Southern Nevada Water Authority

Lake Mead Water Intake No. 3 Update

Ecosystem Monitoring Workgroup

May 23, 2013

The Situation

- Drought in the Colorado River basin
- Colorado River supplies 90% of Las Vegas' water

1983

2011

Existing Lake Mead Water Facilities

Intake No. 1

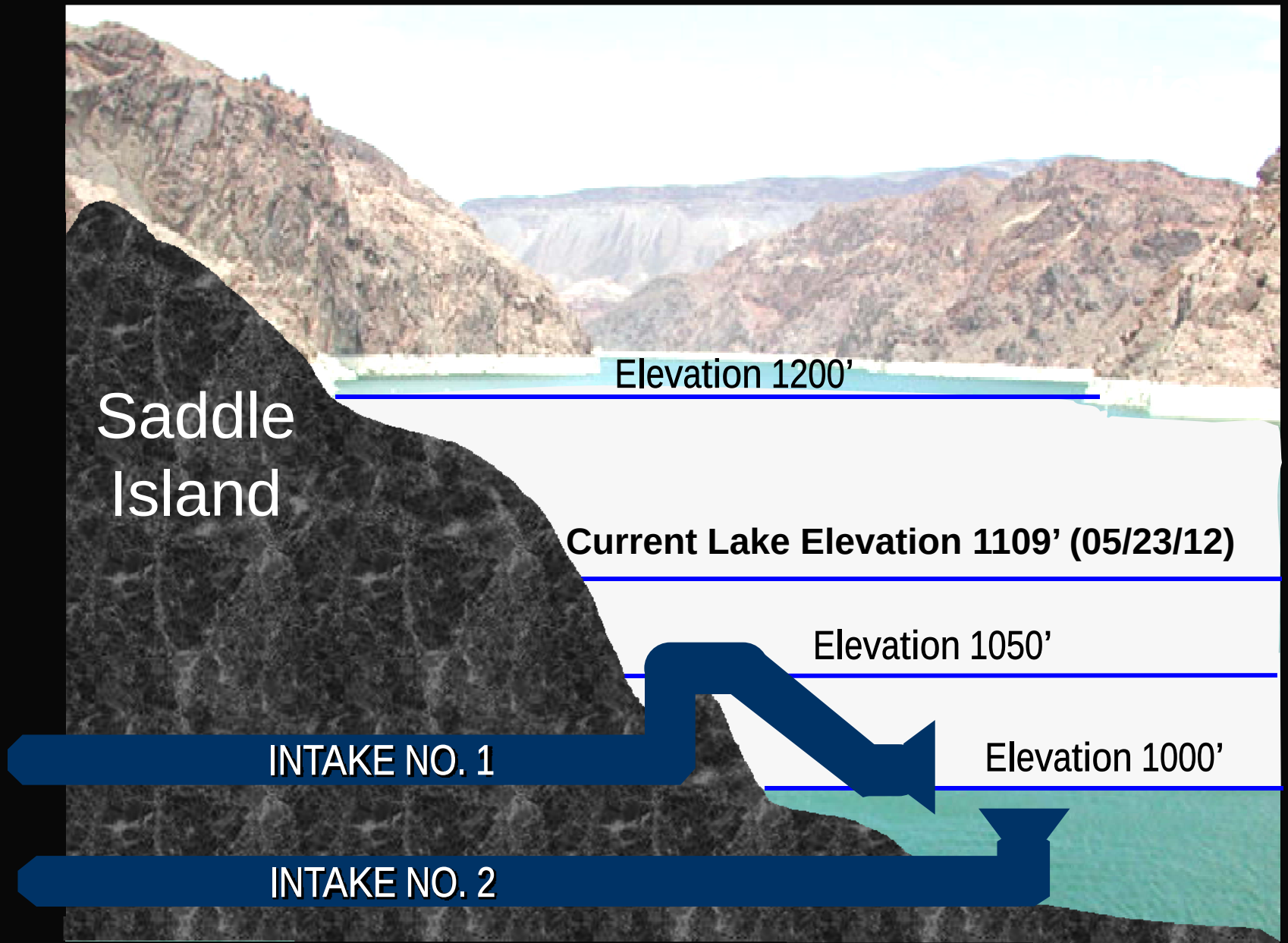
- Intake Pumping Station No. 1 (IPS-1)
- Supplies AMS Water Treatment Facility
- Pumping Capacity – 600 mgd
- Intake Elev=1050’

Intake No. 2

- Intake Pumping Station No. 2 (IPS-2)
- Supplies RM Water Treatment Facility
- Pumping Capacity - 720mgd
- Intake Elev.=1000’

Source: MapQuest

Lake Mead Water Level Impacts



Project Objectives

Intake No. 3 - Primary Objective

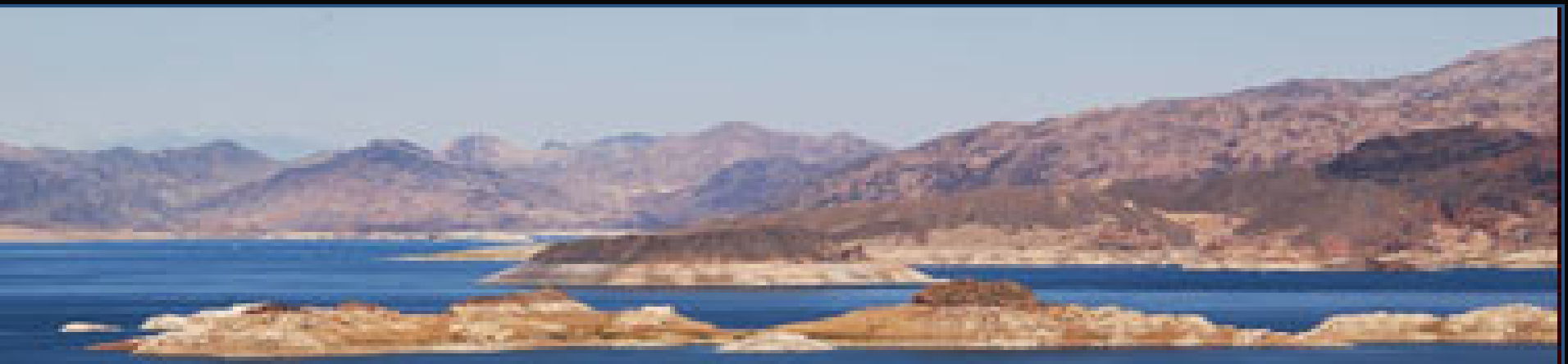
- Preserve existing capacity if lake levels fall below elevation 1,050 feet

Intake No. 3 - Secondary Objectives

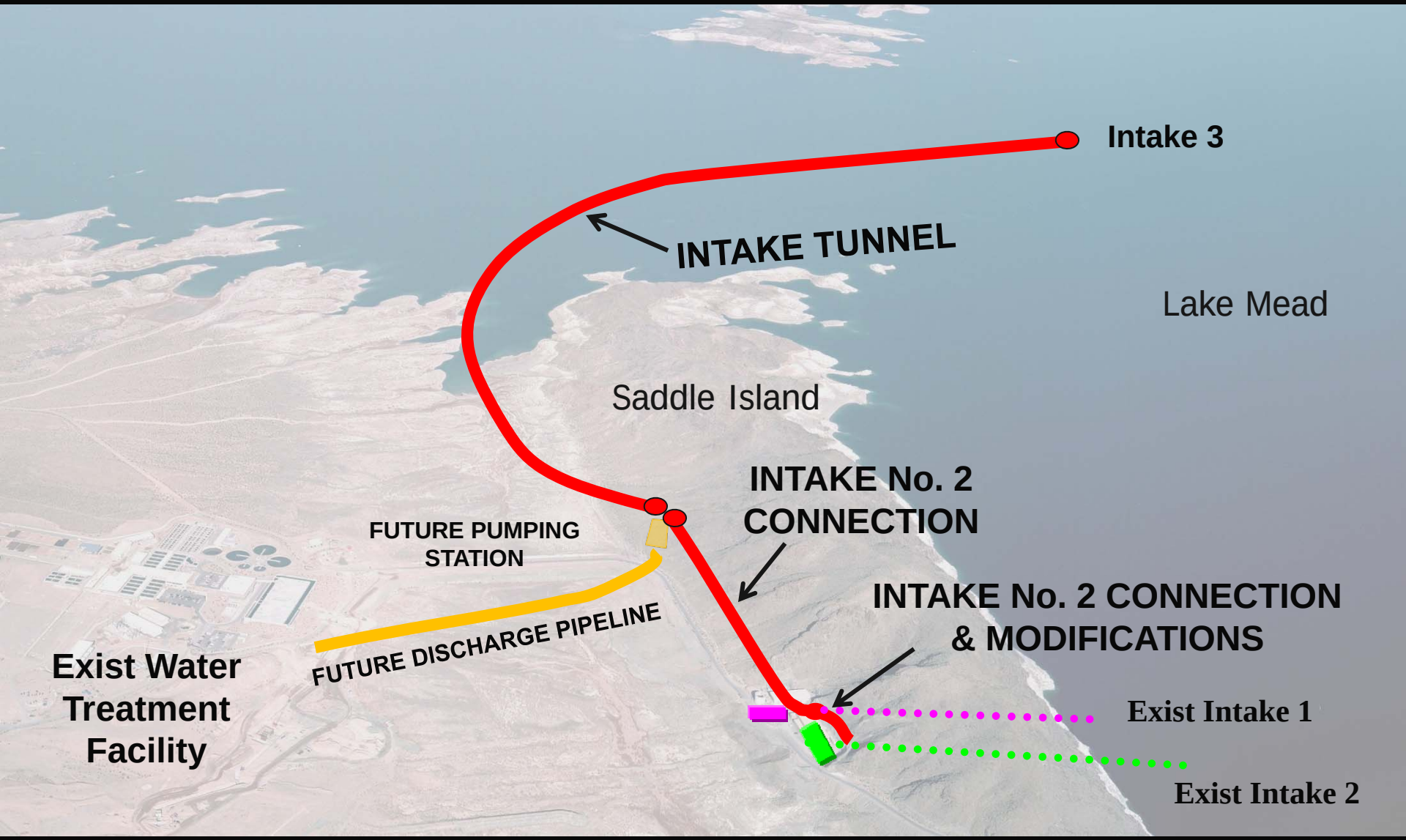
- Improve water quality
- Improve system reliability and operational flexibility

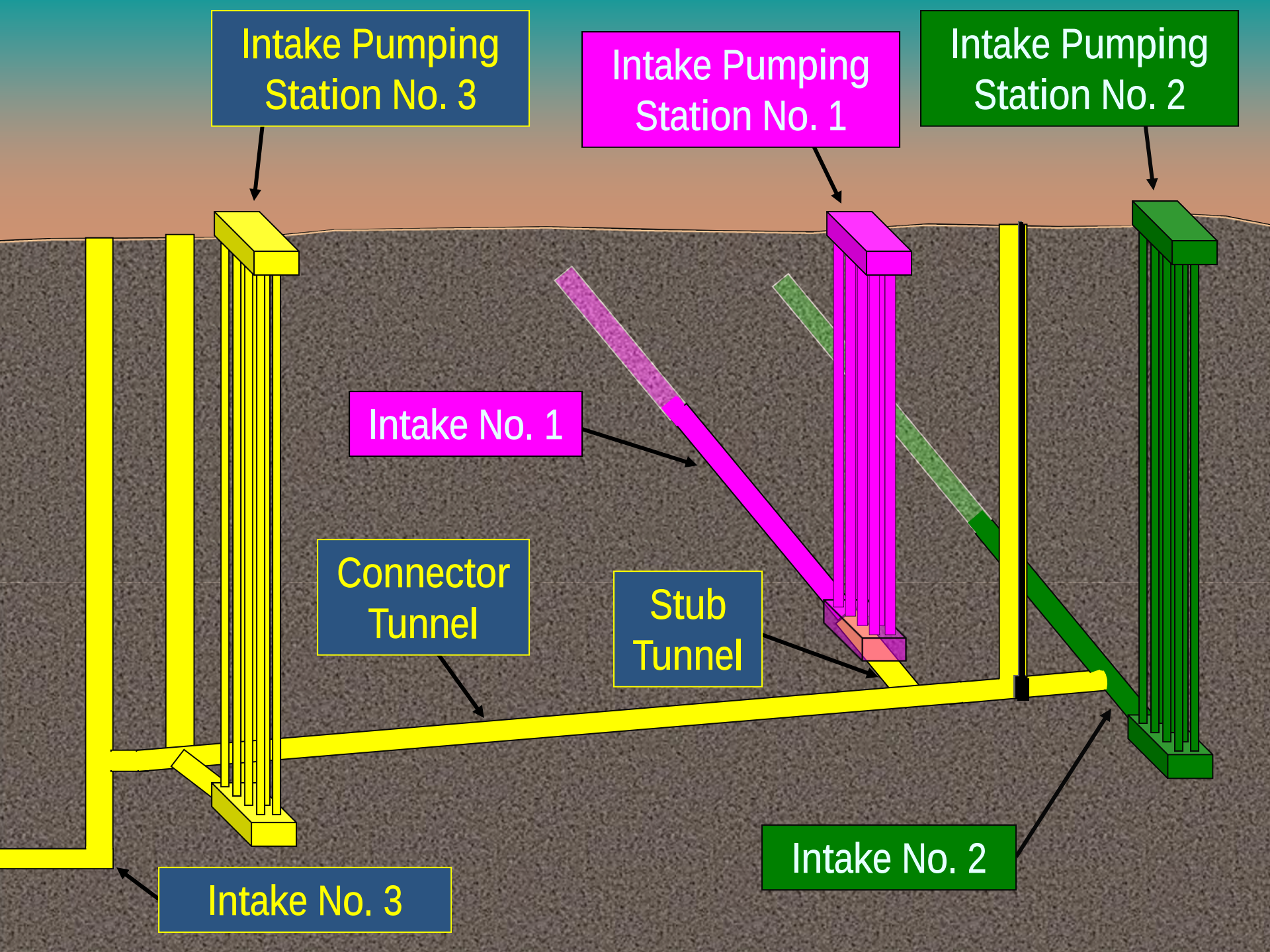
The Project – Lake Mead Intake No. 3

- Approved by SNWA Board of Directors May 2005
- Six contracts (originally), $817 Million total (est)... *now three major contracts $650M (est – Construction value)*
- Completion 2014*



Intake No. 3

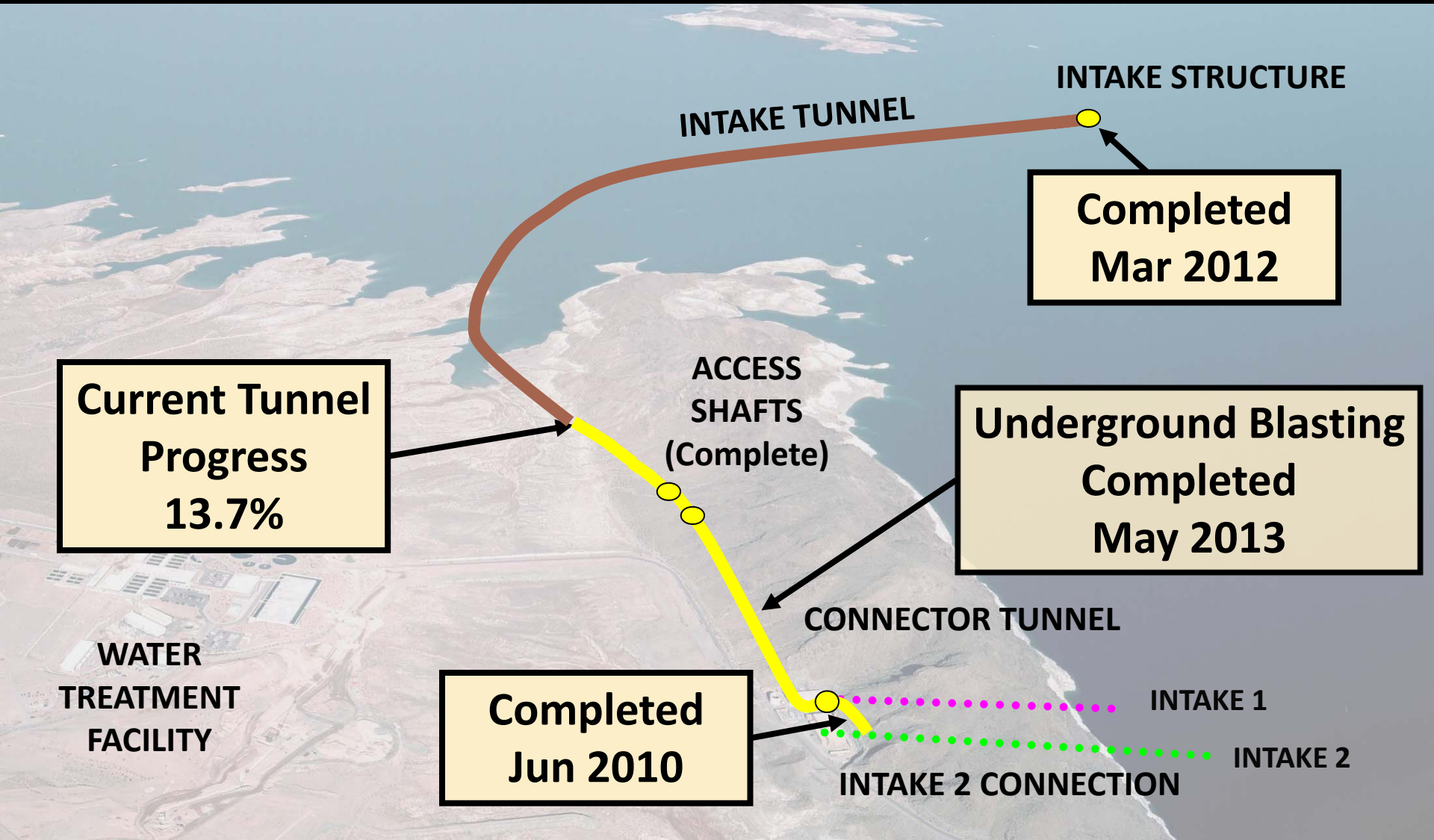

Intake 3
INTAKE TUNNEL
Lake Mead
Saddle Island
INTAKE No. 2
CONNECTION
FUTURE PUMPING
STATION
INTAKE No. 2 CONNECTION
& MODIFICATIONS
FUTURE DISCHARGE PIPELINE
Exist Water
Treatment
Facility
Exist Intake 1
Exist Intake 2


Intake Pumping Station No. 3
Intake Pumping Station No. 1
Intake Pumping Station No. 2
Intake No. 1
Connector Tunnel
Stub Tunnel
Intake No. 2
Intake No. 3

Challenges

- Variable Geology – Hard rock to weak/fractured
- High Water Pressures – Max potential 17 bar
- *Intake Riser Construction – Completed*
- Intake Riser Connection

Lake Mead Intake No. 3
Current Progress



Contract 05 – Intake No. 2 Connection & Modifications

Barnard (Design-Bid-Build) ~ $30 million

May 2008 – June 2010

Access Shaft (Isolation Gate)

- ~ 380’ deep
- 22’ interior diameter

Isolation Gate

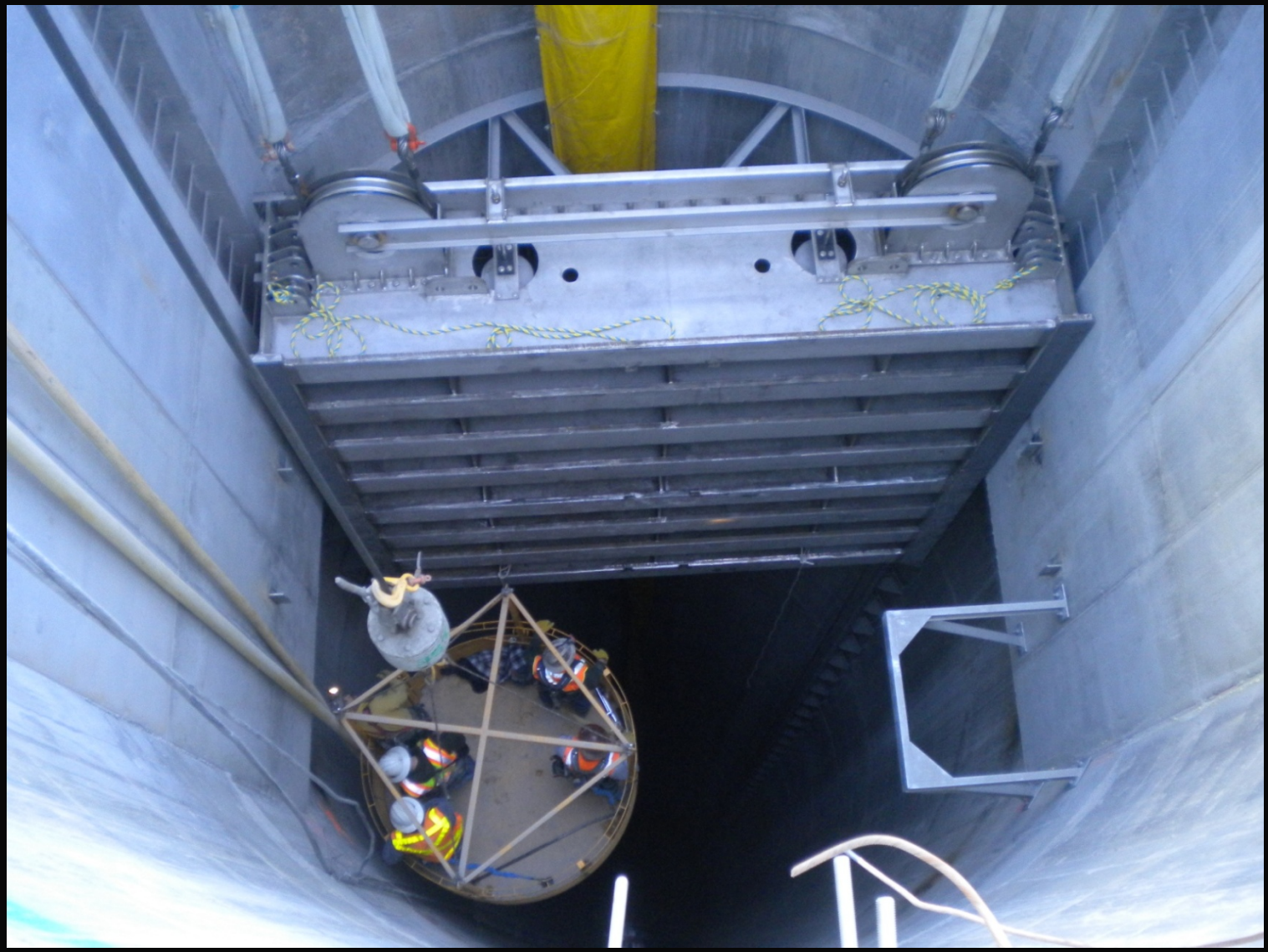
- 12’ w x 14’ h stainless steel

Tunnel

- ~500’ long
- Horseshoe
- Drill & Blast

Exist Inlet Modifications

Isolation Gate



Isolation Gate Installation 12’x14’

Isolation Gate

Isolate Intake No. 2 and No. 3

Stainless Steel - 12’ x 14’

Quagga Mussels – Intake No. 2

Intake No. 2 - Quagga Colonization

Contract 02 – Connector Tunnel

Renda Pacific (Design-Bid-Build) ~ $42 million

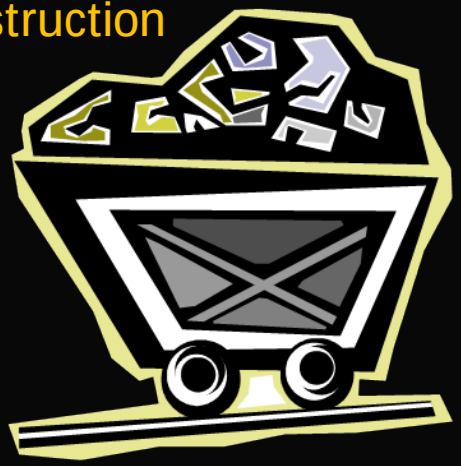
May 2009 Award

Access Shaft (IPS-3 Surge Shaft)

- 450’ deep -complete
- 26’ interior diameter

Tunnel

- 2578’ long horseshoe configuration-under construction
- Drill & Blast Construction

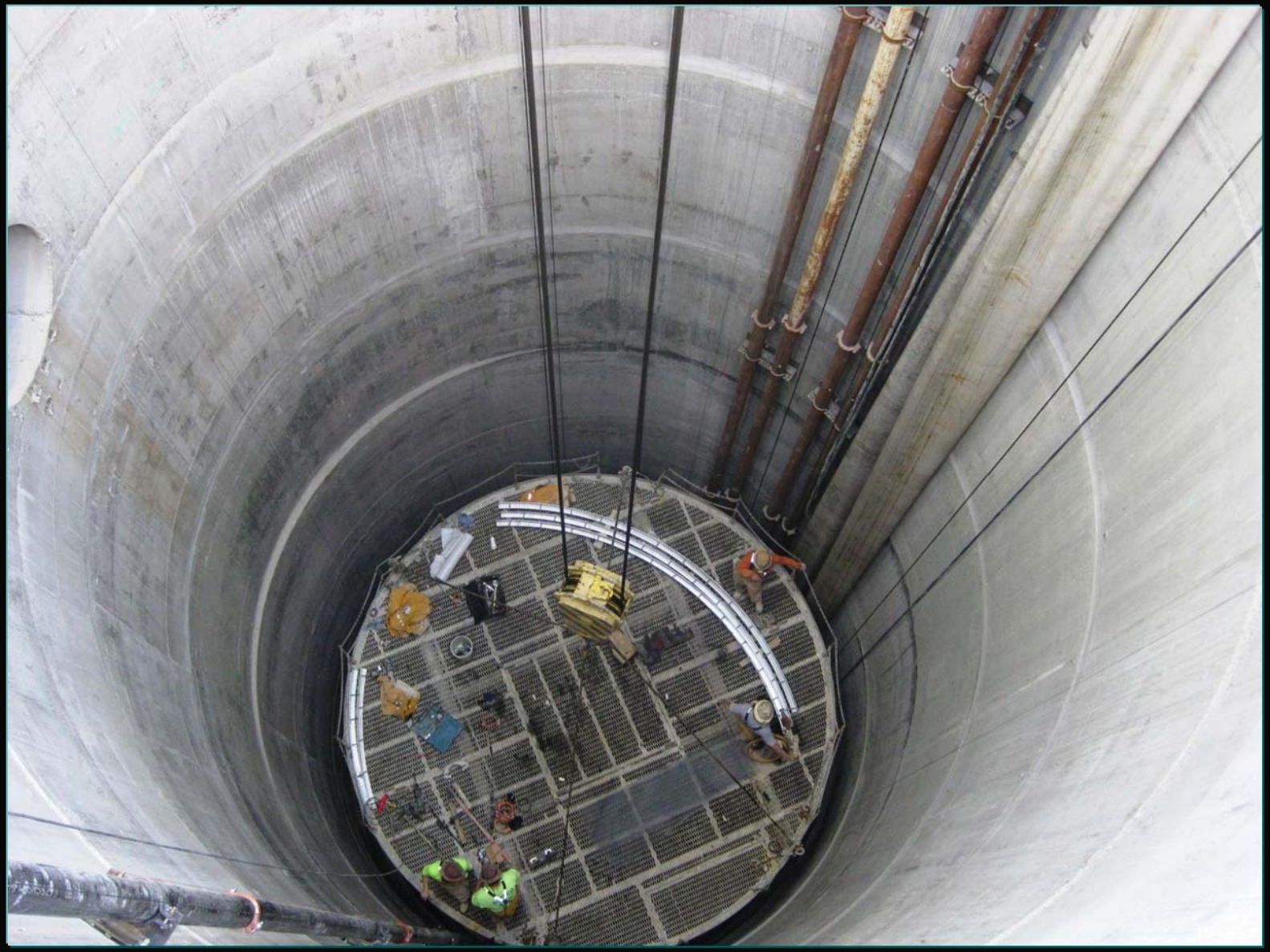



Lake Mead
Saddle Island
070F02C2
Tunnel Excavation Progress Update
Underground Blasting – Completed
Contractor: Renda Pacific
IPS-3 Connector Tunnel
Temp Bulkhead
STA 4+18
STA 1+00
Access Shaft
(450' deep, 26' diameter)
Forebay Tunnel
STA 1+00 100% complete
070F01C1
Intake No. 3 Shaft & Tunnel
IPS-2 Connector Tunnel
Note: *IPS-1 Stub Tunnel
End STA = S 201+95
(Actual)
070F05C1
IPS-2 Connection &
Modifications
(Completed July 2010)
IPS-1
Stub Tunnel
STA S 201+95
100% complete
IPS-1
STA 25+78
100% complete
STA 25+78
IPS-2
Update as of 5/20/13

Connector Tunnel

Shaft Complete

Shaft



Working on Galloway in 26’ Diameter Shaft, June 2010

Drill & Blast

Drilling Blast Holes in Tunnel

Temporary Bulkhead

Temporary Bulkhead

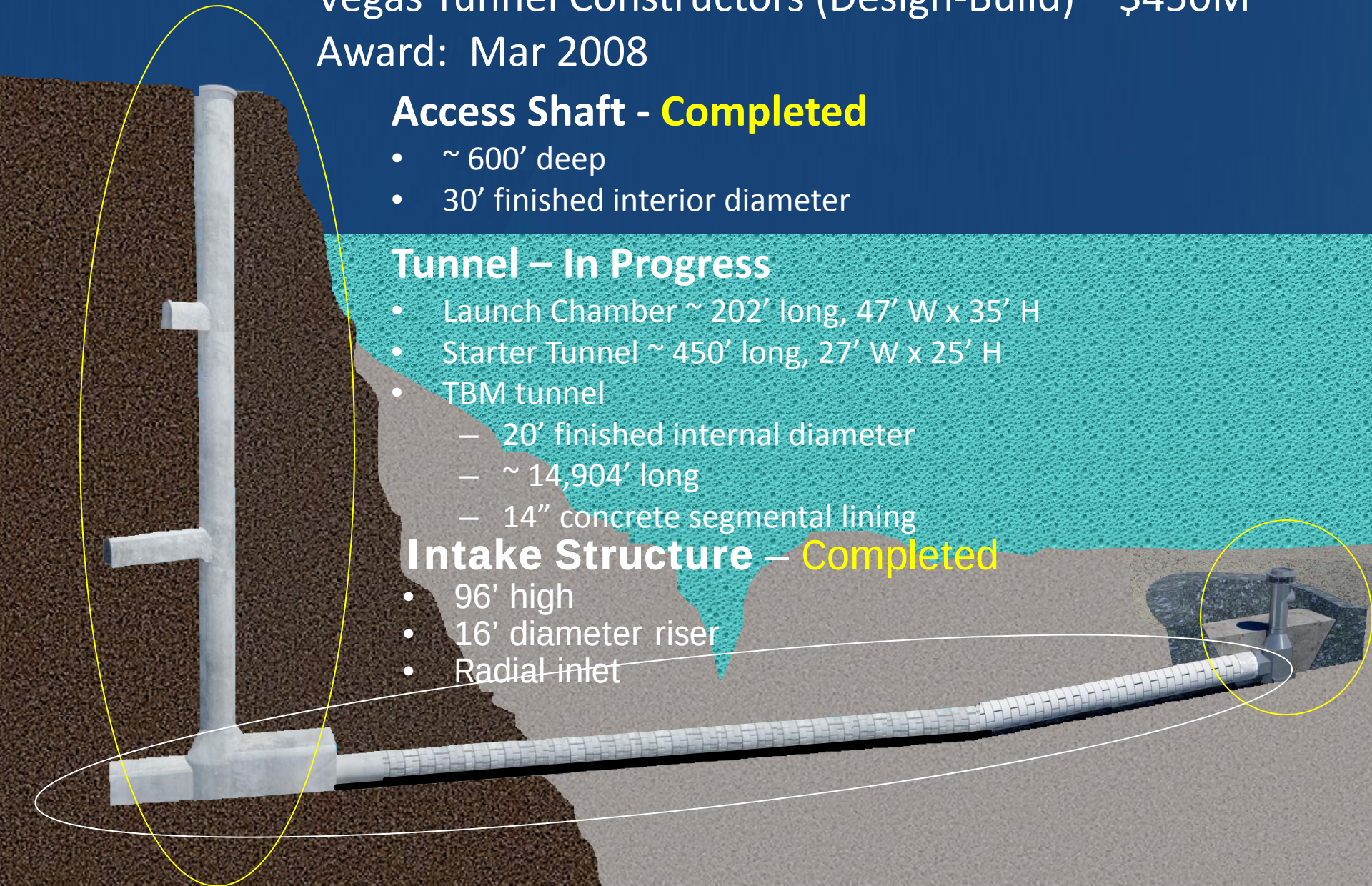
Temporary Bulkhead - Completed April 23, 2013

Holin' Thru – March 27, 2013

Shafts & Tunnel

Vegas Tunnel Constructors (Design-Build) ~ $450M

Award: Mar 2008



Access Shaft - Completed

- ~ 600’ deep
- 30’ finished interior diameter

Tunnel – In Progress

- Launch Chamber ~ 202’ long, 47’ W x 35’ H
- Starter Tunnel ~ 450’ long, 27’ W x 25’ H
- TBM tunnel
  - 20’ finished internal diameter
  - ~ 14,904’ long
  - 14” concrete segmental lining

Intake Structure – Completed

- 96’ high
- 16’ diameter riser
- Radial inlet

1st Blast for Access Shaft - June 2008

Shaft

Shaft Progress – Elevation 970 - March 2009

TBM Assembly Chamber

TBM Chamber Excavating Top Heading – Nov 2009

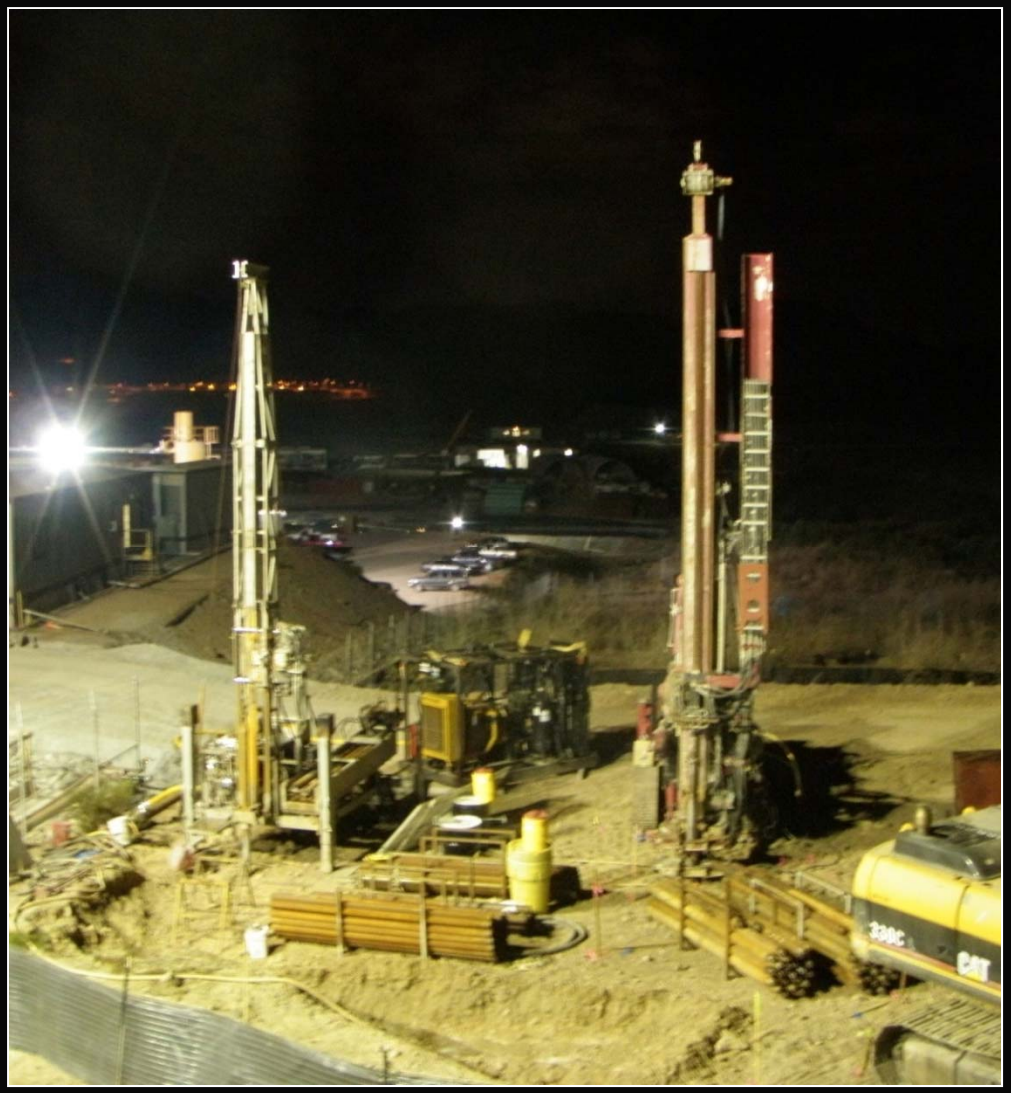
Incursion of Unstable Ground

Beginning of inflow in Starter Tunnel - June 30, 2010

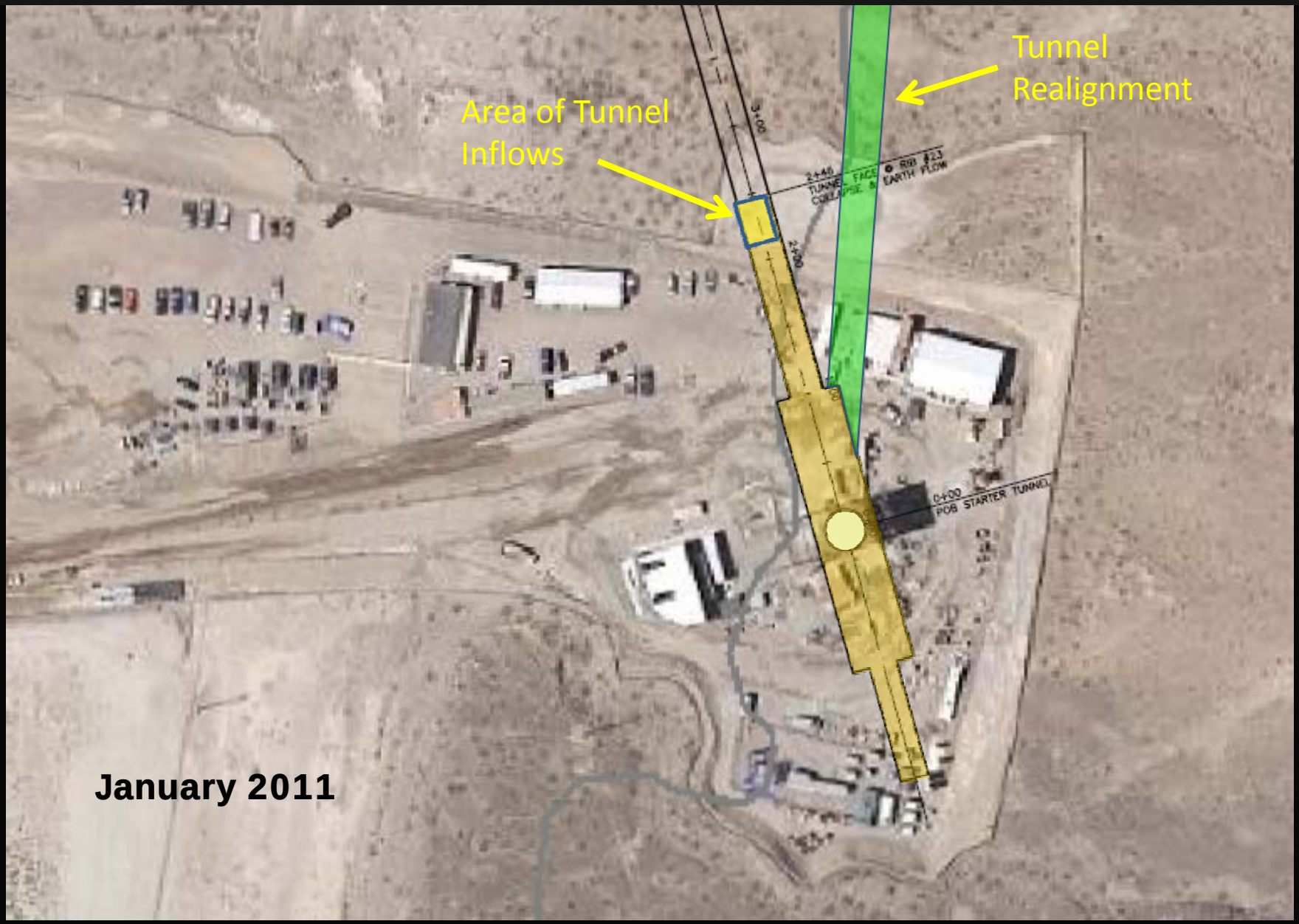
Tunnel Flooding

Flooding Event
June 28th – July 1st

Tunnel Reinstatement - Surface



New Alignment

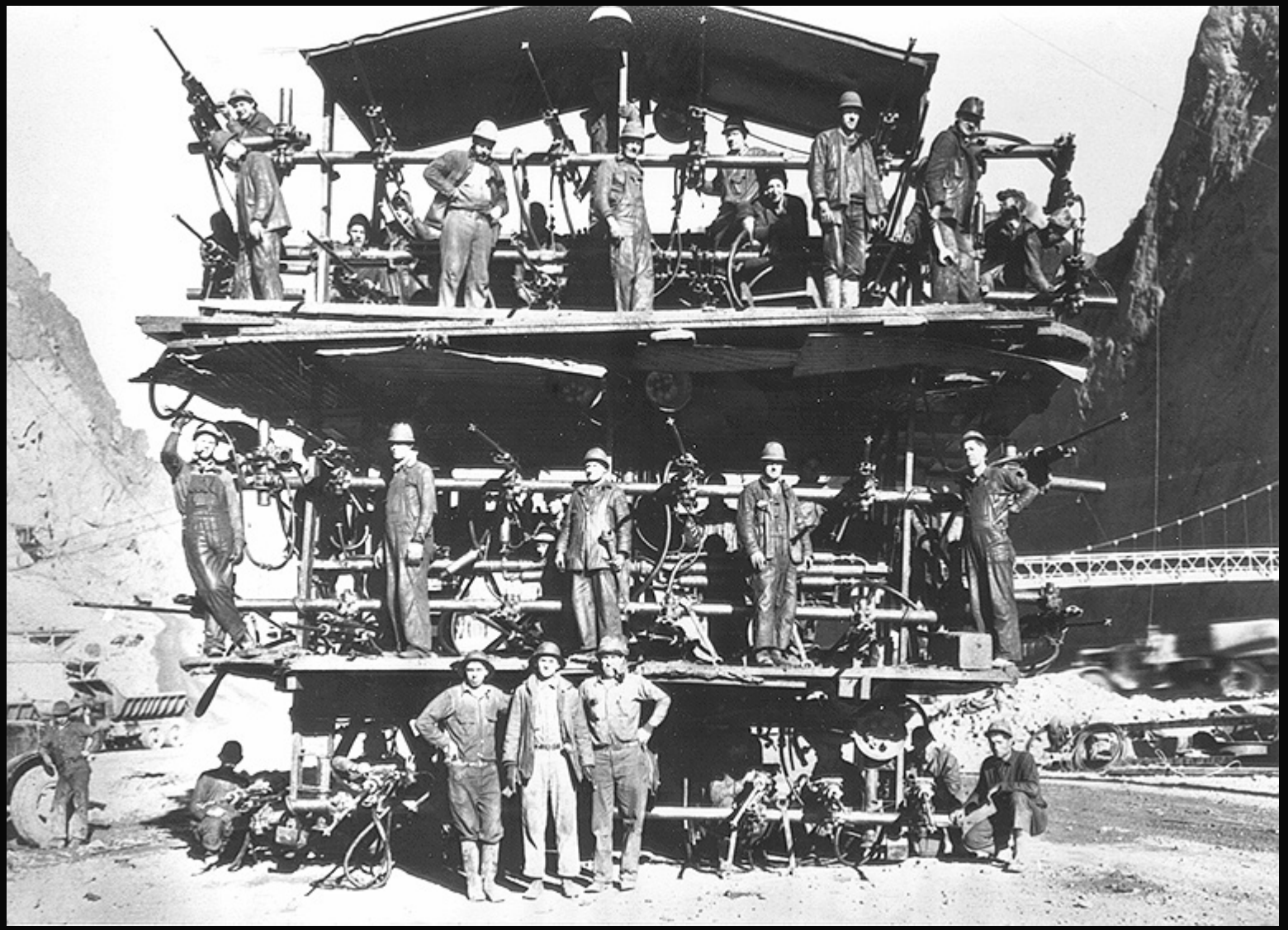


New Alignment

Starter Tunnel

Assembly Chamber

Back then…

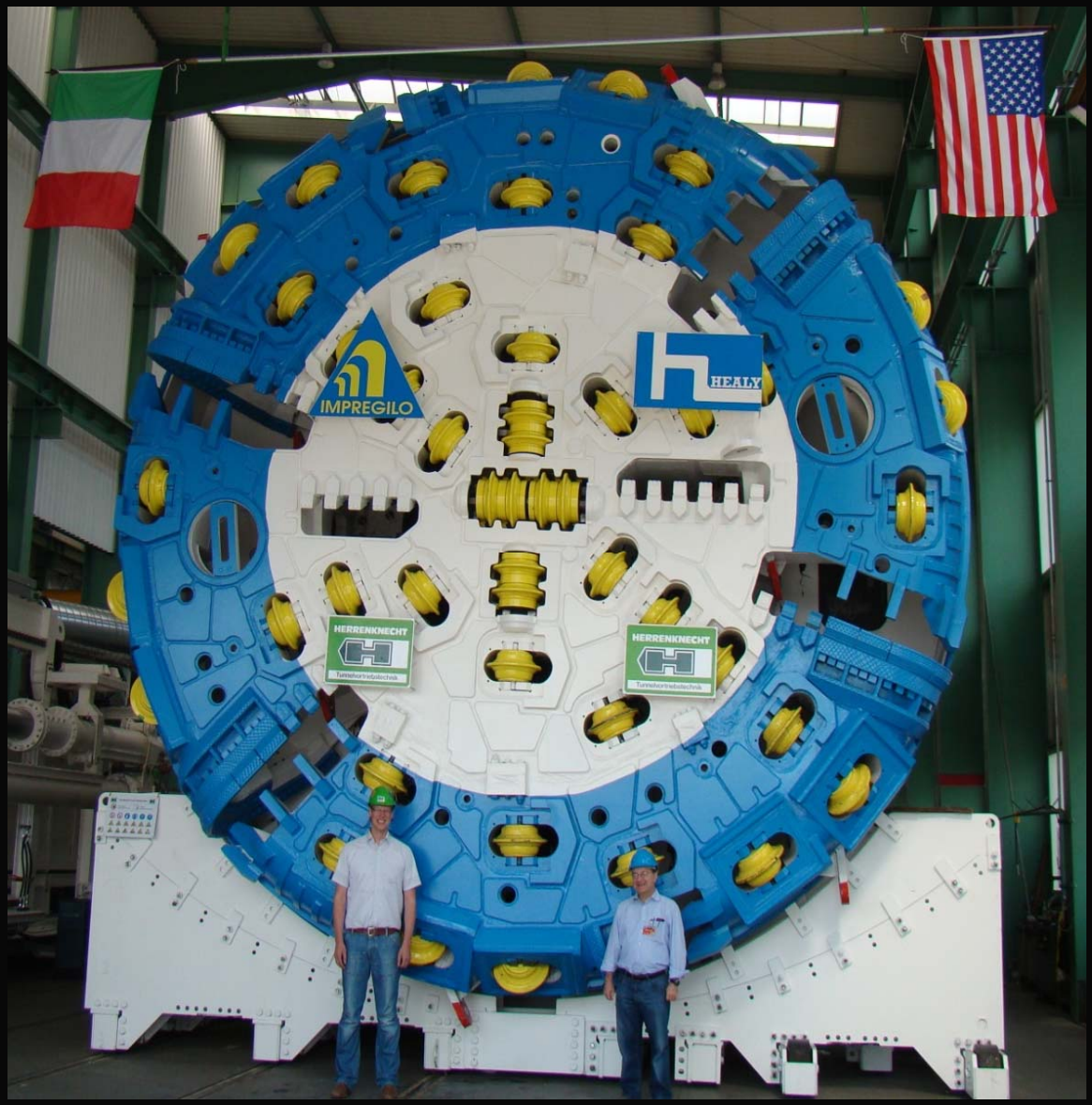


Drilling Jumbo Truck - Hoover Dam Diversion Tunnels

http://www.usbr.gov/history/photos/dams007.jpg

Tunnel Boring Machine (TBM)

- Tunnel Boring Machine (TBM)
- Handle more challenging ground conditions (water pressure, etc)
- Manufactured in Germany by Herrenknecht
- 23.5’ outside diameter

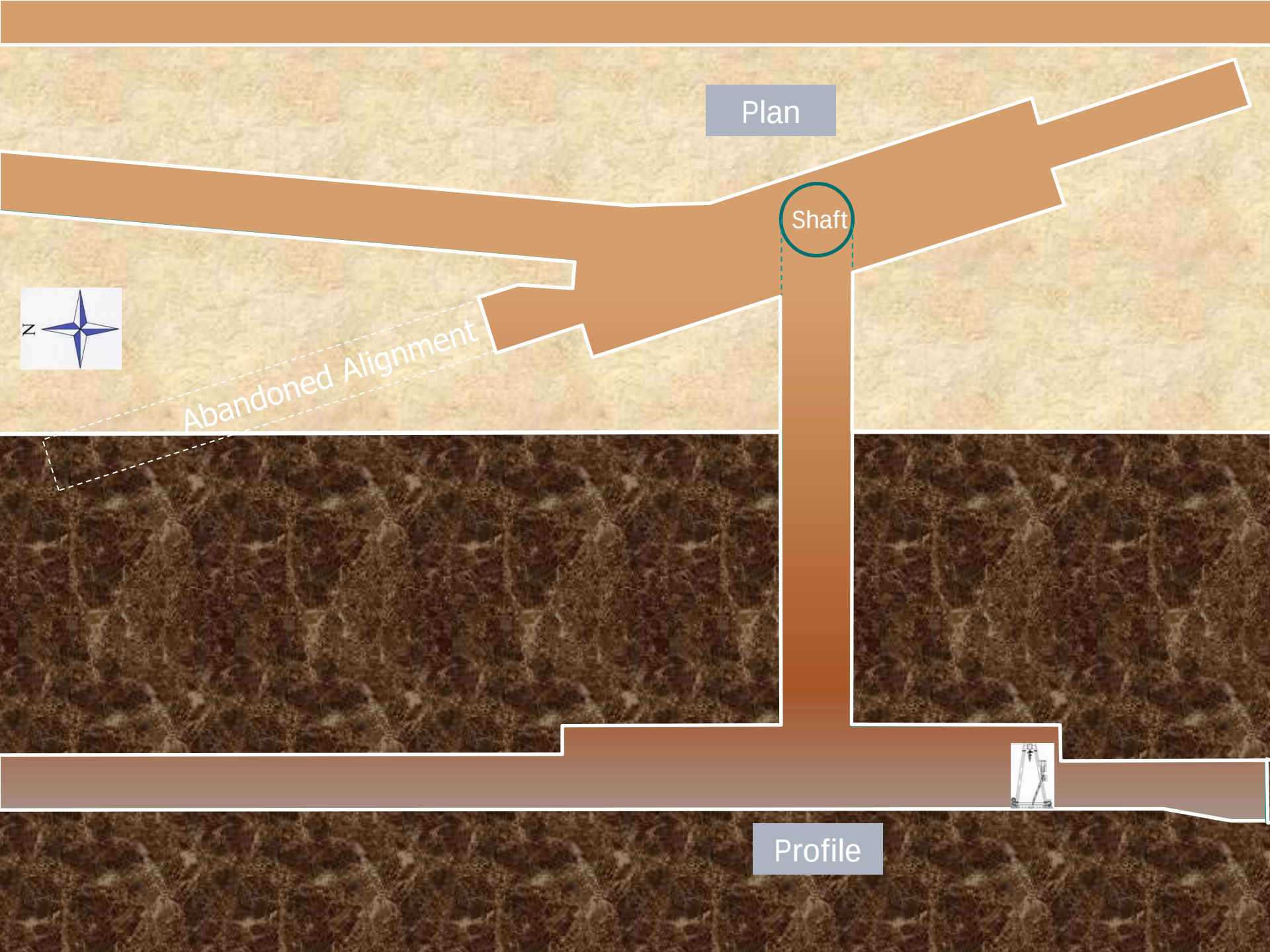


TBM

TBM Gantry Support Equipment 585’ long, 1500 tons

TBM

TBM Assembly On-Site Next to Access Shaft – October 2009


Plan
Shaft
N
Abandoned Alignment
Profile

Lowering and Assembly of the following five TBM Components in Starter Tunnel:

1.	Front Shield	(601,862 lbs)
2.	Cutter Head	(253,532 lbs)
3.	Middle Shield 1	(141,096 lbs)
4.	Middle Shield 2	(573,202 lbs)
5.	Tail Shield	(143,300 lbs)
Total	856.5 tons	(1,712,992 lbs)

First Five TBM Components lowered with 400-ton ALE Gantry Crane

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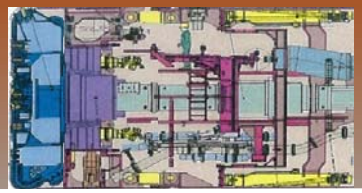

Key TBM Features:

- Stone Crusher
- Shield Articulation
- Mini Grippers for Steering
- Screw and Belt Conveyor System
- Hydraulic Thrust Cylinders
- Slurry System w/ Treatment
- Crane, Feeder and Erector for Segment Liner
- Drills (pre-excavation)
- Hyperbaric Chamber and Shuttle
- Pre and Post-Excavation Grouting System
- Industrial Water System
- Approach Ramp

Remaining TBM Components/Trailing Gear lowered with 50-ton Cimolai Gantry Crane

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Remaining TBM Components/Trailing Gear lowered with 50-ton Cimolai Gantry Crane

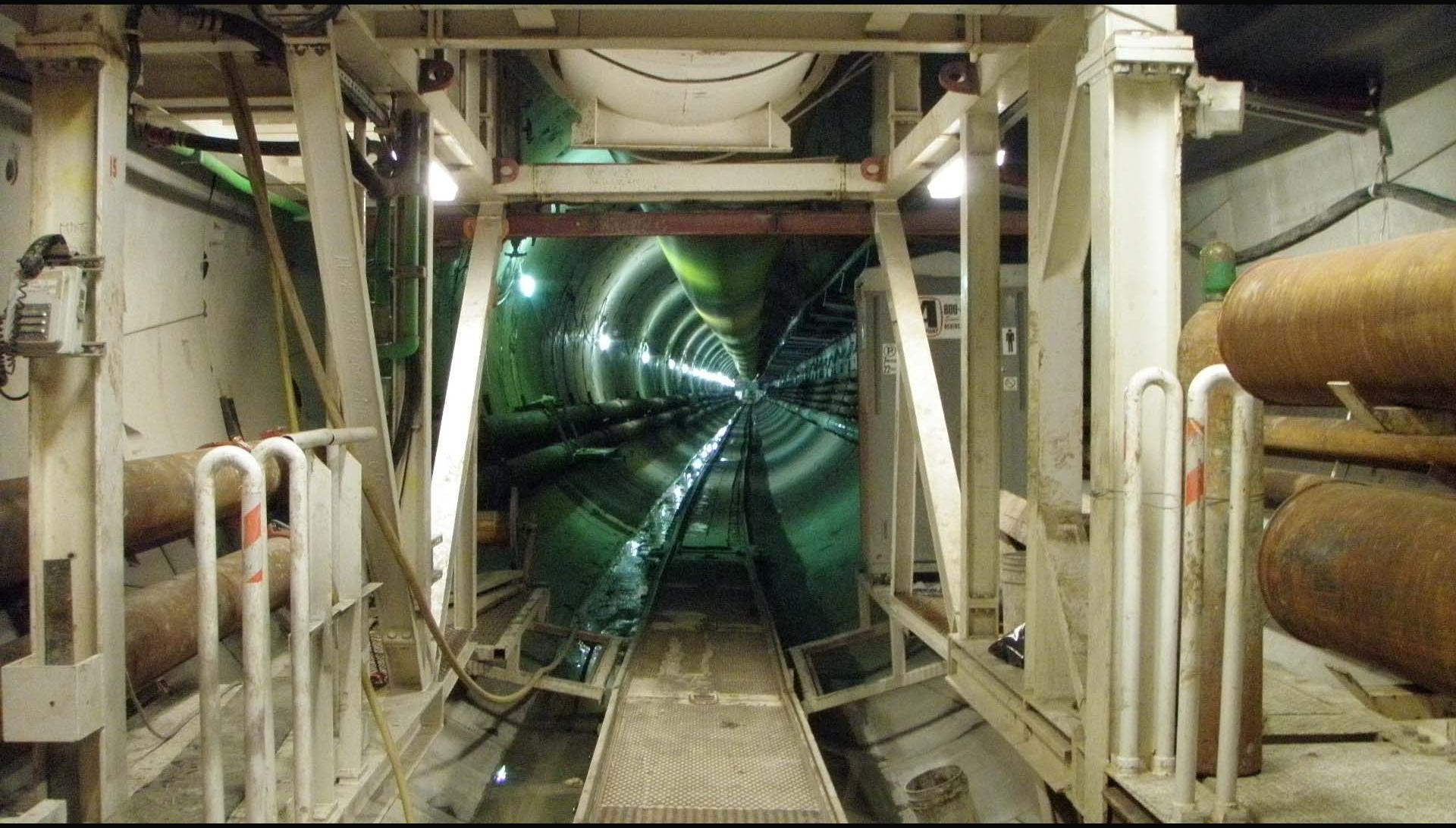
Lowering TBM Down Shaft

TBM Cutter Head Underground

TBM Positioned At Tunnel Face

2060 feet (13.7 %)

1097 feet at 13.5 bar



Precast Segments

Segment Transport

Water Control Grouting – Maintenance Work

Hyperbaric Lock

Hyperbaric Cutter Head Access

Cutter Head Maintenance

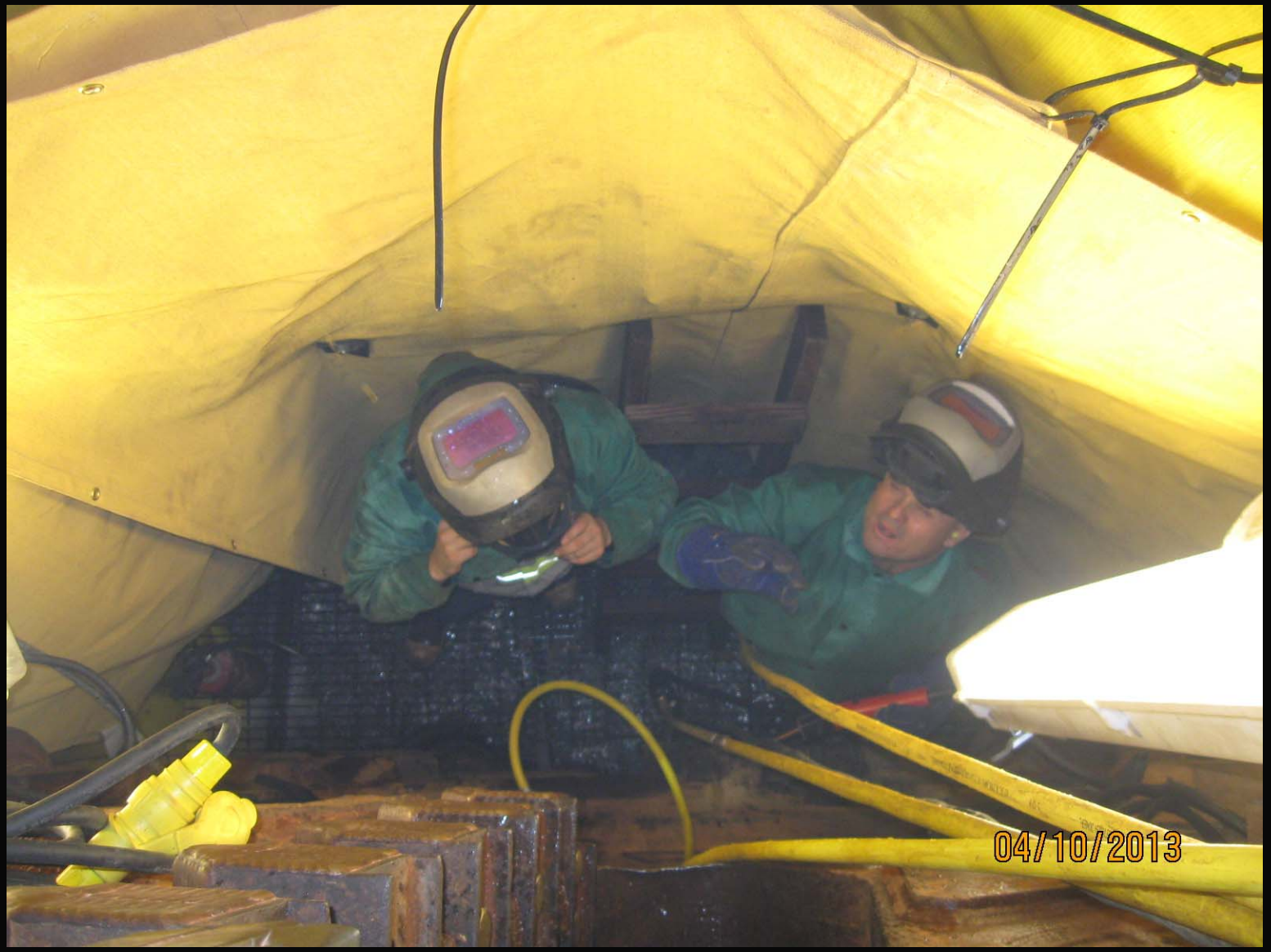
Cutter Head Maintenance

Cutterhead Maintenance

Damaged Cutters
Damaged Cutterhead

Cutter Head Maintenance

Cutter Head Maintenance



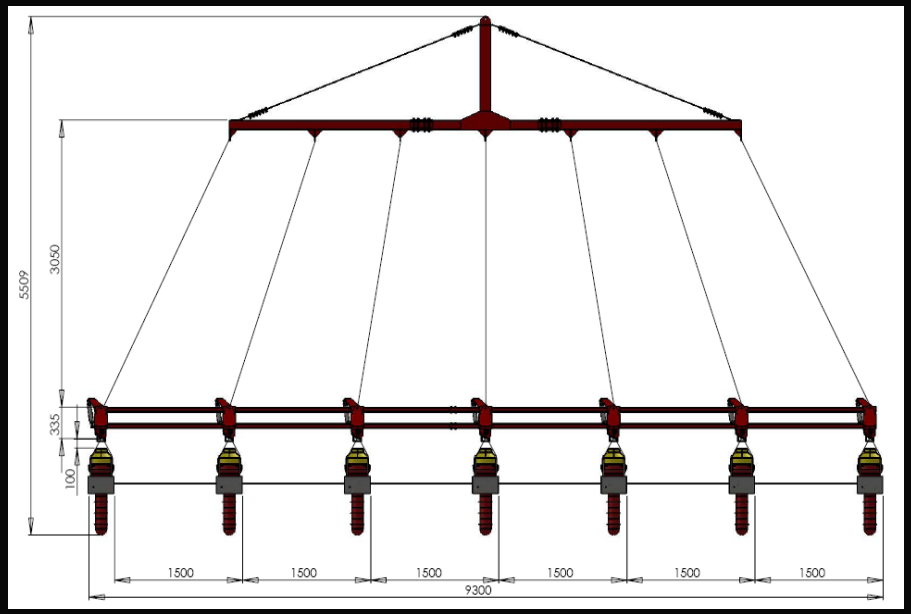
Progress & Schedule

- TBM Tunneling Resumed – May 16, 2013
  - Excavation Progress – **162 feet (27 rings)**
  - Highest Production Day - **48 feet (8 rings)**

Intake Riser - Excavation

Shaped Charges

- Placed on rock surface
- 7.5 kg / charge
- Placement structure
  - 30 ft x 30 ft
- Small blasts at surface




22/10/2010 08:45


Vegas Tunnel
Constructors
Bigge
Bigge


BIGGE
BIGGE
BIGGE
BIGGE
BIGGE

Intake Structure Installation

February and
March 2012

Total Tremie Concrete = 11,300 cy

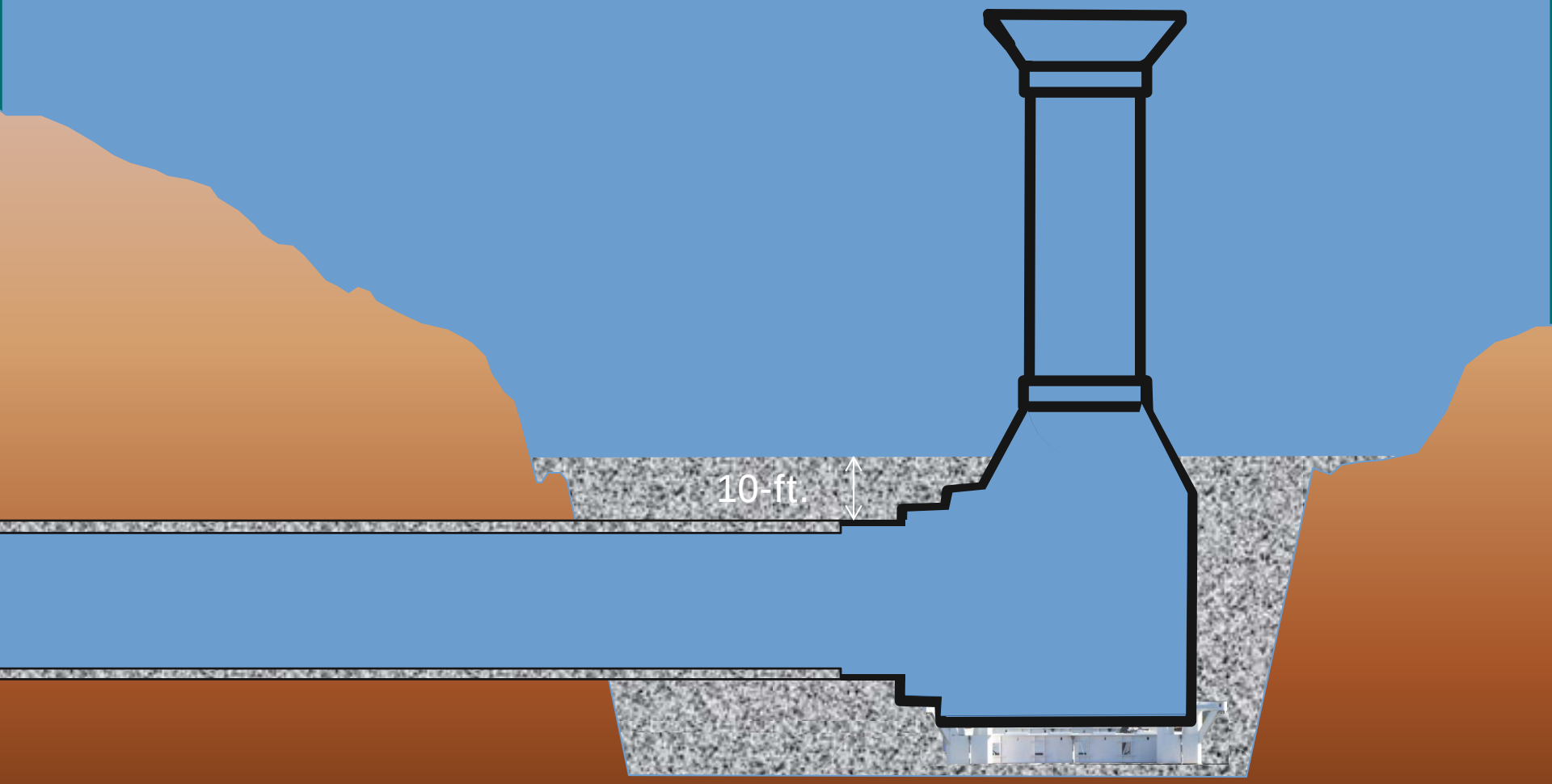
Assembled Intake Structure Conveyed to Intake Site

15 Feb 2012

Concrete Batch Plant

Concrete Transport Barge

Intake Structure Placement



Project Milestones

- Intake No. 3 Shafts & Tunnel
  - TBM Tunnel to Intake Complete — 2013
  - *Operational* — *May 2014**
  - Final Completion — Aug 2014

Questions?