

WINSLOW LEVEE

EMERGENCY ACTION PLAN

AND FLOOD RESPONSE FOR THE FLOOD CONTROL STRUCTURE AREA



Jointly developed by:
U.S. Army Corps of Engineers
Navajo County Flood Control District
Navajo County Emergency Management
City of Winslow
National Weather Service
United States Geological Survey
November 19, 2015



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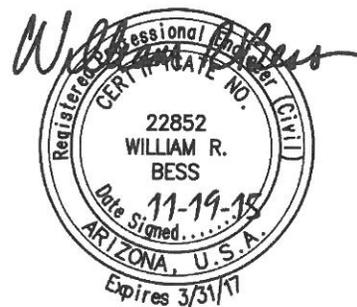
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Plan updated November 19, 2015

Approved by: 

William R. Bess, P.E., CFM
Navajo County Floodplain Administrator



OVERVIEW OF EMERGENCY ACTION PLAN FOR THE WINSLOW LEVEE

The Winslow Levee begins at the junction with the east end of the Ruby Wash Diversion Levee and runs 7.2 miles north along the Little Colorado River (see Figure 1 – Winslow Levee Location Map).

The combined federal and local agencies are preparing an Emergency Action Plan (EAP) should they encounter a flood emergency within the Winslow Levee area; Navajo County Flood Control District (NCFCD), Navajo County Emergency Management (NCEM), the City of Winslow and the US Army Corps of Engineers (Corps). Navajo County is the primary agency responsible for activities described in this EAP. The City of Winslow and the Corps will assist wherever possible.

An Operations and Maintenance (O&M) Manual for the Winslow Levee was prepared subsequent to completion of the project. The O&M Manual was updated in December of 2006. This EAP does NOT supersede the O&M Manual, but provides an emergency response process should a flood event occur. The O&M Manual describes detailed procedures that should be followed as much as possible if not specifically accounted for in this EAP. The Winslow Levee Flood Control Structure O&M Manual is included as Appendix 2 in the EAP.

The purpose of the EAP is to safeguard lives and reduce property damage in the event of a flood. The NCFCD, National Weather Service (NWS) and United States Geological Survey (USGS) have evaluated rainfall and runoff records to determine the appropriate trigger mechanisms to initiate an emergency response. The first phase of the emergency response is to prepare materials and manpower when the threat of flooding is imminent. This requires access to the levee by heavy equipment; thus the action must be initiated prior to flooding. The second phase of the emergency response is to flood fight during an actual flood event.

The following response criteria have been established for various levels of forecasted runoff for the Little Colorado River region in Navajo County. The forecasted runoff is modeled from flow measurements taken at NOAA LCW A3 and utilizes the river modeling software used by the National Oceanic and Atmospheric Administration (NOAA). The trigger mechanism for discharge will be used to alert officials, initiate monitoring, equipment mobilization and flood fighting activities.

River Elevation ft.	River Flow ft ³ /sec	Flood Warning Statements	Response
17 ft.	12,000 cfs	<u>Bank Full</u> – Flooding approaches bridge on Indian Route 71 in Bird Springs, flooded roads in Leupp.	Continuous monitoring, alert Corps, NCEM, City of Winslow, Navajo Nation and NC Public Works
19 ft.	20,000 cfs	<u>Flood Watch</u> – Imminent flooding of Homolovi State Park, Flooding problems in Bird Springs & Leupp	Mobilize equipment to the levee area. Start filling sand bags. Restrict traffic on the Levee.
23 ft.	35,000 cfs	<u>Moderate flood Category</u> – Possible damage to the levee. Damage to Homolovi State Park	Mobilize flood fight emergency teams and place teams on standby
25 ft.	45,500 cfs	<u>Major Flood Category</u> Potential overtopping of levee.	Evacuate area behind levee, and maintain standby flood fighting emergency teams

I. Alert / Notification

NCFCD/ NCEM staff shall use the flow forecast model for the Little Colorado River to trigger alerts. The following alerts will be initiated based on forecasted water levels.

Water Elevation is forecasted to meet or exceed 17 ft. – The NCFCD/ NCEM staff shall notify:

- * Navajo County Manager and Public Works Director – The notification to Public Works will serve to initiate the levee monitoring activity.
- * Army Corps Emergency Operations Chief – Notification to the Corps shall provide an update on monitoring activity and forecasted water level.
- * Navajo County Sheriff's Office – Notification to the Sheriff shall provide an update on monitoring activity and forecasted water level.
- * Winslow City Manager and Chief of Police – Notification to the City of Winslow shall provide an update on monitoring activity and forecasted water level.
- * Navajo Nation Emergency Management – NCEM shall provide an update.

Water Elevation is forecasted to meet or exceed 19 ft. - The NCFCD/NCEM staff shall notify:

- * Navajo County Manager and Public Works Director – The notification shall serve to:
 - Continue the levee monitoring activity.
 - Mobile equipment and material to the levee area.
 - Initiate sand bagging operation and moving stockpiles to designated locations.
 - Restrict public traffic on the levee.
- * Army Corps Emergency Operations Chief – Provide an update and initiate appropriate actions.
- * Navajo County Sheriff's Office – Provide an update and initiate appropriate actions.
- * Winslow City Manager and Chief of Police – Provide an update and initiate appropriate actions.
- * Navajo Nation Emergency Management – Navajo Nation shall provide an update.
- * Public Media – Winslow Area – NCEM shall provide a statement to the Public Media.

Water Elevation is forecasted to meet or exceed 23 ft. – The NCFCD/NCEM staff shall schedule a Coordination Meeting and notify:

- * Navajo County Board of Supervisors – Notification shall initiate consideration of Emergency Declaration
- * Arizona Division of Emergency Management (ADEM) – Notification shall be given to ADEM after Navajo County's Emergency Declaration.

- * Navajo County Manager and Public Works Director – The notification shall serve to:
 - Continue the levee monitoring activity and initiate constant monitoring of trouble spots or strategic locations such as 1) the K3 and I4 gates, 2) the piping & utility crossings, 3) the meandering loop where the river directly flows into the levee bank, and 4) the Spur Dike jetty. The channel observers will provide timely reports on current conditions to NCFC/NCEM which shall be immediately relayed to the other emergency agencies.
 - Additional mobilization of equipment to the levee area.
 - Notify the public of access to sand bags, etc.
- * Army Corps Emergency Operations Chief – Provide an update and initiate appropriate actions.
- * Navajo County Sheriff's Office – Provide an update and initiate appropriate actions.
- * Winslow City Manager and Chief of Police – Provide an update and initiate appropriate actions.
- * Public Media – Winslow Area – NCEM shall provide a statement to the Public Media.
- * Navajo Nation Emergency Management – Navajo Nation shall provide an update.

Water Elevation is forecasted to meet or exceed 25 ft. – The NCFCD/NCEM staff shall notify:

- * Navajo County Manager and Public Works Director – The notification shall serve to:
 - Initiate road closures according to the evacuation plan
 - Continue the levee monitoring.
 - Schedule around the clock equipment operators at the Winslow Levee area.
 - Continue sand bagging operation.
 - Contact the American Red Cross for shelter needs.
- * Army Corps Emergency Operations Chief – Provide an update and initiate appropriate actions.
- * Navajo County Sheriff's Office
 - Coordinate with Navajo County EOC the evacuation process for areas behind the levee.
 - Coordinating traffic control for evacuation and equipment mobilization to the levee.
- * Winslow City Manager and Chief of Police
 - Coordinate with Navajo County EOC the evacuation process for areas behind the levee.
 - Coordinating traffic control for evacuation and equipment mobilization to the levee.
- * Public Media – Winslow Area – NCEM shall provide a statement to the Public Media.
- * Navajo Nation Emergency Management – Navajo Nation shall provide an update.

II. Monitoring.

NCFCFCD will monitor the National Weather Service River Forecast for the flow gage at Little Colorado River in Winslow. If the forecasted runoff at the Little Colorado River Winslow gage equals or exceeds 17 ft., the NCFCFCD staff will notify the Navajo County Public Works to coordinate continuous, 24 hour monitoring of the Winslow Levee. The levee monitoring shall be performed by at least one individual driving the entire levee length and making site inspections as necessary. The monitoring shall be continued until the flow of the Little Colorado River is 10k cfs or less and there are no signs of distress to the levee. The levee monitoring route will consist of the following:

- South Levee Section
 - Drive-by inspection of levee section from – Highway 87 to Railroad Bridge
 - Drive-by inspection of levee section from Highway 87 to I-40
 - Walk-up Inspection of the levee from the Levee junction with the Ruby Wash Diversion Levee to the railroad bridge

- North Levee Section –
 - Drive-by Inspection of entire north levee section
 - Inspect and record reading of depth gage at Interstate 40
 - Walk-up Inspection of K-3 Gates
 - Drive-by inspection of Kinder Morgan Line underground crossing
 - Walk-up Inspection of I-4 Gates
 - Drive-by inspection of Homolovi Water Line underground crossing
 - Walk-up inspection of jetty
 - Drive-by inspection of Piezometer
 - Drive-by inspection of Winslow Wastewater Line
 - Drive-by inspection of Private Electrical Conduit underground crossing
 - Walk-up inspection of meandering loop recording of stick gauge at meandering loop
 - Drive-by inspection of 24” CMP w/ head gate

The monitoring activities will be recorded using the form on Appendix 1 – Levee Monitoring Record and the map in Figure 2 – Levee Operation & Maintenance/Monitoring Map.

III. Mobilization.

NCEM shall invoke a Coordination Meeting when the forecasted river elevation will meet or exceed 23 ft. NCEM will provide teleconferencing facilities and the following will be invited to the meeting:

- Army Corps' Emergency Operations Chief
- Winslow City Manager and Chief of Police
- Navajo County Manager, Public Works Director, and County Engineer
- Navajo Nation Emergency Management
- National Weather Service
- Arizona Division of Emergency Management
- American Red Cross and the Salvation Army

The objective of the meeting will be to evaluate the forecasts, and any other pertinent information that may be available to determine the severity of the emergency and the appropriate level of response.

The coordination of activities shall include:

1. Equipment and Operator Mobilization

The following equipment shall be mobilized to the Winslow Levee Area at the water level forecasts shown below:

- 19 Ft Water Level Forecast
 - 2 Loaders
 - 1 Dump Truck
 - Light Towers as needed
- 23 Ft Water Level Forecast
 - Total of 2 Loaders
 - Total of 2 Dump Trucks
- 25 Ft Water Level Forecast
 - Total of 3 Loaders
 - Total of 1 Dozer
 - 3 Equipment Operators – On Site
 - Total of 4 Dump Trucks
 - 2 Dump Truck Operators – On Site

2. Sand bags and Sand

At a minimum sand bagging operations shall be prepared at the following sites for the water elevations shown below

- 17 ft. – Navajo County Public Works Yards
- 19 ft. – Winslow Levee Area
- 23 ft. – Interstate 40 underpass Area
- 25 ft. – Winslow Fire Dept.

Sand bags shall be retained at the Navajo County Public Works Facility in Winslow. The NCFCD shall maintain a sand bag inventory of 10,000 bags.

3. Traffic Control

The following traffic control operation shall be initiated by the Navajo County Sheriff and the Winslow Police Dept.

19 ft. – Restrict traffic to the Levee

25 ft. – Initiate road closures per evacuation plan

4. Evacuation Operation

The City of Winslow and NCEM shall prepare evacuation plans when the water level is forecasted to meet or exceed 25 feet.

IV. Flood Fight.

The Navajo County Public Works (including NCFCD) shall manage the flood fight for both remedial repairs and levee breaches. Navajo County Public Works will coordinate with City of Winslow and Army Corps for supplemental material and equipment.

a. Stockpiles.

The NCFCD shall be responsible for stockpiling the following material for emergency use:

Sand Bags – 10,000 bags shall be maintained at the PW facility in Winslow
Rip Rap

South Levee Section between Hwy 87 and I-40 – 1,000 Cubic Yards

North Levee Section River Station 120+00 – 2,000 Cubic Yards

North Levee Section River Station 280+00 – 4,000 Cubic Yards

North Levee Section River Station 310+00 – 3,000 Cubic Yards

b. Termination of Emergency.

The flood fighting emergency at the Winslow Levee may be terminated when the real time flow and the forecasted flow of the Little Colorado River have dropped below 17 feet and there are no signs of distress to the levee. The NCFCD/NCEM shall be responsible for terminating the emergency at the Winslow Levee. The Corps' Emergency Operation Center and City of Winslow shall be contacted when the emergency at the Winslow Levee is officially terminated. Authorization for residents to return to their homes in the event of any evacuations shall come from the NCFCD/NCEM.

c. Rehabilitation.

After the storm event is over, the NCFCD/NCEM shall inspect the Winslow Levee and repair flood control structures that were damaged by the flood event subject to the availability of funds. The National Guard may be able to help with rehabilitation.

V. Emergency Contact List

1. US Army Corps of Engineers, Los Angeles District

District Engineer – Colonel Kirk Gibbs	Office: (213) 452-3961 Cell: (213) 509-1448
Chief Emergency Management – Anne Hutton	Office: (213) 452-3444 Cell: (213) 309-4822
Levee Rehab & Inspection – Anne Hutton	Office: (213) 452-3444 Cell: (213) 309-4822
Emergency Operation Center	Office: (213) 452-3440
Engineering Division, Chief – Rick Leifield	Office: (213) 452-3629 Cell: (213) 280-8569
Civil Engineer – Rob Crist (Luke Air Force Base)	Office: (623) 282-9851 Cell: (602) 421-4260
AZ Area Engineer – Richard Fontanilla (Phoenix Office)	Office: (602) 230-6851 Cell: (602) 509-9447
AZ Area Resident Engineer – Troy Olson (Phoenix Office)	Office: (602) 230-6870 Cell: (602) 363-4098

2. Navajo County

District II Supervisor – Jesse Thompson	Office: (928) 524-4053 Cell: (928) 309-9065
Manager – James “Jimmy” Jayne	Office: (928) 524-4031 Cell: (928) 205-8811
Sheriff – Kelly “KC” Clark	Office: (928) 524-4050 Cell: (928) 587-9702
Emergency Manager – Mary Springer	Office: (928) 524-4046 Cell: (928) 243-2584
Emergency Management Assistant – Catrina Roe	Office: (928) 524-4163 Cell: (928) 386-2316
Public Works Director – Eric Oscarson	Office: (928) 524-4100 Cell: (928) 358-6054

Floodplain Administrator William R. Bess, P.E., CFM	Office: (928) 254-4106 Cell: (928) 205-3503
County Engineer – William R. Bess, P.E., CFM	Office: (928) 524-4106 Cell: (928) 205-3503
Highway Maintenance Manager – Ricky Denton	Office: (928) 532-6084 Cell: (928) 358-6329
Holbrook Roads Supervisor – Bill Wilbanks	Office: (928) 524-4385 Cell: (928) 205-3485
Holbrook Public Works	Office: (928) 524-4100

3. City of Winslow

Police Dispatch	Emergency: 911 Office: (928) 289-2431
Chief of Police - Steven Garnett	Office: (928) 289-1446 Cell: (928) 587-0817
City Manager - Stephen Pauken	Office: (928) 289-1414 Personal Cell: (928) 587-0489
Winslow City Manager's secretary - Susi Kaufman	Office: (928) 289-2423
Suzy Wetzel – Winslow City Clerk	Office: (928) 289-1416

4. Navajo Nation Emergency Management

Emergency Management Office Director Rosalita M. Whitehair	Office: (928) 871-6892 (928) 871-6894
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5. National Weather Service

National Weather Service – Flagstaff Forecast Center	Office: (928) 774-4414 Secondary: (928) 774-4164
Warning Coordination Meteorologist	Office: (928) 556-9161 x222

6. Arizona Division of Emergency Management

Emergency Response Deputy Officer	Office: (602) 469-3401
Chuck McHugh – Assistant Director of OPS	Office: (602) 464-6242 Cell: (602) 618-7610

7. Arizona National Guard

Director of Military Support – LTC Scott Hier	Office: (602) 267-2774
Joint Operations Center – MSG David M. Stidham	Office: (602) 267-2466 Desk: (602) 267-2859

8. Arizona Department of Transportation

Highway Maintenance Dept. – Audra Merrick	Office: (928) 779-7596 Cell: (928) 266-6281
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9. BNSF Railroad

Superintendent of Operations – Carlos Perez	Office: (928) 289-7273 Cell: (928) 637-3834
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10. Homolovi State Park

Visitors Center	Office: (928) 289-4106
Park Manager – Chad Meunier	Cell: (928) 587-2216
Park Ranger II – Ken Evans	Cell: (928) 814-5824

11. Kinder Morgan

Pipeline Emergencies	(800) 334-8047
Operations Supervisor – Edward Rasbold	Office: (928) 527-6526 Cell: (435) 820-1756

12. Contractors to Assist in Potential Flood Fight

McCauley Construction
206 W. First Street – office
Winslow, AZ 86047-3502
(928) 289-4557
John McCauley (928) 587-0000 (24/7)
Brady McCauley (928) 587 2824
Email: Dynarock@cableone.net winslowreadymix@cableone.net

Dyna Sand and Rock – Winslow Ready Mix
(928) 289-9349
Owners:
John McCauley (928) 587-0000 (24/7)
Email: McCauleyinc@cableone.net

O'Haco Construction Company
P.O. Box 727
Winslow, AZ 86047
Jim O'Haco (928) 587-4526 Fax (928) 289-3150
Email: jjohaco@yahoo.com

Eagle Mountain Construction Company
3885 E. Industrial Drive
Flagstaff, AZ 86004-2587
(928) 526-2587 x202 - Keith Johanson (928) 220-0755 (24/7)
Fax: (928) 289-0040

Pine River Construction Inc.
21620 N. 19th Avenue
Phoenix, AZ 85027-2716
(623) 780-3152 - Radek Fiedler (602) 617-7690 (24/7)

MRM Construction Services Inc.
406 S. 20th Place
Phoenix, AZ 85034-6717
(602) 340-0378 - Marie Torres (602) 432-6155 (24/7)

Cholla Ready Mix – Joseph City
Dale McKennon Owner (928)-241-2660

RCDS Contractors, Inc.
7200 W. Bell Road, Suite K102
Glendale, AZ. 85308
Rick Cordova (480) 841-7224
Email: rcordova@rcdscontractors.com

Winslow Levee Location Map

● Fire Department
■ Flying J
◆ Police Department

→ Stream Direction of Flow
▭ Levees
▭ Sections

▭ Townships
▭ 1% chance flood zone
▭ 1% chance floodway

▲ N
 0 0.25 0.5 0.75 1 miles


 NAVAJO COUNTY
 PUBLIC WORKS BIS

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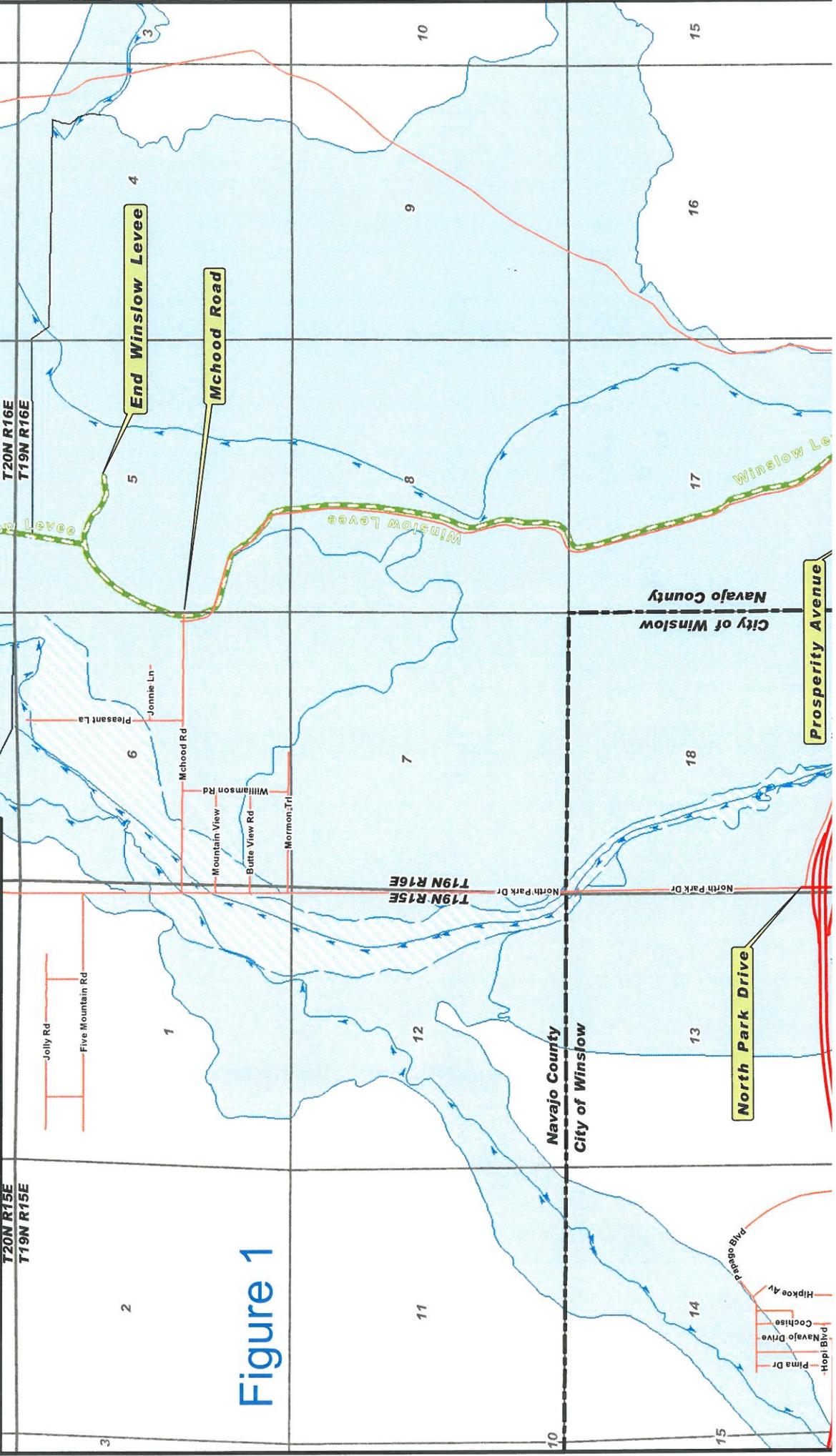


Figure 1

WINSLOW LEVEE MAINTENANCE & OPERATIONS MAP

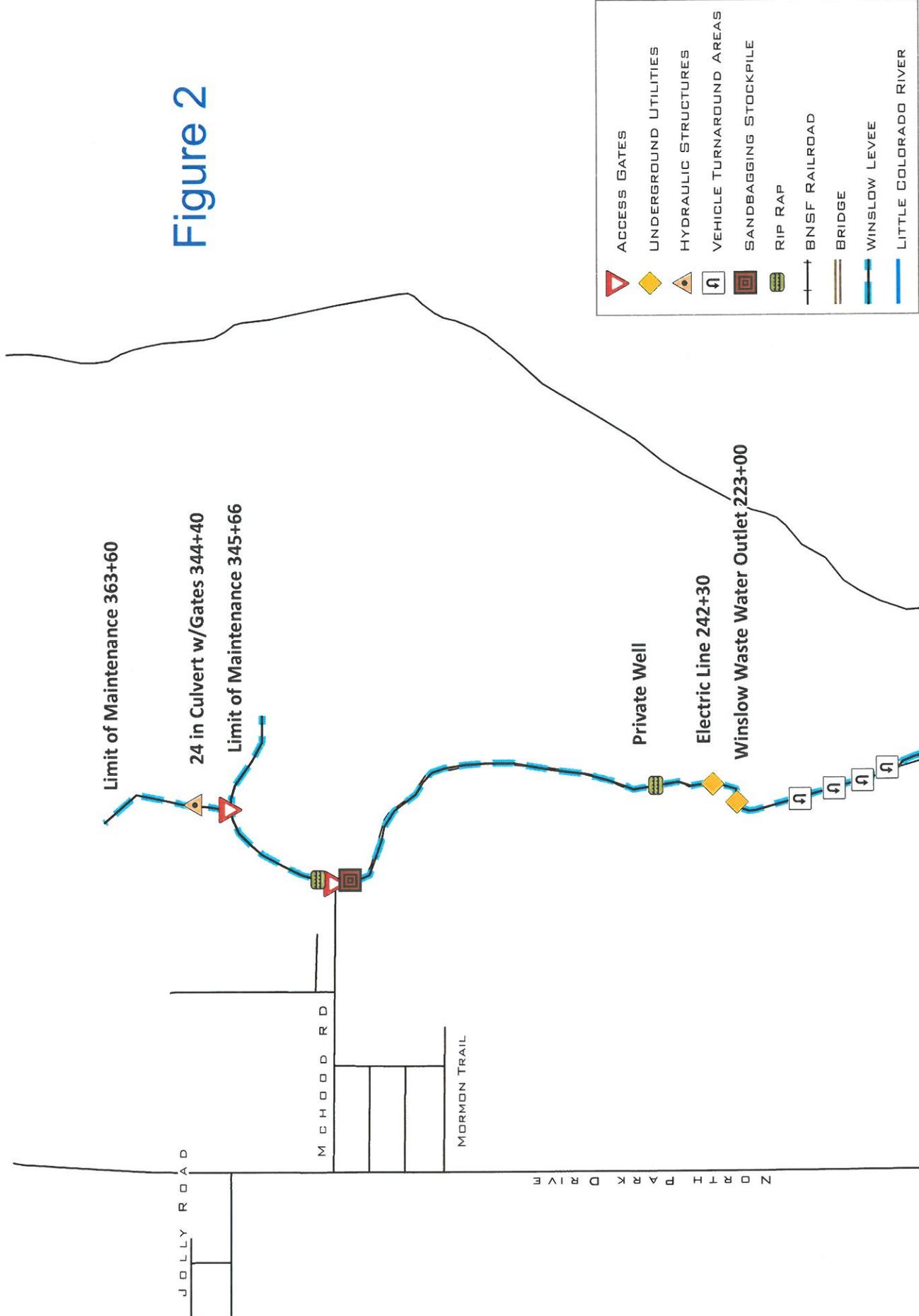
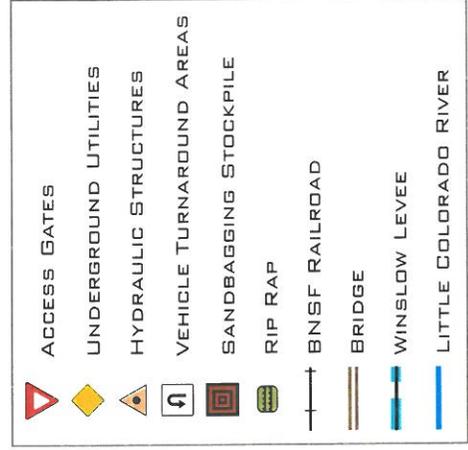


Figure 2



Appendix 1

Levee Monitoring Record

Date: _____ Time: _____ Inspector _____

Inspector needs to look for and record any cracks, depressions, erosion, unstable slopes or breach on the levee. Also make note of anything else that might be a potential problem for the integrity of this flood control structure.

Refer to map in Figure 2 of this plan for locations of these points.

South Levee Section

- Drive-by inspection of levee section from – Highway 87 to Railroad Bridge

Comments _____

- Drive-by inspection of levee section from Highway 87 to Interstate 40

Comments _____

- Walk-up Inspection of the levee from the Levee junction with the Ruby Wash Diversion Levee to the railroad bridge.

Comments _____

North Levee Section

- Recording of depth gauge at Interstate 40 (Station 22+00)

Gauge Reading - Water Elevation: _____ Time: _____

- Walk-up Inspection of K-3 Gate (Station 59+68)

Comments _____

- Drive-by Inspection of Kinder Morgan Line underground (Station 81+11)

Comments _____

- Walk-up Inspection of I-4 Gate (Station 92+13)

Comments _____

- Drive-by Inspection of Homolovi Water Line underground (Station 158+00)

Comments _____

- Walk-up inspection of Jetty

Comments _____

- Drive-by Inspection of Piezometer (Station 200+00)

Comments _____

- Drive-by Inspection of Winslow Wastewater Line underground (Station 223+00)

Comments _____

- Drive-by Inspection of Private Electrical Conduit crossing (Station 242+30)

Comments _____

- Walk-up inspection of meandering loop

Comments _____

- Recording of stick gauge at meandering loop

Gauge Reading - Feet to Overtop: _____ Time: _____

- Drive-by Inspection of 24" CMP w/ Head Gate (Station 344+40)

Comments _____

Appendix 2

MAINTENANCE MANUAL
FOR
LITTLE COLORADO RIVER
FLOOD CONTROL PROJECT
WINSLOW ARIZONA
(WINSLOW LEVEE)

NAVAJO COUNTY FLOOD CONTROL DISTRICT
P.O. BOX 668
HOLBROOK, ARIZONA 86025

November 2015
Issue 3

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NAVAJO COUNTY FLOOD CONTROL DISTRICT
FLOOD CONTROL PROJECT, WINSLOW, ARIZONA
(WINSLOW LEVEE)

MAINTENANCE MANUAL

1.0 GENERAL INFORMATION

1.1 Purpose

This manual applies to the works of improvement along the Little Colorado River near Winslow, Arizona, hereinafter referred to as the Winslow Levee. The purpose of this document is to provide a reasonable and responsible plan of maintenance that preserves the physical integrity of the levee. Properly operated and maintained, the levee will contain flood waters and limit flooding along the left bank of the river. It should be recognized, however, that the Winslow Levee will not protect against all possible floods and that maintenance of the levee under the guidelines in this document does not insure or imply any specific level of flood protection.

1.2 Location

The Winslow Levee is located along the west bank of the Little Colorado River in portions of sections 5, 8, 17, 20, 29 and 33, Township 19 North, Range 16 East, Gila and Salt River base and meridian. A location map is available in Figure 1.

1.3 Ownership

The Winslow Levee is owned, operated and maintained by the Navajo County Flood Control District.

1.4 Limits of Maintenance

The Flood Control District is responsible for maintaining approximately 7.2 miles of levee. The exact limits of maintenance are shown in figure 2.

(The stationing used throughout this report is taken from: Plans for the Construction of the Winslow Flood Control Project, Winslow Arizona, on the Little Colorado River, PRC Engineering, 1984, 1989(As-Built), 1990 (As-Built). A copy of this document is on file with the Navajo County Flood Control District.)

1.5 Other Uses

B. The primary purpose of the Winslow Levee is flood control. The use of the levee for other purposes is prohibited.

2.0 HISTORY OF LEVEE CONSTRUCTION

2.1 History

It is not known exactly when levee construction first began on the Little Colorado River at Winslow. One early account of construction activities comes from the July 30, 1954 Winslow Mail which reported that: Ames Acres, Bushman Acres, and Winslow residents worked side by side Saturday night and Sunday building dikes of old cars, dirt and cement in an effort to change the river's course.

Documents in the Navajo County Public Works Department files indicate that Navajo County first became involved in constructing levees and jetties along the Little Colorado River sometime in the early 1960's. The County was increasingly involved with levee construction, levee repair and flood fight activities from the late 1960's through the 1970's, as damaging floods in the Little Colorado River were reported in 1968, 1969, 1970, 1971, 1972, 1978 and 1979. From 1971 to 1979 the County spent approximately \$600,000 building and repairing levees along the river. During this same period of time, the U.S. Army Corps of Engineers spent nearly \$400,000 dollars for flood fight costs and levee rehabilitation.

The Levee construction completed during the 1960's and 1970's does not appear to have followed any master plan or design. An indication of this can be found in a 1976 report by the U.S. Army Corps of Engineers which states that ... About half a mile north of Winslow, Navajo County is constructing an earth levee of varying cross sectional dimensions. Its aim is to control flood waters from the Little Colorado River. The levee is not yet complete, and it follows neither a set schedule nor a standard design. For these reasons the levee is not entirely effective....

The first efforts to build an engineered levee came following a flood in December of 1978. This flood, which had an estimated peak discharge of 57,600 cfs, caused extensive damage in the Ames Acres and Bushman Acres subdivisions. As a result, in January of 1979, Navajo County requested assistance from the Arizona Water Commission (now the Department of Water Resources) in finding a solution to the problem of flooding along the Little Colorado River.

In 1980, the Department of Water Resources completed reconnaissance and feasibility reports for the Little Colorado River Flood Control Project at Winslow, Arizona. These reports recommended that the existing levee system be improved to provide 100-year flood protection by raising the existing embankment, flattening levee slopes, installing a cutoff trench, and providing slope protection at specific locations.

In 1981, Navajo County retained PRC Engineering to prepare construction plans and specifications for the proposed levee improvements. These plans were

completed in 1984. During this period of time, PRC Engineering also completed a channelization study which concluded that channelization of the Little Colorado River would not be a cost effective method of controlling flooding. However, some dredging was done by Navajo County during the summer of 1984 and additional channelization was done by Crawford Roberson, under contract to the County, between December 1984 and July 1985.

In 1986, Navajo County obtained a loan from the Arizona Department of Water Resources to finance the designed levee improvements. Construction was begun shortly thereafter. T&T Construction, Inc. was hired in October 1986 as the prime contractor for the first phase of improvements, which included reshaping, raising and installing a cutoff trench in the existing levee, as well as adding new sections of levee and other improvements.

In September of 1988 the Wisner Corporation was awarded a contract for the placement of rock rip-rap on the levee. This work, which substantially completed the proposed improvements, was finished in May of 1989. "As-Built" plans for the levee were sealed in 1989 and 1990.

On January 8 of 1993 a large flood in the Little Colorado River basin resulted in an overtopping failure at the Winslow Levee flooding properties in Ames Acres, Bushman Acres, and other areas behind the levee. On December 31, 2003 the levee suffered a piping failure. Emergency action contained the damage and resulted in limited flooding.

2.2 Levee Construction and Modification Time Line 1979-2015

1979: Navajo County requests the assistance of the Arizona Water Commission in finding solutions to the problem of flooding in the Little Colorado River at Winslow.

1980: Arizona Department of Water Resources completes reconnaissance and feasibility reports for the Little Colorado River Flood Control Project, Winslow, Arizona.

1981: PRC Engineering retained by the Navajo County Flood Control District to prepare construction plans and specifications for a flood control levee along the Little Colorado River at Winslow.

1982: PRC Engineering completes a channelization study which concludes that channelization of the Little Colorado River is not a cost effective method of controlling flooding.

1984: PRC Engineering completes final construction plans for the Winslow Levee. The proposed design is a refinement of PLAN-1A recommended in the 1980 feasibility study.

1984-1986: Right-of-way acquisition.

1986: Navajo County obtains a loan from the Arizona Department of Water Resources to finance the construction of the levee.

1986: Construction begins on the levee. Prime contractor is T&T Construction, Inc.

1989: Levee construction is substantially complete. As-Built plans are sealed in 1989 and 1990.

1992: City of Winslow water line extended through the levee to serve Homolovi State Park State Park.

1993: Flood waters overtop the levee causing it to fail and flood properties in the Ames Acres and Bushman Acres subdivisions. Temporary repairs to the levee are completed immediately following the flooding.

1994: Cella Barr Associates completes plans for the permanent repair of the levee between stations 202+00 and 232+00.

1995: Permanent repairs to the levee are completed.

1997: Kimley-Horn and Associates, Inc. completes plans for two-phase improvements involving minor reshaping and addition of rip-rap between stations 163+28 and 202+00.

1998: City of Winslow waste water line extended through the levee at station 223+00.

1999: Improvements are completed for Phase 1, stations 176+93 to 202+00, of the 1997 Kimley-Horn improvement plans.

2005: Piping breach at station 197+80. Emergency temporary repairs to the levee are completed immediately following breach.

2006: Ironside Engineering & Development Inc. completed plans for permanent repair of the levee at station 197+80.

2006: Levee restoration at station 197+80 is complete.

3.0 LEVEE CONDITION

3.1 Designed Conditions

Details of the construction of the levee and of later modifications to the levee are available in the documents listed below. These documents, which are on file with the Navajo County Flood Control District, are provided here as a reference to the designed condition of the levee. It should not be expected that the actual condition of the levee will be exactly as shown on these plans, and it is not the goal of the maintenance program to insure that the levee remains in the exact conditions and dimensions described in these documents.

Plans for the Construction of the Winslow Flood Control Project, Winslow Arizona, on the Little Colorado River. PRC Engineering, 1984. AS-Built copies sealed 10/3/89 and 1/6/90.

Homolovi State Park Water Main Connection to City of Winslow. Arizona State Parks, March 18, 1992.

Winslow Levee Repair Station 202+00 to Station 232+000. Federal Emergency Management Agency D.S.R. No 91325. Cella Barr Associates, September 9, 1994.

Winslow Levee Rip-Rap Project, Phase I Station 176+93.35 To Station 202+00.00, Phase II Station 163+28.45 To Station 176+93.35. Kimley-Horn and Associates, Inc., October 29, 1997.

City of Winslow, Arizona Wastewater Treatment Plant Improvements, Winslow Levee Crossing Station 223+00. Stantech Consulting, December 1997.

On November 2005 the Navajo County Flood Control District submitted a Technical Data Notebook to the FEMA requesting a de-certification of the levee. The work to provide FEMA with all supporting information is on-going. Delph Engineering November 14, 2005.

Engineering summary for Winslow Levee 2005 levee piping breach repairs at Station 197+80. Ironside Engineering and Development, Inc. March 2006.

3.2 Interior Drainage

The Winslow Levee has three hydraulic structures that allow the waters that collect on the landside of the levee (interior drainage) to drain through the levee and into the river. These include concrete box culverts with multiple slide gates at levee stations 59+68 and 92+13 and a culvert with slide gate at station 344+40. The location of these structures is shown in Figure 2. Manufacturer's details for the slide gates are provided in Appendix B.

The slide gates do not operate automatically and need to be manually opened when flood waters collect behind them. Their function is therefore not to prevent interior drainage waters from ponding behind the levee, but instead to provide a way to drain these waters when they do collect. Guidelines for operating the slide gates are given separately in the Winslow Levee Operations Manual.

3.3 Utilities

The following utilities are located along the levee.

- A. Natural Gas: A 4½ inch O.D. high pressure natural gas line crosses the levee at station 6+45, 52+00, and 81+11.10. This line is owned, operated and maintained by the Kinder Morgan. **Pipeline Emergencies - (800) 334-8047**
- B. Water Supply: A 6 inch water line crosses the levee at station 158+00. A gate-valve box and an air release/vacuum valve box are located where the water line enters the landside of the levee. A six inch PVC water line runs south from the gate valve box and stays within the levee easement for approximately 1000 feet before connecting to the city water main at Prosperity Avenue. A six inch ductile iron pipe runs in the direction of South, 75 degrees and 15 minutes East towards Homolovi State Park from the point where the water line crosses the levee. The water line, which serves the park, is owned and maintained by the City of Winslow.
- C. Wastewater: A wastewater effluent pipe crosses through the levee at station 223+00. Discharge is through a 12 inch diameter ductile iron pipe with the outlet located on the riverside of the levee approximately 100 feet off the toe of the levee. The outlet of this pipe is covered by a 12 inch flap valve and reinforced by a concrete headwall. This pipeline is owned, operated and maintained by the City of Winslow.
- D. Irrigation: A power pole for a portable pump is located at approximately station 254+00. The power pole is used by Jim O'Haco to withdraw water from the Little Colorado River. The pole is owned, operated, and maintained by Mr. O'Haco. Pump is removed and stored when not in use.
- E. Electric Power:
 - a. A 12 Kilovolt electric line crosses the levee approximately 3 feet below the surface at station 242+30. This line is abandoned and not energized per APS.
 - b. Wooden Power Lines: Start at STA 223+00 to approximately 242+00 and run on the west side parallel to the levee. Lines are energized to northernmost pole. Meter box and electric riser have been abandoned and are not energized. (See Section 3.3 E a.)

- c. High Tension Poles: Overhead lines cross the levee at STA 9+00. Line runs to Joseph City Power Plant
- F. Buried Telephone Cable: This is shown on the Winslow Levee as-built drawings. Note 2 on Page 6 of the Winslow Levee as-built drawings instructs contractors to cut and remove section of utility line as needed. Cable is located at approximately station 6+10. This cable is an abandoned cable.
- G. Fiber Optic Line: Fiber optic line crosses through the levee. Precise location is unknown likely between STA 6+00 & STA 7+00.
- H. Overhead Light Poles: Arena lights at STA 132+00 to STA 134+00 on west side of levee.

3.4 Access

- A. General: The Winslow Levee is not considered to be a dangerous environment if common sense precautions are exercised. Public access to the levee is therefore not normally restricted except during emergencies, repairs and certain maintenance activities. However, the roads and access ramps along the levee are not public roads and are only maintained to the standards required to allow access for maintenance and emergency vehicles.
- B. Roads: For the portion of the levee located north of Interstate 40, the top of the levee serves as an access road for maintenance, repair and emergency response vehicles. Access to this road from the south is off of the frontage road located on the north side of the Interstate 40, Exit 255 interchange. Access from the north is off the east end of McHood Road. These roads are shown in figure 2.
- C. Ramps and Turnarounds: Access ramps are located at the I-4 hydraulic gates, at Prosperity Avenue and at the private well located at station 92+13. Emergency vehicle turnaround areas are located as shown in figure 2.
- D. Gates: Seven access gates have been installed across the top of the levee. These gates are located as shown in figure 2. Normally, the gates should remain open. However, the gates were installed as part of easement agreements with individual property owners along the levee, and they may be closed and locked if public access to the levee creates problems for these property owners.
- E. Fences: Boundary fences are located on the landside of the levee along the levee easement lines. Fences are also located where the access gates cross the levee. Maintenance and repair of the boundary fences is the responsibility of the individual property owners. Maintenance and repair of the access gate fences is the responsibility of the Flood Control District.

F. Right-of-Way: Permanent easements have been obtained for the entire maintained length of the levee. The location of these easements is shown on Exhibit A, sheets 1-3 of the Plans for the Construction of the Winslow Flood Control Project, Winslow Arizona, on the Little Colorado River. PRC Engineering, 1984.

3.5 Other Features

A. Bank Protection: Rock rip-rap has been placed along sections of the levee that were considered to be susceptible to erosion.

B. Signs: There are no signs that are essential to the function of the levee and therefore no sign plan has been developed for the levee. However, the Flood Control District may want to place signs for various reasons either permanently or temporarily. If signs are placed they should be maintained.

4.0 INSPECTION GUIDELINES

4.1 Responsibility

A regular program of inspection and record keeping is needed to ensure that the levee receives proper maintenance and repair. The Navajo County Flood Control District is responsible for inspecting the levee and completing maintenance and repair activities.

4.2 Schedule

Inspections will be made at intervals not to exceed 3 months, and following significant storms, earthquakes, high flows and other occurrences which might adversely impact the levee.

4.3 Reporting

A written report of the results of each inspection is required. This should include a record of the items inspected, their condition and any maintenance work or repairs that are recommended. An example of an inspection report form is provided in Appendix C.

If problems or unusual conditions are observed for any of the utilities on the levee, the inspector(s) should immediately contact the appropriate utility. A utility contact list is available in Appendix A. This list should be checked and updated at least every 6 months.

Inspectors should also immediately report any other conditions observed that could jeopardize the integrity of the levee or could be an immediate hazard to life or property.

4.4 Duties

The following items should be inspected during each inspection unless otherwise noted.

A. Levee Embankment: Inspect for erosion, unstable slopes, settlement, rodent damage, adverse vegetation, breach, seepage, piping, cracks and fissures, vandalism and illegal dumping.

B. Hydraulic Gates: Inspect concrete for cracking, spalling or other signs of damage. Inspect culverts for damage. At least annually, operate gates and inspect for condition, function and blockage.

C. Utilities: Inspect for obvious damage, unusual circumstances, condition of soil cover, and leakage along the water and wastewater pipes.

- D. Access Roads and Ramps: Inspect for capability to provide all weather access for maintenance and emergency response vehicles.
- E. Fences and Gates: Inspect for function, condition and signs of damage.
- F. Bank Protection: Inspect rip-rap for areas that have been eroded or damaged.
- G. Vegetation: Inspect for deep-rooted vegetation on or near the levee.
- H. Rodents: Inspect for burrows, mounds or other rodent damage.
- I. Signs: Inspect for missing or damaged signs.
- J. Channel: Inspect for areas where the channel is eroding into or undermining the levee.
- K. Vectors: Organisms that carry pathogens (other than burrowing animals) generally do not affect the function or structural integrity of the levee. Therefore, the eradication of these organisms is not part of the levee maintenance program.

4.5 Levee Settlement

Monitoring and controlling levee settlement is beyond the scope of regular maintenance activities and will not be performed as part of the maintenance program outlined in this manual.

4.6 River Channel Sediment

Monitoring and controlling sediment within the Little Colorado River Channel is beyond the scope of regular maintenance activities and will not be performed as part of the maintenance program outlined in this manual.

4.7 River Channel Vegetation

Monitoring and controlling vegetation within the Little Colorado River channel that is more than 15 feet beyond the toe of the levee is beyond the scope of regular maintenance activities and will not be performed as part of the maintenance program outlined in this manual.

5.0 MAINTENANCE GUIDELINES

5.1 Levee Embankment

Repair any settlement, sloughing or erosion that causes a significant change in the levee grade or cross section. If the change in line or grade is greater than one foot, a qualified engineer should be consulted to determine the cause and method of repairs.

5.2 Hydraulic Gates

Repair any damage to the metal gates or culverts. (See Appendix B for manufacturer's information related to the gates.) At least annually, operate the gates to insure that they function properly. Remove any blockage or sediment. Check to insure that the gates are in the closed position and properly seated. Repair cracking or other damage to the concrete using concrete, grout or epoxy. Larger cracks should be monitored to determine if they are actively expanding. A qualified engineer should be consulted to determine the cause and method of repair for active cracking or large areas of concrete damage.

5.3 Utilities

Immediately contact the appropriate utility if buried lines or pipes are exposed or if any leakage, damage or other unusual circumstances are observed. Any activity that involves digging or earth moving on the levee requires the approval of the Flood Control District. Any activity that disturbs the clay core of the levee requires engineered plans. Other activities within the levee on the levee may require engineered plans at the discretion of the Flood Control District. All applicable Local, State and Federal permits are required before beginning any repairs or modifications within the levee right-of-way.

5.4 Access Roads and Ramps

Add materials as needed to control erosion, rutting, facilitate drainage and otherwise provide all-weather access for maintenance and emergency vehicles. Maintain fences, locks and signs as needed.

5.5 Fences and Gates

Repair damaged fences and gates. Boundary fences and gates are the responsibility of the property owners and are not part of the maintenance program.

5.6 Bank Protection

The rock rip-rap on the levee will generally not require any maintenance. Areas that have been damaged by high flows, earthquake, and vandalism or otherwise

should be repaired or replaced. A qualified engineer should be consulted for major repairs.

5.7 Vegetation

Deep-rooted vegetation can create pathways for flow that can result in piping and possible levee failure. A regular program of eradicating deep-rooted vegetation on or within 15 feet of the toe of the levee is required. Vegetation treatment should be at least annually and more frequently if required. Deep-rooted vegetation includes but is not limited to Salt Cedar, Willow, Cottonwood and Camel thorn. Application of chemicals should be done by qualified personnel following the manufacturer's recommendations for proper use and safety precautions.

5.8 Rodent Control

Burrowing animals can create pathways for flow that can result in piping and possible levee failure. A regular program of rodent inspection and eradication is required. Inspection and treatment should be at least bi-annually and more often if required. Burrows should be repaired by opening and compactly filling them. Application of chemicals should be done by qualified personnel following the manufacturer's recommendations for proper use and safety precautions.

5.9 Signs

Missing or damaged signs should be replaced or repaired as needed.

5.10 Channel

Channelization and control of channel meanders is not part of the maintenance program for the levee. However, areas where the channel is impinging on and eroding into or undermining the levee need to be controlled and repaired. A qualified engineer should be consulted for major repairs.