

YOU WANT ME TO GO WHERE?

200 FEET UNDERGROUND: THE MALINE CREEK TUNNEL

Virtual Tour Production

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Facility Background

The Maline Creek Storage Tunnel sits 200-feet below Riverview Blvd in the City of St. Louis. It's the first tunnel of its kind built under MSD Project Clear, and is part of an intricate network of pipes, weirs, shafts and pump stations that are helping eliminate basement backups, reduce wastewater overflows, and protect natural waterways from pollutants.

- **Tunnel**

- 28' diameter concrete lined tunnel
- Overall length of about 3,960 or $\frac{3}{4}$ of a mile.
- Approximate storage capacity of 12.5 million gallons.

- **Pump Station**

- Three (3) wet weather pumps @ 6.25 MGD (4,340 gpm) each
- Maximum design rate of 12.5 MGD (2 Pump Max Operation)
- Two (2) dewatering pumps @ 2 MGD (1,389 gpm) each
- Wet Weather Pumps can drain tunnel in 24hr period.



Project Description

- Construction of the 3D model will require an estimated 30 hours of access. During that time, 360-degree photos will be taken at regular intervals, after which those 360-degree photos will be assembled and hosted on server so that they can be viewed and consumed by anyone. Concurrently, or during hours after the 360-degree camera a crew have vacated the tunnel, a video production crew will shoot video of key assets, intersections, etc... in the tunnel. The video work is expected to take approximately 8 hours to complete independently of the 360-degree photos.



Scope of Project

- Provide safe and reasonable entrance and exit to the Maline underground structure for the completion of three-dimensional mapping.
- Project estimated to take 5 days.
- The crews will range between 4-6 individuals
- One MSD representative will accompany the service provider during the duration of the project.
- Progressing through the space at 15- and 5-foot intervals.

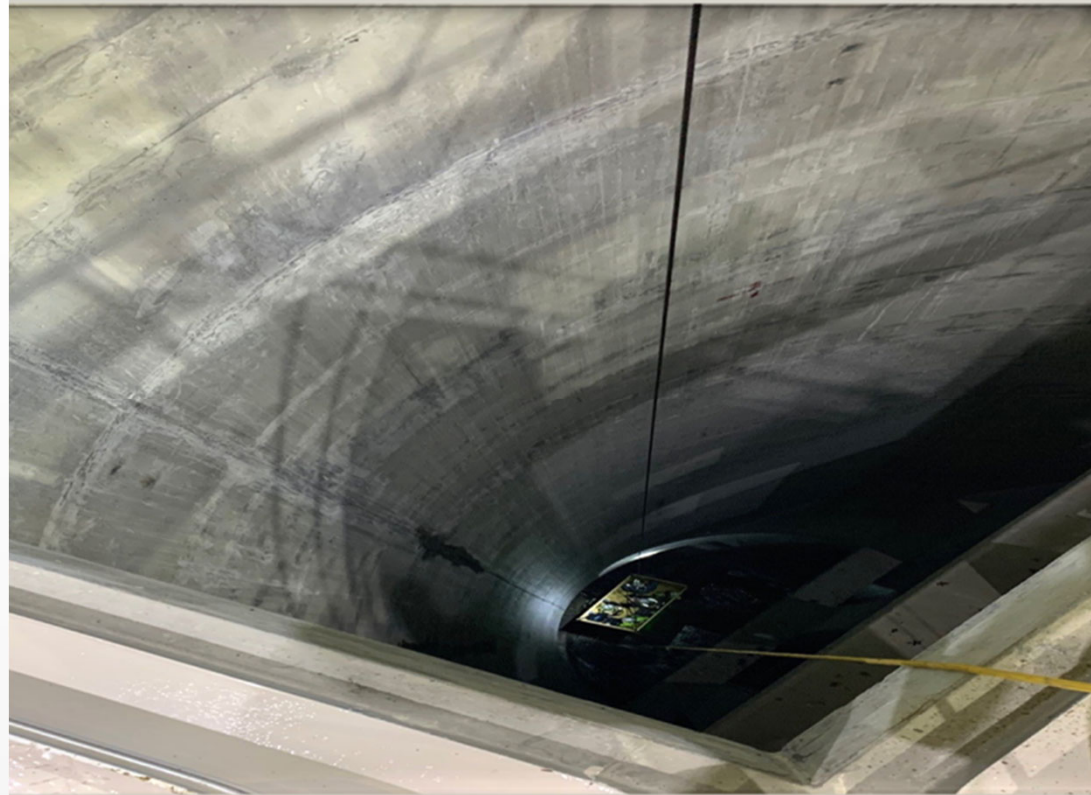


WHY?

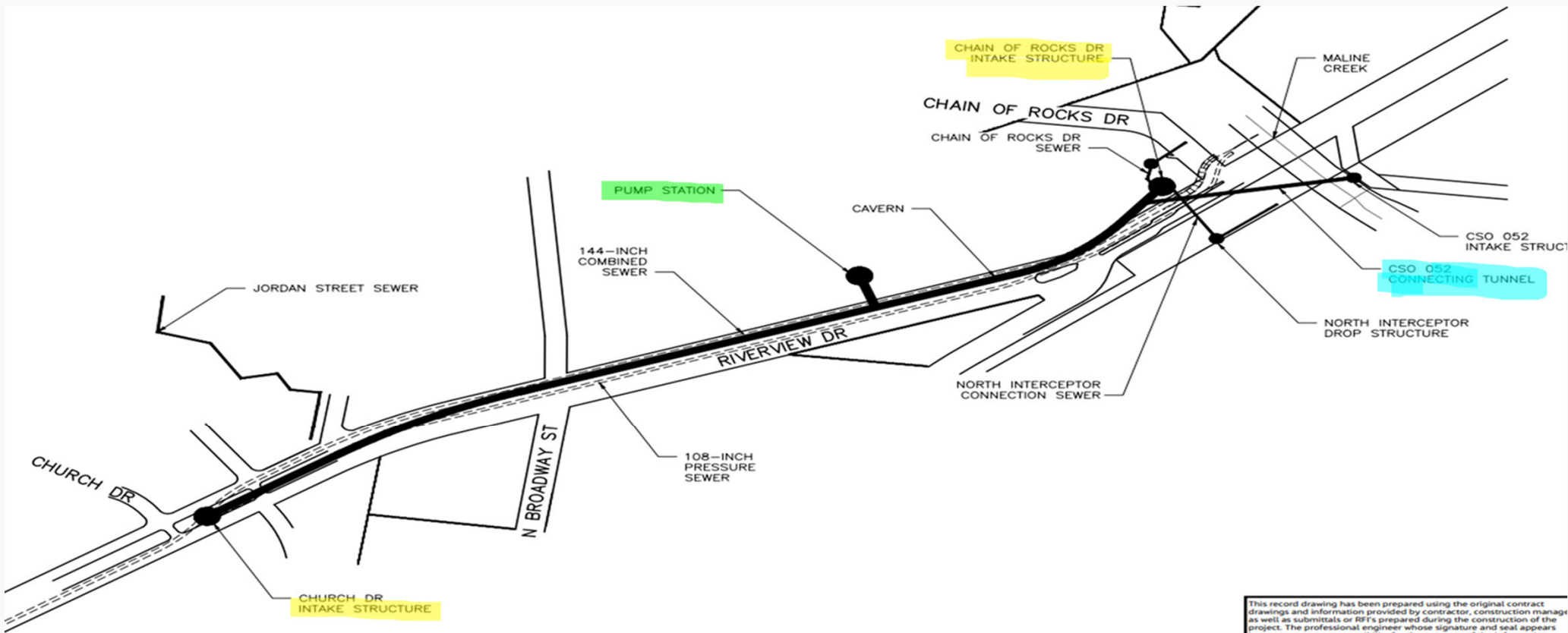


Challenges

- 200' Below Grade
- Site Management
- Emergency Rescue
- Communication
- Logistics of Personnel and Equipment
- Confined Space
- Atmospheric Conditions
- (Post) Start up & Commissioning – Station In Operation



Maline Creek Overview



This record drawing has been prepared using the original contract drawings and information provided by contractor, construction manager as well as submittals or RFI's prepared during the construction of the project. The professional engineer whose signature and seal appears



Main Point Of Entry – Pump Station

- Inside Pump Station – “*Central Command*”
 - ✓ Pre & Post Shift Meetings
 - ✓ Charging & Storage of Communications, PPE and Equipment
 - ✓ Entry team daily tracking Chart
 - ✓ Location of all permits (Confined Space, critical lift, LOTO)
 - ✓ Posted Emergency Info (Contact Names, Numbers, and Ste Address)



Site Safety Plan

Objective - Identify potential hazards of the work site, along with all company policies, controls and work practices selected to minimize those hazards.

- Multiple Remote Location (Comm , LOTO , 2nd egress , Ventilation)
- Training / Safety
- Communication
- Entry Team Tracking
- Ingress / Egress 200' Below Grade
- Weather Monitoring
- Ventilation

❖ Developed by MSD Operation Supervisor & Safety Coordinator over several weeks. This was a living document passed between all parties involved along with multiply departments, divisions and levels of management within MSD.



Roles And Responsibilities

- **Entry Supervisor** - Conduct pre-entry meeting & pre-entry task sequence / inspection, monitoring weather conditions, ensure open line of communication with all remote site attendants, give verbal instruction to start LOTO removal check list, Final go / no go decision maker
- **Safety Coordinator** - (Continuous) site safety audit, assist with pre-entry meeting & pre-entry task sequence / inspection, PPE, confined space training, Onsite EMS contact, Daily communications updates (Email or Phone)
- **Entry Lead** - Communication checks with basket attendant, keeping count of all photo stop intervals, air horn reply
- **Basket Attendant** - Monitor 4 gas meter with 30' tigon tube for atmospheric conditions during basket decent, communication checks with Entry Lead while in tunnel, record photo stop count and 4 gas meter readings, communicate with Main Entry Point signaler during basket travel up and down, all personnel return to basket, inspection of all personnel fall protection and hoist before lift.
- **Signaler (Main Entry Point)** - complete lock out/Tag out /try permit for Maline Creek Pump Station, loading and unloading of personnel, inspection on all personnel fall protection before lift, communicate with basket attendant during hoisting of basket and reply info to crane operator, ensure open communication with basket attendant entire time, secondary record keeping of entry team tracking data



Roles And Responsibilities

- **Church Street Attendant** - complete lock out/tag out / test permit on church street diversion gate, ensure single person basket is at bottom of diversion shaft, signal crane operator if single personnel hoist needs to be utilized, ensure open line of communication with entry supervisor, follow LOTO removal checklist after getting verbal instruction from entry supervisor.
- **Chain of Rocks Attendant** - Complete Lock out/Tag/Try permit at Chain of Rocks diversion gate, monitor mechanical ventilation setup and notify entry supervisor of any ventilation failures or known pollutants sucked in by ventilation intake ASAP, ensure an open line of communication with entry supervisor, follow LOTO removal checklist after getting verbal instructions from entry supervisor.
- **CSO-52 Attendant** - Complete lock out/tag out/try permit on CSO-52, ensure open line of communication with Entry Supervisor, Follow LOTO removal checklist after getting verbal instructions from Entry Supervisor, May act as temporary relief for Entry Supervisor or any site Attendant
- **Entry Team** - Follow safety plan and Basket Attendant instructions while in tunnel.

Safety



Training / Safety

- ST. Louis Fire and Rescue
- Fall Protection and rescue harness
- Rescue Breather (Escape Air)
- Confined Space
- Personnel Lifting (Man Basket)
- Personal Protective Equipment (PPE)
- Area Lighting and personnel Lighting
- Pre-Lift Meeting (Trial Lift, Inspection, and Testing)
- Pre-Entry meeting

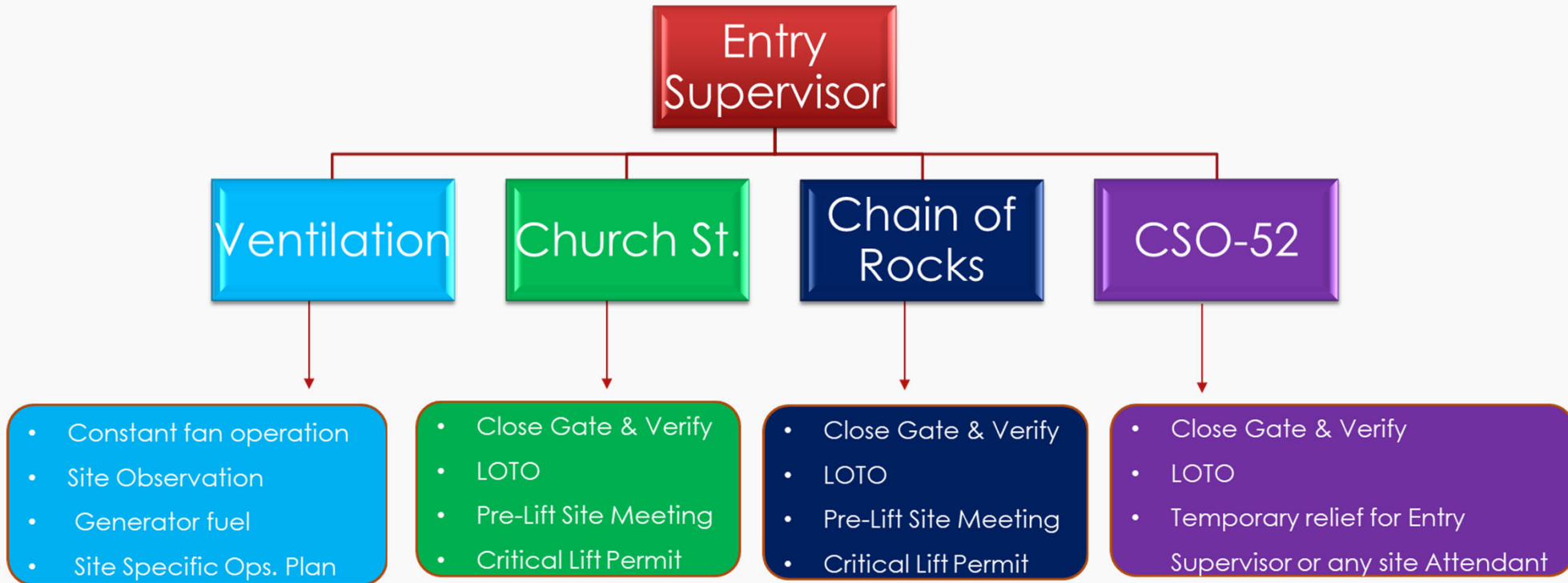


Communications

- Locate type of radio communication that would be the best fit for this situation
- Had two designated channels for each team (Entry Team / Remote Locations)
- Checked for poor communication at all location prior to start of exercise.
- Modified placement of basket attendant in order not to break communication chain
 - Comms. limited to line of sight
- Switched to over the ear communication because of ventilation noise and other ambient noise



Communication Workflow- Remote Location



Communication Workflow – Entry Team

Entry Team Lead

- 5 min comm. Check & stop number

Middle Relay

- Relay stop number to Basket Attendant

Basket Attendant

- Replay stop number to Entry Supervisor

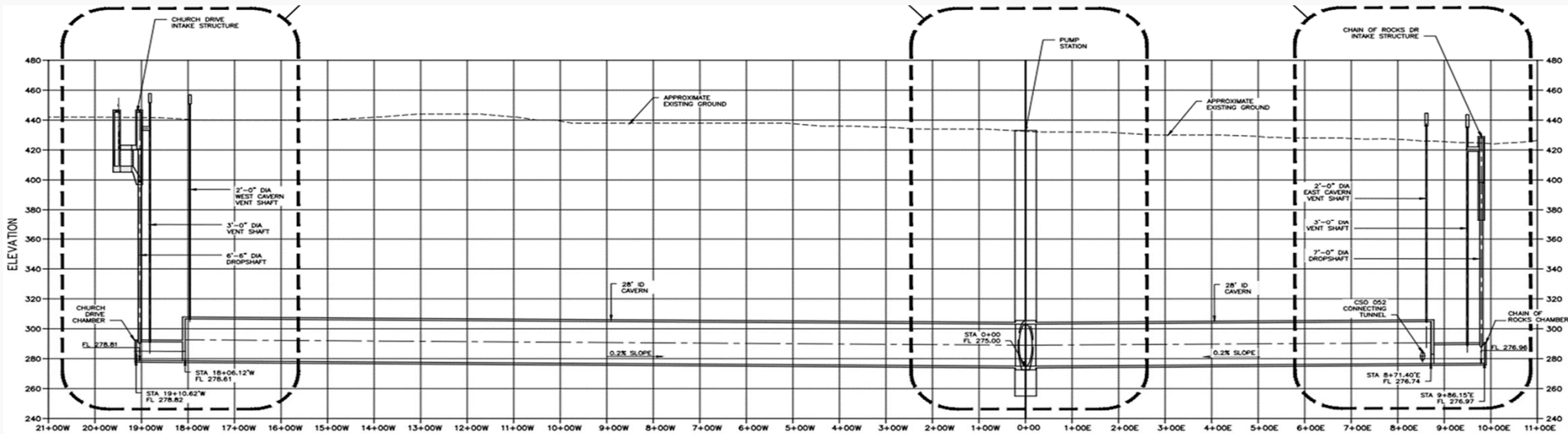
Entry Supervisor

- Update tracking map



Communication- Entry Team

- Entry Team Mandatory Comms Check -5 mins
- Two (2) Missed Comms Checks
 - **1 Air Horn Blast from Basket Attendant = 2 Return Air Horn blasts from Entry Crew & return to primary point of entry**
- Two (2) missed comms check & No return air horn blast = Contact St. Louis Fire and Rescue



Weather

Weather Monitoring:

- Entry Supervisor will monitor weather conditions starting 3 days before planned entry date, and continuously starting one (1) hour before tunnel entry. At any time before or during the job, the Entry Supervisor may stop the job from moving forward due to wet weather or the threat of wet weather. In the event there is a threat of wet weather while personnel are in the tunnel, the entry team will be notified and must return to the Main Point of Entry ASAP
- ✓ Personnel Safety
 - ✓ Facility Online
 - ✓ Regulatory Concerns
 - ✓ Environmental Impact

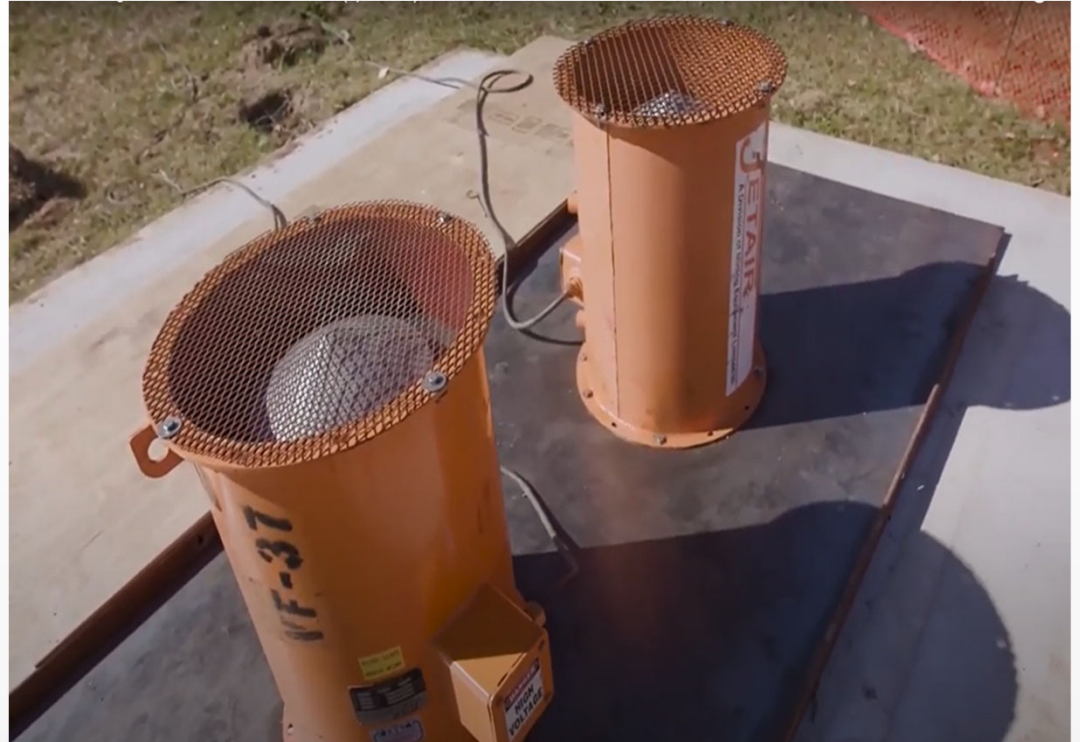


Production



Ventilation Setup

- Two (2) 15Hp ventilation fans – 30cfpm of air velocity
- Liability Concerns
- Identifying best location
- Secure site
- Procurement
- Modifications
- Two (2) 60 kW towable generator (Primary and Secondary)
- Light tower (24hr fan operation)



Take Aways

- Have a documented plan for future tunnel entry
 - Personnel requirement and placement
 - Equipment requirement & placement
 - Entry condition expectations

- Future Tunnel Designs
 - Equipment / Personnel entry
 - Station overhead crane – Personnel Lift
 - Walk-through door on Barscreen

Virtual Tour Experience



Video Links

Part 1 (WHY)

<https://youtu.be/kYXNqbTCrV0>

Part 2 (Production)

<https://youtu.be/JrGytqnS-G8>

Part 3 (Safety)

<https://youtu.be/hmbmm9UBvjc>

Maline Creek Tunnel Virtual Experience @

www.msdproujctclear.org/virtualtour



QUESTIONS ?

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