C-105 Retrieval

Industrial hygiene sampling and monitoring results

Key Performance Parameter #1

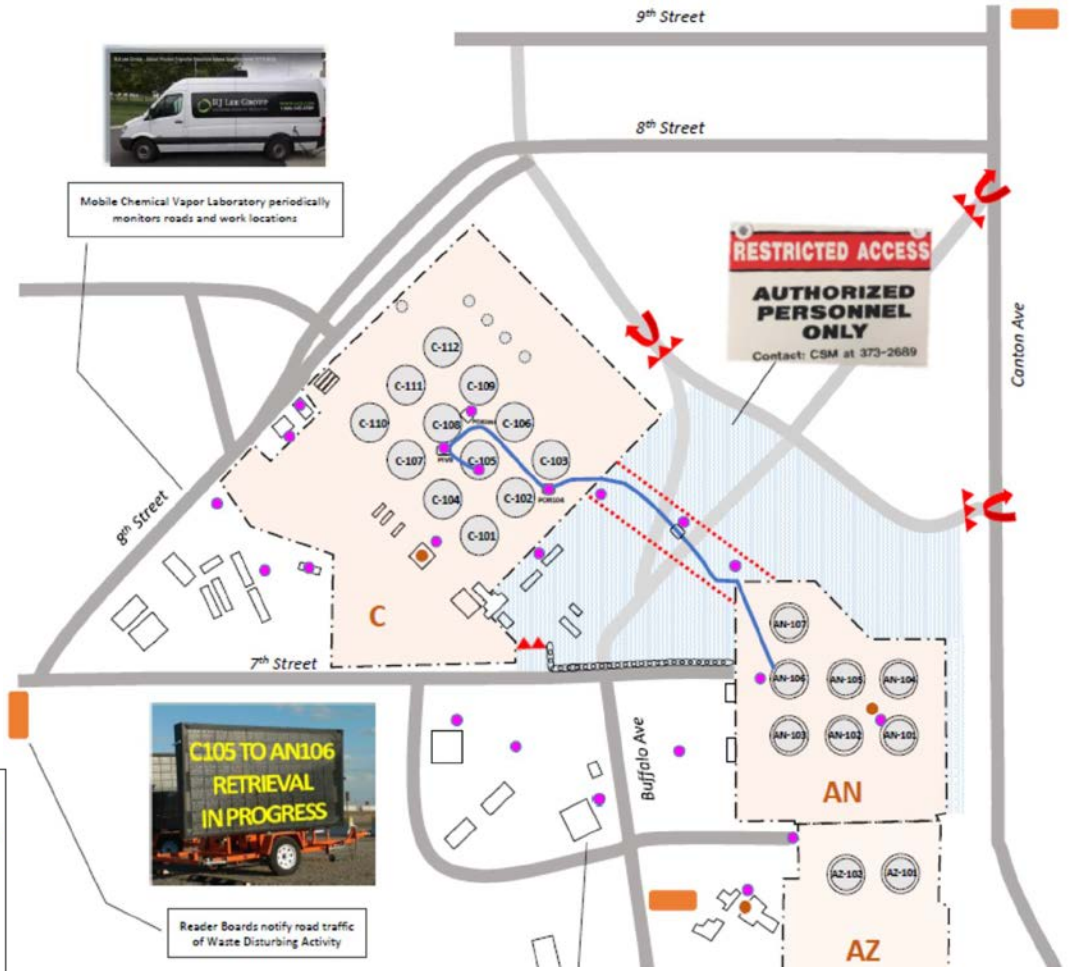
Engagement and Effectiveness Measurement

washington river protection solutions

C-105 to AN-106 Retrieval Industrial Hygiene Strategy

Table 1: AreaRAE Locations
North East of MO-598
East of MO-523
West of AN Farm (between Buffalo and MO-497)
North East of POR107
South East of AN Exhauster
MO-596
MO-597
Middle of C Farm Egress Tent
C Farm Control Trailer/MO-579
North West of C Farm fence line
C-105
PIVB
POR104
POR209 Bypass
AN-106
North West of AN Farm
Corridor 8 Gate
Splice of Berm between AN and C Farm
C Farm Retrieval Change Trailer
702AZ
Outside of C Farm middle Change Trailer
North East Corner of C Farm

Mobile Chemical Vapor Laboratory periodically monitors roads and work locations



Legend

- Waste Transfer Line
- Rad Transfer Boundary
- Location of Exhauster
- AreaRAE Locations
- Restricted Access - Authorized Personnel Only – Contact CSM - 373-2689
- Tank Farm Boundary – Respiratory Protection Required
- Road Blocked
- Turn around location
- Reader Board Locations; Waste Disturbing Activity / C-105 to AN-106
- Chain with Restricted Access Signs

C-105 Campaign Timeline

- **August 11 - 14, 2017**
  - Begin sluicing operations
- **August 15, 2017**
  - Industrial Hygiene evaluation
- **August 16 - 17, 2017**
  - Hot water addition and recirculation
- **August 18 - 20, 2017**
  - AN pump down
- **August 21 - 26, 2017**
  - Sluicing operations resume
- **August 27, 2017**
  - C-105 pump down
- **August 28 - August 31, 2017**
  - Caustic addition
- **September 1 - September 27, 2017**
  - Caustic recirculation
- **September 28, 2017**
  - High pressure water operations
- **September 29 - October 8, 2017**
  - Operations suspended/Maintenance outage
- **October 9 - 20, 2017**
  - Sluicing and water recirculation operations
- **October 21 - 22, 2017**
  - Engineering assessment
- **October 23 - November 2, 2017**
  - Caustic addition and recirculation
- **November 3, 2017**
  - C-105 retrieval concluded

WRPS Industrial Hygiene Group
Direct Read Instrumentation (DRI) Data

C-105 Retrieval Summary – IH Data
DRI 8/11/17 – 11/3/17

- Throughout the retrieval operations and during normal operations, the Industrial Hygiene (IH) group collected Direct Reading Instruments (DRI) measurements throughout the C Farm and AN Farm. This included area, vapor control zone (VCZ), and source readings.

- In addition to retrieval sampling, the IH group continued to conduct its monitoring of work occurring outside of the retrieval operations period. The data was compiled for both operations and analyzed to determine if tank farm chemical concentrations increased during and after retrieval.

- The analysis of the tank farm data did not show any increase in area or vapor control zone chemical concentrations.

- Source readings did show elevated levels of ammonia as expected, however, elevated ammonia levels were not found in the farms during or after retrieval operations.

C-105 Retrieval | Area, BZ, & VCZ DRI Readings 8/10/2017 to 11/4/2017

Farm	Agent	Action Limit	Peak Value	Reading Counts		
				Non-detectable	Detected Below AL	Detected Above AL
C FARM	Ammonia	12 ppm	1.1 ppm	1773	6	-
	Mercury	12,500 ng/m³	253 ng/m3	17	27	-
	Volatile Organic Compound	2 ppm	5.23 ppm	1727	26	4
			Total	3517	59	4

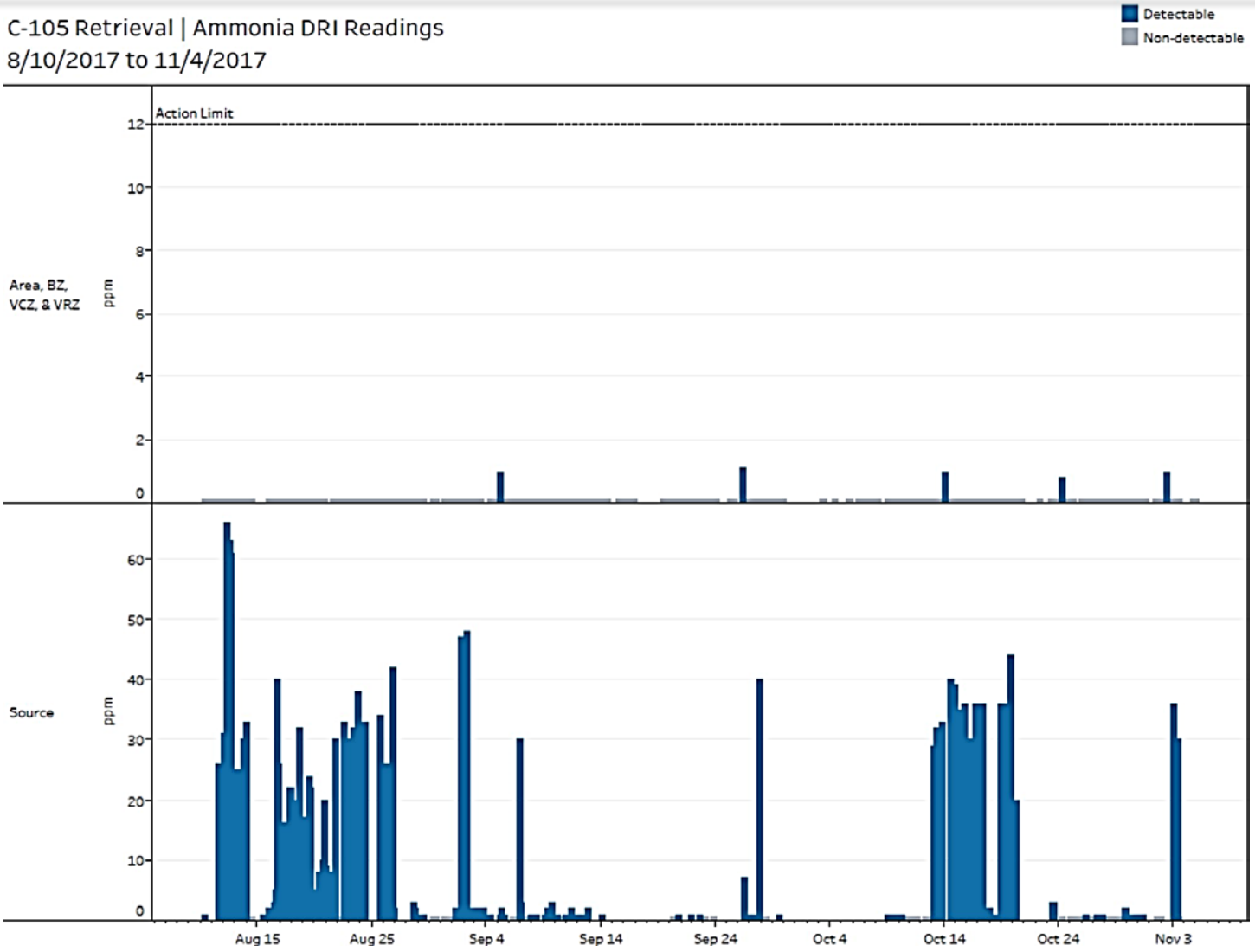
C-105 Retrieval | Source DRI Readings 8/10/2017 to 11/3/2017

Farm	Agent	Peak Value	Total Count of Readings
AN FARM	Ammonia	66 ppm	69
	Volatile Organic Compound	7.9 ppm	69
C FARM	Ammonia	30 ppm	193
	Mercury	267 ng/m3	4
	Volatile Organic Compound	4.48 ppm	193
		Total	528

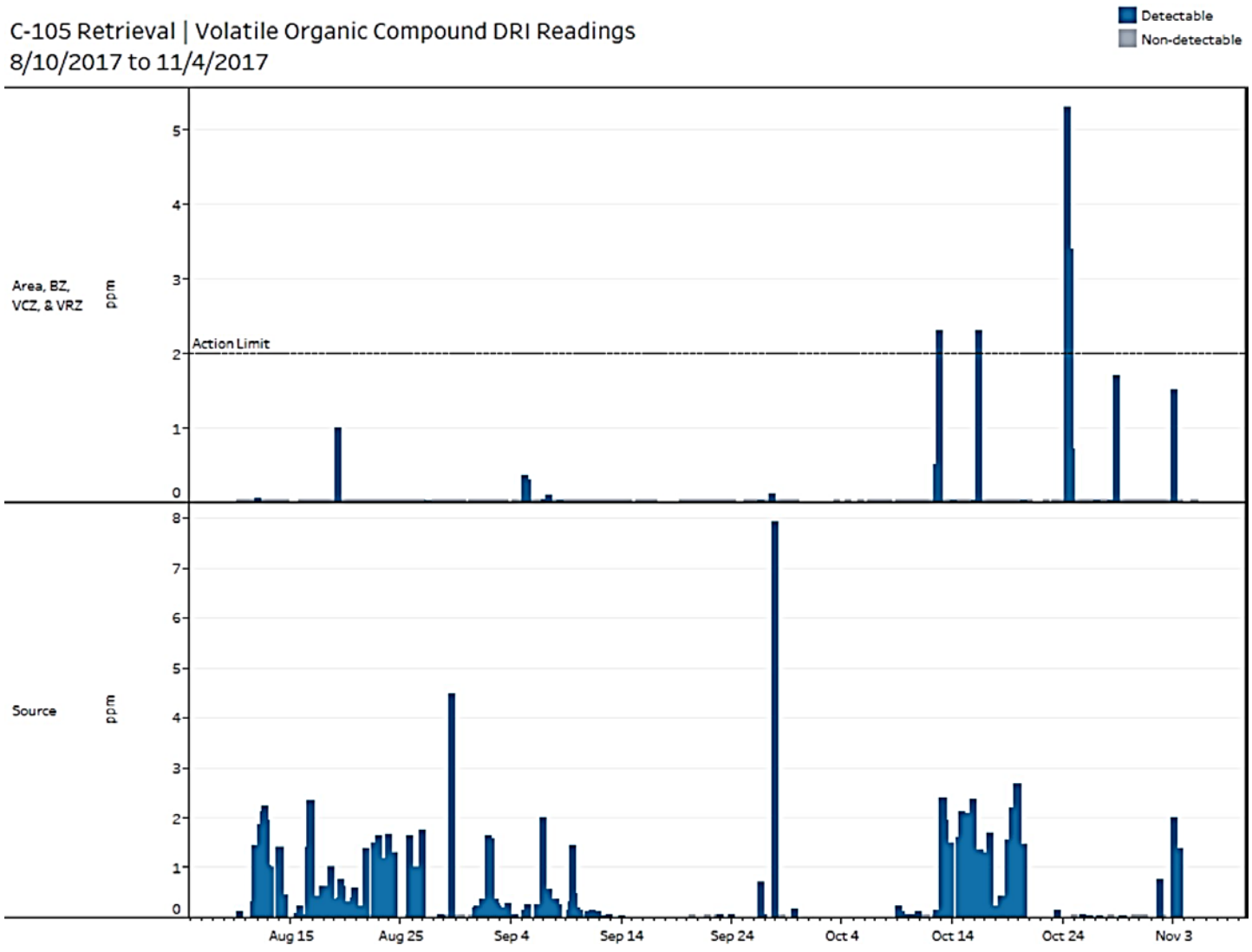
10/12/17: Found to be a malfunctioning AreaRae
10/16/17: Found to be a malfunctioning AreaRae
10/24/17: 2 readings were found above the Action Limit in the middle C egress tent.
Investigation by 2 Industrial Hygiene Technicians indicated 2 potential sources, but they were unable to verify them*.

*Please see the presentation notes for the SWIHD investigation report

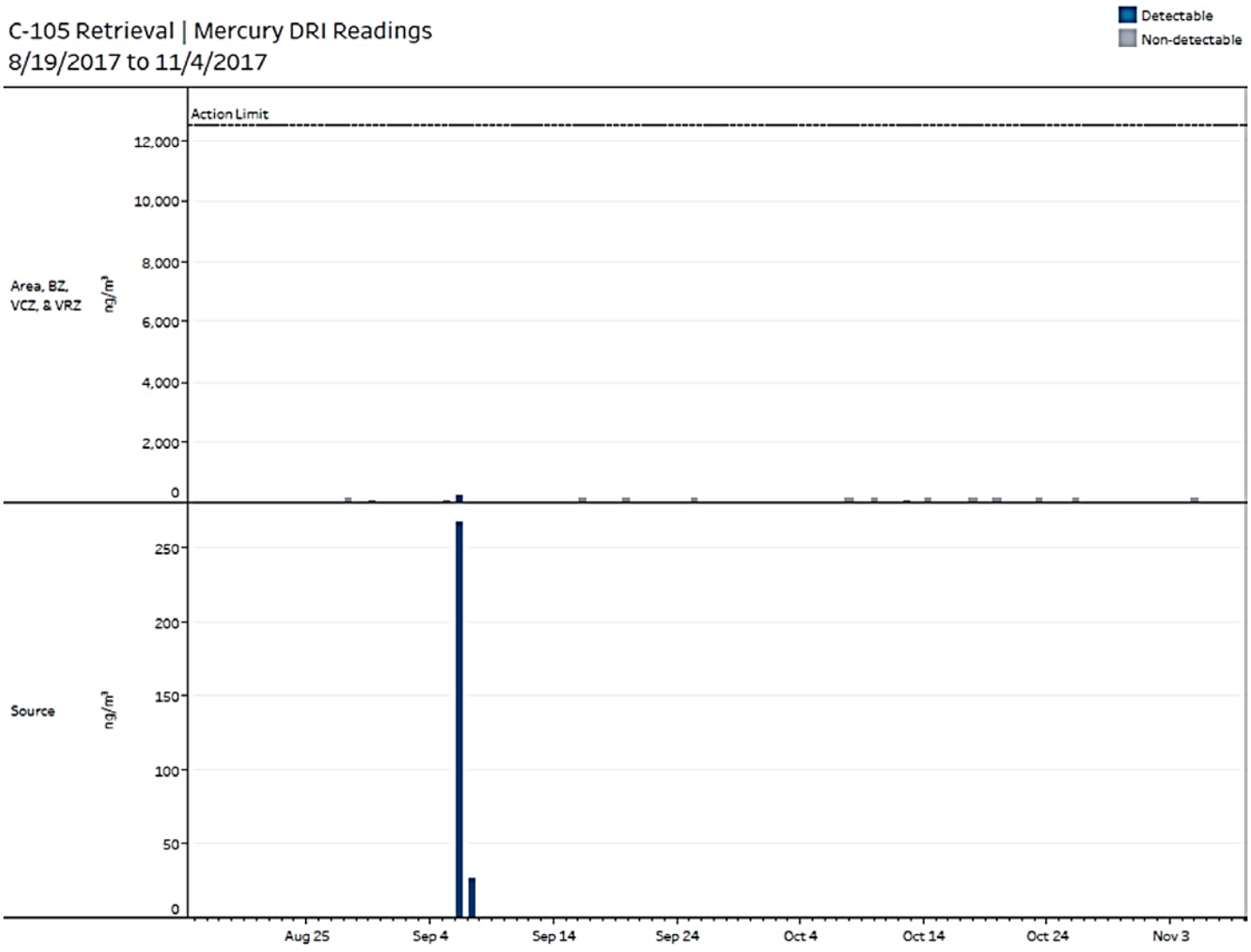
DRI Ammonia readings collected 8/11/17 – 11/3/17



DRI VOC readings collected 8/11/17 – 11/3/17



DRI Mercury readings collected 8/11/17 – 11/3/17



Personal Sampling 8/11/17 – 8/27/17

*all samples not yet analyzed through 11/3/17

C-105 Retrieval | Personal Air Sampling COPC Results
August 12-27, 2017

Farm	Agent	Count of Results	Count of Detectable Results	Maximum Detectable Result (% of OEL)
AN FARM	1-Butanol	2	0	
	1,3-Butadiene	4	0	
	2-heptylfuran	2	0	
	2-Hexanone	2	0	
	2-Methylfuran	2	0	
	2-Pentylfuran	2	0	
	2-propylfuran	2	0	
	2, 4-Dimethylpyridine	2	0	
	2,3-Dihydrofuran	2	0	
	2,5-Dihydrofuran	2	0	
	2,5-Dimethylfuran	2	0	
	4-Methyl-2-hexanone	2	0	
	Ammonia	2	0	
	Benzene	2	0	
	Butanal	2	0	
	Butanenitrile	2	0	
	Ethylamine	2	0	
	Formaldehyde	2	2	0.133 %
	Furan	2	0	
	Hexanenitrile	2	0	
	Mercury	2	0	
	n-Nitrosodiethylamine	2	0	
	N-Nitrosodimethylamine	2	0	
	N-Nitrosomethylethylami..	2	0	
	n-Nitrosomorpholine	2	0	
	Nitrous Oxide	2	0	
	Pentanenitrile	2	0	
	Propanenitrile	2	0	
	Pyridine	2	0	

- Only 2 detections were found in AN Farm.
  - Both were for formaldehyde
  - 0.133% of OEL

C-105 Retrieval Summary – IH Data
Personal Sampling 8/11/17 – 8/27/17

*all samples not yet analyzed through 11/3/17

C-105 Retrieval | Personal Air Sampling COPC Results
August 12-27, 2017

Farm	Agent	Count of Results	Count of Detectable Results	Maximum Detectable Result (% of OEL)
C FARM	1-Butanol	13	1	0.002 %
	1,3-Butadiene	26	0	
	2-heptylfuran	13	0	
	2-Hexanone	13	0	
	2-Methylfuran	13	0	
	2-Pentylfuran	13	0	
	2-propylfuran	13	0	
	2, 4-Dimethylpyridine	13	0	
	2,3-Dihydrofuran	13	0	
	2,5-Dihydrofuran	13	0	
	2,5-Dimethylfuran	13	0	
	4-Methyl-2-hexanone	13	0	
	Acetonitrile	5	2	0.040 %
	Ammonia	13	0	
	Benzene	13	0	
	Butanal	13	0	
	Butanenitrile	13	0	
	Ethylamine	13	0	
	Formaldehyde	13	13	0.133 %
	Furan	14	0	
	Hexanenitrile	13	0	
	Mercury	13	0	
	n-Nitrosodiethylamine	13	0	
	N-Nitrosodimethylamine	13	0	
	N-Nitrosomethylethylami..	13	0	
	n-Nitrosomorpholine	13	0	
	Nitrous Oxide	13	5	2.626 %
	Pentanenitrile	13	0	
	Propanenitrile	13	0	
	Pyridine	13	0	

- 21 detections were found in C Farm.
  - 13 for Formaldehyde
    - 0.133% of OEL
  - 5 for Nitrous oxide
    - 2.626% of OEL
  - 2 for Acetonitrile
    - 0.040% of OEL
  - 1 for 1-Butanol
    - 0.002% of OEL

Readings collected 8/12/17

RJ Lee Mobile Lab

Readings collected 8/12/17

The RJ Lee Mobile Laboratory Proton Transfer Reaction – Mass Spectrometer, or PTR-MS, took readings at the Hanford Site near C Farm to capture data from the C-105 retrieval operation.

The Mobile Lab takes readings every 2 seconds continuously for:

- 185+ compounds, including 52 of the 59 chemicals of potential concern (COPCs)
- Weather data, and
- GPS location data.

The data is analyzed by software to determine the compound identities and their concentrations.

In total, almost 500,000 measurements were recorded on 8/12/17 for 185+ compounds.

C-105 Retrieval Summary – Mobile Lab Data
Readings collected 8/12/17

C-105 Retrieval | Mobile Laboratory COPC Results
8/12/2017

		Number of Readings	Seconds Over AL	Seconds Over OEL
COPC Results	NDMA	2,158	244	8
	NDEA	2,158	8	0
	1-BUTANOL + BUTENES	2,158	0	0
	1,2,3-PROPANETRIOL 1,3-DINITRATE	2,158	0	0
	1,3-BUTADIENE	2,158	0	0
	1,4-BUTANEDIOL DINITRATE	2,158	0	0
	2-ETHYL-2-HEXENAL + 4-(1-METHYLPROPYL)-2,3-DIHYDROFUR..	2,158	0	0
	2-HEPTYLFURAN	2,158	0	0
	2-HEXANONE (MBK)	2,158	0	0
	2-METHYLENE BUTANENITRILE	2,158	0	0
	2-METHYLFURAN	2,158	0	0
	2-OCTYLFURAN	2,158	0	0
	2-PENTYLFURAN	2,158	0	0
	2-PROPYLFURAN + 2-ETHYL-5-METHYLFURAN	2,158	0	0
	2,4-DIMETHYLPYRIDINE	2,158	0	0
	2,4-PENTADIENENITRILE + PYRIDINE	2,158	0	0
	2,5-DIMETHYLFURAN	2,158	0	0
	3-METHYL-3-BUTEN-2-ONE + 2-METHYL-2-BUTENAL	2,158	0	0
	4-METHYL-2-HEXANONE	2,158	0	0
	6-(2-FURANYL)-6-METHYL-2-HEPTANONE	2,158	0	0
	6-METHYL-2-HEPTANONE	2,158	0	0
	ACETALDEHYDE	2,158	0	0
	ACETONITRILE	2,158	0	0
	AMMONIA	2,158	0	0
	BENZENE	2,158	0	0
	BIPHENYL	2,158	0	0
	BUT-3-EN-2-ONE + 2,3-DIHYDROFURAN + 2,5-DIHYDROFURAN	2,158	0	0
	BUTANAL	2,158	0	0
	BUTANENITRILE	2,158	0	0
	BUTYL NITRATE	2,158	0	0
	BUTYL NITRITE + 2-NITRO-2-METHYLPROPANE	2,158	0	0
	ETHYLAMINE	2,158	0	0
	FORMALDEHYDE	2,158	0	0
	FURAN	2,158	0	0
	FURFURAL ACETOPHENONE	2,158	0	0
	HEPTANENITRILE	2,158	0	0
	HEXANENITRILE	2,158	0	0
	METHANOL	2,158	0	0
	METHYL ISOCYANATE	2,158	0	0
	METHYL NITRITE	2,158	0	0
	NEMA	2,158	0	0
	NMOR	2,158	0	0
	PCB	2,158	0	0
	PCB2	2,158	0	0
	PENTANENITRILE	2,158	0	0
	PROPANENITRILE	2,158	0	0

Total number of all mobile lab readings (including non-COPCs): 489,867

Readings collected 8/12/17

Summary of the RJ Lee Mobile Lab detections					
Chemical of potential concern (COPC)	Time above action level concentration	Time above Occupational Exposure Limit (OEL) concentration	Average detection level	Maximum detection level	OEL
NDMA	244 seconds	8 seconds*	0.05 ppb	0.33 ppb	0.3 ppb*
NDEA	8 seconds	0 seconds	0.00 ppb	0.07 ppb	0.1 ppb

The mobile lab only monitored on this day from 2:52 PM to 4:07 PM

***Please note that these concentrations are not a time-weighted average and are not representative of worker exposure.**

Questions?

Please contact:

The Chemical Protection Program Office

WRPSCPPO@rl.gov

Special thanks to Mark Bleuze and Joyce Caldwell for assisting with the IH data summarization.