

Work Activity Matrix for Microtunnel Inspection and Risk Management



Babs Marquis, CCM

November 12, 2019



Agenda

- Work Activity Matrix (WAM) Introduction
- Construction Quality Management Plan
- Target Task WAM for Microtunneling
- WAM Development Plan and Training
- Microtunnel Project Documentation
- WAM Value Added Project Benefits
- Discussion

Introduction

Microtunnel Construction Quality Management Plan

Project Quality Management

- Plan Quality Management - WAM
- Train and Inform
- Perform Quality Assurance
- Control Quality – Document
- Report

CAT-212C Gilboa Dam Reconstruction Project – Low Level Outlet

Appendix ____ Microtunnel

Appendix _____

Microtunnel Construction Quality Management Plan
Contract CAT-212C
Schoharie Reservoir Low Level Outlet

Prepared by:



Construction Management Services
Gilboa Dam Reconstruction Project
Capital Project WM-30

Introduction to Work Activity Matrix - WAM

What is it?

- WAM is a simple at-a-glance tool for project reporting (ONE PAGE)
- Process and Procedure for Quality Assurance good practice
- Baseline for minimum quality activities
- Resource Management



WAM Development

Baseline Schedule and WBS Focused

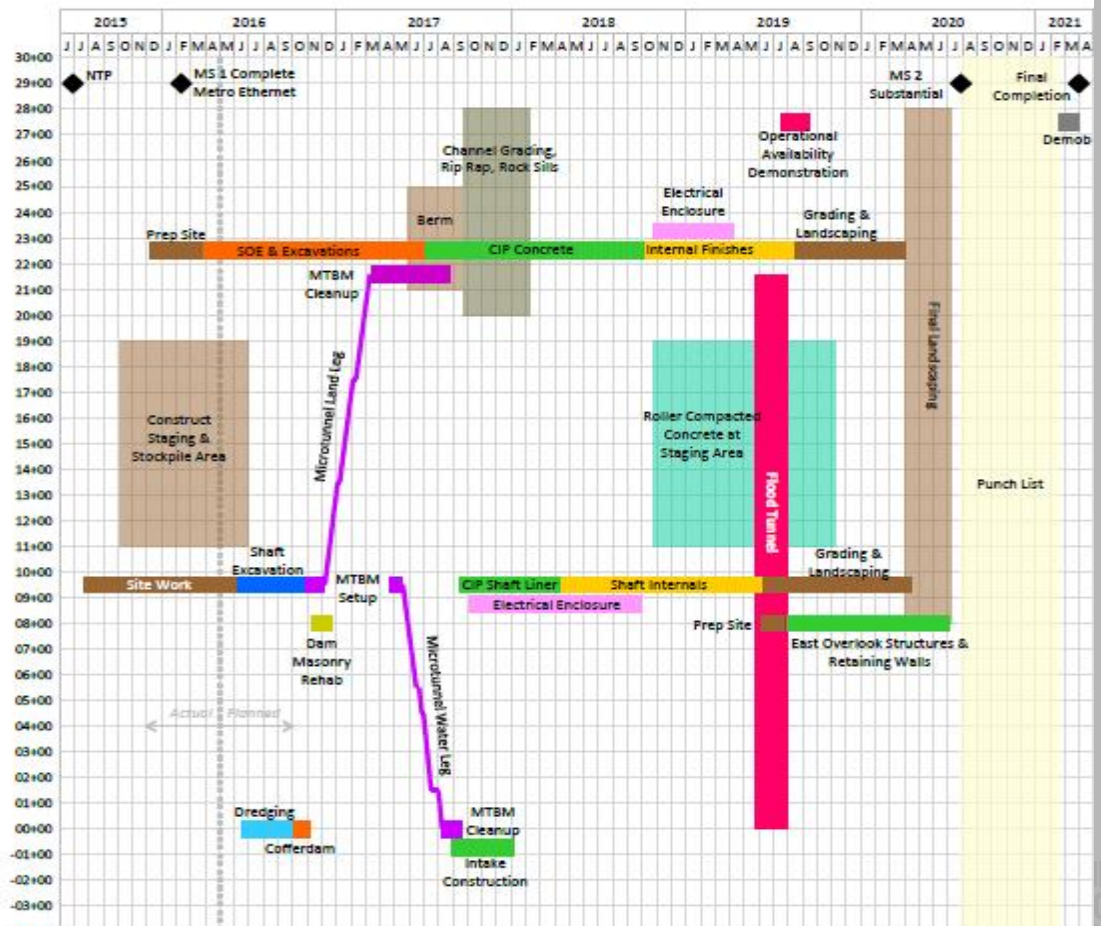


Gilboa Dam Reconstruction - Installation of Low-Level Outlet (CAT-212C)

Simplification of Contractor's CPM Schedule, prepared by McMillen Jacobs Associates

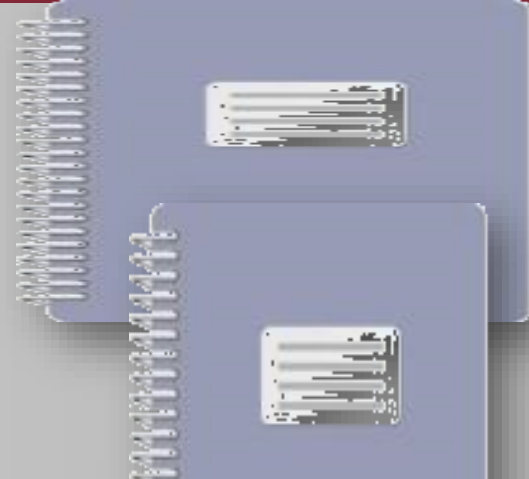
April 2016 Update

EW 5/17/2016



Agenda for WAM Development

- **Participants**
- **Reference Sources – Specs & drawings**
- **Capture – Submittals and deliverables**
- **Develop WAM**
- **Assess**
- **Review**
- **Perform**



WAM Development Plan & Training

	A	B	C	D	F	H	I	J	K	L	M
1	<p align="center">Work Activities Matrix for Area 3 - Microtunneling Land Leg Blasting, excavation and ground support</p>										
2											
3											
4											
5											
6	Objective: Conduct WAM task specific workshop and readiness review coordination for Drilling and blasting										
7											
8	Facilitator: B. Marquis										
9											
10	Column1	Column2	Column3	Column5	Column7	Column8	Column9	Column10	Column11		
11	Detailed Specification					Dates					
12	Item #	No.	Section	Description	Assigned Lead	Due	Follow up	Complete	Comment		
13	1	02414	1.08	Verify relevant submittal compliance	P. Hoosier						
14		02953	1.07								
15		01356		EH&S Plan submittal compliance	K. schutty						
16											
17	2	DWG	212C-C3-301	Related Contract drawings	B. Marquis						
18											
19											
20	3			Scheduled activity duration start/end date	J. Diamante						
21											
22	4			Related RFI and disposition if applicable	J. Diamante						
23											
24	5			Inspection check off, hold points and restrictions	C. Frasier						
25											
26	6			Close-out data requirement	J. Diamante						
27											
28	7			Other(s)							

WAM Development Plan & Training

	A	B	C	D	F	H	I	J	K	L	M
1											
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Work Activities Matrix for Area 3 - Pre-requisit for Microtunneling

Bottom Shaft, Breakout, Thrust Blocks, Jack & MTBM Assembly, Slurry

Planned work activities Bottom shaft finish amd preperation
Breakout walls and launch seals for LL/WL tunnels
Thrust blocks for LL/WL Tunnels
MTBM assembly
Slurry separation plant assembly
Bottom shaft power, utility lines and connection to operator annex
MTBM launch and minning with pipe installation

Hold Points if any 1.11.E (Quality assurance) Microtunneling shall not be performed unless items 1.11.C & D are satisfied-

Objective: Conduct WAM task specific workshop and readiness review coordination for microtunneling

Hold Point:

Facilitator: B. Marquis

Column1	Column2	Column3	Column4	Column6	Column7	Column8	Column9	Column10	Column11
Detailed Specification			Specification Title	Action Item Required		Dates			
Item #	No.	Section	Description		Assigned Lead	Due	Follow up	Complete	Comment
1	02961		Microtunneling	Verify relevant submittal compliance	P. Hoosier				
	02950	1.07	General tunnel requirement						
	02974		Pipe in tunnel		K. schutty				
	02950		General tunnel requirement						
	01356		EH&S Plan	Related Contract drawings	B. Marquis				
	01357		Tunnel and safety requirement	EH&S Plan submittal compliance					
	02990		Tunnel & Shaft Grouting						
2	Related Drawings			Scheduled activity duration start/end date	J. Diamante				
4				Related RFI and disposition if applicable	J. Diamante				
	Related Risk								
5				Inspection check off, hold points and restric	C. Frasier				
	Related Issues								
6				Close-out data requirement	J. Diamante				
7				Other(s)					

WAM Development Plan & Training

2016 CAT-212C SITE SPECIFIC TRAINING/WORKSHOP

WIP

						Ewald Schwarzenegger	John Gerlach	Julio Diamante	Charlie Frasier	Robin Siddall	Dennis Eacott, Jr.	Scott Early	Justin LaSasso	Babs Marquis	Patrick Hoosier	Michel Leonart	Jason LaSasso	Aaron Letterly	Michael Camadine	Kim Scutty
Year	No	Site Specific Training/Work Shop	Expected Training Date (Approx. 30 days prior to the beginning of the Activity)	Proposed Date	Date Completed	Trainee														
2016	00	Field Inspection Report - CAT212C e-Builder's IDR Format	Wednesday, January 13, 2016	Wednesday, January 13, 2016	Wednesday, January 13, 2016	A	A	R	R	A	A	A	A	A						
2016	01	Valve Chamber - Land Based Test Borings	Thursday, January 14, 2016	Thursday, January 14, 2016	Thursday, January 14, 2016			R	R	A	A	A								
2016	02	Valve Chamber - Packer Testing	Thursday, March 10, 2016	Friday, March 11, 2016	Thursday, March 10, 2016			R	A	A										
2016	03	Valve Chamber - Geotechnical Instrumentation	Thursday, March 10, 2016	Thursday, March 10, 2016	Thursday, March 10, 2016			R	A	A	A	A								
2016	04	Gate Shaft - Geotechnical Instrumentation	Thursday, March 10, 2016	Thursday, March 10, 2016	Thursday, March 10, 2016			R	A	A	A	A								
2016	05	General - Concrete Pre-Construction Meeting	Tuesday, March 15, 2016	Tuesday, March 15, 2016	Tuesday, March 15, 2016	A	A	A	A						R		A			
2016	06	Valve Chamber - Wing Wall Construction	Thursday, March 17, 2016	Thursday, March 17, 2016				R												
2016	07	Schedule - CAT212C Scope of Work	Thursday, March 24, 2016	Thursday, March 24, 2016														R		
2016	08	Schedule - 2016 CAT212C Schedule	Thursday, March 24, 2016	Thursday, March 24, 2016														R		
2016	09	Metro-E	Thursday, March 31, 2016	Thursday, March 31, 2016								R								
2016	10	Emergency Control Center - West Access Road Building	Thursday, March 31, 2016	Thursday, March 31, 2016								R								
2016	11	Tunnel & Intake - Water Based Test Borings	Thursday, April 07, 2016					R												
2016	12	General - SWPP Inspection	Thursday, April 14, 2016														R			
2016	13	Administration - eBuilder Reports	Thursday, April 21, 2016																R	
2016	14	Tunnel & Intake - Shaft Excavation	Thursday, April 28, 2016									R		R						
2016	15	General - Open	Thursday, May 05, 2016														R			
2016	16	Tunnel & Intake - Dredging	Thursday, May 19, 2016				R													
2016	17	Tunnel & Intake - Blasting	Thursday, July 07, 2016									R		R						
2016	18	Tunnel & Intake - Tremie Concrete	Thursday, July 14, 2016												R					
2016	19	Miscellaneous - Dam masonry rehabilitation	Thursday, August 11, 2016						R											
2016	20	Tunnel & Intake - Land Leg	Thursday, September 29, 2016											R						
2016	21	Tunnel - Blasting Pre-Con Survey	TBD											R						
2016	22	Special Inspections - Welding	TBD																	
2016	23	Special Inspections - Bolting	TBD																	
2016	24																			

Please consider additional subsections:
 1. Concrete rebar inspection
 2. Concrete form work inspection
 3. Concrete placement inspection
 4. Concrete testing and acceptance

Why Use WAM

Project Documentation & Records:

- Conformance to contract
- Quality in construction
- Project control
- Responsive problem solving
- Resolution of disputes & claims avoidance
- **Preparation for litigation**



Written documentation can be used to reconstruct the actual events that occurred and its existence adds tremendous credibility to any testimony, opinion or evaluation that an individual or firm may be requested to provide (2015 CMAA Professional Construction Management Course)

WAM Construction Records

What to Document?

Pay Quantities

Production

Work performed

Extra work

Site/job conditions

Date/time/weather

Equipment & crew

Construction challenges

Method of work

Work scheduled & not performed

Meetings/telecom/

As-built and photos

etc.



WAM Construction Records

How to Document using the FAT Concept

Factual: Stick to the FACTS

Accurate: If your document is not accurate, it is not credible

Timely: Memory fades with time - record as you go - EOS

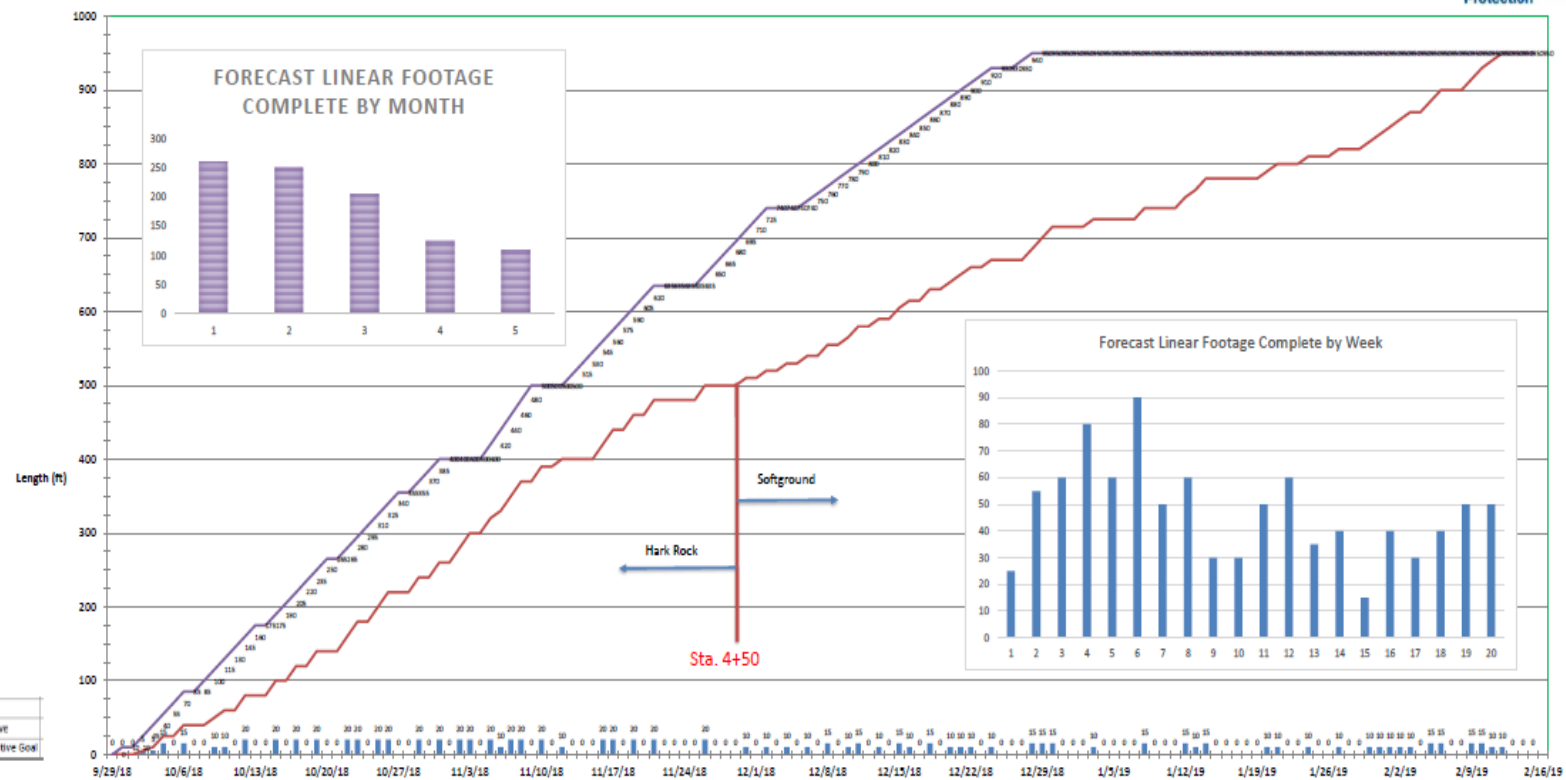
Do not guess, do not assume, do not rely on 2nd hand information and excuse your opinion

Note that personal comments should not be put on project reports or documents as they may show up in claims and reflect personal judgement and not appear objective. (2015 CMAA Professional CM Course)

WAM Microtunnel Production Forecast




5320 Contract CAT-212C - Gilboa Dam Reconstruction Project
Schoharie Reservoir Low Level Outlet - Water Leg
108-in Microtunnel Cumulative Progress Forecast



WAM Microtunnel Production Reports

Weekly Actualized Data & Update



McMILLEN JACOBS ASSOCIATES

Resident Engineer: Julio Diamante
 Assistant RE: Patrick Hoosier
 Tunnel Engineer: Babs Marquis
 Tunnel Inspector:
 Jacking Shaft & Sta.: 9+35 Gate Shaft Receiving Shaft @ Intake Structure 0+10

Weather: Overcast + Rain
 General Contractor: Southland-Renda JV

5320 Contract CAT-212C Gilboa Dam Reconstruction Project
 Schoharie Reservoir Low Level Outlet - Capital Project WM-30
 Microtunnel Shift Report - Gate Shaft Water Leg Tunnel

Report Date: 10/3/18


* ALL TIMES - 24 HR CLOCK

Shift Start: 10/3/18 6:00 Shift End: 10/3/18 18:00 Shift Duration (hrs): 12:00

Tunnel Length Complete (LF): 74
 Approx. Face Sta.: 8+61
 Percent Complete: 8.0%

Temperature: 58 At 06:00

Microtunnel Contractor: Southland-Renda JV



NYC Environmental Protection

Pipe #	Start Date & Time	End Date & Time	Duration (hr-min)	Line & Grade Reference & V Deviation - mm	Comment
1	10/2/18 22:45	10/3/18 7:35	8:50:00	-2 1	Advanced through rock
2	10/3/18 10:50	10/3/18 14:45	5:55:00	1 -1	Advanced through rock, fine to coarse gravel with sand
3	10/3/18 17:15				Work in progress - Continued on back shift

Rock cutting Tool Inspection/Change	Start Date & Time	End Date & Time	Duration (hr-min)	Disk Cutter ID #	Comment
Drain/Inspect Heading	10/2/18 2:15	10/3/18 21:13	18:58		
Change Cutter(s)	10/3/18 6:00	10/3/18 13:30	7:30		
Disk Cutter ID#	19	20	21		Gauge cutters changed
	18	12	17		

MTBM Type: Herrenknecht

MT Superintendent: J Quinones/Glen Marek MTBM Operator: TBD

Intermediate Jacking Station (US)			
IJS #	Front Pipe	Pipe #	Rear
1	17		18
2	28		29

Shift Summary	
No. of Pipes Installed	Length Installed This Shift (ft.)
2	40

Soil Description

Soil: Rock
 Lubricant: Slurry/Bentonite

Slurry System Summary		Closed System? (Y/N)	Y	Slurry Pressure:	
GS Discharge Water Readings:					
GS Flow Meter (gpm)	210		315	pH	5.2
Time	13:42			Turbidity (NTU)	245

Incidental Activities to Microtunneling (Non Down-time)

Start Time	End Time	Duration	Activity Description with Notes
7:30	9:30	1:50	Pipe, utility interchange, bottom shaft crew
8:00	14:25	6:25	Surface crew resumed dewatering well installation
7:00	16:30	9:30	LL tunnel crew continued internal pipe joint welding with controlled access at the VC
		0:00	

Delays and problems

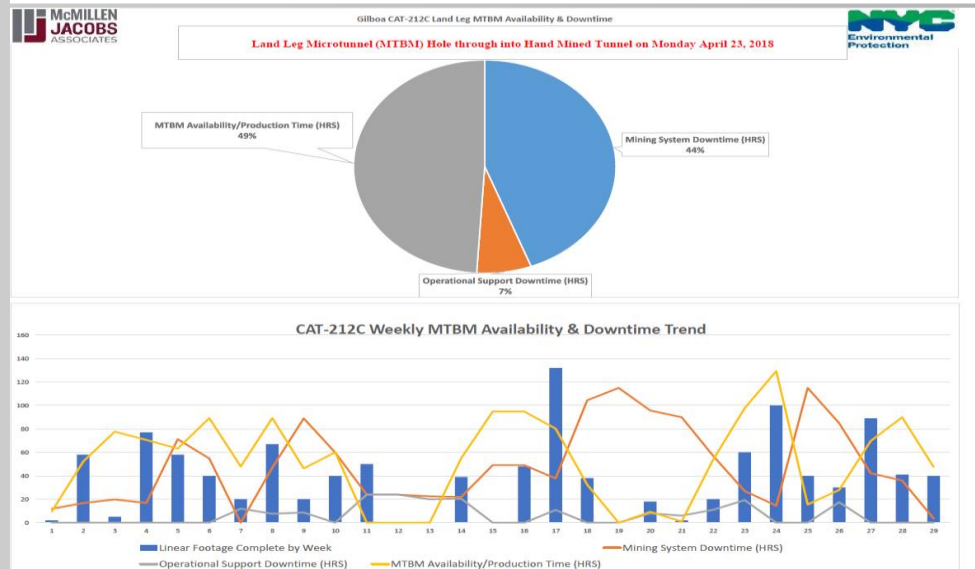
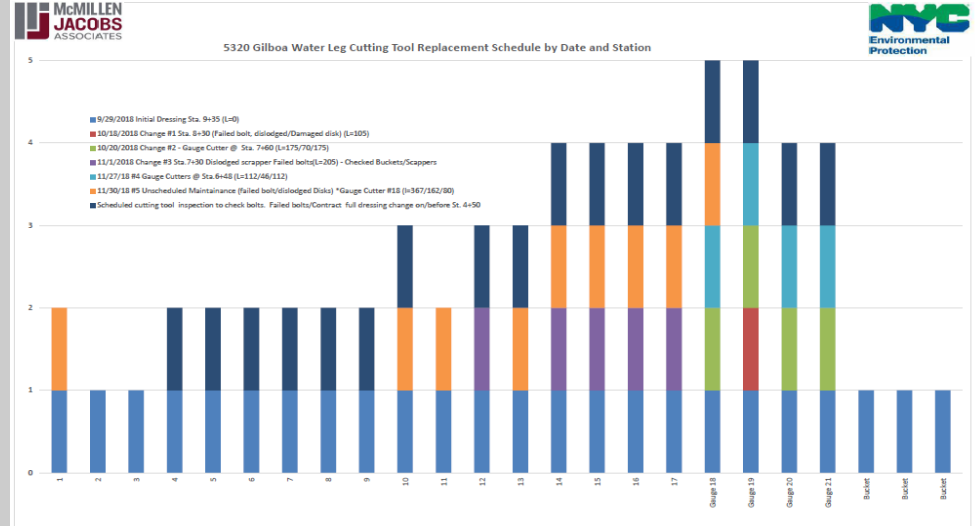
Start	End	Duration	Description/Cause
7:40	9:45	2:05	Replace slurry system coupling at P.1 to P.2
13:10	15:22	2:12	Drill rig compressor hydraulic hose replacement
		0:00	
		0:00	

Daily Random Data Communication with Operator

MTBM Data	1	2	3	4	5	6	Comment
Time	9:15	10:25	11:55	13:20	14:45		
Jacking Force (kN)	2565	1754	2251	3005	2750		
Torque (Bar)	72	108	110	121	120		
Cutter RPM	4.33	5.22	6.11	8.3	7.2		

Other Shift Notes and Comments (Discharge, spills, frac-out, etc.)

- Geologist not on site for DW drilling and sampling. DW bottomed out at 110-ft. BG5
- No contact or backfill grouting
- Take delivery of two tunnel/casing pipes
-
-
-

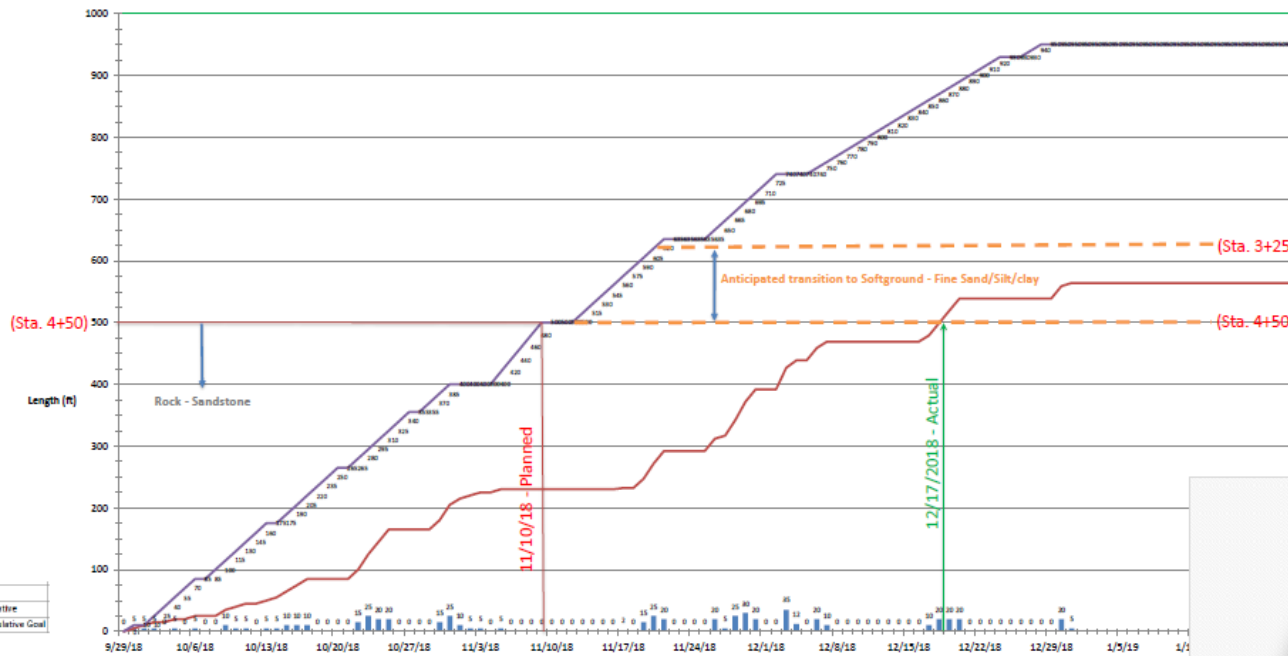


Weekly Microtunnel Production Update

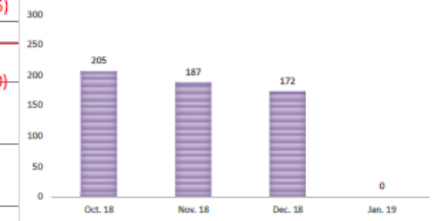
Actualized Schedule Update



5320 Contract CAT-212C - Gilboa Dam Reconstruction Project
Schoharie Reservoir Low Level Outlet - Water Leg
108-in Microtunnel Cumulative Progress



LINEAR FOOTAGE COMPLETE BY MONTH

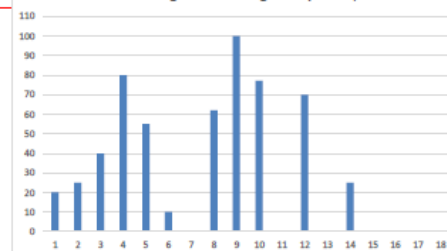


Summary Notes:

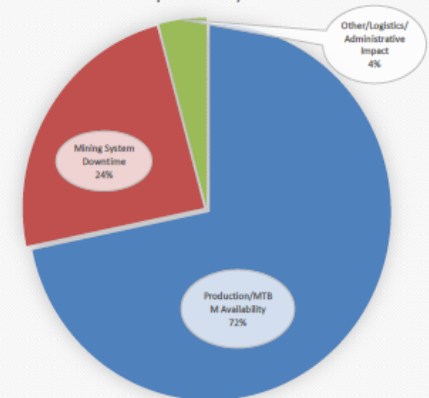
WL tunnel pipe Complete (LF) = 539	WL tunnel Length (LF) = 925
Start date = 9/29/18	Duration calendar days = 93
Month Ending = 12/31/18	% Complete = 58.3%
Number of Pipe Installed (20-ft.) = 26	Start @ Shaft Face Sta. 9+35
Number of US Installed (7-ft.) = 2	Approx. Lead Pipe Sta. 3+96

Approx. MTBM Face Sta. = 3+85
Linear feet to Completion = 386
Number of pipe to Completion = 20

5320 Water Leg Linear Footage Complete by Week



5320 Gilboa WL MTBM Production-Downtime Chart
Sept. 29 - Dec 31, 2018



WAM Shaft Progress Data

Rock Excavation Sequence		Excavation Progress		Rate Shaft Drill & Blast Construction Sequence and Profile		Duration - Production and Preliminary Holes (Dates)			Blast Duration (hrs)			Mucking Duration Date & Time		Stabilize Rock face - Scale, Wire mesh, rock bolt installation					Shotcrete	Groundwater Inflow	Excavation Cycle Duration (Days)	Comment		
Start RL	End RL	Depth (ft)	% Complete			Drill Start	Finish Drill	Depth Drilled (ft)	Load Date	Start	Finish	End	Start	End Muck	Start	End	No. of Bolts Installed	No. Bolts tested	No. of Bolts Failed	Date	Estimated (GPM)			
1125	1118			1st Pre-grouted Zone	1st Pre-grouted Zone	8/11/18	8/18/18	7	8/28/18	13:00	18:30	17:30	8/18/18	8/18/18	8/18/18	8/28/18	51	0	0	8/28/18	Dry	18	Commenced probe hole for water cut-off grouting level 1088 and at 1068 (7' depth)	
1118	1113					8/9/18	8/9/18	10	8/9/18	10:00	14:30	2:00	8/9/18	8/18/18	8/18/18	8/17/18	52	18	1	8/18/18	Dry	12	8/8/2018 - Commence production hole layout, drilled 1 hole	
1113	1108					8/11/18	8/18/18	10	8/20/18	10:00	14:00	18:00	8/20/18	8/22/18	8/22/18	8/24/18	56	4	0	8/27/18	Dry	11	8/8/18 complete production hole drill @ 1020M	
1108	1103					8/24/18	8/27/18	10	8/28/18	8:00	10:30	13:00	8/28/18	8/30/18	8/30/18	10/5/18	52	4	2	10/5/18	Dry	10	Started drilling Round #8	
1098	1088					10/9/18	10/9/18	11.5	10/9/18	18:00	18:15	17:00	10/9/18	10/9/18	10/9/18	10/10/18	76	4	1	10/10/18	Dry	8	8/18/18 CDW-1 Damaged. No further data due to D1 not test penetration	
1088	1078					10/10/18	10/11/18	11.5	10/11/18	13:30	18:00	17:00	10/11/18	10/13/18	10/13/18	10/13/18	27	6	0	10/14/18	<10	8	Round 8 partial completion	
1078	1068					10/28/18	10/27/18	10	11/1/18	8:45	12:00	14:00	11/1/18	11/2/18	11/2/18	11/5/18	28	4	0	11/4/18	>15	11	Finished Round #8 Rock Bolts & shotcrete.	
1068	1058					11/4/18	11/7/18	12	11/8/18	9:00	14:00	18:20	11/8/18	11/10/18	11/10/18	11/13/18	51	4	0	11/14/18	>15	11	Partial shotcrete due to water inflow	
1058	1048					11/11/18	11/14/18	10.8	11/15/18	9:00	12:30	14:00	11/15/18	11/28/18	11/28/18	11/30/18	58	7	2	12/1/18	>10	12	No significant seepage in this zone	
1048	1038					11/10/18	11/9/18	11	11/9/18	18:00	17:00	18:04	11/9/18	11/14/18	11/14/18	11/18/18	49	4	0	12/1/18	>10	18	2 electronic applications	
1038	1028					12/18/18	12/17/17	10.8	12/18/18	11:30	18:40	18:20	12/18/18	1/4/17	1/4/17	1/4/17	28	0	0	NA	>100	21	No significant seepage in this zone	
1028	1018					1/10/17	1/11/17	12	1/18/17	7:00	10:10	13:08	1/18/17	1/28/17	1/28/17	1/30/17	53	5	0	1/27/17		10	Shotcrete applied as per the contractors design/dry	
1018	1008	150	80%	2nd Pre-grouted Zone for Water Tightness	2nd Pre-grouted Zone for Water Tightness	1/28/17	1/28/17	12	1/28/17	7:00	10:15	13:08	1/28/17							NA			No additional water encountered	
1008	998																							No additional water encountered
998	988																							
988	978																							
978	968																							
968	958																							
958	948																							
948	938																							
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208	198																							
198	188																					</		

WAM Value Added Project Benefits

Summary

- Conformance to Contract
- Quality Assurance in Construction
- Project Communication & Collaborative Tool
- Project Control, Records, SOV & Time MGMT
- Risk Management Tool
- Resolution of disputes & Claims Avoidance
- Preparation for Litigation

Discussion

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Syracuse, NY
November 12, 2019

