CN Tunnel Derailment

EPA Response Highlights

6/28/19- 7/6/19

- 46 car derailment
- In tunnel
- 1 sulfuric acid car involved
- LPG, fuel
- Flooded
- Report from USCG

County: ST. CLAIR
City: PORT HURON State: MI Latitude: 42° 57' 30" N

Longitude: 082° 24' 38" W
ST. CLAIR TUNNEL

POTENTIALLY RELEASED MATERIAL(S)

CHRIS Code: CMO Official Material Name: CARBON MONOXIDE
Also Known As:
Qty Released: 0 UNKNOWN AMOUNT
CHRIS Code: LPG Official Material Name: LIQUEFIED PETROLEUM GAS
Also Known As:
Qty Released: 0 UNKNOWN AMOUNT
CHRIS Code: ODS Official Material Name: OIL: DIESEL
Also Known As:
Qty Released: 0 UNKNOWN AMOUNT
CHRIS Code: OTH Official Material Name: OTHER OIL
Also Known As: FUEL OIL
Qty Released: 0 UNKNOWN AMOUNT
CHRIS Code: SFA Official Material Name: SULFURIC ACID
Also Known As:
Qty Released: 50 GALLON(S)

DESCRIPTION OF INCIDENT

CALLER IS REPORTING A TRAIN DERAILMENT. CALLER STATED 46 CARS AND 1 LOCOMOTIVE OUT OF 140 CARS DERAILED INSIDE OF A TUNNEL AND ARE FULLY SUBMERGED IN THE ST. CLAIR RIVER. THE CAUSE OF THE DERAILMENT IS UNKNOWN AT THIS TIME. CALLER STATED 3000 GALLONS OF DIESEL FUEL IS ONBOARD THE TRAIN. 1 CAR CONTAINED 194,000 POUNDS OF SULFURIC ACID. THERE IS AN UNKNOWN AMOUNT OF LPG IN SOME OF THE CARS, UNKNOWN AMOUNT OF LUBE OIL, AND MISCELLANEOUS AUTOMOTIVE FUEL. CALLER STATED THE FIRE DEPARTMENT ENTERED THE TUNNEL AND DISCOVERED 25-50 GALLONS OF SULFURIC ACID ON THE GROUND. THE TUNNEL IS FILLED WITH CARBON MONOXIDE AND THERE IS NO VENTILATION SYSTEM IN THE TUNNEL DUE TO THE DERAILMENT. THERE WERE NO REPORTED INJURIES. CALLER HAD LIMITED INFORMATION AT THE TIME OF THIS CALL.

INCIDENT DETAILS

Grade Crossing: NO

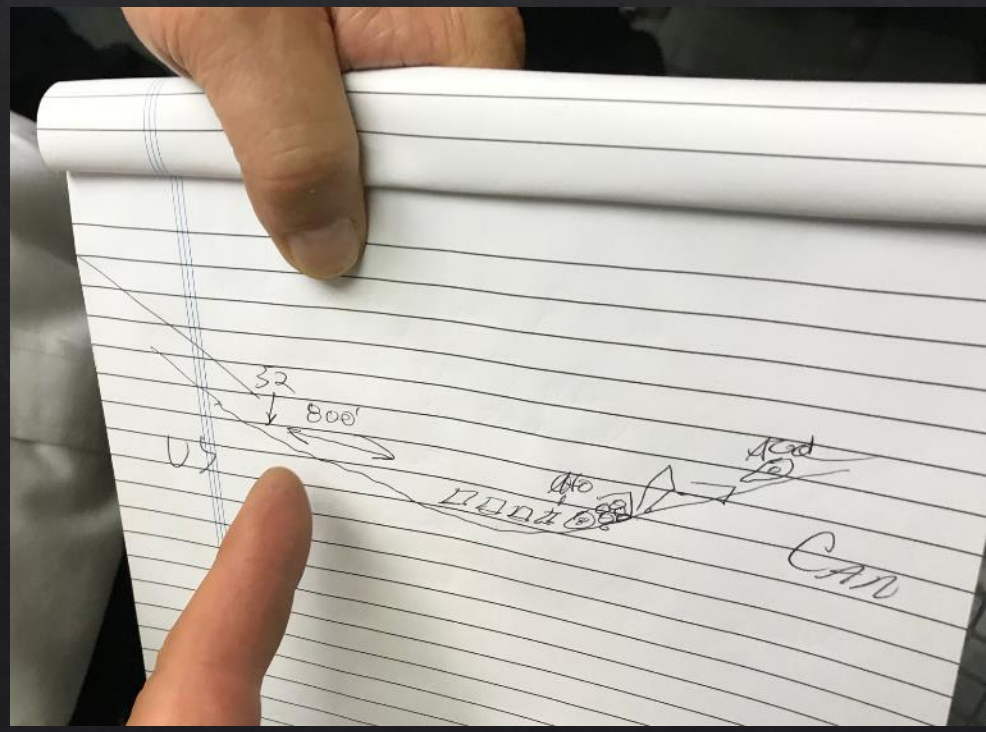

Lake Huron
US
Canada
Tunnel
Fort Gratiot Twp
Point Edward
Sarnia
Township
Kimball
Marysville
Corunna
United States
Canada
Google
Map
3D

Initial Actions

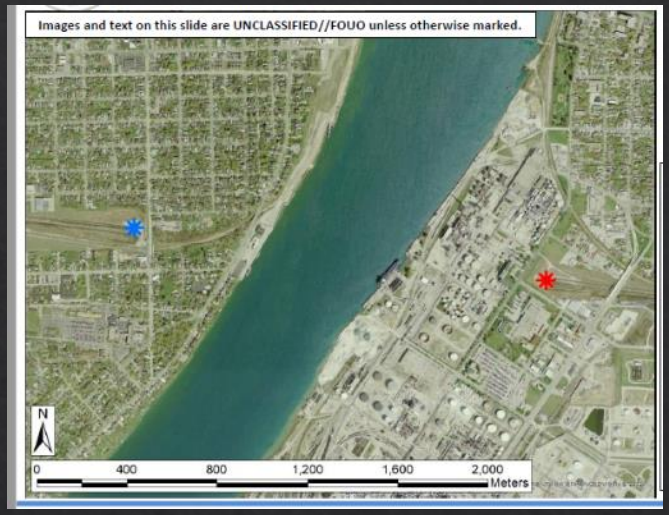
- OSC Betsy Nightingale - Lead OSC
- Checked in with CN, State, County EMA
- Mobilized START, SPM flex units with mineral acid tapes, AreaRAEs, ER response vehicles
- Requested that EOC:
  - Analyze consist
  - Map downstream drinking water intakes
  - Issue precautionary notification to drinking water facilities
- Requested IMMAC Model
- Departed for Port Huron

Arrived on Scene

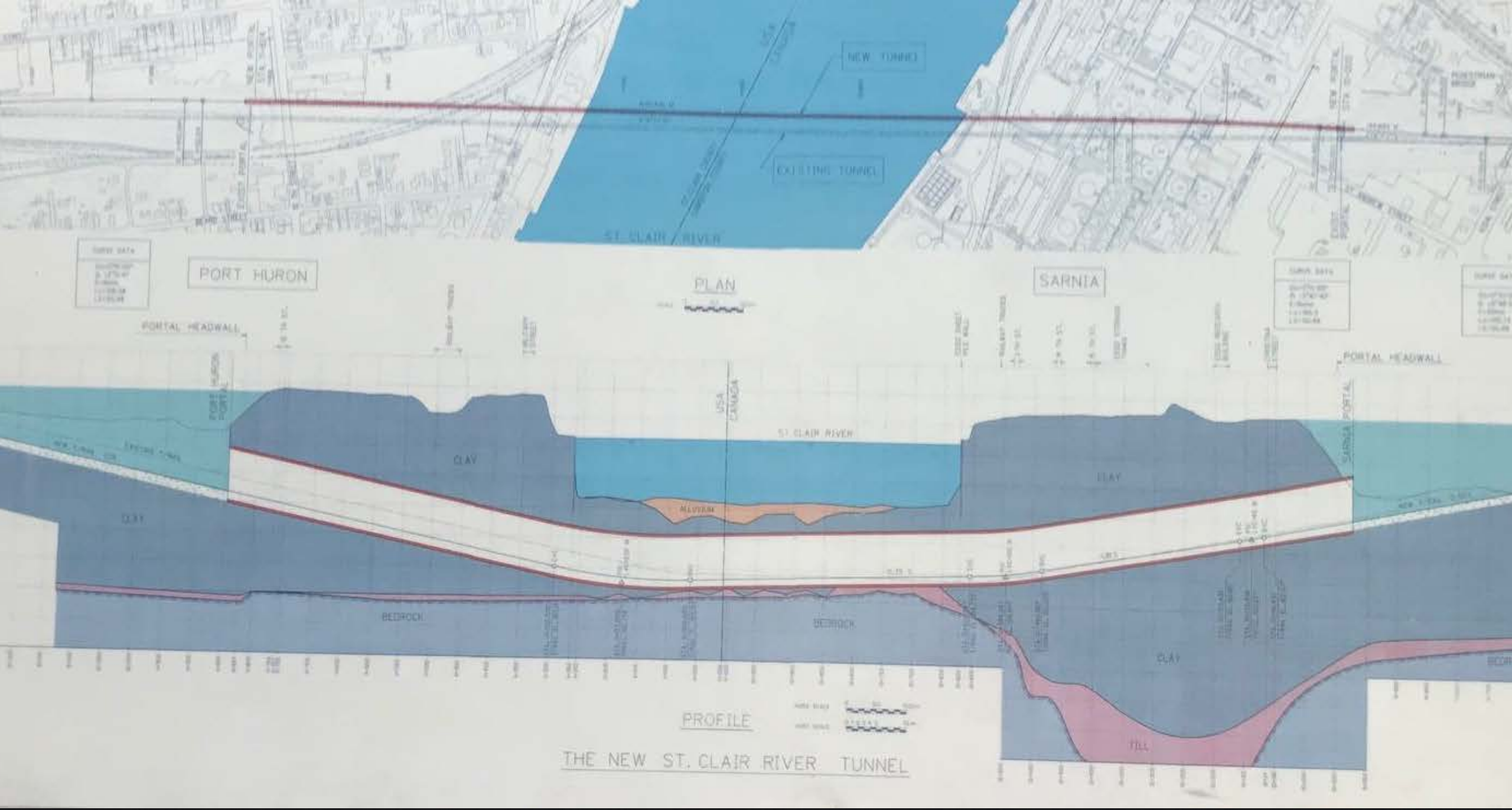
- Update
  - Sulfuric car breached – assumed 13,700 gal of 94% sulfuric acid released
  - No evidence of release to river
  - Aluminum ingots and rolls of paper acid impacted
  - Tunnel not flooded
  - No LPG involved
  - Auto cars involved
  - Ballast was granite, ties concrete
  - Sump
  - Unsure where border lies relative to sulfuric car
  - Ventilation to Canada
  - Drainage piped to Canada into sanitary, but piping destroyed

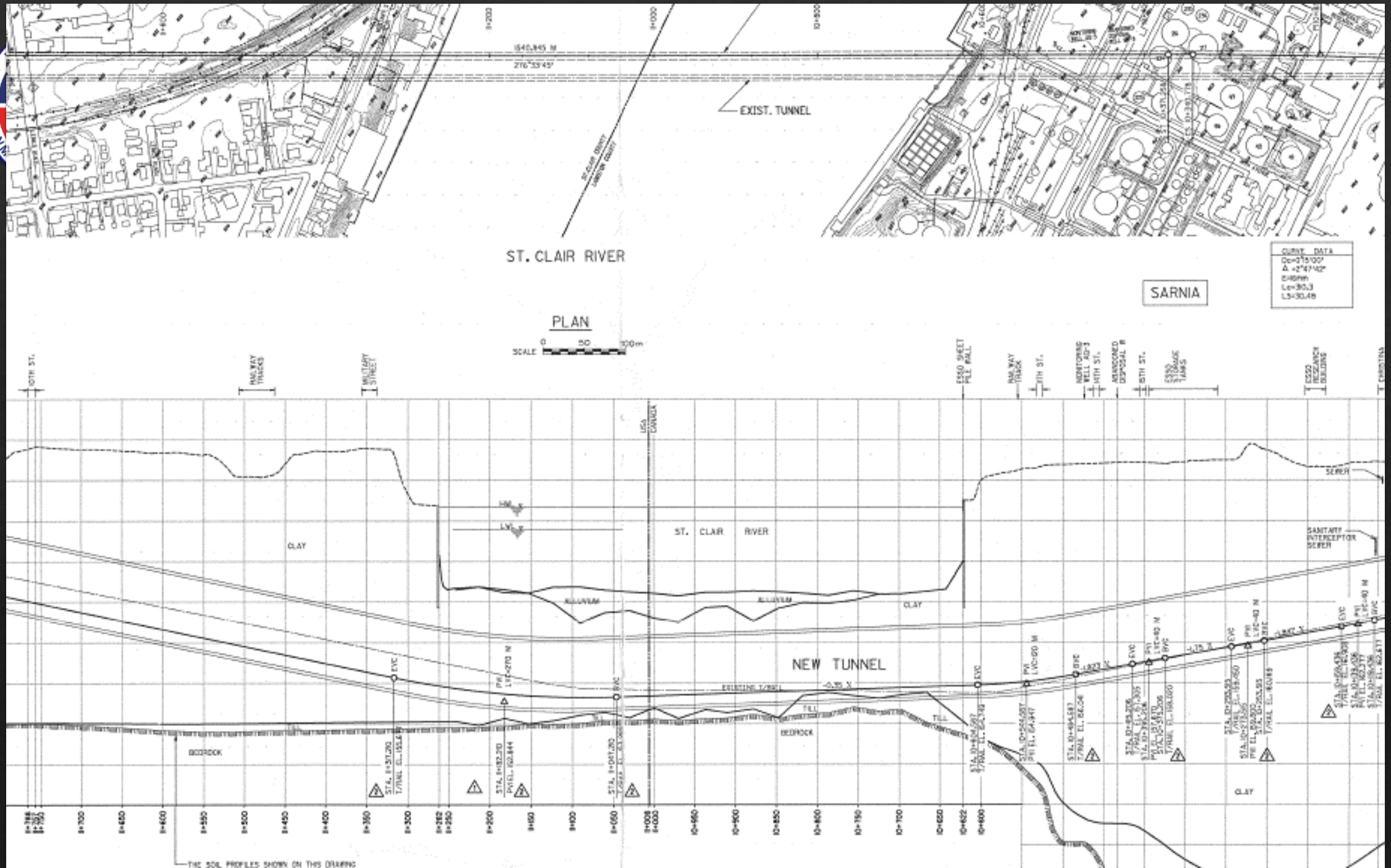


Arrived on Scene



- Discussed lead with USCG
- Formed Unified Command
  - CN, EPA, State (MSP and EGLE), St Clair County EMA, City of Port Huron Fire Department US Customs and Border Protection
- Established Stakeholder/Collab Agency Group
- Established Incident Objectives, Org Structure, Meeting Schedule
- Developed Health and Safety Plan and Air Monitoring Plan
- Developed IAP for first operational period


NEW TUNNEL
EXISTING TUNNEL
ST. CLAIR RIVER
PORT HURON
PLAN
SARNIA
PORTAL HEADWALL
PORTAL HEADWALL
USA
CANADA
ST. CLAIR RIVER
CLAY
CLAY
CLAY
BEDROCK
BEDROCK
TILL
PROFILE
THE NEW ST. CLAIR RIVER TUNNEL


EXIST. TUNNEL
ST. CLAIR RIVER
SARNIA
PLAN
SCALE 0 50 100m
ST. CLAIR RIVER
NEW TUNNEL
EXISTING TUNNEL
CLAY
ALLUVIUM
TILL
BEDROCK
SEWER
SANITARY INTERCEPTOR SEWER
THE SOIL PROFILES SHOWN ON THIS DRAWING

Initial Incident Objectives

- Ensure health and safety of public and response personnel
- Develop health and safety plan
- Develop and implement air monitoring plan
- Develop IMAAC Model
- Research reactivity of material spilled
- Ensure effective containment, cleanup, recovery, and disposal of spilled product
- Protect drinking water sources
- Maximize protection of environmentally sensitive areas
- Investigate the potential for and, if feasible, utilize alternative technologies to support response efforts

ICS Structure

- Unified Command (CN, EPA, State, County, City)
- SO – CN
- LIO– Not Filled
- PIO – CN, County and EPA
- PSC – CN and EPA
  - SITL, DOC, RESL CN; ENVL EPA Remote
- OPS – CN, EPA
  - Air Monitoring Branch – CN, EPA and START
- LOGS- CN
- FSC – CN

Planning - Meeting Schedule

CN

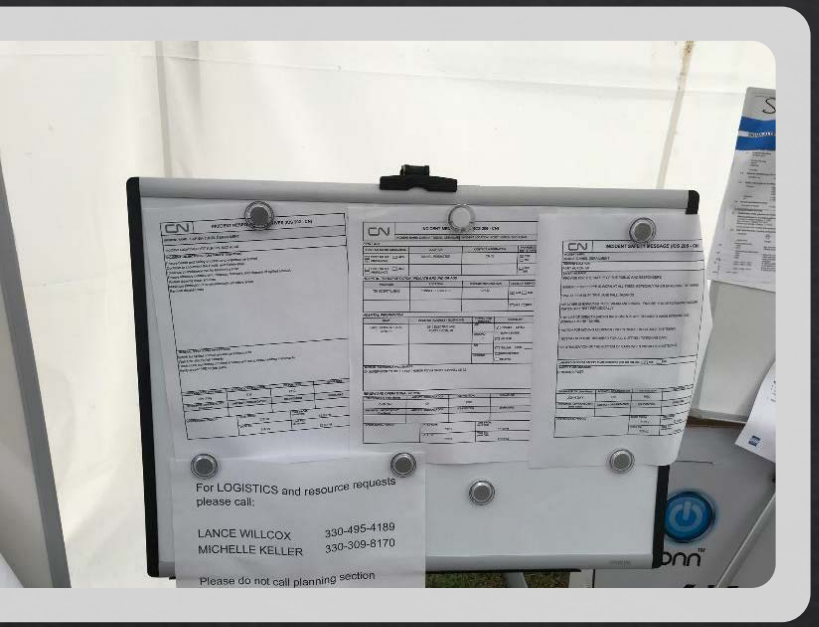
DAILY MEETING SCHEDULE (ICS 230 - CN)

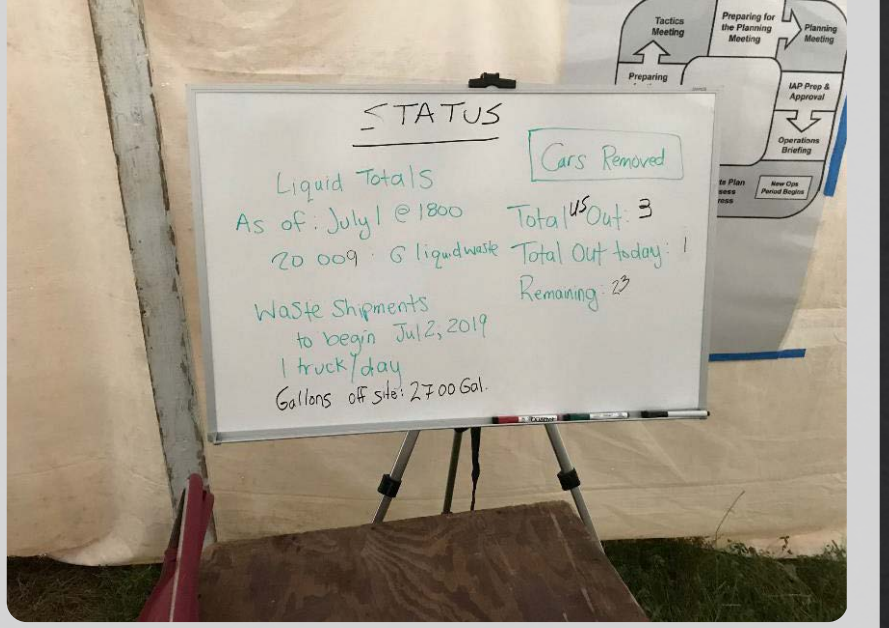
INCIDENT NAME	INCIDENT LOCATION	OPERATIONAL PERIOD (DATE / TI
SARNIA Tunnel Derailment	Port Huron, MI	FROM: 7/1 12:0 TO: 7/3 12:0

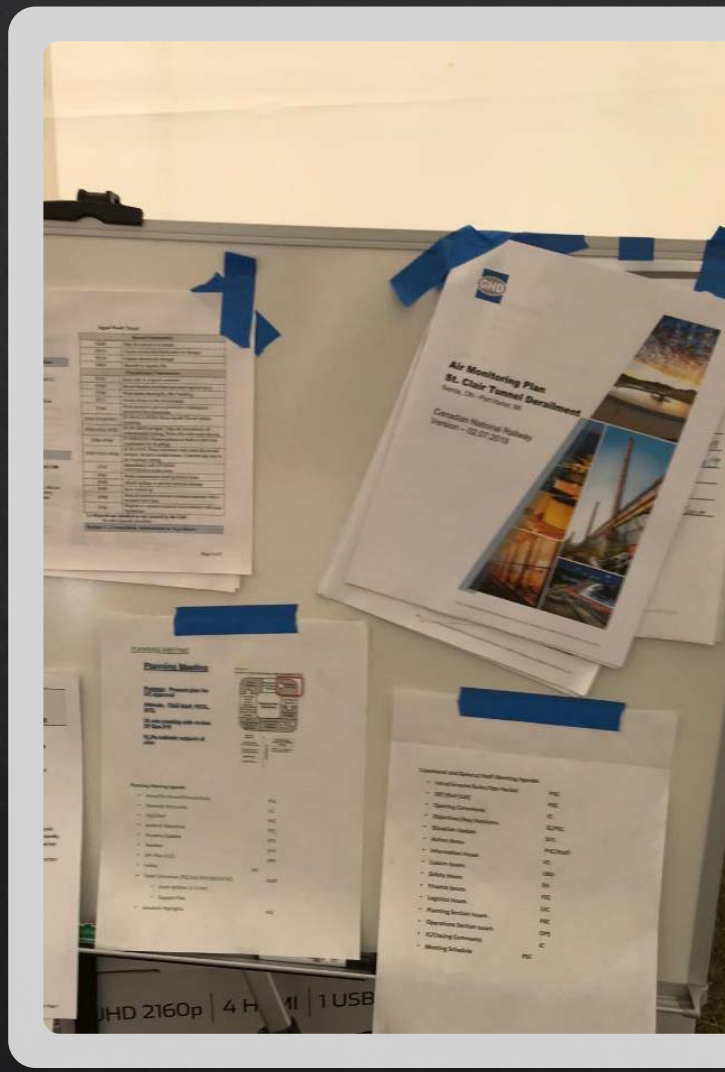
RECORD DAILY MEETING SCHEDULE BELOW.

DATE / TIME	MEETINE NAME	MEETING PURPOSE	ATTENDEES	LOCATIO
7/1 1900	Stakeholder Briefing	Briefing	Stakeholders	tent
7/2 09:00	Stakeholder Briefing	Briefing	Stakehold	tent
7/2 10:30	Tactics	tentative		ten
7/2 12:30	C&GS	Status		tent
~~7/2 1900~~	~~tactics~~			~~tent~~
7/2 1800	Stakeholder	Briefing	S	ten
7/3 0800	tactics			
7/3 0900	Stakeholder			

PREPARED BY	ICS POSITION	DATE / TIME
Sarah Kirkwood	D/PSC	7/1/19



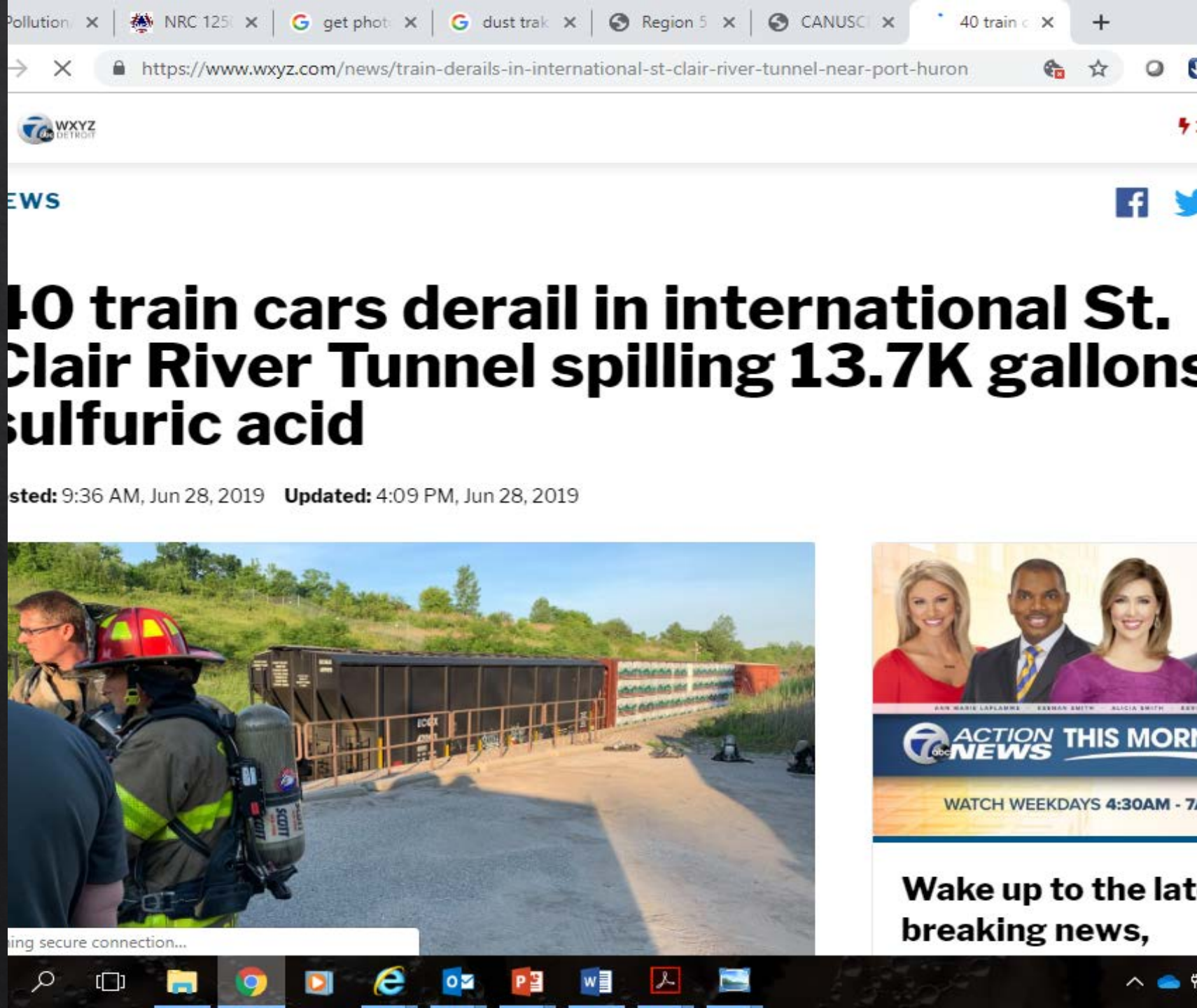




Planning -SITUATION Boards

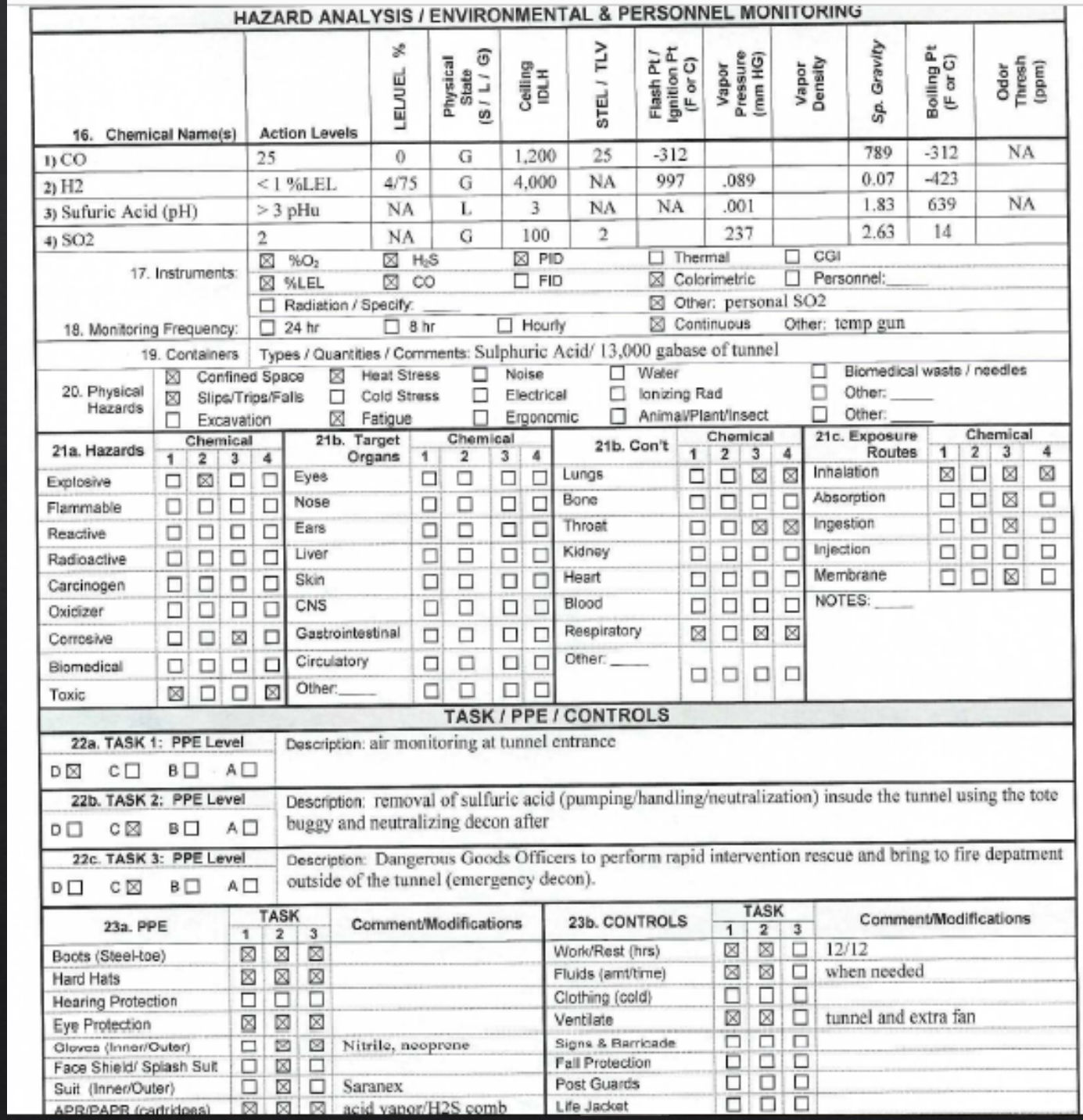
Public Information

- Press releases issued frequently by County and CN
  - Coordinated with Unified Command
- Most media attention was local



Health and Safety Plan

- Long non-site specific plan was presented to UC
- UC approved, but required all tasks to also have EPA ICS Form 208 HM completed and approved



HAZARD ANALYSIS / ENVIRONMENTAL & PERSONNEL MONITORING

16. Chemical Name(s)	Action Levels	LEL/UEL %	Physical State (S / L / G)	Ceiling IDLH	STEL / TLV	Flash Pt / Ignition Pt (F or C)	Vapor Pressure (mm HG)	Vapor Density	Sp. Gravity	Boiling Pt (F or C)	Odor Thresh (ppm)
1) CO	25	0	G	1,200	25	-312			789	-312	NA
2) H2	< 1 %LEL	4/75	G	4,000	NA	997	.089		0.07	-423	
3) Sufuric Acid (pH)	> 3 pHu	NA	L	3	NA	NA	.001		1.83	639	NA
4) SO2	2	NA	G	100	2		237		2.63	14	

17. Instruments: ☒ %O_2 ☒ H_2S ☒ PID ☐ Thermal ☐ CGI; ☒ %LEL ☒ CO ☐ FID ☒ Colorimetric ☐ Personnel:____; ☐ Radiation / Specify: ____ ☒ Other: personal SO2

18. Monitoring Frequency: ☐ 24 hr ☐ 8 hr ☐ Hourly ☒ Continuous Other: temp gun

19. Containers: Types / Quantities / Comments: Sulphuric Acid/ 13,000 gabase of tunnel

20. Physical Hazards: ☒ Confined Space ☒ Heat Stress ☐ Noise ☐ Water ☐ Biomedical waste / needles; ☒ Slips/Trips/Falls ☐ Cold Stress ☐ Electrical ☐ Ionizing Rad ☐ Other:____; ☐ Excavation ☒ Fatigue ☐ Ergonomic ☐ Animal/Plant/Insect ☐ Other:____

21a. Hazards	Chemical 1	2	3	4
Explosive	☐	☒	☐	☐
Flammable	☐	☐	☐	☐
Reactive	☐	☐	☐	☐
Radioactive	☐	☐	☐	☐
Carcinogen	☐	☐	☐	☐
Oxidizer	☐	☐	☐	☐
Corrosive	☐	☐	☒	☐
Biomedical	☐	☐	☐	☐
Toxic	☒	☐	☐	☒

21b. Target Organs	Chemical 1	2	3	4
Eyes	☐	☐	☐	☐
Nose	☐	☐	☐	☐
Ears	☐	☐	☐	☐
Liver	☐	☐	☐	☐
Skin	☐	☐	☐	☐
CNS	☐	☐	☐	☐
Gastrointestinal	☐	☐	☐	☐
Circulatory	☐	☐	☐	☐
Other:____	☐	☐	☐	☐

21b. Con't	Chemical 1	2	3	4
Lungs	☐	☐	☒	☒
Bone	☐	☐	☐	☐
Throat	☐	☐	☒	☒
Kidney	☐	☐	☐	☐
Heart	☐	☐	☐	☐
Blood	☐	☐	☐	☐
Respiratory	☒	☐	☒	☒
Other:____	☐	☐	☐	☐

21c. Exposure Routes	Chemical 1	2	3	4
Inhalation	☒	☐	☒	☒
Absorption	☐	☐	☒	☐
Ingestion	☐	☐	☒	☐
Injection	☐	☐	☐	☐
Membrane	☐	☐	☒	☐

NOTES: ____

TASK / PPE / CONTROLS

22a. TASK 1: PPE Level: D ☒ C ☐ B ☐ A ☐ — Description: air monitoring at tunnel entrance

22b. TASK 2: PPE Level: D ☐ C ☒ B ☐ A ☐ — Description: removal of sulfuric acid (pumping/handling/neutralization) insude the tunnel using the tote buggy and neutralizing decon after

22c. TASK 3: PPE Level: D ☐ C ☒ B ☐ A ☐ — Description: Dangerous Goods Officers to perform rapid intervention rescue and bring to fire depatment outside of the tunnel (emergency decon).

23a. PPE	TASK 1	2	3	Comment/Modifications
Boots (Steel-toe)	☒	☒	☒	
Hard Hats	☒	☒	☒	
Hearing Protection	☐	☐	☐	
Eye Protection	☒	☒	☒	
Gloves (Inner/Outer)	☐	☒	☒	Nitrile, neoprene
Face Shield/ Splash Suit	☐	☒	☐	
Suit (Inner/Outer)	☐	☒	☐	Saranex
APR/PAPR (cartridges)	☒	☒	☒	acid vapor/H2S comb

23b. CONTROLS	TASK 1	2	3	Comment/Modifications
Work/Rest (hrs)	☒	☒	☐	12/12
Fluids (amt/time)	☒	☒	☐	when needed
Clothing (cold)	☐	☐	☐	
Ventilate	☒	☒	☐	tunnel and extra fan
Signs & Barricade	☐	☐	☐	
Fall Protection	☐	☐	☐	
Post Guards	☐	☐	☐	
Life Jacket	☐	☐	☐	

IMAAC

Modeling Summary

- (U//FOUO) Known Information: Single railcar ruptured and releasing 194,000 lbs. of sulfuric acid within the St. Clair River Tunnel.
- (U//FOUO) Modeling Assumptions:
  - Sulfuric acid does not readily evaporate. We estimated a sulfuric acid spill in the tunnel. Rapid analysis was conducted by simulating a very small pool at each entrance and scaling the size relative to internal ventilation estimates. The Canadian source is twice as large due to reported forced ventilation.
- (U//FOUO) Summary:
  - Models indicate minimal toxic vapors just outside of the tunnel entrances.
  - Calculations of potential sulfuric acid vapors inside the tunnel indicate potentially fatal levels inside the tunnel (at least AEGL-3; death possible) at 10 minute exposure).
  - There is likely a toxic environment within the tunnel and PPE should be used in the tunnel until environmental measurements indicate safe levels.

Sulfuric Acid – ppm – U.S Tunnel View – Initial Response

This quick response used a weather prediction model; and was not coordinated with other IMAAC participants. Coordination will follow, and product will be updated as needed.

FACTS

Location 1: Tunnel Entrance Michigan Side
Latitude: 42.960213° N
Longitude: 82.432991° W

Location 2: Tunnel Entrance, Canadian Side
Latitude: 42.958378° N
Longitude: 82410569° W

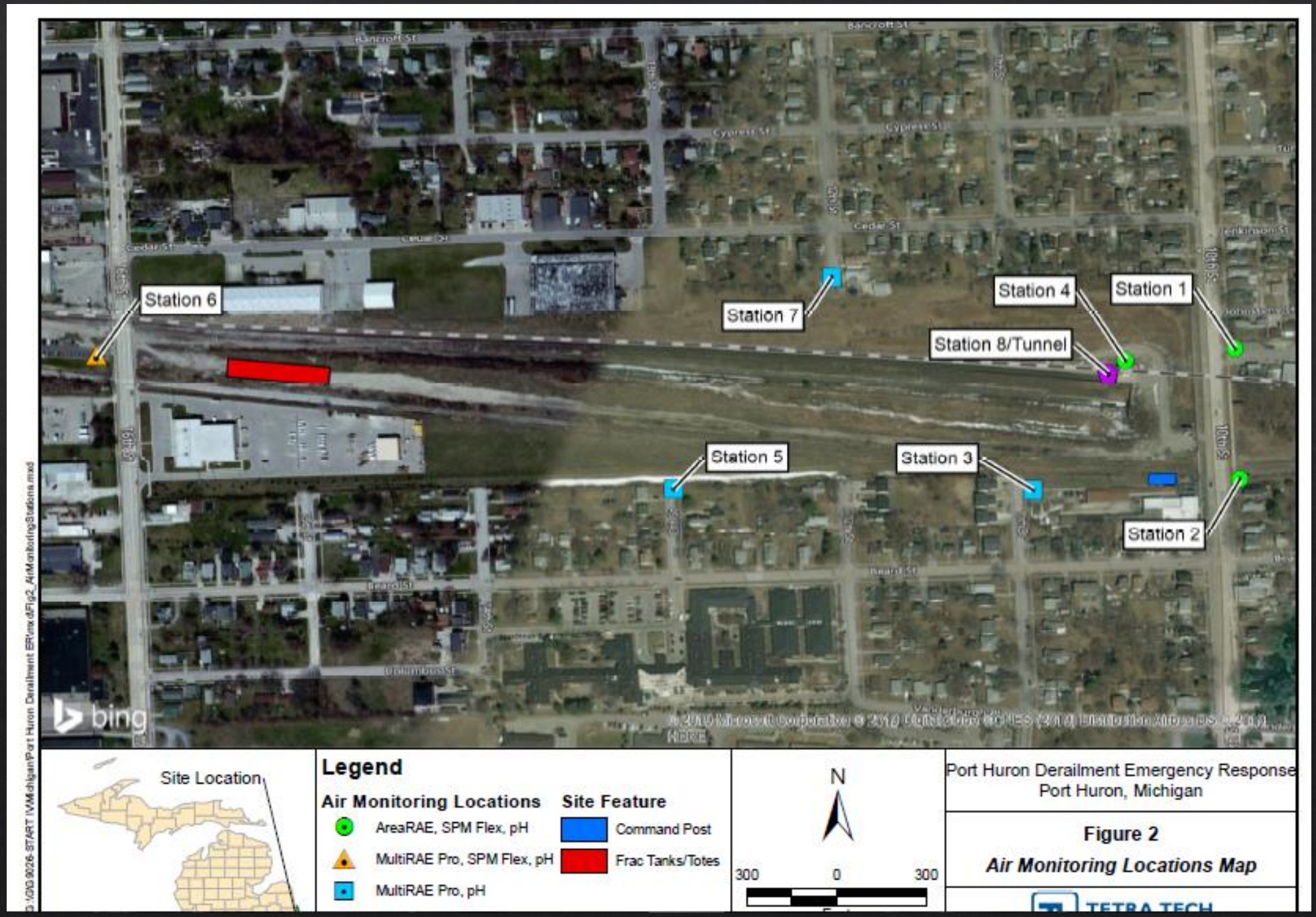
Event Time: 1330 Eastern, 28JUN2019
Type: Sulfuric Acid Spill
Amount: 194,000 lbs
Dissemination: Rail Accident
Weather: 3km NAM
Model: HPAC 6.5
Static Population Estimates: LandScan 2017

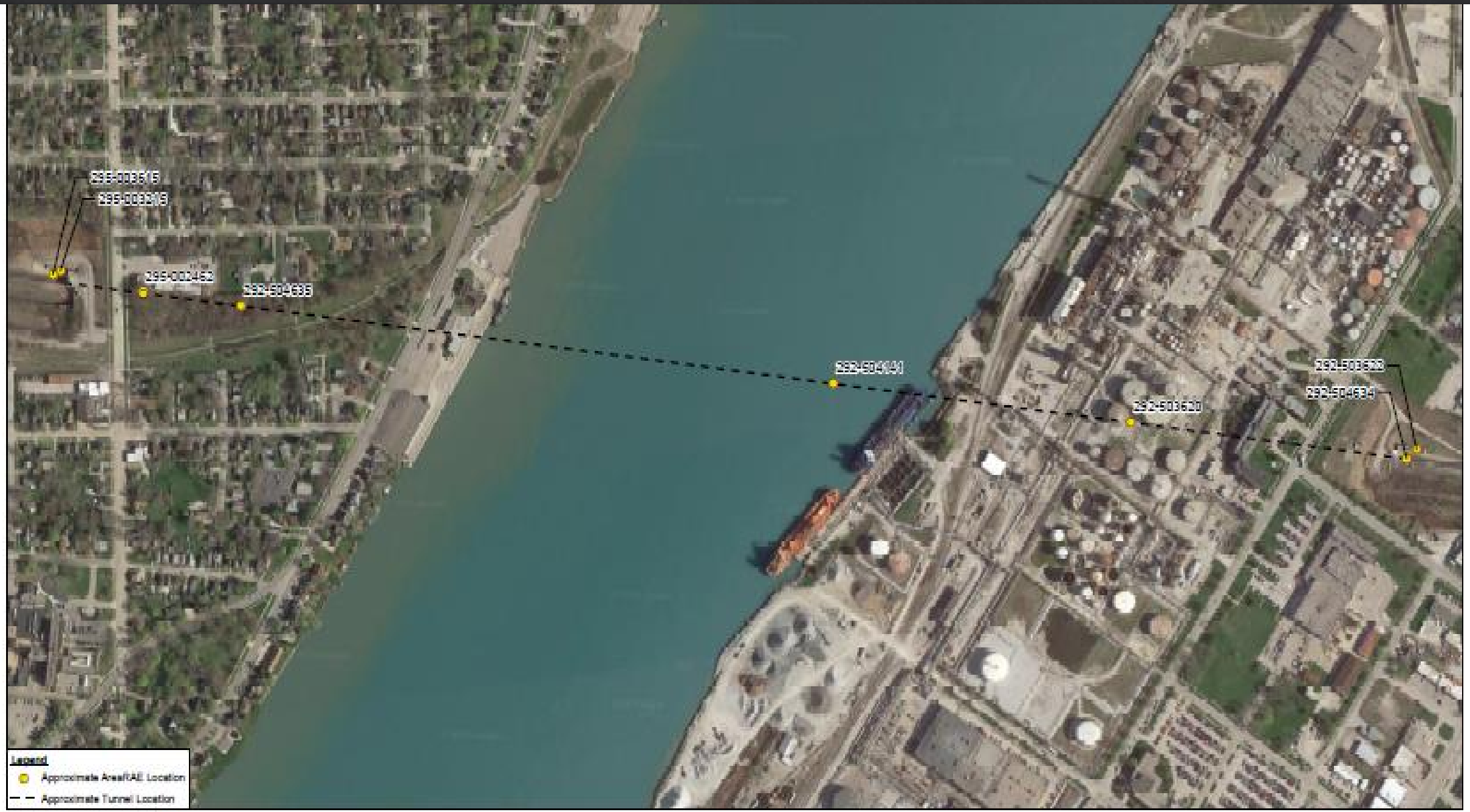
Air Monitoring/Sampling

- EPA conducted perimeter air monitoring and monitored staging areas
- CN conducted air monitoring within the tunnel
- Targets:
  - Sulfuric acid/ H2S /Sulfuric Acid/Hydrogen / VOCs/ O2/ CO/ LEL /Temp / particulates
- Equipment:
  - SPM Flexes
  - AreaRAEs/MultiRAes
  - Single gas meters
  - Draeger tubes
  - Temp guns
  - Dust Traks
  - VIPER
- CN also conducted periodic air sampling

Air Monitoring/Sampling

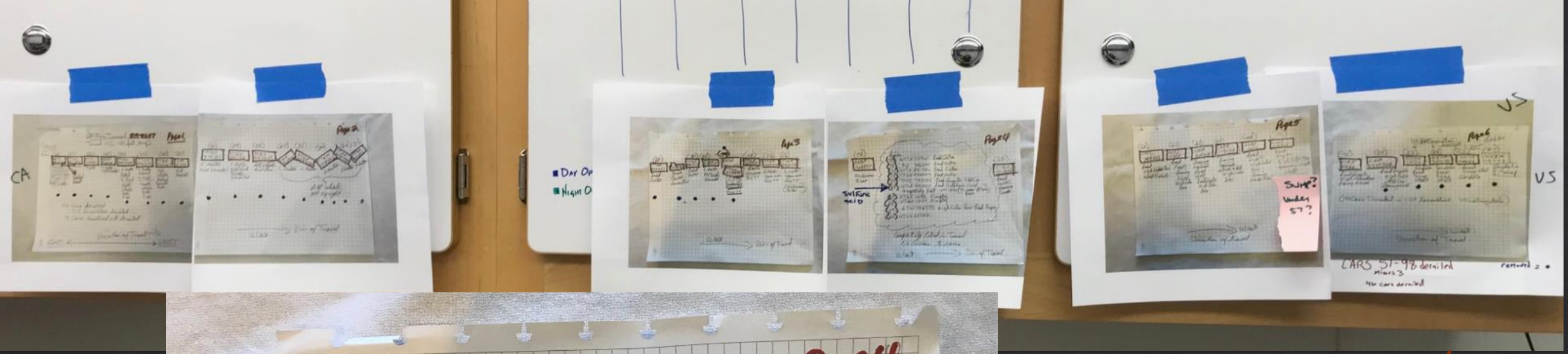
- High particulate levels detected frequently in tunnel
- Particulates may have interfered with SPM flex sulfuric acid detection in tunnel
- Working with ERT to further analyze
- Low levels of sulfuric detected at perimeter – below MDHHS AL
- Most parameters not sustained above action levels within tunnel
- Highest sulfuric detected in sample at tunnel mouth was 0.013 ppm (AL Level D less than 0.49 ppm (ACGIH TLV))


Station 6
Station 7
Station 4
Station 1
Station 8/Tunnel
Station 5
Station 3
Station 2
bing
Site Location
Legend
Air Monitoring Locations
AreaRAE, SPM Flex, pH
MultiRAE Pro, SPM Flex, pH
MultiRAE Pro, pH
Site Feature
Command Post
Frac Tanks/Totes
N
300
0
300
Port Huron Derailment Emergency Response
Port Huron, Michigan
Figure 2
Air Monitoring Locations Map


295-003615
295-003219
295-002462
292-504635
292-504141
292-503620
292-503603
292-504634
Legend
Approximate Area/EAE Location
Approximate Tunnel Location

Operations

- Primary Overarching Goals
  - Protect health and safety of responders and public
  - Remove derailed cars and debris
  - Remove sulfuric acid, sulfuric acid contaminated debris, ballast
    - Neutralize where removal not possible
  - Empty and replace sump
  - Restore tunnel
  - Reopen rail, ASAP
  - Ensure waste is safely and securely staged and properly disposed of



Due to severity of wreckage, exact car locations and border initially unknown

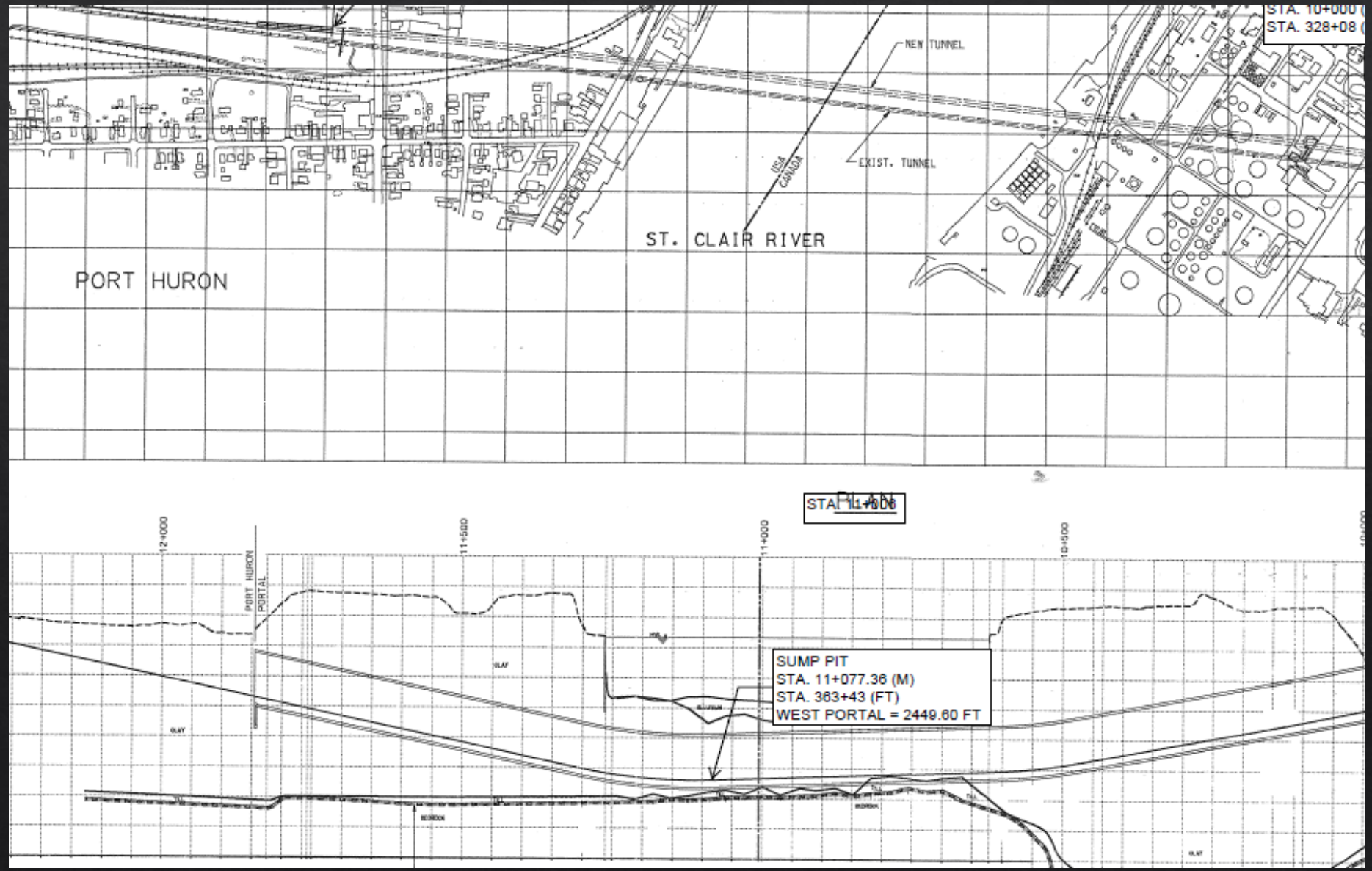
Initial Situation

Acid pooled throughout large segments of tunnel, and filling sump

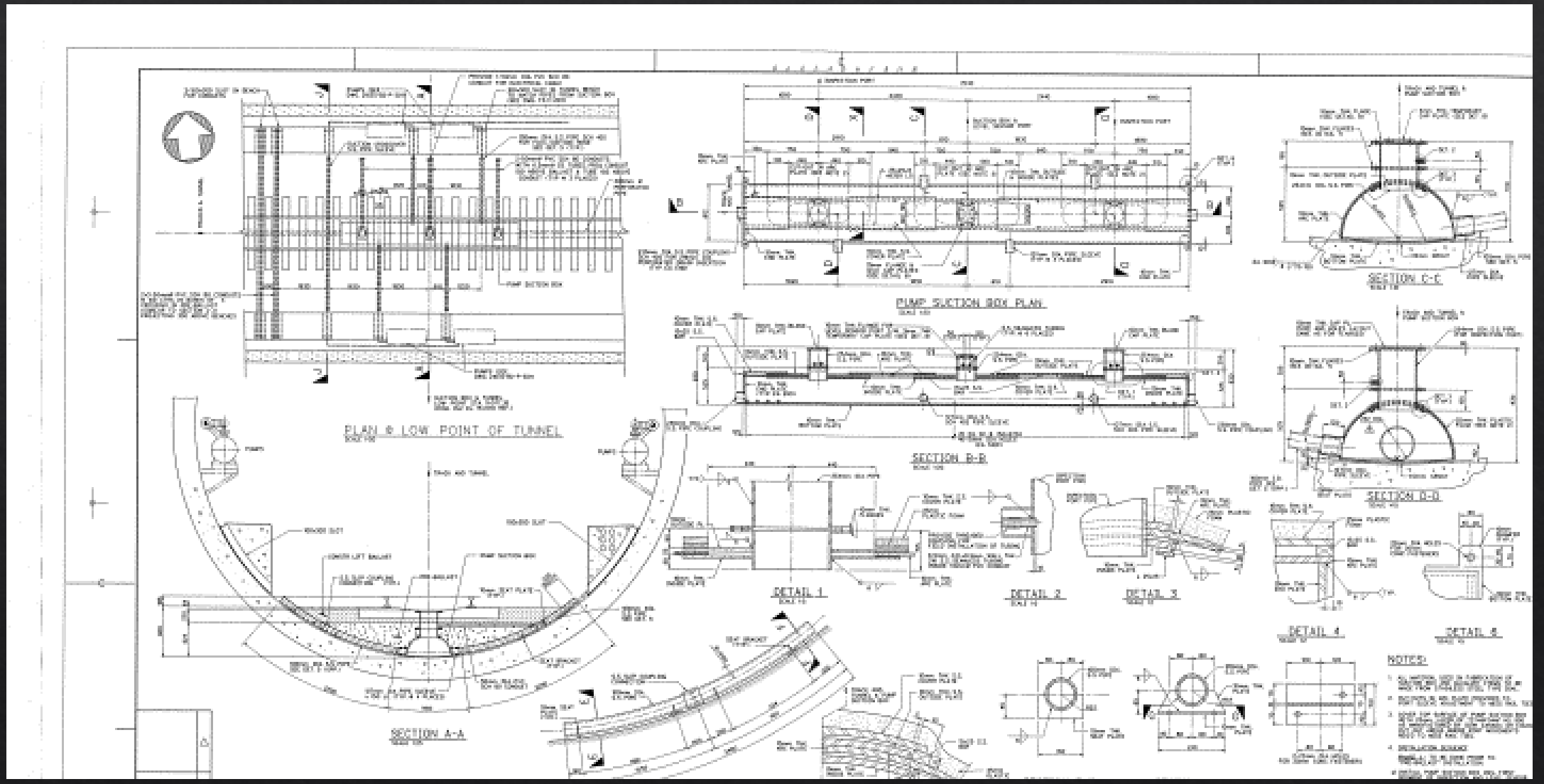
Initial Situation

Acid pooled throughout large segments of tunnel, and filling sump

Initial Situation – Sump Location



Initial Situation – Sump Design



Initial Situation

Paper strewn about wreckage – sitting in acid in areas

Initial Situation

Auto Rack Car adjacent to paper and acid wreckage

Operations – More Detail

- Generally, rail cars were removed into both US and Canada, one by one, working towards the tunnel center
- EPA Special Operations Focus Areas – Specific Plans required for
  - Pumping/removal of sulfuric acid liquid
  - Neutralization
  - Removal of sulfuric acid car
  - Removal of contaminated ballast
  - Removal of acid contaminated paper


295-003615
Tunnel Opening - 60 sign
ID: ENG190702-001 | ID: ENG190704-005
2-Jul-19 | 4-Jul-19
<0.006 mg/m3 | 0.005 mg/m3
295-003215
295-002460
Cleared Rail Car and Equipment Staging Area
GHD Air Monitoring Host Location
Incident Management Command Post
Tunnel Opening
Pump for Liquid Removal
External Tunnel Ventilation System
Liquid Removal Hose
VAT Location (see inset below)
Temporary Liquid Waste Storage Area
Temporary Liquid Removal System and Storage
Bike Path - East side of 10th Ave
ID: ENG190702-003 | ID: ENG190704-001
2-Jul-19 | 4-Jul-19
<0.005 mg/m3 | <0.004 mg/m3
Access Gate
Personnel Check-in Point
Figure 2 - West
CN Incident Command
US EPA Command Trailer
Incident CP3 Area
VAT Inset
Port Huron
Sarnia
Tunnel VAT
ID: ENG190702-005 | ID: ENG190703-001 | ID: ENG190704-003
2-Jul-19 | 3-Jul-19 | 4-Jul-19
0.004 mg/m3 | 0.019 mg/m3 | 0.025 mg/m3
Figure 2 - West
Figure 1 - East
Legend
Analytical Air Sampling Location
Approximate Area/RAE Location
Wind Sock Location
Tunnel Outline
Access Road
Note: mg/m3 - Milligram Per Cubic Meter

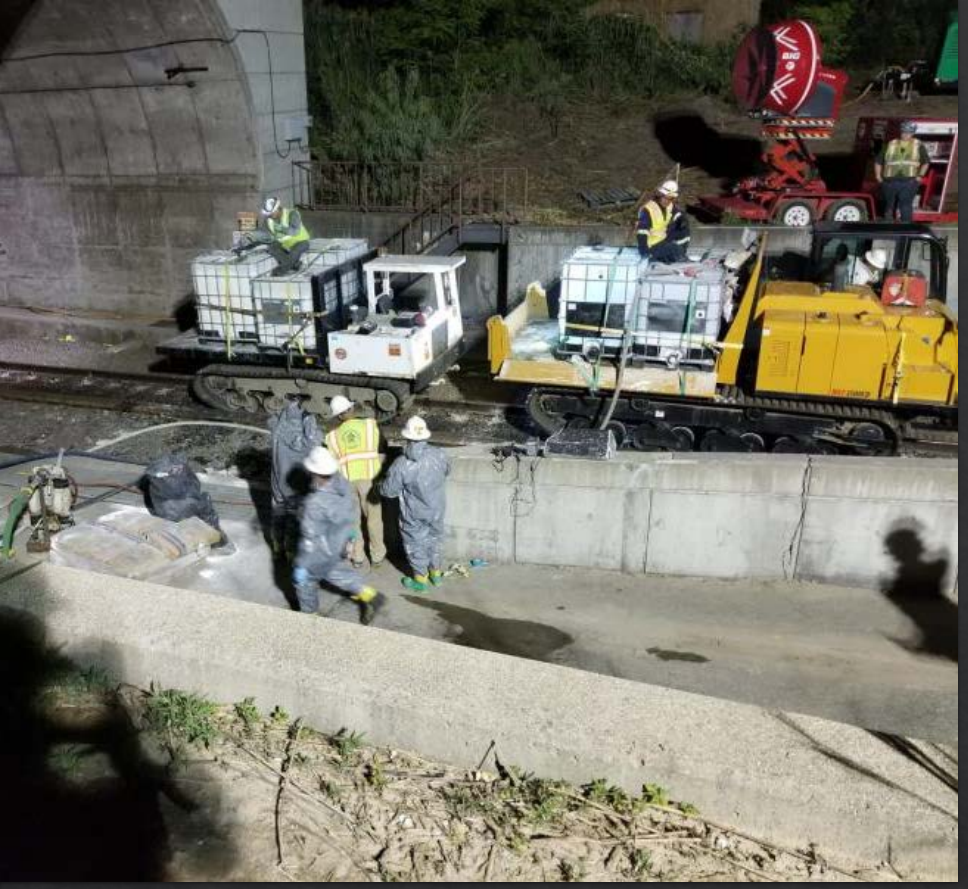
View of exclusion zone entry point from tunnel entrance

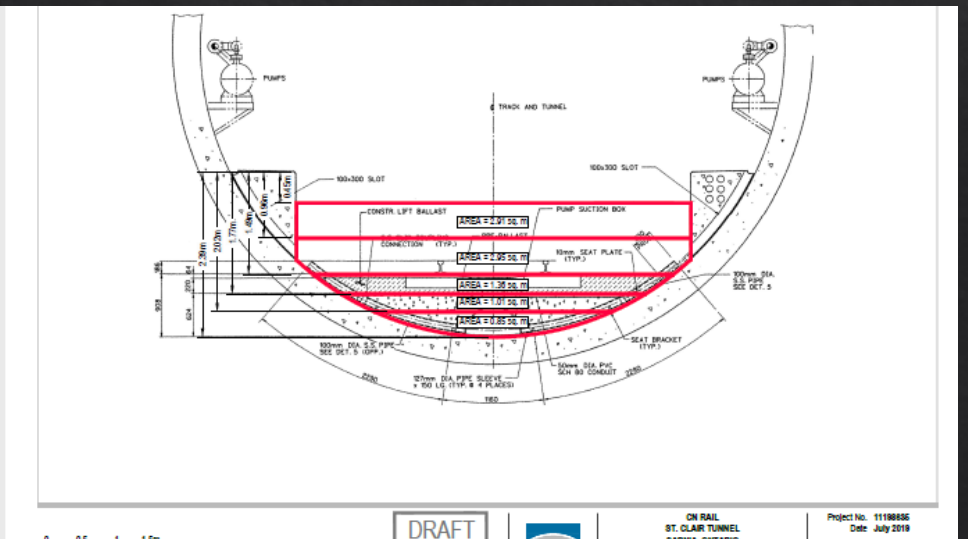
Sulfuric Acid Removal System

Track vehicles with mounted totes and pumps were initially used to remove pooled acid from thought out tunnel and sump. Eventually pumped direct to vac truck.

Sump

- View of sump while liquid is being pumped out
- Approx 90,000 gal very low pH pumped out to date.





Neutralizing

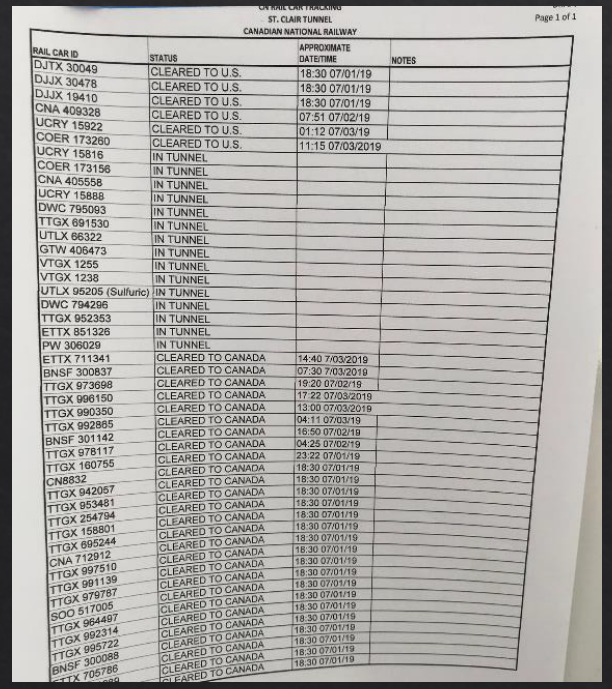
- pH of liquid in sump was zero initially, and 1 in ballast pools
- 1,329 cubic yards contam ballast estimated in tunnel
- Plans were approved to use both lime and sodium hydroxide
- Due to strength of acid, large quantities of neutralizer required
- Crews tried to use lime and pumping exclusively, but sump kept recharging and pH did not improve enough so eventually did use sodium hydroxide as well
- Dave Mickunas and Larissa Leonova commented on multiple drafts

Removal of Sulfuric Acid Car

- Sulfuric acid car was removed into Canada on 7/4/19
- Car was mostly empty
  - Approx 581 gal of sulfuric acid was pumped from the car prior to removal, and 9,000 L of neutralizer was added to area
- Tunnel was evacuated in removal process due to fuming that CN believed was due to neutralization material reacting with remaining sulfuric
- US and Can fire departments cleared tunnel
- UC called standdown after incident to further address safe removal of remaining rail cars, and debris
- All remaining cars were successfully removed by 7/5/19

Removal of Paper and Auto Car

- A plan to safely remove paper and nearby auto car into the US was drafted with Port Huron Fire, and approved by UC on 7/4/19
- Paper, auto car, and all remaining rail cars were successfully removed without incident on 7/5/19



ST. CLAIR TUNNEL
CANADIAN NATIONAL RAILWAY

Page 1 of 1

RAIL CAR ID	STATUS	APPROXIMATE DATE/TIME	NOTES
DJTX 30049	CLEARED TO U.S.	18:30 07/01/19	
DJJX 30478	CLEARED TO U.S.	18:30 07/01/19	
DJJX 19410	CLEARED TO U.S.	18:30 07/01/19	
CNA 409328	CLEARED TO U.S.	07:51 07/02/19	
UCRY 15922	CLEARED TO U.S.	01:12 07/03/19	
COER 173260	CLEARED TO U.S.	11:15 07/03/2019	
UCRY 15816	IN TUNNEL		
COER 173156	IN TUNNEL		
CNA 405558	IN TUNNEL		
UCRY 15888	IN TUNNEL		
DWC 795063	IN TUNNEL		
TTGX 991530	IN TUNNEL		
UTLX 66322	IN TUNNEL		
GTW 406473	IN TUNNEL		
VTGX 1255	IN TUNNEL		
VTGX 1238	IN TUNNEL		
UTLX 95205 (Sulfuric)	IN TUNNEL		
DWC 794296	IN TUNNEL		
TTGX 952353	IN TUNNEL		
ETTX 851326	IN TUNNEL		
PW 306029	IN TUNNEL		
ETTX 711341	CLEARED TO CANADA	14:40 7/03/2019	
BNSF 300837	CLEARED TO CANADA	07:30 7/03/2019	
TTGX 973698	CLEARED TO CANADA	19:20 07/02/19	
TTGX 996150	CLEARED TO CANADA	17:22 07/03/2019	
TTGX 990350	CLEARED TO CANADA	13:00 07/03/2019	
TTGX 992865	CLEARED TO CANADA	04:11 07/03/19	
BNSF 301142	CLEARED TO CANADA	16:50 07/02/19	
TTGX 978117	CLEARED TO CANADA	04:25 07/02/19	
TTGX 160755	CLEARED TO CANADA	23:22 07/01/19	
CN8832	CLEARED TO CANADA	18:30 07/01/19	
TTGX 942057	CLEARED TO CANADA	18:30 07/01/19	
TTGX 953481	CLEARED TO CANADA	18:30 07/01/19	
TTGX 254794	CLEARED TO CANADA	18:30 07/01/19	
TTGX 158801	CLEARED TO CANADA	18:30 07/01/19	
TTGX 695244	CLEARED TO CANADA	18:30 07/01/19	
CNA 712912	CLEARED TO CANADA	18:30 07/01/19	
TTGX 997510	CLEARED TO CANADA	18:30 07/01/19	
TTGX 991139	CLEARED TO CANADA	18:30 07/01/19	
TTGX 979787	CLEARED TO CANADA	18:30 07/01/19	
SOO 517005	CLEARED TO CANADA	18:30 07/01/19	
TTGX 964497	CLEARED TO CANADA	18:30 07/01/19	
TTGX 992314	CLEARED TO CANADA	18:30 07/01/19	
TTGX 995722	CLEARED TO CANADA	18:30 07/01/19	
BNSF 300988	CLEARED TO CANADA	18:30 07/01/19	
ETTX 706786	CLEARED TO CANADA	18:30 07/01/19	

Wrecking

- Slow process on US side
- Heavier cars, derailed cars deep in tunnel

- Many cars broke apart during removal and spilled all contents into tunnel

- CN eventually removed all rails and ties to speed process

Waste Staging

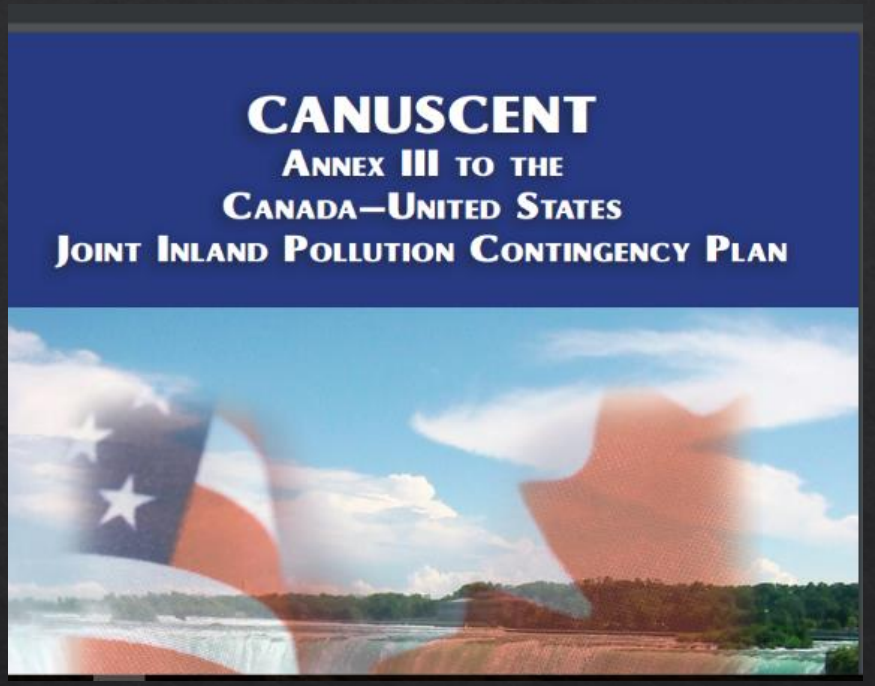
- Several staging areas were established to stage debris and acidic liquid
- Secondary containment was installed at all areas
- CN worked to expedite disposal
- Disposal of liquid was challenging due to very low pH

Incident Location Definition

- On 7/3/19, CN informed EPA that they believed that the sump is located in the US, and the sulfuric acid car is in Canada
- On 7/4/19, NTSB and EPA were able to see the flags painted on the tunnel side.
- On 7/5/19, NTSB and TSB issued a statement indicating that the derailment location was on the Canadian side of the tunnel.

Coordination

- UC composition worked well
- Cooperating Agencies
  - Environment Canada
  - Sarnia (Ontario) Fire Department
  - CA TSB and US NTSB/FRA
    - EPA attended NTSB/TSB daily meetings – great information exchange
  - US Customs and Border Protection
  - US Coast Guard
  - Michigan Department of Health and Human Services
- Contingency Plans
  - Canada – US Joint Inland Pollution Contingency Plan Applied
  - CANUSCENT Annex (agreement for transfer of resources across border) not invoked
- Daily/twice daily calls with Environment Canada. No Canadian requests for assistance.



Release / Jurisdiction

- Derailment determined to have occurred in Canada
- CN did not file NRC report – did not believe they had a release
- Sulfuric car accident location determined to be in Canada
- Sulfuric car removed into Canada
- Acid contaminated waste removed into US
- Acid ran into sump in US, and was pumped out into the US, staged in US, disposal in US
- CN data show sulfuric acid in air sampling results outside tunnel mouth
- SPM flexes show detections around site perimeter

Authority Considerations

- CERCLA
  - Broad authorities to evaluate and mitigate release, or threat of release, of hazardous substances, pollutants or contaminants that present imminent and substantial endangerment to human health and the environment
    - Petroleum exclusion evaluate
- CWA/OPA
  - Response actions linked to discharge, or substantial threat of discharge, of oil or hazardous substance to navigable waters
    - Potential issue when there is no threat to navigable waters
- RCRA
  - Broad authorities to require response actions to solid or hazardous wastes (including oil) but no funding mechanism
    - Need a viable liable party for issuance of a 7003 Order

In Closing

- Waste Disposal
  - >90,000 gallons of Sulfuric Acid
  - >1,700 tons of Ballast Waste

- After Action Review
  - August 27, 2019
  - DRAFT Report in Review

QUESTIONS?