Opportunities for Public Involvement

- Attend public meetings
- Join the mailing list
- Visit project website

Ranger Laura Trover with Campers on Bikes

- Submit comments on what should be included in the MIAD EIS/EIR

RECLAMATION

Recreation, Safety, and Circulation – Project Footprint

RECLAMATION

Recreation, Safety, and Circulation – Trails

The Folsom Point/Brown's Ravine Trail is a multi-use trail that is a 4 mile long medium intensity use area of the SRA (in red)

RECLAMATION

Recreation, Safety, and Circulation: Green Valley Road

- **Within the MIAD project area, Green Valley Road is a two-lane undivided highway with a 45-mph speed limit.**
- **Presently, Green Valley Road provides an "F" Level of Service (LOS F), representing the worst level of traffic conditions.**

RECLAMATION

Recreation, Safety, and Circulation: Roads

ROAD	LOS
Green Valley Road	LOS F; worst level of traffic conditions
Blue Ravine Road	LOS C; average delays to motorists
E. Natoma Street from Cimmaron Circle to Folsom Dam Road	LOS F; worst level of traffic conditions
East Natoma Street from Folsom Dam Road to Green Valley Road	LOS E; limit of acceptable delay

RECLAMATION

Recreation, Safety, and Circulation: Dam Safety During Construction

- **High water levels at Folsom Reservoir could occur during the period of excavation at the toe of MIAD.**
- **Excavation at the toe of MIAD would weaken the structural integrity of the dam, increasing the risk of failure.**

RECLAMATION

Natural Resources: Contact

If you have questions or comments, please contact:

Laura Caballero
Natural Resource Specialist
Central California Area Office
Bureau of Reclamation
MIAD_mods@mp.usbr.gov or 916-988-1707

Or For more information:
http://www.usbr.gov/mp/jfp/index.html

RECLAMATION

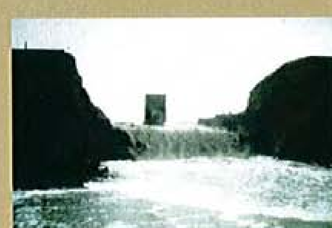
RECLAMATION
Managing Water in the West

Folsom Dam
Safety of Dams Project
Mormon Island Auxiliary Dam (MIAD)
Proposed Modifications

U.S. Department of the Interior
Bureau of Reclamation

Mormon Island Auxiliary Dam
Corrective Action Study Risk Issues

- Lower part of Upstream & Downstream Foundations Liquefiable During Large Earthquake.
- Static Stability Concern for Seepage and Piping
- Overtopping and Erosion During Major Flood
  - (>2000 year flood)
  - JFP Spillway reduces this risk



RECLAMATION

Liquefaction

- Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading. Liquefaction and related phenomena can trigger landslides and cause the collapse of dams.

- Liquefaction occurs in saturated soils, that is, soils in which the space between individual particles is completely filled with water. This water exerts a pressure on the soil particles that influences how tightly the particles themselves are pressed together. Prior to an earthquake, the water pressure is relatively low. However, earthquake shaking can cause the water pressure to increase to the point where the soil particles can readily move with respect to each other.

- Liquefaction of MIAD Tailings was Determined in 1980's

- Remediation of Tailings was Proposed and Implemented in the early 1990's

- Additional Investigation determined lower zones possibly liquefiable of alternatives and study of preferred alternatives under taken in 2004

Increased water pressure can also trigger landslides and cause the collapse of dams. Lower San Fernando dam (above) suffered an underwater slide during the San Fernando earthquake, 1971. Fortunately, the dam barely avoided collapse, thereby preventing a potential disaster of flooding of the heavily populated areas below the dam.

(video link)

RECLAMATION

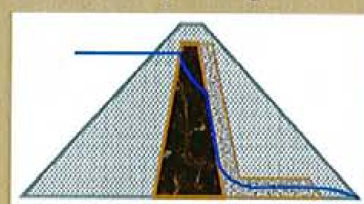
Static Seepage & Piping

- All earth dams have seepage resulting from water percolating slowly through the dam and its foundation. Seepage must, however, be controlled in both velocity and quantity. If uncontrolled, it can progressively erode soil from the embankment or its foundation, resulting in rapid failure of the dam.

- Erosion of the soil begins at the downstream side of the embankment, either in the dam proper or the foundation, progressively works toward the reservoir, and eventually develops a "pipe" or direct conduit to the reservoir. This phenomenon is known as "piping."

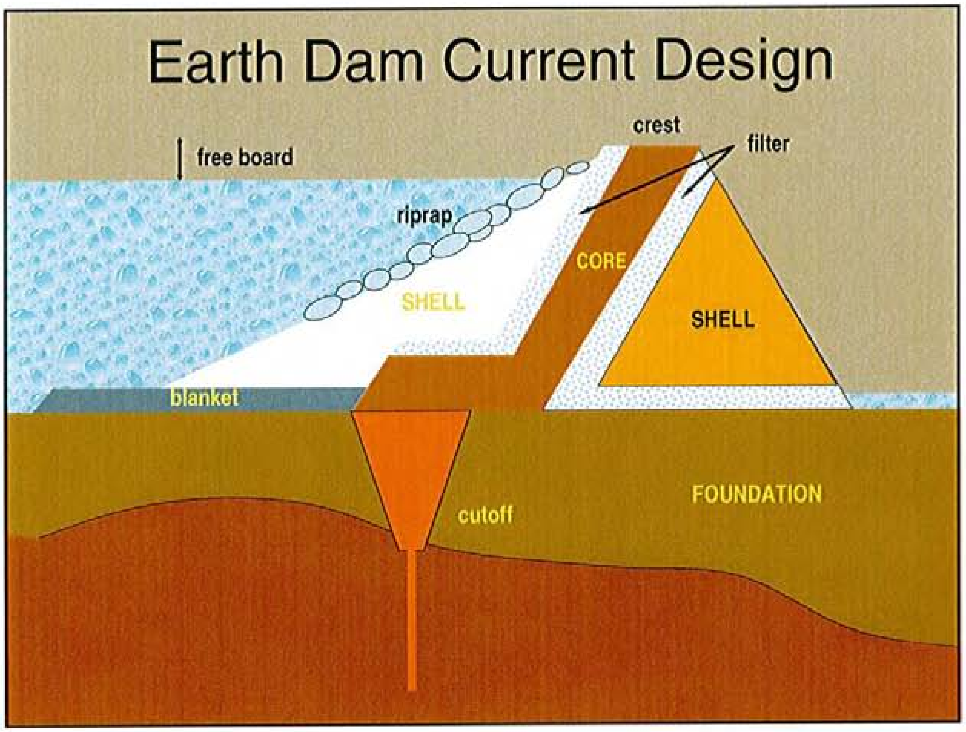
- Seepage, if uncontrolled, can erode fine soil material from the downstream slope or foundation and continue moving towards the upstream slope to form a pipe or cavity to the pond or lake often leading to a complete failure of the embankment.

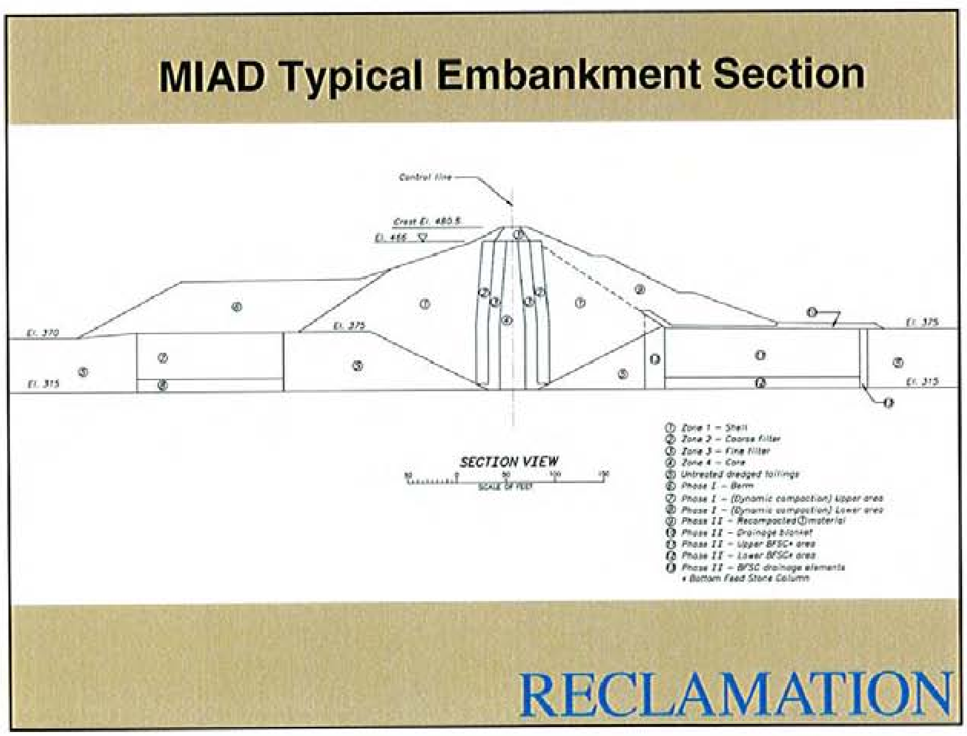
- Seepage failures account for approximately 40 percent of all embankments or dike failures.



(video link)

RECLAMATION


Earth Dam Current Design
crest
filter
free board
riprap
CORE
SHELL
SHELL
blanket
cutoff
FOUNDATION


MIAD Typical Embankment Section
SECTION VIEW
Zone 1 – Shell
Zone 2 – Coarse filter
Zone 3 – Fine filter
Zone 4 – Core
Untreated dredged tailings
Phase I – Berm
Phase I – (Dynamic compaction) Upper area
Phase I – (Dynamic compaction) Lower area
Phase II – Recompacted material
Phase II – Drainage blanket
Phase II – Upper BFSC+ area
Phase II – Lower BFSC+ area
Phase II – BFSC drainage elements
+ Bottom Feed Stone Column
RECLAMATION

Geology

- Foundation Rock
  - Metamorphic Rock of the Amador Group
  - Primarily Schists
  - Numerous Dioritic and Diobasic Dikes
- Blue Ravine
  - Old American River Channel
  - Filled with Alluvial Gravel Deposits
  - Gravels, Sands, Silts & Clays
  - Dredged Tailings - 1800's and early 1900's
  - (Sta. 445 to 455)

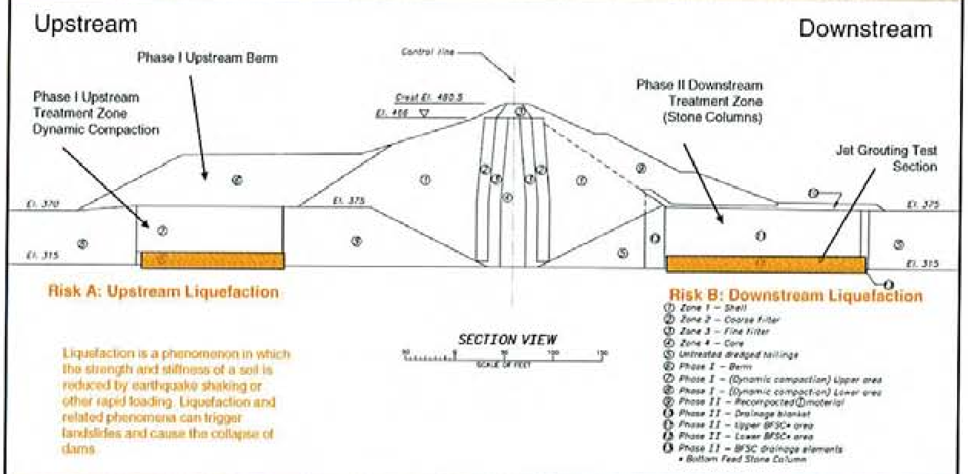
RECLAMATION

INVESTIGATIONS AND ANALYSES

- Drilling Investigations
  - SPT, BPT, Geophysical, Cone Testing, Block Samples, Test Trenches
- Analyses
  - Static, Dynamic, Liquefaction, Deformation, Structural, Other
- Risk Assessment
  - Upstream & Downstream
    - Conclusion: Above ALOL Guidelines
    - Recommend: Additional Treatment Measures Required
      - Increase Density of Lower ~10 feet of Tailings
      - Document Reduced Risk with Testing

RECLAMATION

MIAD Previous Modifications



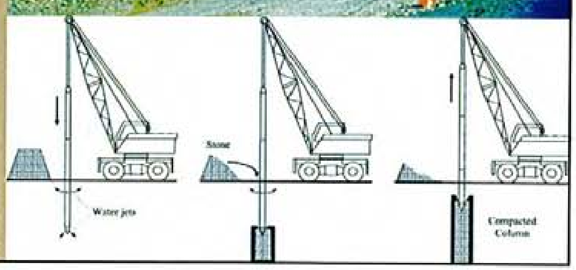
Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading. Liquefaction and related phenomena can trigger landslides and cause the collapse of dams

RECLAMATION

MIAD PHASE I & II MODIFICATIONS

Phase 1 (1990-91): Dynamic Compaction Upstream Constructed a 55-foot High Berm

Phase 2 (1993-94): Stone Columns Downstream



Mormon Island Auxiliary Dam
Corrective Action Study

Seismic Alternatives Considered:

(To be combined with Static and Hydrologic Alternatives)

- **In-situ densification of upstream and downstream treatment zones – Jet Grouting**
- **Downstream overlay, Excavate and Replace with Soil or RCC**
- **Series of Concrete Walls in Foundation Perpendicular to Crest**
- **Continuously Dewater**

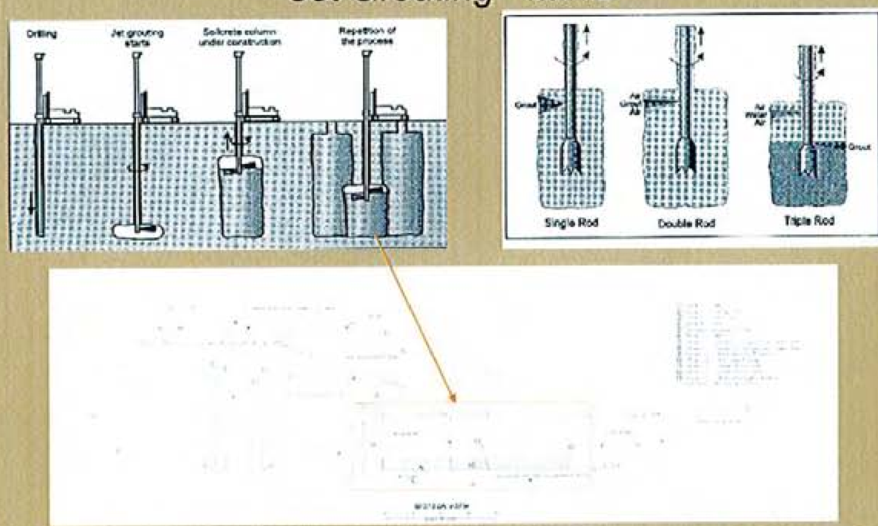
RECLAMATION

Jet Grouting Test Section

(Determined to be technically & economically not feasible)

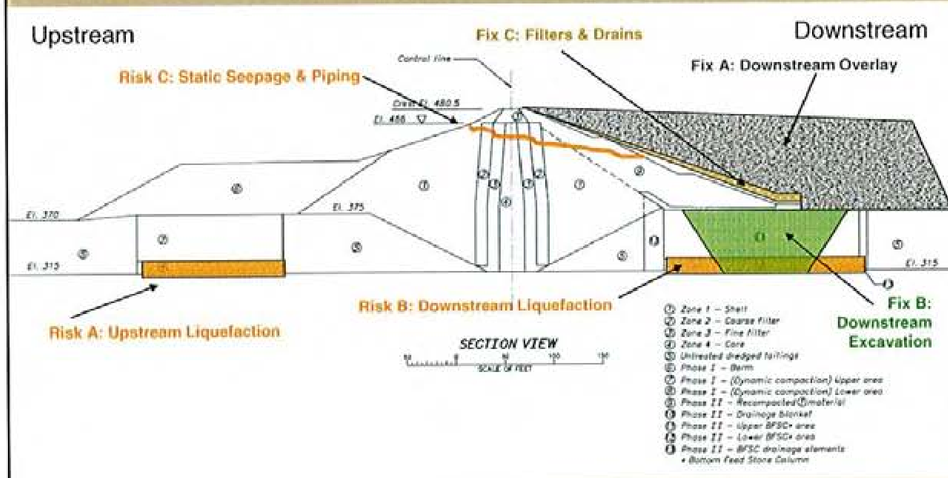
RECLAMATION

Seismic Element Option
Jet Grouting - MIAD



RECLAMATION

Risk and Risk Reduction Modifications



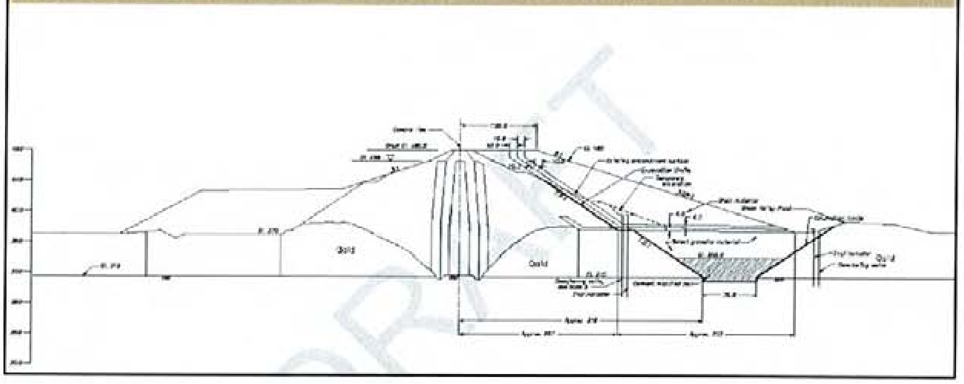
Filter elements allow water to safely pass and prevents internal soil erosion

RECLAMATION

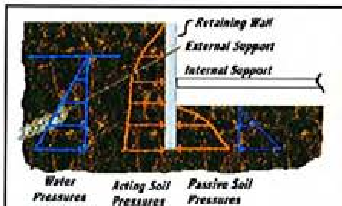
Conventional Excavate and Replace

Advantages: Known methods, Reclamation experience, may be least costly

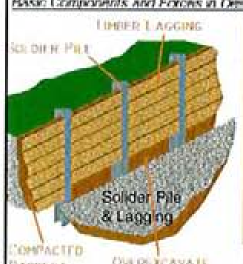
Disadvantages: Highest construction risk and environmental impacts including road

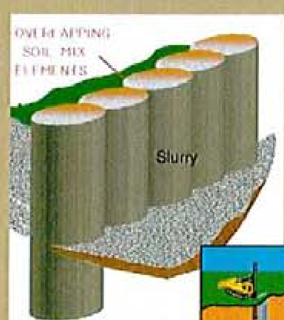


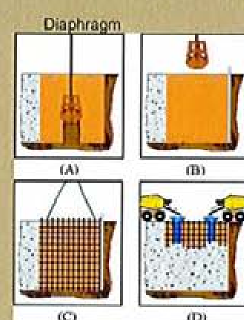
Walls Types

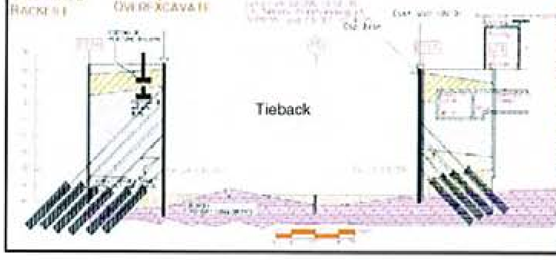


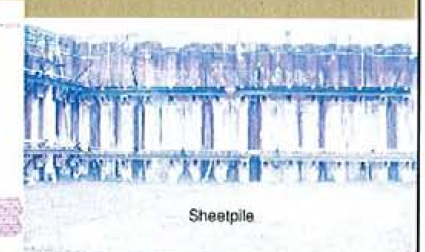
Basic Components and Forces in Deep Excavations







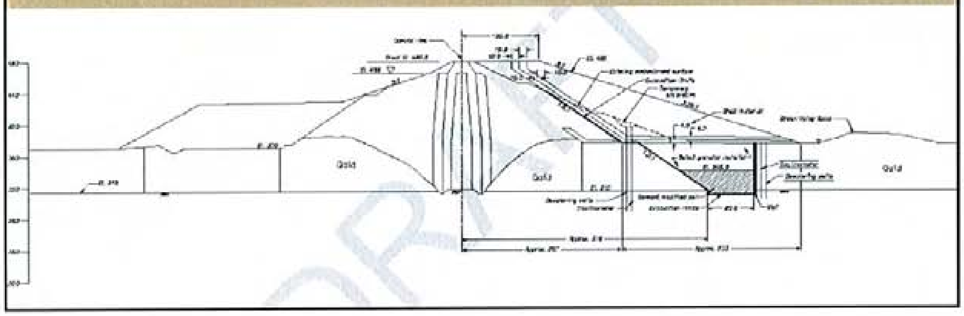




Single Wall Excavate & Replace

Advantages: Known methods, less Reclamation experience, reduces footprint

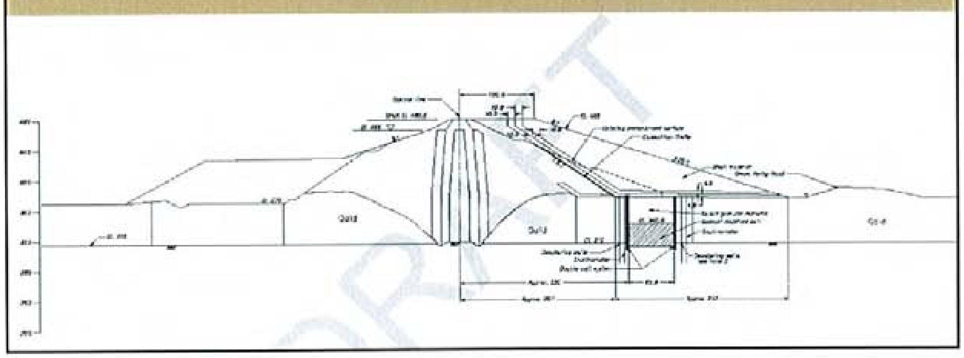
Disadvantages: Highest construction risk remains similar, environmental impacts reduced at the expense of cost and complexity



Dual Wall Excavate & Replace

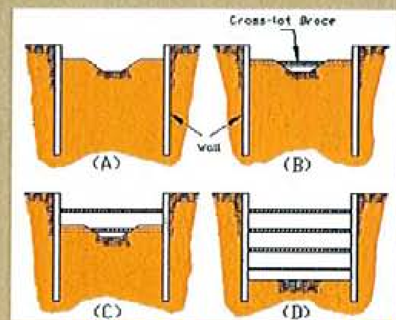
Advantages: Known methods, little Reclamation experience, reduces footprint significantly

Disadvantages: Construction risk reduced, environmental impacts reduced at the expense of significant cost and complexity



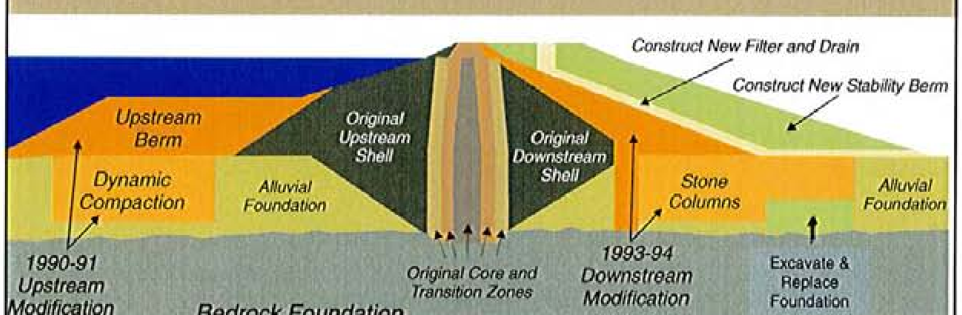
Cellular Excavate & Replace

- Advantages: No Reclamation experience, reduces footprint dramatically Construction risk nearly eliminated along with most, environmental impacts
- Disadvantages: Reductions come with increase time and cost



RECLAMATION

MIAD at Completion



RECLAMATION

SUPPLEMENTAL ENVIRONMENTAL DOCUMENTATION

- PREVIOUS ENVIRONMENTAL STUDIES
- PREVIOUS ENVIRONMENTAL ANALYSIS
- FOLSOM EIS DOCUMENT
  - PLANNING DOCUMENT (ROD) WITH MOD REPORT
  - SUPPLEMENTAL DOCUMENT WITH FINAL DESIGNS
- REVISED ENVIRONMENTAL COMMITMENT PLAN
- REVISED MITIGATION PLAN

RECLAMATION

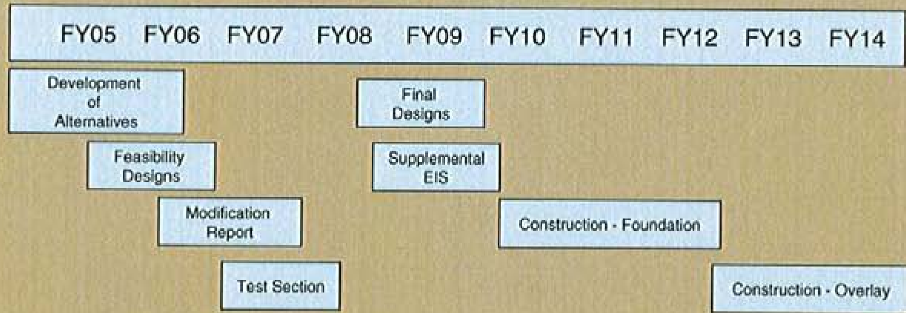
Potential Issues of Concern

- Water quality concerns, ground water concerns
- Wetlands concerns (area across Green Valley Road)
- Other air quality concerns:
  - Monitoring for naturally occurring asbestos
  - dust, construction equipment emissions
- Endangered species concerns
- Public safety during construction
  - Minimizing construction risks
  - Hours of construction
  - Noise from trucks and excavation activities
- Recreation, hiking, closure of trail and parking lot
  - When will closures begin
  - How long will closures last
  - Impacts to recreationists
  - Trail detours
- Potential impacts to Green Valley Road
  - Impacts to City of Folsom easement
  - Impacts to commuters
  - Traffic concerns
  - Signage, flagmen, etc.

RECLAMATION

MIAD

Safety of Dams Proposed Schedule



RECLAMATION

END OF PRESENTATION

PLEASE VISIT OTHER STATIONS FOR FURTHER PROJECT INFORMATION

RECLAMATION

RECLAMATION
Managing Water in the West

Safety of Dams Project
Mormon Island Auxiliary Dam (MIAD)
SITE HISTORY

U.S. Department of the Interior
Bureau of Reclamation

Historical Mormon Island

- *Mormon Island* was once a mining community, which had an abundance of Mormon immigrants seeking fortune along the American River. At its peak, the community was home to 2,500 residents, 4 hotels, 1 school, and 7 saloons.
- The "island" was formed by the American River to the west, north, and east and a man-made canal to the south.
- The town of Morman Island developed upon the higher ground to the south of the canal.

MORMON ISLAND.

RECLAMATION

Historical Mormon Island

In the search for new gold deposits, after the miners began to separate and spread out from Coloma, one of the first notable places occupied was Mormon Island. The community dwindled after the California gold rush and was eventually razed as the Folsom Dam project was set to flood the town in 1956.

The only visible remnant of this community is a relocated cemetery on the dry side of Mormon Island Auxiliary Dam.

RECLAMATION

Historical Mormon Island

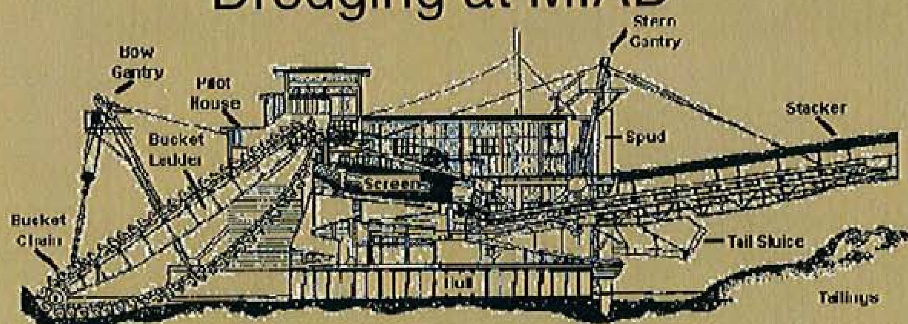
RECLAMATION

Folsom Gold Dredging District

- The District extended from Folsom southwest along the American River to Fair Oaks, Natoma, and Nimbus and bounded on the east by Mather.
- The dredged area is approximately 10 miles long and up to 7 miles wide. The Folsom District is also known as the American River District.
- The region around Folsom and Mormon Bar was extensively placer-mined during the gold rush, with minor lode mining. The area was originally settled in 1849 and was first known as Negro Bar. The present town was laid out in 1855 by T. D. Judah for the Sacramento Valley Railroad and named for Captain J. L. Folsom, quartermaster of Stevenson's Regiment.

RECLAMATION

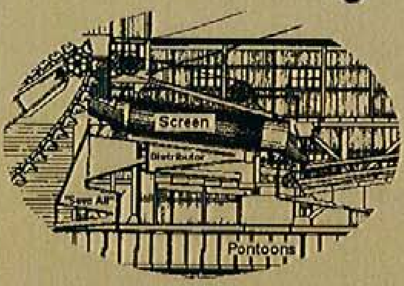
Dredging at MIAD



Numerous Chinese worked the region from the 1860s through the 1890s. A primitive grab-dredger was active at Natoma in 1894. Bucket-line dredging began at Folsom in 1898 and soon became a major industry. Most of the dredging companies were merged into Natomas Consolidated of California.

RECLAMATION

Dredging at MIAD



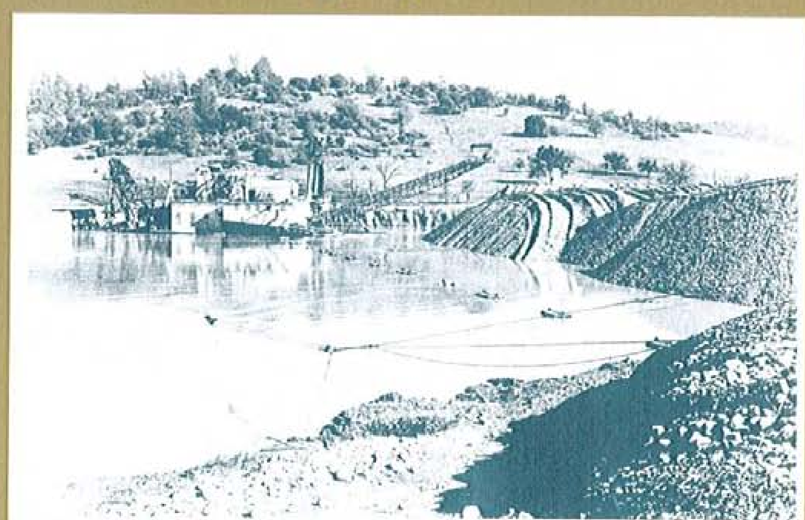
TYPICAL DREDGE

Dredging operations were curtailed during World War II but were resumed on a major scale shortly afterward. However, increasing costs, the depletion of dredging ground, and changing land values caused the dredging operations to be gradually curtailed. By 1960, there was only a single active dredge, and this was shut down in February 1962.

Large portions of the dredged-over areas are now occupied by defense industries, such as the Aerojet-General Corporation and Douglas Aircraft Company plants and by housing tracts. Folsom, one of the largest dredging fields in California, had a total output estimated at $125 million. Approximately one billion cubic yards of gravel were dredged by the Natomas Company.

RECLAMATION

Dredging at MIAD



RECLAMATION

Dam History

- Folsom Project built by US Corps of Engineers from 1948 to 1956
  - Operation and maintenance transferred to Reclamation in May 1956
- Zoned Earthfill Embankment Dam
  - Crest elevation - 480.0 feet
  - 110.0 - feet high
  - 4,820.0 - feet long
- MIAD Constructed Over Dredged Tailings
  - Central core and filters extend down to bedrock
  - Upstream & downstream toe founded on approximately 60 feet of tailings

RECLAMATION

RECLAMATION