



**US Army Corps
of Engineers** ®
Los Angeles District



**LOS ANGELES RIVER/
RIO HONDO DIVERSION 2
LEVEE SYSTEM
LOS ANGELES COUNTY, CALIFORNIA
NLD SYSTEM ID # 3805010047**

**PERIODIC INSPECTION REPORT NO. 2
GENERALIZED EXECUTIVE SUMMARY**

**FINAL SYSTEM RATING: UNACCEPTABLE
FINAL RATING DATE: MARCH 19, 2018**

PERIODIC INSPECTION REPORT PREPARED BY TETRA TECH FOR THE
U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT

SUBMITTED: NOVEMBER 2017
INSPECTED: APRIL 18-21, 2017

EXECUTIVE SUMMARY

This Executive Summary provides an introduction to the Periodic Inspection, an overview of the Los Angeles River/Rio Hondo Diversion 2 (LAR/RH2) Levee System, a summary of the major findings of the Periodic Inspection of the LAR/RH2 Levee System, and the overall rating for the LAR/RH2 Levee System.

1.1 Scope and Purpose of Periodic Inspections

The purpose of the LAR/RH2 Levee System Periodic Inspection is to identify deficiencies that pose hazards to human life or property. The inspection is intended to identify the issues in order to facilitate future studies and associated repairs as appropriate.

This assessment of the general condition of the LAR/RH2 Levee System is based on available data and visual inspections. Detailed investigation and analysis involving hydrologic design, topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of this levee system inspection.

This report is for Periodic Inspection Number 2 (PI No. 2) of the LAR/RH2 Levee System, and supersedes PI No. 1 of the LAR/RH2 Levee System, which was conducted by URS Group, Inc. (URS) on behalf of the U.S. Army Corps of Engineers, South Pacific Division, Los Angeles District (USACE SPL) in 2012.

1.2 System Summary

The LAR/RH2 Levee System is located in the County of Los Angeles, California and is part of the Los Angeles County Drainage Area (LACDA). It is composed of three levee segments (Figure 1) along the east/left bank of the Los Angeles River and the west/right bank of Rio Hondo:

- Los Angeles River LAR/RH2b Levee Segment
- Los Angeles River LAR/RH2a Levee Segment
- Rio Hondo LAR/RH2 Levee Segment

The LAR/RH2 Levee System has two different upstream limits since there are multiple segments within the system. The upstream limits of the LAR/RH2 Levee System are at the upstream end of the Los Angeles River LAR/RH2b Levee Segment, near South Downey Road in the city of Vernon, and at the upstream end of the Rio Hondo LAR/RH2 Levee Segment, at Whittier Narrows Dam in the city of Montebello. The downstream limit of the LAR/RH2 Levee System is at the downstream end of the Rio Hondo LAR/RH2 Levee Segment and the Los Angeles River LAR/RH2a Levee Segment, near Interstate 710 (I-710) and Imperial Highway in the city of South Gate. The total length of the LAR/RH2 Levee System is approximately 75,218 feet (14.25 miles). There are different types of infrastructure that lie within the leveed area, which include: residential, commercial, industrial, educational, transportation, and civic improvements. The bulk of this area is located to the east and north of the Los Angeles River levee segments, west and north of the Rio Hondo LAR/RH2 Levee Segment, and south of the Union Pacific railroad and Interstate 5.

The Los Angeles River LAR/RH2b Levee Segment is located on the left/east bank of the Los Angeles River from the downstream edge of the railroad crossing at the Downey Road Bridge in the city of Vernon, to approximately 300 feet downstream of Southern Avenue in the city of South Gate, a distance of 28,131 feet (5.33 miles). The Los Angeles River LAR/RH2b Levee segment is in the cities of Vernon, Commerce, Bell, Bell Gardens and South Gate.

The Los Angeles River LAR/RH2a Levee segment is located on the left/east bank of the Los Angeles River from the downstream end of the Los Angeles River LAR/CC2a Levee Segment, which is approximately 300 feet downstream of Southern Avenue, to the confluence of the Los Angeles River with Rio Hondo, a distance of 4,118 feet (0.78 miles). This segment is located in the city of South Gate.

The Rio Hondo LAR/RH2 Levee Segment is located on the right/west bank of the Rio Hondo from approximately Whittier Narrows Dam in the city of Montebello, to the confluence of Rio Hondo with the Los Angeles River in the city of South Gate, a distance of 42,969 feet (8.14 miles). This segment lies within the cities of South Gate, Bell Gardens, Downey, Commerce, Montebello, and Pico Rivera.

This levee system consists of an earthen levee embankment and a trapezoidal channel with either reinforced concrete or grouted stone on the riverward slope and reinforced concrete on the invert. Other features along the LAR/RH2 Levee System include the Rio Hondo Spreading Grounds Headworks Structure, parapet walls, retaining walls, 78 conduits associated with the side-drainage structures, two pump stations, 27 bridge crossings, and numerous utility crossings.

The design and construction of the Los Angeles River LAR/RH2a and Los Angeles River LAR/RH2b Levee Segments, along with other similar works in the LACDA, were authorized initially by the Emergency Relief Act of 1935 to provide drainage and flood control. On June 30, 1937 these segments were transferred to the more comprehensive project adopted in the Flood Control Act of June 22, 1936. Portions of the Los Angeles River channel were improved under the provisions of the Flood Control Act of 1941. The LACDA California Flood Control Improvements project, which includes the Los Angeles River LAR/RH2a and Los Angeles LAR/RH2b Levee Segments was authorized under Title I, Section 101(b) of the Water Resources Development Act of 1990 (Public Law 101-640) (USACE SPL 1999b).

The Flood Control Act of May 15, 1950 modified the general plan to authorize construction of channel improvements on the Rio Hondo Diversion (Rio Hondo) from Whittier Narrows Dam to the Los Angeles River, which includes the Rio Hondo LAR/RH2 Levee Segment. The LACDA, California Flood Control Improvements project, which includes the Rio Hondo LAR/RH2 Levee Segment, was authorized under Title I, Section 101(b) of the Water Resources Development Act of 1990 (Public Law 101-640) (USACE SPL 1999).

The National Levee Database Number (NLD No.) for the LAR/RH2 Levee System is 3805010047. The original USACE SPL construction of the LAR/RH2 Levee System was completed on January 24, 1958 and subsequent improvements were completed circa 2000. The Los Angeles County Department of Public Works (LACDPW) operates and maintains the Los Angeles River LAR/RH2a and Rio Hondo LAR/RH2 Levee Segments. The USACE SPL operates and maintains the Los Angeles River LAR/RH2b Levee Segment.

1.3 Summary of Major Deficiencies Found

The PI No. 2 of the LAR/RH2 Levee System was conducted from April 18, 2017 to April 21, 2017. USACE SPL staff were present during the inspection of the Los Angeles River LAR/RH2b Levee Segment. LACDPW staff were present during the inspection of the Los Angeles River LAR/RH2a Levee Segment and Rio Hondo LAR/RH2 Levee Segment. During the inspection of the levee system, deficiencies were noted for which remedial actions are required. The following major deficiencies of the project features were noted during the PI No. 2.

1.3.1 Los Angeles River LAR/RH2b Levee Segment

- Levee Embankment:
 - Non-Compliant Vegetation Growth: Significant vegetation growth, including shrubs and trees with trunks larger than 2 inches in diameter, were present on the crown, riverward slope, landward slope, and within 15 feet of the landward toe. In addition, there were intermittent tree stumps on the landward slope.
 - Encroachments: There were encroachments including grouted weep holes at the toe of the riverward slope, utility poles installed at intermittent locations along the top of the riverward slope and removal of the surrounding grouted stone slope lining, pressurized pipes penetrating the levee embankment, and 12-inch-diameter holes that appeared to have been cored through the grouted stone at the toe of the riverward slope.
 - Erosion/Bank Caving: Significant erosion was located on the landward slope measuring up to 21 inches in depth. The erosion threatened access to the levee crown at some locations.
 - Depressions/Rutting: There were intermittent depressions near the top of the landward slope and through the asphalt-concrete pavement on the levee crown measuring up to 18 inches deep.
 - Animal Control: Animal burrows on the landward slope and through a depression in the asphalt-concrete pavement were located on the levee crown measuring up to 42 inches deep.
 - Revetments other than Riprap: Cracking, undermining, and voids, with some vegetation growth, were located in on the grouted stone. The voids exposed underlying material in several locations and measured up to 31 inches deep and 24 inches wide.
 - Underseepage Relief Wells/Toe Drainage Systems: Intermittent subdrains along the toe of the riverward slope were obstructed by sediment. In addition, four subdrain vaults on the channel invert were missing manhole covers and vegetation was observed inside of these vaults. Per the USACE SPL Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRRR) Manual (USACE SPL 1999b), a test program is required every three years for the subdrain system; however, no maintenance records have been provided by the USACE SPL.
 - Seepage: Water was observed seeping into the channel through the joint between the reinforced concrete and the grouted stone at the toe of the riverward slope along a 50-foot-long reach.
- Floodwalls:
 - Non-Compliant Vegetation Growth: Tree stumps larger than 2 inches in diameter were present at the landward toe of the floodwall.
 - Tilting, Sliding or Settlement of Concrete Structures: Horizontal and vertical offset measuring up to 3.5 inches was observed at various joints in the floodwall.

- Interior Drainage Systems:
 - Vegetation and Obstructions: The outlet or inlet of three of the side-drainage structures were obstructed more than 10 percent by vegetation, sediment, homeless encampments, and/or debris.
 - Encroachments: Several side-drainage structures were abandoned. The USACE SPL has not issued a permit for the abandonment of these side-drainage structures.
 - Fencing and Gates: Fence along the riverward edge of the levee crown above the 12-foot by 8-foot Reinforced-Concrete Box (RCB) side-drainage structure was damaged.
 - Monolith Joints: The outlet of five of the side-drainage structures had a gap measuring up to 2 inches wide, with a depth greater than the thickness of the grouted stone, at the interface of the grouted stone slope protection and reinforced-concrete outlet structure. Vegetation was observed growing in some of the joints around the side-drainage structures.
 - Culverts/Discharge Pipes: None of the side-drainage structures could be visually inspected, because either the flap gate at the outlet blocked access and/or the conduit was too small. In addition, no video inspection records were provided by the USACE SPL.
 - Flap Gates/Flap Valves/Pinch Valves: One pipe did not have a flap gate and no documentation was available to show if a flap gate was required. In addition, two flap gates were completely obstructed by a homeless encampment and could not be observed or exercised.
- Flood Damage Reduction Channels:
 - Concrete Surfaces: Significant spalling was observed at intermittent locations on the concrete channel invert. In addition, there was spalling and broken overlay at intermittent locations on the channel invert, near the toe of the riverward slope, measuring up to 8 feet wide and 6 inches deep.
 - Tilting, Sliding or Settlement of Concrete Structures: Uplift of a reinforced-concrete panel on the channel invert was observed with a vertical offset of up to 8 inches between two adjacent panels. The upstream side of the joint was uplifted.
 - Foundation of Concrete Structures: A sinkhole in the reinforced-concrete invert measured approximately 2 feet deep, 20 feet wide, and 50 feet long. The invert was also undermined by discharges from the adjacent side-drainage structures. This was also noted in USACE SPL Trip Report (USACE SPL 2017).
 - Flap Gates/Flap Valves/Pinch Valves: There was no flap gate at the outlet of one 10-foot by 10-foot RCB and one 12-foot by 4-foot RCB. These side-drainage structures were located along the channel reach and it is unknown whether a flap gate is required since the RCBs are not on the as-built drawings.

1.3.2 Los Angeles River LAR/RH2a Levee Segment

- Levee Embankment:
 - Non-Compliant Vegetation Growth: Significant vegetation growth, including shrubs and trees with trunk diameters greater than 2 inches were present on the levee crown, landward slope, and within 15 feet of the toe of the landward slope. In addition, tree stumps were observed intermittently on the landward slope.

- Depressions/Rutting: There were depressions and rutting on the landward slope and through the asphalt-concrete pavement on the levee crown measuring up to 15 inches deep.
- Animal Control: Animal burrows were scattered on the landward slope measuring up to 4.5 feet deep and up to 14 inches in diameter.

1.3.3 Rio Hondo LAR/RH2 Levee Segment

○ Levee Embankment:

- Non-Compliant Vegetation Growth: Significant vegetation growth, including trees, shrubs and stumps with trunks larger than 2 inches in diameter, were present on the landward slope, levee crown, riverward slope, and within 15 feet of the toe of the landward slope.
- Encroachments: Multiple pressurized pipes that were not shown on the as-built drawings or permitted by the USACE SPL were observed at two locations on the levee crown adjacent to the Union Pacific Railroad (UPRR) bridge crossing and the Telegraph Road Bridge crossing.
- Erosion/Bank Caving: Erosion gullies caused by local surface runoff were observed on the landward slope. The erosion gullies measured up to 3.5 feet deep, up to 3.5 feet wide, and extended from the top to the toe of the landward slope. In addition, erosion potentially caused by a broken recycled water pipe was observed at the toe of the landward slope measuring up to 3 feet deep, 4 feet wide, and 10 feet long at two locations within 20 feet of each other. Finally, erosion was observed near the toe of the landward slope caused by flow into the spreading basin. The erosion measured 4 feet deep and 12 feet wide, along approximately 40 feet of the landward toe.
- Depressions/Rutting: There were depressions and rutting on the landward slope and through the asphalt-concrete pavement on the levee crown measuring up to 2 feet deep.
- Animal Control: Animal burrows were located on the landward slope measuring up to 8 feet deep and 14 inches in diameter at 4 locations along the levee segment.
- Revetments other than Riprap: The grouted stone was damaged at three locations on the riverward slope and landward slope, including missing pieces, undermining, and voids. The damaged areas measured up to 20 feet in length and up to 4 feet in depth.
- Seepage: Active seepage of clear water was observed at the toe of the landward slope at an estimated flow rate of 2 gallons per minute (gpm). The seepage was potentially caused by an adjacent broken utility pipe as the as-built drawings (USACE SPL 1999) show irrigation pipes in this area; however, no utility pipe was observed. The seepage had caused an erosion gully at the toe of the landward slope measuring 2.5 feet deep, 3.5 feet wide, and approximately 25 feet long.

○ Floodwalls:

- Non-Compliant Vegetation Growth: Shrubs measuring approximately 3 inches in diameter and 4 feet tall were observed at intermittent locations with no levee backslope along the levee segment. These areas were typically on the landside of the floodwall between the crown and the right-of-way within 15 feet of the floodwall.

- Interior Drainage Systems:
 - Vegetation and Obstructions: Inlet of one 30-inch-diameter CMP side-drainage structure was obstructed more than 10 percent by vegetation and debris.
 - Encroachments: The outlet of one 18-inch-diameter CMP side-drainage structure was not found in the field and possibly abandoned. The USACE SPL has not issued a permit for the abandonment of the side-drainage structure.
 - Culverts/Discharge Pipes: Video inspection records were missing for one pipe, and records indicated sealing and/or joint repairs were required for four pipes along this segment.
 - Flap Gates/Flap Valves/Pinch Valves: Thirteen side-drainage structures did not have a flap gate, and no documentation was available for these locations to show if a flap gate was or was not required. The flap gates were removed at the outlet of the double 12-inch-diameter RCP side-drainage structure associated with the Los Angeles County Sanitation District (LACSD) Transfer Station Pump Station.
- Flood Damage Reduction Channels:

Concrete Surfaces: Cracking and spalling with exposed rebar were observed at some locations on the riverward slope and low-flow channel. Some damages extended from the toe of the riverward slope to the low-flow channel and measured up to 2 feet wide, and up to 5 inches deep.

1.4 Overall Rating

The Levee Safety Officer Out-Brief Meeting was held on August 23, 2017. An engineering determination concluded that the observed deficiencies could prevent the LAR/RH2 Levee System from performing as intended during the next significant runoff event. Therefore, the Levee Safety Officer (LSO), USACE SPL, has determined the overall rating of the LAR/RH2 Levee System to be “Unacceptable.”

An “Unacceptable” system rating is defined as, “One or more items are rated as Unacceptable and would prevent the segment/system from performing as intended, or a serious deficiency noted in past inspections (which had previously resulted in a minimally acceptable system rating) has not been corrected within the established timeframe, not to exceed two years.”

The USACE SPL Asset Management Division will be notified of the overall rating of the levee system by letter with instructions to correct Critically Unacceptable rated items immediately, Unacceptable rated items as soon as possible, and to correct the Minimally Acceptable rated items within two years so that they do not deteriorate further and become Unacceptable. A public notice will be prepared and coordinated between the USACE SPL and LACDPW. Once the Critically Unacceptable deficiencies are corrected by the USACE SPL, the overall system rating will be revised to “Minimally Acceptable.”

It should be noted that the Los Angeles River LAR/RH2a Levee Segment and the Rio Hondo LAR/RH2 Levee Segment warranted a Minimally Acceptable rating, but the system was rated “Unacceptable” because of the USACE SPL maintained Los Angeles River LAR/RH2b Levee Segment. If the Los Angeles River LAR/RH2b Levee Segment is repaired, then the overall Levee System Rating will be revised to “Minimally Acceptable.”

1.5 Overall System Rating Comparison

Both PI No. 1 and PI No. 2 yielded an Overall System Rating of “Unacceptable” for this levee system. Although the LACDPW levee segments showed improvement in some areas, the USACE SPL levee segment (LAR/RH2b) did not show improvement between PI No. 1 and PI No. 2. Although USACE SPL received supplemental maintenance funds for LACDA this year, improvements have not yet been scheduled for this particular reach of the Los Angeles River. The “Unacceptable” rating associated with the PI No. 2 was driven by the following:

- The voids in the grouted stone on the riverward slope.
- The lack of maintenance records for the subdrainage system.
- The gaps in the joints around the side-drainage structures. USACE SPL will be awarding a channel maintenance contract this fiscal year (FY) that will include sealing all the joints around side-drainage structures. Work is expected to begin in FY19.
- The uplift of the reinforced-concrete panel on the channel invert.
- The sinkhole in the reinforced-concrete invert. USACE SPL is currently putting together preliminary plans to repair the sinkhole. The repair contract is expected to be awarded this FY.

Some of these issues were not noted during PI No. 1 and so a determination if the issue has progressed cannot be made. For the issues that were observed during both PI No. 1 and PI No. 2, the issues do not appear to have progressed.

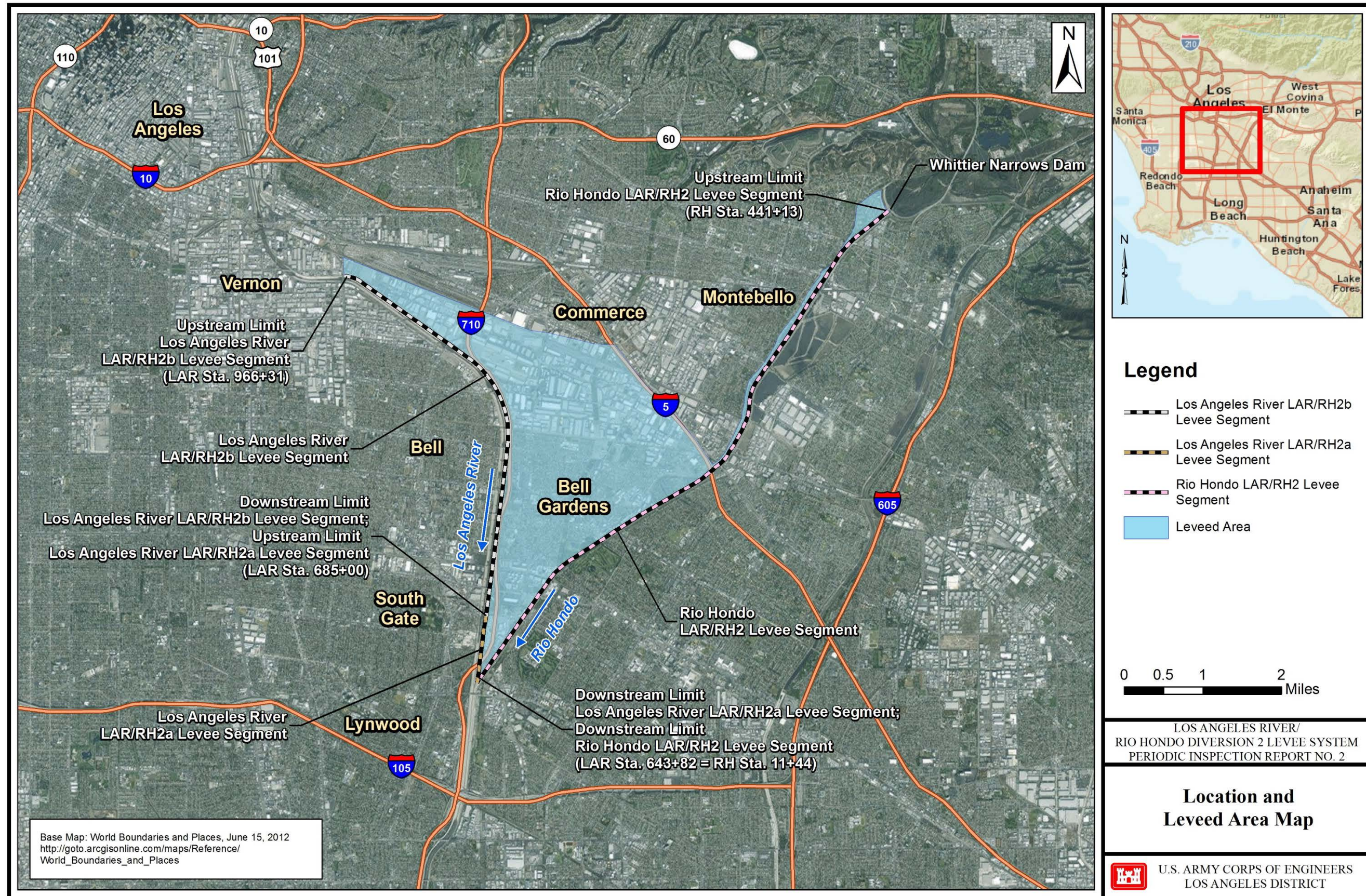


Figure 1