY

SOME BIRDS ARE NESTING RESIDENTS WHILE A LARGER NUMBER WINTERS ALONG RIVERS AND RESERVOIRS. AN ESTIMATED 200 TO 300 BIRDS WINTER IN ARIZONA. ONCE ENDANGERED (32 FR 4001, 03-11-1967; 43 FR 6233, 02-14-78) BECAUSE OF REPRODUCTIVE FAILURES FROM PESTICIDE POISONING AND LOSS OF HABITAT, THIS SPECIES WAS DOWN LISTED TO THREATENED ON AUGUST 11, 1995. ILLEGAL SHOOTING, DISTURBANCE, LOSS OF HABITAT CONTINUES TO BE A PROBLEM. SPECIES HAS BEEN PROPOSED FOR DELISTING (64 FR 36454) BUT STILL RECEIVES FULL PROTECTION UNDER ESA.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: MARICOPA

08/26/1999

NAME: CACTUS FERRUGINOUS PYGMY-OWL *GLAUCIDIUM BRASILIANUM CACTORUM*

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: No CFR: 62 FR 10730, 3-10-97

DESCRIPTION: SMALL (APPROX. 7"), DIURNAL OWL REDDISH BROWN OVERALL WITH CREAM-COLORED BELLY STREAKED WITH REDDISH BROWN. SOME INDIVIDUALS ARE GRAYISH BROWN

ELEVATION RANGE: <4000 FT.

COUNTIES: MARICOPA, YUMA, SANTA CRUZ, GRAHAM, GREENLEE, PIMA, PINAL, GILA, COCHISE

HABITAT: MATURE COTTONWOOD/WILLOW, MESQUITE BOSQUES, AND SONORAN DESERTSCRUB

RANGE LIMIT IN ARIZONA IS FROM NEW RIVER (NORTH) TO GILA BOX (EAST) TO CABEZA PRIETA MOUNTAINS (WEST). ONLY A FEW DOCUMENTED SITES WHERE THIS SPECIES PERSISTS ARE KNOWN, ADDITIONAL SURVEYS ARE NEEDED. CRITICAL HABITAT IN PIMA, COCHISE, PINAL, AND MARICOPA COUNTIES (64 FR 37419).

NAME: MEXICAN SPOTTED OWL *STRIX OCCIDENTALIS LUCIDA*

STATUS: THREATENED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 56 FR 14678, 04-11-91

DESCRIPTION: MEDIUM SIZED WITH DARK EYES AND NO EAR TUFTS. BROWNISH AND HEAVILY SPOTTED WITH WHITE OR BEIGE.

ELEVATION RANGE: 4100-9000 FT.

COUNTIES: MOHAVE, COCONINO, NAVAJO, APACHE, YAVAPAI, GRAHAM, GREENLEE, COCHISE, SANTA CRUZ, PIMA, PINAL, GILA, MARICOPA

HABITAT: NESTS IN CANYONS AND DENSE FORESTS WITH MULTI-LAYERED FOLIAGE STRUCTURE

GENERALLY NESTS IN OLDER FORESTS OF MIXED CONIFER OR PONDERSA PINE/GAMBEL OAK TYPE, IN CANYONS, AND USE VARIETY OF HABITATS FOR FORAGING. SITES WITH COOL MICROCLIMATES APPEAR TO BE OF IMPORTANCE OR ARE PREFERED.

NAME: SOUTHWESTERN WILLOW FLYCATCHER *EMPIDONAX TRAILLII EXTIMUS*

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: No CFR: 60 FR 10694, 02-27-95

DESCRIPTION: SMALL PASSERINE (ABOUT 6") GRAYISH-GREEN BACK AND WINGS, WHITISH THROAT, LIGHT OLIVE-GRAY BREAST AND PALE YELLOWISH BELLY. TWO WINGBARS VISIBLE. EYE-RING FAINT OR ABSENT.

ELEVATION RANGE: <8500 FT.

COUNTIES: YAVAPAI, GILA, MARICOPA, MOHAVE, COCONINO, NAVAJO, APACHE, PINAL, LA PAZ, GREENLEE, GRAHAM, YUMA, PIMA, COCHISE, SANTA CRUZ

HABITAT: COTTONWOOD/WILLOW & TAMARISK VEGETATION COMMUNITIES ALONG RIVERS & STREAMS

MIGRATORY RIPARIAN OBLIGATE SPECIES THAT OCCUPIES BREEDING HABITAT FROM LATE APRIL TO SEPTEMBER. DISTRIBUTION WITHIN ITS RANGE IS RESTRICTED TO RIPARIAN CORRIDORS. DIFFICULT TO DISTINGUISH FROM OTHER MEMBERS OF THE EMPIDONAX COMPLEX BY SIGHT ALONE. TRAINING SEMINAR REQUIRED FOR THOSE CONDUCTING FLYCATCHER SURVEYS. CRITICAL HABITAT ON PORTIONS OF THE 100-YEAR FLOODPLAIN ON SAN PEDRO AND VERDE RIVERS; WET BEAVER AND WEST CLEAR CREEKS, INCLUDING TAVASCI MARSH AND ISTER FLAT; THE COLORADO RIVER, THE LITTLE COLORADO RIVER, AND THE WEST, EAST, AND SOUTH FORKS OF THE LITTLE COLORADO RIVER, REFERENCE 60 CFR:62 FR 39129, 7/22/97.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: MARICOPA

08/26/1999

NAME: YUMA CLAPPER RAIL *RALLUS LONGIROSTRIS YUMANENSIS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67; 48 FR 34182, 07-27-83

DESCRIPTION: WATER BIRD WITH LONG LEGS AND SHORT TAIL. LONG SLENDER DECURVED BILL. MOTTLED BROWN ON GRAY ON ITS RUMP. FLANKS AND UNDERSIDES ARE DARK GRAY WITH NARROW VERTICAL STRIPES PRODUCING A BARRING EFFECT.

ELEVATION RANGE: <4500 FT.

COUNTIES: YUMA, LA PAZ, MARICOPA, PINAL, MOHAVE

HABITAT: FRESH WATER AND BRACKISH MARSHES

SPECIES IS ASSOCIATED WITH DENSE EMERGENT RIPARIAN VEGETATION. REQUIRES WET SUBSTRATE (MUDFLAT, SANDBAR) WITH DENSE HERBACEOUS OR WOODY VEGETATION FOR NESTING AND FORAGING. CHANNELIZATION AND MARSH DEVELOPMENT ARE PRIMARY SOURCES OF HABITAT LOSS.

WILDLIFE OBSERVED IN THE DURANGO DRAINAGE AREA

BIRDS

pied-billed grebe (*Podilymbus podiceps*)

greater white-fronted goose (*Anser albifrons*)

mallard (*Anas platyrhynchos*)

American coot (*Fulica americana*)

great blue heron (*Ardea herodias*)

black-crowned night-heron (*Nycticorax nicticorax*)

green-backed heron (*Butorides striatus*)

snowy egret (*Egretta thula*)

great egret (*Casmerodius albus*)

cattle egret (*Bulbulcus ibis*)

black-necked stilt (*Himantopus mexicanus*)

American avocet (*Recurvirostra americana*)

lesser yellowlegs (*Tinga flavipes*)

killdeer (*Charadrius vociferus*)

willet (*Catoptrophorous semipalmatus*)

greater roadrunner (*Geococcyx californianus*)

mourning dove (*Zenaida macroura*)

Inca dove (*Columbia inca*)

Gambel's quail (*Callipepla gambelii*)

osprey (*Pandion haliaetus*)

sharp-shinned hawk (*Accipiter striatus*)

Cooper's hawk (*Accipiter cooperi*)

red-tailed hawk (*Buteo jamaicensis*)

great-horned owl (*Bubo virginianus*)

American kestrel (*Falco sparverius*)

northern harrier (*Circus cyaneus*)

BIRDS

red-winged blackbird (*Agelaius phoeniceus*)

great-tailed grackle (*Quiscalus mexicanus*)

house wren (*Troglodytes aedon*)

Bewick's wren (*Thryomanes bewickii*)

cactus wren (*Campyloryhnchus brunneicapillus*)

Bewick's wren (*Thryomanes bewickii*)

marsh wren (*Cistothorus palustris*)

rock wren (*Salpinctes obsoletus*)

song sparrow (*Melospiza melodia*)

vesper sparrow (*Pooecetes gramineus*)

white-crowned sparrow (*Zonotrichia leucophrys*)

black-throated sparrow (*Amphispiza bilineata*)

Brewer's sparrow (*Spizella breweri*)

loggerhead shrike (*Lanius ludovicianus*)

verdin (*Auriparus flaviceps*)

yellow-rumped warbler (*Dendroica coronata*)

yellow warbler (*Dendroica petechia*)

Abert's towhee (*Pipilo aberti*)

Bell's vireo (*Vireo belli*)

Say's phoebe (*Sayornis saya*)

black phoebe (*Sayornis nigricans*)

red-winged blackbird (*Agelaius phoeniceus*)

ruby-crowned kinglet (*Regulus calendula*)

lesser goldfinch (*Carduelis psaltria*)

northern cardinal (*Carduelis cardinalis*)

belted kingfisher (*Ceryle alcyon*)

BIRDS

ladder-backed woodpecker (*Picoides scalaris*)

Gila woodpecker (*Melanerpes uropygialis*)

black phoebe (*Sayornis nigricans*)

meadowlark (*Sturnella* sp.)

European starling (*Sturnus vulgaris*)

phainopepla (*Phainopepla nitens*)

loggerhead shrike (*Lanius ludovicianus*)

curve-billed thrasher (*Toxostoma curvirostre*)

northern mockingbird (*Mimus polyglottos*)

common raven (*Corvus corax*)

house finch (*Carpodacus mexicanus*)

REPTILES

desert tortoise (*Gopherus agassizii*) (carcass)

MAMMALS

racoon (*Procyon lotor*) (tracks)

coyote (*Canis latrans*) (tracks, scat)

black-tailed jackrabbit (*Lepus californicus*)

FISHES

tilapia (species unknown)

green sunfish (*Lepomis cyanellus*)

largemouth bass (*Micropterus salmoides*)

common carp (*Cyprinus carpio*)

mosquitofish (*Gambusia affinis*)