WHITE TANKS / AGUA FRIA

AREA DRAINAGE MASTER STUDY – UPDATE

Hydrology – DRAFT

May 17, 2000

Flood Control District of Maricopa County
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DATE: 05/31/00

MEMO TO: Greg Jones

FROM: J. M. Rumann

SUBJECT: White Tanks ADMP Update Existing Hydrology Model Review Comments

The purpose of this memo is to provide you with review comments on the subject referenced above. These comments are based upon the third revised model submitted for review dated May 17, 2000. It appears that the existing model is nearing completion, however the following changes and additional information is needed.

1. Provide a new watershed map reflecting new sub-basins.

2. Revise sub-basins in the Tanks No. 4 watershed to reflect revised soil parameters.

3. Revise draft hydrology report to document specific changes made to the previous ADMS.

4. The discharge per square mile values range from 425 cfs to 2100 cfs. The report should describe the conditions that produce these values, and what are the differences from the previous analyses. In particular the report should describe the hydrology such that should a submittal to FEMA be made to revise the floodplains, the report explains what the differences are between the hydrology used to define the existing floodplains.

5. Please provide the missing figures and tables referenced in the draft hydrology report.

6. The report should describe the assumptions used to model retention from the developed sub-basins.

7. Descriptions on the magnitude of change in hydrologic results should be quantified in the report.

8. An error message on the number of hydrographs must be corrected.

9. The difference in discharge for some concentration points is based upon the change in aerial reduction. Please document the change are in the report. (e.g CP 363 50.64 square miles versus previous study value of 61.67 square miles)

10. Hydraulic calculations or documentation should be provided in the report for all revised routings (e.g. line 7739 RSSC54 STORAGE ROUTING AT MCDOWELL ROAD CULVERTS)

11. It appears that runoff to the White Tanks 3 structure is diverted out of the model. The model should be revised to rout flows through the existing structure.

Once all of the information and changes requested above have been provided, I can review the existing hydrology model for completeness. If you have any questions please feel free to call me, thanks.

Table of Contents

1. Initial Hydrological Report

1.1 Study Purpose

The White Tanks/Agua Fria area, located to the west of metropolitan Phoenix, has experienced a significant increase in population since the publication of the original White Tanks/Agua Fria Area Master Drainage Study (WTAF ADMS) in October 1992. To properly plan for the stormwater conveyance of the proposed Loop 303, the Flood Control District of Maricopa County (FCDMC) has contracted with URS Greiner Woodward Clyde (URSGWC) to conduct a restudy of the WTAF ADMS. The purpose of the restudy is to integrate recent development and drainage improvements within the study area.

The restudy is part of the FCDMC's Area Drainage Master Study Program, which was initiated in 1983. A number of basin-wide studies have been carried out under the program in order to address stormwater management issues for specific regions of Maricopa County. The program's purpose is to identify flooding problems and develop solutions for existing and future development on a regional basis.

1.2 Study Area

The WTAF ADMS covers a 230-square-mile drainage basin to the west of metropolitan Phoenix. The study area is bound to the west by the White Tanks Mountains, to the east by the Agua Fria River, to the south by the Gila River, and to the north by the McMicken Dam and Grand Avenue.

The study area is approximately 15 percent developed. These developed areas include the cities of Avondale, Buckeye, El Mirage, Glendale, Goodyear, Litchfield Park, Peoria, and Surprise. Those remaining areas are predominantly agricultural. Residential communities and large-scale commercial developments both planned and existing within the study area of include, but are not limited to: Canyon Trails, Clearwater Farms, Estrella Vista, Goodyear Gateway, Goodyear 1000, Goodyear Planner Regional Center, Palm Valley, the Spencer development, Sun City and Sun City Grand, the Airport Commerce Center, the Caterpillar property, Estrella Aerospace Center, Estrella Distribution Center, Litchfield Commerce Center, Luke AFB, Pebble Creek Golf Resort, Phoenix-Litchfield Airport, and the Sun Village Resort.

1.3 Section Organization

The first three parts of this section provide overall information for the entire study area. Section 1.1 presents introductory information. Section 1.5 provides an overview of the major elements of the regional drainage system and reviews those changes to the drainage conditions and control structures that have occurred since the 1992 study. Section 1.6 outlines the methods used to revise the 1992 hydrologic model.

The remainder of this section is organized into separate smaller study areas. The numbering system for the sub-regional basins of the original White Tanks study was retained for this study update. Section 1.7 covers the White Tanks Structure #3 drainage area and includes a discussion

of changes in development and other corrective measures that have been accommodated by this restudy. Similarly, Sections 1.5 through 1.13 present the 1992 study conditions and restudy accommodations for the remaining major watersheds within the study area.

Figure 1.1 presents each of the major drainage basins and its corresponding section in this section. The cross-hatched areas drain directly to either the Agua Fria River of the Gila River. These areas were not included within any of the major drainage basins because, under both the 1992 and current conditions, they drain directly to a major outfall. They are, however, included in both hydrologic models.

1.4 Scope of Work

The following paragraphs briefly describe the major items of work included in the WTAF ADMS restudy.

Topographic Mapping

It was decided from discussions with FCDMC and the cities within the study area that new, area-wide topographic mapping was not needed. Regrading associated with development occurs on a local basis. It may affect specific hydrologic routing which will be reflected in the hydrologic model. However, the changes do not warrant the expense of new topographic mapping for 200+ square miles.

Land subsidence in the area north and northwest of Luke AFB is continuing, albeit at a slower rate. Spot elevation checks will be made to ascertain whether some supplemental survey lines might be required in that area.

Soils Mapping

While the soils have not changed in the area since the original study, the hydrologic modeling, of which soil characteristics are an important input parameter, have become more sophisticated. Additional soils analysis was conducted on the watershed in the White Tanks Mountains and the immediate area down-basin by FCDMC. This information has been incorporated into the hydrologic model with this submittal.

Hydrologic Model

The HEC-1 model developed for the 1992 study has been modified to reflect existing conditions as of the publication of this restudy. This was accomplished by compiling those HEC-1 models created for developments and drainage improvements which have taken place since the 1992 study. The first step taken was to revise the Palm Valley HEC-1 model. This updated Palm Valley model was the core of the revised White Tanks/Agua Fria model to which all other updated HEC-1 models have been added.

1.5 Changes in Existing Conditions: 1992-Today

1.5.1 Regional Drainage System

The natural regional drainage system is deficient, as virtually all of the natural drainage ways have long ago been regraded by agricultural interests. There have been several regional drainage projects constructed since the time of the original study. These projects include the Dysart Drain, Colter Channel, the RID overchute, and the Bullard Wash channel. There are also private drainage projects which might be described as sub-regional in nature (for example, SunCor's Indian School road channel which intercepts flows moving south and discharges them to Bullard Wash).

1.5.2 Changes in Drainage Conditions

Very few changes have been made to the overall drainage characteristic of the study area. There have been no significant changes to the major flood control structures: McMicken Dam and the White Tanks Structures #3 and #4. In those areas which, at the time of the 1992 study, were predominantly agricultural and have since been developed, accommodations including retention basins and/or channels have been constructed to manage stormwater that had previously been wide, shallow sheetflow. The improvements due to development are further discussed in subsequent sections.

1.5.3 Flood Control Facilities' Improvements

Dysart Drain

As previously mentioned, the Dysart Drain had been slowly losing a major amount of its capacity due to land subsidence. The 1992 study noted that its conveyance capacity had decreased from 1,100 cfs to 300 cfs. The FCDMC completed construction of the Dysart Drain Improvement Project in 1994. Improvements included a large detention basin at the corner of Reems Road and Northern Avenue as well as the reconstruction of the existing channel. This construction has enabled the Dysart Drain to collect and convey the 100-year flood from Reems Road, east to the Agua Fria River. This has greatly reduced the peak discharge of Bullard Wash just south of Camelback Road from 4,200 cfs to 2,700 cfs.

Dysart Road Channel

As part of their Dysart Road improvements, MCDOT constructed a channel along Dysart Road that discharges to a series of detention basins along the north side of the RID Canal (Figure 1.2). The FCDMC modified the WTAF WDMS HEC-1 model to account for these channel improvements in their estimate of peak discharge for the RID Overchute. The FCDMC's modifications were included in this report.

RID Canal Overchute

The FCDMC constructed a floodwater overchute over the RID Canal at the old Litchfield Road alignment. The purpose of the overchute is to reduce ponding/flooding in the Litchfield Park area north of the canal. The overchute provides an outfall for the 2.8 square mile drainage area to the

north. The FCDMC made modifications to the WTAF ADMS model in order to determine the peak design flow to the overchute. These modifications were included in this report.

Colter Channel

The Colter channel was constructed to intercept 100-year level of flood flows before they could causing damage to Litchfield Park. The project is on the Colter Road alignment, 1/4 mile north of Camelback Road. It extends from just east of Litchfield Road eastward to the Agua Fria channel.

Bullard Wash Channel

The Bullard Wash channel is under construction at the time this report is being written. The project should be finished and fully operational by the time the study is complete. Therefore, it is assumed to be an "existing condition." The channel extends from the Gila River north to the approximate mid-point of the Phoenix-Goodyear airport, between Lower Buckeye Road and Buckeye Road. The channel has 100-year flood flow capacity. Its purpose was to capture the FEMA floodplain waters and confine them to the channel.

Several private interests who are developing parcels adjacent to Bullard Wash have plans to extend the channelization north of the FCDMC project. Construction plans are not yet available so these features have NOT been included in the update as "existing" conditions.

Indian School Road Channel

This feature is being constructed by private developers. Its purpose is to intercept sheet flow at Indian School Road and convey the water east to Bullard Wash. The first reach of the channel, from Bullard Wash west to Sarival Road, is presently under construction. That reach will be considered "existing" for modeling purposes. There are plans to extend the channel to the west, but those will be considered "future" for the purpose of this hydrologic model. Ultimately, this channel will be replaced by a channel along Camelback Road. This will also be constructed by private interests. It will have the same hydrologic function but obviously different, local impacts.

1.6 Restudy Hydrologic Analysis

1.6.1 Methodology

The hydrologic methodology incorporated in this restudy utilized the "Drainage Design Manual for Maricopa County, Arizona" dated January 1, 1995, in combination with the Drainage Design Menu System Version 1.2 computer program (DDMS).

Hydrologic parameters were calculated for those sub-basins for which no S-graphs reflecting current conditions were available. The DDMS computer program Sub-basin Preparation form was used to calculate Green-Ampt loss rate parameters, which were in turn used by the computer program's Maricopa County Unit Hydrograph Procedure 2 form to create an updated HEC-1 data file for the revised sub-basin.

As previously mentioned, the HEC-1 model developed for the 1992 study has been modified to reflect existing conditions as of the publication of this restudy. This was accomplished by compiling those HEC-1 models created for developments and drainage improvements which have taken place since the 1992 study. Some modifications were required due to current levels of development. That is to say, where a HEC-1 model reflected developed conditions where development has not yet been completed, HEC-1 data files were created to reflect current, or interim, conditions.

1.6.2 Sub-basin Delineation

Those sub-basins that most accurately reflected current conditions were used. In areas where appropriate sub-basins overlapped, one of the two were reduced in area based on sub-basin characteristics including current levels of development and corresponding available HEC-1 data files. Sub-basin delineations are more thoroughly discussed within the appropriate watershed sections of this report.

1.6.3 Physical Parameters

Where physical parameters, and those methods used to determine such parameters, vary from the 1992 study, it has been noted in the affected watershed sections within this report. The original WTAF ADMS HEC-1 model incorporated the following hydrologic parameters to calculate runoff:

- ***Runoff*** – The 100-year, 24-hour point rainfall of 4.03 inches was used for the entire watershed.
- ***Rainfall Distribution*** – SCS Type II rainfall distribution pattern.
- ***Depth-Area Reduction*** – NOAA Atlas II, Arizona, provided the depth-area reduction relationships for the 24-hour storm.
- ***Rainfall Losses*** – The Green and Ampt infiltration equation was used to estimate rainfall losses.
- ***Unit Hydrograph*** – The Phoenix Valley S-graphs were utilized to calculate unit hydrographs.
- ***Channel Routing*** – Normal-depth channel routing was used to route the computed hydrographs through each reach of the watershed.

Where methods have deviated from that used in the 1992 study, this has been noted within the section discussing the affected watershed within this report. As a general note, there are now four S-graphs available to more accurately reflect hydrologic conditions in different types of terrain within the watershed. For a more complete discussion of the hydrologic parameters as determined for the 1992 study, refer to the WTAF ADMS Part A: Flood Study Technical Data Notebook.

1.7 White Tanks FRS #3 Watershed

1.7.1 Introduction

This section presents those methods used to update the White Tanks FRS #3 watershed portion of this restudy. Section 1.7.2 reviews drainage and land use conditions that affected the 1992 study. Section 1.7.3 reviews any effective changes to the drainage and land use conditions of the watershed. Section 1.7.4 discusses methods used to update the 1992 HEC-1 model. The area covered is shown on Figure 1:3 (1992 ADMS, Volume B). It includes all of the tributary area (20.5 square miles) to the White Tanks #3 FRS. It also includes the diversion channel and dike along the Beardsley Canal known as Beardsley Canal Wash.

1.7.2 1992 Conditions

Land Use

At the time of the 1992 study, the majority of the land in the watershed was either State land or part of the Maricopa County White Tank Mountain Regional Park. Only about 10% of the watershed was privately owned, most of which was on the Caterpillar Proving Grounds. The J.I. Case Company also operated an earthmoving equipment proving ground located on State lands within the watershed. The only deviations from the watershed's natural character and drainage patterns are due to grading done on the proving grounds, some park roads, and minor, low-impact recreational sites.

Drainage Characteristics

The White Tanks #3 watershed consists of mountainous foothill areas within the White Tank Mountains. Land slopes range from 1% in the foothills up to over 100% in the steepest mountain areas. The elevation is about 1,200 feet at the FRS and rises to over 4,000 feet at the higher peaks.

Stormwater runoff is collected in natural washes that flow east-southeasterly out of the mountains. The floodplains of the most significance of these washes include: Waterfall Wash, Cholla Wash. North Fork Cholla Wash, White Tanks No. 3 Wash, Bedrock Wash, and North Fork Bedrock Wash. White Tanks No. 3 Wash and Bedrock Wash drain directly into the White Tanks No. 3 structure. The remaining washes drain to Beardsley Canal Wash, which diverts flow to the White Tanks No. 3 structure that would otherwise flow in a southeasterly direction across the watershed.

Stormwater runoff from sub-basin No. 16 drains to a large detention basin at the northeast corner of the Caterpillar Proving Grounds. The basin volume is over 1,300 acre-feet, which is more than sufficient to retain the 100-year flood from the 1.13 square mile sub-basin. The 100-year runoff volume from sub-basin No. 16 is 86 acre-feet.

1.7.3 Current Conditions

Changes in Land Use

Approximately 1.75 square miles of the White Tanks FRS #3 watershed are occupied by the Caterpillar Property, formerly the site of the Caterpillar Proving Grounds. The Caterpillar Foundation, in conjunction with Caterpillar, Inc., ceased operation at the site in 1988. At this time, the development of the property as a planned community has been proposed. Of the 1.75 square miles of the property that lies within the White Tanks Structure #3 watershed, only 0.74 square miles are to be developed.

Changes in Drainage Conditions

The development of the Caterpillar Planned Community will only have minor effects on peak discharges within the watershed. It is estimated this development will result in an increase in the percent impervious factors (see Table 1.1)

Table 1.1 Watershed Characteristics – Caterpillar Property

HEC-1 ID	D.A. (mi^2)	VII Dvlp Area (mi^2)	% IMP	VI Dvlp Area (mi^2)	% IMP	% IMP Chankg	Existing % IMP	Total % IMP
4	0.30	0.1	23			7.6	1	8.6
7	0.31	0	0			0	10	10
14	1.47	0	0			0	9	9
15	1.26	0	0			0	6.4	6.4
16	1.13			0.64	16.6	9.4	11.1	20.5

1.8 Update Methodology

NOTE: The soils for the contributing watershed to White Tanks FRS #3 and #4 were re-evaluated by FCDMC. The general sense of the change is that the terrain is very steep, and soil development is minimal. The net result is that moisture retention is low. Changes to the soil input parameters in the HEC-1 model have result in substantially increased runoff values for the White Tanks area sub-basins, and the down slope areas.

order of magnitude
Please provide

1.9 White Tanks FRS #4 Watershed

FCDMC re-evaluated the soil properties in this watershed, relative to hydrologic values. The District then revised the hydrologic model with the new input parameters. The changes for this sub-basin were then incorporated into the overall HEC-1 model as part of this study.

Channel transmission losses were reflected in the original HEC-1 model for washes in the native desert areas. A review of the current literature, including work in Walnut Gulch in southern Arizona, revealed a lack of defensible results regarding specific values for transmission losses that might be appropriate for the washes in this area. Therefore it was decided (FCDMC) to remove the transmission losses from the HEC-1 model. This results in slightly higher runoff values in this sub-basin, as well as the sub-basins down slope.

1.10 Southwest Area Watershed

This area is down slope of the White Tanks #4 watershed. A percentage of the runoff for this area is derived from that watershed. The changes in the hydrologic values assigned to the soils and removing the transmission losses for the channels affect the runoff values in this watershed.

1.11 Estrella Freeway Watershed

1.11.1 Introduction

The Estrella Freeway is part of the ADOT regional freeway system for metropolitan Phoenix. The approximate alignment for the north-south leg is along Cotton Lane. Many freeways in the area also function as regional drainage interceptors with a drainage channel along the upslope side of the freeway. At the time of the original WT study, the relative priority of the Loop 303 was "relatively high." The assumption was that the Loop 303 freeway construction would precede major development, the freeway would include an interceptor channel, and that channel would cut off flows to the east and divert the runoff south to the Gila River.

1.11.2 Conditions

Land Use

Land use at the time of the original study was mostly agricultural in this sub-region. Development was scattered with a few small developments having large lots.

Drainage Characteristics

The drainage pattern was controlled by agriculture, more specifically, by agriculture using flood irrigation. This means the land is laser leveled, typically in 160 acre parcels, with dikes around the perimeter.

1.11.3 Current Conditions

Changes in Land Use

Approximately 4 square miles of the planned community of Palm Valley lie within the boundaries of the Estrella Freeway Watershed, as defined in the 1992 study. However, this area now drains to Bullard Wash, to the east. There are several other master planned communities within the drainage area of Loop 303. Notably, the Canyon Trails development, which extends from I-10 south to Broadway Road along Cotton lane, is nearly bisected by the planned freeway

corridor. Construction is under way on the first phase of Canyon Trails with more to follow in the near future.

Changes in Drainage Characteristics

Given the absence of natural drainage corridors, each developer is required to deal with off-site flows. Solutions to off-site drainage problems vary depending on the location, size and shape of other development and local topography. All developments, whether in a city or in the unincorporated parts of the county, are required to retain some portion of the on-site runoff. So, as a consequence of development and despite a higher percentage of impervious surface area, flood flows are either the same as, if not less than, predevelopment values.

NOTE: Just before this report went to press, it was decided (FCDMC) to include the on-site retention for private development at 80% of the design values. Given the hundreds of retention basins that have been built and modeled, it is unrealistic to think that they all function at 100% capacity. Since this HEC-1 model is intended to function as a regional benchmark, it was thought that being a little conservative would yield a more practical tool.

existing condition

1.12 Bullard Wash Watershed

1.12.1 Introduction

Bullard Wash, one of only a few naturally occurring conveyances within the study area, flows southward from Luke AFB to the Phoenix-Litchfield Municipal Airport east of the Estrella Freeway watershed. The 28-square-mile watershed is fairly long and narrow with a length of 11 miles. Even to characterize this area as a wash is somewhat misleading. A FEMA floodplain delineates the wash. But, a tailwater ditch is the only physical feature even remotely related to a wash in the area, although ADOT had the foresight to incorporate a bridge for the wash into I-10.

This section presents those methods used to update the Bullard Wash watershed portion of this restudy. Section 1.12.2 reviews drainage and land use conditions that affected the 1992 study. Section 1.12.3 reviews any effective changes to the drainage and land use conditions of the watershed. Section 1.12.4 discusses methods used to update the 1992 HEC-1 model. The area covered is shown on Figures 1.4 and 1.5.

1.12.2 1992 Conditions

Land Use

At the time of the 1992 study, the Bullard Wash watershed was approximately 70% agricultural. Approximately 7.5 square miles had already been developed. Previously existing development includes the Luke AFB, the Phoenix-Litchfield Municipal Airport, and portions of the Cities of Avondale and Goodyear.

Drainage Characteristics

Being that the watershed was predominantly used for agriculture, much of the land is generally flat with uniform slopes that range from 0.2 to 0.5 percent. Ponding areas were found along the RID Canal, I-10, and SR 85.

A 96-inch drain in Litchfield Road diverts a considerable amount of stormwater out of the watershed. It collects runoff between I-10 and Lower Buckeye Road and discharges to the Agua Fria River. However, with a capacity of only 360 cfs, it cannot contain the runoff from the 100-year flood. The excess stormwater is captured in a retention basin at the corner of SR 85 and Litchfield Road on the Loral Corporation property.

As previously mentioned, the subsidence of the Dysart Drain had caused the drain to become rather ineffective over time. The WTAF ADMS had advised the improvement of this drain to prevent the breakout of floodwaters at Luke AFB, into the Bullard Wash watershed.

Another area of importance is the downstream end of the wash. South of the Phoenix-Litchfield Airport, the wash was prone to overbank flooding. Over time, developments in the area had nearly eliminated the natural drainage conveyance. These alterations resulted in large areas of land being inundated by overland flooding.

1.12.3 Current Conditions

Land Use

Bullard Wash flows through the center of the Palm Valley planned community. At this time, 2.2 square miles, of the approximately 7 square miles within the watershed, have been developed. The majority of this development consists of the construction of two golf courses and low- to medium-density housing projects. The remaining area is still being used for agricultural purposes.

The southern portion of the watershed is also still agricultural, although development is in the planning stage for virtually the entire length of the wash downstream of Pebble Creek.

Drainage Characteristics

Improvements to the Dysart Drain, in 1995, have eliminated breakout flows of the 100-year flood. At the time of construction, the peak discharge of Bullard Wash just south of Camelback Road had been reduced from 4,200 cfs to 2,700 cfs.

Improvements to the Bullard Wash have allowed the entire 100-year flood, from Lower Buckeye Road to the Gila River, to be contained within the channel. These improvements were intended to reduce the effective floodplain width to that of the channel. This was accomplished by creating an outfall channel, which is capable of intercepting surface runoff north of Lower Buckeye Road and conveying it to the Gila River.

1.12.4 Update Methodology

As previously mentioned, a HEC-1 model (wtmod32), which modeled the current, or interim, conditions of Palm Valley, west of the ADOT Basin watershed, had been provided. An additional HEC-1 model, reflecting the future, or fully developed, conditions for Palm Valley (pvmds) was furnished. These models had taken the improvements to the Dysart Drain and the installation of the Indian Road Channel into account. Therefore, they proved to be an ideal base to which the entire restudy was based.

For those portions of Palm Valley that had been developed, redefined sub-basins were used. Refer to the "Master Drainage Study for Palm Valley," by the WLB Group for more information concerning the redefinition of the developed sub-basins. Figure 1.6 depicts the revised sub-basin boundaries within Palm Valley as delineated for this restudy. It should be noted that, in remaining consistent with the WLB model, Green and Ampt rainfall loss parameters varied slightly from the DDMS default values (Table 1.2).

Table 1.2 – Green and Ampt Rainfall Loss Parameters

Land Use Type	DTHETA Condition	% Veg. Cover	RTIMP %	IA In.	Kn Value
LOW RES	NORMAL	30.0	25.00	0.300	0.015
MED RES	NORMAL	50.0	45.00	0.250	0.015
HIGH RES	NORMAL	50.0	55.00	0.250	0.015
COM	NORMAL	75.0	80.00	0.100	0.015
IND	NORMAL	60.0	55.00	0.150	0.015
GOLF C.	NORMAL	80.0	2.00	0.400	0.030
OPEN S.	NORMAL	80.0	10.00	0.400	0.030
SCHOOLS	NORMAL	50.0	50.00	0.300	0.030

Two sub-basins, 253 and 267, within Palm Valley required new HEC-1 data files to be created specifically for this update, due to development. Essentially, it was required that their size be reduced. Updated soils and basin area information was entered into the DDMS computer program and Agricultural S-graphs were used to create revised HEC-1 data files. Phoenix Valley S-graphs were used to calculate flood hydrographs for all other sub-basins within Palm Valley.

For that portion of the Bullard Wash watershed lying south of Palm Valley, the HEC-1 modeling was extracted from the model prepared by Wood, Patel & Associates, Inc., for Sverdrup Civil, Inc., and the FCDMC for the Bullard Wash Channel Improvements. Both the hydrologic and hydraulic methods of analysis for the improvement project followed those methods outlined in Volumes 1 and 2 of the FCDMC's "Drainage Design Manual." For detailed information concerning the Bullard Wash Channel improvements and the hydrologic and hydraulic methods concerning the resulting HEC-1 model, refer to "Bullard Wash Channel Improvements, Technical Data Notebook, Volumes 1 and 2."

1.13 ADOT Detention Basin Watershed

1.13.1 Introduction

This section discusses the methods used to update the ADOT Detention Basin watershed potion of the WTAF ADMS. The ADOT detention basins are located along the north side of I-10, between Bullard Avenue and Dysart Road. Approximately 7 square miles, including a major portion of the City of Litchfield Park, drain into the basins. The entire basin is located within the bounds of the Palm Valley planned community.

The basins were excavated during the construction of I-10. They are drained by a 48-inch storm sewer pipe into the Agua Fria River at Van Buren Street. The basins were constructed to protect the interstate from offsite floodwaters and to prevent the interstate from discharging concentrated floodwaters that would otherwise be directed toward the Cities of Goodyear and Avondale.

1.13.2 1992 Conditions

Land Use

Existing developments at the time of the 1992 study include the Wigwam Resort and a portion of the master planned Litchfield project. The remaining land was primarily used for agricultural purposes.

Drainage Characteristics

The watershed gently slopes in a southerly direction from Camelback Road to I-10. Runoff generally flowed overland through the streets of Litchfield Park and across the farm fields to the south and west of the city. Both the Airline Canal and the Roosevelt Canal caused ponding of floodwaters.

1.13.3 Current Conditions

Land Use

At this time, almost the entire basin has been developed as part of the Palm Valley planned community. This development has included the construction of two golf courses and both commercial and residential areas. Those areas that remain undeveloped at this time have been left as open space.

Drainage Characteristics

The most significant development affecting drainage characteristics within the watershed is the 1997 construction of the RID Canal Overchute by the FCDMC. The overchute was constructed to reduce ponding/flooding in the Litchfield Park area north of the canal. It provides an outfall for the 2.8 square mile drainage area to the north.

1.13.4 Update Methodology

Within the Master Drainage Study for Palm Valley (MDS), a HEC-1 model reflecting fully developed conditions was created (pvmds). This mod0el took into account both the Dysart Drain improvements and the RID Canal Overchute. However, since the entire area has not yet been fully developed as detailed in the MDS, it was required that new sub-basin HEC-1 data files be created for several sub-basins within the watershed. As previously mentioned, WLB had redefined the sub-basins within Palm Valley as part of the MDS (Figure 1.6).

In order to create HEC-1 data files that reflected current, partially developed, conditions, the first step was to simulate the fully developed sub-basins within the DDMS Sub-basin Preparation program. This was accomplished by calculating weighted Green and Ampt parameters based on development to acquire the percent vegetation cover. This value was then used to determine a correction factor to estimate the weighted hydraulic conductivity within the sub-basin based on the XKSAT value found in the fully developed sub-basins' HEC-1 data file. All undeveloped land was evaluated as open space using those parameters outlined in Table 3.2. Phoenix Valley S-graphs were used due to the fact that this land is no longer being used for agricultural purposes. The HEC-1 data files produced by the DDMS were then integrated into the pvmds model.

The only deviation from this method occurred in the area south of the RID Canal and north of McDowell Road, between Bullard Avenue and Litchfield Road. This area had not yet been developed; therefore, the HEC-1 files for sub-basins 288A and 288B, from the wtmod32, or interim conditions, model, were extracted and integrated into the updated model.

REFERENCES

Bullard Wash Channel Improvements, City of Goodyear, Maricopa County, Arizona, Technical Data Notebook, Volume 1 of 2, Flood Control District of Maricopa County, May 10, 1999.

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FIGURE 1.1

STUDY AREA MAP

WHITE TANKS/AGUA FRIA
AREA DRAINAGE MASTER STUDY