Gold Mines and CIDH Piles

Presented by: Heidi Kuntz

William Bertucci

Brandon Badeker

September 21, 2009

Caltrans Division of Engineering Services

Sacramento, California

Angels Camp, CA

Elevation ≈ 1,400 ft

Located in the foothills

- 140 miles East of San Francisco
- 50 miles East of Stockton on Hwy 4
- 75 miles South of Sacramento on Hwy 49

Angels Camp Hwy 49 Bypass

2.4 mi. of highway

4 bridges

- Cast-in-place prestressed box girders
  - 30’ to 80’ tall
- Single-column bents
- Footings founded on 760mm (30”) Cast-in-drilled-hole (CIDH) piles
  - Lengths between 21’ and 55’

Bridge subcontractor

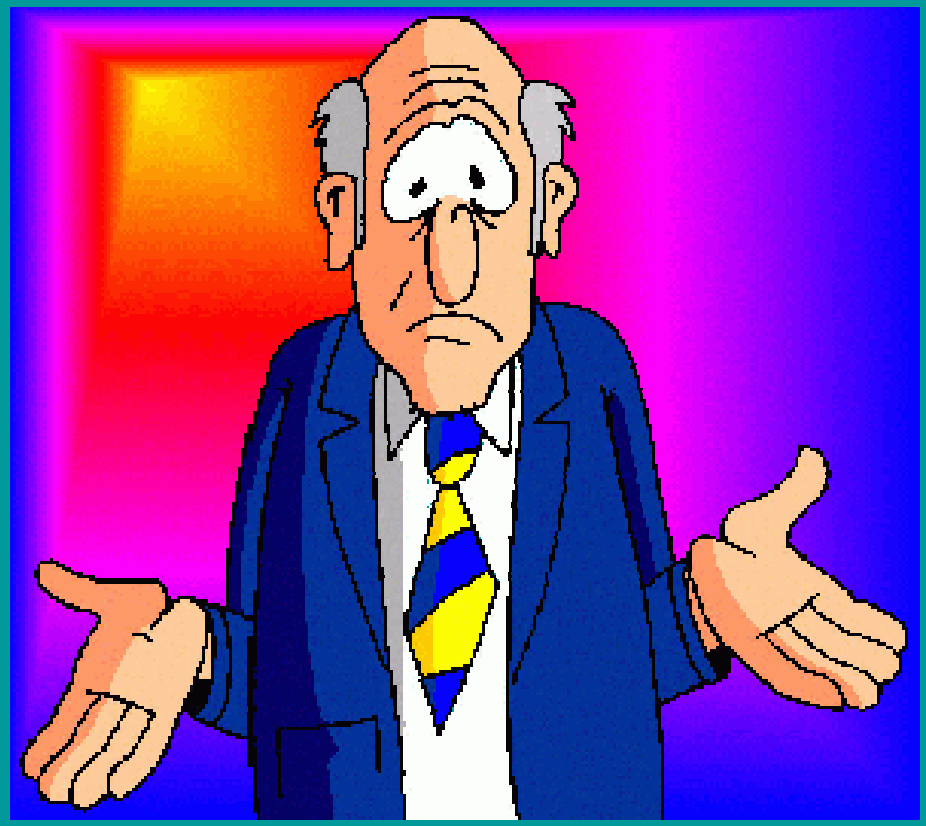
MCM Construction Inc.

Pile Subcontractor

Pacific Coast Drilling Co.


Existing Hwy 4
Existing Hwy 4/49
New Hwy 4
Existing Hwy 4

- **Foundation Report**
  - "Spread footings not recommended…due to the possibility of abandoned mines in the area."
  - "It is unclear where the boundaries of the mines exist and at what depth."
- **Geotechnical Design Report**
  - "It is our understanding that all mines in the vicinity…are currently abandoned."
  - "There are reports of other mining activities…but the shafts are no longer open."



What are the chances we'll find a mine shaft?

Gold Rush town

Who needs a map?

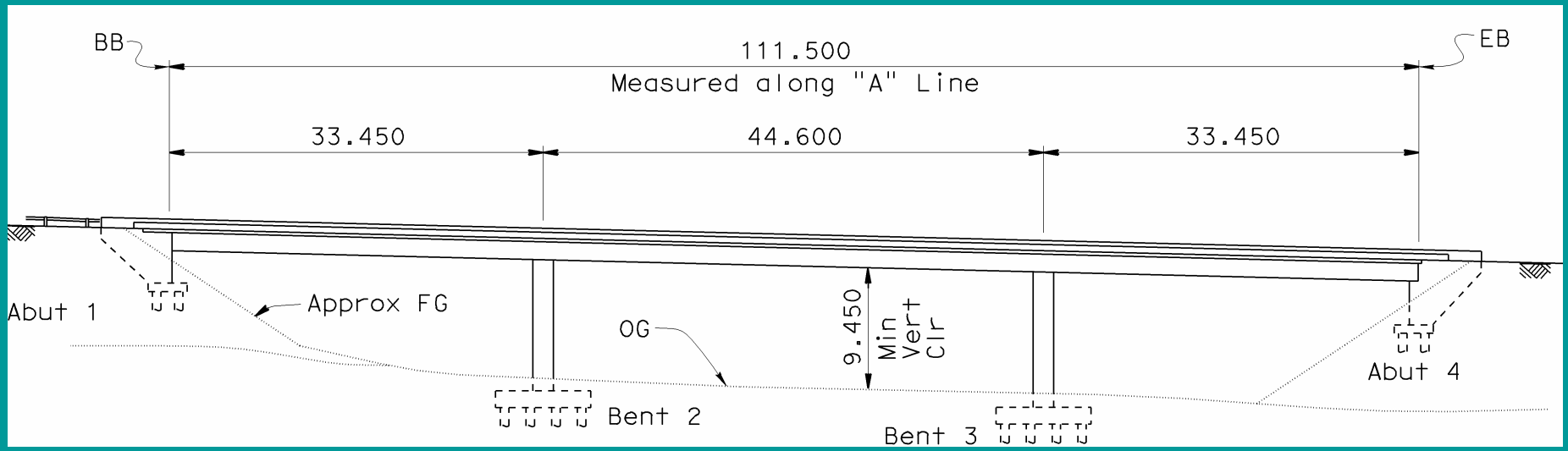
I’m following the gold!

Drilling began May 14, 2008

- Drilled all piles at Angels Creek Bridge
- Drilled all piles at Penstock Bridge
    - **No mineshafts encountered**

Did we dodge the bullet?

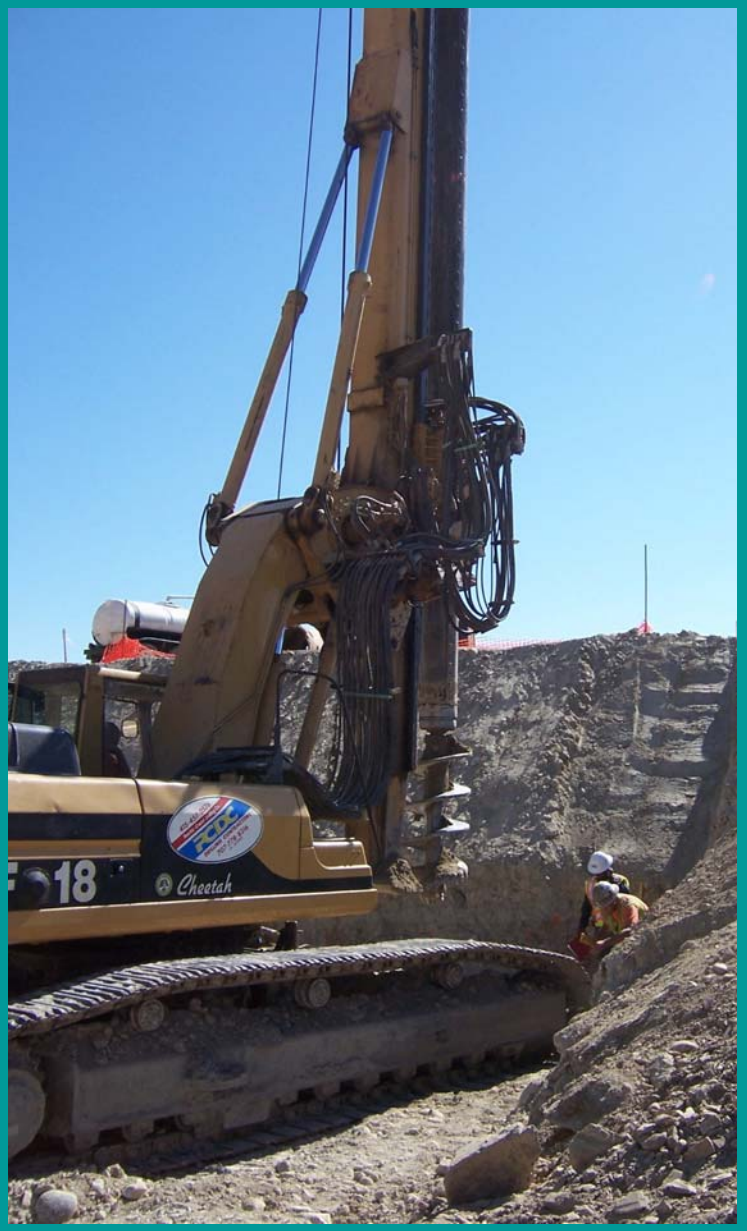
Murphys Grade Rd UC



- 111.5m (365’9”) long
- 9.45m (31’) tall
- 11 piles @ abutments - 16.7m (55’) deep
- 12 piles @ bents – 12m (40’) deep

Murphys Grade Rd UC

- August 11 & 12 – drilled Abutment 4 piles
  - **No mines**
- September 2-9 – drilled Bent 3 piles
  - **No mines**



- September 11 – began drilling Bent 2 piles
- September 12 – Heidi got a phone call

Contractor: Heidi, I think we have a problem.

Yesterday, we drilled 4 piles 40’ deep.

Today two of them were 44’ deep. Didn’t think much of it.

So we put the cage in and started placing concrete. We’ve put two trucks of concrete in the hole and it hasn’t come up the shaft…

AT ALL.

Heidi: “Stop wasting concrete. You’re never going to fill that hole! Looks like we found a mineshaft.

Pull out the rebar cage.

Wait for my call.

I called Foundation Design – Bill Bertucci

Performed research to determine availability of in-house information.

Geotechnical Design Report

HIGHWAY 4 BYPASS - ANGELS CAMP

10-362501
10-CAL-4-KP 33.9/37.7 (PM 21.1/23.4)

Prepared by

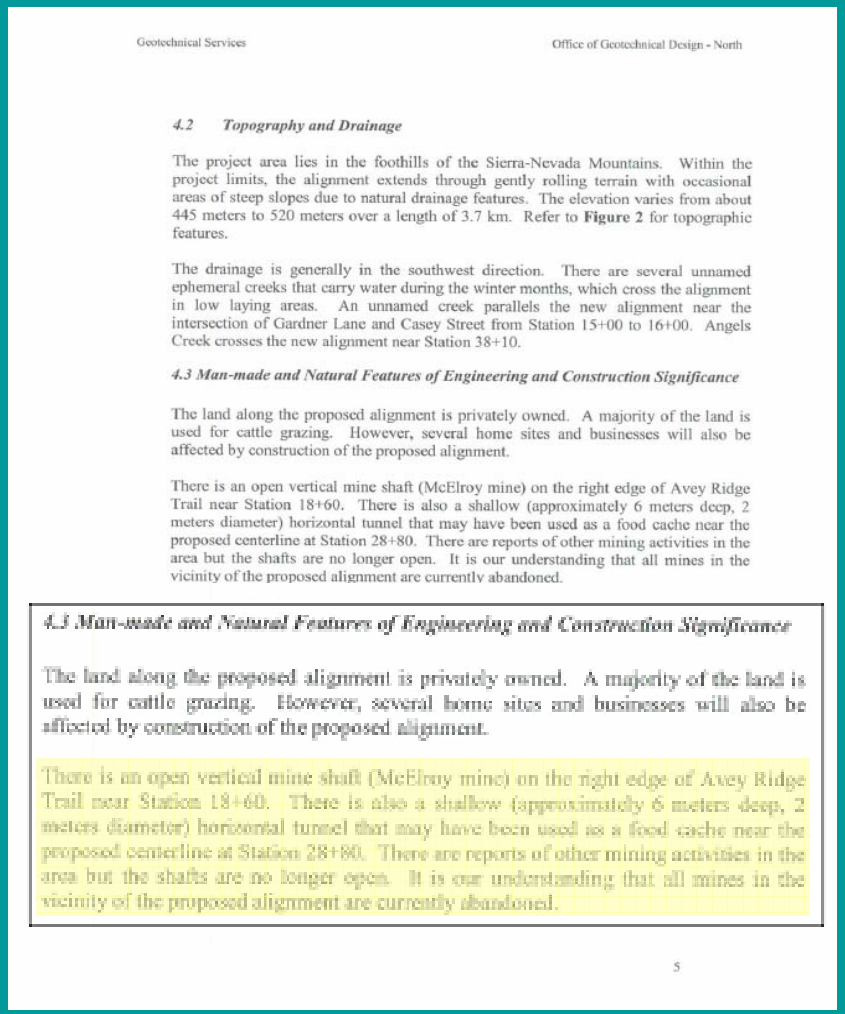
Division of Engineering Services

Geotechnical Services - MS#5

Office of Geotechnical Design - North

October 2002

Generalized clausal statement regarding mining activity in recommendations of Geotechnical and Foundation Reports.



4.2 Topography and Drainage

The project area lies in the foothills of the Sierra-Nevada Mountains. Within the project limits, the alignment extends through gently rolling terrain with occasional areas of steep slopes due to natural drainage features. The elevation varies from about 445 meters to 520 meters over a length of 3.7 km. Refer to **Figure 2** for topographic features.

The drainage is generally in the southwest direction. There are several unnamed ephemeral creeks that carry water during the winter months, which cross the alignment in low laying areas. An unnamed creek parallels the new alignment near the intersection of Gardner Lane and Casey Street from Station 15+00 to 16+00. Angels Creek crosses the new alignment near Station 38+10.

4.3 Man-made and Natural Features of Engineering and Construction Significance

The land along the proposed alignment is privately owned. A majority of the land is used for cattle grazing. However, several home sites and businesses will also be affected by construction of the proposed alignment.

There is an open vertical mine shaft (McElroy mine) on the right edge of Avey Ridge Trail near Station 18+60. There is also a shallow (approximately 6 meters deep, 2 meters diameter) horizontal tunnel that may have been used as a food cache near the proposed centerline at Station 28+80. There are reports of other mining activities in the area but the shafts are no longer open. It is our understanding that all mines in the vicinity of the proposed alignment are currently abandoned.

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Location of abandoned shaft located during performance of project geotechnical investigation.

Upon arriving to the project location, several topographic features stood out as being locations of abandoned mines.

Prominent feature stood out to the south of Murphy's Grade Road.

Discussed with contractor and construction management intent to perform further investigations: possibly boring, geophysics and downhole video.

Investigated reports performed by the United States Geological Survey

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

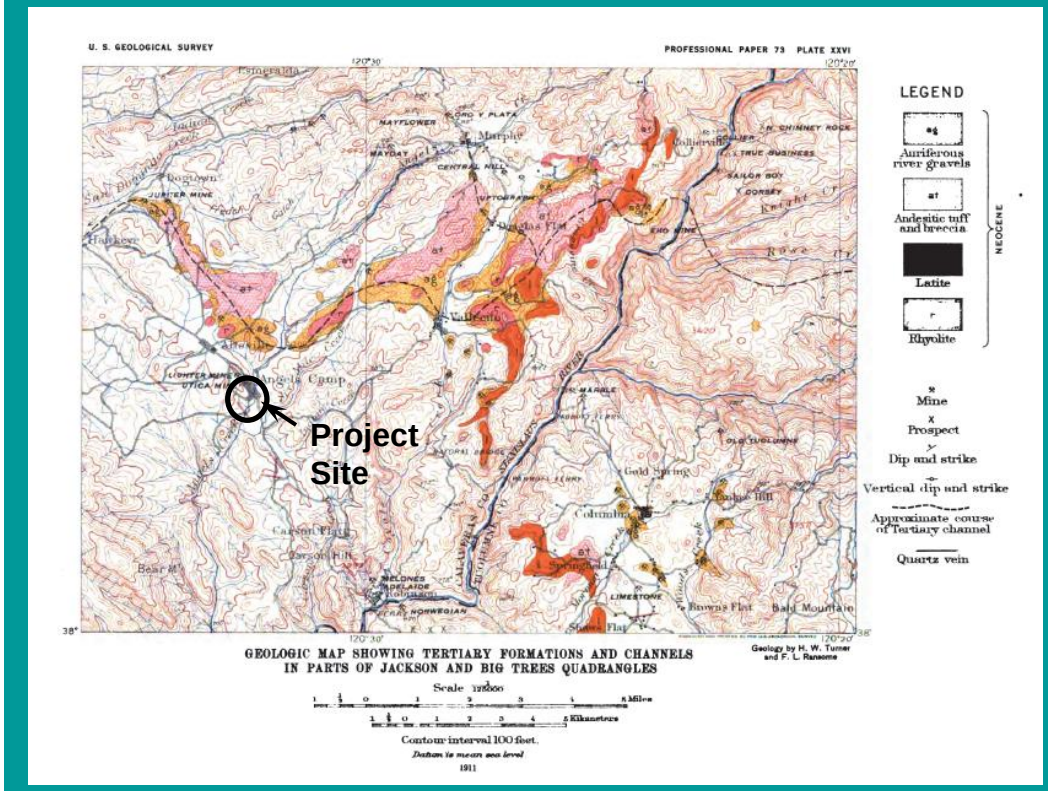
PROFESSIONAL PAPER 73

THE TERTIARY GRAVELS
OF THE
SIERRA NEVADA OF CALIFORNIA

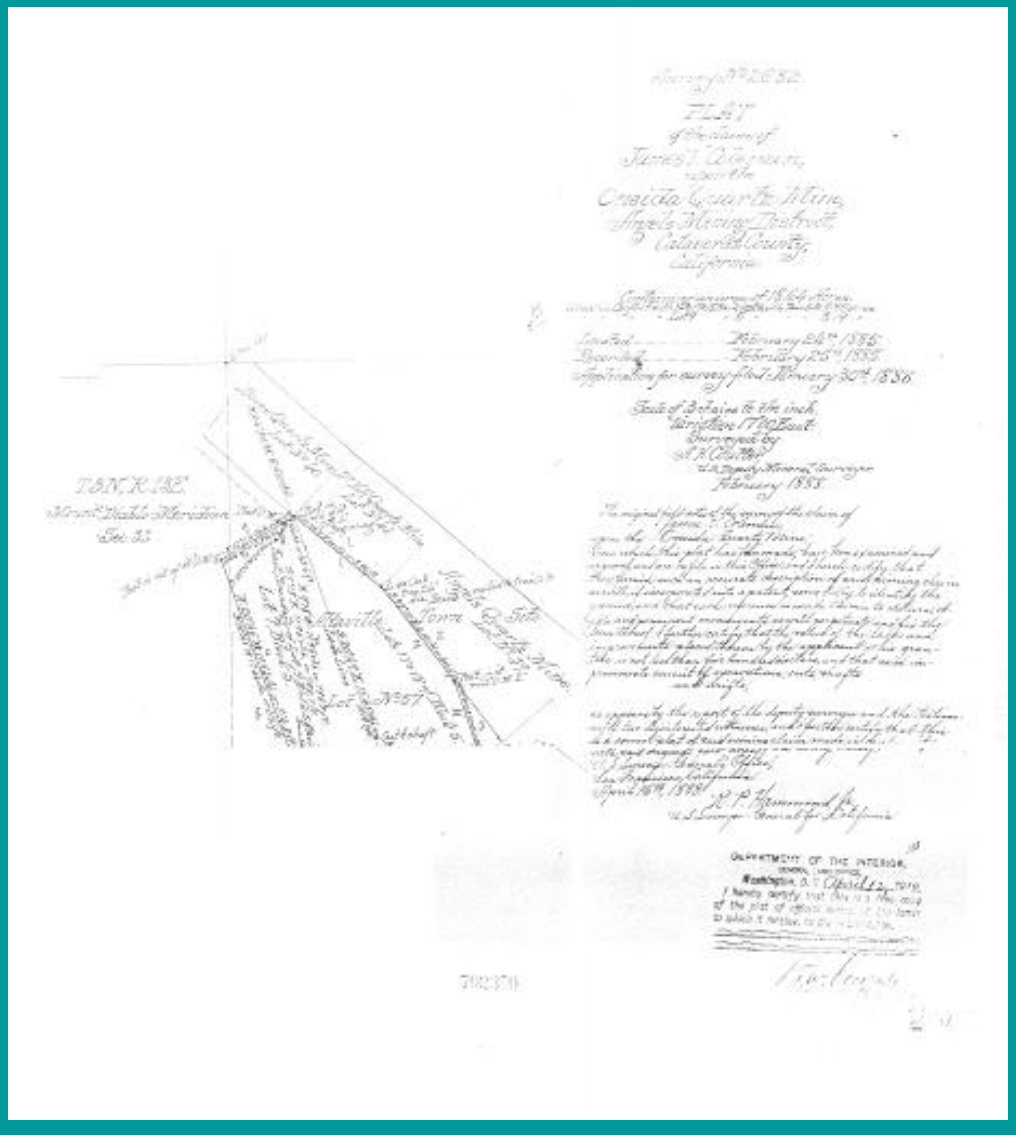
BY

WALDEMAR LINDGREN

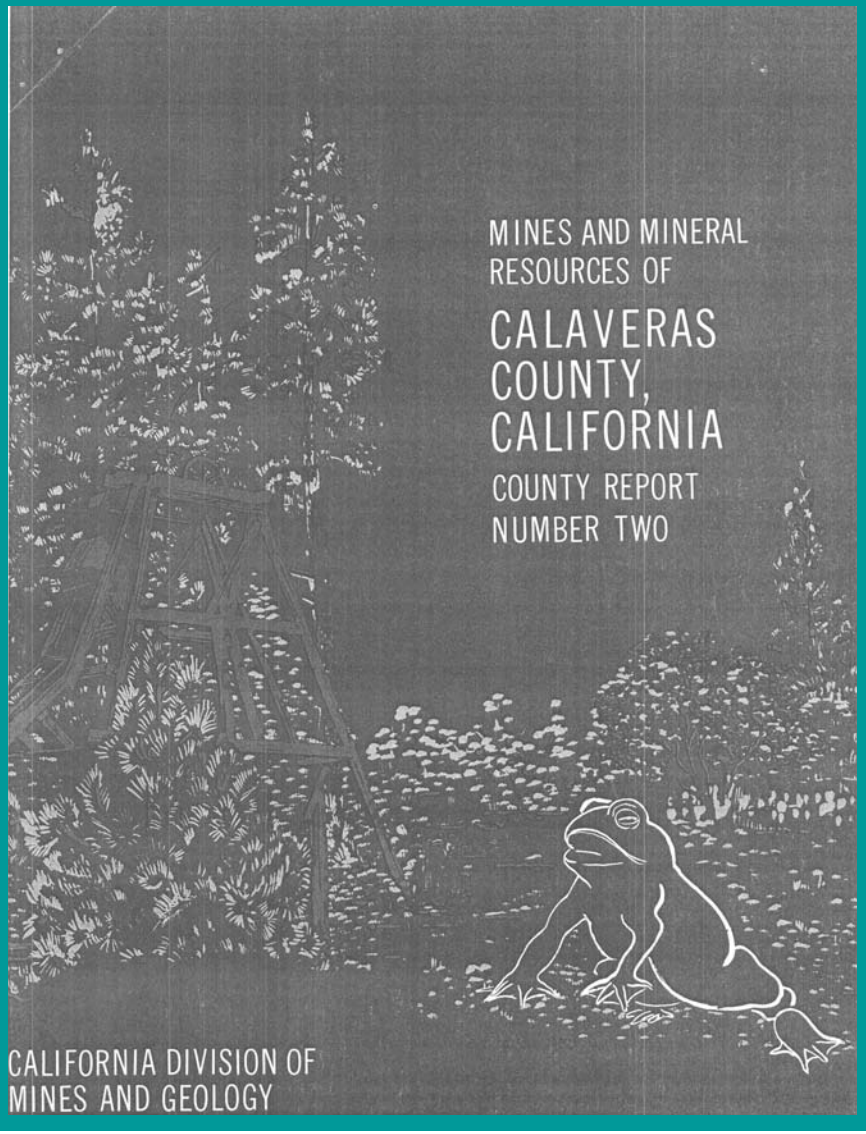
WASHINGTON
GOVERNMENT PRINTING OFFICE
1911



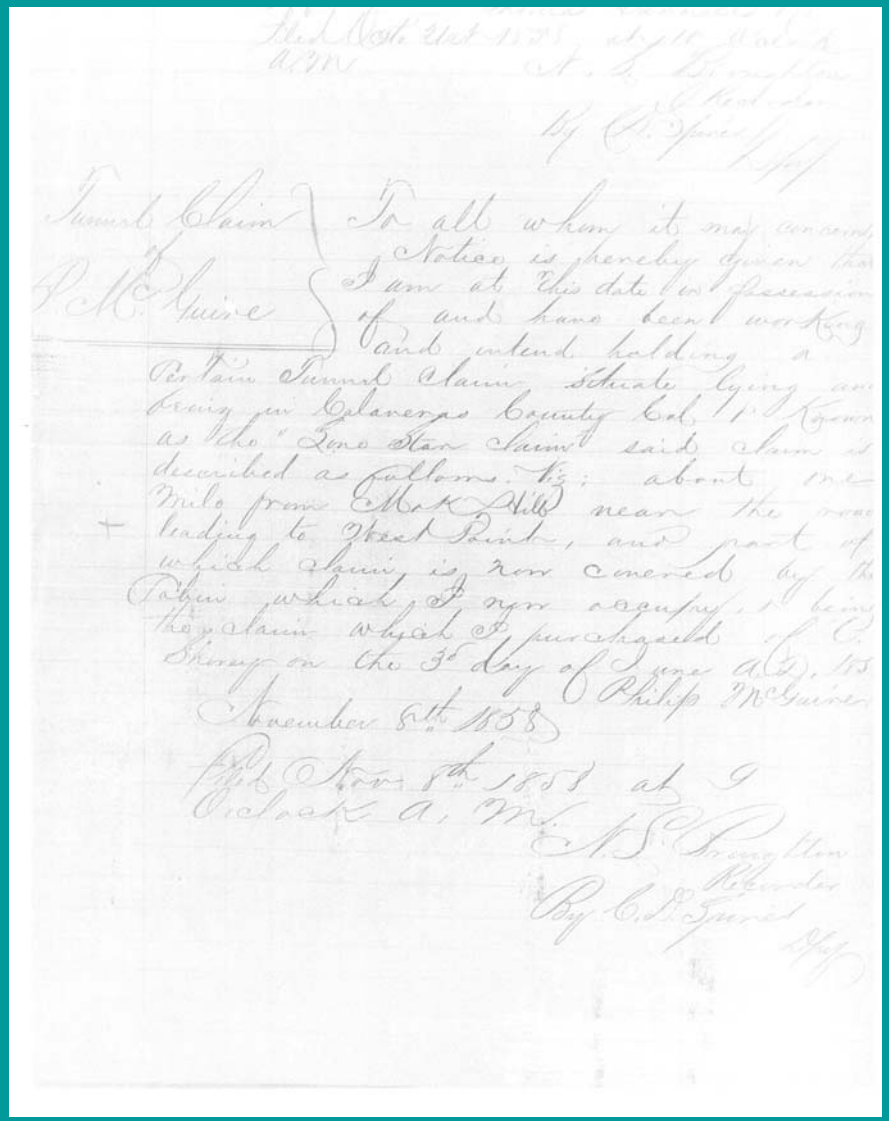
Research conducted at Bureau of Land Management for past mineral surveys.



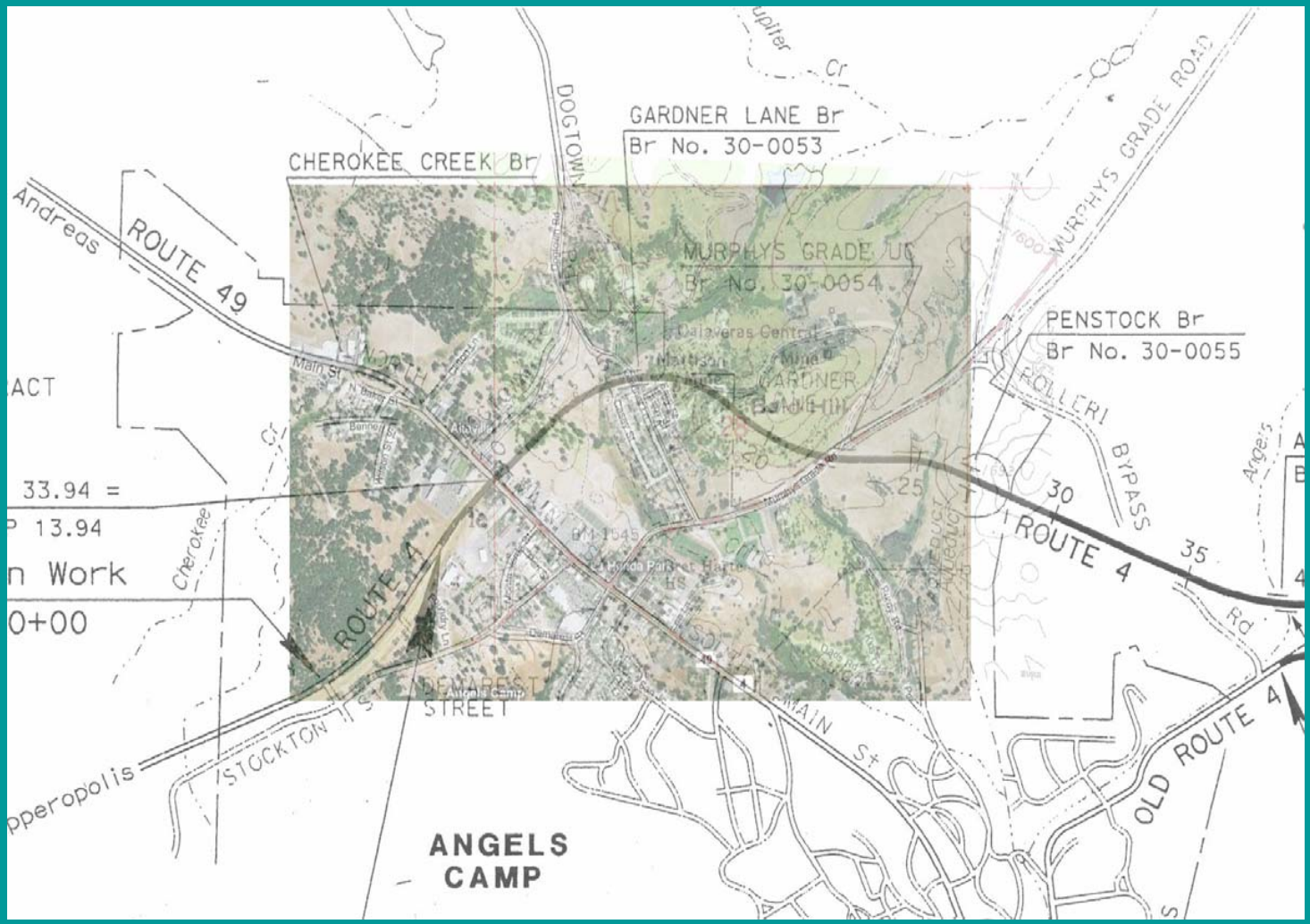
Conducted research at the California Geological Survey Library.



Performed external research at the Calaveras County mine archives.



Compiled data from the various sources to attempt to delineate the extent of the tunnel.

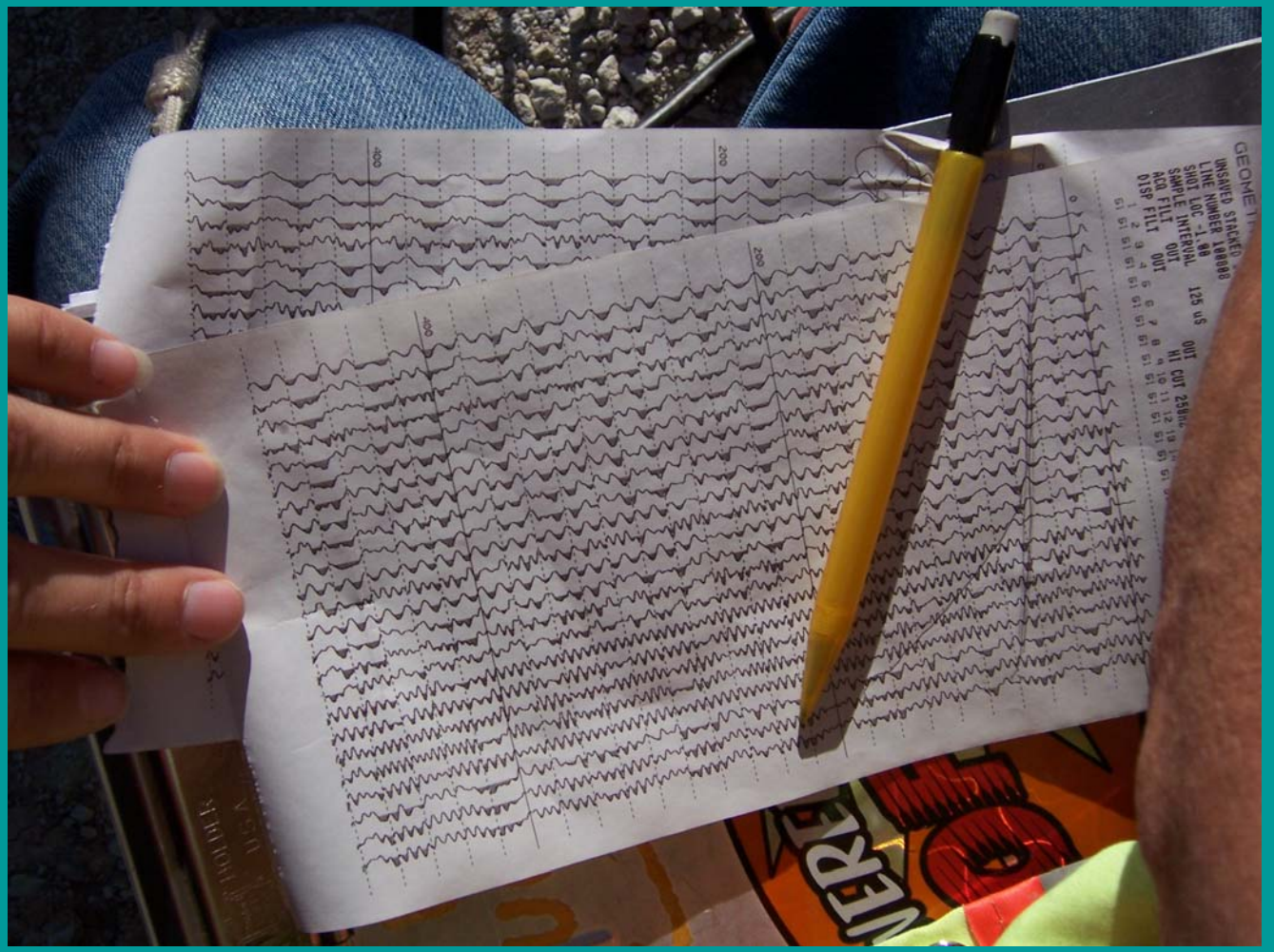


Resourced and consulted with Geophysics branch for geophysical surveys.

Performed Surface Resistivity.

Performed Common Offset Reflectivity.

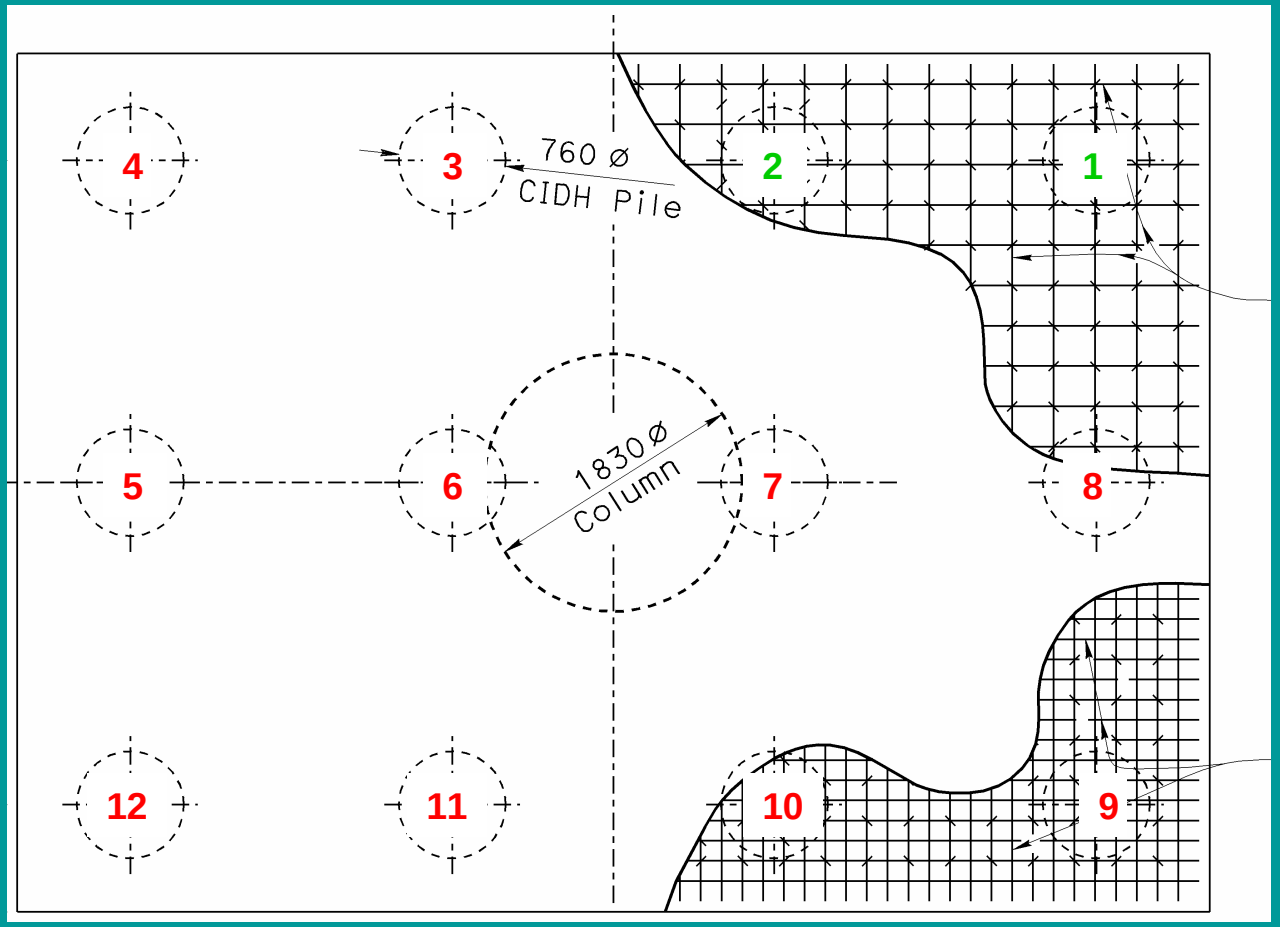
Results concluded that there was not a large scale void beneath the bent cap.



Resourced and consulted with Foundation Testing Branch for downhole video logging.

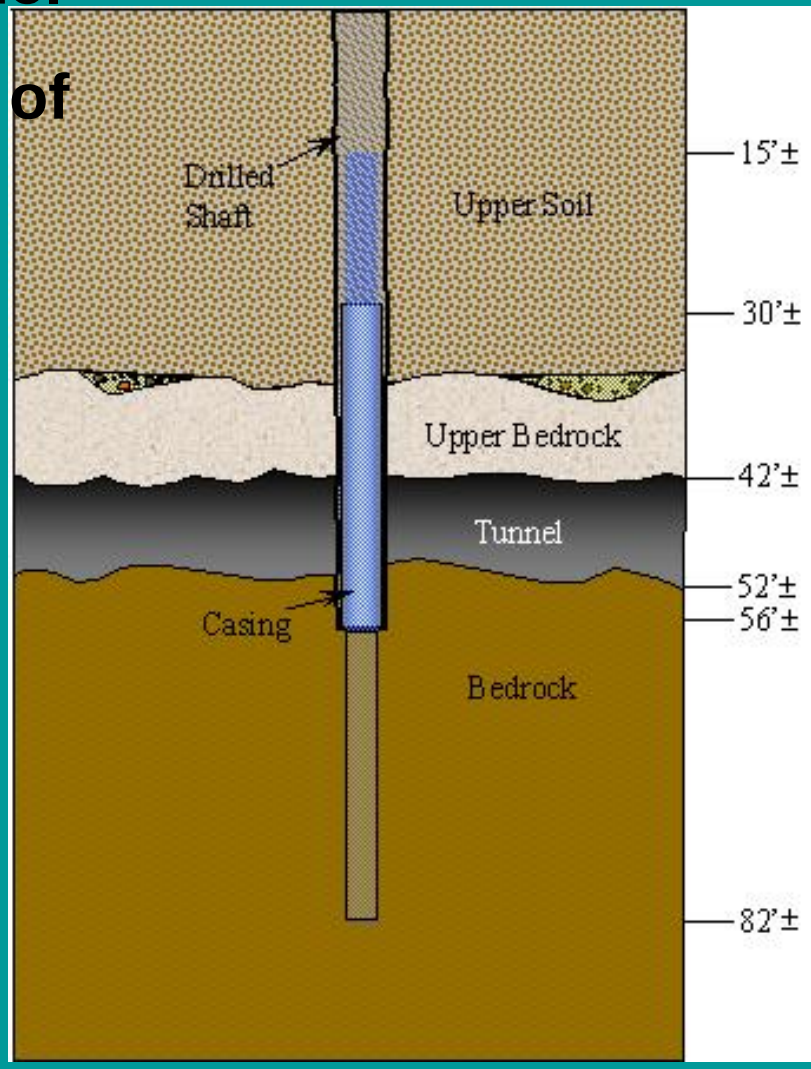
Piles 3, 5, 6, 11 and 12 were downhole logged as well as the abandoned shaft at Station 18+60.

- Additional information about the mine tunnel was needed.
  - How deep is the roof?
  - How tall is the tunnel?
  - In what direction does it run?
  - Which piles are affected?



Direction from Bill was:

- **Install casing larger than original hole**
- **Embed it 2-3’ into bottom of tunnel**
- **Drill additional 10’ below bottom of casing**
- **Extend rebar cage the full length**



- Contractor delivered 32” steel pipe
- Welded teeth onto base of pipe
- Re-reamed the pile shaft
- Cut notches into top of pipe

Contractor inserted casing into the shaft

Contractor spun the casing into place with the drill rig

Contractor used auger to drill additional 10’ below bottom of casing

But when the casing is below the water line, they can’t see the top of casing to align the auger in the shaft

Contractor removed the casing

Used longer casing so top was above water line

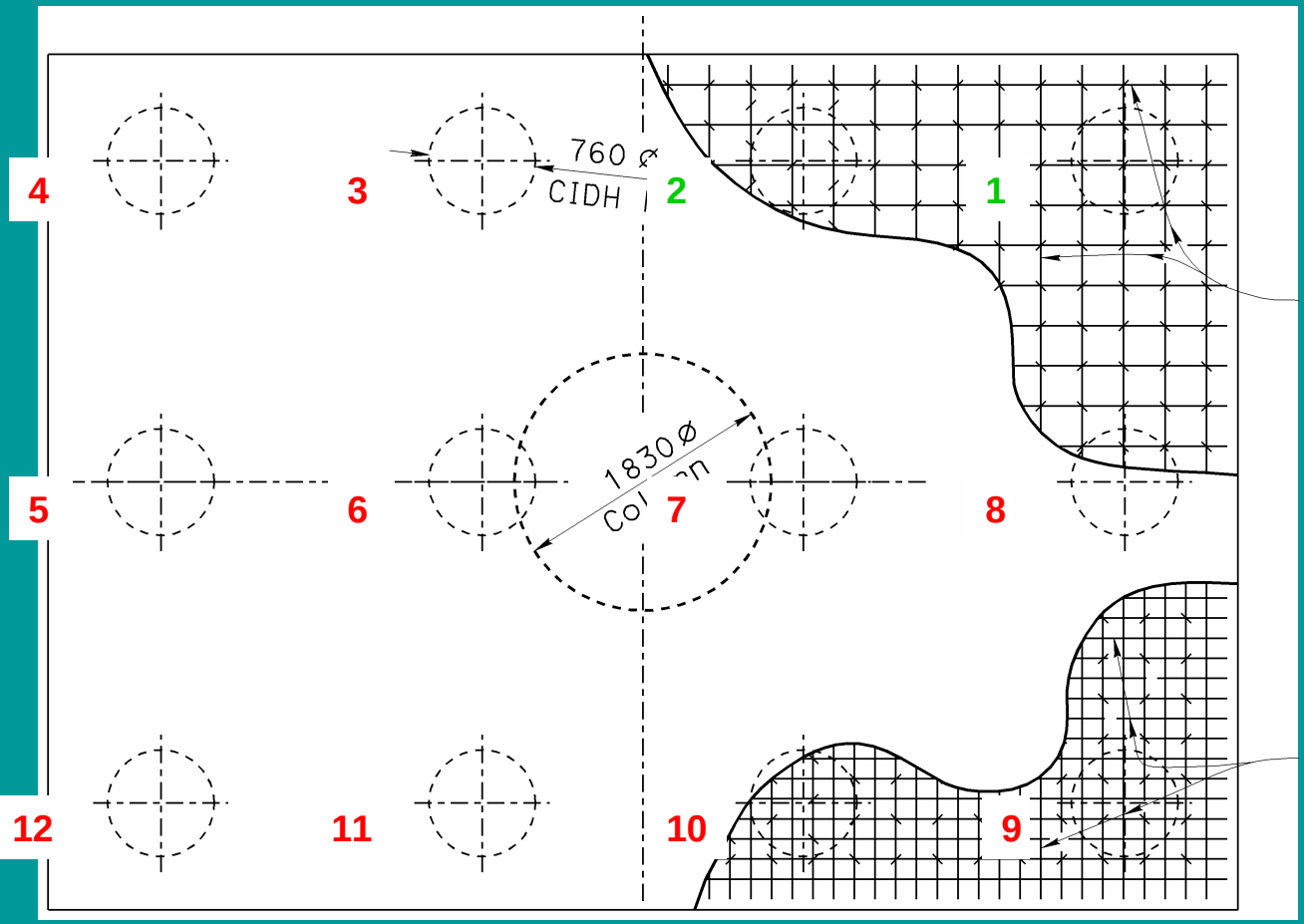
Contractor finished drilling with auger and cleanout bucket

Crane was used to place rebar cage

Larger concrete pump was used to place concrete

The casing for this pile had a plate welded to the bottom and no additional length was required
Concrete was placed in the wet condition
Requiring density testing
Pile 6 became an extraordinary case.
Pile 3 had 2 truckloads of concrete placed in it.
That concrete had filled an area all around it
Auger bit broke off while drilling pile 6

Pile 6 had an anomaly



As allowed by the Specials when anomalies present:

I talked with the Bridge Designer, Corrosion Specialist, Geotech Designer

- **Corrosion not an issue?**
- **Capacity of pile sufficient?**
- **Capacity of the footing as a unit sufficient?**

Adjacent piles gave sufficient strength to the footing.

Pile 6 anomaly mitigation was not required.

Remaining footings were completed without incidence…

Murphys Grade Rd UC

Bridge. No. 30-0054