ABALONE COVE, PORTUGUESE BEND,
KLONDIKE CANYON LANDSLIDES

LANDSLIDE WORKSHOP

RECOMMENDATIONS

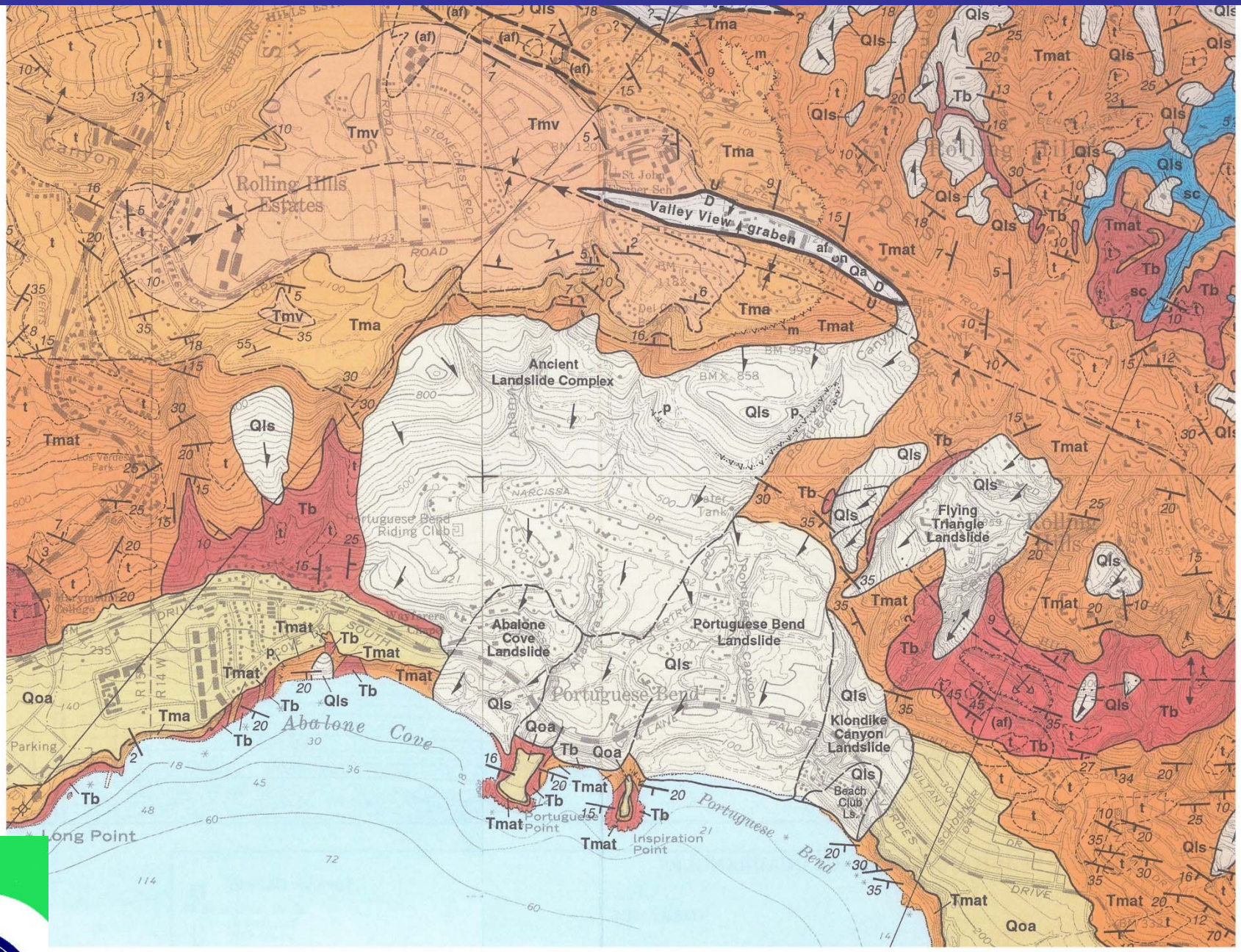
1. Receive and File

2. Consider Future Projects

ABALONE COVE, PORTUGUESE BEND, &
KLONDIKE CANYON LANDSLIDES

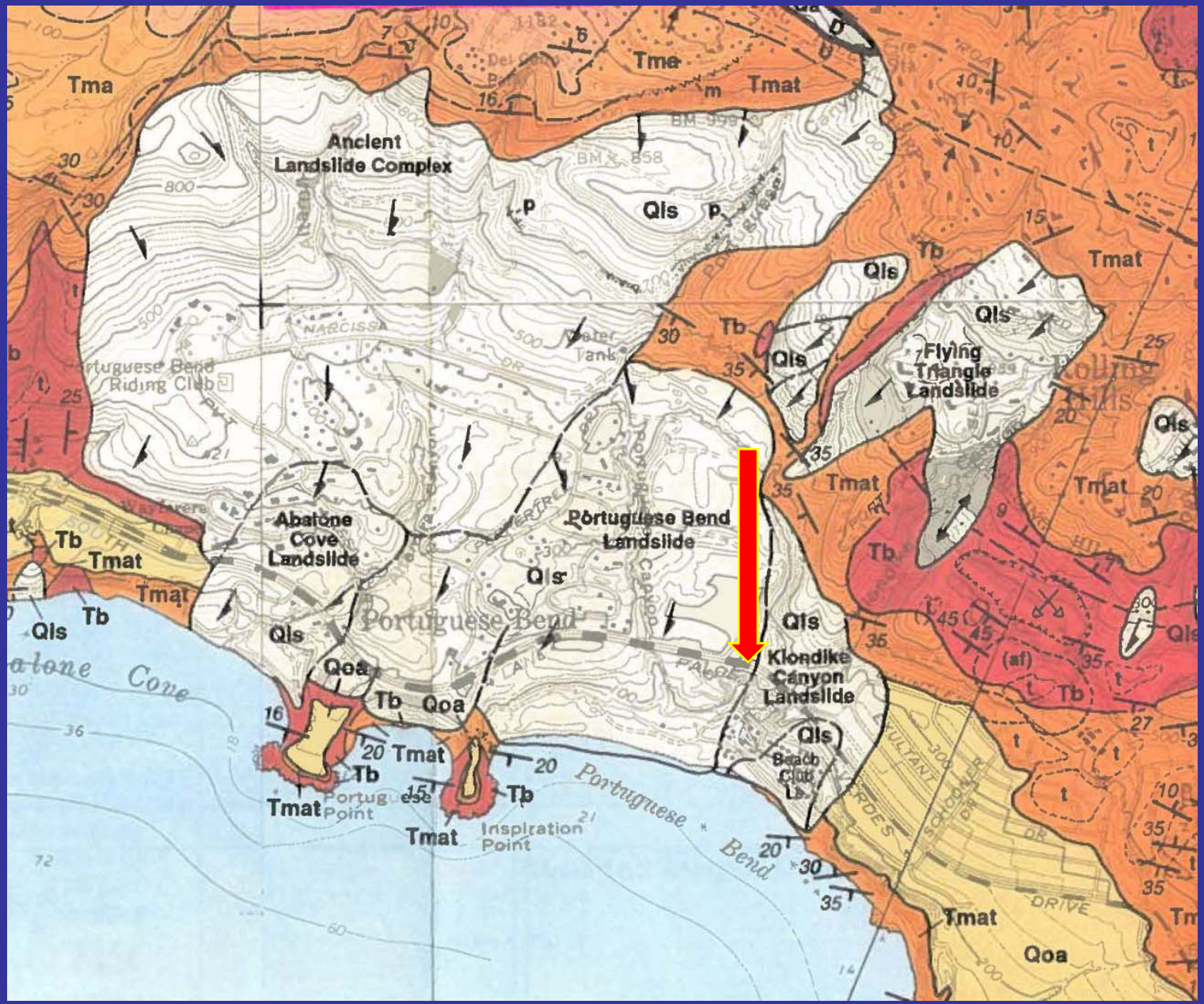
ABALONE COVE & PORTUGUESE BEND LANDSLIDES

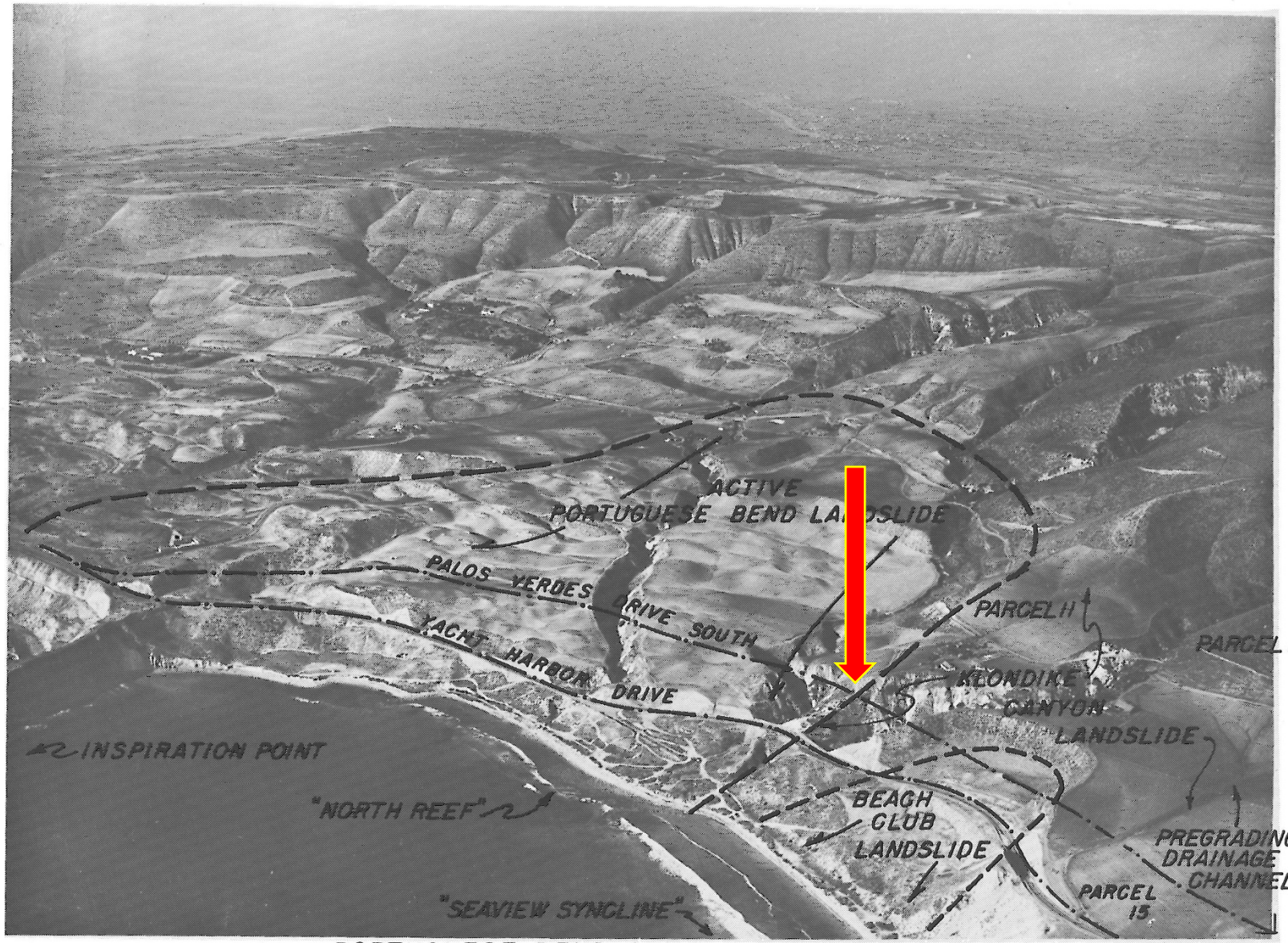
LANDSLIDE COMPLEX



ABALONE COVE, PORTUGUESE BEND,
KLONDIKE CANYON LANDSLIDES

KLONDIKE CANYON LANDSLIDE


Tma
Ancient
Landslide Complex
Qls
Tb
Tmat
Flying
Triangle
Landslide
Abalone
Cove
Landslide
Portuguese Bend
Landslide
Klondike
Canyon
Landslide
Qoa
Portuguese Bend
Abalone Cove
Portuguese Bend
Riding Club
Portuguese
Point
Inspiration
Point
Rolling
Hills
Beach
Club
DRIVE



PORTUGUESE BEND AREA — NOVEMBER 28, 1931

Approximate Extent of Klondike Canyon Landslide
Photo courtesy of Spence Air Photo Collection - Dept. of Geography - U.C.L.A.

PLATE III

CHRONOLOGY

- **Late 1940s:** Residential Development begins
- **1956:** Portuguese Bend Landslide reactivates.
- **Late 1956:** Grading for Seaview Residential Tract complete.
- **1979:** Ground Deformation Observed in Seaview Tract.
- **1980:** Extensive Geologic Investigation Begins
- **1981:** Four Inclinometers Installed
- **May 1981:** Artesian Condition Discovered

Inclinometer and Well Locations

Figure 5.23. Geologic profile and inclinometer observations at failure plane of landslide on I-94, Minneapolis (*5.57*).

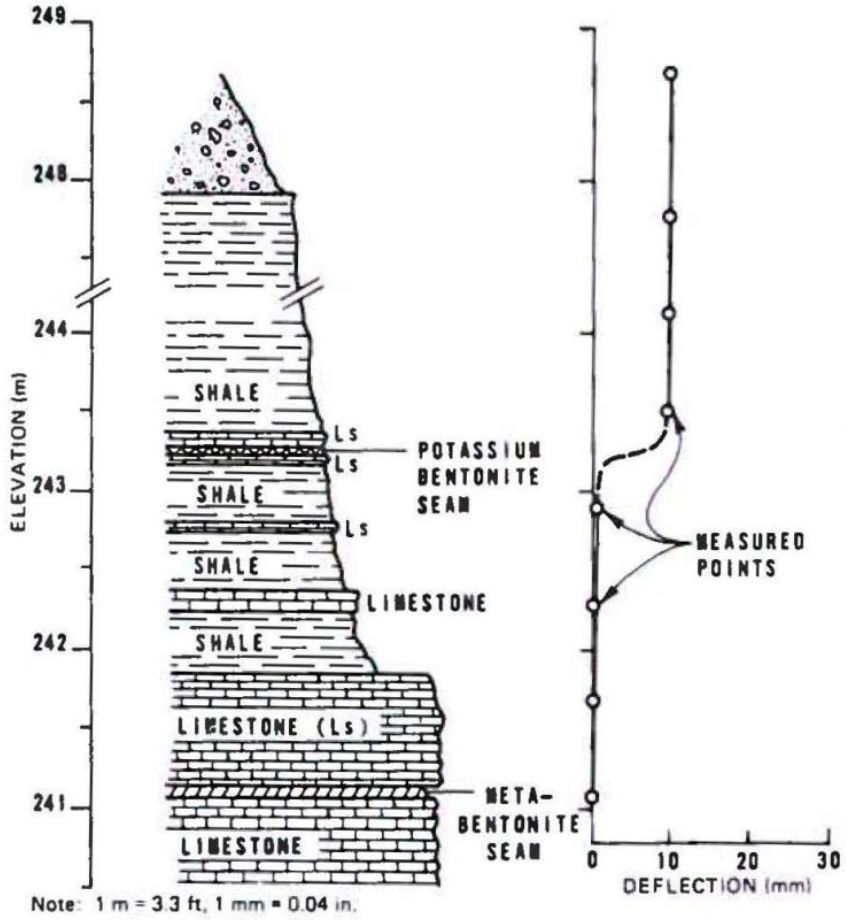


Figure 5.24. Section showing failure plane and movement distribution of landslide on I-94 (*5.57*).

Inclinometer Schematic Drawing

Artesian Dewatering Well Established on the Beach Near the Mouth of Klondike Canyon – May 1981

Initial Flow Rate: 150 Gallons/Minute

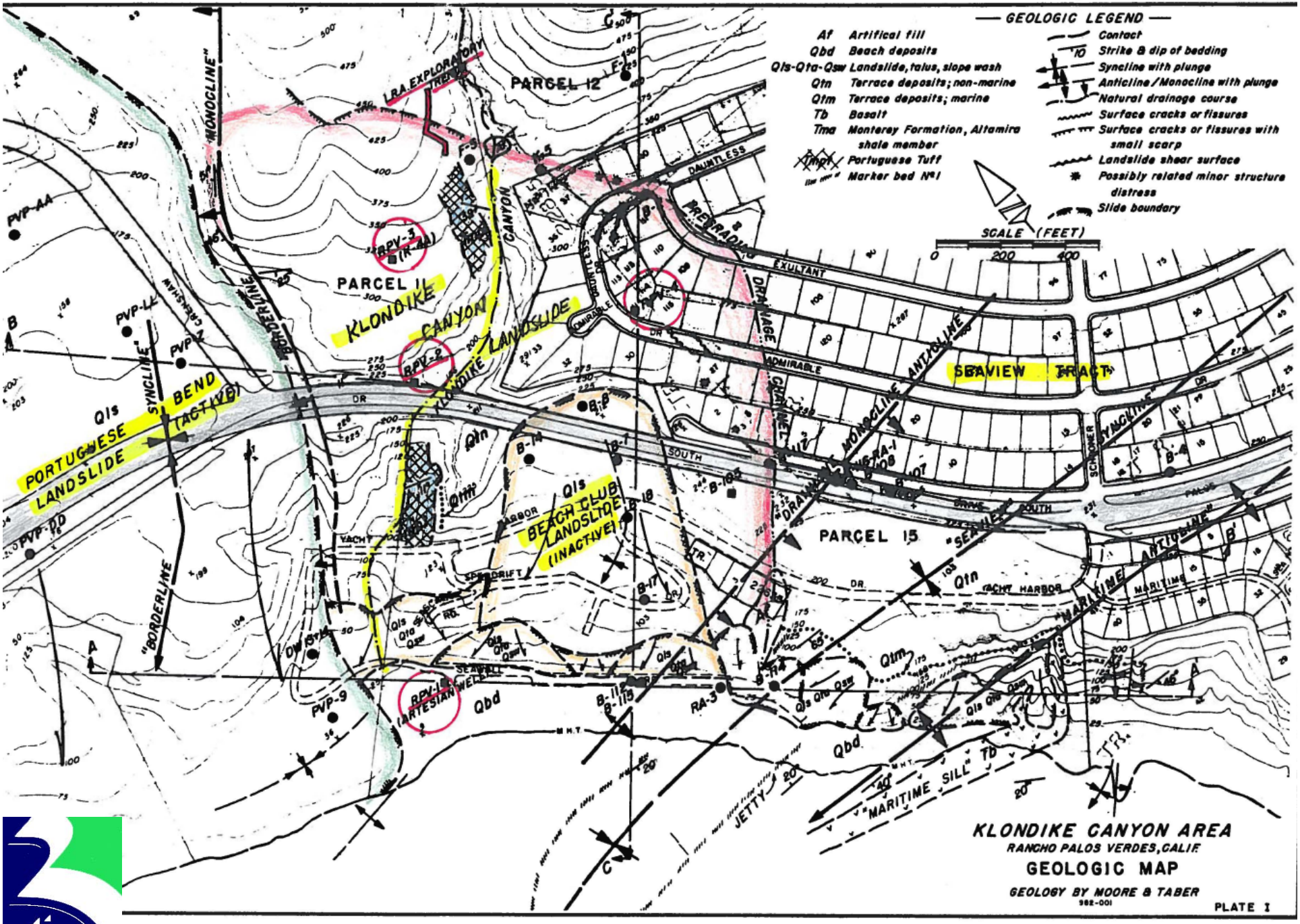
Surface Displacement - Klondike and Beach Club Landslides 1931

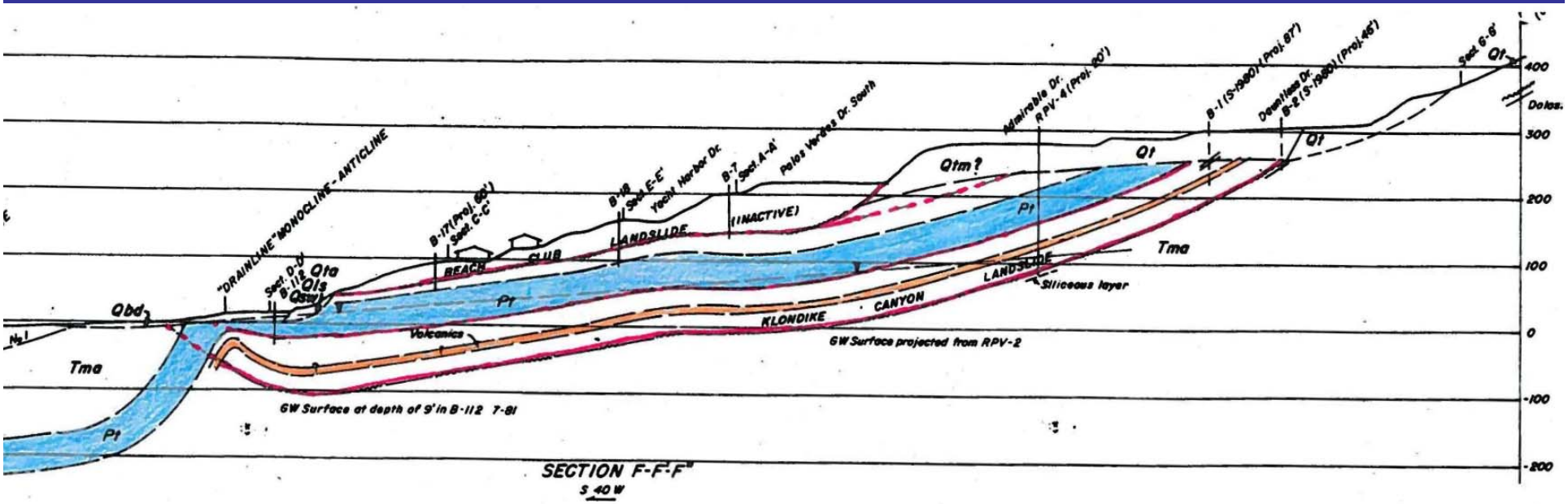
Beach Club Landslide Displacement

- Estimated Total Landslide Displacement: 140’ to 175’ Horiz; 40’ Vert
- Highly Eroded Condition of Landslide
- Landslide Presumed Inactive
- PV Drive South Road Surface Required Re-Paving

Klondike Canyon Landslide Displacement

- Total Displacement 50 to 60 Feet
- Surface Deformation Suggests Small Displacement
- Inclinometer Measurements Showed “Creep”
- Total Measured Displacement Less than 0.5-inch
- 1983- Heavy Rainfall Formed Temporary Lakes
- 1986- Land Surveys showed Seaward Shift of 1.5 over 30 Years
- Pavement Cracks Suggest Slow “Creep”
  - Minor Acceleration Likely During Heavy Rainfall Years.


GEOLOGIC LEGEND
Af Artifical fill
Qbd Beach deposits
Qls-Qta-Qsw Landslide, talus, slope wash
Qtn Terrace deposits; non-marine
Qtm Terrace deposits; marine
Tb Basalt
Tma Monterey Formation, Altamira shale member
Portuguese Tuff
Marker bed No 1
Contact
Strike & dip of bedding
Syncline with plunge
Anticline / Monocline with plunge
Natural drainage course
Surface cracks or fissures
Surface cracks or fissures with small scarp
Landslide shear surface
Possibly related minor structure distress
Slide boundary
SCALE (FEET)
0 200 400
PARCEL 12
PARCEL 11
PARCEL 15
KLONDIKE CANYON
KLONDIKE LANDSLIDE
PORTUGUESE LANDSLIDE (ACTIVE)
BEACH CLUB LANDSLIDE (INACTIVE)
SEAVIEW TRACT
"BORDERLINE" MONOCLINE
SYNCLINE
ANTICLINE
LRA EXPLORATORY TRENCH
PVP-44
PVP-LL
PVP-DD
PVP-9
RPV-3 (IR-44)
RPV-2
RPV-1 (ARTESIAN WELL)
RA-1
RA-3
B-1
B-10
B-11
B-11A
B-12
B-13
B-14
B-15
B-16
B-17
B-18
F-5
F-150
DAUNTLESS
PRE-RADIAN
EXULTANT
ADMIRABLE
DRAINAGE
SCHOONER
MARITIME
YACHT HARBOR
SEAWALL
JETTY
"MARITIME SILL"
KLONDIKE CANYON AREA
RANCHO PALOS VERDES, CALIF.
GEOLOGIC MAP
GEOLOGY BY MOORE & TABER
982-001
PLATE I



Geologic Profile From the Back of the Seaview Tract Down Through Center of Beach Club Landslide

3 Landslide Surfaces:

1. 10 to 20 feet above Portuguese Tuff (Beach Club Landslide)
2. At the Base of the Portuguese Tuff (Klondike Canyon Landslide).
3. Approximately 65 Feet Below the Base of the Portuguese Tuff (Klondike Canyon Landslide)

Portuguese Tuff Exposure – Lower Klondike Canyon
Downstream from PV Drive South

Mitigation Measures in the Klondike Canyon Area

Temporary Lake in Lower Klondike Canyon Behind Yacht Harbor Drive Road Fill - 1983

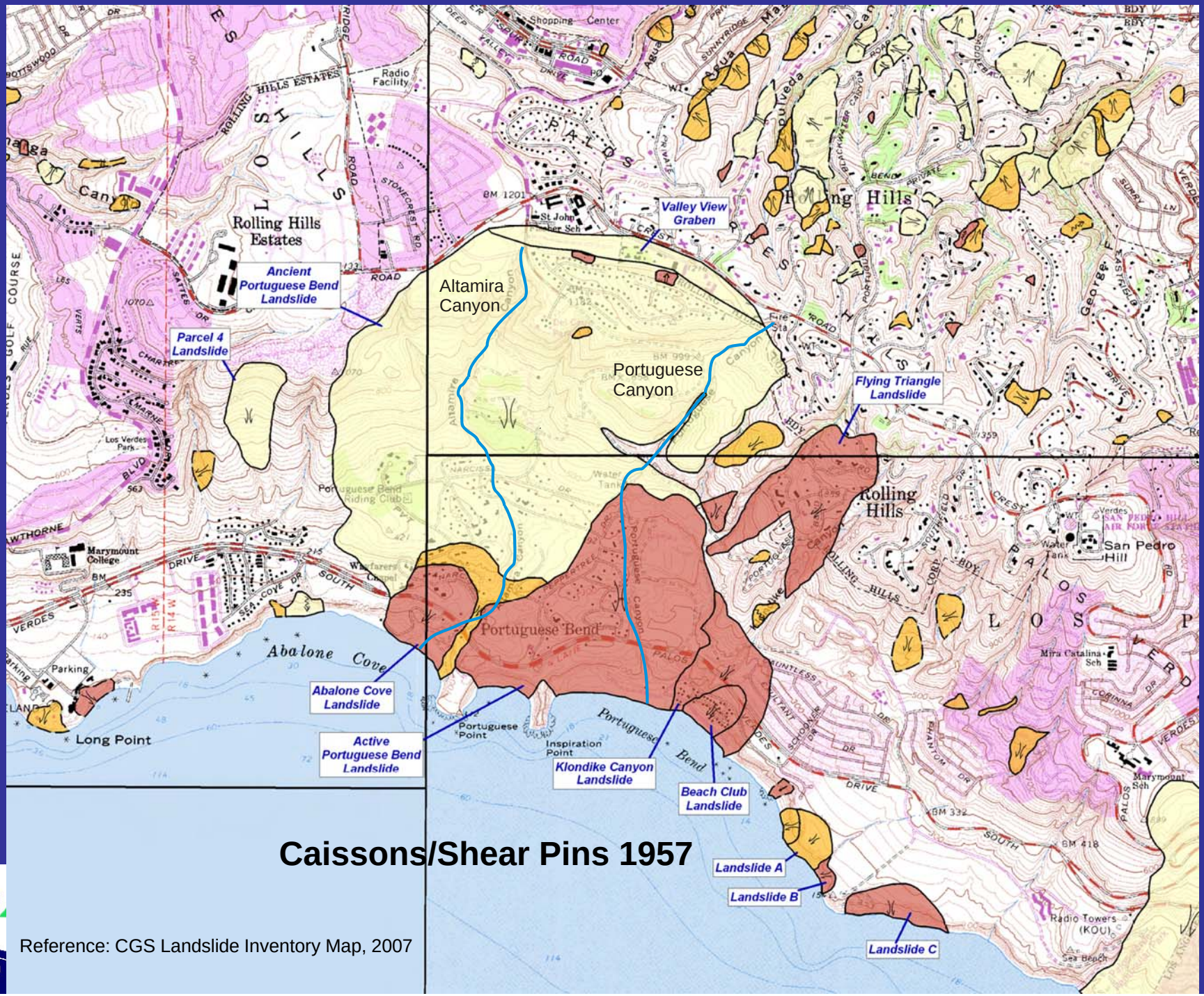
Klondike Canyon and Beach Club Landslide Mitigation Measures

- May 1981- Artesian Dewatering Well
- 1981 - Small Road Fill in Klondike Canyon at Head of Landslide
- 1981 - Start Periodic Pavement Repair in Seaview & PV Drive at Beach Club Slide
- Mid-1980s - Start Grading of PB landslide & Klondike Canyon Landslide
- Late 1980s - Surface Drain Installed In Upper Klondike Canyon
- Late 1980s - Klondike Canyon Storm Drain Installed
- Late 1980s - Dewatering Well Installed at Artesian Site
- Early 1990S - Septic System Replaced

Mitigation Measures in the Abalone Cove & Portuguese Bend Area

MitigationEfforts

- Caissons
- Grading
- Dewatering
- Drainage



Caissons/Shear Pins 1957

Reference: CGS Landslide Inventory Map, 2007

Caisson In Surf Zone

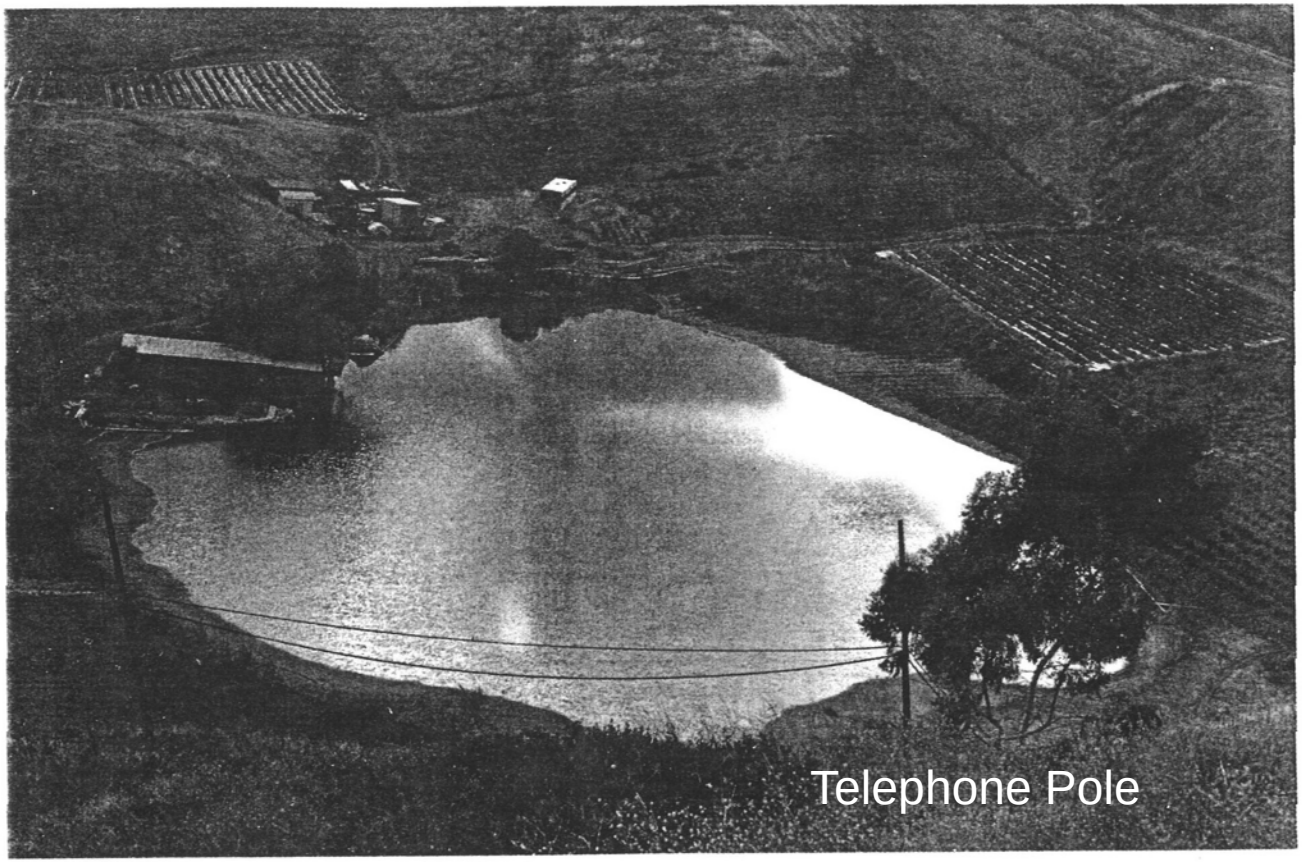
Figure 2. Reinforced concrete caissons exposed by wave erosion at the toe of the Portuguese Bend landslide in 1981. Pins were installed through the base of the landslide with their midpoints 42 feet below sea level in 1957.

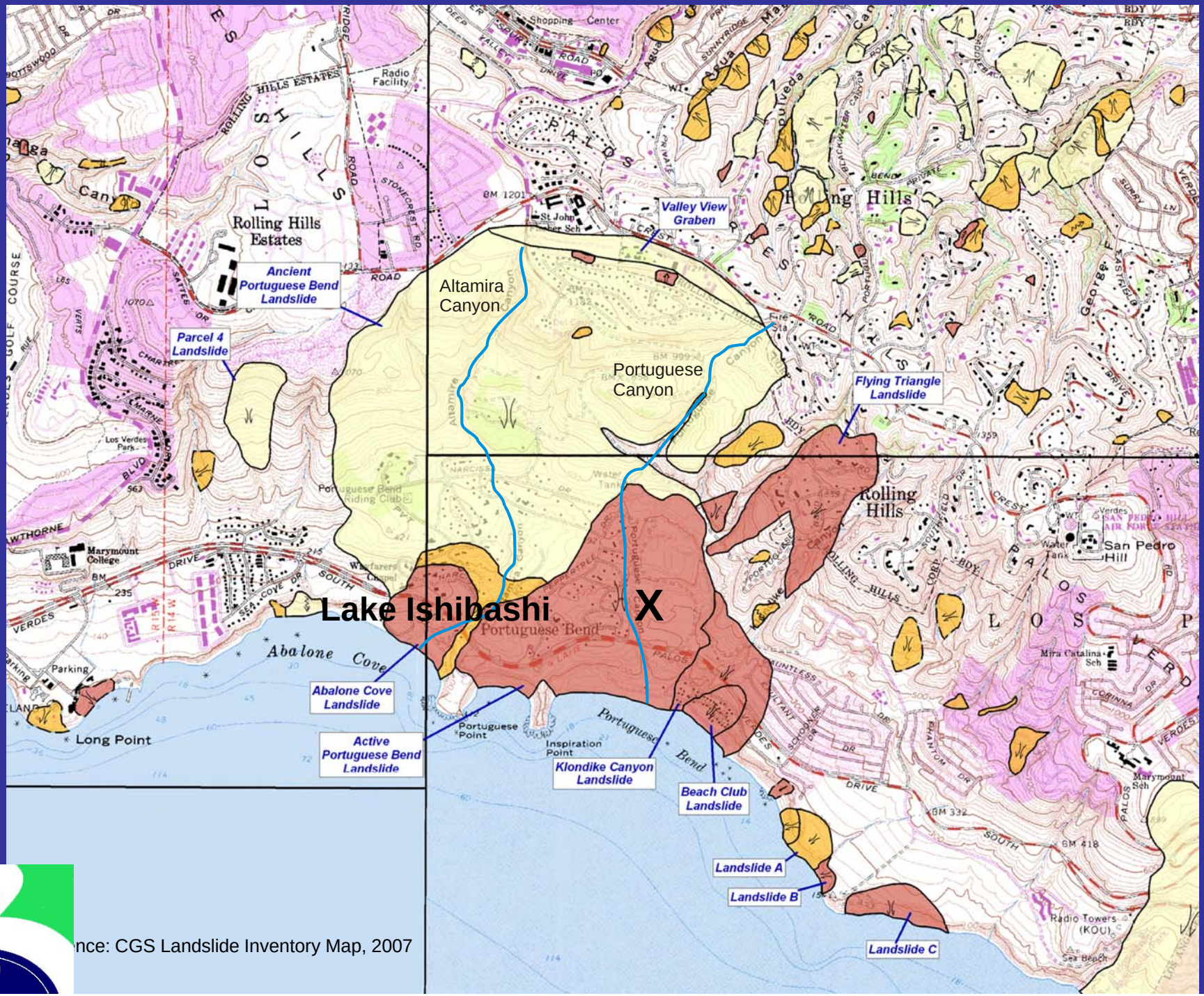
Grading

- 1986 Lake Ishibashi Grading
- Ongoing Yacht Harbor Grading
  - Every 3 to 5 years
- 2010 PVDS Shoulder Grading

Grading

Lake Ishibashi – Pre 1986





nce: CGS Landslide Inventory Map, 2007

- Lake Ishibashi Grading – 1986

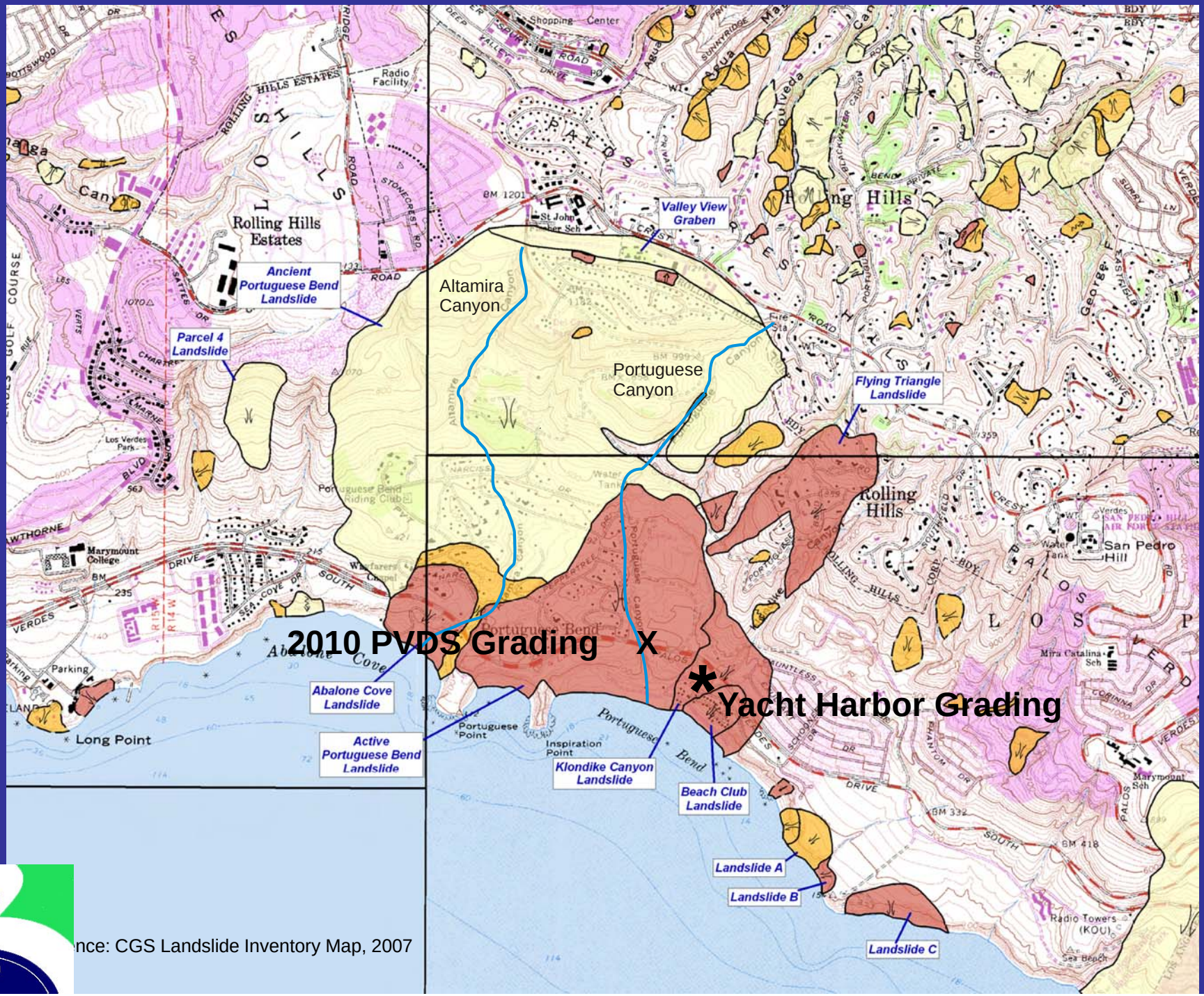
- Two Phases of Grading totaling about 560,000 cubic yards
- Graded depression to drain
- Established existing alignment of PVDS

Grading

Lake Ishibashi – Late 1986 Graded Condition

Today

Grading - 2010



nce: CGS Landslide Inventory Map, 2007

Yacht Harbor Grading- 2010

PVDS - 2010


2010/08/20

Surface Drainage

Major Drainages include Altamira Canyon and Portuguese Canyon and associated Paint Brush Canyon

Past and Current Drainage Systems

- ½ Round Pipe System
- Corrugated Pipe System
- PVDS System
- Graded swales

½ Round Pipe System

Corrugated Metal Pipe

Corrugated Metal Pipe

Corrugated ADS Pipe

Today

Storm Drains

Projects Considered

- Altamira Canyon Improvements
- Continuous Monitoring GPS Station
- Test Wells
- Installation of New Dewatering Wells
- Roadway Stabilization (Landslide Solutions)
- Surface Drain Runoff Collection
- Adjust Ski Jump Drainage System
- Gabion Improvements in Klondike Canyon
- Topographic Survey
- Automatic Rain Gauge
- Seismic Reflector Survey
- Zero-scape Landscaping in Landslide Areas

Staff Recommendations

Collection of Surface Drainage Runoff

Gabion Improvements in Klondike Canyon (Klondike GHAD)

Continuous Monitoring GPS Station / Increase Monitoring Frequency

Dewatering Wells

Topographic Survey

Staff Recommendations

Collection of Surface Runoff

- Collect Drainage at Paintbrush Canyon deliver to Beach
- Adjust & Repair Ski Jump Drainage System
- Collect Drainage at Beach Club Landslide deliver to Beach

Staff Recommendations

Gabion Improvements in Klondike Canyon

Install Collection System and Drainage Improvements to the Trail Fill and Gabion Structure that Has Been Constructed in Klondike Canyon Across the Head of the Landslide (City and KCGHAD).

Staff Recommendations

GPS Program Improvements

- Continuous Monitoring GPS Station
- Increase Monitoring Frequency

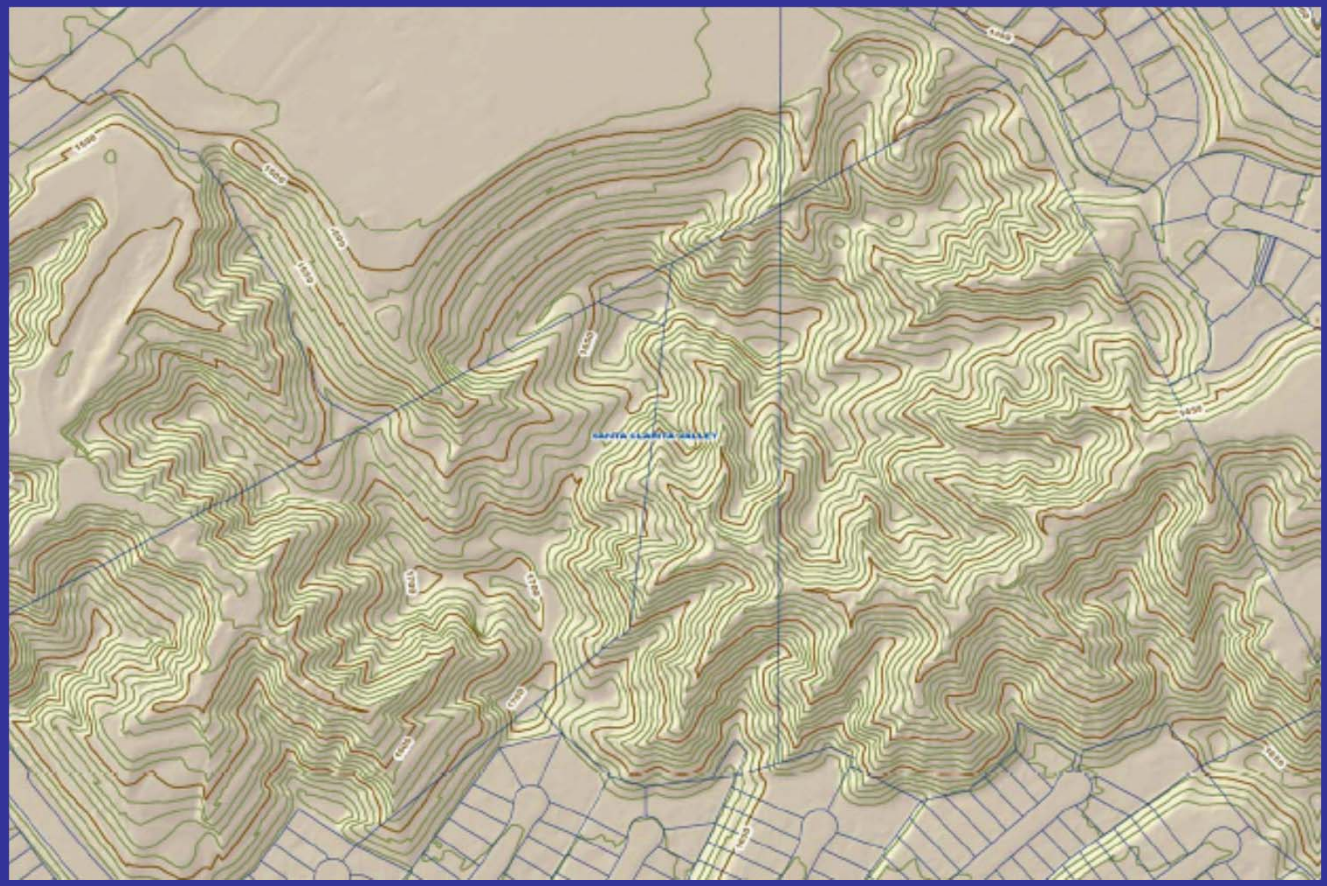
Staff Recommendations

Dewatering Wells

- New Well in Portuguese Bend
- Test Wells

Staff Recommendations

Topographic Survey



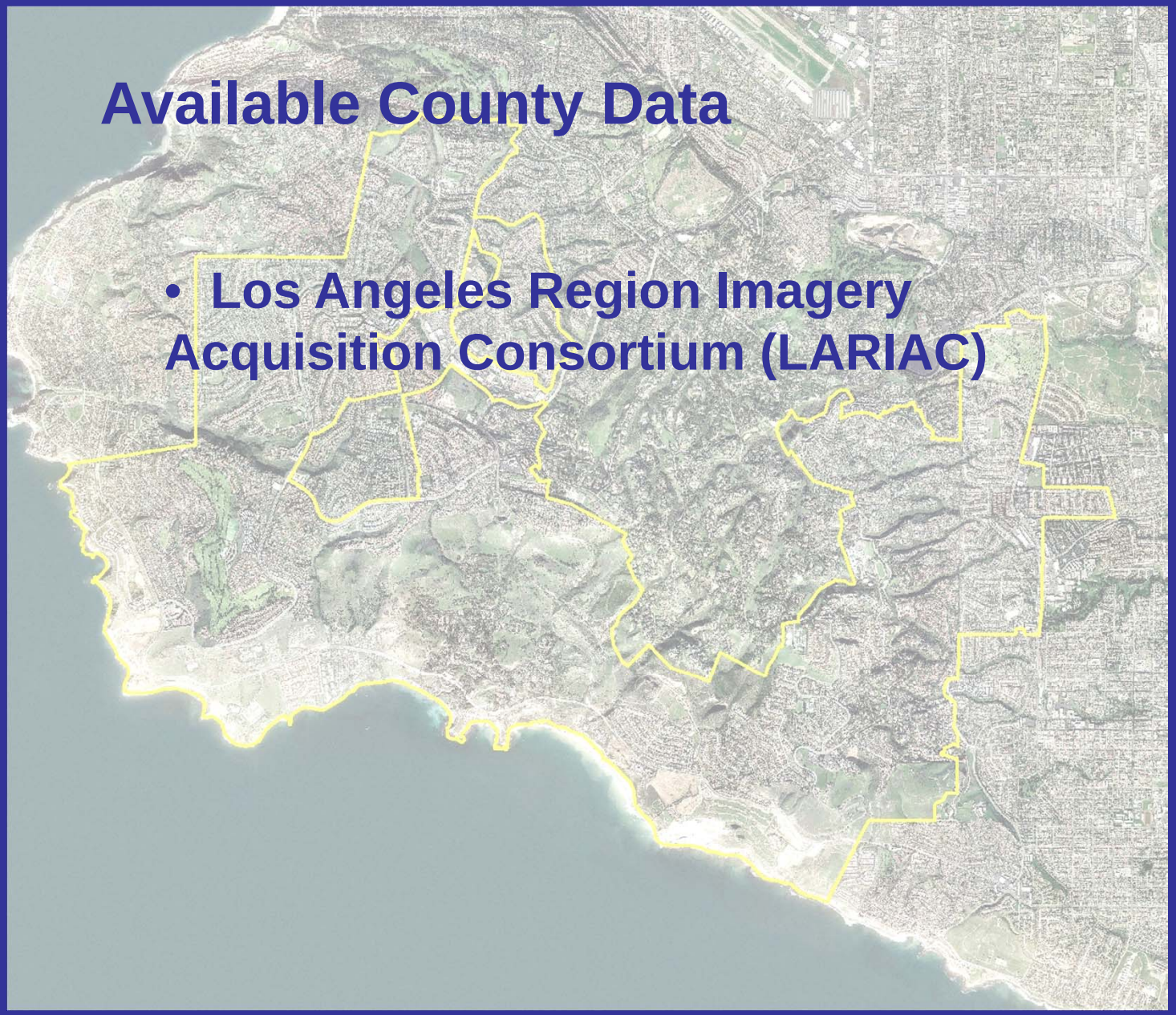
Staff Recommendations

Topographic Survey

Two Choices – Conventional Survey / Consortium Participation

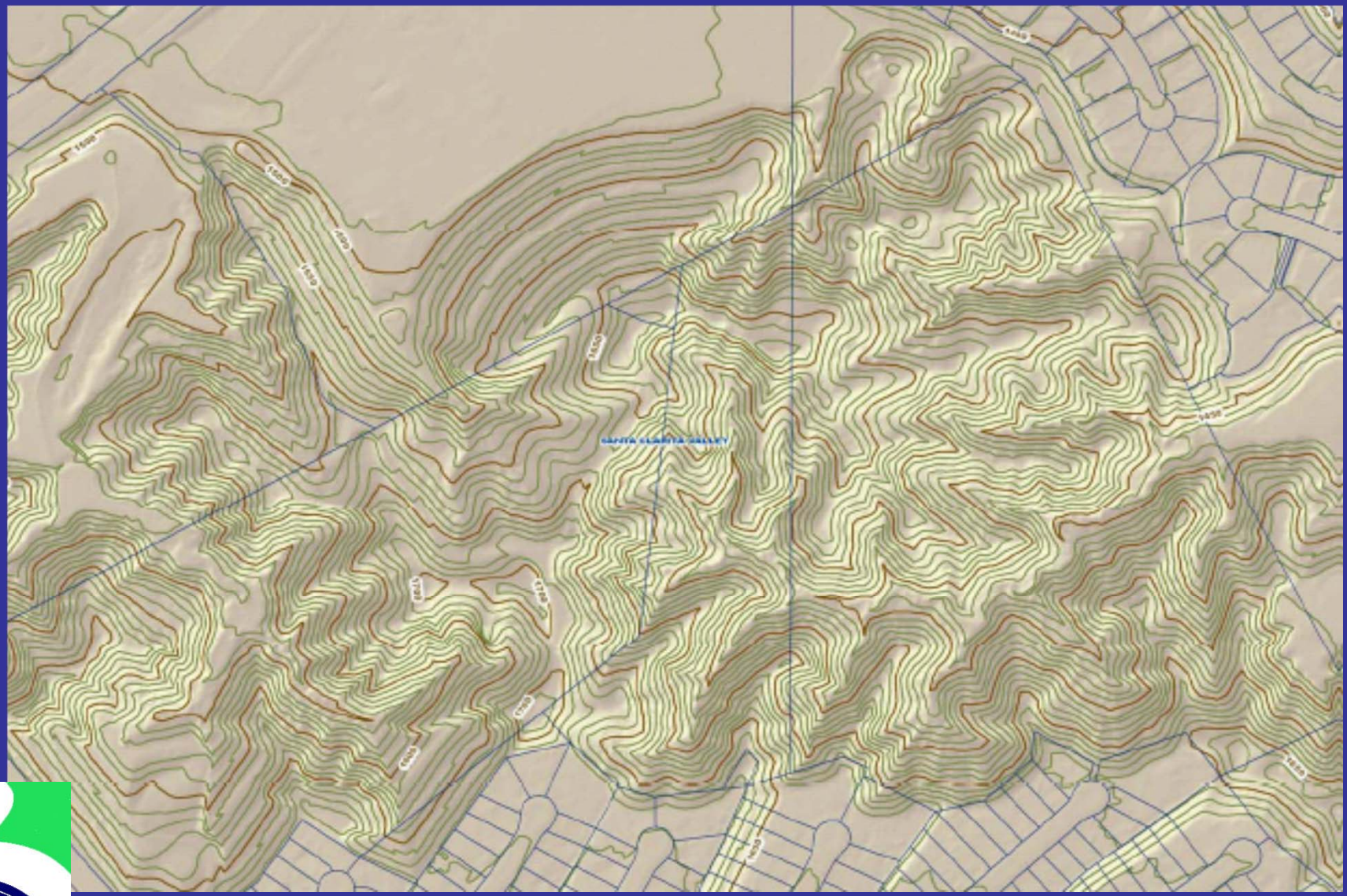
- **Los Angeles Region Imagery Acquisition Consortium (LAR-IAC)**
- **Countywide Project – Available to Cities, Agencies**
- **Integrated with ESRA software**
- **High Resolution Images – Updated 3 Year Interval (1 year pilot area available**
- **Ortho Aerial Photos, Oblique Views, 3-D Footprints etc. (shadow Analysis)**
- **2’ Topographic Contours**

Available County Data



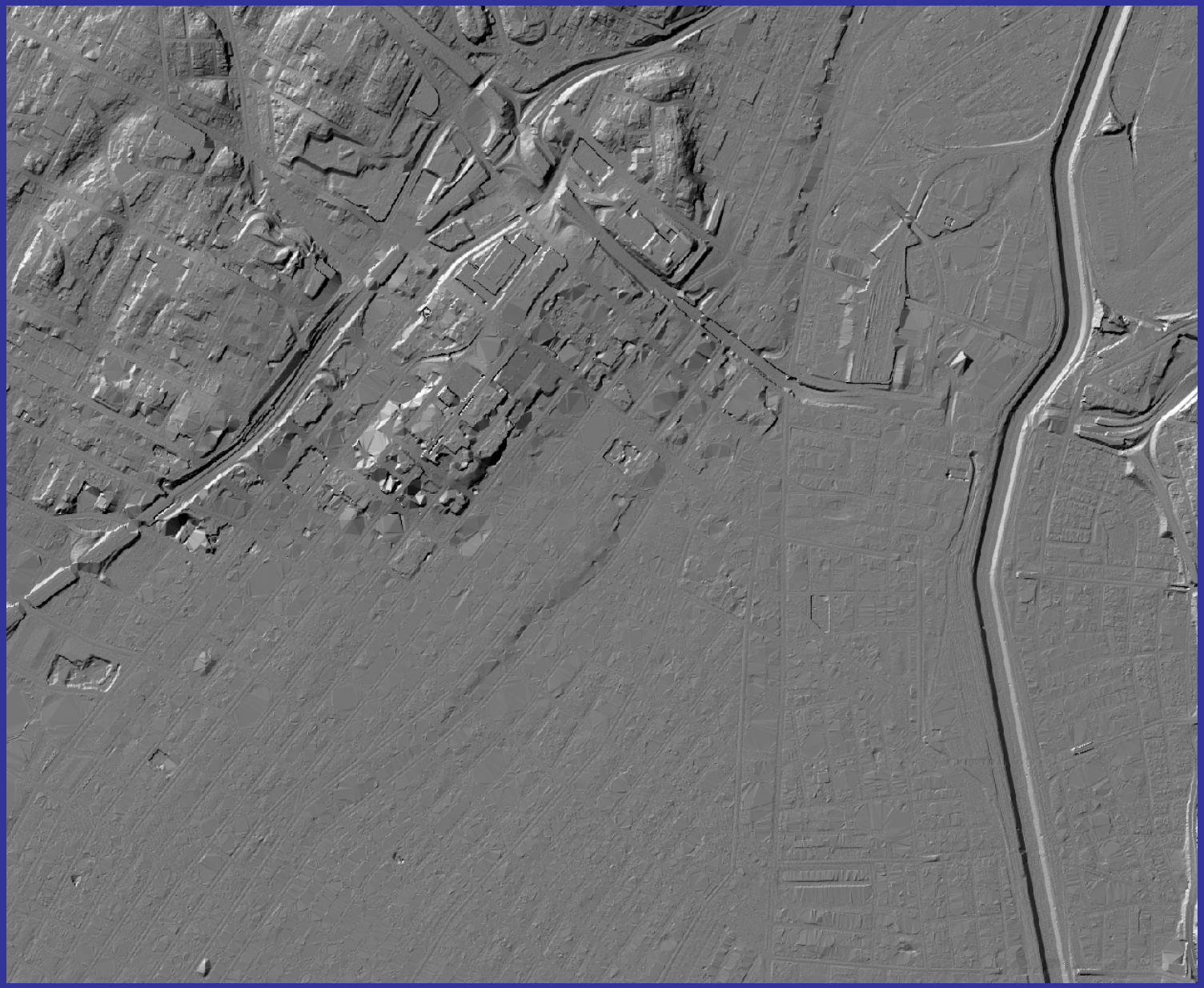
- Los Angeles Region Imagery Acquisition Consortium (LARIAC)

Base Map with 2-foot Contours

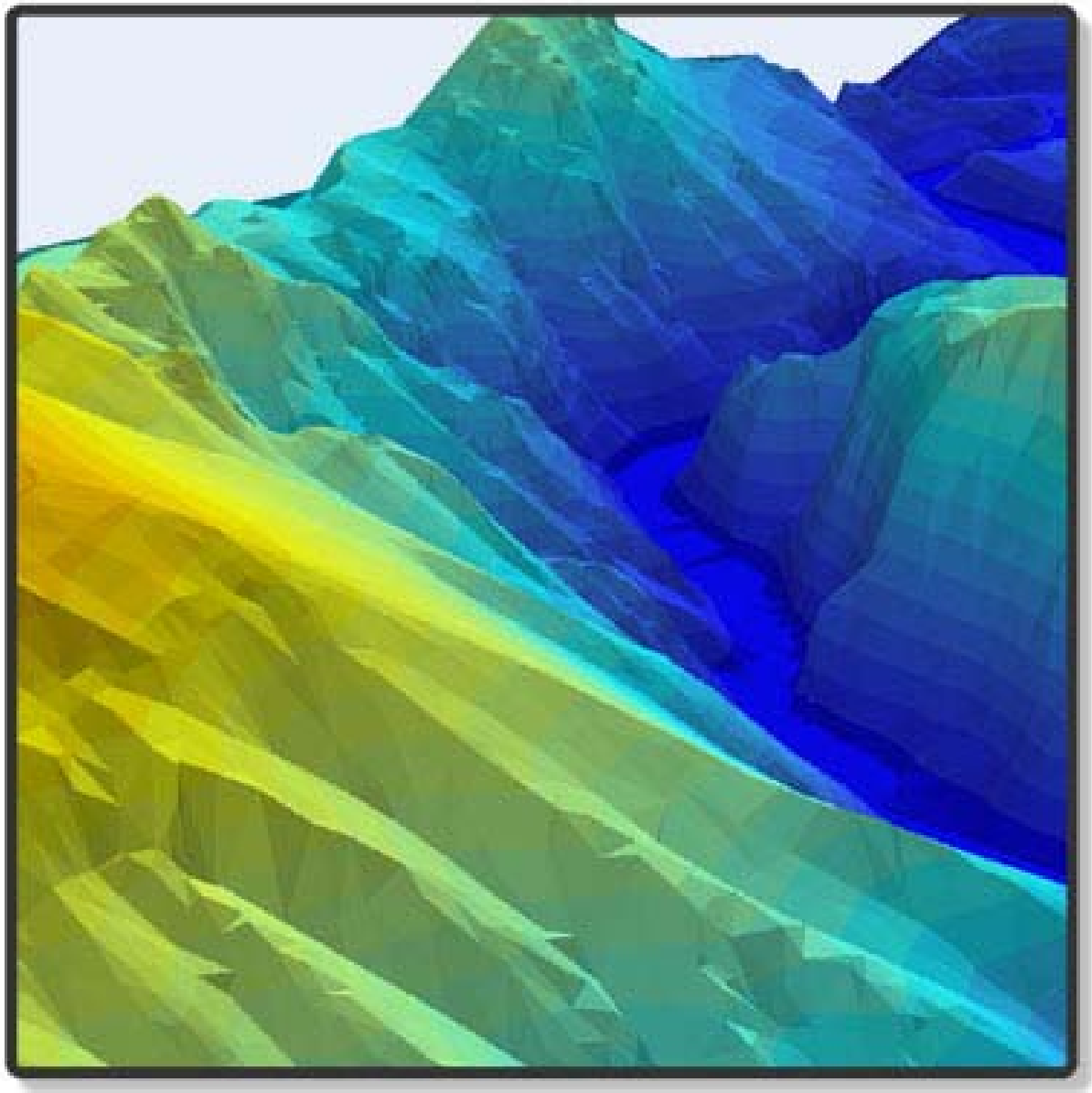


Building Outlines (Impervious Surfaces)

Flood Plain Models



Digital Terrain Models



CONCLUSIONS

1. Receive and File

2. Provide Staff Direction

End of Presentation