RMF Engineering
Reliability. Efficiency. Integrity.

BOND

IDEA Presentation

Underground Best Practices

June 29, 2015

Team

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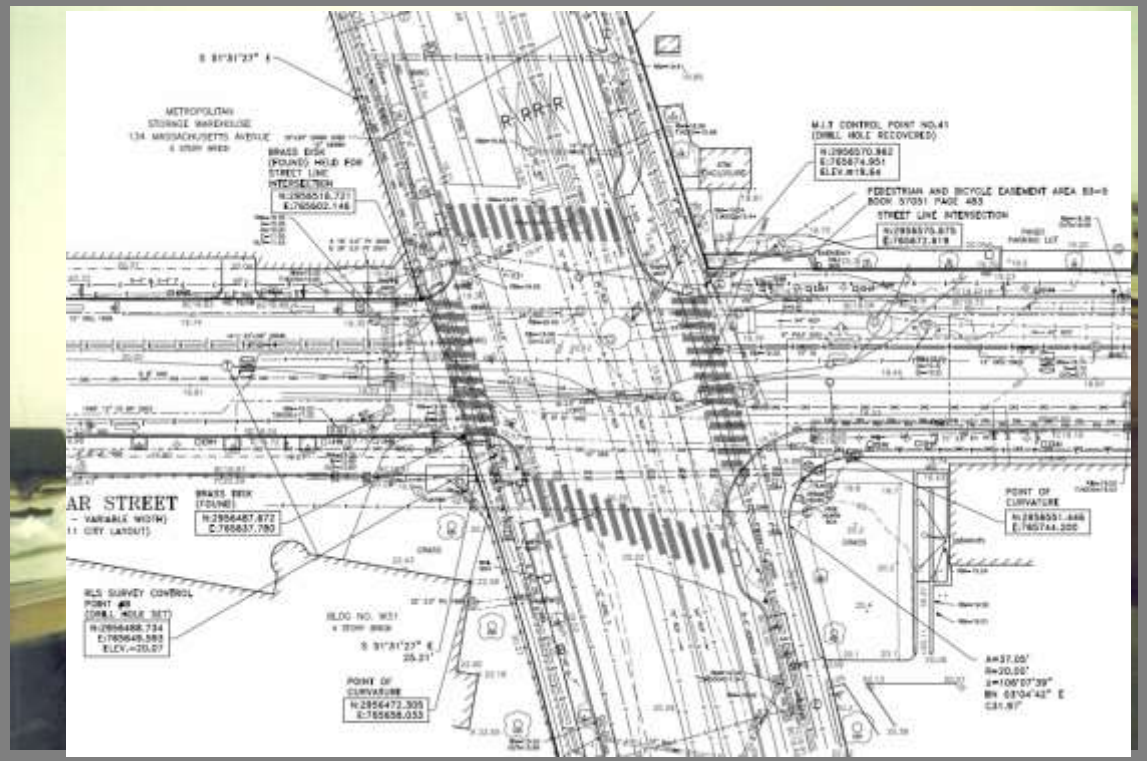
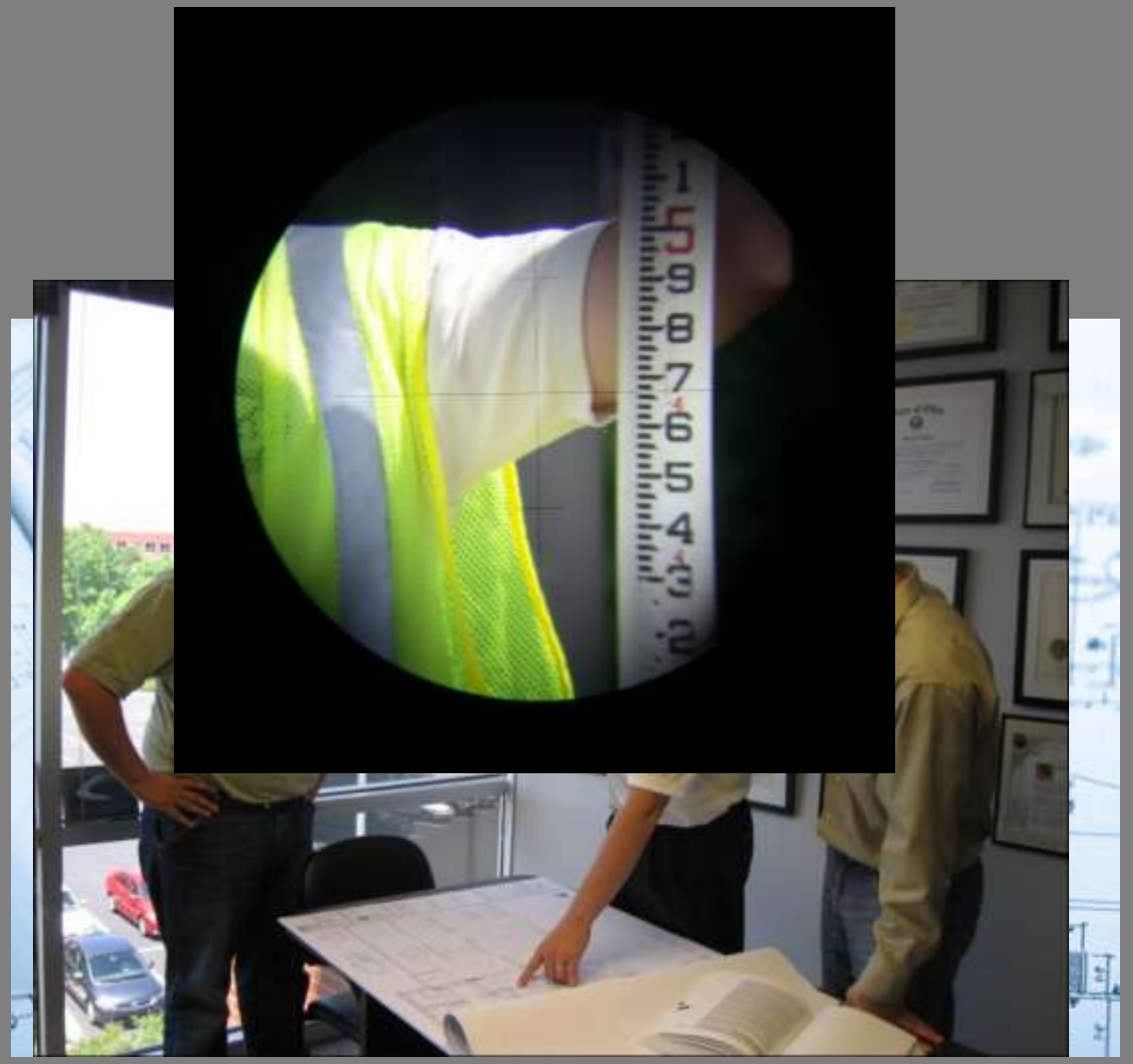
Gathering Information

- Owner's Records
- Discussions with Facilities/Staff
- Topographic Survey





Existing Conditions – Topographic Survey

- Property Lines

Existing Conditions

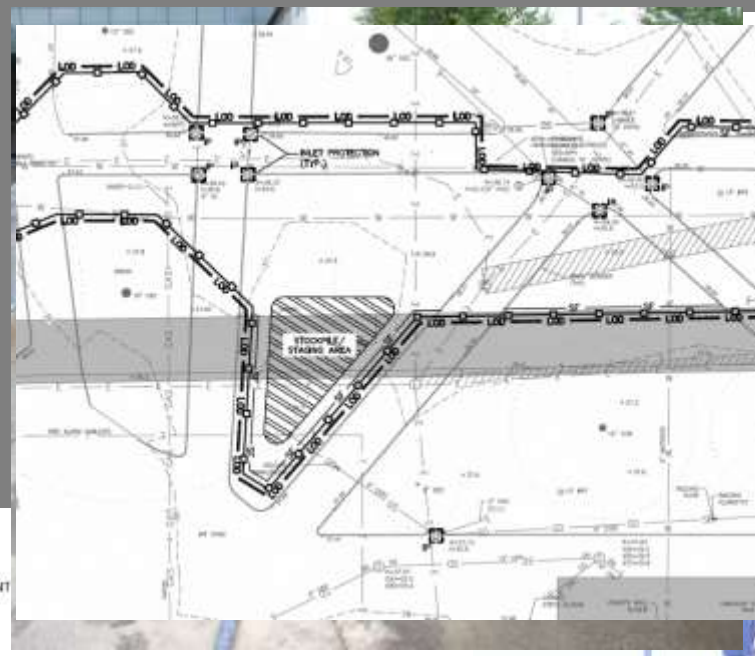
- Property Lines
- Utilities
  - Location
  - Ownership
  - Easements
  - Material
    - Hazards
    - Durability

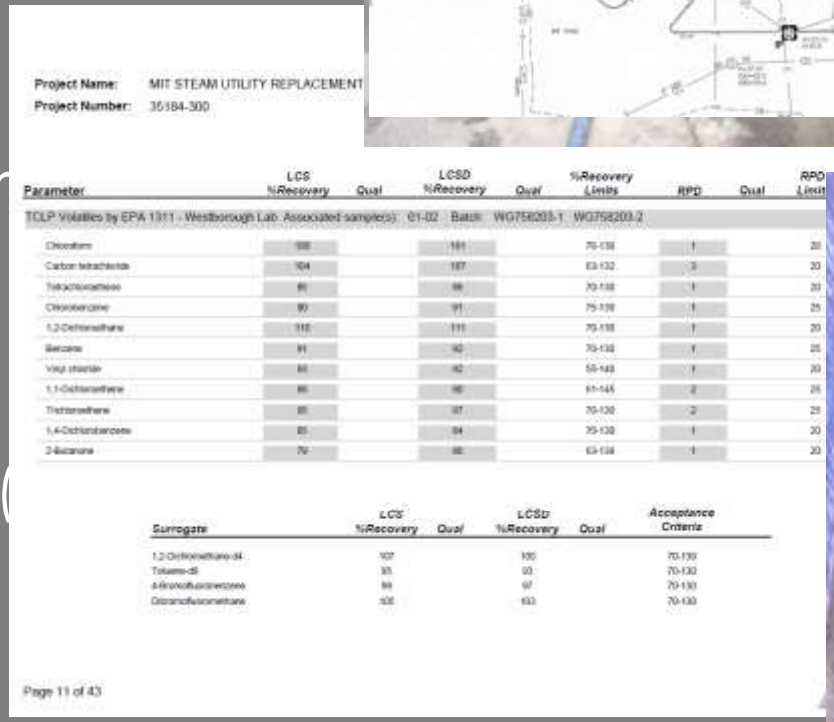
Existing Conditions

- Property Lines
- Utilities
  - Location
  - Ownership
  - Easements
  - Material
    - Hazards
    - Durability
- Trees

Geotech (Soils)

- Physical Properties
  - Structural Stability
- Hazardous Materials
  - Testing
  - Disposal
- Stockpile
- Groundwater
  - Testing
  - Disposal
    - Recharge
    - Discharge (





Schedule

- Moratorium
- Owner's Scheduled Events
  - Academic
    - Graduation
    - Research
  - Other
    - Sports
    - Fundraising
    - Concerts
    - Community Outreach

Weekend

Monday after Graduation

Schedule

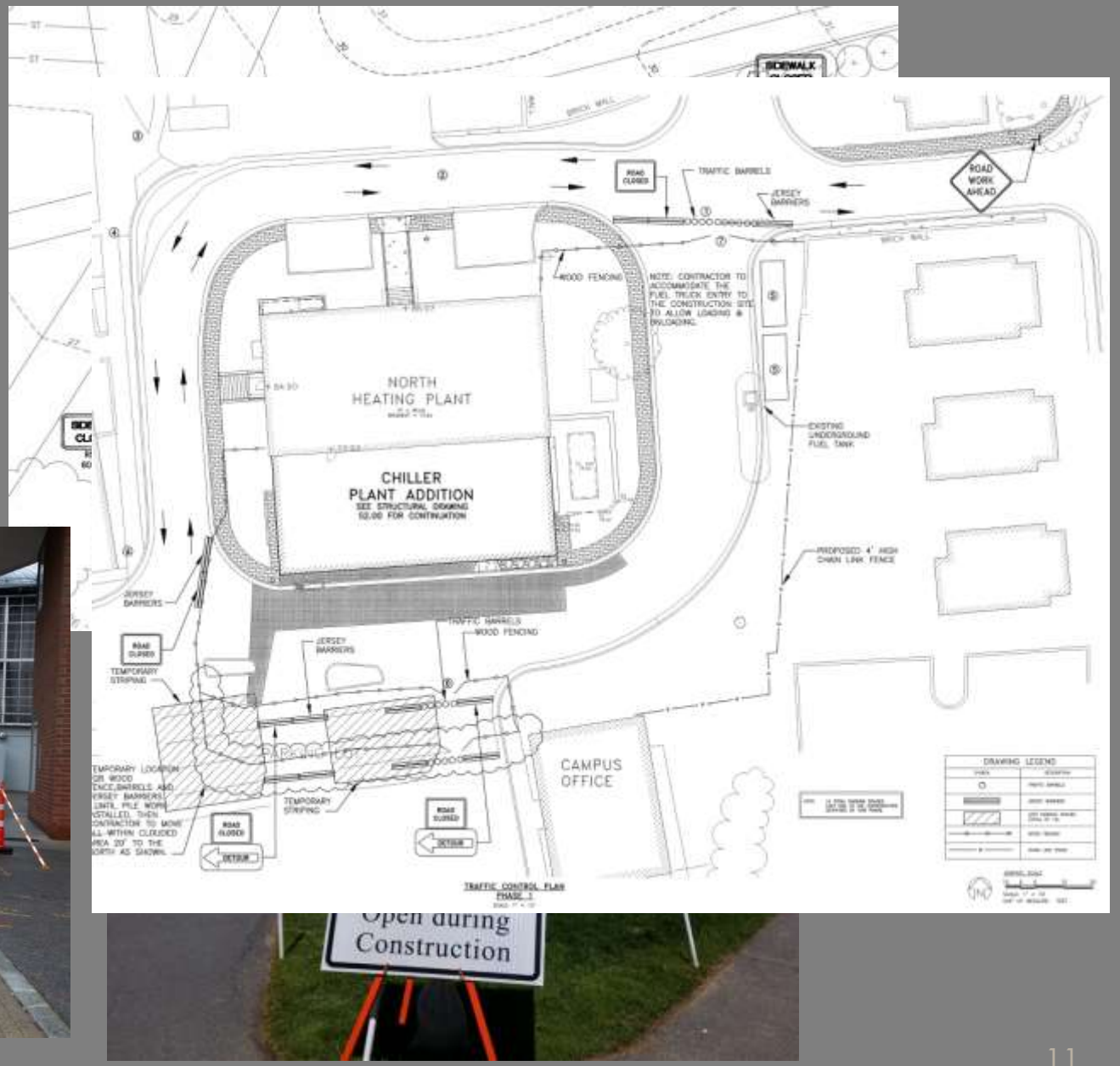
- Moratorium
- Owner's Scheduled Events
  - Academic
    - Graduation
    - Sports
    - Research
  - Other
    - Fundraising
    - Concerts
    - Community Outreach
- City's Scheduled Events
  - Circus
  - Parades
  - Street Cleaning
  - Sports

Schedule

- Adjacent/Related Projects
- Utility Outages
  - Off-hour Work
  - Live Work
- Weather
- Material Lead Time
- Permitting

Traffic Control

- Vehicles
  - Emergency Access
  - Truck Traffic
  - Parking
  - Bicycle
-

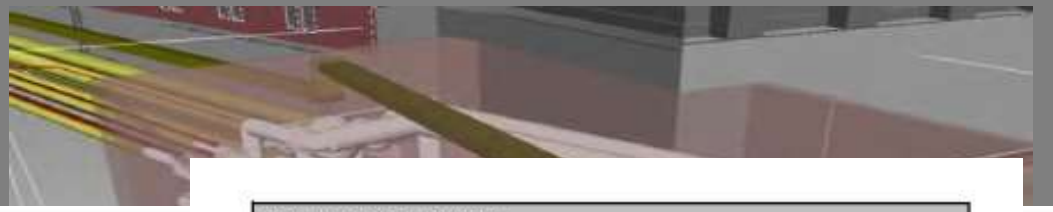


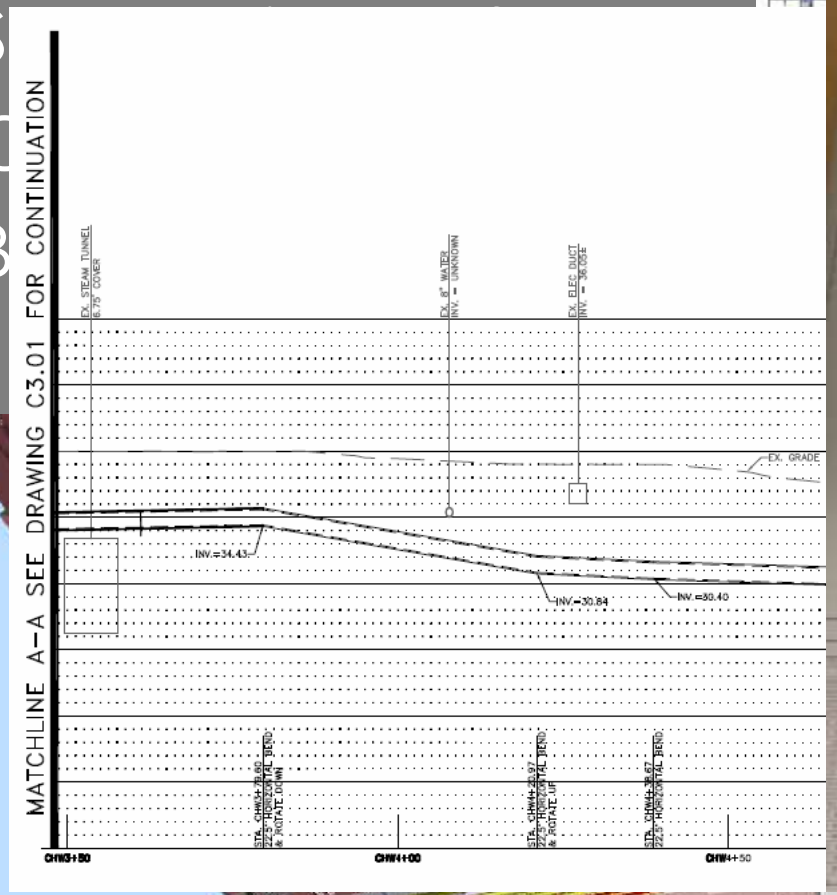
Coordination

- Police Details
- Communications
  - Stakeholder Notice
  - Signage
  - Division of Scope on Adjacent Projects

Design Management

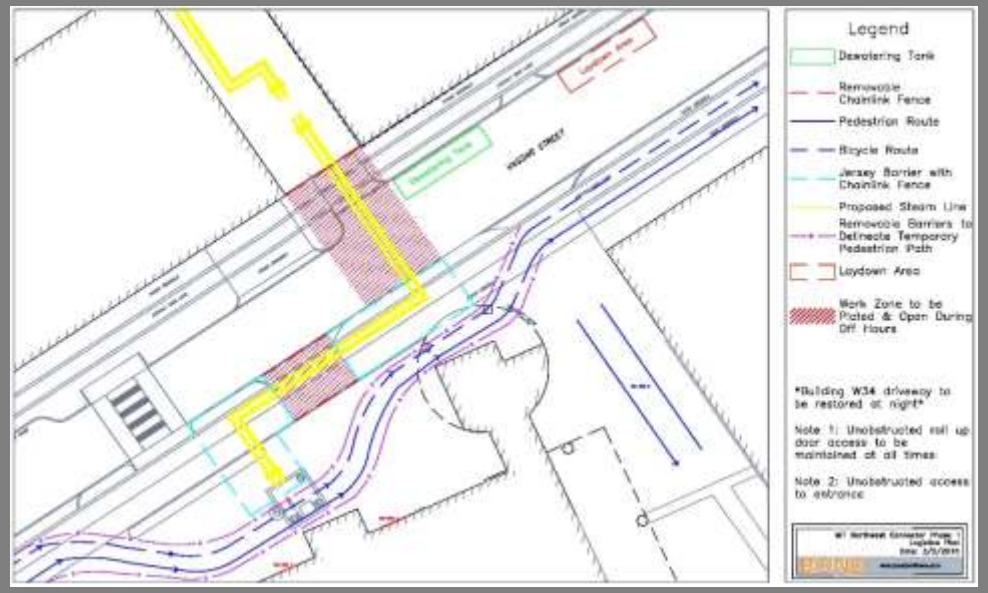
- 3D Modeling Tools
- S
- C
- B

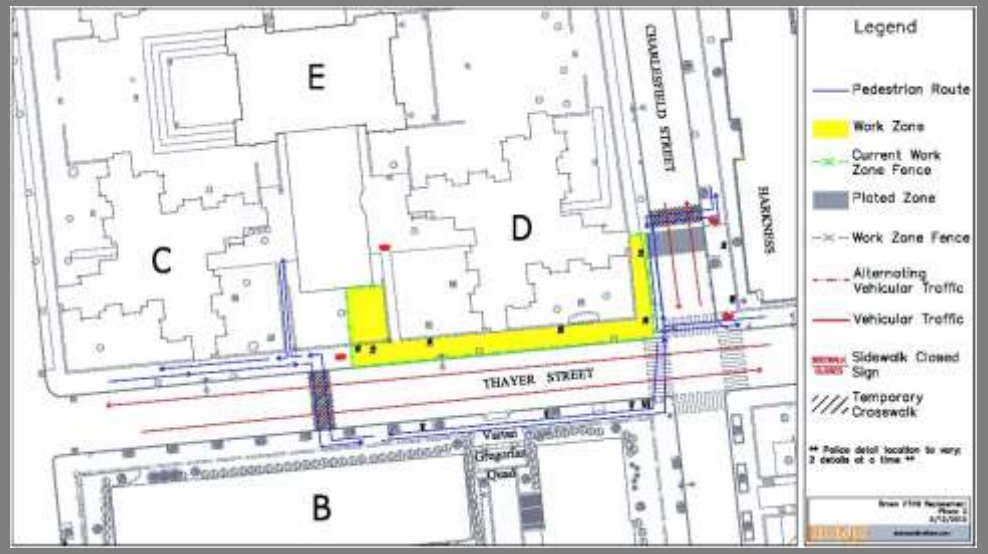




Planning and Precon

- Logistics Planning
  - Day to Day operational impacts
    - Public v Private Complexities
    - Planning movements
  - Needs of user groups / stakeholders
    - Building Managers
    - Daily Deliveries
    - Students / Faculty / Staff / Public
    - Classroom Impact – Noise/Access
  - Campus Environment
    - Academic Schedule
      - Events, Exams, Graduation
    - Pedestrian Traffic Flow
      - Traffic Plans
      - Way finding signage
      - Building / Facility Access/Egress
  - TREES!!!!!!!!!!!!!!!





Planning and Precon

- Systems Outages
  - Planning and minimizing impacts in relation to taking a system out of service
  - Preconstruction Services
  - Outage Preparation
    - ID Isolation Points
    - Lock Out / Tag Out
    - Equipment Protection
    - System Loops
    - Temporary Bypass
  - System Restoration
    - Testing / Commissioning
    - Resource Allocation to ensure timely return to service (planning)

Planning and Precon

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AREA / JOB HAZARD ANALYSIS

JOB DESCRIPTION: Demolition& rebuild of Manhole Wall LOCATION:MIT NANO Job DATE:

DESIGNATED COMPETENT PERSON: Helder Pacheco SUPERVISOR: Rich McEarnes

BOND SAFETY REP: Benjamin Trito

PAST INCIDENT REVIEW: Yes MSDS REVIEW: Yes

REQUIRED INSPECTIONS AND PERMITS: EQUIPMENT: Tripod, gas detector ,Harness , light,

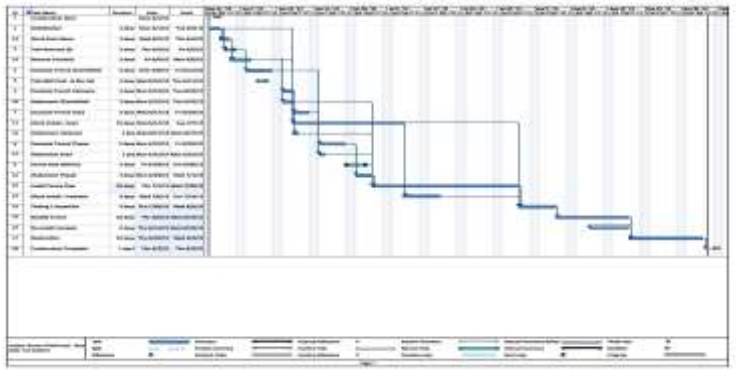
- □ Pre-and Post Task Analysis*
- □ Daily Safety Inspection
- Confined space permit*

*Reference Bond Safety Work Procedure No 1 supplement to this JHA

HAZARD CONTROLS

JOB TASKS	POTENTIAL HAZARDS	CONTROLS
Opening Manhole cover	Pinch point, struck by	Due diligence, solo operation, proper tool choice
Entering Manhole	Unhealthy atmosphere	Gas monitor testing,
Entering Manhole	Fall/retrieval	Tripod with retriever and harness and designated attendant
Entering Manhole	Live Electricity	Fr suit with face shield and needed PPE, live lines moved and covered by Mass Bay ahead of time
Placing Plywood for shielding	Flying Debris(nails, wood fragments,	Safety glasses
Break through concrete wall Of vault	Chips of concrete	Safety glasses and gloves
Cutting out rebar	Sparks and flying metal	Safety glasses with face shield and gloves
	CO from gas engine	Monitor environment , ventilate as needed
	Noise from cutter	Hearing protection
Disposal of demolition debris	Lifting, hoisting buckets	Use proper lifting techniques, Assistance from outside with rope on bucket

- Safety & Quality Focus
  - JHA / PTA
  - Sub Orientations
  - Tool Box Talks
- Schedule Development
  - Coordination
    - Incorporate Owner Requirements
    - Impact of Adjacent Projects
    - Schedule the ACTUAL Work



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MIT .NANO Enabling Project

From: 10/28/2014 To: 11/8/2014

Concentration	Description of Work	Present Work Week						Week 1						Week 2					
		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		####	####	####	####	####	####	####	####	####	####	####	11/1	11/3	11/4	11/5	11/6	11/7	11/8
ZONE A																			
Piles	Pile Installation	X5	X5	X5	X5	X5		X5	X5	X5	X5	X5							
Piles/Areaway	SOE/Pile installation West Areaway			X5	X5	X5													
CHW	Excavation of CHW trench from bldg. 26	X4	X4								X4	X4		X4	X4	X4			
Areaways	Excavate West Areaway							X4	X4	X4	X4	X4							
Areaways	Demo Wall Areaway															X4	X4	X4	
Fire Protection	Breakout DB & repair ruptured 8" FP line			X5	X5	X5		X5	X5										
CHW	Excavate to locate existing CHW lines for new DB			X1	X1														
ZONE B																			
Fire Protection	Install 10" Fire protection (On Hold - Design)																		
Sewer	Install 8" Sanitary Sewer (On Hold - Design)																		
ZONE C																			
Test Pits	Set Sleeves for Piles (Pending CDC approval)							X5	X5	X5	X5	X5							
	Install SOE piles (Pending CDC approval)													X5	X5	X5	X5	X5	
Zone D																			
ZONE E																			
CHW	Excavate for 30" CHW lines							?	?	?	?	?		?	?	?	?	?	
ZONE F																			
Fire Protection	Install 10" FP line																		
Fire Protection	Excavate & Place Concrete Electrical DB	X1	X1													X1	X1	X1	
Electrical	Test Pit M29				X1	X1		X1	X1										
Electrical	M29 Expansion Excavation																		
Chilled Water	Excavate for 16" CHW S&R	X2	X2	X2	X2	X2		X2	X2	X2	X2	X2		X2	X2	X2	X2	X2	
Misc. Work (Not Zone Specific)																			
Trailer Complex	Install Housekeeping Pads (Electrical)			X3	X3	X3		X3	X3										
Trailer Complex	Install Electrical DB for Trailer complex	X3	X3	X3	X3	X3		X3	X3	X3	X3								
Fire Protection	Presidents Courtyard																		
Test Pit	Building grade beam test pit										X3?	X3?							

Page 1 of 2

Installation & Restoration

- Site preparation
  - Fencing, Barricades
  - Tree Protection
  - Street/Walkway Closures, Police Details, Signage
  - Dig Safe / Private Utility Locations
- Earthwork
  - SOE
  - Excavation
  - Existing Utility Support / Protection
  - Trucking / stockpiling / containment
  - Soil contamination issues
  - T&D Soils
    - Pre-characterization
    - ID disposal facilities
    - Facility/Owner Approvals
    - Wastestream tracking & management

Execution – Installation & Restoration

- Utility Installations
  - Utility Shutdowns and Isolation
  - Relocations & Bypass
  - Material Delivery
  - New Installation / Assembly
  - As-built / Records
  - Testing, Commissioning

Execution – Installation & Restoration

- Backfilling,
  - Material Selection Delivery
  - Flowable Fill Options
  - Import v Reuse
  - Compaction
  - Site Access
- Site Restoration
  - Existing Conditions
  - Area Features & Styles

Execution – Installation & Restoration

- Horizontal Approach
  - Multiple sites
  - Linear Progression
    - Prep Site
    - Installation
    - Restore Site
  - Coordinating Multiple Impact Areas
  - Formula for Success = Planning, Planning, Planning

QUESTIONS & ANSWERS