

# Categorizing Levees Using GIS

Alameda County Flood Control & Water Conservation District

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1. Introduction
2. Necessity
3. Process
4. Product



# Alameda County Flood Control & Water Conservation District in California





## Federal Emergency Management Agency (FEMA)

National Flood Insurance Program (NFIP)

**District** is responsible for Alameda County flood control infrastructure.

### Category I Levee Project:

Assess all riverine levees to ultimately certify and have FEMA accredit those that are necessary for NFIP.

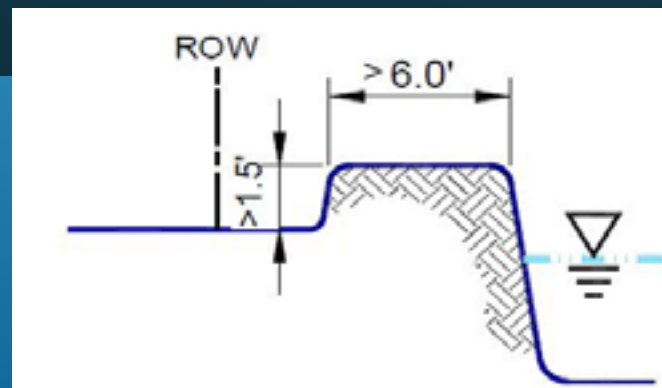


## How do you assess levees?

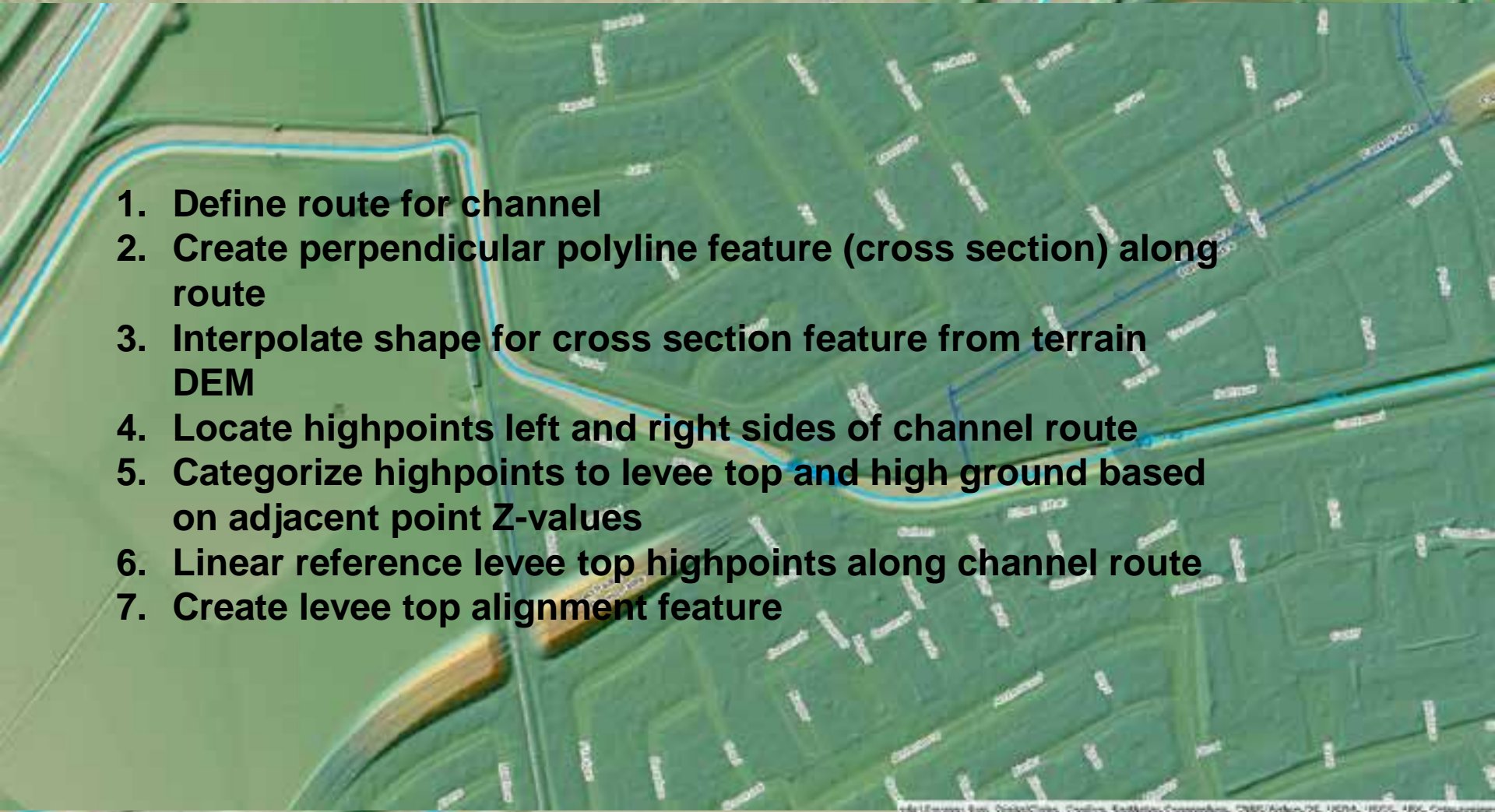
1. Define Levees
2. Find Levees
3. Categorize Levees
4. Document

**levee** - a man-made barrier constructed of soil along a water course for the primary purpose of providing flood protection (*State of California Department of Water Resources*).

**levee** - same as above, also provides protection for the 1% Annual Chance Exceedance event (100-year) against flooding significant enough to be mapped as a Special Flood Hazard Area by FEMA (*Category I Levee Project*)





- 
1. Define route for channel
  2. Create perpendicular polyline feature (cross section) along route
  3. Interpolate shape for cross section feature from terrain DEM
  4. Locate highpoints left and right sides of channel route
  5. Categorize highpoints to levee top and high ground based on adjacent point Z-values
  6. Linear reference levee top highpoints along channel route
  7. Create levee top alignment feature





How do you categorize Levees?

Whether or not they exist, and whether or not they are necessary.

How do you know whether they are necessary?

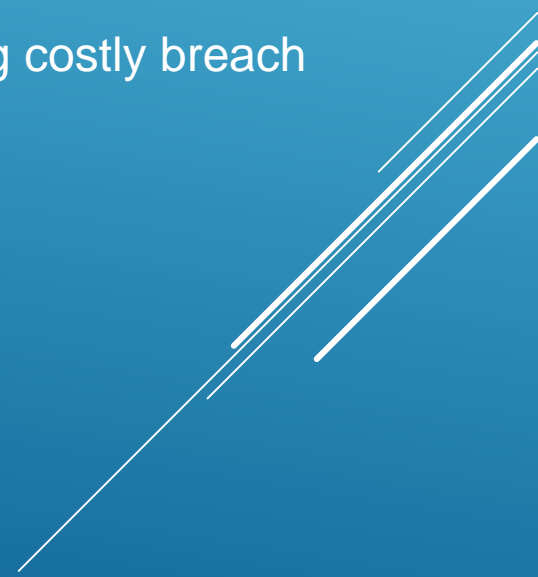
Determine if they hold back flooding.

How do you know if they hold back flooding?

Hydraulic simulations, like breach analyses.

How can you know whether they are necessary without doing costly breach analyses?

Just define their breach/flooding potential.







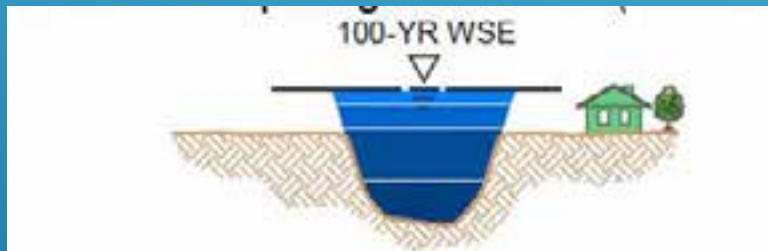
Existing Levee:  
levee required



Existing Levee:  
levee not required



No Existing Levee:  
levee required



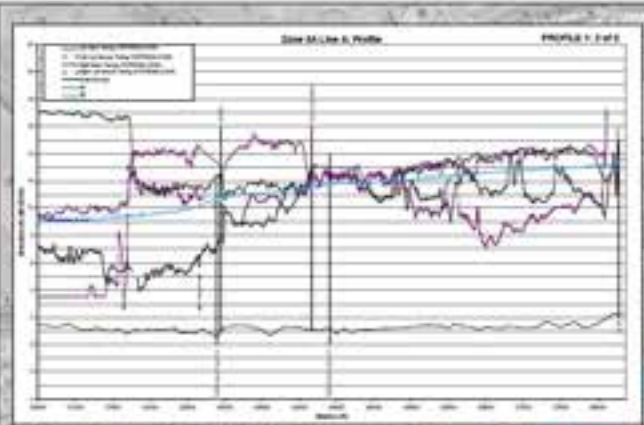
No Levee:  
levee not required





1. Create floodplain projection surface from hydraulic simulation results
2. Perform raster difference between floodplain and ground surfaces
3. Categorize raster feature with different depths
4. Reference levee alignment feature and categorize to:
  - Existing levee required for flood protection
  - Existing levee not required for flood protection
  - Channel required new levee for flood protection
  - Channel not required levee for flood protection

# PRODUCT | CATAGORIZATION MAPS



Embankment/ Floodwall Protection Area  
**Zone 3A Line A**  
 Category I Levee Evaluation  
 Alameda County, California  
 May 2012

**Legend**

- Embankment for Flooding Protection (1.28 ft)
- Embankment for Flooding Protection (0.81 ft)
- Channel for Flooding Protection (0.88 ft)
- Channel for Flooding Protection (0.88 ft)
- East Channel
- Line Ground Alignment
- Limit of Analysis
- Line of Boundary
- Design WSE = Line Ground
- 0-1.0 ft
- +1.0 ft

ADPAA (Blue) Site WSE. (See contained within channel)

MATCH LINE (SEE SHEET 1)

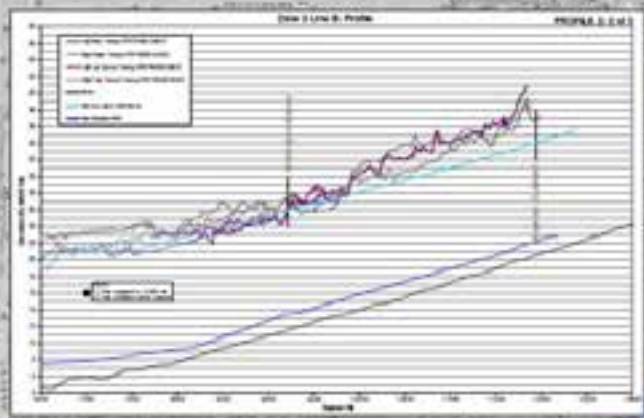


FIGURE 8-1





# PRODUCT | CATAGORIZATION MAPS



Embankment/ Floodwall Protection Area  
**Zone 2 Line B**  
 Category 1 Levee Evaluation  
 Alameda County  
 May 2012

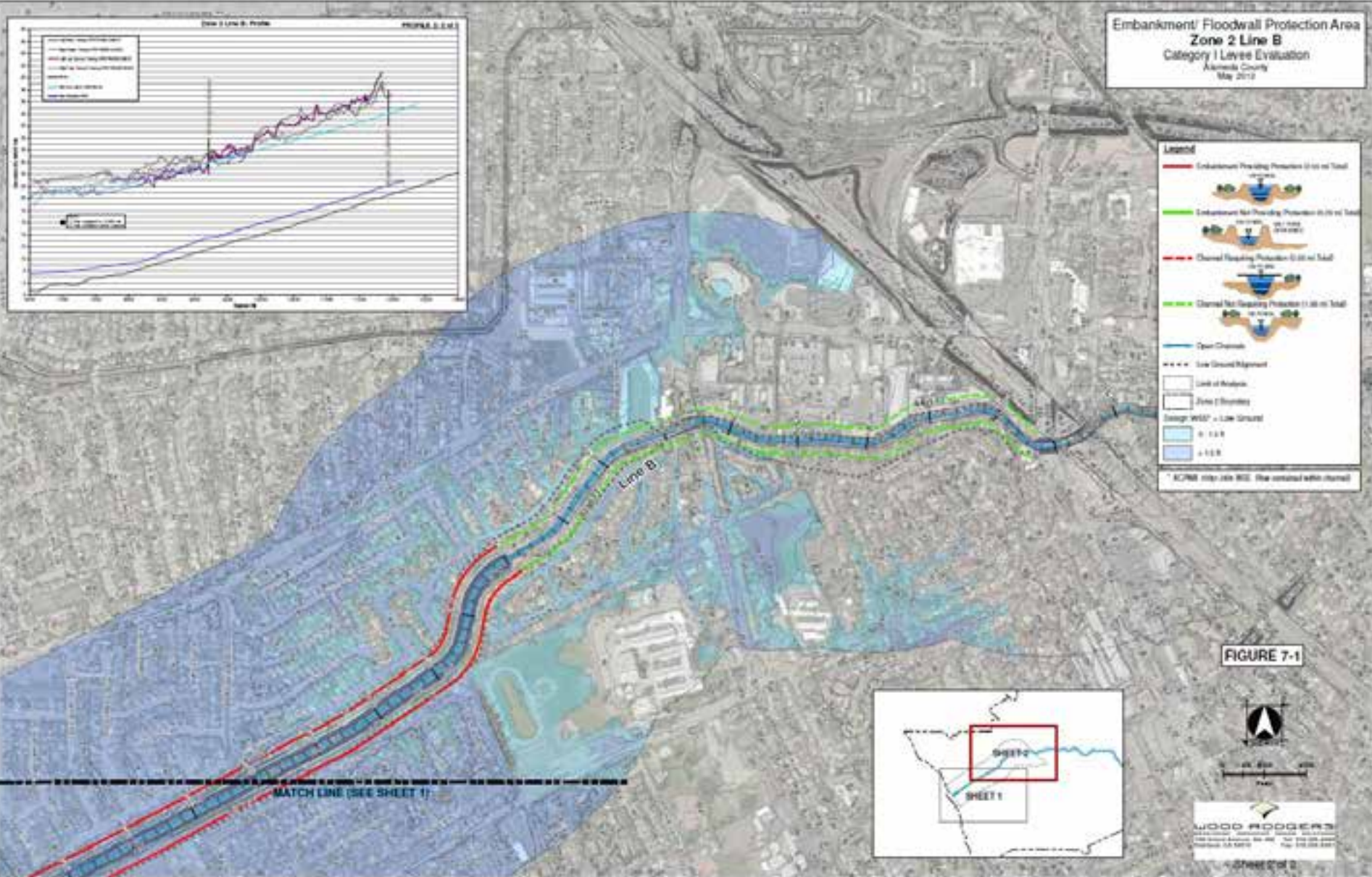
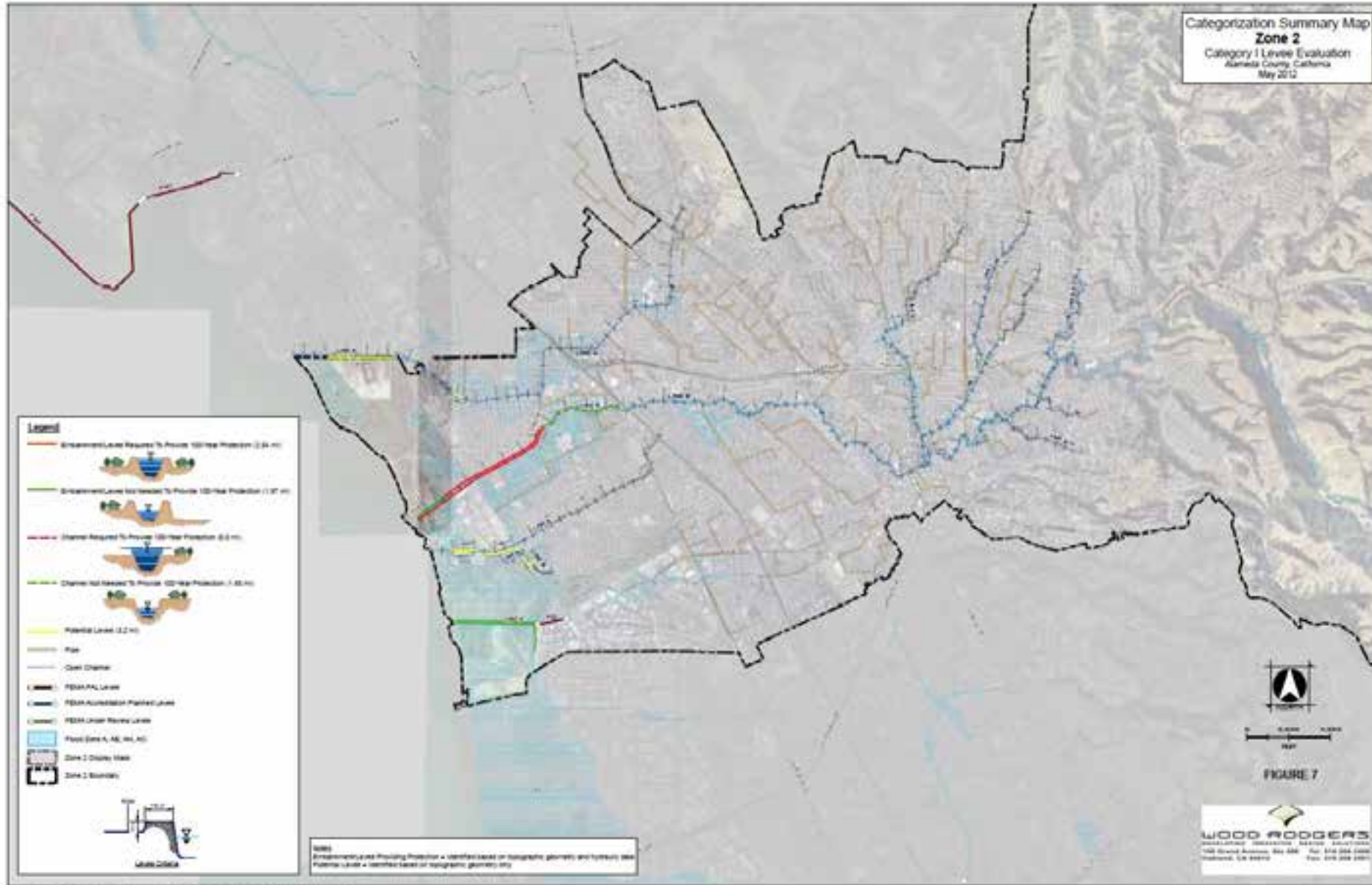
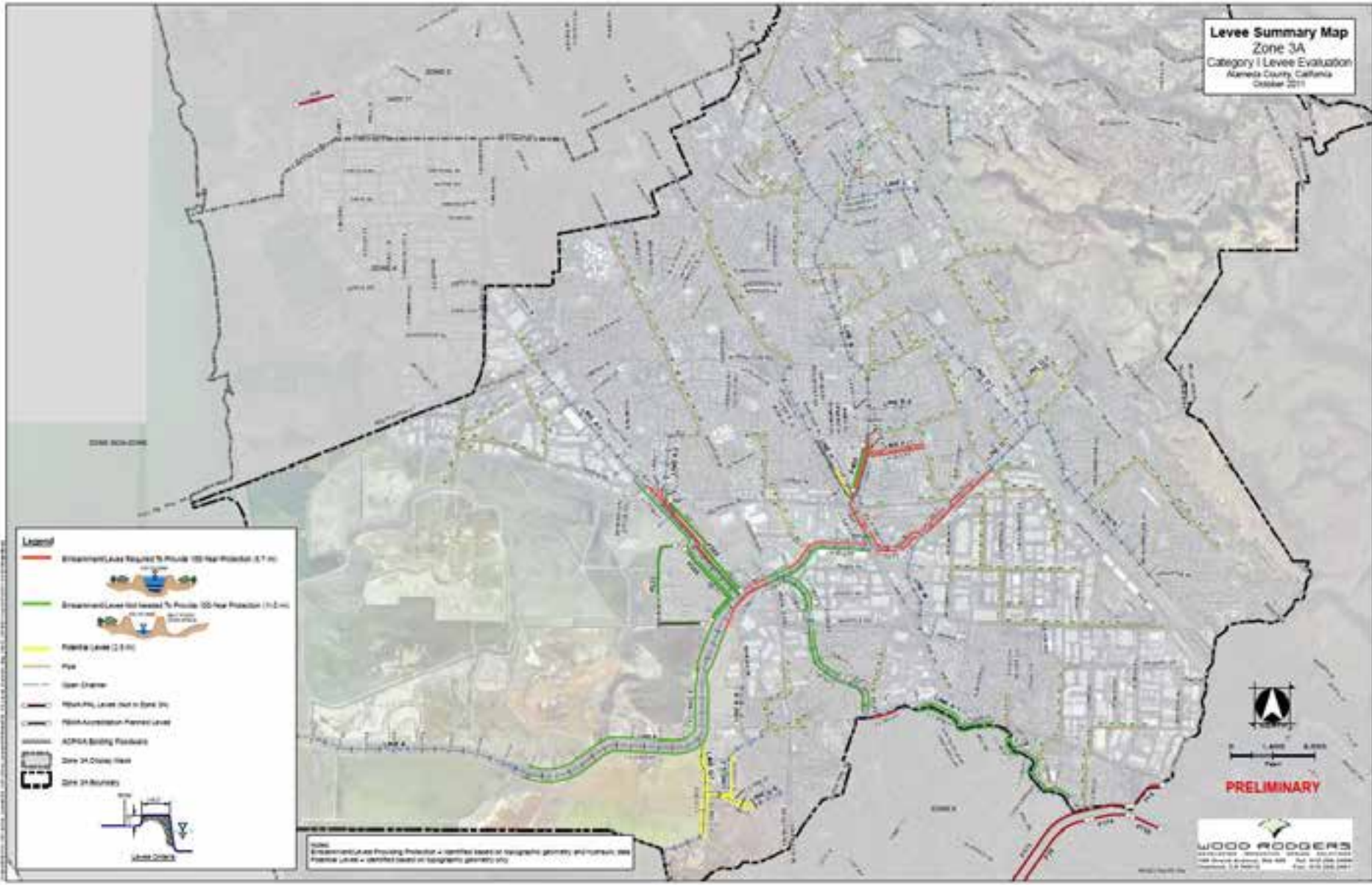


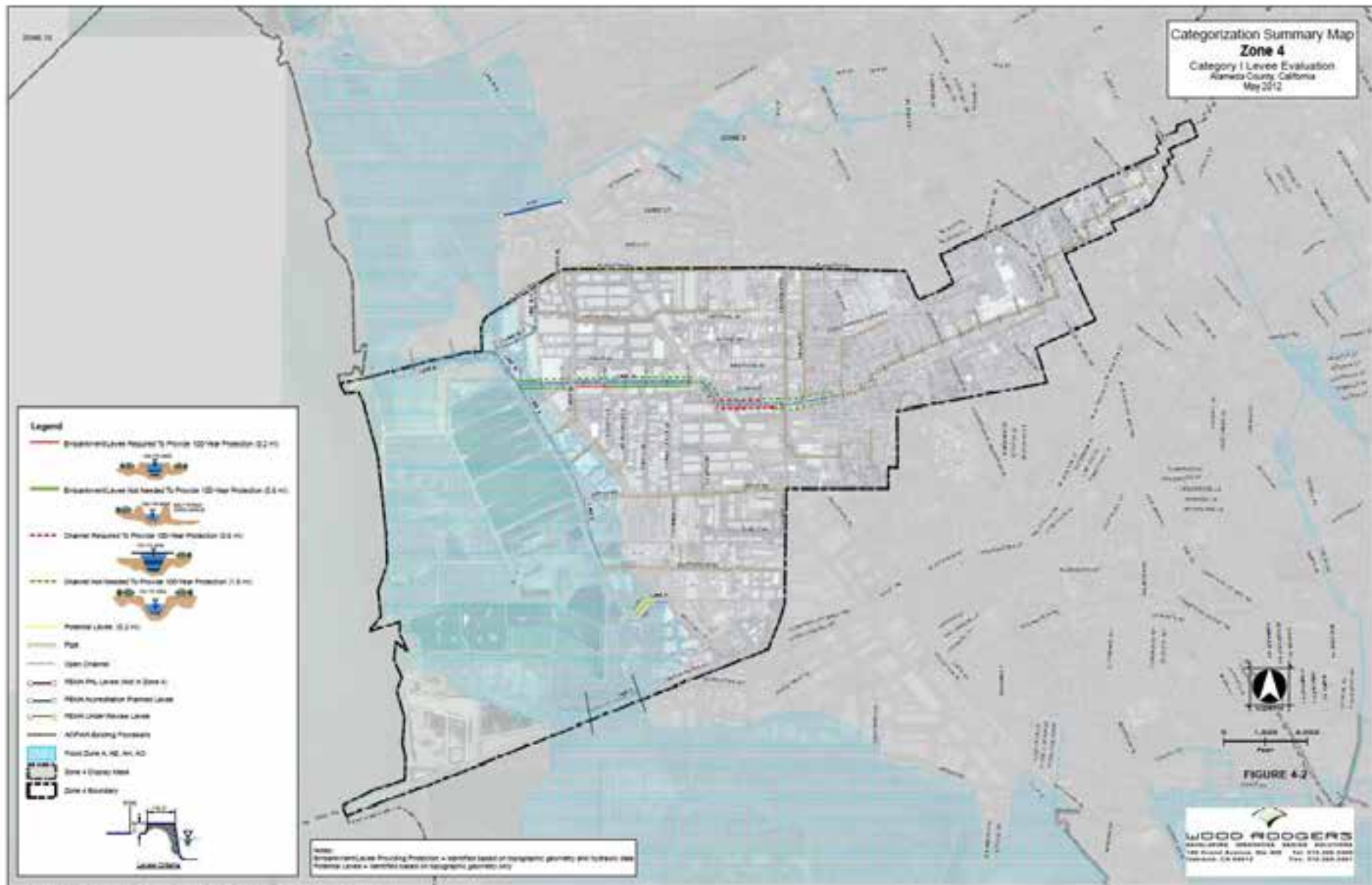
FIGURE 7-1













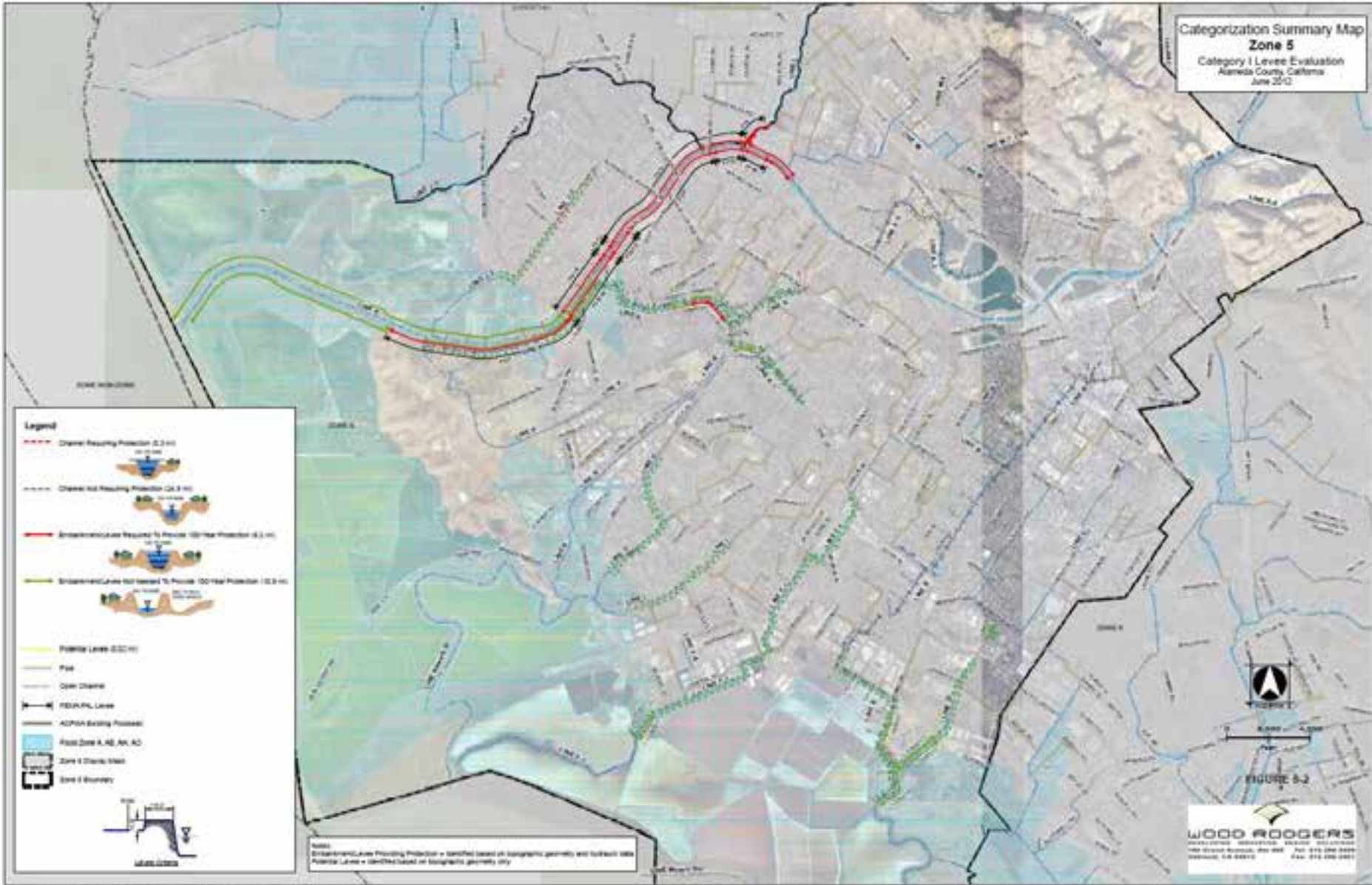
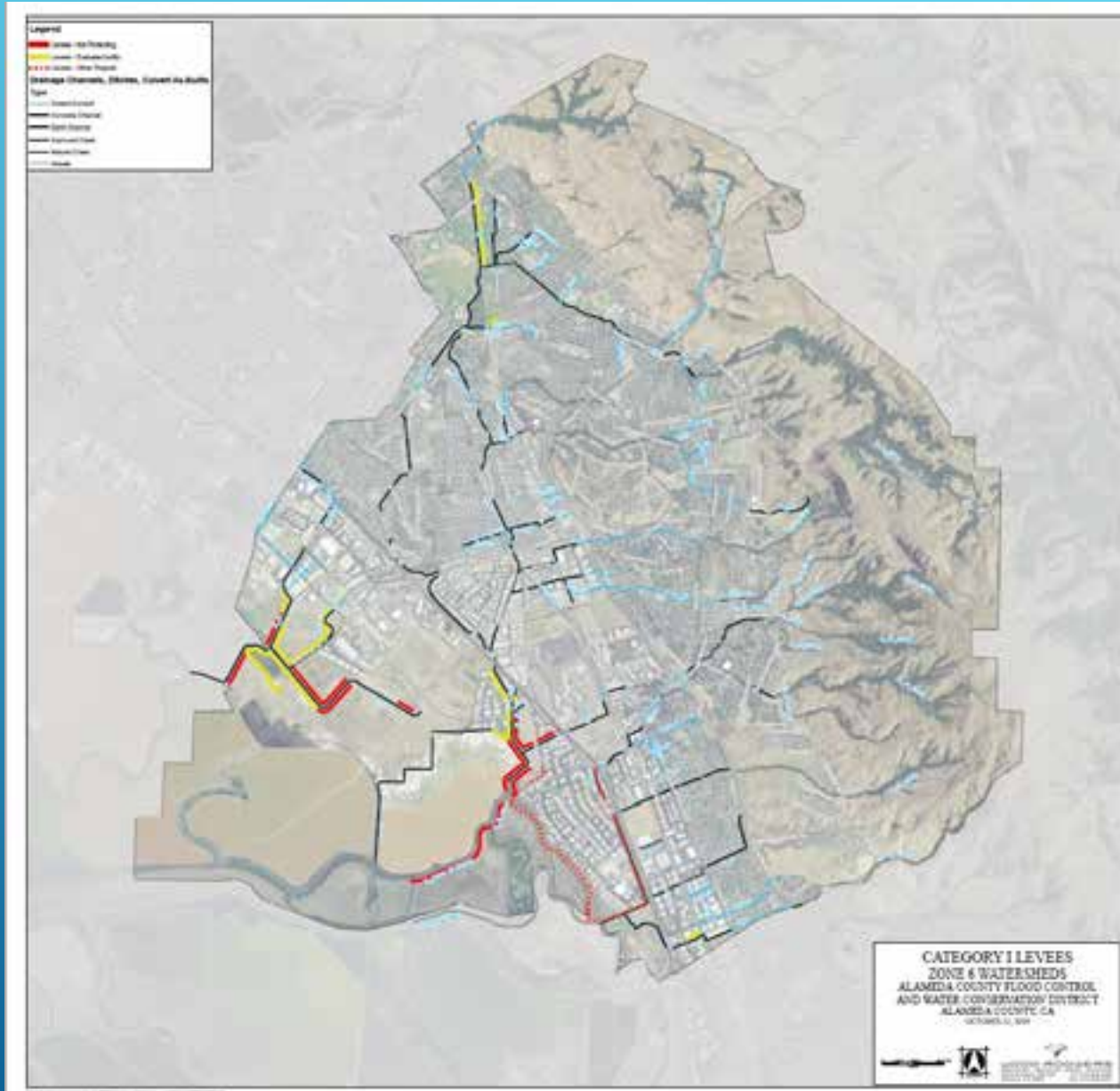
















FIGURE 5-2







## Map Layers

-  sdFloodPlain
-  sdGate
-  2 sdHeadwall
-  sdLevee
-  sdFloodwall\_Proposed
-  sdFloodwall
-  3 sdOutlet
-  sdWetWell
-  sdPumpStation
-  sdStandAlonePump
-  sdStorageArea
-  sdJunctionBox
-  sdXsection
-  sdSpillway

- Hydrology
- Topography
- Survey
- Reference Data
- Record Drawing Catalog
- Base Maps

Show Legend

Filter...





1. Efficient
2. Consistent
3. Reproducible

Method of categorizing levees, using existing, static hydraulic models