

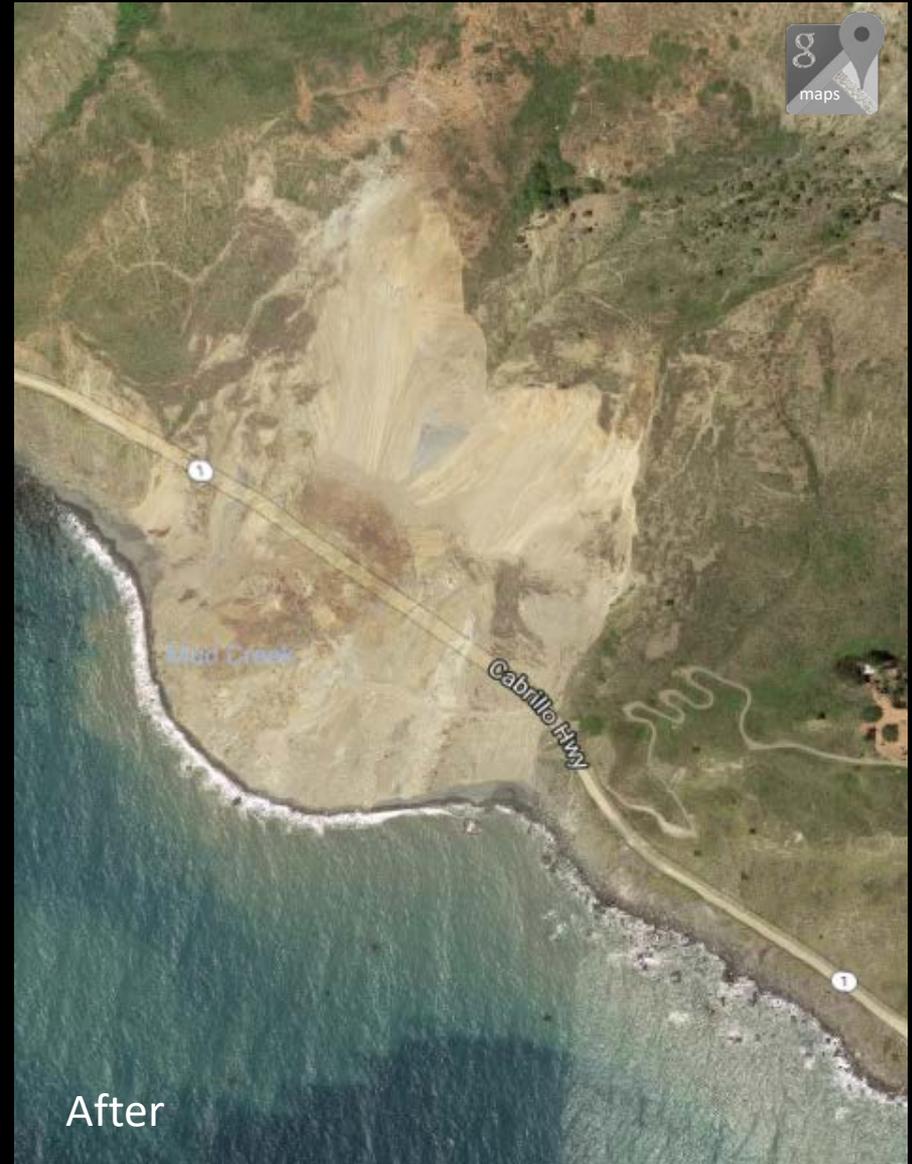
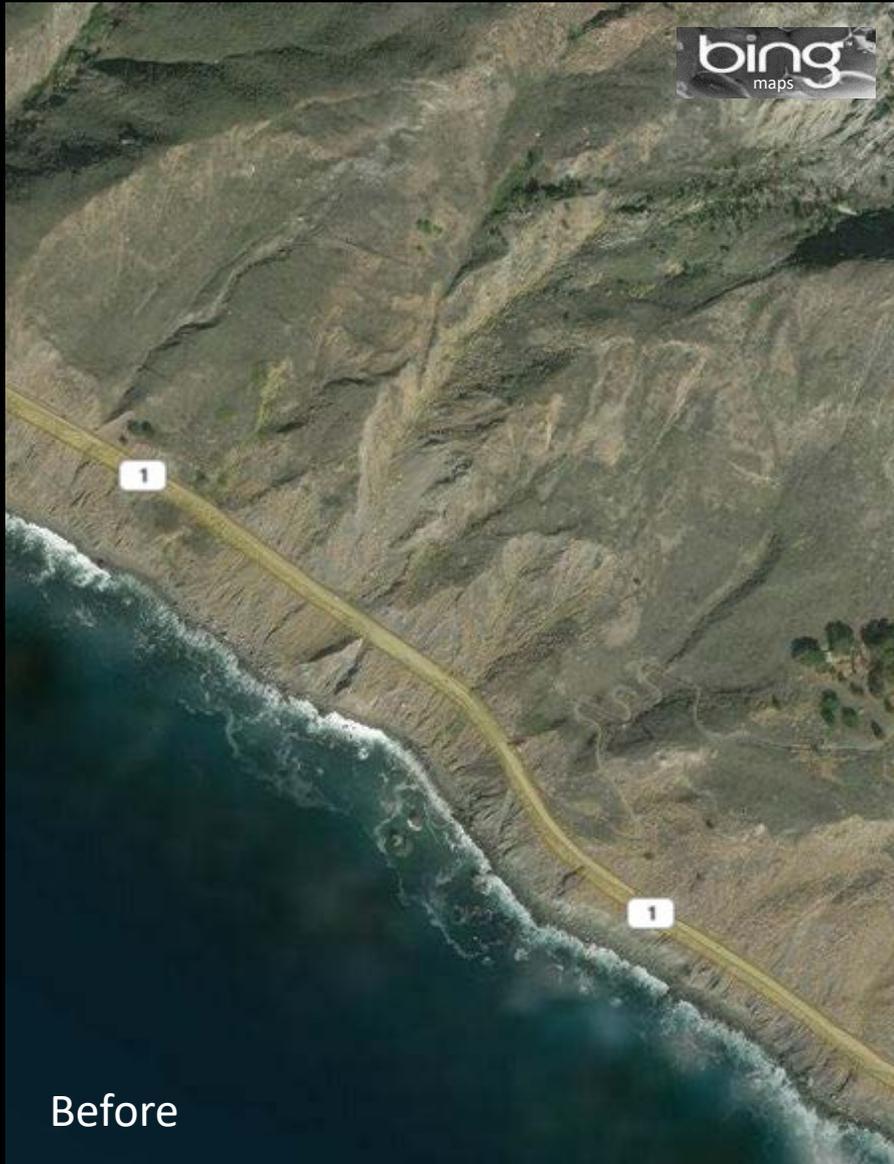


INNOVATION IN ACTION

Hwy. 1/Mud Creek
Monterey County

PM 8.9

May 20th Landslide



Estimation of Quantities

- Estimated **5.5 million cubic yards** of material translated downslope
- Estimated **50 acres** of land displaced
- From original roadway alignment to the toe and ocean
3.0 million cubic yards of material
- From original alignment to base of the head scarp
2.5 million cubic yards of material
- From the original shoreline to the toe
 - **15 acres** of new land
 - Approximately **550 feet** to the toe back to original shoreline
 - **2400 feet** of new shoreline

Innovative Initial Response



Photo courtesy John Madonna



Innovative Initial Response – IDS Radar

Radar was used on-site to scan the slopes in and around the landslide; information from scans taken every 3 minutes provided data on movement.



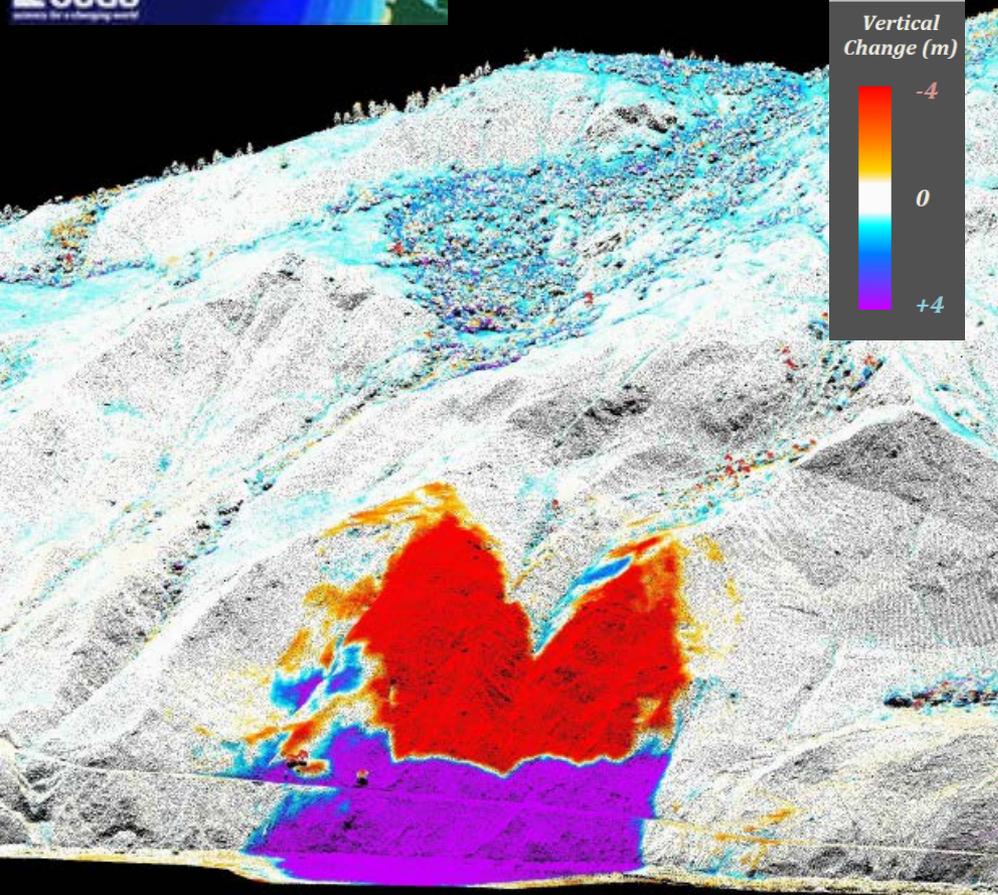
Innovative Initial Response

Safety of Workers Paramount on Site

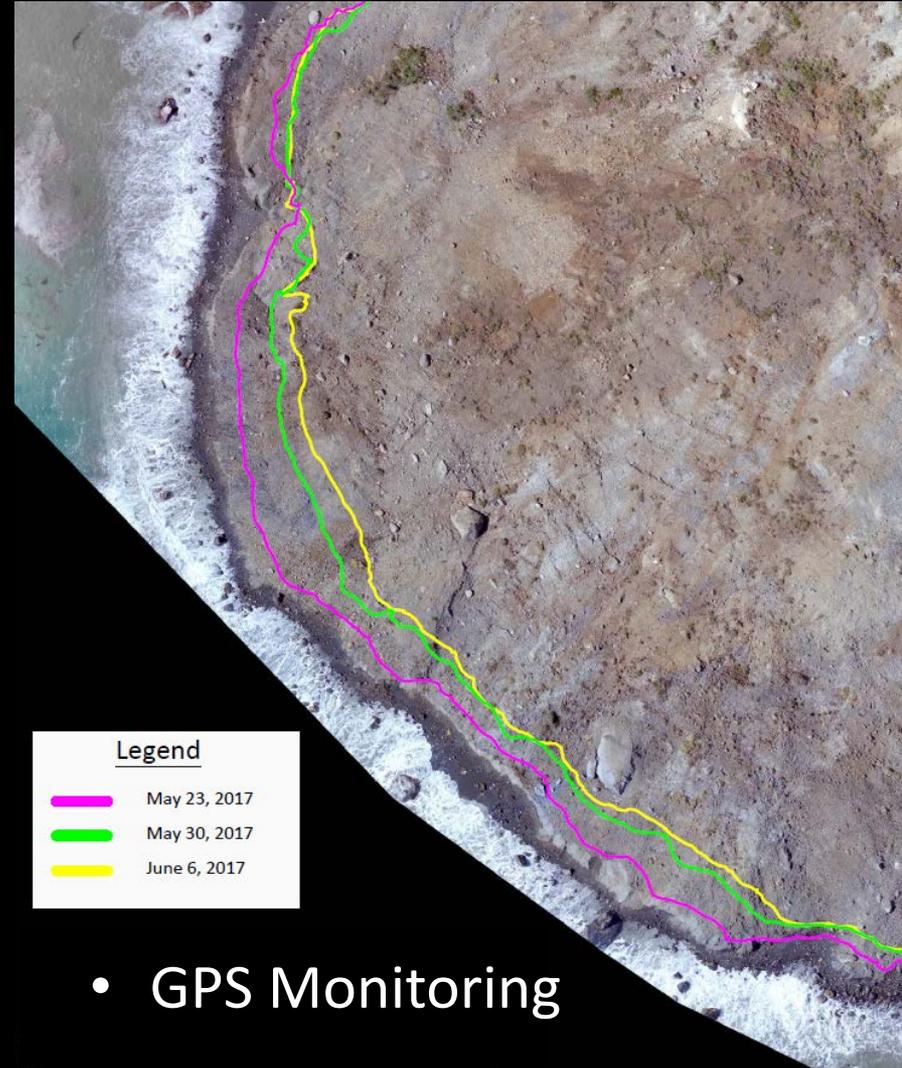
- Ground-based Radar
- Evacuation Protocol
- Radio Communication
- Temporary Rockfall Protection
- Spotters for Equipment

Innovative Initial Response

Understanding the Magnitude



- USGS Photogrammetry



- GPS Monitoring

Innovative Initial Response

Monitoring Movement

Photo courtesy Joe Johnston, SLO Tribune.



Geotechnical Engineers and Surveyors monitor the surface and subsurface.

Strategy for Re-Opening

*Photo of the 1983
Landslide courtesy of
Joe Kennedy, LA Times*



Innovative Design & Construction

Erosive power of the ocean reduces area for alignment and contributes to sediment into critical habitat



Building a Protective Rock Barrier



Photos courtesy Kyle Evans

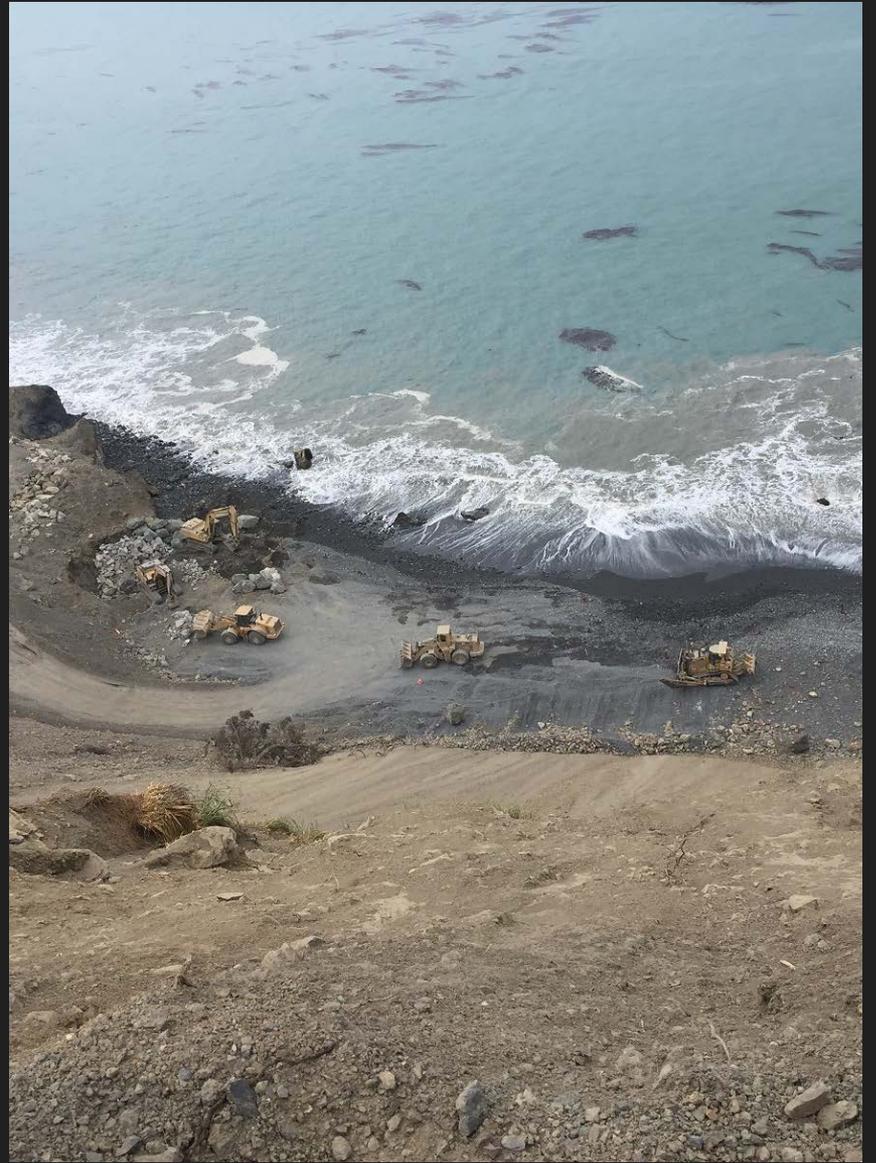
Protecting the Investment & Reducing Erosion



Rocks of up to 8 tons each were hauled to the jobsite and placed individually along the 200+ foot long base. The revetment is 40 feet tall and 60 feet wide, totaling 200,000 tons.

Photos courtesy Kyle Evans and Security Paving





Construction





Innovative Design & Engineering

The new ¼ mile roadway is realigned across the Mud Creek landslide on Highway 1 and is buttressed with a series of reinforced embankments, berms, retaining walls, culverts, rock revetment and netting.



*Photo courtesy CT D-7
Samer Momani*

These aerial views showcase the innovative design, engineering and construction.

Pacific Coast Highway 1 is Open!

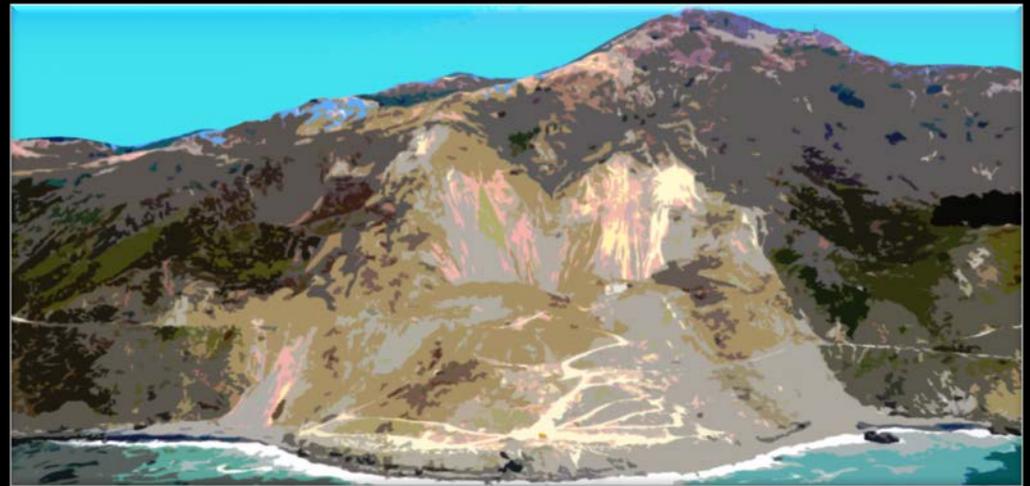
The highway was officially opened on July 18th at 9:45 a.m.





Highway 1 at Mud Creek
reopened within 14 months
of the landslide event.

Total cost = \$54 Million







Special thanks to our Caltrans Maintenance forces, who fought to keep Hwy. 1 open during the Winter of 2017, and then worked with John Madonna Construction at Mud Creek after the landslide.



• Questions?