DEPARTMENT OF PUBLIC WORKS

DRAINAGE MASTER PLAN

JULY 2001

BACKGROUND

The City was severally impacted by heavy storm events on June 2000 and July 2001. These two storms events met or exceeded the 100-year storm characteristics.

The vast majority of the City's nations infrastructure is not designed to handle the 100-year storm events, therefore improvements to the City's infrastructure is proposed to alleviate public and private property.

These improvements will minimize but will not guarantee future flooding. The vast majority of the City lies between the 100-year and 500-year flood zone as identified in the National Flood Insurance Program, Flood Insurance Rate Map, September 1978.

Proposed improvements include regrading and protecting existing main stormwater interceptors, maintenance, channelization and more modern best management practices for stormwater management.

All of the proposed improvements will be prioritized using the cost to benefit ratio. The proposed improvements include curbing in flood prone areas. Curbing will minimize the risk of flooding, but will not guarantee future flooding. Typically, runoff from a 10-year storm must be contained between the curbs of the streets. On arterial streets or multi-laned roadways, at least one travel lane in each direction shall be free from flooding during a 10-year flood. Otherwise, storm drains, drainage channels, or other acceptable methods shall be required where all-weather access cannot be achieved.

The primary purpose of streets shall be to serve as conveyors for vehicular traffic and to permit access to all lots and properties served by any given street. Although t is realized that streets will convey a certain amount of drainage, such as stormwater draining from adjacent lots and stromwater resulting from rainfall directly upon the streets themselves, new streets will not be designed to convey flows other than those of local origin.

STORMWATER IMPACTS-JUNE 2000 AND JULY 2001

The areas that were severally impacted by these storm events are as follows:

- Rose Ave. and San Antonio Ave. from 5th. St. to 8th. St.: This was caused by insufficient carrying capacity of Rose Ave. Ditch.

- 5th. St. from Pan American Ave. to 'I' Ave.: This was caused by insufficient carrying capacity of culvert inlets located at the intersection of 5th. St. and Pan American Ave.

- Washington Ave. and Jefferson Ave. from 5th. St. to 8th. St.: This was caused by insufficient channel carrying capacity as well as a drainage choke caused by a culvert not designed or constructed adequately to handle a 100 year storm event.

- Louis Ave. from 17th. St. to 23rd. St.: This was caused by insufficient carrying capacity of Louis Ave. Channel as well a lack of designated inlets at intersection of the channel and the east to west streets.

- Pan American Ave. from 16th. St. to 20th. St.: This was caused by insufficient carrying capacity of Pan American Ave. West Drainage Channel.

All these areas are located within the 100-year floodplain.

PROPOSED DRAINAGE IMPROVEMENTS

PROJECT NO. 1: Washington Avenue Ditch and Levee Improvements.

This proposed project can be undertaken immediately to repair recent flood damage, and to improve the carrying capacity of the drainage ditch, and raise the height of the levee. The elevation of this levee will require channel improvements to prevent the higher levee increasing flooding east of Washington Avenue. Regular City forces can accomplish the cleaning and regrading of the channel. This project should be started immediately.

The existing culvert located at 4th. St and Washington Ave. should be demolished. The structure should be replaced by an engineered structure or looking at other means to access this area. Staff will determine if all the proposed improvements could be constructed within the City's right-of-way.

Staff is reviewing several alternatives to line and to protect the channel slopes in order to increase the channel capacity as well as to provide a pleasant architectural finish. Staff is recommending the construction of a retention/detention basin in the vicinity of 4th. St. and Washington Ave. with the construction of this basin, it would increase the time of concentration of storm event, especially in the times that both Rose Ave. Ditch and Washington Ave. Ditch are flowing close to its capacity.

Staff is recommending a bar/grader ditch around Douglas Terrace subdivision; this would divert some of the stormwater around this neighborhood. This drainage could be diverted to the proposed retention/detention basin in this area.

PROJECT NO. 2: Rose Ave. Drainage Channel.

Regular City Forces can accomplish the cleaning and regarding of the channel. This will increase the hydraulic capacity of the channel as well as to provide positive drainage.

Improvements to the channel inlets shall be performed in order to ease the drainage flow. Staff is reviewing several alternatives to line and to protect the channel slopes in order to increase the channel capacity as well as to provide a pleasant architectural finish.

In addition, staff is recommending the construction of a new detention and retention basin in the vicinity of 15th. Street and Rose Avenue, this would alleviate the peak flows at the Rose Avenue Ditch from 15th. Street to 5th. Street.

PROJECT NO. 3: Curbing in Flood-Prone Areas

Curbing in these areas would direct stormwater to its designated discharge point. The areas that staff is recommending curbing is as follows.

Apache Drive from 15th. St. to Warpath Drive.
From 15th. St. north to City Limits from A Avenue to Washington Avenue
From 4th. St. to 8th. St. from Rose Ave. to San Antonio Ave.

PROJECT NO. 4: Culvert, Inlet improvements at 5th. St. and Pan American Ave.

This proposed project would make improvements to the existing inlet structures. This should increase the carrying capacity of the culvert, this improvements would eliminate water to back up onto private property, especially on more frequent return periods.

PROJECT NO. 5: Retention/Detention Basin, Rose Ditch at Cemetery.

Retention/Detention Basin, Rose Ditch at Cemetery. This proposed project involves purchasing platted lots and formalizing the ditch, constructing a retention/detention basin on City owned land at the southeast corner of the Cemetery. The spoil excavated from the channel can be used to elevate land adjacent to the basin, improving drainage, and removing part of the land from the floodplain. The function of the basin would be to:

1. Retain one foot of water to settle out sand and prevent passing any water in very minor events,
2. Detain an additional 7 feet of water, allowing it to drain out through a 24-inch pipe at a controlled rate, to limit the downstream flow in a medium event.
3. To allow spilling water over the check dam at a depth of 8 feet in the case of a major flood, while still settling out sand and gravel.

These functions will delay and reduce flood heights lower on the International Ditch regardless of the size of flood event. The right-of-way cost is estimated to cost $50,000, with $30,000 for construction.

Additional channel improvements on the Rose Ditch and Levee, from 8th Street south, can be funded from City Operations and Maintenance funding. These improvements will make breakouts of floodwater across Rose Ditch much less likely.

PROJECT NO. 6: Retention Basin/Park, 15th Street between Jackson and Van Buren Avenues.

This project would create a flat-bottomed basin with a depth of 6 feet, which would store water diverted from the drainage ditch flowing westward along 15th Street. The basin would catch water until full, and then the water would simply flow on by as before.

The trapping of the ""first flush"" water would greatly reduce the frequency and quantity of runoff downstream on 15th Street. A culvert crossing 15th Street would allow part of the flow along the north side of 15th Street to also enter the basin.

Van Buren Avenue would also be provided with a positive drain into the basin. The basin could be landscaped and turfed to provide an attractive neighborhood park and recreation area during the majority of time when it would not be full of water. The sides of the basin would be sloped at 4:1 for stability and safety. Probable construction cost is $35,000.

PROJECT NO. 7: Washington Avenue Drainage Ditch, Applewhite Street to 26th Street

This project would reduce flooding of the intersection of Hohokam Street at Washington Avenue adjacent to Huber Junior High School, and would prevent the water having to cross the densely developed Sunnyside Addition subdivision before eventually reaching the natural drainage, Palm Grove Wash, which runs in the 26th Street alignment.

The proposed project would construct an improved ditch with driveway culverts along the east side of Washington Avenue to provide positive, continuous drainage.

PROJECT NO. 8: Detention/Retention Basin, Intenational Ditch in the Vicinity of Chino Road and 3rd. Street.

This proposal would involve constructing a basin to receive stormwater from the International Ditch running westward, the Chino Road Ditch running southward, and the Phelps Dodge Drainage ditch running southeast.

This basin could be constructed at the natural confluence of the three drainages in the western portion of the so called "jungle", between the high-pressure gas line and the alignment of 3rd Street. The primary function of this basin would be to intercept floodwaters before they cross the international boundary and cause damage in the built-up area of Agua Prieta, Sonora.
The preliminary plans call for permanent retention of 10 feet of stormwater, and the detention of another 10 feet of depth of stormwater, which would drain through a pipe through the embankment. Part of the retention volume could be maintained as a permanent lake and recharge and storage basin for reclaimed water from the Wastewater Treatment Plant.

The soil excavated from the basin could be used to elevate the adjacent land to provide positive drainage, and to remove it from the floodplain. The estimated cost of the project is $150,000 for land acquisition, plus $250,000 for construction, for a total of $400,000.

PROJECT NO. 9: Palm Grove Floodway, Washington Ave. to "A' Ave.

This proposed project would construct an engineered channel 160 feet wide at the top, 80 feet wide at the bottom, 10 feet deep, with 4:1 bank slopes. The slope of the channel is adequate to convey approximately 15,000 cubic feet per second, which is the approximate peak flow of a 100-year flood event.

This channel would provide positive drainage for the area, and soil excavated would be placed to elevate adjacent land above the floodplain. The estimated cost of this project is $75,000 for right-of-way and $325,000 for construction, for a total of $400,000.

PROJECT NO. 10: Concrete lining of International Ditch from Rose Ave. to the Port of Entry.

This proposed project would involve reducing the width and depth of the International Ditch, lining the "banks with concrete, and installing check dams.

The purpose of this project is to protect the banks from erosion, to prevent the growth of vegetation, which may clog downstream culverts, and to control the velocity of the water to prevent overloading downstream culverts.

The narrowing of the channel will also allow pedestrian traffic and aesthetic improvements such as landscaping. The preliminary cost estimate for this project is $1,500,000 for the bare construction of concrete bank protection. Construction would be entirely within land owned by the U. S. Government.

PROJECT NO. 11: Underground Storm Drain along 'A' Ave. from 15th. St. to Palm Grove Wash.

This proposed project consists of the construction and installation of an underground storm drain along 'A' Ave. from 15th. St. to Palm Grove Wash. This storm drain would alleviate flooding on neighborhoods west of 'A' Ave. and Pan American Ave. This project could be incorporated as part of the SR-80 Turnback project and 'A' Ave. enhancement project.

PROJECT NO. 12: Airport Road Drainage Channel.

This proposed project can improve the carrying capacity of the drainage ditch, and raise the height of the levee. The elevation of this levee will require channel improvements to prevent the higher levee increasing flooding east of Airport Rd. (Douglas International Airport).

Regular City forces can accomplish the cleaning and regrading of the channel. This proposed project consists of the construction and installation of culverts to handle a 10 year storm event. This channel would act as the City's first line of defense from stormwater flowing towards the City.

PROJECT NO. 13: Louis Ave. Drainage Channel from 15th. Street to City Limits.

Regular City Forces can accomplish the cleaning and regarding of the channel. This will increase the hydraulic capacity of the channel as well as to provide positive drainage.

Improvements to the channel inlets shall be performed in order to ease the drainage flow. Staff is reviewing several alternatives to line and to protect the channel slopes in order to increase the channel capacity as well as to provide a pleasant architectural finish.