

Wawona Area Stormwater Improvement Project

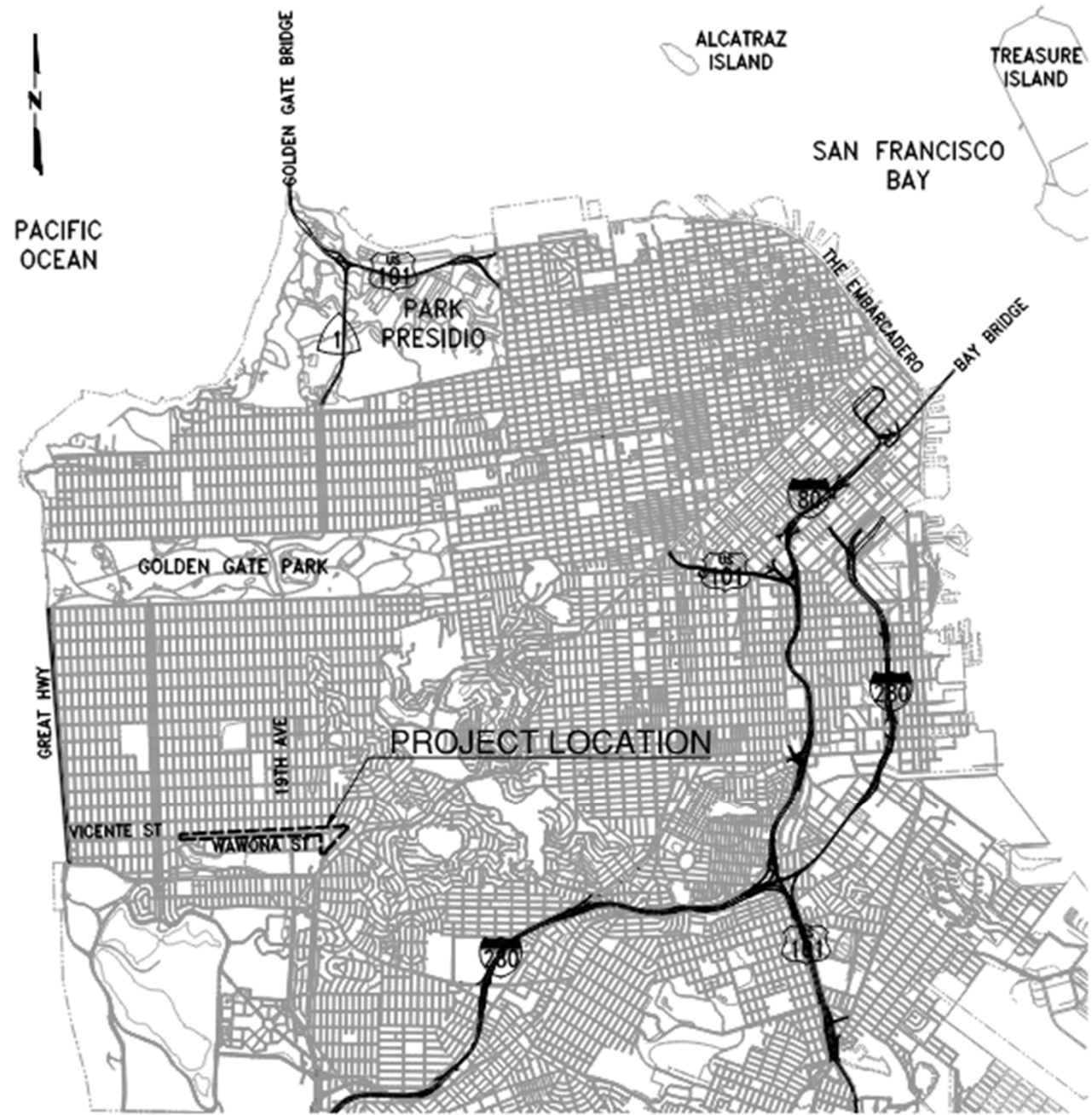
PUG Seminar 2023



Colin Irwin – Ward & Burke

Carl Pitzer, PE – Thompson Pipe Group

Project Location


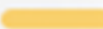



LOCATION MAP
N.T.S.

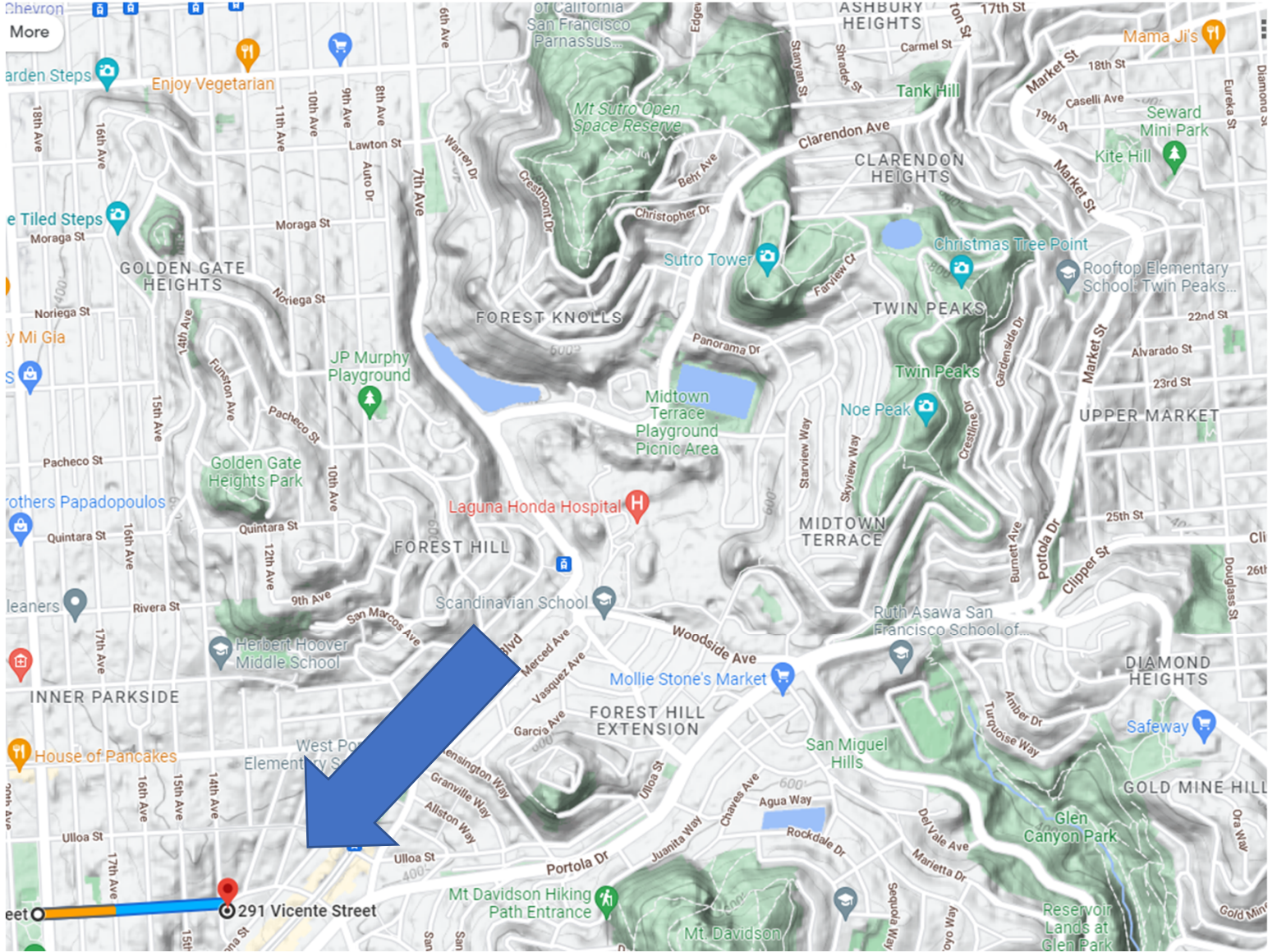
Need

- Improve the stormwater system – Alleviate Flooding
- Bring Up to City Code
- Upgrade the aging waterlines
- Even after project there is flood risk

LEGEND

- | | | |
|--|---|---|
|  SFPUC |  SFMTA |  Pub |
|  Launching/Receiving Shafts |  SFM | |

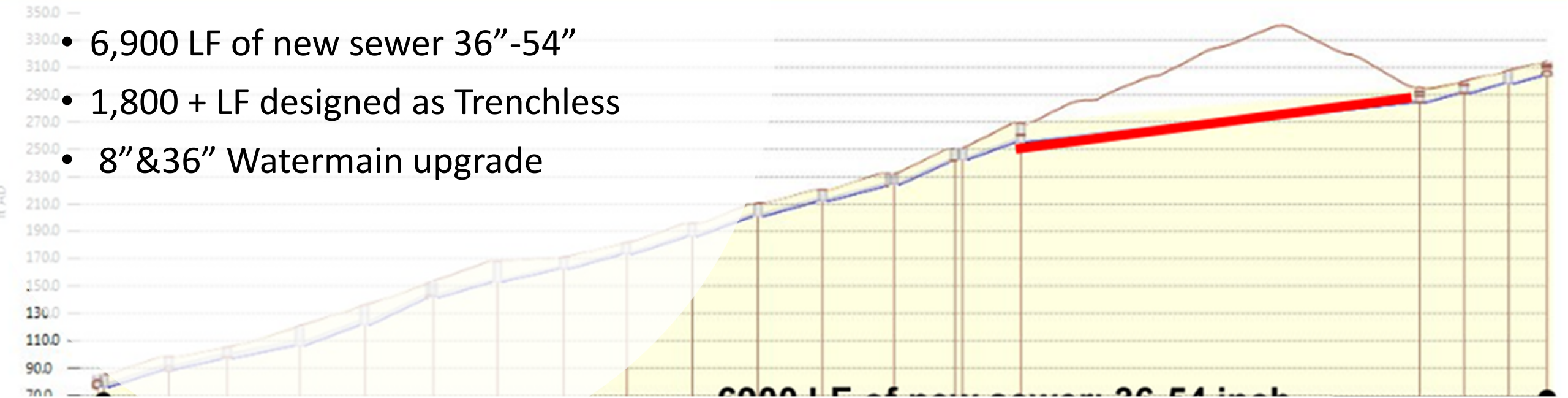
Drainage Area



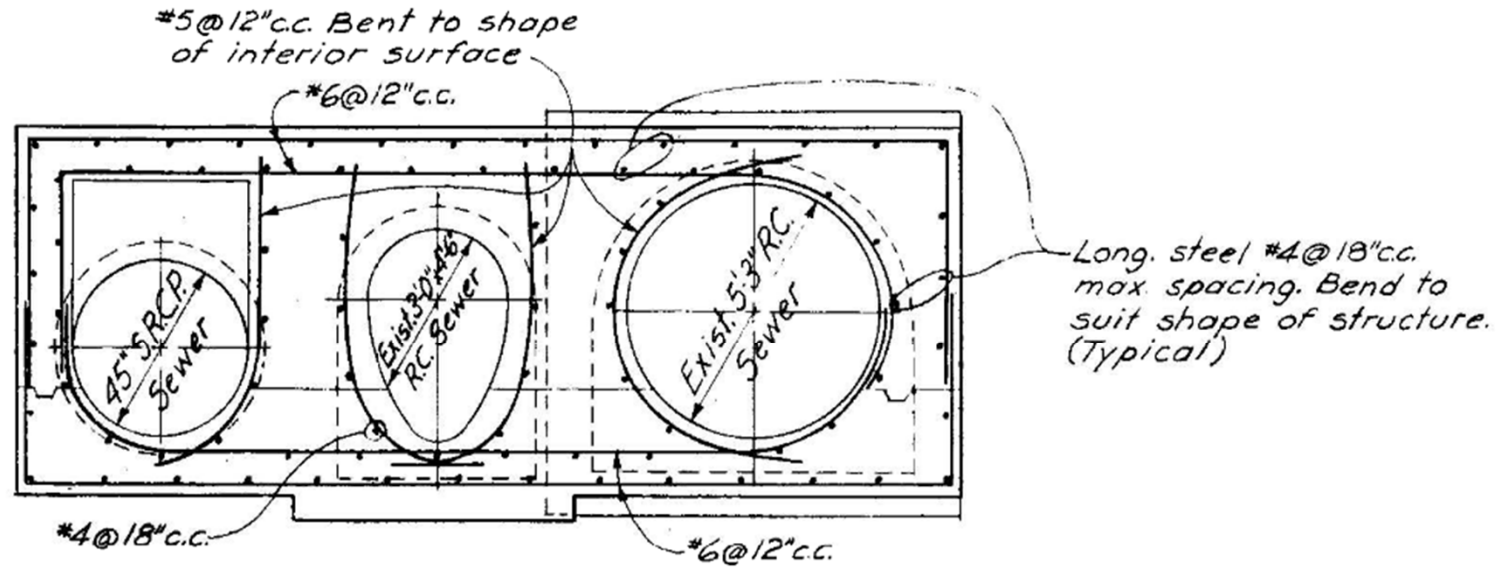


Project Design

- 6,900 LF of new sewer 36"-54"
- 1,800 + LF designed as Trenchless
- 8" & 36" Watermain upgrade

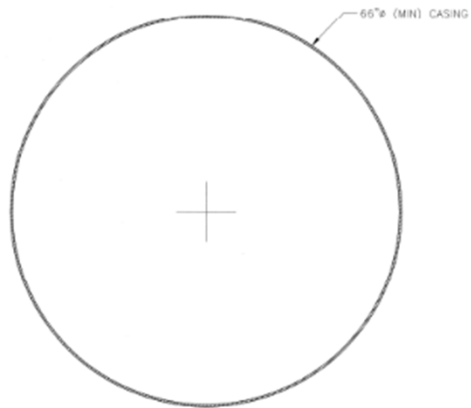


Existing Infrastructure

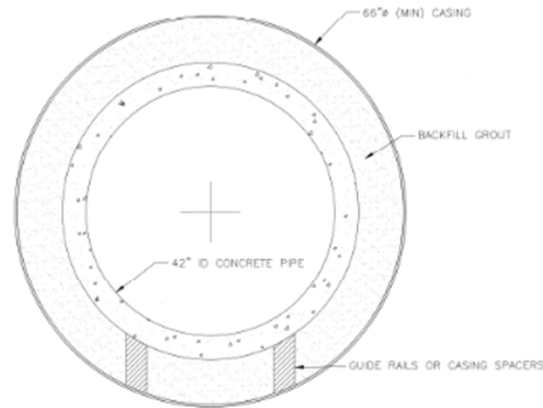


SECTION L-L

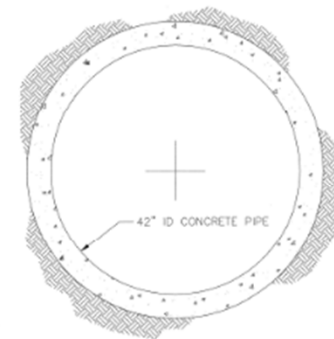
Initial Design



SECTION - CASING INSTALLATION BY PIPE JACKING (A)
NTS



SECTION - FINAL CARRIER PIPE INSTALLATION IN CASING (B)
NTS
SW-4011
SW-4015



SECTION - DIRECT INSTALLATION OF CARRIER PIPE BY MICROTUNNELING (C)
NTS
SW-4012
SW-4013
SW-4013
SW-4015

CONTRACT NO. WW-711

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
INFRASTRUCTURE DIVISION
ENGINEERING MANAGEMENT BUREAU
WAWONA AREA STORMWATER IMPROVEMENT AND
VICENTE STREET WATER MAIN REPLACEMENT

TUNNEL CROSS SECTIONS












Launch Shaft

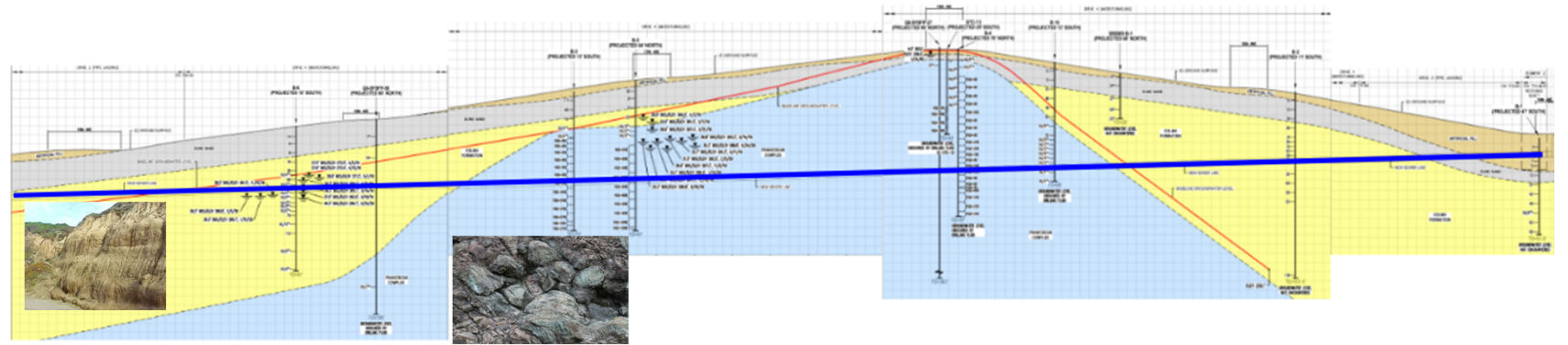
Reception Shaft looking toward Launch



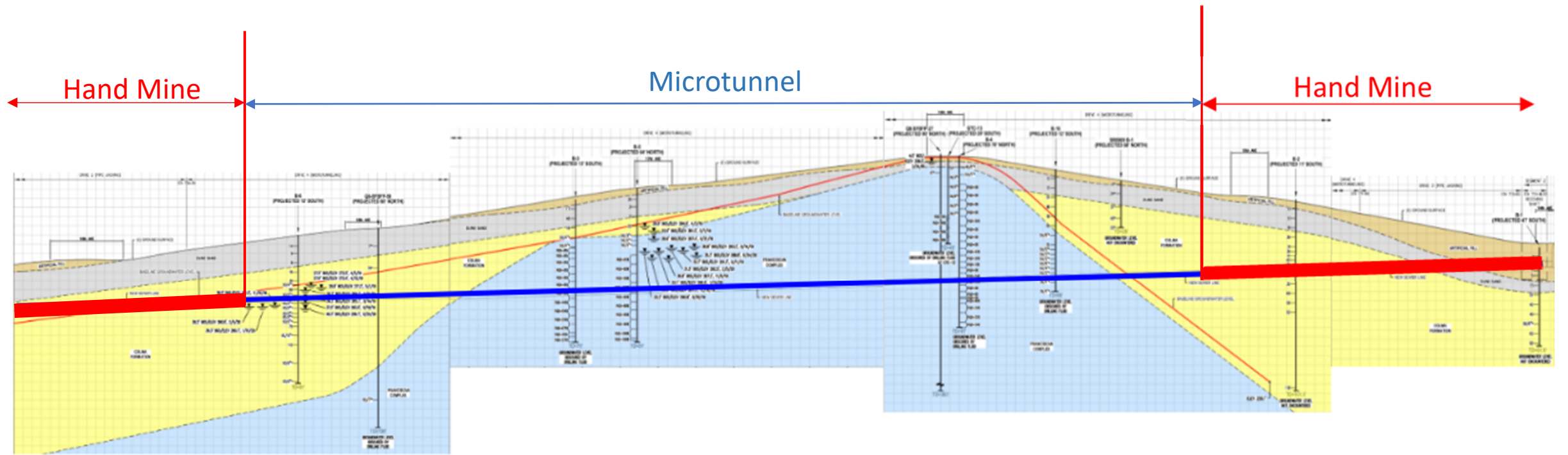
Geology

LEGEND

-  ARTIFICIAL FILL
-  DUNE SAND
-  COLMA FORMATION
-  FRANCISCAN COMPLEX
-  GEOLOGICAL CONTACT, APPROXIMATELY LOCATED
-  UNSTABILIZED GROUNDWATER LEVEL (DURING DRILLING)
-  STABILIZED GROUNDWATER LEVEL (MEASURED IN MONITORING WELL)

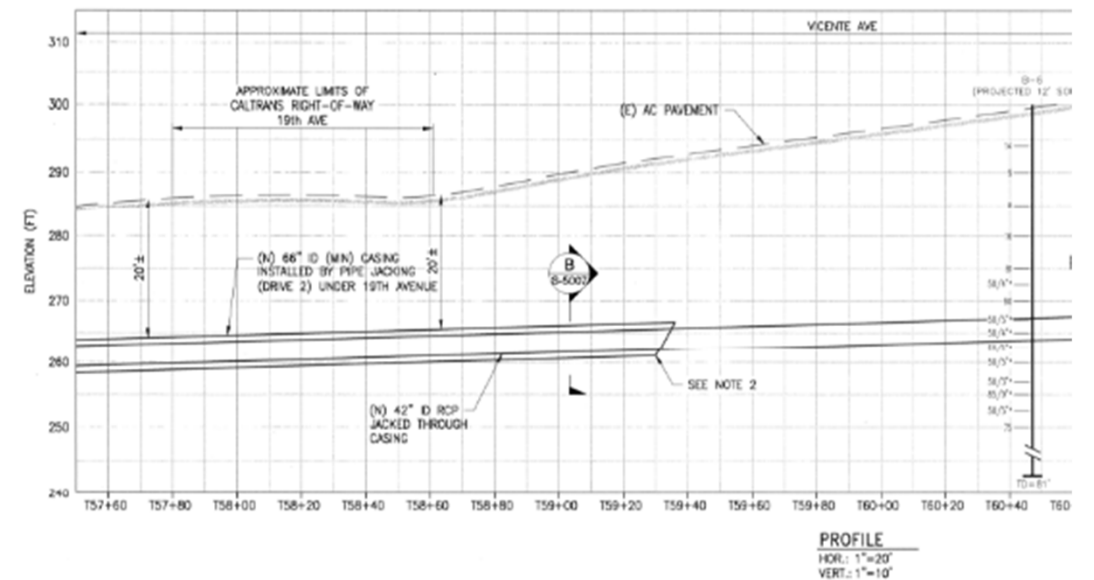
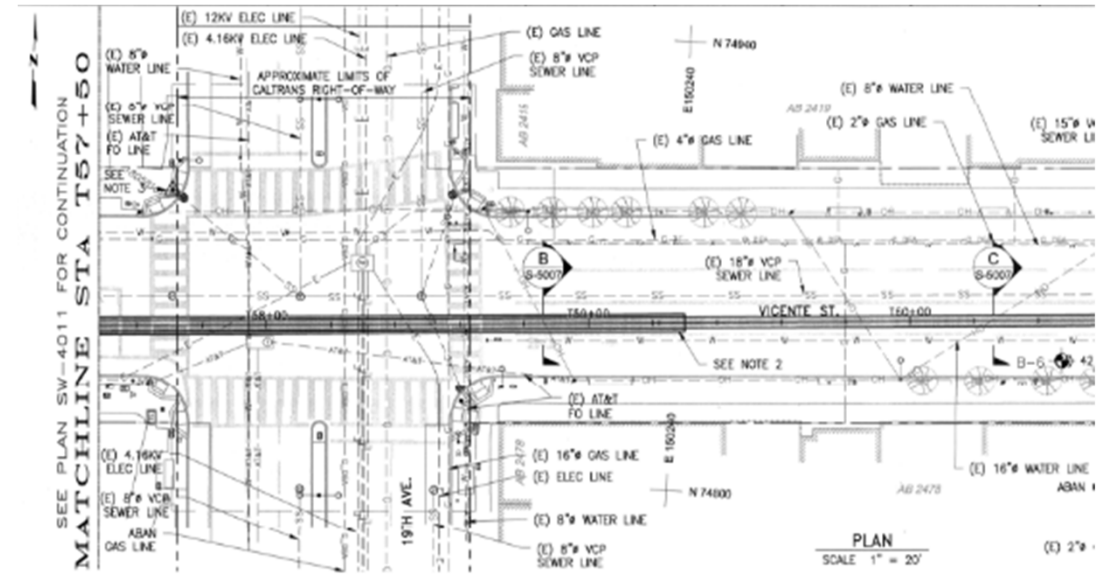


Trenchless Design



Value Engineering Proposal

- Upsize to 48" Pipe
- Remove Steel Casing Portal
- Steel encased RCP for CALTRANS Easement
- Combine drives 1-3 into single drive
- Zero Dollar change order
- 6 Month Schedule reduction

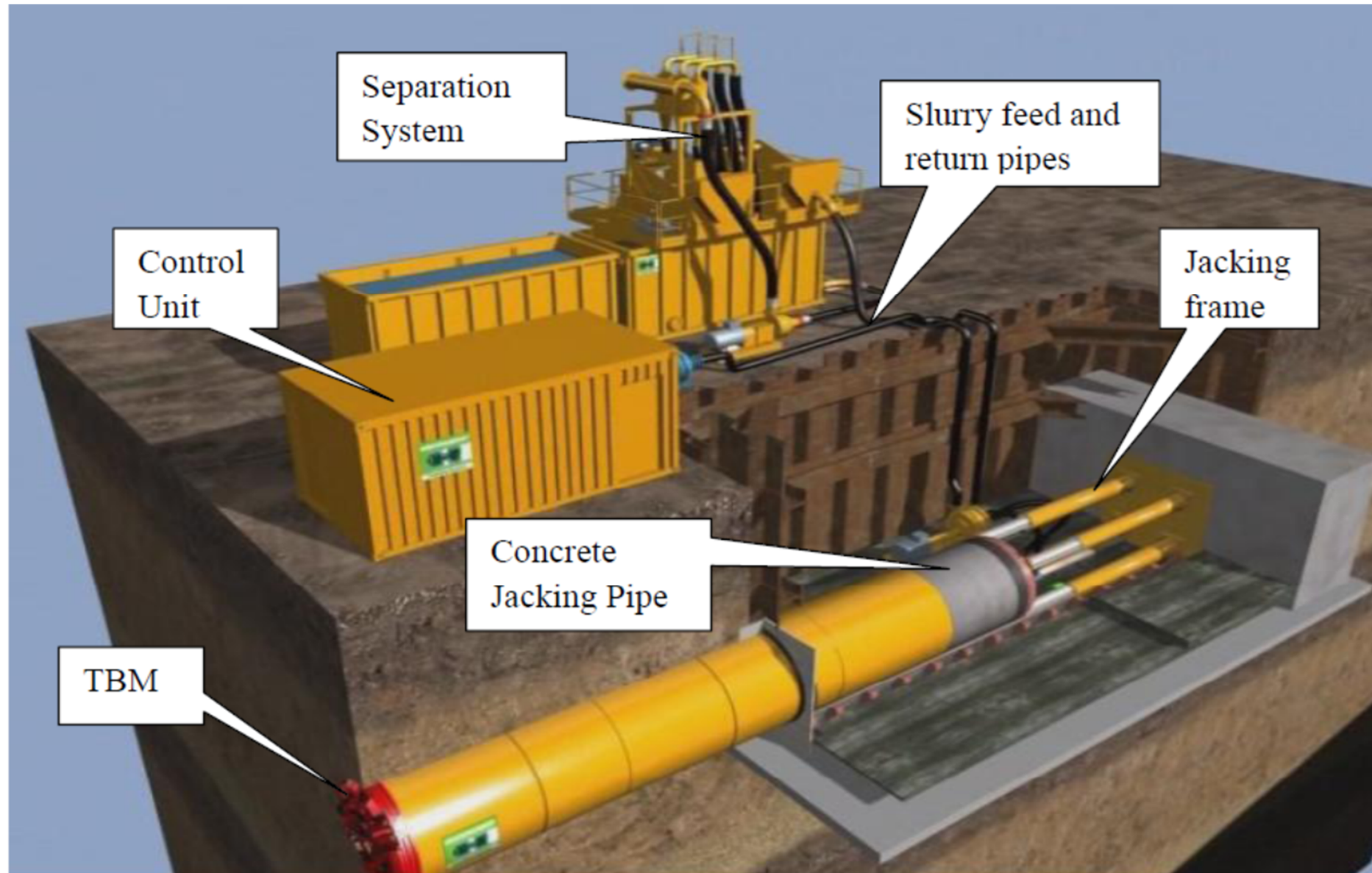




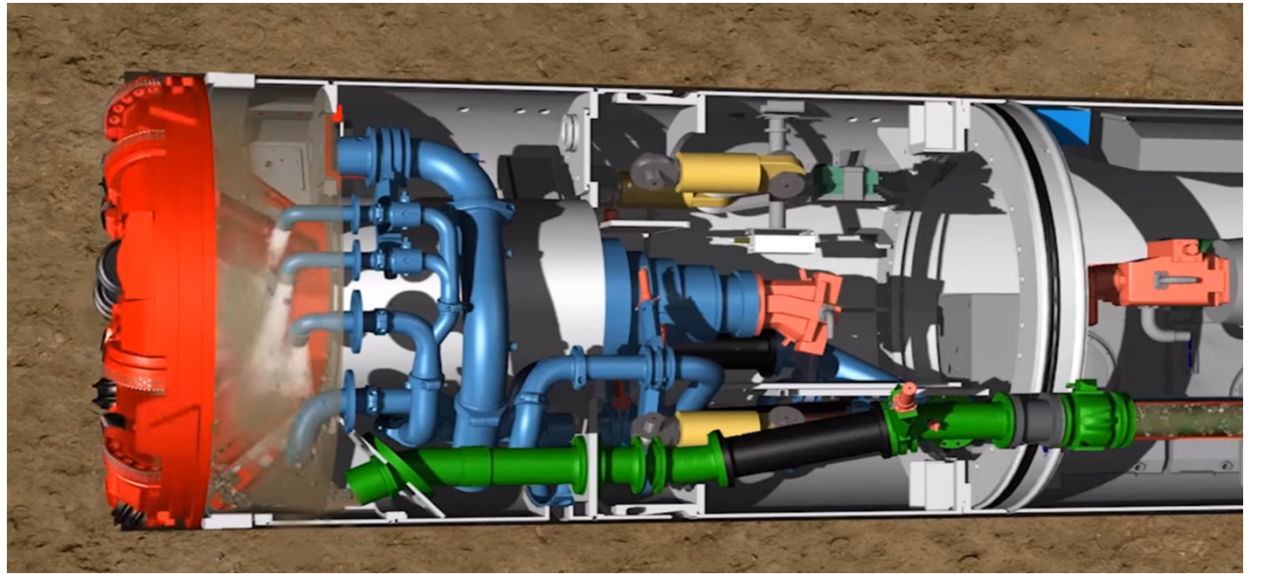
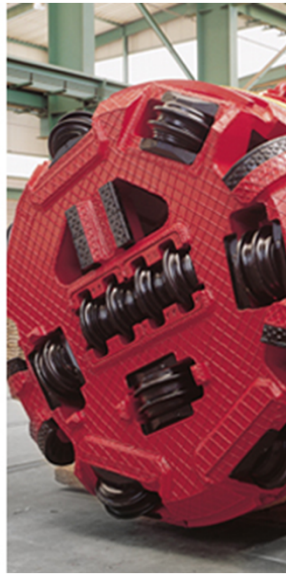
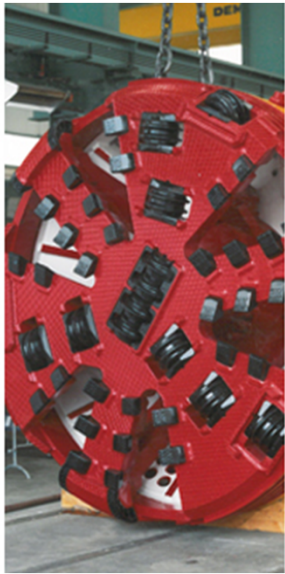
Risk Removal Proposal

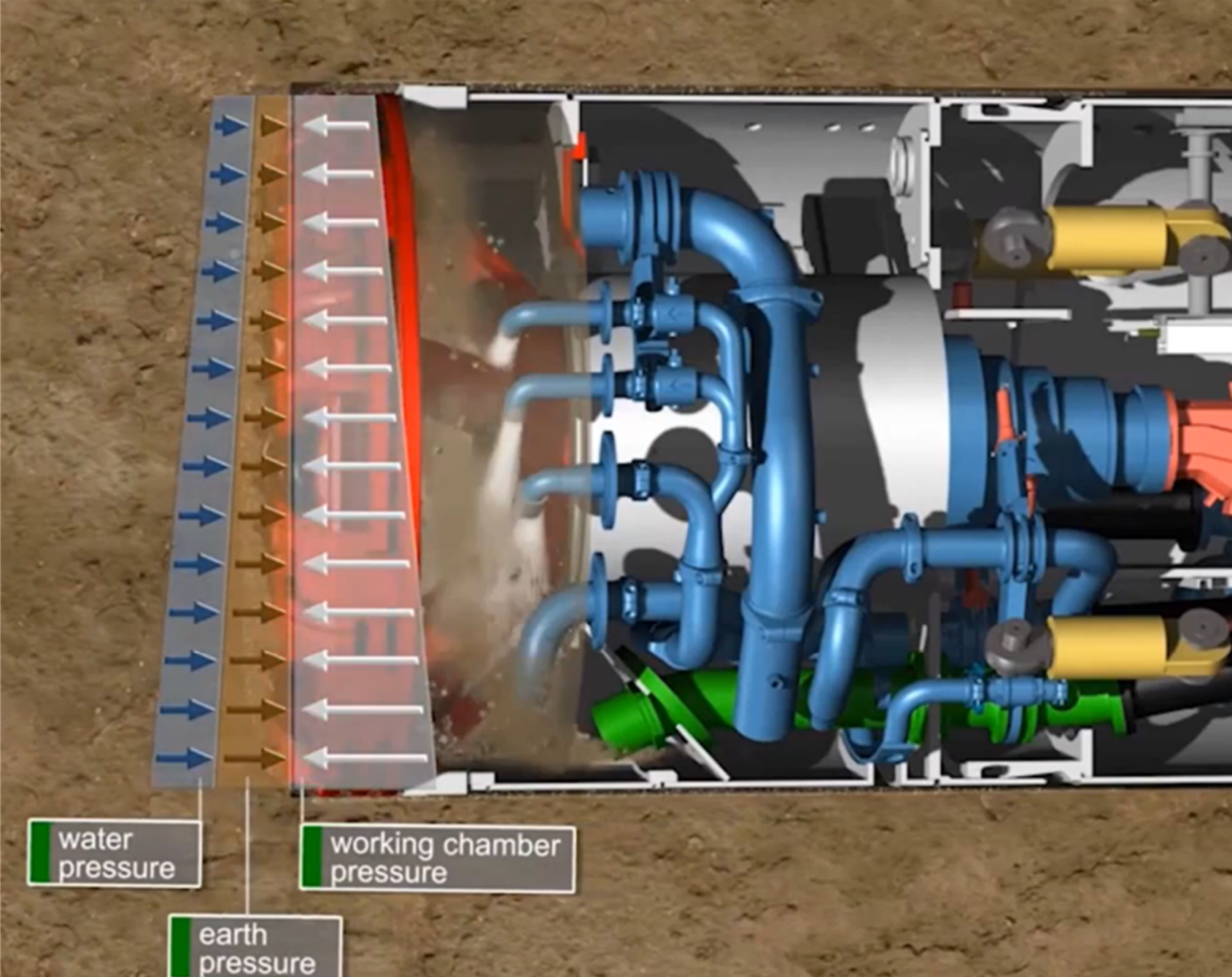
- Face Access
- VMT Capability
- Longer Reach Capabilities'
- Higher Torque Availability
- Removal of Hand Mining in Dune Sand

Typical Microtunnel Layout



MTBM Functions

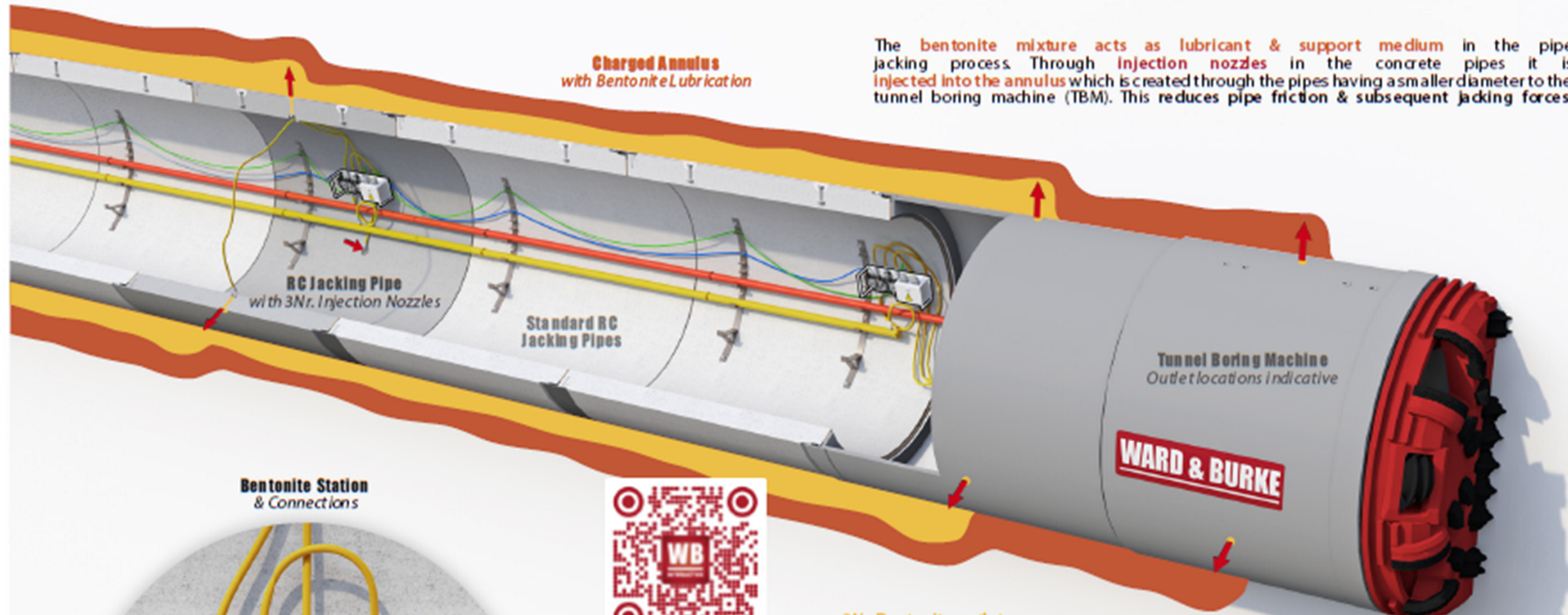




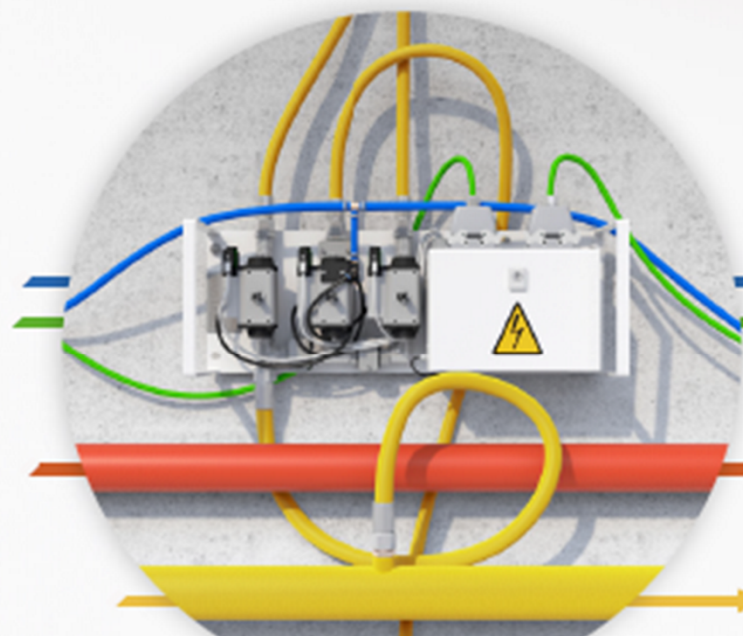
A Closed face is a Controlled face.

**Charged Annulus
with Bentonite Lubrication**

The bentonite mixture acts as lubricant & support medium in the pipe jacking process. Through injection nozzles in the concrete pipes it is injected into the annulus which is created through the pipes having a smaller diameter to the tunnel boring machine (TBM). This reduces pipe friction & subsequent jacking forces.



**Bentonite Station
& Connections**



Inspect the pipe string 3D model

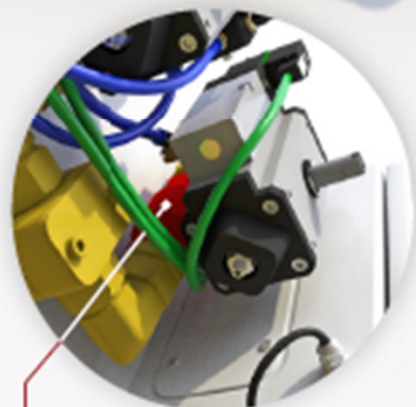
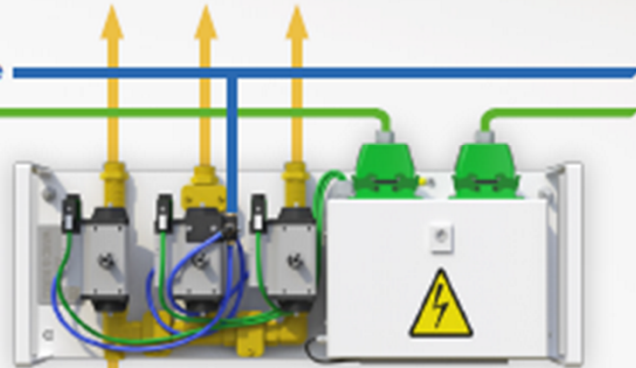
Compressed air supply line

Electrical connections

Bentonite supply - To TBM

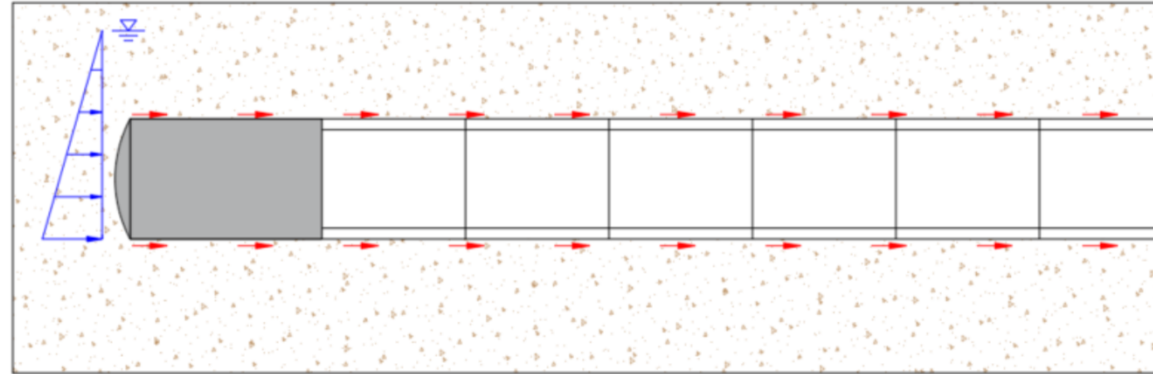
Bentonite supply line - To Stations

3Nr. Bentonite outlets
To jacking pipe nozzles

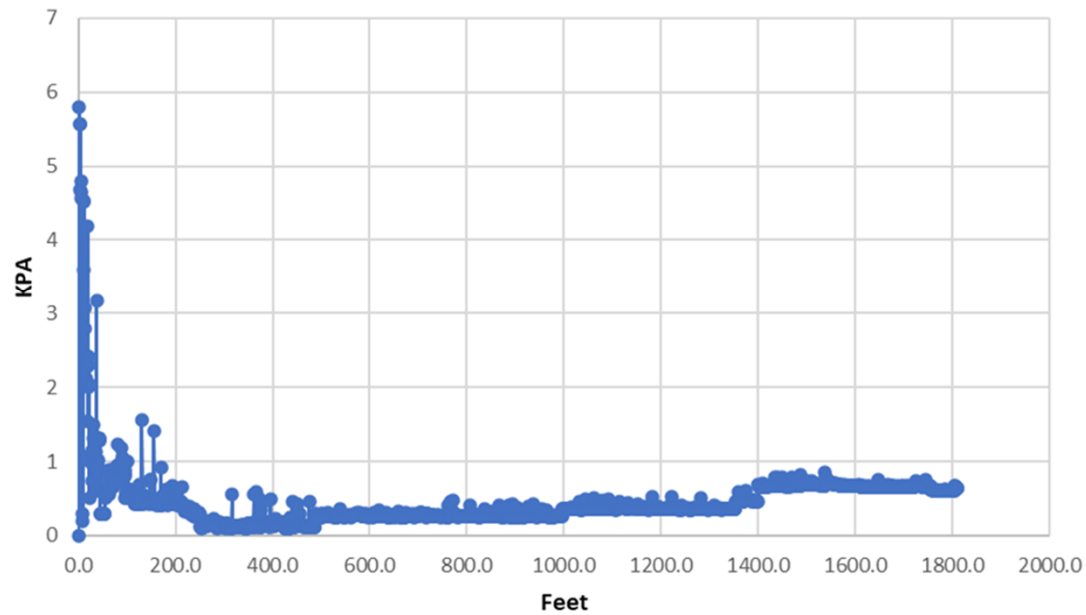




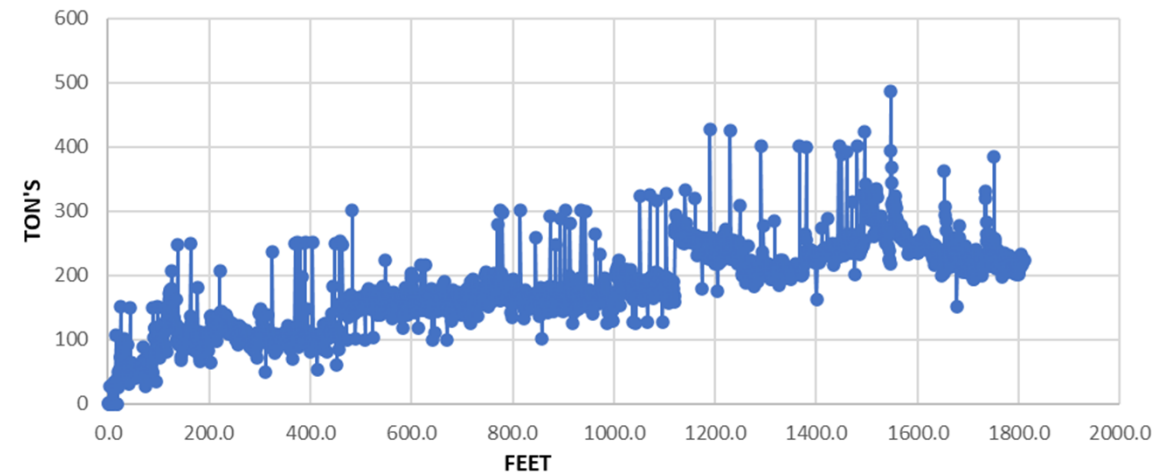
Skin Friction



Wawona Skin Friction Vs Length

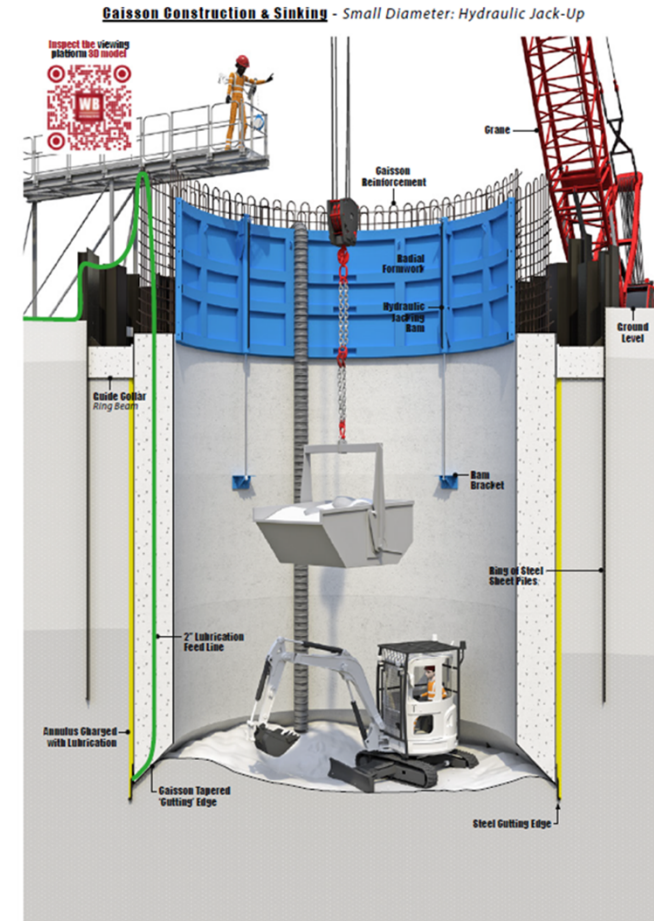
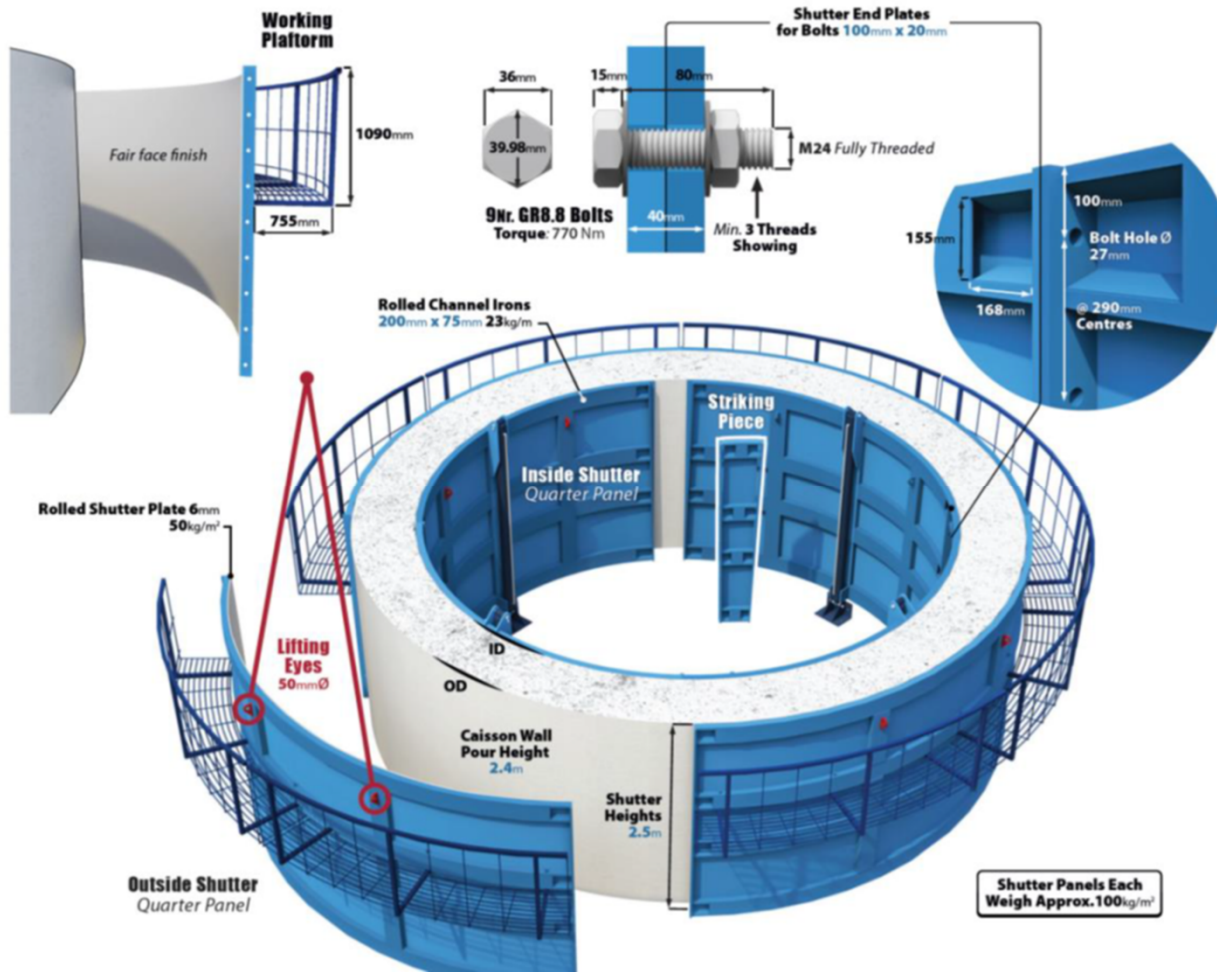


Wawona Jacking Force Vs Tunnel Length





Construction - Shafts



Reinforced Concrete Sunken Caisson

Construction – Tunneling

- 1800LF of 48"
- 8 weeks / 40 Shifts
- Avg 45LF/Shift
- Avg Skin Friction
0.5KPA/0.07PSI
- Max Jacking Force 350
TONS
- Max Allowable JF of
RCP Pipe 1050 TONS



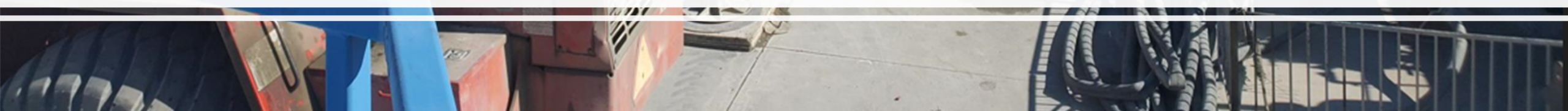


High Strength Reinforced Concrete Jacking Pipe

Manufactured using vertical wetcast method



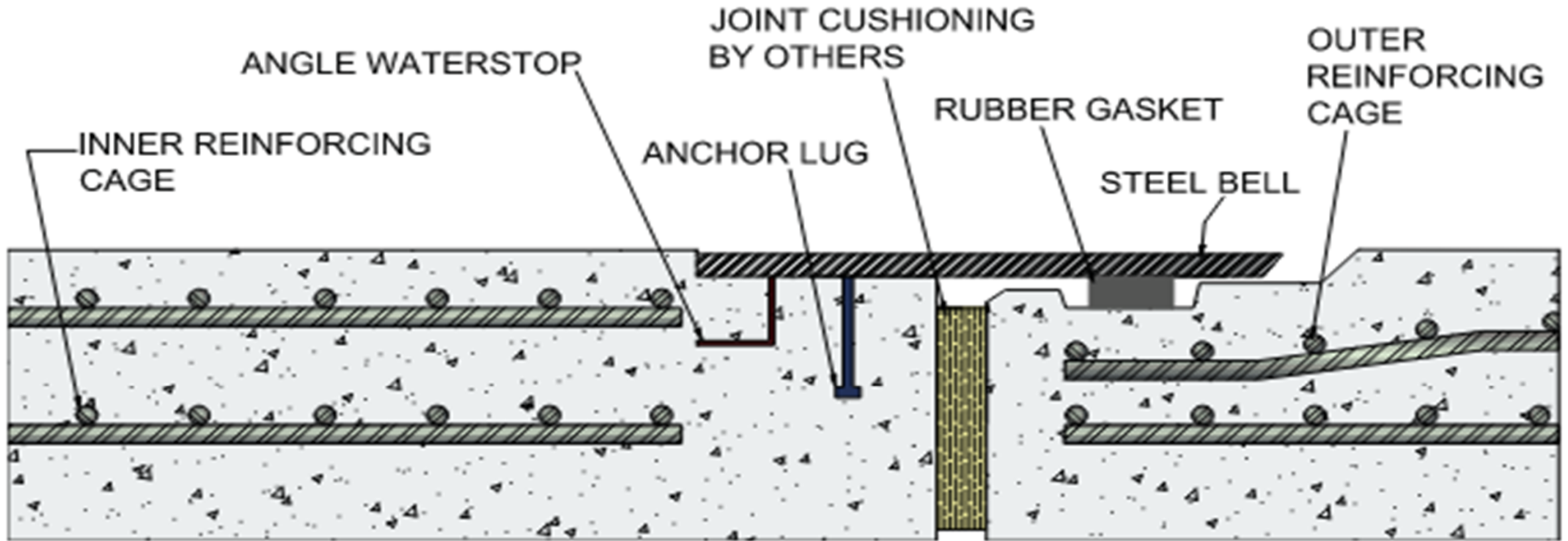
High Strength Reinforced Concrete Jacking Pipe (RCJP)





RCJP

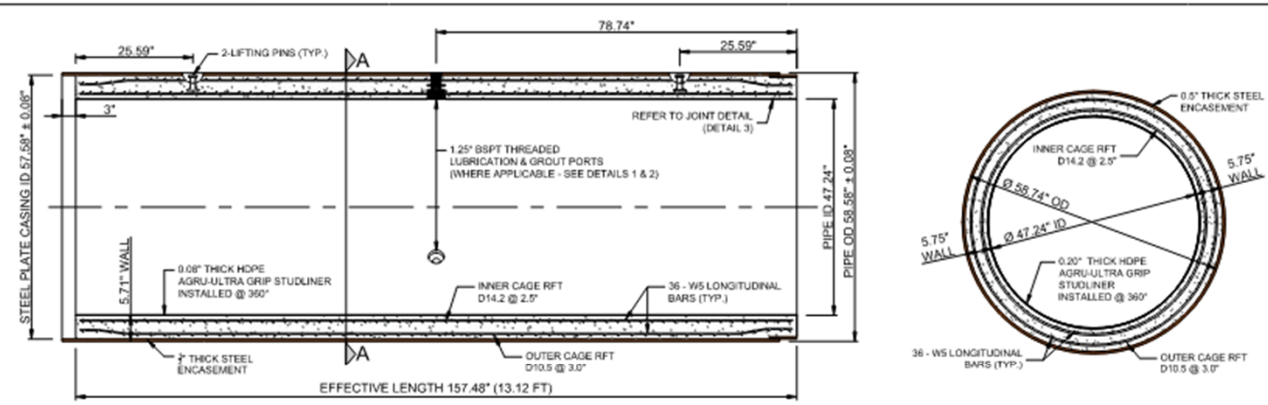
- Rigid Pipe Design with a flexible joint
- Can withstand point loads while Holding its circular shape
- Able to navigate tight radius curves
- Brute strength-Can withstand large jacking loads.



RCJP Design
Requirements

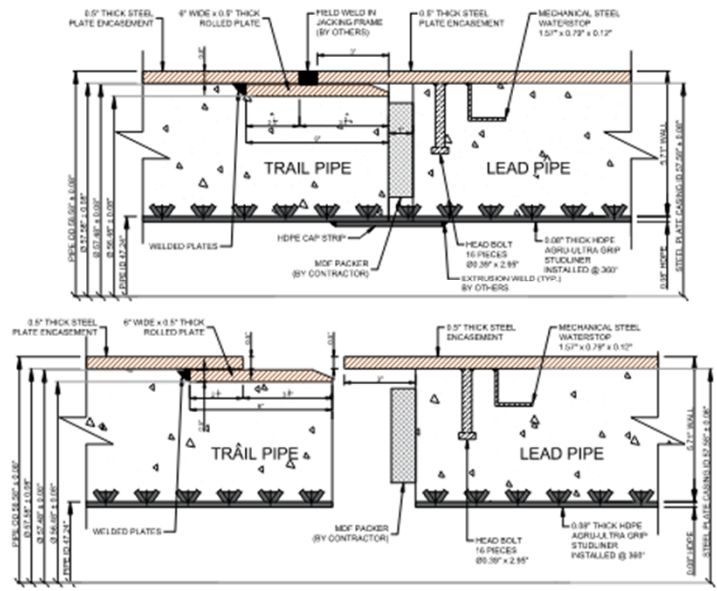
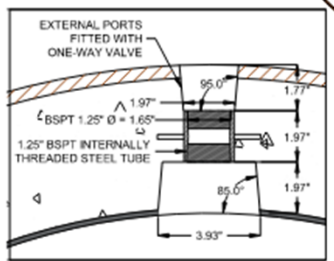
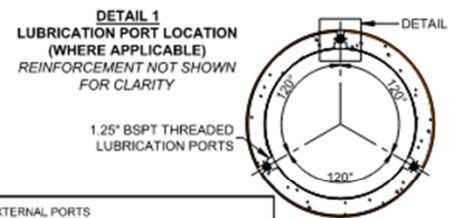
- ASTM C76 – CLASS V, C-WALL
- ASCE 27-17 Direct Design to Incorporate Specific Conditions of Each Tunnel
- 50PSI minimum joint Pressure Requirement

CALTRANS CROSSING PIPE & RR Considerations



LONGITUDINAL SECTION OF 48" MT PIPE w/ HDPE LINER & STEEL CASING

SECTION A-A OF 48" MT PIPE w/ STEEL CASING



DETAIL 3 - 48" MT PIPE w/ HDPE LINER & STEEL ENCASMENT JOINT DETAIL REINFORCEMENT NOT SHOWN FOR CLARITY

DESCRIPTION	
48" MT PIPE w/ HDPE LINER & STEEL CASING	
48" MT PIPE, HDPE LINER, STEEL CASING PORTS	
ITEM #	DESCRIPTION
1	PIPEROSE 48" ID x 13.12' L
2	PIPEROSE 48" ID x 13.12' L
3	PIPEROSE 48" ID x 13.12' L
4	PIPEROSE 48" ID x 13.12' L
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100	PIPEROSE 48" ID x 13.12' L



12/2/21

THOMPSON PIPE GROUP
 3005 N Laurel Ave.
 Redding, CA 96007
 Tel: (530) 244-1000
 Fax: (530) 244-1005

CLIENT: THOMPSON GROUP TUNNELING INC., SAN FRANCISCO PUBLIC UTILITIES COMMISSION
 PROJECT: AVANTAGE AREA FIBER/OPTIC IMPROVEMENTS

JACKING PIPE "STANDARD PIPE" DN48
 ID 47.24" - OD 58.74" L = 5.75' L = 13.12 FT.

PLAN #	DN48-01	SCALE	NTS
DATE	07C 2, 2021	DRAWN	AKJ / VJD
TPG PROJ. No.	N12	CHECKED	AKJ / VJD
DRAWING No.	48-HDPE-STL	REVISION	1

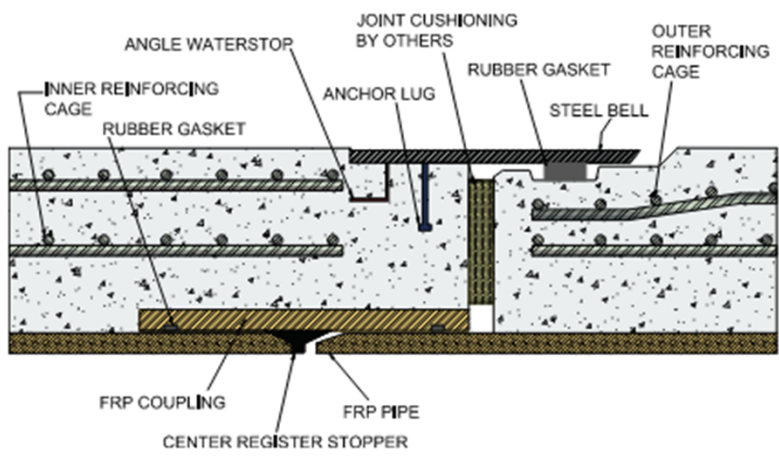
CALTRANS Crossing– Steel vs RCP





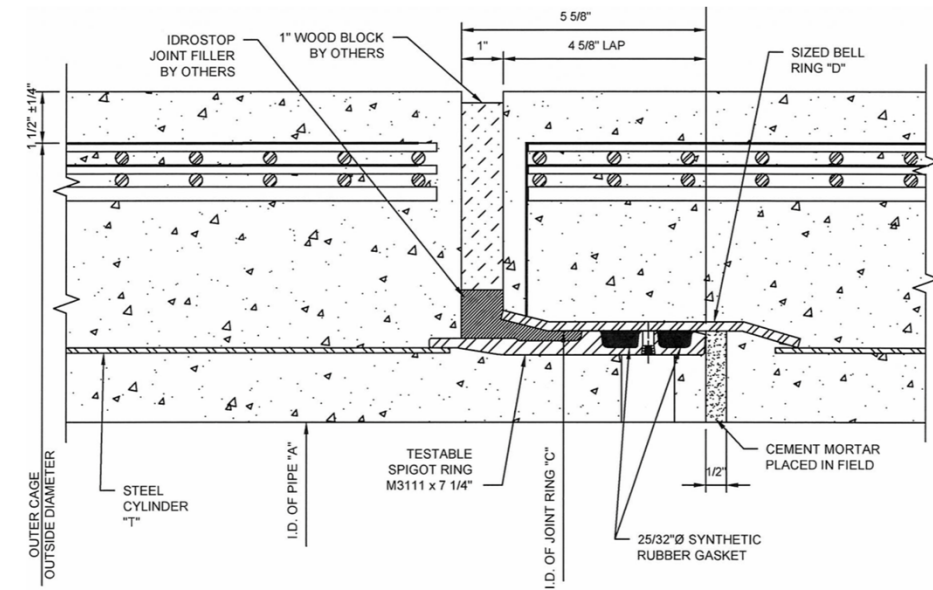
RCJP Considerations – Corrosion – HDPE Liner

Hamilton Kent
make the connection
Hamilton Kent



RCJP Considerations – Corrosion – Flowcrete

RCJP Considerations – Pressure





Conclusion

1,800LF Drive of 48" RCP.
Longest drive of this size in the
USA

Thank you



San Francisco
Water Power Sewer
Services of the San Francisco Public Utilities Commission

DELVE
underground

WARD & BURKE



THOMPSON
PIPEGROUP

Questions

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